

RAIL TRANSIT SIGNAL AND CONTROL SYSTEMS RESEARCH PROGRAM

**EVALUATION OF COMMUNICATION-BASED TRAIN CONTROL FOR A
HEAVY AND LIGHT RAIL TRANSIT SYSTEM**

AGENCY: Federal Transit Administration (FTA), DOT

ACTION: Notice for Request for Proposals (RFP)

SUMMARY: FTA is seeking research proposals to document and evaluate the implementation of Communication-Based Train Control (CBTC) technologies for either heavy or light rail US transit systems. FTA's research activities are authorized by 49 USC 5312, Research, Development, Demonstration, and Deployment Projects. The goal of this research program is to promote the research and development of new technologies that will improve the safety and efficiency of rail transit system operation in the United States (US). The research will include the evaluation of current CBTC technologies, documentation of implementation issues, and the needs for further research in Rail Transit Signal and Control Systems (RTSCS) for heavy and light rail operations.

DATES: An applicant must electronically submit a proposal to <http://www.grants.gov> by January 19, 2011 for consideration. All potential applicants are advised to begin the <http://www.grants.gov> registration process immediately, if they have not previously submitted Federal assistance applications through <http://www.grants.gov>, in order to be able to meet the deadline. FTA expects to award funds to successful contractor(s) through a cooperative agreement by February 19, 2011. In the event of a system problem or technical difficulty with the application submittal, the applicants shall contact the FTA Program Manager for delivery instructions (see FOR FURTHER INFORMATION, CONTACT section below).

ADDRESSES: The website <http://www.grants.gov> allows applicant organizations to electronically find and apply for competitive opportunities from all Federal agencies that award Federal assistance. This website is the single access point for over 1000 Federal assistance programs administered by the 26 Federal agencies.

FOR FURTHER INFORMATION CONTACT: Technical, program management and administrative questions shall be directed to Program Manager: Patrick Centolanzi, Office of Technology (TRI-20), E43-463, Federal Transit Administration, U.S. Department of Transportation, 1200 New Jersey Ave, SE, Washington, D.C. 20590; emailto:Patrick.Centolanzi@dot.gov, or by phone at 202-366-0234.

SUPPLEMENTARY INFORMATION: Reports on PTC and CBTC shall be referenced. See the list of Technical References at the end of this announcement.

Objectives

The purpose of this project is to evaluate the implementation of a CBTC system by a US transit agency with heavy rail operations. The primary goal of this research is to evaluate the potential of standalone or overlay CBTC technology as a replacement for primary train location detection by audio frequency (AF) track circuits.

While the selection of the rail transit agency is left to the grantee, it is desired to seek an agency with an existing system, a system being implemented, a system planned, or a combination of the above. It is acknowledged that the MTA/New York City Transit or the Port Authority Trans-Hudson Railway, or both, would be excellent choices.

Background

The use of Positive Train Control (PTC) technology to improve commuter and regional rail transit safety has been mandated by the Rail Safety Improvement Act (RSIA) of 2008, with implementation for commuter rail operations by 2015. Additionally, the National Transportation Safety Board (NTSB) issued a recommendation (R-09-08)¹ for FTA to facilitate development of positive train control on rail transit systems (heavy and light rail, metro and subway).

CBTC systems permit more efficient operations over conventional systems by allowing trains to operate safely at much closer headways. It will also give rail transit systems greater flexibility and precision in train control, and will provide continuous safe train separation assurance and overspeed protection. Additional benefits of CBTC technology include improved reliability and reductions in maintenance costs through a reduction in wayside equipment.

The primary characteristics of a CBTC system include:

- High Resolution Train Location Determination, Independent of Track Circuits
- Continuous, High Capacity, Bi-Directional Train-to-Wayside Data Communications,
- Onboard and wayside processors performing vital functions.

Project Description

This project will evaluate the implementation of a CBTC system at a US transit agency with heavy or light rail operations. CBTC offers significant performance improvements while increasing safety and lowering operating costs at the same time. The CBTC architecture consists of three subsystems; automatic train protection (ATP), semiautomatic train operation (STO) and automatic train supervision (ATS). While the latter two subsystems are optional, ATP functionality is essential to the CBTC architecture. ATP maintains fail-safe protection against collisions, excessive speed, and other hazardous conditions through a combination of train detection, train separation, and interlocking control.

¹ National Transportation Safety Board Recommendation, July 23, 2009.

The STO subsystem performs any or all of the functions of speed regulation, programmed stopping, door control, performance level regulation, or other functions otherwise assigned to the train operator. The ATS subsystem monitors trains, adjusts the performance of individual trains to maintain schedules, and provides data to adjust service to minimize the inconveniences otherwise caused by irregularities.

The grantee shall conduct the following tasks:

- 1) Describe the operations and maintenance, service levels and, safety issues of the baseline signaling and control system before the CBTC system is installed.
- 2) For the CBTC system, identify and describe the functional requirements of the ATP, STO, and ATS subsystems and how they are being implemented at the component level. Describe how the functional requirements compare and contrast with IEEE Standard 1474.1-2004.
- 3) Identify and describe the performance requirements of the CBTC system. Describe how the performance requirements compare and contrast with IEEE Standard 1474.1-2004. Performance requirements include but are not limited to:
 - CBTC factors contributing to achievable headways,
 - CBTC factors contributing to achievable trip times,
 - System safety requirements,
 - System assurance requirements – system availability, equipment reliability, and equipment maintainability, and
 - Environmental requirements.
- 4) Identify and describe the enabling technologies used in the CBTC system and how they are implemented. The areas of interest include, but are not limited to:
 - High resolution train location determination, independent of track circuits
 - Continuous, high capacity, bi-directional train-to-wayside data communications, and
 - Onboard and wayside processors performing vital functions.
- 5) Document the system safety program plan (SSPP) and requirements for the CBTC system, or if not available, for the rail transit agency. Describe how the SSPP compares and contrasts with 49 CFR Part 659, *Rail Fixed Guideway Systems; State Safety Oversight*, April 29, 2005.
- 6) Document the CBTC system risk assessment process and how it satisfies the system safety requirements.
- 7) Evaluate the extent of service level, operational, maintenance, and safety improvements and change in dispatcher and crew errors after the installation of the CBTC system.

- 8) Document the improvements and/or reductions in effectiveness of the transit system as a result of the deployment of the CBTC system as compared to the baseline system. The areas of interest include, but are not limited to:
- Headway and capacity (service levels) in overlay, and if possible stand-alone fixed block and moving block operational modes
 - Operations
 - Maintenance
 - Safety

Document lessons learned from the development and deployment of the CBTC system. This includes, but is not limited to:

- Design challenges and solutions in meeting system requirements,
 - Interoperability among platforms and vendors,
 - The efficacy of CBTC as an alternative to AF track circuits,
 - Project management issues such as keeping within scope, schedule, and budget faced by the agency implementing the CBTC.
- 9) Document the lessons learned in the freight railroad industry in the application of PTC systems and other transit agencies in the application of CBTC systems.
- 10) Conduct a benefit-cost analysis of the CBTC system for overlay, standalone fixed block, and moving block operational modes, with an emphasis on the efficacy of CBTC supplanting AF track circuits.

Project Schedule

The proposal must include a Project Schedule with detailed timetables on Task Number, Task Description, Start Date, and Period of Performance (POP). Separately, the proposal also needs to identify the Major Milestones with Task Number, Deliverable Name, and Date of the Delivery in a table or in Microsoft Project format. The Final Report shall be delivered to FTA for publication by June 15, 2013. The project shall be closed with a Final Progress Report by June 30, 2013.

Eligibility Information

This is an unrestricted solicitation. Any responsible source may submit a proposal concept paper for consideration, including, but not limited to, states or local governments, or organizations of state or local governments, universities or institutions of higher education, non-profit organizations, private individuals, corporations, and businesses or commercial organizations, except that any business owned in whole or in part by the Federal Government is not eligible. Although businesses owned in whole or in part by the Federal Government are not eligible for funding under the Program, they may contract with eligible participants. Cooperative arrangements (e.g., joint ventures,

limited partnerships, teaming arrangements, or collaboration and consortium arrangements) are permitted and encouraged.

Small, Small Disadvantaged (SD), and Service Disabled Veteran Owned Business Concerns, and Veteran Owned (VO) and Woman-Owned (WO), and Historically Underutilized Business Zone (HUBZone) Small Business Concerns, and Historically Black Colleges and Universities (HBCU) and Minority Institutions (MIs) are encouraged to submit proposal concept papers on their own and/or in collaboration with others. However, no portion of this BAA will be set aside or reserved exclusively for Small, SD, or Service Disabled Veteran Owned Business Concerns, or for VO, WO, or HUBZone Small Business Concerns, or for HBCU and MIs.

Award Information

FTA will fund one application under this program. The total available funding is \$450,000. Future funding will depend on Appropriations. FTA will participate in activities by attending review meetings, commenting on technical reports, maintaining frequent contact with the project manager, and approving key decisions and activities including redirecting activities, if needed.

Cost Sharing or Matching

Federal transit funds are available to research projects at up to 100 percent of the project cost. However, cost sharing will be an evaluation criterion.

Proposal Content

This announcement includes all of the information that you need to apply. The following forms are available on grants.gov and are required to be completed:

1. SF 424 Mandatory
2. Other Attachments Form

SF 424 Mandatory

Most of SF 424 is self-explanatory. The application shall include the following items:

- 1a – Application
- 1b – Annual
- 4a – Leave blank
- 4b – 26

Other Attachments Form:

1. The application shall attach a pre-application (not more than 15 pages in length) as outlined in Chapter II (Item 9.b) of FTA Circular 6100.C: Transit Research and

Technology Programs: Application Instructions and Program Management Guidelines: http://www.fta.dot.gov/laws/circulars/leg_reg_4121.html.

This pre-application shall also address the six criteria laid out below in the Application Review Information section. The project budget justification shall include identification of any matching funds and their source. The Formal Application described in the Circular is not being requested at this time.

2. The application shall attach information on the qualifications of key personnel, including biographies.

Anyone intending to apply shall initiate the process of registering on <http://www.grants.gov> by December 19, 2010 for consideration. All potential applicants are advised to begin the online registration process immediately, if they have not previously submitted Federal assistance applications through <http://www.grants.gov>, in order to meet the deadline.

Application Review Information

A review panel will be convened to review each proposal. Project proposals will be evaluated based on the following criteria:

1. Proposed Research, which includes the applicability of the proposed research to the requirements, the uniqueness and or need for the research, and the expected results. Proposals shall explain how a particular practice or technology will improve rail operations. The proposed project must identify train control issues facing public transportation, why it is of national significance, the uniqueness or relationship of this project to other research, and how the proposed research will address the issue.
2. Qualifications of Key Personnel, which includes knowledge of and prior experience with train control technology.
3. Technical Management Plan, which includes the management approach for planning, scheduling, administering, coordinating and conducting the work effort.
4. Past Performance on activities relevant to the proposed work.
5. Cost and Cost Sharing.
6. Plan for evaluation and data collection. The proposal must address how success will be measured (e.g. before and after studies).
7. Existing positive relationship between grantee and rail transit agency.
8. Selection of rail transit agency or agencies.

Award Administration Information

The successful applicants will be notified of their grant award in February 2011. Following receipt of the notification letter, the successful entities will be required to submit the Formal Application as outlined in Chapter II (Items 10-25) of FTA Circular 6100.C: Transit Research and Technology Programs: Application Instructions and Program Management Guidelines

http://www.fta.dot.gov/laws/circulars/leg_reg_4121.html through the FTA Transportation Electronic Award Management (TEAM) system website.

FTA will manage the cooperative agreement through the TEAM system website. Before FTA may award Federal financial assistance through a Federal grant or cooperative agreement, the entity must submit all certifications and assurances pertaining to itself and its project as required by Federal laws and regulations. Since Federal fiscal year 1995, FTA has been consolidating the various certifications and assurances that may be required of its grantees and the projects into a single document published in the Federal Register. Fiscal year 2010 Annual List of Certifications and Assurances for FTA Grants and Cooperative Agreements and guidelines is published in the Federal Register and posted on the FTA website at:

http://www.fta.dot.gov/funding/apply/grants_financing_10736.html.

Recipients will be required to manage their projects in accordance with FTA Circular 6100.C: Transit Research and Technology Programs: Application Instructions and Program Management Guidelines:

http://www.fta.dot.gov/laws/circulars/leg_reg_4121.html. This includes requirements on project management and administration including quarterly reporting, financial management, and payment.

Technical References

- 1) IEEE Std 1474.1™-2004, *IEEE Standard for Communications-Based Train Control (CBTC) Performance and Functional Requirements*, The Institute of Electrical and Electronics Engineers, Inc, 2004.
- 2) 49 CFR Part 659, *Rail Fixed Guideway Systems; State Safety Oversight*, April 29, 2005.
- 3) TCRP Report 78, *Estimating the Benefits and Costs of Public Transit Projects: A Guidebook for Practitioners*, ECONorthwest and Parsons Brinckerhoff Quade & Douglas, Inc, 2002.
- 4) Polivka, A. Ede, B.M. and Drapa, J., *North American Joint Positive Train Control Project*, U.S. Department of Transportation Federal Railroad Administration, DOT/FRA/ORD-09/04, 2009.
- 5) Smith, M.E., Resor, R.R., and Patel, P., *Train Dispatching Effectiveness with Respect to Communications-Based Train Control; Quantification of the Relationship*, Transportation Research Record 1584, pp. 22-30, 1997.
- 6) Bing, A.B., and E. Sherrock., *Risk Analyses for the IDOT Positive Train Control System to Determine Optimum Communications Timeout: Comparison to Cab Signal Systems with Continuous Train Stop and with Speed Control*, U.S. Department of Transportation Federal Railroad Administration, DOT/FRA/ORD-09/21, 2009.