

April 28, 2000

The Honorable Jolene M. Molitoris  
Administrator  
Federal Railroad Administration  
400 Seventh Street, S.W.  
Washington, D.C. 20590

Dear Administrator Molitoris:

The TRB Committee for Review of the Federal Railroad Administration (FRA) Research and Development (R&D) Program held its fifth meeting on March 2–3, 2000, in Washington, D.C. This meeting provided an opportunity for the committee's annual review of FRA's R&D program, including the fiscal year (FY) 2001 budget proposals, program updates, and program management issues. The meeting was divided into two parts: the Railroad R&D program was addressed on the first day, and the Next Generation High-Speed Rail (NGHSR) program on the second day. The committee also discussed the proposal for a Railroad Safety Institute. The committee roster provided as Enclosure 1 indicates the members who attended the meeting.\* Following an open session with FRA and Volpe Center staff and invited speakers, the committee met in executive session to deliberate on the information presented and to develop this report.

On behalf of the committee, I want to thank Arrigo Mongini, Steven Ditmeyer, Claire Orth, Magdy El-Sibaie, Thomas Raslear, Robert McCown, and Steven Sill of FRA and Robert Ricci of the Volpe Center for participating in the meeting, and for providing the committee with program updates and plans for FY 2001. We would also like to thank the invited speakers who made presentations to the committee during the meeting. External views on FRA's research agenda were presented by Christopher Barkan, Peter French, Howard Moody, and Tom Peacock. Updates on NGHSR projects were provided by Daniel Palardy, Daniel Hubert, Alan Walls, Robert Gallamore, and Larry Light. (See Enclosure 2 for speakers' affiliations and the subjects they addressed.)

The committee's findings and recommendations on the Railroad R&D program, the NGHSR program, and the proposal for a Railroad Safety Institute follow.

## **REVIEW OF RAILROAD R&D PROGRAM**

### **FY 2001 Budget**

The committee is encouraged to see the significant proposed increases in the program budget for FY 2001, particularly for research related to human factors, grade-crossing

infrastructure (including intelligent transportation systems [ITS] integration), and methods for developing performance-based safety regulations—all areas in which the committee has previously made specific recommendations. The committee is concerned, however, that the budget does not include new R&D staff positions to support the larger program or to provide additional technical expertise for handling developing technologies. At present, the R&D program does not have staff assigned full time to cover several critical subjects, including train control and grade crossings. One vacancy in the R&D program staff, intended for a train control expert, remains unfilled because of the scarcity of qualified individuals.

**Recommendation 1.** The committee recommends that, to provide staff support for critical R&D subjects, including grade crossings and train control, FRA analyze the distribution of staff responsibilities and reorient staff assignments to cover these subjects. Further, for the vacant train control position, FRA should not be constrained by a lack of technical expertise, but instead revise the job description and seek an individual with strong R&D project management skills. Technical knowledge of the subject can come from the Volpe Center or contractors. If the R&D budget is significantly increased, the need for additional program staffing should be carefully examined.

### **Need for Contextual Research**

In recent years, the Railroad R&D program has been devoted entirely to safety research in support of FRA's regulatory mandate. As a result of the long cycle time for the R&D process, however, research projects frequently produce answers several years after they are needed. Moreover, the implementation of new technology is constrained because the regulatory process does not keep pace. The committee questions whether FRA can anticipate tomorrow's safety issues, identify related research topics, evaluate relevant research projects, and plan the future R&D program without conducting research to understand the context of the railroad industry of the future. The committee sees such contextual research as a necessary *addition* to FRA's research program for which additional funds should be provided. It should be seen as a necessary part of the program design, and not as a substitute for other research areas.

In its presentation to the committee, FRA outlined "The Railroad Environment in 2000," including the factors from which safety issues arise. Among such factors are increased traffic flows and strains on capacity; the relative mix of commodities in freight traffic; the mix of freight and passenger services; the introduction of new technology and equipment, both freight and passenger; mergers of rail companies; and changes in public policy concerning passenger rail. The committee has focused considerable attention on FRA's project evaluation process, but the agency cannot evaluate projects effectively without insight into tomorrow's safety problems.

**Recommendation 2.** To support relevant project evaluation and to create a solid foundation for a future R&D program, the committee recommends the addition of contextual research to FRA's research programs so that safety issues can be anticipated in the context of rail industry changes and technology developments.

### **Joint Operation of Freight and Passenger Services**

A specific area in which there is a critical need for contextual research is related to the growing trend for joint operation of freight and passenger services in the same corridors, and frequently on the same tracks. In many instances, decisions concerning institutional issues and commercial arrangements for these services are being made without sufficient understanding of the safety implications. Contextual research on these issues would provide justification for R&D projects. An example of a project that would profit from contextual research is FRA's work on the development of positive train control (PTC), which both this committee and the predecessor committee that reviewed only the NGHSR program have encouraged. This is a necessary technology to support joint operations, and progress is being made in this area. As another example, FRA has supported the development of safety assessment models, and more work is needed to provide tools that can be used to evaluate proposals for new services involving joint operation.

In 1999, FRA and the Federal Transit Administration (FTA) recognized their mutual concerns and together issued a draft policy statement on joint operation (transit and railroad) on the general railroad system, which is largely freight owned. In light of these mutual concerns, there also needs to be a more formalized FTA liaison with the FRA R&D program.

**Recommendation 3.** In view of the increasing demands on the freight rail system by incremental high-speed passenger services in a number of corridors and by commuter rail in many cities, the committee recommends an increased focus on safety issues related to the joint operation of freight and passenger services of different types on the part of both the Office of Policy and the R&D program, with a formalized FTA liaison.

### **A Coherent Approach to Grade-Crossing Safety**

In previous letter reports, the committee has expressed concern that insufficient R&D resources are being devoted to grade crossings, the largest source of rail industry fatalities. The committee is encouraged to see proposed increased funding for grade-crossing infrastructure in the FY 2001 budget, including the integration of ITS technologies and continued funding for a recently initiated project on driver behavior. The committee appreciates FRA's responsiveness in this regard.

Some issues remain to be addressed, however. In the update on the R&D Project Evaluation and Investment Analysis (see below), the grade-crossing example correctly

showed significant reductions in fatalities as a result of improved crossing protection. However, it did not clearly show the correlation between the types of crossing protection in use and risk reduction. Both the railroads and public agencies with responsibility for grade-crossing safety need better tools for predicting grade-crossing risks and for identifying the most effective solutions to eliminate certain types of risk. The development of improved tools for predicting risk will in turn require a better understanding of the causal factors involved in grade-crossing accidents, including crossing characteristics and human behaviors that contribute to accidents. More data are needed on evaluation of crossing devices, particularly with before-and-after installation measurements. These data, combined with a better understanding of risk factors, could aid in identifying the appropriate remedial measures for particular types of crossings. Perhaps the sample of the 10 most dangerous crossings in each state now being identified by the FRA Office of Safety, in conjunction with the states, could be used for this sort of analysis.

The committee notes further that perceived gaps in grade-crossing programs result from the fragmented handling of grade-crossing issues within FRA, the U.S. Department of Transportation (USDOT), and state agencies.

**Recommendation 4.** FRA should continue efforts to bring focus to the fragmented grade-crossing programs within FRA, USDOT, and state agencies. Particular emphasis should be placed on developing improved risk-exposure models for grade crossings, using data from current and past analyses and demonstrations. Future research should focus on providing the best advice for determining grade-crossing risk exposure and for identifying the most effective remediation measures for different types of crossings with varying levels of risk.

### **Performance-based Regulations**

The committee is pleased to see that FRA has requested \$500,000 in FY 2001 "...to evaluate methods for developing performance-based regulations for their applicability to FRA's safety regulatory process." In addition, FRA's budget document states: "The Transportation Research Board's Review Committee for FRA's R&D Program has recommended that FRA's safety regulatory process should evolve to the establishment of performance-based regulation." The committee looks forward to further details on this initial project, which is related to new electronic systems. As discussed in its previous letter reports, the committee also encourages FRA to address the range of issues associated with moving toward the broader application of performance-based standards to safety management. Managing the transition to performance-based standards will include ensuring the availability of accurate safety data, developing new procedures for performance measurement, and requiring new skills for safety regulators.

**Recommendation 5.** The committee strongly encourages FRA to continue its efforts related to the transition to performance-based standards. The committee looks forward to seeing more details on the initial project related

to new electronic systems. In addition, the committee will want to see details on the way in which this effort will lead to the next step of analyzing how to manage the transition to a broader application of performance-based regulations to railroad safety.

### **Nationwide Differential Global Positioning System**

The committee supports FRA's role as program sponsor for development of the Nationwide Differential Global Positioning System (NDGPS) and urges continued funding to keep this important project on schedule. NDGPS is an essential component of PTC and of advanced train control and traffic management systems in general, and essential safety projects will be delayed unless the system is completed on schedule.

**Recommendation 6.** The committee believes completion of NDGPS is a matter of very high priority for the nation, offering benefits that more than offset the system's installation and operation costs and extend far beyond railroads, or indeed transport. The committee recommends that the Administrator make an effort to communicate this sense of urgency to the Secretary of Transportation, and that the Secretary make completion of the system a priority within USDOT.

### **Human Factors Program**

The committee appreciates FRA's responses to questions related to the human factors program that were raised in the committee's April 30, 1999, letter report. The increased funds requested in the FY 2001 budget will also be used to address specific human factors issues, such as the new project for cognitive task analyses of PTC. The committee is encouraged by these developments and looks forward to the results of this research. The committee believes an improved understanding of the human factors components of accidents remains an area in which significant contributions to railroad safety could be realized, and looks forward to exploring these issues in more detail at future meetings.

The committee is pleased to learn of cooperation with the Federal Aviation Administration (FAA) and other outside researchers on projects and as program consultants. The committee understands that only a small proportion of the R&D budget is available for contracts to researchers outside the organizations that provide ongoing support to the program (including the Transportation Technology Center, Inc. [TTCI], the Volpe Center, and other contractors retained on a work order basis). Within these constraints, however, the committee encourages FRA to continue to seek opportunities for outreach to other researchers.

**Recommendation 7.** Within budgetary and contractual constraints, the committee strongly encourages FRA to engage a broad range of researchers in the human factors R&D program, especially in the areas of information management and the design of advanced displays.

## **Project Evaluation and Investment Analysis**

The committee expresses its thanks to Robert Ricci of the Volpe Center for providing an update on the development of the FRA R&D Project Evaluation and Investment Analysis. The committee is eager to see this evaluation process applied to the projects proposed for the FY 2002 budget. (Comments on the portion of this presentation that addressed the specific analysis related to grade-crossing risk are provided under “A Coherent Approach to Grade Crossing Safety” above.)

**Recommendation 8.** The FRA R&D staff should apply the Project Evaluation and Investment Analysis methodology to the projects proposed for FY 2002 to determine both the workability of the process and its results in this test case.

## **NEXT GENERATION HIGH-SPEED RAIL PROGRAM**

The NGHSR program has been the subject of review by TRB committees for the past 4 years, and significant developments have occurred in several technologies supported by the program. The committee is encouraged by much of the progress made under this program; comments and recommendations on specific projects are provided below. As these technologies come to fruition, the question arises of what is next for this program. The committee will appreciate hearing about future program plans as they are developed.

### **Nonelectric Locomotive**

The development of a turbine-powered, AC traction, nonelectric locomotive capable of rapid acceleration and cruising speeds of 125 mph and higher is progressing. The rollout of the first locomotive is scheduled for May 1, 2000, and testing is planned for shortly thereafter. The committee is pleased that, in accordance with its earlier recommendation, the development of the locomotive has proceeded separately from that of the flywheel (see below), and is eager to see the results of this effort. Ultimately the marketplace—potentially for commuter rail as well as intercity—will determine the success of this project.

### **Advanced Locomotive Propulsion System**

The Advanced Locomotive Propulsion System (ALPS) incorporates a high-power turbo-alternator and a flywheel energy storage system, both of which are to be completed and ready for testing later this year, to improve the performance of the nonelectric locomotive. The committee is concerned, however, about the ability of this equipment to withstand the rigors of the railroad operating environment and suggests that the testing include vibration testing. As with the nonelectric locomotive, the ALPS technology will succeed only with a sufficient market. The flywheel will provide the capability for rapid acceleration, which may

make this technology more attractive for commuter rail operations with frequent station stops than for intercity services.

### **Grade Crossings**

The success of the North Carolina Sealed Corridor project needs to be documented. It would be desirable to have an estimation of the lives saved by the improvements installed and an evaluation of whether the resulting reduction in accidents is sustainable for the foreseeable future.

The committee also notes a useful technology emerging from the grade-crossing research, with potential for additional industry applications: the use of laser scanning to produce digital maps of rail corridors. For example, this technology could be useful in developing a database for PTC projects.

### **Michigan Incremental Train Control System**

The Michigan Incremental Train Control System (ITCS) Demonstration project, being conducted by a partnership comprising FRA, Amtrak, Michigan DOT, and Harmon Industries, is now in the final testing stage. An important product of this project is the Grade Crossing Warning Advance High-Speed Start, which represents a breakthrough for speeds above 79 mph and will be implemented in other locations. Testing of the ITCS has proven the vitality of the system in real time, and its implementation in revenue service is scheduled for later this year.

### **North American Joint Positive Train Control Program (Illinois Project)<sup>1</sup>**

The North American Joint Positive Train Control Program (Illinois Project), jointly funded by FRA, the Association of American Railroads, and Illinois DOT, is designed to involve all stakeholders in a consensus-building process directed at interoperability. The committee recognizes the political and technical complexities of engaging the railroad industry in the development of new technology, as well as the importance of cultivating and maintaining a broad base of support for this project within the railroad industry. However, as the committee has noted previously, significant resources have been expended to date on the creation of the management structure and industry outreach efforts for this project. The committee remains concerned that the project has become more expensive and

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<sup>1</sup> As disclosed in the endnote to the committee's December 30, 1999, letter report and repeated at the end of this letter, John M. Samuels, a committee member, is also chairman of the management committee for this project. In recognition of the potential conflict posed by his two roles, Dr. Samuels did not participate in the discussion of this project in the committee's executive session on March 3, 2000, and neither provided input for nor approval of this section of the letter report.

complicated than is necessary. It is not clear that the potential outcome of the project will be different from that of the earlier Advanced Train Control Systems (ATCS) project.<sup>2</sup>

The complexity of the project appears to stem from an effort to specify standards and design details well beyond the minimum required to achieve interoperability for a train of one railroad operating on the tracks of another. (For a detailed definition of PTC interoperability, see the annex to this report.) While many of the commonality issues addressed by this project are of interest to both the railroads and the railroad suppliers, they are not organic to safety. With technology development still required, it is premature to burden a PTC demonstration project with obtaining broad industry consensus on issues related to the application of a new train control concept to the entire general railroad system. Obtaining such a consensus requires great effort and could easily result in an impractical, committee-designed system. Technology development is more likely to proceed if a few self-contained experiments, based on different philosophies, are conducted and evaluated for potential technical or regulatory problems. Development of PTC will also require regulatory changes to allow the use of new technology (see the earlier discussion of “Performance-Based Regulations”).

The committee will continue to explore this and other approaches to implementing new train control concepts at its next meeting, possibly addressing the CSX project, the European Train Control System projects, and the New York City Transit communications-based train control project. At this meeting, the committee will also consider the safety and interoperability requirements of moving-block train control systems, such as that proposed for the Illinois project, compared with the less complex requirements of systems based on fixed blocks. The committee recognizes that there are highly complex questions related to new train control developments, and that there are no easy answers to these questions.

**Recommendation 9.** The committee recognizes that any PTC system placed in service must satisfy safety requirements, including the emerging FRA PTC rulemaking. To advance PTC technology development, however, the committee recommends that FRA consider ways of decoupling train control technology demonstration projects from the industry consensus-building process on interoperability and interchangeability standards.

### **Alaska PTC Project**

The committee recognizes that the Alaska PTC project was inserted into the NGHSR program as an earmarked effort. Contract issues between the railroad and its contractor have ensued, and the outcome of the project is unclear at this time. This project illustrates how earmarked projects divert significant management and staff time in both the Office of R&D and the Office of Safety from programmed projects.

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<sup>2</sup> The ATCS project was initiated by the Railway Association of Canada and the Association of American Railroads in 1984 and ended in 1993. Its purpose was to develop a series of comprehensive and advanced operating systems for train control for improved railroad safety, productivity, and energy efficiency.

## PROPOSED RAILROAD SAFETY INSTITUTE

One element of the committee's charge is to determine "...whether it is of critical importance to establish a Railroad Safety Institute and whether such an Institute would be duplicative of current research efforts." At the November meeting, FRA staff provided the committee with additional information related to this proposal. In analyzing this information from FRA, the committee identified a number of benefits of establishing a research institute at a university, including the following: (1) academic expertise in diverse disciplines, different and longer-term perspectives, and opportunities for new approaches should be essential elements of a balanced R&D program; (2) support for graduate students is critical to developing a future professional talent pool; and (3) continuity and institutional memory are important to long-term research. Potential disadvantages of such an institute include the following: (1) the extensive resources required to attain a critical mass in both personnel and equipment, (2) the inability of an institute to concentrate on more than a few research areas, (3) research being limited to aspects appropriate to an academic setting (e.g., fundamental), and (4) diversion of resources from ongoing programs.

Exposure to the academic research community is an essential element of a balanced R&D program. The FRA R&D program already uses institutions of higher education for some of its research work. It has a University Grants Program currently encompassing eight universities that perform safety research in a variety of fields. The agency also sponsors work on specific topics at six additional universities. This relationship with the academic community offers some of the benefits that might accrue from establishing a research institute, such as new perspectives from multiple disciplines and support for graduate students who may become future transportation professionals.

In addition, FRA's long-standing relationships with TTCI and the Volpe Center offer considerable, distinct benefits that could not easily be provided by a university-based institute. TTCI, a subsidiary of the Association of American Railroads, connects the FRA research to the realities of the industry's physical operating environments and requirements. Such linkages make research products more likely to have an immediate impact. The Volpe Center is a part of USDOT itself, so it can act as an extension of staff in a manner that would not be appropriate for other entities. The long-term nature of FRA's relationships with both of these organizations offers the added benefit of continuity in research capability. Work at these two organizations consumes about half of the FRA R&D budget. The remainder of FRA's R&D work is divided among a number of companies, of which ENSCO and Foster Miller together account for yet another 25 percent of the R&D budget.

**Recommendation 10.** FRA's R&D program already draws on a considerable pool of diverse researchers through TTCI, the Volpe Center, and a number of universities. Because of the potential disadvantages of a university-based Railroad Safety Institute—including diversion of resources

from ongoing programs and the limited, incremental benefits to be gained—the committee does not support creation of such an institute. However, the committee does recommend that FRA engage in more outreach to university researchers to increase interaction with the university community and to identify a broader talent pool for the conduct of appropriate research projects.

## CONCLUSION

Two members of the committee have resigned since the last meeting. Ronald Markon resigned because of poor health, and Thomas Downs stepped down because his current professional commitments preclude his attendance at committee meetings.

As mentioned above, the committee is considering an interim meeting later this year, which would be devoted primarily to a review of alternative approaches to train control.

Once again, on behalf of the committee, I wish to express thanks to Steve Ditmeyer and the other FRA staff for their spirit of cooperation during the committee meetings and for their leadership in implementing a number of the committee's recommendations.

Sincerely yours,

Alan J. Bing  
Chair, Committee for Review of the FRA Research and Development Program

Enclosures

cc: The Honorable Ted Stevens  
The Honorable Robert C. Byrd  
The Honorable Richard S. Shelby  
The Honorable Frank R. Lautenberg

The Honorable C. W. Bill Young  
The Honorable David R. Obey  
The Honorable Frank R. Wolf  
The Honorable Martin Olav Sabo

\*As is standard policy for NRC committees, the members of this committee meet in executive session at the outset of each meeting to discuss any potential or perceived conflicts of interest that might have arisen for any of them. The committee has agreed to abide by TRB policies for dealing with conflicts of interest that may arise in the bidding for or winning of FRA contracts by firms with which members are associated. In the interest of full disclosure, we note the following FRA-related activities.

First, FRA funds a research program from its Next Generation High-Speed Rail (HSR) Program that TRB administers on FRA's behalf, as described below. TRB has established policies and procedures to ensure that this committee can evaluate the HSR R&D program independently of any impact its evaluation might have on TRB or the National Research Council. The Innovations Deserving Exploratory Analysis (IDEA) Program for intelligent transportation systems (ITS) includes a component that supports projects on ITS applications for the development and deployment of advanced rail system technologies, including HSR systems. The funds are used to encourage researchers to develop potential innovations in train control and risk reduction at grade crossings. Funding has been provided by FRA at a level of about \$500,000 annually. Because the ITS Joint Program Office has discontinued funding for the ITS-IDEA program in fiscal year 2000, FRA has also ceased to provide funds. However, FRA will continue to provide funds for an HSR-IDEA program that will solicit innovations for technologies related to HSR safety. The IDEA programs are administered by the Special Programs Division of TRB. IDEA investigations explore the feasibility of innovative and unproven new concepts or evaluate novel applications of advanced technologies from defense or industry to ITS or HSR practice. An IDEA award is a pass-through of funds to provide one-step, short-term support.

Second, individuals with the expertise and experience necessary to review the FRA R&D program generally have some prior or ongoing relationship with the sponsor. For example, Alan Bing's employer has had prior contracts with the Volpe Center for FRA research projects. At the end of September 1999, Bing's employer, Arthur D. Little, Inc. (ADL), was awarded a 5-year task order contract by the Volpe Center for rail vehicle crashworthiness research. Two firms received such awards and will normally compete for individual tasks. Most of the research to be carried out under the contract is funded by FRA. ADL has been awarded one contract by Volpe for about \$150,000, to study the buckling and override behavior of Talgo trainsets in collisions. Bing is making minor contributions to this project. Third, John Samuels is chairing the management committee for the North American Joint Positive Train Control Program, which is partially funded by the FRA Office of R&D and is being managed by Transportation Technology Center, Inc. staff with guidance from the management committee. Finally, Thomas Schmidt is also a member of the management committee.

## ANNEX

### DEFINITION OF POSITIVE TRAIN CONTROL INTEROPERABILITY

“Interoperability” means that a PTC-equipped train from Railroad A can operate under PTC on the territory of Railroad B. To achieve interoperability, train A must be able to communicate with the PTC system of Railroad B, and must be able to decipher the format and meaning of the data contained in messages related to train control.

The parameters that characterize train location on the track network, train speed, and time must be standardized, as well as the formats of the basic control messages utilizing these parameters. (Train location is needed to specify authority limits and to report train position; speed is needed to specify speed limits; and time is needed to specify certain aspects of authority limits.) Because the determination of train location from global positioning systems and other sensors requires a geographical map of the track network, the map data must also be included among the parameters that specify train location.

Interoperability among PTC systems *can* be achieved by standardization of the above parameters, basic control messages, and communications system protocols. Implementation of PTC on board a locomotive, including displays to the engineer, need not be common across PTC systems as long as the data are interpreted correctly in accordance with the standards. Likewise, there need be no commonality among dispatch office implementations.

Committee for Review of the Federal Railroad Administration  
R&D Program

Dates of Attendance—March 2-3, 2000, Meeting

CHAIRMAN

Dr. Alan J. Bing  
Senior Manager  
Arthur D. Little, Inc.  
3/2&3

MEMBERS

Ms. Anna M. Barry  
Director of Railroad Operations  
Mass. Bay Transportation Authority  
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Mr. John G. Bell  
Program Director  
High Speed Trainsets  
National Railroad Passenger Corp.  
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Dr. Sherwood C. Chu  
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Mr. Nazih K. Haddad  
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Mr. Thomas P. Schmidt  
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Mr. Louis S. Thompson  
Railways Adviser  
The World Bank  
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Mr. Warren D. Weber  
Rail Program Manager  
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Mr. William Weinstein  
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Liaison Representative

Mr. Steven R. Ditmeyer  
Director, Office of Research &  
Development  
Federal Railroad Administration  
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**Transportation Research Board Committee for Review of the  
Federal Railroad Administration Research and Development Program**

**March 2- 3, 2000**

**Invited Speakers**

**External Views on FRA's Research Agenda**

- Research Needs Statements of TRB Standing Technical Committees, Christopher Barkan, Chair, Section on Railway Systems (A2M00), and Director of Railroad Programs, University of Illinois/Urbana-Champaign
- Risk-Based Safety Performance Standards: A Railroad Industry Perspective, Peter French and Howard Moody, Association of American Railroads
- Research Needs Related to Passenger Rail, Tom Peacock, American Public Transportation Association

**Next Generation HSR Program Project Updates**

- Nonelectric Locomotive, Daniel Palardy, Project & Engineering Manager, and Daniel Hubert, Project Integrator, Bombardier
- Advanced Locomotive Propulsion System, Alan Walls, Project Manager, University of Texas/Austin
- North American Joint Positive Train Control Program (Illinois Project), Robert Gallamore, Project Manager
- Amtrak/Michigan Train Control Project, Larry Light, Senior Technical Director, Amtrak