

# **NCRRP**

**National Cooperative Rail Research Program**

## **Users' Manual**

**Prepared for the NCRRP Oversight Committee**

**By**

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# **National Cooperative Rail Research Program**

## **Users' Manual**

**The National Cooperative Rail Research Program is  
Managed by the Cooperative Research Programs  
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# SUMMARY

## Background

The National Cooperative Rail Research Program (NCRRP) conducts applied research on problems important to freight, intercity and commuter rail operators. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the rail industry. The NCRRP carries out applied research on problems that are shared by freight, intercity, and commuter rail operating agencies and are not being adequately addressed by existing federal research programs. The NCRRP undertakes research and other technical activities in a variety of rail subject areas, including design, construction, maintenance, operations, safety, security, policy, planning, human resources, and administration.

The NCRRP was authorized in October 2008 as part of the Passenger Rail Investment and Improvement Act of 2008 (PL 100-432, Division B). The Program is sponsored by the Federal Railroad Administration (FRA) and managed by the National Academies, acting through its Transportation Research Board (TRB), with program oversight provided by an independent governing board (the NCRRP Oversight Committee) including representatives of rail operating agencies.

The NCRRP carries out applied research on problems that (1) address, among other matters, intercity rail passenger and freight rail services, including existing rail passenger and freight technologies and speeds, incrementally enhanced rail systems and infrastructure, and new high-speed wheel-on-rail systems; (2) address ways to expand the transportation of international trade traffic by rail, enhance the efficiency of intermodal interchange at ports and other intermodal terminals, and increase capacity and availability of rail service for seasonal freight needs; (3) consider research on the interconnectedness of commuter rail, passenger rail, freight rail, and other rail networks; and (4) give consideration to regional concerns regarding rail passenger and freight transportation, including meeting research needs common to designated high-speed corridors, long-distance rail services, and regional intercity rail corridors, projects, and entities.

The NCRRP considers research designed (1) to identify the unique aspects and attributes of rail passenger and freight service; (2) to develop more accurate models for evaluating the impact of rail passenger and freight service, including the effects on highway and airport and airway congestion, environmental quality, and energy consumption; (3) to develop a better understanding of modal choice as it affects rail passenger and freight transportation, including development of better models to predict utilization; (4) to recommend priorities for technology demonstration and development; (5) to meet additional priorities as determined by the advisory board established under subsection (c), including any recommendations made by the National Research Council; (6) to explore improvements in management, financing, and institutional structures; (7) to address rail capacity constraints that affect passenger and freight rail service through a wide variety of options, ranging from operating improvements to dedicated new infrastructure, taking into account the impact of such options on

operations; (8) to improve maintenance, operations, customer service, or other aspects of intercity rail passenger and freight service; (9) to recommend objective methodologies for determining intercity passenger rail routes and services, including the establishment of new routes, the elimination of existing routes, and the contraction or expansion of services or frequencies over such routes; (10) to review the impact of equipment and operational safety standards on the further development of high-speed passenger rail operations connected to or integrated with non-high-speed freight or passenger rail operations; (11) to recommend any legislative or regulatory changes necessary to foster further development and implementation of high-speed passenger rail operations while ensuring the safety of such operations that are connected to or integrated with non-high-speed freight or passenger rail operations; (12) to review rail crossing safety improvements, including improvements using new safety technology; and (13) to review and develop technology designed to reduce train horn noise and its effect on communities, including broadband horn technology.

### **Program Participants**

The primary participants in the NCRRP are (1) an independent governing board, the NCRRP Oversight Committee (ROC), appointed by the Secretary of the U.S. Department of Transportation with representation from freight, intercity, and commuter rail operating agencies, other stakeholders, and relevant industry organizations such as the Association of American Railroads (AAR), the American Association of State Highway and Transportation Officials (AASHTO), the American Public Transportation Association (APTA), and the National Association of Railroad Passengers (NARP) as vital links to the rail community; (2) the TRB as program manager and secretariat for the governing board; and (3) the FRA as program sponsor. The NCRRP benefits from the cooperation and participation of rail professionals, equipment and service suppliers, other rail users, and research organizations. Each of these participants has different interests and responsibilities, and each is an integral part of this cooperative research effort.

### **Selection of Research**

Research problem statements for the NCRRP are solicited periodically but may be submitted to the TRB by anyone at any time. It is the responsibility of the ROC to formulate the research program by identifying the highest priority projects and defining funding levels and expected products.

### **Program Management**

The NCRRP is managed by the TRB using procedures modeled after those used in managing the National Cooperative Highway Research Program (NCHRP), the Transit Cooperative Research Program (TCRP), the Airport Cooperative Research Program (ACRP), and other cooperative research programs administered by the TRB. Day-to-day program management includes the following tasks:

1. Assisting the ROC in identifying and prioritizing research needs;
2. Appointing and coordinating expert technical panels to guide research projects;

3. Developing and distributing Requests for Proposals (RFPs);
4. Processing and evaluating proposals to select the best-qualified research agencies;
5. Executing contracts with the selected researchers;
6. Guiding the research;
7. Reviewing research reports;
8. Publishing and disseminating research reports; and
9. Promoting the application of research results.

## **Project Panels**

Each NCRRP project is assigned to a panel, appointed by the TRB; the panel provides technical guidance and counsel throughout the life of the project. Panels include experienced practitioners and research specialists; heavy emphasis is placed on including rail professionals, the intended users of the research products. The panels prepare requests for proposals and select contractors based on evaluation of the proposals received; the panels also guide the projects and review the reports. As in other TRB activities, NCRRP project panel members serve voluntarily without compensation.

## **Selection of Contractors**

The process for selecting NCRRP researchers has been used by the TRB in managing cooperative research programs for more than 40 years. This open process allows all potential research agencies to compete on the basis of technical merit and ensures that all proposers are treated fairly and that the program has access to the best talent available for each project. Proposals from potential research contractors are evaluated by the project panels. The evaluation considers the following: (1) the proposer's demonstrated understanding of the problem; (2) the merit of the proposed research approach and experiment design; (3) the experience, qualifications, and objectivity of the research team in the same or closely related areas; (4) the plan for promoting application of results; (5) the proposer's plan for involvement of disadvantaged business enterprises; and (6) the adequacy of the facilities.

## **Funding**

The Passenger Rail Investment and Improvement Act of 2008 authorized \$5 million per year for the NCRRP in Fiscal Years 2010 through FY 2013. NCRRP funding in Fiscal Year 2010 and beyond will be determined by the annual federal appropriation process.

## **Products**

Primary emphasis is placed on disseminating NCRRP results to the intended end-users of the research: rail operating agencies, service providers, and suppliers. The NCRRP will produce a series of research reports for use by rail operators, local agencies, the FRA, and other interested parties, and industry associations may

arrange for workshops, training aids, field visits, and other activities to ensure that results are implemented by rail-industry practitioners.

## **Status**

A Memorandum of Agreement officially starting the NCRRP was executed by the FRA and the TRB in September 2010, and the NCRRP governing board was appointed by the Secretary of the U.S. Department of Transportation, according to the terms of the Memorandum of Agreement, in January 2012. Statements of research need are being assembled for consideration in formulating the first NCRRP agenda, and the governing board will meet in the first quarter of 2012, to establish operating procedures for the NCRRP and to prioritize initial research needs.



# 1. INTRODUCTION

## 1.1 ORIGIN

*Learning is what most adults will do for a living in the 21<sup>st</sup> century.*  
S.J. Perelman

The Passenger Rail Investment and Improvement Act of 2008 (PL 100-432, Division B), enacted in October 2008, authorized establishment of a 4-year Rail Cooperative Research Program, which has since been renamed the National Cooperative Rail Research Program (NCRRP).

The Act calls for the NCRRP to carry out applied research on problems that “(1) address, among other matters, intercity rail passenger and freight rail services, including existing rail passenger and freight technologies and speeds, incrementally enhanced rail systems and infrastructure, and new high-speed wheel-on-rail systems; (2) address ways to expand the transportation of international trade traffic by rail, enhance the efficiency of intermodal interchange at ports and other intermodal terminals, and increase capacity and availability of rail service for seasonal freight needs; (3) consider research on the interconnectedness of commuter rail, passenger rail, freight rail, and other rail networks; and (4) give consideration to regional concerns regarding rail passenger and freight transportation, including meeting research needs common to designated high-speed corridors, long-distance rail services, and regional intercity rail corridors, projects, and entities.”

The Act also states that the NCRRP should consider research designed “(1) to identify the unique aspects and attributes of rail passenger and freight service; (2) to develop more accurate models for evaluating the impact of rail passenger and freight service, including the effects on highway and airport and airway congestion, environmental quality, and energy consumption; (3) to develop a better understanding of modal choice as it affects rail passenger and freight transportation, including development of better models to predict utilization; (4) to recommend priorities for technology demonstration and development; (5) to meet additional priorities as determined by the advisory board established under subsection (c), including any recommendations made by the National Research Council; (6) to explore improvements in management, financing, and institutional structures; (7) to address rail capacity constraints that affect passenger and freight rail service through a wide variety of options, ranging from operating improvements to dedicated new infrastructure, taking into account the impact of such options on operations; (8) to improve maintenance, operations, customer service, or other aspects of intercity rail passenger and freight service; (9) to recommend objective methodologies for determining intercity passenger rail routes and services, including the establishment of new routes, the elimination of existing routes, and the contraction or expansion of services or frequencies over such routes; (10) to review the impact of equipment and operational safety standards on the further development of high-speed passenger rail operations connected to or integrated with non-high-speed freight or passenger rail operations; (11) to recommend any legislative or regulatory changes necessary to foster further development and implementation of high-speed passenger rail operations while ensuring the safety of such operations that are connected to or integrated with non-high-speed freight or passenger rail operations; (12) to review rail crossing safety improvements, including improvements using new safety technology; and (13) to review and develop technology designed to reduce train horn noise and its effect on communities, including broadband horn technology.”

The mission of the NCRRP is to produce research results that will be used to improve freight, intercity, and commuter rail operations in the United States. Specific research projects are selected

by an independent governing board composed of rail managers and others committed to the success of the nation's rail system. NCRRP studies are managed by the Transportation Research Board (TRB) of the National Academies using procedures designed to ensure that the research is objective and productive.

Rail systems are vital national resources. These systems operate in a complex environment with many, and often competing, requirements and expectations. To succeed in this environment, rail operators need access to good information and technical guidance based on sound research.

There has been growing recognition of the need for a mechanism for rail operating entities to pool their ideas and resources to develop and disseminate practical solutions to shared problems by creating an rail cooperative research program, modeled partly on existing cooperative research programs for highways, transit, airports, freight, and hazardous materials transportation.

Following enactment of The Passenger Rail Investment and Improvement Act of 2008, the Secretary entered into an agreement with the NAS to manage the NCRRP, under the direction of an independent governing board, the NCRRP Oversight Committee (ROC), appointed by the Secretary.

## **1.2 BACKGROUND**

### **1.2.1 The Railroad System**

The nation's freight and passenger railroad system is a complex, decentralized, and dynamic network of physical facilities, operations, and management practices. Because this system is essential to domestic productivity, international competitiveness, and quality of life, railroad professionals must find innovative ways to provide safe and efficient facilities and service under more difficult conditions in the years to come. It is increasingly clear that many of the challenges faced by freight and passenger railroads can only be met by innovation based on research.

### **1.2.2 Technology and Innovation**

*Progress is a continuing effort to make  
the things we eat, drink, and wear  
as good as they used to be.*  
Bill Vaughn

Rail leaders must anticipate the demands that will be placed on the system. Innovation will be needed for a system that is safe and durable and will meet capacity demands. In recent years, the nation has seen rapid innovation in many fields—such as the space program, national defense, health care, environmental protection, and communications; and of many kinds—technological, managerial, and operational. In the years ahead, it may be technology that exerts the greatest influence on the health of our railroads. The pace of technological change is so rapid that no industry can lag and remain effective, and the rate of discovery and technological breakthroughs for railroads must be accelerated.

### 1.2.3 Research

*The simplest schoolboy is now aware of truths  
for which Archimedes would have given his life.*  
Ernest Renan, 1883

It is most important to understand and use the linkages between research and technological development; between technology and innovative practice; and between innovation and the quality of our railroads. The nation's existing rail transportation system must be sustained, and the opportunities for a more effective system must be developed through innovation only available from research.

The needs of the freight and passenger railroad industry and the scope of the NCRRP are not confined to research in the narrow sense of the word. It is essential that the needs and opportunities for innovation in rail operations be met by not just research (both fundamental and applied) but also by development, education, technology transfer, and other activities needed to bring about improvements in practice, both in administrative as well as technical activities. In the context of the NCRRP, the term "research" is used to denote all of the activities that are used to promote innovative approaches to meeting rail needs.

For the NCRRP to receive a sufficient level of support, administrators, legislators, budget analysts, and others must be convinced that investments in the NCRRP actually produce valuable returns. This necessity does not mean that every research study has to result directly in specific, quantifiable benefits, but it is certainly reasonable to expect that, on a program-wide basis, benefits should exceed costs.

In addition, research can develop critical in-house expertise more effectively than any other form of professional experience. The real payoff from research cannot be measured only by implementation of findings; the benefits of the expertise gained may be incalculable when used in future design, operations, litigation, special investigations, and solving other practical problems. With the changing age profile among rail professionals in the United States, the contribution that research can make to developing expertise is a major benefit.

## 1.3 NCRRP NEEDS AND OBJECTIVES

*You can't build a reputation on what you are going to do.*  
Henry Ford

Many of the nation's freight and passenger railroads are maturing and showing the effects of heavy use, aging, and limited operating capacity. At the same time, the nation's continued economic and population growth and the need to meet environmental, energy, and mobility objectives place ever greater demands on railroads. Innovative solutions are needed to meet those demands and to protect this essential transportation resource.

The rapidly changing railroad environment presents an array of challenges. Emerging national problems, more varied societal needs, regional differences, the regulatory environment, the changing economy, and resource constraints are making new and different demands on railroads. At the same time, dynamically evolving computer, control, and communications technologies can

provide improved hardware and software, service, and safety solutions to the public’s demand for better services. There are unprecedented opportunities for innovation in railroads. It is clear that even small improvements in some problem areas can yield extremely cost-effective results.

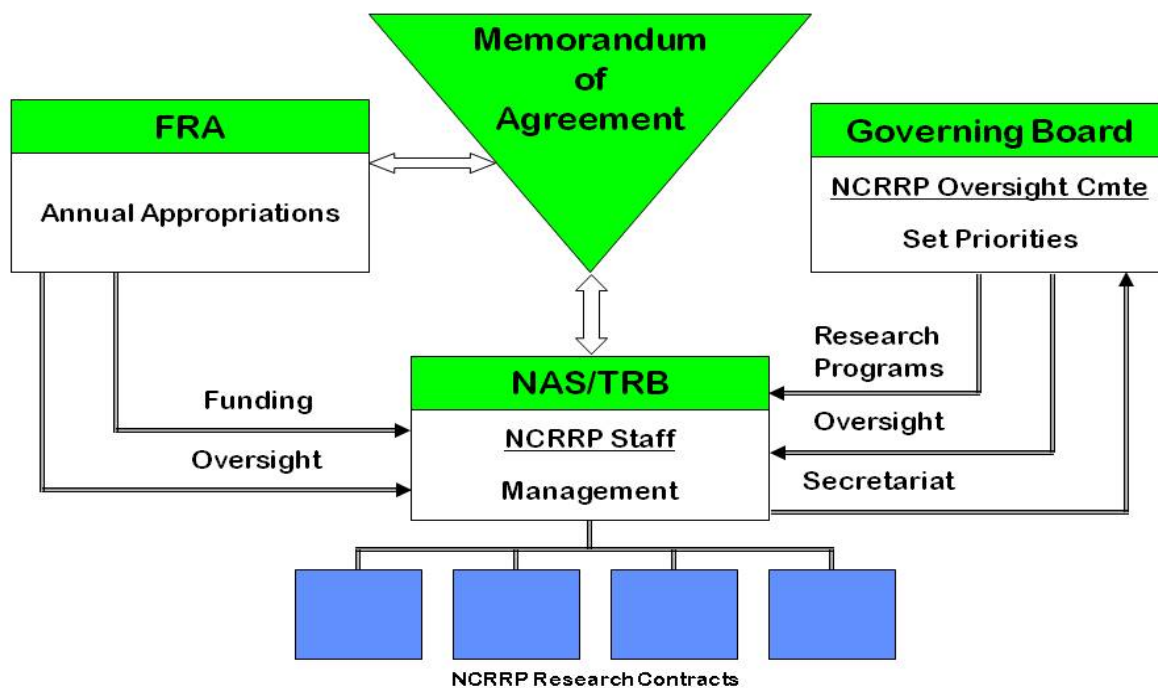
The need for rail research and development is critical. Research is needed in topical areas such as: Operations, Safety, Maintenance, Design of Infrastructure and Equipment, Finance and Administration, Planning and Environment, and Security.

**1.4 NCRRP PARTICIPANTS AND THEIR ROLES**

*Keep your eyes on the stars, and your feet on the ground.*  
 Teddy Roosevelt

The primary participants in the NCRRP are (1) an independent governing board appointed by the Secretary of the U.S. Department of Transportation and designated the NCRRP Oversight Committee (ROC); (2) the TRB as program manager and secretariat for the ROC; and (3) the FRA as program sponsor. The relationships among these organizations are illustrated in Figure 1. Other important participants in the NCRRP include freight, intercity passenger, and commuter rail professionals, state and local government officials, equipment and service suppliers, and research organizations. Each of these participants has different interests and responsibilities, and each is an integral part of this cooperative research effort.

Figure 1  
**National Cooperative Rail Research Program  
 Organizational Structure**



## **1.4.1 The ROC**

### **Responsibilities**

The ROC provides policy guidance and sets priorities for NCRRP research. The NCRRP Memorandum of Agreement assigns the following responsibilities to the ROC: (1) reviewing research needs; (2) selecting research topics; (3) setting project priorities and funding levels; (4) approving budgets and financial statements of the NCRRP; (5) adopting policies and procedures governing the ROC; and (6) evaluating program effectiveness. More specifically, the ROC (1) determines if proposed topics represent important research needs in the freight and passenger railroad field; (2) determines, on the basis of evaluations provided by the TRB and other information sources, whether the proposed research topic does or does not duplicate other research; and (3) formulates an annual program with recommended project funding consisting of new projects and, when appropriate, continuation of projects. The ROC is supported in these efforts by TRB staff.

The ROC is responsible for monitoring the progress of the NCRRP and recommending any corrective action to the FRA and the TRB.

### **Composition**

ROC members are appointed by the Secretary of the U.S. DOT. The composition of the AOC is defined in the Memorandum of Agreement as follows: Twenty-one (21) voting members, including ten (10) members who are chief executive officers, managers, or members of the governing boards of rail operating entities (4 from freight rail, 1 from the Alaska Railroad, 1 from Amtrak, 2 from intercity passenger rail agencies, and 2 from commuter rail); four (4) members from State transportation agencies; two (2) members of railway labor; three (3) members who are officers or officials of universities or private entities who serve as transportation and environmental economists, scientists, and engineers; and the Administrator of the FRA and Associate Administrator of the Office of Railroad and Policy Development. Any such entity shall have no more than one member on ROC. The size of ROC may be adjusted at the discretion of the Secretary. The following seven individuals (or his/her designee) serve as “ex officio,” non-voting members of the ROC: the chief executive of the Association of American Railroads (AAR); the chief executive of the American Public Transportation Association (APTA); the chief executive of the American Association of State Highway and Transportation Officials (AASHTO); the Administrator of the Environmental Protection Agency (EPA); the Administrator of the Federal Aviation Administration (FAA); the chief executive of the National Association of Railroad Passengers (NARP); and the Executive Director of the Transportation Research Board (TRB).

Voting members of the ROC are appointed for a period of 4 years and may serve for two successive full 4-year terms. To provide for staggered representation on the ROC, certain of the initial members of the ROC were appointed for an initial 2-year term. Members selected to fill expired terms shall be appointed by the Secretary. Voting members, having served two successive full 4-year terms, shall be ineligible for reappointment to the ROC for a period of 4 years.

Unless otherwise provided by statute, any member of the ROC may be removed, either with or without cause, and a successor appointed, by the Secretary.

## **Procedures**

The Memorandum of Agreement calls for the ROC Chair and Vice Chair to be selected by the voting members.

The ROC meets at the call of the Chair, not less than one time each year. The Chair may call additional meetings and shall provide at least 14-days prior notice of such meeting.

The presence of 50 percent of the voting members constitutes a quorum.

A vote of a majority of the members present is necessary to decide a question.

Action may be taken without a meeting with prior written consent by all members.

Members of the ROC may not receive compensation for serving in such office but may be reimbursed reasonable and necessary expenses in connection with carrying out the business of the ROC.

It is essential that members of the ROC carry out their responsibilities with great care to avoid even the appearance of conflict of interest; the ROC has guidelines for this purpose.

### **1.4.2 The TRB as Secretariat and Program Manager**

*Opportunity is missed by most people,  
because it is dressed in overalls and looks like work.*

Thomas Edison

The TRB is the secretariat for the ROC and the program manager of the NCRRP with responsibilities carried out in consultation with the ROC Chair. TRB staff carries out the following secretariat activities:

- Issuing announcements to solicit research needs statements for consideration by the NCRRP,
- Conducting preliminary evaluation of research needs statements to determine whether the proposed research duplicates previous or ongoing studies,
- Making preliminary estimates of the cost of conducting each proposed research topic,
- Distributing material necessary for the ROC's prioritization of research for the NCRRP,
- Recording ROC meeting decisions on matters related to the NCRRP,
- Scheduling meetings and preparing and distributing agendas for ROC meetings,
- Preparing and distributing minutes following ROC meetings,

- Keeping records related to NCRRP activities,
- Rendering to the ROC and the FRA quarterly reports on the progress of the NCRRP, and
- Providing other necessary staff support.

Management of the research program is critical to the NCRRP's success. The TRB manages the day-to-day operations of the program. The TRB is responsible for the following program management tasks: appointing expert technical panels with responsibility to direct, monitor, and review the research progress; developing and distributing requests for proposals (RFPs); processing proposals; executing contracts with the selected researchers; reviewing research reports; publishing and disseminating research reports; and promoting dissemination of research results. The TRB cooperates with the ROC and the FRA in performing these program-management functions. More specifically, TRB program-management responsibilities for the NCRRP are detailed in the NCRRP Memorandum of Agreement. Details on the approach the TRB uses in the management of the NCRRP are described in Sections 2 and 3 of this document.

### **1.4.3 Federal Railroad Administration (FRA)**

The FRA provides funding to support the NCRRP. The FRA's role as the steward of federal funds necessitates its participation in program oversight functions relative to achievement of NCRRP technical objectives, budget adherence, and schedule milestones. The FRA also provides the TRB with timely guidance and information on emerging issues of national priority, new federal program initiatives, and information on complementary FRA programs or projects that can enhance the NCRRP's effectiveness. The FRA provides the ROC with current program information on the FRA research program and with guidance in the coordination of any potentially overlapping research studies. The FRA and the TRB maintain close coordination in the development of detailed technical program plans, RFPs, and technical work statements. The close coordination among the ROC, the FRA, and the TRB provides fertile opportunities for structuring creative and more cost-effective projects.

The FRA works cooperatively with the ROC, the TRB, and others as may be appropriate in the management of the NCRRP. This cooperative effort is designed to ensure the effectiveness and success of the overall NCRRP process and is consistent with sound fiscal and resource management. The FRA's responsibilities include the following activities:

1. Participating with the ROC in developing the NCRRP annual program;
2. When practicable, selecting and assigning FRA staff personnel to serve on project panels;
3. Supporting periodic program reviews;
4. Participating in planning, developing, and conducting conferences, workshops, seminars, and other technical meetings associated with NCRRP activities; and
5. Working closely with the TRB and industry associations to ensure dissemination, distribution, marketing, and promotion of the results of NCRRP studies, with an emphasis on timely deployment and mainstreaming of products and practices resulting from the NCRRP.

## 1.5 RELATIONSHIP OF THE NCRRP TO OTHER RAILROAD RESEARCH PROGRAMS

*Overturning the chessboard is not a chess move.*  
Andre Malraux

It might be expected that strong correlation should exist among the technical objectives and individual projects for the NCRRP and other railroad research programs. However, research programs include differences that can be attributed to policies, management perspectives, and emphasis in project definition and scope. The NCRRP was conceived as an operator-based, problem-solving program (i.e., real-world, day-to-day operational issues with near- to mid-term R&D timeframes). The FRA’s research program includes these objectives, but also provides for projects of longer term R&D, FRA-mission issues, and initiatives promoted by the Administration.

Recognizing that the FRA representatives are party to selection of each annual program of NCRRP projects and that the FRA is regularly briefed by NCRRP staff on progress, coordination between the research activities of the FRA and the NCRRP is ensured. The programs are complementary.

All research program areas need to be closely examined by the ROC during the problem-statement evaluation and selection process. The ROC may discover certain research areas that the FRA is emphasizing that the NCRRP is overlooking and vice versa. Adjustments in NCRRP program definition and categorization may also be necessary if the ROC identifies strategic objectives for the NCRRP. A strategic planning process can provide the ROC and FRA officials fresh insight that can be used to calibrate or redirect the programs and to sort out some of the issues associated with the roles and operating characteristics of the NCRRP, the FRA’s research program, and other rail research activities.

## 1.6 INITIATING THE NCRRP

*I am rather like a mosquito in a nudist camp; I know what I ought to do,  
but I don’t know where to begin.*  
Stephen Bayne

Table 1 summarizes milestones in the creation of the NCRRP.

**TABLE 1 – MILESTONES IN THE CREATION OF THE NCRRP**

October 2008	Passenger Rail Investment and Improvement Act of 2008 (PRIIA) authorizes NCRRP starting in FY 2010
December 2009	FY 2010 appropriation for NCRRP
September 2010	NCRRP Memorandum of Agreement executed
September 2010	FRA provides \$5 million to TRB for NCRRP FY 2010
January 2012	Secretary of U.S. DOT appoints NCRRP Oversight Committee (ROC)
First Quarter 2012	ROC holds first meeting



Cooperative research is not new; a number of cooperative research programs are in existence and have worked well in a variety of environments. The opportunity exists, in initiating the NCRRP, to incorporate the best features of other successful programs.

As with any new program, it is important to produce accomplishments soon after the NCRRP is initiated. The research must have rail-industry support and visibility, a high potential for payoff, and broad application across the rail industry. A favorable, early response from rail managers to NCRRP products will increase interest, acceptance, and support for the program.

### **1.6.1 The First Program**

*In the middle of difficulty lies opportunity.*  
Albert Einstein

During the NCRRP's first year, the ROC will not have agreed on strategic objectives for use in selecting projects. Concerned about the source and quality of the problems to be included in the first (Fiscal Year 2010) program, TRB staff, in 2010, solicited research problems from the FRA, as well as from various AASHTO, APTA, and TRB committees interested in freight and passenger rail.

The TRB will assemble these problem statements and will send them to the ROC for review, evaluation, and priority ranking. At a 2-day ROC meeting to be held in late winter/early spring 2011, the ROC will use these problem statements as a starting point in formulating the initial round of NCRRP research.

The structure and operating practices for the NCRRP will evolve over time. The ROC will have the flexibility to determine what is best for the NCRRP, and, in its oversight role, will make changes, add to the program, and redefine processes as necessary.

## 2. PROGRAM FORMULATION

*Making up your mind is the hard part – the rest is just pure work.*

Tom Hirschfeld

The annual research programs selected by the ROC are the foundation of the NCRRP. Formulating the annual program, i.e., identifying the highest priority projects to be researched in a given fiscal year, is probably the ROC's most important duty. Projects to be funded are based on the ROC's assessment of current problems facing freight and passenger rail operators. The TRB assists the ROC by compiling candidate problem statements for the Committee's consideration in programming research projects. The ROC provides the TRB with guidance on the technical content and scope of work for each selected research project. For example, the ROC defines the scope of research, funding levels, and expected products.

### 2.1 PROGRAMMING PROCESS

The programming process encompasses a sequence of events that must occur in order to initiate each year's research activities. The items to be funded are based on the ROC's decisions regarding the type of research to be performed and the current needs of rail operators. NCRRP staff prepares the necessary material on the candidate items for the ROC to review, and, at a meeting to be held at least annually, the Committee selects the projects to be programmed. The programmed projects use the funds available for that given year. Contingent projects may also be selected, in case one or more of the programmed projects cannot proceed.

In formulating an annual program, the ROC makes decisions on the specific content of the program and selects the types of research and subject areas for the projects to be researched. The ROC has the opportunity to select specific subjects based on current needs, and research of strategic importance also can be factored into the program at this point. Each annual program may include both new and continuing research and will have a unique composition, based on the most important issues and problems at the time.

### 2.2 DEVELOPMENT OF A STRATEGIC PLAN

*If you want to hear God laugh, tell him your plans.*

Irish Proverb

Rather than being dictated by a multi-year plan, NCRRP research projects are selected on a year-to-year basis, driven by emerging issues and current priorities. Nevertheless, the ROC may want a frame of reference from which to evaluate needs and formulate priority projects. The frame of reference could be a strategic plan that includes rail-industry business needs, priorities, and objectives.

Development of a strategic plan may be accomplished through a dynamic and flexible process that is subject to review, scrutiny, and adjustment. The process may involve consideration of rail priorities, past and current expenditure levels, transportation and other trends, technology

advances, operational processes, and a range of national considerations such as international competitiveness, national and local economics, and pending legislation. The strategic plan may assist the ROC in assigning project priorities and in allocating financial support. The ROC may use the strategic plan as a point of departure in the annual programming process and may also request the TRB to investigate specific strategic areas of interest prior to final project selection.

### **2.3 NCRRP CLASSIFICATION SYSTEM**

The ROC needs to have a means to oversee the program as a whole. It needs to know what subjects are receiving attention and what research is required to produce solutions to current needs. The subject matter of the research and the types of research approaches are the basic building blocks of an effective program. In order to organize the many problems and research topics that will be suggested to the ROC, a system for categorizing the items is needed.

The NCRRP works in subject areas that cover the full spectrum of freight and passenger rail problems. The classification system outlined below divides NCRRP research into 12 research fields. This system assists the ROC in (1) evaluating multiple problems that fall into the same research categories, (2) accounting for funding that has been committed to a specific research category, and (3) communicating to the research community what research areas are important to the NCRRP program. This administrative grouping of projects also helps the ROC to monitor the overall technical balance of the NCRRP program and to determine the distribution of resources being expended in the research fields.

#### **NCRRP RESEARCH FIELDS**

- |                        |   |
|------------------------|---|
| 1. Operations          | 8. Engineering of Rolling Stock and Equipment |
| 2. Environmental       |   |
| 3. Policy and Planning | 9. Engineering of Fixed Facilities            |
| 4. Safety              |   |
| 5. Security            | 10. Construction                              |
| 6. Human Resources     | 11. Maintenance                               |
| 7. Administration      | 12. Special Projects                          |

## 2.4 RESEARCH CHARACTERISTICS

*He that would have the fruit must climb the tree.*

Thomas Fuller

In addition to classifying research by subject matter, other important, cross-cutting characteristics must be considered. A truly effective program must be designed to achieve appropriate balance among various alternatives.

*Do not let what you cannot do interfere with what you can do.*

John Wooden

Applied vs. Fundamental—Most NCRRP research would be classified as applied research, as opposed to fundamental research. A useful definition is that the results of fundamental research are intended to be used primarily by researchers; whereas, applied research is intended to be used by practitioners. Clearly, both types of research are needed for continued progress on railroad problems; applied research cannot flourish without a constant supply of new ideas flowing from fundamental research. For applied research programs to be effective in producing practical results, projects of a more fundamental nature must also be supported.

*The lure of the distant and the difficult is deceptive.*

*The great opportunity is where you are.*

John Burroughs

Local vs. Nationwide—There is a need for balance between research on problems that exist nationwide and those that are regional or local in scope. The NCRRP concentrates on national issues—problems common to most, if not all, railroads.

Top Down vs. Bottom Up—Most NCRRP research projects will originate from problems identified and suggested by practitioners at the grassroots level; on the other hand, some research may be guided by a strategic plan developed with strong involvement by high-level rail administrators. This “top-down” approach can enhance the effectiveness of a program in dealing with high-priority, long-term problems, while the “bottom-up” approach ensures the responsiveness necessary to address changing research needs. In either approach, it is important that there be support for researchers with innovative ideas and with new solutions to pressing problems.

*Sometimes the road less traveled is less traveled for a reason.*

Jerry Seinfeld

Multi-Year Plan vs. Free Market—Some research is guided by a master plan set out several years in advance. There is also a need for research to be programmed on a year-to-year basis to work on problems in emerging areas that do not necessarily fit into predetermined emphasis areas. The latter “free-market” approach to setting research priorities can, at times, appear to be chaotic and random, but it has proven to be effective and is expected to be the norm for the NCRRP.

*Experience is the name everyone gives to their mistakes.*  
Oscar Wilde

Hard vs. Soft—There should be a balance between “hard side” research directed at problems related to design, construction, and preservation of rail infrastructure and “soft side” research related to administrative, social, financial, safety, and planning considerations. From time to time, emphasis will shift between hard and soft studies, but each type is an essential part of rail research, and both will be included in the NCRRP.

*He that will not sail till all dangers are over must never put to sea.*  
Thomas Fuller

Short Term vs. Long Term—Some research can be designed to produce usable results at the conclusion of a study in 2 years or less, but there are other objectives that can only be achieved over a longer term through multi-stage studies. The NCRRP is expected to include a mix.

*Everyone is trying to accomplish something big,  
not realizing that life is made up of little things.*  
Frank A. Clark

Incremental vs. Breakthrough—Technological progress sometimes can occur in giant steps, but most NCRRP research will be intended to produce incremental progress.

*High-risk research doesn't have to end in tears.*  
D. Reynaud

Low Risk vs. High Risk—A primary objective in managing applied research is to maximize the probability of success. This is accomplished in the NCRRP first by selecting researchable problems that have a reasonable chance for solution within the time and funding available. Next, an agency with an established track record must be selected to do the research, based on a proposal promising the greatest probability of success. Finally, the study must be managed to make sure that the research agency adheres to a research plan that will produce the intended results within the budget. On the other hand, there can be situations where a higher risk of failure is acceptable, in order to attempt to reach an objective with a significantly higher payoff. A well-balanced research program will include some high-risk projects that may not be fully successful. Researchers continually demonstrate how difficult it is to produce specific technological innovations on a timetable, no matter how much money is spent. But it has also been shown repeatedly that investing research money in a worthwhile technological goal can produce important results, even when the results are not exactly what was expected.

There are other categories of research activities, including field testing, synthesizing existing technology, demonstration projects, preparation of standards-of-practice manuals or instructional documents, and development of specifications and other application documents based on new technologies. This full range of activities will be considered for inclusion in the NCRRP.

## 2.5 TYPES OF NCRRP RESEARCH

There are advantages to using various research approaches depending on the nature of the problem to be solved. A variety of research types are available within the NCRRP, and the ROC makes decisions on the types to be included in each annual program. Below are descriptions of seven types of research that might be appropriate for inclusion in the NCRRP.

### 2.5.1 Research Projects

*The reason the Yankees never lay an egg is  
because they don't operate on chicken feed.*

Dan Parker

Research projects are the primary activity of the NCRRP. The research to be undertaken is based on needs that have been identified by published literature, surveys, ROC members, and rail operators. Research objectives are aimed at identifying solutions to immediate problems in the rail environment. Research projects focus on high-priority issues with a reasonably high expectation of producing usable results. Contracts to perform the research for these projects are awarded based on competitive proposals.

The annual process begins with an announcement of a general solicitation for problem statements. TRB staff solicits and collects problem statements for review. Close coordination is maintained with FRA staff. Problem statement evaluations are based on need, urgency, probability of success, and funds available. A search for relevant research may be made using the TRB's computerized information retrieval system, the Transportation Research Information System (TRIS). After the initial evaluation, problem statements are considered by the ROC, and the problem statements chosen are included in the annual program. Research projects derived from the problem-submittal process tend to be complex and require a budget of typically \$400,000 to \$600,000 and 18 to 24 months to accomplish the objective.

### 2.5.2 Synthesis Studies

Reports on the state of the practice in critical areas are an important part of a well-rounded research program. Synthesis studies examine what railroads have done about specific problems and the findings are collected into a readable, useful form for the practicing professional. Given the decentralized nature of the rail industry, where hundreds of railroads face many similar problems, transferring information on practical experiences can be extremely valuable. The NCHRP, ACRP, and the TCRP have produced more than 400 synthesis reports on topics such as: "Waste Control Practices at Bus Maintenance Facilities," "Evaluation of Pavement Friction Characteristics," "Transit Advertising Revenue—Traditional and New Sources and Structures," and "Managing Transit Construction Contract Claims."

These synthesis reports present case studies, based on an extensive examination of current and recent activity on the topic and often include results of surveys of practitioners. Synthesis studies produced by the NCRRP will inform rail managers about innovations that are being used by others to solve problems. The Synthesis studies facilitate a broader implementation of successful innovation by effectively communicating the current state of practice and highlighting critical

problems which may need additional research. Synthesis study topics are selected by a panel appointed to oversee this portion of the program.

### **2.5.3 Legal Studies**

*Never interrupt someone doing something  
you said couldn't be done.*

Amelia Earhart

Legal research has proven to be an important area in the NCHRP, ACRP, and the TCRP, and similar legal studies could be included in the NCRRP. Problems in transportation law are so specific that general solicitations for research needs are not effective and a special mechanism is used to generate legal research problem statements. An NCRRP panel, composed of experts in rail law, can address legal issues and recommend problems to be solved. The need for legal studies continues from year to year, and the emphasis areas can be determined by the NCRRP panel on a periodic basis. These emphasis areas can change over time, depending on conditions in the rail industry. Examples of TCRP and NCHRP legal studies include “Restrictions of Speech and Related Activity at Transit and Terminal Facilities,” “Transportation Construction Contracts,” “Liability under Federal and State Environmental Laws,” and “Impact of the Americans with Disabilities Act on Transit Operations.” Legal studies have proved to be highly cost-effective in producing timely information on legal findings, conclusions, and precedent-setting cases.

### **2.5.4 Emphasis Areas**

Emphasis-area research might encompass families of studies that would provide strategic direction to the NCRRP. Are there areas of particular concern to freight and/or passenger railroads? Do these areas require special treatment? Should the NCRRP set aside funds for such emphasis areas? An example of such research is the NCHRP effort aimed at producing management-oriented solutions specifically designed to assist chief executive officers of state transportation agencies. The NCHRP commits funds to this emphasis area and annually reviews the industry’s needs and selects appropriate research. During the formulation of the NCHRP annual program, the AASHTO Standing Committee on Research (the NCHRP counterpart to the ROC) sometimes establishes an emphasis area and instructs NCHRP staff to convene a workshop at which experts identify and rank specific research needs. These emphasis-area workshops are intended to provide potential research projects to the NCHRP, as well as to the research community at large. Workshop participants and NCHRP staff agree that this is an effective mechanism for sorting out the highest priority issues within an emphasis area. The expense involved in the conduct of the workshops is more than off set by the value of a more coordinated program of studies that results from this process. This approach may be considered for use in the NCRRP.

Emphasis-area research enables the overall program to address issues from a “top-down” perspective. The ROC may delegate responsibility for an emphasis-area workshop to a panel that would develop research priorities. Identifying potential emphasis areas may be accomplished as a part of an NCRRP strategic planning process.

### **2.5.5 Continuation Projects**

*Success is never final...*  
Winston Churchill

Research projects may take two years or more to complete the necessary research. During the course of some projects, the NCRRP panel may identify an expanded scope of work that requires additional funding. Each annual program may include funds for projects that started in an earlier year and have a need to continue. The ROC decides the amount of funding to be allocated to continuation projects as a regular part of the annual programming and funding process.

### **2.5.6 Rapid-Response Studies**

*Transportation Research: Fast, Cheap, Good.*  
*Pick two.*  
R. Reilly

Research is needed for problems that demand a near-term response. Such studies are of short duration with concentrated levels of effort. The flexibility to perform such research can be important for the NCRRP. The normal process for cooperative research requires lead time to define the scope of work, solicit proposals, and select the researcher. On the other hand, rapid-response studies can complement research that is undertaken through this normal process. Rapid-response studies may provide a more timely response to new or emerging regulatory requirements or may produce answers to a problem where help is needed urgently. Such studies may be carried out in collaboration with committees of rail-related associations or other organizations to enable groups of volunteers to accomplish more than they could accomplish without the help of paid consultants.

### **2.5.7 IDEA Investigations**

*You can't steal second base and keep your foot on first base.*  
Michael D. Peary

The NCHRP and the TCRP both include projects called “Innovations Deserving Exploratory Analysis” (IDEA). The IDEA projects present an opportunity to encourage creative approaches to highway and transit problems. Annual funds are set aside to support innovations offering alternative and new approaches to solving transportation problems. The program emphasizes approaches that have the potential to produce “leapfrog technologies.” Typical IDEA research, under the NCHRP or the TCRP, is funded for a first phase, and, if results look promising for development and testing of the IDEA, second-phase funds are approved. If the ROC were to decide to initiate this type of research, the NCRRP would announce that such IDEA proposals are being accepted for problems in a specific area. This approach could also be used in conjunction with planned emphasis-area studies.



## 2.6 SOLICITATION AND SELECTION OF RESEARCH

*The best way to have a good idea is to have a lot of ideas.*  
Linus Pauling

Methods of identifying research opportunity areas and corresponding problem statements for the NCRRP can be grouped into four categories: annual problem solicitations, recommendations from specially appointed panels or committees, recommendations from workshops, and IDEA projects.

*Never mistake motion for action.*  
Ernest Hemingway

Problem Solicitation Process—The most straightforward method for determining the problems to be researched is to use an annual process to solicit input from all of NCRRP's stakeholders. The annual problem-submittal process, used by the NCHRP, ACRP, and the TCRP, has proven to be a most effective approach for gathering problems for research. The first step is a broad solicitation for research problem statements. The staff at the TRB and the FRA then (1) review each statement, (2) identify related research, (3) make suggestions regarding the probability of success of the effort, and (4) comment on the technical content and relevance of the problem to be solved. The problem statements and backup information then are considered by the ROC in selecting projects to be programmed for the upcoming fiscal year.

A “far and wide” solicitation can result in a very large response. There are at least two pitfalls when a very large number of problem statements are received: (1) examining each statement and evaluating its technical feasibility for success can take an inordinate amount of effort and time by the ROC and NCRRP staff, and (2) many submitters may be frustrated when their statements are not selected to be researched. If solicitations are handled in this manner, the NCRRP staff must take care to explain the process so that submitters realize that their problem statement did receive careful consideration. When problem statements are solicited, NCRRP staff provides clear instructions of how they must be written. This is important because many potential submitters are not experienced in writing research problem statements. The success of the NCRRP and the benefits to the rail industry will depend on good ideas being clearly presented.

In addition to rail operators, solicitations go to other members of the broad rail community. Suppliers of equipment and services, universities, other research organizations, and consultants will want to offer input to the NCRRP. The extent of the distribution of solicitations is decided by the ROC.

Table 2 illustrates the time required from solicitation of problem statements until a research agency is under contract to perform the research. Although this schedule is a compressed version of the schedules used for the NCHRP, ACRP and the TCRP, it will still be almost a year from the time a problem statement is submitted until the project is under contract. The longer timeframe for the standard projects makes it important also to pursue alternative types of research, in order to produce some results more quickly.

**TABLE 2—SAMPLE NCRRP SCHEDULE**

Start	Announcement of problem-statement solicitation
Week 12	Due date for problem statements
Week 17	Evaluation of problem statements by NCRRP and FRA staff (no “screening” panels)
Week 19	Distribution to the ROC of candidates for research and ballots for project selection
Week 24	ROC meets to select research topics and set funding levels for new projects
Week 26	Announce new NCRRP projects and solicit panel nominations
Week 40	Project panels meet to write project statements (RFPs)
Week 41	RFPs issued
Week 48	Proposals due
Week 54	Project panels meet to select research contractors
Week 60	Contracts are executed with selected agencies, and research begins

Appointed Panels or Committees—Specially appointed panels or committees are also excellent sources of research problem statements or research topics. These panels or committees can be created by the TRB with guidance by the ROC. The ROC uses a variety of panels and committees to supply input when forming its annual program. For example, the ROC relies on a special panel to determine which topics would benefit by having a synthesis study performed. The panels or committees must have members who are very knowledgeable about the day-to-day activities and problems faced by rail operators.

Recommendations from Workshops—The ROC may request the TRB to conduct workshops to gather specific problems for research. Not only can individual problems be identified in this way, but emphasis areas can be developed through workshops. Workshops are effective tools for bringing together the thinking of many experts and practitioners within a short period of time. The product of a workshop is usually a prioritized list of research needs in a well-defined emphasis area.

IDEA Projects—In addition to requesting problem statements, the ROC can direct the TRB to issue a general request for proposals for IDEA investigations or other investigator-initiated studies where the proposer identifies both the problem and the potential solution.

### 3. PROGRAM MANAGEMENT

*Great works are performed not by strength, but by perseverance.*  
Samuel Johnson

Management of the NCCRP is the responsibility of the TRB. This responsibility encompasses ten major activities necessary to formulate, manage, and administer research projects and ultimately disseminate research results to the rail community. The activities are

- Serving as secretariat to the ROC,
- Appointing and coordinating expert technical panels to guide research,
- Developing and distributing RFPs,
- Processing and evaluating proposals to select the best-qualified research agency,
- Executing contracts with the selected researchers,
- Providing technical and financial oversight of research agencies,
- Coordinating review of research reports by project panels,
- Preparing research reports for publication and dissemination,
- Promoting the application of research results, and
- Closing out contracts.

#### 3.1 SECRETARIAT TO THE ROC

The TRB's role as Secretariat to the ROC is a critical factor in the success of the NCCRP. The ROC members rely on the TRB for timely and accurate information on all aspects of the NCCRP. The TRB's responsibilities as secretariat to the ROC are specified in the Memorandum of Agreement for the NCCRP. The TRB's responsibility for individual projects begins after they are selected by the ROC and accepted by the NRC.

#### 3.2 FORMING PROJECT PANELS

The credibility of NCCRP research findings and recommendations will be based, to a great degree, on the program's ability to reach consensus among technical professionals through the NCCRP advisory panel system. Each project is assigned to a TRB-appointed panel, which provides technical guidance and counsel throughout the life of a project. The panel writes a research project statement (Request for Proposals) based on the problem statement submitted for the research. Each panel also selects a research agency, oversees the project, and reviews and approves final reports. Nominations for panel membership are solicited for each new round of projects. In addition, staff supplement nominations by networking with FRA staff and industry contacts to form panels that meet strict National Research Council requirements for subject matter knowledge; balance; and gender, ethnic, and geographical diversity.

Project panels provide the technical strength in the TRB's approach to management of research projects in cooperative research programs. Panel members are chosen for their technical expertise within the specific problem areas. They are appointed for the duration of individual projects and are looked to for technical guidance and counsel throughout the research and reporting phases. As in other TRB activities, NCCRP project panel members serve voluntarily without compensation. Panel members cannot act as individual consultants or advisors to the researchers; any panel guidance to a researcher must emanate from a majority consensus within the panel

membership. Also, a condition for accepting appointment to a panel is that members are prohibited from submitting proposals on research projects under their jurisdiction.

Project panels are responsible for

1. Developing project objectives and an estimate of the total cost and time to achieve the objectives,
2. Drafting definitive statements of scope and requests for proposals,
3. Reviewing proposals submitted by research agencies and making decisions regarding selection of research agencies,
4. Reviewing the progress of research,
5. Providing counsel and advice to researchers regarding technical aspects of projects,
6. Reviewing and evaluating project reports as to the accomplishment of objectives and suitability for publication, and
7. Making recommendations to the ROC on the need for continuation of projects included in prior fiscal year programs.

Panels include individuals from freight and passenger railroads; federal, state, and local government agencies; universities; national associations; institutions with related interests; consultants; industry; and other agencies. Panel members are appointed as individuals possessing expertise in specialized areas and not as representatives of the organizations by which they are employed. Panel size varies depending on the types of expertise required to cover the project subject. For example, if a project involves the evaluation of computerized railroad maintenance-management information systems, the panel would need experts in railroad maintenance management, computer technology, and information systems. In addition, various sectors of the railroad industry might be included: for example, a railroad executive, a maintenance manager, an information systems manager, a computer vendor, a government official, and a university researcher. Some panel members may have more than one qualifying area of expertise, and six to eight voting members represent a minimum panel size. Members of the ROC are encouraged to serve on panels for projects of particular interest. Emphasis is placed on considering women and minorities for panel membership as a means of increasing opportunities for participation by individuals from these traditionally under-represented groups.

The panels also have non-voting liaison members from the staffs of the FRA and the TRB to provide lines of communication with those organizations on ongoing and completed research so that the NCRRP can address pertinent needs without duplicating other efforts. Liaison members participate fully in all panel deliberations but do not vote on issues before the panel.

The panel is the driving force in the technical direction and conduct of the research project. NCRRP staff officers serve as coordinators, facilitators, and full-time project managers. Each project panel has the responsibility for developing the project's objectives, selecting the researcher, monitoring project output, and reviewing the final research report. This approach has been used successfully in the TCRP, ACRP and the NCHRP.

NCRRP staff selects panel members through a broad solicitation of a wide variety of people and organizations having knowledge of the desired expertise. Where possible, the person primarily responsible for preparing the original project statement will be included as a panel member, because the insight of potential users of the research is vital to the successful implementation of the final products.

After invitations are issued and individuals accept, the proposed panel membership is submitted for approval according to NRC procedures used by the TRB. Confirmation of appointments are made by the TRB Executive Director. An important concern to the National Academies in the selection and approval of panel members is the avoidance of conflicts of interest and prejudicial biases. Because it is rarely possible to secure panel members with the required knowledge and judgment who do not have technical biases, the staff pays particular attention to maintaining a balance of such biases. NCRRP staff acts as the secretariat for panel meetings and as coordinator of all technical, management, and administrative matters requiring panel action.

### **3.3 DEVELOPING REQUESTS FOR PROPOSALS**

*It's what you learn after you know it all that counts.*  
Earl Weaver

The first major task of each project panel is to translate its assigned problem statement into a fully detailed project statement or Request for Proposals (RFP) that will be used to solicit proposals from the research community. Project statements include (1) a statement of the background on the problem and associated needs; (2) a statement of the research desired to satisfy the needs, including a clear and specific statement of the objectives that are expected to be met; and (3) statements of the funds available for the agreement, the project's performance period, and the deadline for proposal submission. The project statements also include "Notes" to provide policy and procedural guidance and general information. Project statements are distributed using an e-mail list that includes individual researchers, private and public research institutions, transportation study centers, university researchers, and consulting firms.

In coordination with the FRA, NCRRP staff will continue to expand the existing RFP mailing list for a broad distribution of the project statements to the rail-research community. The Cooperative Research Programs mailing list includes contacts at traditionally black colleges and women-owned and minority-owned firms. All who ask to be included on the list are retained until they ask to be removed or the supplied e-mail address fails to accept mailings. Special efforts will be made, particularly in the early years of the NCRRP, to ensure that opportunities for participation are well known to all potential researchers.

A level of available funding is stated in the project statement, and the proposers submit responses outlining their technical plans for spending these funds to complete the project. The project panel evaluates proposals entirely on the basis of technical merit and the probability of success and does not attempt to obtain a "lowest bid." This approach is very well received by panel members and proposers.

Usually, project panels are scheduled for meetings of 2 days each in Washington, DC, to prepare the project statements. The project panels also prepare information needed to evaluate the

need for more research in the problem area. Each panel member decides the importance to be assigned to key elements of the proposal-evaluation criteria as enumerated in the following Special Note included in all RFPs.

Proposals are evaluated by the NCRRP staff and project panels consisting of individuals collectively very knowledgeable in the problem area. Selection of an agency is made by the project panel considering the following factors: (1) the proposer's demonstrated understanding of the problem; (2) the merit of the proposed research approach and experiment design; (3) the experience, qualifications, and objectivity of the research team in the same or closely related areas; (4) the plan for promoting application of results; (5) the proposer's plan for participation by Disadvantaged Business Enterprises—small firms owned and controlled by minorities or women; and (6) the adequacy of the facilities.

TRB is continuing efforts to expand its contractor base by identifying additional disadvantaged business enterprises and adding them to the NCRRP e-mail list for RFP notification.

NCRRP staff maintains a web-based "brochure," *Information and Instructions for Preparing Proposals*, for use by proposing organizations. The staff is available to discuss the specifics of each research project and the instructions for preparing proposals but will not generally schedule pre-proposal briefing meetings for proposing organizations. Proposers are allowed at least forty-five (45) days to respond to the problem statements. It is the proposer's responsibility to review and comply with the requirements in the proposal brochure. The proposal must be self-contained; it constitutes the only opportunity for a proposer to state its case.

## **3.4 SELECTING RESEARCH CONTRACTORS**

*It's easy to get good players.  
Getting 'em to play together, that's the hard part.*  
Casey Stengel

The process for selecting researchers, which has been used by the TRB in managing the NCHRP for more than 45 years, the TCRP for more than 18 years, and the ACRP for 5 years is also used for the NCRRP. This open process allows all potential research agencies to compete on the basis of technical merit and ensures that all proposers are treated fairly and that the program has access to the best talent available for each project.

Proposals for NCRRP research projects are evaluated by the project panels and NCRRP staff. The evaluation is based on the six factors enumerated in Section 3.3. Following this approach, cost is usually not a deciding factor in the evaluation, inasmuch as the funds available for the project have been announced in the project statement. Line items in the proposed budget are examined to determine the reasonableness of the allocation of funds and staffing to the various tasks. The unit costs of the research proposed, and such elements as compensation for key personnel, distribution of effort for key tasks, overhead rate, size of any fixed fee, and those expenditures included in direct costs, are evaluated.

Proposals are reviewed by the staff for completeness and conformity with required standards. NCRRP staff will not accept proposals after the submission deadline; late proposals are rejected with

no further review. The conforming proposals are forwarded to the panels for their evaluations within one week; the submitters of any rejected proposals are informed of the reasons for their rejection at the same time.

The technical panel selects the contractor at a second panel meeting, held at least twenty-five (25) days after the panel has received the proposals; the staff assists the panel chair and records the meeting notes. The staff and liaison members participate fully in the discussions during the 1-day deliberation; however, formal voting on the selections is limited to the appointed members (not the liaison members or NCRRP staff). The panel is instructed (1) to evaluate and rate each proposal in accordance with the criteria discussed at the first meeting and (2) to arrive at the next panel meeting prepared to discuss the pros and cons of each proposal. A summary of these pros and cons is used by the staff for debriefing any proposer requesting one. Each proposal is discussed during the meeting before any vote is held. During or after that discussion, panel members are free to alter their preliminary ratings. A panel's first and second (contingency backup) choice for contract award requires a two-thirds consensus and is based on technical merit. The panel's specific reasons for selection are fully documented. Strict confidentiality is applied to all panel deliberations.

### **3.5 EXECUTING RESEARCH CONTRACTS**

*In business as in life, you don't get what you deserve,  
you get what you negotiate.*

Chester L. Karrass

Research-contract negotiations begin when the first-choice proposer receives notification of the project panel's decision, following the second panel meeting. NCRRP staff notifies the first-choice organization of its tentative selection, provides the necessary documentation for it to complete the contracting procedure, and requests the NAS Office of Contracts and Grants (OCG) to begin a pre-contract financial investigation. Each selected organization must provide documentation to support its proposed indirect cost rates and forward information concerning its travel policy and salary and wage schedules. Enclosed with the first-choice notification, the selected organization is referred to an online *Procedural Manual for Agencies Conducting Research in the NCRRP*. This manual provides the organization with detailed guidance in policy and procedural matters.

Final contract negotiations will be the responsibility of the OCG, which incorporates the proposal into the contract as the binding scope of work along with provisions previously agreed to between the NAS and the FRA. Three types of contracts are awarded by the NAS: Cost Reimbursement, Cost Reimbursement Plus Fixed Fee, and Fixed Price.

NCRRP staff also is responsible for notifying unsuccessful proposers of the results of the second project panel meeting and debriefs these organizations on request. The oral debriefings indicate the technical areas in which their specific proposals were judged to be weak or deficient and how the weaknesses or deficiencies were factors in their not having been selected. The information given to the unsuccessful proposers is factual and consistent with the panel evaluations and is delivered in a fair, objective, and impartial manner. The staff disposes of the unsuccessful proposals in accordance with NAS policy.

### 3.6 MONITORING RESEARCH PROJECTS

*Most people like hard work. Particularly, when they are paying for it.*

Franklin P. Jones

Once research begins, the project panel and NCRRP staff monitor the administrative and technical progress of the project. Drawing on the contents of the approved proposal and working plan, NCRRP staff maintains a close awareness of the researcher's activities to ensure conformance with contractual obligations. However, a careful balance must be maintained in the practical exercise of project management; it must be penetrating enough to be effective, and yet, it must not be so complex or burdensome as to distract the researchers from their primary efforts or add unreasonably to the organization's cost of doing business.

The project panel maintains control over the research process during execution of the study. Their first involvement is to review and approve the researcher's working plan. This amplified research plan, due fifteen (15) days after the contract beginning date, provides a detailed expansion and update of the research plan that was included in the contractor's proposal and furnishes a complete description of the activities to be pursued in the conduct of the research. Its purpose is to assist the panel and staff in monitoring activities.

The panel receives copies of quarterly reports directly from the researcher and is encouraged to comment on them. The researcher is required to respond in writing to the panel's comments; correspondence, both to and from the researcher, must pass through the responsible NCRRP staff. Panel approval is required for any changes in the conduct of the research plan, any change in principal investigators, and any interim reports required in the work plan.

NCRRP staff usually meets with each contractor at least once a year. Between site visits, the TRB maintains frequent contact with the principal investigators. NCRRP staff checks researcher invoices to ensure that use of project funds is consistent with the approved plan. Contractors are required to budget for two trips to Washington, DC, to discuss research progress.

Usually an initial site visit is made soon after panel approval of the project's working plan. NCRRP staff provides all liaison activity necessary to maintain the project panel's awareness of research progress and to acquire panel guidance and counsel in technical matters. NCRRP staff members work with panel chairs to coordinate panel actions (e.g., additional meetings or mail ballots) that may be necessary for major changes to account for promising new leads or unproductive lines of study, interim or final report reviews, and so on.

NCRRP staff is responsible for producing quarterly progress reports to the ROC and the FRA. In addition to continuous updating of project status reports on the NCRRP website, annual reports are prepared to provide a comprehensive overview of NCRRP progress in general and particulars on the status of each project. Annual reports include a comprehensive overview of the NCRRP from initiation through December 31<sup>st</sup> of each year. They include a narrative on the overall operation of the NCRRP, a summary table of projects and their status, a list of NCRRP publications, and brief summaries of all NCRRP projects. The annual report is submitted before February 15<sup>th</sup> of each year. In addition, NCRRP staff is available, at the request of the FRA, to make presentations to selected audiences summarizing NCRRP activities and progress.



The researchers must prepare and submit monthly progress schedules and quarterly reports to the TRB in a timely manner. While the researcher's proposal is part of the agreement, it is not the intent of the program to limit the principal investigator's flexibility in conducting research that is consistent with the general scheme of the proposal. The contract amount cannot be exceeded, and anticipated major changes in the original budget estimate must be discussed with the responsible NCRRP staff members.

The researchers must obtain prior written approval of certain expenditures; these include travel to general scientific or technical meetings, and any purchase order or subcontract over twenty-five thousand dollars (\$25,000). A researcher may submit periodic vouchers (not more than once a month) to the NAS for payment. Payments will exclude an amount being withheld as a performance guarantee. NCRRP contracts may be transferred to another research agency, subject to agreement of all parties concerned.

### **3.7 REVIEWING RESEARCH REPORTS**

*Tell a man there are 300 billion stars in the universe,  
and he'll believe you.  
Tell him a bench has wet paint on it, and he'll have to touch it to be sure.*  
Jaeger

All NCRRP projects conclude with a final report prepared by the researcher. All contractors are required to include the review/revision process in their proposed schedule. The NCRRP contracts require submission of preliminary drafts in a standard CRP format that has proved successful in documenting research and facilitating acceptance and implementation of the findings. The preliminary draft reports are treated as privileged documents (available only to the sponsors and participants in the NCRRP) and are reviewed by the panels for acceptability as to the fulfillment of the technical obligations under the contracts. The contract performance periods include ninety (90) days for panel and staff reviews and for the researchers to revise the reports to reflect the review comments.

Panels review draft final reports to assess fulfillment of objectives as set forth in the individual contract, adequacy of documentation, and clarity of presentation. Each panel member is asked to recommend publication or non-publication of the research report on a form accompanying the draft final reports. The NCRRP staff member reviews each report at the same time it is undergoing panel review and summarizes and transmits all reviewer comments to the principal investigator. Based on reviews by panel and staff, decisions are made concerning publication in the report series.

Individual panel member names are not shown on comments sent to researchers but are included with a copy of the comments and the researcher's response returned to the panel members. On receipt of the revised final report, the staff reviews it to determine compliance with panel recommendations and forwards the revised report and researcher's point-by-point response to the panel.

Researchers must give careful thought during proposal preparation to the level of funds that will be required to ensure satisfactory compliance with contract requirements for preparation, editing, submission, and revision of preliminary draft reports and submission of the final report.

Revised final reports are due by the contract's expiration date. The final reports must reflect the reviewers' comments and incorporate editing by a competent technical editor to ensure compliance with the TRB requirements for report style and organization (covered under *Preparing Your Report*).

When interim reports are required, they must be submitted according to the schedule in the working plan. Such reports are reviewed for acceptance under the same criteria as specified for final reports. It is not usually intended that interim reports will be published. If, however, the panel's reviews or other factors determine that publication is warranted, the principal investigator will proceed as for final reports.

### **3.8 PUBLISHING AND DISSEMINATING RESEARCH REPORTS**

Research results are of little value if not disseminated; it is the normal practice of the TRB to make every reasonable attempt to publish and distribute widely the reports submitted on each project. The research reports are part of an ongoing NCRRP publication series and it is important to maintain consistency in their presentation style.

These reports are written in language that is understandable and succinctly summarizes the research project's results. Railroad operators and others must be able to easily determine the applicability of the research to their daily operations. Appendix material is included in each report to address the interest of researchers, developers of transportation manuals and guidelines, and other professional users of the research results who are interested in a high level of technical detail.

Rights to publish and distribute project reports, digests, technical articles, computer software, slides, and audio-visual aids for presenting research findings are reserved by the NAS and are exercised according to NAS policies for broad dissemination of all publications and ancillary materials through the TRB, the FRA, and other appropriate distribution processes.

Permission to use copyrighted materials that are to be included in NCRRP research reports must be obtained by the NCRRP contractor in writing from both the author and the publisher. Documents granting permission must be transmitted to the NCRRP where they become part of the permanent file on the particular report.

Researchers may not copyright or cause or permit to be copyrighted any article, data, written materials, computer software, or other information prepared under an NCRRP contract, whether published directly or by others, in book form or in a scientific or technical journal.

Material contained in interim or final reports that have been reviewed by NCRRP may be published by the researcher, provided that credit is given to the individuals and organizations who conducted and sponsored the work.

### **3.9 PROMOTING APPLICATION OF RESEARCH RESULTS**

*Great ideas need landing gear as well as wings.*

C.D. Jackson

The success of an applied research program should be measured by the benefits derived from application of the results. The NCRRP puts a strong emphasis on delivery of results to potential users. During the early stages of the NCRRP, the ROC and TRB staff will work on strategies for ensuring that NCRRP products are disseminated to the right people in a timely manner. Each report published in the NCRRP series contains a staff-prepared foreword that directs the attention of the reader to the individuals who would be most interested in the results and also to how the results fit into present knowledge and practice.

Prior to publication, extra measures are taken to ensure that useful research results are made immediately available to target audiences. After publication, each report is distributed widely through the TRB's and selected freight and passenger railroad associations' distribution systems. Copies go automatically to about 100 libraries, more than 150 university-liaison representatives, appropriate TRB panels and committees, and individual TRB 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 go to rail industry press. FRA and rail-association staff automatically receive a copy of each published report. Every NCRRP publication is posted in full text, free of charge on the NCRRP website.

Selected groups receive mailings outlining specific research results in their areas of operations, but there may be segments of the rail industry that are not easily reached by the current system, and the need to further expand the distribution process will be considered. The ROC may decide to authorize an NCRRP study to systematically evaluate options and develop a plan for promoting application of NCRRP research results.

### **3.10 CLOSING OUT CONTRACTS**

*It's a little like wrestling a gorilla. You don't quit when you're tired.*

*You quit when the gorilla is tired.*

Robert Strauss

After receipt of each project final report, the close-out of the contract for that project begins. The TRB obtains and evaluates the researcher's inventory of data and equipment. Generally, the NAS's policy is that researchers will retain data for three (3) years, following which the researchers can notify the NAS of their intent to destroy the data unless otherwise directed. Capital equipment purchased or fabricated by researchers using project funds is retained by the researchers until disposition is determined by the NAS. If the NAS decides the equipment is to be sold rather than delivered for further use in the NCRRP, the researchers credit its fair and reasonable price to the Program. NCRRP staff also is responsible for notifying the NAS and the FRA of the status of the close-out activities and for, at the appropriate time, disbanding the technical panels.

### 3.11 SUMMARY

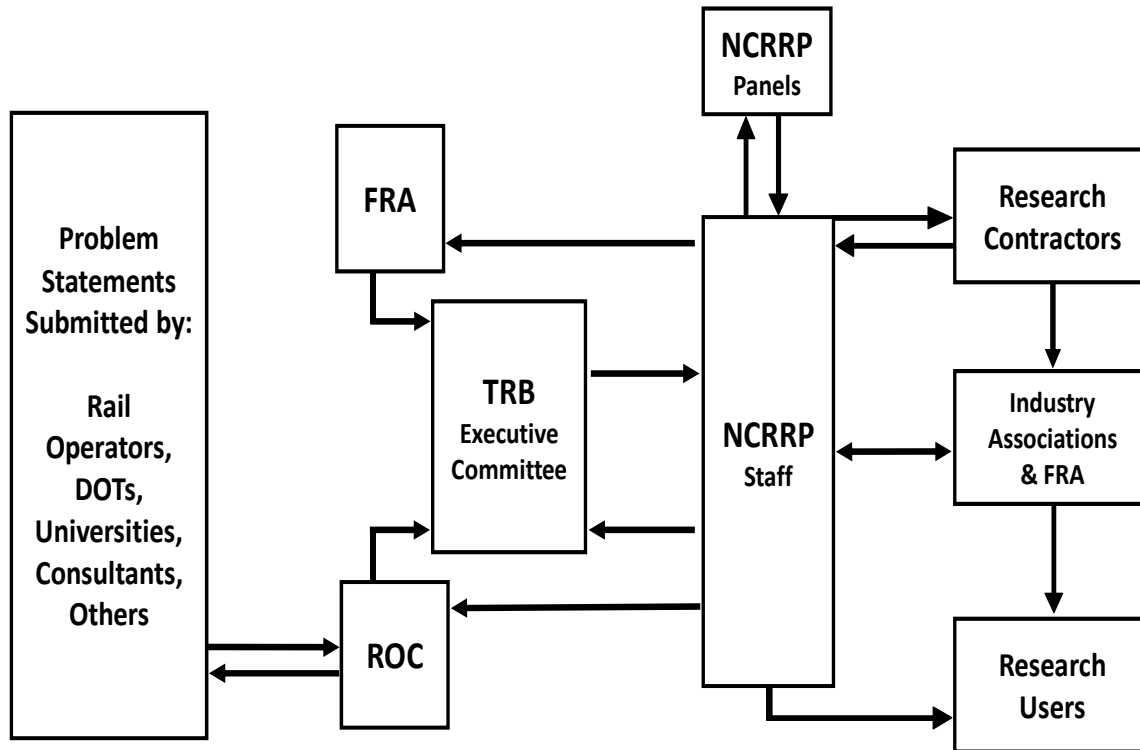
*If you have a job without any aggravations, you don't have a job.*  
Malcolm Forbes

To summarize the roles and responsibilities described in Sections 2 and 3, the activities and actors are listed in Table 3 and illustrated in Figure 2.

**TABLE 3 – NCRRP RESPONSIBILITIES**

Activity	Responsible Party
Submit research needs	Anyone—e.g., rail operators, consultants, universities
Evaluate submittals	NCRRP and FRA staff, rail industry associations, industry screening panels (optional)
Select projects	ROC
Form project panels	NCRRP staff
Develop RFPs	Project panels, staff
Select contractors	Project panels
Execute contracts	NAS Office of Contracts and Grants
Guide progress	Project panels, staff
Review reports	Project panels, staff
Publish reports	NCRRP staff
Disseminate results and encourage applications	Project panels, FRA, TRB, rail industry associations

**Table 2**  
**NCRRP Operating System**



**3.12 PROGRAM FINANCE**

*There are a handful of people money won't spoil,  
and we all count ourselves among them.*  
Mignon McLaughlin

The NCRRP is envisioned as a continuing program, and it is intended that a seamless operation be achieved through a series of multi-year agreements. The agreement for each new fiscal year will overlap with all previous agreements that have not yet reached their termination dates.

Funds provided by the FRA will be expended within 5 years following the FRA's authorization to begin. This time period is needed to ensure that all NCRRP researchers are able to complete their research and submit final vouchers for all project costs before the expiration date of the agreement between the FRA and the NAS.

Expenditures for TRB's administration of the NCRRP will be charged against the earliest agreement in which funds budgeted for administration are still available, and costs for each research

project will be billed against the agreement from which the funds for that particular project were derived.

Although research funds will be expended over a 5-year period, administrative costs are estimated for a 12-month period supported by each grant. Authorization to begin the NCRRP Fiscal Year 2010 program is effective in September 2010; administrative funding in the Fiscal Year 2010 program will be sufficient to cover costs through September 2011, thus ensuring continuity in the event that authorization of the Fiscal Year 2011 program is delayed. Use of administrative funds from a given fiscal-year program will begin only after administrative funds from the previous fiscal-year program have been exhausted.

In the event that the NCRRP is terminated, all remaining administrative funds will be redistributed over a period of up to 5 years to provide for monitoring research through completion of the remaining projects. In addition, some research funds will be reallocated, as necessary, for administrative expenses with the concurrence of the FRA.

The budget for a typical NCRRP fiscal year grant breaks down approximately as follows:

Direct Costs		13.6%
Salary & Benefits	7.1%	
Travel	3.5	
Publications	2.0	
Other Direct Costs	1.0	
Indirect Costs		11.4
Research		75.0
	TOTAL	<u>100%</u>

The amount budgeted for indirect costs is determined by indirect cost rates established and adjusted each year by government auditing agencies. These costs are used to support rent, utilities, accounting, contracts and grants, personnel administration, and other services.

An important contribution to the NCRRP that is not reflected in the NCRRP budget is the value of volunteer time contributed by NCRRP panel members. All panel members serve as volunteers; they are reimbursed only for travel expenses. When the NCRRP is in full operation, there will be as many as 300 to 400 rail professionals working on project panels, each for an average of at least 3 days per year. The value of time spent by volunteers is estimated to be more than \$1.0 million annually, representing significant savings for the NCRRP budget.