

Request for Information

Description of Request for Information on Appropriate Approaches and Technologies for Use in a Potential Low Cost Railroad Collision Avoidance System

Introduction

FRA Office of Research & Development (OR&D) intends to sponsor the specification and development of a low cost collision avoidance system which will improve railroad safety, but without the complexity of the current, comprehensive positive train control (PTC) system initiatives. A low-cost collision avoidance system may be deployable with reduced development and acquisition costs, but capable of performing the most critical function of a PTC system - to reduce the number of train collisions. FRA's sponsorship of this specification and development effort in no way diminishes its support or desire for development of more comprehensive PTC systems.

This Request for Information (RFI) summarizes the background of the initiative, describes the high-level requirements of the envisioned system and requests the submission of comments on the requirements and information describing potential technologies and approaches that could realistically be implemented to meet the requirements of the proposed system. Responses to this RFI will help in the refinement of project objectives and system requirements, and allow potential providers for a system of this nature to identify themselves. Responses to this RFI will be considered during development of a solicitation package for a low-cost collision avoidance system.

Background

Over the last two decades, FRA has been promoting the development of PTC systems to promote the prevention of train collisions and overspeed derailments, and improvement of roadway worker safety. After years of preparation and development, limited deployment and near-deployment of PTC systems are happening with most, if not all, the Class 1 railroads. The PTC systems being pursued by the Class 1 railroads are sophisticated systems that provide a full complement of complex functions and are generally expensive to develop, test, and deploy. The Class 1 railroads have set out plans to deploy the PTC systems gradually because of technical uncertainties in some areas, the need to address interoperability between railroads, and the necessary capital outlays. There is no question that the vitality and functionality of a fully implemented form of PTC are important elements to be implemented.

As the required financial outlays may extend the deployment of PTC systems over a long period of time, FRA OR&D intends to explore development of a low cost collision avoidance system which will not have the full set of requirements of the current, comprehensive PTC systems, thereby reducing development and acquisition costs, but will be capable of performing the most critical function of a PTC system - to reduce the number of train collisions. For the purposes of this document, the term "low cost" is meant to contrast the costs associated with more comprehensive PTC systems. At this time, there is not a target cost associated with the low cost collision avoidance system.

The FRA wishes to explore options for a low cost train collision avoidance system with more limited functionalities than complete PTC systems that can provide a significant incremental safety benefit. It is anticipated that regional and short-line railroads will find the deployment of a low cost collision

avoidance system easier to justify. In addition, major railroads may wish to deploy a system of this nature as an interim measure prior to the deployment of a comprehensive PTC system.

It is extremely important to note that the pursuit of this effort does not in any way imply that FRA is diminishing its desire and support for the development of a vital PTC system with all the functionalities originally envisioned by the industry for such a system. FRA intends to sponsor development of the low cost system in parallel with its PTC activities. It is FRA's vision that if a low cost collision avoidance system is available in the future, some level of train collision protection could be provided everywhere. If it were to be shown through a risk assessment that sufficient safety improvements could be provided by use of a collision avoidance system of this nature, a railroad operation could choose to deploy the less expensive collision avoidance system to improve safety. It is envisioned that a low cost collision avoidance system of this nature could be used as an interim step during a gradual phase-in of a full PTC deployment.

Requirements of a Low Cost Collision Avoidance System

The low cost collision avoidance system envisioned by the FRA has the following requirements:

- The system shall provide for incremental improvement in train collision avoidance over that provided under existing methods of operation. The low cost collision avoidance system should have only one primary function - to provide protection to trains within proximity of each other from collisions.
- The system shall be able to be used in conjunction with various existing methods of operation without major reconfiguration. Specific methods of operation are utilized in signaled territory where authority to move or occupy tracks is conveyed by signal indication, unsignaled territory where movement authority is verbally conveyed by track warrant/permit, and combinations thereof. This may require that the system not be tightly-coupled to any particular set of operating rules or wayside infrastructure.
- The system shall be able to operate in an environment with multiple parallel tracks and be able to distinguish the difference between trains on the same track which may pose a threat for collision and those on different tracks that may or may not pose a threat for collision. The system's ability to discern on which track a train is located in multiple-track territory may or may not rely on the input of track numbers manually.
- The system shall be relatively easy to integrate into an operator's existing fleet and/or existing systems.
- The system shall minimize its negative impact on operations and operational efficiency. A large concern to railroads is a potential reduction in productivity potentially imposed by such systems, due to factors such as conservatism in predictive braking calculations and false or excessive prompts and warnings which require train crew attention and/or train-handling reactions.

The following factors are elaborations on the requirements presented above and are considered to be critical for the successful development of a system of this nature:

- (1) Safety is the most important factor. The low cost collision avoidance system shall provide an incremental safety improvement over that provided by existing methods of operation. The safety improvement shall be measured by a reduction in train collisions as shown in a risk assessment that will have to be conducted in the future. At a minimum, the low cost collision avoidance system should be able to fulfill the requirement that, from a risk assessment standpoint, the system is equal to or better than "base case" methods of operation with a high degree of confidence. New hazards introduced by the low cost collision avoidance system will need to be included in any eventual risk

assessment. To prove the efficacy of this system to prevent train collisions, a set of laboratory tests and field tests will have to eventually be identified and conducted for verification purpose. The final low cost collision avoidance system will be required to fulfill the criteria specified in Subpart H of 49 CFR Part 236.

It is important to note that a risk assessment and a description of tests to verify the system are not being requested in this RFI.

- (2) Cost is the second most important factor. The governing goal of this project is the identification of a cost effective approach that will improve prevention of train collisions.
- (3) Vitality of the system will have to be considered carefully. As the low cost system must provide incremental improvement from the base case, vitality may not be essential. The FRA recognizes that to arrive at a “low” cost system that improves safety, some trade-off between use of vital hardware and software and its associated costs may be required. Where cost is not prohibitive, however, consideration should be given to factors such as fail-safe design, failure warnings and alerts, fall-back operations, and human over-reliance factors. The need for the system to automatically apply the train brakes as a method of enforcement may be desirable, but it is not necessarily required for an improvement in safety over the safeguards against train collision provided in the base case.
- (4) Functionalities normally performed in the PTC systems that are not required to prevent train collisions - like overspeed protection, roadway worker protection, switch monitoring, digital delivery of form authorities, speed restrictions, track/time authorities and signaling authorities - do not need to be addressed in a proposed low cost collision avoidance system. Solutions that provide these functions would not be precluded from consideration as long as the cost was “low.”
- (5) The adaptability of equipment to various vehicles and operating requirements is important. Any hardware that would be employed in a system of this nature should interface with locomotive components with relative ease and modifications to the equipment should ideally be kept to a minimum when the equipment is migrated to a different type of vehicle.
- (6) The collision avoidance system should be virtually independent of operating methods and operation rules. No additional hardware or software should be required in the event that components of the low cost collision avoidance system are migrated to another territory.
- (7) Maintainability, availability and reliability are critical to the viability of any system or components of a system of this nature.
- (8) While the design of the low cost collision avoidance system is intended to be open and based on technology appropriate to fulfilling the train collision avoidance function, it is FRA’s intention that the framework of this particular effort need not be based on the current development of the complex, and relatively expensive, PTC systems. It is not required that the low cost collision avoidance system utilize components that could be used, upgraded or expanded for use in a full PTC deployment.

The FRA is particularly interested in innovative technologies and approaches to the collision avoidance system that are either currently used in the railroad industry or used in other industries that could be applied to the railroad environment. Although proven technologies, such as wireless communication, digital radios and the Global Positioning System (GPS), can be employed in a low cost collision avoidance system, FRA does not wish to limit solutions to approaches employing these technologies. Innovative uses of proven technologies will also be welcomed.

RFI Objective and Response Requirements

The FRA is interested in identifying the functions that are necessary to provide incremental improvement in safety, the level of vitality required in these functions, the availability of the technology for such a system, and the various options for implementing a low cost collision avoidance system satisfying as many of the requirements described in the previous section as possible.

The FRA encourages collaborative efforts between prospective developers, system integrators and manufacturers in providing responses to the RFI, particularly amongst suppliers of innovative approaches to the technological challenges that may not have significant experience within a railroad environment and parties that possess a strong background within the railroad industry. Responses provided for this RFI that do not originate from a “team” will not be precluded from consideration.

The FRA strongly encourages involvement by one or more railroads. Ideally, participation would not be limited to one of the Class I railroads. Not only would responses to this RFI by a railroad significantly contribute to the formative stages of this effort, railroads would be able to provide information on operational and implementation issues, if any.

RFI Respondents should provide a response to each of the questions below, as well as provide any additional information that outlines an approach to providing a low cost collision avoidance system as described in the previous section or any technologies that could be used to achieve the objectives described in this document.

1. General

- a. What do you see as the primary cost drivers of current and emerging PTC systems? What changes to the PTC functional requirements and/or regulatory environment that you believe are necessary to achieve a low cost collision avoidance system?
- b. What do you see as the challenges to designing a collision avoidance system that provides an increase in safety at a relatively low cost? What are the challenges to deploying such a system?
- c. What do you see as the most effective way to realize an increase in safety without altering the underlying methods of operation or impeding operational productivity? How would your answer change if you were to also provide business benefits to the railroads?
- d. What “cost” would qualify as “low cost” if the system only offered safety benefits? How would your answer change if the system also provided business benefits?
- e. What new, emerging, or existing technologies could be adapted for or employed in the design of a low cost collision avoidance system? What specific opportunities/benefits are associated with these technologies? What specific challenges might be associated with these technologies? Are there any technologies that you would NOT want to see in such a system? If so, why would they not be tenable?
- f. What do you see as the key requirements to include in any specification of a low cost collision avoidance system?
- g. In the RFP, what level requirements would you like to see for the low cost collision avoidance system? High level performance requirements? Operational concept? Detailed technical requirements? Please provide rationale for your answer.
- h. The FRA plans to issue an RFP or set of RFPs that will result in the design, test, and ultimate deployment of a low cost collision avoidance system. How would you like to see the procurement

phased for contract award? Would you prefer that a single supplier be selected for all phases, or would you like to see multiple competitive procurements?

2. Your Proposed Solution

- a. Please describe your concept of a low cost collision avoidance system. How would it operate? How long would it take to build? What key technologies would be employed? What would it cost? What would be the challenges to implement and deploy the system? What safety improvements would it provide?

3. Your Organization

- a. How would you classify your organization? (railroad, supplier, integrator)
- b. Do you currently do business within the railroad industry? If so, for how many years?
- c. Do you offer for sale, or are you currently developing a PTC system?
- d. Please provide 2-3 brief project or technology development effort descriptions from your organization that you believe are relevant to the development of a low cost collision avoidance system.

PLEASE DO NOT INCLUDE ANY PROPRIETARY INFORMATION IN YOUR RESPONSE.

Responses to this RFI will provide input to the development of a concept of operations and system description to be included in a future solicitation of proposals to implement a low cost collision avoidance system. It is FRA's intention to review responses to this RFI over a period of 90 days. Following review of the RFI responses, FRA may further commission development of more formal concept of operations and system requirements, and issue a Request for Proposal (RFP) for the implementation of a prototype low cost collision avoidance system; the targeted time for the publication of this is during the spring of 2008.

THERE ARE NO SOLICITATION DOCUMENTS BEING OFFERED AT THIS TIME. RESPONSE TO THIS RFI DOES NOT GUARANTEE AN AWARD DURING THE SUBSEQUENT SOLICITATION PROCESS.

One of the intents of this notice is to identify prospective developers, system integrators and manufacturers interested in participating in future stages of this effort. To that end, interested parties should also submit:

- Company/team member name(s);
- Point(s) of contact with phone number, fax and email;
- Size of the company/companies and whether they are large, small, disadvantaged, etc.

A risk assessment and a description of tests to verify the system are not being requested in this RFI. The RFP that will be issued following evaluation of responses to the RFI will specify the requirements of these work products, including the specific assumptions related to the base cases considered in the risk assessment.

ALL RESPONSES SHOULD BE SUBMITTED NO LATER THAN 4:00 PM ON APRIL 15, 2008.

Send three (3) copies of all information to:

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