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## POSITIVE TRAIN CONTROL

# Most Passenger Railroads Expect to Request an Extension, and Substantial Work Remains Beyond 2018

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## POSITIVE TRAIN CONTROL

### Most Passenger Railroads Expect to Request an Extension, and Substantial Work Remains Beyond 2018

#### Why GAO Did This Study

Forty railroads are currently required by statute to implement PTC, a communications-based system designed to slow or stop a train that is not being operated safely. Of these, 29 passenger railroads collectively provide over 500 million passenger trips annually. Although the deadline for PTC implementation is December 31, 2018, railroads may receive a maximum 2-year extension to December 31, 2020, if they meet certain statutory criteria.

GAO was asked to review passenger railroads' progress toward PTC implementation. This statement discusses (1) passenger railroads' PTC progress and FRA's steps to assist them, and (2) how passenger railroads and FRA plan to approach the 2018 and 2020 deadlines. GAO analyzed railroads' most recent quarterly reports covering activities through June 30, 2018; sent a brief questionnaire to all 40 railroads; and interviewed officials from FRA and 16 railroads, selected in part based on those identified as at-risk by FRA.

#### What GAO Recommends

In March 2018, GAO recommended FRA take steps to systematically communicate extension information to railroads and to use a risk-based approach to prioritize agency resources and workload. FRA has taken some steps to address these recommendations, such as recently communicating and clarifying extension requirements to all railroads during three symposiums. GAO will continue to monitor FRA's progress.

View [GAO-19-135T](#). For more information, contact Susan Fleming at (202) 512-2834 or [flemings@gao.gov](mailto:flemings@gao.gov).

#### What GAO Found

As of June 30, 2018, passenger railroads (28 commuter railroads and Amtrak) generally remained in the early stages of positive train control (PTC) implementation—including equipment installation and early field testing. However, many passenger railroads are nearing completion of the equipment installation stage. For example, two-thirds of passenger railroads reported being more than 90 percent complete with equipment installation. With regard to testing, Amtrak has reported that it has initiated both field testing and revenue service demonstration (RSD), an advanced form of field testing that is required to fully implement PTC. However, most commuter railroads reported slower progress with testing. Of the 28 commuter railroads required to implement PTC, 19 reported initiating field testing, but only eight reported initiating RSD. The Federal Railroad Administration (FRA) recently clarified the criteria railroads must meet to qualify for a 2-year extension past the December 31, 2018, PTC implementation deadline. To receive an extension, railroads must meet six statutory criteria. For the sixth criterion, commuter railroads are authorized to either initiate RSD on at least one track segment or use FRA-approved substitute criteria. FRA clarified these and other requirements at three PTC symposiums hosted for railroads in summer 2018. For example, FRA officials said that initiating field testing instead of RSD was one approach that commuter railroads could potentially take to receive FRA's approval of substitute criteria. FRA's actions are consistent with GAO's March 2018 recommendation that the agency communicate to railroads the requirements and process for an extension.

Challenges related to PTC implementation and FRA's resources raise questions as to the extent FRA and the passenger railroad industry are poised for full PTC implementation by December 31, 2020. Most passenger railroads anticipate needing an extension, leaving substantial work for both railroads and FRA to complete before the end of 2020. Almost three-quarters of passenger railroads (21 of 29) reported that they, or the railroad which owns the track on which they operate, will apply for an extension. More than half of these railroads reported planning to apply for an extension using substitute criteria, and of these, eight intend to apply for substitute criteria based on field testing. Though use of substitute criteria is authorized in law, this approach defers time-intensive RSD testing into 2019 and beyond. In addition, passenger railroads reported that they continue to face many of the same challenges GAO previously identified, such as software defects and limited industry-wide availability of vendors. Further, passenger railroads expressed concern that FRA's workload will markedly increase as railroads submit requests for extension approvals. FRA has acknowledged concerns about the pending surge of submissions and agency officials said they have taken recent steps to help manage the forthcoming influx of documentation, such as reallocating resources. However, as of September 21, 2018, only one passenger railroad had applied for an extension. It remains unclear how many extension requests FRA will receive or what FRA's enforcement strategy will be for noncompliance with the statute, such as for railroads that fail to apply for an extension by the deadline.

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## Chairman Thune, Ranking Member Nelson, and Members of the Committee:

Thank you for the opportunity to discuss our work in reviewing efforts by passenger railroads and the Federal Railroad Administration (FRA) to implement positive train control (PTC). In September 2008—10 years ago last month—a commuter train and freight train collided in the Chatsworth neighborhood of Los Angeles, California, resulting in 25 deaths and over 100 injuries. In the wake of this accident, legislation was enacted requiring certain railroads to implement PTC—a communications-based system designed to slow or stop a train that is not being operated safely.<sup>1</sup> Forty railroads are required to implement PTC.<sup>2</sup> These railroads include 28 commuter railroads and Amtrak, which collectively provide over 500-million passenger trips annually. Railroads that play a key role in our nation’s freight network must also implement PTC, including the seven largest Class I and four Class II and III freight railroads.<sup>3</sup>

As we have previously reported, PTC implementation is a complex and lengthy process, which touches almost every part of major rail lines and almost every aspect of railroads’ train operations.<sup>4</sup> Each implementing railroad must install more than 20 major components that will ultimately communicate trains’ locations, movements, and speed, and then slow or stop a train that is not being operated safely. Full implementation of PTC involves a number of steps, including but not limited to: planning and

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<sup>1</sup>The Rail Safety Improvement Act of 2008, Pub. L. No. 110-432, div. A, 112 Stat. 4848 (2008).

<sup>2</sup>Specifically, these 40 railroads are currently subject to the statutory mandate that requires the implementation of a PTC system on certain main lines.

<sup>3</sup>Freight railroads are classified by operating revenues. As of 2017, Class I railroads are those carriers with annual operating revenues of \$447.6 million or more. Class II railroads are carriers with annual operating revenues of less than \$447.6 million but in excess of \$35.8 million, and Class III railroads have annual carrier operating revenues of \$35.8 million or less.

<sup>4</sup>See GAO, *Positive Train Control: Additional Authorities Could Benefit Implementation*, GAO-13-720 (Washington, D.C., Aug. 16, 2013).

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system development, equipment installation, testing, system certification, and achieving interoperability. Since U.S. railroads often operate some or all of their trains as “tenants” on the track of another railroad, known as the “host,” interoperability is intended to enable trains that operate on the same track to be governed by the PTC system and to move seamlessly across track owned by different railroads.

When PTC implementation was mandated in 2008, the statutory deadline for railroads’ implementation was December 31, 2015. We reported in September 2015 that nearly all railroads did not expect to meet this deadline.<sup>5</sup> In October 2015, Congress extended the deadline to December 31, 2018, and established criteria that would enable FRA, the agency responsible for overseeing PTC implementation, to grant railroads meeting certain requirements an alternative schedule up to year-end 2020.<sup>6</sup> Throughout this statement we refer to the alternative schedule as the “extension.” My testimony today discusses the efforts of FRA and passenger railroads—which include commuter railroads and Amtrak, an intercity passenger railroad—to implement PTC as the December 31, 2018, deadline approaches and since we testified on PTC in March 2018.<sup>7</sup> My statement today will address (1) passenger railroads’ implementation progress and the steps that FRA has taken to assist these railroads and (2) how passenger railroads and FRA plan to approach PTC implementation to meet the December 2018 and December 2020 deadlines.

To describe passenger railroads’ progress, we analyzed the most recent available quarterly PTC implementation reports that railroads submitted to FRA, reports that reflected the progress as of June 30, 2018. We analyzed the reports to determine the extent that each railroad has installed PTC hardware and initiated testing. Based on our review of these data for anomalies, outliers, or missing information and our previous assessment of such quarterly reports for our March 2018 testimony, we determined that these data were sufficiently reliable for our

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<sup>5</sup>See GAO, *Positive Train Control: Additional Oversight Needed As Most Railroads Do Not Expect to Meet 2015 Implementation Deadline*, GAO-15-739 (Washington, D.C., Sept. 4, 2015).

<sup>6</sup>The Positive Train Control Enforcement and Implementation Act of 2015, Pub. L. No. 114-73, § 1302, 129 Stat. 568, 576-582 (2015), codified at 49 U.S.C. § 20157.

<sup>7</sup>GAO, *Positive Train Control: Many Commuter Railroads Still Have Significant Additional Implementation Work and Opportunities Exist to Provide Federal Assistance*, GAO-18-367T (Washington, D.C., Mar. 1, 2018).

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purposes of describing railroads' progress in PTC implementation. To describe passenger railroads' and FRA's progress and approaches, we interviewed representatives from 16 railroads, including the 12 railroads (11 commuter railroads and one Class III freight railroad) that FRA identified in June 2018 as at risk of not having implemented PTC or qualifying for an extension by December 31, 2018. The remaining four railroads we interviewed were: Amtrak, which provides intercity passenger rail service; two Class I freight railroads, which were selected based on their relationships with tenant railroads and substantial progress toward PTC implementation; and a commuter railroad that received approval from FRA in March 2018 for an exception from PTC system implementation.<sup>8</sup> To describe how railroads and FRA plan to approach PTC implementation for the December 2018 and 2020 deadlines, we sent 41 railroads a semi-structured questionnaire.<sup>9</sup> The questions we asked were based on the data collection efforts from our March 2018 testimony. We analyzed railroads' responses and summarized their plans and challenges into common categories. To determine the stage of PTC implementation railroads expected to reach by December 31, 2018, we considered railroads' responses to our questionnaire, information provided in interviews, and documents submitted to FRA regarding railroads' planned implementation approaches, among other information. To describe railroads' progress and FRA's actions to assist railroads, we interviewed the industry associations for commuter (American Public Transportation Association) and freight (Association of American Railroads) railroads, and two PTC vendors. We also reviewed applicable laws and FRA regulations, presentations, reports, and guidance and interviewed FRA officials. While our audit work included Class I, II, and III freight railroads, commuter railroads, and intercity passenger rail, this statement is focused on passenger railroads'—commuter and intercity—

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<sup>8</sup>In March 2018, we reported that 41 railroads were required to implement PTC. However, since then one commuter railroad received approval from FRA for a main line track exception, meaning it is no longer required to implement PTC. FRA can grant main line track exceptions under certain conditions, such as through limited operations. 49 C.F.R. § 236.1019(c). In this case, a commuter railroad reduced its regularly scheduled service by one train on one day of the week to 12 regularly scheduled one-way trains per day. Additionally, in September 2018, FRA approved a temporary main line track exception for another commuter railroad. However, because this exception is temporary and the railroad is still required to implement PTC by December 31, 2020, we consider this railroad as one of the 29 passenger railroads required to install PTC.

<sup>9</sup>We sent the questionnaire to all 40 railroads that are currently required to install PTC and one commuter railroad that was granted a main line track exception in March 2018.

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progress and approaches to meet the December 2018 and December 2020 deadlines.

We conducted this performance audit from June 2018 to October 2018 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

PTC systems are required by law to prevent certain types of accidents or incidents. In particular, a PTC system must be designed to prevent train-to-train collisions, derailments due to excessive speed, incursions into work zone limits, and the movement of a train through a switch left in the wrong position.<sup>10</sup> While railroads may implement any PTC system that meets these requirements, the majority of passenger railroads are implementing one of four types of systems.<sup>11</sup> PTC's intended safety benefits can be fully achieved nationwide when all required railroads have successfully installed PTC components, tested that these components work together and the systems function as designed, and are interoperable with other host and tenant railroads' PTC systems that share track. Interoperability means the locomotives of any host railroad and tenant railroad operating over the same track segment will communicate with and respond to the PTC system, allowing uninterrupted movements over property boundaries.<sup>12</sup> Interoperability is critical to PTC functioning properly given the complexity of the rail network in the United States. In much of the country, Class I freight railroads function as hosts

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<sup>10</sup>The Rail Safety Improvement Act of 2008, Pub. L. No. 110-432, div. A, 122 Stat. 4848 (2008).

<sup>11</sup>The four primary types of PTC systems are the Interoperable Electronic Train Management System (I-ETMS); the Advanced Civil Speed Enforcement System II; the Enhanced Automated Train Control (E-ATC); and the Incremental Train Control System (ITCS).

<sup>12</sup>See 49 U.S.C. § 20157. With certain exceptions, full implementation requires all controlling locomotives to be equipped with a fully operative and functioning onboard PTC apparatus, including the controlling locomotives for each host railroad and each tenant railroad operating on a PTC-equipped track segment. 49 C.F.R. § 236.1006.

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for Amtrak and commuter railroads. For example, one of the seven major Class I freight railroads reports that 24 tenant railroads operate over its PTC-equipped tracks, including freight, Amtrak, and commuter railroads. A notable exception to this is the Northeast Corridor, which runs from Washington, D.C., to Boston, Massachusetts, which Amtrak predominantly owns and over which six freight and seven commuter railroads operate as tenants.

PTC implementation involves multiple stages to achieve full implementation, including planning and system development, equipment installation and testing, system certification, and full deployment, including interoperability. Each railroad must develop an FRA-approved PTC implementation plan that includes project schedules and milestones for certain activities, such as equipment installation.<sup>13</sup> The equipment installation stage involves many components, including communication systems; hardware on locomotives and along the side of the track (called “wayside equipment”); and software in centralized office locations as well as onboard the train and along the track.<sup>14</sup> Each railroad is required to report quarterly and annually to FRA on its PTC implementation status relative to its implementation plan.<sup>15</sup> A railroad can also revise its implementation plan to reflect changes to the project, which then must be reviewed and approved by FRA.

In addition, railroads must demonstrate that the PTC systems are deployed safely and meet functional requirements through multiple stages of testing. Before initiating testing on the general rail system, railroads

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<sup>13</sup>The Rail Safety Improvement Act of 2008 required that railroads submit an implementation plan by April 16, 2010. When the PTC implementation deadline was extended to 2018 under the PTC Enforcement and Implementation Act of 2015, railroads were required to submit a revised implementation plan by January 27, 2016, to outline how and when each railroad plans to achieve full PTC implementation.

<sup>14</sup>See [GAO-18-367T](#) and [GAO-15-739](#). In this statement, we use the term locomotive generally to refer to any of the variety of vehicles, such as cab cars and electric multiple unit trains, that commuter railroads may need to equip. Wayside equipment includes items such as communication towers or poles, switch position monitors, wayside radios, wayside interface units, and base station radios.

<sup>15</sup>To effectively monitor each railroad’s progress implementing PTC, FRA requires the submission of quarterly progress reports under its investigative authorities, See, e.g., 49 U.S.C. §§ 20107, 20902, 20157(c)(2); 49 C.F.R. § 236.1009(h). In addition, each railroad is required to annually report to FRA on PTC implementation progress in areas such as spectrum acquisition, installation progress, and the total number of route miles where revenue service demonstration has been initiated or PTC is in operation. See 49 U.S.C. § 20157(c) (1); 49 C.F.R. § 236.1009(a)(5).

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must submit a formal test request for FRA approval that includes, among other things, the specific test procedures, dates and locations for testing, and the effect the tests will have on current operations. The multiple stages of PTC testing include:

- **Laboratory testing:** locomotive and wayside equipment testing in a lab environment to verify that individual components function as designed.
- **Field testing:** includes several different tests of individual components and the overall system, such as testing of each locomotive type to verify that it meets functional requirements and field integration testing—a key implementation milestone to verify that each PTC component is integrated and functioning safely as designed.
- **Revenue service demonstration (RSD):** an advanced form of field testing in which the railroad operates PTC-equipped trains in regular service under specific conditions.<sup>16</sup> RSD is intended to validate the performance of the PTC system as a whole and to test the system under normal, real-world operations.
- **Interoperability testing:** host and tenant railroads that operate on the same track must work together to test interoperability to ensure each railroad can operate seamlessly across property boundaries. Almost all of the 40 railroads currently required to implement PTC must demonstrate interoperability with at least one other railroad's PTC system.

Using results from field and RSD testing, combined with other information, host railroads must then submit a safety plan to FRA for approval.<sup>17</sup> We have previously reported that these safety plans are about 5,000 pages in length.<sup>18</sup> Once FRA approves a safety plan, the railroad receives PTC system certification, which is required for full implementation, and is authorized to operate the PTC system in revenue service. According to FRA officials, the FRA may impose conditions to the PTC safety plan approval as necessary to ensure safety, resulting in a conditional certification.

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<sup>16</sup> Results and data from RSD testing are also used to support the safety case outlined in each host railroad's safety plan.

<sup>17</sup> 49 C.F.R. § 236.1015.

<sup>18</sup> GAO-18-367T.

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Railroads may receive a maximum 2-year extension from FRA past the December 31, 2018, deadline if they meet six criteria set forth in statute. Specifically, railroads must demonstrate, to the satisfaction of FRA, that they have: (1) installed all PTC system hardware consistent with the total amounts identified in the railroad's implementation plan; (2) acquired all necessary spectrum consistent with the implementation plan;<sup>19</sup> (3) completed required employee training; (4) included in a revised implementation plan an alternative schedule and sequence for implementing the PTC system as soon as practicable but no later than December 31, 2020; (5) certified to FRA that they will be in full compliance with PTC statutory requirements by the date provided in the alternative schedule and sequence; and (6) for Class I railroads and Amtrak, initiated RSD or implemented a PTC system on more than 50 percent of the track they own or control that is required to have PTC. For commuter and Class II and III railroads, the sixth statutory criterion is to have either initiated RSD on at least one territory required to have operations governed by a PTC system or "met any other criteria established by the Secretary," which FRA refers to as "substitute" criteria.<sup>20</sup>

FRA is responsible for overseeing railroads' implementation of PTC, and the agency monitors progress and provides direct assistance to railroads implementing PTC. For example, FRA officials provide technical assistance to railroads, address questions, and review railroad-submitted documentation. FRA has a PTC Staff Director, designated PTC specialists in the eight FRA regions, and additional engineers and test monitors responsible for overseeing technical and engineering aspects of implementation and reviewing railroads' submissions and requests, as well as programmatic support staff. In anticipation of the upcoming implementation deadline, in May 2017, FRA began to send notification letters to railroads it determined were at risk of both not meeting the December 31, 2018, implementation deadline and not completing the requirements necessary to qualify for an extension. FRA identified "at-

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<sup>19</sup>PTC uses radio spectrum to communicate a train's location, speed restrictions, and movements. Radio frequency spectrum is the medium for wireless communications and supports a vast array of commercial and governmental services. Commercial entities also use radio frequency spectrum to provide a variety of wireless services, including mobile voice and data.

<sup>20</sup>49 U.S.C. § 20157(a)(3)(B). FRA defines a "territory" as an entire installation/ track segment as identified in a railroad's PTC implementation plan (e.g., a track segment, territory, subdivision, district, etc.).

“at-risk” railroads by comparing a railroad’s hardware installation status to the total hardware required for PTC implementation, according to the railroad’s implementation plan. FRA has increased the “at-risk” threshold percentage over time as the deadline approaches. (See Table 1).

**Table 1: Installation Thresholds Used over Time by the Federal Railroad Administration (FRA) to Determine Railroads At-Risk for Missing Positive Train Control (PTC) Implementation Deadlines**

Date of railroad’s progress from quarterly reports used to determine whether at-risk	Threshold of percentage of hardware installed relative to railroad’s implementation plan—below which railroads considered “at-risk”	Date of FRA at-risk letters sent to railroads	Number of at-risk railroads identified by FRA
December 31, 2016	50	May 2017	17
December 31, 2017	80	April 2018	15
March 31, 2018	85	June 2018	12
June 30, 2018	90	August 2018	9

Source: GAO presentation of Federal Railroad Administration information. | GAO-19-135T.

FRA has additional oversight tools, which include use of its general civil penalty enforcement authority for failure to meet certain statutory PTC requirements.<sup>21</sup> FRA has used this authority in 2017 and 2018 to assess civil penalties, primarily against passenger railroads that failed to comply with the equipment installation milestones, the spectrum acquisition milestones, or both, that the railroads had established in their implementation plans for the end of 2016 and 2017.

As part of our body of work on PTC, we found that railroads face numerous PTC implementation challenges and made recommendations to FRA to improve its oversight of implementation. Specifically, in 2013 and 2015 we found that many railroads were struggling to make progress due to a number of complex and interrelated challenges, such as developing system components and identifying and correcting issues discovered during testing. For example, we found in March 2018 that FRA had not systematically communicated information or used a risk-based approach to help commuter railroads prepare for the 2018 deadline or to qualify for an extension.<sup>22</sup> We also found that many railroads were concerned about FRA’s ability to review submitted documentation in a timely manner, particularly given the length of some required documentation such as safety plans and FRA’s limited resources for

<sup>21</sup> 49 U.S.C. § 20157(e).

<sup>22</sup> GAO-18-367T.

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document review. In March 2018, we recommended FRA identify and adopt a method for systematically communicating information to railroads and use a risk-based approach to prioritize its resources and workload. FRA agreed with our recommendations. Most recently, in September 2018, we testified on the status of railroads' implementation of PTC.<sup>23</sup>

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## Many Passenger Railroads Remain in Early Stages of PTC Implementation and FRA Has Clarified Extension Requirements

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### Passenger Railroads Continue to Install and to Test PTC Systems, and Report Previously Identified Implementation Challenges

As of June 30, 2018, many passenger railroads reported that they remain in the equipment installation and field-testing stages, which are early stages of PTC implementation. However, since we testified in March 2018, railroads have made progress on equipment installation. Based on our analysis of the 40 railroads' reported status as of June 30, 2018, about half of the railroads have completed equipment installation, and many others are nearing completion of this stage. Specifically, 20 of the 29 passenger railroads reported being more than 90 percent complete with locomotive equipment installation. Nearly two-thirds of passenger railroads that must install wayside equipment reported being more than 90 percent complete.<sup>24</sup> One-third of passenger railroads are among those designated by FRA as at-risk of both not meeting the end of 2018 implementation deadline and not completing the requirements necessary to qualify for an extension. Specifically, in August 2018, FRA identified nine railroads—all commuter railroads—as at-risk, fewer than the 12 railroads FRA had previously designated as at-risk in its June 2018 letters to railroads.

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<sup>23</sup>See GAO, *Positive Train Control: Most Railroads Expect to Request an Extension, and Substantial Work Remains Beyond 2018*, GAO-18-692T (Washington, D.C., Sept. 13, 2018).

<sup>24</sup>As of June 30, 2018, seven passenger railroads reported that they were not required to install wayside equipment because either their hosts were responsible for installation of wayside equipment, or the PTC system being installed did not require it. We did not include these railroads when we analyzed railroads' progress in wayside equipment installation.

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Since we reported in March 2018, Amtrak reported that it has initiated both field testing and RSD, but most commuter railroads reported slower progress with testing, especially with RSD. For example:

- **Laboratory and initial field testing:** 19 of 28 commuter railroads reported having initiated this testing as of June 30, 2018; this number represents six more commuter railroads than the 13 we previously reported as having initiated field testing as of September 30, 2017.<sup>25</sup>
- **RSD testing:** Eight of 28 commuter railroads reported initiating RSD testing as of June 30, 2018; this number represents two more commuter railroads than the six we previously reported as having entered RSD testing as of September 30, 2017. As noted earlier, unless a commuter railroad receives approval for using substitute criteria, the railroad must initiate RSD, a final stage of PTC testing, on at least one territory by December 31, 2018, to qualify for an extension.

Passenger railroad representatives reported that they continued to face many of the same challenges we have previously identified, including limited industry-wide availability of vendors and expertise and software defects. For example, in response to our questionnaire, 12 of 29 passenger railroads reported challenges with PTC vendors and contractors. One passenger railroad noted that because its contractor manages PTC projects across the country with the same deadline and requirements, it can be difficult for all railroads to get the resources they need from their contractor. We previously reported that there are a limited number of vendors available to design PTC systems, provide software and hardware, and conduct testing. For example, we reported in 2015 that, according to railroad industry representatives, there were two vendors for the onboard train management computer and three vendors for the wayside equipment.<sup>26</sup> One small passenger railroad recently testified that, because a single manufacturer was providing PTC equipment and software to many railroads across the country, it had to wait over a year for PTC equipment to be delivered and installed. We also

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<sup>25</sup>See [GAO-18-3677](#). We determined a railroad to have initiated testing if it met one of the following criteria: (1) at least one track segment reported as “testing,” (2) at least one track segment reported as “operational/complete;” or (3) at least one route mile reported as in testing. Accordingly, “testing” in this context includes a range of testing activities from laboratory testing to on-track field integration testing. Additionally, because field testing is a prerequisite for RSD, these counts include some railroads that may have also initiated RSD.

<sup>26</sup>[GAO-15-739](#).

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previously reported that railroads face software challenges, and noted that railroads had concerns with the number of defects identified during software testing, since these take time to address. In response to our questionnaire, nine passenger railroads reported encountering challenges related to maturity of the PTC software systems, such as working through software bugs or defects during testing.

As passenger railroads work to complete PTC implementation activities, some have made service or schedule adjustments to accommodate the need to install equipment or perform testing. Moreover, several passenger railroads told us that as PTC implementation schedules become more compressed, avoiding effects on passengers becomes more difficult. We identified 10 passenger railroads that have made changes to their operations due, in part, to PTC implementation, including the six largest commuter railroads in the country, which collectively reported over 400 million passenger trips in 2017. These changes had effects such as reduced service or longer travel times.<sup>27</sup> For example, one of the largest passenger railroads in the country reduced service on certain routes and eliminated some express trains to accommodate schedules enabling them to complete PTC equipment installation prior to the December 2018 deadline. Another large passenger railroad has shutdown weekend service—providing bus service to transport passengers between stations—for PTC testing. Several passenger railroads had to reduce service for equipment or track installation or testing, resulting in fewer locomotives or less track available for service.

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### FRA Has Recently Clarified Extension Requirements

In June, July, and August 2018, FRA held three PTC symposiums that were attended by representatives from all 40 railroads and that focused on the extension process and substitute criteria, PTC testing, and safety plans, respectively. FRA's June 2018 symposium covered information consistent with our March 2018 recommendation that the agency adopt a method for systematically communicating information related to the requirements and process for an extension to railroads.<sup>28</sup> Specifically, FRA presented information on the procedures for requesting and obtaining FRA's approval for an extension to implement PTC beyond the

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<sup>27</sup>We identified these service changes based on railroads' responses to our questionnaire and in interviews and public statements made by railroad officials.

<sup>28</sup>[GAO-18-367T](#).

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December 2018 deadline including FRA's review process.<sup>29</sup> FRA also clarified that for commuter railroads, initiating field testing was one approach that could potentially qualify as substitute criteria, rather than initiating RSD.<sup>30</sup>

Representatives we interviewed from the passenger railroads that participated in the symposiums found them to be helpful, and some passenger railroads reported that the information presented led them to adjust their approach to meeting the December 2018 deadline. For example, one passenger railroad representative we spoke to said that until the symposium, he was unaware that using field testing as substitute criteria was a potential option. Some passenger railroads we met with also told us they are re-evaluating what activities and documentation need to be revised and submitted to FRA before the December 2018 deadline based on the information presented at the symposiums. For example, representatives from one passenger railroad we met with said that FRA officials encouraged them to update their PTC implementation plan right away with current equipment installation totals, to ensure consistency across all required documentation by the end of 2018. A couple of passenger railroads noted that the information presented at the symposiums clarified many questions and would have been beneficial to know a year or two earlier in the implementation process.

In addition, in recent months FRA has continued to provide assistance to railroads and has taken a series of steps to better prepare railroads for the 2018 deadline. These steps include meeting regularly with individual railroads and developing approaches intended to help many railroads meet the requirements necessary for a deadline extension. For example, representatives from one commuter railroad said agency officials have been willing to share lessons learned, clarify requirements, and review draft documentation to provide informal feedback.

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<sup>29</sup>FRA has 90 days to approve a railroad's alternative schedule and sequence plan and provide notification to the railroad of its decision. See 49 U.S.C. § 20157(a)(3)(C); 49 C.F.R. § 236.1011(a), (c). Within 45 days of receiving notification of a railroad's alternative schedule and sequence plans, FRA must provide to the railroad notification of any deficiencies that would prevent FRA approval and provide an opportunity to correct the deficiencies.

<sup>30</sup>FRA officials note that each application for substitute criteria is different, with different circumstances, and that applications are evaluated individually on a case-by-case basis by FRA.

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## Passenger Railroads and FRA Are Working toward Extensions, Leaving Substantial Work to Be Completed Beyond 2018

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### Most Passenger Railroads Anticipate Needing an Extension, and Many Plan to Start RSD Testing Beyond 2018

Almost three-quarters of passenger railroads (21 of 29) reported to us that they plan to apply for an extension.<sup>31</sup> Five passenger railroads reported to us that they planned to submit their extension request by the end of September 2018, but as of September 21, 2018, only one had submitted the request and required documentation. However, FRA officials noted that with the exception of possibly one or two railroads, they anticipate that all passenger and freight railroads will likely need an extension, and that railroads must submit their requests by the end of the year to be considered in compliance with PTC requirements. A railroad must demonstrate that it has met all of the statutory criteria necessary to qualify before, or when, it formally requests an extension. And as previously discussed, many railroads remain in the early stages of PTC implementation. Of the eight passenger railroads that anticipate reaching full implementation by December 31, 2018, six are already operating under conditionally certified safety plans; one has submitted its safety plan for review; one plans to submit its safety plan to FRA in fall 2018 for certification.<sup>32</sup> FRA officials stated that it is unclear whether the passenger railroads that have obtained conditional PTC System Certification will have achieved full implementation on all route miles by December 31, 2018.

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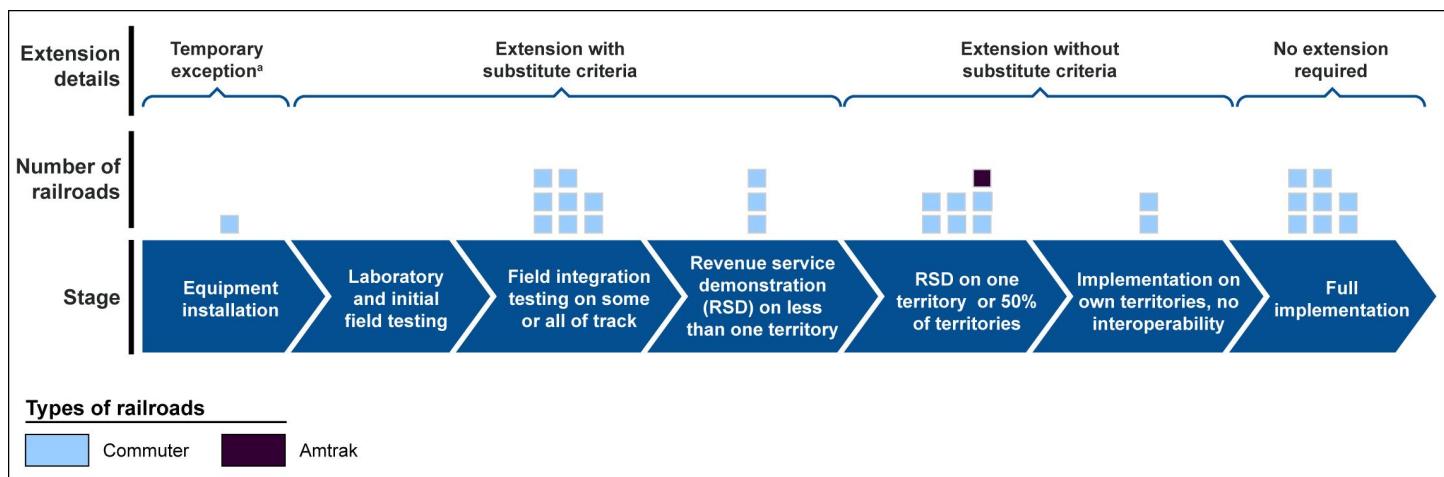
<sup>31</sup>According to FRA officials, tenant-only railroads are not required to apply for an extension but are covered under extensions applied for and granted to their host railroad(s). Therefore, we considered tenant railroads that told us that their hosts would be applying for an extension on their behalf as part of the 21 railroads cited here. This total includes two total tenant railroads that told us that they would require an extension because one or more of their hosts would not reach full implementation.

<sup>32</sup>This includes some tenant railroads that are included in their hosts' conditionally-certified safety plans and that have achieved, or expect to achieve, full interoperability with those host(s).

Of the 21 passenger railroads that intend to apply for an extension, more than half—all commuters—reported that they plan to use substitute criteria to qualify.<sup>33</sup> Moreover, two-thirds of the commuter railroads (8 of 12) that plan to use substitute criteria intend to apply to use their initiation of field integration or functional testing as substitute criteria, and many of these will apply to begin field testing on only a portion of their track.

Figure 1 depicts the stage of PTC implementation that passenger railroads at least expect to reach by December 31, 2018, in order to be in compliance with the deadline, based on railroads' responses to our July-August 2018 questionnaire.

**Figure 1: Number of Passenger Railroads Expected in Each Positive Train Control (PTC) Implementation Stage by December 31, 2018**



Source: GAO. | GAO-19-135T

Note: This graphic is based on railroads' self-reported expectations and approaches to be in compliance by December 31, 2018. Railroads may make more or less progress than expected. For tenant-only railroads—railroads that only run on hosted track—we considered both the tenant and the host railroads' reported expectations, including for extensions, which, according to FRA, are generally applied for and granted to host railroads but which also cover tenants.

<sup>a</sup>Railroads that were granted a temporary mainline track exception may remain in the installation stage. FRA can grant main line exceptions under certain conditions, such as through limited operations. 49 C.F.R. § 236.1019(c).

<sup>33</sup>As previously mentioned, only commuter and Class II and III freight railroads may apply for substitute criteria. Class I freight railroads and Amtrak are not authorized to receive an extension using substitute criteria. According to publicly available documents and FRA, as of September 21, 2018, eight commuter railroads had submitted substitute criteria applications to FRA for approval, and FRA had approved seven.

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Although FRA has recently made clear that it is authorized to grant extensions based on initiating field testing or other FRA-approved substitute criteria, this approach defers time-intensive RSD testing into 2019 and beyond. For example, one commuter railroad we met with has applied for, and was granted approval by FRA to use, the initiation of field testing on a 16.5-mile segment of track as substitute criteria to qualify for an extension. That railroad must ultimately implement PTC over 321 miles of track that it owns and operates over, meaning that it will need to complete field testing, RSD, and interoperability testing on the remaining 95 percent of its track and achieve system certification prior to the 2020 deadline. In March 2018, we testified that FRA officials told us that moving from the start of field testing to the start of RSD can take between 1 and 3 years, and has averaged about 2 years for those railroads that have completed that stage. We also reported that FRA officials believe that most railroads underestimate the amount of time needed for testing.<sup>34</sup> FRA officials told us that they do not consider railroads that are approved for an extension under substitute criteria to be necessarily at a higher risk of not completing PTC implementation by 2020. However, in light of these time estimates and the unknown challenges that railroads may face during testing, railroads that are in the early field-testing stage moving into 2019 could face challenges completing PTC implementation by the extended December 2020 deadline.

Railroads further behind in PTC implementation may need to apply for an extension due to factors such as compressed implementation schedules, as well as the time needed for FRA approvals. For example, representatives from one commuter railroad said that they hope to reach RSD before the December 31, 2018, deadline, but that it would be difficult to meet the extension requirements, apply for, and receive an extension given the volume of paperwork FRA will be receiving at the end of the year. Instead, the railroad plans to submit an extension request using substitute criteria consisting of field testing in order to be in compliance at the end of the year. Such an approach involves first applying for and receiving approval for substitute criteria and then formally requesting an extension and submitting supporting documentation to FRA before the end of the year. Entering RSD prior to the deadline could be difficult given that FRA officials told us they have advised railroads to allow at least a month for FRA's review of test requests, which must be approved prior to initiating field testing and RSD.

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<sup>34</sup> GAO-18-367T.

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Some passenger railroads also reported challenges regarding host and tenant responsibilities, including coordination and interoperability—which are likely to continue beyond 2018. Some passenger railroads told us that coordinating with host or tenant railroads that are in different implementation stages as the 2018 deadline approaches poses several challenges. For example, a few passenger railroads told us that they are unable to conduct interoperability testing because their host or tenant railroad has not yet reached that stage of implementation. Additionally, officials from Amtrak—which interoperates with 21 other railroads—noted that the host-tenant relationship can be complicated and requires a high level of coordination to resolve issues between railroads. Amtrak officials also told us they were conducting risk assessments to determine whether and how to continue service in situations where their host or tenant railroad has not completed PTC implementation or met the requirements necessary for an extension. While few passenger railroads have reached the interoperability stage, one railroad association stated that interoperability is, and will continue to be, a substantial challenge for metropolitan areas with dense and complex rail networks with several host-tenant relationships. For example, according to one passenger railroad, 14 different freight and passenger railroads will need to interoperate in the Chicago area.

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### FRA's Substantial Workload Remains a Concern

FRA's already substantial workload is expected to increase as railroads continue to submit documentation necessary for extensions and continue PTC implementation activities. FRA is focused on ensuring railroads are in compliance by the December 2018 deadline—whether via an extension or by completing implementation. While FRA officials report that they anticipate almost all railroads will likely request an extension, only one passenger railroad had submitted an application for an extension as of September 21, 2018.<sup>35</sup> FRA will need to review and approve all related documentation associated with each extension request and make a determination within 90 days, meaning if a railroad were to submit its extension request on December 31, 2018, FRA would have until the end

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<sup>35</sup>Three railroads—two Class I freight railroads and one passenger railroad—had submitted an application for an extension as of September 21, 2018. FRA has approved only one railroad's revised PTC implementation plan and alternative schedule and sequence as of September 21, 2018.

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of March 2019 to approve or deny the railroad's extension request.<sup>36</sup> In addition to extension requests and supporting documentation, many passenger railroads will also be submitting to FRA: requests for substitute criteria, test requests to initiate field testing or RSD, revisions to PTC implementation plans, and PTC safety plans. Some of these documents can be lengthy and require back and forth between FRA and railroads before approval. For example, we previously reported that PTC safety plans are about 5,000 pages in length and take between 6 and 12 months for FRA to review.

To help manage the forthcoming influx of documentation, FRA officials have offered to review draft documentation, such as substitute criteria requests and test requests, and have advised railroads to take FRA's review times into account prior to submitting required documentation. FRA officials told us that in trying to manage their workload, they initially told railroads they did not have time to review draft submittals. However, they found that taking the time to conduct draft reviews ultimately led to higher quality formal submittals and accelerated the overall review process. In addition, FRA officials said that their goal is to not delay any railroad that is ready to move into testing, and that they advised railroads to build 30 to 45 days for test request reviews into their project schedules.

Despite these efforts, some passenger railroads remain concerned about the agency's ability to manage the PTC workload in the coming months and beyond 2018. For example, seven of 29 passenger railroads identified FRA's resources and review times as a challenge leading up to the December 2018 deadline. In addition, three passenger railroads reported that they would complete all the requirements for full PTC implementation by the December 31, 2018, deadline, but planned to apply for an extension due to concerns that FRA would not be able to review and certify their safety plans to enable them to reach full implementation prior to the deadline. Based on similar concerns, in March 2018, we recommended FRA develop an approach to prioritize the allocation of resources to address areas of greatest risk as railroads work to complete PTC implementation.<sup>37</sup> FRA has acknowledged the railroads'

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<sup>36</sup>FRA officials noted that FRA's decision is based on whether the railroad has met the statutory criteria for an alternative schedule, and that if the requesting railroad meets all applicable statutory criteria, FRA must approve the alternative schedule. 49 U.S.C. § 20157(a)(3)(C). According to FRA officials, if FRA's review and decision regarding a railroad's request for an alternative schedule is pending on or after January 1, 2019, the statute extends the December 31, 2018, deadline until the date of FRA's decision.

<sup>37</sup>[GAO-18-367T](#).

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concern given the surge of submissions requiring FRA approval in 2018 and has reported the agency is reallocating existing expertise and expanding the PTC workforce through training, expanding contracts with existing support contractors, and initiating one additional contract to provide technical support. For example, FRA officials told us that they reallocated resources to shift PTC specialists' responsibilities to focus exclusively on testing-related activities because their involvement is critical for the testing stage. Taking steps to prioritize limited resources will only increase in importance as the amount of documentation needing FRA review continues to grow in 2019 and 2020, as railroads move through testing and submit complex and lengthy safety plans.

Although FRA has taken steps to provide key extension information to railroads and to help ensure railroads' compliance with PTC deadlines, uncertainty remains, particularly in regard to FRA's enforcement strategy if railroads are noncompliant with the PTC implementation requirements, such as if railroads were to fail to apply for an extension by the deadline. Representatives from all railroads implementing PTC with whom we met told us that FRA's planned enforcement approach for any railroad that fails to meet the requirements for an extension beyond 2018 is unclear. FRA officials told us they have shared the range of applicable civil penalties with railroads for years,<sup>38</sup> but that any policy decision about how potential fines will be levied for non-compliant railroads has not yet been made. In addition, it is also unclear how the agency would approach enforcement for railroads that have a host or tenant operating on their tracks that has not completed implementation or met the requirements necessary for an extension. Ten of the 13 passenger railroads we met with told us they do not currently have or see a need to develop contingency plans. For example, representatives from one passenger railroad said they did not have a contingency plan because FRA has made clear they are committed to helping railroads comply with the 2018 deadline. FRA officials said that the goal of enforcement is to help bring all railroads into compliance and that they would look at the specific circumstances for any host-tenant issues before assessing a fine.

In conclusion, almost all passenger railroads will likely request an extension beyond 2018, which will require FRA approval. Many commuter railroads plan to request substitute criteria which may result in those

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<sup>38</sup>FRA officials noted that the schedule of civil penalties is provided for in governing regulations. See 49 C.F.R. pt. 236, App. A.

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railroads remaining in the early stages of PTC implementation at the start of 2019. However, given that only one passenger railroad has submitted an extension request, it is unlikely we will know how many railroads will be granted an extension by the December 31, 2018 deadline. While few passenger railroads had developed contingency plans when we met with them, as December nears and schedules become further compressed, additional railroads may have to make service or schedule adjustments to help them reach compliance with the deadline. Although FRA has reported taking some actions in response to our March 2018 recommendation that they better prioritize resources, FRA resources and review times remain a significant concern—both for near-term efforts such as extension requests and for the safety plans that need to be reviewed and certified prior to the end of 2020. These issues—combined with the ongoing implementation, testing, and interoperability challenges that a number of railroads reported to us—raise questions as to the extent FRA and the nation's passenger railroads are poised for full PTC implementation by December 31, 2020.

Chairman Thune, Ranking Member Nelson, and Members of the Committee, this concludes my prepared statement. I would be pleased to respond to any questions that you may have at this time.

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## GAO Contact and Staff Acknowledgments

If you or your staff have any questions about this testimony, please contact Susan Fleming, Director, Physical Infrastructure at (202) 512-2834 or [FlemingS@gao.gov](mailto:FlemingS@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. GAO staff who made key contributions to this testimony are Susan Zimmerman (Assistant Director); Katherine Blair; Greg Hanna; Delwen Jones; Emily Larson; Joanie Lofgren; SaraAnn Moessbauer; Maria Wallace; and Crystal Wesco.

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