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IN FOCUS

Freight Rail Automation: Driverless Trains, Automated Inspections, and Other Technologies

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Technological advances and cost-cutting pressures in railroading have contributed to smaller train crews and fewer maintenance-of-way employees. A single train commonly has a crew of two aboard. Freight carriers, vehicle manufacturers, and technology companies have explored the potential to improve labor efficiency through the use of driverless locomotives or freight cars that do not require a locomotive to move. Railroads have also explored the use of automated inspections to identify track defects and optimize their infrastructure maintenance workforce. Greater use of automation could result in efficiencies for the rail industry but could also encounter opposition from organized labor and safety advocates.

Autonomous trains are tested technology. Examples exist of autonomous trains in public transit service that feature predictable schedules and self-contained infrastructure. Such systems exist in Paris, São Paulo, Istanbul, Seoul, Shanghai, and Honolulu, among other cities, as well as at many airports and the U.S. Capitol. There are fewer examples of driverless freight trains, which transport a mix of goods across long distances, sometimes in mixed traffic with passenger trains. One example discussed here is the Rio Tinto Mining Company system in Australia.

Automated track inspections have been conducted for decades using specially equipped cars attached to inspection trains or regular freight trains. Railroads have sought flexibility to reduce the frequency of visual inspections in some areas where automated inspection is in use.

This In Focus discusses technologies that could be leveraged to increase labor efficiency in train operation and track inspection and relevant policy considerations for Congress.

Minimum Train Crew Size

Train crew sizes have tended to be determined through collective bargaining. Railroads have explored the use of one-person crews to reduce costs, while unions and some lawmakers have sought to establish a two-person crew minimum (one engineer and one conductor) on safety grounds.

The U.S. Department of Transportation's Federal Railroad Administration (FRA) proposed a minimum crew size rule in 2016 after several crashes but withdrew it in 2019, stating that available data "d[o] not establish that one-person operations are less safe than multi-person train crews." FRA proposed a new crew size rule requiring two-person train crews in most trains in July 2022, after the earlier rule's withdrawal was vacated by a federal court. The final rule, issued in April 2024, requires all trains to have a minimum of two crew members on board except in certain situations. Around the same time, the 2023 train derailment and chemical spill in East Palestine, OH, drew attention to freight rail safety. Several bills introduced since the incident, had they been enacted before sine die adjournment, would have codified a two-person minimum, including the BUILD America 250 Act (H.R. 8870), a surface transportation reauthorization bill ordered reported to the House of Representatives in the 119th Congress.

Rio Tinto Mining Company

One example of driverless long-haul freight trains is the Rio Tinto mining company. Rio Tinto operates a roughly 1,200-mile rail network linking 18 iron ore mines and 2 seaports in Western Australia. Rio Tinto began deploying driverless trains in 2019, using its "AutoHaul" system to run trains from a port to one of the company's mines, fill its cars, and return to the port without a driver on board. Train conditions are centrally monitored from an operations center in Perth, nearly 1,000 miles away. Human operators are generally required in the locomotive cab only when entering or leaving the ports. The company has credited AutoHaul with an increase in average train speed and a reduction in fuel consumption.

The privately owned Rio Tinto system is largely self-contained, featuring few branches or interchanges with other railroads. It is in a sparsely populated area with few road-rail crossings. It accommodates iron ore trains almost entirely and no passenger traffic. These characteristics lead to predictable operations and separate, dedicated right-of-way—in some ways similar to transit rail lines. The U.S. freight rail network does not feature similar self-contained systems on long-haul routes.

Remote Control Locomotives

Technologies to control the movement of trains from outside the locomotive using a remote control device are readily available but do not constitute a fully autonomous train control system. FRA issued regulations on remotely controlled locomotives (RCLs) in 2012, building on a safety advisory issued in 2001 that was broadly adopted by the rail industry. Under the rules, RCLs must be limited to a maximum speed of 15 miles per hour, among other safety requirements. RCLs are most used within rail yards where cars are sorted among several tracks.

A 2006 FRA report analyzing data from December 2003 to December 2004 found that "when comparing all railroads, RCL operations result in more train accidents than conventional operations" but that "on those major railroads where RCL technology has been extensively utilized, safety performance has been roughly equivalent to that of conventional switching." In 2025, roughly 25% of accidents in yards involved an RCL, compared with 13% overall and less than 1% on main line tracks. One bill introduced in the 119th Congress, the Remote Control Locomotives Safety Improvement Act of 2026 (H.R. 9409), would have banned RCL use on main lines. Alternatively, Congress could let industry trends run their

course or proactively establish a process for expanding RCL use for long-haul freight. Another option for Congress could be to direct FRA or another organization to study the issue, including by requiring railroads to publicly disclose additional data related to RCL use.

Autonomous Rail Vehicles

Some companies in the United States and abroad have begun developing autonomous railcars that can transport cargo without a locomotive. The railcars are intended to operate alone or in platoons of several cars, potentially reducing the labor costs associated with moving smaller shipments and potentially mitigating the transit time penalty associated with frequent stops in rail yards.

Various companies are at different stages of automation development. In February 2025, FRA approved a request from Los Angeles-based Parallel Systems and its rail carrier partner to waive some safety rules to test the company's proprietary autonomous railcars on a short segment of a railroad in Georgia. Certain safety-related issues (especially involving at-grade crossings) remain unresolved with the technology, and Parallel Systems' waiver request was opposed by several labor unions representing rail workers. Another company, St. Louis-based Intramotev, has retrofitted existing railcars to be self-propelled and remote-controlled and has deployed its technology on railcars in mining service in Michigan. In 2026, FRA selected the city of Columbia, MO, to receive a $16.2 million grant to deploy Intramotev railcars on the 21-mile Columbia Terminal Railroad.

The same bill that would have banned RCLs on main lines, H.R. 9409, would have prohibited trains from operating outside yards without a human locomotive engineer physically located inside the control cab and would have restricted FRA from waiving that requirement. This could have had the effect of blocking deployment of autonomous railcars without a locomotive attached. Options for Congress could include directing FRA to fund its own research and testing of autonomous railcars, directing efforts to develop or recommend rules for the use of autonomous railcars, and setting aside funding under other grant programs for research, development, and testing of automated rail equipment by carriers or manufacturers.

Autonomous Track Inspection

Rail infrastructure must be inspected by qualified personnel at a frequency established by federal regulations. Tracks must be inspected more often if they accommodate faster trains. The task of inspecting tracks for defects, once done entirely by sight, has been enhanced through the deployment of Track Geometry Measurement Systems (TGMS), also called Automated Track Inspection (ATI).

FRA administers the Automated Track Inspection Program (ATIP) and first deployed ATI technologies in 1974. In 2026, ATIP included a fleet of three staffed and three unstaffed railcars, plus two "hi-rail" vehicles (road vehicles that can also operate on railroad tracks). At full speed, ATIP equipment can take detailed measurements of track conditions and operate alone (with onboard crew) or while attached to freight trains in active service (without crew). Private freight rail companies also use a form of ATI for track measurement. ATI can identify certain anomalies or defects in tracks that might be too small to detect by visual inspection alone and can cover more territory in less time than a traditional visual inspection team.

In December 2025, FRA approved a waiver that allows railroads to reduce the frequency of visual inspections in specific areas where ATI is in use, while meeting certain performance and reporting requirements, for up to five years. Railroads do not require a waiver to deploy ATI on their own networks but do require a waiver to reduce the frequency of visual inspections. Waiver program supporters point to expanded use of ATI as a complement to visual inspections, with the potential to improve efficiency of the inspector workforce. Opponents have observed that most track defects identified by visual inspectors are not detectable by ATI vehicles currently in service and that reducing the frequency of visual inspections could result in those defects going uncorrected before causing an accident. In the 119th Congress, the Secure Tracks Act introduced in the House (H.R. 7784) and the Senate (S. 3987) would have codified a minimum frequency of visual and automated track inspections on many rail lines. It would also have restricted the availability of FRA safety waivers if the alternative inspection methods would fail to identify "all defect conditions defined or recognized as unsafe" by FRA.

The BUILD America 250 Act (H.R. 8870) would have directed the Secretary of Transportation to consider a rule "that specifies performance objectives rather than an approach that identifies or requires the specific manner of compliance that a regulated person or entity must adopt" when issuing new or revised rail safety regulations. A shift toward performance-based rules could incentivize adoption of ATI.

Research and Development

In the Infrastructure Investment and Jobs Act of 2021 (P.L. 117-58), Congress authorized an average of $225 million over five years for FRA to conduct railroad research and development in various safety disciplines, including testing technologies that could further automate certain aspects of railroad operations. Options for Congress could include adjusting the amount available or prioritized for automation and collecting additional data to better measure the safety impacts of automation.

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