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ABSTRACT

To examine the feasibility of establishing Highway Safety Manpower Development and Research (HSMDR) Centers at university-level institutions which would produce three types of manpower--safety specialists, safety professionals, and research manpower, previous National Highway Safety Bureau research studies and approximately 50 federally funded education, training, and research programs were reviewed. This document, the first of a 2-volume report, contains results and recommendations of the feasibility study in these chapters: (1) Skills and Disciplines Required for Highway Safety Manpower Development, (2) Alternative Strategies for Establishing HSMDR Centers, (3) Criteria for the Selection of Candidate Universities, (4) Identification of Candidate Universities, (5) Results of Discussions with University Representatives on the Establishment of Centers, (6) Guidelines for the Administration and Operation of Centers, (7) Evaluation Plan, (8) A General Plan for Program Controls, (9) Congressional Justification for the Establishment of Regional Pilot Centers, and (10) Preparation of a Request for Proposal for the Establishment of Regional Pilot Centers. Several data tables and other study materials are available in Volume II (VT 013 332) in this issue. (SB)

Final Report

THE FEASIBILITY OF ESTABLISHING HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH CENTERS AT UNIVERSITY-LEVEL INSTITUTIONS

Volume I: Study Report

Prepared for:

OFFICE OF SAFETY MANPOWER DEVELOPMENT, TRAFFIC SAFETY INSTITUTE
NATIONAL HIGHWAY SAFETY BUREAU
DEPARTMENT OF TRANSPORTATION
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Volume I: Study Report

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INTRODUCTION

Background

If the toll of accidents and fatalities on the national highways is to be appreciably reduced, it is clear that a sizable professional work force must be created to assume the enormous task of implementing and enforcing highway safety and motor vehicle standards. This work force must be allocated to federal, state, and local levels if the national program is to be successful. The program will require new occupational skills and will compete with other professions and manpower pools for qualified and educated personnel. Attractive programs at the bachelor's, master's, and even doctoral levels, will be needed to entice students and others into these fields. There will also be a need for relatively short training programs at lower skill levels and for programs to provide refresher training and new knowledge to existing members of the work force at all levels of safety manpower.

The National Highway Safety Bureau is particularly interested in developing research talent for highway safety fields through new programs at selected universities. These new programs will be multidisciplinary in nature, inasmuch as highway safety is not a singular science. In this respect, the NHSB shares those problems that were faced in the establishment of occupational programs in areas such as transportation, operations research, and social relations. Each of these has been established as an academic program cutting across several university departments and has had the salutary effect of producing graduates who are at home in several disciplines in addition to their major area of concentration.

As the requirements for training safety manpower have become more defined, it has become quite evident that there is an absence of a sufficient number of educational centers oriented toward highway safety. For those that do exist, the demands that could be placed on them would far exceed their capacity. Projections of the present need for skilled safety manpower surely must be out of proportion with even the most liberal estimates of growth expected in currently established training programs to meet such needs. Considerable effort will be required for the attainment of newly established federal standards and goals for highway safety and accident reduction. It is clear that the training of highway safety specialists and safety professionals and the development of research capability for highway safety cannot be provided on a fragmentary basis.

The problem of highway safety is such a pervasive one in our society that it may justify the establishment of specialized centers such as those provided for research and training in the field of education. After many years of attempting to improve educational practices through a centralized function, the federal government has instituted regionalized laboratories, university research and development centers, and internships at qualified universities to increase the number of professionals in educational research. There is some parallel between this evolution and that which may be envisioned for training and education in highway safety.

The scale of the highway safety manpower development problem on a national basis is so great that several critical issues must be addressed. These include the needs to:

- Marshall existing educational resources, especially those at institutions of higher education, and effect an integration of them into a systematic program

- Integrate existing educational and training centers oriented toward highway and traffic safety and traffic and transportation engineering into an effective program of safety manpower development, since these centers have already developed considerable experience in training, curriculum development, and research

- Develop a manpower development program whose structure will be consistent with the capability and resources of the NHSB to manage, control, and coordinate the program, and which is also consistent with reliable estimates of federal funding that may be made available for the establishment of safety manpower development centers and ensuring their continuity

- Stimulate the interest of employing agencies at state and local agencies so that, as they develop highway safety programs from guidance received through the publication of federal highway safety program standards, they will undertake to create new positions to be filled by qualified personnel

- With the expectation that federally supported training centers will come into being, assist the employing agencies in further developing the proficiencies of personnel employed in job specialties related to highway safety.

Many options exist in the context of higher education for the establishment of a system for the development of highway safety manpower. Centers for such purposes could be established at salient universities in each state, or the major training requirements conceivably could be satisfied through the establishment of a national academy, using the FAA Academy as a model. Between these two approaches is that of establishing a series of regional centers into which would be grouped the resources of highly qualified universities that have established capabilities and experience in operating university-based transportation research centers and traffic and highway safety institutes. Unique possibilities exist, also, for enlisting the support of other segments of the educational system in conjunction with any of the major options just described. Community colleges, for example, could be commissioned to provide instruction on selected job specialties in highway safety, just as they now provide instruction in other technical areas. In the current study, several options similar to those noted above were examined, and unique combinations of these also have been studied. The options or strategies examined in this study do not exhaust the total possible array of alternative approaches, but they do represent the ones in which the NHSB has had an abiding interest. They also represent additional possibilities that have emerged during the course of the study and were not anticipated at the outset. The feasibility of each option or alternative has been guided by such criteria as cost and effectiveness, the ability to stretch the existing resources of experienced personnel in highway safety, the extent of their management and control by the sponsoring federal agency, and other factors, such as the estimated time required for the establishment of a full array of centers.

Objective

The main objective of this study was to examine the feasibility of establishing HSMD&R (Highway Safety Manpower Development and Research) Centers at university-level institutions. These centers would produce three types of manpower: safety specialists, safety professionals, and research manpower.

Major elements of this feasibility study included:

- Determination of the relative feasibility among several alternative strategies of the placement of HSMD&R Centers. It is conceivable that centers could be placed at state, regional, or national levels. Limited variations within these options were also examined.

- Determination of the criteria that should be employed for purposes of assessing the qualifications of a university to support a center, and the identification of universities throughout the country that meet these criteria.

- Development of guidelines for the establishment and operation of the proposed centers, emphasizing the coordination of the NHSB and employing agencies of highway safety manpower, and for the operation of a center and its relations with the university of which it would be a part.

- Development of evaluation procedures and program controls to enable the NHSB to measure the effectiveness of HSMD&R Centers with respect to the quality of their training programs, their ability to provide trained safety manpower in numbers commensurate to the needs of employing agencies, and their ability to produce graduates qualified to perform their safety functions effectively in their employing agencies at local, state, and federal levels.

- Development of preparatory materials for an RFP (Request for Proposal), for establishment of HSMD&R Centers, including a work statement, task descriptions, and related materials, for formalization and submission to bidder universities by the NHSB.

- Development of program justification for HSMD&R Centers, in a form suitable for submission to Congress at the discretion of the NHSB.

SUMMARY OF MAIN FINDINGS

The study of the feasibility of establishing HSMD&R Centers at university-level institutions produced the following main findings. Chapter references indicate where a complete discussion and supporting information may be found in the text of the report.

Skills and Disciplines Required for Highway Safety Education and Training (Chapter 1)

Analyses were made of earlier sponsored studies by this NHSB of highway safety manpower requirements to determine requisite entry and refresher training for 36 general job specialties. These training needs were transformed into "full-time equivalent" student loads so that a national training requirement could be established.

Job specialties were analyzed to determine their skill requirements and the commensurate university disciplines needed to support them in a training program. The primary disciplines are engineering, education, and police sciences. Other related disciplines are psychology, law, medicine, and public or business administration.

The size of the faculty to be allocated to the HSMD&R Centers was determined, by discipline, and for the total education, training, and research requirement. All training requirements were projected on a five-year basis, to 1973, and on a ten-year basis, to 1978.

Alternative Program Strategies for the Establishment of Highway Safety Manpower Development and Research Centers (Chapter 2)

The literature on optimizing resources for training, education, and research was critically reviewed. Several viewpoints were found to be relevant to the proposed HMSD&R Centers:

- There is a "minimum critical size" for a research organization if it is to flourish, however, a large research group having a narrow focus may become unproductive

- Educational effectiveness may be more a function of the quality of the student than of the institution
- The government may be more suited to provide education and training in highly specialized areas.

Approximately 50 federally funded education, training, and research programs have been reviewed to discover a precedence for the proposed HSMD&R Centers. No existing programs are equivalent in scope and complexity to the proposed centers. It is therefore concluded that the NHSB program must establish an original method of operation unless it wishes to modify its current concept of the program to resemble more closely the other government programs of manpower development.

Application of three principal criteria for the strategy of organizing HSMD&R Centers, viz., feasibility, costs, and speed of implementation, produced the following findings:

- Establishment of regional centers appears to be the most feasible approach, combining the advantages of pooling existing limited capabilities within neighboring states, while avoiding the enormous task of building up a single national centers.
- Economy of scale favors a national center; the total system cost, i.e., initial investment and annual operating costs, are the highest for the 50 state centers and lowest for the single national center. However, it should be noted that a single national center served primarily as an analytical base on which other alternatives could be scaled and costed.
- Speed of implementation would probably be the greatest with a federal academy, but only for the training component. However, existing capabilities in highway safety, traffic and transportation engineering, and research would provide a solid base for a relatively fast build-up for several state or regional centers The effect would be more uniform for the entire country, however, if regional centers were embraced.

The United States was divided into ten regions for purposes of this study. Each region accounts for approximately 10 percent of the national safety manpower training requirements, including both state and local needs.

By applying qualitative criteria to the alternative strategies, it was found that state centers might be more responsive to local needs and receive greater local support, and that a central, or national, university center might be more responsive to federal program standards, and standardization of curricula and be more easily administered by the NHSB. Regional centers were ranked high as a means of marshalling interdisciplinary capabilities. Regional centers also received more second-place rankings than the other alternatives on all effectiveness factors.

Since the scope and complexity of operation that would be demanded of a university if it were to function at the regional level is without precedence, it is concluded that a limited number of pilot centers should be established for operational testing of the regional concept. Under actual operation, empirical findings should emerge to substantiate the a priori advantages of HSMD&R Centers at the regional level or indicate that an alternative strategy should be considered. The current study, by itself, does not justify commitment to a system of regional centers except on the basis of lower costs. It is recommended, however, that the cost estimates in this study be interpreted with the reservations that the data have no greater level of reliability than is typically encountered in statistics on educational institutions, where accounting systems may vary among universities and where frequent variations occur in the completeness of sampling and reporting. Judicious selection should be made of universities for pilot centers to maximize the capability existing in this field. If regional pilot centers are successful, it is envisioned that they would be expanded and that their number would be increased throughout the country.

Criteria for the Selection of Candidate Universities (Chapter 3)

A university's qualifications to support an HSMD&R Center are essentially its capabilities in those disciplines pertinent to highway safety, training, education and research. It should be a Ph.D.-granting institution, with strength in engineering, education and police sciences. Law, medicine, psychology, business administration, or public administration should also be represented.

In view of the need to provide graduate-level instruction, minimum levels (i.e., undergraduate, M.A. Ph.D.) have been established for each discipline. Other criteria more closely related to highway safety have been assembled, e.g., driver education, police traffic engineering, in the event that the NHSB may wish to employ these in a future screening process.

Identification of Candidate Institutions (Chapter 4)

Qualified university candidates were found at regional levels and in several states. In every region, there was at least one university with the basic qualifications. In several regions there were more than one qualified public institution or an alternative private university. It was assumed that universities lacking a single capability, such as law or medicine, could subcontract for such support if they were requested to bid on a center.

Results of Discussions with University Representatives on the Establishment of Centers (Chapter 5)

Sixteen universities were visited to exchange information on the program and determine its impact on each campus. All ten U.S. regions were visited, and both public and private universities were included.

Major findings of the university visits are the following:

- General programming of HSMD&R Centers--A minimum of five-year funding is considered desirable for university centers and will allow for the establishment of the program in orderly phases. University representatives regard the responsibility of operating a center sufficient to justify leadership at the vice-president level. The centers are also envisioned as being directed by the school of engineering, where they could be related to ongoing programs of traffic centers or transportation research.

- Coordination with federal agencies--There is general acceptance of NHSB-established performance standards or criteria for short-course instruction. However, little enthusiasm exists for procedures such as detailed supervision, close monitoring, and excessive progress reporting. Site visits by qualified professionals and review at the program level are considered more appropriate.

- Finances--All of the universities visited have had experience with programs financed by matching federal funds with university funds. Matching funds have been highly varied in their amounts and their purposes (e.g., for fellowships, facilities, or faculty salaries). The extent of matching seems to be correlated with the university's interest in a proposed program.

- Facilities--Research and graduate components of the centers are perceived as being administered by the cooperating university departments rather than by a central facility. However, most university representatives favor a separate facility for integrating the requirements for short-course instruction, libraries, and administration of the center.

- Faculty--The pooling of faculty talents is viewed as necessary to meet the multidisciplinary requirements of the proposed program. While it is considered desirable to have faculty members conduct the short-course instruction, the NHSB should be alert to other sources of instruction, such as practitioners from the field and the appointment of full-time instructors. The faculty will require motivation to remain with the program, including opportunities for advancement within the university.

- Students--The attraction of competent graduate students is dependent on the availability of fellowships and grants, the opportunity to participate in research, and the assurance of career opportunities. Insurance of a flow of short-course students from the field will depend on the cooperation of the employing agencies in establishing positions in highway safety, providing release time for attendance at the centers, encouraging employees to attend, and providing reimbursement for costs incurred.

- Curricula--Most of the universities visited have a base of nonresident instruction or continuing education on which to build a highway safety program. In some cases, however, the short-course instruction planned for centers will require expansion of the current program because of the number of students that must be trained. Under the current concept, students enrolled in short-courses will return to their employing agencies with the main purpose of instructing others. Consequently, there is a concern among university representatives that the practitioner from the field learn instructional skills in addition to technical knowledge and skills.

Guidelines for the Administration and Operation of Centers (Chapter 6)

Critical events were time-phased, for the activation of HSMD&R Centers, and cover:

- Organizational policies and procedures.

- Personnel programming for short-course students, graduate students, faculty for training, faculty for education and research, and the administrative staff.

- Curriculum development in training and education. Representative curricula in highway safety were developed from a study of existing programs at several universities.

- Facilities availability, including occupancy of existing or remodeled structures and new construction.

- Funds availability, representing the planned disbursement of funds during the activation phase of HSMD&R Centers.

Guidelines for the ongoing administration and operation of HSMD&R Centers were developed for each alternative program strategy. Guidelines were structured according to the five areas described above, with special emphasis on:

- Relationships between a center and the NHSB, the host university, and the field environment from which most students will be drawn.

- Ensurance that quality of output (students) is in accordance with needs of the highway safety program.

- Maintenance of a qualified instructional staff, which will conduct training in accordance with stipulated teacher student ratios.

- Continuing scrutiny of curriculum for training and education to ensure that it meets the needs of practitioners in highway safety and that the graduate education is oriented to the professional standards of the university.

Plans for Evaluation of Centers (Chapter 7)

The NHSB expressed a need for a continuing evaluation of the quality and effectiveness of HSMD&R Centers after they have been established. Therefore, a plan was developed for the evaluation of:

- Financial expenditures

- Facilities and equipment

- Training and curriculum development

- Research activities

- Administrative policies and procedures

Evaluation of the training program placed emphasis on the need to stipulate objectives in operational and measurable terms so that they may be validated and on the use of field visiting teams to determine more closely the training needs and adequacy of the existing program.

A General Plan for Program Controls (Chapter 8)

Program controls were designed to enable the NHSB to maintain cognizance of:

- Programmed versus actual training, and rate of funds being expended for training.

- Programming of training in accordance with manpower needs, proportioned according to highway and motor vehicle statistics needs of program standards from the NHSB.

- Training effectiveness, as indicated by an information flow and feedback from centers and field employing agencies on the adequacy of training, and the job performance of recent graduates.

Congressional Justification for the Establishment of Centers at University-Level Institutions (Chapter 9)

A statement justifying the establishment of HSMD&R Centers was prepared for submission to the U.S. Congress by the NHSB and includes a presentation of:

- Overwhelming needs for highway safety manpower, and the university disciplines that will be required for their training and education.

- Alternative program strategies that may be embraced (e.g., federal, state, regional), differences in operating costs, and the advantages and disadvantages of each alternative strategy.

- Plans for the selection of candidate universities to support a center, and results of comprehensive discussions with university representatives on the feasibility of university-based centers.

- Plans for the establishment, operation, and control of HSMD&R Centers.

- Reasons for favoring the establishment of regional HSMD&R Centers but with the need to test the regional concept through pilot centers. Funding levels, for the proposed regional pilot centers are presented.

Preparation of a Request for Proposal For The Establishment of Regional Pilot Centers for HSMD&R (Chapter 10)

Preparatory material in the form of a sample RFP was prepared, for future formalization at the discretion of the NHSB. These materials cover:

- The history and evolution of the Highway Safety and Motor Vehicle Acts of 1966, the establishment of the NHSB, and the mission and purpose of the Office of Safety Manpower Development within the National Highway Safety Institute.

- Categorizations of highway safety manpower and their needs.

- Studies authorized by the NHSB on highway safety manpower needs, and their general results.

- Objectives of the RFP, and the statement of work (tasks) for responding universities.

RECOMMENDATIONS AND CONCLUSIONS

This study analyzed the magnitude of the safety manpower development needs on a national basis, and feasible ways of marshalling educational resources of higher education for such purposes. The following recommendations and conclusions were reached:

- Attempts to establish safety manpower development centers in each state would soon overtax the professional capability that exists in this country for training, research, and education in the general field of highway safety. Even if such centers could be established successfully, an inordinate task would arise within the NHSB for coordination and management of the manpower development program and for the introduction of even a modicum of standardization of curricula and proficiency standards for training. The study also demonstrated that an economy of scale exists in this program, as it has in other programs, and that the establishment of centers in each state could be more costly than alternative, larger-scale centers. The Office of Safety Manpower Development must keep this factor in mind, since it must cope with budgetary priorities established within the NHSB.

- Within limitations that may be forced by funding factors and priorities established by the NHSB, there is a need to move ahead with the program of safety manpower development, even if less than the total need for training is accommodated. The establishment of HSMD&R Centers on a pilot basis should serve this purpose, even though they may be forced to operate on a limited scale. It is only by the activation of such centers that a firmer understanding will be gained of the requirement for manpower development with respect to the numbers actually requiring training, the speed with which they can be trained, the costs of such programs, and the realization of methods for resolving problems in management and coordination when field agencies, the university, and the NHSB participate in the same program.

- Although the mission of HSMD&R Centers cannot be interpreted as one requiring scientific breakthroughs, there is very little precedence for such large scale efforts in the civilian sector, and it is very likely that there are many problems attendant on the operation of such centers that should be explored before launching out with even as many centers as might be required by those ten regions defined in this study. Further exploration of the feasibility of establishing centers is necessary, but the next phase should be one of activating a number of pilot centers that will replicate the functions of the system of centers that is ultimately envisioned. This study indicated there are advantages to moving in the direction of regional centers, and one array of regions has been defined. If the regional concept is embraced, it is essential that pilot centers be funded to operate with a scope and complexity adequate to meet regional responsibilities. If the pilot centers are successful, increased funding must be provided as they assume full roles as regional centers. However, great care must be exercised in the funding of university complexes that are selected as beginning or pilot centers, for they will constitute an investment in the establishment of an organization. Fortunately, in terms of the limited number of pilot centers that are being considered by the NHSB, there are many universities that possess the disciplines necessary to support safety manpower development, including its educational and research requirements. Several of these universities have established programs in some aspect of highway safety. To develop excellence, they have tended to specialize in singular areas such as driver education, police training, and traffic and transportation engineering. Those universities selected for pilot centers should be encouraged to move out of specialized areas to meet the broader scope of requirements for safety manpower development.

- Each of the ten national regions designated in this study represents 10 percent of the total state and local manpower requirement. It is inevitable that most of the safety manpower included in current estimates will require training. Future estimates may vary from those that were used in regionalizing the country, but such changes do not affect the principle of an equitable distribution of manpower training needs among regions, therefore, regional centers in any future system may have similar requirements. In every region, a university was selected that offered the capability to support a center and a history of involvement in the safety field. Alternative universities were also found that could provide excellent support to safety manpower development. The distribution of highly qualified universities with prior involvements in highway safety is not uniform throughout all ten regions. Such institutions tend to cluster in the Midwest and are less in evidence in the South and general Rocky Mountain area. Therefore, should the NHSB wish to move in the direction of regional centers, there is no reason to remain with the regional allocation as proposed in this study. The NHSB may wish to rearrange regions to further capitalize on the capabilities existing at universities in highway safety, especially at those universities that have sufficient depth in those disciplines that are critical to the general program. The insistence that all regional centers have equitable manpower development loads, while at the same time being academically pleasing, may be less effective in marshalling existing resources in highway safety at universities than if other criteria were applied to regionalization.

- Even during the regional pilot center phase, consideration should be given to relatively simple consortium arrangements, in the interests of capitalizing on existing capabilities. Consortium arrangements discussed in this study would allocate responsibilities for driver education and police training to other universities in a region. This option could be exercised during the pilot phase by awarding responsibilities for police training to one university and driver education to another, with the two universities thus assigned operating as satellites of the one given prime responsibilities for a pilot center. This would leave the prime university free to explore and develop its program around the remaining job specialties and to promote components of the program calling for graduate education and research. In addition, the prime university would function in a management role with its satellite universities and would be the primary arm of communication with the NHSB.

- There are certain reservations regarding manpower training that may be expected to flourish at the employing agency level. The large numbers requiring training would necessitate that a limited number be drawn and that each individual trained at a center become responsible for training several hundred others in his similar job specialty. Even under the assumption that each man trained at a center would become a trainer of others, large training loads were perceived for centers. While this assumption was accepted for planning purposes in the study, its validity for training at the local level should be further explored. The basis for this assumption should be established early in the development of the pilot centers, for it will have considerable impact on training programs. It will also affect the qualifications of individuals selected at local levels for attendance at centers, the kind of training that is to be provided in instructional skills, and the training packages that are to be provided the new instructor, such as syllabi, lesson plans, and achievement tests. If newly trained personnel are merely absorbed into the work force on return and are not given the opportunity to instruct, or if study of the problem should indicate that little assurance should be anticipated of a commonality of training environment or curricula at local levels, development of new approaches for effective training of the vast bulk of safety specialists and professionals in employing agencies will be required. These new approaches could include the utilization of university extension programs, community colleges, and similar educational institutions. Even with the differences that might prevail among such institutions or programs within a region, the chances of achieving some standardization of curricula and a higher quality of instruction are much greater. These new approaches to training would allow a center to host workshops and conferences on training curricula and to modify and update their own programs, much in the same fashion as that used by teachers and other educational personnel.

- The NHSB will require a system of evaluation procedures and program controls if it should find itself responsible for the management and funding of several regional centers. It will also be concerned with the guidelines that centers will establish for their operation and for relating administratively to their hosting universities. Plans and procedures for these purposes are provided in this report. The purpose of the next phase should be to validate these plans and procedures. The first centers that are established, whether they are pilot centers or full-scale regional centers in very limited numbers, will serve as excellent "test beds" for all planning that has preceded their activation. Among the controls and evaluation procedures that have been planned, the NHSB should eventually be able to identify that minimal flow of information through which it can maintain cognizance of its manpower development program, its effectiveness, and the information necessary to justify the continued support of the total program.

- There is a need to expand the output of qualified personnel in traffic engineering, police training, driver education, driver research, and roadway environment research, through existing traffic safety institutes, departments of engineering, and transportation research groups at universities. Even if the manpower survey used as background to this study has underestimated national needs, the outputs of existing sources of manpower will be sorely needed, in addition to the eventual outputs of centers that may be established. As noted previously, the expanding role of existing traffic safety institutes and transportation research groups is perceived as consistent with the regional center concept, since universities with already developed capabilities could, in effect, become regional centers, or satellites to regional centers and take over large portions of the training in high demand areas, such as police training, driver education, and other highway safety specialties.

Chapter 1

SKILLS AND DISCIPLINES REQUIRED FOR HIGHWAY SAFETY MANPOWER DEVELOPMENT

Chapter 1

SKILLS AND DISCIPLINES REQUIRED FOR HIGHWAY SAFETY MANPOWER DEVELOPMENT

Introduction of the Highway Safety Program Standards in June 1967, resulted in a major change in future manpower requirements and training needs of operating entities in the field of highway safety. It was clear that new employee skills and knowledge would be required and existing skills and knowledge would need to be upgraded if the new standards were to be fully implemented. In addition, some form of periodic updating of employees would be desirable to disseminate new knowledge and refurbish individual skills. It was within this framework, then, that an examination was made of the feasibility of establishing HSMD&R (Highway Safety Manpower Development and Research) Centers to develop and carry out such activities.

As viewed in this study, the proposed centers would engage in three major functions: education, training, and research. Educational activities would consist of preparation of graduate students needed for operating and research positions in the field. Training would center around specialized short courses and instruction necessary for initial orientation and refresher training in highway safety specialties. Research would provide stimulation and dynamics to the education function, as well as furnishing new inputs to the training function. From the standpoint of student load, the largest volume would be in the training function where both entry and refresher training would be provided for federal, state and local government employees engaged in specialized highway safety activities.

The Office of Safety Manpower Development in the NHSB had earlier sponsored research aimed at identifying the manpower needs and the training and education requirements in highway safety activities. Reports available from these contracts included a depth analysis of manpower requirements in the 50 states,* a general estimate of local (county and city) government needs,† and reports on prototype courses developed for the education and training of highway safety researchers‡ and highway

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* Safety Specialist Manpower, Booz-Allen and Hamilton, 1968.

† Letter Report from Booz-Allen and Hamilton, dated October 14, 1968.

‡ Safety Research Manpower, The University of North Carolina Highway Safety Research Center, June 1968.

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safety managers.* In addition, an earlier NHSB-sponsored study into the facility requirements for a national traffic safety research center provided information on potential federal research programs and corresponding manpower needs.† Data from these studies represented the most comprehensive and current information available on the nature and extent of the safety manpower development need, and the skills and disciplines defined in this report were identified and extended from information contained in these reports.

Skills and disciplines identified are principally those related to the technical courses required in safety-related subjects. With the application of the new standards in the field, this will be the most pressing kind of training need. Managerial development and supervisory training will also be needed as safety activities increase at all levels of government, but no special provisions are made for this training because it is readily available from a variety of existing sources, including state and federal training centers, private institutions, and in-house training programs. Particularly at lower levels, supervisory training programs should be developed in terms of the operating practices, procedures, and constraints of the employing agency. Many government entities now offer programs of this type, and those who lack them should be encouraged to create programs tailored to the requirements of their particular agency and mission.

The problem of highway safety is broad and diffuse in nature. No single discipline or field of skill can effectively answer the manpower training and educational needs in the highway safety field. The educational approach used in this report considers the multidisciplinary nature of the problem and structures the training in ways that combine the people and knowledge from a variety of disciplines and skill areas. In terms of existing university structure, seven major disciplines or departments are identified: Law; medicine or public health; business administration or public administration; education; police sciences or criminology; engineering; and the behavioral sciences.

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[*] Regional Safety Program Management Seminars, Automotive Safety Foundation, August 1968.

[†] Facility Requirements for the National Traffic Safety Research Center, TEMPO, General Electric Company, October 1967.

State Manpower Training Requirements

Future staffing needs and training requirements of states were the subject of extensive investigation in the Safety Specialist Manpower study conducted earlier. The duties, responsibilities, and functions of safety specialists in all 50 states were analyzed and combined into a set of 36 generalized job descriptions that embraced and defined the functions of these state-level specialists. As a part of their analysis and description, the contractor who conducted that study also identified the prerequisite education and experience required and the special entry training and periodic refresher training that appeared necessary to orient and update incumbents of these positions.

This information was arrayed in matrix form. Common courses were identified and combined, and an initial estimate was made of both the course content and the duration of the course. Based on the subject matter and the basic nature of the topic, courses were then assigned to the university department or discipline where interest and capability in the academic setting were expected to be found.

During the life of the project, estimates of the kinds and extent of training required were amended and updated, as additional information and experience provided new inputs. The final results of these estimates, including the percentage of training time allocated by discipline for each position, are shown in Table 1-1.

The NHSB had originally identified four major programs that encompassed the main functions and activities in the field of highway safety. These were the Motor Vehicle Program, the Driver and Community Program, the Driver Environment Program, and the Safety Operations Program. A fifth program category, "Planning and Administration," was subsequently designated. As used in this study, this latter category applies to functions of management, administration, planning and public information that encompass the other major programs.

For purposes of identifying manpower requirements and training needs, these five federal program areas were further subdivided into operational program categories dealing with specific safety functions, such as vehicle inspection, police traffic services, and emergency medical services. These operational programs, in turn, closely parallel the functional areas covered by the new standards issued thus far. The relationship between major federal programs, state operational program categories, and the 36 classifications of state safety specialist is portrayed in Table 1-2.

Table 1-1

HIGHWAY SAFETY TRAINING COURSES FOR STATE POSITIONS

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
Generalized Job Title	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medicine	Public or Bus. Admin.	Education	Police Sciences	Engineering	Psychology
1. Governor's Highway Safety Program Director	A. Purpose and Scope of the Highway Safety Program.	15	A. A Review of New Developments in Highway Safety.	24 Tri.			100				
	B. Duties of the Governor's Highway Safety Program Director.	25									
2. Highway Safety Program Analyst	A. The Background, Purpose and Content of the Highway Safety Program.	40	A. A Review and an Examination of New Developments in the Highway Safety Field.	40 Tri.			70		15	15	
	B. Established Federal Administration Procedures in Connection with Highway Safety.	40									
	C. Techniques of Program Formulation, Evaluation and Control as Offered to the Highway Safety Program.	60									
	D. Consultative Methods as Applied to the Highway Safety Program.	20									
3. Highway Safety Public Information Officer	A. The Background, Purpose, and Content of the Highway Safety Program.	40	A. A Review and Examination of New Developments in the Highway Safety Field.	40 Tri.			100				

Table -1 (Continued)

Generalized Job Title	Entry Training: Course Description	Entry Training: No. of Hours	Refresher Training: Course Description	Refresher Training: No. of Hours	Law	Medicine	Public or Bus. Admin.	Education	Police Sciences	Engineering	Psychology
4. Motor Vehicle Inspector	A. The Techniques and Procedures of Conducting a Motor Vehicle Inspection, and in Report Preparation.	30	A. A Review and Examination of New Developments in the Motor Vehicle Inspection Field.	16 Yr.						100	
5. Motor Vehicle Station Inspector	A. The Background of the Highway Safety Inspection Program.	10	A. A Review and Examination of New Developments in the Motor Vehicle Inspection Program.	24 Yr.			15	25		60	
	B. The Techniques and Procedures of Station Investigators and Inspections Including Records Review in Connection with the Highway Safety Inspection Program.	50									
	C. Teaching Methods as Applied to Highway Safety.	20									
6. Driver Training Program Specialist	A. A Review of Highway Safety Research Findings and Methods with Respect to Driver Training.	20	A. A Review of Highway Safety Research Findings and Methods.	40 Tri.			30	70			
	B. An Examination of Program Developments within Driver Education.	20	B. An Examination Program of Developments within Driver Education.	40 Tri.							
7. Driver Education Supervisor	A. A Review of Highway Safety Research Findings and Methods with Respect to Driver Training.	20	A. A Review of Highway Safety Research Findings and Methods.	40 Tri.			30	70			
	B. An Examination of Program Developments within Driver Education.	20	B. An Examination Program of Developments within Driver Education.	40							

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Table 1-1 (Continued)

Generalized Job Title	Entry Training: Course Description	Entry Training: No. of Hours	Refresher Training: Course Description	Refresher Training: No. of Hours	Law	Medicine	Public or Bus. Admin.	Education	Police Sciences	Engineering	Psychology
8. Driver Education Teacher	A. A Review of Highway Safety Research Findings and Methods with Respect to Driver Education.	20	A. A Review and Exploration of New Developments within Driver Education.	24 Yr.				70			30
	B. Behavioral Sciences.	50									
	C. Highway Safety Research Methods.	50									
9. Driver Retraining Instructor	A. Methods and Content of Remedial Driver Education.	60	A. A Review and Exploration of New Developments within the Entire Field of Driver Education.	24 Yr.				50		25	25
	B. Techniques of Commercial Driving School Inspection.	20									
10. Driver License Examiner	A. The Background of the Highway Safety Program.	10	A. A Review and Examination of New Developments.	24 Yr.			15				35
	B. The Background of the Driver License Program.	10									
	C. The Techniques and Procedures of Conducting Driver Tests, Including Special Vehicles Such as Motorcycles, and in Report Preparation.	60									
11. Driver License Hearing Officer	A. Motor Vehicle Laws, Adjudication Procedures, Fact Finding and Interview Techniques, and Report Preparation.	80	A. A Review and Examination of New Developments in the Driver Licensing Field.	24 Yr.	40			30			30

Table 1-1 (Continued)

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
Generalized Job Title	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medicine	Public or Bus. Admin.	Education	Police Sciences	Engineering	Psychology
12. Codes and Laws Program Specialist	A. Understanding of the Highway Safety Program.	10	(not determined)		75		25				
	B. Understanding of the Uniform Motor Vehicle Code.	30									
13. Traffic Court Judge	A. The Background of the Highway Safety Program.	10	A. A Review and Examination of New Traffic Laws and Court Procedures	16 Yr.	75		25				
	B. Content of Motor Vehicle and Traffic Laws.	15									
	C. Traffic Court Legal and Administrative Procedures.	15									
14. Traffic Court Program Specialist	A. The Background of the Highway Safety Program.	10	A. Examination of Developments within Traffic Court Systems and Traffic Laws.	40 Tri.	44		56				
	B. Administrative Techniques of Program Formulation and Evaluation with Respect to the Highway Safety Program.	35									
	C. A Review of the State Traffic Court System and Traffic Laws.	35									
15. Alcohol Technical Specialist	A. The Background of the Highway Safety Program.	10	A. A Review and Examination of New Developments in Relation to the Alcohol Program.	24 Yr.		50	20		30		
	B. Alcohol in Relation to Highway Safety.	10									
	C. Operation and Maintenance of Test Equipment in Connection with the Alcohol Test Procedure in Highway Safety.	20									
	D. Certification and Inspection Procedures of Alcohol Problems in Highway Safety.	20									

Table 1-1 (Continued)

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
Generalized Job Title	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medicine	Public or Bus. Admin.	Education	Police Sciences	Engineering	Psychology
16. Breath Examiner Specialist	A. The Background of the Highway Safety Program.	10	A. A Review and Examination of New Developments within the Alcohol Program.	16 Yr.	25		50		25		
	B. Courtroom Testimony Regarding Alcohol Problems in Highway Safety.	5									
	C. Report Writing in Connection with Alcohol Problems in Highway Safety.	5									
17. Accident Site Investigator	A. General Knowledge of Relationship of Highway Design, construction, maintenance and Traffic Operations, and Enforcement to the Prevention and Reduction of Accidents or the alleviation of their after effects.	40	A. A Review and Examination of New Developments within Accident Site Investigation	40 Tri.			5		25	70	
	B. In-depth Knowledge of the Relationship between Traffic operation, Highway Engineering, or Enforcement and the Prevention and Reduction of Accidents or the alleviation of their aftereffects.	40									
18. Accident Site Investigator Aide	A. General Knowledge of the Highway Safety Program	10	A. A Review and Examination of New Developments within Accident Site Investigation.	24 Yr.			25		10	65	
	B. Relationship of Highway Design Construction Maintenance, Traffic Operations and Enforcement to the Prevention and Reduction of Accidents or the Alleviation of their aftereffects.	30									
	C. Accident Site Investigation Data Collection and Analysis in Connection with Highway Safety.	80									

Table 1-1 (Continued)

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
Generalized Job Title	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medi-cine	Public or Bus. Admin.	Educa-tion	Police Sciences	Engi-neering	Psy-chology
19. Traffic Records Program Analyst	A. The Backgroundof the Highway Safety Program.	10	A. A Review and Examination of New Developments within the Field.	40 Tri.			15	20		45	20
	B. In-depth Investigation of One Area of Traffic Records with Particular Emphasis on the Application of Statistical and Mathematical Techniques to Traffic Records for Research Purposes.	70									
20. Traffic Records Systems Analyst	A. The Background of the Highway Safety Program.	10	A. An Examination of New Developments in Highway Safety Programs and Traffic Records Systems.	40 Tri.			100				
	B. National Highway Safety Bureau Guidance for the Traffic Records Program and in Alternative Systems Concepts.	30									
21. Emergency Medical Services Program Specialist	A. The Background of the Highway Safety Program.	10	A. An Examination of New Developments in Emergency Medical Service Systems.	40 Tri.		70	30				
	B. Emergency Medical Services Systems in Connection with Highway Safety.	35									
22. Emergency Medical Services Field Representative	A. The Background of the Highway Safety Program.	10	A. A Review and Examination of New Developments in Emergency Medical Services Programs.	24 Yr.		70	30				
	B. Emergency Medical Services Systems in Connection with Highway Safety.	35									
	C. Inspection and Consulting Techniques and Procedures in Connection with Emergency Medical Services in Highway Safety.	15									

Table 1-1 (Continued)

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
Generalized Job Title	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medicine	Public or Bus. Admin.	Education	Police Sciences	Engineering	Psychology
22. Emergency Medical Services Field Representative (Cont.)	D. Emergency Medical Services and Accident Cleanup Standards in Connection with Highway Safety.	20									
23. Highway Engineer--Safety	A. Understanding of the Highway Safety Program.	10	A. A Review of the Highway Safety Program.	24 Yr.			25			75	
	B. The Impact of the Highway Safety Program on Highway Design, Construction, and Maintenance.	30	B. An Examination of New Developments in the Field.								
24. Engineering Aide--Safety	A. General Knowledge of the Highway Safety Program.	40	A. A Review and Examination of New Developments in Design, Construction, and Maintenance within the Context of the Highway Safety Program.	24 Yr.			33			67	
	B. The Impact of the Highway Safety Program on Highway Design, Construction, and Maintenance.	80									
25. Highway Safety Site Officer	A. General Knowledge of the Highway Safety Program.	10	A. A Review and Examination of New Developments.	24 Yr.			25			75	
	B. Principles and Practices of Employee and Construction Site Safety with Relation to the Highway Safety Program.	30									
26. Traffic Engineer	A. Understanding of the Highway Safety Program.	10	A. A Review of the Highway Safety Program.	24 Yr.			25			75	
	B. The Impact of the Highway Safety Program on Traffic Operations Activities and Traffic Control Devices.	30	B. An Examination of New Developments in the Field.								

Table 1-1 (Continued)

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
Generalized Job Title	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medi-cine	Public or Bus. Admin.	Educa-tion	Police Sciences	Engi-neering	Psy-chology
27. Engineering Aide--Traffic	A. General Knowledge of the Highway Safety Program.	10	A. A Review and Examination of New Developments within the Highway Safety Program and Traffic Control Devices.	24 Yr.			8			92	
	B. The Impact of the Highway Safety Program on Traffic Operations Activities and Traffic Control Devices.	30									
	C. The Technical Duties in the Areas of Traffic Operations and Traffic Control Devices as Related to Highway Safety.	80									
28. Traffic Control Device Technician	A. General Knowledge of the Highway Safety Program.	10	A. A Review and Examination of New Developments within the Highway Safety Program and Traffic Control Devices.	24 Yr.			25			75	
	B. The Relating of the Highway Safety Program to Traffic Operations and Traffic Control Devices.	30									
29. Pedestrian Safety Program Specialist	A. A Review of Developments within the Highway Safety Program.	10	A. A Review of Developments within Highway and Pedestrian Safety Programs.	40 Tri.			25	75			
	B. A Review of Developments within the Pedestrian Safety Program as Related to Highway Safety.	30									

Table 1-1 (Continued)

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
Generalized Job Title	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medi-cine	Public or Bus. Admin.	Educa-tion	Police Sciences	Engi-neering	Psy-chology
30. Police Traffic Services Program Specialist	A. The Latest Developments in the Police Traffic Services or the Equivalent.	10	A. A Review in Developments in Police Traffic Services at an Established College Level Institution	40 Tri.			12	45	43		
	B. The Techniques of Program Formulation Control and Evaluation in Connection with the Police Traffic Services.	20									
	C. Teaching in Connection with the Police Traffic Services.	16									
	D. Consulting in Connection with the Police Traffic Services.	10									
	E. Substantive Training in Areas in which the Offices will be Engaged.	24									
31. Police Traffic Services Officer	A. Understanding the National and State Highway Safety Program.	10	A. A Review of Interpretations of Traffic Statistics, Allocation and Assignment of Personnel, Command, Techniques, and New Developments in Highway Safety Programs.	20 Yr.			63		37		
	B. Understanding Police Traffic Services Program.	30									
	C. General Techniques and Principles of Supervisors.	40									
32. Police Traffic Services Patrolman	A. Accident Investigation and Reporting.	10	A. A Review of Instruction in Advanced Patrol Techniques, Accident Prevention Measures, First Aid, and Supervising Techniques for Non-Commissioned Officers.	20 Yr.	14	7		36	43		
	B. Accident Prevention.	20									
	C. Motor Vehicle Code.	20									
	D. Traffic Direction and Control.	30									
	E. Defensive and Pursuit Driving.	30									
	F. Patrol Techniques.	20									
	G. First Aid.	10									

Table 1-1 (Concluded)

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
Generalized Job Title	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medicine	Public or Bus. Admin.	Education	Police Sciences	Engineering	Psychology
33. State Wrecker Operator	A. Background of the Highway Safety Programs.	10	A. A Review and Examination of New Developments in Wrecker Operations.	16 Yr.		50	33	17			
	B. Extraction Procedures for Persons Caught in Wrecked Vehicles.	15									
	C. Emergency Driving Methods.	5									
34. State Wrecker Field Representative	A. Background of the Highway Safety Programs.	10	A. A Review and Examination of New Developments within the Accident Cleanup Program.	24 Yr.		17	39	22		22	
	B. Extraction Procedures for Persons Caught in Wrecked Vehicles.	15									
	C. Inspection and Consulting Techniques and Procedures in Connection with Accident Cleanup.	25									
	D. Operation of Wrecker Equipment.	20									
	E. Accident Cleanup Standards.	20									
35. School Bus Program Specialist	A. Background of the Highway Safety Programs.	10	A. Examination of New Developments within School Bus Safety.	40 Tri.			50	50			
	B. School Bus Safety.	40									
	C. Administrative Techniques of Program Formulation and Evaluation.	30									
36. School Bus Driver	A. Teaching of Driving Techniques Uniquely Applicable to School Buses.	40	A. An Examination of New Developments within School Bus Driver Training and Driver Education.	40 Tri.				70			30

Table 1-2

RELATIONS BETWEEN FEDERAL PROGRAMS AND STATE JOBS

Federal Programs	State Operational Programs	Generalized State Job Titles
Planning and Administration	Planning and Administration	Governor's Highway Safety Program Director Highway Safety Program Analyst Highway Safety Public Information Officer
Motor Vehicle Program	Inspector Motorcycle Safety School Bus Safety	Motor Vehicle Inspector Motor Vehicle Station Inspector School Bus Program Specialist School Bus Driver Training Officer
Driver and Community Program	Driver Education Driver Licensing Codes and Laws Traffic Courts	Driver Training Program Specialist Driver Education Supervisor Driver Education Teacher Driver Retraining Instructor Driver License Examiner Driver License Hearing Officer Codes and Laws Program Specialist Traffic Court Judge Traffic Court Program Specialist
Driver Environment Program	Highway Design, Construction and Maintenance Traffic Control Devices Pedestrian Safety	Highway Engineer--Safety Engineering Aide--Safety Highway Safety Site Officer Traffic Engineer Engineering Aide--Traffic Traffic Control Service Technician Pedestrian Safety Program Specialist
Safety Operations Program	Alcohol Identification and Surveillance Traffic Records Emergency Medical Services Policy Traffic Services Accident Cleanup	Alcohol Technical Specialist Breath Examiner Specialist Accident Site Investigator Accident Site Investigator Aide Traffic Records Program Analyst Traffic Records Systems Analyst Emergency Medical Services Program Specialist Emergency Medical Services Field Representative Police Traffic Services Program Specialist Police Traffic Services Officer Police Traffic Services Patrolman State Wrecker Operator State Wrecker Field Representative

A series of tables are included in Appendix 1 that show the number of state highway safety operating personnel to be trained, the place of their training, and the number of full-time professors required to conduct training courses at centers. A brief explanation should be made with respect to some of the parameters used, although complete descriptions of the derivation of table data is included in the appendices. There was general agreement that many of the highway safety personnel could receive training near their places of employment (field training) rather than at the HSMD&R Centers, with instruction by individuals (field trainees) who had been trained at a center especially for this purpose. This arrangement allowed the centers to be kept at reasonable sizes. It was agreed that when the estimated number of occupants of job positions exceeded 100 in the state center alternative and 1,000 in the national and regional center alternatives, the field method of instruction for operating personnel should be used.

For purposes of analyzing different levels of funding, the initial intention was to consider periods of five, eight, and ten years to complete entry training for current job occupants. Calculations disclosed that the teaching manpower yearly cost for the ten-year over the five-year period would only be reduced by about 13 percent. This small decrease is accounted for by the expansion of the program between the fifth and tenth years and the corresponding increase in refresher training. Calculations for funding based on an eight-year period were therefore omitted.

The appendix 1 tables are identified as follows:

Appendix Table 1-1 - A single center for the nation. The updating program to be completed in five years. When the number of occupants for a job position exceeds 100, the occupants will be taught by field trainers who are trained at the center.

Appendix Table 1-2 - Same as Appendix Table 1-1, except that the cutoff number for job position occupants is 1,000.

Appendix Table 1-3 - This table shows the distribution of personnel identified in Appendix Table 1-2 to federal highway safety programs.

Appendix Tables 1-4 and 1-5 - Same as Appendix Tables 1-1 and 1-2, respectively, except that the updating program is completed in ten years.

Appendix Tables 1-6 through 1-11 - State centers, located in a large state (California), a medium-sized state (Alabama), and a small state (Idaho) for five- and ten-year updating programs. The cutoff number for job position occupants is 100.

Local Manpower Training Requirements

Basic data on the numbers and kinds of people needed to man safety specialist positions in county and city government were not available at the time that state manpower requirements were published. However, the NHSB was able to have an estimate made by the contractor who had conducted the Safety Manpower Specialist study of state positions. The contractor's knowledge of the highway safety functions, based on visits to all 50 states, and their familiarity with local government operations allowed them to develop estimates of the number of full-time local government employees who would participate in highway safety activities, as well as the operational program categories in which this activity would be conducted. These estimates were based on the assumption that the level of staffing in local government operational programs would be brought up to the minimum level recommended for the states. This resulted in a magnitude estimate of local government manpower requirements by operational program category and served as the basis for assessment of the skill and discipline requirements for positions in local governments. Details on the contractor's estimate of local government requirements for safety specialists are found in Appendix Table 1-12.

The skills and disciplines required in training safety specialists for local government positions were identified by extending basic information developed in the analysis of state-level positions. For the planning purposes of this study, it was assumed that the functions and the related training requirements for a safety specialist in local government operational programs would closely match that of a state employee engaged in these same programs at the state level. As shown in Table 1-3, this enabled identification of the amount of training required and the academic discipline or university department where it would be located. Actual course titles and content would match or closely resemble those shown for state-level positions in Table 1-1.

Appendix Tables 1-13 and 1-14 indicate the number of local highway safety operating personnel to be trained, the place of their training, and the number of full-time professors required to conduct training courses at centers. In Appendix Table 1-13 it is assumed that training will be completed in five years and in Appendix Table 1-14 that updating will consume ten years.

Uniform and cooperative action is needed in interpreting and enforcing the Federal Highway Safety Program Standards, and the similarity of traffic safety functions at state and local levels and the common training involved point to the need for a unified training effort. It is felt that the Office of Safety Manpower Development of the NHSB should

Table 1-3

HIGHWAY SAFETY TRAINING COURSES FOR LOCAL GOVERNMENT POSITIONS

Operational Program	Number of Hours-Entry Training	Number of Hours-Refresher Training	Per cent of Total Training Hours by Discipline						
			Law	Medicine	Bus. Admin.	Education	Police Sciences	Engineering	Psychology
1. Planning and Administration	40	10 Yr.			80		10	10	
2. Codes and Laws	40	--	75		25				
3. Traffic Courts	40	16 Yr.	70		30				
4. Alcohol in Relation to Highway Safety	50/10	16/4 Yr.	20	10	45		25		
5. Identification and Surveillance of Accident Locations	120	20 Yr.			15		15	70	
6. Traffic Records	60	15 Yr.			40	15		30	15
7. Emergency Medical Services	80	10 Yr.		70	30				
8. Highway Design, Construction and Maintenance	80	24 Yr.			25			75	
9. Traffic Control Devices	80/16	24/4 Yr.			20			80	
10. Pedestrian Safety	40	15 Yr.			25	75			
11. Police Traffic Services	140/20	20/4 Yr.	13	6	4	35	42		
12. Accident Cleanup	80/8	16/2 Yr.		48	33	17		2	
13. School Bus Safety	40/8	16/2 Yr.			10	65			25

NOTE: Where the number of hours in training are shown as two figures, the first figure represents the total number of hours and the second represents the portion of those hours devoted to laboratory training.

give serious consideration to the idea of holding states responsible for training local government employees in safety activities common to both levels of government. Joint training sessions could save time and money in transferring the training to the field, promote a common body of knowledge and skills, and develop the basis for uniform interpretation and action.

Federal Manpower Training Requirements

Estimates of training requirements for administrative, supervisory, and professional positions in the NHSB were based on manpower planning documents and estimates provided by the NHSB staff. The total number of positions at all GS levels authorized for FY 1969 and anticipated for FY 1970 were projected to FY 1974 by the Office of Safety Manpower Development to provide estimates of the numbers of positions for which training will be needed by the end of calendar year 1973.

For estimating purposes, it was assumed that positions in Grades GS-12 and above would form the core of the key administrative and supervisory positions, and that Grades GS-5 through 11 would represent the professional staff participating more directly in program implementation.

Both initial and refresher training courses for the NHSB employees would be centralized in university schools of business or public administration, or both. For employees in Grades GS-5 through 11, 40 hours of initial orientation and training would be supplemented by 24 hours of refresher training triennially. Those in Grades GS-12 and over would receive 80 hours initially, with an estimated 40 hours of courses and seminars triennially to regenerate interests, skills, and knowledge. Courses would include a variety of subjects and activities related to the fundamental administrative role of the NHSB. Increasing levels of complexity and sophistication would be provided in the course series, depending on the position requirements and the level of knowledge and skill that the incumbent possesses.

The number of HSMD&R Center professors required to provide training for federal administrative personnel is shown in the last column of Appendix Table 1-15.

Research Manpower Education Requirements

It is planned that the proposed centers will train most of the researchers needed to carry out new research programs at the federal and state levels. Research activity is seen as a critical function of the proposed centers for additional reasons, however. The opportunity to engage in research will be an important factor in the ability of the centers to attract and retain the participation of a high quality faculty in the instructional programs of the centers. Similarly, a dynamic ongoing highway safety research program will be needed to attract the better undergraduate students from various academic departments and disciplines into related resident graduate-level programs in the highway safety field and will be an important part of the mechanism by which they receive their graduate training. Both the findings of research conducted by the centers and the monitoring and exchange of findings with others conducting research outside the centers will be vital inputs to the initial and refresher training offered to operating people in the highway safety field.

The basic data used in estimating the future research manpower needs of the federal government were drawn principally from the earlier study made for the proposed National Highway Safety Research Center. State research manpower needs are based on estimates of the kind and number of staff required to implement research activities in each state. Curricula for research training for both represents an extension of the kind and hours of training developed originally in the NHSB-sponsored Safety Research Manpower study.

Based on course content recommendations of the University of North Carolina Highway Safety Research Center study of 1968* and the TEMPO--General Electric Company study of 1967,† the distribution of training courses for research personnel allocated to disciplines is estimated to be as follows:

	% of Total
Law	.1%
Medicine	12.8
Business or public administration	6.0
Education	7.0
Police sciences	7.5
Engineering	48.2
Psychology	18.4
Total	100.0%

---

* Safety Research Manpower, The University of North Carolina Safety Research Center, June 1968.

† Facility Requirements for the National Traffic Safety Research Center, TEMPO, General Electric Company, October 1967.

It appears that 80 class hours, eight of which are spent in the laboratory, would be sufficient for entry training purposes, supplemented by 20 class hours, two of which are spent in the laboratory, of refresher course training each year. The ratio of classroom to laboratory instruction has been adopted from the University of North Carolina experimental curriculum.

When highway safety positions above the bachelor level are opened, either as a result of attrition or program expansion, it is envisioned that they will be filled by graduate students who will have had highway safety courses as a part of their graduate education. It is estimated that Masters and Ph.D. students should have 132 and 176 class hours, respectively, of this kind of instruction. These estimates were derived from a study of graduate curricula in safety-related fields at several universities. From them, a sample curriculum was created, as described in Chapter 6, "Guidelines for the Administration and Operation of HSMD&R Centers." The distribution of course content among the disciplines for the various job areas was assumed to be similar to that contained in the study for training courses. Table 1-4 shows this distribution.

Influence of Centers on Resident Educational Programs

Consideration was given to having HSMD&R Centers develop special courses and programs related to highway safety which could be added to undergraduate university curricula throughout the nation. Later assessment revealed that there were several limits on the extent to which undergraduate curricula, particularly in science and engineering, could be augmented. With the concurrence of the client, centers were relieved of this responsibility.

At the graduate level, the centers are expected to develop special courses, programs, and degree options in the highway safety field. These courses would be taught in the appropriate departments at host universities and ultimately at other schools throughout the country. Courses are expected to change over time to reflect the latest information and technology available in the field, and the responsibility for updating course content and syllabi will be an additional responsibility of the centers.

The scope of this study is limited to the needs of government for trained safety specialists. Yet it is worthy of note that automobile manufacturers, operators of truck fleets, and private associations and foundations dedicated to vehicle and highway safety are also seeking personnel with specialized safety training. Demand in the private sector

Table 1-4

PATTERNS OF HIGHWAY SAFETY TRAINING AND EDUCATION

Area of Employment	Number of Class Hours Master's	Number of Class Hours Ph.D.'s	Per Cent of Training and Education Hours By Discipline Law	Medi-cine	Public or Bus. Admin.	Educa-tion	Police Sciences	Engi-neering	Psy-chology
State Operating	132	176	3.70	5.12	18.63	15.83	5.35	44.73	6.58
Local Operating	132	176	11.07	6.60	7.54	38.43	32.18	.56	3.62
Federal Administrative	132	176	--	--	100.00	--	--	--	--
Research	132	176	.01	12.85	5.99	6.93	7.51	48.35	18.36

has not been included in the estimates, but it will contribute to the need for, and the employment opportunities for, people with formal training in the highway safety field.

Summary

Summaries of the numbers of full-time professors required for a HSMD&R Center are shown on Tables 1-5 and 1-6. Table 1-5 shows the needs of a program for bringing present job occupants up-to-date and educating future entering personnel if such a program were completed in five years. Table 1-6 shows similar information for a ten-year period. The tables also indicate the number of people to be trained or educated at the center.

Table 1-5

TOTAL NATIONAL TRAINING AND EDUCATIONAL NEEDS
PROFESSORIAL REQUIREMENTS FOR THE TRAINING AND EDUCATION OF HIGHWAY SAFETY PERSONNEL

Includes 10% Per Year Employee Attrition

Five-Year Program

Area of Employment	Number to be Trained or Educated at University or Safety Center		University or Highway Safety Center Professors by Discipline Full-Time Man Years/Year							
	For Direct Assignments	For Teaching of others	Law	Medicine	Bus. or Public Admin.	Education	Police Sciences	Engineering	Psychology	Total
Training										
State Operating	6,470	350	1.72	2.44	8.95	7.57	2.56	21.38	3.14	47.76
Local Operating	960	2,740	5.17	3.08	3.52	17.97	15.15	.26	1.68	46.83
Federal Administrative	2,100	--	--	--	6.63	--	--	--	--	6.63
Federal Research	1,475	--	.01	1.19	.56	.64	.70	4.49	1.71	9.30
States Research	119	--	.001	.10	.04	.04	.07	.35	.13	.73
Total Training Needs	11,124	3,090	6.90	6.81	19.70	26.22	18.48	26.48	6.66	111.25
Education										
State Operating	1,687	--	.36	.42	1.54	1.30	.44	3.68	.55	8.29
Local Operating	1,516	--	.82	.49	.56	2.87	2.39	.04	.27	7.44
Federal Administrative	157	--	--	--	.82	--	--	--	--	.82
Federal Research	362	--	.001	.24	.11	.13	.14	.91	.34	1.87
States Research	29	--	.001	.02	.01	.01	.01	.07	.03	.15
Total Education Needs	3,751	--	1.18	1.17	3.04	4.31	2.98	4.70	1.19	18.57
Total Training and Education Needs	14,875	3,090	8.08	7.98	22.74	30.53	21.46	31.18	7.85	129.82

Table 1-6

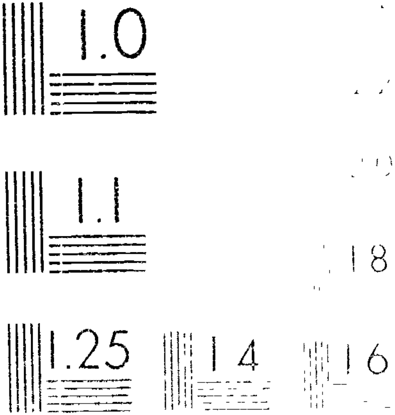
TOTAL NATIONAL TRAINING AND EDUCATIONAL NEEDS
PROFESSORIAL REQUIREMENTS FOR THE TRAINING AND EDUCATION OF HIGHWAY SAFETY PERSONNEL
Includes 10% Per Year Employee Attrition

Ten-Year Program

Area of Employment	Number to be trained or Educated at University or Safety Center		University or Highway Safety Center Professors By Discipline Full-Time Man Years/Year							
	For Direct Assignments	For Teaching of others	Law	Medicine	Bus. or Public Admin.	Education	Police Sciences	Engineering	Psychology	Total
Training										
State Operating	8,250	344	.61	2.52	9.00	5.93	2.03	21.85	1.96	43.90
Local Operating	1,295	2,770	3.69	2.22	2.84	13.94	10.67	.20	1.49	35.05
Federal Administrative	2,770	--	--	--	4.48	--	--	--	--	4.48
Federal Research	1,955	--	.01	1.21	.57	.67	.71	4.60	1.74	9.51
States Research	158	--	.001	.09	.04	.05	.05	.35	.15	.73
Total Training Needs	14,428	3,114	4.31	6.04	16.93	20.59	13.46	27.00	5.34	93.67
Education										
State Operating	3,786	--	.28	.39	1.42	1.20	.41	3.40	.50	7.60
Local Operating	3,395	--	.76	.45	.52	2.64	2.20	.04	.25	6.86
Federal Administrative	358	--	--	--	.76	--	--	--	--	.76
Federal Research	845	--	.001	.23	.11	.12	.13	.86	.33	1.78
State Research	68	--	.001	.02	.01	.01	.01	.07	.03	.15
Total Education Needs	8,452	--	1.04	1.09	2.82	[illegible]	2.75	4.37	1.11	17.15
Total Training and Education Needs	22,880	3,114	5.35	7.13	19.75	24.56	16.21	31.37	6.45	110.82

Chapter 2

ALTERNATIVE STRATEGIES FOR ESTABLISHING HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH CENTERS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Chapter 2

ALTERNATIVE STRATEGIES FOR ESTABLISHING HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH CENTERS

The Organization of Resources for the Conduct of Education, Research, and Training

A considerable body of data has been established concerning the effectiveness of different methods for the organization of research, education, and training. Various facets of this data have been analyzed and reported in detail in educational and technical journals, but few substantive overall findings have been found that are relevant to the organizational questions of the present study. A few of the more pertinent findings are summarized below.

Research Effectiveness

John Rader Platt has reached a number of conclusions regarding research organizations in academic institutions. Most specifically, he believes that there is a "minimum critical size" for a productive multispecialty department in a university.

> Around 15 to 30 full-time staff members is approximately the minimum size of the departments at the top dozen or so American universities when most of the work in mathematics, astronomy, physics, and chemistry is produced. The best men rarely want to go to a smaller group, because of the lack of stimulation and services. Although in those subjects, these dozen departments together have less than half the total science faculty of the country, they . . . publish most of the research articles, edit most of the journals, and probably make over 90 percent of the university discoveries. A group of fifteen good men in one department can produce many times as much research as the same group in five departments of three men each at five different schools. Even separation of a department into different but adjacent buildings may cause considerable loss of research power. . . .

> The critical size for each department would be much larger without the support given by the other departments and the scientific interests of the rest of the university. . . . To a certain extent it is the chain-reaction of the fifteen men that produces these conditions.
>
> We thus reach a first important inference: Research could advance faster if the small faculties of a nation would be combined into a few large ones. . . . It would be foolish, of course, to apply any such policy blindly. Faculties have other functions besides research, although some of these functions might also be done better in larger units.*

This inference tends to favor regional or national types of highway safety manpower development and research centers. State centers might not be large enough in most states to reach critical size. The average number of faculty members in the smaller states would only be about ten, and most of these would be primarily concerned with training activities rather than with research and graduate education. Regional centers with about 38 faculty members, or a national center with 380, would meet the criterion. However, facility size could also be too large.

> The scientists must have intellectual separation as well as intellectual contact. . . . Separation in time and space is needed. The individual scientist reacts best when stimulated by currents from neighboring disciplines as well as those from his own; when he is left alone to work out a thought, then brought together with others to exchange it.
>
> From this principle of separation, we may make another inference: Large intimate groups devoted to single limited projects are frequently less productive than if the same personnel were more diverse in their interests or more widely separated.*

The principle of separation would tend to weigh against a single very large highway safety center of the national type, since such a center might tend to become too narrow in focus. By combining the principle of separation with the critical size principle, one could conclude that the regional center may be the preferred type from a size standpoint. From an organization standpoint, a single university would appear to be more feasible than a consortium of participating schools.

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* John Rader Platt, The Step to Man (Wiley, 1966), pp. 53-70, reprinted in American Scientist 54, 3 (Autumn 1966).

> Research should not be directly administered by a committee. . . . A committee has a hard time starting a fire, especially if there are any difficulties, as anyone who has ever been in such a group realizes. . . . A group rarely has the subtlety or patience to watch for the little clues that show the flame is being nursed in the right direction.
>
> The compromise vote of a committee is a good method of making choices if the consequences are "linear functions" of the choices, that is, if a compromise between two alternatives is as good as either. If several intelligent men differ on a decision in such cases, their average judgment may be the "best" value in both the mathematical and political sense. But with non-linear functions, the extra few percent that the best man can give may be the difference between a chain-reaction working and not working.*

This inference indicates that a center run in a direct hierarchical administration would be more efficient than one run under a consortium arrangement. Given the present administrative practices and viewpoints of university staffs, a consortium would most likely have to be administered by a co-equal committee of representatives from the participating schools. A center established under the auspices of a single university, on the other hand, would most logically and conveniently be organized in some sort of hierarchical manner under a single administrator.

The obverse side of this preference for the efficiency of a strong hierarchical administration is that such an administration also provides (almost paradoxically) an opportunity for greater research freedom to individual staff members.

> Research personnel must be shielded from non-intellectual duties. After the science administrator has gotten good men and given them facilities, his function should be to shield them from all housekeeping problems. Meetings, written reports, orders, memoranda, time sheets, and accounting must all be cut. . . . It is important to keep a research group informed of changes and decisions that affect their work, and to make them feel that their advice is welcome, but the science administrator must resist the democratic urge for employee participation and for spreading his responsibility onto committees.*

Supervision of the research work itself, however, should be very delicate and distant rather than close or exacting. And day-to-day or

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* Ibid.

year-to-year uncertainties in project continuation and administrative support should be minimized. The general idea is one of neither diverting nor inhibiting the researcher from his single-minded attention to research problems.

> Personal research contracts and organization contracts should run for two or three years before critical review, and for considerably longer before maximum output can be expected.
>
> Inquiries and official visits, explanations and justifications, should be rare and brief, limited by custom if not by statute. Changes of policy and reorganization should be very rare, and well-planned in advance.*

Finally, the overall research program has to be supervised in a consistent and careful manner. This means that policies have to be established and held for long enough to permit fruition of long term studies that have been started. Also, policies must encourage the development of a free research climate in general, not just a permissive immediate environment for the individual researcher.

> Research must be run by an insulated agency. This is the central reason for the success of the basic civilian research programs of the Office of Naval Research and of the Atomic Energy Commission in the years just after World War II. Being associated with vast military programs, these civilian projects were assembled and sustained on the one hand by the keen military appreciation of the value of basic research; and on the other hand were protected against financial shock, thanks to reservoirs of military funds and the provision in some cases for three-year and five-year contracts. . . .
>
> In the other direction, we can see from this "principle of insulation" one reason for the low scientific output of many state universities where these schools are limited to one-year budgets and are closely dependent on legislative favor. . . .
>
> No research laboratory can be successful which is too closely tied to elections or legislatures, either politically or financially. . . . An insulated agency may not be good, but to be good it must be insulated.*

Nevertheless, the time-honored method of conducting academic research seems no longer acceptable to the federal government. A second author,

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* <u>Ibid</u>.

Don E. Kash, states that modern problems are intractable within the traditional disciplinary boundaries, and the general trend is toward a more specialized and responsive organization.

> The government in Washington is convinced of the value of interdisciplinary . . . work . . . . This would appear to be, in part, a reaction to the frustration felt in dealing with the universities with their structure based on disciplines. . . . Federal agencies and the Congress are groping around for new organizational approaches. Haworth articulates the thinking: "we believe that there need to be some additional centers for advanced specialized research for . . . such things as the study of urban ecology, regional planning, economic analysis, things of that sort."*

Universities must respond to these types of needs if they wish to maintain a substantial share of federal R&D efforts. They can use two criteria to determine what kinds of programs they should adopt:

> First, . . . the unique contribution of the university is knowledge not with operating skills. . . . Second, . . . the real integrity of the university is violated when large decisions in one area (teaching, research, or service) do not consider the impact on the other two.*

In view of these considerations, the second author appears to prefer centers organized under consortia to centers organized around a single university. However, he does recognize that consortia arrangements can include more serious organizational problems.

> Many problem-oriented programs on individual campuses . . . already exist and tend to overlay the disciplinary structure. That is a response to the evidence that basic research seems to go better under a single-discipline structure, whereas applied research responds better to a problem-oriented, multidisciplinary arrangement. . . . Perhaps the most serious criticism of this approach . . . is that individual universities are unlikely to have all the specialists necessary to do the best work. . . . There is another danger. Even if the individual university were capable of meeting the demand for talent, large-scale projects would be detrimental to teaching and basic research. . . .

---

* Don E. Kash, "Research and Development at the University," Science, June 21, 1968.

> Cooperation among a given group of universities would appeal greatly to many congressmen and federal officials. . . . It provides an alternative where the prospects would be so large or of such a nature as to disrupt the balance of the individual campus. . . .
>
> A cautionary note needs to be entered at this point. It is difficult enough to carry on interdisciplinary research, but to propose that such research also be interuniversity is to compound the problem. . . . Consortia seem to work best when they are the result of decisions by the universities, as in the case of the Midwest's Committee on Institutional Cooperation, rather than interstate compacts, such as the Western Interstate Compact for Higher Education. . . . Interstate compacts are complex to devise, cumbersome to administer, and transfer far too much academic control from the campus to the statehouse.[*]

Educational Effectiveness

Important as the research aspects are in evaluating the proposed highway safety centers, educational effectiveness is more important. That function is more central to the manpower development mission than the centers are primarily intended to fulfill.

However, there is probably even less evidence on which to base an organizational evaluation of academic quality than there is for evaluating research quality. One study of the effects of federal programs on university education found ambivalent attitudes about how research affected education. This study concluded that the heavy concentrations of research funds at a few graduate schools should be maintained, but that other programs should be extended to additional schools. Although the desirability of dispersing more broadly "must be determined by the degree to which this advances the objectives of individual programs," high priority was given to strengthening programs at "leading state universities."[†]

Specific evidence that exists regarding the effects of such programs on education shows little correlation between form or size of organization and quality of learning. Other aspects of motivation and operational implementation seem to be much more significant factors.

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[*] Ibid.

[†] Harold Orlans, "The Effects of Federal Programs on Higher Education," Washington, D.C.: Brookings Institution, 1962.

Some evidence to this effect has been adduced to an article in Science magazine, which stated, in part:

> In the folklore of higher education, it is assumed that the student's learning and intellectual development will be enhanced if he attends a "high-quality" institution. The principal purpose of the research was to test this assumption empirically, by means of a longitudinal study of undergraduate students attending colleges of varying degrees of "quality" . . . .
>
> The measures of intellectual achievement used were the student's scores of the area tests of the Graduate Record Examination. . . . The three area tests cover social science, humanities, and natural sciences . . . .
>
> The two best indicators of institutional affluence turned out to be the average academic ability of the entering student body and the pre-student expenditures for "educational and general" purposes (meaning, primarily, salaries for faculty and staff) . . . .
>
> Within the total population of 4-year institutions, the absolute degree of variation with respect to these (and related) measures of quality is considerable. The 30 most affluent institutions in the United States, for example, spend more than four times as much money per student for educational and general purposes as the 25 most selective institutions in the country recruit half or more of their entering students from among the top 3 percent in academic ability. On the other hand, fully 15 percent of the institutions (nearly 300) enroll virtually no students from this select 3 percent. . . .
>
> The general hypotheses tested in this study were as follows: (i) The academic excellence of the undergraduate institution--as defined by the level of ability of the student body, the degree of academic competitiveness in the college environment, and the level of the institution's financial resources--has a positive effect on the undergraduate student's intellectual achievement; (ii) The extent of the positive effect of institutional quality on intellectual achievement is proportional to the student's academic ability. . . .
>
> The findings offer little support for either of our general hypotheses concerning the effects of institutional quality on student achievement. . . . These results tended to confirm earlier studies of differential college influence, for which variations in student performance on the Graduate Record Examination aptitude tests, in institutional Ph.D. productivity, and in

> other criteria were found to be primarily dependent upon variations in student inputs. . . .
>
> In summary, the analysis failed to confirm the hypothesis that the student's achievement in social science, humanities, or natural science is facilitated either by the intellectual level of his classmates or by the level of academic competitiveness or financial resources of his institution.*

Both the evidence used and the conclusions of these academic performance studies are quite general. They do not, of course, imply that there are no differences in the abilities of different schools to teach particular specialties, but only that significant general differences are not apparent. The ability of a university to educate students in highway safety-related courses will certainly be affected by its background and interest in relevant disciplines. But its general academic standing in other unrelated subjects seems to be essentially uncorrelated with its chances for success.

Training Effectiveness

Training courses in highway safety would be expected to be quite highly programmed. Different organizational arrangements would therefore be less important to training effectiveness than to research or educational effectiveness. However, the resources that could be applied to training activities would be considerably affected by their proposed organization. A National Safety Council committee of leading authorities recently surveyed the dearth of current training in highway safety and concluded that all available resources were needed.

> With few exceptions, educational institutions have neither been called upon nor have they taken the initiative to establish programs for highway safety manpower development other than for driver education teachers. . . . There are few existing training programs which could be considered adequate to provide the training needed by the type of highway safety manpower attending them. In some states there is no training program for many types of highway safety personnel. On the local level, training is generally nonexistent. . . .

---

* Alexander W. Astin, "Undergraduate Achievement and Institutional 'Excellence,'" Science, August 16, 1968.

> Past training has been mostly for personnel at the recruit or operations level. There has been little training for supervisory and administrative levels. Furthermore, little attention has been given to providing training throughout the person's career. . . . Evaluation of training programs is almost nonexistent. . . .
>
> The diversity of training needed . . . may well call for different approaches. . . . The existing interest and capability of every educational institution, agency, training academy, etc. which could and would assist . . . should be utilized. . . . The education and training programs must be geared to the needs of state and local agencies. To accomplish this, a working relationship between educators and official agencies at the state and local level is imperative.*

To achieve this working relationship, the committee recommended that training activities be organized under the leadership of a highway safety center at one of the colleges or universities in each state. These centers would collaborate with other interested colleges in the state and the region who could participate in specialized activities. If a state did not wish to establish such a center or if an interested university could not be found, the necessary training activities could be carried out at a center in a nearby state.

This organizational approach was preferred to a more centralized regional center arrangement largely because it was believed to provide greater incentives to expand existing training activities, it minimized problems of establishing interuniversity and interstate relationships, and it could best maintain the necessary coordination with state and local governmental agencies.

The same type of recommendation had been made earlier in the Congressional testimony by one of the members of the National Safety Council committee, who stated:

> Not only are universities a natural setting for these activities, but many of them, especially State universities and land-grant educational institutions, are interested in helping solve the

---

* National Safety Council, Traffic Education and Training Committee, Highway Safety Manpower and Training, Chicago, Ill., April 1968.

problems affecting the people of their respective States. Furthermore, most of these institutions have good rapport with State and local agencies.*

But expert opinion on the question of university participation in training activities is far from undivided. As in many organizational questions, about as many highly qualified experts can be found on one side of the fence as on the other. For example, a recent Presidential Task Force that examined training and educational policies of the Federal government summarized:

> The Task Force . . . concludes that universities should be used primarily for basic education and knowledge of academic disciplines, for preparation for professional careers, for broad learning about our society, and for horizon-stretching for selected experienced career officers. It also concluded that Government may be best suited to provide training and education (1) in specializations dealing with specific applications of theory to Government programs; (2) in techniques closely related to work performance; (3) on agency and Federal policies, programs, and procedures; and (4) in frontier areas such as space technology.†

The above viewpoint would appear to favor a government-operated facility for the training and preparation of manpower in technical specialties resulting from a program established at the federal level. It may be presumed that the FAA Academy came into being for such reasons, in addition to other strong reasons such as the need to effect a commonality and standardization of skills among FAA employees. To follow the recommendations of the Task Force, an analogous facility for the development of highway safety manpower also might be effective in training large numbers of personnel and reducing problems of administrative control over training. However, differences in the type of manpower being trained would have to be accommodated, since highway safety personnel are not restricted to the federal level.

---

* Gordon H. Sheehe, Hearings to Establish a National Accident Prevention Center, Committee on Interstate and Foreign Commerce, House of Representatives, Feb. 1962, U.S. GPO, Washington, D.C.

† Presidential Task Force on Career Advancement, Investment for Tomorrow, U.S. Civil Service Commission, Washington, D.C., 1967.

A Study of Federally-Funded Programs Analogous to Highway Safety Manpower Development

An analogous program is defined here as any federally-sponsored program that provides support for college-level activities in at least one of the following functions: short-course training, graduate education, or academic research. The objectives of studying each program were to:

- Show direct evidence of the feasibility of the program, if possible.
- Provide precedents that justify the suggested approach to higher levels of the Executive Department, to Congress, to the states and the highway safety community, and to candidate universities.
- Find legislative and administrative documentation of the analogous programs that could be used in subsequent analyses and planning activities to define operational guidelines for individual centers and the overall program, indicate a rationale for Congressional justification, and provide a model for a suggested Request for Proposal.

Any existing federal program that provides for college-level training, graduate education, or academic research activities was considered to be analogous in some degree to the proposed NHSB program. Almost 50 programs were identified that meet this definition. They are classified in Table 2-1 and listed, with descriptions, in Appendix Table 2-8.

Table 2-1 shows a different program in each row. The programs are grouped together according to the types of functions they provide. The analogous programs that provide training (the largest function in terms of effort in the proposed NHSB program) are listed together with various combinations of graduate education and/or academic research in the first four groups. Programs providing education without training are listed in the fifth and sixth groups. The last group consists of those programs that provide only academic research, without either training or education.

The columns list significant attributes of the proposed NHSB programs, with spaces to indicate by a "yes" entry those programs that possess the same attribute. The first three columns display the three program functions described above: training, education, and research. The next

Table 2-1

FEDERAL COLLEGE-LEVEL TRAINING, GRADUATE

Program Group	Program Title	Program Functions			
		Does the program support			
		short-course training?	graduate education?	academic research?	for non govern employ
First: Training, Education, & Research	Educ. Research Training Fellowship	Yes	Yes	Yes	
	Water Pollution Research & Training	Yes	Yes	Yes	Yes
	Library Training & Research	Yes	Yes	Yes	Yes
	Medical Library Assistance	Yes	Yes	Yes	
	Mental Health Research & Training	Yes	Yes	Yes	Yes
	Nuclear Education & Training	Yes	Yes	Yes	
Second: Training & Education	Arts & Humanities "Institutes"	Yes	Yes		Yes
	Allied Health Professions Ed. Assist.	Yes	Yes		
	Institutional Assist. in Education	Yes	Yes		Yes
	Public Health Training	Yes	Yes		Yes
	Train Prof. in Educ. of Handicapped	Yes	Yes		Yes
	Vehicle Safety Educ. & Training	Yes	Yes		
Third: Training & Research	Vocational Rehab. Research & Training	Yes		Yes	Yes
	Regional Medical Programs	Yes		Yes	
	Injury Control Programs	Yes		Yes	Yes
	Occupational Health	Yes		Yes	Yes
	Community Development Training & Research	Yes		Yes	Yes
Fourth: Training Only	FAA Academy	Yes			
	Civil Defense Staff College	Yes			Yes
	Civil Defense Adult Education	Yes			Yes
	Community Service College Programs	Yes			
	Advanced Education "Institutes"	Yes			Yes
	Mental Retardation Training	Yes			Yes
	Training Prof. in Care of Crippled Children	Yes			
Fifth: Education & Research	Howard Univ. & Gallaudet Coll.		Yes	Yes	
	Forestry Research Grants		Yes	Yes	
	Manpower Research		Yes	Yes	
	Res. Fellowships in Health Sciences		Yes	Yes	
Sixth: Education Only	Mid Career Development of Federal Employees		Yes		
	Military Postgraduate Schools		Yes		
	Grad. Education in Science		Yes		
	College Work-Study Programs		Yes		
	Construction of Grad. Educ. Facilities		Yes		
	Health Prof. Educational Assist.		Yes		
	National Defense Grad. Educ. Facilities		Yes		
	Nurse Training		Yes		
	Prospective Teacher Fellowships		Yes		
	Training in the Allied Health Prof.		Yes		
	Fellowships for City Planning		Yes		
Seventh: Research Only	Educational Policy Research Centers			Yes	
	Regional Educational Labs			Yes	
	Univ. Centers for Educ. R & D			Yes	
	Arts & Humanities Research			Yes	
	Correctional Rehab. Manpower			Yes	
	Res. Support in Biology, Med., & Health			Yes	
	Scientific Research Grants			Yes	
	Bio-Medical Research			Yes	

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ABSTRACT

To examine the feasibility of establishing Highway Safety Manpower Development and Research (HSMDR) Centers at university-level institutions which would produce three types of manpower--safety specialists, safety professionals, and research manpower, previous National Highway Safety Bureau research studies and approximately 50 federally funded education, training, and research programs were reviewed. This document, the first of a 2-volume report, contains results and recommendations of the feasibility study in these chapters: (1) Skills and Disciplines Required for Highway Safety Manpower Development, (2) Alternative Strategies for Establishing HSMDR Centers, (3) Criteria for the Selection of Candidate Universities, (4) Identification of Candidate Universities, (5) Results of Discussions with University Representatives on the Establishment of Centers, (6) Guidelines for the Administration and Operation of Centers, (7) Evaluation Plan, (8) A General Plan for Program Controls, (9) Congressional Justification for the Establishment of Regional Pilot Centers, and (10) Preparation of a Request for Proposal for the Establishment of Regional Pilot Centers. Several data tables and other study materials are available in Volume II (VT 013 332) in this issue. (SB)

six columns list program design features that were considered of crucial importance to the administration of the proposed NHSB program. The last column shows the number of similarities in crucial program design features between the proposed NHSB program and each of the analogous programs. (The maximum number of possible similarities is four.)

Findings and Inferences

Detailed findings and inferences of the survey of analogous programs are given below.

1. Only six of the 47 analogous federal programs include all three of the program functions of the proposed NHSB program. None of the existing programs match the proposed NHSB program design in all four crucial respects.

Inference: No single existing federal program for college-level training, education, and research assistance can be considered an essentially complete analogous precedent for the proposed NHSB program. If it is implemented on the basis of its present operational criteria, the NHSB program must establish a modus operandi that is original in at least some respects. Modifying the proposed program to more closely resemble existing programs would be obviously easier from the standpoint of demonstrating feasibility and following precedents. However, the value of unique features in the proposed NHSB program may counterbalance those advantages.

2. The six analogous programs that provide all three functions (those in the first groups of Table 2-1) are all administered through grants to individual institutions. None operate through special centers designed for a special mission.

Inference: Existing all-purpose college-level federal programs are organized in a much more limited and decentralized way than the proposed NHSB program would be. The lack of a clear precedent for an all-purpose program suggests that the NHSB program might feasibly be split into separately organized programs. For example, training facilities might be established and administered in one manner, and graduate education and research in another. The methods used by other agencies (such as USOE, the PHS, and the AEC) in organizing a broad spectrum of activities under separate programs could be investigated as a means of suggesting proven alternatives to meet the NHSB's organizational needs.

Final Report

THE FEASIBILITY OF ESTABLISHING HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH CENTERS AT UNIVERSITY-LEVEL INSTITUTIONS

Volume I: Study Report

Prepared for:

OFFICE OF SAFETY MANPOWER DEVELOPMENT, TRAFFIC SAFETY INSTITUTE
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Final Report

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THE FEASIBILITY OF ESTABLISHING HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH CENTERS AT UNIVERSITY-LEVEL INSTITUTIONS

Volume I: Study Report

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would be forthcoming from the host university and would be paid through the center overhead charges.

A suggested organization design is shown in Table 2-3.

The center director is expected to be a full professor with some experience in highway safety education. His duties fall in four broad categories: First, to provide the continuing liaison between the NHSB and the university administration in matters of highway safety standards, policies and regulations, program controls, and so forth; second, to direct the operations of the center itself, in both academic and administrative matters; third, to assure that the center is constantly attuned to the changes in the host university and in the broader university-level academic world; and fourth, to keep pace with the advances in the state-of-the-art of highway safety in general, but particularly in matters related to manpower development.

The relative position of the center in a university would vary, depending on the unique organization of the host university. Some existing highway safety centers are attached to the continuing education or extension branch of a university. There are advantages in having the director report directly to the president of the university, the vice-president of academic affairs, or the provost, to assure the support of the faculty coming from seven different schools and departments. However, there are examples of successful existing centers that report to the dean of a separate school, such as engineering.

The director of instruction would coordinate the activities of those faculty teaching on a part-time basis in the center, while permanently attached to their respective schools or departments. He would also be active in the development and revision of curricula of courses given in the center. He would supervise the staff of seven administrative assistants and their secretaries, who would provide the administrative support to the faculty when they were active in the center.

The director of research would be responsible for the laboratory operations and also assist the faculty in establishing and conducting research projects in support of education or under contract. The research activities would be performed by students and the faculty. However, five full-time laboratory technicians might be required to provide continuity in the lab operations, since five lab sections probably would be needed to support all aspects of education and training.

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- Its inability to dispense education, i.e., graduate credit courses leading to advanced degrees--It is true that the three military service academies do grant equivalent B.S. degrees, but these are the only exceptions. Recent attempts of the FAA Academy to become a degree-granting institution were turned down by the Civil Service Commission as contrary to national educational policies. Thus, the highway safety academy could not cover the whole spectrum of highway safety manpower development, but would have to be supplemented by other means.

- Legal and regulatory problems--The establishment of a new federal academy would require Congressional authorization, entailing considerable amount of preparatory legal work, and creation of favorable public opinion. If the new administration should move ahead with its plan for a federal police academy, such a precedent may facilitate the organization of a highway safety academy.

- Difficulty in dealing with state and local authorities--The great majority of highway safety positions are at the state and local levels. There are very few precedents of state and local government employees being trained in federal government organizations. There is also a prevalent belief that highway safety training is somewhat similar to secondary education and should be outside of the federal government jurisdiction.

Regional Centers

Two alternative approaches were studied at the regional level: (1) establishment of a single university HSMD&R Center in each region; and (2) establishment of a consortium, with several universities contributing staff to the centers. Two subalternatives were studied with respect to cost and manning requirements for a regional center: (a) where the center is responsible for all highway safety training and education; and (b) where the training for driver education and police positions related to highway safety functions is allocated to other educational institutions in the region.

There are two reasons for considering the allocation of driver and police education to other institutions. First, driver education and police responsibilities for highway safety are local and state functions for which training is now provided in many universities and police academies, and

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INTRODUCTION

Background

If the toll of accidents and fatalities on the national highways is to be appreciably reduced, it is clear that a sizable professional work force must be created to assume the enormous task of implementing and enforcing highway safety and motor vehicle standards. This work force must be allocated to federal, state, and local levels if the national program is to be successful. The program will require new occupational skills and will compete with other professions and manpower pools for qualified and educated personnel. Attractive programs at the bachelor's, master's, and even doctoral levels, will be needed to entice students and others into these fields. There will also be a need for relatively short training programs at lower skill levels and for programs to provide refresher training and new knowledge to existing members of the work force at all levels of safety manpower.

The National Highway Safety Bureau is particularly interested in developing research talent for highway safety fields through new programs at selected universities. These new programs will be multidisciplinary in nature, inasmuch as highway safety is not a singular science. In this respect, the NHSB shares those problems that were faced in the establishment of occupational programs in areas such as transportation, operations research, and social relations. Each of these has been established as an academic program cutting across several university departments and has had the salutary effect of producing graduates who are at home in several disciplines in addition to their major area of concentration.

As the requirements for training safety manpower have become more defined, it has become quite evident that there is an absence of a sufficient number of educational centers oriented toward highway safety. For those that do exist, the demands that could be placed on them would far exceed their capacity. Projections of the present need for skilled safety manpower surely must be out of proportion with even the most liberal estimates of growth expected in currently established training programs to meet such needs. Considerable effort will be required for the attainment of newly established federal standards and goals for highway safety and accident reduction. It is clear that the training of highway safety specialists and safety professionals and the development of research capability for highway safety cannot be provided on a fragmentary basis.

The problem of highway safety is such a pervasive one in our society that it may justify the establishment of specialized centers such as those provided for research and training in the field of education. After many years of attempting to improve educational practices through a centralized function, the federal government has instituted regionalized laboratories, university research and development centers, and internships at qualified universities to increase the number of professionals in educational research. There is some parallel between this evolution and that which may be envisioned for training and education in highway safety.

The scale of the highway safety manpower development problem on a national basis is so great that several critical issues must be addressed. These include the needs to:

- Marshall existing educational resources, especially those at institutions of higher education, and effect an integration of them into a systematic program

- Integrate existing educational and training centers oriented toward highway and traffic safety and traffic and transportation engineering into an effective program of safety manpower development, since these centers have already developed considerable experience in training, curriculum development, and research

- Develop a manpower development program whose structure will be consistent with the capability and resources of the NHSB to manage, control, and coordinate the program, and which is also consistent with reliable estimates of federal funding that may be made available for the establishment of safety manpower development centers and ensuring their continuity

- Stimulate the interest of employing agencies at state and local agencies so that, as they develop highway safety programs from guidance received through the publication of federal highway safety program standards, they will undertake to create new positions to be filled by qualified personnel

- With the expectation that federally supported training centers will come into being, assist the employing agencies in further developing the proficiencies of personnel employed in job specialties related to highway safety.

Many options exist in the context of higher education for the establishment of a system for the development of highway safety manpower. Centers for such purposes could be established at salient universities in each state, or the major training requirements conceivably could be satisfied through the establishment of a national academy, using the FAA Academy as a model. Between these two approaches is that of establishing a series of regional centers into which would be grouped the resources of highly qualified universities that have established capabilities and experience in operating university-based transportation research centers and traffic and highway safety institutes. Unique possibilities exist, also, for enlisting the support of other segments of the educational system in conjunction with any of the major options just described. Community colleges, for example, could be commissioned to provide instruction on selected job specialties in highway safety, just as they now provide instruction in other technical areas. In the current study, several options similar to those noted above were examined, and unique combinations of these also have been studied. The options or strategies examined in this study do not exhaust the total possible array of alternative approaches, but they do represent the ones in which the NHSB has had an abiding interest. They also represent additional possibilities that have emerged during the course of the study and were not anticipated at the outset. The feasibility of each option or alternative has been guided by such criteria as cost and effectiveness, the ability to stretch the existing resources of experienced personnel in highway safety, the extent of their management and control by the sponsoring federal agency, and other factors, such as the estimated time required for the establishment of a full array of centers.

Objective

The main objective of this study was to examine the feasibility of establishing HSMD&R (Highway Safety Manpower Development and Research) Centers at university-level institutions. These centers would produce three types of manpower: safety specialists, safety professionals, and research manpower.

Major elements of this feasibility study included:

- Determination of the relative feasibility among several alternative strategies of the placement of HSMD&R Centers. It is conceivable that centers could be placed at state, regional, or national levels. Limited variations within these options were also examined.

- Determination of the criteria that should be employed for purposes of assessing the qualifications of a university to support a center, and the identification of universities throughout the country that meet these criteria.

- Development of guidelines for the establishment and operation of the proposed centers, emphasizing the coordination of the NHSB and employing agencies of highway safety manpower, and for the operation of a center and its relations with the university of which it would be a part.

- Development of evaluation procedures and program controls to enable the NHSB to measure the effectiveness of HSMD&R Centers with respect to the quality of their training programs, their ability to provide trained safety manpower in numbers commensurate to the needs of employing agencies, and their ability to produce graduates qualified to perform their safety functions effectively in their employing agencies at local, state, and federal levels.

- Development of preparatory materials for an RFP (Request for Proposal), for establishment of HSMD&R Centers, including a work statement, task descriptions, and related materials, for formalization and submission to bidder universities by the NHSB.

- Development of program justification for HSMD&R Centers, in a form suitable for submission to Congress at the discretion of the NHSB.

Table 2-6

DISTRIBUTION OF FACULTY REQUIREMENTS BY HSMD&R CENTER DEVELOPMENT ALTERNATIVES

Faculty Composition for All Alternatives:

1.0 Full professor requires assistance of:
0.7 Associate professors
0.9 Assistant professors
0.3 Instructors
2.9 Faculty members per full professor

This multiplier applies to all professional requirements calculated in Appendices 1-1 through 1-14 and tables 1-5 and 1-6

	Requirements for	
DEVELOPMENT ALTERNATIVES	1973	1978
National Center		
All programs, university-based		
Professorial requirements (Tables 1-5 & 1-6)	= 129.82	110.82
Faculty requirements (Profs x 2.9)	= 377.00	322.00
Training only, federal academy		
Professorial requirements (Tables 1-5 & 1-6)	= 111.25	93.67
Faculty requirements (Profs x 2.9)	= 323.00	272.00
Regional Centers and Regional Consortia		
All programs university-based		
Ten equal regions; therefore:		
Professorial requirement is 1/10 of national university	= 12.98	11.08
Faculty requirement is 1/10 of national university	= 38.00	32.00
Excluding police training & driver education, university-based.		
Excludes 7 generalized job titles (Appendix 2-1), amounting to 48.8% of total manpower requirements; therefore 51.2% of professorial requirements	= 6.65	5.67
51.2% of faculty requirements of regional centers are included	= 20.00	17.00
State Centers		
A typical large state center (similar to a regional HSMD&R center) like California's needs 7% of national manpower requirements (Appendix 2-2) therefore professorial requirement = 0.07 of national university	= 9.08	7.76
and faculty requirements = 0.07 of national university	= 27.00	23.00
A typical medium size state center like Alabama's needs 2.2% of national professorial requirements = 0.022 of national university	= 2.86	2.44
and 2.2% of national faculty requirements = 0.022 of national university	= 9.00	8.00
A typical small size state center like Idaho's needs 1.0% of national professorial requirements = 0.01 of national university	= 1.30	1.11
and 1.0% of national faculty requirements = 0.01 of national university	= 4.00	4.00

SUMMARY OF MAIN FINDINGS

The study of the feasibility of establishing HSMD&R Centers at university-level institutions produced the following main findings. Chapter references indicate where a complete discussion and supporting information may be found in the text of the report.

Skills and Disciplines Required for Highway Safety Education and Training (Chapter 1)

Analyses were made of earlier sponsored studies by this NHSB of highway safety manpower requirements to determine requisite entry and refresher training for 36 general job specialties. These training needs were transformed into "full-time equivalent" student loads so that a national training requirement could be established.

Job specialties were analyzed to determine their skill requirements and the commensurate university disciplines needed to support them in a training program. The primary disciplines are engineering, education, and police sciences. Other related disciplines are psychology, law, medicine, and public or business administration.

The size of the faculty to be allocated to the HSMD&R Centers was determined, by discipline, and for the total education, training, and research requirement. All training requirements were projected on a five-year basis, to 1973, and on a ten-year basis, to 1978.

Alternative Program Strategies for the Establishment of Highway Safety Manpower Development and Research Centers (Chapter 2)

The literature on optimizing resources for training, education, and research was critically reviewed. Several viewpoints were found to be relevant to the proposed HMSD&R Centers:

- There is a "minimum critical size" for a research organization if it is to flourish, however, a large research group having a narrow focus may become unproductive

- Educational effectiveness may be more a function of the quality of the student than of the institution

- The government may be more suited to provide education and training in highly specialized areas.

Approximately 50 federally funded education, training, and research programs have been reviewed to discover a precedence for the proposed HSMD&R Centers. No existing programs are equivalent in scope and complexity to the proposed centers. It is therefore concluded that the NHSB program must establish an original method of operation unless it wishes to modify its current concept of the program to resemble more closely the other government programs of manpower development.

Application of three principal criteria for the strategy of organizing HSMD&R Centers, viz., feasibility, costs, and speed of implementation, produced the following findings:

- Establishment of regional centers appears to be the most feasible approach, combining the advantages of pooling existing limited capabilities within neighboring states, while avoiding the enormous task of building up a single national centers.

- Economy of scale favors a national center; the total system cost, i.e., initial investment and annual operating costs, are the highest for the 50 state centers and lowest for the single national center. However, it should be noted that a single national center served primarily as an analytical base on which other alternatives could be scaled and costed.

- Speed of implementation would probably be the greatest with a federal academy, but only for the training component. However, existing capabilities in highway safety, traffic and transportation engineering, and research would provide a solid base for a relatively fast build-up for several state or regional centers The effect would be more uniform for the entire country, however, if regional centers were embraced.

The United States was divided into ten regions for purposes of this study. Each region accounts for approximately 10 percent of the national safety manpower training requirements, including both state and local needs.

By applying qualitative criteria to the alternative strategies, it was found that state centers might be more responsive to local needs and receive greater local support, and that a central, or national, university center might be more responsive to federal program standards, and standardization of curricula and be more easily administered by the NHSB. Regional centers were ranked high as a means of marshalling interdisciplinary capabilities. Regional centers also received more second-place rankings than the other alternatives on all effectiveness factors.

Since the scope and complexity of operation that would be demanded of a university if it were to function at the regional level is without precedence, it is concluded that a limited number of pilot centers should be established for operational testing of the regional concept. Under actual operation, empirical findings should emerge to substantiate the a priori advantages of HSMD&R Centers at the regional level or indicate that an alternative strategy should be considered. The current study, by itself, does not justify commitment to a system of regional centers except on the basis of lower costs. It is recommended, however, that the cost estimates in this study be interpreted with the reservations that the data have no greater level of reliability than is typically encountered in statistics on educational institutions, where accounting systems may vary among universities and where frequent variations occur in the completeness of sampling and reporting. Judicious selection should be made of universities for pilot centers to maximize the capability existing in this field. If regional pilot centers are successful, it is envisioned that they would be expanded and that their number would be increased throughout the country.

Criteria for the Selection of Candidate Universities (Chapter 3)

A university's qualifications to support an HSMD&R Center are essentially its capabilities in those disciplines pertinent to highway safety, training, education and research. It should be a Ph.D.-granting institution, with strength in engineering, education and police sciences. Law, medicine, psychology, business administration, or public administration should also be represented.

In view of the need to provide graduate-level instruction, minimum levels (i.e., undergraduate, M.A. Ph.D.) have been established for each discipline. Other criteria more closely related to highway safety have been assembled, e.g., driver education, police traffic engineering, in the event that the NHSB may wish to employ these in a future screening process.

Identification of Candidate Institutions (Chapter 4)

Qualified university candidates were found at regional levels and in several states. In every region, there was at least one university with the basic qualifications. In several regions there were more than one qualified public institution or an alternative private university. It was assumed that universities lacking a single capability, such as law or medicine, could subcontract for such support if they were requested to bid on a center.

Results of Discussions with University Representatives on the Establishment of Centers (Chapter 5)

Sixteen universities were visited to exchange information on the program and determine its impact on each campus. All ten U.S. regions were visited, and both public and private universities were included.

Major findings of the university visits are the following:

- General programming of HSMD&R Centers--A minimum of five-year funding is considered desirable for university centers and will allow for the establishment of the program in orderly phases. University representatives regard the responsibility of operating a center sufficient to justify leadership at the vice-president level. The centers are also envisioned as being directed by the school of engineering, where they could be related to ongoing programs of traffic centers or transportation research.

- Coordination with federal agencies--There is general acceptance of NHSB-established performance standards or criteria for short-course instruction. However, little enthusiasm exists for procedures such as detailed supervision, close monitoring, and excessive progress reporting. Site visits by qualified professionals and review at the program level are considered more appropriate.

- Finances--All of the universities visited have had experience with programs financed by matching federal funds with university funds. Matching funds have been highly varied in their amounts and their purposes (e.g., for fellowships, facilities, or faculty salaries). The extent of matching seems to be correlated with the university's interest in a proposed program.

- Facilities--Research and graduate components of the centers are perceived as being administered by the cooperating university departments rather than by a central facility. However, most university representatives favor a separate facility for integrating the requirements for short-course instruction, libraries, and administration of the center.

- Faculty--The pooling of faculty talents is viewed as necessary to meet the multidisciplinary requirements of the proposed program. While it is considered desirable to have faculty members conduct the short-course instruction, the NHSB should be alert to other sources of instruction, such as practitioners from the field and the appointment of full-time instructors. The faculty will require motivation to remain with the program, including opportunities for advancement within the university.

- Students--The attraction of competent graduate students is dependent on the availability of fellowships and grants, the opportunity to participate in research, and the assurance of career opportunities. Insurance of a flow of short-course students from the field will depend on the cooperation of the employing agencies in establishing positions in highway safety, providing release time for attendance at the centers, encouraging employees to attend, and providing reimbursement for costs incurred.

- Curricula--Most of the universities visited have a base of nonresident instruction or continuing education on which to build a highway safety program. In some cases, however, the short-course instruction planned for centers will require expansion of the current program because of the number of students that must be trained. Under the current concept, students enrolled in short-courses will return to their employing agencies with the main purpose of instructing others. Consequently, there is a concern among university representatives that the practitioner from the field learn instructional skills in addition to technical knowledge and skills.

Guidelines for the Administration and Operation of Centers (Chapter 6)

Critical events were time-phased, for the activation of HSMD&R Centers, and cover:

- Organizational policies and procedures.

- Personnel programming for short-course students, graduate students, faculty for training, faculty for education and research, and the administrative staff.

- Curriculum development in training and education. Representative curricula in highway safety were developed from a study of existing programs at several universities.

- Facilities availability, including occupancy of existing or remodeled structures and new construction.

- Funds availability, representing the planned disbursement of funds during the activation phase of HSMD&R Centers.

Guidelines for the ongoing administration and operation of HSMD&R Centers were developed for each alternative program strategy. Guidelines were structured according to the five areas described above, with special emphasis on:

- Relationships between a center and the NHSB, the host university, and the field environment from which most students will be drawn.

- Ensurance that quality of output (students) is in accordance with needs of the highway safety program.

- Maintenance of a qualified instructional staff, which will conduct training in accordance with stipulated teacher student ratios.

- Continuing scrutiny of curriculum for training and education to ensure that it meets the needs of practitioners in highway safety and that the graduate education is oriented to the professional standards of the university.

Plans for Evaluation of Centers (Chapter 7)

The NHSB expressed a need for a continuing evaluation of the quality and effectiveness of HSMD&R Centers after they have been established. Therefore, a plan was developed for the evaluation of:

- Financial expenditures

- Facilities and equipment

- Training and curriculum development

Professor	$15,435
Associate professor	12,335
Assistant professor	9,735
Instructor	7,615

The average faculty salaries for 1973 and 1968, using the "faculty mix" explained earlier and the 5 percent annual increases, amount to $17,037 and $21,745, respectively. The calculations are shown in Table 2-9.

- The salaries of other personnel in the center were based on the 1968 rates for their respective positions. Local and regional differences in salaries and wages across the country may amount to as much as 20 percent, but were not taken into consideration in this study. The annual salaries for each position are shown on the four organization charts in Tables 2-3, 2-5, 2-7, and 2-8. It is conceivable that salaries for lead nonteaching professionals, (director, assistant director, research director, and so forth) could be greater than those shown in these tables. As an estimate the total cost of salaries in 1968 dollars could be increased by 14 percent, on the average, for all centers, with the exception of the budgeted estimate for the national university-based center.

- For the federal academy subalternative, the civil service average grade and pay structure that now prevails at the FAA Academy was assumed, i.e., GS-11 for the instructors and GS-9 for all other personnel. The corresponding annual salaries by the end of 1968 were $11,563 and $9,590, respectively. The current FAA Academy ratio of 3/2 for instructors and other personnel (60 percent of the total personnel are instructors and 40 percent are administrative and support personnel).

- The university overhead rates, among the universities the SRI study team visited, ranged from 20 to 69 percent of direct salaries. Unfortunately, these rates are not comparable, as each one covered a different share of expenditures. An overhead rate of 50 percent of salaries and wages was assumed, which is probably a little above the current average. However, the trend of increasing university rates, as institutions broaden their field of activities and provide more services to students and faculty, is expected to continue. A 35 percent overhead rate is suggested for the academy. This rate approximates the combined overhead rate for the FAA Academy (23 percent),

- Research activities

- Administrative policies and procedures

Evaluation of the training program placed emphasis on the need to stipulate objectives in operational and measurable terms so that they may be validated and on the use of field visiting teams to determine more closely the training needs and adequacy of the existing program.

A General Plan for Program Controls (Chapter 8)

Program controls were designed to enable the NHSB to maintain cognizance of:

- Programmed versus actual training, and rate of funds being expended for training.

- Programming of training in accordance with manpower needs, proportioned according to highway and motor vehicle statistics needs of program standards from the NHSB.

- Training effectiveness, as indicated by an information flow and feedback from centers and field employing agencies on the adequacy of training, and the job performance of recent graduates.

Congressional Justification for the Establishment of Centers at University-Level Institutions (Chapter 9)

A statement justifying the establishment of HSMD&R Centers was prepared for submission to the U.S. Congress by the NHSB and includes a presentation of:

- Overwhelming needs for highway safety manpower, and the university disciplines that will be required for their training and education.

- Alternative program strategies that may be embraced (e.g., federal, state, regional), differences in operating costs, and the advantages and disadvantages of each alternative strategy.

- Plans for the selection of candidate universities to support a center, and results of comprehensive discussions with university representatives on the feasibility of university-based centers.

- Plans for the establishment, operation, and control of HSMD&R Centers.

- Reasons for favoring the establishment of regional HSMD&R Centers but with the need to test the regional concept through pilot centers. Funding levels, for the proposed regional pilot centers are presented.

Preparation of a Request for Proposal For The Establishment of Regional Pilot Centers for HSMD&R (Chapter 10)

Preparatory material in the form of a sample RFP was prepared, for future formalization at the discretion of the NHSB. These materials cover:

- The history and evolution of the Highway Safety and Motor Vehicle Acts of 1966, the establishment of the NHSB, and the mission and purpose of the Office of Safety Manpower Development within the National Highway Safety Institute.

- Categorizations of highway safety manpower and their needs.

- Studies authorized by the NHSB on highway safety manpower needs, and their general results.

- Objectives of the RFP, and the statement of work (tasks) for responding universities.

RECOMMENDATIONS AND CONCLUSIONS

This study analyzed the magnitude of the safety manpower development needs on a national basis, and feasible ways of marshalling educational resources of higher education for such purposes. The following recommendations and conclusions were reached:

- Attempts to establish safety manpower development centers in each state would soon overtax the professional capability that exists in this country for training, research, and education in the general field of highway safety. Even if such centers could be established successfully, an inordinate task would arise within the NHSB for coordination and management of the manpower development program and for the introduction of even a modicum of standardization of curricula and proficiency standards for training. The study also demonstrated that an economy of scale exists in this program, as it has in other programs, and that the establishment of centers in each state could be more costly than alternative, larger-scale centers. The Office of Safety Manpower Development must keep this factor in mind, since it must cope with budgetary priorities established within the NHSB.

- Within limitations that may be forced by funding factors and priorities established by the NHSB, there is a need to move ahead with the program of safety manpower development, even if less than the total need for training is accommodated. The establishment of HSMD&R Centers on a pilot basis should serve this purpose, even though they may be forced to operate on a limited scale. It is only by the activation of such centers that a firmer understanding will be gained of the requirement for manpower development with respect to the numbers actually requiring training, the speed with which they can be trained, the costs of such programs, and the realization of methods for resolving problems in management and coordination when field agencies, the university, and the NHSB participate in the same program.

- Although the mission of HSMD&R Centers cannot be interpreted as one requiring scientific breakthroughs, there is very little precedence for such large scale efforts in the civilian sector, and it is very likely that there are many problems attendant on the operation of such centers that should be explored before launching out with even as many centers as might be required by those ten regions defined in this study. Further exploration of the feasibility of establishing centers is necessary, but the next phase should be one of activating a number of pilot centers that will replicate the functions of the system of centers that is ultimately envisioned. This study indicated there are advantages to moving in the direction of regional centers, and one array of regions has been defined. If the regional concept is embraced, it is essential that pilot centers be funded to operate with a scope and complexity adequate to meet regional responsibilities. If the pilot centers are successful, increased funding must be provided as they assume full roles as regional centers. However, great care must be exercised in the funding of university complexes that are selected as beginning or pilot centers, for they will constitute an investment in the establishment of an organization. Fortunately, in terms of the limited number of pilot centers that are being considered by the NHSB, there are many universities that possess the disciplines necessary to support safety manpower development, including its educational and research requirements. Several of these universities have established programs in some aspect of highway safety. To develop excellence, they have tended to specialize in singular areas such as driver education, police training, and traffic and transportation engineering. Those universities selected for pilot centers should be encouraged to move out of specialized areas to meet the broader scope of requirements for safety manpower development.

- Each of the ten national regions designated in this study represents 10 percent of the total state and local manpower requirement. It is inevitable that most of the safety manpower included in current estimates will require training. Future estimates may vary from those that were used in regionalizing the country, but such changes do not affect the principle of an equitable distribution of manpower training needs among regions, therefore, regional centers in any future system may have similar requirements. In every region, a university was selected that offered the capability to support a center and a history of involvement in the safety field. Alternative universities were also found that could provide excellent support to safety manpower development. The distribution of highly qualified universities with prior involvements in highway safety is not uniform throughout all ten regions. Such institutions tend to cluster in the Midwest and are less in evidence in the South and general Rocky Mountain area. Therefore, should the NHSB wish to move in the direction of regional centers, there is no reason to remain with the regional allocation as proposed in this study. The NHSB may wish to rearrange regions to further capitalize on the capabilities existing at universities in highway safety, especially at those universities that have sufficient depth in those disciplines that are critical to the general program. The insistence that all regional centers have equitable manpower development loads, while at the same time being academically pleasing, may be less effective in marshalling existing resources in highway safety at universities than if other criteria were applied to regionalization.

- Even during the regional pilot center phase, consideration should be given to relatively simple consortium arrangements, in the interests of capitalizing on existing capabilities. Consortium arrangements discussed in this study would allocate responsibilities for driver education and police training to other universities in a region. This option could be exercised during the pilot phase by awarding responsibilities for police training to one university and driver education to another, with the two universities thus assigned operating as satellites of the one given prime responsibilities for a pilot center. This would leave the prime university free to explore and develop its program around the remaining job specialties and to promote components of the program calling for graduate education and research. In addition, the prime university would function in a management role with its satellite universities and would be the primary arm of communication with the NHSB.

- There are certain reservations regarding manpower training that may be expected to flourish at the employing agency level. The large numbers requiring training would necessitate that a limited number be drawn and that each individual trained at a center become responsible for training several hundred others in his similar job specialty. Even under the assumption that each man trained at a center would become a trainer of others, large training loads were perceived for centers. While this assumption was accepted for planning purposes in the study, its validity for training at the local level should be further explored. The basis for this assumption should be established early in the development of the pilot centers, for it will have considerable impact on training programs. It will also affect the qualifications of individuals selected at local levels for attendance at centers, the kind of training that is to be provided in instructional skills, and the training packages that are to be provided the new instructor, such as syllabi, lesson plans, and achievement tests. If newly trained personnel are merely absorbed into the work force on return and are not given the opportunity to instruct, or if study of the problem should indicate that little assurance should be anticipated of a commonality of training environment or curricula at local levels, development of new approaches for effective training of the vast bulk of safety specialists and professionals in employing agencies will be required. These new approaches could include the utilization of university extension programs, community colleges, and similar educational institutions. Even with the differences that might prevail among such institutions or programs within a region, the chances of achieving some standardization of curricula and a higher quality of instruction are much greater. These new approaches to training would allow a center to host workshops and conferences on training curricula and to modify and update their own programs, much in the same fashion as that used by teachers and other educational personnel.

- The NHSB will require a system of evaluation procedures and program controls if it should find itself responsible for the management and funding of several regional centers. It will also be concerned with the guidelines that centers will establish for their operation and for relating administratively to their hosting universities. Plans and procedures for these purposes are provided in this report. The purpose of the next phase should be to validate these plans and procedures. The first centers that are established, whether they are pilot centers or full-scale regional centers in very limited numbers, will serve as excellent "test beds" for all planning that has preceded their activation. Among the controls and evaluation procedures that have been planned, the NHSB should eventually be able to identify that minimal flow of information through which it can maintain cognizance of its manpower development program, its effectiveness, and the information necessary to justify the continued support of the total program.

- There is a need to expand the output of qualified personnel in traffic engineering, police training, driver education, driver research, and roadway environment research, through existing traffic safety institutes, departments of engineering, and transportation research groups at universities. Even if the

The "acquisition" or "capital" costs are nonrecurring initial investments made when the center is being developed and reflect the current prices of labor, materials, and real property.

The "total system cost" is the sum of the annual and capital costs for all centers making up a subalternative system, i.e., three large state centers or ten regional centers or ten university consortia centers.

The "total, all levels" under "faculty" indicates the faculty mix of 1.9 additional faculty members for each full professor.

Cost Analyses for Alternative Strategies

All cost estimates developed and expanded in this section are now summarized in Table 2-10, "Estimated Cost of Development of Alternatives for Highway Safety Manpower Development and Research Centers," and in Table 2-11, "Estimated System Cost of Major Highway Safety Manpower Development and Research Center Alternatives."

The costs in the first table are shown for two points in time; 1973 and 1978, to reflect the differing development of manpower requirements after a five-year interval, the effect of catching up with all training and education needs within five and ten years from now, and finally the effect of inflation on prices and costs of all resources.

All alternatives have different costs except a regional center and a university consortium. Obviously there will be some cost differences between these two types of centers. For instance, salary differentials between universities making up a consortium may well average below or above the average salary of a single university regional center. It is also probable that more alternative personal and other expenses will occur with a consortium than with a single university. Higher costs will be expected for a reimbursement for travel and per diem when students have to spend in-residence time at different universities to obtain an advanced degree or complete their training requirements. However, it is believed that such cost differentials are minor, and the results or cost analyses are not distorted by assuming the same total cost for the regional and consortium centers.

The exclusion of driver education and police training in a national center results in almost proportional reduction of annual operating costs. Thus, it can be assumed that the elimination or placing restrictions on any part of the training or education as it affects the number of FTE students and faculty will proportionately reduce the overall center costs.

manpower survey used as background to this study has underestimated national needs, the outputs of existing sources of manpower will be sorely needed, in addition to the eventual outputs of centers that may be established. As noted previously, the expanding role of existing traffic safety institutes and transportation research groups is perceived as consistent with the regional center concept, since universities with already developed capabilities could, in effect, become regional centers, or satellites to regional centers and take over large portions of the training in high demand areas, such as police training, driver education, and other highway safety specialties.

Chapter 1

SKILLS AND DISCIPLINES REQUIRED FOR HIGHWAY SAFETY MANPOWER DEVELOPMENT

Chapter 1

SKILLS AND DISCIPLINES REQUIRED FOR HIGHWAY SAFETY MANPOWER DEVELOPMENT

Introduction of the Highway Safety Program Standards in June 1967, resulted in a major change in future manpower requirements and training needs of operating entities in the field of highway safety. It was clear that new employee skills and knowledge would be required and existing skills and knowledge would need to be upgraded if the new standards were to be fully implemented. In addition, some form of periodic updating of employees would be desirable to disseminate new knowledge and refurbish individual skills. It was within this framework, then, that an examination was made of the feasibility of establishing HSMD&R (Highway Safety Manpower Development and Research) Centers to develop and carry out such activities.

As viewed in this study, the proposed centers would engage in three major functions: education, training, and research. Educational activities would consist of preparation of graduate students needed for operating and research positions in the field. Training would center around specialized short courses and instruction necessary for initial orientation and refresher training in highway safety specialties. Research would provide stimulation and dynamics to the education function, as well as furnishing new inputs to the training function. From the standpoint of student load, the largest volume would be in the training function where both entry and refresher training would be provided for federal, state and local government employees engaged in specialized highway safety activities.

The Office of Safety Manpower Development in the NHSB had earlier sponsored research aimed at identifying the manpower needs and the training and education requirements in highway safety activities. Reports available from these contracts included a depth analysis of manpower requirements in the 50 states,* a general estimate of local (county and city) government needs,† and reports on prototype courses developed for the education and training of highway safety researchers‡ and highway

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* Safety Specialist Manpower, Booz-Allen and Hamilton, 1968.

† Letter Report from Booz-Allen and Hamilton, dated October 14, 1968.

‡ Safety Research Manpower, The University of North Carolina Highway Safety Research Center, June 1968.

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In other words, there are very few fixed and semivariable costs in the operation of the center.

It should be understood that the travel and per diem costs may not be applicable in 1973 and 1978. It has been suggested that these expenses be reimbursed by the federal government to all students, as an initial encouragement to state and local authorities to participate in the program during its initial phase. It is hopefully expected that once the value of the HSMD&R Centers is proved, the "users," i.e., states and local agencies, will be paying these expenses in the future.

Table 2-11 presents "the system costs" of the five major alternatives for the development of HSMD&R Centers (however, only one set of figures is shown for the regional centers and university consortia).

In this case, the system cost was defined as the cost of operating all centers during one year for a particular configuration; for instance, 50 state centers and the District of Columbia, or ten regional centers, or ten university consortia, or a national center, or a federal academy. In the latter case, one should keep in mind that the academy is performing training only, and not graduate education.

As expected, the state alternative has the highest operating cost but the lowest investment requirements, mainly because of the study's assumption that small and medium state centers would have limited research facilities and equipment. The federal academy has the lowest operating cost and the highest initial investment. However, as mentioned earlier, this alternative requires other means of federal support for graduate education. It is obvious that a national center has the least annual operating costs.

These system estimates do include travel and per diem. If they are excluded, as shown on the same table, independent cost differentials of the four alternatives become much more striking in favor of a national center. The reason for this is that the costs of travel and per diem are substantially higher for the regional centers and for the national center. Students have a relatively short distance to travel to their own state center as compared with routes to regional centers or to a national center from their place of residence or employment.

Funding Levels for Estimating the Size of a Center

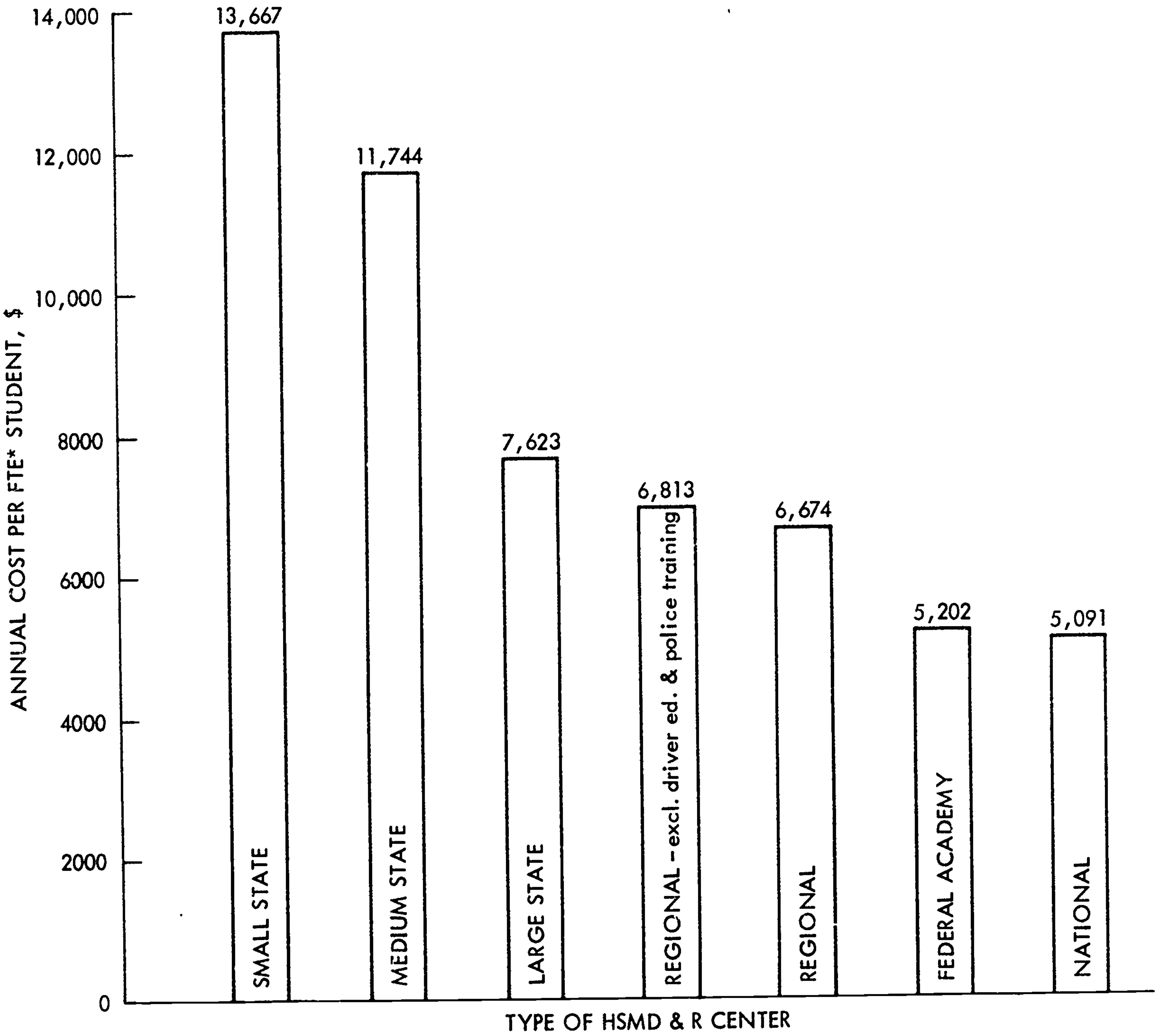
From the breakdown of cost estimates, it can be seen that the student loading is the critical factor that determines the size of a HSMD&R Center. This factor, in turn, determines how large the faculty is to become and how large a facility must be provided for the center. Cost estimates that have been developed for the different sized centers should enable the NHSB to determine the magnitude of the training program that may be expected under variations in funding levels. Also, for the same level of funding, the selection of the strategy that is to be followed will have a bearing on the number of students that can be trained annually since there are differences in cost-per-student among the alternatives. Therefore, should substantial funding become available for safety manpower development, decisions on how it is to be expended will require an integration of two factors: (1) the strategy that is to be embraced; and (2) the student loading that is to be handled, based on full-time equivalents.

HSMD&R Center Annual Cost per FTE Student. Figure 2-2 presents, in the format of vertical bars, the annual costs of operating one center for each of the nine different alternatives, prorated to FTE students.

The expenditures included in the annual operating cost are: (1) the salaries for the faculty and the center personnel, (2) an overhead burden of 50 percent, and (3) facility and equipment operating and maintenance costs of 12.9 percent of the combined payroll and overhead. However, for the federal academy, the current salary and overhead rates now in use at the FAA Academy in Oklahoma City have been approximated. Travel and per diem costs are not included.

A review of Figure 2-2 indicates that the per capita cost (i.e., the cost per each FTE student) is the highest for a small state center ($13,667) and the lowest for a national university center ($5,091), definitely pointing to the effect of the "economy of scale." It should also be noted that the cost of regional centers falls between the two extremes but closely approximates the lowest cost alternative.

HSMD&R Center Annual Cost as a Function of the Number of Students. In Figure 2-3, a linear curve is approximated, relating the total annual operating cost (excluding per diem and travel) and the number of full-time equivalent students at the center. The plot represents only the cost of three typical-size states and one regional center, as the make-up of other centers does not follow the same pattern; for instance, a regional



*Full time equivalent

FIGURE 2-2 HSMD&R CENTER ANNUAL COST PER FTE* STUDENT 1973

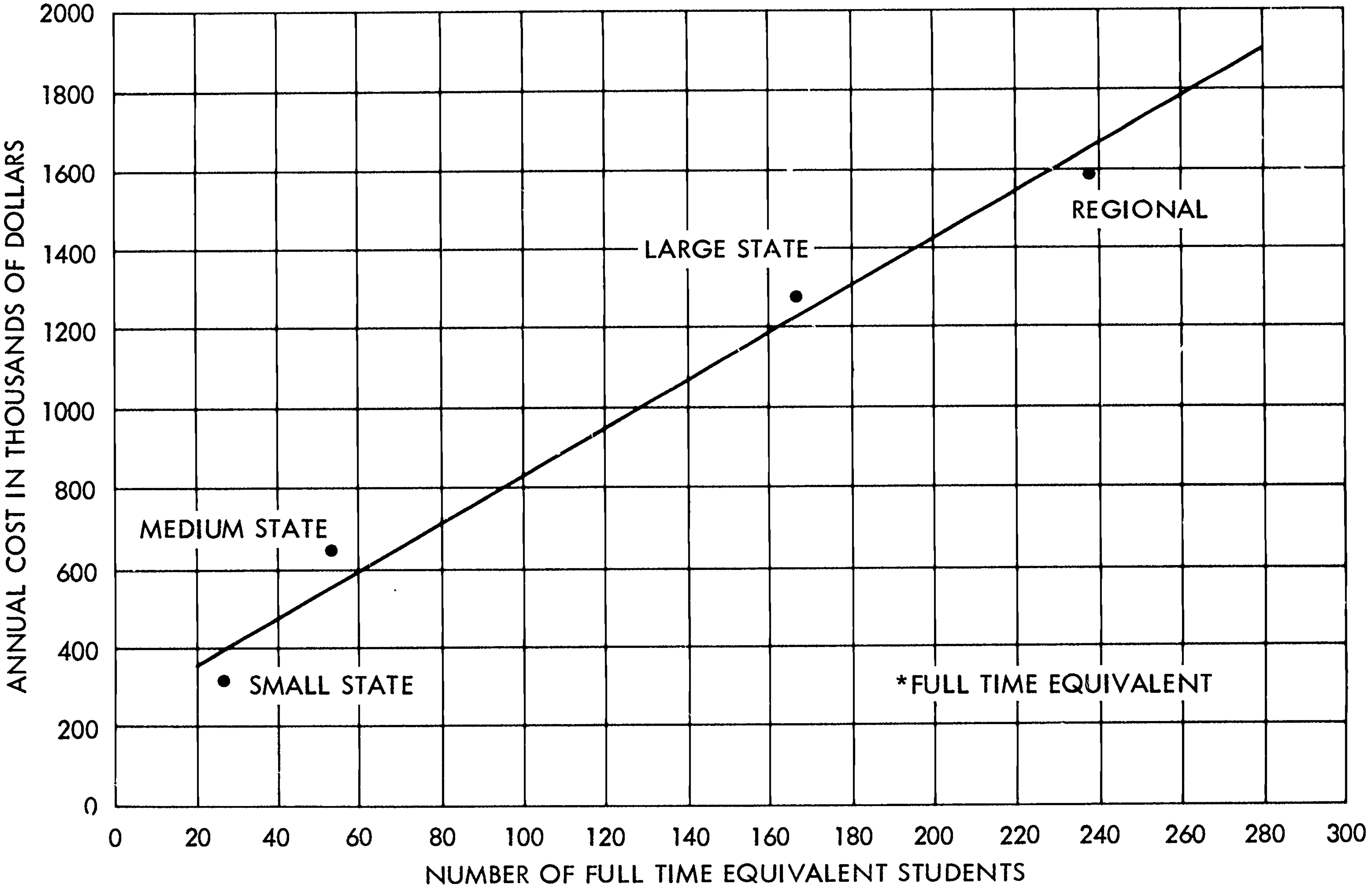


FIGURE 2-3 HSMD&R CENTER ANNUAL COST AS A FUNCTION OF FTE* STUDENTS

center or a consortium excluding driver education and police training, or a federal academy excluding post-graduate education, is excluded.

The curve has not been extended beyond the size of a regional center, because some of the assumptions for developing the cost of a national university center were different. The prorated basis for bringing trainees in from the field varied for regional and national centers as a function of total numbers within each specialty that would require training.

Summary

The cost analyses revealed that an economy of scale does exist when the highway safety manpower development program is aggregated into increasingly larger centers of operation. The program would be more costly if it were to be conducted at the state level than if it were to be implemented at the national level or at regional levels. The greatest economy would prevail if the total mission were to be implemented at a single center. Therefore, if all other advantages lay with a national center, the solution would be straightforward for the selection of the optimal program strategy among those that have been studied. However, this unique solution is not strictly the case in resolving the differences among the program alternatives, since there are advantages and disadvantages accompanying each option. Such advantages and disadvantages have been described in conjunction with each program alternative. Admittedly, they are more difficult to quantify than cost factors and should require further study. If they were to be ignored, however, they might have disastrous effects on the success of the future highway safety manpower development program.

The centralization of the entire program at a single university would provide the NHSB with greater control and ease of administration. However, it might raise considerable problems in securing cooperation of state and local agencies and in responding to the unique needs at these levels. Also, there are some dangers associated with overtaxing the resources of a university and overconcentrating the program in one educational institution. It should be reaffirmed that, while a national university-based center has been treated in the study the same as the other alternatives, its chief advantage lies in its providing of an analytical base from which to scale down to other systems of centers, especially the regional alternative. The national alternative of a federal academy for training components of the program is more appealing only because its speed of implementation might be greater than that of other proposed alternatives. However, there would still remain the problem of developing the graduate education and research components of the program and, perhaps, the inadvisability of separating the latter components from the short-course training requirements. It is true, also, that the FAA Academy is an attractive analogous precedent for training highway safety manpower, but it must be demonstrated that a similar arrangement can function as effectively with an infinitely greater training need and with personnel who belong to state and local agencies, as opposed to the FAA's almost exclusive clientele of federal employees.

State centers possess the attraction of being more responsive to local needs and have a potential for securing greater local cooperation, inasmuch as they would utilize existing, traditional channels of communication already in being for highway safety and other purposes. Several states appear to have major university complexes qualified to establish an HSMD&R Center mission. However, this capability is by no means uniform throughout the entire country and buildup rates of considerable variance among the states may be anticipated. From the NHSB viewpoint, problems in administration and program control may be greater than for other proposed alternatives.

The cost analysis provides the main analytical base for judging among the program alternatives. The alleged advantages for each alternative are of secondary consideration, since they have not been substantiated in this study. The consolidation of the entire program in a single university does not seem warranted, although the estimated costs of a national university center are lower than for the other alternatives. The probability is very low that the existing professional capability in highway safety would countenance a displacement from its home universities. The federally operated training academy is excluded from consideration at this time, even with its low costs, mainly because the essential contract requirement was to determine the feasibility of program alternatives that would be university-based.

After the single-center or national university concept, regional centers follow as the most feasible solution according to costs, and with the potentiality to:

- Organize flexibly to meet the needs of several states
- Capitalize on the limited professional capability in highway safety existing at universities
- Have available one or more highly qualified universities to host an HSMD&R Center in each of the ten regions defined in this study

- Achieve greater standardization of curriculum in training highway safety manpower through a limited number of centers

- Reduce the burden of direct NHSB coordination and control of centers, since a limited number would be involved

- Have a greater speed of implementation than if a larger number of centers were to be activated under other program alternatives

- Capitalize on precedents established among universities in neighboring states in sharing of federal grants.

Since the regional concept offers such potential advantages, it is the view of this study that this program alternative should be tested so that it may demonstrate its ability to meet its described expectations. Submission of the regional concept to test is discussed comprehensively under the "Conclusions" section at the end of this chapter.

Ranking of Alternative Program Strategies

Rationale for the Evaluation

In the previous section, cost estimates for the establishment and operation of HMSD&R Centers have been presented for the different program strategies (e.g., state, regional). In addition, the advantages and disadvantages of each strategy have been described. The provision of proof for those advantages and disadvantages that have been stipulated is beyond the scope of this study, for to do so would require an effort practically as great as that already expended in providing the main findings embodied in this report. This situation is not unique to the evaluation of HMSD&R Centers, since it occurs very frequently in many spheres of research. Further evaluation is needed, even though it is recognized that it may not be obtained through the analysis of objective data. In such cases, the data simply were not available, or an inordinate expense would have been encountered in obtaining them. For such reasons, the method of rankings, or ratings, was used very frequently.

Since six members of the study team acquired considerable familiarity with alternative arrangements for HMSD&R Centers, it was decided that they would function as the judges who would conduct the rankings of the alternatives. Initially, there were reservations about employment of the study team on the grounds that they were "inbred" in their perspective of how centers should be established. In conference discussions held immediately before the ranking, however, it was discovered that considerable diversity of opinion existed among team members on the effectiveness which could be predicted for the different alternatives when specific characteristics were raised. The ranking study described below, therefore, was an attempt to organize opinions of those who had achieved a considerable insight into this problem area.

Methods Used in the Evaluation

The following steps were followed in evaluating the alternatives:

1. Twenty factors were defined for purposes of obtaining judges' rankings on the program alternatives. These included such factors as effectiveness in recruiting students and responsivity to local needs. See Table 2-12 for the complete listing of the 20 factors.

2. Each judge independently provided his rankings on each of the 20 factors for all alternatives.

Table 2-12

EXAMPLE OF FORM USED BY A JUDGE FOR EVALUATING NONQUANTITATIVE QUALITY FACTORS IN HIGHWAY SAFETY RESEARCH CENTERS

Factors	Organizational Alternatives			
	Universities in States	Regional Universities	Regional Consortia	National Universities
1. Standardization of curricula	4	2	3	1
2. Effectiveness in recruiting students: Training	4	2.5	2.5	1
3. Effectiveness in recruiting students: Education and Research	4	2	3	1
4. Responsiveness to changing program standards	4	2	3	1
5. Responsiveness to local highway safety needs	1	3	2	4
6. Identification with national program objectives	4	2	3	1
7. Establishment of interdisciplinary capabilities	4	2	3	1
8. Retention of graduates in highway safety work	1	3	2	4
9. Ease of administration by NHSB	4	2	3	1
10. Simplicity of school administration	1	2	3	4
11. Information transfer: technical skills	1	2.5	2.5	4
12. Information transfer: instructional skills	1	2.5	2.5	4
13. Opportunities for supplementary Federal funds	1	2.5	2.5	4
14. Opportunities for supplementary non-Federal funds	1	2.5	2.5	4
15. Stability of contracting provisions	2.5	2.5	2.5	2.5
16. Availability of qualified professionals for staff	4	3	2	1
17. Responsiveness to build-up or contraction in program needs	4	2	3	1
18. Effectiveness in attracting staff	4	2	3	1
19. Attraction of political support	1	2	3	4
20. Overall effectiveness	4	1	2	3
21. Total summed rankings	54.5	45	53	47.5
22. Rank Order	4	1	3	2

3. Statements were obtained from each judge to justify his rankings and these comments were summarized for each factor.

4. The rankings were analyzed to develop overall conclusions about the relative effectiveness of each alternative strategy, based on agreement that was achieved among judges.

Procedures Followed in Ranking Alternatives

Rankings for the four alternatives were obtained from the six SRI technical staff who worked most actively on the project. All of the six judges were reasonably knowledgeable about the operational aspects of the program alternatives. Their rankings thus established an order of preference among the alternatives in terms of the 20 qualitative effectiveness factors mentioned above.

The procedure for obtaining the rankings is described below.

1. Rankings were obtained from each judge to reflect his estimate of the comparative effectiveness of each alternative on each factor. Thus, every judge assigns a rank in each of 80 cells, as shown in Table 2-12. The sum of the rankings by each judge on each factor equals 1 + 2 + 3 + 4, or 10. (This sum remains constant, even where tied ranks are given.) The sum of rankings for all cells by each judge equals 10 X 20, or 200.

2. The average preferences of the judges were determined next. Rankings given by all judges were totalled for each of the 80 cells, as shown in Table 2-13. Since the summed ranks on each factor is 10 for each judge, the total on each factor for all six judges must be 10 X 6, or 60.

3. The extent of consensus among the judges on each factor was assessed by means of the Kendall coefficient of concordance for nonparametric ordinal measurements.* This test provides a "coefficient of concordance," W, which is analogous in the multijudge case to the "correlation coefficient," r, for the two-judge case. It also permitted calculations to be made

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* Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences, McGraw Hill, New York, 1956.

Table 2-13

TOTALLED RANKINGS OF ALL SIX JUDGES ($R_j=R_1+R_2+R_3+R_4+R_5+R_6$)

Factors	Organizational Alternatives			
	Universities in States	Regional Universities	Regional Consortia	National Universities
1. Standardization of curricula	24	12.5	17.5	6
2. Effectiveness in recruiting students: Training	9	16	15	20
3. Effectiveness in recruiting students: Education and Research	14	13	14	19
4. Responsiveness to changing program standards	24	13	17	6
5. Responsiveness to local highway safety needs	6	16.5	14.5	23
6. Identification with national program objectives	24	13	17	6
7. Establishment of interdisciplinary capabilities	22	16	11	11
8. Retention of graduates in highway safety work	9	14.5	14.5	22
9. Ease of administration by NHSB	24	12.5	17.5	6
10. Simplicity of school administration	9	12	22	17
11. Information transfer: technical skills	18.5	14	12	15.5
12. Information transfer: instructional skills	16.5	14	14	15.5
13. Opportunities for supplementary Federal funds	16	16.5	15.5	12
14. Opportunities for supplementary non-Federal funds	8	14.5	13.5	24
15. Stability of contracting provisions	20.5	13.5	18.5	7.5
16. Availability of qualified professionals for staff	21	16	11	12
17. Responsiveness to build-up or contraction in program needs	23	13	15	9
18. Effectiveness in attracting staff	16.5	14	12	17.5
19. Attraction of political support	6	16	16	22
20. Subjective evaluation of overall effectiveness	20	10	12	18
21. Sum of all 20 features	20	13	15	12

of the significance level of the extent of agreement (i.e., of the fraction of randomized rankings by six judges that would yield agreements as good as the observed agreements). The test included several steps:

- The mean value of the totaled rankings in each cell was subtracted from the actual value of the totaled ranks in that cell. (Since there are four alternatives and the totaled rankings equal 60, the mean value for each cell is obviously 15.) The difference between the mean and actual values was squared. The squared value was entered in the corresponding cell, and the indicated values were summed in each row to obtain the value "S." Results of these operations are shown in Table 2-14.

- Given the number of alternatives, the number of judges, and the calculated value of S, a statistical table was used to determine whether the indicated value of S was significant at the 0.01 or 0.05 level. If less than 0.01 (1 percent of factors that had been ranked randomly yielded a value of S exceeding the observed value, the significance level was said to exceed 0.01. Similarly, a 0.05 significance level corresponded to a value of S exceeded by 5 percent of randomized rankings. The value of "W" (the Kendall coefficient of concordance) was calculated by dividing the value of S by 180. The value of W always falls between +1.00 and -1.00. Significance levels and the coefficient of concordance are shown in Table 2-15.

From inspection of Table 2-15, it may be seen that the reliability of the pooled judges' rankings was not the same for all 20 factors that were used to rank the four alternatives. The index of agreement among judges failed to exceed chance levels for 8 of the 20 factors. Those factors on which there was disagreement include effectiveness in recruiting students, training effectiveness, opportunities to obtain supplementary federal funds, the ability to attract staff, and overall effectiveness. Failure to obtain statistically significant indices of agreement on all factors was not surprising, in view of the diversity of opinion that was discovered among the project team members at the outset of the ranking study. Another reason that must be considered as underlying the lack of agreement may be attributed to the inherent nature of those factors of effectiveness on which the coefficient of concordance was not statistically significant. One should not expect agreement among any group of judges if they cannot rate certain phenomena realistically. This problem safety managers.* In addition, an earlier NHSB-sponsored study into the facility requirements for a national traffic safety research center provided information on potential federal research programs and corresponding manpower needs.† Data from these studies represented the most comprehensive and current information available on the nature and extent of the safety manpower development need, and the skills and disciplines defined in this report were identified and extended from information contained in these reports.

Skills and disciplines identified are principally those related to the technical courses required in safety-related subjects. With the application of the new standards in the field, this will be the most pressing kind of training need. Managerial development and supervisory training will also be needed as safety activities increase at all levels of government, but no special provisions are made for this training because it is readily available from a variety of existing sources, including state and federal training centers, private institutions, and in-house training programs. Particularly at lower levels, supervisory training programs should be developed in terms of the operating practices, procedures, and constraints of the employing agency. Many government entities now offer programs of this type, and those who lack them should be encouraged to create programs tailored to the requirements of their particular agency and mission.

The problem of highway safety is broad and diffuse in nature. No single discipline or field of skill can effectively answer the manpower training and educational needs in the highway safety field. The educational approach used in this report considers the multidisciplinary nature of the problem and structures the training in ways that combine the people and knowledge from a variety of disciplines and skill areas. In terms of existing university structure, seven major disciplines or departments are identified: Law; medicine or public health; business administration or public administration; education; police sciences or criminology; engineering; and the behavioral sciences.

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* Regional Safety Program Management Seminars, Automotive Safety Foundation, August 1968.

† Facility Requirements for the National Traffic Safety Research Center, TEMPO, General Electric Company, October 1967.

State Manpower Training Requirements

Future staffing needs and training requirements of states were the subject of extensive investigation in the Safety Specialist Manpower study conducted earlier. The duties, responsibilities, and functions of safety specialists in all 50 states were analyzed and combined into a set of 36 generalized job descriptions that embraced and defined the functions of these state-level specialists. As a part of their analysis and description, the contractor who conducted that study also identified the prerequisite education and experience required and the special entry training and periodic refresher training that appeared necessary to orient and update incumbents of these positions.

This information was arrayed in matrix form. Common courses were identified and combined, and an initial estimate was made of both the course content and the duration of the course. Based on the subject matter and the basic nature of the topic, courses were then assigned to the university department or discipline where interest and capability in the academic setting were expected to be found.

During the life of the project, estimates of the kinds and extent of training required were amended and updated, as additional information and experience provided new inputs. The final results of these estimates, including the percentage of training time allocated by discipline for each position, are shown in Table 1-1.

The NHSB had originally identified four major programs that encompassed the main functions and activities in the field of highway safety. These were the Motor Vehicle Program, the Driver and Community Program, the Driver Environment Program, and the Safety Operations Program. A fifth program category, "Planning and Administration," was subsequently designated. As used in this study, this latter category applies to functions of management, administration, planning and public information that encompass the other major programs.

For purposes of identifying manpower requirements and training needs, these five federal program areas were further subdivided into operational program categories dealing with specific safety functions, such as vehicle inspection, police traffic services, and emergency medical services. These operational programs, in turn, closely parallel the functional areas covered by the new standards issued thus far. The relationship between major federal programs, state operational program categories, and the 36 classifications of state safety specialist is portrayed in Table 1-2.

Table 1-1

HIGHWAY SAFETY TRAINING COURSES FOR STATE POSITIONS

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
Generalized Job Title	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medi-cine	Public or Bus. Admin.	Educa-tion	Police Sciences	Engi-neering	Psy-chology
1. Governor's Highway Safety Program Director	A. Purpose and Scope of the Highway Safety Program.	15	A. A Review of New Developments in Highway Safety.	24 Tri.			100				
	B. Duties of the Governor's Highway Safety Program Director.	25									
2. Highway Safety Program Analyst	A. The Background, Purpose and Content of the Highway Safety Program.	40	A. A Review and an Examination of New Developments in the Highway Safety Field.	40 Tri.			70		15	15	
	B. Established Federal Administration Procedures in Connection with Highway Safety.	40									
	C. Techniques of Program Formulation, Evaluation and Control as Offered to the Highway Safety Program.	60									
	D. Consultative Methods as Applied to the Highway Safety Program.	20									
3. Highway Safety Public Information Officer	A. The Background, Purpose, and Content of the Highway Safety Program.	40	A. A Review and Examination of New Developments in the Highway Safety Field.	40 Tri.			100				

Table 2-16

HIGHEST AND LOWEST SIGNIFICANT RANKINGS FOR THE FOUR ALTERNATIVES

Universities in States

Ranked Highest on the Following Factors:

2 Effectiveness in recruiting trainees
5† Responsiveness to local needs
8* Retention in highway work
10* Simplicity of school administration
14† Opportunities for non-Federal funds
19† Attraction of political support

Ranked Lowest on the Following Factors:

1† Standardization of curricula
4† Responsiveness to program standards
6† Identification with national objectives
7* Interdisciplinary capabilities
9† Ease of administration, NHSB
11 Information transfer, technical skills
12 Information transfer, instructional skills
15† Stability of contract
16 Availability of professional staff
17† Responsiveness to program needs
20 Overall effectiveness
21 Sum of all factors

Regional Universities

Ranked Highest on the Following Factors:

3 Effectiveness in recruiting students
12 Information transfer, instructional skills (tie)
20 Subjective evaluation, overall effectiveness

Ranked Lowest on the Following Factors:

13 Opportunities for Federal funds

Table 1-1 (Continued)

Generalized Job Title	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medicine	Public or Bus. Admin.	Education	Police Sciences	Engineering	Psychology
Motor Vehicle Inspector	A. The Techniques and Procedures of Conducting a Motor Vehicle Inspection, and in Report Preparation.	30	A. A Review and Examination of New Developments in the Motor Vehicle Inspection Field.	16 Yr.						100	
Motor Vehicle Station Inspector	A. The Background of the Highway Safety Inspection Program.	10	A. A Review and Examination of New Developments in the Motor Vehicle Inspection Program.	24 Yr.			15	25		60	
	B. The Techniques and Procedures of Station Investigators and Inspections Including Records Review in Connection with the Highway Safety Inspectior Program.	50									
	C. Teaching Methods as Applied to Highway Safety.	20									
6. Driver Training Program Specialist	A. A Review of Highway Safety Research Findings and Methods with Respect to Driver Training.	20	A. A Review of Highway Safety Research Findings and Methods.	40 Tri.			30	70			
	B. An Examination of Program Developments within Driver Education.	20	B. An Examination Program of Developments within Driver Education.	40 Tri.							
7. Driver Education Supervisor	A. A Review of Highway Safety Research Findings and Methods with Respect to Driver Training.	20	A. A Review of Highway Safety Research Findings and Methods.	40 Tri.			30	70			
	B. An Examination of Program Developments within Driver Education.	20	B. An Examination Program of Developments within Driver Education.	40							

7

Table 1-1 (Continued)

Generalized Job Title	Entry Training: Course Description	Entry Training: No. of Hours	Refresher Training: Course Description	Refresher Training: No. of Hours	Percent of Total Training Hours by Discipline: Law	Medi-cine	Public or Bus. Admin.	Educa-tion	Police Sciences	Engi-neering	Psy-chology
8. Driver Education Teacher	A. A Review of Highway Safety Research Findings and Methods with Respect to Driver Education.	20	A. A Review and Exploration of New Developments within Driver Education.	24 Yr.				70			30
	B. Behavioral Sciences.	50									
	C. Highway Safety Research Methods.	50									
9. Driver Retraining Instructor	A. Methods and Content of Remedial Driver Education.	60	A. A Review and Exploration of New Developments within the Entire Field of Driver Education.	24 Yr.				50		25	25
	B. Techniques of Commercial Driving School Inspection.	20									
10. Driver License Examiner	A. The Background of the Highway Safety Program.	10	A. A Review and Examination of New Developments.	24 Yr.			15				85
	B. The Background of the Driver License Program.	10									
	C. The Techniques and Procedures of Conducting Driver Tests, Including Special Vehicles Such as Motorcycles, and in Report Preparation.	60									
11. Driver License Hearing Officer	A. Motor Vehicle Laws, Adjudication Procedures, Fact Finding and Interview Techniques, and Report Preparation.	80	A. A Review and Examination of New Developments in the Driver Licensing Field.	24 Yr.	40			30			30

Table 1-1 (Continued)

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
Generalized Job Title	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medicine	Public or Bus. Admin.	Education	Police Sciences	Engineering	Psychology
12. Codes and Laws Program Specialist	A. Understanding of the Highway Safety Program.	10	(not determined)		75		25				
	B. Understanding of the Uniform Motor Vehicle Code.	30									
13. Traffic Court Judge	A. The Background of the Highway Safety Program.	10	A. A Review and Examination of New Traffic Laws and Court Procedures	16 Yr.	75		25				
	B. Content of Motor Vehicle and Traffic Laws.	15									
	C. Traffic Court Legal and Administrative Procedures.	15									
14. Traffic Court Program Specialist	A. The Background of the Highway Safety Program.	10	A. Examination of Developments within Traffic Court Systems and Traffic Laws.	40 Tri.	44		56				
	B. Administrative Techniques of Program Formulation and Evaluation with Respect to the Highway Safety Program.	35									
	C. A Review of the State Traffic Court System and Traffic Laws.	35									
15. Alcohol Technical Specialist	A. The Background of the Highway Safety Program.	10	A. A Review and Examination of New Developments in Relation to the Alcohol Program.	24 Yr.		50	20		30		
	B. Alcohol in Relation to Highway Safety.	10									
	C. Operation and Maintenance of Test Equipment in Connection with the Alcohol Test Procedure in Highway Safety.	20									
	D. Certification and Inspection Procedures of Alcohol Problems in Highway Safety.	20									

Table 1-1 (Continued)

Generalized Job Title	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medi- cine	Public or Bus. Admin.	Educa- tion	Police Sciences	Engi- neering	Psy- chology
16. Breath Examiner Specialist	A. The Background of the Highway Safety Program.	10	A. A Review and Examination of New Developments within the Alcohol Program.	16 Yr.	25		50		25		
	B. Courtroom Testimony Regarding Alcohol Problems in Highway Safety.	5									
	C. Report Writing in Connection with Alcohol Problems in Highway Safety.	5									
17. Accident Site Investigator	A. General Knowledge of Relationship of Highway Design, construction, maintenance and Traffic Operations, and Enforcement to the Prevention and Reduction of Accidents or the alleviation of their after effects.	40	A. A Review and Examin- of New Developments within Accident Site Investigation	40 Tri.			5		25	70	
	B. In-depth Knowledge of the Relationship between Traffic operation, Highway Engineering, or Enforcement and the Prevention and Reduction of Accidents or the alleviation of their aftereffects.	40									
18. Accident Site Investigator Aide	A. General Knowledge of the Highway Safety Program	10	A. A Review and Examination of New Developments within Accident Site Investigation.	24 Yr.			25		10	65	
	B. Relationship of Highway Design Construction Maintenance, Traffic Operations and Enforcement to the Prevention and Reduction of Accidents or the Alleviation of their aftereffects.	30									
	C. Accident Site Investigation Data Collection and Analysis in Connection with Highway Safety.	80									

Table 1-1 (Continued)

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
Generalized Job Title	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medicine	Public or Bus. Admin.	Education	Police Sciences	Engineering	Psychology
19. Traffic Records Program Analyst	A. The Backgroundof the Highway Safety Program.	10	A. A Review and Examination of New Developments within the Field.	40 Tri.			15	20		45	20
	B. In-depth Investigation of One Area of Traffic Records with Particular Emphasis on the Application of Statistical and Mathematical Techniques to Traffic Records for Research Purposes.	70									
20. Traffic Records Systems Analyst	A. The Background of the Highway Safety Program.	10	A. An Examination of New Developments in Highway Safety Programs and Traffic Records Systems.	40 Tri.			100				
	B. National Highway Safety Bureau Guidance for the Traffic Records Program and in Alternative Systems Concepts.	30									
21. Emergency Medical Services Program Specialist	A. The Background of the Highway Safety Program.	10	A. An Examination of New Developments in Emergency Medical Service Systems.	40 Tri.		70	30				
	B. Emergency Medical Services Systems in Connection with Highway Safety.	35									
22. Emergency Medical Services Field Representative	A. The Background of the Highway Safety Program.	10	A. A Review and Examination of New Developments in Emergency Medical Services Programs.	24 Yr.		70	30				
	B. Emergency Medical Services Systems in Connection with Highway Safety.	35									
	C. Inspection and Consulting Techniques and Procedures in Connection with Emergency Medical Services in Highway Safety.	15									

Table 1-1 (Continued)

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
Generalized Job Title	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medi-cine	Public or Bus. Admin.	Educa-tion	Police Sciences	Engi-neering	Psy-chology
22. Emergency Medical Services Field Representative (Cont.)	D. Emergency Medical Services and Accident Cleanup Standards in Connection with Highway Safety.	20									
23. Highway Engineer--Safety	A. Understanding of the Highway Safety Program.	10	A. A Review of the Highway Safety Program.	24 Yr.			25			75	
	B. The Impact of the Highway Safety Program on Highway Design, Construction, and Maintenance.	30	B. An Examination of New Developments in the Field.								
24. Engineering Aide--Safety	A. General Knowledge of the Highway Safety Program.	40	A. A Review and Examination of New Developments in Design, Construction, and Maintenance within the Context of the Highway Safety Program.	24 Yr.			33			67	
	B. The Impact of the Highway Safety Program on Highway Design, Construction, and Maintenance.	80									
25. Highway Safety Site Officer	A. General Knowledge of the Highway Safety Program.	10	A. A Review and Examination of New Developments.	24 Yr.			25			75	
	B. Principles and Practices of Employee and Construction Site Safety with Relation to the Highway Safety Program.	30									
26. Traffic Engineer	A. Understanding of the Highway Safety Program.	10	A. A Review of the Highway Safety Program.	24 Yr.			25			75	
	B. The Impact of the Highway Safety Program on Traffic Operations Activities and Traffic Control Devices.	30	B. An Examination of New Developments in the Field.								

Factor 19, "attraction of political support"--Strong favor was shown for centers in state universities. Those connected with politics reflect local interests and therefore want local control and locally situated facilities. A regional center could attract some of these influences, but a single national university would have very little political support.

Factor 20, "subjective evaluation of overall effectiveness"--The greatest preference was shown for centers at universities in regions. The reasons for this preference, which reflects an intermediate type of choice, are discussed in detail above.

Summary

The ranking study represents an attempt to come to grips with nonquantitative factors that could have a [illegible] effect on decisions to adopt one of the proposed alternatives for establishing HSMD&R Centers. All factors were given unit weight, in the absence of supporting evidence, by which they might be awarded differential weights. In the last analysis, many of the factors would depend for their differential weighting, on the philosophy that is to govern the operation of centers, such as determining what the trade-offs are to be between the marshalling of local support and the ease of administration and control desired by the NHSB. The ground rules that governed the judges' rankings, however, did not include a consideration of the trade-offs that might prevail at the moment when the decision would be made to adopt one of the alternative strategies.

State and national alternatives achieve first rank on several factors; but on the other hand, they also receive the lowest rankings on several of the nonquantitative factors. The regional nonconsortia alternative receives none of the lowest rankings for any factors on which there is statistically significant agreement among judges. The regional alternative also receives second-place rankings for eight out of twelve factors on which agreement among judges exceeds chance levels. Purely on the basis of the ranking study, the regional concept would appear to be in a strong contention with the other alternatives, since it received none of the lowest rankings and so many of the number of second-place rankings.

It should be recalled that a national center was posited as an analytical base on which to determine total manpower training requirements for the entire country and, alternatively, to partition this requirement among several regional centers. While an economy of scale has been demonstrated in findings that indicate that larger, more aggregated centers are less costly to operate, strong reasons may arise to mitigate the establishment of a national center at a single university meeting all

~~Table 1-1 (Continued)~~

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
[illegible]	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medi-cine	Public or Bus. Admin.	Educa-tion	Police Sciences	Engi-neering	Psy-chology
27. Engineering Aide--Traffic	A. General Knowledge of the Highway Safety Program.	10	A. A Review and Examination of New Developments within the Highway Safety Program and Traffic Control Devices.	24 Yr.			8			92	
	B. The Impact of the Highway Safety Program on Traffic Operations Activities and Traffic Control Devices.	30									
	C. The Technical Duties in the Areas of Traffic Operations and Traffic Control Devices as Related to Highway Safety.	80									
28. Traffic Control Device Technician	A. General Knowledge of the Highway Safety Program.	10	A. A Review and Examination of New Developments within the Highway Safety Program and Traffic Control Devices.	24 Yr.			25			75	
	B. The Relating of the Highway Safety Program to Traffic Operations and Traffic Control Devices.	30									
29. Pedestrian Safety Program Specialist	A. A Review of Developments within the Highway Safety Program.	10	A. A Review of Developments within Highway and Pedestrian Safety Programs.	40 Tri.			25	75			
	B. A Review of Developments within the Pedestrian Safety Program as Related to Highway Safety.	30									

Table 1-1 (Continued)

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
Generalized Job Title	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medi-cine	Public or Bus. Admin.	Educa-tion	Police Sciences	Engi-neering	Psy-chology
30. Police Traffic Services Program Specialist	A. The Latest Developments in the Police Traffic Services or the Equivalent.	10	A. A Review in Developments in Police Traffic Services at an Established College Level Institution	40 Tri.			12	45	43		
	B. The Techniques of Program Formulation Control and Evaluation in Connection with the Police Traffic Services.	20									
	C. Teaching in Connection with the Police Traffic Services.	16									
	D. Consulting in Connection with the Police Traffic Services.	10									
	E. Substantive Training in Areas in which the Offices will be Engaged.	24									
31. Police Traffic Services Officer	A. Understanding the National and State Highway Safety Program.	10	A. A Review of Interpretations of Traffic Statistics, Allocation and Assignment of Personnel, Command, Techniques, and New Developments in Highway Safety Programs.	20 Yr.			63		37		
	B. Understanding Police Traffic Services Program.	30									
	C. General Techniques and Principles of Supervisors.	40									
32. Police Traffic Services Patrolman	A. Accident Investigation and Reporting.	10	A. A Review of Instruction in Advanced Patrol Techniques, Accident Prevention Measures, First Aid, and Supervising Techniques for Non-Commissioned Officers.	20 Yr.	14	7		36	43		
	B. Accident Prevention.	20									
	C. Motor Vehicle Code.	20									
	D. Traffic Direction and Control.	30									
	E. Defensive and Pursuit Driving.	30									
	F. Patrol Techniques.	20									
	G. First Aid.	10									

Table 1-1 (Concluded)

	Entry Training		Refresher Training		Percent of Total Training Hours by Discipline						
Generalized Job Title	Course Description	No. of Hours	Course Description	No. of Hours	Law	Medicine	Public or Bus. Admin.	Education	Police Sciences	Engineering	Psychology
33. State Wrecker Operator	A. Background of the Highway Safety Programs.	10	A. A Review and Examination of New Developments in Wrecker Operations.	16 Yr.		50	33	17			
	B. Extraction Procedures for Persons Caught in Wrecked Vehicles.	15									
	C. Emergency Driving Methods.	5									
34. State Wrecker Field Representative	A. Background of the Highway Safety Programs.	10	A. A Review and Examination of New Developments within the Accident Cleanup Program.	24 Yr.		17	39	22		22	
	B. Extraction Procedures for Persons Caught in Wrecked Vehicles.	15									
	C. Inspection and Consulting Techniques and Procedures in Connection with Accident Cleanup.	25									
	D. Operation of Wrecker Equipment.	20									
	E. Accident Cleanup Standards.	20									
35. School Bus Program Specialist	A. Background of the Highway Safety Programs.	10	A. Examination of New Developments within School Bus Safety.	40 Tri.			50	50			
	B. School Bus Safety.	40									
	C. Administrative Techniques of Program Formulation and Evaluation.	30									
36. School Bus Driver	A. Teaching of Driving Techniques Uniquely Applicable to School Buses.	40	A. An Examination of New Developments within School Bus Driver Training and Driver Education.	40 Tri.				70			30

Table 1-2

RELATIONS BETWEEN FEDERAL PROGRAMS AND STATE JOBS

Federal Programs	State Operational Programs	Generalized State Job Titles
Planning and Administration	Planning and Administration	Governor's Highway Safety Program Director Highway Safety Program Analyst Highway Safety Public Information Officer
Motor Vehicle Program	Inspector Motorcycle Safety School Bus Safety	Motor Vehicle Inspector Motor Vehicle Station Inspector School Bus Program Specialist School Bus Driver Training Officer
Driver and Community Program	Driver Education Driver Licensing Codes and Laws Traffic Courts	Driver Training Program Specialist Driver Education Supervisor Driver Education Teacher Driver Retraining Instructor Driver License Examiner Driver License Hearing Officer Codes and Laws Program Specialist Traffic Court Judge Traffic Court Program Specialist
Driver Environment Program	Highway Design, Construction and Maintenance Traffic Control Devices Pedestrian Safety	Highway Engineer--Safety Engineering Aide--Safety Highway Safety Site Officer Traffic Engineer Engineering Aide--Traffic Traffic Control Service Technician Pedestrian Safety Program Specialist
Safety Operations Program	Alcohol Identification and Surveillance Traffic Records Emergency Medical Services Policy Traffic Services Accident Cleanup	Alcohol Technical Specialist Breath Examiner Specialist Accident Site Investigator Accident Site Investigator Aide Traffic Records Program Analyst Traffic Records Systems Analyst Emergency Medical Services Program Specialist Emergency Medical Services Field Representative Police Traffic Services Program Specialist Police Traffic Services Officer Police Traffic Services Patrolman State Wrecker Operator State Wrecker Field Representative

A series of tables are included in Appendix 1 that show the number of state highway safety operating personnel to be trained, the place of their training, and the number of full-time professors required to conduct training courses at centers. A brief explanation should be made with respect to some of the parameters used, although complete descriptions of the derivation of table data is included in the appendixes. There was general agreement that many of the highway safety personnel could receive training near their places of employment (field training) rather than at the HSMD&R Centers, with instruction by individuals (field trainees) who had been trained at a center especially for this purpose. This arrangement allowed the centers to be kept at reasonable sizes. It was agreed that when the estimated number of occupants of job positions exceeded 100 in the state center alternative and 1,000 in the national and regional center alternatives, the field method of instruction for operating personnel should be used.

For purposes of analyzing different levels of funding, the initial intention was to consider periods of five, eight, and ten years to complete entry training for current job occupants. Calculations disclosed that the teaching manpower yearly cost for the ten-year over the five-year period would only be reduced by about 13 percent. This small decrease is accounted for by the expansion of the program between the fifth and tenth years and the corresponding increase in refresher training. Calculations for funding based on an eight-year period were therefore omitted.

The appendix 1 tables are identified as follows:

Appendix Table 1-1 - A single center for the nation. The updating program to be completed in five years. When the number of occupants for a job position exceeds 100, the occupants will be taught by field trainers who are trained at the center.

Appendix Table 1-2 - Same as Appendix Table 1-1, except that the cutoff number for job position occupants is 1,000.

Appendix Table 1-3 - This table shows the distribution of personnel identified in Appendix Table 1-2 to federal highway safety programs.

Appendix Tables 1-4 and 1-5 - Same as Appendix Tables 1-1 and 1-2, respectively, except that the updating program is completed in ten years.

Appendix Tables 1-6 through 1-11 - State centers, located in a large state (California), a medium-sized state (Alabama), and a small state (Idaho) for five- and ten-year updating programs. The cutoff number for job position occupants is 100.

Local Manpower Training Requirements

Basic data on the numbers and kinds of people needed to man safety specialist positions in county and city government were not available at the time that state manpower requirements were published. However, the NHSB was able to have an estimate made by the contractor who had conducted the Safety Manpower Specialist study of state positions. The contractor's knowledge of the highway safety functions, based on visits to all 50 states, and their familiarity with local government operations allowed them to develop estimates of the number of full-time local government employees who would participate in highway safety activities, as well as the operational program categories in which this activity would be conducted. These estimates were based on the assumption that the level of staffing in local government operational programs would be brought up to the minimum level recommended for the states. This resulted in a magnitude estimate of local government manpower requirements by operational program category and served as the basis for assessment of the skill and discipline requirements for positions in local governments. Details on the contractor's estimate of local government requirements for safety specialists are found in Appendix Table 1-12.

The skills and disciplines required in training safety specialists for local government positions were identified by extending basic information developed in the analysis of state-level positions. For the planning purposes of this study, it was assumed that the functions and the related training requirements for a safety specialist in local government operational programs would closely match that of a state employee engaged in these same programs at the state level. As shown in Table 1-3, this enabled identification of the amount of training required and the academic discipline or university department where it would be located. Actual course titles and content would match or closely resemble those shown for state-level positions in Table 1-1.

Appendix Tables 1-13 and 1-14 indicate the number of local highway safety operating personnel to be trained, the place of their training, and the number of full-time professors required to conduct training courses at centers. In Appendix Table 1-13 it is assumed that training will be completed in five years and in Appendix Table 1-14 that updating will consume ten years.

Uniform and cooperative action is needed in interpreting and enforcing the Federal Highway Safety Program Standards, and the similarity of traffic safety functions at state and local levels and the common training involved point to the need for a unified training effort. It is felt that the Office of Safety Manpower Development of the NHSB should

Table 1-3

HIGHWAY SAFETY TRAINING COURSES FOR LOCAL GOVERNMENT POSITIONS

Operational Program	Number of Hours- Entry Training	Number of Hours- Refresher Training	Per cent of Total Training Hours by Discipline						
			Law	Medi- cine	Bus. Admin.	Educa- tion	Police Sciences	Engi- neering	Psy- chology
1. Planning and Administration	40	10 Yr.			80		10	10	
2. Codes and Laws	40	--	75		25				
3. Traffic Courts	40	16 Yr.	70		30				
4. Alcohol in Relation to Highway Safety	50/10	16/4 Yr.	20	10	45		25		
5. Identification and Surveillance of Accident Locations	120	20 Yr.			15		15	70	
6. Traffic Records	60	15 Yr.			40	15		30	15
7. Emergency Medical Services	80	10 Yr.		70	30				
8. Highway Design, Construction and Maintenance	80	24 Yr.			25			75	
9. Traffic Control Devices	80/16	24/4 Yr.			20			80	
10. Pedestrian Safety	40	15 Yr.			25	75			
11. Police Traffic Services	140/20	20/4 Yr.	13	6	4	35	42		
12. Accident Cleanup	80/8	16/2 Yr.		48	33	17		2	
13. School Bus Safety	40/8	16/2 Yr.			10	65			25

NOTE: Where the number of hours in training are shown as two figures, the first figure represents the total number of hours and the second represents the portion of those hours devoted to laboratory training.

give serious consideration to the idea of holding states responsible for training local government employees in safety activities common to both levels of government. Joint training sessions could save time and money in transferring the training to the field, promote a common body of knowledge and skills, and develop the basis for uniform interpretation and action.

Federal Manpower Training Requirements

Estimates of training requirements for administrative, supervisory, and professional positions in the NHSB were based on manpower planning documents and estimates provided by the NHSB staff. The total number of positions at all GS levels authorized for FY 1969 and anticipated for FY 1970 were projected to FY 1974 by the Office of Safety Manpower Development to provide estimates of the numbers of positions for which training will be needed by the end of calendar year 1973.

For estimating purposes, it was assumed that positions in Grades GS-12 and above would form the core of the key administrative and supervisory positions, and that Grades GS-5 through 11 would represent the professional staff participating more directly in program implementation.

Both initial and refresher training courses for the NHSB employees would be centralized in university schools of business or public administration, or both. For employees in Grades GS-5 through 11, 40 hours of initial orientation and training would be supplemented by 24 hours of refresher training triennially. Those in Grades GS-12 and over would receive 80 hours initially, with an estimated 40 hours of courses and seminars triennially to regenerate interests, skills, and knowledge. Courses would include a variety of subjects and activities related to the fundamental administrative role of the NHSB. Increasing levels of complexity and sophistication would be provided in the course series, depending on the position requirements and the level of knowledge and skill that the incumbent possesses.

The number of HSMD&R Center professors required to provide training for federal administrative personnel is shown in the last column of Appendix Table 1-15.

Research Manpower Education Requirements

It is planned that the proposed centers will train most of the researchers needed to carry out new research programs at the federal and state levels. Research activity is seen as a critical function of the proposed centers for additional reasons, however, The opportunity to engage in research will be an important factor in the ability of the centers to attract and retain the participation of a high quality faculty in the instructional programs of the centers. Similarly, a dynamic ongoing highway safety research program will be needed to attract the better undergraduate students from various academic departments and disciplines into related resident graduate-level programs in the highway safety field and will be an important part of the mechanism by which they receive their graduate training. Both the findings of research conducted by the centers and the monitoring and exchange of findings with others conducting research outside the centers will be vital inputs to the initial and refresher training offered to operating people in the highway safety field.

The basic data used in estimating the future research manpower needs of the federal government were drawn principally from the earlier study made for the proposed National Highway Safety Research Center. State research manpower needs are based on estimates of the kind and number of staff required to implement research activities in each state. Curricula for research training for both represents an extension of the kind and hours of training developed originally in the NHSB-sponsored Safety Research Manpower study.

Based on course content recommendations of the University of North Carolina Highway Safety Research Center study of 1968* and the TEMPO--General Electric Company study of 1967,† the distribution of training courses for research personnel allocated to disciplines is estimated to be as follows:

	% of Total
Law	.1%
Medicine	12.8
Business or public administration	6.0
Education	7.0
Police sciences	7.5
Engineering	48.2
Psychology	18.4
Total	100.0%

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* Safety Research Manpower, The University of North Carolina Safety Research Center, June 1968.

† Facility Requirements for the National Traffic Safety Research Center, TEMPO, General Electric Company, October 1967.

It appears that 80 class hours, eight of which are spent in the laboratory, would be sufficient for entry training purposes, supplemented by 20 class hours, two of which are spent in the laboratory, of refresher course training each year. The ratio of classroom to laboratory instruction has been adopted from the University of North Carolina experimental curriculum.

When highway safety positions above the bachelor level are opened, either as a result of attrition or program expansion, it is envisioned that they will be filled by graduate students who will have had highway safety courses as a part of their graduate education. It is estimated that Masters and Ph.D. students should have 132 and 176 class hours, respectively, of this kind of instruction. These estimates were derived from a study of graduate curricula in safety-related fields at several universities. From them, a sample curriculum was created, as described in Chapter 6, "Guidelines for the Administration and Operation of HSMD&R Centers." The distribution of course content among the disciplines for the various job areas was assumed to be similar to that contained in the study for training courses. Table 1-4 shows this distribution.

Influence of Centers on Resident Educational Programs

Consideration was given to having HSMD&R Centers develop special courses and programs related to highway safety which could be added to undergraduate university curricula throughout the nation. Later assessment revealed that there were several limits on the extent to which undergraduate curricula, particularly in science and engineering, could be augmented. With the concurrence of the client, centers were relieved of this responsibility.

At the graduate level, the centers are expected to develop special courses, programs, and degree options in the highway safety field. These courses would be taught in the appropriate departments at host universities and ultimately at other schools throughout the country. Courses are expected to change over time to reflect the latest information and technology available in the field, and the responsibility for updating course content and syllabi will be an additional responsibility of the centers.

The scope of this study is limited to the needs of government for trained safety specialists. Yet it is worthy of note that automobile manufacturers, operators of truck fleets, and private associations and foundations dedicated to vehicle and highway safety are also seeking personnel with specialized safety training. Demand in the private sector

Table 1-4

PATTERNS OF HIGHWAY SAFETY TRAINING AND EDUCATION

Area of Employment	Number of Class Hours		Per Cent of Training and Education Hours By Discipline						
	Master's	Ph.D.'s	Law	Medicine	Public or Bus. Admin.	Education	Police Sciences	Engineering	Psychology
State Operating	132	176	3.70	5.12	18.69	15.83	5.35	44.73	6.53
Local Operating	132	176	11.07	6.60	7.54	38.43	32.18	.56	3.62
Federal Administrative	132	176	--	--	100.00	--	--	--	--
Research	132	176	.01	12.85	5.99	6.93	7.51	48.35	18.36

has not been included in the estimates, but it will contribute to the need for, and the employment opportunities for, people with formal training in the highway safety field.

Summary

Summaries of the numbers of full-time professors required for a HSMD&R Center are shown on Tables 1-5 and 1-6. Table 1-5 shows the needs of a program for bringing present job occupants up-to-date and educating future entering personnel if such a program were completed in five years. Table 1-6 shows similar information for a ten-year period. The tables also indicate the number of people to be trained or educated at the center.

Table 1-5

TOTAL NATIONAL TRAINING AND EDUCATIONAL NEEDS
PROFESSORIAL REQUIREMENTS FOR THE TRAINING AND EDUCATION OF HIGHWAY SAFETY PERSONNEL
Includes 10% Per Year Employee Attrition

Five-Year Program

Area of Employment	Number to be Trained or Educated at University or Safety Center		University or Highway Safety Center Professors by Discipline Full-Time Man Years/Year							
	For Direct Assignments	For Teaching of others	Law	Medicine	Bus. or Public Admin.	Education	Police Sciences	Engineering	Psychology	Total
Training										
State Operating	6,470	350	1.72	2.44	8.95	7.57	2.56	21.38	3.14	47.76
Local Operating	960	2,740	5.17	3.08	3.52	17.97	15.15	.26	1.68	46.83
Federal Administrative	2,100	--	--	--	6.63	--	--	--	--	6.63
Federal Research	1,475	--	.01	1.19	.56	.64	.70	4.49	1.71	9.30
States Research	119	--	.001	.10	.04	.04	.07	.35	.13	.73
Total Training Needs	11,124	3,090	6.90	6.81	19.70	26.22	18.48	26.48	6.66	111.25
Education										
State Operating	1,687	--	.36	.42	1.54	1.30	.44	3.68	.55	8.29
Local Operating	1,516	--	.82	.49	.56	2.87	2.39	.04	.27	7.44
Federal Administrative	157	--	--	--	.82	--	--	--	--	.82
Federal Research	362	--	.001	.24	.11	.13	.14	.91	.34	1.87
States Research	29	--	.001	.02	.01	.01	.01	.07	.03	.15
Total Education Needs	3,751	--	1.18	1.17	3.04	4.31	2.98	4.70	1.19	18.57
Total Training and Education Needs	14,875	3,090	8.08	7.98	22.74	30.53	21.46	31.18	7.85	129.82

Table 1-6

TOTAL NATIONAL TRAINING AND EDUCATIONAL NEEDS
PROFESSORIAL REQUIREMENTS FOR THE TRAINING AND EDUCATION OF HIGHWAY SAFETY PERSONNEL
Includes 10% Per Year Employee Attrition

Ten-Year Program

Area of Employment	Number to be trained or Educated at University or Safety Center		University or Highway Safety Center Professors By Discipline Full-Time Man Years/Year							
	For Direct Assignments	For Teaching of others	Law	Medicine	Bus. or Public Admin.	Education	Police Sciences	Engineering	Psychology	Total
Training										
State Operating	8,250	344	.61	2.52	9.00	5.93	2.03	21.85	1.96	43.90
Local Operating	1,295	2,770	3.69	2.22	2.84	13.94	10.67	.20	1.49	35.05
Federal Administrative	2,770	--	--	--	4.48	--	--	--	--	4.48
Federal Research	1,955	--	.01	1.21	.57	.67	.71	4.60	1.74	9.51
States Research	158	--	.001	.09	.04	.05	.05	.35	.15	.73
Total Training Needs	14,428	3,114	4.31	6.04	16.93	20.59	13.46	27.00	5.34	93.67
Education										
State Operating	3,786	--	.28	.39	1.42	1.20	.41	3.40	.50	7.60
Local Operating	3,395	--	.76	.45	.52	2.64	2.20	.04	.25	6.86
Federal Administrative	358	--	--	--	.76	--	--	--	--	.76
Federal Research	845	--	.001	.23	.11	.12	.13	.86	.33	1.78
State Research	68	--	.001	.02	.01	.01	.01	.07	.03	.15
Total Education Needs	8,452	--	1.04	1.09	2.82	3.97	2.75	4.37	1.11	17.15
Total Training and Education Needs	22,880	3,114	5.35	7.13	19.75	24.56	16.21	31.37	6.45	110.82

Chapter 2

ALTERNATIVE STRATEGIES FOR ESTABLISHING HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH CENTERS

OF

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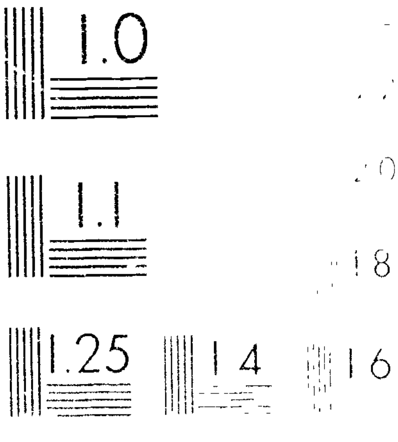

An opportunity to pioneer the application of the pilot approach is afforded the NHSB in its efforts to develop safety manpower that will be responsive to the safety needs of the highway transportation system.*

The principal function of the pilot approach is to provide design data for the ultimate system, although in the process it may also be required to produce small quantities of critically-needed, trained key personnel. The small scale approach might be called a model whose chief function is to exhibit the effects of varying approaches more quickly and economically than would be possible by experiments on a full-sized prototype. For the present purpose, it is not important whether the small scale unit is the forerunner from which a full-sized system will ultimately be scaled up, as in the case of a pilot industrial plant, or whether the small unit is a scaled-down model of a subsystem. The concern is with identifying alternative system strategies, the testing of systems or critical subsystems to identify and resolve problems and evaluate the various approaches.

General Considerations in Establishing Pilot Centers

At the present time, the future level of activity of all federal agencies is uncertain. An unpredictable international situation, coupled with a change in administration, promises to keep plans in an unsettled state at least for several months. Uncertainties stemming from changing highway safety standards or unpredicted technological changes, such as shifts to steam or electrical automobiles, or shifts in modes of transportation, such as rapid transit (or even short haul air buses), also interferes with efforts at careful long range planning by imposing additional unknowns. Therefore, when considering what approach to employ in education and research for highway safety, one principle is clear:

> There is a need for a built-in flexibility to enable effective response to unforeseen changes in transportation modes and standards of highway and motor vehicle safety.

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* Other instances where pilot methods are being employed in social areas include: The Educational Policy Research Center at SRI, the National Institute of Public Affairs, and the Michigan State University Highway Traffic Safety Center (said to be a 'pilot' model for the Association of Land-Grant Colleges and State Universities). See "University Transportation and Accident Prevention Centers," Association of State Universities and Land-Grant Colleges, 1962, page 16.

Chapter 2

ALTERNATIVE STRATEGIES FOR ESTABLISHING HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH CENTERS

The Organization of Resources for the Conduct of Education, Research, and Training

A considerable body of data has been established concerning the effectiveness of different methods for the organization of research, education, and training. Various facets of this data have been analyzed and reported in detail in educational and technical journals, but few substantive overall findings have been found that are relevant to the organizational questions of the present study. A few of the more pertinent findings are summarized below.

Research Effectiveness

John Rader Platt has reached a number of conclusions regarding research organizations in academic institutions. Most specifically, he believes that there is a "minimum critical size" for a productive multispecialty department in a university.

> Around 15 to 30 full-time staff members is approximately the minimum size o` the departments at the top dozen or so American universities when most of the work in mathematics, astronomy, physics, and chemistry is produced. The best men rarely want to go to a smaller group, because of the lack of stimulation and services. Although in those subjects, these dozen departments together have less than half the total science faculty of the country, they . . . publish most of the research articles, edit most of the journals, and probably make over 90 percent of the university discoveries. A group of fifteen good men in one department can produce many times as much research as the same group in five departments of three men each at five different schools. Even separation of a department into different but adjacent buildings may cause considerable loss of research power. . . .

> The critical size for each department would be much larger without the support given by the other departments and the scientific interests of the rest of the university. . . . To a certain extent it is the chain-reaction of the fifteen men that produces these conditions.
>
> We thus reach a first important inference: Research could advance faster if the small faculties of a nation would be combined into a few large ones. . . . It would be foolish, of course, to apply any such policy blindly. Faculties have other functions besides research, although some of these functions might also be done better in larger units.*

This inference tends to favor regional or national types of highway safety manpower development and research centers. State centers might not be large enough in most states to reach critical size. The average number of faculty members in the smaller states would only be about ten, and most of these would be primarily concerned with training activities rather than with research and graduate education. Regional centers with about 38 faculty members, or a national center with 380, would meet the criterion. However, facility size could also be too large.

> The scientists must have intellectual separation as well as intellectual contact. . . . Separation in time and space is needed. The individual scientist reacts best when stimulated by currents from neighboring disciplines as well as those from his own; when he is left alone to work out a thought, then brought together with others to exchange it.
>
> From this principle of separation, we may make another inference: Large intimate groups devoted to single limited projects are frequently less productive than if the same personnel were more diverse in their interests or more widely separated.*

The principle of separation would tend to weigh against a single very large highway safety center of the national type, since such a center might tend to become too narrow in focus. By combining the principle of separation with the critical size principle, one could conclude that the regional center may be the preferred type from a size standpoint. From an organization standpoint, a single university would appear to be more feasible than a consortium of participating schools.

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* John Rader Platt, The Step to Man (Wiley, 1966), pp. 53-70, reprinted in American Scientist 54, 3 (Autumn 1966).

> Research should not be directly administered by a committee. . . . A committee has a hard time starting a fire, especially if there are any difficulties, as anyone who has ever been in such a group realizes. . . . A group rarely has the subtlety or patience to watch for the little clues that show the flame is being nursed in the right direction.
>
> The compromise vote of a committee is a good method of making choices if the consequences are "linear functions" of the choices, that is, if a compromise between two alternatives is as good as either. If several intelligent men differ on a decision in such cases, their average judgment may be the "best" value in both the mathematical and political sense. But with non-linear functions, the extra few percent that the best man can give may be the difference between a chain-reaction working and not working.*

This inference indicates that a center run in a direct hierarchical administration would be more efficient than one run under a consortium arrangement. Given the present administrative practices and viewpoints of university staffs, a consortium would most likely have to be administered by a co-equal committee of representatives from the participating schools. A center established under the auspices of a single university, on the other hand, would most logically and conveniently be organized in some sort of hierarchical manner under a single administrator.

The obverse side of this preference for the efficiency of a strong hierarchical administration is that such an administration also provides (almost paradoxically) an opportunity for greater research freedom to individual staff members.

> Research personnel must be shielded from non-intellectual duties. After the science administrator has gotten good men and given them facilities, his function should be to shield them from all housekeeping problems. Meetings, written reports, orders, memoranda, time sheets, and accounting must all be cut. . . . It is important to keep a research group informed of changes and decisions that affect their work, and to make them feel that their advice is welcome, but the science administrator must resist the democratic urge for employee participation and for spreading his responsibility onto committees.*

Supervision of the research work itself, however, should be very delicate and distant rather than close or exacting. And day-to-day or

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* Ibid.

year-to-year uncertainties in project continuation and administrative support should be minimized. The general idea is one of neither diverting nor inhibiting the researcher from his single-minded attention to research problems.

> Personal research contracts and organization contracts should run for two or three years before critical review, and for considerably longer before maximum output can be expected.
>
> Inquiries and official visits, explanations and justifications, should be rare and brief, limited by custom if not by statute. Changes of policy and reorganization should be very rare, and well-planned in advance.*

Finally, the overall research program has to be supervised in a consistent and careful manner. This means that policies have to be established and held for long enough to permit fruition of long term studies that have been started. Also, policies must encourage the development of a free research climate in general, not just a permissive immediate environment for the individual researcher.

> Research must be run by an insulated agency. This is the central reason for the success of the basic civilian research programs of the Office of Naval Research and of the Atomic Energy Commission in the years just after World War II. Being associated with vast military programs, these civilian projects were assembled and sustained on the one hand by the keen military appreciation of the value of basic research; and on the other hand were protected against financial shock, thanks to reservoirs of military funds and the provision in some cases for three-year and five-year contracts. . . .
>
> In the other direction, we can see from this "principle of insulation" one reason for the low scientific output of many state universities where these schools are limited to one-year budgets and are closely dependent on legislative favor. . . .
>
> No research laboratory can be successful which is too closely tied to elections or legislatures, either politically or financially. . . . An insulated agency may not be good, but to be good it must be insulated.*

Nevertheless, the time-honored method of conducting academic research seems no longer acceptable to the federal government. A second author,

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* Ibid.

Don E. Kash, states that modern problems are intractable within the traditional disciplinary boundaries, and the general trend is toward a more specialized and responsive organization.

> The government in Washington is convinced of the value of interdisciplinary . . . work . . . . This would appear to be, in part, a reaction to the frustration felt in dealing with the universities with their structure based on disciplines. . . . Federal agencies and the Congress are groping around for new organizational approaches. Haworth articulates the thinking: "we believe that there need to be some additional centers for advanced specialized research for . . . such things as the study of urban ecology, regional planning, economic analysis, things of that sort."*

Universities must respond to these types of needs if they wish to maintain a substantial share of federal R&D efforts. They can use two criteria to determine what kinds of programs they should adopt:

> First, . . . the unique contribution of the university is knowledge not with operating skills. . . . Second, . . . the real integrity of the university is violated when large decisions in one area (teaching, research, or service) do not consider the impact on the other two.*

In view of these considerations, the second author appears to prefer centers organized under consortia to centers organized around a single university. However, he does recognize that consortia arrangements can include more serious organizational problems.

> Many problem-oriented programs on individual campuses . . . already exist and tend to overlay the disciplinary structure. That is a response to the evidence that basic research seems to go better under a single-discipline structure, whereas applied research responds better to a problem-oriented, multidisciplinary arrangement. . . . Perhaps the most serious criticism of this approach . . . is that individual universities are unlikely to have all the specialists necessary to do the best work. . . . There is another danger. Even if the individual university were capable of meeting the demand for talent, large-scale projects would be detrimental to teaching and basic research. . . .

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* Don E. Kash, "Research and Development at the University," Science, June 21, 1968.

> Cooperation among a given group of universities would appeal greatly to many congressmen and federal officials. . . . It provides an alternative where the prospects would be so large or of such a nature as to disrupt the balance of the individual campus. . . .
>
> A cautionary note needs to be entered at this point. It is difficult enough to carry on interdisciplinary research, but to propose that such research also be interuniversity is to compound the problem. . . . Consortia seem to work best when they are the result of decisions by the universities, as in the case of the Midwest's Committee on Institutional Cooperation, rather than interstate compacts, such as the Western Interstate Compact for Higher Education. . . . Interstate compacts are complex to devise, cumbersome to administer, and transfer far too much academic control from the campus to the statehouse.[*]

Educational Effectiveness

Important as the research aspects are in evaluating the proposed highway safety centers, educational effectiveness is more important. That function is more central to the manpower development mission than the centers are primarily intended to fulfill.

However, there is probably even less evidence on which to base an organizational evaluation of academic quality than there is for evaluating research quality. One study of the effects of federal programs on university education found ambivalent attitudes about how research affected education. This study concluded that the heavy concentrations of research funds at a few graduate schools should be maintained, but that other programs should be extended to additional schools. Although the desirability of dispersing more broadly "must be determined by the degree to which this advances the objectives of individual programs," high priority was given to strengthening programs at "leading state universities."[†]

Specific evidence that exists regarding the effects of such programs on education shows little correlation between form or size of organization and quality of learning. Other aspects of motivation and operational implementation seem to be much more significant factors.

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[*] Ibid.

[†] Harold Orlans, "The Effects of Federal Programs on Higher Education," Washington, D.C.: Brookings Institution, 1962.

widely distributed among the consortia members. In either case, an opportunity is available to test the degree of cooperation between universities, both public and private, and to find out how varying distances between universities modify the effectiveness of this kind of collaboration.

Pilot Center No. 2 could be allocated to a state university in a large state and serve the highway safety training needs of that particular state in limited areas of the program. This allocation would permit the NHSB to compare, at least to some extent, the administration and operation of a state center with the consortium arrangement in Pilot Center No. 1.

Other contrasting characteristics might also be considered for the two pilot centers. Pilot Center No. 1 might be situated within a group of universities that have not yet participated in the Highway Safety Program, with Pilot Center No. 2 at a state university that is already actively supporting some kind of highway safety training. The consortia arrangement might have a loose organizational structure under the guidance of a steering committee, while the other could be tightly administered by the university hierarchy. Pilot Center No. 2 might be under the jurisdiction of one school within the university and only include training in a small number of Highway Safety Standards, and Pilot Center No. 1 might cover training in all standards with education-research activities included. These variations would permit the NHSB to make some evaluations with respect to organizational considerations and how effectively a group of universities, inexperienced in highway safety, can respond to training and educational requirements.

The recruitment and placement of studies in Pilot Center No. 1 might be undertaken by the center in collaboration with the NHSB, while this responsibility assigned to state government in pilot matters and operations could be accomplished by periodic visits of an NHSB committee to one center and by quarterly reports from the other center. A five-year funding arrangement, with facilities supplied by the NHSB, might be established for Pilot Center No. 1 and two-year funding and facility requirements supplied to a maximum extent by the university for Pilot Center No. 2. Two methods of measuring the quality of student training and education might be tested. In Pilot Center No. 1 this could be done by NHSB inquiries to employers or former students and the administering of a questionnaire oriented toward the quality of course content and instructor capability. In Chapters 7 and 8 of this report, methods have been described for evaluating the effectiveness of training for HSMD&R Centers. These methods could be selectively applied to pilot centers.

Some evidence to this effect has been adduced to an article in Science magazine, which stated, in part:

> In the folklore of higher education, it is assumed that the student's learning and intellectual development will be enhanced if he attends a "high-quality" institution. The principal purpose of the research was to test this assumption empirically, by means of a longitudinal study of undergraduate students attending colleges of varying degrees of "quality" . . . .
>
> The measures of intellectual achievement used were the student's scores of the area tests of the Graduate Record Examination. . . . The three area tests cover social science, humanities, and natural sciences . . . .
>
> The two best indicators of institutional affluence turned out to be the average academic ability of the entering student body and the pre-student expenditures for "educational and general" purposes (meaning, primarily, salaries for faculty and staff) . . . .
>
> Within the total population of 4-year institutions, the absolute degree of variation with respect to these (and related) measures of quality is considerable. The 30 most affluent institutions in the United States, for example, spend more than four times as much money per student for educational and general purposes as the 25 most selective institutions in the country recruit half or more of their entering students from among the top 3 percent in academic ability. On the other hand, fully 15 percent of the institutions (nearly 300) enroll virtually no students from this select 3 percent. . . .
>
> The general hypotheses tested in this study were as follows: (i) The academic excellence of the undergraduate institution--as defined by the level of ability of the student body, the degree of academic competitiveness in the college environment, and the level of the institution's financial resources--has a positive effect on the undergraduate student's intellectual achievement; (ii) The extent of the positive effect of institutional quality on intellectual achievement is proportional to the student's academic ability. . . .
>
> The findings offer little support for either of our general hypotheses concerning the effects of institutional quality on student achievement. . . . These results tended to confirm earlier studies of differential college influence, for which variations in student performance on the Graduate Record Examination aptitude tests, in institutional Ph.D. productivity, and in

> other criteria were found to be primarily dependent upon variations in student inputs. . . .
>
> In summary, the analysis failed to confirm the hypothesis that the student's achievement in social science, humanities, or natural science is facilitated either by the intellectual level of his classmates or by the level of academic competitiveness or financial resources of his institution.*

Both the evidence used and the conclusions of these academic performance studies are quite general. They do not, of course, imply that there are no differences in the abilities of different schools to teach particular specialties, but only that significant general differences are not apparent. The ability of a university to educate students in highway safety-related courses will certainly be affected by its background and interest in relevant disciplines. But its general academic standing in other unrelated subjects seems to be essentially uncorrelated with its chances for success.

Training Effectiveness

Training courses in highway safety would be expected to be quite highly programmed. Different organizational arrangements would therefore be less important to training effectiveness than to research or educational effectiveness. However, the resources that could be applied to training activities would be considerably affected by their proposed organization. A National Safety Council committee of leading authorities recently surveyed the dearth of current training in highway safety and concluded that all available resources were needed.

> With few exceptions, educational institutions have neither been called upon nor have they taken the initiative to establish programs for highway safety manpower development other than for driver education teachers. . . . There are few existing training programs which could be considered adequate to provide the training needed by the type of highway safety manpower attending them. In some states there is no training program for many types of highway safety personnel. On the local level, training is generally nonexistent. . . .

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* Alexander W. Astin, "Undergraduate Achievement and Institutional 'Excellence,'" Science, August 16, 1968.

> Past training has been mostly for personnel at the recruit or operations level. There has been little training for supervisory and administrative levels. Furthermore, little attention has been given to providing training throughout the person's career. . . . Evaluation of training programs is almost nonexistent. . . .
>
> The diversity of training needed . . . may well call for different approaches. . . . The existing interest and capability of every educational institution, agency, training academy, etc. which could and would assist . . . should be utilized. . . . The education and training programs must be geared to the needs of state and local agencies. To accomplish this, a working relationship between educators and official agencies at the state and local level is imperative.*

To achieve this working relationship, the committee recommended that training activities be organized under the leadership of a highway safety center at one of the colleges or universities in each state. These centers would collaborate with other interested colleges in the state and the region who could participate in specialized activities. If a state did not wish to establish such a center or if an interested university could not be found, the necessary training activities could be carried out at a center in a nearby state.

This organizational approach was preferred to a more centralized regional center arrangement largely because it was believed to provide greater incentives to expand existing training activities, it minimized problems of establishing interuniversity and interstate relationships, and it could best maintain the necessary coordination with state and local governmental agencies.

The same type of recommendation had been made earlier in the Congressional testimony by one of the members of the National Safety Council committee, who stated:

> Not only are universities a natural setting for these activities, but many of them, especially State universities and land-grant educational institutions, are interested in helping solve the

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* National Safety Council, Traffic Education and Training Committee, Highway Safety Manpower and Training, Chicago, Ill., April 1968.

problems affecting the people of their respective States. Furthermore, most of these institutions have good rapport with State and local agencies.*

But expert opinion on the question of university participation in training activities is far from undivided. As in many organizational questions, about as many highly qualified experts can be found on one side of the fence as on the other. For example, a recent Presidential Task Force that examined training and educational policies of the Federal government summarized:

> The Task Force . . . concludes that universities should be used primarily for basic education and knowledge of academic disciplines, for preparation for professional careers, for broad learning about our society, and for horizon-stretching for selected experienced career officers. It also concluded that Government may be best suited to provide training and education (1) in specializations dealing with specific applications of theory to Government programs; (2) in techniques closely related to work performance; (3) on agency and Federal policies, programs, and procedures; and (4) in frontier areas such as space technology.†

The above viewpoint would appear to favor a government-operated facility for the training and preparation of manpower in technical specialties resulting from a program established at the federal level. It may be presumed that the FAA Academy came into being for such reasons, in addition to other strong reasons such as the need to effect a commonality and standardization of skills among FAA employees. To follow the recommendations of the Task Force, an analogous facility for the development of highway safety manpower also might be effective in training large numbers of personnel and reducing problems of administrative control over training. However, differences in the type of manpower being trained would have to be accommodated, since highway safety personnel are not restricted to the federal level.

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* Gordon H. Sheehe, Hearings to Establish a National Accident Prevention Center, Committee on Interstate and Foreign Commerce, House of Representatives, Feb. 1962, U.S. GPO, Washington, D.C.

† Presidential Task Force on Career Advancement, Investment for Tomorrow, U.S. Civil Service Commission, Washington, D.C., 1967.

A Study of Federally-Funded Programs Analogous to Highway Safety Manpower Development

An analogous program is defined here as any federally-sponsored program that provides support for college-level activities in at least one of the following functions: short-course training, graduate education, or academic research. The objectives of studying each program were to:

- Show direct evidence of the feasibility of the program, if possible.
- Provide precedents that justify the suggested approach to higher levels of the Executive Department, to Congress, to the states and the highway safety community, and to candidate universities.
- Find legislative and administrative documentation of the analogous programs that could be used in subsequent analyses and planning activities to define operational guidelines for individual centers and the overall program, indicate a rationale for Congressional justification, and provide a model for a suggested Request for Proposal.

Any existing federal program that provides for college-level training, graduate education, or academic research activities was considered to be analogous in some degree to the proposed NHSB program. Almost 50 programs were identified that meet this definition. They are classified in Table 2-1 and listed, with descriptions, in Appendix Table 2-8.

Table 2-1 shows a different program in each row. The programs are grouped together according to the types of functions they provide. The analogous programs that provide training (the largest function in terms of effort in the proposed NHSB program) are listed together with various combinations of graduate education and/or academic research in the first four groups. Programs providing education without training are listed in the fifth and sixth groups. The last group consists of those programs that provide only academic research, without either training or education.

The columns list significant attributes of the proposed NHSB programs, with spaces to indicate by a "yes" entry those programs that possess the same attribute. The first three columns display the three program functions described above: training, education, and research. The next

Table 2-1

FEDERAL COLLEGE-LEVEL TRAINING, GRADUATE

Program Group	Program Title	Program Functions			
		Does the program support			
		short-course training?	graduate education?	academic research?	for non govern employ
First: Training, Education, & Research	Educ. Research Training Fellowship	Yes	Yes	Yes	
	Water Pollution Research & Training	Yes	Yes	Yes	Yes
	Library Training & Research	Yes	Yes	Yes	Yes
	Medical Library Assistance	Yes	Yes	Yes	
	Mental Health Research & Training	Yes	Yes	Yes	Yes
	Nuclear Education & Training	Yes	Yes	Yes	
Second: Training & Education	Arts & Humanities "Institutes"	Yes	Yes		Yes
	Allied Health Professions Ed. Assist.	Yes	Yes		
	Institutional Assist. in Education	Yes	Yes		Yes
	Public Health Training	Yes	Yes		Yes
	Train Prof. in Educ. of Handicapped	Yes	Yes		Yes
	Vehicle Safety Educ. & Training	Yes	Yes		
Third: Training & Research	Vocational Rehab. Research & Training	Yes		Yes	Yes
	Regional Medical Programs	Yes		Yes	
	Injury Control Programs	Yes		Yes	Yes
	Occupational Health	Yes		Yes	Yes
	Community Development Training & Research	Yes		Yes	Yes
Fourth: Training Only	FAA Academy	Yes			
	Civil Defense Staff College	Yes			Yes
	Civil Defense Adult Education	Yes			Yes
	Community Service College Programs	Yes			
	Advanced Education "Institutes"	Yes			Yes
	Mental Retardation Training	Yes			Yes
	Training Prof. in Care of Crippled Children	Yes			
Fifth: Education & Research	Howard Univ. & Gallaudet Coll.		Yes	Yes	
	Forestry Research Grants		Yes	Yes	
	Manpower Research		Yes	Yes	
	Res. Fellowships in Health Sciences		Yes	Yes	
Sixth: Education Only	Mid Career Development of Federal Employees		Yes		
	Military Postgraduate Schools		Yes		
	Grad. Education in Science		Yes		
	College Work-Study Programs		Yes		
	Construction of Grad. Educ. Facilities		Yes		
	Health Prof. Educational Assist.		Yes		
	National Defense Grad. Educ. Facilities		Yes		
	Nurse Training		Yes		
	Prospective Teacher Fellowships		Yes		
	Training in the Allied Health Prof.		Yes		
	Fellowships for City Planning		Yes		
Seventh: Research Only	Educational Policy Research Centers			Yes	
	Regional Educational Labs			Yes	
	Univ. Centers for Educ. R & D			Yes	
	Arts & Humanities Research			Yes	
	Correctional Rehab. Manpower			Yes	
	Res. Support in Biology, Med., & Health			Yes	
	Scientific Research Grants			Yes	
	Bio-Medical Research			Yes	

university expenditures and faculty staffing known to the study team. However, when complex programs are being considered, costs should not be interpreted as the sole parameter of feasibility. Ignoring of other factors could lead to a situation in which costs would rise astronomically in the selected program before it reached the desired level of effectiveness. Also, the reported costs should be interpreted with the following caveat: The cost estimates, although based upon the best known available data, should be interpreted as having the same level of reliability that is typically encountered in statistics on educational institutions where accounting systems may vary among universities and where variations occur frequently in completeness of sampling and reporting.

If a decision were to be made purely on the basis of costing, the recommendation of this study would be that the regional concept be adopted, subject to those reservations expressed above on the source data for costs which have been utilized. If budgetary factors are the primary concern to the NHSB, then it should find the establishment of regional centers most promising. It must be noted, however, that the advantages alleged for regional centers have been stipulated only on a contingent basis, since they have not been demonstrated in the study. The same is true, of course, for advantages that have been attributed to other program alternatives. What are lacking are effectiveness measures for purposes of comparing alternatives, since it is the concept of effectiveness that is directly implied in all advantages and disadvantages that were detailed for the program alternatives. A tacit assumption was made at the outset of the cost analysis that the trained or educated quality of the student would not differ materially among the alternatives studied. This assumption had to be made to proceed with the study and because the training effectiveness could not be determined at the outset. However, the quality of the trained student is the ultimate criterion of effectiveness, and intermediate to it there exist other measurable components that, as noted above, are implicit in the detail of advantages and disadvantages that have been described for each alternative. These, in fact, are where the "trade-offs" would be encountered, since hypothetically the different program alternatives could produce students of different quality, but with commensurate differences in costs. If such findings were actually to occur, the NHSB might find the program alternative with the lowest costs to be more attractive, since it might not be necessary to produce the "best" students.

The proposed HSMD&R Centers are calling for implementation of a program with large operational components within a tri-partite arrangement of employing agencies, the university, and the federal government. Exploration of analogous federal programs has revealed very little precedence for such large scale programs calling for such close coordination and with demonstrable effects upon a national problem. From

2-1 Table 2-1

TE GE-LEVEL TRAINING, GRADUATE EDUCATION, AND RESEARCH PROGRAMS

	Program Functions			Program Design						
	Does the program support			Is the program			Is it geographically organized			No. of design
r non overn ploy	short-course training?	graduate education?	academic research?	for non-Fed. government employees?	at mission-oriented Centers?	inter-disciplinary?	at state level?	at region level?	at natl. level?	features like NHSB program
	Yes	Yes	Yes							-
Yes	Yes	Yes	Yes	Yes						1
Yes	Yes	Yes	Yes	Yes						1
	Yes	Yes	Yes							-
Yes	Yes	Yes	Yes	Yes						1
	Yes	Yes	Yes							-
Yes	Yes	Yes		Yes						1
	Yes	Yes								-
Yes	Yes	Yes		Yes						1
Yes	Yes	Yes		Yes						1
Yes	Yes	Yes		Yes			Yes			2
	Yes	Yes			Yes	Yes				2
Yes	Yes		Yes	Yes	Yes		Yes			3
	Yes		Yes					Yes		1
Yes	Yes		Yes	Yes			Yes			2
Yes	Yes		Yes	Yes						1
Yes	Yes		Yes	Yes			Yes			2
	Yes				Yes				Yes	2
Yes	Yes			Yes	Yes				Yes	3
Yes	Yes			Yes			Yes			2
	Yes						Yes			1
Yes	Yes			Yes						1
Yes	Yes			Yes			Yes			2
	Yes									-
		Yes	Yes						Yes	1
		Yes	Yes							
		Yes	Yes							-
		Yes	Yes							-
		Yes								-
		Yes			Yes				Yes	2
		Yes								-
		Yes								-
		Yes								-
		Yes								-
		Yes								-
		Yes								-
		Yes								-
		Yes								-
		Yes								-
			Yes		Yes	Yes			Yes	3
			Yes		Yes	Yes		Yes		3
			Yes		Yes			Yes		2
			Yes							-
			Yes							-
			Yes							-
			Yes							-
			Yes							-

six columns list program design features that were considered of crucial importance to the administration of the proposed NHSB program. The last column shows the number of similarities in crucial program design features between the proposed NHSB program and each of the analogous programs. (The maximum number of possible similarities is four.)

Findings and Inferences

Detailed findings and inferences of the survey of analogous programs are given below.

1. Only six of the 47 analogous federal programs include all three of the program functions of the proposed NHSB program. None of the existing programs match the proposed NHSB program design in all four crucial respects.

Inference: No single existing federal program for college-level training, education, and research assistance can be considered an essentially complete analogous precedent for the proposed NHSB program. If it is implemented on the basis of its present operational criteria, the NHSB program must establish a modus operandi that is original in at least some respects. Modifying the proposed program to more closely resemble existing programs would be obviously easier from the standpoint of demonstrating feasibility and following precedents. However, the value of unique features in the proposed NHSB program may counterbalance those advantages.

2. The six analogous programs that provide all three functions (those in the first groups of Table 2-1) are all administered through grants to individual institutions. None operate through special centers designed for a special mission.

Inference: Existing all-purpose college-level federal programs are organized in a much more limited and decentralized way than the proposed NHSB program would be. The lack of a clear precedent for an all-purpose program suggests that the NHSB program might feasibly be split into separately organized programs. For example, training facilities might be established and administered in one manner, and graduate education and research in another. The methods used by other agencies (such as USOE, the PHS, and the AEC) in organizing a broad spectrum of activities under separate programs could be investigated as a means of suggesting proven alternatives to meet the NHSB's organizational needs.

3. The second group of programs--those that provide training and education but not research--also show few close analogies to the proposed NHSB program. The sole exception in this group is the Vehicle Safety Education and Training program contracted with colleges by the military services. The major difference between it and the envisioned NHSB program are that (a) it does not incorporate a significant research program, and (b) it has few features for organizing a training program within a specific geographic territory and recruiting on a regular basis from within that territory.

Inference: The existing Vehicle Safety Education and Training program, which is substantively perhaps the closest analogy to the proposed NHSB program, nevertheless presents a considerably simpler organization problem. It attempts to encompass only two (rather than three) functions, and it recruits the bulk of its governmental students from a single source rather than from numerous independent state and local agencies. Their significant differences pose the question of whether administration "span-of-control" limits may be stretched by the proposed NHSB program and, if so, what organizational methods might be adopted to to stretch the limits.

4. The third group (those providing training and research but not education) have several closely analogous programs. The Vocational Rehabilitation Research and Training program, in particular, has more design similarities to the NHSB program than any other that provides at least two of the three program functions.

Inference: The Vocational Rehabilitation program seems to provide for training non-federal government employees on at least a rudimentary geographic organizational basis. Perhaps the recruiting methods used in this program could be applied to solve the deficiencies noted in point (b), above.

5. The fourth group (which provides short-course training only) contains one rather closely analogous program: the Civil Defense Staff College. Except for the Vocational Rehabilitation programs (mentioned above), this is the only program in the entire list that provides services for non-federal government employees at a special-purpose training center. Civil Defense Adult Education programs in each state are similar to this

program, but they do not provide for special centers. The FAA Academy at Oklahoma City, also listed in this group, does not attempt to recruit non-federal employees.

Inference: These Civil Defense and FAA examples are good models for a program oriented specifically toward training, but they are inadequate analogies for organizing graduate education and academic research programs. They seem especially barren of any clues for establishing an interdisciplinary program. Throughout this study, in fact, the impression has been received that the objective of interdisciplinary learning receives a great deal more lip service than actual implementation. Programs that combine more than two or three disciplines are quite scarce. This rarity in the midst of almost universal approval of the concept indicates that serious operational problems may inhibit interdisciplinary programs. It requires a more detailed analysis of the actual need for and problems in achieving interdisciplinary programs.

6. The fifth and sixth groups (programs providing education with research, and programs providing education alone) have hardly any programs that compare closely in operation to the proposed NHSB program. The Military Postgraduate Schools come closest, but the historical background and rationale of their development and the employment relationships of their students are completely different from those of the NHSB.

Inference: Federal education programs in general seem to be much more loosely organized than the proposed NHSB plan envisions. Very few of the education-related programs (those in the first and second and in the fifth and sixth groups) are located at special mission-oriented centers with specific geographic coverage. Only one of these programs attempts to integrate different disciplines in its program. This signifies that the NHSB proposal to provide a full-fledged and accredited graduate education program at special purpose centers may prove difficult. An alternative that could avoid this problem would be to provide graduate education in safety under regular college programs at existing facilities. The special-purpose safety centers could then be limited to short-course training and, possibly, to some academic research.

7. The last group (programs providing for research only) includes two interdisciplinary programs that are somewhat analogous to the proposed program: Educational Policy Research Centers and Regional Educational Laboratories. However, these programs do not attempt to provide the predominant training and education functions of a highway safety center.

Inference: The demonstrated interdisciplinary coverage and flexibility of programs designed purely for research illustrate that these attributes can more easily be obtained when the function is limited than when it attempts to be more comprehensive. This is another clue to the extent of practical trade-offs that may have to be made among the somewhat incompatible objectives of providing multiple functions, covering a wide spectrum of disciplines, and establishing a highly organized program.

8. The overall conclusions of this analysis are that existing analogous federal programs only partially resemble the proposed NHSB program. The lack of close precedents may indicate that feasibility of the proposed program is questionable. Even if the lack of precedents simply reflects differing administrative needs, a convincing rationale for the new and unique features will have to be presented to the Bureau of the Budget and Congress. The rising interest of those bodies in standardizing administrative features of federal assistance programs serve to emphasize this requirement.

Inference: The NHSB can present its proposed program to best advantage before the higher review levels in the Executive Department and Congress if it is able to answer the type of problems of feasibility and precedent that have been raised in this exploratory analysis of analogous programs. To do this most persuasively, it could present a detailed comparison of administrative features of analogous programs that compare most closely to the NHSB plan and an explanation of the significance of notable differences.

Summary

Approximately 50 federally funded programs were studied and grouped into seven categories according to the functions that they provide, e.g., training, research, education and research. Each program group was compared to the proposed NHSB-sponsored HSMD&R Centers. It was found that only a limited number of programs include all of the major functions of such centers. The main characteristics of HSMD&R Centers which differentiate them from the other programs include: the extensiveness of the interdisciplinary requirement; regional education and training requirements on a national scale; the combining of training, graduate education, and research into a singular mission; and the relatively greater requirements for centralized coordination and control from the NHSB, since activities of the proposed centers would have to be correlated with other components of the nation's highway safety program. Supporting evidence for the justification of such uniqueness may be necessary in the process of obtaining funding for the centers. Another alternative would be that of altering the concept of HSMD&R Centers as they are currently being proposed and studied so that they may more closely resemble the functioning of other programs that have gained acceptance.

Alternative Strategies for Establishing Highway Safety Manpower Development and Research Centers

Introduction

A requirement existed for the examination of at least four alternative strategies for locating HSMD&R Centers at university-level institutions. These four alternates are:

- Development of centers on a regional basis.
- Same as above, plus development of a limited capability at selected colleges and universities within the states.
- Development of centers on a state basis.
- Development of a regional facility utilizing visiting faculty from a variety of universities.

In addition, the study explored the advantages and disadvantages of establishing at least two university centers to test the concept on a pilot basis before proceeding with the organization of university centers on a large scale.

Several visits were made to universities having a prior history of involvement in highway safety and allied fields. Findings from these visits were used to augment earlier work in the study and create a structure of alternative centers, as proposed by the NHSB and for additional types that arose during the course of the study.

Table 2-2, in addition to the four prescribed alternative types of HSMD&R Centers, shows one new alternative--a national center--with two subalternatives. These are a university-based center and a federal academy. Pilot centers as a major option, are dealt with in the last section of this Chapter.

Table 2-2

HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH CENTERS ALTERNATIVES

Alternatives by Geographical Area	Sub-alternatives by Programs	Description
National Center (1)	a - All programs b - Training only Education & Research	University based Federal Academy University grants and fellowships
Regional Centers (10)	a - All programs b - Excluding direct Police Training & Driver Education	University based University based
Regional Consortia (10)	a - All programs b - Excluding direct Police Training & Driver Education	University based University based
State Centers (50+D.C.)	All programs	University based

A National Center

The vastness of highway safety education and training needs and the intensive state and local government involvements may preclude the establishment of a single national center. However, a single center does have some obvious advantages. These are economy of scale, more uniform curricula, and probably a faster implementation rate than can be expected from regional or state centers. Apart from such advantages, a logical first step was to design a single national center for the practical purpose of establishing an analytical base from which the alternative HSMD&R Center structures, i.e., regional and state, could be scaled down.

University-Based Center. In developing a national, university-based HSMD&R Center, the following ground rules and assumptions were made:

- The center would satisfy all training and education needs, for all highway safety positions, on a nationwide basis, i.e., federal, state, city, and county levels of government.
- "Training" was interpreted to mean instruction given to all newly employed personnel in highway safety positions and periodic refresher courses given to personnel already employed. In both cases the training would consist of relatively short-term courses, varying from 40 to 380 class hours.
- "Education" was assumed to mean graduate-level university instruction for resident students pursuing an advanced degree with specialization, or at least a minor, in some aspect of highway safety.
- Research conducted at the center would have the primary purpose of supporting and supplementing education and training of the students. A secondary purpose would be to provide a limited research capability to attract competent faculty who would use the laboratory facilities for some contract research work. Such research would be related in some way to the educational function of the center.
- The organization of the center would be structured to provide administrative and a limited logistic support to the students, both resident and visiting, and the faculty. However, a large share of support and services

would be forthcoming from the host university and would be paid through the center overhead charges.

A suggested organization design is shown in Table 2-3.

The center director is expected to be a full professor with some experience in highway safety education. His duties fall in four broad categories: First, to provide the continuing liaison between the NHSB and the university administration in matters of highway safety standards, policies and regulations, program controls, and so forth; second, to direct the operations of the center itself, in both academic and administrative matters; third, to assure that the center is constantly attuned to the changes in the host university and in the broader university-level academic world; and fourth, to keep pace with the advances in the state-of-the-art of highway safety in general, but particularly in matters related to manpower development.

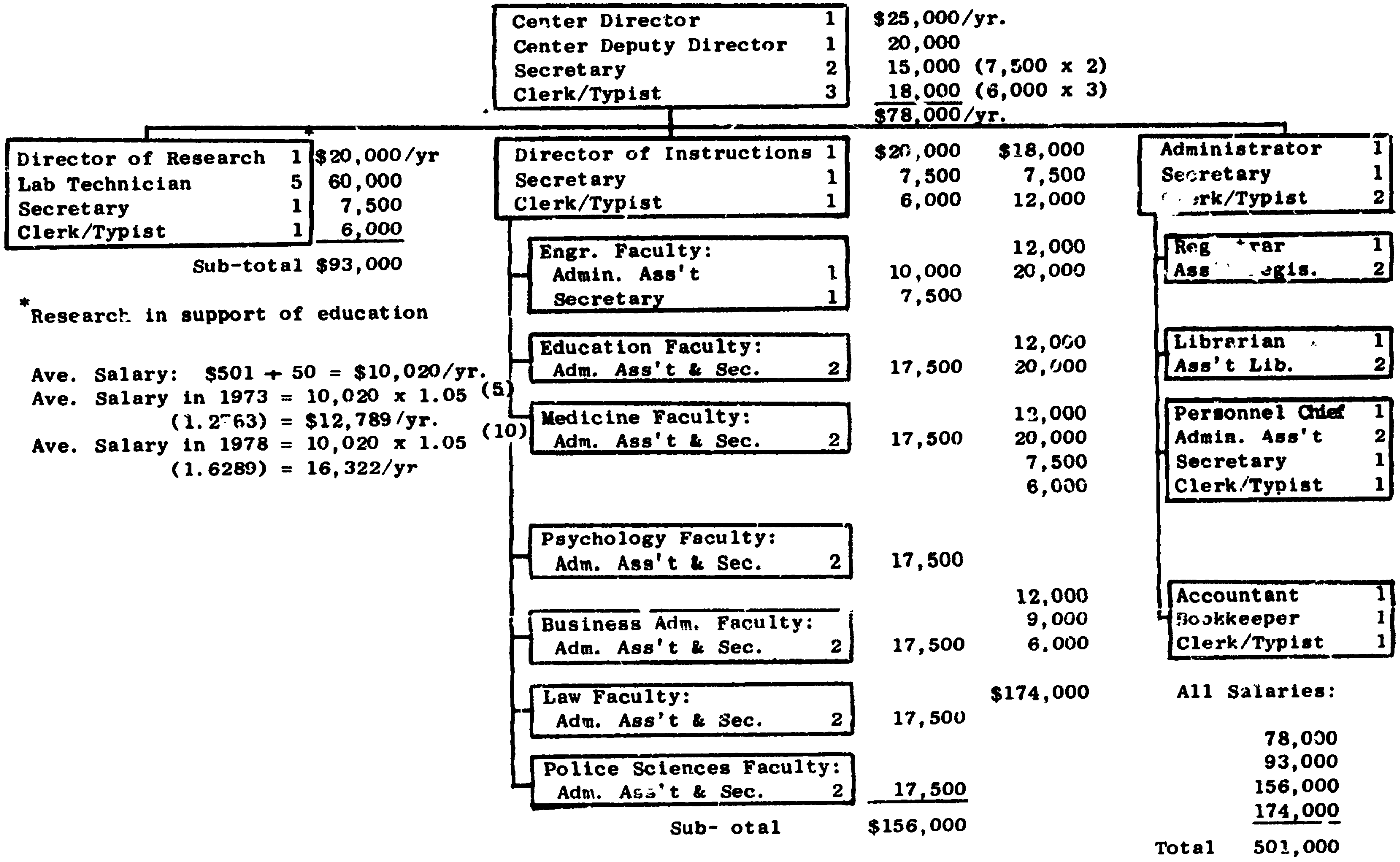
The relative position of the center in a university would vary, depending on the unique organization of the host university. Some existing highway safety centers are attached to the continuing education or extension branch of a university. There are advantages in having the director report directly to the president of the university, the vice-president of academic affairs, or the provost, to assure the support of the faculty coming from seven different schools and departments. However, there are examples of successful existing centers that report to the dean of a separate school, such as engineering.

The director of instruction would coordinate the activities of those faculty teaching on a part-time basis in the center, while permanently attached to their respective schools or departments. He would also be active in the development and revision of curricula of courses given in the center. He would supervise the staff of seven administrative assistants and their secretaries, who would provide the administrative support to the faculty when they were active in the center.

The director of research would be responsible for the laboratory operations and also assist the faculty in establishing and conducting research projects in support of education or under contract. The research activities would be performed by students and the faculty. However, five full-time laboratory technicians might be required to provide continuity in the lab operations, since five lab sections probably would be needed to support all aspects of education and training.

Table 2-3

NATIONAL, UNIVERSITY-BASED MD&R CENTER--ORGANIZATION CHART & SALARIES (1969)



*Research in support of education

Ave. Salary: $501 + 50 = $10,020/yr.

Ave. Salary in 1973 = 10,020 x 1.05 (5) (1.2763) = $12,789/yr.

Ave. Salary in 1978 = 10,020 x 1.05 (10) (1.6289) = 16,322/yr

These five sections are:

Human factors lab

Biomedical lab

Highway design and materials

Vehicle design and mechanics

Driver research

The assumption was made that the faculty composition will follow the existing pattern in universities. From a study on the "Graduate Student Support and Manpower Resources in Graduate Science Education," 1965/1966, published by the National Science Foundation, 20 universities were selected, all of them meeting most of the criteria developed in this study for supporting HSMD&R Centers. These universities reflect the following faculty composition as a ratio of other faculty members to full professors, as shown in Table 2-4.

The averages calculated from the preceding table are:

0.7 Associate professor for each full professor

0.9 Assistant professor for each full professor

0.3 Instructor for each full professor

or total of 1.9 support faculty members for each full professor.

Faculty requirements were established on the premise that the average class would have 20 students. Realizing that certain highly specialized courses and almost all lab classes would have fewer students, a review was made of graduate school student-teacher ratios, as presented in the previously mentioned NSF study. The average ratio for all doctorate-granting departments was 3.3 to 1, ranging from 2.5 to 1 for life and medical science departments to 4.1 for the psychology department. Surprisingly enough, in master's-granting departments the corresponding ratios were lower, 1.3 and 2.7, respectively.

In this study, a student-teacher ratio of 7 to 1 was postulated, or 2.9 faculty members (1 full professor, 0.7 associate professors, 0.9 assistant professors, and 0.3 instructor) for a class of 20 students. This ratio is more than double the one indicated in all graduate schools; but it is felt to be justifiable by the generalized composition of graduate highway safety courses and the great preponderance of short-term instruction.

Table 2-4

RATIO OF OTHER FACULTY TO FULL PROFESSORS

School	Associate Professors / Full Professors	Assistant Professors / Full Professors	Instructors / Full Professors
UC (all campuses)	0.556	1.198	0.211
USC	.739	0.690	.103
Mich. State	.698	0.931	.405
U. of Mich.	.599	0.626	.130
U. of Minn.	.790	0.862	.534
U. of Mo.	.976	1.203	.839
Columbia	.447	0.552	.324
Cornell	.520	0.644	.149
NYU	.731	0.542	.391
SUNY (Buffalo)	.183	1.117	.352
U. of N. C.	.606	0.595	.155
Ohio State	.642	0.653	.253
U. of Cinn.	.993	1.104	.705
U. of Pa.	.604	0.727	.157
U. of Va.	.816	1.189	.183
U. of Wash.	.803	0.887	.073
U. of Wisc.	.605	1.149	.557
U. of Ill.	.663	0.895	.472
Texas A & M	.939	0.976	.400
U. of Texas	.704	0.887	.248

A Federal Academy. The second subalternative of a single national HSMD&R Center is that of a federal academy. The academy would be responsible for all training functions, as defined previously, but not for the education of graduate students specializing in highway safety. The latter function would continue as currently carried out in several universities. The NHSB might augment this capability in existing university centers through fellowships, grants, and so forth.

A federal highway safety academy is envisioned as having considerable similarity with the FAA Academy in Oklahoma City.

The potential advantages of a federal academy for highway safety are:

- Speed of implementation--It may be more expedient than any other alternative for setting up curricula, recruiting and placing the teaching and administrative staff, by drawing personnel from the vast federal government employees pool.
- Availability of facilities and equipment--Abandoned military bases or those phased for deactivation in the near future, and surplus government equipment could be made available to the new academy.
- Quality and intensity of training--A federal academy could provide more concentrated and purposeful instruction through techniques such as "need-to-know" or "job-oriented" training, which are not yet accepted universal practices in university-level education.
- Ease of administration--From the point of view of the NHSB, administrative tasks should be obviously much greater with a practically "fully-owned" academy than in the case of any other alternative. The same reasoning would apply to the establishment of NHSB program controls.
- Economy--In addition to the possible free use of government facilities, the current pay scale of federal government employees, both in teaching and administrative/support positions compared to university faculty and other salaries would favor the academy as the most economical alternative.

Among the potential disadvantages of a federal highway safety academy are the following:

- Its inability to dispense education, i.e., graduate credit courses leading to advanced degrees--It is true that the three military service academies do grant equivalent B.S. degrees, but these are the only exceptions. Recent attempts of the FAA Academy to become a degree-granting institution were turned down by the Civil Service Commission as contrary to national educational policies. Thus, the highway safety academy could not cover the whole spectrum of highway safety manpower development, but would have to be supplemented by other means.

- Legal and regulatory problems--The establishment of a new federal academy would require Congressional authorization, entailing considerable amount of preparatory legal work, and creation of favorable public opinion. If the new administration should move ahead with its plan for a federal police academy, such a precedent may facilitate the organization of a highway safety academy.

- Difficulty in dealing with state and local authorities--The great majority of highway safety positions are at the state and local levels. There are very few precedents of state and local government employees being trained in federal government organizations. There is also a prevalent belief that highway safety training is somewhat similar to secondary education and should be outside of the federal government jurisdiction.

Regional Centers

Two alternative approaches were studied at the regional level: (1) establishment of a single university HSMD&R Center in each region; and (2) establishment of a consortium, with several universities contributing staff to the centers. Two subalternatives were studied with respect to cost and manning requirements for a regional center: (a) where the center is responsible for all highway safety training and education; and (b) where the training for driver education and police positions related to highway safety functions is allocated to other educational institutions in the region.

There are two reasons for considering the allocation of driver and police education to other institutions. First, driver education and police responsibilities for highway safety are local and state functions for which training is now provided in many universities and police academies, and thereby could be left out of the scope of work of HSMD&R Centers. The centers, however, could provide guidance in curriculum development, dissemination of highway safety research findings, and so forth. Second, if budget limitations do not allow an HSMD&R Center to carry out all of the required manpower development activities, then driver education and police training would seem to be the most logical ones for implementation through individual state resources.

A regionalization of the United States was carried out to conduct an appropriate study of the regional concept. The essential findings of the regionalization are presented below. See Appendix Table 2-2 for a more detailed discussion of the data procedures that were used. The regional division was determined by the following ratio:

$$\frac{\text{Nation's total safety manpower development needs}}{\text{Regional center optimal output}} = \text{Number of regions}$$

The nation's total safety manpower needs were studied in terms of the combined numbers of safety specialists anticipated to be required by the federal, state, and local governments. The estimated numbers and projections appearing in the Manpower Requirements report,* although limited to the requirements at the state government level, were used to extrapolate to local requirements. Local government manpower estimates were available on a national level in a general letter estimate submitted as a supplement to the Safety Specialist Manpower report. From this, each state was allocated local requirements proportionate to its total requirement.

While the definition of regional center optimal output, and therefore of its size, may be an elusive concept, the establishment of certain criteria made it possible to proceed with regionalization. Consistent with the nationwide aims of the new Highway Safety Program Standards, the optimal conditions for organization and operation of the regional centers should be equally applicable to all regions. Accordingly, the following criteria were used:

- Balanced output--The responsibilities for Highway Safety Manpower development were equally distributed among the regional centers; an equivalent share of the training, education, and research loads was therefore obtained by developing a manpower

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* Safety Specialist Manpower, Manpower Requirements, Vol 1, Oct. 14, 1968, by Booz-Allen & Hamilton, Inc., prepared for the Office of Manpower Development, NHSB, contract FH-11-6496.

requirement density map of the nation (see Figure 2-1). A composite index appearing in each state represents a weighted combination of the basic factors of safety manpower requirements that were obtained from analysis of the Manpower Requirements report.

- Existing legal, political, and legislative factors are preserved by refraining from splitting a state so that it might fall into more than one region.
- The existing available data used as a basis for the analysis, corresponds to the states as a geographical unit and the local governments or divisions within each one of those states.
- Homogeneity of regions was assumed for purposes of manpower development programs, aimed at uniform implementation of the Highway Safety Program standards. The existing framework of state organizations would deal with heterogenous problems that may occur within the region. The regional delineation obtained offers administrative convenience and control by the Office of Safety Manpower Development, through a function parallel to the existing Federal Highway Administration regional network.

The faculty requirements of a regional center are one-tenth of the national requirements, based on the criteria that have been used for regionalization. Other personnel needs are shown on the organizational chart of Table 2-5.

Duties of each position shown in Table 2-5 are similar to those explained previously for a national center. The same organization is assumed for both subalternatives, since the difference in faculty needs seems to be relatively small when police training and driver education are excluded.

Potential advantages of regional centers may be the following:

- In each of the ten regions delineated, there is at least one university meeting the most stringent interpretation of selection criteria for universities as candidates for HSMD&R Centers.
- The logistics of establishing and operating a regional center, as compared to a single national university-based center, should be less complicated.

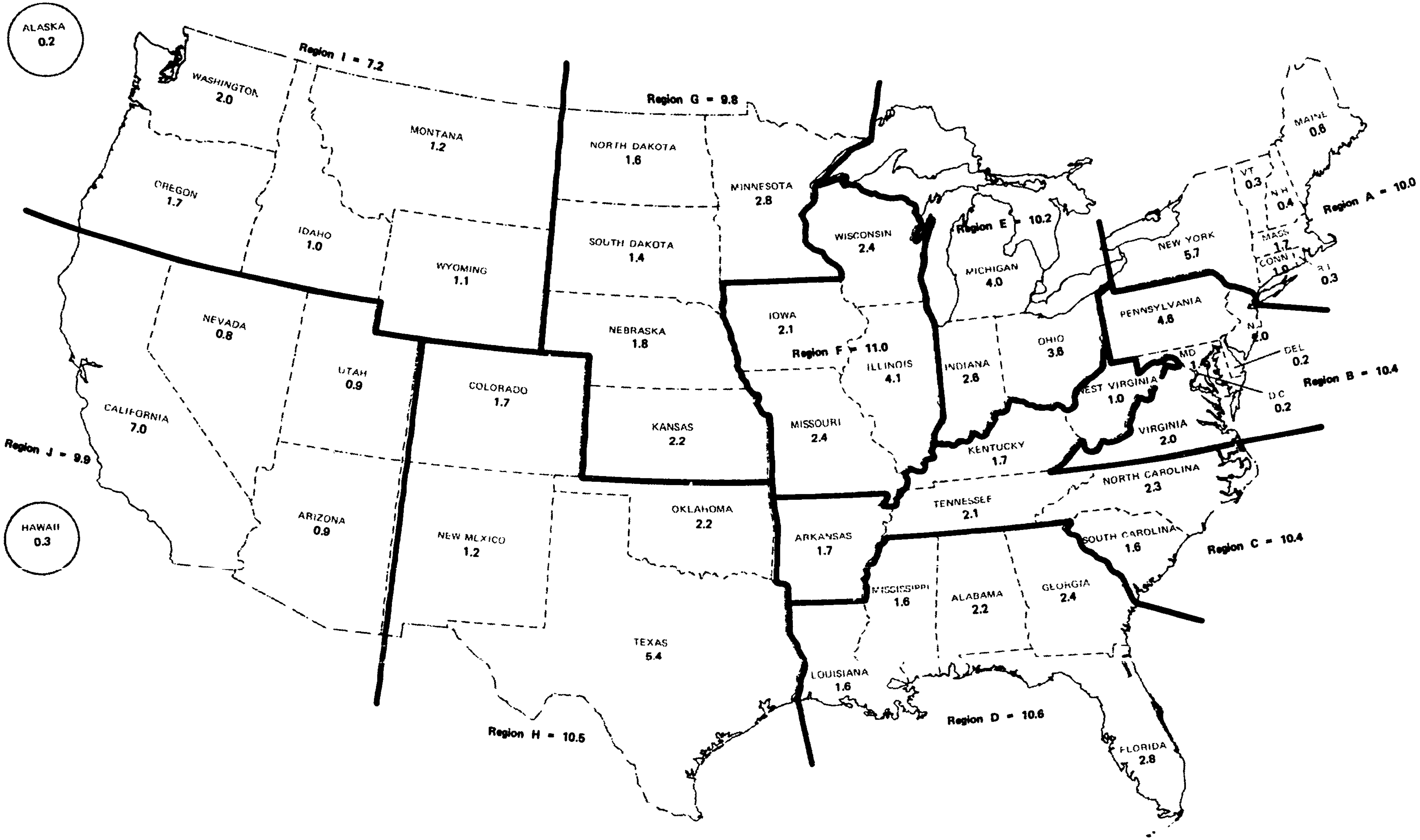
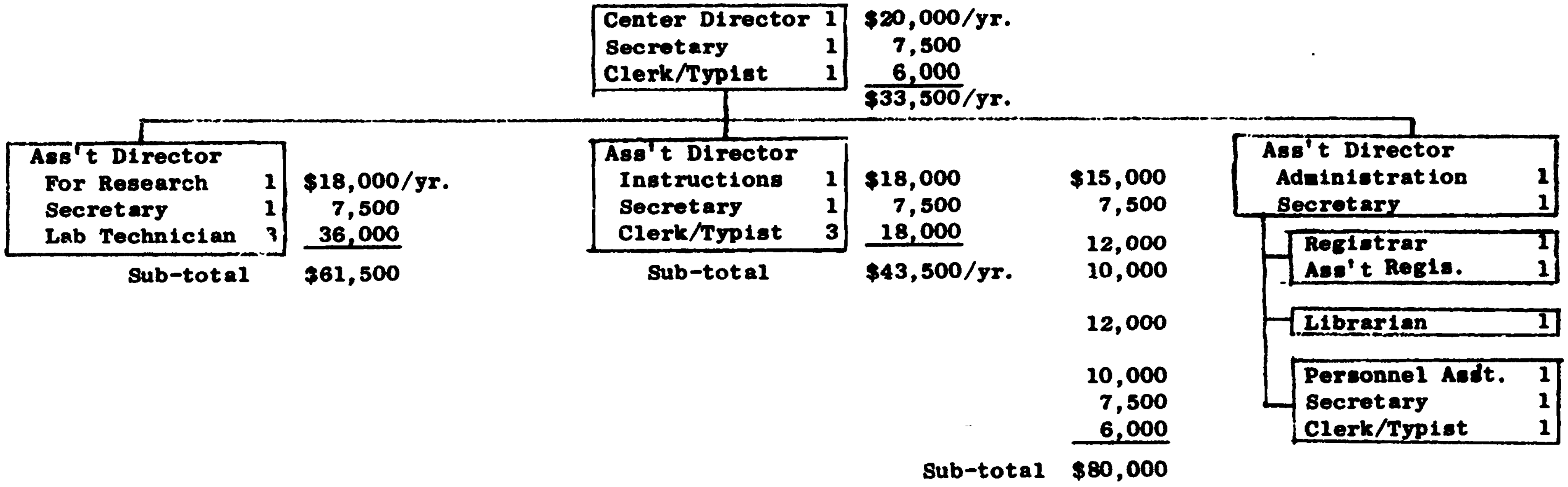


FIGURE 2-1 GEOGRAPHICAL DISTRIBUTION OF STATE AND LOCAL MANPOWER REQUIREMENTS BY STATES AND REGIONS—percent

Table 2-5

REGIONAL OR LARGE STATE MD&R CENTER--ORGANIZATION CHART & SALARIES (1969)



Center Director	1	$20,000/yr.
Secretary	1	7,500
Clerk/Typist	1	6,000
		$33,500/yr.

Ass't Director For Research	1	$18,000/yr.
Secretary	1	7,500
Lab Technician	3	36,000
Sub-total		$61,500

Ass't Director Instructions	1	$18,000
Secretary	1	7,500
Clerk/Typist	3	18,000
Sub-total		$43,500/yr.

Ass't Director Administration	1	$15,000
Secretary	1	7,500
Registrar	1	12,000
Ass't Regis.	1	10,000
Librarian	1	12,000
Personnel Asst.	1	10,000
Secretary	1	7,500
Clerk/Typist	1	6,000
Sub-total		$80,000

Total Personnel
Excluding Driver = 21
Ed. and Police Training = (51.2%) = 11

All Salaries:
$ 33,500
61,500
43,500
80,000
Total $218,500/yr. ÷ 21 = $10,400/yr. Average Salary

For 1973: 10,400 x $1.05^{(5)}$ = 13,274/yr.

For 1978: 10,400 x $1.05^{(10)}$ = 16,941/yr.

- State involvement and cooperation may be enhanced in a regional arrangement, especially where neighboring states have precedents in sharing federal grants. The Head-Start Center for California-Nevada-Arizona is an example.

- Speed of implementation should be great for centers, if they are to be established around existing capabilities. However, the implementation of all ten regional centers would probably take more time than the development of a single national center.

- Coordination and program control from the viewpoint of the NHSB should be more effective than if it were forced to coordinate with all states in manpower development.

The potential disadvantages of regional centers appear to be as follows:

- There would probably be dilution of existing capabilities in faculty and other resources, compared to their concentration in a national HSMD&R Center.

- There would be disparity in the quality of training and education. None of the ten centers might match the potential excellence of a single national center.

- A longer implementation time for all ten centers could be anticipated, since they might not all be developed simultaneously.

- Possible antagonism and resistance might develop between adjoining states making up a regional center, particularly among the universities that were not selected to host the HSMD&R Center. However, these problems might be overcome by sharing the responsibility of training with other universities in the region. region.

The Regional consortium concept is probably most applicable to the regional center alternative, although it could be applied to a national center or even to major and some medium-sized states. The main advantage of a university consortium would be its ability to combine complementary resources needed for highway safety manpower development that are not available in any single university.

This pooling of university resources can be accomplished in at least two ways; a HSMD&R regional center, similar to one previously described, could be established at one of the university campuses that make up the consortium, with visiting faculty from other universities. In some regions, the close proximity of several universities making up a consortium would allow the faculty to commute to give lectures at the center. This would not be universal among all regions, however. In the southeastern region (Region D), for instance, the considerable distance between the universities would require the faculty members to "relocate" for at least a quarter period at a time.

As an additional possibility, students--both graduate students and short-term specialists--would go to that university within the consortium that offered courses required for their position or academic degree. In such cases, advantage would be taken of already established precedence among many universities in which there is a sharing of resources.

State Centers

A total of 51 state centers, including one for the District of Columbia, would carry out all functions--i.e., entry and refresher training for all state highway safety positions, county and city positions within the state, and their proportional share of federal research and management positions. In addition, these centers would conduct highway safety education and research leading to advanced degrees with minors or specializations in highway safety.

To simplify the analysis and the cost estimates, states have been categorized according to a composite index including such factors as population, number of vehicles registered, and number of miles of roadway. This has resulted in categories of three large states, 14 medium states, and 34 small states, including the District of Columbia. The 50 states and the District of Columbia were ranked in terms of their manpower requirements composite index (see Appendix Table 2-2), representing a weighted combination of the basic factors that determine their manpower development needs. The state of Idaho was selected as representative of the lower third, or the states with the smallest manpower requirements, while the state of Alabama represents the middle third, or the group of states with a medium range of manpower requirements. A different criterion was used in selecting the representative of the high manpower requirement group: the state of California, having the highest index, was chosen because the results of its detailed analysis are directly applicable to the study of both the large state centers and the regional centers.

California was selected as a model of a large state, the other two in this category being New York and Texas. Teaching loads, and student body and faculty requirements developed earlier in this study were applied; the results are summarized in Table 2-6 for 1973 and 1978.

Table 2-6

DISTRIBUTION OF FACULTY REQUIREMENTS BY HSMD&R CENTER DEVELOPMENT ALTERNATIVES

Faculty Composition for All Alternatives:

1.0 Full professor requires assistance of:
0.7 Associate professors
0.9 Assistant professors
0.3 Instructors
2.9 Faculty members per full professor

This multiplier applies to all professional requirements calculated in Appendices 1-1 through 1-14 and tables 1-5 and 1-6

DEVELOPMENT ALTERNATIVES	Requirements for 1973	1978
National Center		
All programs, university-based		
Professorial requirements (Tables 1-5 & 1-6)	= 129.82	110.82
Faculty requirements (Profs x 2.9)	= 377.00	322.00
Training only, federal academy		
Professorial requirements (Tables 1-5 & 1-6)	= 111.25	93.67
Faculty requirements (Profs x 2.9)	= 323.00	272.00
Regional Centers and Regional Consortia		
All programs university-based		
Ten equal regions; therefore:		
Professorial requirement is 1/10 of national university	= 12.98	11.08
Faculty requirement is 1/10 of national university	= 38.00	32.00
Excluding police training & driver education, university-based.		
Excludes 7 generalized job titles (Appendix 2-1), amounting to 48.8% of total manpower requirements; therefore 51.2% of professorial requirements	= 6.65	5.67
51.2% of faculty requirements of regional centers are included	= 20.00	17.00
State Centers		
A typical large state center (similar to a regional HSMD&R center) like California's needs 7% of national manpower requirements (Appendix 2-2) therefore professorial requirement = 0.07 of national university	= 9.08	7.76
and faculty requirements = 0.07 of national university	= 27.00	23.00
A typical medium size state center like Alabama's needs 2.2% of national professorial requirements = 0.022 of national university	= 2.86	2.44
and 2.2% of national faculty requirements = 0.022 of national university	= 9.00	8.00
A typical small size state center like Idaho's needs 1.0% of national professorial requirements = 0.01 of national university	= 1.30	1.11
and 1.0% of national faculty requirements = 0.01 of national university	= 4.00	4.00

This table indicates that the teaching requirements for California are not appreciably lower than for a region. Thus, for large states, the same HSMD&R Center organization was assumed for a region (shown in Table 2-5).

For medium-size state centers, e.g., Alabama, the supporting staff is reduced, as shown on the organization chart in Table 2-7, approximately in the same proportion as the reduction for faculty shown in Table 2-6.

Similarly, the manpower requirements for both faculty and administration for small states, as illustrated by Idaho, are further reduced and are shown in Table 2-8.

The potential advantages of having state HSMD&R Centers are as follows:

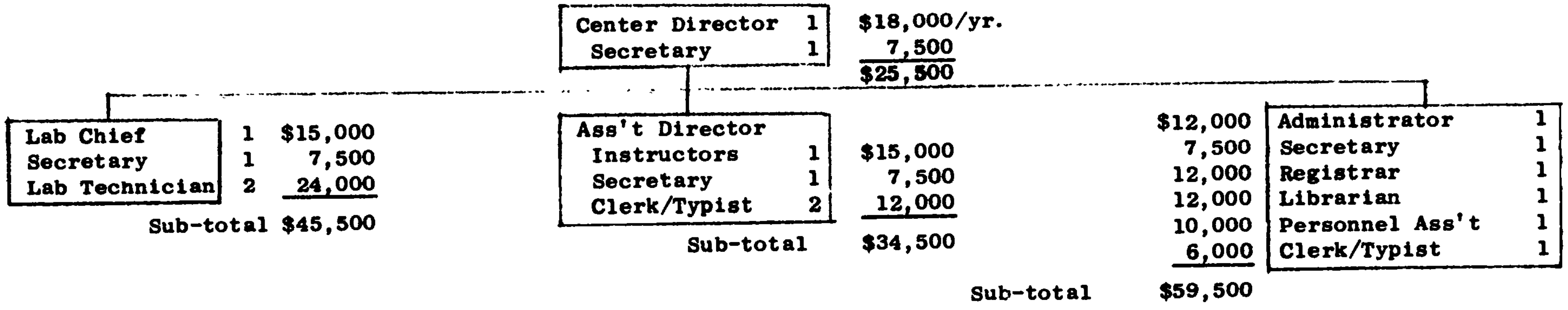
- The center would be in close proximity to its students, the vast majority being state and local government employees.
- State HSMD&R Centers would be in the best position to tap the existing capabilities in highway safety education and training. The majority of existing safety centers or departments in universities are active exclusively within their states and may encounter problems in expanding their activities to other states.
- It appears that the majority of the present establishment in highway safety education, state and local government officials, and possibly the general public, believe that highway safety education should remain a state prerogative, with federal assistance through funding only; thus, the promotional and legalistic requirements of establishing HSMD&R Centers may be the most feasible with a state-by-state approach..

The potential disadvantages of state HSMD&R Centers could outweigh their advantages.

- All medium and small states do not have universities with the capabilities for training, education, and research in highway safety; therefore, they might not be able to carry out all HSMD&R education and training functions.
- Fifty-one HSMD&R Centers might present an unnecessary duplication and waste of scarce educational resources, particularly in faculty staffing.

Table 2-7

MEDIUM STATE MD&R CENTER--ORGANIZATION CHART & SALARIES (1969)



Center Director	1	$18,000/yr.
Secretary	1	7,500
		$25,500

Lab Chief	1	$15,000
Secretary	1	7,500
Lab Technician	2	24,000
Sub-total		$45,500

Ass't Director		
Instructors	1	$15,000
Secretary	1	7,500
Clerk/Typist	2	12,000
Sub-total		$34,500

$12,000	Administrator	1
7,500	Secretary	1
12,000	Registrar	1
12,000	Librarian	1
10,000	Personnel Ass't	1
6,000	Clerk/Typist	1
Sub-total $59,500		

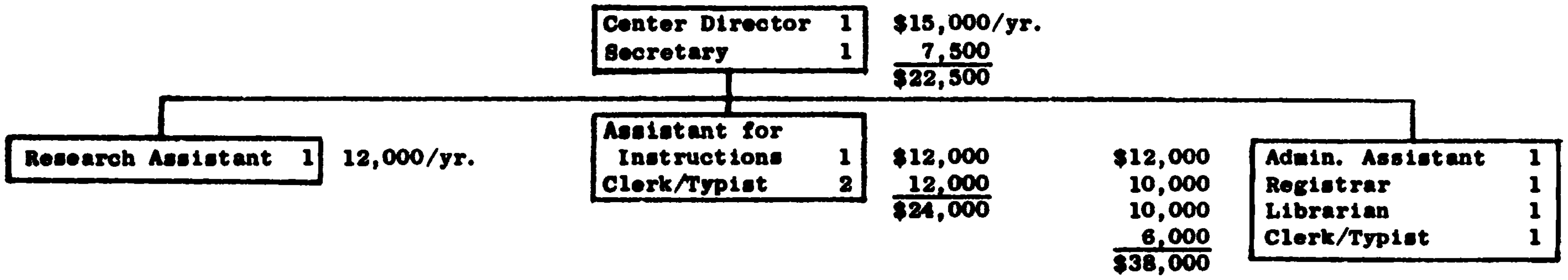
All Salaries:

	$ 45,500
	25,500
	34,500
	59,500
Total	$165,000/yr. ÷ 16 = $10,300/yr. average salary

For 1973: $\$10,300 \times 1.05^{(5)} = 13,145$/yr.
For 1978: $10,300 \times 1.05^{(10)} = 16,778$/yr.

Table 2-8

SMALL STATE MD&R CENTER--ORGANIZATION CHART & SALARIES (1969)



All Salaries:

$22,500
12,000
24,000
38,000

Total $96,000 ♦ 10 = $ 9,650/yr. Ave. Salary

For 1973: $9,650 \times 1.05^{(5)}$ = 12,317/yr.

For 1978: $9,650 \times 1.05^{(10)}$ = 15,719/yr.

- The implementation of the highway safety manpower development program in each state through university-level institutions might be more time-consuming than with any of the previously discussed alternatives. There may be exceptions in large states, where capabilities now exist, that could be organized in a relatively short time.

- Country-wide compatibility of highway safety education, such as standardization of curricula and selection of best textbooks, may be most difficult to achieve with state centers.

- The quality of instruction may vary considerably from state to state and in general may be lower than in a national or regional alternative.

- NHSB administrative and program control problems could be considerably greater than in dealing with ten regional centers.

Cost Estimates for Alternative Strategies

In preparing the cost estimates for the five main HSMD&R Center alternatives and six subalternatives, the following ground rules and assumptions were established.

- To extrapolate costs to 1973 and 1978 an average annual salary increase of 5 percent was assumed for all HSMD&R Center personnel, i.e., faculty, administrative and support, and, in the case of a highway safety academy, for federal employees. In recent years, faculty salaries have risen faster than for most other professions (a survey in California indicated a rise of 5.4 percent), but it is anticipated that in the next ten years faculty compensation increases will approximate other white-collar wage increases.

- The faculty salaries used in this study were derived from a "Report on the Self-Grading Compensation Survey, 1966-1967," by the American Association of University Professors. From a salary scale with several levels, the second from the top was selected, representing a compensation level quite good but not outstanding. These average annual salaries are:

Professor	$15,435
Associate professor	12,335
Assistant professor	9,735
Instructor	7,615

The average faculty salaries for 1973 and 1968, using the "faculty mix" explained earlier and the 5 percent annual increases, amount to $17,037 and $21,745, respectively. The calculations are shown in Table 2-9.

- The salaries of other personnel in the center were based on the 1968 rates for their respective positions. Local and regional differences in salaries and wages across the country may amount to as much as 20 percent, but were not taken into consideration in this study. The annual salaries for each position are shown on the four organization charts in Tables 2-3, 2-5, 2-7, and 2-8. It is conceivable that salaries for lead nonteaching professionals, (director, assistant director, research director, and so forth) could be greater than those shown in these tables. As an estimate the total cost of salaries in 1968 dollars could be increased by 14 percent, on the average, for all centers, with the exception of the budgeted estimate for the national university-based center.

- For the federal academy subalternative, the civil service average grade and pay structure that now prevails at the FAA Academy was assumed, i.e., GS-11 for the instructors and GS-9 for all other personnel. The corresponding annual salaries by the end of 1968 were $11,563 and $9,590, respectively. The current FAA Academy ratio of 3/2 for instructors and other personnel (60 percent of the total personnel are instructors and 40 percent are administrative and support personnel).

- The university overhead rates, among the universities the SRI study team visited, ranged from 20 to 69 percent of direct salaries. Unfortunately, these rates are not comparable, as each one covered a different share of expenditures. An overhead rate of 50 percent of salaries and wages was assumed, which is probably a little above the current average. However, the trend of increasing university rates, as institutions broaden their field of activities and provide more services to students and faculty, is expected to continue. A 35 percent overhead rate is suggested for the academy. This rate approximates the combined overhead rate for the FAA Academy (23 percent),

Table 2-9

FACULTY AVERAGE SALARY CALCULATIONS

A. Faculty Composition:

Professor	1
Associate Professor	0.7
Assistant Professor	0.9
Instructor	0.3
All Faculty	2.9

B. Faculty Salaries, in 1966/67:

Professor	$15,435/yr.
Associate Professor	12,335
Assistant Professor	9,735
Instructor	7,615

C. Average Faculty Salary, in 1966/67 for a mix as shown below:

Professor	$15,435	X 1.0 =	$15,435.00
Associate Professor	12,333	X 0.7 =	8,634.50
Assistant Professor	9,735	X 0.9 =	8,761.50
Instructor	7,615	X 0.3 =	2,284.50
Sub-Total		2.9	$35,115.50

$35,115.40 : 2.9 = 12,108.80 or $12,109/yr.

D. Future Average Faculty Salaries:

For 1973: $\$12,109 \times 1.05^{(7)} =$
$12,109 \times 1.4071 = \$17,037$

For 1978: $\$12,109 \times 1.05^{(12)} =$
$12,109 \times 1.795856 = \$21,745$

plus 5 percent for the Aeronautical Center, Oklahoma City, and 5 percent for the FAA headquarters, Washington, D.C.

- Capital expenditures were based on the estimated value of the physical plant that will be required for peak student load at the end of the five- and ten-year buildup periods. Allowances for plant requirements for faculty and support personnel were also included.

- The overall cost of the physical plant for each of the alternatives considered in this report was based on a national average value per student, corresponding to two- and four-year higher education institutions and their full-time and part-time degree-credit enrollment. Although this average does not reflect the variations in value inherent to the type of control (public or private), geographical location or size of institutions, it is adequate for estimating the relative cost of the alternatives. Subsequent selection of specific institutions for placement of centers will therefore require refinement of cost estimates to include these variables. The book value of the physical plant per student corresponds to the national average of the actual cost of the plant and first-term enrollment from surveys of the Office of Education:*†

Year	No. of Institutions of Higher Education	Value of Physical Plant per Student
1958	1940	$3,818
1960	2015	4,199
1962	2044	4,458
1964	2140	5,001
1973 Projection		7,760
1978 Projection		9,900

Projections for 1973 and 1978 at the end of the five- and ten-year buildup period were based on the average annual increase of 5 percent.

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* U.S. Dept. of Health, Education and Welfare, Office of Education, 1964, "Financial Statistics of Institutions of Higher Education, 1959-1960."

† U.S. Dept. of Health, Education and Welfare, Office of Education, 1968, "Digest of Educational Statistics, 1964 and 1968."

- The capital outlay over the same period was distributed as follows:

Land	6.0%
Buildings, including fixed equipment	74.3
Improvements, such as roadways, utility lines, and landscaping	3.1
Equipment, including laboratory and office equipment and machinery, furniture and furnishings, trucks, and library books	16.6
Total	100.0%

- The cost of a physical plant for a HSMD Federal Academy was estimated on an average plant-value-per-student that corresponded to the "other professional schools" group within the Independently Organized Professional School classification of the Office of Education: This covers nonuniversity-affiliated schools under public control. Based on the Office of Education statistics* the average value per student is as follows:

Year	Value of Physical Plant per Student
1960	$ 5,245
1973 projected (13 yrs @ 5% = 5245 X 1.886)	9,892
1978 projected (18 yrs @ 5% = 5245 X 2.407)	12,625

- Plant operation and maintenance averaged 12.9 percent of all educational and general expenditures,† or 0.148 X payroll and overhead for all private and publicly controlled universities in the United States. This percent was used for estimating all alternatives except the Highway Safety Federal Academy, for which 20.2 percent or 0.253 X burdened payroll was applied, corresponding to the Independently Organized Professional School (technological) classification of the Office of

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* _Op. cit._
† _Op. cit._

Education. Plant operation and maintenance was assumed to include all expenditures for salaries, wages, supplies, other expenses and equipment for the operation and maintenance of the institutional plant, and miscellaneous expenses. Such items as repairs of furniture and equipment, care and maintenance of ground, utilities, rent, property insurance, general trucking, and so forth were included.

- Per diem for all federal, state and local government highway safety specialists was assumed to remain at the present rate of $16.00 for the 1973 estimates and to increase to $18.00 for the 1978 estimates.

- Travel between place of employment and training center was estimated on the following bases:
  - All personnel to travel on personal time to and from the center
  - All travel cost assumed on tourist class air fares
  - Number of trips for entry training: once a year (for refresher training once a year and every other year, as required)
  - Estimated origins for the various types of specialist are as follows

Origin	Destination
Centroid of state	State center
State capital	Regional center
State capital	Federal academy

- FTE (full-time student equivalent) was derived from the professorial requirement tables (Appendix Tables 1-1 to 1-5) which are representative of all center development alternatives; 90 percent of instruction is in the classroom, with 20 students per class, and 10 percent is in the laboratory, with four students per class; therefore, $0.90 \times 20 + 0.10 \times 4 = 18.4$ FTE students per full professor.

The cost estimates for all alternatives and subalternatives are summarized in Table 2-10. Each cost component has been explained earlier, but their arrangement should be clarified. The "total annual cost" consists of salaries, wages, overhead, and plant operations and maintenance expenditures incurred during one fiscal year by a single center in one of the 11 subalternatives. These are annual recurring expenses and reflect the inflationary increases stated earlier.

ESTIMATED COST O
OF HIGHWAY SAFETY MANPOWE

Five- and Ten-Ye
Money Figures

Alternative	Year	Faculty: Total All Levels	Faculty: Av. Salary	Faculty: Total Salaries	Other Personnel: Total All Levels	Other Personnel: Av. Salary	Other Personnel: Total Salaries	Total Salaries	O/H Rate (%)
State Centers									
Large States	1973	27	17.037	460	21	13.274	279	739	50
	1978	23	21.745	500	21	16.941	356	856	50
Medium States	1973	9	17.037	153	16	13.145	210	363	50
	1978	8	21.745	174	16	16.778	269	443	50
Small States & D.C.	1973	4	17.037	68	10	12.317	123	191	50
	1978	4	21.745	87	10	15.719	157	244	50
Regional Centers and University Consortia									
All Programs	1973	38	17.037	647	21	13.274	279	926	50
	1978	32	21.745	696	21	16.941	356	1,052	50
Excluding Direct Police Training & Driver Education	1973	20	17.037	341	11[5]	13.274	146	487	50
	1978	17	21.745	370	11[5]	16.941	186	556	50
National Center									
All Programs	1973	377	17.037	6,423	50	12.789	639	7,062	50
	1978	322	21.745	7,002	50	16.322	816	7,818	50
Federal Academy Training Only	1973	323	14.720	4,755[1]	130[2]	12.230[3]	1,590	6,345	35
	1978	272	18.700	5,086[1]	113[2]	15.600[3]	1,763	6,849	35

Notes:
1 Faculty salary for GS-855-11, S9, projected @ 5%.
2 40% of all levels of faculty.
3 Administrative support salary for GS-9, S5, projected at 5%.
4 Perdiem @ $16.00 for 1973 and $18.00 for 1978 for No. of FTE students.
5 51.2% of National Center (all programs).
6 0.148 X burdened payroll for all alternatives (except for the academy) @ 0.253 X burdened payroll.

Table 2-10

T O D COST OF DEVELOPMENT ALTERNATIVES
OWE MANPOWER DEVELOPMENT AND RESEARCH CENTERS

-Ye d Ten-Year Programs (1973 & 1978)
res Figures in Thousands of Dollars

/H ate %)	l es	O/H Rate (%)	Burdened Payroll	Travel	Per Diem[4]	Plant Ops. & Maint.[6]	Total Annual Cost	No. of Students Enrolled	No. of Students FTE	Acquisition (capital) Cost (thousands of dollars) Land	Buildings	Improvements	Equipment	Total	Total "System" Cost Annual	Total "System" Cost Capital
0	9	50	1,109	96	962	164	2,331	1,258	167	78	963	40	215	1,296	2,331	1,296
0	5	50	1,284	140	927	190	2,541	1,820	143	85	1,051	44	235	1,415	2,541	1,415
0	3	50	544	30	305	80	959	396	53	25	304	13	69	411	959	411
0	3	50	665	44	292	98	1,099	572	45	27	330	14	74	445	1,099	445
0	1	50	286	14	138	42	480	143	24	11	138	6	31	186	480	136
0	4	50	366	20	136	54	576	176	21	12	155	6	35	208	576	208
0	6	50	1,389	138	1,377	206	3,110	1,797	239	111	1,378	58	308	1,855	3,110	1,855
0	2	50	1,578	200	1,322	234	3,334	2,599	204	121	1,501	63	335	2,020	3,334	2,020
0	7	50	730	71	708	108	1,617	916	123	57	710	30	159	956	1,617	955
0	6	50	834	102	680	123	1,739	1,331	105	62	773	32	173	1,040	1,739	1,040
	2	50	10,593	1,376	13,761	1,568	27,298	17,965	2,389	1,112	13,775	575	3,077	18,539	27,298	18,539
	8	50	11,727	2,001	13,219	1,736	28,683	25,994	2,040	1,211	15,006	626	3,353	20,196	28,683	20,196
	5	35	8,579	1,089	11,791	2,170	23,629	14,214	2,047	1,213	15,026	628	3,357	20,224	23,629	20,224
	9	35	9,246	1,350	11,171	2,340	24,107	17.542	1.724	1,306	16,172	675	3,613	21,766	24,107	21,766

The "acquisition" or "capital" costs are nonrecurring initial investments made when the center is being developed and reflect the current prices of labor, materials, and real property.

The "total system cost" is the sum of the annual and capital costs for all centers making up a subalternative system, i.e., three large state centers or ten regional centers or ten university consortia centers.

The "total, all levels" under "faculty" indicates the faculty mix of 1.9 additional faculty members for each full professor.

Cost Analyses for Alternative Strategies

All cost estimates developed and expanded in this section are now summarized in Table 2-10, "Estimated Cost of Development of Alternatives for Highway Safety Manpower Development and Research Centers," and in Table 2-11, "Estimated System Cost of Major Highway Safety Manpower Development and Research Center Alternatives."

The costs in the first table are shown for two points in time; 1973 and 1978, to reflect the differing development of manpower requirements after a five-year interval, the effect of catching up with all training and education needs within five and ten years from now, and finally the effect of inflation on prices and costs of all resources.

All alternatives have different costs except a regional center and a university consortium. Obviously there will be some cost differences between these two types of centers. For instance, salary differentials between universities making up a consortium may well average below or above the average salary of a single university regional center. It is also probable that more alternative personal and other expenses will occur with a consortium than with a single university. Higher costs will be expected for a reimbursement for travel and per diem when students have to spend in-residence time at different universities to obtain an advanced degree or complete their training requirements. However, it is believed that such cost differentials are minor, and the results or cost analyses are not distorted by assuming the same total cost for the regional and consortium centers.

The exclusion of driver education and police training in a national center results in almost proportional reduction of annual operating costs. Thus, it can be assumed that the elimination or placing restrictions on any part of the training or education as it affects the number of FTE students and faculty will proportionately reduce the overall center costs.

Table 2-11

ESTIMATED SYSTEMS COSTS OF MAJOR HIGHWAY SAFETY MD&R CENTER ALTERNATIVES
1973 PROGRAM

Alternative	Annual Operating Cost Excluding Per Diem and Travel	Total Operating Cost	Initial Investment
50 State Centers and D.C.	$ 23,707,000	$ 36,740,000	$ 15,966,000
10 Regional Centers	15,595,000	31,100,000	18,550,000
1 National Center	12,463,000	27,298,000	18,539,000
1 Federal Academy	10,740,000	23,629,000	20,224,000

In other words, there are very few fixed and semivariable costs in the operation of the center.

It should be understood that the travel and per diem costs may not be applicable in 1973 and 1978. It has been suggested that these expenses be reimbursed by the federal government to all students, as an initial encouragement to state and local authorities to participate in the program during its initial phase. It is hopefully expected that once the value of the HSMD&R Centers is proved, the "users," i.e., states and local agencies, will be paying these expenses in the future.

Table 2-11 presents "the system costs" of the five major alternatives for the development of HSMD&R Centers (however, only one set of figures is shown for the regional centers and university consortia).

In this case, the system cost was defined as the cost of operating all centers during one year for a particular configuration; for instance, 50 state centers and the District of Columbia, or ten regional centers, or ten university consortia, or a national center, or a federal academy. In the latter case, one should keep in mind that the academy is performing training only, and not graduate education.

As expected, the state alternative has the highest operating cost but the lowest investment requirements, mainly because of the study's assumption that small and medium state centers would have limited research facilities and equipment. The federal academy has the lowest operating cost and the highest initial investment. However, as mentioned earlier, this alternative requires other means of federal support for graduate education. It is obvious that a national center has the least annual operating costs.

These system estimates do include travel and per diem. If they are excluded, as shown on the same table, independent cost differentials of the four alternatives become much more striking in favor of a national center. The reason for this is that the costs of travel and per diem are substantially higher for the regional centers and for the national center. Students have a relatively short distance to travel to their own state center as compared with routes to regional centers or to a national center from their place of residence or employment.

Funding Levels for Estimating the Size of a Center

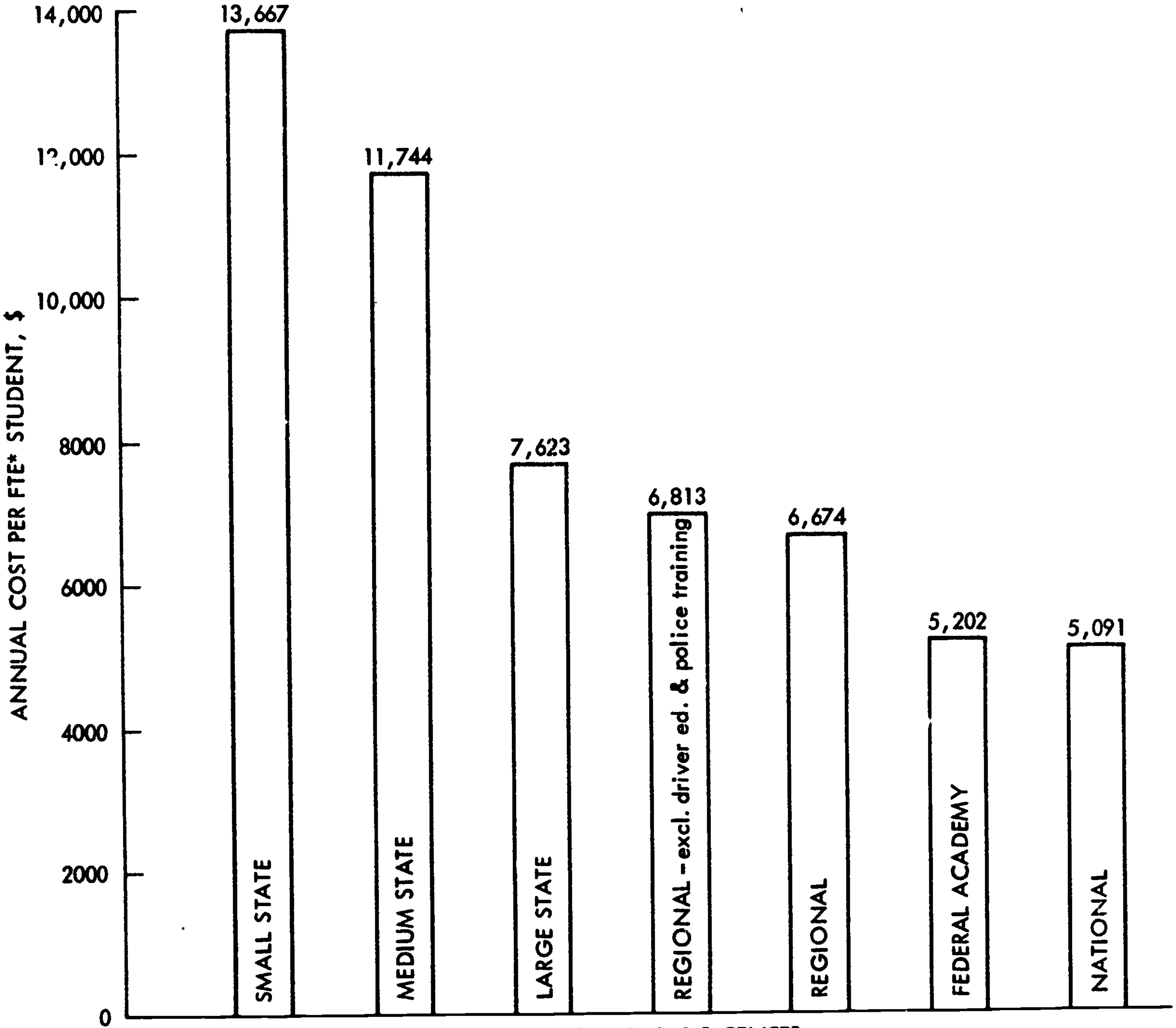
From the breakdown of cost estimates, it can be seen that the student loading is the critical factor that determines the size of a HSMD&R Center. This factor, in turn, determines how large the faculty is to become and how large a facility must be provided for the center. Cost estimates that have been developed for the different sized centers should enable the NHSB to determine the magnitude of the training program that may be expected under variations in funding levels. Also, for the same level of funding, the selection of the strategy that is to be followed will have a bearing on the number of students that can be trained annually since there are differences in cost-per-student among the alternatives. Therefore, should substantial funding become available for safety manpower development, decisions on how it is to be expended will require an integration of two factors: (1) the strategy that is to be embraced; and (2) the student loading that is to be handled, based on full-time equivalents.

HSMD&R Center Annual Cost per FTE Student. Figure 2-2 presents, in the format of vertical bars, the annual costs of operating one center for each of the nine different alternatives, prorated to FTE students.

The expenditures included in the annual operating cost are: (1) the salaries for the faculty and the center personnel, (2) an overhead burden of 50 percent, and (3) facility and equipment operating and maintenance costs of 12.9 percent of the combined payroll and overhead. However, for the federal academy, the current salary and overhead rates now in use at the FAA Academy in Oklahoma City have been approximated. Travel and per diem costs are not included.

A review of Figure 2-2 indicates that the per capita cost (i.e., the cost per each FTE student) is the highest for a small state center ($13,667) and the lowest for a national university center ($5,091), definitely pointing to the effect of the "economy of scale." It should also be noted that the cost of regional centers falls between the two extremes but closely approximates the lowest cost alternative.

HSMD&R Center Annual Cost as a Function of the Number of Students. In Figure 2-3, a linear curve is approximated, relating the total annual operating cost (excluding per diem and travel) and the number of full-time equivalent students at the center. The plot represents only the cost of three typical-size states and one regional center, as the make-up of other centers does not follow the same pattern; for instance, a regional



*Full time equivalent

FIGURE 2-2 HSMD&R CENTER ANNUAL COST PER FTE* STUDENT IN 1973

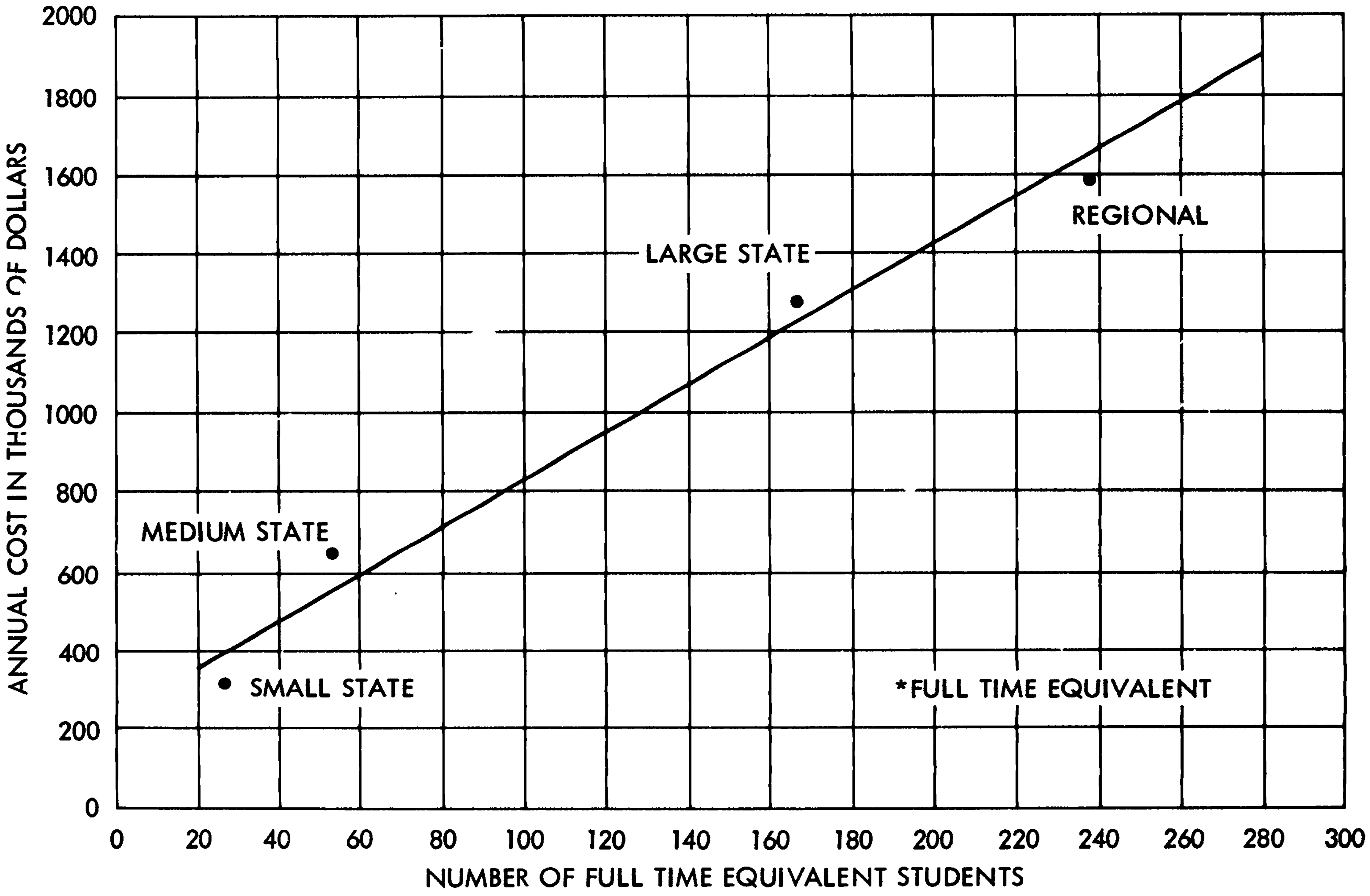


FIGURE 2-3 HSMD&R CENTER ANNUAL COST AS A FUNCTION OF FTE* STUDENTS

center or a consortium excluding driver education and police training, or a federal academy excluding post-graduate education, is excluded.

The curve has not been extended beyond the size of a regional center, because some of the assumptions for developing the cost of a national university center were different. The prorated basis for bringing trainees in from the field varied for regional and national centers as a function of total numbers within each specialty that would require training.

Summary

The cost analyses revealed that an economy of scale does exist when the highway safety manpower development program is aggregated into increasingly larger centers of operation. The program would be more costly if it were to be conducted at the state level than if it were to be implemented at the national level or at regional levels. The greatest economy would prevail if the total mission were to be implemented at a single center. Therefore, if all other advantages lay with a national center, the solution would be straightforward for the selection of the optimal program strategy among those that have been studied. However, this unique solution is not strictly the case in resolving the differences among the program alternatives, since there are advantages and disadvantages accompanying each option. Such advantages and disadvantages have been described in conjunction with each program alternative. Admittedly, they are more difficult to quantify than cost factors and should require further study. If they were to be ignored, however, they might have disastrous effects on the success of the future highway safety manpower development program.

The centralization of the entire program at a single university would provide the NHSB with greater control and ease of administration. However, it might raise considerable problems in securing cooperation of state and local agencies and in responding to the unique needs at these levels. Also, there are some dangers associated with overtaxing the resources of a university and overconcentrating the program in one educational institution. It should be reaffirmed that, while a national university-based center has been treated in the study the same as the other alternatives, its chief advantage lies in its providing of an analytical base from which to scale down to other systems of centers, especially the regional alternative. The national alternative of a federal academy for training components of the program is more appealing only because its speed of implementation might be greater than that of other proposed alternatives. However, there would still remain the problem of developing the graduate education and research components of the program and, perhaps, the inadvisability of separating the latter components from the short-course training requirements. It is true, also, that the FAA Academy is an attractive analogous precedent for training highway safety manpower, but it must be demonstrated that a similar arrangement can function as effectively with an infinitely greater training need and with personnel who belong to state and local agencies, as opposed to the FAA's almost exclusive clientele of federal employees.

State centers possess the attraction of being more responsive to local needs and have a potential for securing greater local cooperation, inasmuch as they would utilize existing, traditional channels of communication already in being for highway safety and other purposes. Several states appear to have major university complexes qualified to establish an HSMD&R Center mission. However, this capability is by no means uniform throughout the entire country and buildup rates of considerable variance among the states may be anticipated. From the NHSB viewpoint, problems in administration and program control may be greater than for other proposed alternatives.

The cost analysis provides the main analytical base for judging among the program alternatives. The alleged advantages for each alternative are of secondary consideration, since they have not been substantiated in this study. The consolidation of the entire program in a single university does not seem warranted, although the estimated costs of a national university center are lower than for the other alternatives. The probability is very low that the existing professional capability in highway safety would countenance a displacement from its home universities. The federally operated training academy is excluded from consideration at this time, even with its low costs, mainly because the essential contract requirement was to determine the feasibility of program alternatives that would be university-based.

After the single-center or national university concept, regional centers follow as the most feasible solution according to costs, and with the potentiality to:

- Organize flexibly to meet the needs of several states
- Capitalize on the limited professional capability in highway safety existing at universities
- Have available one or more highly qualified universities to host an HSMD&R Center in each of the ten regions defined in this study

- Achieve greater standardization of curriculum in training highway safety manpower through a limited number of centers

- Reduce the burden of direct NHSB coordination and control of centers, since a limited number would be involved

- Have a greater speed of implementation than if a larger number of centers were to be activated under other program alternatives

- Capitalize on precedents established among universities in neighboring states in sharing of federal grants.

Since the regional concept offers such potential advantages, it is the view of this study that this program alternative should be tested so that it may demonstrate its ability to meet its described expectations. Submission of the regional concept to test is discussed comprehensively under the "Conclusions" section at the end of this chapter.

Ranking of Alternative Program Strategies

Rationale for the Evaluation

In the previous section, cost estimates for the establishment and operation of HMSD&R Centers have been presented for the different program strategies (e.g., state, regional). In addition, the advantages and disadvantages of each strategy have been described. The provision of proof for those advantages and disadvantages that have been stipulated is beyond the scope of this study, for to do so would require an effort practically as great as that already expended in providing the main findings embodied in this report. This situation is not unique to the evaluation of HMSD&R Centers, since it occurs very frequently in many spheres of research. Further evaluation is needed, even though it is recognized that it may not be obtained through the analysis of objective data. In such cases, the data simply were not available, or an inordinate expense would have been encountered in obtaining them. For such reasons, the method of rankings, or ratings, was used very frequently.

Since six members of the study team acquired considerable familiarity with alternative arrangements for HMSD&R Centers, it was decided that they would function as the judges who would conduct the rankings of the alternatives. Initially, there were reservations about employment of the study team on the grounds that they were "inbred" in their perspective of how centers should be established. In conference discussions held immediately before the ranking, however, it was discovered that considerable diversity of opinion existed among team members on the effectiveness which could be predicted for the different alternatives when specific characteristics were raised. The ranking study described below, therefore, was an attempt to organize opinions of those who had achieved a considerable insight into this problem area.

Methods Used in the Evaluation

The following steps were followed in evaluating the alternatives:

1. Twenty factors were defined for purposes of obtaining judges' rankings on the program alternatives. These included such factors as effectiveness in recruiting students and responsivity to local needs. See Table 2-12 for the complete listing of the 20 factors.

2. Each judge independently provided his rankings on each of the 20 factors for all alternatives.

Table 2-12

EXAMPLE OF FORM USED BY A JUDGE FOR EVALUATING NONQUANTITATIVE QUALITY FACTORS IN HIGHWAY SAFETY RESEARCH CENTERS

Factors	Organizational Alternatives			
	Universities in States	Regional Universities	Regional Consortia	National Universities
1. Standardization of curricula	4	2	3	1
2. Effectiveness in recruiting students: Training	4	2.5	2.5	1
3. Effectiveness in recruiting students: Education and Research	4	2	3	1
4. Responsiveness to changing program standards	4	2	3	1
5. Responsiveness to local highway safety needs	1	3	2	4
6. Identification with national program objectives	4	2	3	1
7. Establishment of interdisciplinary capabilities	4	2	3	1
8. Retention of graduates in highway safety work	1	3	2	4
9. Ease of administration by NHSB	4	2	3	1
10. Simplicity of school administration	1	2	3	4
11. Information transfer: technical skills	1	2.5	2.5	4
12. Information transfer: instructional skills	1	2.5	2.5	4
13. Opportunities for supplementary Federal funds	1	2.5	2.5	4
14. Opportunities for supplementary non-Federal funds	1	2.5	2.5	4
15. Stability of contracting provisions	2.5	2.5	2.5	2.5
16. Availability of qualified professionals for staff	4	3	2	1
17. Responsiveness to build-up or contraction in program needs	4	2	3	1
18. Effectiveness in attracting staff	4	2	3	1
19. Attraction of political support	1	2	3	4
20. Overall effectiveness	4	1	2	3
21. Total summed rankings	54.5	45	53	47.5
22. Rank Order	4	1	3	2

3. Statements were obtained from each judge to justify his rankings and these comments were summarized for each factor.

4. The rankings were analyzed to develop overall conclusions about the relative effectiveness of each alternative strategy, based on agreement that was achieved among judges.

Procedures Followed in Ranking Alternatives

Rankings for the four alternatives were obtained from the six SRI technical staff who worked most actively on the project. All of the six judges were reasonably knowledgeable about the operational aspects of the program alternatives. Their rankings thus established an order of preference among the alternatives in terms of the 20 qualitative effectiveness factors mentioned above.

The procedure for obtaining the rankings is described below.

1. Rankings were obtained from each judge to reflect his estimate of the comparative effectiveness of each alternative on each factor. Thus, every judge assigns a rank in each of 80 cells, as shown in Table 2-12. The sum of the rankings by each judge on each factor equals 1 + 2 + 3 + 4, or 10. (This sum remains constant, even where tied ranks are given.) The sum of rankings for all cells by each judge equals 10 X 20, or 200.

2. The average preferences of the judges were determined next. Rankings given by all judges were totalled for each of the 80 cells, as shown in Table 2-13. Since the summed ranks on each factor is 10 for each judge, the total on each factor for all six judges must be 10 X 6, or 60.

3. The extent of consensus among the judges on each factor was assessed by means of the Kendall coefficient of concordance for nonparametric ordinal measurements.* This test provides a "coefficient of concordance," W, which is analogous in the multijudge case to the "correlation coefficient," r, for the two-judge case. It also permitted calculations to be made

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* Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences, McGraw Hill, New York, 1956.

Table 2-13

TOTALLED RANKINGS OF ALL SIX JUDGES ($R_j=R_1+R_2+R_3+R_4+R_5+R_6$)

Factors	Organizational Alternatives			
	Universities in States	Regional Universities	Regional Consortia	National Universities
1. Standardization of curricula	24	12.5	17.5	6
2. Effectiveness in recruiting students: Training	9	16	15	20
3. Effectiveness in recruiting students: Education and Research	14	13	14	19
4. Responsiveness to changing program standards	24	13	17	6
5. Responsiveness to local highway safety needs	6	16.5	14.5	23
6. Identification with national program objectives	24	13	17	6
7. Establishment of interdisciplinary capabilities	22	16	11	11
8. Retention of graduates in highway safety work	9	14.5	14.5	22
9. Ease of administration by NHSB	24	12.5	17.5	6
10. Simplicity of school administration	9	12	22	17
11. Information transfer: technical skills	18.5	14	12	15.5
12. Information transfer: instructional skills	16.5	14	14	15.5
13. Opportunities for supplementary Federal funds	16	16.5	15.5	12
14. Opportunities for supplementary non-Federal funds	8	14.5	13.5	24
15. Stability of contracting provisions	20.5	13.5	18.5	7.5
16. Availability of qualified professionals for staff	21	16	11	12
17. Responsiveness to build-up or contraction in program needs	23	13	15	9
18. Effectiveness in attracting staff	16.5	14	12	17.5
19. Attraction of political support	6	16	16	22
20. Subjective evaluation of overall effectiveness	20	10	12	18
21. Sum of all 20 features	20	13	15	12

of the significance level of the extent of agreement (i.e., of the fraction of randomized rankings by six judges that would yield agreements as good as the observed agreements). The test included several steps:

- The mean value of the totaled rankings in each cell was subtracted from the actual value of the totaled ranks in that cell. (Since there are four alternatives and the totaled rankings equal 60, the mean value for each cell is obviously 15.) The difference between the mean and actual values was squared. The squared value was entered in the corresponding cell, and the indicated values were summed in each row to obtain the value "S." Results of these operations are shown in Table 2-14.

- Given the number of alternatives, the number of judges, and the calculated value of S, a statistical table was used to determine whether the indicated value of S was significant at the 0.01 or 0.05 level. If less than 0.01 (1 percent of factors that had been ranked randomly yielded a value of S exceeding the observed value, the significance level was said to exceed 0.01. Similarly, a 0.05 significance level corresponded to a value of S exceeded by 5 percent of randomized rankings. The value of "W" (the Kendall coefficient of concordance) was calculated by dividing the value of S by 180. The value of W always falls between +1.00 and -1.00. Significance levels and the coefficient of concordance are shown in Table 2-15.

From inspection of Table 2-15, it may be seen that the reliability of the pooled judges' rankings was not the same for all 20 factors that were used to rank the four alternatives. The index of agreement among judges failed to exceed chance levels for 8 of the 20 factors. Those factors on which there was disagreement include effectiveness in recruiting students, training effectiveness, opportunities to obtain supplementary federal funds, the ability to attract staff, and overall effectiveness. Failure to obtain statistically significant indices of agreement on all factors was not surprising, in view of the diversity of opinion that was discovered among the project team members at the outset of the ranking study. Another reason that must be considered as underlying the lack of agreement may be attributed to the inherent nature of those factors of effectiveness on which the coefficient of concordance was not statistically significant. One should not expect agreement among any group of judges if they cannot rate certain phenomena realistically. This problem

Table 2-14

SQUARES OF THE DEVIATIONS OF R_j VALUES FROM THEIR MEAN VALUE: $(R_j-15)^2$
AND THE SUM OF ALL DEVIATIONS FOR EACH FACTOR: $S = \Sigma(R_j-15)^2$

	Factors	Organizational Alternatives				
		Universities in States	Regional Universities	Regional Consortia	National Universities	"S"
1.	Standardization of curricula	81.00	6.25	6.25	8100	174.5
2.	Effectiveness in recruiting students: Training	36.00	1.00	--	25.00	62.0
3.	Effectiveness in recruiting students: Research and Education	1.00	4.00	1.00	16.00	22.0
4.	Responsiveness to changing program standards	81.00	4.00	4.00	81.00	170.0
5.	Responsiveness to local highway safety needs	81.00	2.25	.25	64.00	147.5
6.	Identification with national program objectives	81.00	4.00	4.00	81.00	170.0
7.	Establishment of inter-disciplinary capabilities	49.00	1.00	16.00	16.00	82.0
8.	Retention of graduates in highway safety work	36.00	.25	.25	49.00	85.5
9.	Ease of administration by NHSB	81.00	6.25	6.25	81.00	174.5
10.	Simplicity of school administration	36.00	9.00	49.00	4.00	98.0
11.	Information transfer: technical skills	12.25	1.00	9.00	.25	22.5
12.	Information transfer: instructional skills	2.25	1.00	1.00	.25	4.5
13.	Opportunities for supplementary Federal funds	1.00	2.25	.25	9.00	12.5
14.	Opportunities for supplementary non-Federal funds	49.00	.25	2.25	81.00	132.5
15.	Stability of contracting provisions	30.25	2.25	12.25	56.25	101.0
16.	Availability of qualified professionals for staff	36.00	1.00	16.00	9.00	62.0
17.	Responsiveness to build-up or contraction in program needs	64.00	4.00	--	36.00	104.0
18.	Effectiveness in attracting staff	2.25	1.00	9.00	6.25	18.5
19.	Attraction of political support	81.00	1.00	1.00	49.00	132.0
20.	Overall effectiveness	25.00	25.00	9.00	9.00	68.0
21.	Sum of ratings	25.00	4.00	0	9.00	38.0

Table 2-15

SIGNIFICANCE LEVELS AND "W" (KENDALL COEFFICIENT OF CONCORDANCE)

Factors	S	Significant at .01-.05 Level	Significant at Beyond .01 Level	W
1. Standardization of curricula	174.5	--	Yes	.97
2. Effectiveness in recruiting students: Training	62.0	--	--	.34
3. Effectiveness in recruiting students: Education and Research	22.0	--	--	.12
4. Responsiveness to changing program standards	170.0	--	Yes	.94
5. Responsiveness to local highway safety needs	147.5	--	Yes	.82
6. Identification with national program objectives	170.0	--	Yes	.94
7. Establishment of interdisciplinary capabilities	82.0	Yes	--	.46
8. Retention of graduates in highway safety work	85.5	Yes	--	.48
9. Ease of administration by NHSB	174.5	--	Yes	.97
10. Simplicity of school administration	98.0	Yes	--	.54
11. Information transfer: technical skills	22.5	--	--	.13
12. Information transfer: instructional skills	4.5	--	--	.03
13. Opportunities for supplementary Federal funds	12.5	--	--	.07
14. Opportunities for supplementary funds	132.5	--	Yes	.74
15. Stability of contracting provisions	101.0	--	Yes	.56
16. Availability of qualified professionals for staff	62.0	--	--	.34
17. Responsiveness to build-up or contraction in program needs	104.0	--	Yes	.58
18. Effectiveness in attracting staff	18.50	--	--	.10
19. Attraction of political support	132.00	--	Yes	.73
20. Overall effectiveness	68.00	--	--	.38
21. Sum of ratings	.21	38	--	--

may have arisen in the conduct of this ranking study, although it may not be separated from the possible existence of a genuine diversity of opinion.

Findings of the Judges' Combined Rankings

The results of the totaled rankings of Table 2-13 are recompiled in Table 2-16, which shows the highest-ranked factors and the lowest-ranked factors for each alternative. All factors are presented, but the discussion will be concerned with those on which there were statistically significant indices of agreement.

State centers are ranked highest on factors exemplifying local support, simplicity of operation, responsiveness to local needs, and better retention of graduates in the highway safety field. Against those five factors on which state centers are ranked the highest, there are 7 factors on which they receive the lowest rankings. These seem to be a function of the relationships in the sense of coordination that could be expected to prevail with the federal government. State centers, therefore, are not perceived as providing standardized curricula, or the best medium for responding to changing program standards and needs generated at the federal level. It is also predicted that they would increase problems of administration from the NHSB vantage point.

Regional centers-nonconsortia received none of the lowest combined rankings on factors for which there is agreement among judges. Further results of the pooled rankings were found for the alternative of regional centers through analyzing the number of times it succeeded in achieving second place, if not the highest ranking, on each factor. These findings will be treated in separate discussion immediately following the findings on first- and last-place rankings for the remaining two alternative program strategies.

Regional centers-consortia received the highest ranking on only one of the factors, namely, its ability to attract a more effective interdisciplinary capability, since it would be drawing on several universities for its faculty and research support. However, it shares first-rank on this factor with the concept of a single or national university that would hypothetically conduct the manpower development and research mission for the entire country. In the direction that might be expected, regional consortia are ranked the lowest on simplicity of administration, since they would require extensive coordination with other universities providing faculty or conducting part of the training mission.

Table 2-16

HIGHEST AND LOWEST SIGNIFICANT RANKINGS FOR THE FOUR ALTERNATIVES

Universities in States

Ranked Highest on the Following Factors:

2 Effectiveness in recruiting trainees
5† Responsiveness to local needs
8* Retention in highway work
10* Simplicity of school administration
14† Opportunities for non-Federal funds
19† Attraction of political support

Ranked Lowest on the Following Factors:

1† Standardization of curricula
4† Responsiveness to program standards
6† Identification with national objectives
7* Interdisciplinary capabilities
9† Ease of administration, NHSB
11 Information transfer, technical skills
12 Information transfer, instructional skills
15† Stability of contract
16 Availability of professional staff
17† Responsiveness to program needs
20 Overall effectiveness
21 Sum of all factors

Regional Universities

Ranked Highest on the Following Factors:

3 Effectiveness in recruiting students
12 Information transfer, instructional skills (tie)
20 Subjective evaluation, overall effectiveness

Ranked Lowest on the Following Factors:

13 Opportunities for Federal funds

Table 2-16 (continued)

Regional Consortia

Ranked Highest on the Following Factors:		Ranked Lowest on the Following Factors:	
7[*]	Interdisciplinary capabilities (tie)	10[*]	Simplicity of school administration
11	Information transfer, technical skills		
12	Information transfer, instructional skills (tie)		
16	Availability of professional staff		
18	Effectiveness in attracting staff		

National University

Ranked Highest on the Following Factors:		Ranked Lowest on the Following Factors:	
1[†]	Standardization of curricula	2	Effectiveness in recruiting trainees
4[†]	Responsiveness to program standards	3	Effectiveness in recruiting students
6[†]	Identification with national objectives	5[†]	Responsiveness to local needs
7[*]	Interdisciplinary capabilities (tie)	8[*]	Retention in highway work
9[†]	Ease of administration, NHSB	14[†]	Opportunities for non-Federal funds
13	Opportunities for Federal funds	18	Effectiveness in attracting staff
15[†]	Stability of contract	19[†]	Attraction of political support
21	Sum of all factors		

[*] This ranking is significant at the .05 level (i.e., the observed degree of consensus of judges on this ranking would occur less than 5% of the time if rankings were at random).

[†] This ranking is significant at the .01 level.

A single, or national, university is perceived by the combined judges to be best able to achieve standardized curricula, most responsive to changing program standards and national objectives in highway safety, easier for the NHSB to administer, and most stable in its funding or contractual agreements. Against those six factors on which it received the highest rankings, the national university received lowest rankings on four factors that connote local political support, local responsiveness, and the ability to attract nonfederal funds. Presumably, the university that would host such a center would be so heavily funded from the federal government that foundation funds, state funds, and so forth, would be attracted elsewhere.

An inherent weakness in all ranking studies is that rankings, by themselves, provide no indication of the actual distances or numerical gaps that exist between ranks. Differences between first and second rank, for example, may actually represent a two- or three-point difference in the supporting raw data from which the ranks were transformed. The implication for operational purposes is that an alternative may not receive the greater number of first-place rankings but may actually receive the preponderant number of second-place rankings. One interpretation of such findings would be that the alternative with the highest second-place count might actually represent a compromise, or a middle ground, for resolving the differences posed by extreme alternatives. A second-place count was made on regional centers-nonconsortia, and it was found that it was ranked in second place, when all judges' rankings were combined, for 8 of the 12 factors on which the index of agreement exceeded chance levels. Those factors on which it was ranked in second place by the judging team are listed below:

No.	Regional Centers-Nonconsortia Second Place Rankings
1.	Stardardization of curricula
4.	Responsiveness to changing program standards
6.	Identification with national program objectives
8.	Retention of graduates in highway safety work
9.	Ease of administration by the NHSB
10.	Simplicity of school administration
15.	Stability of contracting provisions
17.	Responsiveness to buildup or contraction in program needs

The above findings are intended to amplify the information shown in Table 2-16, where each alternative is identified according to those factors on which it was ranked first by the combined judges' rankings, especially for those characteristics where the index of agreement exceeded chance levels. The national university ranked first on six statistically significant factors, while the state center ranked first on five such factors. However, since distances between ranks, in terms of the raw supporting data, can be very small, it appears necessary to consider the additional ranking information exemplified by second-place choices when interpreting this study of judges' ranks.

Judges' Comments in Support of Rankings

At the time that the judges compared various alternatives on the 20 different factors, they commented on their rationale for the assignment of ranks. The general thrust of these comments is summarized below:

Factor 1, "standardization of curricula"--Most judges ranked the national university first on this factor, since this alternative entails establishment of only one curriculum. Control over that curriculum is also facilitated by minimizing geographical separation. State universities were ranked last, since curriculum standardization and control would have to be carried out for 51 different campuses.

Factor 2, "effectiveness in recruiting students: training"--Here, the state universities were favored, because each one would draw from its traditional recruitment sources, which are geared to the government organizations within that state. State highway departments are particularly influential in recruitment for local and state agencies. Also, the training facilities that are more closely located to the organizations they serve will tend to draw more students, and graduates of the facility will be more likely to assume field training duties for more widespread training. On the other hand, certain advantages are obtainable by more widespread recruiting efforts, such as would be required under a national or regional organization. Widespread recruiting would tend to provide better intellectual stimulation and more uniformity of student qualifications in various centers.

Factor 3, "effectiveness in recruiting students, education and research"--This factor was not sensitive to different alternatives. A slight preference was shown for the state and regional programs over the single national university. This preference reflects the same influences as it did in Factor 2, except that in this case the preferences are less strong. The advantages of nearby locations for recruitment are somewhat offset by the attractions for education and research of large and prestige schools. Consortia would have the advantage in recruiting of being able to draw from a larger pool of students than single universities could; but this would be offset by the advantage of single universities in dealing with a more cohesive and locally oriented student body. A single national center would have the most difficult problem in recruiting graduate students from distant locations and accommodating their great differences in research interests.

Factor 4, "responsiveness to changing program standards"--The alternatives were ranked inversely with the number of links between centers and Washington, D.C. Therefore, a single national university was ranked highest and the state universities were ranked lowest.

Factor 5, "responsiveness to local highway safety needs"--The alternatives were ranked in the opposite order to Factor 4. It was estimated that schools close to local influences would be more responsive to local needs. In addition, the state universities have traditional channels for obtaining information about needs within the state. Such channels do not exist at the regional or national levels.

Factor 6, "identification with national program objectives"--The national university ranked highest, on the grounds that this alternative provides the most natural focus for nationwide goals. Universities in states were ranked last, since each school has a traditional commitment and identification with the home state and its unique highway problems.

Factor 7, "establishment of interdisciplinary capabilities"--This factor yielded a first-place tie between the alternatives for a national university and regional consortia. Obviously, larger schools have better interdisciplinary capabilities. Consortia have the advantage of being able to draw on a wider choice of disciplines from several schools. A national university would have the advantage of a large centralized budget with which to assemble or coordinate interdisciplinary groups.

Factor 8, "retention of graduates in highway safety work"--Universities in the states were ranked first. Graduates tend to have a stronger commitment to the home state environment, either because of their origins with the state or their experiences while at the school. It is well-known from manpower research studies on mobility that such ties can be quite significant for both job and locational stability.

Factor 9, "ease of administration by the NHSB"--A center at a national university was ranked first. Administrative ties to schools are obviously simpler and possible conflicts in communications, procedures and institutional values are minimized when there are fewer schools to deal with. For the same reason, ties to a single campus in a region would be easier to administer than ties to a regional consortium of several schools.

Factor 10, "simplicity of school administration"--Somewhat contradictory preferences to those of Factor 9 were shown for this factor. The internal structures of smaller centers at state universities would be easier to administer than those of larger centers. However, consortia are judged to be administratively more unwieldy than are single universities.

Factor 11, "information transfer of technical skills"--Minor differences among the alternatives were shown. However, a slight preference for centers at larger schools implies that more extensive facilities may permit more efficient transfer of technical information to the students.

Factor 12, "information transfer of instructional skills"--Less significant differences were shown between alternatives than in Factor 11. The critical element in transfers of this type of skill would seem to lie in the quality of teaching rather than in the type of institutional environment.

Factor 13, "opportunities for supplementary federal funds"--A slight consensus was shown in favor of centers at a national university. The rationale for this preference is that the federal government would tend to take care of its own facilities ahead of those at state schools. Also, other federal agencies could more easily coordinate with a noticeable single educational center of rather large proportions, since it would afford them better administrative convenience and more control than they might have over widespread institutions. On the other hand, centers at state institutions would have some compensating advantages in being close to the local political representatives and more able to assert their influence in Congress.

Factor 14, "opportunities for supplementary nonfederal funds"--State centers were ranked highest. Nonfederal funding of a national center would be most difficult because people would tend to identify it with federal domination. Regional centers might be more acceptable to the states and to private foundations, and so forth. Regional Educational R&D Centers that are established under Title IV of the Elementary and Secondary Education Act do often get such outside research funds. Regional centers, in fact, might even prove more attractive to private funds than the more "parochial" state centers would. A consortium might be able to draw from more widespread sources than a single university, although this advantage would to some extent be offset by the lack of a well-established contributing clientele.

Factor 15, "stability of contracting provisions"--A national center was ranked highest. The Federal government would have a big investment in such a center and would want to maintain continuity. It would be less reluctant to reduce drastically or to cut off smaller centers, particularly in states or regions that are not adequately complying with federal safety standards. For regional centers, organization in a single university would be likely to be more stable than in a consortium, which might require concurrence on policy by each of the participating schools.

Factor 16, "availability of qualified professionals for staff"--The regional consortia alternative was favored. Consortia can draw on a large pool of faculty and are better able to recruit and employ specialized staffs than is the average university with strict tenure requirements, and so forth. A single national center would have the advantage of being able to recruit a large group of specialized personnel, although it would have the disadvantage of requiring such personnel to locate in a single place. Also, the "bigness" factor might discourage some research personnel and teachers.

Factor 17, "responsiveness to buildup or contraction in program needs"--A preference is shown for a center at a national university. For similar reasons to those of Factor 6, larger units will be more responsive to national program needs. A national center could compensate for random variations of different state needs. When increases in national needs occur, it could subcontract for the extraordinary instructional needs and keep a constant cadre of faculty and staff to meet minimum requirements.

Factor 18, "effectiveness in attracting staff"--The regional alternative, particularly the regional consortium was favored. Regional centers would be big enough in size and reputation to attract people, but not so large or centralized as to create a feeling of rigidity and anonymity on the part of the staff. Consortia would have the additional advantage of being relatively independent and best able to attract specialized types of positions (however, this is counteracted by the advantages of established position and identity that most individual universities have). Many state universities, because of geography, tradition, local perspective, or other factors, might find difficulties in attracting staff.

Factor 19, "attraction of political support"--Strong favor was shown for centers in state universities. Those connected with politics reflect local interests and therefore want local control and locally situated facilities. A regional center could attract some of these influences, but a single national university would have very little political support.

Factor 20, "subjective evaluation of overall effectiveness"--The greatest preference was shown for centers at universities in regions. The reasons for this preference, which reflects an intermediate type of choice, are discussed in detail above.

Summary

The ranking study represents an attempt to come to grips with nonquantitative factors that could have a marked effect on decisions to adopt one of the proposed alternatives for establishing HSMD&R Centers. All factors were given unit weight, in the absence of supporting evidence, by which they might be awarded differential weights. In the last analysis, many of the factors would depend for their differential weighting, on the philosophy that is to govern the operation of centers, such as determining what the trade-offs are to be between the marshalling of local support and the ease of administration and control desired by the NHSB. The ground rules that governed the judges' rankings, however, did not include a consideration of the trade-offs that might prevail at the moment when the decision would be made to adopt one of the alternative strategies.

State and national alternatives achieve first rank on several factors; but on the other hand, they also receive the lowest rankings on several of the nonquantitative factors. The regional nonconsortia alternative receives none of the lowest rankings for any factors on which there is statistically significant agreement among judges. The regional alternative also receives second-place rankings for eight out of twelve factors on which agreement among judges exceeds chance levels. Purely on the basis of the ranking study, the regional concept would appear to be in a strong contention with the other alternatives, since it received none of the lowest rankings and so many of the number of second-place rankings.

It should be recalled that a national center was posited as an analytical base on which to determine total manpower training requirements for the entire country and, alternatively, to partition this requirement among several regional centers. While an economy of scale has been demonstrated in findings that indicate that larger, more aggregated centers are less costly to operate, strong reasons may arise to mitigate the establishment of a national center at a single university meeting all highway safety manpower development requirements, including that of graduate education and research. Elimination of a single national university center would lead to comparison of state and regional centers. In this comparison, a reasonable expectation would be that those advantages perceived for the national center in the ranking study would accrue to the regional concept. It may be true, also, that under this comparison, regional centers might inherit the lowest rankings currently assigned to the national concept on factors of responsiveness to local needs, attraction of political support, and so forth. If one adheres to the current results of the judges' rankings, however, there is an indication that the regional concept could capitalize on the advantages alleged for a national center.

Pilot Centers for Safety Manpower Development and Research

Introduction

For at least half a century manufacturers have turned to pilot models where large investments were anticipated.* The principle behind such under-scale experiments is expressed succinctly by Baekeland's now famous statement: "Commit your blunders on a small scale and make your profits on a large scale."

Government procurement has followed the lead of industry in the purchase of large hardware systems by insisting that before production and high level funding will be authorized, models and prototypes will be subjected to "engineering" and "users" tests. Although not documented, the savings to taxpayers brought about by following this pilot procedure must be very great.

In the case of social systems, however, the requirement for pilot tests has not usually existed as a standard requisite for funding and execution. Many attempts at social improvement projects undertaken in massive proportions have failed sometimes, in spite of great investments and valiant efforts. However, such failures only point the way to the use of pilot or under-scale models for purposes of validating new social systems before their large scale adoption.

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* See Baekeland, L. H.: Journal of Industrial Engineering and Chemistry, 8:184 (1916).

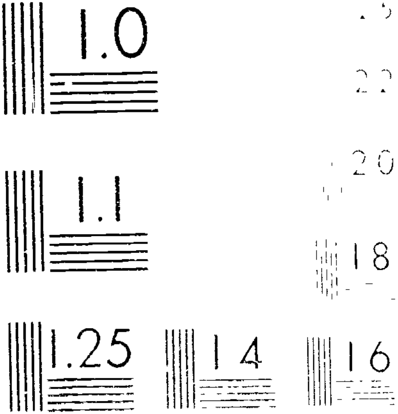
1.0
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

Table 5-17

HIRING OF NEW STAFF WITH FULL-TIME STATUS AND PART-TIME RESPONSIBILITIES AT THE CENTER

	No. of Univ. Responding
University operates this way at present with various Centers, i.e., with joint appointments	4
Need continuity of program to bring in new faculty, at least five years	4
Would bring in with joint appointments but person will not continue unless he has opportunity to do research	3
Faculty from related departments would teach short courses or there would be non-tenured positions	2
Would be willing to hire full-time with a minimum three-year appointment without tenure	2
Would seek faculty for possible tenure and retainment; getting faculty a problem unless you can give tenure	2
Could bring in full-time faculty without necessarily joint appointments but they would participate in the Center	2
Program needs to present a challenge and/or be visible on the campus to attract faculty	2
Younger instructors or graduate students could provide a pool for short courses, since continuing senior faculty dedicated to short courses might pose a problem	2
Could bring in professionals from the field on a part-time basis	1
Primarily depends on approval of departments involved	1
Could hire instructors directly into the Center without department affiliation, but recruitment might be difficult	1
Establish university chair with interdisciplinary responsibilities to stimulate interest in the program	1

An opportunity to pioneer the application of the pilot approach is afforded the NHSB in its efforts to develop safety manpower that will be responsive to the safety needs of the highway transportation system.*

The principal function of the pilot approach is to provide design data for the ultimate system, although in the process it may also be required to produce small quantities of critically-needed, trained key personnel. The small scale approach might be called a model whose chief function is to exhibit the effects of varying approaches more quickly and economically than would be possible by experiments on a full-sized prototype. For the present purpose, it is not important whether the small scale unit is the forerunner from which a full-sized system will ultimately be scaled up, as in the case of a pilot industrial plant, or whether the small unit is a scaled-down model of a subsystem. The concern is with identifying alternative system strategies, the testing of systems or critical subsystems to identify and resolve problems and evaluate the various approaches.

General Considerations in Establishing Pilot Centers

At the present time, the future level of activity of all federal agencies is uncertain. An unpredictable international situation, coupled with a change in administration, promises to keep plans in an unsettled state at least for several months. Uncertainties stemming from changing highway safety standards or unpredicted technological changes, such as shifts to steam or electrical automobiles, or shifts in modes of transportation, such as rapid transit (or even short haul air buses), also interferes with efforts at careful long range planning by imposing additional unknowns. Therefore, when considering what approach to employ in education and research for highway safety, one principle is clear:

> There is a need for a built-in flexibility to enable effective response to unforeseen changes in transportation modes and standards of highway and motor vehicle safety.

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* Other instances where pilot methods are being employed in social areas include: The Educational Policy Research Center at SRI, the National Institute of Public Affairs, and the Michigan State University Highway Traffic Safety Center (said to be a 'pilot' model for the Association of Land-Grant Colleges and State Universities). See "University Transportation and Accident Prevention Centers," Association of State Universities and Land-Grant Colleges, 1962, page 16.

Several universities have instituted centers or departments aimed, at least in part, at improving highway safety. Everyone believes that these centers have succeeded to one degree or another in reducing the accident and death rate. No one is known to have correlated the accident reduction in states employing the educational centers compared with those states not having the benefit of such centers. Such correlations are fraught with difficulties because of the many variables concerned.* To illustrate, how can one attribute accident reductions to the education centers rather than to vehicle codes, highway engineering, or other factors that bear heavily on safety? Although there are difficulties in demonstrating such relationships, it still remains incumbent on the NHSB to select highly qualified university institutions with the appropriate disciplines, history of engagement in the general safety field, and the genuine motivation for operating one or more pilot centers. The need to follow this selection philosophy is especially critical in regions where the number of qualified universities is extremely limited. This would imply that:

> Universities selected for pilot centers should be expected to endure and form a prominent component of a "system of centers" that may ultimately come into being.

Educational techniques are experiencing a rapid evolution. Most changes are the result of an exploding student population. The development of faculties, on the other hand, requires a long lead time, and the competition for competent teachers is severe. HSMD&R Centers must also face the faculty shortage and originate means for circumventing the problem. Therefore at least one major function of the proposed pilot center would be to:

> Strive to attain maximum utilization of available faculty by examining and evaluating alternative and innovative approaches to highway safety education.

Recruiting competent personnel is a problem faced by all organizations. Both highway safety research and education must face an increasingly competitive race for the bright, imaginative, but scarce part of the work force. It is reported, for example, that in a survey conducted at the onset of the manned space center, over 85 percent of those who responded

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* See, for example, "Possible Accident Correlates," An Outline of Background and Current Activities Concerning the ITTE Role in Traffic Safety, University of California, June 1966, p. 11.

were willing to move to Houston. When surveyed again in a few years, only 15 percent of the same sample responded favorably. Clearly, attitudes may spell success or failure in recruiting the prime personnel needed for the highway safety program.* Hence:

> Experiments with innovative recruiting methods may have long-term pay-offs.

The resources that will be available for the pilot studies are likely to be limited (less at the outset than one million dollars per year). The work that can be accomplished with this amount is also limited. In 1965, SRI conducted a survey of 289 research contracts that had been negotiated with universities. The value of these contracts amounted to about $120 million. It was found that this level of expenditure supports the equivalent of about 12,000 full-time employees (55 percent of whom were professionals and 45 percent support and indirect personnel). Hence, it can be projected that an expenditure of $1 million would support about 100 full-time research employees, of which 55 would be professionals.† Stated another way, the research cost amounted to about $10,000 per full-time research employee or $18,000 per full-time research professional. Today the cost of a full-time research professional would probably exceed $20,000 per year.

Fellowship and traineeship grant programs, on the other hand, were found in a more recent analysis by the Government Accounting Office to have cost $421.8 million in support of 62,535 fellows and trainees in 1967.‡ The overall average cost per fellow or trainee amounted to about $6,750 per year. These costs varied by degree level sought and by granting agency.

Finally, for short-term and refresher courses, the FAA Academy computes its cost at about $6.00 per student hour, plus about 20 percent to cover course materials, supplies, and agency overhead costs--a total of

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* Further exemplified by Campbell's statement, "Some courses on accident research probably would not be given more than once every other year--simply because of the small numbers of interested students." Campbell, B. J., Safety Research Manpower, University of North Carolina, June 1968, p. 85.

† Howell, R. P., Breswick, W. N., Wenrick, E. D., The Economic Impact of Defense R&D Expenditures: In Terms of Value Added and Employment Generated, Stanford Research Institute, Frebruary 1966.

‡ Need for Government-Wide Standardization of Allowances Under Federal Fellowship and Traineeship Grant Programs, by the Comptroller General of the United States, May 24, 1968.

about $7.25 per student hour. This amount is over and above transportation, per diem, and other related costs. Classes varied on the average from 8 to 12 students and from 7 to 60 class hours in length. It is evident that:

> There is a cost trade-off between research or educational activities that might be supported by pilot centers.

Finally, there is the problem of considering what activities are most critical and therefore most worthy for testing in a pilot center. It is understood that the NHSB may canvass cognizant agencies to determine such criticalities. Subject matter for which specialist training is required has been outlined.* Although the defined subject matter is valuable in determining which curricula should be taught, it is also possible that:

> Great leverage may be obtained by experiments aimed primarily at how to educate, rather than focusing completely on what subjects should be taught.

Ways must be found for transferring, multiplying, and communicating more effectively the excellent pioneering work being performed at some existing highway safety centers. Some insights could be gained by studying new techniques in conducting driver training. Recent contractual studies let by the NHSB in driver education, driver task analysis, and so forth, also should provide pilot centers with new information and findings through which breakthroughs might be achieved. Evaluation of the extensive use of paraprofessionals to stretch the limited supply of competent highway safety professional faculties may also be indicated. Finally, there is a need to evaluate mechanical, audiovisual, programmed learning, and computer teaching devices as they might improve the effectiveness of highway safety training.

Administration and Organization

How the administration and organization of the HMSD&R Centers should be implemented would fall into the scope of pilot centers, although, because of their size, they could only provide a limited test of the concepts of state, regional, and federal centers or combinations of such

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* Safety Specialist Manpower, Booz-Allen and Hamilton, 1968, conducted for NHSB.

concepts. However, some administration methods might be developed and tested, at least to a degree, through the pilot centers and their relative effectiveness found might provide a partial answer to the question of "how to organize."

Suggested Variations in the Mission and Location of Pilot Centers

At least one pilot center should be concerned with improving the effectiveness of highway safety education and training. In this capacity, it would be concerned with communicating and transferring the existing and developing knowledge to the practitioner. Hence, the center would be concerned with evaluating devices and methods of knowledge transfer but would obtain the content to be transferred from existing sources in government and safety centers. Presumably, this "content" would be furnished under subcontracts negotiated through competitive bidding at the request of the center. With the purpose of developing cost-benefit criteria, at least the following techniques might be examined:

- The programmed text--This approach has been successfully employed in complex disciplines. Computer programming,and statistics, for example, have been taught with programmed texts without the need for faculty.

- The paraprofessional--Stanford Research Institute has recently studied the incidence of employing nondegreed paraprofessionals and teacher aides in elementary and secondary education and has discovered that this practice is increasing.*

- Closed-circuit television--Greater use in the future may be made of television in the classroom. The University of Florida for several years has conducted a major graduate engineering program employing microwave television. The 600 students enrolled have found the SUNSTAR system of particular value under conditions where on-the-job continued education was desired. Other universities and colleges employing television include Purdue (where experiments were conducted as early as 1957), University of Wisconsin, University of Rhode Island, University of Connecticut,

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* Rittenhouse, C. H., "An Interpretive Study of the Use of Paraprofessional Aides in Education," 1969.

Ohio State, Colorado State, Stanford, University of California, and perhaps others.* A wide range of television systems might employed, ranging from full two-way television to videotape.

- Computer-assisted instruction with multi-site network--The power of the computer as an instructional aide is being investigated at various sites. For example, Stanford University is conducting experiments involving lower elementary school students. State University of New York, Albany, is conducting university-level experiments linking seven state colleges and three from the City University of New York system. The links in this last system are telephone lines.
- Audiovisual aids--Other more conventional training aids should also be evaluated, including strip film, movies, and view-graphs.

Administratively, it is suggested that the NHSB test the matching-fund route, since many of the techniques are currently being supported by state funds or private university funds. At least one (computer-assisted instruction) derives part of its support from a foundation (Carnegie). Fiscal approaches in matched funding could actually be subjected to test in a pilot center.

Suggested Variations if Two Pilot Centers Are Adopted

If two pilot centers are planned, it would be desirable to make their characteristics as divergent as practicable to test a variety of criteria. These criteria are shown in Table 2-17.

Pilot Center No. 1 might be located in a region of small states having both state and private universities and where there was a likelihood that a number of the universities would collaborate in forming a consortium to train and educate personnel for highway safety activities within the region and for other highway safety positions outside the region as may be approved by the NHSB. The principal activities of the center might be conducted at one of the largest universities of the consortium, with other universities contributing professional teachers for highway safety courses. On the other hand, a substantial portion of the load might be

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* See Arthur, Paul D., "Continuing Education Using Television: Past Experience and Future Prospects," 19th Congress of the International Astronautical Federation, New York, New York, October 1968, IAF Paper E98.

Table 5-20

MOTIVATING STUDENTS TO PARTICIPATE IN PROGRAMS LIKE HIGHWAY SAFETY

	No. of Univ. Responding
Need for stipends, fellowships, and assistantships	11
Need to assure career opportunities and future salary incentives	11
Best motivation is current career involvement in field where person is already salaried in a safety related job	4
Community colleges or undergraduate courses could be used to stimulate interest	3
May be difficult to get short course students unless they have to meet specific standards in the field	1
Motivating students into safety may be easier since increased publicity is being given to safety	1
Possibility of a low response if in short courses you expect people to come in from out-of-state	1
Give the institution a cost of education allowance	1
May have to set up special courses at graduate level to avoid too much mixing of students from different disciplines	1
Student flow will be stimulated by attitudes of administrators in state government, city managers, etc.	1
State highway people are assigned to university on full-time basis as graduate students	1
Work study programs could provide motivation toward a career	1
Most graduate students have made their decision before entering special programs	1
Reimburse short course expenses and pay student salaries while they are in training	1
Coordinate short course students with slack periods and work environment to insure a good turn out	1
Provide a sense of accomplishment by giving short course completion certificates	1

Table 2-17

PILOT CENTERS

Alternatives for Criteria Distribution

Pilot Center No. 1:

1. Located in a consortia of state and private universities in a region of small states.
2. Located in universities which have not yet participated in the Highway Safety Program.
3. Under the guidance of a steering committee composed of representatives from each university and responsible to NHSB.
4. Associated with the central staffs of the universities.
5. Curriculum includes both training and education-research.
6. Curriculum includes all Highway Safety Standards.
7. Student recruitment and placement by Center in collaboration with NHSB.
8. Fiscal matters and operations monitored by a committee from NHSB.
9. Facilities furnished by NHSB.
10. Five-year funding by NHSB.

Pilot Center No. 2:

1. Located in a single state university in a large state.
2. Located in a state university which is now participating extensively in the Highway Safety Program.
3. Administered by the state university which is responsible to NHSB.
4. Associated with one school within the university.
5. Curriculum includes training only.
6. Curriculum includes only three standards: (1) Vehicle Inspection, (2) Driver Education, and (3) Driver Licensing.
7. Student recruitment and placement through state government.
8. Fiscal matters and operations monitored by reports from Center through university to NHSB.
9. Facilities furnished to maximum extent by the university.
10. Two-year funding--to maximum extent by the university.
11. Quality control through reactions of students to curriculum and instructors.

widely distributed among the consortia members. In either case, an opportunity is available to test the degree of cooperation between universities, both public and private, and to find out how varying distances between universities modify the effectiveness of this kind of collaboration.

Pilot Center No. 2 could be allocated to a state university in a large state and serve the highway safety training needs of that particular state in limited areas of the program. This allocation would permit the NHSB to compare, at least to some extent, the administration and operation of a state center with the consortium arrangement in Pilot Center No. 1.

Other contrasting characteristics might also be considered for the two pilot centers. Pilot Center No. 1 might be situated within a group of universities that have not yet participated in the Highway Safety Program, with Pilot Center No. 2 at a state university that is already actively supporting some kind of highway safety training. The consortia arrangement might have a loose organizational structure under the guidance of a steering committee, while the other could be tightly administered by the university hierarchy. Pilot Center No. 2 might be under the jurisdiction of one school within the university and only include training in a small number of Highway Safety Standards, and Pilot Center No. 1 might cover training in all standards with education-research activities included. These variations would permit the NHSB to make some evaluations with respect to organizational considerations and how effectively a group of universities, inexperienced in highway safety, can respond to training and educational requirements.

The recruitment and placement of studies in Pilot Center No. 1 might be undertaken by the center in collaboration with the NHSB, while this responsibility assigned to state government in pilot matters and operations could be accomplished by periodic visits of an NHSB committee to one center and by quarterly reports from the other center. A five-year funding arrangement, with facilities supplied by the NHSB, might be established for Pilot Center No. 1 and two-year funding and facility requirements supplied to a maximum extent by the university for Pilot Center No. 2. Two methods of measuring the quality of student training and education might be tested. In Pilot Center No. 1 this could be done by NHSB inquiries to employers of former students and the administering of a questionnaire oriented toward the quality of course content and instructor capability. In Chapters 7 and 8 of this report, methods have been described for evaluating the effectiveness of training for HSMD&R Centers. These methods could be selectively applied to pilot centers.

Advantages of Establishing Pilot Centers

The advantages of establishing pilot centers are that they will provide the opportunity to:

- Exercise components of the potentially larger system of centers more quickly and economically.

- Determine the applicability of latest advances in the state of the art in instructional technology, such as programmed learning and videotaped sequences, for instruction on highway safety.

- Determine flexible methods for responding to rapidly changing events in the field of highway safety, such as new program standards, creation of new job specialties, new field needs, and changing policy at the level of the NHSB.

- Determine the equitable proportion of short-course instruction, education, and research, which should prevail at a center.

- Validate evaluation procedures and program controls proposed for the management of centers.

- Enable the NHSB and the pilot centers to develop methods of relating to state and local agencies for purposes of generating a flow of students to the centers, even though they might be few in number during the pilot phase and although they may be be restricted in scope with respect to the number of students and courses that can be managed.

- Move into a relatively large scale effort for at least two centers rather rapidly, should a system of centers be approved for establishment. If the two centers selected for the pilot phase prove to be effective, they could be expanded by stepped-up funding.

- Provide guidance to other new centers in an ultimate system by making available the hard-earned experience gained at pilot centers to those undertaking establishment of a center under contract to the NHSB.

- Establish cost levels per student or per course so that financial planning at the center level and budgeting and programming at the NHSB level may proceed more realistically.

- Develop methods for determining the effectiveness of graduates in the field, and of the training program in general, so that such tools would be readily available to other centers of an ultimate system.

- Assess the numbers of safety specialists or safety professionals actually requiring training at state or regional levels.

- Determine how the relationship between a center and the host university may be optimized with respect to matters of administrative and organizational arrangements, procurement of faculty, sustaining faculty interest in highway safety research and instruction, integration of a HSMD&R Center with large scale Traffic and Transportation Research Centers (which show promise of coming into being in several states) and development of graduate student motivation to undertake careers in research on highway safety.

- Enabling the NHSB to determine the feasibility c continuing with the development of new pilot curricula under contract but for actual implementation elsewhere, or, in the present case, at a pilot center.

- Determine, for those limited numbers of courses that may be launched at the pilot centers, the extent of training that should be offered at the centers and which skills should be expected to be acquired in the field. This determination should be expected to result in the objectification of knowledges and skills that are requisite to certain job specialties.

Disadvantages of Establishing Pilot Centers

It is difficult to speak of the disadvantages that will accompany the establishment of centers without defining the conditions that could cause them to arise. While described as disadvantages, they are more representative of unforeseen consequences that could have been eliminated either through planning or funding. It is difficult to speak of disadvantages, also, without knowing the ground rules that will exist at the moment a decision might be made, e.g., to move in the direction of pilot centers, or to recognize the first two centers to be established as the beginning of a series of centers to be funded and activated in each succeeding year. The following disadvantages, therefore, are not presented as fixed, adamant characteristics of pilot centers, but rather as undesirable outcomes that could prevail unless they were either circumvented or eliminated altogether through appropriate program planning:

- The basic reason for the establishment of Pilot Centers is for the gaining of, and ultimate extrapolation of, experience, for centers on a larger scale. This implies that the level of funding should be sufficiently high enough that critical functions may be allowed to operate with the sophistication and complexity that may be anticipated later, i.e., pilot center operations will have to reach a sufficient "critical mass" that will reasonably permit transfer of knowledge, operational procedures, and so forth, to the larger environment.

- Even with sufficient funding and an adequacy of scope and complexity added to the program, there is always the danger of a pilot center being forced into an inordinate number of activities, thereby dissipating its talents and restricting the range of experience to be gained from any single activity or project on which it embarks. This pitfall is not unique to safety manpower development centers and could occur as an unforeseen consequence in any newly planned venture.

- While the notion of experimenting with or varying the "parameters" of a pilot center's operations is in keeping with the spirit of flexibility that it should adopt, there is the danger that its method of operation, organizational structure, and so forth, may become "frozen." This could occur should the center find itself beset with heavy demands from the field, the university, and the NHSB. It suggests that the mission of a pilot center should be structured around the twofold purpose of experimental test, and operational functions, with the latter to include short-course instruction and a graduate program of education and research. Unless the experimentation is built deliberately into the program, the optimism that pilot centers should function as "test beds" for larger, ultimate centers, will fade.

- Pilot centers may require as much as three to five years to reach full operation. The decision to move in this direction would imply that action on the national safety manpower development needs is to be postponed until the experience of pilot centers has matured sufficiently to enable determination of what the next step should be. Pilot centers may be expected to contribute to the solution of manpower training needs in the state or region for which they are held responsible, but the larger national problem would still remain.

- Pilot centers, in other contexts, have been reserved for endeavors requiring a scientific or technological breakthrough. Such breakthroughs are not envisioned for pilot centers responsible for manpower development, although it would be desirable if they could contribute significantly to new methods of driver education. If it is true that the capability to plan and coordinate the activities of a regional center should be demonstrated, then funds should be provided for research which might conceivably result in breakthroughs which are relevant to the general program of highway safety manpower development.

Summary

Pilot centers offer an excellent opportunity to test concepts of operation and develop capability at a limited number of universities that may be expanded if the operation proves to be successful. Training concepts also may be examined in the context of pilot centers with regard to innovative instructional technologies and procedures, in addition to sheer determination of what the curriculum content is to be. All of the experience gained in pilot centers is perceived as being extended to a larger scale network of HSMD&R Centers that may ultimately come into being. The advantages of establishing pilot centers appear to far outweigh their disadvantages.

Conclusions

In retrospect, the entire funding for this study could have been expended on an investigation of the feasibility of the various program alternatives and the trade-offs existing among them. However, the contractual requirement existed for the delivery of organized information on ten tasks, including the development of program controls, evaluation procedures, determination of qualified universities, and so on. However, these efforts have not necessarily been crucial to the determination of an optimal strategy, since it is now evident that their products are applicable to practically all of the proposed center alternatives. The only "hard data" existing in the findings on which to base a decision are that of costs associated with each alternative strategy. It is believed that the costing was a thorough undertaking, since a considerable number of ground rules were adopted from the best available sources on

Table 5-22

COMPATIBILITY OF NEW SAFETY PROGRAM WITH EXISTING NON-RESIDENT PROGRAMS

	No. of Univ. Responding
Perceived as being consistent with general university continuing education program	10
Short courses also given within respective departments or schools	4
Already have highway safety courses going	2
Short courses best handled at state level to get local government participation, or because university may not have charter provision to go into another state	2
Main difference in this program might be the need to train people who will go back into the field and instruct	1
University provides support to short course instruction at four year colleges from the standpoint of planning	1
This field needs standardized non-credit courses	1
Have AA program for off-campus work to which safety program could be related	1
Intensive short course training seen as needed in this field; a large standardized program	1
Could use a highway safety educator for general coordination and planning of short courses	1
Would give short course on non-credit to people already in the field	1
No problem in getting regular faculty to teach extension courses in safety	1

university expenditures and faculty staffing known to the study team. However, when complex programs are being considered, costs should not be interpreted as the sole parameter of feasibility. Ignoring of other factors could lead to a situation in which costs would rise astronomically in the selected program before it reached the desired level of effectiveness. Also, the reported costs should be interpreted with the following caveat: The cost estimates, although based upon the best known available data, should be interpreted as having the same level of reliability that is typically encountered in statistics on educational institutions where accounting systems may vary among universities and where variations occur frequently in completeness of sampling and reporting.

If a decision were to be made purely on the basis of costing, the recommendation of this study would be that the regional concept be adopted, subject to those reservations expressed above on the source data for costs which have been utilized. If budgetary factors are the primary concern to the NHSB, then it should find the establishment of regional centers most promising. It must be noted, however, that the advantages alleged for regional centers have been stipulated only on a contingent basis, since they have not been demonstrated in the study. The same is true, of course, for advantages that have been attributed to other program alternatives. What are lacking are effectiveness measures for purposes of comparing alternatives, since it is the concept of effectiveness that is directly implied in all advantages and disadvantages that were detailed for the program alternatives. A tacit assumption was made at the outset of the cost analysis that the trained or educated quality of the student would not differ materially among the alternatives studied. This assumption had to be made to proceed with the study and because the training effectiveness could not be determined at the outset. However, the quality of the trained student is the ultimate criterion of effectiveness, and intermediate to it there exist other measurable components that, as noted above, are implicit in the detail of advantages and disadvantages that have been described for each alternative. These, in fact, are where the "trade-offs" would be encountered, since hypothetically the different program alternatives could produce students of different quality, but with commensurate differences in costs. If such findings were actually to occur, the NHSB might find the program alternative with the lowest costs to be more attractive, since it might not be necessary to produce the "best" students.

The proposed HSMD&R Centers are calling for implementation of a program with large operational components within a tri-partite arrangement of employing agencies, the university, and the federal government. Exploration of analogous federal programs has revealed very little precedence for such large scale programs calling for such close coordination and with demonstrable effects upon a national problem. From discussions with university representatives, it has been learned that regional HSMD&R Centers are potentially capable of placing large burdens of responsibility on administrators, although several universities have an impressive base in the highway safety education field on which centers could be built. Many universities also are highly motivated to undertake additional responsibilities for the training of manpower for the highway safety field. However, many problems have arisen in the consideration of HSMD&R Centers, some of which would characterize centers proposed under all program alternatives. These, in general, characterize the operational aspects of the program concerned with the vast training programs needing to be implemented to accommodate the projected thousands of safety manpower and the communication, control, and coordination essential for success of the overall highway safety manpower development program. The establishment of regional centers could accentuate some of the problems that are discussed below.

The NHSB is faced with the task of developing a system of HSMD&R Centers for highway safety manpower development, including training for safety specialists, professionals, and researchers. This will be a multimillion-dollar system if the costs determined in this study are indicative of what may be anticipated. There is little precedence for this system, which is required if universities are to be enlisted as its components. In the history and evolution of systems development, an operational test phase has been invented to intervene between the conceptualization of a system and its final operational configuration, to provide for experimentation and test to avoid placing an undue burden for modification on the ultimate operational units. In most cases, the systems concept is changed so considerably during the test phase that the prototype established for test is unrecognizable from what it was at its inception. Some systems have been abandoned altogether because during test they do not reach expected levels of effectiveness.

While the regional concept is considered most feasible from the standpoint of its costs and presumed advantages, a major conclusion of this study is that it be committed to test as soon as possible, especially if the NHSB should be desirous of establishing its feasibility on an empirical basis. A test phase is more applicable to the regional approach, since it can take on so many different configurations within a region, some of which have been described. The operational test phase is defined as requiring a production of students, establishment of lines of communication with employing agencies, and with the NHSB, development and standardization of curricula in several job specialties, and so forth, in a limited number of regional pilot centers to be funded by the NHSB. These pilot centers would service regions defined in the current study or regions demarcated for the explicit purpose of exercising the operational responsibilities of regional HSMD&R Centers consistent with funding levels prescribed by the NHSB. Provided that an effective evaluation plan is developed, such pilot centers would settle issues of the university capability to service a region to the satisfaction of the NHSB. The present study has accumulated no evidence of the effectiveness of the regional concept for highway safety manpower development or of the effectiveness of comparable federally funded programs, although the research involvement of many universities in federally-defined national problems is most impressive.

Regional pilot centers would provide a "test-bed" for validation of manpower training requirements for their sheer number, determining the feasibility of guidelines for the establishment and operation of centers, verification of costs, program controls, and other products of the current study. It should be demonstrated that a practitioner brought in from the field for training can be equipped with appropriate instructional skills within the limited training time allocated to several highway safety job specialties. It should be demonstrated that a regional center is capable of establishing or at least meeting standards of training representing, or correlated with, the proficiencies required in singular job specialties throughout the region. Also, it is not sufficient to say that a regional center has been successful without a determination of the effectiveness with which highway safety practitioners implement training programs in their local agencies, since one major premise of this study has been that the bulk of the training would be conducted within the employing agency. Admittedly, responsibility for success of the local training programs would not rest exclusively with the regional center, but one purpose of the operational test phase would be to determine how such responsibilities would be shared and coordinated among the NHSB, the center, and state and local agencies. Other functions that could be submitted to test have already been described in the final section of Chapter 2 on pilot centers.

If it can be demonstrated that the regional concept can be implemented effectively through the established regional pilot centers, it is envisioned that they would be granted stepped-up funding to increase their scope of operations and that additional regional centers would be funded and activated.

Chapter 3

CRITERIA FOR THE SELECTION OF CANDIDATE UNIVERSITIES

Chapter 3

CRITERIA FOR THE SELECTION OF CANDIDATE UNIVERSITIES

Introduction

The support of a HSMD&R Center will place many demands on the host university. It will be required to provide residence and classroom space for large numbers of short-course students and maintain records on all students who have participated in the training programs. New faculty will have to be hired who will have part-time responsibilities for short-course training. These new faculty will have to familiarize themselves with highway safety and motor vehicle safety research literature related to their respective disciplines. A research program must be generated to create enthusiasm among faculty and motivate graduate students to undertake dissertations in this field. New interdisciplinary courses will be generated at the graduate level, since the safety field calls for the application of many disciplines, ranging from psychology to engineering and medicine. The administration and planning inherent in the establishment and operation of a center almost demand that a university shall have had considerable experience with large scale, federally funded programs. Ideally, there should already have been a demonstrated competence in some aspect of highway safety, however narrow the experience might have been. There should be the presence, also, of laboratory or field facilities that may have been applied to highway safety problems or that could be modified for such purposes without excessive costs. Although the literature has been accumulating for several years in highway safety, very few universities are in possession of the range of literature now compiled in bibliographies by the National Highway Safety Bureau's Documentation Center, The National Safety Council, or a limited number of other sources. There ought to have been an ongoing history of dedication to the provision of short courses to practitioners in the field, supported especially by those disciplines having some relevance to highway safety problems. Finally, all of these ideal characteristics should be found in a university of high professional caliber in terms of the reputation of its faculty and staff, its reputation for research, its general adequacy as a facility for higher education, and its capacity to attract promising students.

The foregoing are the general characteristics that guided the development of selection criteria for universities qualified to operate a HSMD&R Center. In many instances, success was encountered in finding universities that possessed most of these characteristics. The search for criteria may be characterized as having proceeded from the study of general university characteristics, relatively independent of the specific purpose of safety manpower development, to the study of those capabilities that might be needed to properly man and operate centers for the NHSB. However, after universities had been identified with the appropriate specific capabilities, they generally possessed those broad qualities of eminence of staff, comprehensive facilities, potential capability for expansion, and extensive research programs, and had a history of involvement in large scale, "operational," federally funded programs requiring training in addition to research. The study of selection criteria, then, followed a several-stage process, with the first stage devoted to a search for generally relevant factors and the other stages to a search for more specific determiners of university qualifications to support a center.

First Stage in Determining Selection Criteria for Candidate Institutions

The study of selection criteria began simultaneously with other work in this study that was expected to aid in the identification of qualified universities. The analysis of safety manpower job specialities to determine the underlying skills required and the knowledges that would have to be acquired is explained in Chapter 1, "Skills and Disciplines Required For Highway Safety Manpower Development." This work took several months to reach fruition. Meanwhile, broader distinguishing criteria and university characteristics were studied through the use of more traditional sources, such as publications of the American Council on Education and the U.S. Office of Education. (See Appendix Table 3-1 for a complete listing of publications and sources that were used).

The first array of university characteristics to be studied included:

Departments and schools

Teaching staff

Distinctive ongoing programs and activities

Degrees conferred

established in such programs are seen as the responsibility of each department, rather than as being taught at the center. The center is perceived as having a role in coordination of the program.

Enrollment levels

Library volume and special separate libraries

Building facilities

The study of university characteristics then was expanded to include further consideration of:

Student-to-teacher ratios

Teaching-to-research ratios and budgets

Undergraduate-to-graduate ratios

Disciplines relevant to safety manpower development

Production rates of students, graduate and undergraduate, in related disciplines

Faculty composition by full-time or part-time for professors, associates, assistants, and instructors

Characteristics and ratio of administration to faculty

Size of library and extent of special libraries that are relevant to related disciplines

Size of current physical plant and expansive capability, and the ability to maintain an expanded facility

History of previous involvement in multidisciplinary and government supported programs

History of matching funds with government for construction of research or laboratory facilities

As expected, the information derived from sources shown in Appendix Table 3-1 were not arranged in any way that would relate directly to the mission of developing highway safety manpower. Gaps also were found in the information, with some of it being very complete, while in other instances it was utterly lacking. Student enrollment data was found to be abundant, and information on the number of degrees conferred by discipline also was very comprehensive. Other data, however, such as the magnitude of university-matched funds with federal funds and the rate of involvement in multidisciplinary programs, called for an actual visit to a university to uncover the information. However, the search in the first stage of involvement with general university characteristics provided a base from which a more specific search was to be made, even though it was limited in those respects that have been mentioned. Much of the source material was found to be useful in the second stage, which is discussed below.

Second Stage in Determining Relevant Criteria for the Selection of Candidate Institutions

Further study of skills and disciplines required for highway safety manpower development was made on requirements for research and education at the graduate level before the Safety Specialist Manpower report became available. This analysis identified three general university characteristics as pivotal elements of the selection criteria: departments and schools, distinctive ongoing programs, and activities and degrees conferred.

The study of specific university characteristics resulted in development of criteria for the initial identification of candidate institutions. The ideal characteristics can be summarized as follows:

A Ph.D. degree granting institution

Civil engineering (Master's degree level or above)

Education (Master's degree level, at least)

Psychology (Ph.D. level)

Physiology (Master's degree level or above)

Public administration (Bachelor's degree level, and preferably beyond)

Business administration (Bachelor's degree level, and preferably beyond)

Medicine (Master's degree level or above)

Public health (Master's degree level, and preferably beyond)

Law (LLB degree level)

Criminology

Police training

Police instruction and administration

Safety and traffic education and administration

Traffic engineering

Transportation engineering

A first level of selection was aimed at obtaining a basic group of university-level institutions that would become the "universe" within which an ultimate selection could be made. By successive application of criteria requiring varying numbers of the specific characteristics to be available "in residence" at each institution, a suitable number of candidate institutions then could be chosen for establishing HSMD&R Centers on a regional, state, or national basis. Two characteristics were considered as essential for the first level of selection: (1) Ph.D. granting authority and (2) Civil engineering Master's degree program or higher. An inventory of the available characteristics among the other 14 characteristics was simultaneously compiled for each institution.

A second level of selection required that the next three characteristics, i.e., education, psychology, and physiology, be taught "in-residence," with additional support obtained from other sources, such as cooperative programs with other institutions in the same area or established as part of the HSMD&R Centers as necessary.

In addition to the five basic characteristics of the preceding levels, a third level of selection was based on the in-residence availability of any our of the 11 remaining characteristics.

A fourth level of selection was based on the in-residence availability of any six of the remaining characteristics, in addition to the five basic characteristics of the first and second levels of selection.

The second stage, therefore, established the framework for a largely quantitative evaluation of the specific characteristics available at the various candidate institutions as an indication of the capabilities of these institutions to support HSMD&R Centers. Again, it should be noted that the preliminary selection of candidates made in the "second stage" was conducted before full analysis of the skills and disciplines related to highway safety had been completed. When this analysis was completed, it paved the way for the third stage in the identification of selection criteria on a quantifiable basis.

Third Stage in Determining Relevant Criteria for the Selection of Candidate Institutions

The study effort described in Chapter 1, "Skills and Disciplines Required for Highway Safety Manpower Development," advanced considerably when the Safety Specialist Manpower Report became available. A description of those university disciplines that should be enlisted to support the development of highway safety manpower, was based on 36 safety specialist job titles developed in that report. This permitted refinement of the criteria for selecting candidate institutions and enabled the basic disciplines to be reduced to seven. It was possible, also, to determine the varying degrees of emphasis to be placed among these in terms of their respective percentage of total professional requirements for a complete center. The final criteria are summarized as follows:

Basic Disciplines	Relative Degree of Emphasis*
Engineering	26%
Education	23
Business or public administration	17
Police science	16
Psychology	6
Medicine	6
Law	6
Total	100%

Application of these percentages to the inventory of available disciplines of university-level institutions obtained with the selection procedures previously described, resulted in a quantified percentage of the criteria offered by each institution. In effect, a score was compiled for each university, based on the percentage requirements shown above. Appendix Table 4-5 presents composite percentages scores for those universities that were considered. On this basis the most highly qualified institutions could be selected for establishing HSMD&R Centers on a national, regional or state basis.

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* Average of professional requirements for total training and education needs for 5-and 10-year programs. Chapter 1, Tables 1-5 and 1-6.

Summary

A three-stage process was followed in the development of criteria for the selection of universities qualified to support an HSMD&R Center. This process may be described as progressing from a general examination of university characteristics to a convergence on specific capabilities that must be provided in supporting disciplines, if the needs of highway safety manpower development are to be met. The final criteria emerged from earlier analyses conducted in this study on training and education requirements reflected in earlier studies funded by the NHSB. Universities meeting criteria established earlier in the selection process were scored on their possession of relevant disciplines in accordance with a weighting established for each discipline.

Chapter 4

IDENTIFICATION OF CANDIDATE UNIVERSITIES

Table 6-1 (Continued)

ALTERNATIVE I STATE CENTERS	ALTERNATIVE II REGIONAL CENTERS	ALTERNATIVE III NATIONAL CENTERS	ALTERNATIVE IV REGIONAL CONSORTIA
A-4 Centers will be organized into two divisions, each reporting to the top Center administrator: a. Entry and refresher training b. Higher education (above bachelor level) and research.	Same as Alt. I A-4.	A-4 The university Educational and Research Center will be organized into two divisions: a) Education, and b) Research. Organizational members of each will be instructed to work closely together. Two divisions will be established at the Training Academy: a) Entry training, and b) Refresher training.	A-4 The National Highway Safety Bureau will select lead universities for (a) training, and (b) education and research although, conceivably, both activities may be conducted at the same university. In any case, two divisions will be organized as outlined in Alt. I, A-4. The contributions of assisting universities in the Consortium may be only that of furnishing instructors who will teach at the lead universities to avoid excessive travel by students.
A-5 An outline of objectives will be negotiated between the university and NHSB showing the planned expansion of the Center with respect to initial classes, student output over time, etc.	Same as Alt. I A-5.	A-5 An outline of objectives will be negotiated between the university and NHSB, with respect to education and research, showing the planned expansion of the Center with respect to initial classes, student output over time, etc. NHSB will establish similar objectives for the Training Center.	A-5 An outline of objectives will be negotiated between each university in the Consortium and the regional committee as representatives of NHSB, showing the planned expansion of the university activity with respect to initial classes, student output over time, etc.
A-6 The university will construct a milestone chart showing dates of critical events for the purpose of periodically measuring progress toward the accomplishment of objectives.	Same as Alt. I A-6.	A-6 The university will construct a milestone chart showing dates of critical events for the purpose of periodically measuring progress toward the accomplishment of objectives. NHSB will construct a similar chart for the Training Center.	Same as Alt. I A-6.
A-7 Although Centers will be administered by universities, there will be free communications between Centers and NHSB.	Same as Alt. I A-7.	A-7 Although the Educational and Research Center will be administered by the university and the Training Center by NHSB, there will be free communications between the Centers and with NHSB.	A-7 Although Highway Safety activities will be administered by universities, there will be free communications between Highway Safety personnel and NHSB.

Chapter 4

IDENTIFICATION OF CANDIDATE UNIVERSITIES

Introduction

This chapter describes the procedure followed in identifying the university-level institutions that meet all or the greatest share of the criteria discussed in Chapter 3, "Development of Criteria for the Selection of Candidate University Institutions."

Work toward identification of possible candidate institutions progressed concurrently with the development of selection criteria. Thus, several groups of institutions were developed to correspond to each of the levels of selection criteria described in Chapter 3.

Additional inputs contributed toward the final selection of candidate universities during the various stages of the identification process. Data from a pilot university survey conducted by SRI teams, interviews with professionals in the field of education, analysis of existing analogous programs, and consultations with the NHSB staff have been incorporated in the tables and analysis described in this chapter.

First Stage of Identification of Possible Candidate Institutions

Numerous reference sources were consulted, primarily Office of Education publications (see Appendix Table 4-1), to obtain the most complete and current description of the departments and schools, distinctive ongoing programs and activities, and degrees conferred, at potential candidate institutions.

Second Stage of Identification of Possible Candidate Institutions

A basic group of university-level institutions was screened by applying two characteristics of the optimum criteria on an absolute basis: All institutions were to have at least degree-granting authority at the Ph.D level in any field and at the M.S. level in civil engineering. This first level of selection enabled identification of 113 candidate institutions, for which information was simultaneously compiled regarding their ability to meet the remaining 14 characteristics developed in Chapter 3, "Criteria for the Selection of Candidate University Institutions." All the states are represented, with the exception of Alaska and Vermont; according to Office of Education publications, the Universities of Alaska and Vermont do not offer Master's programs in civil engineering; therefore, they were omitted in this preliminary screening.

The information compiled in the first level of selection was arranged in a matrix form (Appendix Table 4-2) and used as a source for further refinements of selection. To test the sensitivity of the selection process in response to the characteristics of the optimum criteria, several passes were made, each requiring the institutions to comply with an increasing number of characteristics. The iterative application of this process provided a means to place a varying degree of emphasis on a limited number of the 16 characteristics developed in Chapter 3. Before the Safety Specialist Manpower Report* was available, a tentative gradation of these 16 characteristics was made, largely on evaluation of existing literature and staff judgment as to their degree of relevance to the development of highway safety manpower.

Thus, a second level of selection was made, requiring five basic degree-granting and departmental characteristics:

Ph.D. level in any field

M.S. level in civil engineering

M.A. level in education

Ph.D. in psychology

M.S. level or above in physiology

Fifty-two university-level institutions were identified that satisfy the five characteristics listed above. Concurrently, additional data was compiled on their ability to meet the remaining 11 characteristics on degrees conferred, in addition to information on distinctive ongoing programs and activities in fields related to highway safety manpower development. This information was also arranged in tabular form and is presented in Appendix Table 4-2.

A third level of selection was achieved by retaining the same five basic characteristics in degree-granting authority and in-residence departments used in the second level of selection; in addition, comparable

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* Safety Specialist Manpower, Manpower Requirements, Booz, Allen & Hamilton report to NHSB, Vol. I, Appendix B, August 15, 1968.

degrees of emphasis were assigned to all the remaining special characteristics, requiring that a minimum of three be available in-residence. This further narrowed the selection to 34 candidate institutions, listed in Appendix Table 4-4. This same procedure could be repeated by requiring a greater number of special characteristics to be available in-residence; thus, Appendix Table 4-4 will show that, requiring a minimum of six special characteristics in-residence, 19 institutions can be identified. If the minimum of required special characteristics is seven, only nine candidate institutions can be identified, and so forth.

Third Stage of Identification of Possible Candidate Institutions

The relevant criteria for selection of candidate institutions developed in conjunction with the Safety Specialist Manpower Report* introduced the elements required for assignment of appropriate emphasis among the various characteristics of the optimum criteria. The numerical expression obtained for the degree of importance of each of the seven basic disciplines was applied to the basic group of candidate institutions obtained from the first level of selection (Appendix Table 4-2). This produced a relative ranking of each candidate institution against the aggregate for the seven characteristics of the finalized optimum criteria. (See Appendix Table 4-5.) This ranking can be used to select those institutions meeting the highest percentage of the optimum criteria that simultaneously meet other requirements, such as the institution's previous involvement in highway safety programs, and geographical location within a given state or region.

Additional requirements were included in the selection criteria to identify the candidate institutions for each of the Highway Safety Program development alternatives studied in Chapter 2, "Development of Program Strategy for the Placement of Centers" (see Table 2-2):

- A federal academy--The location strategy described in Appendix 2 suggests St. Louis, Mo. as the most desirable location, offering the minimum annual travel costs and a high degree of accessibility.

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* <u>Op</u> <u>Cit</u>.

- Regional centers--Based on the relative ranking of possible candidates shown in Appendix Table 4-5, the two institutions with the highest percentage of the optimum criteria were identified for each of the ten regions. The selection of the instituions for the regional HSMD&R Centers was made in two levels: at the regional level, a "host state" was identified by gravitational analysis, which selected the state with the highest manpower requirements and, therefore, the least travel requirements (see combined weighted index, Appendix Table 2-2). At the selected host state, the two institutions meeting the highest percentage of the optimum selection criteria (Appendix Table 4-5) were identified. It was recognized that in all regions there were highly qualified universities that could support a regional center. The primary reason that these universities were not identified as regional center alternatives is that their location failed to meet the strategic requirement established by the gravitational analvsis, i.e., that they be located in the state within their region that has the highest manpower requirements.

- State centers--candidate institutions were selected from those ranked in Table Appendix 4-5 by identifying the two institutions meeting the highest percentage of the optimum criteria for each individual state and the District of Columbia.

The qualifications of candidate university-level institutions identified for the various program development alternatives are summarized in Table 4-1, indicating those that were visited by NHSB-SRI representatives (described in Chapter 5, "Visits to Candidate Universities)."

Summary

Through the application of increasingly stringent selection criteria (described in Chapter 3, "Criteria for the Selection of Candidate Universities"), the most qualified universities to support an HSMD&R Center were identified at state and regional levels. Two universities were identified for each state and for each region to provide a highly qualified alternative. In each region, the host-state was selected as the one having the highest manpower requirements in highway safety, as established in the regionalization of the United States presented in Chapter 2,

Table 4-1

POSSIBLE CANDIDATE INSTITUTIONS FOR HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH CENTERS BY PROGRAM DEVELOPMENT ALTERNATIVES

Possible Candidate University-Level Institutions	State HSMD&R Center	Regional Centers and Regional Consortia
Cornell University	New York	Region A
*New York University	New York	Region A
Harvard University	Massachusetts	
Northeastern University	Massachusetts	
University of Connecticut	Connecticut	
Yale University	Connecticut	
University of Maine	Maine	
Gorham State College	Maine	
University of New Hampshire	New Hampshire	
Dartmouth College	New Hampshire	
University of Rhode Island	Rhode Island	
Brown University	Rhode Island	
University of Vermont	Vermont	
Middleburg College	Vermont	
*Pennsylvania State University	Pennsylvania	Region B
University of Pittsburgh	Pennsylvania	Region B
Rutgers University	New Jersey	
Princeton University	New Jersey	
University of Virginia	Virginia	
Virginia Polytechnic Institute	Virginia	
*University of Maryland	Maryland	
Johns Hopkins University	Maryland	
University of Delaware	Delaware	
Delaware State College	Delaware	
Catholic University of America	District of Columbia	
George Washington University	District of Columbia	

*Visited by NHSB-SRI representatives

Table 4-1 (continued)

Possible Candidate University-Level Institutions	State HSMD&R Center	Regional Centers and Regional Consortia
*University of North Carolina	North Carolina	Region C
Duke University	North Carolina	Region C
*University of Tennessee	Tennessee	
Vanderbilt University	Tennessee	
University of Kentucky	Kentucky	
University of Louisville	Kentucky	
University of Arkansas	Arkansas	
Arkansas State College	Arkansas	
University of South Carolina	South Carolina	
Clemson University	South Carolina	
West Virginia University	West Virginia	
Marshall University	West Virginia	
University of Florida	Florida	Region D
University of Miami	Florida	Region D
Georgia Institute of Technology	Georgia	
University of Georgia	Georgia	
University of Alabama	Alabama	
Auburn University	Alabama	
University of Mississippi	Mississippi	
Mississippi State University	Mississippi	
Louisiana State University	Louisiana	
*Tulane University of Louisiana	Louisiana	
*Michigan State University	Michigan	Region E
University of Michigan	Michigan	Region E
University of Cincinnati	Ohio	
*Ohio State University	Ohio	
Indiana University	Indiana	
Purdue University	Indiana	

*Visited by NHSB-SRI representatives

Table 6-2

GUIDELINES FOR ADMINISTRATION AND OPERATION OF HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH CENTERS - CRITICAL EVENTS

CRITICAL EVENT*	FIRST YEAR	SECOND YEAR	THIRD YEAR
Organization A-1 Establishment of operational policies and procedures.	Organization A-1 Substantial attention will have been given to operational policies and procedures in connection with the reply to the RFP. The University administration should, therefore, have no difficulty in establishing temporary operational policies and procedures within one month after the date of the agreement with NHSB. It is anticipated that revisions will be made as experience is gained with the operation of the Center.	Organization A-1 Operational policies and procedures revised based on Center operational experience.	Organization A-1 Same as Second Year.
Personnel Programming - Student Training B-a-1-(a) Promotion of the Highway Safety Training Program and schedules established for training with federal, state and local governments.	Personnel Programming - Student Training B-a-1-(a) Promotion of the Highway Safety Training Program and the scheduling of students for courses should be started immediately after the agreement between NHSB and the University has been negotiated. Completion of promotion and scheduling of students is anticipated by the end of the first year.	Personnel Programming - Student Training B-a-1-(a) The Center will continue to schedule students for training in accordance with planning and, with the assistance of NHSB, promote the program as required.	Personnel Programming - Student Training B-a-1-(a) Same as Second Year.

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* Critical events timing starts at agreement date.

Table 4-1 (continued)

Possible Candidate University-Level Institutions	State HSMD&R Center	Regional Centers and Regional Consortia
*University of Illinois	Illinois	Region F
*Northwestern University	Illinois	Region F
University of Missouri	Missouri	
Washington University	Missouri	
*University of Wisconsin	Wisconsin	
Marquette University	Wisconsin	
University of Iowa	Iowa	
Iowa State University of Science & Technology	Iowa	
*University of Minnesota	Minnesota	Region G†
Mankato State College	Minnesota	
University of Kansas	Kansas	
Kansas State University	Kansas	
University of Nebraska	Nebraska	
Creighton University	Nebraska	
University of North Dakota	North Dakota	
North Dakota State University	North Dakota	
South Dakota State University	South Dakota	
South Dakota School of Mines & Technology	South Dakota	
*University of Texas	Texas	Region H
Texas A & M (Texas Transportation Institute)	Texas	Region H
University of Oklahoma	Oklahoma	
Oklahoma State University	Oklahoma	
University of Colorado	Colorado	
Colorado State University	Colorado	
New Mexico State University	New Mexico	
University of New Mexico	New Mexico	
*University of Washington	Washington	Region I
Washington State University	Washington	Region I
Oregon State University	Oregon	
University of Oregon	Oregon	

*Visited by NHSB-SRI representatives

†No regional alternative was found in state with highest manpower requirements

Table 4-1 (concluded)

Possible Candidate University-Level Institutions	State HSMD&R Center	Regional Centers and Regional Consortia
Montana State University	Montana	
University of Montana	Montana	
University of Wyoming	Wyoming	
Casper College	Wyoming	
University of Idaho	Idaho	
Idaho State University	Idaho	
University of Alaska	Alaska	
Alaska Methodist University	Alaska	
*University of California	California	Region J
*University of Southern California	California	Region J
University of Utah	Utah	
Utah State University	Utah	
University of Arizona	Arizona	
Arizona State University	Arizona	
University of Nevada	Nevada	
Nevada Southern University	Nevada	
University of Hawaii	Hawaii	
Chaminade College of Honolulu	Hawaii	

*Visited by MHSB-SRI representatives

"Alternative Strategies for Highway Safety Manpower Development." The intention was to reduce travel requirements to a minimum, in addition to placing a center in a state having the heaviest need for safety manpower. If the NHSB should desire to forego this limiting requirement, other highly qualified universities can be found in most regions. Also, the process by which universities were scored on their capabilities is sufficiently flexible to meet changing needs in the stringency of selection or the criteria themselves.

Chapter 5

RESULTS OF DISCUSSIONS WITH UNIVERSITY REPRESENTATIVES ON THE ESTABLISHMENT OF CENTERS

Chapter 5

RESULTS OF DISCUSSIONS WITH UNIVERSITY REPRESENTATIVES ON THE ESTABLISHMENT OF CENTERS

Objectives of the University Visits

The objectives of the university visits were to:

- Determine the motivations and responsiveness of universities to a mission of safety manpower development.
- Familiarize university representatives with the general structure of the NHSB and the purposes of the Office of Safety Manpower Development.
- Familiarize university representatives with the study being conducted for the Office of Safety Manpower Development by Stanford Research Institute and present interim findings of that study.
- Determine potential areas of conflict that could arise between the federal agency and the university in implementation of a safety manpower development program.
- Determine problems envisioned by university representatives as arising in implementation of the program with respect to faculty recruitment, funding, provision of facilities, and so forth.
- Exchange ideas on the feasibility of establishing regional centers for manpower development that would require coordination with states outside of the one in which the university resided.
- Determine evaluation procedures and program controls that might be acceptable to universities, and determine the extent of standardization of curriculum and requirements for end-of-course proficiencies that would be tolerated.

Universities Selected for Visitation

Two criteria guided the selection of universities that were visited:

1. Coverage was desired of those regions which had been established earlier as shown in Chapter 2, "Alternative Strategies for Establishing Highway Safety Manpower Development and Research Centers. See also Appendix Tables 2-3 through 2-6 for further treatment of regionalization. Ten regions had been established and it was felt that universities should be visited in each one.
2. It was felt that private universities as well as public universities should be visited, especially those that were in separate regions and were in possession of most, if not all, criteria as described in Chapter III.

In some instances, more than one university was visited in the same region, since there were several that met the criteria outlined in Chapter III and that had already demonstrated considerable involvement in some aspect of highway safety. Sixteen universities were visited; 12 of these were public, or state, institutions, and four were private universities. They included the following universities:

State Universities

University of California at Los Angeles
University of Illinois
University of Maryland
Michigan State University
University of Minnesota
University of North Carolina
Ohio State University
Penn State University
University of Tennessee
University of Texas
University of Washington
University of Wisconsin

Private Universities

New York University
Northwestern University
University of Southern California
Tulane University

Procedures for Visits to Universities

Correspondence was undertaken with the president of each visited university. The purpose of the visit was described, and permission was requested for a joint NHSB/SRI team to undertake discussions with interested university representatives on the subject of HSMD&R Centers.

For purposes of developing guidelines for Alternative III, a national center, the research and education component was assigned to a single university for the entire country and the training component was assigned to a federal academy. If a national center were selected to fulfill the entire mission, it is most likely that it would function like a regional center in its relation to the host university and the NHSB, with the exception that it would be serving all states rather than those in a single region. If the national center were to function as a consortia, the guidelines developed for Alternative IV, regional consortia, would be best interpreted for its purposes. In the current instance, however, the guidelines have embraced two separate entities at the national level, i.e., a national center for education and research, to handle the graduate and research requirements only, and a federal academy for the conduct of the short-course training program for already employed safety specialists and safety professionals. Guidelines for the federal academy could be applied, of course, in the event the academy approach was to be adopted, even if a single university were not defined to take solitary responsibility of the other requirements. If both entities ever were to come into being, communication between the two would be necessary to ensure a flow of research findings into the training content and provide information on operational problems that could be subjected to research.

Several options are possible for the organization of Alternative IV (regional consortia). At one extreme, the best qualified university in a region might be appointed to take the lead, with other universities merely furnishing instructors for particular courses. On the other hand, administration might be performed by a committee composed of at least one member from each university. The latter arrangement is preferred on the grounds that each university would contribute more responsibly to the overall objectives of the highway safety program. Admittedly, however, the latter form of organization would be somewhat more unwieldy than the former.

It is suggested that five-year agreements initially be negotiated with universities, and that these agreements be sufficiently flexible to permit them to be renegotiated each year, so that accomplishments can be reviewed and program adjustments made. Although universities will appoint center administrative personnel, it is likely that assistance from the NHSB will be welcomed because of the NHSB contacts throughout the nation. In this way, the NHSB can, to a large extent, influence the placement of people who will guide the center in accordance with NHSB policies.

A center could be organized into two divisions, each reporting to the top center administrator: (1) entry and refresher course training, and (2) education and research. These divisions are suggested because

Information copies of this letter were sent to members of the university who might have an interest in this subject area, and especially those who were directors of traffic safety institutes or centers. After approval had been received from the president's office, further coordination for the actual visit was made with these individuals, with recommendations for a broad representation of university people to be present at the discussions. A cross-section of administrative, planning, and research viewpoint was desired on the subject of the feasibility of establishing centers at a university. A conference guide was developed that included several topics related to the following:

- General program considerations
- "Control" procedures and problems that might be generated by interaction with the federal agency
- Finances
- Facilities
- Faculty requirements
- Students (motivating them for careers in highway safety, and so forth)
- Problems in curriculum planning and development, accreditation, and so forth

Exhibits of the correspondence with universities and the Conference Guide are presented in Appendix Tables 5-1, 5-2, and 5-5.

The average time for each conference discussion was approximately six hours. The discussion period was preceded by a presentation by the NHSB representative. This presentation emphasized the extent of the manpower problem facing the country in implementation of the motor vehicle and highway safety program standards originating at the federal level. Results of an earlier manpower survey were presented to show where manpower shortages were anticipated. The mission and purpose of the NHSB also were presented, with closing emphasis on the Office of Safety Manpower Development as the primary responsible office within the NHSB for acting on the nation's shortages in highway safety manpower. The NHSB briefing was followed by a presentation of the scope of the study being conducted by SRI on the feasibility of establishing university-based centers for the development of safety manpower and research. A handout (see Appendix Table 5-3) was provided that described preliminary cost estimates for state, regional, and national centers, number of students to be anticipated, faculty size, operating costs, and so forth.

Cautions in Interpreting Summarized Results of University Visits

The basic metric used in summarizing the discussions held at universities with respect to each question in the Conference Guide is in the frequency with which the same observation was made by one or more universities. In this way, some understanding of relative popularity of responses could be obtained among the 16 universities visited. The extent of interpretation that has been placed on the summaries is reflected in the discussion that follows in each case. Too literal an interpretation, however, should not be placed on relative frequencies or infrequencies because:

- University representatives in attendance at the discussions could not be "standardized," i.e., the same levels of university administration and relevant disciplines could not be expected to be present at precise moments when points on which they were expert should be raised. Also, discussion centered frequently about university policy at a time when policy-makers might not have been present.

- Theoretically, every university would have an opinion on any of the responses that have been summarized, even for those representing the response of a single university. However, it was not possible to "play back" such singular responses to all universities.

- Low responses items, although not necessarily representative of the group of universities that were visited, nevertheless, are very meaningful to the university from which they were obtained and would have to be dealt with realistically if the concerned institution were to consider bidding on a center.

- The responses should more properly be treated as indicating trends of opinion and experience on the problem of developing safety manpower and conducting the related research. They should not be treated as expressions of official university positions on any of the questions that were raised for discussion. In several instances, university policy was raised, especially as it was reflected in the practices and university experience with similar programs. Again, these must be related to the university responsible for the response and, as such, should be considered something requiring confirmation, should the university bid on establishment of a safety manpower development center.

- Low response items, i.e., those having a low frequency of mention, should be viewed as potentially adding to a constellation of items from which a trend of opinion or a felt problem may be discerned among the universities visited.

- Since specific points for discussion were mailed in advance to all universities that were visited, the responses that have been summarized may be considered as the most salient reactions of those who were present for the discussions. In the main, concerns and information exchanged during the discussions are those of major consequence and meaning in the context of universities' experiences in similar programs and their abilities to establish and operate the proposed centers.

Summarized Results of Discussions

The results of the discussions have been summarized for all universities visited. Summaries are presented for each key topic listed in the Conference Guide, as shown in Appendix Table 5-4.

University Representatives in Attendance at Discussions

A summary of university representatives who were in attendance is presented in Table 5-1, according to their role or function at the university. This summary is intended to provide a cross-section of all universities visited so that it may be seen where, among university departments and schools, there was a major interest. It was left to each university to develop a schedule for its own people after the recommendation was made that there be a broad representation of those who might be concerned with the proposed centers. The listing in Table 5-1 should not be construed as representing those who remained throughout the duration of the discussion periods. Many of them, especially school deans and those at the president or vice-president level, spent two hours or less from their busy schedules. There were exceptions to this practice, for example, where a dean of the engineering school, for example, had an abiding interest in the topic and was present during practically all of the discussion period. Faculty members of relevant disciplines, directors, and other personnel representing traffic safety centers and institutes, were more enduring participants in the discussions.

Table 5-1

UNIVERSITY REPRESENTATIVES IN ATTENDANCE AT CONFERENCE DISCUSSIONS

	Number in Attendance for 16 Conferences, Combined	
University President or Chancellor	2	
Provost, Assistant Provost	2	
Vice-President for Planning	1	
Vice-President for Research	3	
Vice-Chancellor for Administration	1	
Vice-President for Academic Affairs	5	
Dean, Research Administration	1	
Dean, Associate Dean, Graduate School	3	
Director, Assistant Director, Continuing Education for University	8	
Representatives from University Business Office	6	
Total number representing university administration		32
Dean, Assoicate Dean, School of Engineering	10	
Chairmen, Departments of Engineering (C.E., M.E., I.E., Basic, Agr.)	9	
Faculty, Departments of Engineering (same departments as above)	31	
Associate Dean for, or Representative of, Continuing Education in School of Engineering	5	
Total number representing Schools of Engineering		55
Directors, Assistant Directors of Traffic Safety Centers and Institutes, Transportation Centers	17	
Faculty and other personnel assigned to Traffic Safety Centers and Institutes, Transportation Centers	27	
Total number from Traffic and Safety Centers		44

Table 5-1 (concluded)

	Number in Attendance for 16 Conferences, Combined	
Dean, Associate Dean, School of Medicine	4	
Faculty, School of Medicine	11	
Total number representing Schools of Medicine		15
Dean, School of Education	1	
Faculty, School of Education	4	
Total number representing Schools of Education		5
Dean, Law School	1	1
Dean, School of Public Health	1	
Faculty, School of Public Health	8	
Total number representing Schools of Public Health		9
Chairman, Department of Psychology	1	
Faculty, Department of Psychology	6	
Total number representing Departments of Psychology		7
Faculty, School of Business		2
Total number of university representatives attending all 16 conference discussions on safety manpower development Centers		170

The following representation was found for all conference groups:

Engineering	32%
Traffic Safety Institutes and Centers	26%
University Administration	19%
Medicine	9%
Public Health	5%
Psychology	4%
Education	3%
Business	1%
Law	1%
	100%

Heaviest attendance was found among deans, associate deans, and faculties of schools of engineering. Many of the universities visited had existing programs of traffic and transportation engineering, research experience with state highway departments, and continuing education programs. The university administration generally was represented by the vice-president who might be most concerned with new federally funded programs and their impact on the university. Directors and other members of traffic safety institutes, centers, and transportation research centers, of course, had an abiding interest in the proceedings of the conferences, since the instruction and research that they have fostered relate very strongly to the proposed mission of safety manpower development. Medicine, public health, psychology, education, business and law also provided representatives. The disciplines that were represented were those that had been described in prior correspondence to each university as having a potential interest in the proposed centers.

General Program Topics

Previous Experience with Federally Funded Programs

Initial discussions were devoted to a description of university experience with other federally funded programs. It was felt that universities with a prior experience of this kind would have a familiarity with government reporting and accounting procedures and with the procedures essential to the establishment of new research or training programs. All 16 universities visited had federally funded programs of prominence in existence on campus. The true frequency of such programs on a particular campus would have required access to program summaries of government been done, support should be available for developing the educational curriculum.

Facilities

It is anticipated that most universities that seriously desire to become associated with the Highway Safety Program will make some classroom space available. Living quarters for students participating in training courses are likely to be a larger problem. After the center has defined its ultimate requirements, plans should be made for acquiring new facilities. These needs will undoubtedly vary widely between universities. A training academy should have minimum problems in this connection, because it can occupy a suitable abandoned government facility.

Financial

Table 6-5 shows the format for a projected summary of center income and expenditures. Supplementary statements in sufficient detail for NHSB analysis should accompany the summary.

The universities, with the assistance of the NHSB, should have little difficulty in obtaining federal funds for student and instructor fellowships and scholarships and for research for such an urgent cause as highway safety. According to the Brookings Institution, "Since World War II there has been a marked change in federal policy related to students. The government is now heavily involved in supporting undergraduate and graduate students, as well as postdoctoral and faculty fellows."[*] In 1961, the National Science Foundation provided funds for about 4,000 fellowships and the National Institutes of Health for about 3,700.[†] Financial grants might be expected from state and local governments, especially after the manpower development program has demonstrated its value and the demand for highway safety manpower has increased. It seems likely that a substantial number of nongovernmental institutions would be willing to make grants to the program.

Funds for building and equipment might be more difficult to obtain. If state centers were the choice among alternatives, the problem would

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[*] The Role of the Federal Government in Financing Higher Education, Alice M. Rivlin, The Brookings Institution, Washington, D.C., 1961, p. 61.

[†] Ibid., p. 62.

research being sponsored at the university. The frequency with which government-sponsored programs were mentioned is derived primarily from the discussion sessions. Table 5-2 presents the frequency with which each listed program was recalled for all 16 universities. Those mentioned

Table 5-2

UNIVERSITY INVOLVEMENTS WITH FEDERAL PROGRAMS

	No. of Univ. Responding
NIH Grants--training and research	13
Air and Water Resources--training and research	10
Department of Transportation (BPR, NHSB)	6
OE research	4
Office of Civil Defense training	3
Omnibus crime bill	3
Center for Urban Studies, experimental city programs	2
Sea grants, Marine sciences	2
NASA programs	2
Bio-Engineering	2
PHS--accident and injury control	2
Agricultural research	1
Civil engineering research	1
NSF	1
AEC teacher training grants	1
DOD research	1
Ford Foundation research on school buildings	1
Federal funds for Primate Research Center	1
OEO programs	1

most frequently included NIH training and research grants, training and research in air and water resources, contract research with the BPR and the NHSB in the Department of Transportation, and Office of Education research. NIH grants and research programs on air and water resources were mentioned by more than half of the universities visited.

Effects of Federally Funded Programs on the University

A discussion on this subject was pursued in depth with at least four universities among those visited. A summary of responses from representatives of these universities is shown in Table 5-3. The development of

Table 5-3

EFFECTS OF FEDERALLY FUNDED PROGRAMS UPON THE UNIVERSITY
(Information Derived From Four Universities:)

	No. of Univ. Responding
Enabled development of multi-disciplinary programs	3
Provided financial aid	2
Enabled hiring of additional faculty	1
Enabled purchase of additional equipments	1
Enabled awarding of additional fellowships	1
Enabled university to influence federal programs	1
Enabled introduction of new subject matter from federal programs into course work	1
Created a dependence among graduate students upon federal fellowships	1
Medical school now very dependent upon federal funds	1

multidisciplinary programs was mentioned most frequently as a product of federal funds, followed by responses indicative of how such funds were channeled, i.e., for faculty, equipments, or fellowships. Inputs to university curricula from research conducted under auspices of the government was mentioned as a payoff. Finally, there were a limited number of responses indicating that a state of dependence on federal funds had been created by the advent of government financed programs.

Length of Commitment Desired from the NHSB

The following commitments were considered to be desirable by university representatives and these are presented in descending order along with the number of times they were mentioned by universities.

Commitments	No. of Universities Responding
5-year funding	12
3-year funding, with longevity funding mechanism for phase out	3
7- to 10-year funding, with a minimum of 3-year phase out	2
Similar to PHS 5-year programs	1

The general feeling was expressed for at least a five-year contract, with a step funding or longevity funding mechanism similar to other federal programs that universities have encountered. The phase-out years would allow time to absorb staff into the regular faculty and terminate graduate programs and other short-course programs. Another expressed advantage of a five-year program was that it would allow sufficient time to recruit faculty and integrate them into the program.

Build-Up Rates Perceived for a HSMD&R Center with Respect to Students

The following estimates of build-up rates should not be considered as representative of all 16 universities visited. They are presented to provide examples of build-up rates perceived by some of the individuals with whom discussions were held.

- "Centers could handle a one-third to one-half of the total annual program requirement in the first year, using estimates for a large state center (179 FTE students in residence)."

- "It would take somewhere between three to six months to staff the program and to start producing student graduates of short courses."

- "If a center had to go to a flow of 2,500 short course students annually, approximately 300 to 500 could be handled in the first year, 1,000 to 1,500 the second year, and then, finally, 2,500 short-course students in the third year "

- "If a center had to handle approximately 4,000 students, it could start the first year handling 1,000, and then build up 1,000 each additional year until it had reached the full load of 4,000."

- "Training could be started immediately, but full build-up could take five to ten years."

- "Fifteen months might be needed for build-up time."

The order of magnitude projected for student production rates, especially short-course students, for regional centers, lay outside the experience of several universities. Others would have had to consult records of student flow in continuing education at their respective universities before responding. Even with the relatively brief exposure to anticipated student training requirements, as presented in the briefing, several university representatives were willing to provide their estimates. The number of responses is too severely limited to provide a conclusive answer. They may only be used as broad yardsticks requiring further confirmation, i.e., that start-up time in achieving readiness to produce students could take from six months to more than a year and that full student production rates could be anticipated three or four years later.

Problems Perceived in the Build-Up of a Center

University representatives were asked to present their views on problems that might arise in establishment and operation of HSMD&R Centers. It was anticipated that their responses might be governed by direct experience gained in the activation of other large scale government funded programs.

Table 5-4 presents the wide variety of problems that were perceived as arising if the proposed centers were to be established. The most frequently mentioned problem is represented by a cluster of responses representing the need to establish relationships with employing agencies, ensure the flow of students, and define standards of training that will meet

Chapter 7

EVALUATION PLAN

Chapter 7

EVALUATION PLAN

Introduction

The overall purpose of the evaluation procedure is to assist the NHSB in determining the quality and effectiveness of HSMD&R Centers. Effective gauging of HSMD&R Centers can be achieved in two ways: (1) through an evaluation of administrative and operating guidelines as shown in Chapter 6, "Guidelines for Administration and Operation"; and (2) by means of on-site periodic inspection visits.

These two methods are not exclusive. Actually, the best results would be achieved by using both a procedural evaluation of guidelines and on-site inspection. Subsidiary tasks to be dealt with are selection and composition of evaluation teams, schedules of evaluation team visits to HSMD&R Centers and incorporation of the evaluation procedures into the RFP.

Evaluation Procedures

The evaluation procedures are grouped according to the following five categories, taken from Chapter 6, "Guidelines for Administration and Operations":

Financial affairs

Facilities and equipment

Curriculum and research activities

Administrative and operational policies and procedures

Personnel aspects

Financial Affairs

In financial matters, the HSMD&R Center performance would be measured and evaluated against the following parameters.

Matching funds

Scholarship and fellowship funds

Recruitment costs

Program funding and budget performance

Faculty salaries

Other salaries

Overhead

Financial and accounting methods and procedures

Cost of training and education per student

Matching Funds

The matching funds performance would be recorded and presented as shown in Table 7-1.

Scholarship and Fellowship Funding

The scholarship and fellowship funds measurements and evaluation could be reported according to Table 7-2.

Recruitment Evaluation

The recruitment costs could be distributed by three main objects of recruiting, i.e., students, faculty, and administrative support personnel. Attracting students to the HSMD&R Center is a continuous recruiting function, while the hiring of faculty and other center personnel is an initial intensive recruiting effort, but is subsequently limited to future personnel replacement as a result of turnover.

Recruitment costs could be also evaluated by subfunctions rather than objects, such as costs of advertising, interviewing, and initial indoctrination and training.

Table 7-3 illustrates a recruiting cost recording and evaluation format.

Table 7-1

MATCHING FUNDS STATUS REPORT

Fiscal Year________________

Accounting Period________________

		Accounting Period Performance			Cumulative Performance		
Description (Purpose) of Matching Fund	Total Amount $	Budgeted	Spent or Committed	Spent or Committed Over Budgeted—%	Budgeted	Committed	Spent or Committed Over Budgeted—%
1.							
2.							
3.							
4.							
All Matching Funds							

Table 7-2

SCHOLARSHIPS AND FELLOWSHIPS STATUS REPORT

Academic Year_______________ Semester or Quarter_______________

				No. of Students[1]		
Type of Scholarship or Fellowship	Source of Funds	Amount of Sch. or Fellowship	No. of Recipients	This Quarter/Sem.	Previous Quarter/Sem.	A Year Ago
(i.e., doctoral, post-doctoral, M.S., M.A.)	(i.e., NHSB, State, University, private, etc.)					

Notes: [1] No. of students taking a minor in highway safety

Table 7-3

RECRUITMENT COSTS STATUS REPORT

Academic Year________________ Semester or Quarter__________________

	Students	Faculty	Other Personnel	Total
1. Advertising Cost				
2. Interview Cost				
3. Indoctrination/Initial Training Cost				
4. Unit Cost (i.e., Cost per student)				

Comments:

Program Funding and Budget Performance

Program funding and budget performance are so closely related that they should be examined and evaluated simultaneously. Sources of funds will vary with the type of HSMD&R Centers; budgeting, however, should be made as uniform as possible among all centers. A suggested control format is shown in Table 7-4.

All excessive variance in budgeted expenditures should be explained in detail, i.e., causal factors, and corrective actions undertaken. The NHSB may wish to establish a criterion, e.g., 10 percent variance, as the critical point, beyond which explanation or justification would be required. In the last analysis, however, experience will dictate those variances in budgeted expenditures on which an "alarm" should be rung.

Faculty Salaries

Faculty salaries probably represent the single highest expense category in the HSMD&R Center. Basically, there are two benchmarks against which to gauge the faculty salary levels: (1) against the average of the entire program, i.e., all centers, and against the nationwide averages; and (2) faculty salary per student-hour (student-hours is the product of the number of class and lab instruction hours, and the number of students), as compared with the program average.

A suggested format for monitoring faculty salaries is shown in Table 7-5.

It should be noted that faculty salaries are reported annually, rather than each quarter or semester, as the changes in faculty salary levels are negligible during any given academic year.

A long term corrective action to lower faculty salaries, if found appreciably higher than the program and national averages, may be an attempt to reduce the seniority level of the faculty staff through more intensive recruitment. In other words, particular courses given by a full professor might be as well taught by an associate or assistant professor.

Other Salaries

"Other" salaries (i.e., other than faculty salaries), shown in Table 7-6, could be evaluated similarly to the faculty salaries, except that, in this case, comparison with "local labor market conditions" would

Table 7-4

PROGRAM FUNDING AND BUDGET PERFORMANCE

Academic Year________________ Semester or Quarter__________________

Funds		Expenditures			
Source	Amount	Category	Budgeted	Actual	Variances
(i.e., NHSB, State, Private Grant, University Grant, etc.)		Faculty Salaries, Other Salaries, Facilities, Equip., Ops., & Maintenance.			
		Overheard			
		Capital Expenses			
Total					

Table 7-5

FACULTY SALARIES

Academic Year______________________

Average Annual Salary			Faculty Salary per Student/Hour	
Center	Program	National	Center	Program

Table 7-6

OTHER THAN FACULTY SALARIES
(Academic Year___)

Average Annual Salaries			Salaries per Student/Hr.	
Center	Program	% Increase over Last Year	Center	Program

be more meaningful than comparing with national averages. In this case, also, annual reporting would be adequate.

Overhead

Reported changes in overhead rates have no real meaning unless the makeup of the overhead is known. Controllable and noncontrollable (by the center and the university) expenditure items should be separate, and corrective actions should be documented, when they are appropriate.

Financial and Accounting Methods and Procedures

Financial and accounting methods and procedures, i.e., financial forecasts, budgets, cost accounting, allocation of general and administrative expenses, capitalization, estimating practices, etc., vary widely among universities. It is expected that the guidelines used in the RFP and in actually organizing HSMD&R Centers will provide a standard for financial management and reporting eventually to be achieved by all centers. This will be a lengthy process and probably will never be completely successful because of the varied and independent structures of U.S. universities.

In addition to evaluating financial methods and procedures for compliance with guidelines, these methods should periodically be reviewed for accuracy, adequacy of expenses, distribution, and timeliness.

Facilities and Equipment

Procedures for evaluating facilities and equipment used by the HSMD&R Centers fall into two broad categories: (1) evaluating the adequacy and utilization of existing facilities and equipment; and (2) monitoring the progress of new facilities and equipment planning, design, construction, procurement, and installation.

The adequacy of facilities and equipment currently available to the centers can best be evaluated by visual inspection. The utilization assessment can be made by means of periodic reporting, which would indicate a potential "crowding" situation or an under-utilization of real assets.

Suggested formats are shown in Tables 7-7 and 7-8.

Table 7-7

FACILITY UTILIZATION

Academic Year______________ Semester or Quarter______________

Types of Facilities	Percent Utilization during Reporting Period			Remarks
	Preceding	Current	Following	
(i.e., office space class rooms, auditoriums, laboratory space, special facilities: —driving range " " —fog chamber				

Table 5-4

PROBLEMS PERCEIVED BY UNIVERSITIES IN BUILD-UP OF A CENTER

	No. of Univ. Responding
Need for funding mechanism to provide assurance to universities and maintain program continuity	7
Recruitment and attraction of faculty to program	6
Establishing of relationships with employing agencies in states	5
Developing a mechanism for getting students from the field	4
Funding appropriate universities' facilities to house Center and students	4
Getting faculty to teach short courses on a continuing basis, especially if courses are "canned"; acceptance of highway safety as a field of education needs to be obtained	3
Need for standard requirements in training	3
Education and research may take longer to build-up than short course; needs to be tied to an existing school	3
Getting release time for people in the field to come in for training; overcoming resistance to training	2
Travel from another state may be a problem	2
Finding qualified directors, especially state Centers	2
Need specificity of numbers requiring training	1
Expecting that all Centers could teach all areas competently	1
Taxing university resources by adding a new Center	1
Need more standardization in administrative provisions for federal programs	1
Some government agencies want close control in overseeing campus programs	1
Difficulty in coordination of faculty on each small decision	1

needs in the field. Success of the program was felt to be highly contingent on the establishment of this field orientation.

The second most frequently mentioned problem was concerned with the consequences of not providing an appropriate funding mechanism that would maintain program continuity. Problems also were envisioned as arising if insufficient funds were allocated for housing the proposed center and the large number of students requiring accommodations.

The third most frequently mentioned problem was concerned with the recruitment of faculty, attracting them to the program, and achieving their acceptance of highway safety instruction.

Other problem areas receiving less frequent mention were concerned with longer time requirements to build up education and research components of the program and finding qualified directors.

Optimum Placement of Proposed Centers in the University

Traditional arrangements exist at each university in the administrative and management structure adopted for programs of highway safety and transportation research. Since the proposed centers would have an extensive multidisciplinary flavor, and would have the multiple mission of nonresident instruction, graduate education, and research, the NHSB has a concern for where they would be assigned and how they would relate to ongoing programs in highway safety. Varied responses are shown in Table 5-5, especially with regard to a focal point in the university administration, i.e., placing it under the dean of the graduate school, vice-president for research, provost and so forth. Actually, ten universities indicated that leadership should be provided at the vice-president level. This is some indication of the importance and magnitude of the proposed centers as perceived by representatives of these universities. Slightly more than half of the universities visited responded in favor of some connection with the school of engineering, either placing the center there directly or within traffic and transportation centers that nominally are associated with engineering. The point of coordination at university administration level might vary, and other related disciplines might be included in its operation, such as people from continuing education. However, strong administrative ties would exist with engineering.

Table 7-9

NEW CONSTRUCTION PROGRESS

Academic Year________________ Semester or Quarter________________

Type of Facility	Schedule Completion in %		Fiscal Performance		Remarks
	Actual	Planned	Expenditures	Budget	
(i.e., Office Space,					
Lab Bldg.,					
Auditorium					
Class Rooms					
Special Structure:					
—Driving Range					
—Parking Lot					
Site Preparation					
Landscaping					
Utilities					
Etc.					

Table 5-5

OPTIMUM PLACEMENT OF A CENTER IN THE UNIVERSITY

	No. of Univ. Responding
Place within the School of Engineering	4
Place a Center under VP for Research who would have coordinators, respectively, for graduate programs and short courses	3
Under a Traffic and Transportation Center with short courses to be developed under a Director for Continuing Education and graduate students to be handled under the research element of such a Center	2
Under the Dean of the Graduate School, including integration with a Transportation Research Center	2
Place under the VP for Academic Affairs	2
Administer through School of Engineering but actually run by a joint committee of related disciplines	1
Have the Director of the Center report to a VP (unspecified)	1
Place under Provost who is the chief academic officer	1
Place it under the Vice Chancellor for a particular campus where a university structure is made up of several state universities	1
Arts and sciences	1
Under VP for Graduate Education and run by a coordinating committee	1
Independent Center with its own degree but coordinated with existing departments	1

Plans of the University in Research and Education in Highway Safety, Including a Previous History of Involvement in This Field

Present offerings of the universities visited in research and education related to highway safety are shown in Table 5-6. Most of the universities have experience in providing highway safety-related courses in their continuing education program. At least half of these 16 universities have had interdisciplinary research experience in this field, provide graduate programs in traffic and transportation engineering--either directly with an MA, or through a specialty provided under an MS in civil engineering--and have plans or have presented plans for fairly large scale transportation research centers or centers for research and development in driver education. Nine of the schools have existing transportation research centers or highway safety institutes. At least two of the universities have received recent funding for transportation research. These include the Ohio State University and the University of North Carolina. To a considerable extent, the findings presented in Table 5-6 reflect the selection that was made of universities to be visited. While all universities had most of the basic disciplines required to support the development of highway safety manpower, 60 percent of them had operational programs that related directly to the mission of the proposed centers. Underlying the selection, of course, was the need to visit qualified and interested universities in all of the regions that had been drawn up as described in Chapter 2 of this report.

Previous Experience in Coordinating Programs With Other Universities

Under one alternative for the establishment of HSMD&R Centers there might exist a requirement for considerable coordination with other universities in the region. This alternative strategy is discussed more completely in Chapter 2 and would require that training for police sciences and driver education take place elsewhere than at the regional center. The visiting team was interested in determining the extent to which universities had accumulated the experience represented by previous coordination with other institutions of higher education. Table 5-7 reflects the number of universities responding as having had such experience and also reflects the kinds of coordination that have been effected. Approximately 90 percent of responding universities indicated that they had previous experience in dealing with other universities. The type of coordination most frequently mentioned was that of joint programs with others and general university education, with such typical programs as CIC (Committee on Institutional Cooperation), engineering, and extension and continuing programs being mentioned. The next most frequently mentioned joint effort was concerned with research programs, with such typical research programs mentioned as Air and Water Pollution, The Argonne Laboratories, and Nuclear

Table 5-6

PLANS OF THE UNIVERSITY IN RESEARCH AND EDUCATION IN HIGHWAY SAFETY, INCLUDING A PREVIOUS HISTORY OF INVOLVEMENT IN THIS FIELD

	No. of Univ. Responding
Have a program of continuing education in highway safety related courses, including short courses	10
Have an existing transportation research Center or a traffic safety institute	9
Have a history of interdisciplinary research in highway safety or traffic related problem areas	8
Have graduate programs in traffic engineering with an M.A., or with an M.S., in Civil Engineering and a specialty in traffic and transportation engineering	8
Have prepared plans and presented them for a large scale transportation and traffic research center; driver education, etc.	8
Have received new funding for a transportation research Center	2
Application of aerospace safety to problems of highway safety	1

Table 5-7

PREVIOUS EXPERIENCE IN COORDINATING PROGRAMS WITH OTHER UNIVERSITIES

	No. of Univ. Responding
Universities having a history of coordination with other universities	14
Involvement in joint programs on general university education. Typical programs include CIC* and Engineering; vocational, extension, or continuing education	14
Research programs including air and water pollution, Argonne Laboratories, nuclear or biological research	9
Overseas programs such as AID, teaching, establishment of universities	5
Development of driver and safety education, including short courses	4

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* Committee on Institutional cooperation

and Biological Research. Several universities indicated involvements in overseas programs with other institutions with AID, in teaching, and in the establishment of universities. A small number, 25 percent of the responding universities, actually had undertaken coordinations with other institutions on driver and safety education.

Summary

- All 16 universities visited have had prior experience with large federally funded programs that can be extended to the proposed centers.
- Federally funded programs have enabled the development of multidisciplinary programs at several universities. This is also the goal of the proposed HSMD&R Centers.
- For planning purposes, the NHSB should consider a minimum of five-year funding for the proposed centers, since contractual arrangements of this duration have high acceptance at universities and enable them to conduct an orderly phasing in establishment or disestablishment of a program. Also, once a program is established, the essential need is to maintain program continuity in which the funding mechanism plays a critical role.
- A serious problem is perceived in relating to the field environment from which short-course students are to be drawn. The need is seen for establishing relationships with employing agencies, ensuring the flow of students, and defining standards of training that would meet needs in the field.
- Another major problem that must be considered is that of attracting faculty and gaining their acceptance of highway safety instruction.
- The scope and complexity of the proposed program is sufficiently great for most universities to propose that it be provided leadership at the vice-president level. Several universities perceive it as flourishing in the school of engineering, where it could be related to ongoing programs of traffic centers or transportation research.

- Most of the universities that were visited have plans, or are proceeding with plans, to increase their activities in traffic and highway safety research and education and transportation research. The additional staff, facilities, and equipment could be of material assistance to support activities of HSMD&R Centers.

- Practically all of the universities indicated that they had previous experience in coordination of programs with other universities. This experience includes both academic and research programs. This experience would be invaluable under the regional center concept, where the prime center might subcontract for training with other universities in the region.

Coordination with Federal Agencies

Federally Funded Programs Regarded as Easily Administered

Table 5-8 presents the frequency with which several government-funded programs were mentioned when universitites were asked to indicate those programs that they felt were easily administered from their standpoint. There was an interest in determining whether differences existed among various federally funded programs, since each government agency has its own procedures for administration and accounting of funds. NIH training programs and research grants were mentioned frequently, and several universities indicated a preference for grants as opposed to contracts. Programs such as water resources, civil defense, and sea grants each received mention by at least one university as being the type of program easily administered. There are reservations in interpreting the results that are shown in Table 5-8, since the conference discussions, of necessity, could not include all university personnel engaged in the execution of federally funded research. The responses that were obtained as to ease of administration reflect those programs that representatives were aware of.

General Comments Regarding Federally Funded Programs

The following are some general comments that arose during discussion, as university representatives provided an explanation as to why certain programs were more easily administered than others. These comments should not be considered as representative of all universities visited, but there is a degree of cogency about each one, and each has a strong meaning for the university that mentioned it.

- Bilateral negotiations are preferred to a competitive RFP approach

- Cost reimbursable contracts are preferred over fixed-fee contracts independent activity with its own sources of funding through grants and outside contracts. It may become a problem to do so, since the obtaining of research contracts is an entrepreneural task and is also, a function of what is needed by government agencies. If the NHSB were to provide research funding, it could provide direction to the research by recommending that it be related to the center's program. At the same time, it should be realized that the scope of manpower development is so great from the standpoint of job specialties that it is somewhat difficult to envision that any kind of highway research would not be related. It is perhaps the over-specialization in interest areas that has traditionally characterized university research which might create an imbalance in the research program.

Administrative and Operational Policies and Procedures

The evaluation in this area should consist of gauging the operating practices rather than reviewing the written policies and procedures; it is possible to follow the letter of written rules and regulations without accomplishing the goals and objectives of the organization.

The guidelines for administration and operation of the center are applicable in the areas of university-center relations (interface), internal operation of the center, and coordination with the NHSB. Thus, the evaluation efforts will concentrate on the same aspects.

The evaluation of university-center relations should be directed to determining if the center is still optimally located in the university organization, if the relationship between the center and the participating schools and departments in the Highway Safety Program is satisfactory, and if university overhead-covered services are satisfactory.

The evaluation of the center internal procedures should be directed towards their compatibility and eventual standardization for all centers in a category (i.e., large state, regional, or consortia). Internal procedures should also be periodically checked against the changing university administrative and operating procedures to avoid conflict or duplication.

Policy and procedures governing relations with the NHSB are probably the most critical as they affect all three parties concerned with the program, the HSMD&R Center, the university, and the federal government. Ideally, the procedures within the three organizations that pertain to their interrelationship should be reviewed, evaluated, and updated by representatives of all three groups.

Table 5-8

COORDINATION WITH FEDERAL AGENCIES UNDERWRITING UNIVERSITY PROGRAMS

Federally Funded Programs Easily Administered	No. of Univ. Responding
NIH training programs and research grants	6
Grants preferred to contracts	4
Environmental sciences programs such as air pollution	3
Public Health fellowships	2
Water resources programs	1
OCD program	1
Sea grants	1
Bio-Engineering	1
NASA programs	1
National Science Foundation	1
Omnibus crime bill	1
Computer sciences program	1
Multidisciplinary program conducted for ARPA	1
Fluid dynamics research	1
Prefer bi-lateral negotiations to competitive RFP approach	1
Prefer cost reimbursable to fixed fee contracts	1
Programs easily administered if they can be accomplished within existing structure	1

- Programs are easily administered if they can be accomplished within the existing university structure

- Long-lead applications for training or research grants are not as welcome as those that can be approved to meet a rapidly developing need

- Costing is preferred on the basis of a total program rather than having to plan costs around what it takes to train a single student

- Fellowship programs in which a cost-of-education allowance to the university approximates the amount given to the student received approval

- Programs in which the university is not required to go out and find students are preferred

- Programs in which excessive coordinations with other universities are not required are favored.

Review Procedures Considered Most Effective

In the establishment of a new program, it would be desirable if review procedures established by the funding government agency could take advantage of the experiences of universities with receiving monitorship in connection with other programs. Some review procedures were found to be acceptable, while objections arose to others. Table 5-9 presents the spread of responses that resulted from discussion of desirable review procedures that would be desired and those that have been found to be objectionable. There seems to be an acceptance of NHSB-established performance criteria for training, especially for short-course instruction and that it would be the responsibility of the university to attain these standards in training. Several universities mentioned that they would make it their responsibility to even try to exceed the standards in the production of a trained individual. However, the application of standards is not seen as acceptable for graduate courses and for research. It is presumed that the university would have been chosen for the establishment of the center on the basis of its past performance and record, and that it would already have a well-qualified program in research and graduate instruction. Progress reports did not seem to receive strong approval, although it was recognized that they might be necessary. Site visits were welcomed, especially if the university had been instrumental in recommending team members for the visiting team. It was suggested that if the

Table 5-9

REVIEW PROCEDURES CONSIDERED MOST EFFECTIVE

	No. of Univ. Responding
They would teach from a performance criterion or outline provided by NHSB but the university should establish courses	10
Reviews of time allocation most unpleasant but few problems encountered in fiscal review; do not like close monitoring; dislike progress reports	6
They want site visits from qualified professionals	5
The federal government should set standards to be met and the university will reach for a program which is better, but not be evaluated on method	4
Federal requirements (NHSB defined performance objectives) are seen as acceptable on short courses but not on graduate courses	4
The school welcomes review of work in process but does not like to have people sitting in on classes	4
Detailed supervision would not be appropriate. Review should be at the program level rather than at lower, more specific levels	3
The Engineering Council on Professional Development approach is liked in which teams are chosen and which are acceptable to the university	2
There is a willingness to take NHSB research findings and incorporate them into the curriculum	2
Two approaches needed: (1) interim evaluation as by teams, and (2) evaluation of the end product	1
Faculty like to coordinate on an exchange of views with a client	1
People visiting Centers could be obtained from other Centers and responsibilities could be rotated among Centers	1
Standardization of different federal programs would be useful particularly in per diem schedules	1
Channelizing highway safety through governor's office to university creates political problems	1

system of centers should come into being, a visiting team could be appointed from all centers and provide membership to the team on a rotational basis. Detailed supervision and close monitoring were perceived as inappropriate by the universities. It was also suggested that review should be aimed at the program level instead of having people sitting in on classes, and so forth.

Summary

In discussing federal programs that are regarded as easy to administer, a popular preference was expressed for the arrangements made possible by NIH training programs and grants. A general acceptance seems to exist for having the NHSB establish performance standards or criteria for short-course instruction and having universities teach toward these criteria.

Detailed supervision, close monitoring, and excessive progress reporting represent review procedures for which there is very little enthusiasm. However, site visits from qualified professionals are considered desirable, and review at the program level rather than at the classroom level is preferred.

Finances

Previous Experience in Matching of University Funds with Federal Funds

Responses on the history of a university in matching its funds with those of the government and attitudes expressed about such matching are shown in Table 5-10. Over 40 percent of the universities visited indicated that they have matched federal funds with their own funds. Matching has been highly varied, with some universities indicating a 50-50 matching and at least one university indicating that it had obligated 75 percent of the funds required for a federal program. Several universities expressed the opinion that, on fellowships and grants, 100 percent federal funding should be anticipated. On short-courses, there was an expectancy among several universities that such instruction should be fully funded by the government. In general, there was the feeling that universities prefer to expend their own funds on the construction of facilities, and that even if there was government matching on facility construction, the buildings should become possessions of the university.

Table 5-10

MATCHING OF UNIVERSITY FUNDS WITH FEDERAL FUNDS IN THE PAST

	No. of Univ. Responding
Number reporting having matched federal funds in the past	7
Have matched on equal basis of 50 percent to 75 percent university funding to federal	4
Would try to get additional money from education funds, highway agency, department of instruction, or other interested agency within the state	4
Expect 100 percent federal funding on fellowships or grants	4
In general, expect 100 percent federal funding, especially on short courses	4
University willing to provide funds for fellowships and faculty grants	3
Have matched faculty salaries in amounts up to 50 percent	2
Have matched funds for facilities to as much as 50 percent	2
Dislike matching funds for facility construction, as the university prefers to use its own funds	2
Have matched as much as 50/50 in the past but dependent upon the program involved	2
Willing or may be willing to provide land	2
Would provide facilities but not the funding	1
Grants for student education and research more likely to be matched by university funds	1
Have refused past projects where 25 percent university funds were desired, when there was a budget shortage	1

Except for these opinions regarding facilities, the willingness of the university partially to support fellowships, faculty salaries, and research seems to be a function of the program under consideration. If the university is highly motivated to enter the program, it is more likely to extend itself financially than if the program stimulates only a modicum of interest.

Justifiable Ways of Expending Federal Funds

The universities were asked to indicate their preferences for how they would like to see funds spent in a program. Table 5-11 presents the distribution of responses for those elements of the proposed Highway Safety Manpower Development Program on which there would be a need for expenditures. The main concern seemed to be for the provision of funds for fellowships and tuition for graduate students, research funding, funding for faculty salaries, and construction or remodeling of facilities. A need was expressed, also, for funds to be allocated to the development of an educational program and short-course curriculum and the purchase of equipment. The spread in the number of universities responding in terms of preferences for how funds should be expended is not very great, varyirg from five to eight universities. Therefore, the best interpretation of results in Table 5-11 is that it reflects salient components of the proposed program for which funds should be allocated.

Funding Levels Perceived for Highway Safety Manpower Development and Research Centers

The SRI portion of the briefing that preceded discussions included estimates prepared by SRI on financial support that will be required for state centers of three different sizes, i.e., small, medium, and large; for regional centers, consortia, and nonconsortia; and for national centers having variations in the extent of their mission and responsibilities. Since these were presented for the first time at the conference discussions, the universities did not have sufficient opportunity truly to assess the cost estimates. They did not appear to have objections to the ground rules that were followed for estimating student costs and faculty cost estimates.

Several universities have developed plans for expanded transportation research centers that would provide for short-course instruction and research. However, it was not possible to directly relate their local estimates to those that were presented in the briefing, since the magnitude of their short-course requirements and the projected research were

Table 5-11

JUSTIFIABLE WAYS OF SPENDING FUNDS

	No. of Univ. Responding
Fellowships and tuition	8
Research	6
Faculty salaries	6
Facilities, including construction and remodeling, laboratories, classrooms, offices, student housing, etc.	6
Education program and short course development	5
Equipment	5
Allow the faculty budget committee or the university to decide leave it flexible	3
Concentrate fund in states which have poor highway performance	1
Renting of space	1
Charges for short course students	1
Funding a professorial chair	1

at variance with that presented in the briefing. As an example, in one instance, it was stated by university representatives that cost estimates for a center would have to be increased by at least $2 or $3 million if the center was to have a research facility at its disposal similar to the one that the university was proposing. Under current planning, it was not intended that safety manpower centers would have large-scale research programs approximating the ambitious plans of proposed transportation research centers.

Establishment of University-Funded Fellowships and Grants

A summary of university attitudes concerning the establishment of fellowships and grants out of its own funds is shown in Table 5-12. Most of the responses indicated a general university willingness to provide fellowships out of its own funds, with certain conditions attached. Several universities bidding on proposed centers would already have ongoing research programs related to highway safety and would have fellowships available in such programs. Additionally, they would seek other funds from state-level agencies that have abiding interests in supporting programs in highway safety. At least two universities indicated that they would have to be assured of jobs for their graduates before establishing fellowships in this field could be justified.

Summary

Among the universities that were visited, there has been a general experience of having matched federal funds with university funds. The extent of matching has been very varied with respect to the extent of matching and its purposes (for fellowships, facilities, salaries, and so forth). The extent of matching funds is correlated with the university's interest in a proposed program. For the short-course instruction, the general impression is that 100 percent federal funding should be expected.

When university funds have been expended on federal programs, there is a preference for fellowships, research, faculty salaries, and facilities construction. The willingness of the university to provide funds for facility or building construction is predicated on the desire to have the new building ultimately become the property of the university.

Expenditure of federal funds is felt to be justifiable for fellowships and tuition, research, faculty salaries, facilities, and for curriculum development.

Table 5-12

ESTABLISHMENT OF UNIVERSITY FUNDED FELLOWSHIPS AND GRANTS TO MATCH FEDERAL FUNDS

	No. of Univ. Responding
University would expect to have on-going research studies funded from the university and other sources from which it could supply research grants and fellowships, e.g., state	6
Willingness to provide university funds for fellowships and faculty grants	3
Expect 100 percent federal funding on fellowships	3
There would have to be assurance of jobs for graduates before establishing additional fellowships	2
Fellowships are available in the safety program but are not considered as matching funding	1
University is supplementing fellowships to the extent of $1,200 a year to increase financial base for graduate students	1
The establishment of university-funded fellowships would be a function of the university interest in getting a program	1
No state money available	1

Facilities

Type of Facility Perceived from the Operation of a Center

In discussing the kind of a facility that might be perceived for a HSMD&R Center, a concern arose regarding where center functions would be carried out within the university and where components of the center should be housed. According to results in Table 5-13, several university representatives indicated that any research related to highway safety should be carried on in those departments or disciplines that were in support of the center rather in the establishment of a centralized research capability. Under these conditions, additional research equipment facilities would be combined with those already in existence in those academic departments supporting the center. It was the belief of representatives of at least four universities that graduate education also should be conducted in the separate departments. Opinions about where research should be implemented and how the graduate education should be conducted were not universally the same, since there was a limited number of responses indicating that research should be done in a common facility and that it would be desirable to provide space for graduate students near a central facility. Generally, however, the opinions expressed were in favor of combining the research and graduate instruction with existing capabilities.

For short-course instruction, the associated library space, and offices that would be required, the general opinion was different. Here the need was seen for the establishment of a separate facility. This was the opinion of approximately 56 percent of the universities that were visited. Again, this attitude was not universal, with an exception of one university in which the opinion was expressed that the short-course instruction should be combined with the existing facilities in continuing education. In view of the sizable numbers of students that would have to be provided short-course instruction, it was felt that the center might profitably be placed at some distance from the campus, rather than having it overlap with the nominal day student program. The suggestion also was made that surplus government facilities might be available, at least for the large task of short-course instruction, and this could hold down initial investment costs.

Problems Envisioned in Meeting Facility Requirements

Table 5-14 presents a summary of problems envisioned by university representatives in accommodating the proposed centers. The most frequently mentioned problem was that of providing adequate office and

Table 5-13

TYPE OF FACILITY PERCEIVED FOR OPERATION OF A CENTER

	No. of Univ. Responding
Conduct research in related departments	7
Need separate facility for short courses, including library space, classrooms, and offices	6
Conduct education in related departments	4
Lease, remodel, or expand existing space	3
Combine with existing facilities in research or engineering	3
Establish Center at some distance from the campus	3
House graduate students near facility and provide office space for them	2
Use surplus government facilities	2
Combine with existing facilities in continuing education	1
Center should be near cooperating departments	1
Research should be done in a common facility	1
Do research in respective departments if you do not have a comprehensive research facility	1
Justify additional research equipments and place them in respective departments	1

Table 5-14

PROBLEMS ENVISIONED IN MEETING FACILITY REQUIREMENTS

	No. of Univ. Responding
Office and classroom space is the big problem	4
Would need housing facility for students	2
Additional facilities necessary if space requirements exceeded current inventories	1
Will have to reassess classroom space throughout university	1
Would need additional classroom space even to the extent of getting new buildings	1
Classroom space--the critical factor and really should have a separate facility	1
Flexibility is important in the use of funding for facilities	1
Short course instruction for a Center could swamp a new facility under construction for continuing education at one university	1
Would need funding to develop a facility for integrated study of driver, vehicle, and roadway	1
Will have to accommodate administrative space	1
State university could not contribute money to facility development on a private campus in the case of split responsibility with other university	1
Facilities not a constraint	1
Such problems would be defined in a proposal when an RFP is actually delivered	1
Would need new facilities	1

classroom space. Almost half of the responses to this problem were concerned with providing sufficient space for instructional purposes, especially the short-course instruction. Housing was perceived as a problem, in as much as large numbers of students would have to be accommodated on a short-term basis. Generally, the impression was obtained that additional facilities would have to be made available, but that universities would have to inventory their existing capabilities to determine whether new construction would be necessary, whether remodeling of an existing building would provide the required space, or whether rescheduling of classroom space throughout the university could result in the provision of additional space for instruction. At least one university felt that facilities would not be a constraint should it become interested in bidding on the program.

Summary

Research and graduate education components of the proposed centers were perceived as residing in the cooperating departments rather than in a central facility. This procedure would avoid duplication of existing research capabilities and allow them to be applied to NHSB-generated research problems.

For the short-course instruction and associated administrative and library space, an integrated separate facility is perceived. This facility, and housing for short-course students, would not necessarily have to be located directly on the campus.

Classroom administrative, and housing space were the major concerns expressed by university representatives should they become hosts to one of the proposed centers. Reassessment of existing space, remodeling, and even new construction planning would be among the necessary actions that would be taken to accommodate a center.

Faculty

Pooling of Faculty Talents in Disciplines Related to Highway Safety

Table 5-15 presents the summary of university attitudes regarding the need to pool faculty talents to support the proposed program. The general tenor of responses was that since it has been done in other programs, pooling of faculty talents could be extended to the field of highway safety. Reservations were expressed by representatives of at least four universities on the feasibility of having research-oriented or senior faculty conduct the short-course instruction. The remaining

Table 5-15

POOLING OF FACULTY TALENTS IN DISCIPLINES RELATED TO HIGHWAY SAFETY

	No. of Univ. Responding
Pooling of talents for transportation or safety research is recognized and has been used	8
Pooling of faculty talents has been done in other research programs and could be extended to safety research	4
Like to have regular faculty do teaching in continuing education	3
Faculty interests go either to research or training, seldom are both combined	2
Like to bring in practitioners from the field to teach	2
Have people teach short courses who do not necessarily have advanced degrees and may be assigned to a safety Center; use graduate students for teaching	2
Joint appointments need the approval of both departments	1
Pooling works in engineering and medicine, not necessarily in psychology and psychiatry	1
Interdisciplinary action can be overdone because focus is necessary	1

responses provided alternative ways whereby short-course components for the program could be conducted: the regular faculty should conduct such instruction; practitioners from the field should be brought in to teach; and, it is possible to build a capability of people without advanced degrees, to teach short-courses at a safety center. Some schools have found that they are able to employ graduate students successfully in short-course instruction.

University Status of a Small Resident Staff at the Center

Table 5-16 reflects attitudes concerning the university status of a resident staff that would be employed at the center. More than half of the university representatives believed that the resident staff should have full faculty status. However, exceptions to this majority opinion were encountered, as shown in Table 5-16. It was seen as necessary for the director of the center and the research director to have full academic status, but an exception was made for those who would be teaching the short courses. It was emphasized by representatives of at least two universities that only regular faculty should be used in the research and education aspects of the center program. One representative felt that the large scale training requirements would justify the appointment of a director for the center from continuing education. Presumably, a man at director level from continuing education would have tenured status.

Hiring of New Staff with Full-Time Status and Part-Time Responsibilities at the Center

Table 5-17 presents the summarized responses concerning the hiring of the full-time staff who would have part-time responsibilities at the center. Several university representatives acknowledged that they had encountered previous programs which required that they bring in faculty personnel on full-time status in regular university departments. These personnel then were detailed on a part-time basis to a new program that was receiving federal funds. However, they indicated that there were problems involved in such arrangements. First of all, continuity of the new program would have to be assured to allow the time to recruit faculty. For this reason, the need for a five-year funding period arose frequently in the discussions. But sustaining the interest of senior faculty in providing support to a special program in which they would be teaching short-courses, for example, is perceived as a problem. There has to be a challenge in the program, or other motivations must be present, such as opportunities to conduct research.

Table 5-16

UNIVERSITY STATUS OF A SMALL RESIDENT STAFF AT THE CENTER

	No. of Univ. Responding
Should have full university faculty status	10
For others than director, need only non-tenured status	4
For short courses no need to be regular faculty	2
For research and education should be regular faculty	2
Director should have full faculty tenured status	1
Research director should have academic status	1
Director should come from continuing education	1
Non-tenured research associate status is not liked by some of the regular faculty	1

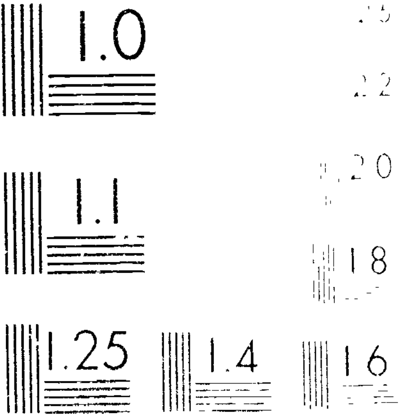
1.0
2.5
2.2
1.1
2.0
1.8
1.25
1.4
1.6

Table 5-17

HIRING OF NEW STAFF WITH FULL-TIME STATUS AND PART-TIME RESPONSIBILITIES AT THE CENTER

	No. of Univ. Responding
University operates this way at present with various Centers, i.e., with joint appointments	4
Need continuity of program to bring in new faculty, at least five years	4
Would bring in with joint appointments but person will not continue unless he has opportunity to do research	3
Faculty from related departments would teach short courses or there would be non-tenured positions	2
Would be willing to hire full-time with a minimum three-year appointment without tenure	2
Would seek faculty for possible tenure and retainment; getting faculty a problem unless you can give tenure	2
Could bring in full-time faculty without necessarily joint appointments but they would participate in the Center	2
Program needs to present a challenge and/or be visible on the campus to attract faculty	2
Younger instructors or graduate students could provide a pool for short courses, since continuing senior faculty dedicated to short courses might pose a problem	2
Could bring in professionals from the field on a part-time basis	1
Primarily depends on approval of departments involved	1
Could hire instructors directly into the Center without department affiliation, but recruitment might be difficult	1
Establish university chair with interdisciplinary responsibilities to stimulate interest in the program	1

Chapter 8

A GENERAL PLAN FOR PROGRAM CONTROLS

Other ways were suggested for handling the relatively operational components of the Safety Manpower Development Program. These included the hiring of a nontenured full-time faculty on as long as a three-year basis; bringing in professionals from the field on a part-time basis; providing a pool of young instructors or graduate students who would actually conduct the short-course instruction; and the actual hiring of instructors who could go directly into the center without necessarily providing them with a departmental affiliation. In the latter case, however, it was recognized by at least one university that recruiting under such conditions might be difficult. One suggestion was made that a way to motivate the senior faculty was to establish a university chair that would be endowed with interdisciplinary responsibilities.

Faculty Attitudes About Teaching Short Courses in Interdisciplinary Programs

Table 5-18 presents faculty attitudes that might be anticipated with respect to the teaching of short-courses in a program such as that proposed. It may be seen that there is no question that the faculty role in teaching of short-courses is an accepted practice among the universities visited, since 60 percent of all the responses indicated an awareness of this role, acceptance of such responsibilities by faculty, and a willingness to provide additional stipends to motivate faculty for such purposes. However, there were several conditional statements made with respect to the attitudes of faculty once they did participate in short-course instruction. Faculty members apparently wish to have flexibility in the planning and teaching of such courses; they might resist having to teach in standardized ways; they like to teach basic or fundamental information; they like to believe that the work they are doing in the applied program is related to promotion opportunities. The issue of sustaining senior faculty interest in such teaching on an indefinite basis was raised, and providing opportunities for research was mentioned as one way to sustain continuing motivation in the program. Although the universities in general indicated acceptance and awareness that the regular faculty would have to participate in short-courses, there were a number of responses indicating that the center also might have to resort to bringing in full-time nontenured faculty for the short-course aspects of the program.

Table 5-18 also presents a distribution of responses derived from university representatives that indicate the kinds of applied programs in which regular faculty support has been provided in short-course instruction. The most frequently mentioned courses are those connected with traffic and highway safety, since many of the representatives participating in the discussions were connected with traffic safety institutes and traffic and transportation engineering. . .

Table 5-18

FACULTY ATTITUDES ABOUT TEACHING SHORT COURSES IN INTERDISCIPLINARY PROGRAMS

	No. of Univ. Responding
Previous history of faculty involvement in short courses and interdisciplinary training	12
Comments indicating acceptance of this role by faculty	10
Advanced faculty professionals have received additional stipends on university scale to motivate them for short courses	4
Participation in applied interdisciplinary programs varies in popularity among departments	2
Already have faculty participating in applied work and teaching in extension programs	2
For short courses can separate them from the regular university curriculum and provide separate instructors	2
Key is to have joint appointments for the faculty which is to do the training	1
There may be a need for full-time non-tenured faculty for short-course work	1
Faculty wants to have flexibility in teaching short courses	1
Hard to find faculty to take on long term chore of operational training	1
Faculty might resist teaching from course guides	1
Faculty likes to teach "fundamental information"	1
Work must be perceived as related to promotion	1
Graduate students have been given stipends to teach short courses	1
Research will attract faculty to short-course aspects of the program	1
Programs Mentioned in Which Faculty have Provided Instruction	
Traffic and highway safety	6
Water resources	3

Table 5-18 (continued)

	No. of Univ. Responding
Public health	2
Medical engineering	2
OCD	2
Human factors (psychology and engineering)	2
Short courses for engineers	2
Short courses in education	2
Marine sciences	1
Courses for State Highway Commission	1
Medical teams go into the field	1
Medicine in general	1

Summary

All of the universities that were visited have had experience in the pooling of faculty talents to meet the requirements of multidisciplinary programs. Extension of this experience to the proposed centers, therefore, is acceptable and is seen as a necessary step. It would be desirable to have regular faculty conduct the short-course instruction, and several universities expressed this preference. At the same time, the NHSB should be alert to other sources of instructors, such as allowing a center to bring in practitioners from the field of highway safety to teach short-courses. Some universities also have employed instructors without advanced degrees for such purposes and have found this procedure to be successful.

Full university status would be preferred for the resident staff at the center. This would apply especially to the center director, research director, and other faculty participating in graduate education and research. There was the recognition, however, that regular faculty status might not be extended to instructors in the short-course program. Center personnel other than the center director, research director, and faculty working in graduate education and research would be fully funded from federal sources.

If full-time faculty are to be hired by the university to have part-time responsibilities at the center, they will require some motivation to remain with the program. This could include opportunities for research, provision of tenure, and additional stipends. If such motivations cannot be ensured, the university may have to seek nontenured personnel for the short-course instruction. In limited instances, it has been found that graduate students can be employed successfully for such purposes.

Regular faculty would not welcome close monitorship over their short-course instruction. They would accept standards for end-goals of training, but would wish to make a liberal interpretation of course guides associated with the training.

Students

Recruiting of Students for Federally Funded Programs

Table 5-19 presents the experiences and problems encountered by universities in recruiting students for programs that are funded by the government. From the responses, it can be seen that there was no question

Table 5-19

RECRUITING OF STUDENTS FOR FEDERALLY FUNDED PROGRAMS

	No. of Univ. Responding
University would rather get fellowship money and then get qualified students rather than grants going directly to students	4
Student interest is increased with the availability of fellowships and loans; there is competition for good graduate students	4
Need an active research program and faculty interest in research brings in graduate students	3
Recruiting would be helped if the time when the university must offer fellowships and available federal assistance were better coordinated	2
Recruiting is a function of job opportunity	2
For short courses to be attractive need reimbursement to student and local government support	2
Practically all graduate students come to the university with fellowship or training grants	1
Perhaps traineeships could be established and states could apply for them and then send people	1
Promotion of program by professors will attract students	1
University does not like to find students but has compromised in the past	1
Program must appeal to academic interests of students	1
Informal channels of recruitment work best, e.g., exchanging application lists with other universities	1
Recruitment for graduate work is not a problem	1

that students can be motivated to enter such programs, provided certain conditions prevail. First, there is a need to establish fellowships and grants, since competition exists for good graduate students. Next, there is a need to establish an active research program and generate faculty interest in the program. If the faculty becomes interested, then they, in turn, will attract students. There is an indication, also, that the ability of a new program to attract qualified graduate students may be a function of opportunities that exist in the field, i.e., students must be assured that they will have jobs after they have completed their educational program.

Several universities were concerned in the discussions of the mechanics of handling student fellowships and grants. In some instances, students apply and receive a grant from a government agency and then go shopping for a university. Representatives of several universities indicated that they would prefer it if the university was given a lump sum to apply to fellowships and then found qualified students. The greatest success would be obtained in getting qualified students if the availability of federal funds were better coordinated with the time when the university must offer fellowships. Universities expressed a concern, also, for the recruitment of students for short-course instruction, in addition to recruitment problems at the graduate level. Motivating people to come in from the field was thought by some representatives to be the responsibility of local governments, which should provide reimbursement to the student while he was undergoing training.

Motivating Students to Participate in Programs Such as Highway Safety

Table 5-20 presents a summary of responses of university representatives to the problem of motivating students to participate in programs of highway safety. The discussions were directed at both graduate-level students and those students who would be coming in from the field to undertake short-courses. For graduate students, the summary is very clear, since approximately 70 percent of the responding universities indicated that there would be a need for stipends, fellowships, assistantships, and so forth, to motivate the graduate student. There was also strong opinion that there would be a need to assure attractive career opportunities in the field and adequate salary incentives. The latter should apply to specialists coming into the field as well as to graduate students. It was indicated by several representatives that the best motivation a person could have would be that evolving from his direct involvement in highway safety.

As seen in Table 5-20, there was concern with how to stimulate a student flow from the employing agencies and how motivational treatments could be applied to the short-course students. Although the tally of

Table 8-3

ILLUSTRATION OF COARSER-GRAIN REPORTING FORMAT

Program Element Control Summary

Program Element New Vehicle Standards

Regional Administrative Unit No.__________

Period Ending ________________ Estimated Passenger Miles (or other base) ________________

Date Report Issued ________________

State or Administrative Unit	Student Backlog/ Enrollment	Class Hours /Faculty	U.S./State Funds Allotted	Committed/ Allocated Funds	Programmed/ Expenses
1.	.80	40	1.25	.55	1.05
2.	.95	43	1.30	.53	1.02
3.	1.50	20	2.0	.62	.80
4.	.75	38	1.15	.49	.98
5.	.76	36	1.50	.56	.95
6.	.82	45	1.20	.50	.99
7.	.93	39	1.26	.54	1.03
8.	.60	40	1.00	.48	1.20
9.	.81	38	1.23	.52	1.02
10.	.87	42	1.31	.51	1.05
Total	.80	41	1.25	.52	1.02

Table 5-20

MOTIVATING STUDENTS TO PARTICIPATE IN PROGRAMS LIKE HIGHWAY SAFETY

	No. of Univ. Responding
Need for stipends, fellowships, and assistantships	11
Need to assure career opportunities and future salary incentives	11
Best motivation is current career involvement in field where person is already salaried in a safety related job	4
Community colleges or undergraduate courses could be used to stimulate interest	3
May be difficult to get short course students unless they have to meet specific standards in the field	1
Motivating students into safety may be easier since increased publicity is being given to safety	1
Possibility of a low response if in short courses you expect people to come in from out-of-state	1
Give the institution a cost of education allowance	1
May have to set up special courses at graduate level to avoid too much mixing of students from different disciplines	1
Student flow will be stimulated by attitudes of administrators in state government, city managers, etc.	1
State highway people are assigned to university on full-time basis as graduate students	1
Work study programs could provide motivation toward a career	1
Most graduate students have made their decision before entering special programs	1
Reimburse short course expenses and pay student salaries while they are in training	1
Coordinate short course students with slack periods and work environment to insure a good turn out	1
Provide a sense of accomplishment by giving short course completion certificates	1

responses for any given suggested idea may be low, the number of separate responses indicates the concern that university representatives had for this aspect of the program. Any one of these singular problems or suggestions could have salient impacts on the success of the program. One of the main points that emerged was the need to obtain the cooperation of administrators in state employing agencies, city managers, and others in local agencies, who, once they had been sold on the program would then provide opportunities for their employees to go to the safety manpower development center. Another way of stimulating the entry of short-course students might be that of establishing more specific standards for job specialties in the field. Then if people wished to qualify, they would have to undergo instruction related to that specialty at the center. It was suggested, also, that since short-courses normally are not accredited, at least certificates of completion could be given to provide short-course trainees with a sense of accomplishment. In general, the impression was gained that employees in the field would be willing to enter the training program to receive instruction, provided that (1) they could be released by their employers, (2) reimbursements would be made possible so that they were not obligated to the financial expense of travel and the residency at the university, and (3) their work requirements would not suffer while they were gone.

Attitudes of Graduate Students Towards Joint Dissertation Between the Center and Home Departments

Table 5-21 represents the attitudes that might be anticipated among graduate students toward earning joint dissertations between the home departments and the HSMD&R Center. These viewpoints deal not only with the attitudes of students; they also describe the conditions that would have to prevail for graduate students to begin their joint dissertation program.

Two main findings emerge from Table 5-21: (1) that several universities already are offering joint dissertations in fields such as air and water resources, transportation, and safety: and (2) that students are in favor of establishing joint dissertation programs but that they need to be encouraged by award of fellowships. However, a mechanism is needed whereby the student's own department establishes a relationship with a multidisciplinary center. If a department is successful in establishing a joint program, then faculty will move into the center for teaching and research purposes and will bring in graduate students to work on projects. With several departments thus participating, the next step would be the establishment of courses throughout the university for the cross-training of graduate students. The feeling was expressed that a center should not attempt to develop a separate specialty of its own, for it could lose the cooperation of related departments in doing so. At the same time, it was

Table 5-21

ATTITUDES OF GRADUATE STUDENTS TOWARD JOINT DISSERTATIONS BETWEEN HOME DEPARTMENTS AND THE CENTER

	No. of Univ. Responding
Students will accept such a program but fellowships must be provided	4
Joint dissertations have been earned in fields such as air and water resources, safety, transportation research, chemistry	4
Student attitudes will vary with the ability of the Center to establish a joint program with their department	2
Students would have to carry additional credits toward safety which would be above their normal mandatory requirements	1
Students need a mechanism for an interdisciplinary degree; grad school now grants such a degree	1
Center should not attempt to develop a separate specialty or it will lose the cooperation of related departments	1
Students are interested in safety but are deterred by a lack of jobs in the field	1
Must allow the grad student to follow his professor into the Center	1
Joint dissertations are popular because they represent dynamic areas offering jobs on the outside	1
Feelings of inferiority are sometimes generated toward another discipline in joint dissertations	1
Some departments resist work on highway safety	1
Depends upon the program; polymer chemistry, for example, is very popular among engineers	1
Institute runs its own graduate program and does not cooperate with other department on joint degrees	1

discovered that at least one institute has succeeded in establishing its own graduate program and did not depend upon other departments.

Summary

Three major factors are involved in the attraction of competent graduate students to highway safety: (1) fellowships and grants must be made available, since there is competition for graduate students among several federally funded programs; (2) a research program must be established to generate faculty interest, for the faculty, in turn, will create opportunities for graduate students in the research projects; and (3) assurances must exist that opportunities exist in the field for careers after academic preparation in highway safety has been completed.

There is a strong need to obtain the cooperation of state and local employing agencies in the establishment of positions in highway safety and provide opportunities for their employees to attend programs of short-course instruction such as those that would be offered by the proposed centers. Stimulating a flow of students from employing agencies is seen as one of the more critical elements to ensuring success of the training program. The encouragement to attend, the provision of release time, and reimbursement for travel and resident costs are seen as ways of providing support to the training program.

The establishment of joint dissertations between the proposed centers and cooperating university departments is a function, initially, of involving the faculty in teaching and research in highway safety. Once this relationship has been established, the faculty will invite graduate students to work with them on research projects. However, the center should not necessarily attempt to establish a separate specialty, such as a Ph.D. in highway safety, since it may lose the cooperation of participating departments.

Curricula

Compatability of the Proposed Highway Safety Program with Existing University Nonresident Programs

Since the short course training requirements in the proposed manpower development centers will be very extensive and will include large numbers of students, there was an interest in determining how consistent this aspect of the program would be with what the university has been providing in comparable instruction. It was found that over half of the universities visited perceived the proposed short-course instruction as consistent with the programs they have been conducting in their continuing education (see Table 5-22). This is with respect to the continuing education that has been conducted at university level under a separate director and also with respect to short-course training programs being provided at school and department levels. At several universities it was discovered, for example, that schools of engineering have ambitious programs of continuing education. Universities are not necessarily dedicated to the notion of providing instruction in standardized training courses. In the case of the proposed short-course instruction, however, several representatives believed there would actually be a need for standardization, inasmuch as several centers throughout the country were being contemplated for the provision of the training program. Their observations were also a result of their realizing that the training has to be geared to job specialty requirements in the field.

Although not borne out in the tallies shown in Table 5-22, intensive discussion was centered about the problem of providing additional time in a training course to prepare a student for his eventual role as an instructor in the field. This is because the current operating philosophy of the proposed centers is that, because such large numbers require training, and because they could not all be brought to a limited number of centers, those who did receive instruction would ultimately provide a similar training experience to others in their same job specialty.

Acceptability of Highway Safety Courses as Part of the General University Curriculum

It was recognized by all university representatives that courses on highway safety would form an integral part of the short-course instruction program at HSMD&R Centers. The acceptance of courses in highway safety as part of the general university curriculum, however, tended to be considered in a different light (see Table 5-23). Only a limited number of university representatives, therefore, reported that they currently have courses in this field in the curriculum--especially in the undergraduate curriculum. It was acknowledged that a graduate program in highway safety could be arranged and that a Master's degree could be given in safety or even awarded under a Master's of Public Health. The general impression is that, at present, there is some safety content in many courses scattered throughout a university, but that only in a limited number of institutions have these courses been brought together under a center. Discussion on courses for highway safety, whether at the graduate or undergraduate level, must be differentiated from the university conception of courses given in traffic and transportation engineering that usually are offered at the graduate level. Several of the schools visited had ongoing programs in

Table 5-22

COMPATIBILITY OF NEW SAFETY PROGRAM WITH EXISTING NON-RESIDENT PROGRAMS

	No. of Univ. Responding
Perceived as being consistent with general university continuing education program	10
Short courses also given within respective departments or schools	4
Already have highway safety courses going	2
Short courses best handled at state level to get local government participation, or because university may not have charter provision to go into another state	2
Main difference in this program might be the need to train people who will go back into the field and instruct	1
University provides support to short course instruction at four year colleges from the standpoint of planning	1
This field needs standardized non-credit courses	1
Have AA program for off-campus work to which safety program could be related	1
Intensive short course training seen as needed in this field; a large standardized program	1
Could use a highway safety educator for general coordination and planning of short courses	1
Would give short course on non-credit to people already in the field	1
No problem in getting regular faculty to teach extension courses in safety	1

their respective programs. This information would be varied and consist of the following:

- New pilot curricula, with directions for experimental implementation and subsequent revision, validation, and so forth.
- Program standards covering motor vehicle and highway safety.
- Proficiency standards reflecting performance criteria for selected short courses or for what is required in the way of performance in the field. (In some instances these may be the same where a course is intended to provide skills that may be applied immediately in the field without further on the job training under a supervisor. In actuality, a single course may have a mix of terminal objectives, with some directed toward the complete engendering of skills and others indicative of partial training only.)
- Research results of studies conducted under contract to NHSB that have a bearing on course content.
- Manuals and other materials developed by the NHSB, or under contract, that interpret program standards and provide guidance for the training of safety manpower.

Having generated the information flow to the centers, the NHSB will wish to maintain cognizance of the extent to which they are incorporating essential materials into the training program. In addition, it is perceived that the NHSB will establish channels of communication with employing agencies in the field, especially at state level; and through such interaction it will become informed of needs that have a direct bearing on the training programs that are being given to safety manpower from the same agencies. This information would be screened and evaluated by the NHSB that, in turn, would provide it in organized form to the relevant centers. In some instances, the information would be reserved strictly for the center responsible for training in the region or state in which the need arose. It might be decided at the NHSB, however, that the expressed need deserved universal concern and, in such cases, the emerging guidance would be made available to all centers.

Information Flow to NHSB from Centers on Actions Taken

Figure 8-2 reflects an information flow from the centers to the NHSB as a function of guidance and information received at an earlier date. Responses from the centers would indicate the extent to which

Table 5-23

ACCEPTABILITY OF HIGHWAY SAFETY COURSES AS PART OF THE GENERAL UNIVERSITY CURRICULUM

	No. of Univ. Responding
For short courses generally there is no credit	8
Must appear in the general university catalog for credit to be given	5
An interdisciplinary committee would be formed to develop curriculum which could be reviewed by NHSB; a standardized program would not be acceptable, however	4
Number of universities indicating they provide courses related to highway safety, i.e., in general curriculum	3
A professional degree (M.S. or M.P.H.) could be given in safety, for graduate credit	3
Safety courses and channels exist in several departments but it is perceived that a Center will be necessary to provide a joint function more efficiently	3
There is little involvement in highway safety in the general university curriculum at present	2
Extension credit has been given for short courses	2
Evening courses generally are certificated, not accredited	2
Acceptability for graduate credit would require a committee for approval	1
If for a professional degree, like an M.S. in safety, graduate credit would be given	1

traffic engineering, regardless of whether a Master's degree was offered directly in that field or whether it was offered as a specialty under civil engineering. Inevitably, concepts of highway safety were touched on in traffic engineering, but the courses themselves, were not recognized outright as highway safety courses.

Regarding credit for courses in highway safety the general response was that a course would have to appear in the general university catalog if credit was to be granted. This would imply that courses in highway safety would have to be reviewed through nominal procedures, established at each university, prior to their inclusion in the university catalog. Where universities teach highway safety or other content areas through short-courses, generally no credit is given. There were limited instances in which extension credit was reported to have been granted for short-courses. However, there are limits at each university as to the number of credits earned through extension that may be allocated towards a degree. Another mechanism at some universities has been that of certificating short-courses instead of accrediting them. The feeling among the representatives of several universities was that the structuring of new curricula in highway safety would literally require an interdisciplinary committee to develop the curricula which, in turn, would be reviewed by the NHSB under the concept of the proposed centers.

Acceptance of Credits on Highway Safety from Other Institutions

Having explored the acceptability of highway safety courses at those institutions visited, there was an interest in determining how receptive each university would be to a transference of credit of highway safety courses that had been taken elsewhere. Instead of restricting their responses to highway safety, per se, university representatives expressed a general university policy on transferability of any work done elsewhere, as noted in Table 5-24. The strong indication among most representatives was that transfer credit will not be allowed unless the course itself is accredited at the university, i.e., that it has a recognizable counterpart in the university catalog. In several instances it was noted that, if a transfer of credit is desired, a combined program like CIC (Committee for Institutional Cooperation) can be established with another college. The impression was derived that transferability at the Master's level is discouraged, with schools indicating that their policy is not to transfer credits at that level, or that they accept only a limited number of credits, i.e., 4 to 6 credits, for courses taken elsewhere by graduate students working toward a Master's degree. For Ph.D work, however, there is some evidence that the policy is more liberal. It was mentioned by at

Table 5-24

ACCEPTANCE OF CREDITS ON HIGHWAY SAFETY FROM OTHER INSTITUTIONS

	No. of Univ. Responding
Transfer credit not allowed unless course is accredited at university	11
Will accept limited number of credits at M.S. or M.A. level	4
Can set up a combined program (like CIC) with another college	3
Can transfer credits at Ph.D. level	3
No transferability at M.S. or M.A. level	2
Almost any ECPD accredited course will be accepted	1

least one university that ECPD (Engineering Council for Professional Development) accredited courses would be acceptable for transfer for unlimited credits.

Establishment of Jointly Sponsored Degree Programs for Graduate Students

From the findings reflected in Table 5-25, there is no question about the willingness of the universities visited to establish jointly sponsored advanced degree programs for students wishing to acquire a multidisciplinary background for highway safety. Practically all of the universities indicated an awareness of the need to establish such programs for applied fields that defy categorization within a singular discipline. The universities seemed to be well beyond the point of deciding whether such jointly sponsored programs should be provided, for most of their comments were concerned with the machinery for arranging and operating them. Realizing that graduate students taking courses outside their own department might not fare so well, several recommendations were made that they take such courses on a pass-fail option and that they not be accountable for the material in their written comprehensives. The need was seen for the establishment of a joint committee comprising the supporting disciplines whenever a multidisciplinary program was planned for a graduate student. Other discussion was concerned with the need to cross-list courses so that credit could be given in each department, provision of seminars, provision of majors with split-minors, and so forth. It was stressed that the work should go on in each department, rather than being given at the center, or presented in the form of the experimental course on highway safety for graduate students at the University of Carolina. This course was sponsored by the NHSB and consisted of a mixed body of graduate students with interest in highway safety, and of lecturers brought in from relevant disciplines to teach in the course. The suggestion was made by at least one university that, although the experimental course was not typical of university offerings in jointly sponsored programs, it could be given for no credit and provide a survey of the field, for it consisted of only 35 hours.

Summary

Short-course training requirements in each center will be very extensive and require the training of large numbers of students. Most of the universities visited have had considerable experience with such programs and have an excellent base on which to build short-course curricula in highway safety. Nonresident training and continuing education at

Table 5-25

ESTABLISHMENT OF JOINTLY SPONSORED DEGREE PROGRAMS FOR GRADUATE STUDENTS

	No. of Univ. Responding
Graduate students can take courses or pass-fail option outside their departments, cross-listing courses so that credit can be given, seminars in other departments, major with split-minor, etc.; pressure now exists to get into interdisciplinary programs	13
A faculty committee or graduate school can be responsible for planning a joint program where it is required by a student; need well planned general course background when crossing discipline boundaries	8
Joint programs seen as acceptable but course work should go in each department rather than as a series of generalized graduate courses (e.g., the experimental University of North Carolina course)	5
The trend is increasing towards interdisciplinary graduate work where job requirements are not specified	4
Such programs need well defined specifications for whom the students will be, what jobs they will go into, and what curriculum should contain	1
Courses like the University of North Carolina experimental course could be given on a short-course non-credit basis to graduate students	1
Although such programs are established for graduate students, this might be difficult to do directly through the Center	1
There has been experience in teaching research courses by bringing in professors from different disciplines	1
Graduate students are not held responsible for material outside their discipline on comprehensives	1
A post-doctoral program could provide opportunity for a specialist in one discipline to remain over and take a sequence of safety courses at the Center	1
Flexibility exists for providing many tracks such as an M.D.-MPH program	1
At present there is no specific need seen to produce a Ph.D. in safety	1

several universities have already reached large proportions, and the nature of short-course instruction, provision for housing, and so forth, are well understood. It was understood, also, that standardization might be necessary in training because of field requirements and the need to replicate the same training course at several centers.

A concern exists for the training that would be required to engender instructor capabilities in the typical practitioner of highway safety who is brought in from the field for short-course instruction. Success of the manpower development program depends on those returning to the field to develop training programs from what they have learned and with materials they will have brought with them from the HSMD&R Center. The preparation of an instructor and the provision of training in technical knowledge and skills in a short-course program or in continuing education represents a dual requirement that is not typically encountered.

Highway safety is not recognized as a singular discipline, and consequently only a limited number of university representatives indicated that they have courses listed in their general curricula expressly identified as highway safety. This seems to be more indicative of the undergraduate curriculum than of the graduate curriculum. The impression gained from several universities was that content on highway safety exists in many courses that may be scattered throughout a university. It was conceded that with the establishment of an HSMD&R Center, the establishment of a joint program among different academic departments would be accelerated.

Courses on highway safety, or in any other subject area, must appear in the general catalog, if credit is to be given for them. Short-courses typically do not receive academic credit. Some universities have resorted to certification of short-courses in the highway safety fields as one way of recognizing formal completion. Each university has its own nominal procedures for getting new courses accepted for listing in the general catalog. Because of the varied nature of highway safety, an interdisciplinary committee might be required to structure the curricula in this field.

A general acceptance was found for the need to establish jointly sponsored graduate programs because of the interdisciplinary nature of highway safety. The universities have already developed a set of mechanisms for handling joint programs, such as cross-listing of courses in several departments, pass-fail options for courses taken outside of one's nominal department, provision of seminars for mixed groups of graduate students, interdisciplinary faculty committees, and so forth. All of these mechanisms are seen as being brought to bear on highway safety, should a university contract for an HSMD&R Center. Courses or seminars

Table 8-7

FEEDBACK REPORT - NUMBER TWO(a)

Student Achievement Report

CENTER LOCATION:

PREPARED BY:

DATE:

Course Description	Number Entered in Course	Percent Passing Proficiency Standards on Skill Requirements	Percent Achieving at Cut-Off or Above on Knowledge Requirements
Governor's Highway Safety Program Director			
Highway Safety Program Analyst			
Highway Safety Public Relations Officer			
Motor Vehicle Inspector			
Motor Vehicle Station Inspector			
Driving Training Program Specialist			
Etc.			

established in such programs are seen as the responsibility of each department, rather than as being taught at the center. The center is perceived as having a role in coordination of the program.

Chapter 6

GUIDELINES FOR THE ADMINISTRATION AND OPERATION OF CENTERS

Chapter 6

GUIDELINES FOR THE ADMINISTRATION AND OPERATION OF CENTERS

Introduction

In establishing the requirements for guidelines for the operation of HSMD&R Centers, the NHSB asserted that "In general, guidelines should contain a specific set of time-phased requirements describing precisely how the centers should be operated," and furthermore, that "These guidelines should include a well-defined, measurable set of milestones relating to program development." Webster defines a guideline as "A standard or principle by which to make a judgment or determine a policy or course of action."* For the purposes of this report, a guideline is defined as "a critical event in a segment of the program where progress toward an objective can be measured."

For purposes of referencing the alternatives in this chapter, Roman numerals have been assigned as follows:

I State Centers
II Regional Centers
III National Center
IV Regional Consortia

Guidelines were first derived for Alternative I (state centers) by giving balanced consideration to:

- Expressions by NHSB officials as to how they would prefer to see the centers administered and operated.

- Expressions by university officials as to the degree of control that would permit an admissible latitude of academic freedom.

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* Webster's New World Dictionary of the American Language, The World Publishing Company, Cleveland and New York, 1966.

- Analogous programs negotiated between federal government agencies and universities.

The guidelines for Alternatives II (regional centers), III (national centers), and IV (university consortia), adhere as closely as possible to those of Alternative I (state centers), except where organizational constraints dictate that differences must exist.

Guidelines have been categorized as follows:

A. Organizational guidelines

B. Personnel programming

  (a) Students
  (b) Instructors
  (c) Administrators

C. Curriculum

  (a) Training
  (b) Education and research
  (c) General

D. Facilities

E. Financial

Suggested guidelines are shown on Table 6-1 for the four alternatives. Table 6-2 indicates the critical events in typical center development from which the milestone sequence on Table 6-3 was evolved.

Organizational Guidelines

Since the NHSB will be charged with a major part of the organizational responsibility in connection with the training and education of highway safety personnel, it is suggested that the lines of communication and authority between the NHSB and the centers be shortened as much as practicable. Although the NHSB should be permitted to communicate freely with center personnel, lines of control should be directed from the NHSB, through the university, to the center administration. Direct control of the center by the NHSB would not be feasible, because a substantial amount of coordination will be needed between the Center and the disciplinary structures within the university. Lengthening the lines of authority to include states and/or local government between the NHSB and the university appears impractical because local political issues might become involved, which would adversely affect the objective of uniform national safety standards.

Table 6-1

GUIDELINES FOR THE ADMINISTRATION AND OPERATION OF HIGHWAY SAFETY TRAINING & EDUCATIONAL CENTERS

ALTERNATIVE I STATE CENTERS	ALTERNATIVE II REGIONAL CENTERS	ALTERNATIVE III NATIONAL CENTERS	ALTERNATIVE IV REGIONAL CONSORTIA
Organization	Organization	Organization	Organization
A-1 The National Highway Safety Bureau will select a university within each state in which to establish a Highway Safety Center to train and educate personnel involved in highway safety. The university will be responsible for the administration of the Center.	A-1 The National Highway Safety Bureau will select a university within each region in which to establish a Highway Safety Center to train and educate personnel involved in highway safety. The university will be responsible for the administration of the Center.	A-1 The National Highway Safety Bureau will select a university within the nation to educate personnel who will later be involved in highway safety. In addition, NHSB will establish a Highway Safety Training Academy for the purpose of training presently engaged highway safety personnel. The university will be responsible for the administration of the educational segment and NHSB will be responsible for the administration of the Training Academy.	A-1 The National Highway Safety Bureau will select a group of universities within each region, each group to form a consortium for the purpose of training and educating personnel in highway safety. The highway safety program in each consortium will be administered by a committee composed of at least one member from each university. A committee chairman will be elected annually. The committee will be responsible to NHSB.
A-2 The university will negotiate a five-year agreement with NHSB initially. The terms of the agreement will be subject to annual renegotiation.	Same as Alt. I A-2.	A-2 The university will negotiate a five-year agreement with NHSB for the education of personnel (above bachelor level) who will be later involved in highway safety. The terms of the agreement will be subject to annual renegotiation. The highway safety training academy will meet the training needs of those presently engaged in highway safety.	A-2 Each university member of a consortium will negotiate a five-year agreement with the committee which will act as the representative of NHSB. The terms of the agreement will be subject to annual renegotiation.
A-3 The administrative officials of the Center will be appointed by the university with the approval of NHSB.	Same as Alt. I A-3.	A-3 The administrative officials of the Educational and Research Center will be appointed by the university with the approval of NHSB. The administrative officials of the Training Academy will be appointed by NHSB.	A-3 The top university administrator of Highway Safety Education and Training in each university in a consortium will be a member of the region committee.

Table 6-1 (Continued)

ALTERNATIVE I STATE CENTERS	ALTERNATIVE II REGIONAL CENTERS	ALTERNATIVE III NATIONAL CENTERS	ALTERNATIVE IV REGIONAL CONSORTIA
A-4 Centers will be organized into two divisions, each reporting to the top Center administrator: a. Entry and refresher training b. Higher education (above bachelor level) and research.	Same as Alt. I A-4.	A-4 The university Educational and Research Center will be organized into two divisions: a) Education, and b) Research. Organizational members of each will be instructed to work closely together. Two divisions will be established at the Training Academy: a) Entry training, and b) Refresher training.	A-4 The National Highway Safety Bureau will select lead universities for (a) training, and (b) education and research although, conceivably, both activities may be conducted at the same university. In any case, two divisions will be organized as outlined in Alt. I, A-4. The contributions of assisting universities in the Consortium may be only that of furnishing instructors who will teach at the lead universities to avoid excessive travel by students.
A-5 An outline of objectives will be negotiated between the university and NHSB showing the planned expansion of the Center with respect to initial classes, student output over time, etc.	Same as Alt. I A-5.	A-5 An outline of objectives will be negotiated between the university and NHSB, with respect to education and research, showing the planned expansion of the Center with respect to initial classes, student output over time, etc. NHSB will establish similar objectives for the Training Center.	A-5 An outline of objectives will be negotiated between each university in the Consortium and the regional committee as representatives of NHSB, showing the planned expansion of the university activity with respect to initial classes, student output over time, etc.
A-6 The university will construct a milestone chart showing dates of critical events for the purpose of periodically measuring progress toward the accomplishment of objectives.	Same as Alt. I A-6.	A-6 The university will construct a milestone chart showing dates of critical events for the purpose of periodically measuring progress toward the accomplishment of objectives. NHSB will construct a similar chart for the Training Center.	Same as Alt. I A-6.
A-7 Although Centers will be administered by universities, there will be free communications between Centers and NHSB.	Same as Alt. I A-7.	A-7 Although the Educational and Research Center will be administered by the university and the Training Center by NHSB, there will be free communications between the Centers and with NHSB.	A-7 Although Highway Safety activities will be administered by universities, there will be free communications between Highway Safety personnel and NHSB.

As shown in Table 8-10, the NHSB may wish to know how many refresher training courses are to be given at each center for designated time periods, e.g., quarterly or on a semiannual basis, and for which job specialties the training is to be provided. Next, there would be the need to remain informed concerning major changes taking place in such training, representing those arising from critical events in the field and those that have been requested by the NHSB. For those changes initiated by the NHSB to take advantage of the refresher cycle and impact on practitioners who may not have had training exposure for several years, there may be a need to determine the number of centers that are planning to present refresher training for each job specialty during the same designated time period. The next step would be to determine whether the recommended changes have been adopted in planning of the courses and what percentage of all refresher courses being offered in a single job specialty represent those that have adopted the requested changes.

How the personnel accounting system will function must be determined between the NHSB and state safety administrators, who will have the responsibility for ensuring that a flow of safety personnel to centers is maintained. It is highly probable that the centers will participate in the personnel accounting of trainees, since they will maintain records of the number of specialists or professionals requiring refresher training, including an identification of the job specialties that they represent. This information may be used to schedule refresher training with sufficient lead time allocated for incorporation of new curriculum material, training of center instructors on new curricula, and so forth.

Summary

Critical elements have been selected for reporting in a system of program controls that emphasises the need for the NHSB to maintain cognizance of the training effectiveness of the short-course instruction to be carried on by safety manpower development centers. The reporting procedures are seen as providing:

- A "tracking" of information flow and guidance to centers that require action.
- Feedback to the NHSB on the extent of action taken to modify training programs, adopt new programs, and so forth, including such subordinate information on percentage of a course altered as a function of NHSB guidelines.

Table 6-1 (Continued)

ALTERNATIVE I STATE CENTERS	ALTERNATIVE II REGIONAL CENTERS	ALTERNATIVE III NATIONAL CENTERS	ALTERNATIVE IV REGIONAL CONSORTIA
A-8 The university will, through the Center, provide information and reports as required by NHSB.	Same as Alt. I A-8.	A-8 The university will, through the Educational and Research Center, provide information and reports as required by NHSB. Information and reports from the Training Center will be forthcoming as directed by NHSB.	A-8 Each consortium will, through its Highway Safety administration, provide information and reports as required by NHSB.
A-9 Lines of control will be established between NHSB and the university administration.	Same as Alt. I A-9.	A-9 Lines of control will be established between NHSB and the university administration in connection with Education and Research. NHSB will control the administration and operation of the Training Center.	Same as Alt. I A-9.
Personnel Programming--Students	Personnel Programming--Students	Personnel Programming--Students	Personnel Programming--Students
B-a-1 The Center will establish a program of scheduling student training, educational and research activities in accordance with the need in its jurisdictional area and the requirements of NHSB.	Same as Alt. I B-a-1.	B-a-1 The Training Academy and the Educational and Research Center will establish programs of scheduling student training, educational and research activities in accordance with the national need as specified by NHSB.	B-a-1 The Consortium will establish a program of scheduling student training, educational and research activities in accordance with the need in its jurisdictional area and the requirements of NHSB.
B-a-2 The Center will maintain a history of its current and former students indicating their training, education and work activities.	Same as Alt. I B-a-2.	B-a-2 The Training Academy and the Educational and Research Center will maintain a history of its current and former students indicating their training, education and work activities.	B-a-2 The Consortium will maintain a history of its current and former students indicating their training, education and work activities.
B-a-3 The Center will monitor the quality of its output to assure that its students are acceptable to employers.	Same as Alt. I B-a-3.	B-a-3 The Training Academy and the Educational and Research Center will monitor the quality of its output to assure that its students are acceptable to employers.	B-a-3 The Consortium will monitor the quality of its output to assure that its students are acceptable to employers.
B-a-4 The Center will survey its jurisdictional areas annually to forecast the number of students to be trained or educated each year during the succeeding five years in the various courses.	Same as Alt. I B-a-4.	B-a-4 The Training Academy and the Educational and Research Center will survey the nation annually to forecast the number of students to be trained or educated each year during the succeeding five years in the various courses.	B-a-4 The Consortium will survey its jurisdictional areas annually to forecast the number of students to be trained or educated each year during the succeeding five years in the various courses.

Table 6-1 (Continued)

ALTERNATIVE I STATE CENTERS	ALTERNATIVE II REGIONAL CENTERS	ALTERNATIVE III NATIONAL CENTERS	ALTERNATIVE IV REGIONAL CONSORTIA
B-a-5 The Center will establish milestone events with respect to the teaching of students with accompanying dates at which the events will take place for the purpose of periodically measuring progress toward the accomplishment of objectives.	Same as Alt. I B-a-5.	B-a-5 The Training Academy and the Educational and Research Center will establish milestone events with respect to the teaching of students with accompanying dates at which the events will take place for the purpose of periodically measuring progress toward the accomplishment of objectives.	B-a-5 The Consortium will establish milestone events with respect to the teaching of students with accompanying dates at which the events will take place for the purpose of periodically measuring progress toward the accomplishment of objectives.
Personnel Programming--Instructors	Personnel Programming--Instructors	Personnel Programming--Instructors	Personnel Programming--Instructors
B-b-1 The Center will provide up-to-date biographies of instructors indicating their training, educational and work background and their contractual arrangements with the Center.	Same as Alt. I B-b-1.	B-b-1 The Training Academy and the Educational and Research Center will provide up-to-date biographies of instructors indicating their training, educational and work background and their contractual arrangements with the Center.	B-b-1 The Consortium will provide up-to-date biographies of instructors indicating their training, educational and work background and their contractual arrangements with the Center.
B-b-2 The Center will maintain a sufficient staff of instructors to permit classes of 15-25 (average 20) in classroom instruction and 3-6 (average 4) in laboratory type instruction.	Same as Alt. I B-b-2.	B-b-2 The Training Academy and the Educational and Research Center will maintain a sufficient staff of instructors to permit classes of 15-25 (average 20) in classroom instruction and 3-6 (average 4) in laboratory type instruction.	B-b-2 The Consortium will maintain a sufficient staff of instructors to permit classes of 15-25 (average 20) in classroom instruction and 3-6 (average 4) in laboratory type instruction.
B-b-3 The university will collaborate in providing qualified instruction personnel for the Center.	Same as Alt. I B-b-3.	B-b-3 The university will collaborate in providing qualified instruction personnel for the Educational and Research Center and for the Training Academy.	B-b-3 The universities within the Consortium will collaborate in providing qualified instruction personnel as required.
B-b-4 The Center will forecast the number of instructors required and their teaching disciplines for each year during the succeeding five years.	Same as Alt. I B-b-4.	B-b-4 The Training Academy and the Educational and Research Center will forecast the number of instructors required and their teaching disciplines for each year during the succeeding five years.	B-b-4 The Consortium will forecast the number of instructors required and their teaching disciplines for each year during the succeeding five years.

Table 6-1 (Continued)

ALTERNATIVE I STATE CENTERS	ALTERNATIVE II REGIONAL CENTERS	ALTERNATIVE III NATIONAL CENTERS	ALTERNATIVE IV REGIONAL CONSORTIA
B-b-5 The Center will establish milestone events with respect to the appointment of instructors with accompanying dates at which the events will take place for the purpose of periodically measuring the progress toward the accomplishment of objectives.	Same as Alt. I B-b-5.	B-b-5 The Training Academy and the Educational and Research Center will establish milestone events with respect to the appointment of instructors with accompanying dates at which the events will take place for the purpose of periodically measuring the progress toward the accomplishment of objectives.	B-b-5 Each university member of a Consortium will establish milestone events with respect to the appointment of instructors with accompanying dates at which the events will take place for the purpose of periodically measuring the progress toward the accomplishment of objectives.
Personnel Programming--Administrators	Personnel Programming--Administrators	Personnel Programming--Administrators	Personnel Programming--Administrators
B-c-1 The administrative staff at the Center will be encouraged to recruit students from the university disciplines and from other areas as required.	Same as Alt. I B-c-1.	B-c-1 The administrative staff at the Educational and Research Center will be encouraged to recruit students from the university disciplines and from other areas as required. The NHSB will recruit students for the Training Academy.	B-c-1 The administrative staff at the lead university of a Consortium will be encouraged to recruit students from the university disciplines and from other areas as required.
B-c-2 The university will collaborate in providing qualified administrative personnel for the Center.	Same as Alt. I B-c-2.	B-c-2 The university will collaborate in providing qualified administrative personnel for the Educational and Research Center and will train administrators for the Training Academy.	B-c-2 The universities within the Consortium will collaborate in providing qualified administrative personnel for the Center.
B-c-3 The Center will furnish descriptions of the qualifications, experience and assignments of Center administrators.	Same as Alt. I B-c-3.	B-c-3 The Educational and Research Center will furnish descriptions of the qualifications, experience and assignments of Center administrators. The Training Academy will furnish equivalent data for administrators.	B-c-3 The Consortium will furnish descriptions of the qualifications, experience and assignments of Center administrators.
B-c-4 The Center will forecast the number of administrative employees required and their job titles for each year during the succeeding five years.	Same as Alt. I B-c-4.	B-c-4 The Educational Center will forecast the number of administrative employees required and their job titles for each year during the succeeding five years. The Training Academy will make a like forecast for its administrators.	B-c-4 Each Consortium will forecast the number of administrative employees required and their job titles for each year during the succeeding five years.

Table 6-1 (Continued)

ALTERNATIVE I STATE CENTERS	ALTERNATIVE II REGIONAL CENTERS	ALTERNATIVE III NATIONAL CENTERS	ALTERNATIVE IV REGIONAL CONSORTIA
B-c-5 The university will establish milestone events with respect to the appointment of administrative staff with accompanying dates at which the events will take place for the purpose of periodically measuring the progress toward the accomplishment of objectives.	Same as Alt. I B-c-5.	B-c-5 The university and Training Academy officials will establish milestone events in their respective areas with regard to the appointment of administrative staff with accompanying dates at which the events will take place for the purpose of periodically measuring the progress toward the accomplishment of objectives.	B-c-5 Each Consortium will establish milestone events with respect to the appointment of administrative staff with accompanying dates at which the events will take place for the purpose of periodically measuring the progress toward the accomplishment of objectives.
Curriculum--Training	Curriculum--Training	Curriculum--Training	Curriculum--Training
C-a-1 The Center will canvass its students upon the completion of educational, training, or refresher courses to determine their satisfaction or dissatisfaction with course content and their viewpoints on instructors and instruction methods.	Same as Alt. I C-a-1.	C-a-1 The Training Academy will canvass its students upon the completion of training or refresher courses to determine their satisfaction or dissatisfaction with course content and their viewpoints on instructors and instruction methods.	C-a-1 Each Consortium will canvass its students upon the completion of educational, training, or refresher courses to determine their satisfaction or dissatisfaction with course content and their viewpoints on instructors and instruction methods.
C-a-2 The Center's entry and refresher training staff will, in collaboration with its education and research staff, design training courses to be taught at the Center and in the field. Course content will be subject to NHSB headquarter's approval.	Same as Alt. I C-a-2.	C-a-2 The Training Academy's entry and refresher staff will, in collaboration with the university education and research staff, design training courses to be taught at the Center and in the field. Course content will be subject to NHSB headquarter's approval.	C-a-2 Each Consortium's entry and refresher staff will, in collaboration with the university, design training courses to be taught at the Center and in the field. Course content will be subject to NHSB headquarter's approval.
Curriculum--Education & Research	Curriculum--Education & Research	Curriculum--Education & Research	Curriculum--Education & Research
C-b-1 The university will give academic credit for courses conducted at the Center as agreed to with NHSB.	Same as Alt. I C-b-1.	Same as Alt. I C-b-1.	C-b-1 The Consortium universities will give academic credit for courses conducted at the Center as agreed to with NHSB.
C-b-2 The Center will canvass its students periodically to determine their satisfaction or dissatisfaction with curricula and their viewpoints on instructors and instruction methods.	Same as Alt. I C-b-2.	Same as Alt. I C-b-2.	C-b-2 The Consortium will canvass its students periodically to determine their satisfaction or dissatisfaction with curricula and their viewpoints on instructors and instruction methods.

Table 6-1 (Continued)

ALTERNATIVE I STATE CENTERS	ALTERNATIVE II REGIONAL CENTERS	ALTERNATIVE III NATIONAL CENTERS	ALTERNATIVE IV REGIONAL CONSORTIA
C-b-3 Research activities at the Center will be only those connected with education. Students working on Masters and Ph.D. degrees in highway safety may become involved with research projects being conducted at the Center or with highway safety research projects in other university areas.	Same as Alt. I C-b-3.	Same as Alt. I C-b-3.	C-b-3 Research activities at the Consortium will be only those connected with education. Students working on Masters and Ph.D. degrees in highway safety may become involved with research projects being conducted at the Center or with highway safety research projects in other university areas.
C-b-4 The Center's education and research staff will design educational courses in highway safety in connection with Masters and Ph.D. degrees. Course content will be subject to NHSB headquarter's approval.	Same as Alt. I C-b-4.	Same as Alt. I C-b-4.	C-b-4 The Consortium's education and research staff will design educational courses in highway safety in connection with Masters and Ph.D. degrees. Course content will be subject to NHSB headquarter's approval.
C-b-5 The administrative staff of the Center will survey the content of courses given at the University in relevant disciplines to determine whether these courses can be made part of student requirements.	Same as Alt. I C-b-5.	Same as Alt. I C-b-5.	C-b-5 The administrative staff of the Consortium will survey the content of courses given at the universities of the Consortium in relevant disciplines to determine whether these courses can be made part of student requirements.
Curriculum--General	Curriculum--General	Curriculum--General	Curriculum--General
C-c-1 The university will collaborate with the Center in updating curricula as new developments in highway safety occur.	Same as Alt. I C-c-1.	C-c-1 The university will collaborate with the Training Academy in updating curricula as new developments in highway safety occur.	C-c-1 The universities within the Consortium will collaborate with the Consortium staff in updating curricula as new developments in highway safety occur.
C-c-2 The university will collaborate with the Center in coordinating curricula.	Same as Alt. I C-c-2.	Same as Alt. I C-c-2.	C-c-2 The universities within the Consortium will collaborate with the Consortium staff in coordinating curricula.
C-c-3 The Center will develop milestone charts which will indicate the dates of critical events in the development and implementation of curricula for the purpose of measuring progress in the attainment of objectives.	Same as Alt. I C-c-3.	Same as Alt. I C-c-3.	C-c-3 The Consortium staff will develop milestone charts which will indicate the dates of critical events in the development and implementation of curricula for the purpose of measuring progress in the attainment of objectives.

Table 6-1 (Concluded)

ALTERNATIVE I STATE CENTERS	ALTERNATIVE II REGIONAL CENTERS	ALTERNATIVE III NATIONAL CENTERS	ALTERNATIVE IV REGIONAL CONSORTIA
C-c-4 The Center will establish milestone events with respect to the development of curricula in training and education with accompanying dates at which the events will take place for the purpose of periodically measuring progress toward the accomplishment of objectives.	Same as Alt. I C-c-4.	Same as Alt. I C-c-4.	C-c-4 The Consortium staff will establish milestone events with respect to the development of curricula in training and education with accompanying dates at which the events will take place for the purpose of periodically measuring progress toward the accomplishment of objectives.
Facilities	Facilities	Facilities	Facilities
D-a-1 The Center administration will outline the facilities required to support and operate the Center with accompanying dates when each should be ready for use. A milestone chart should be furnished for the purpose of measuring the progress toward the accomplishment of objectives.	Same as Alt. I D-a-1.	Same as Alt. I D-a-1.	D-a-1 The Consortium administrative staff will outline the facilities required to support and operate the Center with accompanying dates when each should be ready for use. A milestone chart should be furnished for the purpose of measuring the progress toward the accomplishment of objectives.
D-a-2 The Center will utilize university buildings and equipment according to a pre-arranged pattern of priority.	Same as Alt. I D-a-2.	Same as Alt. I D-a-2.	D-a-2 The Consortium will utilize university buildings and equipment according to a pre-arranged pattern of priority.
D-a-3 The Center will define the facilities which should be constructed with dates when each should be ready for use. A milestone chart should be constructed for each limiting item for the purpose of measuring progress toward the accomplishment of objectives.	Same as Alt. I D-a-3.	Same as Alt. I D-a-3.	D-a-3 The Consortium will define the facilities which should be constructed with dates when each should be ready for use. A milestone chart should be constructed for each limiting item for the purpose of measuring progress toward the accomplishment of objectives.
Financial	Financial	Financial	Financial
E. The Center administration, in collaboration with the university, will furnish a pro forma statement showing estimates of income from identified sources and estimated disbursement of funds for planned purposes for each year of the agreement.	Same as Alt. I E.	Same as Alt. I E.	E. The Consortium administration, in collaboration with the universities involved, will furnish a pro forma statement showing estimates of income for identified sources and estimated disbursement of funds for planned purposes for each year of the agreement.

Discipline	Training	Education
Law	6.2%	6.4%
Medicine	6.1	6.3
Business or public administration	17.7	16.4
Education	23.6	23.2
Police sciences	16.6	16.0
Engineering	23.8	25.3
Psychology	6.0	6.4
	100.0%	100.0%

The estimated number of highway safety personnel currently available and the number required for the implementation of the proposed program at local, state, and federal levels are:

	Number of People
1968	796,000
1973	892,000
1978	972,000

Only about 1.5 percent of the training will actually be done at the centers. The balance will be conducted by field instructors near the highway safety employees' area of employment, in junior colleges, nigh schools, or other suitable places of congregation. All highway safety educational courses for advanced-degree students will be conducted at the center.

Program Strategy for the Placement of Centers

Four alternatives were selected for studying highway safety training and education centers, based on centralization of responsibility for leadership. These were:

Table 6-2

GUIDELINES FOR ADMINISTRATION AND OPERATION OF HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH CENTERS - CRITICAL EVENTS

CRITICAL EVENT*	FIRST YEAR	SECOND YEAR	THIRD YEAR
Organization A-1 Establishment of operational policies and procedures.	Organization A-1 Substantial attention will have been given to operational policies and procedures in connection with the reply to the RFP. The University administration should, therefore, have no difficulty in establishing temporary operational policies and procedures within one month after the date of the agreement with NHSB. It is anticipated that revisions will be made as experience is gained with the operation of the Center.	Organization A-1 Operational policies and procedures revised based on Center operational experience.	Organization A-1 Same as Second Year.
Personnel Programming - Student Training B-a-1-(a) Promotion of the Highway Safety Training Program and schedules established for training with federal, state and local governments.	Personnel Programming - Student Training B-a-1-(a) Promotion of the Highway Safety Training Program and the scheduling of students for courses should be started immediately after the agreement between NHSB and the University has been negotiated. Completion of promotion and scheduling of students is anticipated by the end of the first year.	Personnel Programming - Student Training B-a-1-(a) The Center will continue to schedule students for training in accordance with planning and, with the assistance of NHSB, promote the program as required.	Personnel Programming - Student Training B-a-1-(a) Same as Second Year.

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* Critical events timing starts at agreement date.

Table 6-2 (Continued)

CRITICAL EVENT	FIRST YEAR	SECOND YEAR	THIRD YEAR
Personnel Programming - Education of Graduate Students B-a-1-(b) Recruitment of students for beyond Bachelor level work in Highway Safety.	Personnel Programming - Education of Graduate Students B-a-1-(b) The recruitment of graduate students to prepare them for future positions in Highway Safety, opened because of program expansion or attrition, should be started immediately after the agreement between NHSB and the University has been negotiated. It is anticipated that the administrative and professorial staffs of the University and Center will collaborate in inducing graduate students, who are working toward Master's and Ph.D. degrees in such areas as traffic engineering, psychology, transportation engineering, etc. to become interested in Highway Safety. A sufficient number of degreed students should be available to satisfy 50% of the demands within a year after the date of the agreement.	Personnel Programming - Education of Graduate Students B-a-1-(b) Recruitment of graduate students will continue. A sufficient number of degreed students will be available to satisfy 100% of demands within eighteen months after the date of the agreement.	Personnel Programming - Education of Graduate Students B-a-1-(b) Recruitment of graduate students will continue to the extent necessary to satisfy demands.
Personnel Programming - Teaching Staff for Training B-b-1-(a) Recruitment of teaching staff for training.	Personnel Programming - Teaching Staff for Training B-b-1-(a) A teaching staff sufficient to meet the needs of students scheduled for training will be available within six months after the date of the agreement between NHSB and the University.	Personnel Programming - Teaching Staff for Training B-b-1-(a) A teaching staff sufficient to meet the needs for student training will be maintained.	Personnel Programming - Teaching Staff for Training B-b-1-(a) Same as Second Year.
Personnel Programming - Teaching Staff for Education and Research B-b-1-(b) Recruitment of teaching staff for education and research.	Personnel Programming - Teaching Staff for Education and Research B-b-1-(b) A teaching staff, sufficient to meet the needs of graduate students participating in highway safety courses, will be available within nine months after the date of the agreement between NHSB and the University.	Personnel Programming - Teaching Staff for Education and Research B-b-1-(b) The Center will continue to expand teaching staff to meet the needs of graduate students participating in highway safety courses.	Personnel Programming - Teaching Staff for Education and Research B-b-1-(b) Same as Second Year.

Table 6-2 (Continued)

CRITICAL EVENT	FIRST YEAR	SECOND YEAR	THIRD YEAR
Personnel Programming - Administrative Staff B-c-1 Appointment of Director and administrative staff.	Personnel Programming - Administrative Staff B-c-1 The University will appoint a Center Director immediately after the date of the agreement with NHSB. It is likely that a suitable candidate will have been selected earlier with the consent of NHSB. Other administrative staff members sufficient to meet needs will be appointed within three months after the date of the agreement.	Personnel Programming - Administrative Staff B-c-1 The Center administration will adjust the staff in accordance with needs and the concurrence of the University and NHSB.	Personnel Programming - Administrative Staff B-c-1 Same as Second Year.
Curriculum - Training C-a-1 The development of courses for entry and refresher training.	Curriculum - Training C-a-1 It is anticipated that much of the entry and refresher training course development will have been accomplished prior to the initiation of the Highway Training and Educational Center program. Instructors should be prepared to conduct classes at the Center with this material within three months after the date of the agreement with NHSB.	Curriculum - Training C-a-1 Entry and refresher training course materials should be up-dated as new developments occur in Highway Safety.	Curriculum - Training C-a-1 Same as Second Year.
Curriculum - Education and Research C-b-1 The development of courses for education and research.	Curriculum - Education and Research C-b-1 It is anticipated that much of the education and research course development will have been accomplished prior to the initiation of the Highway Training and Educational Center program. Instructors should be prepared to conduct classes at the Center with this material within six months after the date of the agreement with NHSB.	Curriculum - Education and Research C-b-1 Education and research course materials should be updated as new developments occur in Highway Safety.	Curriculum - Education and Research C-b-1 Same as Second Year.

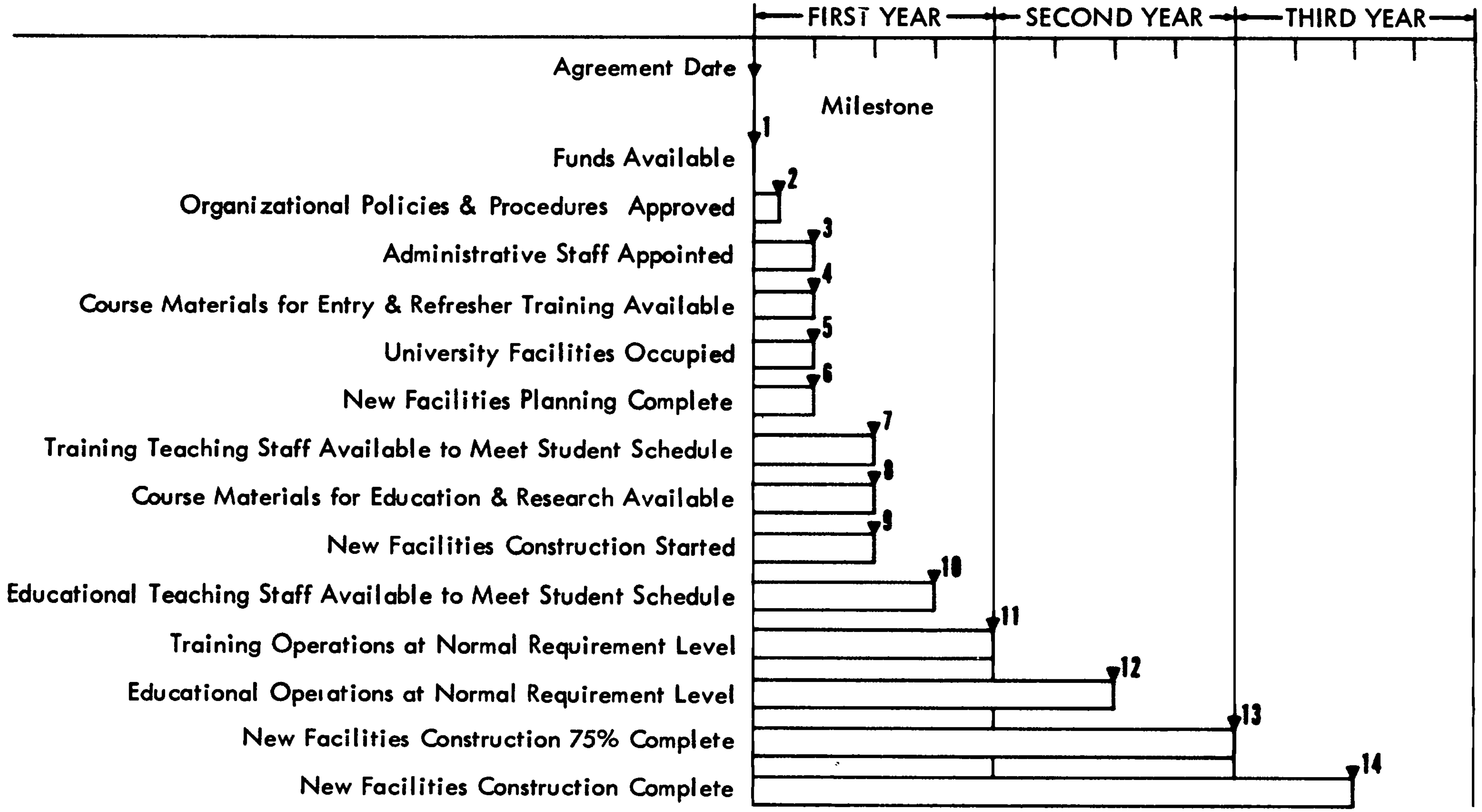
Table 6-2 (Concluded)

CRITICAL EVENT	FIRST YEAR	SECOND YEAR	THIRD YEAR
Facilities Availability - University D-a-1 The availability for occupancy of University and/or temporary facilities.	Facilities Availability - University D-a-1 University and/or temporary facilities identified for training, education and living quarters by the agreement for highway safety student use should be available for occupancy within three months following the date of the agreement between the University and NHSB.	Facilities Availability - University D-a-1 The University will continue to make facilities available in accordance with agreement.	Facilities Availability-University D-a-1 Same as Second Year.
Facilities - New D-b-1 The construction of new buildings and the procurement of new equipment.	Facilities - New D-b-1 The planning of new buildings will be completed within three months after the date of the agreement. Construction will start no more than three months later. New equipment will be ordered and scheduled to be available consistent with construction progress.	Facilities - New D-b-1 New buildings will be 75% complete by the end of the second year. Equipment will be installed as scheduled.	Facilities - New D-b-1 New buildings will be ready for occupancy by the sixth month of the third year. Equipment will be installed as scheduled.
Financial E Commitment and availability of funds.	Financial E It is anticipated that the University will have explored a variety of sources of funds in connection with the reply to the RFP and that these funds will be available immediately after the signing of the agreement.	Financial E Same as First Year.	Financial E Same as First Year .

TABLE 6-3

GUIDELINES FOR ADMINISTRATION AND OPERATION OF HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH CENTERS-- MILESTONES FOR CRITICAL EVENTS

CRITICAL EVENTS TIMING STARTS AT AGREEMENT DATE



For purposes of developing guidelines for Alternative III, a national center, the research and education component was assigned to a single university for the entire country and the training component was assigned to a federal academy. If a national center were selected to fulfill the entire mission, it is most likely that it would function like a regional center in its relation to the host university and the NHSB, with the exception that it would be serving all states rather than those in a single region. If the national center were to function as a consortia, the guidelines developed for Alternative IV, regional consortia, would be best interpreted for its purposes. In the current instance, however, the guidelines have embraced two separate entities at the national level, i.e., a national center for education and research, to handle the graduate and research requirements only, and a federal academy for the conduct of the short-course training program for already employed safety specialists and safety professionals. Guidelines for the federal academy could be applied, of course, in the event the academy approach was to be adopted, even if a single university were not defined to take solitary responsibility of the other requirements. If both entities ever were to come into being, communication between the two would be necessary to ensure a flow of research findings into the training content and provide information on operational problems that could be subjected to research.

Several options are possible for the organization of Alternative IV (regional consortia). At one extreme, the best qualified university in a region might be appointed to take the lead, with other universities merely furnishing instructors for particular courses. On the other hand, administration might be performed by a committee composed of at least one member from each university. The latter arrangement is preferred on the grounds that each university would contribute more responsibly to the overall objectives of the highway safety program. Admittedly, however, the latter form of organization would be somewhat more unwieldy than the former.

It is suggested that five-year agreements initially be negotiated with universities, and that these agreements be sufficiently flexible to permit them to be renegotiated each year, so that accomplishments can be reviewed and program adjustments made. Although universities will appoint center administrative personnel, it is likely that assistance from the NHSB will be welcomed because of the NHSB contacts throughout the nation. In this way, the NHSB can, to a large extent, influence the placement of people who will guide the center in accordance with NHSB policies.

A center could be organized into two divisions, each reporting to the top center administrator: (1) entry and refresher course training, and (2) education and research. These divisions are suggested because

3. The implementation of the highway safety manpower development program through university-level institutions in each state would take more time than with any other alternative.

4. Country-wide compatibility of highway safety education, such as standardization of curricula, and selection of best textbooks, would be most difficult to achieve with state centers.

5. The quality of instruction in state centers may, in general, be more uneven than in the academy or regional alternatives.

6. The NHSB administrative and program control problems would be considerably greater in state centers than in regional centers.

Analysis

A cost comparison of alternatives is as follows:

Development Alternatives	1973 Average Annual Operating Costs	1973 Captial Requirement
1 federal academy	$23,629,000	$20,224,000
10 regional centers	31,100,000	18,550,000
10 regional consortia	31,100,000	18,550,000
50 state centers + D.C.	36,740,000	15,966,000

The above tabulation indicates the federal academy to have the lowest, and the state centers to have the highest, annual operation costs. The costs of regional centers fall in between these state centers and a federal academy. It should be kept in mind, however, that the federal academy would offer only the noncredit training function, while graduate education and other degree-related activities would be supported by university programs.

Speed of implementation is a highly important consideration, and a federal academy could achieve full operational status to serve all of the federal, state and local governments in a shorter time period than any other alternative. The state centers would require the longest time for full activation, although a few state centers, where most of the resources are already available, could be organized in a relative short time. In general, regional centers would take longer to organize than a federal academy but would become operational more quickly than regional consortia centers.

entry and refresher courses are visualized to be more of a concentrated, "canned" type, while those in the educational and research area will be more academically oriented. In spite of these administrative divisions, exchanges of ideas between the training and the education and research divisions should be encouraged.

Personnel Programming

The scheduling of students for entry and refresher training courses can be a very difficult task, unless federal, state, and local governments cooperate wholeheartedly with the center. It should be the center's responsibility to publish schedules indicating precisely when the various highway safety courses prescribed by the NHSB will be taught and then be prepared to accept students in accordance with a prearranged plan negotiated with each governmental unit. Federal, state, and local governments should have the responsibility of supporting the program by requiring their employees to attend courses according to plan. Promotion of the program in its initial stages, with the assistance of the NHSB administrative staff, will undoubtedly be essential in many areas.

It is suggested that government positions in highway safety requiring graduate degrees that have become open either as a result of expansion or attrition can best be filled by new graduates who have taken prescribed highway safety courses as part of their graduate education. Professors and administrators at the center and in the relevant disciplinary areas of the university should encourage graduate students to become interested in participating in highway safety education. The NHSB should assist by arranging for scholarship and fellowship funds and by promoting the educational program outside the university-center complex.

Substantially more assistance will be required by the university from the NHSB in the instructive and administrative manpower area of a national educational and research center because of the larger requirements in numbers. For the same reason, it is likely that the NHSB will be able to better control the quality of this manpower.

Curricula

Considerable research has already been conducted in connection with highway safety curricula. Furthermore, a variety of colleges and universities are now offering highway safety courses in the related disciplines. Table 6-4 lists some of these courses and indicates the titles of new courses that could be initiated. In view of the groundwork that has

Table 6-4

CURRICULA FOR HIGHWAY SAFETY EDUCATION

Suggested Quarter Credits	Course Title	Location of Present Course Instruction
	Law	
3	Legal Aspects of Driver Education and Driver Training	California State at Los Angeles
3	Traffic Law Enforcement and Planning	Southern Illinois University
2	Legal Aspects of Highway Safety Programs (Survey Course)	New
2	Legal Aspects of Highway Safety Programs (Seminar)	New
	Medicine and Public Health	
3	Measurements in Motor Vehicle Accident Epidemiology	University of North Carolina
3	Clinical Problem; Auto Accident	University of Michigan
1-1/2	Principles and Practices of Public Health I	University of Michigan
1-1/2	Principles and Practices of Public Health II	University of Michigan
1-1/2	Introduction to Epidemiology	University of Michigan
1-1/2	Principles and Methods of Epidemiology	University of Michigan
3	Medical Factors in Driving and Licensing	Michigan State University
3	Emergency Medical Services in Post Crash Situations	Michigan State University

Table 6-4 (continued)

2	Alcohol Testing	Indiana University
3	Medical and Health Aspects of Highway Safety	New
	Public or Business Administration	
3	Field Experience for the Safety Specialist	New York University
3	Systems Safety Research and Design	University of North Carolina
2	Overview of Government Promotions of Safety Research	University of North Carolina
3	Highway Problems Analysis	Texas A & M
3	Organization and Administration in Safety Education	Arizona State University
2	Accident Records Management	Northern Illinois University
3	Public Administration and Management of Highway Safety (Survey Course)	New
1	Background, Scope, Purpose and Content of the Highway Safety Program	New
	Education	
1	Organization and Administration of Health and Safety Education	North Dakota State University
3	Principles and Methods of Teaching Safety Education	Pennsylvania State University
3	Driver and Safety Education (Seminar)	University of Michigan
2	Workshop in Motorcycle Education	Arizona State University

Table 6-4 (continued)

2	Traffic Simulator Instruction	California State at Los Angeles
3	Driver Education Curriculum	California State at Los Angeles
3	Advanced Studies in Traffic and Safety Education	California State at Los Angeles
3	Multi-Car Off-Street Driving Ranges and Simulation in Traffic Education	University of Georgia
3	Traffic Safety Education in Secondary Schools	University of New Mexico
3	Methods and Techniques of Driver Education	Texas Tech. College
2	Driver Improvement Programs	Oregon State University
3	Driver and Traffic Safety Education (Survey Course)	New
2	Mass Teaching Methods for Driver Education	Northern Illinois University
2	Instructional Innovations and Procedures for Driver and Traffic Safety Education	University of Wisconsin
	<u>Police Sciences and Criminology</u>	
2	Principles and Procedures of Accident Prevention and Control (Survey Course)	New
2	Traffic Accident Investigation	Sacramento State College
3	Transportation Accident Research	Ohio State University
3	Accident Control Methods	University of North Carolina
2	Accident Reports and Methods	Northwestern University

Table 6-4 (continued)

Engineering

2	Highway Traffic Characteristics	University of Illinois
3	Traffic Characteristics and Vehicle Safety	Pennsylvania State University
2	Principles of Pavement Design	University of Michigan
2	The Role of Road Geometry and Other Roadway Considerations in the Production of Accidents	University of North Carolina
2	Dynamics of Energy Exchange in Crashes with Roadside Obstacles	University of North Carolina
2	Considerations of Roadside Structures and Crash Alternatives	University of North Carolina
2	Vehicle Handling Factors in Automobile Safety	University of North Carolina
2	Vehicle Layout Factors	University of North Carolina
3	Mathematical Simulation Techniques in Vehicle Safety Programming	University of North Carolina
2	Structural Considerations and Energy Exchange During Vehicle Crash	University of North Carolina
2	Essentials of Traffic Safety	Sacramento State College
3	Highway Location and Design	Iowa State University
2	Highway Safety and Traffic Control	Southern Methodist University
3	Engineering Aspects of Highway Safety (Survey Course)	New
4	Transportation and Traffic Engineering	New

Table 6-4 (concluded)

Psychology

3	Socio-Economic Analysis in Highway Transportation	Pennsylvania State University
3	Research on Driver Attitudes	University of North Carolina
2	Psychology in Safety Education and Accident Prevention	University of North Carolina
2	Driver Skill and Performance	University of North Carolina
3	Human Factors Considerations in the Layout of Automobile Controls	University of North Carolina
2	Behavioral Aspects of Accident Prevention	American University
2	Human Factors and Highway Safety Problems	Florida State
2	Behavioral Factors in Safety	Northern Illinois University
4	Psychological Aspects of Driver Performance and Highway Safety (Survey Course)	New

5. Financial Reporting

A format for a projected summary of each center's income and expenditures was designed for periodic reporting to the NHSB. Supplementary statements by the centers, in sufficient detail for analysis by the NHSB, should accompany the summary.

Development of Evaluation Procedures

Before finalizing an agreement with a university in connection with the establishment of a highway safety center, it is proposed that the NHSB and the university subscribe to a series of specific, detailed objectives that will permit the NHSB subsequently to measure the progress of the center in meeting these objectives. There are at least two basic methods of accomplishing this purpose.

- Periodic formal reporting by the center through the university.
- On-site periodic inspection visits.

A combination of the two methods possibly would accomplish the best results. The areas of reporting or observation should be:

1. Adminstrative and operational policies and procedures
    - (a) Operating practices
    - (b) Written policies and procedures
    - (c) Center status in university organization
    - (d) Relationship between the center and participating schools
    - (e) Quality of university services
    - (f) Adherence of the center to NHSB standards
    - (g) Relationship between the NHSB and the center

been done, support should be available for developing the educational curriculum.

Facilities

It is anticipated that most universities that seriously desire to become associated with the Highway Safety Program will make some classroom space available. Living quarters for students participating in training courses are likely to be a larger problem. After the center has defined its ultimate requirements, plans should be made for acquiring new facilities. These needs will undoubtedly vary widely between universities. A training academy should have minimum problems in this connection, because it can occupy a suitable abandoned government facility.

Financial

Table 6-5 shows the format for a projected summary of center income and expenditures. Supplementary statements in sufficient detail for NHSB analysis should accompany the summary.

The universities, with the assistance of the NHSB, should have little difficulty in obtaining federal funds for student and instructor fellowships and scholarships and for research for such an urgent cause as highway safety. According to the Brookings Institution, "Since World War II there has been a marked change in federal policy related to students. The government is now heavily involved in supporting undergraduate and graduate students, as well as postdoctoral and faculty fellows."* In 1961, the National Science Foundation provided funds for about 4,000 fellowships and the National Institutes of Health for about 3,700.† Financial grants might be expected from state and local governments, especially after the manpower development program has demonstrated its value and the demand for highway safety manpower has increased. It seems likely that a substantial number of nongovernmental institutions would be willing to make grants to the program.

Funds for building and equipment might be more difficult to obtain. If state centers were the choice among alternatives, the problem would

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* _The Role of the Federal Government in Financing Higher Education_, Alice M. Rivlin, The Brookings Institution, Washington, D.C., 1961, p. 61.

† _Ibid._, p. 62.

Table 6-5

PROJECTED SOURCE OF FUNDS AND EXPENDITURES RECAPITULATION

Source of Funds	1969	1970	1971	1972	1973
Tuition and fees from students					
Contributed by university					
Non-government scholarships and fellowships					
Income from sale of publications					
State government grants					
Local government grants					
Federal government grants					
Matching funds from NHSB					
Planned Expenditure of Funds					
Grants to students					
Grants to teaching staff					
Recruitment costs					
Administrative costs					
Building construction costs					
Equipment costs					
Publication costs					
Miscellaneous overhead costs					

be minimized, because most of the larger universities could probably provide housing within their present capabilities. On the other hand, the national center would present the greatest problem because of the larger number of students. High cost, special equipment for large projects could be included in project cost.

4. Facilities Evaluation
    (a) Adequacy of buildings and equipment
    (b) Utilization of facilities
    (c) Monitoring the planning, design, construction, procurement, and installation of additional facilities

5. Financial
    (a) Matching funds
    (b) Scholarship and fellowship funds
    (c) Recruitment costs
    (d) Program funding and budget performance
    (e) Faculty salaries
    (f) Other salaries
    (g) Overhead
    (h) Financial and accounting methods and procedures
    (i) Cost per student for education and training

Forms were designed for the above subcategories to provide guides for centers reporting to the NHSB.

Development of Program Controls

Program controls should be aimed at maximizing the training effectiveness, both entry and refresher, of Highway Safety Manpower Development and Research Centers. This is not to minimize the importance of graduate instruction, and the research that will accompany it, but NHSB control of the latter need not be as rigid because it is believed that the proper selection of universities to undertake the responsibilites of manpower development in the graduate area should lessen the need for close controls. For short course instruction, however, the assurance of training effectiveness will require closer communications and a reporting procedure including the Office of Safety Manpower Development, the employing agencies of safety manpower, and the university responsible for conducting the training program.

When centers begin operations, the NHSB should provide them a flow of information consisting of the following:

- New pilot curricula
- Program standards covering highway safety
- Proficiency standards performance criteria for short courses
- Research results of studies which have a bearing on course content
- Manuals and other materials in highway safety

The NHSB will establish channels of communication with employing agencies and through these channels will become informed of the needs that have a bearing on the training programs. This information will be screened by the NHSB who will pass it on to the centers in an organized form.

Suggested procedures for the exchange of information between the NHSB, the employing agencies, and the centers are described below:

Information Flow to the NHSB from Centers on Actions Taken

Responses from the centers would indicate the extent to which they have adopted the changes, new standards, shift in emphasis, etc., in their training programs.

Reports to the NHSB on Student Gain

This report would indicate how much the student has absorbed of the course subject matter as determined by tests given at the beginning and end of the course.

Reports to the NHSB on Student Achievement

This measure is predicted on the assumption that proficiency standards or end-of-course criteria, will come into being and that the NHSB will wish to maintain cognizance of how effective each training course is in producing graduates who meet such criteria.

Feedback From the Field Environment

This report presents employing supervisor's satisfactions or dissatisfactions with returning graduates of short courses, allowing them to express their opinions as to whether the graduates were "well-prepared," and ranging to "poorly prepared." The expression of opinion, if it is unfavorable, should be supported by recommended changes in training to improve the quality of the graduate.

Feedback on Refresher Training

The opportunity to have operating personnel from the field placed in a training environment for a second time should provide the centers with an excellent opportunity to provide training on new concepts and new requirements emerging from the NHSB research and the field working environment.

Pilot Centers

Consideration was given to programs developed by universities in collaboration with the federal government. It was concluded they provide little precedence for the centers proposed by NHSB. Therefore, a considerable problem may arise in establishing HSMD&R Centers at universities if they are to implement all components of the program effectively. Further evidence is needed on a university's capability to satisfy highway safety manpower development needs for regional areas it may not have encountered before. This is especially true of the regional concept for operating such centers, which has been identified as prime for operation and test, in regional pilot centers.

One of the purposes of establishing pilot centers is to test basic concepts for administration and operation. It is recommended that a minimum of two pilot centers be included in the initial pilot plan to provide the opportunity to test centers whose operation would be made divergent. Some of the factors that would be tested include:

- A regional center at a single university or a consortium of universities
- Functional relationships between a center and the NHSB with respect to channels of communication and reporting procedures
- Program controls and evaluation procedures for determining the effectiveness of HSMD&R Centers

- Innovative instructional procedures and technologies that would enhance the training program

- The feasibility of specializations in curriculum offerings among centers in addition to development of a general curriculum for all highway job specialties

- Guidelines for the establishment and operation of centers, including procedures for interface with the university structure, and for internal center organization

- Methods for determining training needs in employing agencies of highway safety manpower and for stimulating the flow of students from the field into the center

Following are three-year estimated costs for a pilot center, assuming that activities start at the beginning of the year 1970 and that 20, 40, and 60 equivalent full-time students will be trained or educated during the years 1970, 1971, and 1972:

	Estimated Costs (X $1,000)		
	First Year (1970)	Second Year (1971)	Third Year (1972)
Operating Costs			
Faculty salaries	$ 59	$124	$ 195
Other salaries	101	182	227
Payroll burden (50%)	80	153	208
Travel	5	10	15
Per Diem ($16.00/day)	115	230	346
Plant maintenance (.147 X burdened payroll)	36	68	93
Total operating costs	$396	$767	$1,084
Capital Costs			
Land	$ 35	$ --	$ --
Buildings	80	221	117
Improvements	17	--	--
Equipment	14	60	20
Total capital costs	$146	$281	$ 137
Total costs	$525	$1,048	$1,221

It should be noted that approximately 30 percent of the operating costs is incurred from students' travel and per diem costs. These costs have been included for planning purposes and as encouragement for state and local agencies to send their personnel to the centers for training. In actual functioning, other arrangements may become possible for sharing the cost of student expenses.

Capital costs also are reflected for purposes of planning, on the grounds that separate facilities would be provided for the pilot centers. This has been necessary since it is not possible to determine a university's capacity to absorb a center into its existing facilities before determining which university is to host a center.

Summary and Recommendations

Deaths from highway traffic accidents amounted to about 50,000 in 1967 and 55,000 in 1968. Will these deaths be 65,000 in 1970 and more than 90,000 in 1975? They probably will reach at least these proportions, if the proper countermeasures are not taken. The facts are that little is known about the fundamental causes of traffic accidents and the countermeaures that should be used to reduce them. Breakthroughs have been made in military programs, in the development of nuclear energy, in space exploration, in medicine, and in other national programs. There is no reason to believe that the traffic accident problem cannot be solved by similar means. Initial tasks are to educate people to discover the true causes of traffic accidents through the use of modern research and testing technologies and to train operating personnel in methods that would subsequently be followed in the application of remedies.

It is the conclusion of the feasibility study that the establishment of regional centers is, at present, the most promising plan for meeting the nation's highway safety manpower education and training needs, although this judgment may be modified as a result of experience with proposed pilot centers. The major reasons for favoring the regional university center concept at this time are as follows:

- Attempts to establish safety manpower development centers in each state would soon overtax the professional capability that exists in this country for training, research, and education in the general field of highway safety.

- The regional center type of organization is flexible, in that it can be structured in different ways to meet the training requirements of several states and the educational interests of universities servicing these states. Furthermore, the regional concept would lend itself to a standardization of curriculum and more uniform proficiency standards for training.

- An economy of scale exists in this program, as has been discovered in other programs, and the establishment of centers in each state could be more costly than other proposed larger-scale centers. Careful selection of universities as regional centers would enable the NHSB to capitalize on existing capabilities and interests in highway safety education and training among these institutions. For example, regional centers would include less duplication of buildings, equipment, and so forth, than a center within each state.

- All regions developed for purposes of the study have one or more universities that meet the stipulated selection criteria.

- The NHSB administrative and programming problems would be less complicated with regional centers than with a large number of individual state centers.

- In many cases, neighboring states have established precedents in sharing federal grants on certain projects. In these cases, state involvement and cooperation may be enhanced by a regional arrangement.

- Speed of implementation would be greater for regional centers than for state centers, especially if centers are established around existing capabilities.

- Regional centers can train all classes of safety manpower--research, professional, and technical. Both credit (degree-related) and noncredit courses can be given, in contrast to a federal academy, where no degree-related credit courses are ordinarily given.

The study has described such advantages in moving in the direction of regional centers, and one array of regions has been defined. However, it is very likely that there are many problems attendant on the organization and operation of these centers, and these problems should be explored before establishing even as many centers as might be required by the ten regions defined in the study.

It is recommended that a number of pilot centers be activated to replicate the functions of the proposed regional centers. It is only by such activation that a firmer understanding will be gained of the requirements for manpower development with respect to the numbers actually requiring training, the speed with which they can be trained, the costs of such programs, and the realization of methods for resolving problems in management and coordination when field agencies, the university, and the NHSB participate in the same program. Testing of the regional concept should be embraced in the charter for pilot centers. Therefore, it is essential that the pilot centers be funded to operate with adequate scope and complexity as may be demanded to meet regional responsibilities. If the initial centers are successful, they would be graduated into the role of permanent regional centers, with proportionately increased funding over time. If the operational test of the regional concept is successful, it is also recommended that additional regional centers be established so that the total need for the development of highway safety manpower will be met.

Chapter 10

PREPARATION OF A REQUEST FOR PROPOSAL FOR THE ESTABLISHMENT OF REGIONAL PILOT CENTERS FOR HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH

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Introduction

Under the contractual arrangements governing the present study, the NHSB has stipulated that it is to receive a work statement, tasks, and related material that will enable the preparation of an RFP (Request for Proposal) to be submitted to bidder universities. To meet these requirements, a sample RFP has been developed in accordance with a format derived from consultation with the NHSB. The document that follows should not be construed as an issuing RFP, inasmuch as it is not a finalized version and represents only preparatory materials for disposition by the NHSB.

In accordance with the basic recommendations of the SRI study, this sample RFP has been predicated on the establishment of a limited number of pilot centers to determine the operational effectiveness of HSMD&R Centers at the regional level. However, the information compiled for future use by NHSB in formalizing an RFP actually is applicable, with little alteration, to all strategies of center location that would call for a university to function as a base of operation.

Since funding levels for regional pilot centers are unknown at this time, no restriction has been placed on the information that is compiled in each of the tasks described in the RFP's Statement of Work. The intent is to provide a comprehensive discussion of the information that might be required from bidding universities, should the NHSB desire to fund pilot centers at regional levels. It is anticipated that the NHSB would scale its requirements for those responding to the RFP to the constraints that would become known at that time with respect to targeted funding levels, full-time-equivalent student loads to be anticipated, ratio of research budget to training budget, number of states to be allocated to a center to replicate a region, and so on. Also, the NHSB may choose selectively from information in the task statements to prepare an RFP that might be predicated on any one of the program strategies that was investigated in the study or on new approaches that may emerge in the future which have a university orientation.

While functioning as pilot centers, successful bidders would be expected to operate as if they were responsible for regional training requirements within the budgetary limitations to be negotiated with the NHSB. It is only in this way that a true test could be made of the effectiveness of regional program strategies for highway safety manpower development. Within the regional concept, there is some flexibility in methods of establishing centers. The first and most obvious option is that of consolidating all requirements for training, education, and research, at a single university, which would augment its staff and facilities, if necessary, to meet such needs. Another option is to have a consortium of several universities within a region provide the necessary facilities, equipment, faculty, and so on, required to meet the training requirements that would be established for a region. Within consortia-type centers, there are several subalternatives. The center could be located in one university, while credits could be given for courses given in several universities within the same region. An extreme case would be to rotate the center location among the universities comprising a consortium. One objective in the selection of universities to host regional pilot centers will be to fund for the implementation of different regional strategies so that a maximum of experience may be gained.

Bidder universities would be asked to describe experimentation they would conduct in the process of meeting operational requirements of training and education. This experimentation could include study of how the center would relate to employing agencies, how it would evaluate its own effectiveness in training, and how it would relate to other universities in its region. Planned variations in the implementation of training curricula, adaptation of innovative instructional technologies, and so on, should also be described. Experimentation suggested by responding universities should be supported by a description of the procedures which would be used for evaluation purposes. The experimentation should provide for an operational test of critical major functions of the center. Therefore, any variations introduced for purposes of testing such functions would have to be embedded in the nominal operation of the center as it provided for manpower development and research. A critical function which could be subjected to test, might be that of validating operational procedures for determining training loads, either independently or with NHBS support.

Sample Request for Proposal:

THE ESTABLISHMENT OF REGIONAL PILOT CENTERS FOR HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH

BACKGROUND

Highway Safety and Motor Vehicle Acts of 1966

The current basic legislation underlining all highway safety activities at the federal, state, and local levels is contained in two laws; the National Traffic and Motor Vehicle Safety Act and The Highway Safety Act of 1966.

Public Law 89-563, promulgated on September 9, 1966 and titled the "National Motor Vehicle Safety Act" has as its main purpose the reduction of traffic accidents, deaths, and injuries to persons resulting from traffic accidents. Congress has determined that it is necessary to establish safety standards for motor vehicles and equipment in interstate commerce, undertake and support necessary research and development, and expand the national driver register.

Section 106(a) states that the Secretary of Transportation is authorized to conduct research, testing, development and training by making grants for the conduct of such research, testing, development and training to state, interstate agencies and non-profit institutions.

Public Law 89-564, issued on September 9, 1966, provides for the Highway Safety Act, which states that each state shall have a highway safety program approved by the Secretary of Transportation, designed to reduce traffic accidents and injuries and property damages resulting therefrom. Such programs are required to be in accordance with uniform standards promulgated by the Secretary.

Under Section 402 of the Act, matching funds are to be apportioned to states on the following basis: 75 percent of the funds will be based on population, and the remaining 25 percent will be apportioned according to a formula developed by the Secretary.

The Highway Safety Act provides that at least 40% of all federal funds apportioned under Section 402 to a state for any fiscal year will be extended by the political subdivisions of the state carrying out authorized local highway safety programs.

Chapter 7

EVALUATION PLAN

Chapter 7

EVALUATION PLAN

Introduction

The overall purpose of the evaluation procedure is to assist the NHSB in determining the quality and effectiveness of HSMD&R Centers. Effective gauging of HSMD&R Centers can be achieved in two ways: (1) through an evaluation of administrative and operating guidelines as shown in Chapter 6, "Guidelines for Administration and Operation"; and (2) by means of on-site periodic inspection visits.

These two methods are not exclusive. Actually, the best results would be achieved by using both a procedural evaluation of guidelines and on-site inspection. Subsidiary tasks to be dealt with are selection and composition of evaluation teams, schedules of evaluation team visits to HSMD&R Centers and incorporation of the evaluation procedures into the RFP.

Evaluation Procedures

The evaluation procedures are grouped according to the following five categories, taken from Chapter 6, "Guidelines for Administration and Operations":

Financial affairs

Facilities and equipment

Curriculum and research activities

Administrative and operational policies and procedures

Personnel aspects

Financial Affairs

In financial matters, the HSMD&R Center performance would be measured and evaluated against the following parameters.

Matching funds

Scholarship and fellowship funds

Recruitment costs

Program funding and budget performance

Faculty salaries

Other salaries

Overhead

Financial and accounting methods and procedures

Cost of training and education per student

Matching Funds

The matching funds performance would be recorded and presented as shown in Table 7-1.

Scholarship and Fellowship Funding

The scholarship and fellowship funds measurements and evaluation could be reported according to Table 7-2.

Recruitment Evaluation

The recruitment costs could be distributed by three main objects of recruiting, i.e., students, faculty, and administrative support personnel. Attracting students to the HSMD&R Center is a continuous recruiting function, while the hiring of faculty and other center personnel is an initial intensive recruiting effort, but is subsequently limited to future personnel replacement as a result of turnover.

Recruitment costs could be also evaluated by subfunctions rather than objects, such as costs of advertising, interviewing, and initial indoctrination and training.

Table 7-3 illustrates a recruiting cost recording and evaluation format.

- Serve on national educational and safety committees, participate in safety and education conferences, and generally contribute to the professional development of safety manpower.

- Represent the NHSB on matters of professional and national interest in the safety manpower field.

Highway Safety Manpower Requirements

The following quote from the chief counsel's statement at Congressional Hearings on July 15, 1966, is only one example of the shortages of safety manpower existing in this country:

> Manpower shortage--competent inspection personnel will be in short supply; mediocre inspection personnel will be worse than none at all. Automobile manufacturers maintain training schools for the service departments and the dealerships. It should be possible to establish similar training schools for vehicle inspection personnel, staffed by competent automotive engineers. This could be established on a regional basis, with operating costs shared by the states within the service area.

A severe nationwide shortage of trained manpower exists in all safety technician and professional categories. These shortages embrace all levels of skills and knowledge within these specialties. An intensive national education and training effort is needed to bridge these gaps and to keep abreast of the manpower requirements for initiating and sustaining highway safety programs necessary to implement the two Acts of 1966.

Categories of Highway Safety Manpower

There are four basic categories of highway safety manpower: research manpower-post-doctoral, research manpower-doctoral, professional manpower, and technical manpower.

Representative of the first category are research administrators and traffic safety researchers of many disciplines. In the second category are doctoral research manpower, consisting mainly of multidisciplinary traffic safety researchers.

Professional manpower consist of such categories as traffic engineers, traffic safety program managers, driver education teachers, automotive engineers, and driver education supervisors.

Table 7-1

MATCHING FUNDS STATUS REPORT

Fiscal Year________________ Accounting Period________________

Description (Purpose) of Matching Fund	Total Amount $	Accounting Period Performance			Cumulative Performance		
		Budgeted	Spent or Committed	Spent or Committed Over Budgeted—%	Budgeted	Committed	Spent or Committed Over Budgeted—%
1.							
2.							
3.							
4.							
All Matching Funds							

Table 7-2

SCHOLARSHIPS AND FELLOWSHIPS STATUS REPORT

Academic Year____________

Semester or Quarter____________

Type of Scholarship or Fellowship	Source of Funds	Amount of Sch. or Fellowship	No. of Recipients	No. of Students[1]		
				This Quarter/Sem.	Previous Quarter/Sem.	A Year Ago
(i.e., doctoral, post-doctoral, M.S., M.A.)	(i.e., NHSB, State, University, private, etc.)					

Notes· [1] No. of students taking a minor in highway safety

Table 7-3

RECRUITMENT COSTS STATUS REPORT

Academic Year________________ Semester or Quarter________________

	Students	Faculty	Other Personnel	Total
1. Advertising Cost				
2. Interview Cost				
3. Indoctrination/Initial Training Cost				
4. Unit Cost (i.e., Cost per student)				

Comments:

Program Funding and Budget Performance

Program funding and budget performance are so closely related that they should be examined and evaluated simultaneously. Sources of funds will vary with the type of HSMD&R Centers; budgeting, however, should be made as uniform as possible among all centers. A suggested control format is shown in Table 7-4.

All excessive variance in budgeted expenditures should be explained in detail, i.e., causal factors, and corrective actions undertaken. The NHSB may wish to establish a criterion, e.g., 10 percent variance, as the critical point, beyond which explanation or justification would be required. In the last analysis, however, experience will dictate those variances in budgeted expenditures on which an "alarm" should be rung.

Faculty Salaries

Faculty salaries probably represent the single highest expense category in the HSMD&R Center. Basically, there are two benchmarks against which to gauge the faculty salary levels: (1) against the average of the entire program, i.e., all centers, and against the nationwide averages; and (2) faculty salary per student-hour (student-hours is the product of the number of class and lab instruction hours, and the number of students), as compared with the program average.

A suggested format for monitoring faculty salaries is shown in Table 7-5.

It should be noted that faculty salaries are reported annually, rather than each quarter or semester, as the changes in faculty salary levels are negligible during any given academic year.

A long term corrective action to lower faculty salaries, if found appreciably higher than the program and national averages, may be an attempt to reduce the seniority level of the faculty staff through more intensive recruitment. In other words, particular courses given by a full professor might be as well taught by an associate or assistant professor.

Other Salaries

"Other" salaries (i.e., other than faculty salaries), shown in Table 7-6, could be evaluated similarly to the faculty salaries, except that, in this case, comparison with "local labor market conditions" would

Table 7-4

PROGRAM FUNDING AND BUDGET PERFORMANCE

Academic Year_______________ Semester or Quarter__________________

Funds		Expenditures			
Source	Amount	Category	Budgeted	Actual	Variances
(i.e., NHSB, State, Private Gr[illegible] Unive[illegible] Grant, etc.)		Faculty Salaries, Other Salaries, Facilities, Equip., Ops., & Maintenance.			
		Overheard			
		Capital Expenses			
Total					

Table 7-5

FACULTY SALARIES

Academic Year ____________________

Average Annual Salary			Faculty Salary per Student/Hour	
Center	Program	National	Center	Program

This description should include the build-up time that will be necessary to bring full faculty support to the proposed program and show the number of faculty that will be added to the program during build-up.

- The present faculty structure, i.e., the ratio of full professors to associate professors and assistant professors. This outline should indicate how these ratios would be applied to the proposed program or whether it would be necessary to make a departure from existing ratics because of unique requirements in the program. Describe plans, if any, to employ instructors or other types of personnel for instructional purposes.

- A description of the short-course instructional staff, including the availability of lecturers from the university and from the surrounding areas. The description should indicate whether these would be full-time or part-time lecturers and from what other sources they would be drawn (e.g., industry, other universities, government agencies, and so forth).

- The present student/teacher ratios prevailing in the university and the ratios that would be observed in the proposed program. If an exception to the prevailing ratios will be necessary, an explanation should be presented.

- The normal faculty instructional load and the instructional load that faculty assigned to the center may be expected to carry.

- Procedures for faculty recruitment observed at the university and how they would be extended to this program to obtain additional faculty.

- Faculty salary schedules, including entry levels and average annual increases.

- University policy on providing time to faculty for private consulting and research.

- University policy and procedures that would govern the assignment of faculty to the different teaching requirements such as the training of technical personnel, highway safety professional manpower, practitioners in highway safety research, and graduate students.

Table 7-6

OTHER THAN FACULTY SALARIES
(Academic Year___)

Average Annual Salaries			Salaries per Student/Hr.	
Center	Program	% Increase over Last Year	Center	Program

be more meaningful than comparing with national averages. In this case, also, annual reporting would be adequate.

Overhead

Reported changes in overhead rates have no real meaning unless the makeup of the overhead is known. Controllable and noncontrollable (by the center and the university) expenditure items should be separate, and corrective actions should be documented, when they are appropriate.

Financial and Accounting Methods and Procedures

Financial and accounting methods and procedures, i.e., financial forecasts, budgets, cost accounting, allocation of general and administrative expenses, capitalization, estimating practices, etc., vary widely among universities. It is expected that the guidelines used in the RFP and in actually organizing HSMD&R Centers will provide a standard for financial management and reporting eventually to be achieved by all centers. This will be a lengthy process and probably will never be completely successful because of the varied and independent structures of U.S. universities.

In addition to evaluating financial methods and procedures for compliance with guidelines, these methods should periodically be reviewed for accuracy, adequacy of expenses, distribution, and timeliness.

Facilities and Equipment

Procedures for evaluating facilities and equipment used by the HSMD&R Centers fall into two broad categories: (1) evaluating the adequacy and utilization of existing facilities and equipment; and (2) monitoring the progress of new facilities and equipment planning, design, construction, procurement, and installation.

The adequacy of facilities and equipment currently available to the centers can best be evaluated by visual inspection. The utilization assessment can be made by means of periodic reporting, which would indicate a potential "crowding" situation or an under-utilization of real assets.

Suggested formats are shown in Tables 7-7 and 7-8.

Table 7-7

FACILITY UTILIZATION

Academic Year________________ Semester or Quarter________________

Types of Facilities	Percent Utilization during Reporting Period			Remarks
	Preceding	Current	Following	
(i.e., office space class rooms, auditoriums, laboratory space, special facilities:				
—driving range				
" "				
—fog chamber				

Table 7-8

EQUIPMENT UTILIZATION

Academic Year____________________ Semester or Quarter______________

Type of Equipment	Percent Utilization during Reporting Period			Remarks
	Proceding	Current	Following	
(i.e., EDP				
—Laboratory (by major type)				
—Driving Simulators				
—Special Equipment:				
—				
—				
—				

The evaluation of new construction and equipment procurement and installation, once the plans, design and financing have been firmly established, consists of monitoring the progress against time schedules and budget performance. As time and costs expenditures are closely related, they should be reported in one document.

Suggested formats are shown in Tables 7-9 and 7-10.

The crucial phase of facilities and equipment is the planning aspect, i.e., the time when requirements are matched to design criteria, available funds, forecasts of future growth and changes, etc., as most of the decisions involving capital expenditures are irrevocable. The evaluation of the progress of facilities and equipment, construction, procurement, and installation becomes secondary in importance and, therefore, should be a relatively simple procedure.

Cost of Training and Education per Student

General comparison of the instructional cost per student between two or more HSMD&R Centers or between training and education can be obtained as follows:

$$\text{Instructional cost per student} = \frac{\text{Total Educational and General Expenditures}}{\text{Total Number of Students}}$$

Table 7-11 shows a suggested format according to the definitions given below.

Total Educational and General Expenses. It is recommended that the account definition of the College and University Business Administration Manual* be followed. These expenses include the following items:

- General administration and general expenses--Include salaries and expenses of the dean of students and his staff, the guidance and counseling staff, the student health services, and student activities financed from institutional funds and the registrar's office.

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* College and University Business Administration, Vol. 1, American Council on Education, Washington 6, D.C.

Table 7-9

NEW CONSTRUCTION PROGRESS

Academic Year________________

Semester or Quarter________________

Type of Facility	Schedule Completion in %		Fiscal Performance		Remarks
	Actual	Planned	Expenditures	Budget	
(i.e., Office Space,					
Lab Bldg.,					
Auditorium					
Class Rooms					
Special Structure:					
—Driving Range					
—Parking Lot					
Site Preparation					
Landscaping					
Utilities					
Etc.					

Table 7-10

EQUIPMENT PROCUREMENT AND INSTALLATION PROGRESS

Academic Year____________ Semester or Quarter____________

Type of Equipment	Acquisition and Installation Completion Schedule--in %		Fiscal Performance		Remarks
	Actual	Planned	Expenditures	Budget	
—Laboratory (by type)					
—Driving Simulators					
—Special Equipment					
Etc.					

Table 7-11

COST OF TRAINING AND EDUCATION PER STUDENT

State, Regional, or Pilot HSMD&R Centers ____________

Academic Year ____________

HSMD&R Center	Educational and General Expenditures					Student Population			Instrnl. Cost Per Student
	Gen. Adm. Trn. & Gen. Exp.	Instr. & Deptl. Research	Libraries	Operations & Maint.	Total Educ. & Gen. Exp.	Enrollmt.	WSCH[1]	FTE[2]	

---

[1] WSCH = Weekly Student Class Hour (for training classification only)

[2] FTE = Full-time-equivalent Students

- Instruction and departmental research--Includes expenditures of instructional departments, colleges, or schools, class and laboratory instruction, and departmental research activities; excludes, and should be distinguished from, large appropriations for "organized research."

- Libraries--Includes the cost of operating separately organized libraries, such as salaries of library staff, purchase of books, supplies, and library operating costs.

- Operations and maintenance of the physical plant--Includes operations and maintenance salaries, wages, supplies, and other expenses and equipment for the operation and maintenance of the institutional plant, with such items as repairs of furniture and equipment, care of grounds, utilities, rent, property insurance, general trucking, and so forth; excludes overhead expenses attributable to organized research, public service, and extension services.

Total number of students. Student enrollment in each education classification requires conversion of part-time students to FTE for the academic year, with allowance for summer session students. The Office of Education has used the following adjustments, based on an earlier study* that analyzed expenditures in 16 states: all full-time resident degree-credit students; one-fifth of those enrolled part-time resident degree-credit; three-fifths of those classified as terminal occupational; one-fifth of those enrolled resident adult education, one-fifth of those enrolled for extension degree-credit. Summer session enrollment is adjusted as one-third of the enrollment in the fourth quarter and one-fifth of the enrollment reported for each summer session.

Student enrollment in the training classification, includes nondegree-credit trainees attending short-courses on a part-time basis. The WSCH (Weekly Student Class Hour) measurement of student population is recommended for description of costs, faculty load, and class size. Through an appropriate divisor, this measure can be converted to FTE.

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* Student Higher Education, by Mushkin & McLoone, National Planning Assoc., Washington, D.C., 1960.

Curricula Activities

The mission of the HSMD&R Centers is the education and training of research, technical, and administrative personnel engaged in highway safety activities at all government levels, including those already employed and those who will be enrolled in a center shortly after college graduation. The curricula adequacy, presentation (delivery), and evaluation are prime objects of evaluation. Research activities are of interest only as they support the education/training process in the center.

Assuming that the curricula for highway safety instruction will be established soon after organizing the HSMD&R Centers, the essential purpose of evaluation is twofold in this respect. First, to identify gaps in the original curricula planning as they become apparent early in the operation of the center. Second, to provide an information base for modifying the curricula so they reflect the changing conditions of highway safety manpower development needs.

Evaluation through the medium (and tedium) of periodic reporting can best give indication of trends but rarely the reasons for shortcomings or failures. The latter can be discovered through visits, conferences, working seminars, and so forth, between the NHSB, the HSMD&R Center and university officials, the faculty and students. The feedback of "graduates" (i.e., both advanced degree recipients and short-course attendees) could be a valuable input to the evaluation process.

An indication of the quality and pertinence of curricula can be obtained by a comparative evaluation of highway safety practitioners immediately before and after their attending courses at the HSMD&R Center. It should be kept in mind, however, that their improved (or impaired) performance on the job, following training at the center, may be a result of changes in attitude as well as the newly acquired knowledge.

Evaluation of the training program should have two primary concerns:

1. Curriculum adequacy with respect to

    - Reduction of the requisite end-of-course skills to behavioral objectives, stated in terms understandable by the NHSB as it attempts to relate them to job specifications and program standard guidelines. The objectives should also be meaningful to supervisors in the field if they are to employ newly returned graduates from short-courses at the skills levels that the students have recently acquired.

- Equitable distribution of training time within a course according to the relative criticality of knowledges and skills required in job performance.

- Appropriate applications of state-of-the art advances in instructional technology, including programmed learning, and individualized instruction. Applications of the new technologies have been remarkably successful in military technical training programs, and the short technical courses proposed for highway safety personnel should also profit from these new developments.

- Equipping those who will return to the field as instructors with manuals, syllabi, lesson plans, and so forth, so that they will not be forced to plan their field courses from the beginning and thereby possibly obviate any hopes that a modicum of standardization would prevail in the training programs other than that which might be achieved at the centers. The burgeoning groups of new instructors also must be equipped with basic instructional skills, and it should be expected that curriculum objectives will cite those skills that are to be acquired in instruction, with an exception made for those coming to centers in such small numbers that do not require establishment of field training programs.

2. The objectifying of student proficiencies and understandings through measurement to

   - Provide an understanding of what each course is creating in terms of student achievement and thus provide guidelines for curriculum change.

   - Ensure that the courses are motivating in their own right, so that students are not exercised in skills or understandings that they have already acquired.

   - Validate, literally, the adoption, even on interim or experimental grounds, of new instructional technologies such as those that have been mentioned earlier. Individualizing the instruction, for example, of relatively highly placed safety manpower, may lead to a more rapid acquisition of skills and knowledge than would the insistence of traditional classroom instruction. However, such eventual outcomes are capable of evaluation only if the objectives of each course of instruction have been stipulated in measurable ways.

Traditional ways of evaluating the effectiveness of graduates in the field have included use of the survey questionnaire. These are typically mailed to supervisors, who are then asked to register their satisfactions with recently received graduates, suggest changes in the training program, indicate critical performance areas in which the graduate has failed to live up to their expectations, and so forth. The assumption has been that the compiled wisdom of polled supervisors will unlock the secrets of curricula change. The actual experience is, however, that such results do not transpire and that they must be interpreted very carefully. Very frequently there is either a misunderstanding or lack of agreement between people in the field and those in charge of training programs as to what the end-of-course proficiencies should be; actually, such log-jams point to the need for more activistic approaches to validation of training programs.

The conduct of off-site evaluation (away from the center) would provide center personnel with an opportunity to assess the effectiveness of their students in ways additional to query of the supervisor, although the supervisor would always be the key individual to be contacted and interviewed. Through interviews, much would be learned of his problems with newly trained personnel that could have impact upon the center's training program. Interviews would provide an opportunity to inform supervisors as to what they could reasonably expect from graduates of short courses.

As a critical point in off-site evaluation, the center should be most concerned with the instructional effectiveness of its graduates, the conditions under which they are being forced to instruct, and the adequacy of the materials (e.g., syllabi, lesson plans) with which they have equipped the newly commissioned instructor. Such things could never be found through interview or survey of the supervisor but must be ascertained by direct contacts with the field situation. The periodicity of such field visitation and the magnitude (e.g., number of courses to be visited, sites to be visited) would be within the purview of each center in coordination with the NHSB. The NHSB may wish to commission teams for such purposes or, perhaps, provide funds to each center to contract for such support within its region.

Research Activities

The evaluation of research activities is intrinsically a difficult task. One of the main problems is to keep research related to the instructional requirements and not to allow it to become a self-perpetuating, independent activity with its own sources of funding through grants and outside contracts. It may become a problem to do so, since the obtaining of research contracts is an entrepreneural task and is also, a function of what is needed by government agencies. If the NHSB were to provide research funding, it could provide direction to the research by recommending that it be related to the center's program. At the same time, it should be realized that the scope of manpower development is so great from the standpoint of job specialties that it is somewhat difficult to envision that any kind of highway research would not be related. It is perhaps the over-specialization in interest areas that has traditionally characterized university research which might create an imbalance in the research program.

Administrative and Operational Policies and Procedures

The evaluation in this area should consist of gauging the operating practices rather than reviewing the written policies and procedures; it is possible to follow the letter of written rules and regulations without accomplishing the goals and objectives of the organization.

The guidelines for administration and operation of the center are applicable in the areas of university-center relations (interface), internal operation of the center, and coordination with the NHSB. Thus, the evaluation efforts will concentrate on the same aspects.

The evaluation of university-center relations should be directed to determining if the center is still optimally located in the university organization, if the relationship between the center and the participating schools and departments in the Highway Safety Program is satisfactory, and if university overhead-covered services are satisfactory.

The evaluation of the center internal procedures should be directed towards their compatibility and eventual standardization for all centers in a category (i.e., large state, regional, or consortia). Internal procedures should also be periodically checked against the changing university administrative and operating procedures to avoid conflict or duplication.

Policy and procedures governing relations with the NHSB are probably the most critical as they affect all three parties concerned with the program, the HSMD&R Center, the university, and the federal government. Ideally, the procedures within the three organizations that pertain to their interrelationship should be reviewed, evaluated, and updated by representatives of all three groups.

Personnel Aspects

An attempt should be made to keep track of the number of students by their departments and schools, as well as of their employment after graduation, for at least one--and preferably three--years. This will provide fairly good statistics on the overall efficiency of the program.

Another pertinent item of information would be the number of students in each class (i.e., the variation of class sizes, by quarters or semesters). The mix of graduate students is also of interest. It was assumed that, based on overall university statistics, there would be five Master degree candidates for each Ph.D. candidate. Tracking of such statistics would confirm or revise forecasts of future enrollment. Another important statistic is the ratio of part-time or short-time course attendees versus full-time graduate students. Student enrollment by geographic origin is of interest, particularly in the case of regional centers, where it would indicate if the regionalization was properly made or does require revision. The quality of students will be difficult to measure; however, reporting grades might indicate, in the long run, the quality of the program, curricula, and instruction.

The evaluation of faculty policies and procedures should be limited to the reporting of student-teacher ratio, the faculty mix (i.e., the relative number of full professors, associate professors, assistant professors, instructors, and graduate assistants). The faculty instructional load should be evaluated periodically to see if it matches the original assumption of ten hours of teaching a week for eleven weeks in a quarter. The load of each faculty member as far as the center-sponsored courses are concerned should also be monitored. In other words, are faculty spending most of their instruction time at a center or in their school or department?

The evaluation of the center staff should be limited to a work load analysis of each staff member, and particularly with reference to the interaction with the university staff and the NHSB staff members who are monitoring or participating in the highway safety program.

The above evaluation procedures appear fairly simple; however, a proper evaluation of personnel affairs cannot be made by periodic reporting only. Periodic reports should be supplemented by an outside audit, preferably conducted by one or more teams that would audit several or all centers in the highway safety program.

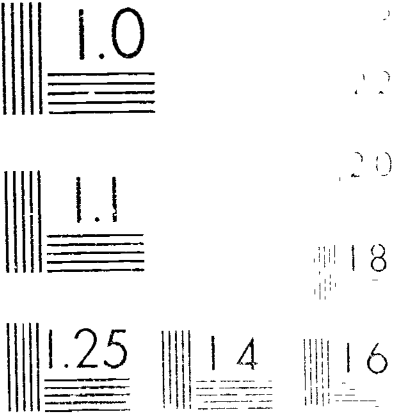
Evaluation Teams

The on-site evaluation could be accomplished in two different manners: (1) by an evaluation team of members mutually acceptable to the university and the NHSB. Of course, these members would be prominent in the field of highway safety, would represent a good balance of geographical representation and will also represent all concerned factions. By this is meant that there would be representatives from the university faculty and administration, officials from the NHSB, and preferably some independent consultant or senior professional members of a disinterested organization, such as a nonprofit research institute; (2) by an outside agency contracted to set up a small team that would devote full-time attention to the evaluation of the NHSB highway safety centers. This could be a newly-formed, nonprofit organization, very small, and with the sole purpose of evaluating the HSMD&R Centers; or it could be a nonprofit or management consulting concern that would form from its pool of professional consultants a team to conduct this evaluation task.

The pros and cons of the two approaches are briefly discussed below. From an economic point of view, the first approach (i.e., by an "ad hoc" team) would cost less than contracting an agency. The members of the team working only part-time, for a fee, on the evaluation of the HSMD&R Center would definitely require less funds than a contract for a full-time effort by an existing or new agency where, in addition to the salaries of the professional team members, the NHSB would have to fund the overhead burden and the fee.

On the other hand, an agency approach might be more effective, since by contractual obligation a member of the team would devote full-time attention to the evaluation, while the part-time "ad hoc" team members, having their own main interests and occupations, would probably become less involved in the evaluation effort. Another advantage of using an agency is that its members would be more likely to be objective in the evaluation effort, as they have no vested interest in any aspect of highway safety or highway safety manpower development. The prominent members of an ad hoc team are probably now engaged either in teaching or some other aspects of highway safety research, education, and promotion.

Scheduling the team visits to the centers would be much simpler with a contracted agency, as their effort is full-time and the visitation schedules could be easily arranged at any time during the academic year, depending on the availability of the NHSB staff and faculty members at the center. With an ad hoc team, the scheduling problems would be much greater as all team members have many other commitments; it would be quite a task


1.0
1.1
1.25
1.4
1.6
1.8
2.0

Task 5 - Organization

The objective of this task is to have the contractor describe his perceived organizational structure of the center and, in particular, how it will fit within the existing university organization. The description should include the relationship of the center to the university administration, relevant schools and departments, and other research activities within the university. In the event there is a precedence for or a desire to share the program with other universities, how a consortium-type organization would be established and operated should be explained. The advantages of having a center within the university, or of establishing a consortium should also be presented.

In responding to this task, the following information should be provided:

- The organizational structure of the center, indicating the positions by type and number of employees (professional and support).

- Location of the center within the university organization. For example, would the center director report to the president, the provost, or a vice-president of the university, or would the center be incorporated in one of the schools or colleges, such as engineering or education?

- Interface of the center with the university in the areas of finances, administration, special services, student affairs, and so forth. The functions that would be established in the center and those that would be provided by existing university facilities should be outlined.

- University preferences in dealing with the NHSB curricula, financing, and administration. A preferred plan for communications and relations between the center and the NHSB should also be described.

Task 6 - Facilities and Equipment

In responding to this task, a description should be presented of facilities and equipment that would be made available for the operation of the center. This description should include the funding requirements and schedules for completion of all additional facilities that would be needed to accommodate the new center. If available, the description of to arrange a mutually agreeable time for visitations for all team members to a center. Actually, the scheduling requirement might be the critical one in setting up an "ad hoc" team approach to the evaluation of HSMD&R Centers.

In addition to the two alternative ways for organizing evaluation teams, the possibility of the evaluation being performed exclusively by the NHSB or other federal government civil service officials should also be considered. Recently, however, sponsors of federally funded programs have come to rely increasingly on outside consultants and experts in particular fields to conduct on-site visits.

Chapter 8

A GENERAL PLAN FOR PROGRAM CONTROLS

Chapter 8

A GENERAL PLAN FOR PROGRAM CONTROLS

Background

In August 1965, President Johnson ordered all major federal departments and agencies to adopt a PPBS (Planning-Programming-Budgeting System) defining for each agency its goals and the most appropriate programs to carry them out. In a PPBS, each program is analyzed in detail to determine what costs and benefits might be expected and enable selection of those programs that offer the best cost-benefit ratio. Planning on a five-year projected basis is required, rather than the one-year budget review of the past.

In the Department of Transportation, the program format is likely to experience a change in emphasis as time progresses. For example, a NHSB program format is illustrated in Table 8-1. It is evident from this table that variation in emphasis of several of the missions specified would affect the activities of HSMD&R Centers. Hence, in terms of planning, higher level requirements are apt to be imposed on centers without the center's instigation or approval. The center's own program, then, will be a subpackage or element fitting into a larger matrix.

For the purpose of this report, such overriding requirements are treated as "givens" and the program controls are developed from what might be considered as the perspective of HSMD&R administration.

Programs Controls--General

Program controls are made effective through a feedback process in which measured quantities are compared with preset standards. In the event that the comparisons indicate variations between the quantities and their standards, corrective actions can be taken. As a practical matter, the closer the controlling point is to the point being measured, the more effective the control will tend to be. This constitutes decentralization of control which, along with delegation of authority, is a well-known management technique. In large systems, particularly management systems, the feedback details which flow up through the system will

Table 8-1

ILLUSTRATIVE PROGRAMS FOR NHSB

- New Motor Vehicle Standards
  - Standards
  - Compliance
- Used Motor Vehicle Standards
  - Standards
  - Repair Technology
  - Inspection
- State and Community Highway Safety Programs
  - Standards and Guides
  - Safety Grants
- Accident Investigation and Injury Information and Analysis Systems
  - Accident Investigation
  - Information Systems
- Research and Development (Support)

tend to become more and more gross as one proceeds closer to top management. Yet under a controlled program, the capability must exist to follow quickly from gross information, which does not meet standards, to the detailed point or points that are causing the variation. The literature refers to this process as "management by exception."

Control Elements

In the case of the Highway Safety Manpower Development and Research Centers, quantities one might wish to control (or use as a basis for control) include, but are not limited to, the following:

Student enrollment

Degrees or certificates granted

Classroom hours

Student attendance hours

Faculty count

Student-to-faculty ratio

"Catchment basin" statistics such as

  Passenger miles traveled

  Accidents

  Lost-time accidents

  Backlogged students

  Number of miles of way completed

  Number of miles of way placed under construction

  Population density

  Urban transit passenger miles, and so forth

Dollars spent for

- Faculty
  - Professional
  - Paraprofessionals
- Administration
- Facilities
- Educational materials
- Utilities
- Training aids, and so forth

Source of funds

Finally, and perhaps of most importance, the program elements listed in Table 8-1

Program Controls--Decentralized

Centers at state or departmental levels might be required to report activities on a format similar to that of Table 8-2. Table 8-2 has three major sections--one aimed at physical counts, another at financial source data, and the third at expenditure breakdown information. This report is representative of what would be prepared at an individual center or department of a center, and it would have a defined "issue date." Control data must be current to be effective.

The base selected as a measure of what activity might be expected within a "territory" or "catchment basin" is "passenger miles traveled," which seems to be a reasonable yardstick on which to base highway safety manpower activities. It would be particularly useful if it could be easily estimated, such as, on the basis of gasoline consumption.

The programmed amounts in Table 8-2 are estimated on the basis of time related costs and variable costs related to passenger miles traveled or student load. Time-related costs are usually the result of executive decision and do not vary from one period to the next. Such costs as depreciation, real estate taxes, insurance, and administrative salaries

Table 8-2

ILLUSTRATION OF DECENTRALIZED REPORTING FORMAT

Program Control Summary

Program Element, e.g., New Vehicle Standards
State or Other Sub-Category ____________

Period Ending ____________________________ Standard Base
Date Report Issued ________________ Estimated Passenger Miles ______

Students Enrolled _________ Student Backlog _________ Ratio _______
Teaching Faculty _________ Classroom Hours _________ Ratio _______

Funds Allotted: State _______ U.S. _______ Ratio ______ Total _______
Funds Expended: _____________ Committed ___________ Total _________
Ratio _____________

Expenditures Description Code	Expense	Programmed	Ratio
01 Administration & Executive			
02 Professors			
03 Associate Professor			
04 Assistant Professor			
05 Instructor			
06 Other Technical and Support			
07 Clerical and Other Office			
08 Vacation and Paid Holidays			
09 Other Compensation			
10 Texts and Other Training Supplies			
11 Office Supplies			
12 Utilities			
13 Other Supplies			
14 Outside Service Contracts			
15 Equipment Rental			
16 Associations and Subscriptions			
17 Travel and Per Diem			
18 Communications			
19 Miscellaneous Expense			
20 Payroll Taxes			
21 Depreciation			
22 Allocated Overhead			
Total			

fall into this category, Variable costs, on the other hand will fluctuate with the level of activity in an organization. However, most variable costs do not vary strictly in proportion to the level of activity. Some experience is required, therefore, to establish how categories of expenditures react, so that the program controls can be computed realistically.* Hence, for at least the first year or two, the programmed values must be based on estimates that are educated guesses rather than experience-based computations. The estimates, in turn, will depend on the emphasis that NHSB executives wish to place on each program element.

With the passage of time, it will be possible to base programmed values on models developed from experience. The models need not be complicated. For example, a model relating student enrollment to passenger miles traveled could be constructed employing scatter diagram procedures. Or, using the same technique, relations could easily be found between student enrollment and categories of expenditures (e.g., professors, and so forth).

With such models in hand, it is a relatively simple process to make estimates that reach out in time by extrapolating passenger miles traveled statistics. Hence, five-year plans as called for under the PPBS would become routine and almost mechanical in nature.

Centralized Controls

As one proceeds up the administrative chain, the details become progressively aggregated. Nevertheless, a means for identifying trouble spots is needed. Table 8-3 points to a technique that serves to spotlight deviations from norms, so that corrective actions can be taken at an early date. In Table 8-3, program controls are illustrated for a region, or consortium encompassing a group of states or departments. To demonstrate how the exception principle works, values have been entered into the form illustrated.

It is shown in this form that if the average values for all states (or units) are any mark of what "normal" might be, unit 3 and unit 8 would appear to need attention. The other units are "excepted" from further administration--at least for the present.

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* A more complete treatment of this subject, particularly as employed in industry, is found in Fred Gardner's Profit Management and Control, published in paperback by McGraw-Hill.

Table 8-3

ILLUSTRATION OF COARSER-GRAIN REPORTING FORMAT

Program Element Control Summary

Program Element New Vehicle Standards

Regional Administrative Unit No. __________

Period Ending ______________ Estimated Passenger Miles (or other base) ______________

Date Report Issued ______________

State or Administrative Unit	Student Backlog/ Enrollment	Class Hours /Faculty	U.S./State Funds Allotted	Committed/ Allocated Funds	Programmed/ Expenses
1.	.80	40	1.25	.55	1.05
2.	.95	43	1.30	.53	1.02
3.	1.50	20	2.0	.62	.80
4.	.75	38	1.15	.49	.98
5.	.76	36	1.50	.56	.95
6.	.82	45	1.20	.50	.99
7.	.93	39	1.26	.54	1.03
8.	.60	40	1.00	.48	1.20
9.	.81	38	1.23	.52	1.02
10.	.87	42	1.31	.51	1.05
Total	.80	41	1.25	.52	1.02

Unit 3 (or state 3) has about twice the backlog of students that other states average. One cause of this excess may rest on the faculty, for average class hours for the period covered are less than half the average for other states or administrative units. It will be noted that the apathy apparently exhibited by the faculty is shared by the local government that has not met federal allotments to the extent that other states have. As a result, a troubled financial future lies in store for this unit and commitments and expenditures are getting out of hand. Clearly, corrective action is required if the state (or unit) program is to return to a "controlled" situation.

Unit 8, meanwhile, might be reviewed to determine why the student backlog is so low. It is known from the summary that the state (or unit) government has appropriated generously, and that expenditures are considerably below what has been programmed. The corrective action here might consist of a greater emphasis on recruiting students. On the other hand, a judgment might be made to reduce allotments--both state and federal--if not immediately, at least for the next fiscal period.

It is clear that a series of regional reports such as that described above could be summarized on a single central report in a way that would indicate whether or not the program is in a "controlled" state and, where not, where corrective action might be applied. Table 8-4 illustrates the form that such a report might take. Note that the elements being controlled are those of the NHSB program shown in Table 8-2.

This example of a report shows the level of concentration that might exist at the top executive level. A reporting by program is illustrated here. By glancing at the lower right corner, it may be seen that, overall, monies are being expended at a slightly more rapid rate than that planned (100 percent indicates exactly meeting plans; less than 100 percent indicates expenditures exceeding plans). If this slight difference is to be rectified, it can be seen that the largest deviation is in the Used Vehicle Standards program.

By similar rationale, it is seen that if student backlog is considered too high, the program most in need of corrective action is that of New Vehicle Standards. By returning now to Table 8-3, it will be found that one state or administrative unit should engage in corrective action.

Summary

Although the form that HSMD&R Centers might take are unknown at this time, an illustration of how the program might be controlled has been made above. Features considered to be desirable are as follows:

Table 8-4

ILLUSTRATION OF CENTRALIZED REPORTING FORMAT

Program Control Summary

Period Ending December 31, 1970 Standards Based on

Date Report Issued January 7, 1971 ____________ Passenger Miles

Program Element	Student Backlog/ Enrollment	Class Hours /Faculty	U.S./State Funds Allocated	Committed/ Allocated Funds	Per cent Programmed Cost/Actual Costs
New Vehicle Standards*	.80	41	1.25	.52	1.02
Used Vehicle Standards	.75	42	1.15	.45	.90
State and Community Highway Safety Programs	.76	43	1.20	.50	1.00
Accident Investigation and Injury Information and Analysis Systems	.78	42	1.17	.51	1.02
R&D Support	.77	44	1.18	.50	1.01
Total	.77	42	1.20	.49	.99

* Note that these values come from previous table.

- There is a need for standards against which actual events can be compared to spotlight variations from plans so that corrective actions may be taken. These standards should bear a relationship to the level of highway activity that might be measured by passenger miles or other appropriate measures.

- There is a need for decentralization of controls so that corrective actions can be taken promptly and close to the scene.

- There is a need for a reporting system that becomes more aggregated as one proceeds up the administrative chain. Such a procedure not only discourages excessive detail, but tends to keep communications links open and vibrant.

A Plan for Program Controls with Emphasis on Maintenance of Training Effectiveness

General

The Office of Safety Manpower Development, within NHSB, has indicated a need for the development of program controls that will be aimed at maximizing the training effectiveness of Highway Safety Manpower Development and Research Centers. The emphasis of such plans should be on the training that is to be conducted in short courses for safety specialist and safety professional manpower rather than on the output of students trained at the graduate levels. This is not intended to minimize graduate instruction and the research that will accompany it, for it is felt that the proper selection of universities to undertake responsibilities of manpower development should ensure that such instruction will be the finest that can be provided throughout the country. For short course instruction, however, the assurance of training effectiveness will require a reporting procedure and a series of coordinations among the Office of Safety Manpower Development, the field environment consisting of the employing agencies of safety manpower, and the university responsible for conduct of the training program.

Information Flow and Guidance to Centers from NHSB

Figure 8-1 diagrams the flow of information and guidance that could prevail when the centers begin operations. A flow of guidance, specifications, and other allied information would be directed to centers from the NHSB and from this information they would commence development of

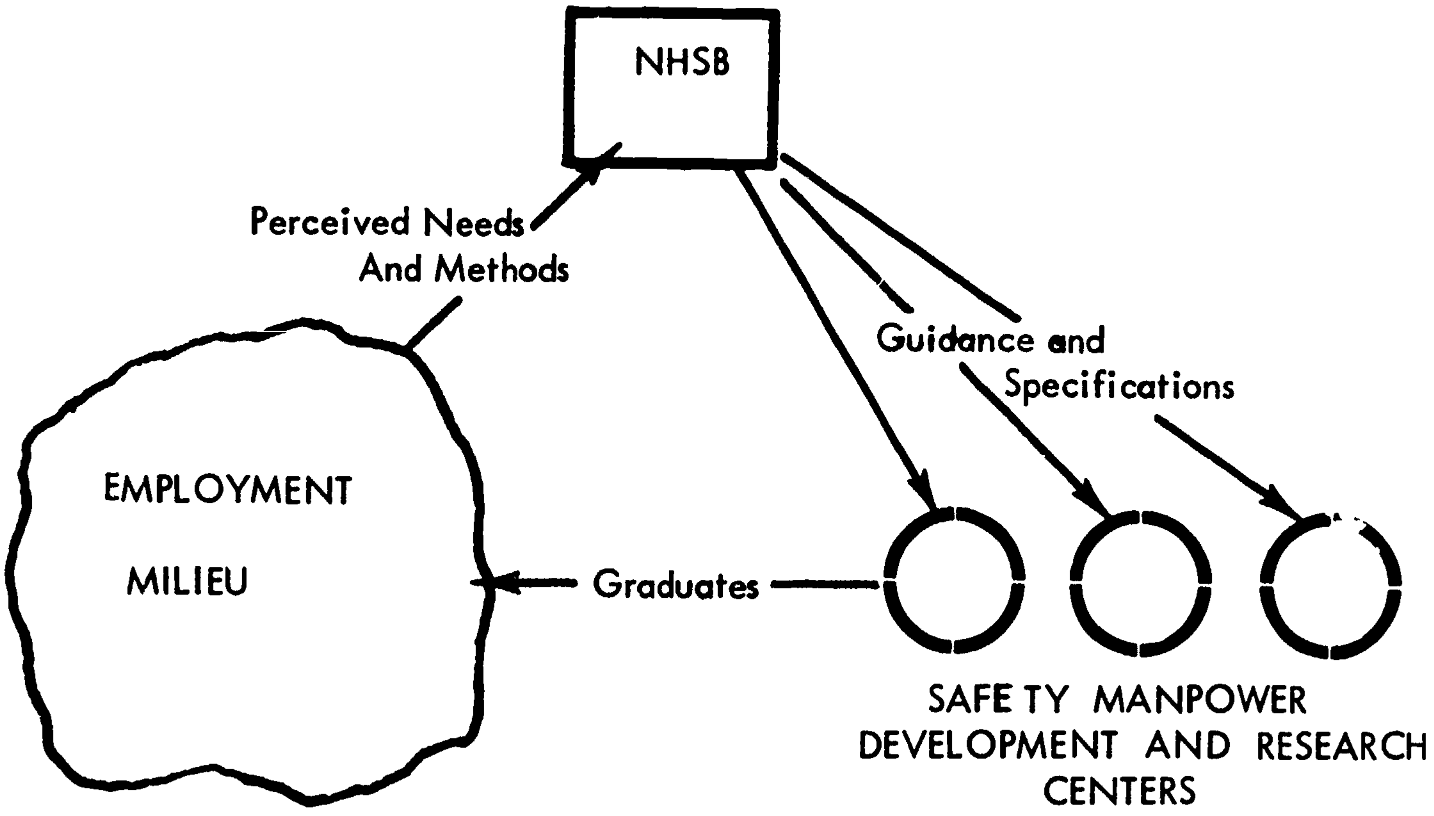

FIGURE 8-1 INFORMATION FLOW AND GUIDANCE TO CENTERS FROM NHSB

their respective programs. This information would be varied and consist of the following:

- New pilot curricula, with directions for experimental implementation and subsequent revision, validation, and so forth.
- Program standards covering motor vehicle and highway safety.
- Proficiency standards reflecting performance criteria for selected short courses or for what is required in the way of performance in the field. (In some instances these may be the same where a course is intended to provide skills that may be applied immediately in the field without further on the job training under a supervisor. In actuality, a single course may have a mix of terminal objectives, with some directed toward the complete engendering of skills and others indicative of partial training only.)
- Research results of studies conducted under contract to NHSB that have a bearing on course content.
- Manuals and other materials developed by the NHSB, or under contract, that interpret program standards and provide guidance for the training of safety manpower.

Having generated the information flow to the centers, the NHSB will wish to maintain cognizance of the extent to which they are incorporating essential materials into the training program. In addition, it is perceived that the NHSB will establish channels of communication with employing agencies in the field, especially at state level; and through such interaction it will become informed of needs that have a direct bearing on the training programs that are being given to safety manpower from the same agencies. This information would be screened and evaluated by the NHSB that, in turn, would provide it in organized form to the relevant centers. In some instances, the information would be reserved strictly for the center responsible for training in the region or state in which the need arose. It might be decided at the NHSB, however, that the expressed need deserved universal concern and, in such cases, the emerging guidance would be made available to all centers.

Information Flow to NHSB from Centers on Actions Taken

Figure 8-2 reflects an information flow from the centers to the NHSB as a function of guidance and information received at an earlier date. Responses from the centers would indicate the extent to which

Feedback Report--NUMBER ONE

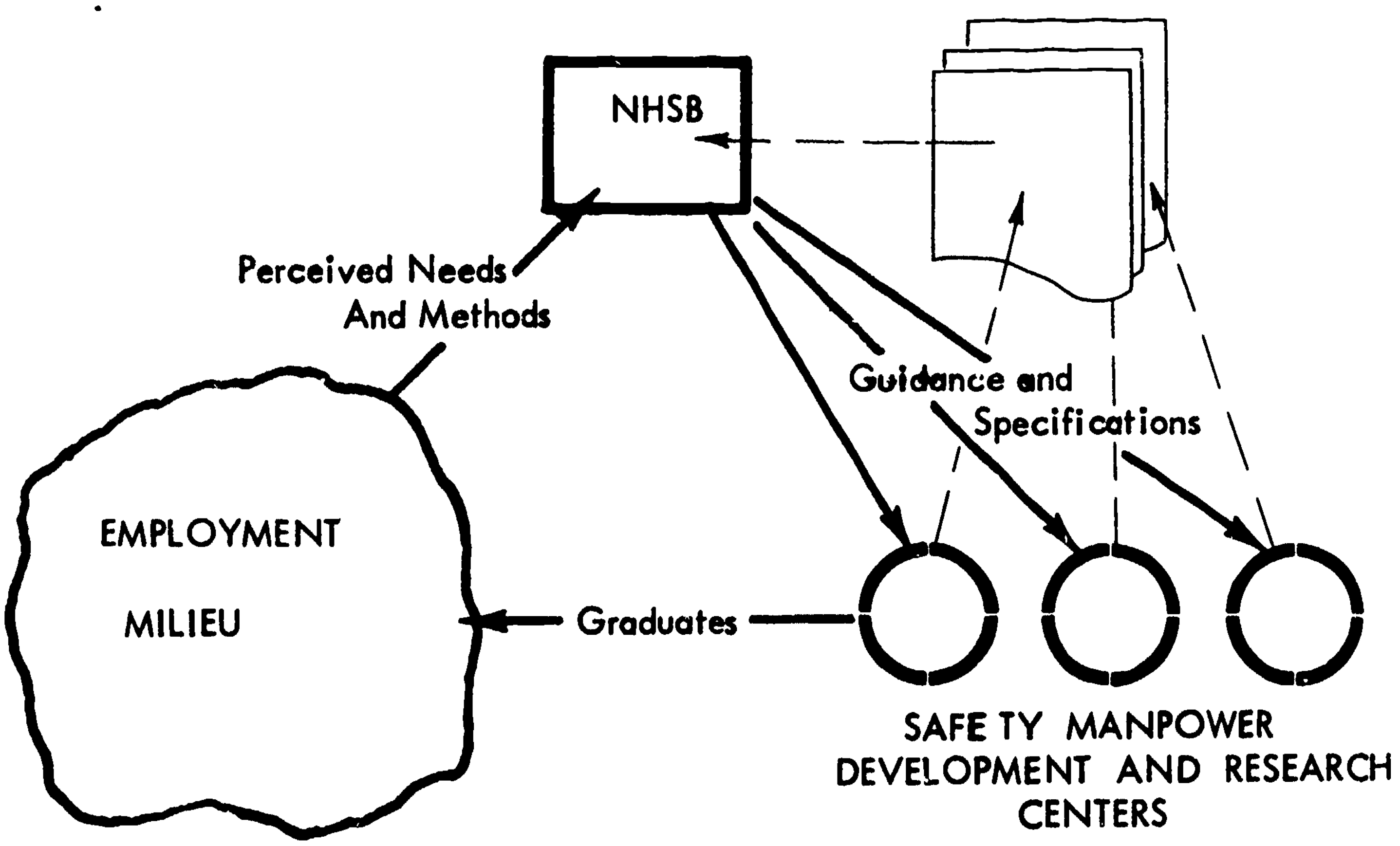

FIGURE 8-2 FEEDBACK REPORT—NUMBER ONE

they have adopted the changes, new standards, shift in emphasis, and so forth, in their training programs. The kind of information that centers could provide is shown in Table 8-5. The example presented in Table 8-5 is one in which guidance has been received by centers to either change or institute instruction on new curricula content to be specified, with an indication of the number of hours that are recommended. Centers would be allowed sufficient time to adopt the new directions in training; then they would be required to report on the extent to which they had provided for the new instruction in the specified training course. Further, the NHSB may wish to remain cognizant of what percent of any course has been influenced by guidelines that it has initiated.

Feedback to NHSB on Student Gain

Figure 8-3 reflects essentially the same channel of reporting back to the NHSB, except that it is intended to convey a different kind of information feedback than that of rate of adoption of actions recommended by it. In this instance, the reporting would consist of showing student gains as a result of completing a course at a center. This type of feedback to the NHSB implies that centers will establish testing programs for purposes of measuring student achievement as a function of either entry or refresher training. Results of such testing must be interpreted very carefully, especially where no appreciable shifts in student achievement occur between the beginning and ending phases of a course. This may be especially true of refresher courses where the range of differences in background among students in a single course may be very narrow and where incremental knowledge to be acquired as a result of refresher training is limited. Or, they may have already acquired the information on the job. Both kinds of information could have a strong bearing on decisions to modify, or continue offering, courses reflecting such findings. It is most probable that centers will provide a verbal report in addition to tabular findings of the kind indicated in Table 8-6 to explain why gains failed to materialize or why large, substantial gains had been encountered in some courses and not in others.

Feedback to NHSB on Student Achievement

The effectiveness of the short-course training program of a safety manpower development center should be judged according to the terminal skills and understandings that have been acquired in each course of instruction. If the end-of-course results can be stipulated in measurable terms related to student achievement, curriculum development will be facilitated, and the probability may be increased at the NHSB level that

Table 8-5

FEEDBACK REPORT - NUMBER ONE

Guideline Realization Report

CENTER NAME: LOCATION:

PERSON PREPARING REPORT: DATE:

Job Position	Course Description	Entry	Refresher	Guideline Hours	Actual Hours	% of Guideline To Actual Total Program	% of Total Program
Governor's Highway Safety Director	Purpose and Scope of Highway Safety Program	X					
	Duties of Position	X					
	New Developments		X				
Highway Safety Program Analyst	Background, Purpose and Scope of Highway Safety Program	X					
	Federal Administrative Procedures	X					
	Techniques of Program Formulation, Evaluation and Control	X					
	Consultive Methods	X					
	New Developments		X				
Highway Safety Public Information Officer	Background, Purpose and Scope of Highway Safety Program	X					
	New Developments		X				
Motor Vehicle Inspector	Etc.						

Feedback Report--NUMBER TWO

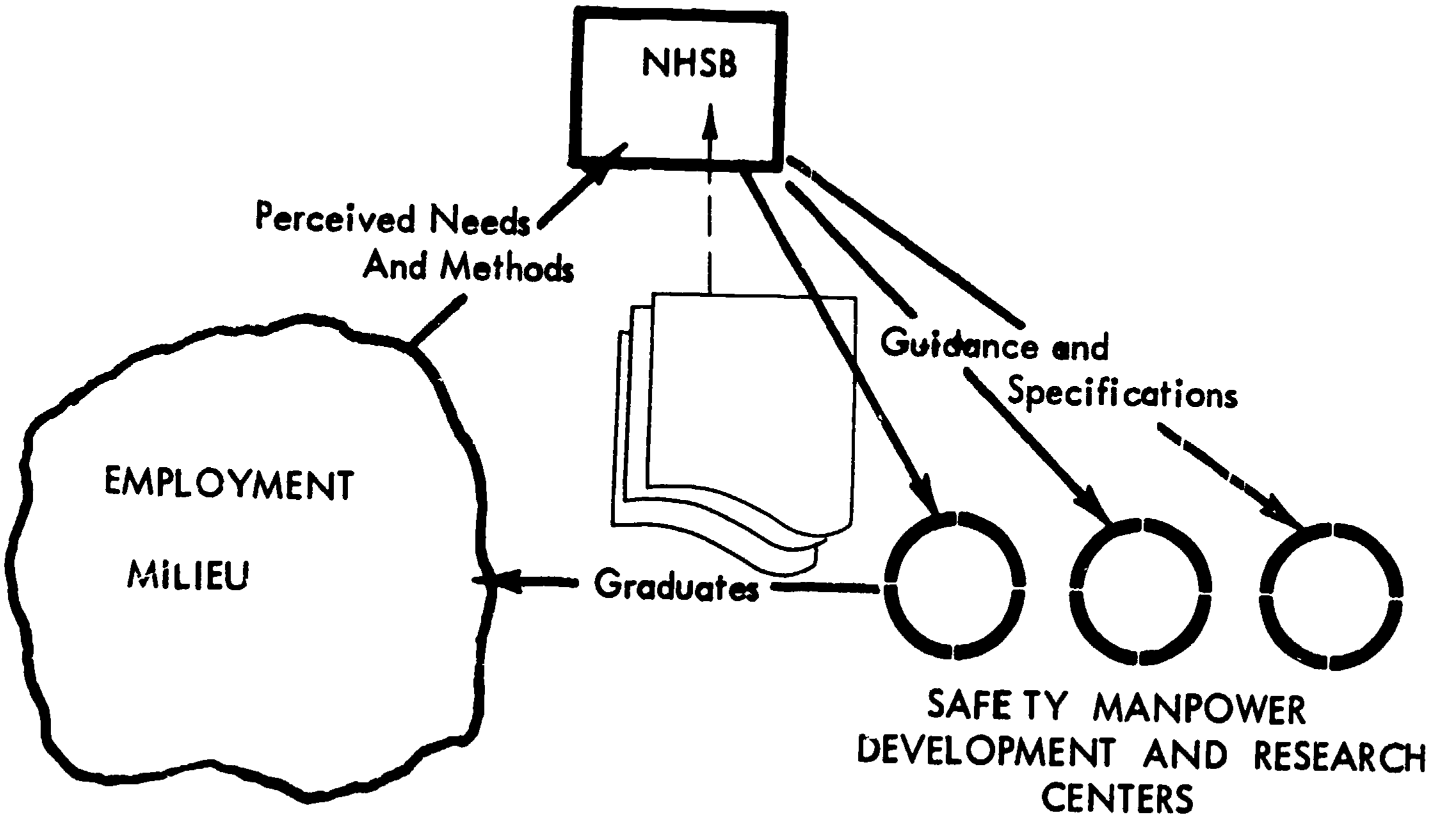

FIGURE 8-3 FEEDBACK REPORT—NUMBER TWO

Table 8-6

FEEDBACK REPORT - NUMBER TWO

Student Gain Report

CENTER LOCATION:

PREPARED BY:

DATE:

Position	New Trainees	Refresher Trainees	Average Beginning Score	Average Ending Score	Average Percent Gain
Governor's Highway Safety Program Director		X			
	X				
Highway Safety Program Analyst		X			
	X				
Highway Safety Public Relations Officer		X			
	X				
Motor Vehicle Inspector		X			
	X				
Motor Vehicle Station Inspector		X			
	X				
Driver Training Program Specialist		X			
	X				
Etc.					

Corrective Actions being taken on }
Explanations for } Low Student Gains

some standardization of objectives may be reached among several centers for singular job specialties. The machinery for arriving at acceptable end results of training must be established by the NHSB in conjunction with personnel assigned to centers and supervisors or training specialists from the employing agencies. Table 8-7 is predicated on the assumption that proficiency standards, or end-of-course criteria, will come into being, and that the NHSB will wish to maintain cognizance of how effective each training course is in producing graduates who meet such criteria. Separate reporting would be made on the effectiveness of a course with regard to the acquisition of skills that should be demonstrated in performance and the acquisition of information or knowledge nominally demonstrated through written tests.

Feedback from the Field Environment

For a truly comprehensive program of controls on the training of safety manpower, periodic surveys should be held for selected job specialties throughout the area for which a center has training responsibility. If there are budgetary limitations, these surveys can be conducted by mail; however, they would be more effective if an array of specialties were selected for survey and a team was commissioned to enter the area for purposes of deriving appropriate information. The findings would be ultimately summarized at a level that would be appropriate to the needs of the Office of Safety Manpower Development and its desires to understand the degree of acceptance being accorded to the graduates of courses offered at each center. By entering the field, the team would be in a position to accumulate additional observations and responses from supervisors that could not be obtained solely through survey questionnaire.

Figure 8-4 presents a general schematic of "closing the loop" so that information from the field may be cycled back to the NHSB. Documentation of the field-derived information would include table summaries similar to those shown in Tables 8-8 and 8-9. Table 8-8 presents supervisory satisfactions with graduates of short courses, allowing them to express their opinions as to whether the graduates they have received were "well-prepared," and ranging to "poorly prepared." The expression of opinion by itself, of course, would be worthless, unless it was supported by recommended changes to training to improve the quality of the graduate and the reasons that supervisors have given to justify low ratings.

Table 8-7

FEEDBACK REPORT - NUMBER TWO(a)

Student Achievement Report

CENTER LOCATION: PREPARED BY:

DATE:

Course Description	Number Entered in Course	Percent Passing Proficiency Standards on Skill Requirements	Percent Achieving at Cut-Off or Above on Knowledge Requirements
Governor's Highway Safety Program Director			
Highway Safety Program Analyst			
Highway Safety Public Relations Officer			
Motor Vehicle Inspector			
Motor Vehicle Station Inspector			
Driving Training Program Specialist			
Etc.			

Feedback Report--NUMBER THREE

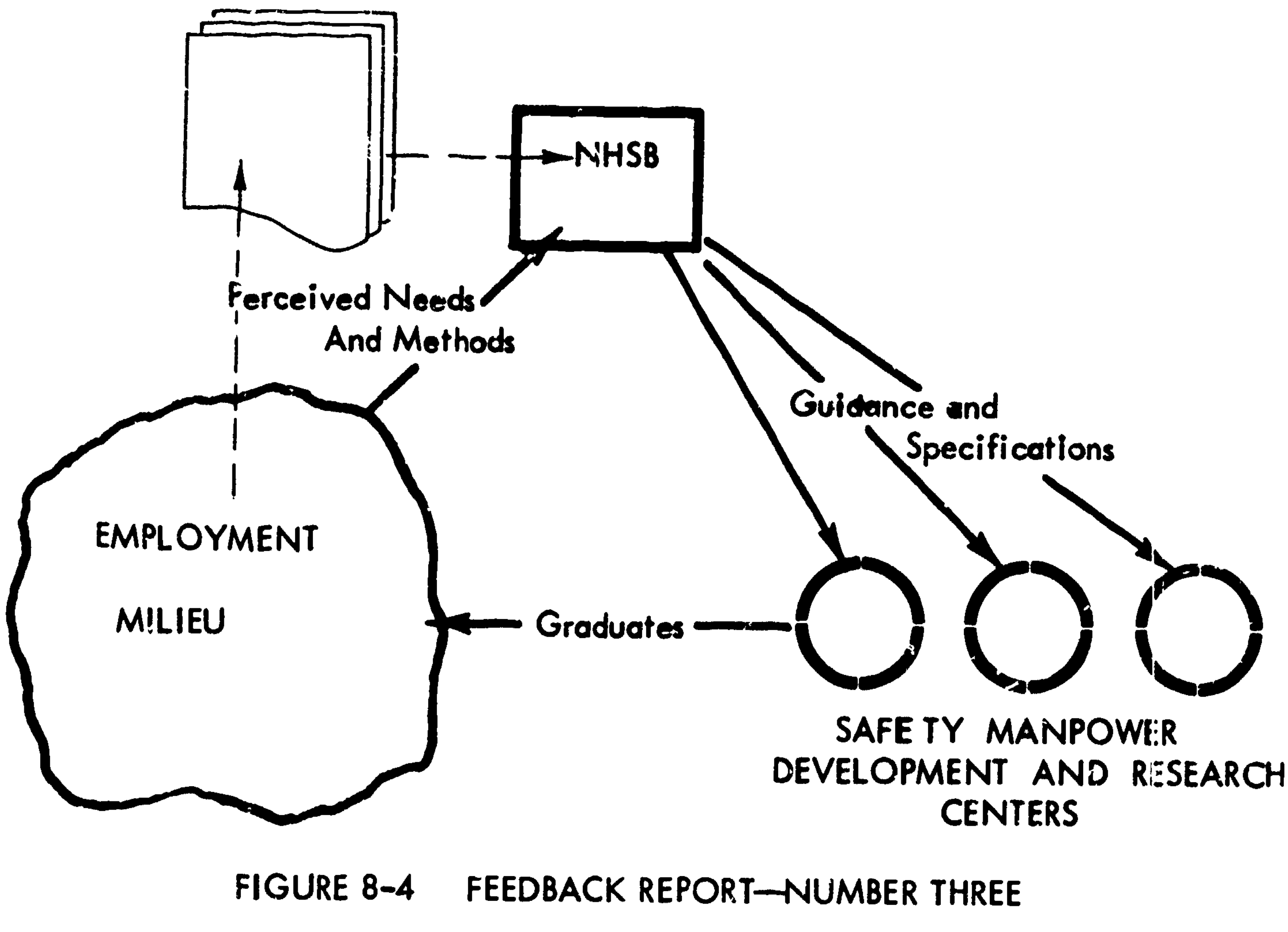

FIGURE 8-4 FEEDBACK REPORT—NUMBER THREE

Table 8-8

FEEDBACK REPORT - NUMBER THREE

Supervisor's Satisfaction Survey

GRADUATES OF CENTER LOCATED:

PREPARED BY: DATE:

Position	Number of Graduates	Percent of Supervisors Expressing that Graduates are		
		Well-Prepared	Moderately Prepared	Poorly Prepared
Governor's Highway Safety Program Director				
Highway Safety Program Analyst				
Highway Safety Public Relations Officer				
Motor Vehicle Inspector				
Motor Vehicle Station Inspector				
Driver Training Program Specialist				
Etc.				

<u>Summary</u> (Request for changes in training by Supervisors identified by course)

(Supervisor's reasons for poor preparation)

Table 8-9

FEEDBACK REPORT - NUMBER THREE(a)

Supervision Survey of Training Adequacy

GRADUATES OF CENTER: PREPARED BY:

DATE:

Course Description	Need for Training		
	Present Training Adequate	Should have Further Training	Training No Longer Required
Requisite Knowledges #1 ______ #2 ______ Etc. ______			
Requisite Skills #1 ______ #2 ______ Etc. ______			
Additional Training Required: Knowledge Skills			

Feedback, as represented by supervisory ratings of satisfaction, also would be augmented by their responses to specific components of training courses for the job specialty being surveyed. These responses would be organized according to Table 8-9, in which the essential knowledges and skills being taught in a course would be rated by the supervisor according to his perspective of "training adequacy." The supervisor also would identify additional training that should be given beyond those knowledge and skill areas shown for the course. For NHSB purposes, the derived field information could be collated by areas, or across areas if a national picture of supervisory responses to a singular training course were desired.

Feedback on Refresher Training

The present concept of training calls for a two-stage process: first, training will be conducted on an entry basis for those in safety training who will return to their home working environments for purposes of instructing others on what they have learned. At the professional level, there will be many who will not have the responsibility to train others in similar employment. Since they will comprise only a small number, they will return to discharge the responsibilities of their positions with the aid of what they have learned at the HSMD&R Center; second, those having been provided their entry training at a center will be cycled back through the training program at a later date, as stipulated for their particular specialty. The periodicity of such recycling may vary from one to three years after having received training on an entry basis.

The opportunity to have practitioners from the field placed in a training environment for the second time should provide centers with an excellent chance to provide training on new concepts and new requirements emerging from the NHSB and from the field working environment. Optimization of refresher training for such purposes will not occur by itself, and there is a need, therefore, to install control procedures that will ensure that maximal advantage will be taken of the interpolated training experiences represented by refresher courses. By viewing refresher training as an important component of the total manpower development program to be carried out by the centers, the NHSB may wish to establish reporting mechanisms through which it will remain cognizant of the changing picture of refresher training requirements occurring at each center and so that the centers, themselves, will find that information being requested is of value to them in organizing and revising such training in time for the safety manpower who will require it.

As shown in Table 8-10, the NHSB may wish to know how many refresher training courses are to be given at each center for designated time periods, e.g., quarterly or on a semiannual basis, and for which job specialties the training is to be provided. Next, there would be the need to remain informed concerning major changes taking place in such training, representing those arising from critical events in the field and those that have been requested by the NHSB. For those changes initiated by the NHSB to take advantage of the refresher cycle and impact on practitioners who may not have had training exposure for several years, there may be a need to determine the number of centers that are planning to present refresher training for each job specialty during the same designated time period. The next step would be to determine whether the recommended changes have been adopted in planning of the courses and what percentage of all refresher courses being offered in a single job specialty represent those that have adopted the requested changes.

How the personnel accounting system will function must be determined between the NHSB and state safety administrators, who will have the responsibility for ensuring that a flow of safety personnel to centers is maintained. It is highly probable that the centers will participate in the personnel accounting of trainees, since they will maintain records of the number of specialists or professionals requiring refresher training, including an identification of the job specialties that they represent. This information may be used to schedule refresher training with sufficient lead time allocated for incorporation of new curriculum material, training of center instructors on new curricula, and so forth.

Summary

Critical elements have been selected for reporting in a system of program controls that emphasises the need for the NHSB to maintain cognizance of the training effectiveness of the short-course instruction to be carried on by safety manpower development centers. The reporting procedures are seen as providing:

- A "tracking" of information flow and guidance to centers that require action.
- Feedback to the NHSB on the extent of action taken to modify training programs, adopt new programs, and so forth, including such subordinate information on percentage of a course altered as a function of NHSB guidelines.

Table 8-10

FEEDBACK REPORT - NUMBER FOUR

Refresher Training

CENTER: DATE:

Refresher Courses Planned for ________ Quarter Period, 19____	Number of Safety Manpower Requiring Refresher Training	Major Changes in Training Based Upon Inputs from Field	Major Changes in Training due to NHSB Guidance

- A mechanism for reporting on student gains as a function of training and thus providing an indication of whether skills and understandings have been altered appreciably.

- Information on student achievement as measured against end-of-course proficiency criteria.

- Feedback from the field with respect to supervisory judgments of training effectiveness, and their recommended changes to the training program.

- Special treatment for refresher training, since it provides too valuable an opportunity to be missed for getting information and material to people who may not be seen again at centers for two or three years.

To effectively manage the entire program of training for all centers, the NHSB is literally faced with the need to establish a management information system. The emphasis in this information system should be on training. Program controls, reporting formats, and reporting procedures as described in this study should be viewed as a preliminary phase in the establishment of the system, with what has been developed so far remaining to be validated through experience. There is a need to avoid an undue loading on centers for reporting requirements, and the NHSB must avoid becoming engulfed in information from the field. Little precedence exists in computer processing of data reflecting the effectiveness of training programs at the level of detail that has been defined. Ideally, information on training effectiveness, i.e., student gains, percent of students meeting end-of-course proficiency criteria, percent of training time allocated to major subject areas within each training course, compiled supervisory comments from the field and so forth, would be computer-processed and stored for "call up" at the discretion of the NHSB. A computer program would be written that would allow for data and information to be read out for a single course for all centers with respect to the total number of students passing the course requirement, or to reflect the total history of success in student achievement resulting from implementation of the same course at a specific center. Whether for such purposes, or for purposes of deriving collated results on the nature and extent of curriculum changes made to improve student gains and achievement, it is clear that simplified reporting formats will be needed and that the ultimate minimal array of information that the NHSB will require to manage the training program intelligently, will require further study. A closer determination of such needs could be made should a limited number of centers become operational. A project on information and training management needs could be established at a pilot center.

Chapter 9

CONGRESSIONAL JUSTIFICATION FOR THE ESTABLISHMENT OF REGIONAL PILOT CENTERS FOR HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH AT UNIVERSITY-LEVEL INSTITUTIONS

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Introduction

Appalling losses of lives and property due to highway traffic accidents continue to mount year after year. It became apparent earlier in this decade that state and local government efforts to solve this problem were not going to be sufficiently effective. Accordingly, in 1966, the Congress passed the "National Traffic and Motor Vehicle Safety Act" and the "National Highway Safety Act." These acts presented extensive and energetic programs to reduce deaths, injuries, and property damage resulting from traffic accidents and directed the Secretary of Transportation to take action toward implementation.

Since being given this assignment, the Department of Transportation, in collaboration with traffic experts in the safety field, has developed a comprehensive set of Highway Safety Program Standards. These standards require a major change in future manpower requirements and in the educational and training needs of practicing highway safety personnel. Furthermore, the standards deal with biological and engineering considerations that cannot be understood except through carefully planned laboratory and field research, followed by scientific analysis of the data. Additionally, the test results must be correlated against information derived from actual accident experience. However, the required data on the causes of accidents do not,for the most part, exist. There is a lack of knowledge about the behavior of individuals in connection with highway accidents. More needs to be known about improvements in vehicle design factors that could result in minimizing the seriousness of injuries in collisions.

It is possible that many of the countermeasures now in practice are ineffective. On the other hand, it is equally possible that many effective countermeasures have been completely overlooked. The capacity to develop effective countermeasures is directly related to the kind and quality of data obtained in the field or laboratory. Furthermore, the relevancy and quality of data is directly related to the quality of manpower gathering the information. Viable and meaningful information cannot be obtained where basic knowledge must be gained without appropriately educated and trained personnel. This fact was illustrated in World War II, when highly educated scientists applied the principles of operations research in assisting the allied military in overcoming the enemy in submarine and aerial warfare. Alan S. Boyd, the former Secretary of Transportation asserted, in connection with research, that:

> This principle, amply demonstrated over and over again, in the brilliant breakthroughs in medicine, space exploration, nuclear energy and other major national programs, is equally valid for motor vehicles and highway safety. The facts however, are that modern research and testing technologies that have contributed so heavily to the broad advances in these and other fields, have not been applied until now in any significant amounts to the amelioration of the unfortunate tragedies that occur daily on our Nation's highways.*

Objective and Scope

In July 1968, a research project was funded by the NHSB to explore alternative programs for meeting the national highway safety manpower development needs. The objective of this research was to study the feasibility of establishing highway safety training, education and research centers at university-level institutions.

The scope of the study included:

1. Indentification of skills and disciplines required to perform optimally in the field of highway safety
2. Development of program strategy for the placement of the centers
3. Development of selection criteria for candidate institutions
4. Identification of possible candidate institutions

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* Requirements for Motor Vehicle Safety Research and Test Facilities, A Report to the Congress from the Secretary of Transportation, Volume I, U.S. Department of Transportation, October 1968.

5. Visit candidate universities
6. Development of guidelines
7. Development of evaluation procedures
8. Development of program controls

Skills and Disciplines Required for Highway Safety Manpower Development

A close examination of the content of the Highway Safety Program Standards, introduced in June 1967, clearly establishes that new employee skills and knowledge will be required and existing skills and knowledge will need to be upgraded if the new standards are to be fully implemented. In addition, some form of periodic updating of employees will be essential to disseminate new knowledge and refurbish individual skills. It was within this framework that the examination of the feasibility of establishing Highway Safety Manpower Development and Research Centers at universities was undertaken.

As viewed in this study, the proposed Centers would engage in three major functions: training, education, and research. Training would center around specialized short courses of instruction necessary for initial orientation and refresher training in highway safety specialties. Educational activities would include preparation of graduate students needed for operating and research positions in the field. Research would provide stimulation and dynamics to the education functions, in addition to furnishing inputs to the training function. From the standpoint of student load, about 85 percent would be in the training function, where both entry and refresher training would be provided for federal, state and local government employees engaged in specialized highway safety activities.

Skills and disciplines required for the training and education of highway safety personnel were identified from previous research contracted by the NHSB. The following tabulation shows the disciplines included and the estimated percentage of professional time that should be devoted to each at the center:

Discipline	Training	Education
Law	6.2%	6.4%
Medicine	6.1	6.3
Business or public administration	17.7	16.4
Education	23.6	23.2
Police sciences	16.6	16.0
Engineering	23.8	25.3
Psychology	6.0	6.4
	100.0%	100.0%

The estimated number of highway safety personnel currently available and the number required for the implementation of the proposed program at local, state, and federal levels are:

	Number of People
1968	796,000
1973	892,000
1978	972,000

Only about 1.5 percent of the training will actually be done at the centers. The balance will be conducted by field instructors near the highway safety employees' area of employment, in junior colleges, nigh schools, or other suitable places of congregation. All highway safety educational courses for advanced-degree students will be conducted at the center.

Program Strategy for the Placement of Centers

Four alternatives were selected for studying highway safety training and education centers, based on centralization of responsibility for leadership. These were:

1. A Federal Academy

With the vastness of highway safety education and training needs, it is conceivable that a more rapid buildup could be achieved through establishment of a federal academy, which could provide a more uniform curricula of higher quality and a faster implementation rate than can be expected from state or regional centers. This alternative might result in separating the training activity from education and research and operating it as a separate entity similar to the FAA Academy. The educational and research functions would then be allocated to universities, as proposed in other alternatives.

2. A Center for Each Region

The regional centers would provide similar services, as indicated under state centers, but would function at a selected university on a regional basis.

3. A Center for Each State

Centers located at a selected university within each state would provide entry and refresher training for state highway positions, county and city positions within the states, and their proportional share of federal research and administrative positions. In addition, they would furnish highway safety education and research in support of education for advanced degrees with minors or specialization in highway safety.

4. A Consortium of Universities Forming Centers in Each Region

The university consortium is probably most applicable to the regional center alternative. The main advantage of the university consortia is their ability to combine complementary resources needed for highway safety manpower development that are not available in any single university. The pooling of university resources can be accomplished by establishing the center at one of the university campuses that make up the consortium, with visiting faculty from other universities. If the universities were in close proximity, the faculty could commute to instruct at the center. In other regions a considerable distance between universities would require the faculty members to relocate for a period of time. Another possibility is to have the students, both graduate and short term specialists, go to any one or all consortium universities to take the courses required for their position or academic degree.

An assessment of potential advantages and disadvantages of a federal academy follows:

Potential Advantages

1. The speed of implementation is considerably higher for a federal academy than for any other alternative including setting up curricula, recruiting and placing the teaching and administrative staff, and drawing personnel from the vast federal government employees pool.

2. A federal academy offers an almost immediate availability of facilities and equipment. Abandoned military bases, or those phased for deactivation in the near future, as well as surplus government equipment, could be made available.

3. Ease of administration and effectiveness of program controls from the point of view of the NHSB would be much greater for a federal academy than for any other alternative.

4. In addition to the availability of government facilities, the current pay scales of federal government employees, both in teaching and administrative support positions, would favor the federal academy as the most economical alternative for noncredit courses.

Potential Disadvantages

1. A federal academy would be unable to dispense graduate credit courses leading to advance degrees. Thus, the federal academy could not cover the whole spectrum of highway safety manpower development, but would have to be supplemented by other means.

2. The establishment of a federal training center, physically separated from a university, would require congressional authorization entailing a considerable amount of preparatory legal work and favorable public opinion.

3. Difficulties would conceivably arise in a federal academh's dealings with state and local authorities, since the great majority of highway safety positions are at the state and local levels.

4. A federal academy would experience difficulty in recruiting students, in contrast to the experiences of the FAA Academy, whose students are, for the most part, federal government employees.

5. It is difficult to perceive the role of established traffic safety institutes at universities in manpower development if a federal academy should undertake this function.

The potential advantages and disadvantages of regional centers are listed below:

Potential Advantages

1. In each of the ten regions delineated in the current study, there is at least one university that meets the stringent selection criteria for university candidates.

2. The logistics of establishing and operating a regional center may be generally less complicated than those for a single federal academy.

3. State involvement and cooperation may be enhanced in a regional set-up, especially in cases where neighboring states have precedents in sharing federal grants on certain projects.

4. Speed of implementation would be greater for regional centers than for state centers, if centers are established around existing capabilities.

Potential Disadvantages

1. Existing capabilities in faculty and other resources would probably be diluted in a regional center compared with their concentration in a federal academy.

2. There would be disparity in the quality of training among the regional centers, and probably none of them would match the potential excellence of a single federal academy.

3. The regional centers would require longer implementation time, than a federal academy, as it is not anticipated that their development could be simultaneous.

4. There is a possibility of antagonism and resistance in adjoining states making up a regional center, particularly when their universities have existing capabilities that were not selected to host the center.

The potential advantages and disadvantages of state centers are as follows:

Potential Advantages

1. The proximity of a center to its students.

2. State centers would be in the best position to tap the existing capabilities in highway safety education and training.

3. It appears that the majority of the present establishment in highway safety education, state and local government officials, and possibly the general public, believe that highway safety education should stay a state prerogative, with federal assistance through funding only.

4. State centers may be more responsive to local needs, since they would be in closer proximity to local problems.

5. The operation of state centers might offer greater simplicity than other, large scale centers.

6. State centers might better attract local and state funds to support the center.

Potential Disadvantages

1. Many medium and small state universities would have difficulty in meeting the criteria stipulated for qualified institutions.

2. Staffing a center in each state would soon exhaust the small supply of qualified faculty in this field.

3. The implementation of the highway safety manpower development program through university-level institutions in each state would take more time than with any other alternative.

4. Country-wide compatibility of highway safety education, such as standardization of curricula, and selection of best textbooks, would be most difficult to achieve with state centers.

5. The quality of instruction in state centers may, in general, be more uneven than in the academy or regional alternatives.

6. The NHSB administrative and program control problems would be considerably greater in state centers than in regional centers.

Analysis

A cost comparison of alternatives is as follows:

Development Alternatives	1973 Average Annual Operating Costs	1973 Captial Requirement
1 federal academy	$23,629,000	$20,224,000
10 regional centers	31,100,000	18,550,000
10 regional consortia	31,100,000	18,550,000
50 state centers + D.C.	36,740,000	15,966,000

The above tabulation indicates the federal academy to have the lowest, and the state centers to have the highest, annual operation costs. The costs of regional centers fall in between these state centers and a federal academy. It should be kept in mind, however, that the federal academy would offer only the noncredit training function, while graduate education and other degree-related activities would be supported by university programs.

Speed of implementation is a highly important consideration, and a federal academy could achieve full operational status to serve all of the federal, state and local governments in a shorter time period than any other alternative. The state centers would require the longest time for full activation, although a few state centers, where most of the resources are already available, could be organized in a relative short time. In general, regional centers would take longer to organize than a federal academy but would become operational more quickly than regional consortia centers.

Development of Selection Criteria for Candidate Institutions

The criteria for selecting institutions to train highway safety manpower would ideally aim at successfully matching a clearly defined educational profile of the various types of safety specialists, professionals, and researchers with a well-documented survey of the institutions most effectively able to meet the corresponding qualifications at a minimum cost. A total of 16 criteria on basic and subordinate disciplines were developed as follows:

1. A Ph.D.-granting institution
2. Civil engineering (Masters)
3. Education (Masters)
4. Psychology (Masters)
5. Physiology (Masters)
6. Public administration (Bachelors)
7. Business administration (Bachelors)
8. Medicine (MD and Masters)
9. Public health (Masters)
10. Law (LLB)
11. Criminology
12. Police training
13. Police instruction and administration
14. Safety and traffic education and administration
15. Traffic engineering
16. Transportation engineering

These criteria were supplemented with source documents to provide information on the following school characteristics:

Department and schools

Teaching staff

Distinctive ongoing programs and activities

Degree conferred

Enrollment

Library volume and special separate libraries

building facilities

The following university characteristics were also studied to determine whether they were relevant selection criteria:

Student-to-teacher ratio

Teaching-to-research ratio and budget

Undergraduate-to-graduate ratio

Disciplines relevant to safety manpower development

Production rates of students, graduate and undergraduate, in related disciplines

Faculty composition by full-or part-time by professors, associates, assistants, and instructors

Characteristics and ratio of administration to faculty

Size of library and extent of special libraries that are relevant to related disciplines

Size of current physical plant and expansive capability and the ability to maintain an expanded facility

History of previous involvement in multidisciplinary and government-supported programs

History of matching funds with government for construction of research or laboratory facilities

Identification of Possible Candidate Institutions

Additional inputs that contributed toward the final selection of candidate institutions include:

1. A pilot university survey conducted by the research teams
2. Formal university visitations by a joint NHSB-SRI research team
3. Interviews with highly qualified professionals in the field of education
4. Analysis of existing analogous university training programs that are Federally funded

Within the regional delineation that was developed, it was found that each region had at least one highly qualified candidate institution. In several regions, there were more than one university with excellent qualifications.

Based on the guidelines established with the NHSB, a list of candidate institutions for state centers was compiled, including the best qualified institution for each state. Correspondingly, another list of candidate institutions was developed for regional centers, including the two best qualified institutions for each region.

Visits to Candidate Universities

Visits were made to 16 universities selected as being typical of the best-qualified institutions. The following general impressions were derived from discussion held with university representatives at these sixteen universities:

- All of the universities visited have had experience with federally funded programs and are aware of their impact on the university.

- All universities visited feel a commitment to national problems, especially those that impinge upon their daily lives, such as air and water pollution and highway safety.

- The proposed regional centers are seen as creating a much larger requirement than most federally funded programs, since there will be a need to provide a considerable amount of operational short course instruction.

- It is recognized that even for a limited number of regional centers there may be problems in assembling competent staffs for their operation.

- A general experience exists in coordinated programs with other universities in education and research. Universities are therefore familiar with the interactions that may be required, should regional centers be established on a consortium basis.

- Suggestions for placement and operation of the proposed centers generally call for leadership to be provided at the vice-president level. If they were to be implemented at the school level, the school of engineering was mentioned most frequently as their place of assignment.

- General sentiment among universities seems to be for a minimum five-year funding program. Three years, at least, would be required before a center could become fully operational.

- There is a general concern for the problem of recruiting additional competent faculty and the provision of job assurance in the event the program should be cancelled.

- Accommodation of faculty to short course instruction at several universities has consisted of establishing full-time teaching positions in a highway traffic institute. These positions are non-tenured but allow for people with appropriate skills to be brought in.

- Students will need assurance that jobs are available in the field before deciding on highway safety as a career.

- This program will need to compete with other federal programs that seek capable students at the graduate level. To compete effectively, attractive arrangements should be made for stipends and fellowships, since most graduate students receive some form of training grant, research grant, or other similar type of income.

- Students will follow faculty into a new program so the initial stimulus should be that of attracting highly capable faculty members.

- Support of the employing agencies will be required to provide release time for students to come in from the field and for proper employment of their skills on their return from the training environment.

- Firm estimates of the number of individuals requiring training will be required to plan effectively for university support.

- A strong need will exist to establish working relationships with employing agencies, especially to stimulate flow of trainees from another state.

Guidelines for the Administration and Operation of Centers

A guideline is defined as "a standard or principle by which to make a judgment or determine a policy or course of action." In preparing guidelines for the administration and operation of centers, attention was given to making measurable as many as possible, so that they might serve as milestones relating to program development. Guidelines were derived by giving balanced consideration to:

- Expression by the NHSB officials as to their preference for the centers' administration and operation.
- Expressions by university officials as to the degree of control that would permit an admissible latitude of academic freedom.
- Analogous programs negotiated between federal government agencies and universities.

Based on these criteria, guidelines were defined for all alternatives.

1. Organizational Guidelines

It is anticipated that the selection of universities at which centers will be installed will, in large measure, be based on an appraisal of the university's projected performance in replies to Requests for Proposals and in its expressions of interest and enthusiasm for the program. Because the NHSB will be charged with a major part of the organizational responsibility, it is suggested that the lines of authority between the NHSB and the centers be shortened to the maximum degree practicable. Lines of control should be directed from the NHSB through the university administration to the centers' administration. Direct control of the centers by NHSB would not be feasible, because a substantial amount of coordination will be needed between the center and the disciplinary structures within the university. Lengthening the lines of authority to include states or local government between the NHSB and the university appears impractical because local issues might become involved and the objective of uniform national safety standards would be adversely affected.

2. Personnel Programming

The scheduling of students for entry and refresher training courses can be a very difficult task unless federal, state, and local governments cooperate wholeheartedly with the centers. It should be the centers' responsibility to publish schedules indicating precisely when the various highway safety training courses prescribed by the NHSB will be taught, and then be prepared to accept students in accordance with a prearranged plan negotiated with each governmental unit. Federal, state, and local governments should have the responsibility of supporting the program by requiring their employees to attend courses according to plan. Government positions in highway safety that open either as a result of program expansion or attrition can best be filled at lower levels by new graduates who have taken the prescribed highway safety courses as part of their graduate education. Professors and administrators in the centers and in the relevant disciplinary areas of the university should encourage graduate students to become interested in participating in highway safety education.

3. Curricula

Considerable research has already been conducted in connection with highway safety curricula. Furthermore, a variety of universities and colleges are now offering highway safety courses in the related disciplines. A tabulation of these courses being given by institutions throughout the nation indicates that there is a substantial base for a complete initial curricula in all areas related to highway safety standards. New courses and curricula will be developed as the need arises and as the "state-of-the-art" advances within a particular program.

4. Facilities

It is anticipated that most universities that seriously desire to become associated with the Highway Safety Program will make classroom space available. Providing living quarters for students participating in training courses will probably be a larger problem. After a center has defined its ultimate requirements, plans should be made for acquiring additional facilities. These needs will undoubtedly vary widely among universities.

5. Financial Reporting

A format for a projected summary of each center's income and expenditures was designed for periodic reporting to the NHSB. Supplementary statements by the centers, in sufficient detail for analysis by the NHSB, should accompany the summary.

Development of Evaluation Procedures

Before finalizing an agreement with a university in connection with the establishment of a highway safety center, it is proposed that the NHSB and the university subscribe to a series of specific, detailed objectives that will permit the NHSB subsequently to measure the progress of the center in meeting these objectives. There are at least two basic methods of accomplishing this purpose.

- Periodic formal reporting by the center through the university.
- On-site periodic inspection visits.

A combination of the two methods possibly would accomplish the best results. The areas of reporting or observation should be:

1. Adminstrative and operational policies and procedures
    - (a) Operating practices
    - (b) Written policies and procedures
    - (c) Center status in university organization
    - (d) Relationship between the center and participating schools
    - (e) Quality of university services
    - (f) Adherence of the center to NHSB standards
    - (g) Relationship between the NHSB and the center

2. Personnel policies and procedures

   (a) Number of students participating in each course.

   (b) Employment of students after graduation

   (c) Variation in class sizes

   (d) Mix of graduate students

   (e) Ratio of short-course students to graduate students

   (f) Student enrollment by geographic origin

   (g) Student-teacher ratios

   (h) Faculty mix

   (i) Faculty instructional load

   (j) Work load analysis of Center administrative staff

   (k) Relationship between Center administrative staff members and university staff

3. Curricula and research activities

   (a) Completeness of initial curricula

   (b) Adequacy of procedures in updating curricula

   (c) Feedback of graduates on curricula quality

   (d) Equitable distribution of training time within courses

   (e) Applications of state-of-the-art advances in instructional technology

   (f) Degree of course motivation

   (g) Evaluation of teaching equipment for those who return to field to instruct others

   (h) Relation of research to instruction requirements

4. Facilities Evaluation

   (a) Adequacy of buildings and equipment

   (b) Utilization of facilities

   (c) Monitoring the planning, design, construction, procurement, and installation of additional facilities

5. Financial

   (a) Matching funds

   (b) Scholarship and fellowship funds

   (c) Recruitment costs

   (d) Program funding and budget performance

   (e) Faculty salaries

   (f) Other salaries

   (g) Overhead

   (h) Financial and accounting methods and procedures

   (i) Cost per student for education and training

Forms were designed for the above subcategories to provide guides for centers reporting to the NHSB.

Development of Program Controls

Program controls should be aimed at maximizing the training effectiveness, both entry and refresher, of Highway Safety Manpower Development and Research Centers. This is not to minimize the importance of graduate instruction, and the research that will accompany it, but NHSB control of the latter need not be as rigid because it is believed that the proper selection of universities to undertake the responsibilites of manpower development in the graduate area should lessen the need for close controls. For short course instruction, however, the assurance of training effectiveness will require closer communications and a reporting procedure including the Office of Safety Manpower Development, the employing agencies of safety manpower, and the university responsible for conducting the training program.

When centers begin operations, the NHSB should provide them a flow of information consisting of the following:

- New pilot curricula
- Program standards covering highway safety
- Proficiency standards performance criteria for short courses
- Research results of studies which have a bearing on course content
- Manuals and other materials in highway safety

The NHSB will establish channels of communication with employing agencies and through these channels will become informed of the needs that have a bearing on the training programs. This information will be screened by the NHSB who will pass it on to the centers in an organized form.

Suggested procedures for the exchange of information between the NHSB, the employing agencies, and the centers are described below:

Information Flow to the NHSB from Centers on Actions Taken

Responses from the centers would indicate the extent to which they have adopted the changes, new standards, shift in emphasis, etc., in their training programs.

Reports to the NHSB on Student Gain

This report would indicate how much the student has absorbed of the course subject matter as determined by tests given at the beginning and end of the course.

Reports to the NHSB on Student Achievement

This measure is predicted on the assumption that proficiency standards or end-of-course criteria, will come into being and that the NHSB will wish to maintain cognizance of how effective each training course is in producing graduates who meet such criteria.

Feedback From the Field Environment

This report presents employing supervisor's satisfactions or dissatisfactions with returning graduates of short courses, allowing them to express their opinions as to whether the graduates were "well-prepared," and ranging to "poorly prepared." The expression of opinion, if it is unfavorable, should be supported by recommended changes in training to improve the quality of the graduate.

Feedback on Refresher Training

The opportunity to have operating personnel from the field placed in a training environment for a second time should provide the centers with an excellent opportunity to provide training on new concepts and new requirements emerging from the NHSB research and the field working environment.

Pilot Centers

Consideration was given to programs developed by universities in collaboration with the federal government. It was concluded they provide little precedence for the centers proposed by NHSB. Therefore, a considerable problem may arise in establishing HSMD&R Centers at universities if they are to implement all components of the program effectively. Further evidence is needed on a university's capability to satisfy highway safety manpower development needs for regional areas it may not have encountered before. This is especially true of the regional concept for operating such centers, which has been identified as prime for operation and test, in regional pilot centers.

One of the purposes of establishing pilot centers is to test basic concepts for administration and operation. It is recommended that a minimum of two pilot centers be included in the initial pilot plan to provide the opportunity to test centers whose operation would be made divergent. Some of the factors that would be tested include:

- A regional center at a single university or a consortium of universities

- Functional relationships between a center and the NHSB with respect to channels of communication and reporting procedures

- Program controls and evaluation procedures for determining the effectiveness of HSMD&R Centers

- Innovative instructional procedures and technologies that would enhance the training program

- The feasibility of specializations in curriculum offerings among centers in addition to development of a general curriculum for all highway job specialties

- Guidelines for the establishment and operation of centers, including procedures for interface with the university structure, and for internal center organization

- Methods for determining training needs in employing agencies of highway safety manpower and for stimulating the flow of students from the field into the center

Following are three-year estimated costs for a pilot center, assuming that activities start at the beginning of the year 1970 and that 20, 40, and 60 equivalent full-time students will be trained or educated during the years 1970, 1971, and 1972:

	Estimated Costs (x $1,000)		
	First Year (1970)	Second Year (1971)	Third Year (1972)
Operating Costs			
Faculty salaries	$ 59	$124	$ 195
Other salaries	101	182	227
Payroll burden (50%)	80	153	208
Travel	5	10	15
Per Diem ($16.00/day)	115	230	346
Plant maintenance (.147 x burdened payroll)	36	68	93
Total operating costs	$396	$767	$1,084
Capital Costs			
Land	$ 35	$ --	$ --
Buildings	80	221	117
Improvements	17	--	--
Equipment	14	60	20
Total capital costs	$146	$281	$ 137
Total costs	$525	$1,048	$1,221

It should be noted that approximately 30 percent of the operating costs is incurred from students' travel and per diem costs. These costs have been included for planning purposes and as encouragement for state and local agencies to send their personnel to the centers for training. In actual functioning, other arrangements may become possible for sharing the cost of student expenses.

Capital costs also are reflected for purposes of planning, on the grounds that separate facilities would be provided for the pilot centers. This has been necessary since it is not possible to determine a university's capacity to absorb a center into its existing facilities before determining which university is to host a center.

Summary and Recommendations

Deaths from highway traffic accidents amounted to about 50,000 in 1967 and 55,000 in 1968. Will these deaths be 65,000 in 1970 and more than 90,000 in 1975? They probably will reach at least these proportions, if the proper countermeasures are not taken. The facts are that little is known about the fundamental causes of traffic accidents and the countermeaures that should be used to reduce them. Breakthroughs have been made in military programs, in the development of nuclear energy, in space exploration, in medicine, and in other national programs. There is no reason to believe that the traffic accident problem cannot be solved by similar means. Initial tasks are to educate people to discover the true causes of traffic accidents through the use of modern research and testing technologies and to train operating personnel in methods that would subsequently be followed in the application of remedies.

It is the conclusion of the feasibility study that the establishment of regional centers is, at present, the most promising plan for meeting the nation's highway safety manpower education and training needs, although this judgment may be modified as a result of experience with proposed pilot centers. The major reasons for favoring the regional university center concept at this time are as follows:

- Attempts to establish safety manpower development centers in each state would soon overtax the professional capability that exists in this country for training, research, and education in the general field of highway safety.

- The regional center type of organization is flexible, in that it can be structured in different ways to meet the training requirements of several states and the educational interests of universities servicing these states. Furthermore, the regional concept would lend itself to a standardization of curriculum and more uniform proficiency standards for training.

- An economy of scale exists in this program, as has been discovered in other programs, and the establishment of centers in each state could be more costly than other proposed larger-scale centers. Careful selection of universities as regional centers would enable the NHSB to capitalize on existing capabilities and interests in highway safety education and training among these institutions. For example, regional centers would include less duplication of buildings, equipment, and so forth, than a center within each state.

- All regions developed for purposes of the study have one or more universities that meet the stipulated selection criteria.

- The NHSB administrative and programming problems would be less complicated with regional centers than with a large number of individual state centers.

- In many cases, neighboring states have established precedents in sharing federal grants on certain projects. In these cases, state involvement and cooperation may be enhanced by a regional arrangement.

- Speed of implementation would be greater for regional centers than for state centers, especially if centers are established around existing capabilities.

- Regional centers can train all classes of safety manpower--research, professional, and technical. Both credit (degree-related) and noncredit courses can be given, in contrast to a federal academy, where no degree-related credit courses are ordinarily given.

The study has described such advantages in moving in the direction of regional centers, and one array of regions has been defined. However, it is very likely that there are many problems attendant on the organization and operation of these centers, and these problems should be explored before establishing even as many centers as might be required by the ten regions defined in the study.

It is recommended that a number of pilot centers be activated to replicate the functions of the proposed regional centers. It is only by such activation that a firmer understanding will be gained of the requirements for manpower development with respect to the numbers actually requiring training, the speed with which they can be trained, the costs of such programs, and the realization of methods for resolving problems in management and coordination when field agencies, the university, and the NHSB participate in the same program. Testing of the regional concept should be embraced in the charter for pilot centers. Therefore, it is essential that the pilot centers be funded to operate with adequate scope and complexity as may be demanded to meet regional responsibilities. If the initial centers are successful, they would be graduated into the role of permanent regional centers, with proportionately increased funding over time. If the operational test of the regional concept is successful, it is also recommended that additional regional centers be established so that the total need for the development of highway safety manpower will be met.

Chapter 10

PREPARATION OF A REQUEST FOR PROPOSAL FOR THE ESTABLISHMENT OF REGIONAL PILOT CENTERS FOR HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH

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Introduction

Under the contractual arrangements governing the present study, the NHSB has stipulated that it is to receive a work statement, tasks, and related material that will enable the preparation of an RFP (Request for Proposal) to be submitted to bidder universities. To meet these requirements, a sample RFP has been developed in accordance with a format derived from consultation with the NHSB. The document that follows should not be construed as an issuing RFP, inasmuch as it is not a finalized version and represents only preparatory materials for disposition by the NHSB.

In accordance with the basic recommendations of the SRI study, this sample RFP has been predicated on the establishment of a limited number of pilot centers to determine the operational effectiveness of HSMD&R Centers at the regional level. However, the information compiled for future use by NHSB in formalizing an RFP actually is applicable, with little alteration, to all strategies of center location that would call for a university to function as a base of operation.

Since funding levels for regional pilot centers are unknown at this time, no restriction has been placed on the information that is compiled in each of the tasks described in the RFP's Statement of Work. The intent is to provide a comprehensive discussion of the information that might be required from bidding universities, should the NHSB desire to fund pilot centers at regional levels. It is anticipated that the NHSB would scale its requirements for those responding to the RFP to the constraints that would become known at that time with respect to targeted funding levels, full-time-equivalent student loads to be anticipated, ratio of research budget to training budget, number of states to be allocated to a center to replicate a region, and so on. Also, the NHSB may choose selectively from information in the task statements to prepare an RFP that might be predicated on any one of the program strategies that was investigated in the study or on new approaches that may emerge in the future which have a university orientation.

While functioning as pilot centers, successful bidders would be expected to operate as if they were responsible for regional training requirements within the budgetary limitations to be negotiated with the NHSB. It is only in this way that a true test could be made of the effectiveness of regional program strategies for highway safety manpower development. Within the regional concept, there is some flexibility in methods of establishing centers. The first and most obvious option is that of consolidating all requirements for training, education, and research, at a single university, which would augment its staff and facilities, if necessary, to meet such needs. Another option is to have a consortium of several universities within a region provide the necessary facilities, equipment, faculty, and so on, required to meet the training requirements that would be established for a region. Within consortia-type centers, there are several subalternatives. The center could be located in one university, while credits could be given for courses given in several universities within the same region. An extreme case would be to rotate the center location among the universities comprising a consortium. One objective in the selection of universities to host regional pilot centers will be to fund for the implementation of different regional strategies so that a maximum of experience may be gained.

Bidder universities would be asked to describe experimentation they would conduct in the process of meeting operational requirements of training and education. This experimentation could include study of how the center would relate to employing agencies, how it would evaluate its own effectiveness in training, and how it would relate to other universities in its region. Planned variations in the implementation of training curricula, adaptation of innovative instructional technologies, and so on, should also be described. Experimentation suggested by responding universities should be supported by a description of the procedures which would be used for evaluation purposes. The experimentation should provide for an operational test of critical major functions of the center. Therefore, any variations introduced for purposes of testing such functions would have to be embedded in the nominal operation of the center as it provided for manpower development and research. A critical function which could be subjected to test, might be that of validating operational procedures for determining training loads, either independently or with NHBS support.

Sample Request for Proposal:

THE ESTABLISHMENT OF REGIONAL PILOT CENTERS FOR HIGHWAY SAFETY MANPOWER DEVELOPMENT AND RESEARCH

BACKGROUND

Highway Safety and Motor Vehicle Acts of 1966

The current basic legislation underlining all highway safety activities at the federal, state, and local levels is contained in two laws; the National Traffic and Motor Vehicle Safety Act and The Highway Safety Act of 1966.

Public Law 89-563, promulgated on September 9, 1966 and titled the "National Motor Vehicle Safety Act" has as its main purpose the reduction of traffic accidents, deaths, and injuries to persons resulting from traffic accidents. Congress has determined that it is necessary to establish safety standards for motor vehicles and equipment in interstate commerce, undertake and support necessary research and development, and expand the national driver register.

Section 106(a) states that the Secretary of Transportation is authorized to conduct research, testing, development and training by making grants for the conduct of such research, testing, development and training to state, interstate agencies and non-profit institutions.

Public Law 89-564, issued on September 9, 1966, provides for the Highway Safety Act, which states that each state shall have a highway safety program approved by the Secretary of Transportation, designed to reduce traffic accidents and injuries and property damages resulting therefrom. Such programs are required to be in accordance with uniform standards promulgated by the Secretary.

Under Section 402 of the Act, matching funds are to be apportioned to states on the following basis: 75 percent of the funds will be based on population, and the remaining 25 percent will be apportioned according to a formula developed by the Secretary.

The Highway Safety Act provides that at least 40% of all federal funds apportioned under Section 402 to a state for any fiscal year will be extended by the political subdivisions of the state carrying out authorized local highway safety programs.

The Act provides for comprehensive driver training programs, including (1) the initiation of a state program for driver education in the school systems or for significant expansion and improvement of such programs already in existence, to be administered by appropriate school officials under the supervision of the governor; (2) the training of qualified school instructors and their certification; (3) appropriate regulation of other driver training schools, including licensing of the schools and certification of the instructors; (4) other driver training programs for the retraining of selected drivers; and (5) other research, development, and procurement of practice driving facilities, simulators, and other similar teaching aids for both secondary school and other driver training programs.

The Secretary of Transportation is authorized to use funds appropriated under Section 403 to carry out safety research. In addition, the Secretary may use the funds appropriated to carry out the sections of this Act, either independently or in cooperation with other federal departments or agencies, for (1) grants to state or local agencies, institutions, and individuals for training or education of highway safety personnel; (2) research fellowships in highway safety; (3) developments for improved accident investigations procedures; (4) emergency service plans; (5) demonstration projects; and (6) related activities that are deemed by the Secretary to be necessary. Monies appropriated under Section 403 are 100 percent federal funds.

Federal Government Involvement

On October 15, 1966 Public Law 89-670 established the Department of Transportation. The Department has three main operating agencies; the FRA (Federal Railroad Administration), the FAA (Federal Aviation Administration), and the FHWA (Federal Highway Administration).

The provisions of the Highway Safety Act of 1966 are carried out by the NHSB (National Highway Safety Bureau), which is established under the FHWA. The NHSB is headed by a director who is appointed by the President, by and with the advice and consent of the Senate.

Within the NHSB, there is a National Safety Institute headed by a director. The purpose of the Institute is to conduct or sponsor such research, development, testing, and evaluation projects as needed by the NHSB to develop uniform standards for state highway safety programs and, as needed, to develop federal motor vehicle safety standards and a uniform quality grading system for motor vehicle tires, and assist other components of the NHSB, at their request, in administering or enforcing the provisions of the National Traffic and Motor Vehicle Safety Act and the Highway Safety Act of 1966. The Institute also establishes and maintains demonstration projects to facilitate incorporating improved safety technology into practice in the state and community highway safety programs as quickly as practical; conducts or sponsors education and training programs designed to increase the supply of qualified manpower required to implement effective traffic safety programs; develops, evaluates, and assimilates, as appropriate, statistical data relating to traffic safety; acquires and maintains a collection of applications and documents relating to traffic safety; and performs related work. The Institute, with the head of the NHSB, investigates the need for a facility or facilities to conduct research, development, and testing in traffic safety.

Within the National Highway Safety Institute, an Office of Safety Manpower Development was established. The goals of this office are to plan and administer activities designed to increase the supply and improve the skills of all classes of manpower required to implement effective highway and traffic safety programs at the federal, state, and local levels, including (1) training for technicians and specialists in various program areas; (2) short-courses and a degree program for the preparation and advancement of management and professional personnel; and (3) predoctoral and post-doctoral fellowship programs for safety research workers and research administrators.

The mission of the Office of Safety Manpower Development is to plan, initiate, and manage a program designed to improve the qualities and increase the quantity of all classes of highway safety manpower at all levels in the nation's government, institutional and public stratas. This office has the overall management responsibility and authority to perform the following functions:

- Ascertain the current status of and need for highway safety professional, technical and research manpower at the state, county, and municipal levels; at the federal level; and within all classes of safety manpower throughout the nation.

- Identify the levels of professional competence and skills required for each category of safety manpower and develop course content and curricula for education and training for all classes of safety manpower throughout the nation.

- In conjunction with other federal agencies, professional organizations, societies and associations, recommend national policies and priorities for the development of highway safety manpower.

- Develop meaningful criteria and methods of measurement and evaluation for curriculum and course content to ensure the adequate selection, training, and education of highway safety manpower and the maintenance of an acceptable level of competence of training and performance for each category of required manpower.

- Promote needed research and the application of research results to improve the contents of the educational programs.

- Develop comprehensive skill measurements designed to aid federal, state, and local governments in the training of all categories of highway safety manpower.

- Conduct or sponsor short-courses, training schools and courses, pilot programs, and pre-doctoral and post-doctoral fellowships in the highway safety field.

- Develop and maintain a continual program, including appraisal techniques, to identify weaknesses in any phase of the safety manpower teaching and preparation program; initiate procedures to analyze, evaluate, and translate research findings into improved programs covering the multiple aspects of the highway and traffic safety spectrum.

- Establish effective channels of communication among educational institutions, private research organizations, research foundations, and other members of the highway safety research community.

- Establish and maintain lines of communication with the National Highway Safety Programs Service, the National Motor Vehicle Safety Performance Service, and other elements within the NHSB, regarding manpower quality, quantity, and skill levels.

- Coordinate with other federal government agencies engaged in operating or supporting manpower development programs that relate to the safety manpower development activities within the NHSB.

- Consult with and advise the Highway Safety Programs Service and the Motor Vehicle Safety Performance Service on safety manpower development matters.

- Serve on national educational and safety committees, participate in safety and education conferences, and generally contribute to the professional development of safety manpower.

- Represent the NHSB on matters of professional and national interest in the safety manpower field.

Highway Safety Manpower Requirements

The following quote from the chief counsel's statement at Congressional Hearings on July 15, 1966, is only one example of the shortages of safety manpower existing in this country:

> Manpower shortage--competent inspection personnel will be in short supply; mediocre inspection personnel will be worse than none at all. Automobile manufacturers maintain training schools for the service departments and the dealerships. It should be possible to establish similar training schools for vehicle inspection personnel, staffed by competent automotive engineers. This could be established on a regional basis, with operating costs shared by the states within the service area.

A severe nationwide shortage of trained manpower exists in all safety technician and professional categories. These shortages embrace all levels of skills and knowledge within these specialties. An intensive national education and training effort is needed to bridge these gaps and to keep abreast of the manpower requirements for initiating and sustaining highway safety programs necessary to implement the two Acts of 1966.

Categories of Highway Safety Manpower

There are four basic categories of highway safety manpower: research manpower-post-doctoral, research manpower-doctoral, professional manpower, and technical manpower.

Representative of the first category are research administrators and traffic safety researchers of many disciplines. In the second category are doctoral research manpower, consisting mainly of multidisciplinary traffic safety researchers.

Professional manpower consist of such categories as traffic engineers, traffic safety program managers, driver education teachers, automotive engineers, and driver education supervisors.

The technical manpower category is exemplified by motor vehicle inspectors, driver license examiners, law enforcement officers, accident investigators, accident analysts, accident data processing specialists, emergency medical specialists, traffic court personnel, and instructors within these various specialties.

The educational requirements for the first two groups are the Ph.D. or D.S. degree; for the professional manpower, the M.S. or B.S. degree, and supplementary short-courses required to upgrade practitioners at this level. The latter category requires a junior college Associate Degree or nondegree short-courses given at vocational or technical schools, or on the job through apprentice-type programs.

Accomplishments to Date

The Office of Safety Manpower Development has sponsored several studies for the purpose of identifying manpower needs and training and education requirements in the highway safety field. Most noteworthy among these studies is a survey of safety specialist manpower needs at the state level conducted by Booz, Allen, and Hamilton, Inc., and published in September 1968. This report identifies the various safety specialist manpower requirements in all 50 states and projects this need ahead ten years on a year-by-year basis. It consists of a comprehensive inventory of all existing state highway safety positions and those projected for the future. To provide a comparative basis, all position titles were translated into 36 composite occupations based on similar training requirements, for instance, state highway safety director, traffic engineer, school bus driver, driver education teacher and accident investigator.

Subsequently, Booz, Allen, and Hamilton, Inc., issued a letter report during October 1968, containing estimates of the number of specialists needed to fill all local (county and city) highway safety positions and projecting these estimates for five and ten years.

A second study of highway safety manpower needs will be conducted during FY 1970 by the National Association of Counties. This survey will identify safety manpower required at the local (cities and counties) level and project these requirements for ten years.

A study entitled, "Safety Research Manpower" was prepared by the University of North Carolina Highway Safety Research Center in June 1968. The product of that study is a tentative post-graduate curriculum for highway safety research manpower training, drawing from existing capabilities of four campuses at the University of North Carolina.

In the highway safety management field, the Automotive Safety Foundation held several regional safety management seminars, in August 1968, for state managers of safety-related programs.

Somewhat related to the research manpower requirement is a report entitled, "Facility Requirements for the National Traffic Safety Research Center," prepared by TEMPO, A Division of General Electric Company, in cooperation with Stanford Research Institute and Bechtel. The report was published in October 1967.

The most pertinent of the studies accomplished under the sponsorship of NHSB to date is the recently published SRI study on the Feasibility of Establishing Highway Safety Education and Research Centers at University-Level Institutions. The study report should be thoroughly reviewed by any university responding to this RFP.

OBJECTIVE

The objective of this Request for Proposal is to solicit the following information from universities interested in participating in a program of regional pilot centers for highway safety manpower development and research.

- A description of university qualifications for supporting a regional pilot center, including faculty, facilities, and financial resources.

- A statement of plans developed by the university for the establishment of a regional pilot center, with respect to internal operation, and relationships with the NHSB and field employers' agencies that require development of highway safety manpower.

- An indication of university qualifications for supporting and developing a research program that will lead to the solution of highway safety problems and assist in the development of research manpower.

- A description of university plans for providing for an operational test of the feasibility and effectiveness of the regional concept.

STATEMENT OF WORK

The statement of work is oriented to 11 tasks that are described below. Supplemental tasks that are felt to be of necessity in the establishment of the proposed centers may be added by bidding universities.

Task 1 - Curriculum Development

There are two main requirements in curriculum development for highway safety manpower. The first is to design curricula that will be appropriate for specialists engaged in technical jobs related to highway safety and for professional personnel in the same field who function in administrative and managerial positions. The instruction for these personnel will be of the short-course type, varying in length from one to four weeks. The instruction is intended to be practical and related to job requirements at state and local levels. However, the quality of instruction should parallel that which is provided nominally by the university. The second requirement is to develop graduate curricula that will lead to a specialization, or at least a minor, in highway safety. These courses should be fully comparable with other courses offered at the graduate level.

Guidance for responding to this task may be found in the SRI study report, in which it has been shown that several disciplines may be expected to contribute courses, or parts of courses, to instruction in highway safety. Engineering, education, and police sciences are mentioned most prominently. Courses for safety manpower are analyzed for their content against representative university disciplines. Chapter 1, "Skills and Disciplines Required for Highway Safety Manpower Development," and Chapter 6, "Guidelines for the Administration and Operation of Centers" are especially to the development of curricula at both the short-course and graduate levels. Findings in the SRI report should be considered as guidance and as subject to interpretation by responding universities according to their own experience in providing similar instruction.

In responding to this task, the contractor will submit the following information and description of planned activities:

- A short description of (1) all graduate courses related to highway safety that are currently being offered, according to department or school, and (2) courses that the university intends to undertake at graduate level in support of the program to produce qualified research manpower, and professional manpower such as traffic engineers, driver education supervisors.

- A description of plans for post-graduate curricula that will lead to a specialization related to highway safety or a minor at the M.S., M.A., or Ph.D. levels.

- A description of all short-courses of instruction currently being offered in which training is being provided for either technicians, professional (managerial, administrative, and so forth), and research categories of highway safety manpower. Each short-course should be described briefly, indicating the frequency with which it is offered and its duration. A plan also will be presented for the development of new short-courses, with an identification of the types of safety manpower for whom they will be intended.

Task 2 - Recruitment and Enrollment of Students

In this task, the contractor will describe what his experience has been in the attraction and enrollment of students in other federally funded programs and will indicate those procedures that he intends to adopt in conjunction with an HSMD&R Center. He will indicate how the services of the university, such as placement and counseling, will be placed at the disposal of the student who desires to develop a career in highway safety in either professional or research capacities. He will also indicate the advisability of making available general university services that relate to recruitment for programs, placement, and guidance of students attending short-courses. Based on his experience, the contractor will indicate the build-up rates he perceives in student loads, for graduate students and short-course students. The information to be provided will include:

- A brief description of university experience in establishing courses for students holding positions in government agencies at all levels, with special emphasis on methods and procedures for enrolling students.

- Outline of a plan for student recruitment and placement in the field of highway safety. This plan will emphasize the attraction of graduate students to the program and university provisions for assisting them to find work in the field.

- Availability of the student counseling program for those students who have expressed an interest in the program.

- A description of student fellowship and scholarship plans, with an explanation of how they will be used in support of this program.

- Procedures used by the university to keep track of its students that could be extended to this program, and indications of the kinds of statistics that are used for these purposes and how long they are maintained.

- A description of student-load build-up, for short-course students and graduate students. Estimated build-up rates should be indicated by highway safety program area, i.e., driver education, motor vehicle inspection, and should be extended for at least a five-year period.

Task 3 - Faculty

The objective of this task is to obtain a description of the faculty that would be available to teach at the HSMD&R Center; needs that would exist for the recruitment of additional faculty to teach courses in highway safety; financial arrangements for the faculty; opportunities for the faculty to conduct research on related problems; student/faculty ratios; and other information that would indicate that the university could provide an appropriate faculty capability for the proposed program.

The following information should be presented in responding to this task:

- The present availability of faculty to support instruction in highway safety courses, laboratory work, and related research; the disciplines that are represented; and faculty availability, i.e., full-time or part-time; if on a part time basis, availability is to be shown on a percentage basis.

- Additional faculty that may have to be provided, on either a full- or part-time basis, for support of short-course and graduate student instruction presented by the contractor under Task 1.

This description should include the build-up time that will be necessary to bring full faculty support to the proposed program and show the number of faculty that will be added to the program during build-up.

- The present faculty structure, i.e., the ratio of full professors to associate professors and assistant professors. This outline should indicate how these ratios would be applied to the proposed program or whether it would be necessary to make a departure from existing ratios because of unique requirements in the program. Describe plans, if any, to employ instructors or other types of personnel for instructional purposes.
- A description of the short-course instructional staff, including the availability of lecturers from the university and from the surrounding areas. The description should indicate whether these would be full-time or part-time lecturers and from what other sources they would be drawn (e.g., industry, other universities, government agencies, and so forth).
- The present student/teacher ratios prevailing in the university and the ratios that would be observed in the proposed program. If an exception to the prevailing ratios will be necessary, an explanation should be presented.
- The normal faculty instructional load and the instructional load that faculty assigned to the center may be expected to carry.
- Procedures for faculty recruitment observed at the university and how they would be extended to this program to obtain additional faculty.
- Faculty salary schedules, including entry levels and average annual increases.
- University policy on providing time to faculty for private consulting and research.
- University policy and procedures that would govern the assignment of faculty to the different teaching requirements such as the training of technical personnel, highway safety professional manpower, practitioners in highway safety research, and graduate students.

- Biographical descriptions of all faculty members who would be assigned to the program, either on a part-time or a full-time basis, including those who would function in teaching, research, and managerial/administrative roles.

Task 4 - Other Supporting Personnel

The purpose of this task is to have bidding universities demonstrate the sufficiency and availability of all staff for support of student and faculty needs, and administrative, facility, and equipment requirements. Specifically, the following should be provided:

- Initial staff requirements that would be needed to support the center.

- The availability of staff members who would provide partial support to administrative functions in the center.

- A time-scale for staff build-up from the initial year of operation of the center to full implementation of the program, or at least for the next five years.

- The qualifications of staff members other than faculty.

- The salaries to be offered to the staff members, including beginning and expected average annual increases.

- Functions to be performed by the administrative and clerical staff.

- Biographical descriptions of all administrative personnel who would be employed full-time or part-time by the center.

- A description of the library support personnel.

- A description of the research support personnel, such as laboratory technicians and how they would support the center, from their existing laboratories, by forming new laboratory units in full-time support of the center, or by other means.

- Who would provide facilities and equipment support, i.e., existing personnel or new personnel. If new personnel would be required, a breakdown should be given by skill and occupation the number of personnel required, including their entry salaries and projected annual increases.

Task 5 - Organization

The objective of this task is to have the contractor describe his perceived organizational structure of the center and, in particular, how it will fit within the existing university organization. The description should include the relationship of the center to the university administration, relevant schools and departments, and other research activities within the university. In the event there is a precedence for or a desire to share the program with other universities, how a consortium-type organization would be established and operated should be explained. The advantages of having a center within the university, or of establishing a consortium should also be presented.

In responding to this task, the following information should be provided:

- The organizational structure of the center, indicating the positions by type and number of employees (professional and support).
- Location of the center within the university organization. For example, would the center director report to the president, the provost, or a vice-president of the university, or would the center be incorporated in one of the schools or colleges, such as engineering or education?
- Interface of the center with the university in the areas of finances, administration, special services, student affairs, and so forth. The functions that would be established in the center and those that would be provided by existing university facilities should be outlined.
- University preferences in dealing with the NHSB curricula, financing, and administration. A preferred plan for communications and relations between the center and the NHSB should also be described.

Task 6 - Facilities and Equipment

In responding to this task, a description should be presented of facilities and equipment that would be made available for the operation of the center. This description should include the funding requirements and schedules for completion of all additional facilities that would be needed to accommodate the new center. If available, the description of of facilities should be supported by drawings, photographs, layouts, and so forth. If there are current plans for new facilities, a summary of such plans should be included if these new facilities could be used for the operation of the center.

The following information should be provided:

- For existing facilities, the availability of office space for faculty, staff, and support personnel, classroom space laboratory space, space for graduate students' offices and study rooms, conference rooms, library facilities, and so forth. A brief description of the adequacy and size of these facilities should also be included.
- Equipment and furnishings for these facilities (e.g., desks, chairs, tables, and office machines).
- For planned new facilities, a description of the type and size, the time scale for build-up, and the cost for the next five years.
- Existing and projected costs of facilities and equipment repair and maintenance, on a unit basis (area or cost per student).
- Facilities outside the university that are currently being used or that could be used for student housing and recreation, with respect to their adequacy, proximity to the university, rental price levels, and so forth.

Task 7 - Funding Requirements

Funding requirements related to program quality and size would be a major factor in the final selection of a university to receive a center. In general, funding requirements should be shown in detailed terms. Wherever possible, they should be converted to cost per student for each type of instructional program.

The funding requirements should be shown in a detailed accounting format for the first, second, third, fourth, and fifth years of the program. In presenting the financial data, traditional methods of accounting should be used.

Justification should be provided for each budget item, for the purpose of indicating relevance to the center program and its objectives. As part of the justification, levels of fundings for other government-funded programs at the university should be referenced.

Further, the following information should be provided in responding to this task:

- Funding requirements for center staff and support personnel salaries and fringe benefits, i.e., for faculty, temporary instructional staff, secretaries, librarians, graduate assistance, and so forth.
- Compatibility of funding requirements shown above with general university salary policies and salary levels.
- Current sources of fellowships that could be awarded to graduate students specializing in highway safety.
- Description of comprehensive fellowship program that would be suitable for center operation, including stipends to students, dependents' allowances, and overhead to the university; budgetary requirements for the support of a comprehensive fellowship program; whether tuition is to be paid from the amount granted by the government.
- Other potential supplemental sources of funds that would be available to the university in addition to government funds; sources of other funds, i.e., university, state, several states in a region, private sources, and so forth.
- A brief description of university funding experience in conjunction with other government funded programs.

Task 8 - Program Plan

The purpose of this task is to have the contractor develop a program plan that will describe his procedures for the establishment, organization, and operation of a future regional center. This should include his plans for administrative and operational guidelines by which the center will be operated, his own internal plans for evaluating the effectiveness of the center, reporting procedures, and their frequency, and a time-based plan for the start-up phase, and annual build-up to full implementation of center operations.

The following information should be provided in responding to this task:

- A time-phasing of critical events that will occur during start-up, and each year thereafter for a period of five years, with respect to personnel programming, i.e., faculty, students, administrative personnel, curriculum development, facilities, procurement and construction, research program development, and so forth.

- Guidelines for center operation, including internal operations and interface with other components of the university and the NHSB. These guidelines should be brief but of sufficient detail to enable the NHSB to determine whether the contractor has a sufficient grasp of what center operation requires.

- Guidelines for interface and coordination with other universities in a region if the university should choose to follow a consortium route; also, guidelines for coordination with the employing agencies for purposes of maintaining a curriculum in a state of currency for field needs.

- A detailed description of a preferred plan by which the university operation of a regional HSMD&R Center would be appraised by the NHSB on the quality and effectiveness of the training, education, and research programs, scheduled activities, financial expenditures, development of facilities, and so forth.

Task 9 - Regional Aspects

In the SRI study on the feasibility of establishing HSMD&R Centers, it was concluded that, among the alternative strategies studied, regional centers were one of the more economical approaches and that the current capability residing at universities in highway safety might be best marshalled at the regional level. The purpose of this task is to have the contractor explain how he would undertake regional responsibilities that might call for cooperative arrangements with other educational institutions in the region and coordination of training with state and local employing agencies.

In conjunction with this task the following information should be provided:

- Under one strategy of regionalization established in the SRI study, your university would be located in a region made up of the following states: __________, __________, __________, __________, __________, __________. What arrangements are already in existence for cooperation with these universities in exchange of students, cooperative instruction, joint research programs, exchange of credits, and so forth?

- Cooperative arrangements that the university would be willing to undertake in the formation of a regional consortium of universities, including a brief description of how the consortium would be established and how it would be operated. The type of consortia should be described e.g., whether training and education requirements would be allocated to other universities in the region, or having professorial staff from other universities would be in residence at the regional center.

- A description of ongoing programs that would require coordination with state and local agencies for purposes of providing research support, training, or continuing education programs, and so forth.

- Outline of a plan for establishing and maintaining cooperative educational and training arrangements with state and local governments in states comprising the region.

Task 10 - Research Activities

Research programs to be established in HSMD&R Centers will have two main purposes: (1) to support the education and training in research for graduate students who develop career aspirations in highway safety and related fields; and (2) to provide research opportunities for faculty members who are attracted to the program. It is anticipated that each center should eventually make salient contributions to solution of problems in highway safety. The purpose of this task is to have the contractor describe the program of research that he would undertake in addition to the training requirements of the center's program and the facilities and funds that could be made available for such purposes.

The information to be provided in responding to this task should include:

- Research capacities at the university that could be allocated to a research program in highway safety, including facilities such as driving ranges, simulators, medical facilities, experimental laboratories, and test stations.
- A proposed program of research that would be operated in support of the development of Master's and Doctoral students.
- Other sources of research funding, such as private industry, government grants or contracts, private grants, that could be used to support research in highway safety in addition to those funds granted under the aegis of a center.
- Facilities outside of the university that could be made available for the conduct of research related to highway safety.

Task 11 - Operational Test and Evaluation

In keeping with the true spirit of pilot centers, it is anticipated that an opportunity will be provided to introduce variations in center operations so that more may become known about methods for maximizing the effectiveness of HMSD&R Centers. The operational test would be con-concerned with critical functions such as validating the effectiveness of the training curriculum in the field, innovations in instruction, administrative procedures, improving methods of communication, and so on. The percentage of the budget to be allocated to operational test will be determined in consultation with the NHSB by successful bidders. For the present purpose, responding universities are expected to demonstrate their experience in similar operations by suggesting experimentation that might be conducted within the scope of nominal center functioning. The experimentation or operational test that is needed is that which typically might be evaluated on a time sampling basis rather than according to the need for matched groups. However, it is recognized that there may be a need for controlled sampling when studying differences in instructional methods or technologies.

In responding to this task, the following information will be provided:

- A brief description of meaningful operational tests that could be administered during the daily operation of pilot centers on center operation, interface with the NHSB and field employing agencies, self-evaluation of center effectiveness. establishment of required student proficiencies, instructional innovations, and so on.

- A brief discussion of the gain that could be expected from each of the proposed tests, and the length of time that might be required for the test to run before meaningful data could be obtained.

- A brief description of the measures that would be taken to evaluate each proposed test and how they would be analyzed to determine the test results.

In summary, it should be understood that this RFP is intended to serve as a guideline to assist universities in preparing the main body of their proposals. However, from previous experience that may have been gained in the operation of similar centers, and from the ongoing or recent studies on highway safety manpower education and training needs, each university may indicate additional plans that would contribute to the establishment and effective operation of HSMD&R Centers on a pilot basis at the regional level, and that would enhance operational tests of the regional concept.