OFFICE of INSPECTOR GENERAL
NATIONAL RAILROAD PASSENGER CORPORATION

TRAIN OPERATIONS:

Better Estimates Needed of the Financial Impacts of Poor On-Time Performance

OIG-A-2020-001 | October 14, 2019

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AMTRAK OFFICE *of* INSPECTOR GENERAL
NATIONAL RAILROAD PASSENGER CORPORATION

Memorandum

To: Stephen Gardner
Senior Executive Vice President / Chief Operating and Commercial Officer

From: Jim Morrison
Assistant Inspector General, Audits

Date: October 14, 2019

Subject: *Train Operations: Better Estimates Needed of the Financial Impacts of Poor On-Time Performance* (OIG-A-2020-001)

On-time performance (OTP)[1] of Amtrak's (the company) trains has been a longstanding challenge for the company, which identifies poor OTP as a key factor driving its annual operating loss—about $171 million in fiscal year (FY) 2018. In that year, 27 percent of the company's trains were late, with some routes performing better than others. The company's best performing routes were its state supported and Northeast Corridor (NEC) lines, which arrived on time 81 percent and 78 percent of the time, respectively. Long distance routes, however, typically performed the worst; just 46 percent of trains arrived on time, and the average delay was 49 minutes.

Experts agree that there is a financial correlation between trains being on time and a railroad's financial performance. A 2008 report by the Department of Transportation (DOT) Office of Inspector General (OIG) quantified the financial impacts of the company's poor OTP.[2] That report found that poor OTP weakens the company's financial position by reducing revenues and increasing operating costs.

In February 2019, Congress directed[3] our office to update DOT OIG's report. To fulfill this mandate, we developed an econometric model that estimates ranges of short-term revenue opportunities and cost savings based on improved OTP.[4] We modeled the financial impacts of improving OTP on each route by 5 percentage points, which is more conservative than prior efforts and below the company's stated OTP goals.

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[1] OTP is defined as how a train performs compared with its published, scheduled arrival time at each station and final destination on its route.

[2] DOT OIG, *Effects of Amtrak's Poor On-Time Performance*, (CR-2008-047), March 28, 2008.

[3] See the Conference Report (H.R. Rep. No. 116-9) accompanying the Consolidated Appropriations Act of 2019, Pub. L. No. 116-6 (February 15, 2019).

[4] Our forecasts do not include penalties and incentives to the freight (or host) railroads that own some of the tracks the company uses or revenue from food and beverages because their relationship to OTP is difficult to model.

We validated our approach with public- and private-sector economists and a statistician and, although it differs from prior efforts, it allows us to forecast with more confidence. Comparing our forecasts with prior forecasts, however, is not appropriate given the differences in approaches.

In addition, we met with company officials to identify the potential long-term financial impacts of significant and sustained improvements to OTP—particularly on long distance routes. Finally, we used company financial and operating data to estimate the potential financial impact of some of these improvements. We did not attempt to identify the various causes of poor OTP. Rather, we focused the audit on identifying potential cost savings and revenue improvements associated with improved OTP.

SUMMARY OF RESULTS

Ensuring that trains arrive on time is an important element in the company's strategy to reduce its operating losses: more reliable performance helps retain existing customers and attract new riders while reducing labor, fuel, and other operating costs. Using company data on costs and ticket revenues, we identified the following short-term and long-term financial benefits of improving OTP:

- **The short-term benefits**. We estimate that improving OTP on each route by 5 percentage points—a conservative assumption based on common forecasting principles[5]—could result in net financial short-term benefits of $12.1 million in the first year, including $8.2 million in reduced costs and $3.9 million in increased revenue. These benefits would accrue immediately based on shorter train-operating times and improved customer satisfaction. Our decision to forecast a 5 percentage point increase was strictly a modeling decision and not a ceiling on what we expect the company could achieve under more favorable circumstances. Similar to the findings in prior reports, we would expect greater financial impacts to follow more significant improvements in OTP.

- **The long-term benefits.** Using company data and estimates, we identified a range of other financial benefits that could accrue if the company was able to improve OTP to a minimum level of 75 percent on long distance trains and sustain those improvements for at least a year. Based on company and our own analyses, we identified opportunities to realize at least $41.9 million per year in additional cost

[5] According to common forecasting principles and our subject matter experts, forecasts become increasingly unreliable the further they predict outside the range of historical experience.

savings and revenue improvements and an estimated $336 million in one-time savings associated with reduced equipment replacement needs.

We also found that the company does not fully and systemically measure the impacts of poor OTP and therefore has limited data to discuss OTP's financial consequences with stakeholders such as Congress and affected parties. Although the company developed OTP cost and revenue forecasting models in FY 2015, it has not kept them up to date, in part because managers said that financial data alone were not persuasive in convincing freight railroads to help improve the performance of Amtrak trains operating on their tracks. We found, however, that producing timely, accurate, and comprehensive financial data on the impacts of poor OTP would support the company's quest to achieve operating self-sufficiency and would also inform ongoing congressional assessments of the company's funding and other legislation relating to passenger rail.

Accordingly, we recommend that the company update its models to improve the reliability of its forecasts of the short-term financial impacts of various rates of OTP and use its models to develop more reliable estimates of the financial impacts of delays associated with various business activities.

In commenting on a draft of this report, the Senior Executive Vice President / Chief Operating and Commercial Officer agreed with our recommendation but commented that a forecast associated with significantly improved OTP would be more useful to the company than a forecast based on modest improvements. However, in order to produce a reliable forecast, we based our modeling decisions on common forecasting principles that recommend developing forecasts using ranges more closely aligned with historical rates of OTP. We anticipate that once the company updates its models—consistent with our recommendation—it can use them to model various levels of OTP improvement. For management's complete response, see Appendix C.

BACKGROUND

The company tracks OTP for all three of its service lines: the NEC, state supported routes, and long distance routes. In the NEC, the company owns most of the track and controls train movements. On its state supported and long distance routes, however, freight (or host) railroads generally own the tracks and dispatch trains.
Although federal law[6] requires host railroads to give passenger trains preference over

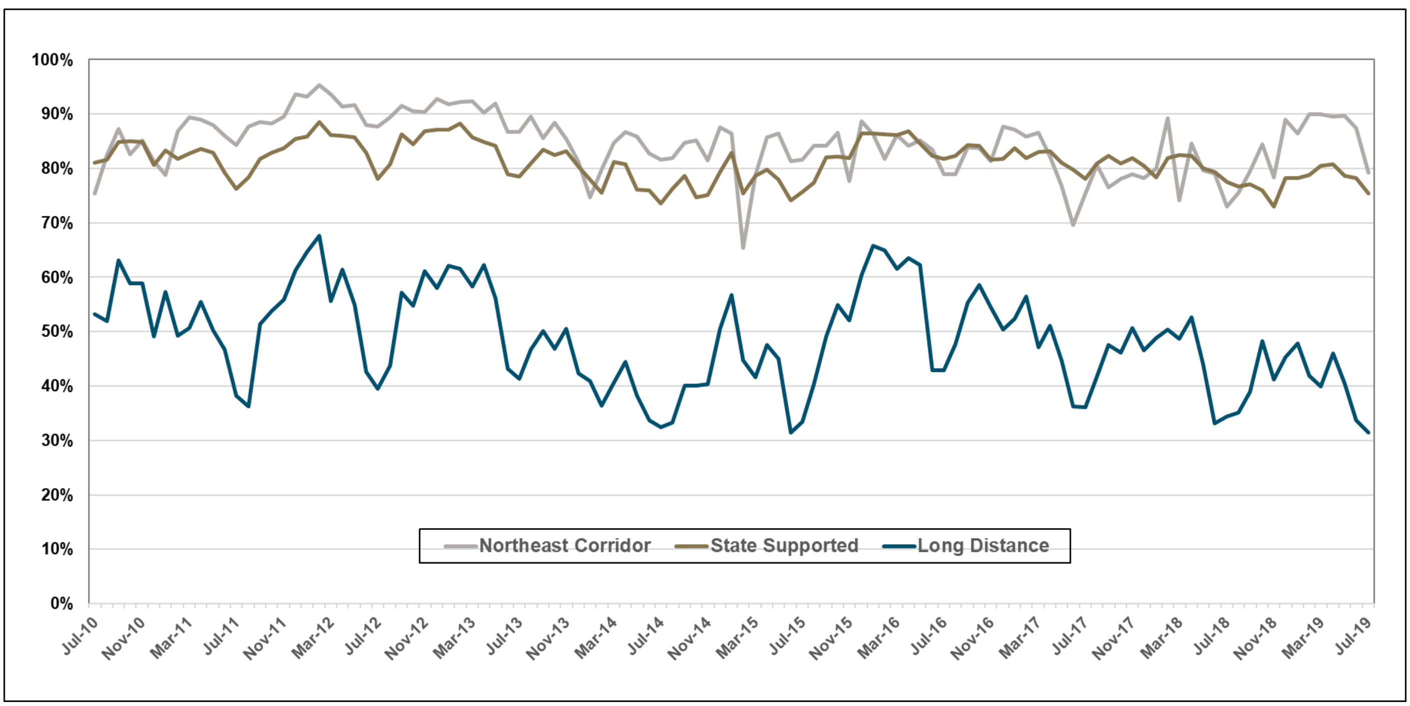
[6] Under 49 U.S.C. 24308(c), the company has a statutory right to operate over host railroad tracks and has been granted preference over freight transportation in using a rail line, junction, or crossing.

freight trains, company executives have stated publicly that host railroads routinely disregard these laws, resulting in delays. The company also provides financial incentives and penalties to encourage host railroads to support the company's OTP goals. Over the past three years, the company has paid an average of about $32.8 million each year in incentive payments to host railroads.

Nonetheless, for the first 9 months of FY 2019, the company reported that freight railroads were responsible for about 59 percent of the delays on its long distance routes. Poor OTP, however, can result from a variety of other factors such as late-arriving crews and malfunctioning equipment. Factors outside the company's control such as bad weather and congestion can also drive delays.

Historically, the company's long distance routes have had the poorest OTP. From July 2010 through July 2019, OTP on long distance routes ranged from 31.4 percent to 67.6 percent (see Figure 1).

Figure 1: OTP Trends, July 2010–July 2019



Source: Amtrak OIG analysis of Amtrak data

Note: The company uses several metrics to measure OTP. This figure shows "all-stations OTP," which compares a train's actual arrival times at each station on its route with its scheduled arrival times.

Three departments have responsibilities related to quantifying the revenue and cost impacts of poor OTP and maintaining costs and OTP data:

- **The Marketing and Revenue department** has primary responsibility for quantifying the revenue and ridership impacts of poor OTP and developing train schedules that incorporate OTP-related issues, such as recovery time to cover expected delays. The department has econometric models, which it procured in 2015, that can forecast the revenue, ridership, and cost impacts of poor OTP.

- **The Finance department** maintains data on the costs associated with train delays, including the cost of overtime at stations, overtime for train crews, and compensation for inconvenienced passengers. It also maintains data on the cost of incentive payments to host railroads. These data feed the OTP models (when used) and managers can also use the data to develop estimates of longer term savings at higher, sustained levels of OTP.

- **The Operations department** is responsible for collecting, managing, and reporting OTP operations data to external and internal users, such as federal agencies, host railroads, and various company managers and departments. For example, the company uses these operating data to produce the Host Railroad Performance Report Cards.

IMPROVING OTP COULD REDUCE COSTS AND INCREASE REVENUES

Even small improvements in OTP could reduce costs and increase revenues in the short term; in the longer term, our analysis of company data indicates that significant and sustained improvements could lead to substantial savings. By quantifying these impacts, the company would better fulfill its mandate to operate as a for-profit corporation, understand how OTP relates to its financial goals, and support external decision makers.

Small Improvements in OTP Could Result in Short-Term Benefits of About $12 Million

We estimate that improving OTP by 5 percentage points on all routes would produce a net financial benefit of $12.1 million in the first year. This level of improvement would reduce operating costs by about $8.2 million and increase ticket revenue by about $3.9 million. These benefits would primarily help the financial performance of the long distance business line, which has the highest operating losses. On a route basis, however, the largest gains would be on the two NEC routes. If OTP improved by more than 5 percentage points, the company would likely realize significantly greater benefits.

We did not try to forecast the impacts of OTP improvements greater than 5 percentage points. According to common forecasting principles and external subject matter experts, forecast results become increasingly unreliable the further the forecast scenario is outside the range of historical experience.[7] Nonetheless, based on our observations that improving OTP leads to financial improvements, we would expect to see a marked increase in revenues if average OTP on each route improved by 30 to 40 percentage points, which would bring performance on long distance routes more in line with NEC and state supported services, and what executives have stated as company goals. For a more detailed description of our methodology, along with our statistical test results, see Appendix B.

Specifically, we used company cost and revenue data to identify the following financial impacts:

- **$8.2 million in cost savings**. These savings would result from changes such as shorter train run times, which would reduce labor costs for conductors, engineers, and also for onboard service personnel, such as sleeper car attendants and dining car workers. Fewer delays would also decrease train idling, which would reduce fuel costs. In addition, improved OTP would decrease the frequency of missed connections, which would reduce the cost of providing hotel and food vouchers for inconvenienced passengers.

- **$3.9 million in additional revenue.** Improved service reliability would increase revenue and help support the company's future growth strategy, which focuses on developing shorter-distance markets around major city centers—markets that currently suffer from poor OTP. The company's service line plans identify growth opportunities in the south and west, which are experiencing significant population growth. The company's ability to maximize revenue in these markets, however, will depend on the quality of service it can provide, which includes

[7] For example, OTP on the *Crescent* averaged 46 percent from FY 2015 through FY 2018; therefore, predicting how passengers might respond if average OTP improved to 86 percent (a 40 percentage point increase) is far less reliable than predicting behavioral changes at 51 percent (a 5 percentage point increase).

predictability regarding when the trains will arrive and depart, according to company officials. Table 1 shows FY 2018 OTP rates and other delay data at major stations along the company's long distance routes in the south and west.

Table 1. FY 2018 OTP and Delay Data at Selected Stations in Major Cities

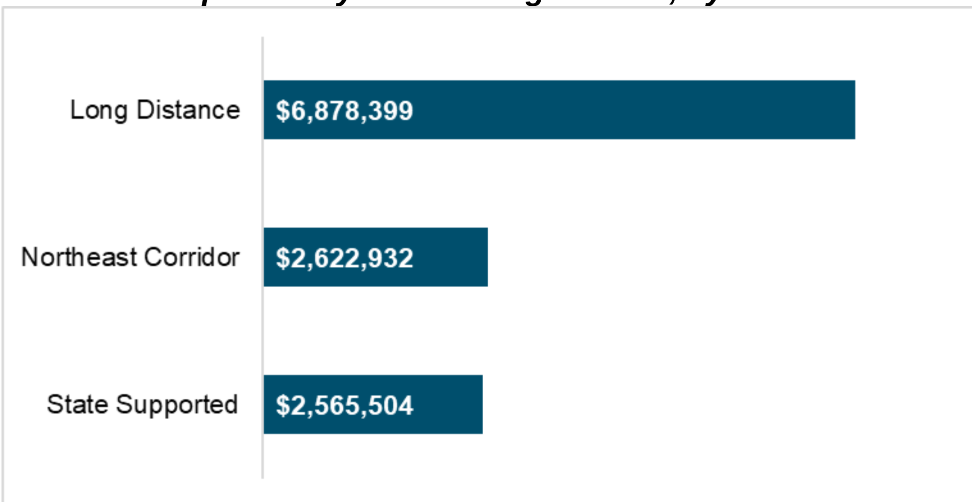
City	Route	Station OTP (% Arriving within 15 Minutes of Schedule)	Average Minutes Late	% Trains Delayed More than 2 Hours
Atlanta	*Crescent* (N)	3%	124	46%
Austin	*Texas Eagle* (W)	27%	82	23%
Birmingham	*Crescent* (S)	5%	109	34%
Charlotte	*Crescent* (N)	6%	147	57%
Charlottesville	*Cardinal* (E) *Crescent* (N)	35% 9%	71 142	17% 54%
Dallas	*Texas Eagle* (W)	39%	65	22%
Fort Lauderdale	*Silver Star* (S)	14%	101	32%
Houston	*Sunset Limited* (W) *Sunset Limited* (E)	40% 42%	53 66	12% 19%
Orlando	*Silver Star* (S)	35%	64	16%
Maricopa (Phoenix)	*Sunset Limited* (W)	33%	91	23%

Source: Amtrak OIG analysis of OTP data

Note: We selected cities based on the company's stated strategic focus areas; all but three were included by the United States Census Bureau in the top 10 metropolitan population growth areas from 2010 to 2018—Birmingham, Alabama; Charlotte, North Carolina; and Charlottesville, Virginia.

Using company revenue and cost data, we estimate that the net financial benefit would be greatest on long distance routes, which account for $6.9 million—more than half of the total impact (see Figure 2).

Figure 2. Total Estimated Financial Benefit If OTP Improved by 5 Percentage Points, by Service Line



Source: Output from Amtrak OIG statistical models

We also estimate that improving OTP by 5 percentage points would have significant route-level impacts in the NEC and some long distance routes. For the NEC, the company has a significant market share because highway and air congestion make train travel an attractive travel option—and improving OTP would further enhance this competitive advantage. By making these modest OTP improvements on the two NEC routes—the *Northeast Regional* and the *Acela*—we estimate net gains of about $1.5 million and $1.2 million, respectively. Among long distance routes, we estimate that the *Empire Builder*, *California Zephyr*, and *Southwest Chief* would generate the greatest net gains, exceeding $500,000 each.

Significantly Improved and Sustained Levels of OTP Could Drive Substantial Long-Term Cost and Revenue Improvements

Achieving and sustaining high rates of OTP, especially on long distance trains, would likely provide opportunities for the company to realize additional cost savings and revenues. Our analysis of company data confirmed that OTP has significantly impacted the company's operating costs over the past four decades. For example, the company has made financial accommodations for poor OTP by purchasing and maintaining extra equipment and keeping extra personnel on stand-by to ensure that the trains can keep running despite long delays. Further, poor OTP affects revenue opportunities.
For example, to minimize the impact of poor OTP on customer experience, the company

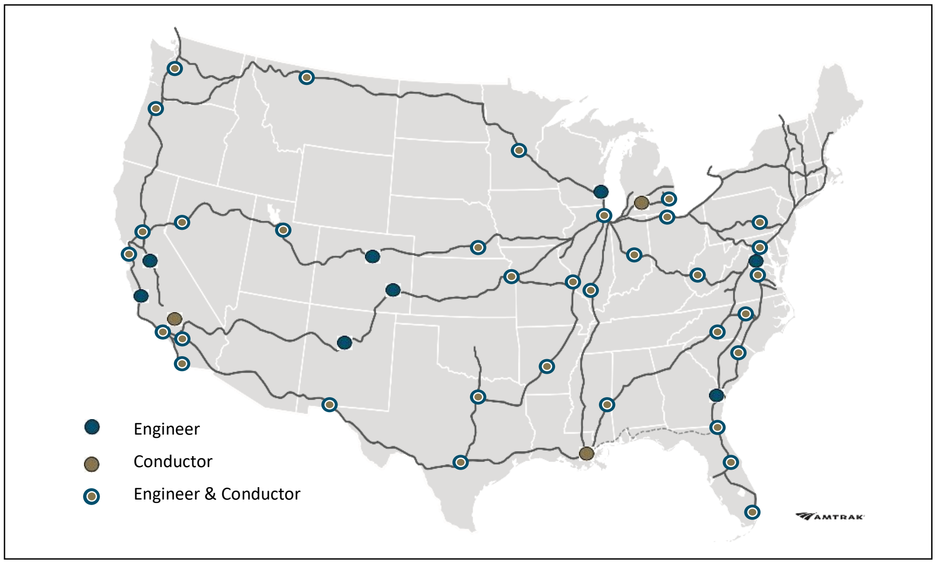
does not sell local tickets on four chronically delayed northbound long distance trains at any stops along the NEC.

We asked the company to identify longer-term cost and revenue impacts of some OTP-driven decisions. Based on company data, we were able to independently estimate or verify company estimates of some of the financial impacts that stem from the company's efforts to accommodate longstanding poor OTP. According to these analyses, we confirmed that significantly improving and sustaining OTP on all routes—particularly the long distance lines—would result in an estimated $41.9 million in annual costs savings or additional revenues and an estimated $336 million in one-time equipment savings. Company managers told us that OTP would need to improve to a minimum 75 percent on all routes—with greater emphasis on long distance routes—and be sustained at that level for at least a year before consideration could be given to making structural changes such as moving crew bases or removing schedule padding. These impacts would be in addition to the short-term cost and revenue estimates we discussed above, and include the following:

- **Reducing the number of on-call conductors and engineers could save about $11.5 million annually.** Due to poor OTP, the company retains more conductors and engineers than it needs. These employees are on call to ensure that trains can continue to operate if regularly scheduled conductors or engineers call in sick or are on vacation. They are also on call if train delays cause crews to arrive late or reach the legal limit to the number of hours they can work in a single shift. The company pays these employees a minimum guaranteed wage and benefits even if they are not working. A company manager estimated that, at crew bases outside the NEC with at least three on-call conductors and engineers, improved and sustained OTP would allow the company to eliminate one of these extra employees at each crew base.[8] Using the company's data, we identified 43 conductor and 47 engineer crew bases where we calculated that sustained improvements could yield about $11.5 million per year. Figure 3 illustrates locations where the company could reduce on-call staff if OTP improved significantly.

[8] We excluded crew bases in Zones 1, 2, and 3, where the Director of the Consolidated National Operations Center told us that OTP is not a significant factor in crew base staffing. In addition to the NEC, these zones include crew bases that staff state supported routes along the NEC—for example, Springfield, Massachusetts; Albany, New York; and Harrisburg, Pennsylvania.

Figure 3. Locations of Conductor and Engineer Crew Bases with Extra On-Call Staff due to Poor OTP



Source: Amtrak OIG analysis of Amtrak data

Note: There are multiple crew bases in Chicago, Jacksonville, and Los Angeles

- **Eliminating excess train equipment could save $20.5 million per year in maintenance and generate an estimated one-time savings of $336 million.** The company owns, maintains, and deploys more locomotives and rail cars than it needs, primarily due to poor OTP on long distance routes. For example, the company maintains three complete equipment sets[9] to operate the *Capitol Limited* daily service between Washington, D.C., and Chicago. Officials told us that with better OTP and schedule adjustments, the company could maintain scheduled service with two sets. Company officials identified six other specific routes where opportunities exist to remove one equipment set with improved OTP: the *Silver Meteor*, *Crescent*, *California Zephyr*, *Empire Builder*, *Southwest Chief*, and *Texas Eagle*. In state supported Chicago-based corridors, managers told us that improved OTP would also allow the company to run equipment sets through Chicago from one route to another, allowing the company to provide seamless service between more cities and potentially eliminate another set of equipment.[10]

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[9] Sample equipment set for the *Capitol Limited* includes two diesel locomotives, five sleeper/coach cars, three lounge/diner cars, and two baggage cars.

[10] As of August 2019, all but one route serving the Midwest originated and terminated in Chicago.

According to company officials, the removal of one equipment set from each of the above long distance routes and the Chicago Corridor would allow the company to own and maintain less equipment or redeploy equipment to places where it would increase revenues. We confirmed managers' estimates that removing this equipment could save approximately $20.5 million per year in maintenance costs.[11] Company officials estimated, and we confirmed, that as Amtrak pursues fleet replacements over the longer term, sustained improvements to OTP could allow it to avoid approximately $336 million in equipment replacement costs.[12] On the 7 long distance routes that the company has identified opportunities for fleet reductions, OTP would need to improve significantly for these savings to occur: the annual OTP on long distance routes has not averaged above 55 percent since July 2010.

- **Minimizing crew penalties could result in significant annual savings.** Last year, poor OTP caused the company to incur more than $430,000 in penalties for train delays that led to crew staffing violations. When a trip is scheduled for more than six hours, labor agreement rules require two engineers on trains. If delays cause a trip with a single engineer to last more than six hours, the company pays the engineer's regular pay along with a penalty equal to an additional eight-hour shift. Using the company's data, we calculated that the company paid $430,630 associated with 1,329 penalties for late trains in FY 2018. Engineers on the *Illini*/*Saluki* route[13] accounted for 811 of these penalties (about 61 percent), totaling $264,715. Table 2 identifies performance on each route, with station OTP and percentage of trains delayed more than one hour at endpoint stations in FY 2018.

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[11] Based on an estimated $534,000 in annual maintenance costs per diesel locomotive and $150,000 in annual maintenance costs per passenger car. With an average of 2 locomotives and 10 passenger cars per train on 8 routes, the estimated annual maintenance savings for 16 locomotives is $8.5 million, and the estimated savings for 80 passenger cars is $12 million.

[12] Based on an estimated $42 million per equipment set, with each set consisting on average of 2 locomotives ($6 million each) and 10 passenger cars ($3 million each). Based on this consist, eliminating one set of equipment set on 8 routes would result in savings of about $336 million.

[13] The *Illini* and *Saluki* trains operate in Illinois, connecting 246,000 riders each year between downtown Chicago, Champaign-Urbana, and Carbondale—homes to major universities in the state.

Table 2. OTP and Delays Beyond One Hour on Illinois Trains in FY 2018

Train/*Route*	Endpoint Station	Station OTP (% Arriving within 15 minutes of schedule)	% Trains Delayed More than One Hour
390 (Northbound *Saluki*)	Chicago	49%	7%
391 (Southbound *Saluki*)	Carbondale	17%	18%
392 (Northbound *Illini*)	Chicago	6%	21%
393 (Southbound *Illini*)	Carbondale	40%	15%

Source: Amtrak OIG analysis of Amtrak data

- **Fewer crew bases could generate additional annual savings.** The company has more crew bases than it needs, and these crew bases are spaced more closely together along routes than would be necessary with substantially higher levels of OTP. The company determines crew base locations and length of route segments—also known as crew district lengths—in part on its expectation of poor OTP. For example, a regular engineer crew shift is eight hours; however, some crew districts are only a five- or six-hour run because the company expects delays on those segments to increase the running time. Managers told us that improved and sustained levels of OTP could allow the company to explore lengthening the crew route segments and potentially eliminating some crew bases because crews would be able to cover more distance in the same amount of time. The company has not quantified the potential savings associated with this scenario but told us that doing so would be possible although it would be both time- and labor-intensive.

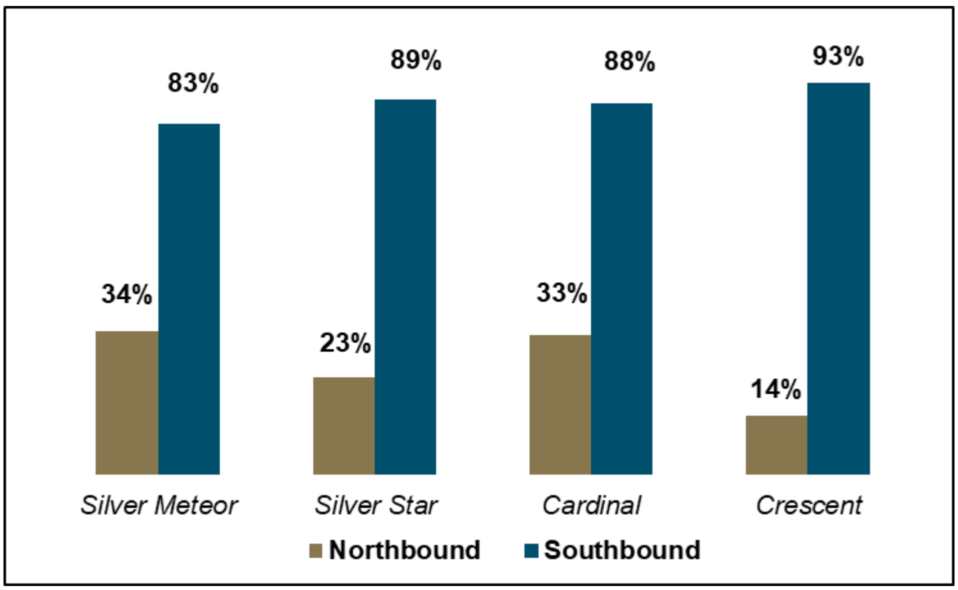
- **Selling local NEC tickets on northbound long distance trains could increase revenues by $2.3 million annually.** The company does not sell local NEC tickets on four northbound long distance trains because OTP on these trains is too unreliable to do so.[14] The company sells tickets on southbound trains along these routes because they operate exclusively in Amtrak-owned territory from New York City through Washington, D.C., giving the company more control over their OTP.

[14] The *Silver Meteor* and *Silver Star* originate in Miami, Florida; the *Cardinal* originates in Chicago, Illinois; and the *Crescent* originates in New Orleans, Louisiana. All four trains terminate in New York City.

Northbound trains operate through host railroad territory before reaching the NEC and are often delayed by several hours by the time they reach the NEC.

According to a 2016 Market Research and Analysis group study and our own analysis of recent southbound sales on these trains, selling local NEC tickets on these northbound trains could provide an additional $2.3 million in net revenue each year. Figure 4 illustrates the difference in FY 2018 OTP between northbound and southbound long distance trains arriving in Philadelphia, Pennsylvania, a major NEC station on each route.

Figure 4. Comparison of OTP on Northbound and Southbound Long Distance Trains arriving in Philadelphia, Pennsylvania (FY 2018)



Source: Amtrak OIG analysis of Amtrak data

On the 4 northbound long distance routes, OTP ranged from 37 percent to 47 percent from July 1, 2014, through June 30, 2019, which was far below the performance of *Acela* and *Northeast Regional* trains serving the same markets over the same time period (with OTP averaging 83 and 82 percent, respectively). In FY 2018, these trains were chronically late, and the magnitude of their delays was significant: for example, 150 of the company’s 355 northbound *Crescent* trains (42 percent) arrived in Washington, D.C., more than 2 hours beyond their scheduled arrival times. Managers told us OTP would need to improve to a minimum of 75 percent on these 4 trains and be sustained for at least a year before the company would consider selling local tickets in order to collect this missed revenue.

- **Reducing schedule recovery time could increase revenues by at least $7.2 million annually.** To make scheduled arrival and departure times more predictable for customers, the company adds time to its schedules as a buffer against anticipated delays. Although this buffer helps trains adhere more closely to schedules, the extra time makes train travel less competitive with other transportation options, such as car or air travel. A Schedule and Consist Planning director estimated that about 70 percent of the extra time in the company's schedules is built in due to anticipated host railroad delays, and that eliminating this buffer would make trip times more competitive and thus attract more riders.

  For example, the scheduled time on the *California Zephyr* between Reno, Nevada, and Sacramento, California, is 5 hours and 37 minutes, with 52 minutes of time built in for delays. Eliminating this buffer would allow the company to advertise this trip as 4 hours and 45 minutes. We calculated the reduced trip times for 3 long distance routes if the company could remove 70 percent of the buffer and asked the Market Research and Analysis group to calculate the revenue impacts associated with the shorter schedules. Table 3 identifies the projected annual revenue impacts, by route.

Table 3. Projected Incremental Revenue Associated with Reducing Schedule Buffer by 70 percent on 3 Long Distance Routes

Route	Increased Revenue
California Zephyr	$3,237,000
City of New Orleans	$1,114,000
Empire Builder	$2,825,000
Total	$7,176,000

Source: Amtrak Market Research

Fully Quantifying the Impacts of Improved OTP Would Support the Company's Financial Goals and Congressional Decision-Making

The company does not use metrics to fully quantify either the short- or long-term financial impacts of poor OTP, even though the company routinely identifies OTP as a major driver of continued financial losses. In FY 2015, the company developed two models to estimate the aggregate revenue and cost impacts of OTP because of management's interest and anticipated interest from host railroads.

Although these models generally followed common forecasting principles, we found that the company has not kept them up to date, and no longer uses them to develop aggregate estimates of financial impacts. Because they are out of date, the models may not reflect current OTP trends, customer demand, economic conditions, and service offerings. The models also do not use the company's preferred OTP metric—customer OTP—which measures the percentage of customers (versus trains) arriving on time at their destinations.[15]

Executives and managers told us they have not updated the models because they do not think that the financial estimates alone are useful in improving OTP. For example, managers told us they previously presented model data on the cost impacts of OTP to host railroads, but the data did not persuade host railroads to reduce delays to Amtrak trains traveling on their tracks. Further, executives and managers told us that external parties such as Congress would still need to act on any financial data the company produced in order to address external causes of poor OTP.

Nonetheless, the benefits of developing more robust and comprehensive estimates of the short-term impacts of poor OTP would likely justify their time and expense for several reasons. An ability to quantify major financial drivers will assist the company in its efforts to operate as a for-profit company and to minimize its federal subsidies and maximize its resources. In addition, the company has publicly committed to eliminating its net operating loss by the end of 2021. Understanding the relative size of the net losses from poor OTP could help the company determine how to best target its resources to address the underlying causes of poor OTP.

Further, updated revenue and cost OTP models could be a valuable tool to help eliminate operating losses by enabling better identification and recovery of costs associated with various company operations. Properly updated models are capable of producing data on the cost-per-minute of delays[16]—a metric that airlines commonly use to make scheduling and other decisions. For example, we identified the following

[15] The company's model incorporates two other OTP measures: (1) the percentage of trains arriving on time at each station, and (2) the percentage of trains arriving on time at the last stop on each train.
[16] This metric includes costs associated with delayed trains and estimates of future lost revenues.

functions where such a metric could improve the company's ability to recover costs associated with activities that contribute to delays:

- **Incident-related claims**. The Claims department relies on an outdated revenue estimate to develop claims for losses associated with train delays resulting from vehicle-strikes, which is inconsistent with management control standards in the public and private sectors that call for management to use relevant and timely data. More precise route-specific data could support more accurate estimates of the costs and revenues lost as a result of these incidents and thus enable better cost recovery from the parties at fault.

- **Private railcar operations.** The company provides owners of private railcars the opportunity to couple and move their railcars with regularly scheduled trains for a fee. We recently reported that the company does not know the extent to which these fees adequately capture the company's costs.[17] The Finance department provided data showing that private railcars operations resulted in more than 2,800 minutes of delay in the first 5 months of FY 2018—an average of 21 minutes per move. A Finance director concluded that such delays likely led to poor customer satisfaction and revenue and ridership impacts but did not attempt to quantify them. Although the company has since taken steps to minimize delays caused by these movements, the company could use updated OTP models to quantify the cost and revenue impacts of any remaining delays, and then use that data to help set appropriate fees for the service.

- **Express package shipments**. The company offers express small package and less-than-truckload shipping services between more than 100 cities. In July 2019, an Operations manager conducted an informal 3-month analysis and estimated that handling these packages led to 109 delays with average lengths of about 5 minutes. More accurate route-specific data on the financial impacts of delays—such as those from the updated OTP models—could help quantify the impact of such delays. A company executive confirmed that better information about the financial impacts of these delays could allow the company to ensure that it charges appropriate rates for this service and allow the company to make fact-based decisions about the value of the program.

[17] *Train Operations: Opportunities Exist to Improve Private Railcar Management and Business Practices* (OIG-A-2019-003), February 6, 2019.

Finally, congressional staff told us that accurate estimates of the size and significance of the financial impacts of poor OTP could be useful for Congress in its continual assessment of funding for the company and substantive legislation relating to passenger rail.

CONCLUSIONS

The company's strategy for reducing its operating losses hinges on providing a valuable service that retains its existing customers and attracts new riders. Ensuring that trains arrive on time is an important part of this plan. Although the company cannot control all of the elements that interfere with OTP, knowing the costs and revenues associated with delayed trains would help the company make decisions about where to focus attention and resources. For example, we identified $12.1 million in short-term benefits with minimal improvements to OTP and another $41.9 million in annual benefits that could accrue with more substantial and sustained OTP improvements. Further, data on these impacts would likely help Congress and other external decision makers weigh the need for legislation or other solutions to address delays outside the company's control.

RECOMMENDATION

We recommend that the Senior Executive Vice President / Chief Operating and Commercial Officer update the company's existing models to improve the reliability of its short-term forecasts of the financial impacts of OTP. The updates should ensure that the models include all business lines and routes, be able to state impacts using the company's preferred OTP metric, and be able to produce data on the cost-per-minute of delays by route. In addition, the company should identify the full range of business activities that contribute to delays—such as Express package services—and use the route-specific per-minute cost and revenue impacts to better quantify the financial impacts of these activities.

MANAGEMENT COMMENTS AND OIG ANALYSES

In commenting on a draft of this report, the Senior Executive Vice President / Chief Operating and Commercial Officer agreed with our recommendation but emphasized that our forecast scenario of a 5 percentage point improvement in OTP is far short of what the company or passengers would consider reliable service on some routes. He added that a forecast associated with significantly improved OTP would be more useful for the company than a forecast based on modest improvements.

However, in order to produce a reliable forecast, we based our modeling decisions on common forecasting principles that recommend estimating ranges more closely aligned with historical rates of OTP. We anticipate that once the company updates its models—consistent with our recommendation—it can use them to model various rates of OTP improvement.

The Senior Executive Vice President / Chief Operating and Commercial Officer identified actions the company is planning to take to address our recommendation and a timeline for doing so. The Strategy and Planning and Marketing and Revenue departments will update the company's OTP cost and revenue models for all company services by April 30, 2020. The company will then use the updated models to determine the marginal cost and revenue impacts associated with changes in OTP. These data will be used to provide additional financial context for corporate decisions related to activities that affect the reliability of train operations. For management's complete response, see Appendix C.

APPENDIX A

Objective, Scope, and Methodology

Our objective was to estimate the revenue and cost impacts of poor OTP. The scope of our work focused on company data, which we analyzed to obtain information on OTP and associated revenues, costs, and other related factors. We performed our work from February 2019 through October 2019 in Boston, Massachusetts; Chicago, Illinois; and Washington, D.C.

To address our objective, we developed statistical models to estimate the short-term revenue and cost impacts if OTP increased by 5 percentage points on each route. We used R, an open-source programming language with an extensive catalog of statistical programs, to analyze monthly revenue, cost, OTP, and other data from FY 2015 through FY 2018. We took several actions to mitigate potential methodological limitations with our approach and assessed the reliability of our forecasts against alternative forecasting models using a variety of common statistical tests. After performing the statistical tests, we verified our methodological approach with officials from the company's Marketing and Revenue department, as well as a statistician and economists from the Government Accountability Office (GAO), Northwestern University Transportation Center, and the Volpe National Transportation Systems Center. They all agreed with our approaches and our interpretation of the results. For more information about our statistical models and forecast methodology, see Appendix B.

To identify opportunities for longer-term financial improvements, we interviewed officials from four departments: Finance, Marketing and Revenue, Operations, and Transportation. The officials identified opportunities to increase revenues and reduce costs contingent on the company significantly improving and sustaining OTP. Some officials provided supporting data that we used to quantify estimates of the financial impacts. In these analyses, we relied on company data from July 2014 to June 2019. In addition, we asked company officials to identify the level of OTP the company would need to achieve, and how long it would need to be sustained, in order to realize these additional revenues and cost savings. Because of our statutory reporting deadline, we did not have sufficient time to verify these assumptions or assess offsetting costs, such as mandatory severance payments for eliminated crew positions.

To assess the company's ability to quantify the revenue and cost impacts of poor OTP, we compared its consultant-developed econometric models against common forecasting principles. We identified these principles through a review of statistical textbooks, business articles, and management control standards for using quality data described in the Committee of Sponsoring Organizations of the Treadway Commission's *Internal Control-Integrated Framework* and GAO's *Standards for Internal Control in the Federal Government*. We also met with company officials and congressional staff to determine the potential need for and uses of OTP financial data in decision-making processes.

We conducted this performance audit 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.

Internal Controls

To assess the company's internal controls, we compared its practices for quantifying the financial impacts of poor OTP with the standards used in the private and public sectors described above. Specifically, we reviewed company controls for processing data related to these impacts into quality information to support informed decision making. We did not review other controls in the company's efforts to collect and analyze relevant data, such as the reliability of its information systems that store the data.

Computer-Processed Data

We obtained computer-processed data from various information systems. As discussed above, we obtained the following types of monthly data:

- **Cost allocation data from the Amtrak Performance Tracking system**. To ensure that these data were sufficiently reliable to achieve our audit objective, we checked the source data and ensured that proper cost categories were present, all entries were valid, and data were logical and complete.
- **Revenue and ridership data from the Marketing and Revenue department's database**. To assess the reliability of these data, we analyzed the data for obvious errors, including negative values, blanks, and illogical entries. Additionally, we discussed the reliability of key fields with company officials and the consultants involved in developing the company's econometric models.

- **Station-level OTP data from the OTP and delay reporting system**. To assess the reliability of these data, we sampled data from four months over a four-year period and checked for discrepancies across reports. Although the data were reasonably accurate, we found minor discrepancies and discussed them with the company official who prepares the monthly OTP reports. After our discussion, we determined that the discrepancies would have no material impact on our findings.

We found that all of the data we used were reliable for the purposes of this audit.

Prior Reports

The following reports were relevant to our work:

Amtrak OIG:

- *Train Operations: Opportunities Exist to Improve Private Railcar Management and Business Practices* (OIG-A-2019-003), February 6, 2019
- *Comparison of Reports on the Impact of Poor OTP* (E-08-03), May 15, 2008
- *Impact of Poor Long Distance Train OTP* (E-06-05), September 29, 2006

DOT OIG:

- *Effects of Amtrak's Poor On-Time Performance* (CR-2008-047), March 28, 2008

APPENDIX B

Forecasting Data and Methods

This appendix describes the data and methods we used to estimate the short-term revenue and cost impacts if OTP increased. We used several sources of company data from FY 2015 through FY 2018 to estimate these impacts. We then developed statistical models to produce short-term forecasts. Consistent with common forecasting principles, we limited our forecast range to a 5-percentage point increase on each route and limited our forecast period to one year. After performing statistical tests, we determined that our models generated a reliable short-term forecast. We presented our technical findings and analysis to company officials and subject matter experts, who corroborated our approach to assessing and using models to develop a short-term forecast.

Forecasting Data

To obtain information on revenues, costs, OTP, and other related factors, we used the following sources for monthly data from FY 2015 through FY 2018:

- **Ticket revenue data.** The Marketing and Revenue department provided detailed ticketing data, including information on total ridership and revenue between station pairs on every train.

- **Operating cost data.** The Finance department provided data on costs likely to be affected by OTP. These data included the following cost categories: car and locomotive maintenance, commissary, onboard services, passenger inconvenience, reservations and call centers, route and shared stations, train and engine crew, train fuel, turnaround servicing, and yard operations. These data came from the Amtrak Performance Tracking system, which is the company's tool for allocating costs to individual routes.

- **OTP data.** The Operations department provided monthly route-level OTP reports. Although the company has several OTP measures, we used only the "all-stations OTP" measure, which calculates OTP at each station on a route.[18] The calculation for this measure is based on a train's actual departures from its origin

[18] Other OTP measures include customer OTP and end-point OTP. Customer OTP measures the OTP of customers rather than trains. End-point OTP measures only whether a train is on time at the endpoint destination and does not account for OTP at intermediate stations along the route.

and arrivals within an established tolerance[19] at all intermediate stations and its destination.

- **Available seat miles data.** The Finance department provided data on available seat miles from the Amtrak Performance Tracking system. This measure of passenger-carrying capacity is equal to the number of seats available multiplied by the number of miles traveled. Because the company increases and reduces service periodically, we used this measure to control for the effects of capacity changes on ticket revenue and to help isolate the effects of OTP.

To assess the reliability of these data, we reviewed information about the data, including technical documentation and assessments from prior reports that used the data. We also interviewed company officials and external subject matter experts who are familiar with the company's revenue, cost, and OTP data. Based on this assessment, we determined that the data were sufficiently reliable for our purposes.

Forecasting Methods

To estimate the revenue and cost impacts of OTP, we considered two different quantitative methods: (1) the company's econometric models and (2) our own statistical models. We selected this comparative approach to help us to generate the most reliable forecasts possible.

The company's econometric models. In 2015, the company engaged a consultant to develop econometric models to estimate the revenue and cost impacts of OTP.

- **Revenue model.** The company's consultant used a regression analysis technique to relate monthly ridership levels to a monthly measure of minutes late, controlling for other factors such as fuel prices for competing automobile trips, economic factors, and seasonal ticket revenue patterns. The consultant also controlled for characteristics such as the route, station origin, station destination, and ticket class. Using information from this analysis, the consultant then developed another regression analysis to estimate the effects of OTP on ticket revenue. The consultant developed separate models for NEC trains, non-NEC trains that run once per direction per day, and non-NEC trains that run more

[19] Most trains have a 15-minute OTP tolerance at every station although the *Acela* tolerance is 10 minutes.

than once per direction per day because of different assumptions of ridership trends on these routes.

- **Cost model.** The company's consultant developed a series of regression models relating various OTP measures to different cost categories (car and locomotive maintenance, commissary, onboard services, passenger inconvenience, reservations and call centers, route and shared stations, train and engine crew, train fuel, turnaround servicing, and yard operations) as well as food and beverage revenue. Each of these models included all routes together.

Our statistical models. To estimate the revenue and cost impacts of OTP, we used R, an open-source programming language with an extensive catalog of statistical programs. Using regression models for time series data, we split route-level data into *seasonal* and *trend* components, with each representing an underlying pattern that is generally predictable for each route.

- **Seasonal patterns**. The seasonal component reflects the regular variations in revenue that recur in a given month year after year for each route; for example, demand on the *Adirondack* is higher during fall foliage months. We used a mathematical transformation to simplify the seasonal patterns among routes and make them more consistent across our whole data set. We followed a common approach in statistical analysis known as logarithmic transformation.

- **Trend components.** The trend component reflects the long-term movement of the time series over multiple years for each route. In addition, because ticket advance purchases can lead to time lags between poor OTP and ticket revenue effects, we calculated the moving average of the past three months of OTP for our revenue model.

We then developed the following statistical models:

- **Revenue model.** We used the log of seasonally adjusted ticket revenue as our forecast variable. Our predictor variables were (1) the log of lagged OTP, (2) the log of ticket revenue trends, (3) the log of available seat miles, and (4) the route.

- **Cost model.** We used the log of total costs as our forecast variable. Our predictor variables were (1) the log of OTP, (2) the log of cost trends, (3) monthly dummy variables, and (4) the route.

Methodological Limitations

We assessed the limitations of the company's econometric models and our own statistical models to inform our decision on which approach to use for our report.

The company's econometric models. We performed several steps to familiarize ourselves with the company's econometric models. We reviewed technical documentation detailing the design and methodology of the models, reviewed reports and presentations discussing model results, interviewed the consultant who developed the models and company officials who have used the models, and compared the models against common forecasting principles. We found that the models were generally consistent with common forecasting principles. For example, the consultant used sound logic in creating assumptions, included relevant variables, used appropriate statistical methods, took steps to reduce errors, and thoroughly documented the methodology and results.

We also identified the following limitations with the company's econometric models:

- To build the models, the company's consultant used data from FY 2005 through FY 2014. Although the company updated the revenue model for NEC routes in 2017, it has otherwise not updated the models with more recent data or, more important, reassessed the relationships between variables for state supported and long distance routes.

- The cost data from FY 2005 through FY 2009 came from a legacy system that did not provide reliable information and was unable to precisely delineate costs, potentially limiting the ability of the model to accurately assign costs to individual routes.

- The cost model does not include the two NEC routes and, therefore, cannot capture the total cost impact of poor OTP.

Our statistical models. We ensured that our statistical models overcame the limitations in the company's econometric models. Specifically, we used the most recent data (FY 2015 through FY 2018), used cost data only from the company's current cost accounting system, and used cost data on NEC routes. We also performed common statistical procedures to check the residuals—the difference between the observed values and the predicted values—and evaluate our models.

When fitting a regression model to time series data, as our statistical models do, it is common for the following limitations to exist, and, as discussed below, we took appropriate steps to mitigate their potential impact on our estimates:

- **Forecasts may be reasonable only in the short term.** The potential for spurious regression is a common limitation with the methodology we used. Although we took steps to mitigate this issue, our forecasts may be reasonable in the short term but may not continue to work in the future. For the purpose of our audit, our goal was to generate the most reliable short-term forecast possible. We acknowledge that our estimates may not hold true into the future as a result of this limitation.

- **Forecasts outside historical ranges may be unreliable.** An additional limitation with the methodology we used is the potential for multicollinearity, which occurs when similar information is provided by two or more of the predictor variables in the regression model. This could cause forecasts to be unreliable if the values of the future predictors are outside the range of historical values. Some degree of multicollinearity was unavoidable in our models; therefore, to mitigate any issues and generate the most reliable estimates possible, we ensured that the scenario forecast we considered—an increase of 5 percentage points in OTP—was largely within historical ranges.

Other methodological limitations. We also identified several other types of revenue and costs that would likely change in the short term with improved OTP, but we were not able to fully estimate the dollar amounts associated with these impacts. For example, more riders resulting from improved OTP would likely lead to more opportunities for food and beverage sales, but these riders would also be spending less time onboard trains, offsetting potential gains. In addition, the company pays host railroads incentives to improve OTP, and we would expect these payments to increase as OTP improved; these incentives, however, are based on individual contractual arrangements with each host railroad and are thus difficult to model. Due to time and resource constraints, we were unable to estimate the short-term impacts of improving OTP on food and beverage revenue and incentive payments to host railroads. Therefore, our short-term estimates are likely conservative because they do not include all potential impacts.

Forecast Reliability

Based on our assessment that the company's models have not been kept up to date and thus are not representative of the company's current operating profile, we decided to use our own model to produce a short-term forecast. To assess the ability of our statistical models to generate reliable forecasts, we performed the following actions:

- **Developed a benchmark model.** We developed a seasonal naïve model, which is a simple estimating technique in which we used the last period's actuals as this period's forecast, without adjusting them or attempting to establish causal factors. We found that by setting the forecast for each route equal to the last observed value from the same month of the prior year, the results were generally reliable. Therefore, we used the seasonal naïve model as a benchmark against which to compare the performance of our more sophisticated technique.

- **Assessed our statistical models.** To determine forecast reliability, we considered how well our models would perform on future data. Specifically, we followed common practice by separating the available data into two sets: training and test data. We used training data from FY 2015 through FY 2017 to estimate the parameters, and we used test data from FY 2018 to evaluate forecast reliability. Because we did not use the test data in determining the forecasts, the test data provided a reliable indication of how well the models are likely to forecast on future data.

- **Performed statistical tests.** We performed several statistical tests to quantify the forecast "error"—the difference between the observed value and the forecasted value[20] — including the following:
    - **Mean absolute error** measures the average size of the forecast error in absolute terms.
    - **Mean absolute percentage error** (MAPE) measures the size of the forecast error in percentage terms.
    - **Root mean squared error** measures how spread out the residuals are.

[20] The error is simply the unpredictable part of an observation and does not mean a mistake.

Of these, we found the MAPE results to be the most useful and easiest to understand.[21] As Table 4 shows, the forecast reliability of our statistical models was similar to that of the seasonal naïve model in FY 2018. Our other statistical tests generated similar results; however, we do not present them here because they can be slightly more difficult to interpret. After performing all our tests, we determined that our statistical models generated sufficiently reliable forecasts and were appropriate to use for our audit.

Table 4. Comparison of Mean Absolute Percentage Error Between Different Models, FY 2018

Category	Mean Absolute Percentage Error	
	Seasonal naïve model	OIG statistical models
Costs	5.4%	9.2%
Revenue	9.1%	4.2%

Source: Amtrak OIG analysis of Amtrak data

Consultation with Subject Matter Experts

After performing the statistical tests, we verified our methodological approach and statistical interpretation with subject matter experts. We consulted with a statistician and economists from GAO, Northwestern University Transportation Center, and the Volpe National Transportation Systems Center to validate our analysis. We described our approach and methodology with them, sent them the results of our statistical results, and met with them in person to discuss the results and identify additional tests or methods to use to assess the model results. They all agreed with our approach and interpretation of the results.

In addition, we sought assistance from three other federal OIGs to independently review the programming code and statistical output we developed to estimate the short-term revenue and cost impacts of improving OTP. We would like to thank the staff at the Corporation for National and Community Service OIG, Department of Agriculture OIG, and Department of State OIG, who volunteered to perform a line-by-line review of our programming code. They all verified that our code had no

[21] MAPE is an absolute measure over multiple forecasts and shows total error. It is the sum of the absolute percentage error (absolute error for each forecast divided by actual observations) divided by the number of forecasts. MAPE is useful for comparing forecasts from different series.

programming errors or logical flaws and confirmed that our results matched the initial specifications.

APPENDIX C

Management Comments

NATIONAL RAILROAD PASSENGER CORPORATION

Memo

AMTRAK

Date	October 9, 2019	From	Stephen Gardner, Senior EVP/Chief Operating and Commercial Officer
To	Jim Morrison, Assistant Inspector General, Audits	Departments	Operations and Commercial
		cc	Eleanor Acheson, EVP General Counsel Jim Blair, Sr Director Host RRs Carol Hanna, VP Controller Roger Harris, EVP Kenneth Hylander, EVP Scot Naparstek, EVP Dennis Newman, EVP Mark Richards, Sr Director Amtrak Risk & Controls DJ Stadtler, EVP Tracie Winbigler, EVP CFO Christian Zacariassen, EVP

Subject Management Response to *Train Operations: Better Estimates Needed of the Financial Impacts of Poor On-Time Performance* (Draft Audit Report for Project No. 007-2019)

This memorandum provides Amtrak Management's Response to the draft audit report entitled, "*Train Operations: Better Estimates Needed of the Financial Impacts of Poor On-Time Performance*" (the "Updated Amtrak OIG Report"). Management appreciates the opportunity to respond to the OIG recommendations.

As the OIG notes, Congress "direct[ed] the Inspector General to update a 2008 DOT OIG report titled 'Effects of Amtrak's Poor On-Time Performance [OTP].'"[1] That report (the "Original DOT OIG Report") "estimated both the impact on revenues and costs as a consequence of Amtrak's poor OTP"[2] and centered its findings on the estimated financial impact of "achieving reliable OTP."[3]

The Original DOT OIG Report found that an improvement in OTP to 85% for trains off the Northeast Corridor would result in a net annual gain to Amtrak of $136.6 million, consisting of a $111.4 million increase in revenue, $39.3 million decrease in expenses, and a $14.1 million increase in costs associated with performance payments to host railroads. The report further noted the following: "The reliability and timeliness of passenger rail largely determines its viability as an alternative means of

[1] Conference Report (H.R. Rep. No. 116-9) accompanying the Consolidated Appropriations Act of 2019, Pub. L. No. 116-6 (Feb. 15, 2019).
[2] Department of Transportation Office of Inspector General, Effects of Amtrak's Poor On-Time Performance, (CR-2008-047), March 28, 2008, 1.
[3] *Ibid.*, 4.

transportation. Poor OTP has significant negative impacts on Amtrak's financial condition and may undermine Amtrak's ability to retain and grow ridership."[4]

Whereas the Original DOT OIG Report estimated the financial impact of "reliable OTP," the Updated Amtrak OIG Report builds upon these findings by estimating the short-term impact of "improving OTP on each route by five percentage points."[5] These short-term impacts should be acknowledged in the current OTP context: on many state-supported services and nearly all long-distance routes, a five-point improvement in reliability would still result in unacceptable levels of OTP by any definition. In FY 2018, long-distance customers were 43% on-time. With a five-point improvement, most long-distance customers would still be late, often severely so, and Amtrak would not likely see significant ridership increases from such small OTP changes. For the bottom third of state-supported corridor routes, even after a five-point OTP improvement, more than 30% of Amtrak customers would still be late.

The Original DOT OIG Report calculated the net effect of an increase in OTP to 85%. At this level, reliability becomes a strong selling point for customers and shifts customer demand. The Updated Amtrak OIG Report confirms these findings: "we would expect to see a marked increase in revenues if average OTP on each route improved by 30 to 40 percentage points."[6] Such a large improvement in reliability is indeed possible. Around the time of the passage of the Passenger Rail Investment and Improvement Act of 2008, which contained new on-time performance requirements, OTP for long-distance trains climbed 45 percentage points.

The Updated Amtrak OIG Report also verified Amtrak's estimates of the financial impacts of discrete long-term cost savings opportunities that would be available to Amtrak if OTP were significantly improved and sustained, including additional one-time equipment savings of $336 million and annual cost savings and revenue improvements of $41.9 million not identified in the Original DOT OIG Report.

While the Updated Amtrak OIG Report provides important information and recommendations with which Amtrak Management agrees and will implement in a timely manner, an updated estimate of the financial benefits of sustained OTP levels at levels above 80 percent would provide an essential perspective of the financial stakes and the urgency needed to improve reliability across the network.

<u>Recommendation</u>:

We recommend that the Senior Executive Vice President / Chief Operating and Commercial Officer update the company's existing models to improve the reliability of its short-term forecasts of the financial impacts of OTP. The updates should ensure that the models include all business lines and routes, be able to state impacts using the company's preferred OTP metric, and be able to produce data on the cost-per-minute of delays by route. In addition, the company should identify the full range of business activities that contribute to delays—such as Express package services—and use the route-specific per-minute cost and revenue impacts to better quantify the financial impacts of these activities.

[4] *Ibid.*, 2.
[5] *Train Operations: Better Estimates Needed of the Financial Impacts of Poor On-Time Performance* (OIG-A-2019-007), September 10, 2019, 2.
[6] *Ibid.*, 6.

Management Response/Action Plan:

Management agrees with the recommendation. The Strategy and Planning and Marketing and Revenue Departments will work to update Amtrak's existing models that estimate the revenue and cost impacts of changes in OTP for all Amtrak services. The updated models will be used to determine the marginal cost and revenue by route associated with changes in OTP, which will provide additional financial context for corporate decisions related to Amtrak and third-party activities that affect the reliability of train operations.

Responsible Amtrak Official(s): EVP Strategy & Planning and EVP Marketing & Revenue

Target Completion Date: April 30, 2020

APPENDIX D

Abbreviations

DOT	Department of Transportation
FY	fiscal year
GAO	Government Accountability Office
MAPE	Mean absolute percentage error
NEC	Northeast Corridor
OIG	Office of Inspector General
OTP	on-time performance
the company	Amtrak

APPENDIX E

OIG Team Members

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OIG MISSION AND CONTACT INFORMATION

Mission

The Amtrak OIG's mission is to provide independent, objective oversight of Amtrak's programs and operations through audits and investigations focused on recommending improvements to Amtrak's economy, efficiency, and effectiveness; preventing and detecting fraud, waste, and abuse; and providing Congress, Amtrak management, and Amtrak's Board of Directors with timely information about problems and deficiencies relating to Amtrak's programs and operations.

Obtaining Copies of Reports and Testimony

Available at our website www.amtrakoig.gov

Reporting Fraud, Waste, and Abuse

Report suspicious or illegal activities to the OIG Hotline

www.amtrakoig.gov/hotline

or

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