

Information Technology and Innovation Foundation
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Comments of ITIF

to

THE FEDERAL RAILROAD ADMINISTRATION

)
In the Matter of:)
)
The Proposed Rule on)
Train Crew Size Safety Requirements,)
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CONTENTS

Introduction and Summary.....	2
The Proposed Rule Underestimates Compliance Costs.....	4
The Proposed Rule Overstates Likelihood of Approval.....	5
The Proposed Rule Largely Ignores Safety Data on One-Person Crews.....	6
The Proposed Rule Will Deter Rail Innovation.....	7
The Proposed Rule Ignores Potential Benefits, Including Cost Savings.....	8
An Alternative, Pro-Innovation Approach.....	9

INTRODUCTION AND SUMMARY

The Federal Railroad Administration (FRA) has promulgated a proposed rule regarding train crew size safety requirements. The Information Technology and Innovation Foundation (ITIF) appreciates this opportunity to comment on this proposed rule.¹

The proposed rule, while written to suggest that it will enable rail innovation and the operation of less-than-two-person crews, will in fact likely stifle continued rail innovation and limit any expansion of one-person crews and the economic productivity that generates. While the rule is careful to not frame this rule as a ban of less-than-two-person trains, it appears to in fact be an almost de facto ban, with a set of regulatory hurdles that are so opaque and difficult to meet that few if any train operators could pass it.

More fundamentally, the FRA should focus on promoting rail innovation, something many other governments around the world are doing. As such, ITIF recommends that the FRA abandon this rule and, if a rule is needed, it should establish a pilot program whereby freight rail companies could easily adopt one-person crew pilots on tracks with fully operational positive train control technology, with the guidance and

¹ Founded in 2006, ITIF is an independent 501(c)(3) nonprofit, nonpartisan research and educational institute—a think tank. Its mission is to formulate, evaluate, and promote policy solutions that accelerate innovation and boost productivity to spur growth, opportunity, and progress. ITIF’s goal is to provide policymakers around the world with high-quality information, analysis, and recommendations they can trust. To that end, ITIF adheres to a high standard of research integrity with an internal code of ethics grounded in analytical rigor, policy pragmatism, and independence from external direction or bias. See About ITIF: A Champion for Innovation, <https://itif.org/about>.

assistance from the FRA. Such a program would involve extensive data collection to guide additional crew size reduction efforts.

Moreover, at first glance, the most positive aspect of the proposal regulation—the preemption of state crew size regulations—appears welcome. But on closer examination, it is likely negative as well, as it will prohibit pro-innovation states from allowing one-person or even fully autonomous trains from operating within their borders.

The overarching statement in the notice of proposed rulemaking (NPRM) is emblematic of overall intent and approach: “A minimum requirement of two crewmembers is proposed for all railroad operations, with exceptions proposed for those operations that do not pose significant safety risks to railroad employees, the public, or the environment.” There is no mention of innovation, productivity, or other benefits. In addition, the regulation assumes that, going forward, two crewmembers will always be needed, except on the few routes the FRA deems safe enough to grant approval.

Before discussing the specifics of the NPRM, it is important to note that whenever regulators address a safety issue they are always weighing trade-offs. The federal government could reduce the 43,000 automobile fatalities annually by significantly lowering speed limits, or even resurrecting red flag laws that require all cars to follow behind a person carrying a red flag. Obviously regulators don’t do that because this would significantly reduce consumer welfare and economic output.

As such, the principal question regarding this NPRM is what the appropriate trade-offs are, if any. But any discussion of safety data on one-person crew trains, whether operating in the United States or other nations, is absent—as is data on cost savings and performance improvements of one-person crews. Absent such data, how can the FRA balance costs and benefits?

Moreover, transportation safety is not static. In the future, motor vehicles that have higher levels of autonomy will likely be significantly safer than current vehicles, as most accidents are caused by driver error. In fact, at some point, fully autonomous (e.g., level 5) vehicles could be possible and would likely significantly reduce traffic accidents.² Similar autonomy-enabling technologies for rail systems are improving as well. In either case, innovation is key to improvements in safety. However, because the proposed rule dramatically limits innovation by making it extremely difficult to deploy one-person trains, the regulation could actually mean *less* safety in the future.

Finally, the goal of economic regulation should not be to preserve jobs but to promote the public interest. Preserving jobs, even unionized jobs, that are no longer needed is redundant, the equivalent of the government imposing a tax on all Americans. If regulations keep workers employed when they are not needed, by definition, costs will not go down. If, instead, freight rail could become more efficient, including

² Stephen Mraz, “SAE’s 6 Levels of Self-Driving Cars,” *Machine Design*, January 23, 2017, <https://www.machinedesign.com/a-skeptical-engineer/article/21832324/saes-6-levels-of-selfdriving-cars>.

through the use of technology, rail costs would decline, with consumers and the U.S. economy being the ultimate beneficiaries.

THE PROPOSED RULE UNDERESTIMATES COMPLIANCE COSTS

The proposed regulation implies that gaining approval will be straightforward and involve minimal time on the part of railroads seeking approval. In reality, this does not appear to be the case. For example, beyond filing a separate application for each rail route, the regulation would require the development of a hazard analysis that would include:

(1) a hazard log, consisting of a comprehensive description of all hazards associated with the proposed train operation; (2) an assessment of each hazard in terms of the severity (i.e., a measure of the worst-credible mishap resulting from the hazard); (3) an assessment of each hazard in terms of probability of occurrence, based on the likelihood of the sequence of events that could lead to the hazardous condition; and (4) a hazard mitigation analysis outlining the sustainable actions and associated components, equipment, systems or processes that are put in place to reduce or eliminate the probability or severity, or both, of each hazard.

The NPRM goes on to note:

A hazard log is a living document that must be maintained and updated to reflect the current operating environment. If new hazards are identified, the hazard log must be updated. Similarly, if operational changes are made in a way that introduces additional risk, the hazard log must be updated. Changes to a hazard log must be effectively managed, e.g., through a configuration management process. A configuration management process is the practice of analyzing changes in the operating environment and systematically documenting those changes, and the impact of those changes, on the risk assessment and hazard log. An effective configuration management process must be used to determine when and how often a risk assessment needs to be reviewed and re-validated.

For this reason, FRA expects the evaluation of hazards identified as “acceptable under specific conditions” to be very fact based and focused on the specific facts of an operation, as demonstrated by the supporting evidence provided in a railroad's risk report and underlying hazard analysis.

The NPRM states:

[P]roposed paragraph (b)(1)(viii) would require a railroad to report the total number of instances where a railroad employee did not comply with a railroad rule or practice applicable to the FRA-approved train operation(s) with fewer than two crewmembers, but not applicable to train crew operations with two or more crewmembers.

Not only would this increase compliance costs, but it would provide no rationale for why this requirement would not also apply to train crew operations with two or more crewmembers.

In short, the compliance process does not appear to be a 40-hour process, which is what the proposed regulation estimates to be the time involved in obtaining and keeping approval. In other words, it does not appear over a 10-year period that the annual costs to the entire industry would be just \$172,000 per year. Rather, both the time and costs are likely to be considerably more.

THE PROPOSED RULE OVERSTATES LIKELIHOOD OF APPROVAL

The proposed rule claims to not be an outright ban, but it may very well serve as a de facto ban, depending on how the FRA implements the vague regulations. Yet, the language in the rule implies that approvals will be straightforward, as long as the train is not carrying any hazardous cargo (many are), the rail lines do not run through congested areas (many do), and rail unions and communities do not object (many will), etc.

This is how the rule can be stated: “Additionally, the proposed safety requirements in this NPRM would allow the rail industry to maintain its strong safety record without proposing any restrictions that would directly impact its competitiveness compared with other modes of transportation.” As is, the rule makes no estimate of what percentage of freight trains could potentially qualify for single-person crews, including after allowing for review and likely opposition by communities and workers.

Given the steady movement of trucking toward more autonomous vehicles, including platooning, this regulation is indeed likely to directly impact the industry’s competitiveness compared with other modes of transportation. Should this happen, not only would this lead to environmentally harmful mode shifting, but it would also lead to relatively higher U.S. transportation costs. As a report from the National Academy of Sciences Transportation Research Board notes, “Future regulatory actions, particularly those related to climate change, truck size and weight, and autonomous vehicles could significantly shape mode shares.”³ To the extent there is mode shifting, especially to trucks, what is the safety impact of this, given the risk of accidents on highways? The proposed rule is silent on this.

In addition, much of the approval process appears to give wide discretion to the FRA. The NPRM states:

FRA proposes that its decision to grant or deny a petition would be based on whether a railroad submits all required data and information and, as applied to legacy operations, whether that data and information demonstrates that the operation has historically operated consistent with railroad safety, and for proposed new operations, whether the railroad submits all required data and information, and additionally provides evidence of a properly conducted risk assessment demonstrating that the operation will be operated consistent with railroad safety.

It goes on to note that “if FRA identifies inaccuracies in the supporting data or information submitted with a railroad’s petition, it will not approve the petition.” At one level, this makes sense, but at another level, it

³ National Academy of Sciences Transportation Research Board, *Impacts of Policy-Induced Freight Modal Shifts* (Washington, DC: NCFRP, 2019), 36, <https://nap.nationalacademies.org/read/25660/chapter/6>.

appears to provide the FRA with reasons to reject applications whenever there is an error, no matter how minor.

Given the considerable discretion the proposed rule gives to the FRA, freight rail companies would be well within their rights to be uncertain if an approval under one presidential administration might in fact be rescinded by another that has a different view of the issue. Such uncertainty would deter investment in innovation.

THE PROPOSED RULE LARGELY IGNORES SAFETY DATA ON ONE-PERSON CREWS

The proposed rule relies on anecdotes and generalized claims about the safety (or claimed lack thereof) of one-person crews. When it discusses the U.S. experience with one-person crews, it argues that the number of companies using them has fallen slightly, suggesting, wrongly, that rail companies do not care about this issue. And the FRA does not discuss safety data for the companies that have implemented one-person crews.

The proposed rule also dismisses the experience of other countries, including in Europe, where one-person trains have been common practice for many years, simply stating that the experience is not the same:

Foreign train operations in developed countries, other than Canada, are not comparable for the most part due to differences in train lengths, territory, and infrastructure. For instance, a foreign, one-person freight train operation in an industrial-type railroad servicing only one origin and one destination would not be comparable due to the complexity of most U.S.-based freight rail operations. Most foreign, one-person freight train operations also do not carry out extensive interlining or switching with other railroads. Further, many foreign, one-person passenger train operations do not have to share track with freight operations or operate over highway-rail grade crossings, and thus the safety hazards associated with those foreign operations are not comparable to those involving U.S. passenger train operations.

Rather than engage in a careful analysis of each foreign one-person system, the proposed rule language appears to be simply a justification for regulations limiting one-person crews. Exactly how are foreign experiences not applicable to the U.S. situation, and how, specifically, would these differences play out in the United States? The proposal rule does not say.

Nor does the proposed rule reference prior studies of one-person crews, such as one by Transport Canada of one-person rail operations in other nations.⁴ This study describes the operations, technology, training, and other factors that enable freight rail in other nations to safely operate one-person crews.

In addition, the proposed rule makes statements that attempt to justify a near ban that in fact does not do so. For example, the NPRM states that “railroads lacking proper training, testing, or supervision programs for

⁴ Wasi Hanafi, “Study of One-person Train Operations” (Beauchemin Beaton Lapointe Inc, May 1997), https://publications.gc.ca/collections/collection_2021/tc/T86-66-1997-eng.pdf.

one-person crew operations could introduce new safety risks for neighboring communities.” Rather than impose a near ban, the FRA could simply mandate that railroads putting in place one-person crew operations also engage in proper training, testing, and supervision.

THE PROPOSED RULE WILL DETER RAIL INNOVATION

Because the NPRM takes a “precautionary principle” approach to rail innovation—two person trains are best—and can only be deviated from in special circumstances where the company must get permission, the rule will deter innovation. As the NPRM notes, the FRA rightly found in 2019 that “implementation of a train crew staffing rule would establish a potential barrier to automation or other technology improvements.” Yet, the current NPRM states, “FRA finds that a train crew staffing rule would not necessarily halt rail innovation or automation.” The key words here are “necessarily” and “halt.” It may not “necessarily halt” innovation, but it is likely to. And even as restrictive as the proposed rule is, it is unlikely to halt innovation completely—but it is likely to slow it.

Take the case of a start-up formed by former SpaceX engineers who raised \$50 million in venture capital to transform individual freight train cars into autonomous electric-powered vehicles.⁵ Parallel Systems also received a \$4.4 million loan through the Department of Energy’s Advanced Research Projects Agency-Energy program.⁶ Rather than manufacturing traditional trains, Parallel Systems builds small, electrically powered carriers, two of which can carry a single- or double-stacked freight container. The carriers are fully autonomous and in constant communication with each other. As such, the carriers can “platoon” and move as a single vehicle (much like a traditional train connects and moves a group of individual cars). However, they can also separate and branch off from one another when necessary. Parallel Systems argues that this provides greater flexibility to the rail system and makes more efficient use of rail lines.⁷ The \$4.4 million is currently funding a 29-month field test that started earlier this year.⁸ Yet, the risk to their business would increase significantly if this proposed rule were adopted, stifling what could be a transformative innovation for the industry, helping shift short-haul freight from trucks and highways to rail. Imagine if the companies seeking to implement this technology would have to obtain regulatory approval for every single autonomous train car and route? Innovation and adoption would grind to a near halt.

⁵ Mark Wilson, “Former SpaceX engineers raised \$50 million to build a Tesla for freight trains,” *Fast Company*, January 19, 2022, <https://www.fastcompany.com/90713785/former-spacex-engineers-raised-50-million-to-build-a-tesla-for-freight-trains>.

⁶ “Autonomous Rail Vehicle Project Receives \$4.4 Million Federal Grant,” *Trains.com*, February 15, 2022, <https://www.trains.com/trn/news-reviews/news-wire/autonomous-rail-vehicle-project-receives-4-4-million-federal-grant/>.

⁷ “Product,” Parallel Systems, accessed September 8, 2022, <https://moveparallel.com/product/>.

⁸ “Autonomous Rail Vehicle Project Receives \$4.4 Million Federal Grant,” *Trains.com*, February 15, 2022, <https://www.trains.com/trn/news-reviews/news-wire/autonomous-rail-vehicle-project-receives-4-4-million-federal-grant/>.

By putting in place such high regulatory barriers, the FRA is reducing the incentive for companies to focus on autonomous train technology, which in theory could be safer than human-controlled trains, and certainly cheaper.

The FRA ignores these risks to innovation, and, in fact, claims—with no evidence and little logic—that the regulation is actually pro-innovation:

In other words, safety continues to be DOT’s top priority, and, rather than issue voluntary guidance, this NPRM would require regulated entities to analyze and demonstrate how innovations are consistent with safety, and receive FRA’s approval, before implementing the technologies.

The only way this could be true is if rail companies moved to less-than-two-person trains and accidents increased significantly, thus dampening demand for such innovation. Not only is this unlikely, but the innovation-limiting effects of having to get approval for each application (as opposed to each technology) is more likely to deter innovators.

THE PROPOSED RULE IGNORES POTENTIAL BENEFITS, INCLUDING COST SAVINGS

There is no discussion of the benefits to the U.S. freight rail system of moving to one-person crews. In part, this is because the regulation is written as if such approvals are likely. The NPRM does not include the costs of not moving to single-crew trains because it assumes that many applications would be approved. But clearly one-person crews will save the freight rail system money that in turn will benefit the U.S. economy and consumers. And to the extent the rule limits the movement to one-person crews, this will impose tangible costs.

Consider the cost savings and performance improvement enjoyed by Rio Tinto in Australia in the development of its completely autonomous train hauling minerals. One article notes that:

removing the drivers has helped to deliver some of the project’s most notable enhancements in performance, notably improvements in locomotive fuel efficiency and reduced wear-and-tear on the track and the locomotives. The need for 1.5 million-km of annual road movements to transport drivers to and from trains mid-journey has also been cut. However, removing the drivers has helped to deliver some of the project’s most notable enhancements in performance, notably improvements in locomotive fuel efficiency and reduced wear-and-tear on the track and the locomotives. The need for 1.5 million-km of annual road movements to transport drivers to and from trains mid-journey has also been cut.⁹

Not all these benefits would result from one-person crews in the United States, but many would.

⁹ Kevin Smith, “Rise of the machines: Rio Tinto breaks new ground with AutoHaul,” *IRJ*, August 9, 2019, https://www.railjournal.com/in_depth/rise-machines-rio-tinto-autohaul/.

AN ALTERNATIVE, PRO-INNOVATION APPROACH

Rather than adopt a rule grounded in the precautionary principle, the FRA should be focused on how to advance automation. To be sure, the FRA has made some, albeit small, efforts in this direction. It recently devoted approximately \$2.1 million to eight research projects that seek to advance autonomous monitoring and predictive analysis of the conditions of trains, tracks and track beds, and any other infrastructure that comprises the rail system (e.g., bridges).¹⁰

In contrast, a number of other nations see rail innovation as a key goal. The Ontario Train Autonomy Collaboration (OnTRAC) Project, started in 2019 by Lumibird Canada, Thales, and the Lassonde School of Engineering at York University and funded in part by the government of Ontario, announced that it had successfully concluded its 30-month testing period earlier this year.¹¹ OnTRAC is developing a Light Detection and Ranging (LiDAR)-based sensor and detection system specially designed for freight rail vehicles so that trains can automatically monitor themselves and their surroundings with accuracy. The WinterTech Development Program, being carried out by Thales, Invision AI, and Metrolinx and also receiving funding from the government of Ontario, uses LiDAR technology to improve detection of a train's surroundings in varying weather conditions.¹² The WinterTech Program successfully completed an 18-month test period last October and remains focused on commuter rail.

The European Union established Europe's Rail Joint Undertaking (EU-Rail), which is the successor of Shift2Rail and focuses on both freight and commuter transport.¹³ EU-Rail seeks to institute an integrated and interoperable continental rail network and enable the research, development, and implementation of innovative rail technologies.¹⁴ To that end, EU-Rail is contributing €2 million to the Technologies for Autonomous Rail Operation (TAURO) project between December 2020 and May 2023.¹⁵ The TAURO project is coordinated by Spain's Construcciones y Auxiliar Ferrocarriles, and its stated goal is to "identify, analyze and finally propose suitable founding technologies for the future European automated and autonomous rail transport, to be further developed, certified and deployed through the activities planned for

¹⁰ U.S. Department of Transportation Federal Railroad Administration (FRA), *FRA Office of Research, Development, and Technology: Current Research Projects* (Washington, DC: FRA, December 2021), https://railroads.dot.gov/sites/fra.dot.gov/files/2021-12/2022_RDT_CurrentProjects.pdf.

¹¹ Lumibird Canada, "Lumibird Canada, Thales, and the Lassonde School of Engineering at York University Announce the Successful Completion of the 30-Month Ontario Train Autonomy Collaboration (OnTRAC) Project," news release, January 13, 2022, <https://www.lumibird.com/en/ontario-train-autonomy-collaboration-ontrac-project/>.

¹² Richard Clinnick, "GO Transit Trial Advances All-Weather Autonomous Ops," *Railway Age*, October 1, 2021, <https://www.railwayage.com/news/go-transit-trial-advances-all-weather-autonomous-ops/>.

¹³ "Europe's Rail Joint Undertaking," *European Union*, https://european-union.europa.eu/institutions-law-budget/institutions-and-bodies/institutions-and-bodies-profiles/europes-rail-joint-undertaking_en.

¹⁴ Ibid.

¹⁵ "Technologies for Autonomous Rail Operation," *EU Community Research and Development Information Service*, April 29, 2022, <https://cordis.europa.eu/project/id/101014984>.

[EU-Rail].”¹⁶ The TAURO project involves four broad areas of work: 1) environmental perception of automation, 2) remote driving and command, 3) automatic status monitoring and diagnostics for autonomous trains, and 4) technologies to support the transition from the European Train Control System (ETCS) to Automatic Train Operation (ATO).¹⁷

China’s autonomous developments beyond a positive train control system appear to be focused on commuter rail. The country unveiled its driverless bullet train from its Fuxing series operating between Beijing and Zhangjiakou for the 2022 Beijing Winter Olympics. CRRC, China’s largest state-owned enterprise (SOE) in the railroad industry, began development of the new Fuxing (which translates to “Rejuvenation”).¹⁸ In 2015, the Chinese government allotted \$9.2 billion to the construction of rail lines for the 2022 Beijing Winter Olympics, though it is unclear how much of that budget was realized versus devoted to the development of the autonomous train and system.¹⁹ The train’s carriages are equipped with 5G signaling equipment and 2,718 sensors to collect data and detect problems.²⁰ Although it operates fully autonomously, a monitoring driver is onboard at all times.

In 2021, Russian Railways, Russia’s state-owned railway company, commissioned Siemens and Ural Locomotives with building a fully automated passenger train to be tested in 2023.²¹ The train is intended to be Grade 4 autonomous, meaning no overseeing human would be present.²² In September 2018, the chairman of France’s SNCF group, Guillaume Pepy, announced that his company would introduce “semi-autonomous” trains by 2020 and fully automated ones within five years. The French national operator plans to launch self-driving freight trains by 2021, while the automated passenger service will start in 2023 on the RER network in Paris and its suburbs. The self-driving TGV high-speed trains will run in 2025.²³ The Netherlands is also conducting tests of automated freight and passenger trains.”²⁴

¹⁶ Ibid.

¹⁷ Ibid.

¹⁸ “China’s Standard EMU Named ‘Fuxing,’” *Xinhua News Agency*, June 25, 2017, http://www.xinhuanet.com/photo/2017-06/25/c_1121206644.htm.

¹⁹ “China Approves Budget for 2022 Winter Olympics Rail Link,” *Associated Press*, November 4, 2015, <https://apnews.com/article/fd8914b868d744b7a8b33dbff8515e30>.

²⁰ Maggie Hiufu Wong, “World’s First 350km-per-hour Driverless Bullet Train Goes into Service in China,” *CNN Travel*, January 8, 2020, <https://www.cnn.com/travel/article/driverless-bullet-train-china/index.html>.

²¹ “Russian Railways to Test Fully Automatic Train in 2023,” *RailTech.com*, October 22, 2021, <https://www.railtech.com/infrastructure/2021/10/22/russian-railways-test-fully-automatic-train-in-2023/>.

²² Ibid.

²³ Mykola Zasiadko, “China to launch regular automated high-speed trains in 2022,” *RailTech.com*, April 1, 2019, <https://www.railtech.com/policy/2019/01/04/china-to-launch-regular-automated-high-speed-trains-in-2022/>.

²⁴ Rob Goverde, “Trends and developments in the automation of heavy rail operations,” *Global Railway Review*, March 5, 2020, <https://www.globalrailwayreview.com/article/97734/trends-developments-automation-heavy-rail/>.

The FRA should support rail research and development and innovation efforts with the goal of ensuring that the U.S. rail system can be the most technologically advanced and automated in the world.

With respect to one-person trains, rather than adopt this costly and difficult-to-meet regulatory standard, the U.S. rail system should scrap this proposed NPRM and enable rail companies, in consultation with rail worker unions, to decide on what routes can be one-person. If the FRA still insists on regulation of this process, it should instead establish a pilot program whereby rail companies can propose select routes for one-person operation and more or less gain automatic approval, so long as they collect safety data and provide adequate training for the one engineer.

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