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# BACK ON TRACK II: HOW INNOVATION AND AUTOMATION IMPROVE RAIL SAFETY



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# EXECUTIVE SUMMARY

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The Alliance for Innovation and Infrastructure (Aii) published a report in 2015 – “Back on Track: Bringing Rail Safety to the 21st Century” – documenting the rise in crude oil rail traffic and recommending government, the rail industry, shippers, first responders, and other stakeholders revisit rail safety standards and best practices. In the four years since publication, the leadership at the U.S. Department of Transportation (USDOT) has turned over, crude-by-rail traffic has subsided, and rail industry safety performance has continued to move in a positive direction. Analysis shows that many of the rail safety gains are attributable to targeted industry investments, including a growing emphasis on technological solutions – the focus of two of Aii’s four key recommendations from the 2015 report.

Whether transporting hazardous materials, commodities, or passengers, the U.S. rail network boasts a very strong safety record, and accidents remain rare. The industry is far from perfect, as accidents – as with any transportation mode – still occur, and can be particularly disruptive to communities and sensitive environments. Data show – as detailed in the 2015 report – that accidents are most often caused by track and rail failures, as well as human factors, which should receive the most concentrated attention from private rail carriers and government. Yet the data also show that as the rail sector has addressed these primary incident causes, progress has largely leveled off, and that the deployment of new technologies is needed to move closer to a zero-accident future.

Technological advancement can and will improve the safety, functionality, and efficiency of the rail transport network, but the USDOT and the Federal Railroad Administration (FRA) must do their part to advance policies that encourage and facilitate maximum innovation. This includes more frequently and seamlessly granting rail operators waivers allowing them to test and demonstrate new technologies that will help resolve safety issues in a timely manner. The industry must also do its part to communicate transparently and regularly with its oversight bodies, helping regulators better understand that safe operations are mutually beneficial to government and industry.





To reach new heights on rail safety and increase application of safety enhancing technologies, we recommend the USDOT and FRA consider the following reforms:

- ▶ **Increase Safety Technology Deployment** – expand use of commercially available technologies to continuously monitor track, equipment, and roadbed conditions.
- ▶ **Reduce and Eventually Eliminate Human Error Caused Incidents** – encourage the evolution of Positive Train Control (PTC) and automation for both rail safety and efficiency and enhance multimodal communication to address human error more broadly.
- ▶ **Improve Safety Consistent with President Trump’s Deregulatory Agenda** – consider actions that could advance the Trump administration’s deregulatory agenda, while also helping improve safety





# INCREASE SAFETY TECHNOLOGY DEPLOYMENT

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Railroad track, rail, equipment, and roadbed conditions have long been the leading causes of derailments, accounting for between 40-50 percent of all incidents annually.[1] Aii's 2015 report identified several technologies that could address these deficiencies head on, both by continuously monitoring the integrity of the track, roadbed, and rail conditions, and improving the effectiveness of track and rail inspections. Specifically, Aii recommended universal adoption of track integrity sensors, ballast integrity sensors, autonomous track geometry measurement systems, ultrasonic and induction rail testing, and automated track inspections to improve frequency and accuracy.[2]

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In January 2018, the Association of American Railroads (AAR) – the trade association representing America's freight rail operators – released a summary of technology-driven rail safety solutions that have been or are being developed in the association's Transportation Technology Center (TTIC).[3], [4] According to the report, many of the technologies recommended by Aii are already being developed and tested for use by AAR, all of which would significantly improve safety across the U.S.'s extensive 140,000-mile private rail network. Some are now in use on the network. Passenger rail carriers, such as Amtrak, would also benefit from these improvements, as 70 percent of the miles traveled by Amtrak trains use tracks owned by freight railroads.[5] Available safety technologies include:

- **Rail Integrity** – Defect detector vehicles that use a laser-based rail inspection system to detect the internal (i.e. not visible to the naked eye) flaws in rail segments.
- **Track Integrity** – The aforementioned track geometry cars that “use sophisticated electronic and optical instruments to inspect track alignment, gauge, curvature, and other track conditions.”[6]
- **Ballast and Roadbed Integrity** – Sophisticated, ground-penetrating radars that can identify below the ground issues that can ultimately lead to track integrity issues, such as excessive water accumulation or foundational deterioration are under development.

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[1] See Federal Railroad Administration, [Train Incidents and Rates](#) (query accessed on June 6, 2019).

[2] Alliance for Innovation and Infrastructure, [Back on Track: Bringing Rail Safety to the 21st Century](#), August 6, 2015.

[3] Transportation Technology Center, Inc. (TTIC) is a wholly owned subsidiary of the Association of American Railroads.

[4] Association of American Railroads, [High-Tech Advances Improve Rail Safety and Efficiency](#), January 2018.

[5] Association of American Railroads, [Railroad 101](#), accessed June 5, 2019.

[6] Association of American Railroads, [High-Tech Advances Improve Rail Safety and Efficiency](#), January 2018.

Unfortunately, broader deployment of these safety technologies still needs expanding, which regulators can help facilitate. As with many innovative industries, the very government regulations that were promulgated to improve safety in the past may actually be hindering safety improvements in the present, having failed to keep pace with technological advancements. For example, manual track inspections are still required, despite the fact that new technologies can continuously monitor track and roadbed conditions, identify non-visible flaws within rail segments, and perform automated inspections that could identify flaws too small or seemingly benign to draw attention from an inspector using the naked eye.

Further, crucial waivers from existing regulations to test and demonstrate the safety and cost-saving attributes of new technologies in the field can take far too long to process. Even when granted, these waivers might include arbitrary limits on the time and scope of demonstration projects.[7] In fact, according to a recent regulatory filing, railroads seeking USDOT approval to use sophisticated track inspection technologies and automated wayside detectors have been rebuffed or delayed.[8]

To be sure, Aii does not advocate for industry self-regulation – the federal government has the core responsibility to ensure the movement of products and persons across state lines is done safely and in the best interest of the public writ large. However, good governance also requires being open to new ideas from industry experts about how to best achieve public safety and ensuring that new and existing regulations don't "unnecessarily stifle innovations that may be possible in the future." [9] FRA should issue long-standing waivers allowing railroads to test and demonstrate new safety technologies and use the data gathered to determine how new technologies impact rail safety comparatively to methods required by existing regulations.



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[7] See Comments submitted by Association of American at Docket No. FRA-2018-0027 and Docket No. PHMSA-2018-001.

[8] Id.

[9] See Dan Bosch, [FRA Crew Size Withdrawal Holds Lessons for Other Regulators](#), American Action Forum, May 24, 2019.



# REDUCE AND EVENTUALLY ELIMINATE HUMAN ERROR CAUSED INCIDENTS

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Second only to the rail, track and equipment issues discussed in the previous section, human error is another leading cause of train incidents, accounting for 37 percent of all accidents in 2018.[10] Over the past 15 years, Congress and the FRA have proposed and implemented statutes and regulations directed at combatting human caused errors, including broad deployment of Positive Train Control (PTC) technology and increased crew staffing requirements. While PTC is a strong step in the right direction, more can be done to improve rail safety and reduce incidents across the network.

## A. Positive Train Control

To combat the human error problem, Congress mandated adoption of Positive Train Control (PTC) technology in the Rail Safety Improvement Act of 2008.[11] PTC accounts for human error by effectively communicating with other trains and railroad equipment to avoid train-to-train collisions, excessive train speeds, passage through misaligned track switches, and unauthorized entry into work zones.[12]

The initial PTC implementation deadline was set for December 31, 2015. As a whole, the nation's railroads were nowhere near ready for compliance by that time due to a host of technical and practical issues. Congress delayed the deadline to December 31, 2018 and as late as December 31, 2020 in certain circumstances approved by the FRA. Almost all freight rail carriers applied for and were granted time to test for interoperability between 2018 and 2020. According to FRA, as of March 31, 2019, 48,050 of the 58,000 route miles subject to the statutory mandate were in compliance.[13] As railroads implement PTC, they are learning more about the safety benefits of automating certain train functions.

Similar to some of the other technology-driven safety measures described in the previous section, the regulatory framework for implementing PTC was well-suited to enforce compliance with the law Congress passed in 2008, but too narrowly tailored to allow for the additional safety benefits that would arise as PTC was more widely implemented. For example, existing regulations explicitly forbid automation of train operations by requiring that only “qualified persons” operate a locomotive or train.[14] It is true that any “person” operating a locomotive or train should be a certified locomotive engineer as prescribed by regulation. However, this narrow definition does not allow for non-persons to perform these functions.

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[10] See Federal Railroad Administration, [Train Incidents and Rates](#) (query accessed on June 7, 2019).

[11] Public Law 110-432.

[12] See Union Pacific, [Positive Train Control](#) (accessed on June 7, 2019).

[13] Federal Railroad Administration, FRA Publishes Railroads' First Quarter 2019 Positive Train Control Implementation Status Updates, May 29, 2019.

[14] 49 C.F.R. 240.1.



"According to FRA, as of March 31, 2019, 48,050 of the 58,000 route miles subject to the statutory mandate were in compliance"

## B. Automation and Multimodal Communication

In June 2016, the FRA proposed a new regulation mandating two-person crews in train cabs to provide a second pair of eyes and reduce instances of human error.[15] Aii advocated for such a regulation only months earlier in October 2015.[16] Now, nearly three years later, the proposed rule has been rescinded, with the USDOT explicitly preempting states from imposing such measures.[17] Between its introduction and abandonment, the reality is that more advanced technologies were developed to address the same problems two-person crews were designed to solve, while others were developed that could significantly reduce the likelihood of human caused multimodal incidents. Moreover, a review of the literature, docket comments and comments from bodies such as the National Transportation Safety Board (NTSB) in the U.S. and Transportation Safety Board of Canada show an increased number of people in a locomotive cab does not correlate with greater safety gains.

While there are legitimate concerns surrounding this issue, including the potential for displaced workers over time, as well as a lack of detail to date from the rail sector in how it would modernize operations to potentially include one-person crews on a more widespread basis, the matter largely settled due to the USDOT's ruling. The FRA looked at the issue for more than five years, with neither the current or previous administration being able to make a data-driven safety justification for such a proposal.

As a result, despite Aii's previous support for two-person crews, Aii believes FRA should continue to collect data on how two-person crews would impact public safety when compared to new technologies that may not have been widely deployed when the rule was proposed. After all, that is the specific purpose of the Administrative Procedure Act's requisite notice and comment period.[18] Aii also proposes that FRA work with other offices across DOT to implement technologies that address other leading safety issues, including collisions between trains and passenger vehicles caused by unsafe grade crossings.

[15] 81 Fed. Reg. 13,918 (March 15, 2016). Docket FRA-2014-003, status pending (accessed June 7, 2019).

[16] Alliance for Innovation and Infrastructure, [Back on Track: Bringing Rail Safety to the 21st Century](#), August 6, 2015.

[17] See Docket [FRA-2014-003](#) (accessed June 17, 2019).



For example, the technology needed to fully automate trains is already available on the market, [19] but the regulatory framework needed to deploy these technologies is not. Moreover, there are clear market differences between locales such as Australia and the U.S., or running an airport tram versus a 250-car freight train. Train automation comes with all the same safety benefits as other automated modes of transportation – reduce or eliminate accidents caused by human error, avoid unnecessary collisions even where human error is not a factor, and make up for yet to be repaired deficiencies on the roadway or track – but has not received the same level of attention from policymakers. FRA, particularly should leadership change following the 2020 elections, should use any and all available regulatory tools to authorize testing and demonstration projects for automated trains prior to finalizing any regulations that would mandate two-person crews.

The same functionality needed to automate trains – real time sensors needed to avoid any unnecessary collisions and account for any surface deficiencies and the ability to communicate with other trains, equipment, and signals – is currently being tested to automate passenger automobiles and freight trucks. As these technologies become more widely deployed, offices across USDOT should work together to ensure that these different modes of transportation can not only communicate among themselves, but with others as well.

According to FRA data, there were 2,214 rail grade crossing incidents accounting for 270 fatalities in 2018 alone.[20] The USDOT Office of Inspector General attributed 94 percent of these incidents and 84 percent of the associated fatalities to poor driver judgment and decision-making.[21] Technologies that would facilitate communication between different modes of transportation – in this case, trains, passenger vehicles and freight trucks – could go a long way in reducing grade crossing and incidents while save lives.

"Technologies that would facilitate communication between different modes of transportation... could go a long way in reducing grade crossing and incidents while save lives"



[18] The Administrative Procedure Act (APA) governs the process by which federal agencies develop and issue regulations. It includes requirements for publishing notices of proposed and final rulemaking in the Federal Register and provides opportunities for the public to comment on notices of proposed rulemaking.

[19] Matt O'Sullivan, [Driverless Train Runs Full Length of New Sydney Line Ahead of Opening](#), Sydney Morning Herald (January 14, 2019).

[20] Operation Lifesaver, [Crossing Collisions & Casualties by Year](#) (Updated April 9, 2019).

[21] Yeh and Multer, [Driver Behavior at Highway-Railroad Grade Crossings: A Literature Review from 1990–2006](#) (October 2008).

## IMPROVE SAFETY CONSISTENT WITH PRESIDENT TRUMP'S DEREGULATORY AGENDA

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In many cases, “improving safety” is another way of saying “promulgate new regulations.” But as we explain, that is not always the case. The current administration has gone to great lengths to avoid excessive regulation where possible and to purge existing regulations that either are no longer needed or provide benefits that could be achieved through less intrusive means. The least intrusive and least market-distorting method to improving public safety is to facilitate private sector innovation and allow the market to dictate the most efficient way to achieve the desired performance outcomes.



This is not to say that the market should decide what is defined as safety. Only that once the government determines the requisite industry standard of performance, it should give regulated parties the freedom to experiment with the best and most efficient ways to meet those standards. Providing railroads long-standing waivers, and the ability to test and demonstrate new safety technologies that might more effectively achieve the goals of existing regulations and obviate the need for pending or future regulations is the best way to strengthen rail safety in furtherance of President Trump’s deregulatory agenda.



# CONCLUSION

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Increasing deployment of rail safety technologies, facilitating the evolution and broader deployment of PTC, and eventually automating a wide-range of rail and train-related functionality will go a long way in improving safety. While new and more open-ended regulations will be needed to increase safety across different modes of transportation, the overall effort can be achieved consistent with the current deregulatory agenda favored by the administration.

For example, an openness to new data and new ideas will allow federal agencies to engage in performance-based rulemaking whereby the federal government mandates safety outcomes rather than the means to achieving those outcomes. This type of rulemaking is superior not only because it ensures government objectives are met, but also because it allows for new technologies and best practices that were either not contemplated or not deployed when the regulations were promulgated. As technology drives improved safety outcomes, outdated and unnecessary regulations can be scraped from the books.

However, none of this is possible if regulated parties are not able to test and demonstrate the safety attributes of newly developed technologies. There are steps FRA and Congress can and should take right now to help advance safety and regulatory efficiency consistent with a deregulatory agenda.

First, FRA should issue long-standing or indefinite waivers allowing railroads to test and demonstrate new PTC automation technologies and create a process whereby these waivers could be converted into formal rule-makings if test results prove promising.[22]

Second, FRA could by rule, or Congress could by statute, “chang[e] any reference to a ‘person’ to include ‘technology that accomplishes the same purpose.’”[23]

Aii supports these recommendations to ensure both that the best available technologies are used to improve rail safety now and that flexibility remains to further improve safety in the future.

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[22] See Comments submitted by Association of American at Docket No. FRA-2018-0027 and Docket No. PHMSA-2018-001.

[23] Id.

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The Alliance for Innovation and Infrastructure (Aii) is an independent, national, educational organization dedicated to identifying our nation's infrastructure needs, creating awareness of those needs, and finding solutions to critical public policy challenges. Aii strives to promote proven, innovative technology and higher safety standards to achieve excellence nationwide.