

# National Cooperative Transit Research and Development Program

*FOR THE PERIOD  
JULY 1 THROUGH DECEMBER 31, 1981  
CONTRACT DTUM60-81-C-72012*

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PROGRESS REPORT 1

NATIONAL COOPERATIVE TRANSIT RESEARCH & DEVELOPMENT PROGRAM

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# National Cooperative Transit Research & Development Program

TRANSPORTATION RESEARCH BOARD

NATIONAL RESEARCH COUNCIL

NATIONAL ACADEMY OF SCIENCES—NATIONAL ACADEMY OF ENGINEERING

## PROGRESS REPORT 1

*FOR THE PERIOD JULY 1 THROUGH DECEMBER 31, 1981*

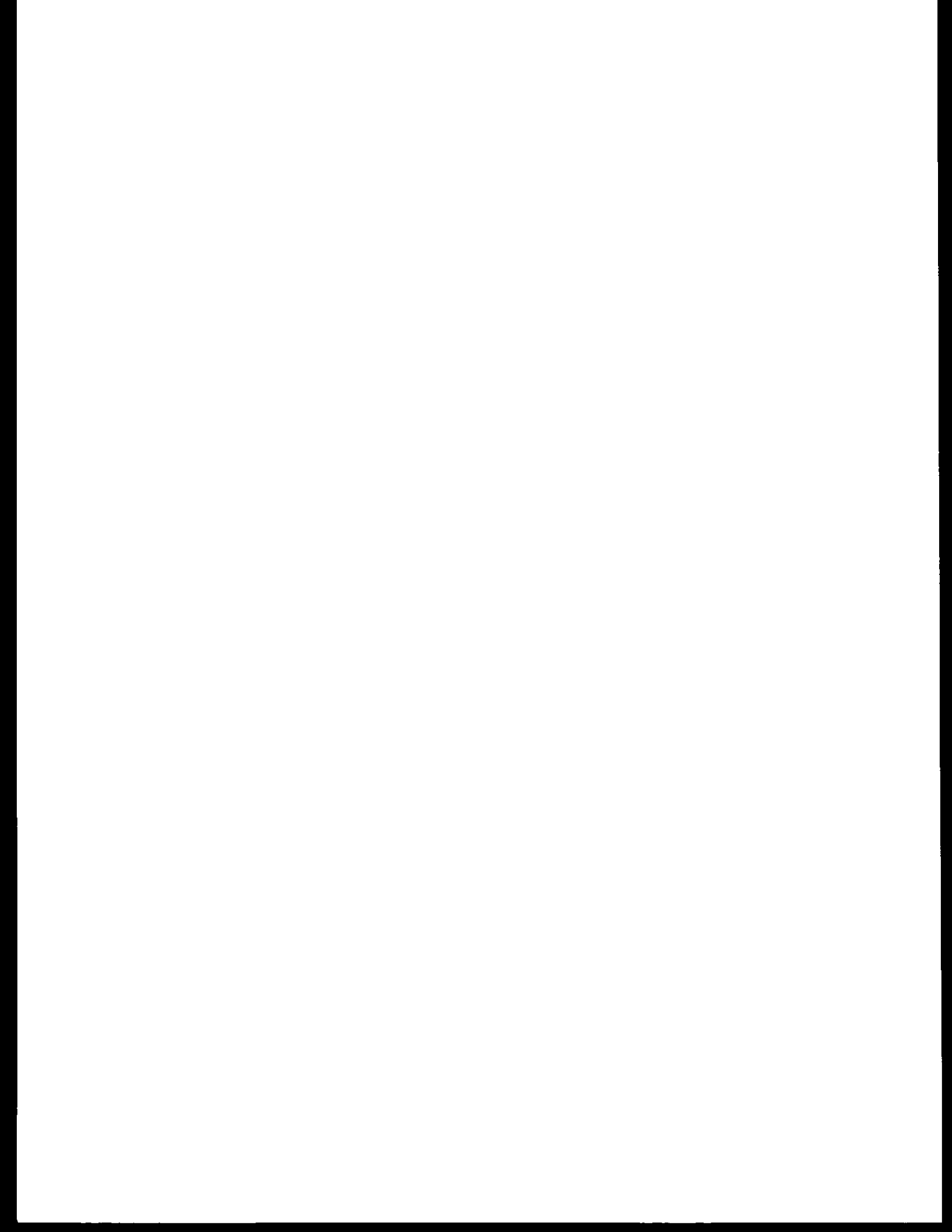
TO THE U.S. DEPARTMENT OF TRANSPORTATION/URBAN MASS TRANSPORTATION ADMINISTRATION  
(DOT CONTRACT DTUM60-81-C-72012)

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## FOREWORD

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This document responds to Article II, Deliverable Items and Delivery Schedule, of DOT Contract DTUM60-81-C-72012 between the U.S. Department of Transportation/Urban Mass Transportation Administration and the National Academy of Sciences, designated the Primary Technical Contractor(PTC), for technical and administrative services relative to the Urban Mass Transportation Administration's National Cooperative Transit Research & Development Program(NCTRP). Distribution of this document is made only to the sponsors and others participating officially in the conduct of the NCTRP.

Annual NCTRP activity consists of five(5) distinct phases: (1) Problem Identification, (2) Program Formulation, (3) Project Formulation, (4) Project Execution, and (5) Project Reporting. The Academy's obligation as the PTC is relative to Phases 2 through 5, and responsibilities for administration of technical matters under these phases has been assigned to the Transportation Research Board, a unit of the National Research Council, the operating arm of the National Academy of Sciences and the National Academy of Engineering. The TRB operates within the NRC's Commission on Sociotechnical Systems and consists of four(4) divisions with Division D, Cooperative Research Programs, being the one to which NCTRP administration is assigned.

Research programs are referred annually by UMTA to the Academy for administration, and semi-annual progress reporting, accomplished for the first time in the format of this document, consists of: (1) general coverage of the historical development of the NCTRP and the means by which the Program is carried forward, (2) elaboration on the management practices exercised by the TRB in behalf of the Academy and UMTA, (3) summarization of management activities and deliverables in the six months reported, and (4) provision of detailed reports on each project under contract during the report period as to the: (a) general research need, (b) specific research objectives, (c) progress in achieving project objectives, (d) availability of any reports emanating from the study, and (e) prognosis for ultimate success. Each project report includes identification of the TRB staff engineer having surveillance responsibility and with whom contact may be made for additional insight concerning any details of the contractor's work. Opinions and/or conclusions conveyed by the project reports are those of the research agencies and do not necessarily reflect the position of the National Research Council or the Government, and no official endorsement should be inferred.

A detailed overview of all aspects of NCTRP operation may be obtained from the following:

- NCTRP Summary of Progress Through 1981
- NCTRP Information and Instructions for Preparing Proposals

These are available from the Transportation Research Board on request through:

Cooperative Research Programs  
Transportation Research Board  
2101 Constitution Avenue, N.W.  
Washington, D.C. 20418  
(202) 334-3224

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## NATIONAL COOPERATIVE TRANSIT RESEARCH & DEVELOPMENT PROGRAM

### INTRODUCTION

Administrators, engineers, and many others in the transit industry are faced with a multitude of complex problems that range between local, regional, and national in their prevalence. How they might be solved is open to a variety of approaches; however, it is an established fact that a highly effective approach to problems of widespread commonality is one in which operating agencies join cooperatively to support, both in financial and other participatory respects, systematic research that is well designed, practically oriented, and carried out by highly competent researchers. As problems grow rapidly in number and escalate in complexity, the value of an orderly, high-quality cooperative endeavor likewise escalates.

Recognizing this in light of the many needs of the transit industry at large, the Urban Mass Transportation Administration, U.S. Department of Transportation, got under way in 1980 the National Cooperative Transit Research and Development Program (NCTRP). This is an objective national program that provides a mechanism by which UMTA's principal client groups across the nation can join cooperatively in an attempt to solve near-term public transportation problems through applied research, development, test, and evaluation. Particularly noteworthy is the fact that the client groups now have a channel through which they can directly influence a portion of UMTA's annual activities in transit technology development and deployment. Although present funding of the NCTRP is entirely from UMTA's Section 6 funds, the planning leading to inception of the Program envisioned that UMTA's client groups would join ultimately in providing additional support, thereby enabling the Program to address a larger number of problems each year.

The NCTRP operates by means of agreements between UMTA as the sponsor and (1) the National Academy of Sciences, a private, nonprofit institution, as the Primary Technical Contractor (PTC) responsible for administrative and technical services, (2) the American Public Transit Association responsible for operation of a Technical Steering Group (TSG) comprised of representatives of transit operators, local government officials, State DOT officials, and officials from UMTA's Office of Technology Development and Deployment, and (3) the Urban Consortium for Technology Initiatives/Public Technology, Inc., responsible for providing the local government officials for the Technical Steering Group.

Annual NCTRP activity consists of five (5) distinct phases: (1) Problem Identification, (2) Program Formulation, (3) Project Formulation, (4) Project Execution, and (5) Project Reporting. The Academy's role as the PTC is relative to Phases 2 through 5.

Research programs are developed annually by the Technical Steering Group, which identifies key problems, ranks them in order of priority, and establishes programs of projects for UMTA approval. Once approved, they are referred to the National Academy of Sciences for acceptance and administration through the Transportation Research Board.

The Board, established in 1920, operates within the National Research Council, which serves both the National Academy of Sciences and the National Academy of Engineering, and is uniquely suited for the administrative role because: it has a record of successful management of the National Cooperative Highway Research Program (NCHRP) since 1962, the program after which the NCTRP has been modeled; it maintains an extensive committee structure from which authorities on any transportation subject may be drawn; it possesses the avenues of communications and cooperation with federal, state, and local governmental agencies, universities, and industry; it is recognized for its objectivity and understanding of modern research practices; its relationship to its parent organization is an insurance of objectivity; and it maintains a full-time staff of research specialists in transportation matters to take the findings of research directly to those who are in a position to use them.

Research projects addressing the problems annually referred from UMTA are defined by panels of experts established by the Board to provide technical guidance and counsel in the problem areas. The projects are advertised widely for proposals, and qualified agencies are selected on the basis of research plans offering the greatest probabilities of success. The research is carried out by these agencies under contract to the Academy, and administration and surveillance of the contract work are the responsibilities of the Academy and Board.

The needs for transit research are many, and the National Cooperative Transit Research and Development Program is a mechanism for deriving timely solutions for transportation problems of mutual concern to many responsible groups. In doing so, the Program operates complementary to, rather than as a substitute for or duplicate of, other transit research programs.

## MANAGEMENT PRACTICES IN THE NCTRP

The commentary that follows is to provide insight into the Academy's functions directed to management, through TRB, of UMTA's resource allocation for NCTRP research under Contract DTUM60-81-C-72012. Highlighted are those activities in which all possible opportunity is taken to weight the odds in favor of obtaining implementable solutions to near-term public transportation problems. A more detailed overview of all aspects of Program operation may be obtained from the following:

- NCTRP Summary of Progress Through 1981
- NCTRP Information and Instructions for Preparing Proposals

Organizationally, the TRB consists of four divisions, each headed by an assistant director reporting to an executive director, who, in turn, reports to an executive committee. Division D, now designated *Cooperative Research Programs*, was established in 1962 as a special-purpose activity to administer contracts for research under the NCHRP, and it now encompasses the NCTRP. Division D's activities are thus distinctly different from the Board's traditional role of information gathering and dissemination on behalf of a variety of sponsors. Among the differences in operation is the fact that the funds supporting Division D are obtained through channels outside those pertaining to the Board's other divisions; they are budgeted separately; they are accounted for separately; and they are audited independently of those for the Board's other activities. Furthermore, the funds can be spent only on the research designated by the sponsors of the programs administered under Division D.

It should also be recognized that the overall policies and procedures, including the formulation of annual research programs, are entirely the responsibilities and prerogatives of the sponsors. Neither the regular committees nor the Board's staff have a role in the submission or selection of research problems.

UMTA's goal for the NCTRP is a program within which its resources will be managed well and appropriately directed in the search for solutions to near-term public transportation problems. Applied, or mission-oriented, research is a means to the end as regards the technological approach.

The findings from basic research completed elsewhere are brought into play to bring about new technologies. The expectation from the sponsor is that the resource allocation will result in the development of technology that, when implemented, will make life a little easier—not merely the development of scientific knowledge that has no direct practical application. Meeting this expectation is somewhat comparable to new-product research in industry, and, in addition to being extremely costly, the probability of failure is high. Furthermore, although projects may begin as applied research, the synergistic nature of research often catapults them back into the realm of basic studies, because true solutions are not achieved without understanding the underlying causes for the problem so that they may be accounted for in the future.

Currently, each year's research program is funded at about \$1 million, which represents about one-fourth the

amount contemplated in the planning processes leading to establishment of the NCTRP. As earlier stated, it is hoped that the present level can be increased through financial support ultimately obtained from UMTA's client groups joined in a cooperative venture. In any event, proper management of resources is the sole basis for establishment of the Board's entire philosophy, organization, and functions regarding work under Division D—*only the sponsors' expectations matter*. Toward this end, network control is employed in the classic sense of network utilization for project management. Primary focus is on those milestones where the best opportunities lie for positively weighting the odds of success. These opportunities are afforded through the use of common-sense strategies to control various circumstances surrounding each milestone. Subtle processes result that will, through the natural evolution of interdependent events, increase the probability of research results being implemented and improving transportation practices. Such an approach is based on game theory, is admittedly idealistic, is complex, and must be monitored constantly. Nonetheless, its practical validity cannot be denied if, in the context of total administrative responsibility, one wants to take advantage of all possible opportunities to insure the best return on the sponsor's investment.

As a first element of strategy, the NCTRP establishes the research agency and personnel qualifications that are mandatory if the projects are to have any chance of success. These are spelled out to potential proposers and are adhered to in selecting research agencies. By means of the project statements and various other widely distributed publications, the NCTRP clearly states the agency attributes deemed essential and thereby hopefully precludes proposals from any but qualified researchers having practical experience in the problem area. Emphasis is placed on the importance of a record of successful past performance in endeavors similar to those to be undertaken. The specifications for proposals are demanding in the sense of requiring the agencies to lay their knowledge, experience and accomplishments on the line, and proposals simply are not accepted if, among other factors, they do not contain specific statements as to how the contemplated results can be used to improve practice.

The next element of strategy comes into play when a research problem and its objectives are first defined in the form of an NCTRP Project Statement by which research proposals will be solicited. A continuing responsibility of the Board is to see that the projects are sensibly structured around the practical facts of operational life and that they represent current circumstances. Therefore, this task is carried out by persons not only very knowledgeable in the problem area but who also have a complete understanding of the needs of the practitioners with whom the problem originated and the best format by which the practitioner can utilize the results. Improved odds therefore become immediately inherent.

Toward the goal of sensible projects, the Board has established seven broad research fields under which project panels are organized to deal with research in specific problem areas falling within the broad fields (refer to Figure 1). For example, in the broad subject field of Operations each project falling within the more specific subject areas of



## NCTRP RESEARCH FIELDS AND AREAS

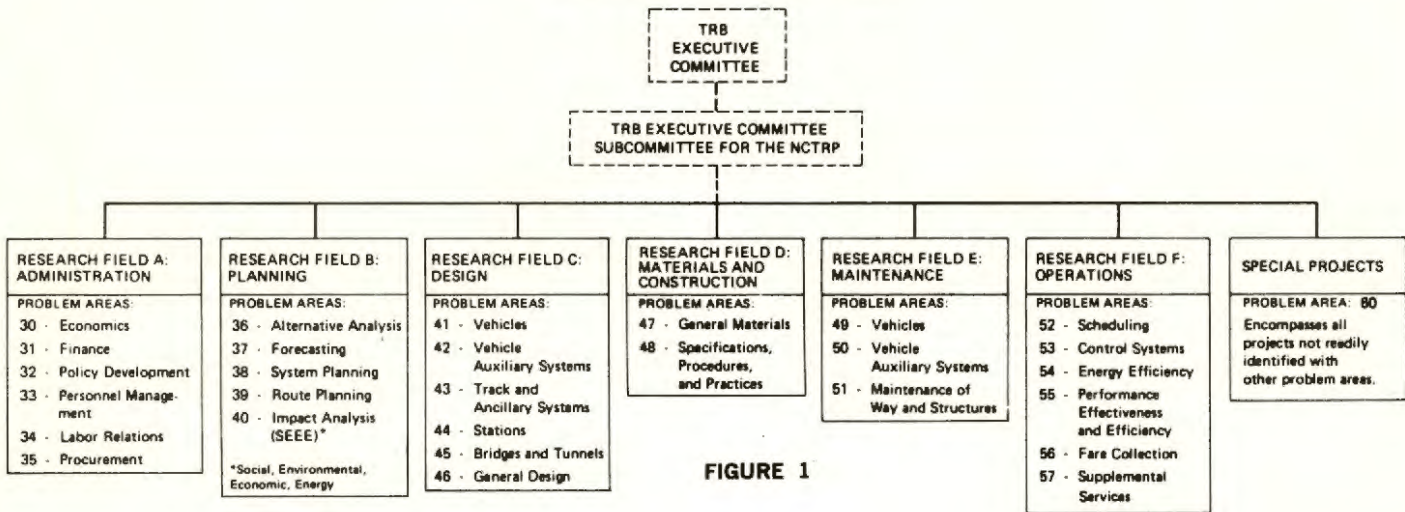


FIGURE 1

Energy Efficiency—Area 54—is assigned a project panel comprised of outstanding individuals who are very knowledgeable in the specifics of the particular project and who are looked to for guidance and counsel throughout the research and reporting phases. Those projects that do not conveniently fit under one of the first six general fields are assigned to the seventh one, Special Projects.

When the project panels meet for the first time to prepare project statements, it is stressed to them that a first-class statement is the first of the two most important factors bearing on the ultimate success of any project. Accordingly, extreme care is exercised in the development of clear, concise project statements that are distributed to the research community at large. These statements contain objectives designed to result in the most extensive work possible for the available funding. They spell out what is expected of a contractor in terms of findings from innovative research that can be applied practically; they do not spell out how to go about the research. Statements of explicit objectives, matched to funding, places proposers in the position of knowing exactly what is expected of them, because the available funding is made known along with the objectives. Not only does this result in more realistic proposals, but it most assuredly eases each project panel's task of comparative evaluation. Of the members of the project panels for the NCTRP's first program (FY 1980), about 36 percent come from transit operating agencies. Because of their intimate involvement in the development of the various research projects, their knowledge of what is to be expected, and the "spreading of the word" among their associates, there is yet another step toward improving the odds that results will be put to use.

The second of the two most important factors, and the next element of strategy, concerns the process of evaluating proposals to select research agencies. The odds can be advanced materially if extreme care is exercised throughout this activity. Indeed, this activity constitutes the milestone on which the success of the project can become totally dependent, irrespective of the strengths built in at the preceding milestones. Prior to contracting, there *must* be satis-

faction not only that the proposed research plan is the best possible in addressing the specifics of the objectives, but also that it culminates with the best promise for providing transit agencies with a product that is both usable and readily implementable; otherwise, the proposal process—and possibly that of project definition—should be repeated. The importance of this activity is made abundantly clear to the project panels when they meet to select agencies and suggest minor modifications of the research plans as a means for keeping them squarely on target. A comprehensively detailed research plan not only aids the selection process but also serves as the yardstick by which the staff exercises day-to-day surveillance of research progress.

Two top proposals are chosen for each project. The deliberations of the project panel include a review of all known aspects of agency performance on other research projects under NCTRP or elsewhere and a determination that the first-choice research plan offers the best promise for providing a product that is both usable and readily implementable. A key factor is the merit of the research approach and the experiment design. There is nothing anywhere in the Program's specifications that says the project statements must be adhered to strictly in every detail and that any deviation in research thrust or from the proposed project period warrants outright rejection. The key element is that the agencies must present a strong, convincing case for whatever approaches they take. These always receive just consideration because the sole interest of the project panels is to determine the plan with the best probability of success.

Prior to contracting, any suggested modifications are taken by the Program staff to the agencies, and a clear meeting of the minds is established regarding what is specifically expected from the research and the personnel carrying it out. By means of the "Procedural Manual for Agencies Conducting Research in the National Cooperative Transit Research and Development Program," further emphasis is placed on the requirement for practically oriented research and the proper means for reporting it. Experience has demonstrated that, once the research is



under way, the practical fact of life is that the destiny of the research is pretty well committed, no matter how extensive the staff surveillance or how many administrative processes are available to accommodate changes. Rarely are changes accompanied by gains when having to stay within the original funding; rather, the effects are usually negative.

A first requirement of the research agency immediately after contracting is the development of a working plan that is intended to be a comprehensively detailed amplification of the approved research plan, inclusive of a specific schedule of events for the major tasks. This document is used by the staff in the day-to-day surveillance of the project's progress. Should review of this document by the staff and project panel bring to light necessary changes that were not previously apparent, these can be accommodated without hindering prosecution of the work. Through this activity, an additional opportunity is afforded for improvement of the odds of success.

As a means of mutual assistance while work is under way, two types of progress reports are required from the agencies. On a monthly basis, one-page progress schedules are submitted that graphically depict several aspects of progress. On a calendar quarter basis, narratives are required that fully describe accomplishments to date and outline future activities based on the accomplishments. Based on these reports and information gained through surveillance visits, Program staff prepares its own progress reports that are sent to UMTA and the Technical Steering Group as a measure of providing a current awareness of on-going work. By these controls the Program is, to some degree, able to appraise the agency's level of performance, while at the same time the agency is provided with tools to assist its own management responsibility in both administrative and technical respects. All too often in the administration of research programs problems arise because there is insufficient communication between the agency's management staff and the technical staff performing the research.

Project surveillance constitutes a major element of strategy in achieving the administrative goal. The gains here reflect the effort that the NCTRP staff exerts (a) to keep the research in line with the approved research plan; (b) to keep the researchers continually aware of the needs of the practicing engineer; and (c) to see that all project developments, through final reporting, center around these practical needs. Projects engineers with wide ranging experience are assigned to the NCTRP by the Board and are responsible for administrative and technical surveillance of the contracts. Their activities include visiting each research agency at least once every six months to discuss the status of the work with the principal investigator(s) and to determine if the research is being pursued in line with the approved research plan. Any need for change in the plan is referred to the project's panel for review and approval. Finally, the staff engineer and the project panel evaluate the final report on the completed research to determine the degree of technical compliance with the contract and to ensure adherence to the Program's specifications for report writing.

Research agencies are required to report their results in language that is understandable and succinctly summarizes

the results so that the transit administrator and others may easily determine their usefulness to their operations. The objectives are accomplished through a "Summary of Findings" and a chapter on "Interpretation, Appraisal, and Application of Results." The detailed research techniques and analyses in which a researcher would be interested are presented as report appendices. Available to the researchers in report preparation are guidelines that have been developed with the objective of providing a report of maximum utility to the transit industry. Each report, as finally published in the regular NCTRP series (Reports or Syntheses of Transit Practice) also contains a staff-prepared foreword that directs the attention of the busy reader to the persons who would be most interested in the results and, also, to how the results fit into present knowledge and practice.

Prior to publication, extraordinary measures are taken to ensure that useful research results are made immediately available to the appropriate personnel. One means consists of forwarding copies of the research agency drafts of final reports. According to the urgency of the particular circumstances, these drafts may be either uncorrected or corrected on the basis of an acceptance review. Several copies of unedited drafts of the agency reports are retained until formal publication and are available, on a loan basis, to others having an interest in the research. Once published in their entirety, the drafts are destroyed.

After publication, each report is distributed widely through the TRB's selective distribution system. Copies go automatically to about 100 libraries, TRB transit representatives, educational institution liaison representatives, appropriate project panels and committees of the Board, and individual members who have selected publications in the particular subject area of the report. As a further means of disseminating the research reports, announcements of their availability are made to the trade press. Also, the Technical Activities Staff comprising the Board's Division A follow the progress of the work throughout its conduct and consequently are able to discuss application of the research results with potential users during visits to operating agencies.

A tragic result of much research is a compilation of findings that, because of language and form, simply cannot be used until the sponsor devotes considerable supplementary effort to translating the findings into the language and working tools of the users. This kind of time cannot be afforded in the sponsor's scheme of day-to-day operation. In an applied research program such as the NCTRP, the sponsor rightfully expects a product that has immediate applicability to practice. This is not asking too much, because improvements are going to occur mostly in the form of moderate refinements of existing practices, rather than as dramatic innovations or breakthroughs that one might expect from extensive basic research. Therefore, where necessary as an integral part of administration, staff assumes the role of interpreter and interjects itself as a third party between the sponsor and the researcher by means of a very brief publication titled *NCTRP Research Results Digest*. The Digests are issued as a series of flyers to provide in understandable language an early awareness of project results so as to encourage early implementation.

They are brief in summarizing specific findings—they do not deal with methodology—and require the reader to expend very little time in determining the usefulness of the findings. Reference is made in each to the fact that uncorrected draft copies of the agency's report are available on a loan basis for those desiring more extensive information. Where circumstances warrant, staff does not wait for requests for reports but distributes copies of the agencies' draft final reports to appropriate personnel.

With the culmination of the formal reporting activity, plus any of the special measures just described, the NCTRP reaches the final milestone of its administrative network. What happens beyond that point—how successful the projects really turn out to be—is entirely up to UMTA and the operating agencies. Projects that have accomplished their objectives in providing useful products might just as well have been failures if, at least, consideration is not given to how the results might be used to improve operations. It simply does not make good sense to invest millions in research on critical problems and then not give adequate attention to a determination of the implementation value of the products. Such determination can range from mere thought to total, immediate incorporation as standard practice. Certainly, any action must be temperate to avoid the pitfalls that are present in pushing too hard too fast. To aid decisions as to the course to be pursued, future NCTRP publications will report on all known uses of results, be they limited or extensive. Given the fact that the NCTRP addresses critical, national problems, documented payoff to any one agency should attract study by others. So should documented failures, for they also contain lessons by which all can profit. Research is a venture into risk and uncertainty, the risk being particularly high in applied or mission-oriented research such as the NCTRP undertakes. The wisdom of accepting risk is impossible to determine without studious inquiry into the benefits derived.

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In summary, the NCTRP is an applied, contract research program that has been structured along specific lines to enable it to respond to specific needs of the nation's transit industry. The needs are expressed through problem statements referred from UMTA, and each problem is accompanied by the funds to see it through. From the preparation of project statements through final reporting on the projects results, the goal of the NCTRP is administration that, in the final analysis, will prove to be fully effective in obtaining the best return on the investment supporting the Program.

## SUMMARY OF ADMINISTRATIVE PROGRESS

The following summary addresses the research programs for fiscal years 1980 and 1981 and pertains to activities in the six months subsequent to July 1, 1981. The narrative for each year is cross-referenced to the networks cited and included at the end of the summary. Accompanying the networks are descriptions of the activities (subtasks); those underlined represent the deliverables to which the PTC is committed.

There are five (5) networks that represent the PTC's overall perception of the nature and sequence of activities required by all NCTRP participants for an efficient, fully coordinated operation. All five are included in this report to provide perspective of the total operation. Certain of them appear twice inasmuch as there is one for each of the years being reported. Relative progress on tasks and subtasks is indicated by shading of the activity nodes, i.e., a fully shaded node represents completion of a subtask; a partially shaded node represents, to the extent of shading, the relative degree of accomplishment of the subtask. Accordingly, progress for the respective fiscal-year programs is as follows.

### FY 1980 Program

#### I. *Reference:* Networks #2, #3, and #4; Tasks 3.3 (begin with 3.3.9), 3.4, 4.1, and 4.2 (through 4.2.11).

Work in the report period was completed on schedule and continued from the preceding period relative to processing of the seventy-seven (77) proposals received from sixty-eight (68) agencies in response to a distribution of well over 3,000 project statements. The proposals were sent, along with evaluation guidelines, to the project panels for evaluation and ranking in preparation for August meetings (2 days scheduled for each panel between August 3 and 11) in which research agencies were to be selected. The meetings were held, and, in addition to the primary task of selections, the panels updated the Problem Evaluation Forms (PEF) developed in the first meetings to serve as a succinct file record of the important elements for each project, and, further, they prepared a second form titled, "Proposal Review and Recommendations (PRR)," and by which general comments on and suggested modifications of the proposed research plan were recorded for conveyance to the first-choice agencies. The same level of effort was devoted to selection of second-choice agencies for the projects, these agencies constituting contingency backups in the event contracts did not materialize with any of the first choices.

Within one week of each meeting, all proposers were informed as to how they fared, and the first-choices were asked to respond to the PRR's. The responses were sent to the panels for evaluation and eventual guidance to staff. Then, miscellaneous tasks necessary for contract negotiations and contract executions, e.g., pre-award audits of agencies' financial responsibilities, proposed overhead rates, and other budget matters, were completed with the assistance of the agencies, as needed.

Concurrently, a report was submitted on August 31, 1981, to UMTA for purposes of identifying the agencies

selected, detailing the reasons for such selections, identifying all proposers, and providing various statistics. Also, debriefings of unsuccessful agencies were performed as requested, and work was completed with UMTA on development of a standard format for subcontracts, the approval for which was conveyed by UMTA letter of September 3, 1981.

Contract negotiations ensued, and contracts were executed such that effective dates for beginning work ranged between October 1 and November 30, 1981.

Required from the agencies soon after commencement of work were Working Plans intended to amplify, to all possible extent, on the approved research plans. The Working Plans were submitted for review, evaluation, and approval by the project panels, following which the resulting comments were returned to the agencies for reconciliation, a process much like that pertaining to proposal evaluation and selection.

Required monthly progress schedules and quarterly progress reports were received from the agencies, following which staff and panel evaluations were made, and reconciliations, as needed, were effected in concert with the agencies.

#### II. *Reference:* Networks #3 and #4; Tasks 3.4, 4.2, and General.

Concurrently with all the foregoing, work was completed as to final development, production, and distribution of the document, "Procedural Manual for Agencies Conducting Research in the NCTRP"; updating, revision, and distribution of the brochure, "Information and Instructions for Preparing Proposals"; and completion and production of the publication, "NCTRP Summary of Progress Through 1981." Work on the instant report, "Progress Report 1," was initiated; and, begun again, was work on development of a general NCTRP brochure that can be used to broadcast widely the nature and importance of NCTRP to the transit industry and, further, to emphasize the extreme importance to the Program's ultimate success of participation by persons from the transit industry in the work of the Technical Steering Group operated through the American Public Transit Association, TRB's project panels, and elsewhere.

#### III. *Reference:* Synthesis Task (Unnumbered).

The two subjects being synthesized are:

TS-1, "Improved Transit Bus Interior Cleaning Equipment and Procedures"

TS-2, "Priority Treatment for Buses on Urban Streets"

Both were scheduled to be in the editorial and/or publication process by December 31, 1981, and both should be formally published early in the next report period.

#### IV. *Reference:* Contract DTUM60-81-C-72012.

In line with the requirements of Article XIX, Subcontracting Reporting Requirements, of the prime contract, it is reported that six (6) subcontracts for research on FY '80 problems were entered into during the quarter ending December 31, 1981. Copies of each of these subcontracts were sent to the DOT Contracting Officer in accordance with established procedures.



## FY 1981 Program

### I. *Reference:* Network #1, Task 2.1

All activities under this task pertained to support of the TSG in formulation of the FY '81 program. Relative to the 166 1st-stage problems submitted to the TSG, PTC staff extracted key words, saw to TRIS searches for relevant information from either ongoing or completed research, prepared written evaluations of the merits of the proposed research, and participated in the TSG program formulation meeting of October 7, 1981, by way of a progress report on PTC operation and accomplishments to date and provision of input of varying nature in response to questions by the TSG chairman and members. No further work is required on this task.

### II. *Reference:* Network #2; Tasks 3.0, 3.1 (through 3.1.9),

All steps relative to Academy acceptance of the FY '81 program are yet to be completed as they depend on UMTA approval and official referral of the program recommended by the TSG. Because the TSG's development of the program was not completed by 31 December, PTC action under Task 3.0 will be taken early in the next report period. Meanwhile, preparation of paperwork internal to the Academy in respect to the acceptance process was taken as far as possible and is being held for completion and processing.

Notwithstanding the above stated circumstances, the PTC moved ahead according to the annual schedule of events, represented by the networks, in the areas of setting dates for project panel meetings (March and August) to prepare project statements for soliciting proposals and to select research agencies, soliciting widely for project panel nominees, and review of the qualifications of the nominees thus far submitted.

Work in the next report period will consist of structuring the project panels, obtaining Academy approvals of them, holding the first meeting (2 days scheduled for each panel between March 22 & 30.), preparation and distribution of project statements by which proposals will be solicited, receiving and processing proposals for reviews by staff and project panels, and preparation for the second meeting

(2 days scheduled for each panel between August 16 & 20) in which research agencies will be selected.

### III. *Reference:* Contract DTUM60-81-C-72012.

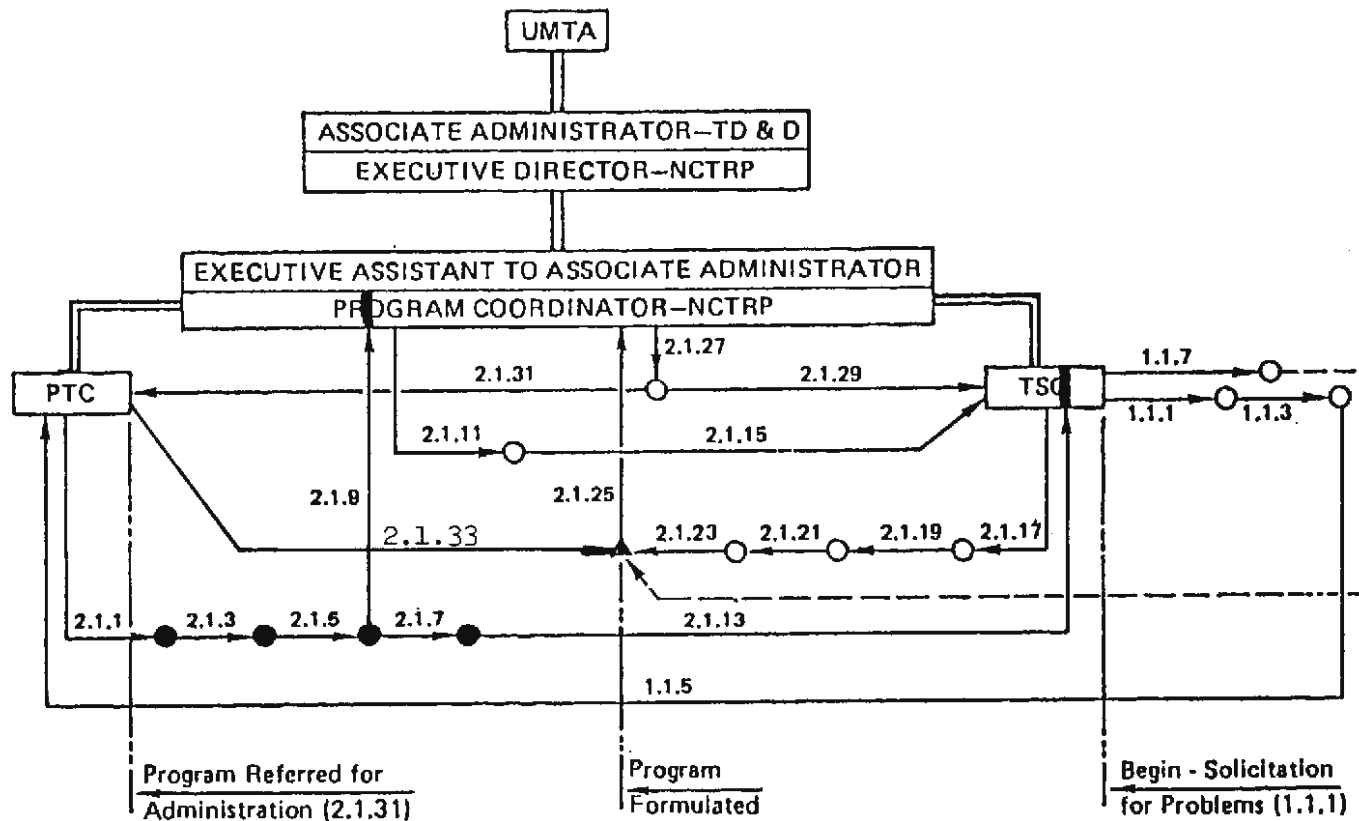
In line with the requirements of Article XIX, Subcontracting Reporting Requirements, of the prime contract, it is reported that no subcontracts were entered into as regards the FY 1981 program for the period ending December 31, 1981.

### Difficulties Encountered During Report Period

None

### PTC Activities in the Next Report Period

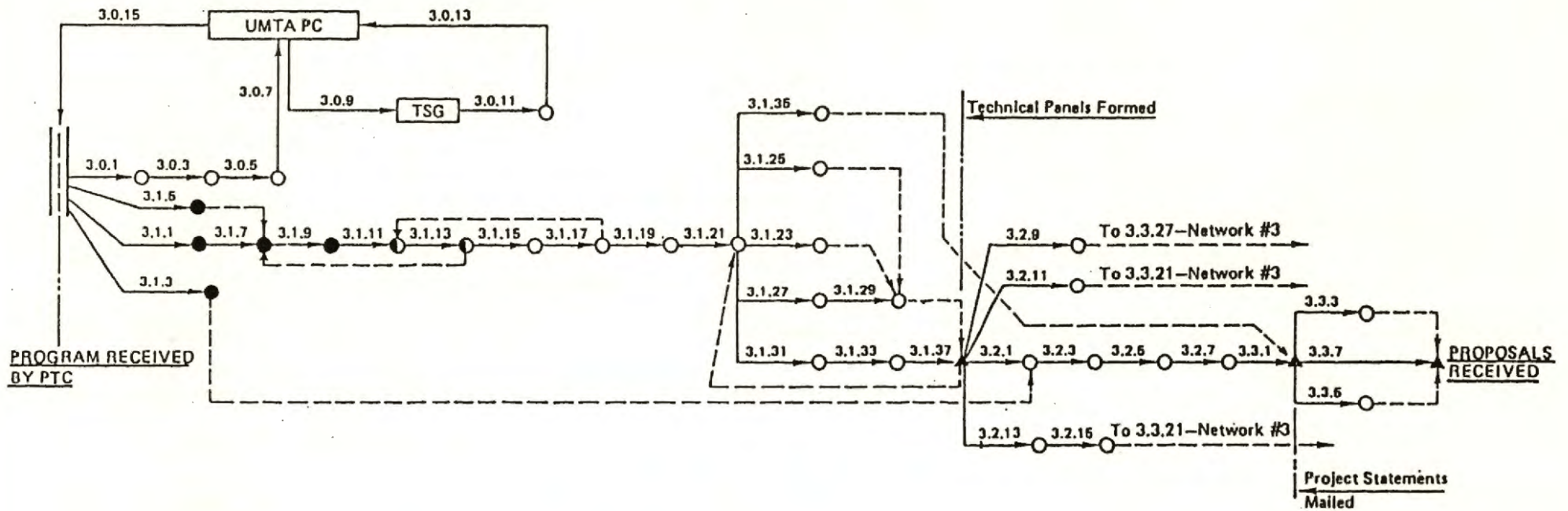
1. Routine surveillance of FY '80 research in progress, including the first on-site visits.
  2. Following UMTA approval of the program recommended by the TSG for FY 1981 and referral of it to the PTC for administration, the activities of Network #2, Tasks 3.0 and 3.1, will be initiated with a view toward formulation of project panels and meetings in March 1982 for preparation of the Project Statements by which research proposals will be solicited. As stated earlier, some work on Task 3.1, through Subtask 3.1.9, in fact has been started while awaiting the official referral. The report period will culminate with processing of the proposals on the FY '81 projects.
  3. Work will be completed relative to development, production, and distribution of a general brochure on the NCTRP, one that can be used by all formal participants for broad dissemination to further the awareness of the transit industry to the existence of the NCTRP and the need for persons from the industry to become involved in the Program's work.
  4. Work will begin, as may be required, in support of the TSG's processes for evaluation of problems emanating from a solicitation for FY 1982 submittals.
-



**NCTRP NETWORK #1**  
 TSG Initiation of Program  
 through Referral to PTC  
*KWH - May '79*

RE: FY 1981 PROGRAM  
 31 December 1981

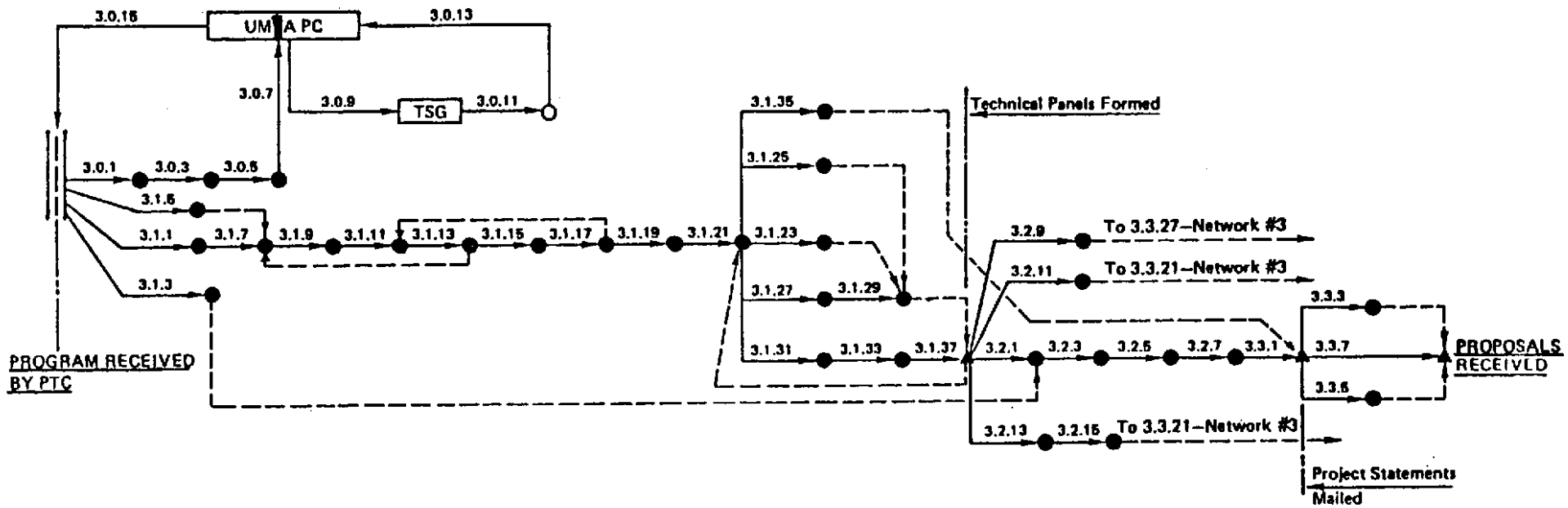
**NOTE:**  
 Fully shaded nodes represent completed subtasks; partially shaded nodes indicate relative degree of subtask completion.



RE: FY 1981 PROGRAM  
 31 December 1981

NCTRP NETWORK #2  
 PTC Receipt of Program  
 through Receipt of Proposals  
*KWH - May '79*

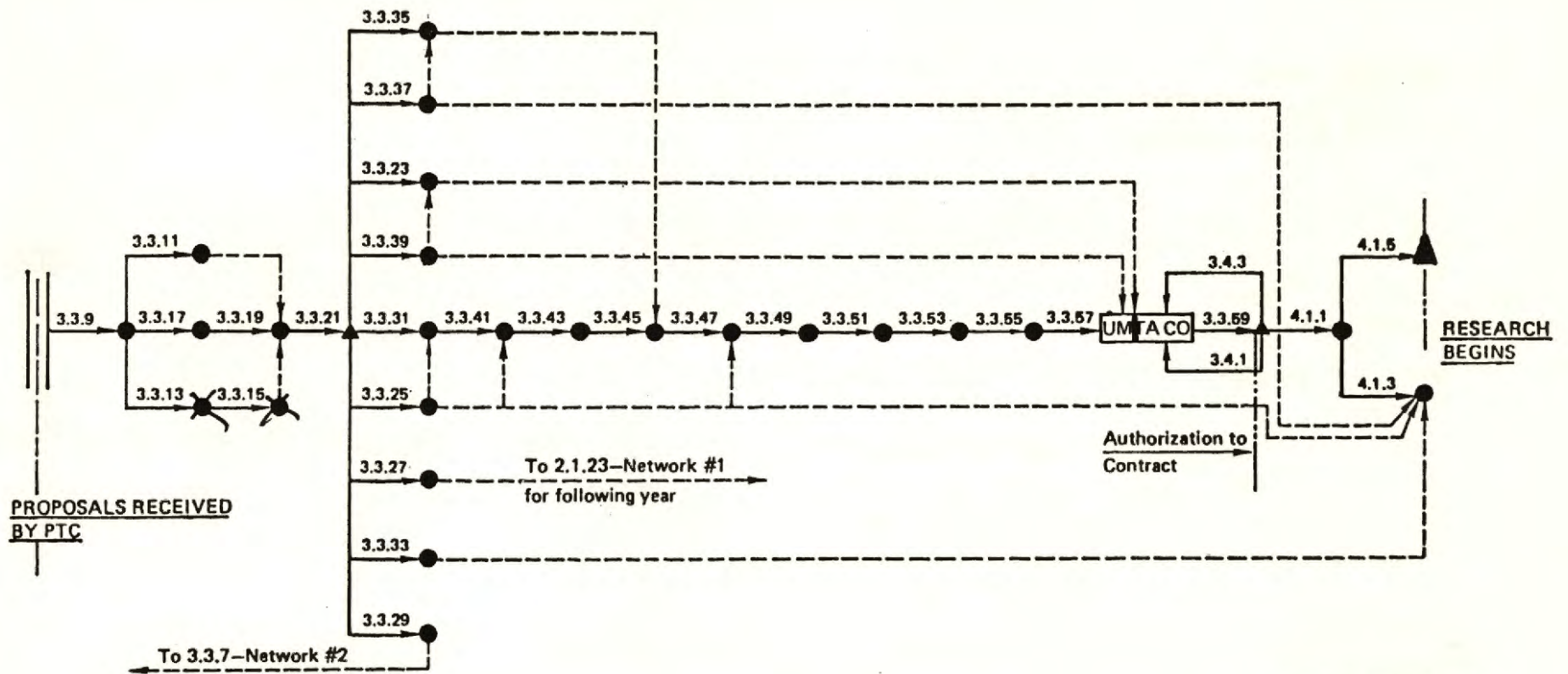




RE: FY 1980 PROGRAM  
 31 December 1981

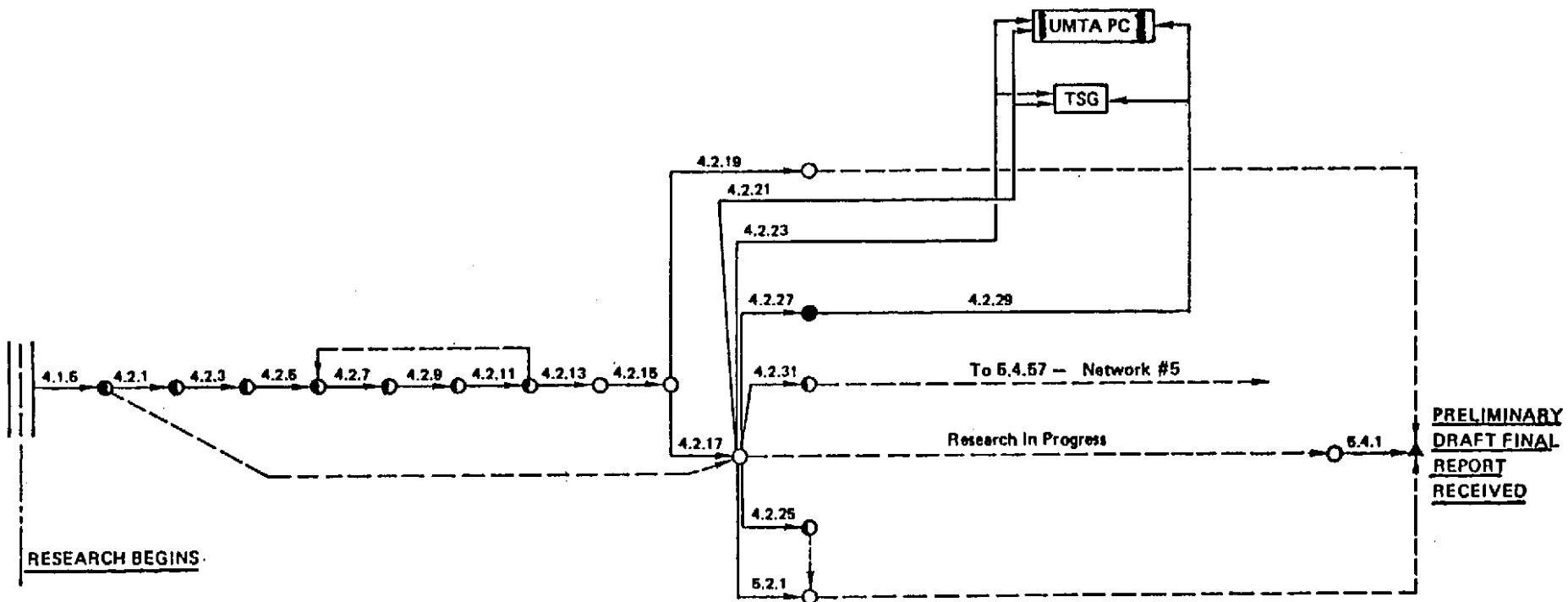
NCTRP NETWORK #2  
 PTC Receipt of Program  
 through Receipt of Proposals

*KWH - May '79*



**NCTRP NETWORK #3**  
 Receipt of Proposals through  
 Initiation of Research  
*KW4-May 79*

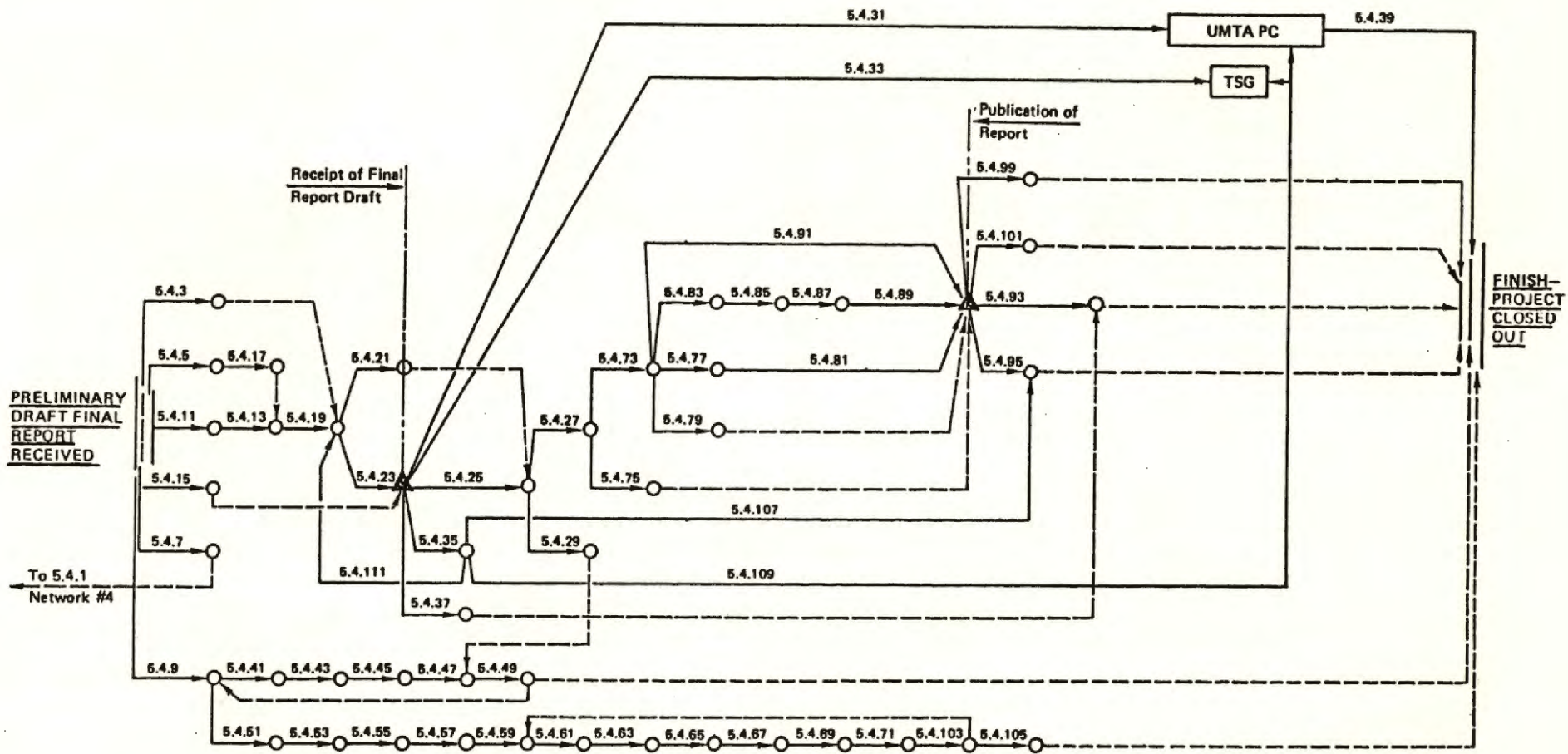
RE: FY 1980 PROGRAM  
 31 December 1981



NCTRP NETWORK #4  
 Initiation of Research through Receipt  
 of Preliminary Draft Final Report  
*KYM - May 79*

RE: FY 1980 PROGRAM  
 31 December 1981





**NCTRP NETWORK #5**  
 Receipt of Preliminary Draft Report  
 through Project Close Out  
*KWH - May '70*

## ACTIVITY DESCRIPTIONS FOR NCTRP NETWORKS

TASK	SUBTASK AND DESCRIPTION OF ACTIVITIES	DELIVERY DATE
1.1	1.1.1 TSG solicits problem statements in detailed format	
	1.1.3 Problem statements prepared and submitted	
	1.1.5 As received, problem statements are forwarded to PTC (TRB)	
	1.1.7 TSG sets date for meeting to formulate annual work program	
2.1	<u>2.1.1</u> PTC (TRB staff) extracts key words and sends to TRIS	As required
	<u>2.1.3</u> TRIS searches files, forwards output to TRB	As required
	<u>2.1.5</u> PTC staff screens out nonrelevant materials	As required
	<u>2.1.7</u> PTC staff prepares evaluations	As required
	<u>2.1.9</u> PTC sends copy of problem statement and TRIS output to UMTA Program Coordinator to obtain UMTA evaluation	
	2.1.11 UMTA staff prepares evaluations	
	<u>2.1.13</u> As made, PTC staff evaluations and TRIS output are forwarded to TSG	As required
	2.1.15 As made, UMTA evaluations are forwarded to TSG	
	2.1.17 Based on evaluations, TSG modifies details of problem	
	2.1.19 By letter ballot, TSG members rate revised problem statements	
	2.1.21 TSG ratings are converted to rankings and circulated to membership	
	2.1.23 TSG meets to formulate annual work program	
	2.1.25 TSG sends annual work program to UMTA for approval	
	2.1.27 UMTA acts on approval of program	
	2.1.29 UMTA and TSG Coordinate as needed if revision of recommended program is necessary	
	2.1.31 UMTA refers approved program to PTC, with copy of correspondence to TSG	
	2.1.33 Staff participates in TSG meeting	As required
3.0	<u>3.0.1</u> TRB ballots Executive Committee subcommittee for the NCTRP on acceptability of problems to be identified with the Academy	+ 1 week*

\*Accumulative from date PTC receives work program.



<u>TASK</u>	<u>SUBTASK AND DESCRIPTION OF ACTIVITIES</u>	<u>DELIVERY DATE</u>
3.0	<u>3.0.3</u> Subcommittee acts on ballot	+ 3 weeks
	<u>3.0.5</u> TRB recommends acceptance action to PTC	+ 3.5 weeks
	<u>3.0.7</u> PTC acts on acceptance recommendation and so notifies UMTA	+ 4.0 weeks
	3.0.9 UMTA notifies TSG of PTC acceptance	
	3.0.11 TSG acts as appropriate re PTC rejections of problems or programs	
	3.0.13 TSG submits revisions to UMTA	
	3.0.15 UMTA submits revisions to PTC	
	<u>3.0.17</u> 3.0.1 through 3.0.9 repeated as needed	As required
3.1	<u>3.1.1</u> Concurrently with 3.0.1, Director, CRP, assigns problems to research areas and staff	+ 4.2 weeks
	<u>3.1.3</u> Director sets panel meeting dates	+ 4.5 weeks
	<u>3.1.5</u> PTC prepares background materials for letters soliciting nominees for panels	+ 6.0 weeks
	<u>3.1.7</u> Staff determines balance of expertise required by problem	+ 6.0 weeks
	<u>3.1.9</u> Solicitation letters are mailed	+ 6.5 weeks
	3.1.11 Nominees are submitted	
	<u>3.1.13</u> Staff balances nominee expertise against problem needs and recommends panels to Director	As required
	<u>3.1.15</u> Director and staff agree on tentative rosters	As required
	<u>3.1.17</u> Director sends invitation-to-serve letters	As required
	3.1.19 Responses are returned	
	<u>3.1.21</u> Director sends additional invitations in instances of turndowns	As required
	<u>3.1.23</u> Director sets tentative rosters	As required
	<u>3.1.25</u> Director sends acknowledgment letter to those accepting	As required
	<u>3.1.27</u> Concurrently with 3.1.25, Director submits tentative rosters to Academy for approval	As required
	<u>3.1.29</u> Academy acts on approvals and notifies Director	As required
	<u>3.1.31</u> Concurrently with 3.1.27, Director prepares formal appointment letters for TRB Executive Director's signature	As required
	<u>3.1.33</u> Appointment letters are mailed	+ 15 weeks
	<u>3.1.35</u> Director begins coordination with UMTA and TSG to develop mailing list for Project Statements	+ 12 weeks
	3.1.37 Cards confirming acceptance of appointment are mailed to TRB	



<u>TASK</u>	<u>SUBTASK AND DESCRIPTION OF ACTIVITIES</u>	<u>DELIVERY DATE</u>
3.2	<u>3.2.1</u> Technical panels meet to prepare Project Statements	+ 19.5 weeks
	<u>3.2.3</u> Project Statements are submitted to editorial and production processes	As required
	<u>3.2.5</u> Project Statements are printed	As required
	<u>3.2.7</u> Project Statements are forwarded to mailer	+ 23.5 weeks
	<u>3.2.9</u> Panels prepare Problem Evaluation Forms	+ 19.5 weeks
	<u>3.2.11</u> Panels review guidelines for proposal evaluation and agree on weights for key elements	+ 19.5 weeks
	<u>3.2.13</u> Staff drafts meeting notes and circulates for approval	+ 21.5 weeks
	<u>3.2.15</u> Meeting notes types, duplicated, and mailed	+ 23.5 weeks
3.3	<u>3.3.1</u> Project Statement mailed	+ 24 weeks
	<u>3.3.3</u> Staff responds to inquiries as necessary	As required
	<u>3.3.5</u> Staff coordinates with Minority Business Enterprises	As required
	<u>3.3.7</u> Agencies prepare and submit proposals	
	<u>3.3.9</u> Proposals processed	+ 32.5 weeks
	<u>3.3.11</u> Notifications of rejections mailed	As required
	<u>3.3.13</u> Conflicts determined	As required
	<u>3.3.15</u> Letters dropping conflicts from panels mailed	As required
	<u>3.3.17</u> Proposals mailed to panel	+ 33 weeks
	<u>3.3.19</u> Panels evaluate proposals and prepare pros and cons	As required
	<u>3.3.21</u> Panels meet to rank proposals and make selections	+ 41-45 weeks
	<u>3.3.23</u> Panels prepare statements of reasons behind selections	+ 41-45 weeks
	<u>3.3.25</u> Panels prepare Proposal Review and Recommendation Form (PRRF)	+ 41-45 weeks
	<u>3.3.27</u> Panels update Problem Evaluation Form (PEF)	+ 41-45 weeks
	<u>3.3.29</u> Notification to unsuccessful proposers prepared and mailed	+ 42-46 weeks
	<u>3.3.31</u> 1st-choice letters prepared and mailed	+ 42-46 weeks
	<u>3.3.33</u> 2nd-choice letters prepared and mailed	+ 42-46 weeks
	<u>3.3.35</u> PTC's Senior Project's Officer sent 1st-choice proposal and asked to determine agency's financial responsibility	+ 41.5-45.5. weeks
	<u>3.3.37</u> Comptroller's Office sent 1st-choice proposal	+ 41.5-45.5. weeks
	<u>3.3.39</u> PTC report to UMTA on agency selections is prepared and mailed to UMTA, copy to TSG	+ 47 weeks
	<u>3.3.41</u> Agencies respond to PRRF	As required
	<u>3.3.43</u> Panels act on approvals of agencies' responses	As required
	<u>3.3.45</u> Contract Information Summary (CIS) is prepared and sent to PTC's SPO	+41.5-45.5 weeks
	<u>3.3.47</u> PTC's SPO prepares preliminary draft subcontract and forwards to NCTRP staff for approval	+ 43.5-47.5 weeks



<u>TASK</u>	<u>SUBTASK AND DESCRIPTION OF ACTIVITIES</u>	<u>DELIVERY DATE</u>
3.3	<u>3.3.49</u> NCTRP staff acts on approval and returns draft	+ 44-48 weeks
	<u>3.3.51</u> PTC's SPO prepares final draft and mails to agencies	+ 46-50 weeks
	<u>3.3.53</u> Agencies review and respond to SPO	
	<u>3.3.55</u> SPO and NCTRP staff coordinates as needed re agency response	As required
	<u>3.3.57</u> SPO prepares formal subcontract and sends copy to UMTA	+ 48-52 weeks
	<u>3.3.59</u> UMTA coordinates, as required, with SPO subcontract	+ 51-55 weeks
3.4	<u>3.4.1</u> PTC provides UMTA with a statement of safeguards against personal or organizational conflicts of interest	As required
	<u>3.4.3</u> PTC provides UMTA with copy of Procedural Manual for Agencies Conducting Work in the NCTRP	As required
4.1	<u>4.1.1</u> SPO forwards subcontract to agency for execution	+ 52-56 weeks
	<u>4.1.3</u> Agencies execute subcontracts and return to SPO	+ 53-57 weeks
	<u>4.1.5</u> Research begins	+ 53-57 weeks
4.2	<u>4.2.1</u> Agencies submit Working Plan (WP)	+ 55-59 weeks
	<u>4.2.3</u> Staff forwards WP to panels for review and approval	As required
	<u>4.2.5</u> Panels act and notify staff	As required
	<u>4.2.7</u> Panel review comments on WP sent to agencies	As required
	<u>4.2.9</u> Agencies revise as needed and resubmit	
	<u>4.2.11</u> Staff coordinates with panels as necessary re revised submittal	As required
	<u>4.2.13</u> Agencies notified of approval action	As required
	<u>4.2.15</u> PTC staff makes first surveillance visit	As required
	<u>4.2.17</u> PTC staff monitors research in progress through contacts, visits, progress reports - monthly and quarterly	Continuous
	<u>4.2.19</u> PTC staff keeps panels abreast of work	Continuous
	<u>4.2.21</u> PTC staff distributes quarterly progress reports from agencies and coordinates re review comments	Calendar quarter
	<u>4.2.23</u> PTC staff prepares semi-annual progress report for UMTA and TSG	December & July
	<u>4.2.25</u> PTC staff participates in briefings as required	As required
	<u>4.2.27</u> PTC staff prepares annual report on PTC progress in administration of NCTRP activities	December annually
	<u>4.2.29</u> Annual report is distributed	March 15 annually
	<u>4.2.31</u> Staff checks and approves agency invoices	As required



<u>TASK</u>	<u>SUBTASK AND DESCRIPTION OF ACTIVITIES</u>	<u>DELIVERY DATE</u>
5.2	<u>5.2.1</u> As necessary and appropriate to circumstances, PTC staff will see to preparation and distribution of digests, technical articles, etc., reporting to the transit community on useful products soon after they are developed	As required
5.4	<u>5.4.1</u> Final report received in preliminary draft	As completed
	<u>5.4.3</u> Copy is sent to editor	On receipt
	<u>5.4.5</u> Copy is sent to responsible staff engineer	On receipt
	<u>5.4.7</u> Acknowledgment of receipt prepared and sent to Principal Investigator	On receipt
	<u>5.4.9</u> Staff engineer advises SPO of receipt and asks SPO to request inventory of data and equipment from subcontractor and final audit through Comptroller's Office if final bill is in	On receipt
	<u>5.4.11</u> Staff engineer prepares and mails memo requesting panel review of report re technical compliance with subcontract requirements	On receipt
	<u>5.4.13</u> Panels complete reviews and mail to staff engineer	As required
	<u>5.4.15</u> Two (2) copies are sent to file	On receipt
	<u>5.4.17</u> Staff engineer completes his review	Receipt + 30 days
	<u>5.4.19</u> Staff engineer summarizes review comments and mails to Principal Investigator	Receipt + 7 weeks
	<u>5.4.21</u> Principal Investigator prepares point-by-point letter response to review comments and mails to TRB	As required
	<u>5.4.23</u> Principal Investigator revises report according to panel review comments and ships prescribed number of copies to PTC	As required
	<u>5.4.25</u> Copy of final draft is sent to staff engineer	On receipt
	<u>5.4.27</u> Staff engineer reviews final draft and accumulates information, materials, etc., as appropriate to needs of editorial and publication processes	As necessary
	<u>5.4.29</u> Staff engineer sends copy of report to SPO as evidence of fulfillment of contract	On receipt
	<u>5.4.31</u> Director sends fifty (50) copies of report to UMTA and requests approval	On receipt
<u>5.4.33</u> Director sends fifty (50) copies of report to TSG	On receipt	
<u>5.4.35</u> PTC staff arrives at decision as to manner of publication and distribution of report, copy to TSG	As necessary	
<u>5.4.37</u> Reports not to be published are submitted by PTC to University Microfilms International (UMI)	As appropriate	



<u>TASK</u>	<u>SUBTASK AND DESCRIPTION OF ACTIVITIES</u>	<u>DELIVERY DATE</u>
5.4	<u>5.4.39</u> UMTA reviews report and forwards approval to PTC, copy to TSG	Receipt + 30 days
	<u>5.4.41</u> Subcontractor prepares and mails response re data and equipment inventory to PTC (SPO)	As required
	<u>5.4.43</u> SPO requests TRB comments on agency recommendation for disposition of data and equipment	As required
	<u>5.4.45</u> Staff engineer advises SPO of instructions to agency	As required
	<u>5.4.47</u> SPO responds to agency	As required
	<u>5.4.49</u> Agency acknowledges instructions	
	<u>5.4.51</u> DCAA performs audit and notifies PTC SPO of results	
	<u>5.4.53</u> SPO sends DCAA report to TRB for comments	As received
	<u>5.4.55</u> Staff engineer and Program Director agree on comments re final payment and forward them to SPO	As required
	<u>5.4.57</u> SPO instructs agency to submit final (completion) voucher and Contractor's Certification	As required
	<u>5.4.59</u> Agency prepares and submits final voucher and Contractor's Certification	
	<u>5.4.61</u> SPO forwards voucher through Comptroller's Office for TRB approval	As received
	<u>5.4.63</u> TRB acts on approval and sends voucher to Comptroller's Office	As required
	<u>5.4.65</u> Comptroller's Office invoices UMTA	As necessary
	<u>5.4.67</u> UMTA acts on invoice and forwards to Treasury	
	<u>5.4.69</u> Treasury forwards payment to PTC	
	<u>5.4.71</u> PTC makes final payment to agency	As appropriate
	<u>5.4.73</u> Staff engineer writes Foreword and puts report into editorial and publication process	As appropriate
	<u>5.4.75</u> Staff engineer forwards report abstract to TRIS	On receipt
	<u>5.4.77</u> Staff editor places copy of Foreword in suspense file for retrieval at galley stage	On receipt
	<u>5.4.79</u> Staff editor acquires Library of Congress number	As appropriate
	<u>5.4.81</u> Editor and staff engineer review Foreword to ensure relevancy to current circumstances at galley stage	As appropriate
	<u>5.4.83</u> Staff engineer forwards Foreword to Principal Investigator for checking	As prepared
	<u>5.4.85</u> Principal Investigator reviews and returns to staff engineer with comments	
	<u>5.4.87</u> Editor completes work and sends report for publication	As appropriate

<u>TASK</u>	<u>SUBTASK AND DESCRIPTION OF ACTIVITIES</u>	<u>DELIVERY DATE</u>
5.4	<u>5.4.89</u> Report is published	As appropriate
	<u>5.4.91</u> Staff editor coordinates with staff engineer to prepare summary sheet necessary for placing published report in NTIS (Form NTIS-35, Rev. 10/73)	As appropriate
	<u>5.4.93</u> Report is distributed through PTC (TRB) selective distribution processes to UMTA, TSG, and many others	As appropriate
	<u>5.4.95</u> PTC staff prepares and mails letters sending published report to panel members	As appropriate
	<u>5.4.97</u> TRB advises Academy of panel disbandment	As appropriate
	<u>5.4.99</u> PTC prepares and mails letter of appreciation to Principal Investigator (includes copy of published report)	As appropriate
	<u>5.4.101</u> PTC mails copies as prescribed in subcontract, of published report to subcontractor's contracts officer	As appropriate
	<u>5.4.103</u> Comptroller's Office forwards to TRB notification of amount of final payment and closure of project account	As appropriate
	<u>5.4.105</u> PTC project records closed on receipt of final payment information	As appropriate
	<u>5.4.107</u> When decision is made re publication of report, panel is so notified via letter of appreciation. They are also told that we will take steps to disband panel but that they will receive copy of report when published	As appropriate
	<u>5.4.109</u> UMTA is advised of publication decision, copy to TSG	As appropriate
	<u>5.4.111</u> Principal Investigator is advised of publication decision	As appropriate



## **PROGRESS BY PROJECTS**

The following pages present detailed status reports on those projects continuing beyond December 31, 1981. The status of projects whose completion dates were reached prior to or during the six months being reported can be found in Table I.



TABLE I  
PROJECTS FOR FY '80 THROUGH FY '81—SUMMARY OF STATUS THROUGH DECEMBER 31, 1981

PROJECT		RESEARCH AGENCY	CONTRACT AMOUNT OR CONTRACT COST (\$)
NO.	TITLE		
<b>AREA 30: ECONOMICS</b>			
30-1	Comparative Study of Small Buses	—	\$300,000
<b>AREA 31: ADMINISTRATION—FINANCE</b>			
31-1	The Impacts of Federal Grant Requirements on Transit Agencies	Booz-Allen	50,000
<b>AREA 33: ADMINISTRATION—PERSONNEL MANAGEMENT</b>			
33-1	Transit Bus Operator Selection and Training for Dealing with Stress	GAMS Inc.	150,000
33-2	Development of Programs for Job Enrichment in the Transit Industry	—	100,000
<b>AREA 36: PLANNING—ALTERNATIVE ANALYSIS</b>			
36-1	Improving Decision-Making for Major Urban Transit Investments	Systems Des. Concept	150,000
<b>AREA 38: PLANNING—SYSTEM PLANNING</b>			
38-1	National Transit Computer Software Directory	—	100,000
<b>AREA 39: PLANNING—ROUTE PLANNING</b>			
39-1	Study of Automatic Passenger Counting System	—	175,000
<b>AREA 40: PLANNING—IMPACT ANALYSIS</b>			
40-1	Development of a National Standard Analysis Process for Cost/Benefit of Transit Systems	—	150,000
<b>AREA 43: DESIGN—TRACK AND ANCILLARY SYSTEMS</b>			
43-1	Detection of Low Current Short Circuits	—	100,000
<b>AREA 47: MATERIALS AND CONSTRUCTION—GENERAL MATERIALS</b>			
47-1	Improved Service Life of Urban Transit Coach Brakes	Battelle Mem Inst	300,000
<b>AREA 54: OPERATIONS—ENERGY EFFICIENCY</b>			
54-1	Improve Transit Bus Energy Efficiency and Productivity	Booz-Allen	39,976
54-2	Energy Management of Electric Rail Transit Systems	Carnegie-Mellon	135,115
<b>AREA 60: SPECIAL PROJECTS</b>			
60-1	Synthesis of Information Related to Transit Problems	TRB	210,000 <sup>a</sup>
TS-1:	Cleaning Equipment and Procedures for Transit Buses	ATE Mgmt	17,160
TS-2:	Priority Treatment for Buses on Urban Streets	PAWA	19,716
TS-3:	Cost-Benefit Analysis of Fuel Additives and Alternative Fuel Grades	—	30,000
TS-4:	Standard for Allocation of Time for Maintenance Workers	—	30,000

<sup>a</sup> Continuing activity supported in FY '80 and FY '81 at amount shown.

START- ING DATE	COMPLE- TION DATE	PROJECT STATUS (for details, see latest Summary of Progress)	PROJECT NO.
—	—	Project details will be developed in March 1982	30-1
11/30/81	8/31/82	Research in progress	31-1
10/15/81	10/14/83	Research in progress	33-1
—	—	Project details will be developed in March 1982	33-2
11/2/81	2/1/83	Research in progress	36-1
—	—	Project details will be developed in March 1982	38-1
—	—	Project details will be developed in March 1982	39-1
—	—	Project details will be developed in March 1982	40-1
—	—	Project details will be developed in March 1982	43-1
12/1/81	11/30/83	Research in progress	47-1
10/1/81	4/30/82	Research in progress	54-1
10/1/81	12/31/82	Research in progress	54-2
11/7/80	*	Research in progress	60-1
2/16/81	12/31/81	Report in editorial and publication process	(TS-1) 60-1
3/16/81	12/31/81	Report in editorial and publication process	(TS-2) 60-1
—	—	Project details will be developed in early 1982	(TS-3) 60-1
—	—	Project details will be developed in early 1982	(TS-4) 60-1



AREA THIRTY-ONE: FINANCE

Project: 31-1, FY '80  
 Title: The Impacts of Federal Grant Requirements on Transit Agencies

Research Agency: Booz, Allen & Hamilton, Inc.  
 Principal Investigator: Subhash R. Mundle

Effective Date: November 30, 1981  
 Completion Date: August 31, 1982

AGENCY PERFORMANCE

1. Is the project on schedule? Yes Percent project complete 5
2. Is the research in keeping with the approved research plan? Yes
3. Contract Amount: \$50,000
4. Estimated Expenditures to 12/31/81: \$3,000
5. Are the expenditures in keeping with the project progress? Yes

As the federal transit program has grown, this growth has been accompanied by a proliferation of federally imposed requirements. The costs and effects of grant requirements are causing increasing concern to transit agencies. A Section 3 grant application for a new bus purchase requires approximately 21 exhibits to comply with UMTA requirements. Additionally, several annual submissions are required if the grant approval process takes more than one year.

Such requirements have forced many transit operators to allocate scarce resources to federally required procedural work. The costs of compliance may include (1) inflationary cost escalations, (2) allocation funds to administrative detail, (3) project delays, (4) revisions of project scope, (5) reductions in management flexibility, and (6) increased capital costs.

There is a need to quantify the impacts of federal requirements on the capacity of a transit system to (1) comply and (2) serve effectively the intent of the legislation. Furthermore, there is a need to develop recommendations to improve the grant application process.

Presently available funds are sufficient to address but a portion of the entire problem; therefore, research needed beyond that described below will depend on provision of additional resources from future years.

The general objective of this study is to determine the costs and effects of federal legislation, regulations, UMTA circulars, administrative letters and formal administrative guidelines for the Section 3 capital grant application process and to make recommendations for its improvement. The study results are anticipated to be useful to (1) transit agencies in their decision to apply for federal grants, (2) legislators drafting legislation, and (3) the Urban Mass Transportation Administration in amending requirements. In recommending improvements consideration will be given to the intent of legislation, regulations, circulars, letters, and guidelines.

Because of the limitation on available funds, the research specifically excludes consideration of Section 13(c) and 504 requirements. Additionally, the research will not consider Section 5 capital and operating grants; applicability to fixed guideway systems; project management requirements for approved grants; and applicability to specialized transit services.

Toward the general objective stated above, the following tasks will be performed.

Task 1--Develop four scenario(s) that will describe medium-sized transit agencies qualifying for and applying for an increase in size of their bus fleet by 25 percent. Such scenario(s) will identify the requirements that the agency would have to meet in order to be eligible for funding under UMTA Section 3. Scenario elements will include but not necessarily be limited to (1) project justification and planning (SRTP-TIP), (2) grant application and documentation, (3) bus maintenance requirements, (4) human resource regulations, and (5) public hearing requirements.

Task 2--Conduct and analyze six case studies based on the scenarios developed in Task 1. On-site interviews will be conducted.

Task 3--Determine applicability of the cost and impact results of Tasks 1 and 2 to larger and smaller agencies. Telephone interviews will be conducted with eight to ten agencies.

Task 4--Compare the actual results of Tasks 1 and 2 with the procedural intents of the regulations.

Task 5--Develop recommendations: (a) procedural reform to expedite UMTA's obligation of funds, and (b) strategies to reduce costs to transit agencies.

Work accomplished through December 31, 1981, has been the submission and review of the working plan. The working plan constitutes a detailed extension of the research plan and provides the NCHRP staff with sufficient information of methodology, proposed activities, time phasing of tasks, and expenditure of funds for day-to-day surveillance of the project.

PROBABILITY OF SUCCESS: Good

REPORT(S) AVAILABILITY: None



Project -31-1 continued

PRINCIPAL INVESTIGATOR(S): Mr. Subhash R. Mundle  
Booz, Allen & Hamilton, Inc.  
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RESPONSIBLE NCTRP STAFF ENGINEER: R. Ian Kingham - 202/334-3224

AREA THIRTY-THREE: PERSONNEL MANAGEMENT

Project: 33-1, FY '80  
 Title: Transit Bus Operator Selection and Training for Dealing with Stress

Research Agency: Group Associated Management Services, Inc.  
 Principal Investigator: Dr. Brownlee Elliott

Effective Date: October 15, 1981  
 Completion Date: October 14, 1983

AGENCY PERFORMANCE

1. Is the project on schedule? Yes Percent project complete 5
2. Is the research in keeping with the approved research plan? Yes
3. Contract Amount: \$150,000
4. Estimated Expenditures to 12/31/81: \$7,000
5. Are the expenditures in keeping with the project progress? Yes

Some bus operators possessing the basic skills to operate the vehicle may still experience difficulties in performing their job satisfactorily because of inability to cope effectively with the public. Use of all possible training and disciplinary action does not help when the individual hired does not have the psychological strengths necessary to deal effectively with continuous public contact, and the resultant stress may lead to more workers' compensation claims for nonvisible physical injury (i.e., heart and psychological problems) as well as to more accidents, absenteeism, and personnel turnover.

Various selection and training methods are currently being used by individual transit agencies. Some of these methods have been developed specifically for application in the transit industry, some have evolved from practice within individual agencies, and others represent modifications to methods originally developed for agencies outside of the transit industry. At present, however, no one single method of selecting or training bus operators from the viewpoint of their ability to deal with stress is considered to be generally acceptable for wide application by transit agencies. To ensure that methods have general applicability, the range of needs and capabilities of different size transit agencies, regional differences, and the makeup of the bus operator population (i.e., male/female and minorities) must be fully considered.

The objective of this research is to provide an evaluative device or questionnaire for use as part of the bus-driver-selection process that will validly indicate the applicant's susceptibility to stress which is likely to affect job performance. The research will also provide two training modules: one designed to help newly hired operators anticipate and deal with typical stressful situations, and one designed to help supervisors recognize stress symptoms displayed by operators and provide guidance on appropriate courses of action.

Reference literature and existing training programs are being reviewed to identify the various environmental, psychological, and physiological factors commonly used in stress analysis. From this review, a preliminary set of factors and characteristics relevant to the bus operators' job will be prepared. This preliminary set will be reviewed and evaluated by managers, operators, and labor representatives from selected transit agencies for suggested additions and deletions. The sample to be selected will include a minimum of one large agency (more than 500 buses), two medium agencies (100 to 500 buses), and three small agencies (less than 100 buses).

Existing operator-selection-test mechanisms will be evaluated for general applicability in measuring an individual's tolerance for stress, and then either an existing device will be modified or a new test device will be developed. The resulting device will bring together current efforts dealing with the effects of stress, will have wide applicability in the transit industry, and will be primarily aimed at screening new applicants. The device will treat stress factors individually and in groups such as passenger contact, environment, management/union/employee relations, personal problems, and equipment. The device will be field tested by operators from selected transit agencies.

Two sample training modules will also be prepared: one for newly hired operator training (and perhaps for voluntary retraining) and one for supervisor training. The primary focus of the new operator training will be to alert the driver to typical stress-causing situations and provide specific guidance on how to cope with each situation. Typical situations include (1) passenger contacts, e.g., fights on the bus; (2) environmental factors, e.g., bad weather; (3) management/union/employee relations; (4) personal problems, and (5) equipment. The supervisor's training module will focus on the recognition of stress symptoms and tendencies (resulting from personal or job-related causes) and on the identification of appropriate courses of action. Both modules will be adaptable by an individual transit agency so that through property-specific modifications they can be made part of existing training programs.

A listing will be provided of pertinent data and resources (films, videotapes, surveys, models, books, papers, etc.) identifying concomitant costs, sources, and transit agencies that are using such methods for selection and stress management training of bus operators and supervisors.

PROBABILITY OF SUCCESS: Good

REPORT(S) AVAILABILITY: None



Project 33-1 continued

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RESPONSIBLE NCTRP STAFF ENGINEER: Robert E. Spicher - 202/334-3224

AREA THIRTY-SIX: ALTERNATIVE ANALYSIS

Project: 36-1, FY '80  
 Title: Improving Decision-Making for Major Urban Transit Investments

Research Agency: System Design Concepts, Inc.  
 Principal Investigator: Joseph R. Stowers

Effective Date: November 2, 1981  
 Completion Date: February 1, 1983

AGENCY PERFORMANCE

1. Is the project on schedule? Yes Percent project complete 13
2. Is the research in keeping with the approved research plan? Yes
3. Contract Amount: \$150,000
4. Estimated Expenditures to 12/31/81: \$20,000
5. Are the expenditures in keeping with the project progress? Yes

The environment for transportation planning and investment decisions is in a period of dramatic change. Fiscal constraints, a possible reorientation of federal transportation policies, and an increasing reliance on local commitment and decision-making are all likely to influence significantly the future of transportation in urban areas. Even with these pressures, however, urban areas will still be facing decisions on major investments in transit systems. Thus, there will be a need in future years for a planning and analysis process which examines major transportation options and which informs decision-makers so that most cost-effective investment decisions can be effected.

Since 1975, the Urban Mass Transportation Administration has required, as a condition for federal funding support, a structured process termed alternatives analysis for proposed major investments in urban mass transit facilities. This process is used to identify priority corridors for possible major investments and to assess the cost-effectiveness of these investments in comparison to less costly transit improvements. Information generated in the process is used both by federal officials in administering a discretionary capital grant program and by state and local officials in determining priorities and identifying needed improvements in mass transportation services. Three important decision points occur within the UMTA major transit investment planning process. First, appropriate local officials identify the corridor(s) where major investments appear to be most needed. Second, local and federal officials agree on a small set of investment alternatives that encompass a reasonably broad range of options. Finally, local, state, and federal officials agree on one (or more) of these alternatives for advancement into preliminary engineering.

Since the advent of the alternatives analysis requirement, a significant number of urban areas have been involved in some aspect of the process. Concerns have been expressed with the process. For example, there is uncertainty regarding both the effect on the timing of transit investment decisions and the use of information in the federal review process and in local decision-making. Although adjustments to the process have been made to enhance its usefulness in local, state, and federal decision-making, no comprehensive assessment has been made of the degree to which analytical requirements have provided appropriate information at key decision points.

There is a need to evaluate past experience with alternatives analysis and to recommend improvements in the process that will result in more effective local, state, and federal decision-making. Such an assessment would be useful, for example, in identifying points where decision-makers have not had complete information, where the process has constrained appropriate decisions, or where significant efforts are invested in the development of information that is not used in decision-making. Such an assessment would be useful, for example, in identifying points where decision-makers have not had complete information, where the process has constrained appropriate decisions, or where significant efforts are invested in the development of information that is not used in decision-making. Although it is unclear what direction federal policy will take in regard to alternatives analysis, the need for some form of alternatives analysis for such investments will continue.

The general objective of this research is to assess the federal, state, and local decision-making process for major urban mass transportation investments by evaluating recent alternatives analysis experiences. The purpose of the assessment is to identify potential improvements in policy, procedures, and use of technical information; and to formulate planning procedures recommendations for use by federal, state, and local agencies. Such improvements would be in terms of time, costs, scale, presentation of information, role of participants, and the like. (The assessment is not intended to prescribe specific analytical techniques or to judge the appropriateness of previous major urban transit decisions.) Research tasks to satisfy the general objective will be as follows:

Task 1--Inventory all applicable regulations and requirements concerning the evaluation of proposed major urban mass transportation investments.

Task 2--Review relevant literature on alternatives analysis and transit investment decision-making.

Task 3--Prepare methodologies for (a) the analysis and assessment of recent alternatives analysis decision-making experiences and (b) the selection of case studies.

Task 4--Select and conduct case studies, including those undertaken pursuant to the 1976 guidelines as well as other cases.



Project 36-1 continued

Task 5--Evaluate the usefulness of information developed in alternatives analysis for decision-making at each level of government.

Task 6--Formulate recommendations to Federal DOT and to state and local agencies.

Progress to December 31, 1981, includes completion of Tasks 1 and 2 and a start on Task 3.

PROBABILITY OF SUCCESS: Good

REPORT(S) AVAILABILITY: None

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RESPONSIBLE NCTRP STAFF ENGINEER: R. Ian Kingham - 202/334-3224

AREA FORTY-SEVEN: GENERAL MATERIALS

Project: 47-1, FY '80  
 Title: Improved Service Life of Urban Transit Coach Brakes  
 Research Agency: Battelle Memorial Institute  
 Principal Investigator: Dr. Thomas A. Dow  
 Effective Date: December 1, 1981  
 Completion Date: November 30, 1983

AGENCY PERFORMANCE

1. Is the project on schedule? Yes Percent project complete 3
2. Is the research in keeping with the approved research plan? Yes
3. Contract Amount: \$300,000
4. Estimated Expenditures to 12/31/81: \$9,000
5. Are the expenditures in keeping with the project progress? Yes

The operation and maintenance history of advanced design urban transit coaches shows a dramatic decline in brake life compared with "new look" coaches. Major factors associated with this decline in brake life appear to be, but are not limited to: increased gross vehicle weight, increased operating speed, body configuration, and changed regulations.

The resultant increased brake temperatures are believed to be the cause of reduced brake life that has increased operational costs to unacceptable levels. Therefore, the need exists to identify and develop methods to increase brake life to previous levels.

The overall project objective is to develop methodologies for improving existing and future urban transit coach brake life. This will include quantification of in-service brake operating temperatures plus identification of methods of reducing brake operating temperatures and/or alternate friction materials.

The project objective will be accomplished in two phases. Phase I will include the following tasks:

Task 1--Confirmation of the premise that temperature is the cause of reduced brake life by the collection and evaluation of brake operating temperatures. This is to be accomplished in cooperation with a major metropolitan transit operator that has experienced the problem. As a minimum, temperature levels will be established for advanced design and early "new look" transit coaches.

Task 2--Development of practical methods for reduction of operating temperatures and/or identification of friction materials for compatibility with the service temperatures determined in Task 1. The following factors must be considered: (a) adaptability to coaches in service, (b) initial and operating costs, (c) regulations, (d) serviceability, (e) reliability, (f) public acceptability, and (g) feasibility.

Task 3--Cost-benefit prioritization of methods for increasing brake life based on Tasks 1 and 2.

Task 4--Preparation of an interim report with recommendations for implementation of Phase II demonstration.

The Phase II effort will include:

Task 5--Demonstration of one or more suggested corrective methods selected by the NCTRP from those recommended in Phase I. This will be accomplished in cooperation with a major metropolitan transit operator.

Task 6--Preparation and submittal of the final report.

Research is under way on Phase I of the study. The researchers met with representatives of the Southern California Rapid Transit District (SCRTD) on December 2 and 3, 1981 at the main bus maintenance shop to make arrangements for instrumenting three types of buses to collect brake temperature data. The detailed work plan has been submitted and is being reviewed by the project panel.

PROBABILITY OF SUCCESS: Based on the background and experience of the research agency and cooperating agencies, prospects for success appear good at this time.

REPORT(S) AVAILABILITY: None

PRINCIPAL INVESTIGATOR(S): Dr. Thomas A. Dow  
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RESPONSIBLE NCTRP STAFF ENGINEER: Harry A. Smith - 202/334-3224



AREA FIFTY-FOUR: ENERGY EFFICIENCY

Project: 54-1, FY '80  
 Title: Improve Transit Bus Energy Efficiency and Productivity

Research Agency: Booz, Allen & Hamilton, Inc.  
 Principal Investigator: Archie M. Riviera

Effective Date: October 1, 1981  
 Completion Date: April 30, 1982

AGENCY PERFORMANCE

1. Is the project on schedule? Yes Percent project complete 40
2. Is the research in keeping with the approved research plan? Yes
3. Contract Amount: \$39,976
4. Estimated Expenditures to 12/31/81: \$15,000
5. Are the expenditures in keeping with the project progress? Yes

Because of rapidly rising fuel prices and uncertain fuel availability, there is a critical need in the transit industry to improve energy efficiency. However, as a result of governmental regulation and other factors, the recent trend in bus technology has actually been toward poorer efficiency. For example, the Advanced Design Buses introduced in recent years require more energy than the buses replaced and, compounding the problem, also have fewer seats. Source of the many causes for losses in energy efficiency are requirements to satisfy environmental considerations, safety, styling, accessibility, and the like.

Transit operators need to become more aware of the inherent relationships between energy efficiencies and other objectives, such as low initial bus cost and passenger comfort. To promote this awareness, the specific trade-offs involved in the decision to purchase a particular bus need to be identified and documented in guidelines directed to transit property managers.

The objective of this research is to develop guidelines for transit property managers to follow in specifying a new bus. The guidelines will focus on the energy efficiency and productivity of different bus types, equipment, and options; and be applicable to properties of all sizes and geographic locations.

The researchers have cataloged the basic types of equipment and options available in 35-ft, 40-ft, and articulated transit buses. The equipment and options of interest include power train features (e.g., transmission shift schedule and converters, axle gear ratios, engine size and power rating); special equipment (e.g., wheelchair lifts, kneeling capability); standard component options (e.g., type of heating/air conditioning systems, tire size and type, lighting and other hotel loads); basic design and safety features (e.g., overall weight, seating plan, safety bumpers); and environmental controls (e.g., air pollution and noise).

Estimates of the relative energy consumption levels of the various items of equipment and options are now being developed. For each bus type and size, a baseline equipment configuration will be specified; and the energy-consumption characteristics of each option will be related to the baseline using Booz, Allen's speed-of-transit bus model. An approach will be developed for estimating energy-efficiency characteristics of buses over the full range of operating environments (e.g., terrain, altitude, climate, maximum operating speed, number of stops per mile). This approach will specifically address (1) the interrelationship of components and combination of components (e.g., axle ratio vs. engine rating vs transmission shift points); and (2) the trade-offs between energy efficiency and speed, acceleration, passenger comfort, etc.

The final product of this research will be a concise set of guidelines for use by managers of individual transit properties in selecting and specifying buses for purchase. The guidelines will be designed for immediate use and be capable of being updated as additional information is developed by individual properties and manufacturers and/or through further research.

PROBABILITY OF SUCCESS: Excellent

REPORT(S) AVAILABILITY: None

PRINCIPAL INVESTIGATOR(S): Mr. Archie M. Riviera  
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RESPONSIBLE NCTRP STAFF ENGINEER: Robert E. Spicher - 202/334-3224



AREA FIFTY-FOUR: ENERGY EFFICIENCY

Project: 54-2, FY '80  
 Title: Energy Management of Electric Rail Transit Systems

Research Agency: Carnegie-Mellon University  
 Principal Investigator: Dr. Richard A. Uher

Effective Date: October 1, 1981  
 Completion Date: December 31, 1982

AGENCY PERFORMANCE

1. Is the project on schedule? Yes Percent project complete 8
2. Is the research in keeping with the approved research plan? Yes
3. Contract Amount: \$135,115
4. Estimated Expenditures to 12/31/81: \$8,000
5. Are the expenditures in keeping with the project progress? Yes

Rapidly increasing electric energy costs have resulted in a dramatic increase in operating expenses of transit authorities operating electric rail systems. This problem is further augmented by additional increases in rates being sought by electric utilities. The peak demand component of these rates is directly associated with the electric energy generation, transmission, and distribution facilities cost. As major electric energy consumers, transit authorities are subject to allocated costs associated with these facilities. If transit authorities can improve the management of peak demand on their systems, energy costs can be significantly reduced. Several transit authorities have developed strategies for: reducing peak energy consumption (such as load management), improving vehicle energy efficiency, and more energy efficient operating practices.

The objective of this research is to provide guidelines for transit authorities to lower peak electric demand and thereby, lower costs. It is anticipated that the proposed study will include but not be limited to:

1. Identification of the contributing factors that cause peak demand and the timing and significance of each.
2. Identification of monitoring strategies and conservation opportunities in order to be able to control peak demand.
3. Identification and evaluation of various load management techniques and their cost/benefits and effectiveness on reducing peak demand.
4. Development of strategies so that the benefits of peak demand management are reflected in rates.

It is intended that the research will result in the development of methodologies for: (1) forecasting the peak electric energy demand, (2) monitoring the actual demand, and (3) controlling the demand. It is also intended that a preliminary plan will be prepared for validating and demonstrating the developed methodologies.

Research is under way on Tasks 1 and 2 and data have been collected from four transit properties. A model for energy management by transportation systems was developed previously by Carnegie-Mellon University, and it will be utilized during the study.

PROBABILITY OF SUCCESS: Based on the background and experience of the research agency and the principal investigator, prospects for success appear good at this time.

REPORT(S) AVAILABILITY: None

PRINCIPAL INVESTIGATOR(S): Dr. Richard A. Uher  
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