



MECHANICAL MAINTENANCE:

Improved Practices Have Significantly Enhanced Acela Equipment Performance and Could Benefit Performance of Equipment Company-wide

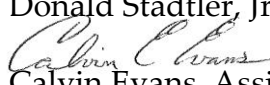
Report No. OIG-E-2012-008 | May 21, 2012





Memorandum

To: Donald Stadler, Jr., Acting Vice President, Operations

From: 
Calvin Evans, Assistant Inspector General, Inspections and Evaluations

Date: May 21, 2012

Subject: *Mechanical Maintenance: Improved Practices Have Significantly Enhanced Acela Equipment Performance and Could Benefit Performance of Equipment Company-wide (Report No. OIG-E-2012-008)*

This report presents the results of our review of the actions Amtrak has taken in response to our 2005 evaluation of Amtrak's mechanical maintenance program (*Mechanical Maintenance Operations*, E-05-04, September 6, 2005). At that time, we observed an equipment maintenance program (costing approximately \$500 million/year) that consisted mainly of preventive maintenance inspections and services, conducted at mostly time-based intervals, augmented by a high number of reactionary, unscheduled repair actions. To improve equipment reliability and reduce maintenance costs, we recommended that Amtrak adopt a more modern maintenance philosophy based on reliability-centered maintenance (RCM), similar to that used by airlines and other major railroads. Our report made 34 recommendations designed to move Amtrak to a reliability-centered-maintenance philosophy and to improve the overall efficiency and effectiveness of Amtrak's mechanical maintenance program. Amtrak agreed with our recommendations and developed plans to implement them.

This follow-up review was conducted to assess the progress that has been made in the last 6 years and to identify opportunities for continued improvement. For a detailed discussion of our scope and methodology, see Appendix I.

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SUMMARY OF RESULTS

Since our previous report, Amtrak has made significant progress in improving its mechanical maintenance processes and procedures. For example, the company adopted condition-based maintenance¹ as the corporate maintenance philosophy, analyzed the content of preventive maintenance using RCM² principles, and developed new standardized preventive maintenance procedures for all of its major fleets of equipment. Amtrak also developed a comprehensive quality management program that redefined and revitalized quality management operations, developed and started tracking a range of metrics to measure fleet performance, and established several process-focused teams to improve maintenance processes and drive other operational improvements. Furthermore, Amtrak also significantly improved the capabilities and use of its computerized work management system, implemented a life-cycle preventive maintenance program for its diesel locomotives, and improved the availability of repair parts through electronic material requisitioning and the expansion of automated material vending machines at the major shops. Overall, Amtrak's progress is the result of management's commitment and the hard work of many individuals in the Mechanical Department, supported by the work of many others throughout the company.

However, improvements in equipment performance have been uneven. Acela, which represents about 10 percent of Amtrak's total fleet of equipment and was the first fleet where RCM was implemented, has seen significant improvements in reliability and availability. To illustrate, since Fiscal Year (FY) 2006,

¹ Condition-based maintenance is maintenance that is performed only when there is objective evidence of need. RCM is the methodology used to determine whether that objective evidence of need exists.

² Reliability-Centered Maintenance (RCM) was first described in the 1978 Nolan and Heap report for United Airlines—*Reliability Centered Maintenance*, and subsequently popularized by the late John Moubray in his RCMII series, including *RCMII Reliability-Centered Maintenance*, Industrial Press, 1997. Elements of Nolan and Heap's work have been incorporated into federal railroad safety standards in 49 CFR Part 238 (Passenger Equipment Safety Standards), Appendix E—General Principles of Reliability-Based Maintenance Programs.

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- Acela terminations³ have decreased by 29 percent,
- Acela annulments⁴ have decreased by 50 percent,
- Acela reliability⁵ has improved by 11 percent, and
- Acela trainset⁶ availability has improved by 14 percent.⁷

These improved maintenance results allowed Amtrak to deploy two additional Acela trainsets, generating over 50 million dollars in additional revenue since the trains were put into service.

In contrast, similar metrics have remained the same or declined slightly for the remainder of Amtrak's equipment. Compared with Acela's trainset availability improvement of 14 percent, the availability of the rest of Amtrak's equipment has stayed roughly the same; and compared with Acela's reliability improvement of 11 percent, the rest of Amtrak's equipment is, on average, less reliable than before. To determine why the performance of the Acela trainsets has improved so much more than the conventional (non-high-speed) fleets, we examined the differences in the maintenance practices employed. Based on our review, Acela's greater improvements in reliability and availability can be attributed to four major factors:

- *RCM principles have been more fully implemented* with Acela, including the creation of a standing committee fully dedicated to equipment reliability, access to more and better data, and the consistent use of a structured approach to analyzing failures.
- *Amtrak established strong management accountability* for improving Acela equipment performance, including routine executive-level scrutiny of Acela equipment performance and clear accountability for results.
- *More management and technical support* is devoted to Acela maintenance, including three times as many managers per agreement-covered (union) employee and six times as much dedicated engineering and technical support per piece of equipment, including on-site, 24/7 support at each facility.

³ A termination occurs when a train begins its trip but does not reach its final destination. When a train is terminated, passengers are usually transferred to another train or bused to their final destinations.

⁴ An annulment occurs when a train is canceled before it leaves its station of origin.

⁵ As measured by mean distance between trainset failures.

⁶ An Acela trainset consists of two power cars, four business-class coaches, one first-class coach, and a café car.

⁷ Based on planned Acela service availability.

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- *The workforce maintaining the Acela equipment is, on average, more qualified, better trained, and better incentivized, including 12 weeks of structured Acela-specific equipment training and a financial incentive program tied to equipment performance.*

Improving the reliability and availability of the conventional fleets to a comparable level as that achieved with the Acela trainsets would result in significant financial benefits to Amtrak and significant passenger experience benefits to its customers. As with Acela, better reliability and availability would lead to improved on-time performance (OTP). Not only would this directly support Amtrak's goal to improve customer satisfaction, but improved OTP would also have an impact on increased ridership and ticket revenue.

In addition, other financial benefits of improving maintenance practices are clearly compelling. If the availability of the conventional fleets were improved to the level of the Acela equipment, Amtrak could provide the same level of service with over 120 fewer conventional cars and 45 fewer conventional locomotives than presently required. Based on the estimates in Amtrak's *Fleet Strategy*,⁸ this would save Amtrak almost \$600 million in fleet procurement costs over the next 15 years.⁹

Therefore, we are recommending that the Vice President for Operations develop goals for improving the performance of Amtrak's conventional fleet that support Amtrak's strategic plan; provide direction, support, and resources to achieve these goals; and hold the Chief Mechanical Officer (CMO) accountable for meeting the goals. Furthermore, we are recommending that, in addressing those goals, the VP for Operations and the CMO establish and implement an agreed-upon plan for improving the performance of the conventional fleets that includes adopting the Acela maintenance practices, as appropriate.

Finally, more can be done to implement our original recommendations, such as tracking all critical components by serial number, optimizing the content and frequency of the heavy overhaul programs, maintaining accurate cost data, and verifying that preventive maintenance is being conducted correctly. Therefore, we are also recommending that, as

⁸ Amtrak *Fleet Strategy* (Version 2), February 2011.

⁹ These savings do not account for any additional costs potentially required to achieve this improved level of equipment availability.

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part of the plan mentioned above, the CMO develop a plan to fully address the recommendations from our previous report that have not yet been completed. In commenting on a draft of this report, management agreed with and has committed to taking actions responsive to our recommendations.

AMTRAK HAS MADE SIGNIFICANT PROGRESS IN IMPROVING MAINTENANCE PRACTICES, ALTHOUGH WORK REMAINS IN SOME IMPORTANT AREAS

Since our previous report, Amtrak has made significant progress in improving its mechanical maintenance processes and procedures. For example, the company has

- officially adopted condition-based maintenance as the corporate maintenance philosophy,
- hired an experienced senior manager to coordinate the RCM program,
- analyzed the content of preventive maintenance using RCM principles and developed new standardized preventive maintenance procedures for all major fleets of equipment,
- significantly changed the way maintenance is performed on the Acela trainsets,
- established several process-focused teams to improve maintenance processes and drive other operational improvements,
- implemented a life-cycle preventive maintenance program for diesel locomotives,
- consolidated diesel locomotive maintenance to gain efficiencies,
- developed a comprehensive quality management program that redefined and revitalized quality management operations,
- developed and started tracking a range of metrics to measure fleet performance,
- significantly improved the capabilities and use of the computerized work management system, and
- significantly improved the availability of repair parts through electronic material requisitioning and the expansion of automated material vending machines at the major shops.

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This has been the result of a lot of hard work by many individuals in the Mechanical Department, supported by the work of many others. However, there is still work to do in some important areas, such as

- tracking all critical components by serial number,
- optimizing the content and frequency of the heavy overhaul programs,
- maintaining accurate cost data, and
- verifying that preventive maintenance is being performed correctly.

Appendix II includes a more detailed discussion of the current status of each of our previous recommendations.

EQUIPMENT RELIABILITY AND AVAILABILITY HAVE IMPROVED DRAMATICALLY FOR ACELA, BUT NOT FOR CONVENTIONAL FLEETS

Based on the progress that Amtrak has made, we expected to see considerable improvement in the overall reliability and availability of Amtrak's equipment fleets. Yet this has only been the case with the Acela fleet, which was the first fleet where RCM was implemented. Since FY 2006,¹⁰

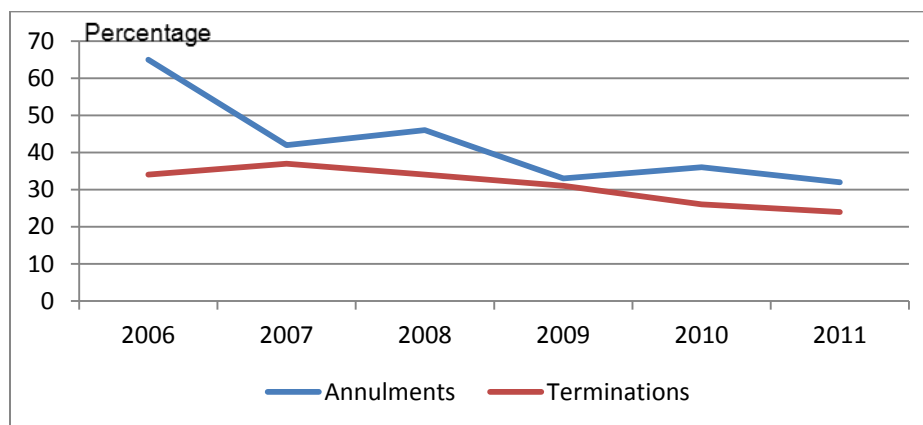
- Acela terminations have decreased by 29 percent, and
- Acela annulments have decreased by 50 percent.

See Figure 1.

¹⁰ FY 2006 was chosen as the baseline for comparison because it was the transition year when Amtrak took over maintenance of the Acela trainsets from the manufacturer. Amtrak started implementing RCM on the Acela trainsets in FY 2007.

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Figure 1. Acela Fleet Performance, FY 2006–2011



Source: OIG based on Amtrak data

Additionally,

- Acela reliability has improved by 11 percent,¹¹ and
- Acela trainset availability has improved by 14 percent.¹²

Yet we have not seen the same level of improvement in the reliability and availability of the conventional (non-high-speed) fleets of equipment. Compared with Acela's availability improvement of 14 percent, the availability of the rest of Amtrak's equipment has stayed about the same or decreased. Since FY 2006,

- car availability has increased by just 2 percent,
- electric locomotive availability has increased by less than 1 percent, and
- diesel locomotive availability has *decreased* by 3 percent.

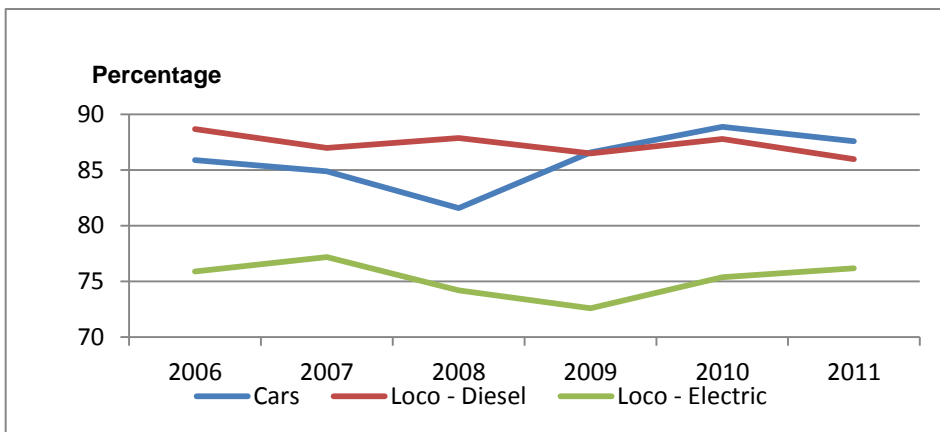
See Figure 2.

¹¹ Reliability had improved by 30 percent between FY 2006 and FY 2009, but has since fallen.

¹² Implementing RCM on the Acela fleet allowed Amtrak to change to a continuous-maintenance approach, in which quarterly preventive maintenance tasks are spread throughout the quarter. This helped contribute to the improvement in availability.

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Figure 2. Conventional Fleet Availability, FY 2006–2011

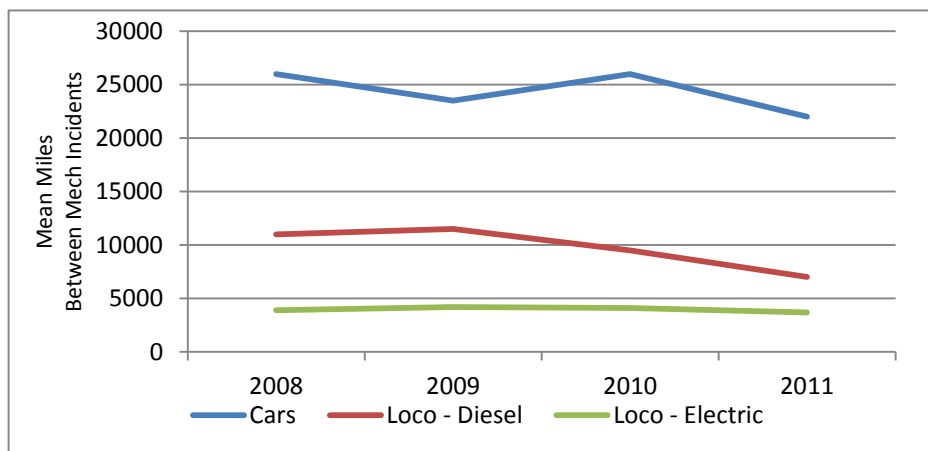


Source: OIG based on Amtrak data

Compared with Acela’s reliability improvement of 11 percent, since 2008,¹³ the rest of Amtrak’s equipment, on average, was reported as less reliable than before.

See Figure 3.

Figure 3. Conventional Fleet Reliability, FY 2008–2011



Source: OIG based on Amtrak data

¹³ Amtrak changed the way it measures reliability after FY 2007 for the conventional fleets; therefore, comparisons against current reliability cannot be made to data before FY 2008.

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However, according to Mechanical Department officials, they changed the way they recorded mechanical incidents in March 2010, from a manual method to an automated method that is fully integrated with the on-time-performance database. The new method captures more incidents than were being captured manually, which could explain the drop in reliability observed in 2011. Therefore, we examined reliability of the conventional fleet up to the time that the method was changed. From October 2007 through February 2010, the overall reliability of the conventional fleet dropped about 1 percent. Since then, reliability has continued to drop slightly, although it is difficult to make conclusions from only 18 months of data. Regardless of the exact number, it is clear that the reliability of the conventional fleet has not improved.

SIGNIFICANT BENEFITS WILL LIKELY ACCRUE FROM IMPROVING THE AVAILABILITY AND RELIABILITY OF AMTRAK'S CONVENTIONAL EQUIPMENT

The improvements in Acela equipment performance over the past 6 years have now made that equipment stand clearly above the rest of Amtrak's equipment in availability and reliability. These improved maintenance results allowed Amtrak to deploy two additional Acela trainsets, generating millions of dollars in additional revenue each year. Improving the conventional fleets to a comparable level would likely result in significant additional benefits to Amtrak—both financial and in terms of noticeable improvements in passenger experience.

Availability

Availability can be defined as "present and ready for service." Amtrak tracks the availability of its conventional equipment by measuring the actual amount of time its cars and locomotives are available for service throughout the month, compared against the total number of hours in the month. Availability is then reported on a monthly basis for the different types of conventional cars and locomotives.

Amtrak does not track and report on the availability of its Acela equipment in a comparable fashion. For Acela, work is planned so that the required number of trainsets

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is available for revenue service each morning (16 on a normal weekday¹⁴). Extra effort is not expended solely to have more trainsets available than are necessary to meet service requirements.

An Acela trainset is only available for service if all six of its cars and both of its power cars are available. Conversely, if one of the eight pieces of equipment is not available, the entire trainset is unavailable. Therefore, to compare the availability of the Acela equipment with the conventional equipment requires converting the trainset availability into an equivalent availability by individual piece of equipment. Based on probabilities, for a trainset to be available for service, on average, 80 percent of the time, each piece of equipment in the trainset must be available for service, on average, better than 97 percent of the time.¹⁵ Using this approach, the availability of the different fleets of equipment in FY 2011 is shown below:

- Average Acela car and locomotive availability:¹⁶ 97 percent
- Average conventional car availability: 88 percent
- Average conventional diesel locomotive availability: 86 percent
- Average conventional electric locomotive availability: 76 percent

Reliability

Reliability can be defined as “performing the intended function without failure.” Measuring reliability discloses how often the equipment performs as desired. Amtrak tracks the reliability of its conventional equipment using the metric of mean distance between mechanical incidents, which is reported on a monthly basis for different types of cars and locomotives.

Amtrak used to report mean distance between failures for the Acela trainsets until sometime in FY 2010, when this metric was discontinued.¹⁷ Amtrak still tracks certain

¹⁴ Equals 80% of the total number of Acela trainsets.

¹⁵ Trainset availability is equal to the product of the availability of the eight individual pieces of equipment ($97.2\% \times 97.2\% \times 97.2\% \times 97.2\% \times 97.2\% \times 97.2\% \times 97.2\% \times 97.2\% = 80\%$).

¹⁶ Based on 80 percent planned trainset availability in FY 2011.

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Acela reliability indicators (for example, annulments, terminations, and delay minutes), but always at the trainset level rather than separately for Acela cars and locomotives. Therefore, in attempting to make an accurate comparison of Acela reliability with Amtrak's conventional equipment, we used the Federal Railroad Administration (FRA) published metric for equipment reliability that was created pursuant to Section 207 of the Passenger Rail Investment and Improvement Act of 2008 (PRIIA).¹⁸ This metric measures service interruptions per 10,000 train miles due to equipment-related problems. An annulment, a termination, or a train delay of greater than 30 minutes because of mechanical reasons is considered a service interruption.

The FRA metric is published by route rather than fleet of equipment. However, since all Amtrak services, except Acela, use conventional equipment, the published metrics can be used to compare the performance of the Acela equipment with that of the conventional equipment as a whole. In addition to comparing Acela to overall conventional equipment performance, we have included below the FRA-published metric for the Amtrak Regional service, which is the conventional service that best compares with the Acela service since it operates over largely the same electrified territory in the northeastern United States.

For the 12 months ending June 30, 2011, service interruptions per 10,000 train miles due to equipment-related problems were

- Amtrak Regional trains 0.91
- Total, all conventional trains 0.73
- Acela trains 0.45

Source: FRA website

Stated another way, for this 12-month period, the trains using conventional equipment experienced service interruptions due to equipment-related problems more than one and a half times as often as the Acela trains, and the Amtrak Regional trains

¹⁷ Amtrak tracked and routinely reported on mean distance between trainset failures at the Acela Executive Oversight Committee (EOC) between 2004 and the beginning of 2010. At some point after the Chief Operating Officer stopped chairing the Acela EOC, this metric was no longer routinely reported, although delay incidents are still tracked and reported separately.

¹⁸ <http://www.fra.dot.gov/rpd/passenger/2165.shtml>

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experienced service interruptions due to equipment-related failures about twice as often as the Acela trains. Both of these ratios demonstrate the significantly greater reliability of the Acela equipment.

Benefits to Amtrak

Improving the reliability of the conventional fleets to a level comparable to that of the Acela trainsets would result in significant benefits to Amtrak and its customers. Improvements in reliability will lead to better on-time performance (OTP) and greater customer satisfaction. Not only would this directly support Amtrak's goals in these specific areas, but Amtrak's market research has shown that improved OTP also has an impact on increased ridership demand and expected ticket revenue. For example, Amtrak previously estimated that a sustained 1-percent improvement in OTP for Northeast Corridor Regional trains would generate about \$1 million in additional ticket revenue per year.¹⁹ Increased OTP will affect ridership and revenue differently for each Amtrak route, but higher sustained OTP across the Amtrak system by improving the reliability of all conventional equipment could generate millions of dollars in additional revenue every year.

In addition, if the availability of the conventional fleets could be improved to the level of the Acela equipment, Amtrak could provide the same level of service with over 120 fewer conventional cars and 45 fewer conventional locomotives than what is currently required.²⁰ Based on the estimates in Amtrak's *Fleet Strategy*, this could save the company almost \$600 million²¹ in fleet procurement costs over the next 15 years.

¹⁹ Based on an Amtrak study done in late 2007. Revenue estimates are route-specific and are dependent on trip time and base OTP.

²⁰ This comparison is made to illustrate the magnitude of the benefits possible. It does not suggest that the Acela level of availability is the optimum level, taking into consideration the differences in the fleets and the costs that may be needed to achieve this level of performance.

²¹ Assumes no savings from reduced numbers of electric locomotives and single-level long-distance sleeper trainsets since Amtrak has already contracted for new equipment of this type.

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RCM IMPLEMENTATION, MANAGEMENT ACCOUNTABILITY, GREATER SUPPORT, AND WORKFORCE DIFFERENCES ACCOUNT FOR ACELA'S GREATER IMPROVEMENTS IN RELIABILITY AND AVAILABILITY

There are significant differences between the maintenance practices utilized for the Acela trainsets and those used for the rest of Amtrak's equipment. After analyzing these differences, we attribute Acela's greater improvements in reliability and availability to four major factors: fuller implementation of RCM; greater accountability for Acela equipment performance; considerably greater management and technical support devoted to Acela maintenance; and a more qualified, better trained, and better incentivized workforce maintaining the Acela equipment.

RCM Has Been More Fully Implemented with Acela

Reliability-centered maintenance is based on understanding equipment failures. It requires continually capturing and analyzing significant amounts of data on equipment performance and failures, and then taking appropriate maintenance actions based on that analysis. The team maintaining the Acela equipment is significantly more advanced in this area than the teams maintaining the conventional fleets. The Acela team has access to more and better failure data, more consistently uses a structured approach to analyzing the data, and has a standing committee that is focused solely on monitoring equipment reliability and prioritizing activities to improve equipment performance.

Access to More and Better Data. The Acela team has access to more and better failure data. For example, the data currently entered into the Work Management System for Acela work orders is consistently more detailed and specific than for work orders on the conventional equipment. This is because the Acela team is more mature in its usage of the data and has put more emphasis on the value of the specificity of the information in diagnosing problems. In addition, the Acela team has worked aggressively to utilize the information available from Acela's on-board health monitoring systems. Through the Maintenance Events Analysis Program initiative, the Acela team now receives

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automated daily downloading of the equipment's health data. By monitoring the health of the equipment on a routine basis, many impending failures have been averted before they affected service.

Although equipment health data are also available for some of the conventional locomotives, Amtrak has only recently started routinely downloading the information and is now working on presenting it in a way that will help facilitate sophisticated analysis. Without detailed equipment failure and performance data, it is much more difficult to conduct the analysis required to routinely anticipate or properly react to equipment problems and failures.

Consistent Use of Structured Approach to Analyzing Failures. The Acela team has made extensive use of root cause analysis in studying serious equipment failures. Root cause analysis is a structured approach to identifying the factors that cause a failure and the actions needed to prevent its recurrence. Teams using this approach have been formed to study several Acela component failures, including Acela/HHP²² power module failures, Acela side door failures, and Acela tilting mechanism problems. In each case the team uncovered the root cause of the problem and recommended solutions that have significantly increased the reliability of those components.

Teams have also used root cause analysis to successfully address problems with the conventional fleets, most notably electric locomotive pantograph²³ problems. However, the use of this structured approach is standard practice for studying major Acela failures; while the formal process is still used only sparingly in addressing conventional equipment problems. The likelihood that a problem will resurface in the future is significantly reduced when a formal, structured approach is used to study and address the failure.

Standing Committee Focused on Equipment Reliability. In January 2008 the Amtrak Chief Operating Officer formed an Acela Reliability Subcommittee²⁴ to study and improve the reliability of the Acela fleet. This subcommittee has met biweekly since then, tracking key performance indicators for equipment reliability (annulments,

²² HHPs are Amtrak's high-horsepower electric locomotives.

²³ A pantograph is the part of the electric locomotive that comes in contact with the overhead electric power cable.

²⁴ This was formed as a subcommittee to the Acela Executive Oversight Committee.

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terminations, and delay minutes) and prioritizing activities to address the major causes of Acela failures. The regular meetings of this subcommittee, with continued attendance by the Chief Mechanical Officer, have kept a focus on activities designed to improve reliability and have prioritized the use of limited resources to activities where the greatest benefit could be gained.

Teams have also been formed for the major conventional fleets, but these teams have not focused solely on reliability and have not all met with the frequency of the Acela reliability subcommittee. These process-focused teams have worked to improve maintenance operations; but without a dedicated focus on reliability, they have not had the same level of impact on reliability as has the Acela Reliability Subcommittee. As with most improvement initiatives, constantly measuring performance against goals and taking aggressive actions designed to achieve those goals are critical to achieving success.

Greater Accountability Exists for Acela Equipment Performance

The performance of the Acela equipment has held the particular interest of Amtrak's executive leadership since the first day the equipment was put into service in 2000. Since that time, no other fleet of equipment at Amtrak has been put under the same executive-level scrutiny as Acela, and no one individual has been held more accountable for a fleet's performance than the Acela Master Mechanic.

Executive-Level Scrutiny of Acela Equipment Performance. In 2004, when Amtrak was starting to prepare to take over the maintenance of the Acela equipment from its manufacturer, an Acela Executive Oversight Committee (EOC) was formed by the Chief Operating Officer. This committee was scheduled to meet monthly and review issues associated with the operation and maintenance of the Acela trainsets. As part of this monthly meeting, equipment performance metrics were reviewed. The Acela Master Mechanic and Chief Mechanical Officer were routinely questioned about equipment failures and their plans to address reliability issues. The Acela EOC met regularly for over 5 years with the Chief Operating Officer as the head of the committee. Every month during this period the Acela Master Mechanic and Chief Mechanical Officer were subject to questioning about the performance of the fleet.

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No other Amtrak master mechanic has been subjected to this regular level of scrutiny on the performance of a fleet of equipment. In fact, since Acela has been in service, no other single fleet of equipment has been the subject of an executive-level oversight committee or a regularly scheduled meeting with executive leadership. The executive-level interest in Acela fleet performance clearly sent a message about the importance of the reliability of the Acela equipment, which was, in turn, reflected in the actions and priorities demonstrated by Mechanical Department leadership.

Interestingly, in early 2010, the high-speed rail team stopped reporting on the mean distance between failures (MDBF) for the Acela fleet—one of the common metrics used for measuring equipment reliability. Since that time, reliability, as measured by MDBF, has decreased by 15 percent for the Acela equipment, after having improved by 30 percent while being subjected to monthly reporting and questioning at the Acela EOC.

Accountability of the Acela Master Mechanic. Amtrak's Mechanical Department is organized largely on a geographical basis. There are six master mechanics responsible for equipment maintenance throughout the country. Five of the master mechanics are accountable for maintenance activities within their geographic areas of responsibility. The Acela Master Mechanic is the sole exception. Except for Acela, none of the major fleets of Amtrak equipment are maintained solely within one master mechanic's area of responsibility,²⁵ and therefore none of the other master mechanics are solely accountable for the performance of any of the major fleets.²⁶ In contrast, everyone who maintains the Acela trainsets works for the Acela Master Mechanic, and works in a maintenance facility under the control of the Acela Master Mechanic. With control comes accountability. For Acela availability and reliability, it is clear that the Acela Master Mechanic has ultimate accountability for performance.

²⁵ There are some small fleets of equipment, such as the Talgo-built cars and the auto carriers, that are maintained solely within one master mechanic's boundaries.

²⁶ Three of the master mechanics head process-focused teams on diesel locomotives, electric locomotives, and cars, respectively. These master mechanics are tasked with improving the maintenance processes associated with these fleets, but since they do not control all of the maintenance activities being performed on their respective fleets, they do not have the same level of accountability for fleet performance as does the Acela Master Mechanic.

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Greater Management and Technical Support is Devoted to Acela

The employees maintaining the Acela fleet currently have much greater and quicker access to technical support, and the Acela Master Mechanic has more management resources at his disposal to react to problems, analyze failures, and plan work, than do the other master mechanics. This logically contributes to Acela's better performance, and any increase in management and technical support for the conventional fleets, if properly employed, would also help improve the performance of those fleets.

The Acela fleet consists of 40 power cars (locomotives), 100 passenger coaches, and 20 café cars. The fleet is currently being maintained by 285 agreement-covered²⁷ employees and 47 management employees. This equates to almost two agreement-covered employees per piece of equipment, and about six agreement-covered employees per manager. In addition, the Acela fleet is supported by a dedicated group of 32 engineers and technicians under the Deputy Chief Mechanical Officer for Engineering, Standards, and Planning. This equates to one dedicated engineer or technician for every five pieces of equipment. Included in this group of 32 employees are 19 service engineers who provide on-site 24/7 technical support and trouble-shooting assistance at each of the three Acela maintenance facilities (in Washington, D.C.; New York; and Boston).

The conventional fleet consists of approximately 350 locomotives and 1,400 cars of widely differing types. Comparing the staff devoted to the conventional fleet with the Acela fleet, Acela is maintained by about the same number of agreement-covered employees per piece of equipment, but there are three times more managers per agreement-covered employee for Acela and six times more dedicated engineering and technical support per piece of equipment for Acela. In addition, although Rolling Stock Engineering has some dedicated engineering and technical support at the conventional field locations, it does not provide on-site, 24/7 support at each of the 11 major conventional maintenance facilities—as is done at the Acela maintenance facilities.

Increasing the ratio of managers to agreement-covered employees and engineers and technicians per piece of equipment will help improve the performance of the conventional fleet. However, we have not performed a detailed study to determine

²⁷ Agreement-covered employees are union employees working under a collective bargaining agreement.

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whether the Acela employee ratios would be the optimal ratios for the conventional fleets. This optimal level of support would be best determined by a cost-benefit analysis, taking into consideration the goals to be achieved.

The Acela Workforce is More Qualified, Better Trained, and Better Incentivized

Compared with the agreement-covered employees maintaining the conventional fleets, the Acela workforce is, on average, more qualified, better trained, and better incentivized.

Qualifications. The Acela trainsets have always been maintained by Amtrak agreement-covered employees, initially under the management of the manufacturer's maintenance contractor (NEC-MSD) and, since 2006, under the supervision of Amtrak managers. From the outset, employees who wanted to work on Acela were screened using instruments that measured elements of mechanical aptitude, depending on the craft, as part of the initial selection process. The purpose of this was to ensure that those selected would be more likely to complete the specialized Acela maintenance training and succeed on the job. Not all applicants successfully completed this screening, and those who did not were not selected.

By comparison, until about a year ago, no comparable screening was undertaken of newly-hired mechanical employees maintaining conventional equipment. Therefore, the vast majority of current employees working on the conventional equipment were not subjected to similar screening and consequently have not demonstrated the same level of mechanical aptitude. Although mechanical aptitude is but one element of what makes a mechanic successful, expanding this testing to all newly hired Mechanical Department employees rather than just those working on Acela is a positive step.

Training. All employees who will be assigned to maintain Acela trainsets are given a total of 12 weeks of structured Acela-specific equipment training before they are allowed to work on the trainsets without supervision. Every third week of this training is hands-on, under close supervision, to apply the knowledge and principles learned in the classroom. This training is in addition to the various other non-equipment-specific courses normally administered to newly-hired mechanical employees.

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No comparable structured, equipment-specific training program exists for new employees who maintain the conventional equipment. Although numerous conventional equipment-specific courses are available and the Mechanical Department has a team developing recommendations for a more structured program, there is currently no mandatory, structured program requiring each new employee working on the conventional fleets to take these courses before they start working on the equipment.

Due to the in-depth training program, new employees assigned to maintain Acela are much more knowledgeable and much better prepared to perform the tasks they are assigned than are their conventional-equipment counterparts.

Incentives. In November 2007, Amtrak started a program that pays a monthly financial incentive to eligible agreement-covered employees who work on the Acela equipment if they meet certain availability, reliability, and overtime goals. Between November 2007 and September 2011, Amtrak paid out \$862,500 in bonuses under this program—about one quarter of the total bonuses possible during this period. It is difficult to quantify the effect these financial incentives have on the motivation of the Acela employees and the achievement of performance goals, but it is logical to assume at least some effect and this program is therefore most likely a contributing factor to the greater reliability of the Acela equipment.

No comparable financial incentive program is currently in place for workers who maintain the conventional fleets. Amtrak is, however, contemplating a company-wide incentive program and has included language about this program in the recently-signed labor agreements with its unions. Yet the details have not been finalized and a firm timeline for starting the program has not been set.

CONCLUSIONS

The results of implementing many of our 2005 recommendations to improve the efficiency and effectiveness of Amtrak's maintenance practices—especially with the Acela fleet—have been significant, but have not come easily. Much hard work and extra resources have been devoted to improving the performance of the Acela fleet. In many

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ways, the Acela fleet and those who maintain it have been treated differently from those involved with the conventional fleets and the rest of the Mechanical Department employees. Regardless of why this was done, the results have shown that, given the proper tools and resources, Amtrak can maintain its equipment at a very high level of performance. We believe that a comparable high level of performance can also be achieved for the conventional fleets.

While all of the different Acela maintenance practices discussed in this report will logically contribute to improved equipment performance, it is difficult to tell the relative importance of each of the different practices in achieving better results. Because of this, our recommendations leave some flexibility on how far to go in adopting them. For example, an incentive program should logically help motivate employees to give the extra effort to achieve improved results. However, the costs of such a company-wide program, if not properly designed, could exceed its expected benefits.

Therefore, while specifics remain to be worked out, the actions that Amtrak has taken to improve the performance of the Acela fleet have created a roadmap for Amtrak to follow in achieving greater performance of its conventional fleets. With a well thought-out plan and the proper resources, Amtrak could greatly improve the availability and reliability of its conventional equipment.

RECOMMENDATIONS

To improve conventional fleet performance to an appropriate level, we recommend that the Vice President, Operations:

- (1) Develop goals for improving the performance of Amtrak's conventional fleets that support Amtrak's strategic plan; provide direction, support, and resources to achieve those goals; and hold the Chief Mechanical Officer (CMO) accountable for meeting those goals.
- (2) In addressing these goals, the VP for Operations and the CMO should establish and implement an agreed-upon plan for improving the performance of the conventional fleets that includes

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- (a) completing implementation of RCM, including
 - i. creating Acela-like reliability-improvement teams, focused solely on reliability, for each major fleet of conventional equipment;
 - ii. taking actions to improve the quality and quantity of failure data available to these teams; and
 - iii. increasing the use of root-cause analysis for studying failures and serious problems with conventional fleet reliability;
- (b) establishing clear and specific accountability and responsibility for fleet performance;
- (c) determining the appropriate level of management and technical support needed to achieve the equipment performance goals;
- (d) developing and implementing a comprehensive training program that ensures that employees maintaining the conventional fleets possess the knowledge, skills, and abilities needed to adequately perform their jobs;
- (e) developing and implementing a financial incentive program for employees maintaining the conventional fleets, if it is determined that the costs are worth the expected benefits; and
- (f) developing and implementing a plan to fully address the open recommendations from our previous report (see Appendix II).

MANAGEMENT COMMENTS AND OIG ANALYSIS

In commenting on a draft of this report, the Acting Vice President for Operations agreed with our recommendations. He highlighted the progress that the Mechanical Department has made since our earlier report (*Mechanical Maintenance Operations*, E-05-04, September 6, 2005), and also acknowledged that opportunities exist for further progress, particularly in applying the lessons learned from Acela maintenance practices to the conventional fleet.

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The response discussed detailed actions being planned to address our recommendations, including action plans to address the open recommendations from our previous report. The Acting Vice President for Operations also committed to providing quarterly updates on the progress being made. We consider these actions responsive to our recommendations.

Amtrak's letter commenting on the draft report is reprinted as Appendix III.

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Thank you for your cooperation during the course of this evaluation. If you have any questions, please contact me at calvin.evans@amtrakoig.gov or 202.906.4507.

cc: Joseph H. Boardman, President & CEO
Mario Bergeron, Chief Mechanical Officer
Jessica Scritchfield, Senior Director, Internal Controls/Audit

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Appendix I

SCOPE AND METHODOLOGY

This report discusses our follow-up evaluation of the progress Amtrak has made in implementing the recommendations contained in an earlier OIG report. In late 2004, Amtrak OIG conducted a broad, system-wide evaluation of Amtrak's mechanical maintenance program, which resulted in the issuance of Report E-05-04, *Amtrak Mechanical Maintenance Operations*, on September 6, 2005. This report contained 34 recommendations, all of which were subsequently agreed to by Amtrak management.

The objective of our follow-up evaluation was to assess Amtrak's progress in implementing these recommendations, and to identify opportunities for continued improvement. To address our objectives, we began by conducting a detailed review of the 34 recommendations in the previous evaluation report, E-05-04, and the corresponding Amtrak management response. With this background, we then held a preliminary meeting with the Chief Mechanical Officer (CMO) to identify other areas of possible focus or special interest. Using these as a guide, we then conducted on-site visits, over a 4-month period, to all major Amtrak mechanical facilities nationwide, interviewing responsible local managers, reviewing documentation, inspecting each facility, taking photographs, and gathering data. In addition, we conducted extensive interviews with all of the Deputy CMOs, five of the Master Mechanics, and selected senior Mechanical Department support staff. We compared these latest observations with our previous recommendations and the Amtrak management response, and used that comparison to identify both areas of progress—much of it substantial—and remaining challenges and opportunities. Finally, to assess the validity of our conclusions, we met with senior Mechanical Department management and provided them with an opportunity to review the results and provide feedback.

Our work was performed in accordance with government *Quality Standards for Inspection and Evaluation* and our statutory responsibilities contained in the Inspector General Act of 1978, as amended.

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Appendix II

STATUS OF PRIOR RECOMMENDATIONS

Report Area	Numbered Recommendation	Amtrak Management Response	OIG Staff Observation
Maintenance Content and Frequency	1A. That the Chief Mechanical Officer (CMO) develop and implement a process that records usage data (miles, hours, etc.) on all major serialized components, including (but not limited to) traction motors, wheel sets, air compressors, and brake valves, so that a database can be created to use in scheduling maintenance and analyzing failure characteristics	Agree. Amtrak's Work Management System (WMS) (Spear Technologies) has a fully functioning module that supports component serialization and gathering of asset-related metrics. The Mechanical Department has developed an interface with the wheel shop production database that will allow WMS to automatically read the "born on" data and create the asset record, nameplate, and assign serialization. This process has been in the development phase for some time and final testing is being completed. This interface will go live during the first quarter of calendar year 2006. (Abbreviated)	Some progress. P-42 traction motors, wheels, and major Acela components are being tracked by serial number in WMS, but the rest of the recommended components are still not being tracked.
	1B. That the CMO conduct a systematic review of all scheduled maintenance activities to ensure that the activities are appropriate and justified by the best information currently available (manufacturer's recommendations, industry studies, documented experience, etc.).	Agree. The CMO will conduct a systematic review of all scheduled maintenance activities to ensure that they are appropriate and justified. In order to accomplish this review, the CMO would enlist the services of a qualified consulting firm to validate the ongoing practices or to recommend the required changes utilizing the best information currently available, as well as provide an evaluation of	Complete.

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		the existing fleet conditions. This effort will be completed within the next 8 to 10 months and result in a comprehensive fleet review and recommendation for improvements.	
	<p>1C. That the CMO, in coordination with Human Resources, develop a training program to educate key personnel in the Mechanical Department on reliability-centered maintenance (RCM) and other modern maintenance management techniques.</p>	<p>Agree. The CMO, in conjunction with the Human Resources Department, will enlist the services of a qualified consulting firm to educate key Mechanical personnel on RCM and other modern maintenance management techniques. A brief introduction to RCM concepts as well as some modern maintenance management techniques has been incorporated into the Mechanical Managers "Leadership in Action" workshop that is currently underway for approximately 160 Mechanical Department managers. This group represents the preponderance of Mechanical Department Operations personnel. As a follow-up to this program, plans are underway to provide a more detailed review of RCM philosophy with the CMO's direct reports in calendar year 2006. Further training will be evaluated as data and systems are brought online to support RCM analysis.</p>	<p>Complete. Refresher training may be needed.</p>

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	<p>1D. That the CMO develop and implement a process that continually reviews scheduled maintenance content and frequency to ensure that it is being performed optimally in accordance with the RCM philosophy.</p>	<p>Agree. The CMO will develop and implement a process to continually review the content and frequency of the scheduled maintenance programs to ensure that the RCM philosophy is utilized optimally. To begin this process, the CMO will begin to develop senior management through an educational approach to the RCM philosophy. Implementation is targeted to begin in the latter part of calendar year 2006.</p>	<p>Some progress. A process has been set up to update the toolbox reference guides on a recurring basis based on feedback from the field. However, there are still no structured programs to update the maintenance procedures for each fleet based on a review of the scheduled maintenance content and frequency to ensure that it is being performed optimally in accordance with RCM philosophy.</p>
	<p>1E. That the CMO investigate the costs and benefits associated with outsourcing part of the maintenance operation to an experienced maintenance provider who is already employing RCM, as a means to quickly gain the benefits associated with RCM and also gain first-hand experience with the techniques.</p>	<p>Agree. The CMO has initiated a project that is investigating the costs and benefits associated with outsourcing part of the maintenance operation to an experienced maintenance provider who is already employing RCM, as a means to quickly gain the benefits associated with RCM and also gain first-hand experience with the techniques. This review is being undertaken with the assistance of an experienced consultant in the field of diesel locomotive contract maintenance. The Mechanical Department is acting on identified opportunities from the consultant's initial assessment dated June 2005 relating to the maintenance of the diesel locomotive fleet. The next phase will include issuing</p>	<p>Complete.</p>

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		a request for quote, and based on the responses, the CMO will provide strategic recommendations by the third quarter of calendar year 2006.	
	1F. That the CMO petition the Federal Railroad Administration (FRA) to allow the use of different maintenance intervals than the ones specified in 49 CFR Parts 229 and 238 for those components where historical data are available and a justified case can be made to support the change.	Agree. The corporation has, in the past, successfully petitioned FRA to change the legal requirements as specified in the CFR. We will continue to evaluate and identify opportunities to petition for changes in the legal requirements. As the Mechanical Department implements an RCM program and has the data to support and perform predictive failure analysis, we will be able to identify additional potential changes to the current legal requirements.	Complete. The Mechanical Department requested and FRA approved extending the Acela clean, oil, test, and stencil (COT&S) cycles from 5 to 10 years. The HHP-8 locomotive approval is currently at 7 years, with a plan to go to 10. Although we are considering the recommendation complete, other opportunities that may be worth exploring appear to be available to increase maintenance intervals.
	1G. That the CMO review his organizational structure and modify it as appropriate to support an RCM operation. This should include creating and filling key analytical and other important management positions with technically educated, experienced, and knowledgeable personnel from external sources to help speed the transition to an RCM operation.	Agree. The CMO will review the organizational structure of the Mechanical Department and modify it as appropriate to support an RCM environment. The review will take place in conjunction with the RCM training that is required to better understand how to align the organization to operate under the RCM philosophy.	Complete.

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Heavy Overhaul Program	<p>2A. That the CMO immediately change the content and frequency of the P42 heavy overhaul program to more closely align with the manufacturer's recommendations and industry practice.</p>	<p>Agree. In the future, the Mechanical Department will work more closely with the Transportation department to optimize the right mix of mileage (i.e., service where units run) to generate the best possible overhaul schedule. With the change of frequency from 5 to 6 years, some of the overhaul and other planned work will be moved to the field. The 5-year electronic air brake COT&S, dryers, nozzle change-out, and interior cab work will be performed during the annual preventive maintenance inspection in the field. (Abbreviated)</p>	<p>Complete.</p>
	<p>2B. That the CMO conduct a systematic review of the content and frequency of all heavy overhauls to ensure that the activities included in the overhauls are appropriate and justified by the best information currently available (manufacturer's recommendations, industry studies, documented experience, etc.).</p>	<p>Agree. The CMO will conduct a systematic review of all heavy overhaul activities to ensure that the activities are appropriate and justified. In order to accomplish this review, the CMO will enlist the services of a qualified consulting firm to review current scope and frequency and recommend changes utilizing the best information available as well as provide an evaluation of existing fleet conditions. This evaluation process will be initiated within 90 days.</p>	<p>Limited progress. Considerable effort has been expended on documenting the current overhaul content and procedures. In addition, much work has been done on the diesel locomotive fleet in implementing life-cycle preventive maintenance (LCPM). However, there is no current ongoing effort to conduct the systematic review that was recommended for the rest of the fleets.</p>

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	<p>2C. That the CMO review the cost-effectiveness of continuing to perform heavy overhauls and remanufactures in the current manner in lieu of programming maintenance on a pure condition- or usage-based cycle as part of normal scheduled maintenance.</p>	<p>Agree. The CMO will review the cost-effectiveness of continuing to perform heavy overhauls and remanufactures in the current manner. The CMO will utilize the consultants' report as identified in Recommendation 1B to perform the analysis.</p>	<p>Limited progress. Beyond the life-cycle preventive maintenance work with the diesel locomotives, there is no current activity to review the cost-effectiveness of continuing to perform heavy overhauls and remanufacturers in the current manner.</p>
<p>Work Management System (WMS)</p>	<p>3A. That the CMO immediately mandate the use of WMS at all maintenance locations (that currently have the capability) to start the capture of equipment and cost data that are not currently being captured.</p>	<p>Agree. The Mechanical Department supports the full usage of WMS to track and manage all aspects of the maintenance program. The department is aggressively driving the full implementation of the manual payroll process while final testing of the SAP interface is completed. A second major initiative is underway to automate the requisitioning of repair parts and materials. This work will build on the interface already in place that provides catalog information and balance-on-hand data. These two initiatives, when completed and fully implemented, will capture all labor and inventory materials usage and associate them with work orders and tasks in WMS. Field survey work is underway to identify all network infrastructure requirements to fully support this effort. (Abbreviated)</p>	<p>Complete.</p>

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	3B. That the CMO conduct a comprehensive assessment of the equipment and cost data required to effectively manage a corporate-wide RCM operation.	Agree. The CMO, along with the software manufacturer, Spear Technologies, will conduct a comprehensive assessment of the existing cost data and system implementation to determine additional actions to fully implement and support a Mechanical RCM strategy.	Complete.
	3C. That the CMO, in coordination with Amtrak Technologies (AT), conduct a review of the current capabilities of WMS to assess if it will satisfy the needs of an RCM operation. If not, modify, supplement, or replace WMS with a Computerized Maintenance Management System (CMMS) that can satisfy the needs of an RCM operation.	Agree. The CMO will coordinate an assessment of the capabilities of the Spear3i software to support the needs of a reliability-centered maintenance program. Most CMMS and EAS systems have basic analytical tools built into them but are primarily designed to feed data into an external tool to conduct more in-depth analysis. (Abbreviated)	Substantial progress. Assessment is complete. Replacement of WMS with MAXIMO asset management software has been proposed as part of Strategic Asset Management Phase 2 implementation.
	3D. That the CMO, with support from AT and Human Resources, develop and execute a plan to complete implementation of WMS (or another CMMS) at all maintenance locations. The plan should include a timeline containing all critical activities; an assessment of infrastructure and hardware requirements at all locations; and a comprehensive training plan that includes training for new users, refresher training for existing users, and training for senior managers on the capabilities of the system	Agree. The CMO is developing a comprehensive action plan for full implementation of Spear 3i. Meetings with various groups within AT and Mechanical senior management are being conducted to educate the supporting departments on the need and criticality of this effort. Senior-level meetings are taking place to develop the strategy and timing of significant milestones. A full and comprehensive schedule will be finalized over the 2nd quarter of calendar year 2006 and will include	Complete.

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		key milestones. (Abbreviated)	
	<p>3E. That the CMO establish a WMS steering committee for the Mechanical Department, consisting of the master mechanics and facility superintendents, to review, on a yearly basis, the direction of WMS implementation and identify the needs for expansion or upgrade of the system.</p>	<p>Agree. The CMO has established a WMS Steering Committee that includes the following positions:</p> <p>Chief Mechanical Officer Deputy Chief Mechanical Officer Senior Director, Planning, Logistics, and Budgeting Senior Director, Equipment Engineering Senior Director, Standards and Compliance Rotating Seat, General Manager, Shops Rotating Seat, Master Mechanic, Division</p> <p>The purpose and role of the Steering Committee is to set overall direction and leadership, and provide support and resources to successfully implement Spear 31. Future expansion, significant enhancements, and upgrades will be addressed by this committee. The CMO will also establish a user committee focused on implementing key user functionality and ensuring high levels of compliance throughout the user community. It will serve as the bridge among the facilities/shops, the system, and senior</p>	<p>Some progress. A WMS Steering Committee was created but it has not been meeting regularly to actively guide the expansion and upgrade of the system. However, there are plans to reinvigorate this committee.</p>

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		<p>management to ensure consistency of purpose and clear understanding of the use and functionality of the system. This group will meet quarterly, with this frequency being reviewed as functionality is implemented. This committee will comprise master mechanics, superintendents, assistant superintendents, managers, and a general foreman. The group will initially meet quarterly. The exact makeup of the group will be determined over the next quarter.</p>	
<p>Quality Management</p>	<p>4A. That the CMO develop a comprehensive corporate-wide quality management (QM) program that, at minimum, evaluates the conduct of PM to ensure that it is being done correctly and consistently throughout the organization, evaluates the conduct of PM to ensure that the time scheduled for PM is appropriate to accomplish a given scope of work, evaluates and reports on the condition of the fleet by car/locomotive type to be used in prioritizing work or capital expenditures, evaluates the root cause of equipment failures to address systemic issues and modify procedures, and evaluates the quality of the WMS data on a recurring basis to ensure that it is accurate and dependable.</p>	<p>Agree. A corporate-wide QM program that includes document control, material oversight, uniform procedures, and appropriate measurement tools will address the lack of uniform consistency cited in the DIG report. The CMO and the management team, over the next 6-8 months, will identify those elements of fleet maintenance that align with an RCM-based strategy and develop a plan that defines how the major elements referenced above will be administered consistently in all Amtrak facilities. External resources will be identified as needed to ensure that Amtrak is adopting best practices.</p>	<p>Substantially complete. A corporate-wide QM program has been developed; however, there is evidence that it does not adequately "evaluate the conduct of PM to ensure it is being done correctly and consistently throughout the organization." This was the first, key element of the initial recommendation and should be addressed.</p>

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	<p>4B. That the CMO hire additional experienced and trained personnel to implement the comprehensive QM program.</p>	<p>Agree. The CMO is always seeking to improve the quality of the organization. Concurrent with identification of the framework for the QM program, an analysis of departmental resources will be undertaken to determine if the proper experience and expertise is available to ensure successful implementation. After review, the CMO will make recommendations for organizational changes consistent with the resources required to implement a comprehensive QM program.</p>	<p>Complete.</p>
<p>Performance Metrics</p>	<p>5A. That the CMO take immediate action to select and implement a set of performance metrics to use to monitor the status of the mechanical fleet and to help in resource allocation and decision-making. The set of metrics should include, at minimum, metrics in the following areas: <i>Reliability:</i> Mean time between failures for each type of locomotive/car, mean miles between failures for each type of locomotive/car, mean time between shoppings for each type of locomotive/car, mean miles between shoppings for each type of locomotive/car, minutes of delay to revenue service due to equipment failures. <i>Availability:</i> Locomotives by type available for service</p>	<p>Agree. The CMO has initiated a review of current metrics and suggested metrics included in the report that will effectively monitor the status of the fleet and drive improvement and change. Further, the CMO will review the data that are currently collected in Spear 3i to prioritize an implementation schedule. The CMO will further examine industry best practices to develop a comprehensive reporting strategy. This review will include examining each suggested metric as well as any others that are generally accepted in the transportation—and specifically, the passenger rail—industry.</p>	<p>Complete.</p>

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	<p>divided by total number of active locomotives by type, cars by type available for service divided by total number of active cars by type. <i>Condition:</i> Equipment condition index (based on an independent evaluation of equipment serviceability and cleanliness), number of customer complaints about condition of equipment over a given period. <i>Cost:</i> Fully allocated maintenance cost per year for each locomotive type, fully allocated maintenance cost per mile for each locomotive type, fully allocated maintenance cost per year for each car type, fully allocated maintenance cost per mile for each car type. <i>State of Good Repair (SOGR):</i> Number of locomotives by type in "State of Good Repair" divided by total number of active locomotives by type, number of cars by type in "State of Good Repair" divided by total number of active cars by type.</p>	<p>Some of the metrics suggested include costs outside the Mechanical Department and may be part of a more comprehensive financial metric. Mechanical will provide data available to other departments as needed to support fully allocated cost analysis. The implementation timeline will be determined by data availability and system technical requirements, and will be formalized during the second quarter of calendar year 2006.</p>	

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	<p>5B. That the CMO routinely track the metrics, analyze trends, and publicize the results to both senior management and the Mechanical Department workforce.</p>	<p>Agree. The CMO publishes the current metrics and will continue to publish results against any modified or new set of measures. Current metrics are published and reviewed monthly with the Senior VP–Operations. They are also the topic of weekly and daily calls with respect to fleet availability and shop counts. To increase the visibility of the need for change and to support the concepts introduced during the department's ongoing Leadership in Action classes, the CMO will place "Production and Performance" boards in each facility as a way to take the message of improvement and change to all Mechanical facilities. The Department is fast-tracking the implementation of the Engineering-style dashboard.</p>	<p>Complete.</p>

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	<p>5C. That the CMO develop appropriate action plans based on the analysis of the metrics.</p>	<p>Agree. The CMO currently reacts to and implements changes when there is any variance to the planned results. This will continue as metrics and measures are reviewed and changes are adopted and implemented. The department is looking at a number of metrics and measures that will enhance the transparency of the effectiveness of the maintenance programs. Metrics are only useful to the extent that they inform management about a variance to a goal or objective and facilitate intervention to improve performance. The CMO is developing an operational dashboard that will be available with the next release of Spear 3i. This will facilitate the reporting of many of the metrics with a direct link into the database. As an interim measure the department is moving ahead to implement the Engineering-style dashboard, which will give the Department metrics on financial results, overtime, safety, and project completion status. All these metrics are currently managed through reports but the dashboard will allow for departmental distribution in a forum that is easier to view and will improve accountability throughout the organization.</p>	<p>Complete.</p>

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	5D. That the Chief Operating Officer define SOGR for the mechanical fleet in measurable terms.	Refer to discussion above. The Mechanical Department will fully support a corporate-wide definition of SOGR.	Complete.
Fleet Planning	6A. That the Vice President for Planning and Analysis develop, and keep current, a comprehensive fleet plan (that includes both locomotives and cars) to be used to forecast and prioritize mechanical capital expenditures. The equipment requirements in the fleet plan should be based on realistic shop projections and a rational business case analysis of the incremental costs and benefits for the equipment allocated to every train.	Agree. The CMO will provide any requested data that are available to support the Vice President for Planning and Analysis in completing this task.	Closed. Tracked under OIG Evaluation Report E-06-02.
	6B. That the CMO develop the mechanical capital budget to support the requirements in the fleet plan.	Agree. The capital budget process as of now takes into account current requirements and prioritizes overhauls based on condition, time from previous overhaul, mileage, and regulatory requirements.	Complete.
	6C. That the CMO identify equipment that is considered excess to requirements and store the equipment at a secure location in a manner that will prevent deterioration, to the greatest extent possible, until it is potentially needed in the future.	Agree. The first step in identifying excess equipment is to complete a multi-year comprehensive fleet plan for all cars and locomotives. This plan must be a coordinated effort among various departments, including Operations, Strategic Planning, Transportation, Marketing, and Mechanical. Monthly meetings are taking place to ensure input from these	Complete.

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		<p>departments. Once completed, periodic reviews must take place to adjust the fleets to the right size. Upon completion of this plan, the CMO will continue to take the steps necessary to store equipment identified as excess. (Abbreviated)</p>	
<p>Material Availability</p>	<p>7A. That the Vice President for Procurement and Materials Management, in coordination with the CMO and the AT Department, expand the usage of vending machine-type containers (or other new technology that allows parts and supplies to be maintained closer to the work locations), to all Amtrak maintenance facilities.</p>	<p>Agree. The CMO will coordinate with the Vice President for Procurement and Materials Management to utilize new technology to improve material availability and access in the most efficient manner.</p>	<p>Complete. Amtrak has considerably expanded the use of vending machine-type containers at Amtrak maintenance facilities. However, we noted that the actual use of the machines varies widely. Some locations manage the machines very well with a regular process to adjust the items that are carried in order to maximize their use. Other locations have simply filled the machines with personal protective equipment and no effort is made to adjust the content based on actual material consumption. Although we are considering this recommendation complete, the processes of the well-managed locations, such as Albany and Brighton Park, should be copied throughout the system to ensure maximum efficiency and utilization.</p>

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	7B. That the CMO keep the Vice President for Procurement and Materials Management continually informed of changes planned in the mechanical maintenance operation.	Agree. The CMO and the Vice President for Procurement and Materials Management have continually worked together to develop the communication links throughout both departments to ensure that all changes planned and unplanned are discussed on a regular basis, with monthly meetings that ensure continuity.	Complete.
	7C. That the Vice President for Procurement and Materials Management continually reassess material requirements, inventory levels, warehouse requirements, and material control manning levels based on changes planned in the mechanical maintenance operations.	Refer to response from VP, Procurement and Materials Management.	Complete.
Facility Rationalization/ Consolidation	8A. That the CMO conduct a study of the condition, capacity, capabilities, and costs of each mechanical maintenance location to evaluate the potential benefits of consolidating maintenance operations into fewer locations.	Agree. The CMO, in conjunction with the Office of Inspector General (OIG), has already set this process in motion. The consulting firm has been identified and dates have been confirmed for site evaluations around the country of the mechanical facilities' capacity and rationalization. An overall study of condition, capabilities, and costs of each mechanical maintenance location will be conducted as we further define the impact of RCM and identify what capability and capacity requirements will be	Complete.

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		necessary to optimize utilization and apply consolidation and/or elimination of existing mechanical assets. (Abbreviated)	
	8B. That the Vice President for Transportation support the CMO's study by providing analysis of the potential additional costs for routing equipment to different locations.	The CMO will engage the VP, Transportation in planning and implementing the shop rationalization project.	Complete.
	8C. That the Chief Engineer support the CMO's study by providing cost estimates of any facility modifications that would be required to support consolidation.	Refer to the response from the Chief Engineer.	Complete.
	8D. That the Vice President for Procurement and Materials Management support the CMO's study by providing estimates of any savings in material management and storage costs associated with consolidating maintenance operations into fewer locations.	Refer to the response from the Vice President for Procurement and Materials Management.	Complete.

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Maintenance Cost Data	9A. That the CMO determine the level of detail required in the cost data to support effective decision-making in an RCM operation	Agree. The CMO's staff is reviewing the current accounting structure and use of various data elements to improve the accuracy and reporting of activities. The Spear 3i system will completely support an RCM philosophy. The Spear 3i software is built around a robust database comprising unit history and component serialization coupled with defect history. This structure will provide the data to support an RCM system. The cost detail that is needed to enable the CMO to make predictive maintenance strategy decisions is at the unit and component level. The data must provide life-cycle information and support root-cause and failure-mode analysis. The process of collecting the traceable component costs, as outlined in Section 1, will be implemented in parallel with other efforts to integrate RCM into Amtrak's maintenance practices.	Complete. Although we are considering this complete, the current process still does not capture the accurate cost of repaired components. This will be necessary if Amtrak attempts to insource component repair work in the future or wants to judge the efficiency of its current component repair operations.
	9B. That the CMO coordinate with the Chief Financial Officer (CFO) and AT to modify the account structure in the current financial system, if necessary, to provide the detail required to better support the Mechanical maintenance operation.	Agree. The CMO's Planning and Budgeting staff is currently reviewing the accounting system structure and will propose changes to improve transparency and reporting clarity. There is also significant development underway in WMS to implement	Complete.

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		automated electronic material requisitioning and job-level-specific coding.	
	9C. That the CMO coordinate with the CFO to ensure that the Mechanical Department's requirements are included in the new financial system being designed and implemented by the Finance Department.	Agree. The CMO's Planning and Budgeting staff is currently working with the CFO's organization to provide input on the department's requirements in a new system.	Complete.

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Appendix III

**COMMENTS FROM THE
 ACTING VICE PRESIDENT, OPERATIONS**

NATIONAL RAILROAD PASSENGER CORPORATION
 40 Massachusetts Ave, NW Washington, DC 20002

Memo



Date March 19, 2012
 To Calvin Evans

D.J. Stadler
 From D.J. Stadler
 Department Operations
 Subject OIG Report Draft Evaluation Report
 cc Mario Bergeron
 Gordon Hutchinson
 Jessica Scritchfield
 Dee Waddell
 Charlie Woodcock
 Barry Melnkovic

Message

Attached is the response to your Memorandum dated February 8, 2012, entitled *Mechanical Maintenance: Improved Practices Have Significantly Enhanced Acela Equipment Performance and Could Benefit Performance of Equipment Company-wide (Draft Evaluation Report)* which was performed as a follow-up review to an earlier evaluation. We believe that we have addressed all of the recommendations that the OIG offers including an update on the status of those recommendations from the Evaluation Report E-05-04.

In an effort to close out the recommendations and in order to keep the OIG informed of the progress of our efforts, we are proposing that a quarterly status report be sent to the OIG. The Chief Mechanical Officer will initiate a status update report during his monthly staff meeting and will summarize this report for transfer to the OIG on a quarterly basis.

As the OIG evaluation report points out, there has been significant progress made within the Mechanical Department to the benefit of our customers, and we acknowledge that there may be opportunities to further progress particularly in applying lessons learned to the conventional fleet. To this end we are focusing our senior management team to review, resolve and complete the recommendations provided by the OIG Evaluation. We believe that the responses offered are clear, to the point and provide the responsible position for implementing action, as well as an outline for completion as has been requested.

Attachment

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The OIG report highlights the significant difference in the staffing levels of management and technical resources between the Acela Express maintenance and conventional fleet maintenance and Amtrak Management recognizes that improvements can be made if staffing were optimized at the conventional maintenance facilities. An optimized staffing level, by facility, may mean an increase in headcount, but it would need to be tied to performance metrics and be value driven. As the report indicates, there are fundamental differences between the operation and maintenance of the Acela train sets and the conventional rolling stock which can impact the availability and reliability metrics, particularly when considering available support resources. Specifically, the fact that the conventional fleet operates across several Master Mechanic's divisions and coast-to-coast, whereas the Acela fleet only on the Northeast Corridor (NEC), lends to the complexity of establishing a responsibility and process management matrix by fleet type. That said, Amtrak Management has detailed a response below for each of the OIG recommendations as well as the open recommendations from the prior evaluation that are referenced in this report.

OIG Recommendation

- (1) That the Vice President for Operations develop goals for improving the performance of Amtrak's conventional fleets that support Amtrak's *Strategic Plan*; provide direction, support, and resources to achieve those goals; and hold the Chief Mechanical Officer (CMO) accountable for meeting those goals.

Management Response to (1)

Amtrak agrees with the OIG's recommendation and previously developed goals and metrics to improve the service to our customers starting as far back as 2006 with the publication of performance metrics and the initiation of the mechanical scorecard. Further, in 2011 Amtrak Mechanical began to align the higher level mechanical management team goals with those at the Amtrak executive level as outlined in the strategic plan. The process of evaluating performance metrics and developing meaningful goals is an ever-evolving process. There is a concentrated effort to drive the decision making process by carefully considering the data used for the performance metrics.

The goal process has further progressed in 2012 with the entire Mechanical Department's goals aligning to the *Strategic Plan*. In a parallel effort there was significant progress in developing metrics to measure the progress of the department in meeting the goals that had been established. Improvements in data input, coupled with improved analysis and data mining tools have enabled more robust performance metrics. The 2012 goals for the Mechanical Department list specific benchmarks for availability, reliability, on-time performance, customer satisfaction, partner satisfaction and initial terminal performance and are tied back to the strategic plan goal of advancing customer service quality through greater customer focus. These goals are then driven down through all levels of the organization to ensure the greatest impact.

Management Action to (1)

The Vice President of Operations will work with the CMO to develop goals for improving the performance of Amtrak's conventional fleets that support Amtrak's *Strategic Plan* by September 30, 2012. The appropriate individuals within Amtrak will be held accountable for the developed goals starting in fiscal year 2013. Additionally, the appropriate direction, support, and resources to achieve these goals will be provided by fiscal year 2013.

Specifically related to mechanical goals addressed by the OIG evaluation report, the CMO assigned the Senior Director of Production Planning & Logistics to gather and publish the annual Mechanical Departmental goals. The Senior Director of Production Planning & Logistics will continue to engage all levels of the mechanical organization on a monthly basis to review department progress against these goals through scorecard meetings and on an annual basis during the yearly CMO's departmental staff meeting. Amtrak Management views this as an ongoing process; the initial effort will be completed in time for alignment with the corporate goals and no later than December 31, 2012.

OIG Recommendation

- (2) In addressing these goals [from (1)], the VP for Operations and the CMO should establish and implement an agreed upon plan for improving the performance of the conventional fleets that includes
- (a) completing implementation of reliability-centered maintenance (RCM), including
 - i. creating Acela-like reliability-improvement teams, focused solely on reliability, for each major fleet of conventional equipment;
 - ii. taking actions to improve the quality and quantity of failure data available to these teams; and

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- iii. increasing the use of root-cause analysis for studying failures and serious problems with conventional fleet reliability;

Management Response to 2(a)

Amtrak agrees with the OIG's recommendation. As a result of recent restructuring, the RCM process will transition from the Deputy for Reliability Centered Maintenance to the Mechanical Department. This transition will continue the RCM implementation for the Mechanical Department by transferring process ownership to the Deputy Chief Mechanical Officer (DCMO) – Engineering, Standards and Planning. The RCM implementation for planned maintenance, servicing, inspection and cleaning tasks has been completed on all major fleets of rolling stock. The DCMO - Engineering, Standards and Planning will continue the RCM process during this transition period and develop a team, initially comprised of four (4) new positions, within his organization. The new team will have the responsibility to complete any outstanding RCM implementations, initiate any required Maintenance Effectiveness Reviews (MER), develop RCM implementation plans for new equipment acquisitions and begin the next round of reviews for those processes that had previously been completed.

Management Action to 2(a)

The DCMO – Engineering, Standards and Planning will work with the Vice President of Operations and the CMO to establish and implement an agreed upon plan for improving the performance of the conventional fleets that includes continuing the implementation of RCM beginning in fiscal year 2013. Specifically, management will hire four (4) new positions, develop the transition process for the RCM effort previously undertaken, develop the next level of RCM implementations, and refine the process for moving forward.

Management Response to 2(a)(i)

Amtrak agrees with the OIG's recommendation. The Mechanical Department established six (6) Process Focus Teams (PFT's) in 2006 to define objectives, prioritize efforts and resources and design effective tactics with action plans to ensure process improvement for the various key elements of Amtrak's operation. These teams are setup as a matrix style organization of process owners to manage the mechanical processes and include representatives from Rolling Stock Fleet Engineering and all levels of Mechanical Operations and often pull resources as issues are being addressed. Each Master Mechanic not only manages their Division of responsibility, but also is a Process Owner. Within the PFT's, there are Process Action Teams (PAT's) which are tasked with the planning and execution of change efforts as directed by the larger PFT. Amtrak Management believes there is an opportunity to review the effectiveness of the PFT's and to determine if their goals can more closely aligned with the *Strategic Plan* as recommended by the OIG report. Amtrak Management also recognizes that there may be an opportunity to focus the PAT's on areas that will specifically improve fleet reliability and availability.

The Mechanical Department is reviewing staffing options that would take lessons learned from successfully managing and improving Acela train performance and apply them to the conventional fleets. This includes the use of train set maintenance engineers who have clear lines of responsibility for specific train equipment performance as well as training in Root Cause Analysis (RCA) and Failure Mode and Effects Analysis (FMEA) tools and techniques. It also includes Work Management System (WMS) level configuration to ensure that the failure modes that affect reliability are identified and effective reporting is produced. It utilizes the Plan→ Do→ Check→ Act (PDCA) cycle to continually examine equipment performance and its impact on on-time performance, customer satisfaction and other performance metrics. The PDCA cycle together with accurate data capture, RCA tools, and effective reporting ensures that management is aware of and focused on the failure modes that if reduced or eliminated would radically improve performance. The fleet performance working team would be comprised of fleet engineers, maintenance engineers, quality engineers, process engineers, and field maintenance personnel that would meet periodically to review specific fleet performance data including fleet reliability and associated failure mode data. Output from this team would include recommendations to improve any aspect of the entire maintenance cycle in areas such as:

- Training – Mechanic or internal customer
- Component, part or assemblies re-design
- Vendor Quality Issues
- Maintenance Procedures, Practices, or Periodicity
- Overhaul Content

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- Equipment modification

Management Action to 2(a)(i)

The DCMO – Terminals, assisted by the DCMO – Engineering, Standards and Compliance, will be tasked with leading the initiative of reviewing the effectiveness of the PFT's and determining how to drive the performance metrics through these groups. The DCMO – Terminals will develop a process outline for enhancement of the PFT's and deliver an implementation schedule for these improvements by December 31, 2012. It is anticipated that the Acela-like reliability improvement teams will be in place by the end of March, 2013.

Management Response to 2(a)(ii)

Amtrak agrees with the OIG's recommendation. The DCMO – Engineering, Standards and Planning has already taken the lead in evolving Amtrak's data analytics from HSR to conventional fleet in an effort to standardize and improve data representation, in part through the use of a software package called Tableau. This effort has taken current performance data, displayed it in a dashboard format that assists managers in the decision making process. The Deputy Chief Mechanical Officer-Terminals will assist the data improvement effort by ensuring that the individual PFT's review and evaluate the quality of the data available and that they set the guidelines for mining data within the Amtrak systems.

Management Action to 2(a)(ii)

The DCMO – Engineering, Standards and Planning assisted by the DCMO – Terminal Operations will lead the effort to evaluate the quality of the data available to the PFT's and provide an analytical study on improvements that can be made. Together they will study the quality of available data and the relevancy of current reports, and by September 30, 2012 develop a guideline for improvements that will drive higher quality data and improved reporting. Actions to improve the quality and quantity of failure data available to the PFT's is expected to be completed by the end of March 2013.

Management Response to 2(a)(iii)

Amtrak agrees with the OIG's recommendation that RCA can be used more widely. Procedures for the use of RCA were defined in SMP25023 in September 2007. Formal RCA efforts can require dedication of numerous resources for several months and can be a very demanding endeavor. RCA training has been provided to every member of Rolling Stock Engineering (RSE) and High Speed Rail Engineering (HSRE) and is included in the Leadership in Action (LIA) course for all new hire supervisory management and agreement employees.

Management Action to 2(a)(iii)

Amtrak Management will continue to train all RSE and HSRE new hires in the RCA process through a formal RCA training course and will continue to introduce all new hire supervisors to the RCA process through the LIA course. Secondly, the DCMO – Engineering, Standards and Planning will review and update SMP25023 to the most current standards and have that completed by September 30, 2012. The ability to expand the use of RCA is recognized to be a function of available resources, as discussed in 2(c); therefore, a completion date for this recommendation has not yet been determined.

OIG Recommendation

(2)(b) In addressing these goals [from (1)], the VP for Operations and the CMO should establish and implement an agreed upon plan for improving the performance of the conventional fleets that includes

- (b) establishing clear and specific accountability and responsibility for fleet performance

Management Response to 2(b)

Amtrak agrees with the OIG's recommendation and the observation that responsibility of the equipment be focused under one Master Mechanic. However, the operation of the Acela on the NEC is fundamentally different than the equipment on conventional routes in that the geographic alignments of the Master Mechanics do not coincide with specific equipment fleets, nor can it fully. Ideally the Master Mechanic would maintain and be the process owner for the equipment that is operated in his division. Given the geographic size and operational complexity of the Amtrak system this is impractical. This said, Amtrak mechanical management had attempted to provide as much individual responsibility with an effort to have a specific Master Mechanic responsible for specific fleets through the PFT process. The Master Mechanics currently have allocation of process ownership and accountability that is generally aligned with process work within their division. For instance most planned maintenance for the P42 locomotive fleet is performed in Chicago; therefore the Master

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Mechanic – Central Division has process ownership for that fleet. As such the Master Mechanic is required to follow equipment performance across all divisions and assist with resolving issues specific to that equipment as they arise.

Management Action to 2(b)

The Vice President of Operations will work with the CMO to review the specific metrics established in recommendation (1) to determine if there is an opportunity to further define those metrics as related to fleet performance, ensure that they will be filtered to the respective Master Mechanic and established as a measurable goal for the Master Mechanic. The DCMO – Terminal Operations will lead this initiative and will have the review completed and individual goals established in time for alignment with the corporate goals and no later than the September 30, 2012. This effort is expected to parallel the corporate restructuring in alignment with the *Strategic Plan* and will further define the role and expectation of field and corporate functions.

OIG Recommendation

(2)(c) In addressing these goals [from (1)], the VP for Operations and the CMO should establish and implement an agreed upon plan for improving the performance of the conventional fleets that includes

- (c) determining the appropriate level of management and technical support needed to achieve the equipment performance goals

Management Response to 2(c)

Amtrak agrees with the OIG's recommendation and understands that current management and engineering staffing levels for the conventional maintenance are not in line with the ratios for Acela maintenance, which may in turn affect performance. Amtrak Management further recognizes that staffing the conventional maintenance to the same levels as established for the Acela maintenance would require hiring over 600 new management and engineering employees.

As a proposed pilot program, Amtrak mechanical will evaluate the staffing specific to the Chicago 16th street locomotive shop and other strategic locations involved with the P42 fleet and perform a value analysis to determine the optimum ratios for that facility. Amtrak mechanical will work with marketing to determine the value of specific improvements to the metrics outlined in recommendation (1) above and to establish the baseline for improvement. This baseline will be used to develop a strategic analysis geared to implement technical and managerial staffing levels that will bring the highest value to the company. Assuming that sufficient value is recognized through this process, additional fleets will be studied on a priority basis. The facilities where the highest value is estimated will become the high priority location and be next in line for the value analysis study.

Management Action to 2(c)

The DCMO – Terminal Operations will lead an effort, supported closely by DCMO – Engineering, Standards and Compliance, to develop a project plan for the pilot program. This team will have a preliminary outline and project plan including expected benefits, pilot duration, schedule and expected costs and value, available by September 30, 2012. Implementation of the pilot plan will then be evaluated by executive management with a budget and implementation to follow once approval has been granted.

OIG Recommendation

(2)(d) In addressing these goals [from (1)], the VP for Operations and the CMO should establish and implement an agreed upon plan for improving the performance of the conventional fleets that includes

- (d) developing and implementing a comprehensive training program that ensures that employees maintaining the conventional fleets possess the knowledge, skills, and abilities needed to adequately perform their jobs

Management Response to 2(d)

Amtrak agrees with the OIG's recommendation and recognizes that having a highly qualified, highly trained workforce is paramount to providing our customers with the greatest transportation experience possible. In fact, in partnership with the labor organizations under the auspices of the mechanical "Joint Labor/Management Steering Committee", Amtrak Management began the process for improving the mechanical training program early in 2011. One of the tasks of the Committee is to review recommendations for enhancing the existing new hire safety orientation training, establishing new technical skills training program for new hires, establishing standard job descriptions and developing a hiring plan to

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support the increased training requirements. There have been three (3) teams established to accomplish these tasks, two (2) of which are co-chaired by an Amtrak manager and labor organization leader.

Management Action to 2(d)

The DCMO –Terminals has the lead for developing and implementing a comprehensive training program, supported closely by Technical training staff and the Staff Officer for Mechanical. Given the expansive and ongoing nature of this undertaking, this team is expected to provide a progress report for action to the executive sponsors by December 31, 2012.

OIG Recommendation

(2)(e) In addressing these goals [from (1)], the VP for Operations and the CMO should establish and implement an agreed upon plan for improving the performance of the conventional fleets that includes

- (e) developing and implementing a financial incentive program for employees maintaining the conventional fleets, if it is determined that the costs are worth the expected benefits

Management Response to 2(e)

Amtrak agrees with the OIG's recommendation. Amtrak Management recognizes the power of an incentive program as implemented with Acela but also recognizes that costs must be balanced with value to the organization and drive improvements in key performance indicators. Within the latest collective bargaining agreements, there is a new provision that allows incentive payments to all shop craft agreement covered employees. However, since not all of the Amtrak labor organizations have ratified the new agreements, the incentive plan has not yet been implemented within the Mechanical Department and across Amtrak.

Further, Amtrak is in the process of evaluating an incentive program at the Bear and Wilmington, Delaware backshops, for the High Speed Rail Major Work Program (HSR MWP) and has been working with the labor organizations to determine the most appropriate metrics for driving performance.

Management Action to 2(e)

Further progression of the incentive program will be worked jointly by the Vice President of Operations, CMO, Chief Financial Officer, Assistant Vice President of Labor Relations and the Chief Human Capital Officer and take place once the Amtrak organization is prepared and implementation timing is appropriate as the incentive implementation is largely dependant on the other unions ratifying and all parties agreeing to proceed.

The DCMO – Main Facility Operations will lead this HSR MWP incentive initiative working closely with the Human Capital and Labor Relations Departments and other stakeholders with planned completion date by September 30, 2012.

OIG Recommendation

(2)(f) In addressing these goals [from (1)], the VP for Operations and the CMO should establish and implement an agreed upon plan for improving the performance of the conventional fleets that includes

- (f) developing and implementing a plan to fully address the open recommendations from our previous report (see Appendix III)
- (1A) That the Chief Mechanical Officer (CMO) develop and implement a process that records usage data (miles, hours, etc.) on all major serialized components, including (but not limited to) traction motors, wheel sets, air compressors, and brake valves, so that a database can be created to use in scheduling maintenance and analyzing failure characteristics

OIG Observation: Some progress. P-42 (heavy overhaul program) traction motors, wheels, and major Acela components are being tracked by serial number in WMS, but the rest of the recommended components are still not being tracked.

Management Response to 2(f) (1A)

Serialization of components used in the conventional fleet is a very large initiative that will require the full commitment, involvement and identification of resources to implement and manage this process from Materials Management, Procurement and Mechanical. A business decision was made in 2008 to not implement serialization for Mechanical Department materials until the SAP initiative was completed.

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The Mechanical Department has been tracking serialization of wheel sets and traction motors produced within our shop facilities. We continue to evaluate our processes and procedures on these components. Our recommendation to move beyond these two items is to solicit the services of an experienced outside consulting service that has a solid track record of implementing a serialization process in a transportation environment. The output of this effort would be a process, vetted and agreed to by Materials Management, Procurement and Mechanical that would include the resources, technology and processes required to implement a successful serialization program for Amtrak. This plan will also include a full cost-benefit analysis of the expected return on Amtrak's investment in implementing this program and a prioritized listing of the appropriate components to track that will return maximum value to Amtrak. This study should also identify the savings attributable to warranty recovery that would be identified by this process. We would estimate that this study would take a minimum of six months to complete once funding and approval has been committed. The timetable to implement a serialization program would be dependent on the outcome of the study.

Management Action 2(f) (1A)

The Senior Director of Production and Planning & Logistics will work with Procurement and Materials Management to develop a scope of work and task listing in order to issue a Request for Quote by May 31, 2012. Evaluation of responses will be completed by June 30, 2012 and award and issue of a purchase order for a serialization study by September 30, 2012. Management will strive to develop and implement a process, by September 30, 2013, that records usage data on all those major serialized components, where a positive return on investment has been forecasted.

OIG Recommendation

(2)(f) In addressing these goals [from (1)], the VP for Operations and the CMO should establish and implement an agreed upon plan for improving the performance of the conventional fleets that includes

(f) developing and implementing a plan to fully address the open recommendations from our previous report (see Appendix III)

(1D) That the CMO develop and implement a process that continually reviews scheduled maintenance content and frequency to ensure that it is being performed optimally in accordance with the RCM philosophy.

OIG Observation: Some progress. A process has been set up to update the toolbox reference guides on a recurring basis based on feedback from the field. However, there are still no structured programs to update the maintenance procedures for each fleet based on a review of the scheduled maintenance content and frequency to ensure that it is being performed optimally in accordance with RCM philosophy.

Management Response to 2(f) (1D)

The new transition team, as discussed in response 2(a)(i), aligns with the effort required to establish the structured program required to update the maintenance procedures. Multiple processes are being evaluated for using performance of the conventional fleet to optimize maintenance practices. The tool box reference guide (TBRG), the monthly Equipment Performance Report (EPR), process focus teams (PFTs), and the new data team using Train Communication Data (TCD) and Maintenance Events Analysis Program (MEAP's) data are all focused to improve maintenance practices on all fleet types. With the transition of the RCM process to the DCMO – Engineering, Standards and Planning further review and improvements to these processes will be enabled.

Management Action 2(f) (1D)

The DCMO – Engineering, Standards and Planning will have the new RCM team in place by September 30, 2012. This team will provide an action plan and outline for the optimization of the scheduled maintenance tasks and how the review process will be accomplished by December 31, 2012. Management will strive to develop and implement a process that continually reviews scheduled maintenance content and frequency to ensure that it is being performed optimally in accordance with the RCM philosophy by September 30, 2013.

OIG Recommendation

(2)(f) In addressing these goals [from (1)], the VP for Operations and the CMO should establish and implement an agreed upon plan for improving the performance of the conventional fleets that includes

(f) developing and implementing a plan to fully address the open recommendations from our previous report (see Appendix III)

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(2B) That the CMO conduct a systematic review of the content and frequency of all heavy overhauls to ensure that the activities included in the overhauls are appropriate and justified by the best information currently available (manufacturer's recommendations, industry studies, documented experience, etc.).

OIG Observation: Limited progress. Considerable effort has been expended on documenting the current overhaul content and procedures. In addition, much work has been done on the diesel locomotive fleet in implementing life-cycle preventive maintenance (LCPM). However, there is no current ongoing effort to conduct the systematic review that was recommended for the rest of the fleets.

Management Response to 2(f) (2B)

Implementation of LCPM has occurred on P42's and P32DM's and progressing for the F59's. The Mechanical Department is evaluating alternative approaches for preventative maintenance beyond LCPM such as Condition Based Maintenance (CBM). As noted in the OIG report, fleet performance has not improved as compared to HSR despite the implementation of LCPM and the continued adjustments of the life cycle intervals. Further development of LCPM and other maintenance methodologies continues in an effort to determine the most cost effective method of maintenance for all equipment. This, in conjunction with other strategic business decisions related to maintenance locations will determine the final selection of maintenance practices to be used by Amtrak.

The systematic review of performance data is utilized when developing the passenger car heavy overhaul programs. The passenger car overhauls have been stratified into three (3) levels L1, L2, and L3 each representing a different scope of work. The level chosen is based on the reliability performance data as well as previous maintenance performed on that particular vehicle. At this time we do not intend to conduct further systematic reviews of items other than diesel locomotives, and therefore, we request to close this recommendation as unimplemented.

Management Action 2(f) (2B)

The DCMO - Engineering, Standards and Planning assisted by the DCMO – Main Facility Operations will reevaluate the performance of the LCPM and other maintenance methodologies taking into consideration cost effectiveness and provide an update by the September 30, 2012.

OIG Recommendation

(2)(f) In addressing these goals [from (1)], the VP for Operations and the CMO should establish and implement an agreed upon plan for improving the performance of the conventional fleets that includes

(f) developing and implementing a plan to fully address the open recommendations from our previous report (see Appendix III)

(2C) That the CMO review the cost-effectiveness of continuing to perform heavy overhauls and remanufactures in the current manner in lieu of programming maintenance on a pure condition- or usage-based cycle as part of normal scheduled maintenance.

OIG Observation: Limited progress. Beyond the life-cycle preventive maintenance work with the diesel locomotives, there is no current activity to review the cost-effectiveness of continuing to perform heavy overhauls and remanufacturers in the current manner.

Management Response to 2(f) (2C)

The response to this recommendation is discussed in the previous response 2(f) 2B.

Management Action 2(f) (2C)

The response to this recommendation is discussed in the previous response 2(f) 2B.

OIG Recommendation

(2)(f) In addressing these goals [from (1)], the VP for Operations and the CMO should establish and implement an agreed upon plan for improving the performance of the conventional fleets that includes

(f) developing and implementing a plan to fully address the open recommendations from our previous report (see Appendix III)

(3E) That the CMO establish a WMS steering committee for the Mechanical Department, consisting of the Master Mechanics and facility superintendents, to review, on a yearly basis, the direction of WMS implementation and identify the needs for expansion or upgrade of the system.

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OIG Observation: Some progress. A WMS Steering Committee was created but it has not been meeting regularly to actively guide the expansion and upgrade of the system. However, there are plans to reinvigorate this committee.

Management Response to 2(f) (3E)

The Mechanical Department established the Integrated Technology Steering Committee group and began meeting in June 2010. A prioritized listing of initiatives was developed and assignments of key supporting staff members responsible for progressing these tasks had been completed at that meeting. This committee met quarterly through April 2011, when the heavy demands of the SAM initiative began to become an issue with the group being able to schedule productive meeting dates.

Management Action 2(f) (3E)

Since go-live of SAM and the following months of implementation, we have re-established regular meetings of this group starting in January 2012. It will be the responsibility of the Senior Director of Production Planning & Logistics to ensure that the meetings continue on a two month schedule thereafter to discuss the direction of WMS implementation and identify the needs for expansion or upgrade of the system.

OIG Recommendation

(2)(f) In addressing these goals [from (1)], the VP for Operations and the CMO should establish and implement an agreed upon plan for improving the performance of the conventional fleets that includes

(f) developing and implementing a plan to fully address the open recommendations from our previous report (see Appendix III)

(4A) That the CMO develop a comprehensive corporate wide quality management (QM) program that, at minimum, evaluates the conduct of preventive maintenance (PM) to ensure that it is being done correctly and consistently throughout the organization, evaluates the conduct of PM to ensure that the time scheduled for PM is appropriate to accomplish a given scope of work, evaluates and reports on the condition of the fleet by car/locomotive type to be used in prioritizing work or capital expenditures, evaluates the root cause of equipment failures to address systemic issues and modify procedures, evaluates the quality of the WMS data on a recurring basis to ensure that it is accurate and dependable.

OIG Observation: Substantially complete. A corporate-wide QM program has been developed; however, there is evidence that it does not adequately "evaluate the conduct of PM to ensure it is being done correctly and consistently throughout the organization." This was the first, key element of the initial recommendation and should be addressed.

Management Response to 2(f) (4A)

A Mechanical Department-wide program Quality Management System (QMS) has existed for the past four (4) years and all mechanical facilities are audited for compliance to five categories which include control of documents, calibration of gages, process control, material disposition, non-conformance, and corrective actions. Each facility is audited annually and tracked to improve overall performance. Vehicle specific PM requirements have been developed utilizing the RCM process and are stored in Paradigm. PM templates have been revised to reflect these requirements. Product aids such as the Tool Box Reference Guides are published and issued to all operations maintenance employees to insure that the correct process is used. Quality audits are conducted at all facilities and the performance of each location is summarized in a monthly report and includes date for Day Out Of Maintenance (DOOM) and Opportunities for Improvements (OFI). Equipment performance reports are issued periodically documenting the performance of each vehicle type for the past 7, 15, 30, 90, 182 days. Recent installations of MEAPs and TCD provide electronic data from on-board locomotive systems (including the Acela) concerning existing or impending problems. The new data analysis group is developing analytical tools to further enhance maintenance focus.

Management Action 2(f) (4A)

The DCMO – Engineering, Standards and Planning will initiate our preliminary review of the QMS process specifically related to the PM events and will continue to evaluate and develop new methods to improve maintenance focus as well ensure PM is being done correctly and consistently throughout the organization. The DCMO will deliver an analysis for refining the PM process and procedure compliance by September 30, 2012. Management will strive to refine the PM process by September 30, 2013.

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Appendix IV

ABBREVIATIONS

AT	Amtrak Technologies
CFO	Chief Financial Officer
CMMS	Computerized Maintenance Management System
CMO	Chief Mechanical Officer
COO	Chief Operating Officer
COT&S	clean, oil, test, and stencil
EOC	Acela Executive Oversight Committee
FRA	Federal Railroad Administration
FY	fiscal year
HHP	high horsepower
MDBF	mean distance between failures
NEC-MSC	Northeast Corridor Maintenance Service Company
OIG	Office of Inspector General
OTP	on-time performance
PM	preventive maintenance
PRIA	Passenger Rail Investment and Improvement Act of 2008
QM	Quality Management
RCM	reliability-centered maintenance
SOGR	State of Good Repair
VP	Vice President
WMS	Work Management System

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Appendix V

OIG TEAM MEMBERS

Calvin Evans, Assistant Inspector General, Inspections and Evaluations

George P. Binns, Senior Operations Analyst, Inspections and Evaluations

John (Skip) MacMichael, Principal Operations Analyst, Inspections and Evaluations

Garry A. Fuller, GF Rail, Consultant

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OIG MISSION AND CONTACT INFORMATION

Amtrak OIG's Mission	<p>Amtrak OIG's mission is to</p> <ul style="list-style-type: none"> • conduct and supervise independent and objective audits, inspections, evaluations, and investigations relating to Amtrak programs and operations; • promote economy, effectiveness, and efficiency within Amtrak; • prevent and detect fraud, waste, and abuse in Amtrak's programs and operations; • review security and safety policies and programs; and • review and make recommendations regarding existing and proposed legislation and regulations relating to Amtrak's programs and operations.
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Obtaining Copies of OIG Reports and Testimony	Available at our website: www.amtrakoig.gov .
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<hr/>	
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