



4910-06-P

DEPARTMENT OF TRANSPORTATION

Federal Railroad Administration

Docket No. FRA-2018-0027

Automation in the Railroad Industry

AGENCY: Federal Railroad Administration (FRA), Department of Transportation (DOT)

ACTION: Request for Information (RFI).

SUMMARY: This request for information notice replaces the version published in the Federal Register on March 22, 2018 (83 FR 12646), to make technical corrections to the prior version. FRA requests information and comment on the future of automation in the railroad industry. FRA is interested in hearing from industry stakeholders, the public, local and State governments, and any other interested parties on the potential benefits, costs, risks, and challenges to implementing automated railroad operations. FRA also seeks comment on how the agency can best support the railroad industry's development and implementation of new and emerging technologies in automation that could lead to safety improvements or increased efficiencies in railroad operations.

DATES: Comments and information responsive to this request should be received by May 7, 2018.

ADDRESSES: You may submit information and comments identified by the docket number FRA-2018-0027 by any one of the following methods:

- Fax: 1-202-493-2251;
- Mail: U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue, SE, Washington, DC 20590;
- Hand Delivery: U.S. Department of Transportation, Docket Operations, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue, SE, Washington, DC 20590, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays; or
- Electronically through the Federal eRulemaking Portal, <http://www.regulations.gov>. Follow the online instructions for submitting comments.

Instructions: All submissions must include the agency name, docket name, and docket number for this RFI (FRA-2018-0027). Note that all comments and data received in response to this RFI will be posted without change to <http://www.regulations.gov>, including any personal information provided. Please see the Privacy Act heading in the SUPPLEMENTARY INFORMATION section of this document for Privacy Act information related to any submitted comments or materials.

Docket: For access to the docket to read comments received, go to <http://www.regulations.gov> at any time or to U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue, SE, Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT:

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SUPPLEMENTARY INFORMATION:

I. Overview

FRA seeks to understand the current stage and development of automated railroad operations and how the agency can best position itself to support the integration and implementation of new automation technologies to increase the safety, reliability, and the capacity of the nation's railroad system. As in other transportation modes, there are varying levels of automation that already are, or could potentially be, implemented in the railroad industry. Currently, U.S. passenger and freight railroads do not have a fully autonomous rail operation in revenue service, however, railroads commonly use automated systems for dispatching, meet and pass trip planning, locomotive fuel trip time optimization, and signaling and train control. Railroads conduct many switching and yard operations by remote control and automated equipment and track inspections technologies are used to augment manual inspection methods. Modern locomotive cabs are equipped with intelligent information systems designed to provide operating crews with up-to-date situational awareness as train sensor data and alarms are continuously updated and displayed in operator consoles within the cab. Railroads often now utilize energy management technology (the equivalent of automobile cruise-control) to optimize fuel consumption based on specific operational and equipment factors, as well as movement planner systems

designed to optimize in real-time, train movements on the rail network. Railroads are implementing statutorily mandated positive train control technology (a processor-based/communications-based train control system) to prevent train accidents by automatically controlling train speeds and movements if a train operator fails to take appropriate action in certain operational scenarios. These various systems of automation and technologies have transformed rail operations in recent years, improving railroad operational safety and efficiency.

FRA has helped developed many of these technologies and enhancements to these technologies are currently underway to support more advanced train control schemes and fully autonomous operations. In the fall of 2017, the Association of American Railroads, the freight rail industry's primary industry organization that focuses on policy, research, standard setting and technology, formed a Technical Advisory Group on autonomous train operations (ATO TAG). The focus of the ATO TAG is to define industry standards for an interoperable system to support enhanced safety and efficiency of autonomous train operations. The ATO TAG intends to develop standardization to support common interfaces and functions, such that technology may be applied in an interoperable fashion, while also allowing some flexibility in the specific design, implementation and packaging of the technology.

Internationally, the only known fully-autonomous freight railroad system is in Australia. The system is part of the Australia Rio Tinto mining company and began fully-autonomous train operations on an approximately 62-mile stretch of track in Western Australia. This Rio Tinto train is equipped with a variety of sensors (e.g., radar, cameras,

kangaroo collisions sensors) and with a switch to toggle between autonomous operation or operation with an operator on board.

FRA seeks to understand the rail industry's plans for future development and implementation of automated train systems and technologies and the industry's plans and expectations related to potential fully-automated rail operations. FRA is specifically interested in the anticipated benefits, costs, risks, and challenges to achieving the industry's desired level of automation. FRA also seeks to understand how the rail industry's plans for future automation may affect other stakeholders, including railroad employees, the traveling public and freight shipping industry, railroad industry suppliers and equipment manufacturers, communities through which railroads operate, local and state governments with roles in regulating highway-rail grade crossing safety, and any other interested parties.

FRA also seeks comment on the appropriate taxonomy to use to provide a baseline framework for the continued development and implementation of automated technology in the railroad industry. For example, both SAE, for on-road vehicles, and the International Association of Public Transport's (UITP) for public transit fixed guideway (rail) have developed taxonomies for their respective modes of transportation.

The SAE definitions divide vehicles into levels based on "who does what, when."

Generally:

- At SAE Level 0, the driver does everything.
- At SAE Level 1, an automated system on the vehicle can *sometimes assist* the driver conduct *some parts* of the driving task.
- At SAE Level 2, an automated system on the vehicle can *actually conduct* some

parts of the driving task, while the driver continues to monitor the driving environment and performs the rest of the driving task.

- At SAE Level 3, an automated system can both actually conduct some parts of the driving task and monitor the driving environment *in some instances*, but the driver must be ready to take back control when the automated system requests.
- At SAE Level 4, an automated system can conduct the driving task and monitor the driving environment, and the driver need not take back control, but the automated system can operate only in certain environments and under certain conditions.
- At SAE Level 5, the automated system can perform all driving tasks, under all conditions that a driver could perform them.

Using the SAE levels described above, the Department has drawn a distinction for non-road vehicles between Levels 0-2 and 3-5 based on whether the human driver or the automated system is primarily responsible for monitoring the driving environment.

Automatic Train Operation of public transit fixed guideway (rail) systems is an operational safety enhancement to automate operations of trains. It is mainly used on fixed guideway rail systems which are easier to ensure safety of agency staff and passengers. Basically, each grade defines distinct functions of train operation that are the responsibility of agency staff and those that are the responsibility of the rail system itself.

Similar to SAE, UITP defines grades of automation (GoA) for fixed guideway (rail) systems.

Generally:

- At UITP Grade 0, on-sight train operation, similar to a streetcar running in mixed

traffic.

- At UITP Grade 1, manual train operation where a train operator controls starting and stopping, operation of doors and handling of emergencies or sudden diversions.
- At UITP Grade 2, semi-automatic train operation where starting and stopping is automated, but the train operator or conductor controls the doors, drives the train if needed and handles emergencies (many ATO systems worldwide are Grade 2),
- At UITP Grade 3, driverless train operation where starting and stopping are automated but a train attendant or conductor controls the doors and drives the train in case of emergencies.
- At UITP Grade 4, unattended train operation where starting and stopping, operation of doors and handling of emergencies are fully automated without any on-train staff.

FRA requests comment on whether these or other taxonomies for automation should be applied to railroads.

II. Questions Posed

Although FRA seeks comments and relevant information and data on all issues related to the development and continued implementation of automated train systems and technologies and potentially fully autonomous train operations, FRA specifically requests comment and data in response to the following questions:

GENERAL QUESTIONS

1. To what extent do railroads plan to automate operations? Do railroads plan to implement fully autonomous rail vehicles (i.e., vehicles capable of sensing their environments and operating without human input)? If so, for what types of operations?

2. How do commenters envision the path to wide-scale development and implementation of autonomous rail operations (or operations increasingly reliant on automated train systems or technologies)? What is the potential timeframe for technology prototype availability for testing and for deployment of such technologies?

3. As discussed above, the railroad industry is currently taking steps in developing standards for automation. How does the railroad industry currently define “autonomous operations”? Would it be helpful to develop automated rail taxonomy; a system of standards to clarify and define different levels of automation in trains, as currently exists for on-road vehicles and rail transit? What, if any, efforts are already under way to develop such rail automation taxonomy? Should FRA embrace any existing and defined levels of automation in the railroad industry or other transportation modes such as highways or public transit? For example, should FRA consider SAE Standard J3016_201609 (see http://standards.sae.org/j3016_201609/), which provides for six GoA for on-road vehicles, or the four GoA for public transit fixed guideway vehicles?

4. What limitations and/or risks (e.g., practical, economic, safety, or other) are already known or anticipated in implementing these types of technologies? How should the railroad industry anticipate addressing these limitations and/or risks, and what efforts are currently underway to address them? Are any mitigating efforts expected in the future and what is the timeline for such efforts?

5. What benefits and efficiencies (e.g., practical, economic, safety, or other) do commenters anticipate that railroads will be able to achieve by implementing these technologies?

6. What societal benefits if any, could be expected to result from the adoption of these technologies (e.g., environmental, or noise reduction)? What societal disadvantages could occur?

7. What, if anything, is needed from other railroad industry participants (e.g., rail equipment and infrastructure suppliers, manufacturers, maintainers) to support railroads' automation efforts?

8. How does the state of automation of U.S. railroad operations compare to that of railroads in other countries? What can be learned from automation employed or under development in other countries? What are the unique characteristics of U.S. railroad operations and/or infrastructure as compared to railroads in other countries that may affect the wide-scale automation of railroad operations in this country?

SAFETY AND/OR SECURITY ISSUES

9. How do commenters believe these technologies could increase rail safety?

10. What processes do railroads have in place to identify potential safety and/or security, including cybersecurity, risks arising during the adoption of these technologies and that may result from the adoption of such technologies?

11. How should railroads plan to ensure identified safety and/or security risks are adequately addressed during the development and implementation of these new technologies? What is an acceptable level of risk in this context?

12. How should railroads plan to ensure the integration of these technologies will not adversely affect, and will instead improve, the safety and/or security of railroad operations?

13. What are the safety and security issues raised by automation in railroad operations at public and private at-grade highway-rail crossings? To what extent should DOT coordinate with state or local governmental entities on certain safety or security issues? How might automation improve the safety of the general public at highway-rail grade crossings or along the railroad rights-of way?

14. How do railroads plan to ensure safety and security from cyber risks?

15. How do the safety and/or security, including cyber risks, faced by U.S. railroads implementing these technologies compare to the risks faced by railroads operating in other countries? How have railroads in other countries addressed or mitigated these risks? Are there opportunities for cross-border collaboration to address such risks?

INFRASTRUCTURE

16. What are the infrastructure needs for effectively, safely, and securely implementing these technologies? FRA is particularly interested in wayside, communication, onboard, operating personnel, testing, maintenance, certification, and data infrastructure needs, as well as any other expected or anticipated infrastructure needs.

17. How can the nation's existing rail infrastructure be leveraged to support the implementation of new infrastructure, necessary for the adoption of automated and autonomous operations?

WORKFORCE VIABILITY

18. What is the potential impact of the adoption of these technologies on the existing railroad industry workforce?

19. Would the continued implementation of these technologies, including fully

autonomous rail vehicles, create new jobs and/or eliminate the need for existing jobs in the railroad industry?

20. What railroad employee training needs would likely result from the adoption of these technologies? For example, if the technology fails en route, will an onboard employee be trained to take over operation of the vehicle manually or be required to repair the technology en route?

LEGAL/REGULATORY ISSUES

21. What potential legal issues are raised by the development and implementation of autonomous train systems and technologies within the industry?

22. What are the regulatory challenges (rail-specific or DOT-wide) that must be addressed before autonomous rail vehicles can be made a part of railroad operations in the United States?

23. Are there current safety standards and/or regulations that impede the development and/or implementation of automated train systems or technologies in the railroad industry, including the development and/or implementation of autonomous rail vehicles? If so, what are they and how should they be addressed?

OPPORTUNITIES FOR JOINT GOVERNMENT/INDUSTRY COOPERATION

24. Are there current or anticipated railroad industry, private, international, or State or local government pilot projects or research initiatives involving automated train systems or technologies potentially in need of FRA support? If so, what are the needs (e.g., regulatory, technical)?

25. What data relevant to the development and integration of automated train systems and technologies currently exists that could be leveraged to address future government/industry research needs?

III. Public Participation

FRA invites all interested parties to submit comments, data, and information related to the specific questions listed in Section II above and any other comments, data, or information relevant to issues related to the development and implementation in the railroad industry of new automated train systems or technologies.

How do I prepare and submit comments?

Your comments should be written and in English. To ensure that your comments are filed in the correct docket, please include docket number FRA-2018-0027 in your comments.

Please submit your comments to the docket following the instruction given above under **ADDRESSES**. If you are submitting comments electronically as a PDF (Adobe) file, we ask that the document submitted be scanned using an Optical Character Recognition process, thus allowing FRA to search your comments.

How do I request confidential treatment of my submission?

Although FRA encourages the submission of information that can be freely and publicly shared, if you wish to submit any information under a claim of confidentiality, you must follow the procedures in 49 CFR 209.11.

Will FRA consider late comments?

FRA will consider all comments received before the close of business on the

comment closing date indicated above under **DATES**. To the extent possible, FRA will also consider comments after that date.

How can I read the comments submitted by other people?

You may read the comments received at the address given above under Comments. The hours of the docket are indicated above in the same location. You may also read the comments on the Internet, filed in the docket number at the heading of this notice, at <http://www.regulations.gov>.

Please note that, even after the comment closing date, FRA will continue to file any relevant information it receives in the docket as it becomes available. Further, some people may submit late comments. Accordingly, FRA recommends that you periodically check the docket for new material.

IV. Privacy Act Statement

FRA notes that anyone is able to search (at www.regulations.gov) the electronic form of all filings received into any of DOT's dockets by the name of the individual submitting the filing (or signing the filing, if submitted on behalf of an association, business, labor union, or other organization). You may review DOT's complete Privacy Act Statement published in the Federal Register on April 11, 2000 (Volume 65, Number 70, Pages 19477-78), or you may view the privacy notice of [regulations.gov](http://www.regulations.gov) at <http://www.regulations.gov/#!privacyNotice>.

Authority: 49 U.S.C. 20101 *et seq.*

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