ALLIANCE FOR INNOVATION AND INFRASTRUCTURE

Unlocking Rail Safety Through Technology:

A Simple, High-Impact Opportunity for FRA Action on Pending Waivers to Advance Safety

Introduction

The United States railroad network is the largest in the world, transporting over 1.6 billion tons of freight every year.[1] Innovation and technology have always been integral to improving both its safety and efficiency. Because the scale of railroad operations generates potential risks, regulators closely monitor operational data and emerging technology. This scrutiny requires new technology to be tested thoroughly before seeing wider adoption.

The relationship between industry leaders and regulators has often been cooperative, with both parties striving for safety as a core objective, but with different approaches to innovation. Whereas private industry invests in, develops, and seeks to implement technology, the government may seek to manage or slow new implementation or mandate proven technologies.

This has at times created tension, with prescriptive rules that require certain practices to achieve a result. Overly specific rules can dampen the development and implementation of new technology capable of achieving the same or better safety outcomes in a way different than prescribed in regulation. In those cases, railroad companies require waivers to implement more systemic use of safety technology when the rigid rules prevent needed operational changes.

This dynamic means that evolving safety practices primarily emerge from the industry itself. Recently, however, tensions between regulators and railroads have escalated into litigation and uncertainty. This has likely had a negative safety impact and offers a simple high-impact opportunity for the next Federal Railroad Administration (FRA) to bring swift resolution.

Recent Innovation and Regulatory Drag

The rail industry invests billions of dollars annually to maintain and upgrade the railroad network and advance research. In addition to this self-funding, significant external investments drive technological innovation. Recent innovations have led to remarkable improvements in safety and efficiency. Notable examples of cutting-edge technologies developed in the past few years include railcar enhancements, positive train control (PTC), drone-assisted bridge inspections, wheel defect detectors, and automated track inspection (ATI) technologies.

One of the most effective recent advancements has been in rail inspection technology. Track defects are a leading cause of train derailments.[2] This makes careful track inspection and timely maintenance crucial for preventing accidents. Regulations require that human inspectors walk or slowly pass over track while technology is an afterthought; but technology is increasingly

enhancing the safety and precision of inspections. The prescriptive regulations do not generally afford flexibility for companies to implement improved safety technology by shifting labor assets elsewhere. Technology is specifically and solely contemplated as an add-on.[3]

Advanced track measurement systems that precisely evaluate the track for deficiencies using sensors have been in service with inspectors for many years, with train derailments and accidents decreasing significantly over this timeframe. More recently, there have been movements toward expanding ATI technology, where manual inspection would be required at different frequency and in different settings than today.

In order to maintain safe operations, expand investment into further innovative safety technology, and remain competitive for cost-effective shipping, railroads aim to partially automate certain track inspections by running scanning equipment during regular operations, rather than relying on as many dedicated inspectors. With these ATI systems, tracks can be continuously monitored in real-world conditions, reducing the need for as many manual, time-consuming inspections, and collecting data with minimal additional effort. Additionally, the technology can more precisely discern deficiencies surpassing what the human eye can detect, leading to clear safety advantages. The technology does not remove human inspectors but serves as an asset that is proven to reduce accidents, allowing workers to focus on other safety risks that cannot be as well detected by machines.[4]

This is where the rigidity of prescriptive rules restrains progress and inhibits safety outcomes. Both existing regulation and railroad companies seek to deploy human inspectors and technology simultaneously, but whereas regulation requires substantial human inspections, a more goal-oriented and performance-focused regulation should value inspection quality and safety data, leaving the balance between technology and labor to be settled in each specific context. Within the current framework, waivers are required to force this safety-efficiency outcome, but those waivers must be approved.

The FRA is responsible for overseeing the deployment of new safety rules and technologies. For many years, the FRA heartily supported the increased deployment of ATI technology, saying it "will result in earlier detection of track defects… ultimately reducing the number of track caused derailments…"[5] Every Class I railroad operated an ATI testing program, and the FRA granted waivers reducing the number of required manual inspections for specific stretches of track so that railroads could collect data for comparison.[6] ATI systems found many deficiencies and defects that the human eye could not. However, the continued need for waivers underscores a rigid prescriptive regulatory code that is not designed to encourage innovation. Moreover, the impermanence of the waiver solution creates costs that manifest in both safety and financial losses.

Concerning Trend

From 2011 until 2021, the FRA was a clear supporter of ATI systems and other innovative advances in rail technology. It granted numerous waivers for railroads to test new technology and increase use of ATI. To receive a waiver, the exception must be "in the public interest and consistent with railroad safety."[7] However, since 2021 there may be an increasing de-prioritization or skepticism within the FRA toward innovation. A number of waiver delays raise questions that demand attention and highlight the need for pro-innovation and performance-based regulation that removes prescriptions and rigidity that set up waiver reviews.

Railroads must receive waivers to break from regular track inspection and safety protocol. These waivers are time-limited but are approved regularly for both technological development and other reasons. However, recently the FRA has been reluctant to address waivers at all. BNSF a large Class I railroad, appealed to the courts after its petition for a continuation of reduced manual inspections while using ATI technology was denied. After lengthy legal proceedings, the 5th Circuit Court of Appeals ultimately sided with BNSF in June 2024, finding that the FRA's rationale for denial did not hold up to review.[8] The waiver would allow BNSF to gather more data on how increased automated inspections and reduced visual inspections compare to traditional inspection schedules. If this were an isolated incident, it would be bad policy as real-world safety outcomes and invaluable data were unrealized during the interim. Other examples, however, raise further concern.

The FRA has repeatedly denied or slowed review of numerous waivers, while many petitions have gone unanswered beyond the mandated regulatory deadline. Recently, railroad companies have filed several petitions to the courts over the FRA's failure to rule on waiver requests in the required timeframes. These petitions request that the court treat the FRA inaction as a denial and reverse it, or else compel the FRA to rule on the pending waivers within 30 days.[9] In 2019, the FRA granted a request for BNSF Railway to use thermal technology to assess brake health, but a 2021 petition to expand the use of the technology to another rail line has been pending for more than three years.[10] This is despite a 2013 FRA report concluding that thermal brake testing gathered more data and was up to four times as effective as traditional testing.[11] Other delayed petitions have ultimately lead to railroad companies abandoning technological development.[12]

The delay in responding to railroad petitions is a regulatory failure. Not only is the FRA moving slower than agency statutes allow, but the delay of several petitions is constraining the expansion of innovative safety technology. There may be politics at play within these delays and denials, but they are getting in the way of real innovative safety improvements. At the end of the day, what is most needed is a simple decision. If the agency approved or denied all waivers, it would allow efficient decision-making, and companies could allocate resources to prioritize safety within the existing rules. The uncertainty creates a cost-multiplying limbo that threatens safety, valuable data collection, and economic costs that ultimately could further safety investments.

Actionable Improvements

Innovation is crucial to any industry. Change may bring uncertainty, but also progress. Recent innovations in the railroad industry are responsible for improving safety significantly, resulting in consistent decreases in accidents and derailments.[13] New and innovative use of technology would allow railways to move more freight faster, which is both safer than freight-trucking and produces far fewer carbon emissions.[14]

The delay from the FRA in responding to waiver petitions has escalated tensions and diminished safety coordination. Frustration runs high among industry leaders, but ultimately mutual dialogue is needed. The Department of Transportation must work together with industry to advance prudent safety technology. While political disagreements may remain, the FRA and railroad carriers have the same fundamental goal: keep the railroads safe and operating efficiently.

The U.S. has the largest freight rail network in the world, and innovation is critical for its long-term viability and safety. The FRA must consider that delaying a response to any petition hinders safety innovations. Regulation must return to being a stabilizing factor in the industry, rather than a source of conflict.

Swift, but data-based decisions on all pending waivers is a high-priority for the agency at the earliest opportunity. Further reforms in performance-oriented policy should be pursued, but the immediate impact of resolving pending waivers is an unmistakable short-term priority.

Citations and Notes

[1] *Freight Rail State Data - AAR.* Association of American Railroads. (2024, November 7). https://www.aar.org/data-center/railroads-states/.
[2] Tracy, A., & Reznik, T. (2015, May 13). *Broken Rails Are Leading Cause of Train Derailments*. Scientific American. https://www.scientificamerican.com/article/broken-rails-are-leading-cause-of-train-derailments/.
[3] "Each inspection shall be made on foot or by riding over the track in a vehicle at a speed that allows the person making the inspection to visually inspect the track structure for compliance with this part. However, mechanical, electrical, and other track inspection devices may be used to supplement visual inspection."
U.S. Government Publishing Office. (n.d.). *Title 49 - Transportation, Subtitle B, Part 213 – Track Safety Standards, Subpart F - Inspection, Section 233 – Visual Track Inspection.* U.S. Government Code of Federal Regulations. https://www.ecfr.gov/current/title-49/subtitle-B/chapter-II/part-213/subpart-F.
[4] *Freight Rail Automated Inspections - AAR.* Association of American Railroads. (2024, January 31). https://www.aar.org/issue/automated-track-inspections/.
[5] Federal Railroad Administration. (2018, March 9). Autonomous Track Geometry Measurement Technology Design, development, and testing. https://railroads.dot.gov/elibrary/autonomous-track-geometry-measurement-technology-design-development-and-testing.
[6] Tuzik, B. (2024, February 2). *Examining Autonomous Track Geometry Testing and Instrumented Revenue Vehicle Technology*. Railway Track and Structures. https://www.rtands.com/news/examining-autonomous-track-geometry-testing-and-instrumented-revenue-vehicle-technology/.
[7] United States Code. (n.d.). *Title 49 - Transportation, Subtitle V - Rail Programs, Part A - Safety, Chapter 201 - General, Subchapter I - General, Section 20103 - General Authority.* U.S. Government Publishing Office. https://www.govinfo.gov/content/pkg/USCODE-2022-title49/pdf/USCODE-2022-title49-subtitleV-partA-chap201-subchapI-sec20103.pdf.
[8] BNSF Railway v. FRA (https://www.govinfo.gov/app/details/USCOURTS-ca5-22-60217/USCOURTS-ca5-22-60217-1 June 21, 2024).
[9] *Rail Industry Challenges FRA's Inaction on Waivers*. Association of American Railroads. (2024, November 8). https://www.aar.org/news/rail-industry-challenges-fras-inaction-on-waivers/.
[10] Federal Railroad Administration. (2018). *Petition for waiver of compliance: Burlington Northern and Santa Fe Railway.* (Docket No. FRA-2018-0049). https://www.regulations.gov/docket/FRA-2018-0049.
[11] Federal Railroad Administration. (2013, December). Using Wheel Temperature Detector Technology to Monitor Railcar Brake System Effectiveness. https://railroads.dot.gov/sites/fra.dot.gov/files/fra_net/3520/Using%20Wheel%20Temperature%20Detector%20Technology_20131227_final.pdf.
[12] Federal Railroad Administration. (2010). *Petition for waiver of compliance*: *BNSF Railway Company - Positive Train Control Plans.* (Docket No. FRA-2010-0056). https://www.regulations.gov/docket/FRA-2010-0056
[13] Bureau of Transportation Statistics. (2024, March 12). *Train Fatalities, Injuries, and Accidents by Type of Accident*. Bureau of Transportation Statistics. https://www.bts.gov/content/train-fatalities-injuries-and-accidents-type-accidenta.
[14] California Air Resources Board. (2020, September 23). Truck vs. Train Emissions Analysis. https://ww2.arb.ca.gov/resources/fact-sheets/truck-vs-train-emissions-analysis.

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