Evaluation of Amtrak's FY 2010 Fleet Strategy:

A Commendable High-Level Plan That Needs Deeper Analysis and Planning Integration

Report Number E-11-2

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NATIONAL RAILROAD PASSENGER CORPORATION
OFFICE OF INSPECTOR GENERAL
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Memo

Date:	March 31, 2011	**From:**	Ted Alves, Inspector General
To:	Joseph Boardman, President and Chief Executive Officer	**Department:**	Office of Inspector General
		Subject:	Evaluation of Amtrak's FY 2010 Fleet Strategy
		cc:	Mario Bergeron, Chief Mechanical Officer Stephen Gardner, VP, Policy and Development DJ Stadtler, Chief Financial Officer Al Engel, VP, High Speed Rail Emmett Fremaux, VP Marketing & Product Development Jessica Scritchfield, Internal Controls Officer

Attached is the report of our recently completed evaluation of Amtrak's FY 2010 Fleet Strategy. This review was requested by the then-Ranking Member of the Senate Appropriations Committee, Subcommittee on Transportation, Housing and Urban Development, and Related Agencies. Our objective was to assess whether the critical data and assumptions that have a material impact on the equipment and financial resource estimates contained in the Fleet Strategy were reasonable and valid.

This report documents our findings and makes seven specific recommendations to improve Amtrak's Fleet Strategy and the fleet planning process. Your response to our draft report is included as Appendix I.

We appreciate the courtesies and cooperation of Amtrak representatives during this evaluation. If you have any questions, please contact me at (202) 906-4499 (Ted.Alves@amtrakoig.gov); Calvin Evans, Assistant Inspector General for Inspections and Evaluations, at (202) 906-4507 (Calvin.Evans@amtrakoig.gov); or Nico Lindenau, Director, Inspections & Evaluations, at 202-906-4961 (Nico.Lindenau@amtrakoig.gov).

Attachment

Amtrak Office of Inspector General
Evaluation of Amtrak's FY 2010 Fleet Strategy:
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EXECUTIVE SUMMARY

The FY 2010 Transportation, Housing and Urban Development and Related Agencies Appropriation Act mandated that Amtrak prepare a comprehensive plan that provides details and time frames for the maintenance, refurbishment, replacement, and expansion of Amtrak's rolling stock fleet.[1] In February 2010, Amtrak included this plan, referred to as the Fleet Strategy, as part of its FY 2011 Grant and Legislative Request. The Fleet Strategy outlines the company's strategic approach for acquiring new locomotives and cars to replace its aging equipment fleet, and additional capacity to accommodate the projected increase in ridership over the next 30 years. The plan also identifies funding requirements, discusses financing alternatives, and includes a procurement approach designed to support a competitive supplier base.

The Fleet Strategy calls for buying 1,200 passenger cars, 334 locomotives, and 25 high speed train sets within the next 14 years at a cost of approximately $11 billion.[2] Over the entire planning period, from 2009 to 2040, the strategy estimates that $23 billion of capital funding will be required to acquire equipment, undertake necessary equipment overhauls, manage procurement projects, upgrade maintenance facilities, and provide inventories of spare parts.

Based on the importance of the Fleet Strategy to Amtrak's future operational and financial success, as well as the magnitude of the estimated funding requirements, in May 2010 the then-Ranking Member of the Senate Appropriations Committee, Subcommittee on Transportation, Housing and Urban Development, and Related Agencies, requested that we conduct a comprehensive review of the strategy. Our specific objective was to assess whether the critical data and assumptions that have a material impact on the equipment and financial resource estimates contained in the plan are reasonable and valid.

RESULTS

Amtrak has done a commendable job of using a holistic approach to create a comprehensive Fleet Strategy that identifies and addresses the myriad of issues related to fleet acquisition, maintenance, and retirement. For example, the strategy discusses the size and age of the fleet, factors to consider in determining when to retire equipment, financing alternatives, advantages to pursuing different procurement strategies, and factors that could limit growth possibilities. It provides a long-term perspective on equipment acquisition that will be very useful and that Amtrak greatly needed.

The Strategy recognizes that additional refinements in both data and assumptions are needed to provide more precise estimates, and that these refinements will be incorporated into future

[1] This term refers to Amtrak's passenger cars, locomotives, and train sets (line of permanently coupled passenger coaches drawn by a locomotive).
[2] This and all other Fleet Strategy-related figures are in 2009 dollars.

annual revisions to the plan. For example, the document notes that although ridership demand projections should be based on a detailed route by route analysis, in order to meet the congressional deadline for submitting a strategy, Amtrak assumed a 2-percent annual growth rate for the car fleet. While the Fleet Strategy clearly identifies the need to refine some assumptions, in other cases it is not clear whether Amtrak plans to revisit all of the assumptions and estimates in the annual strategy updates.

Our evaluation identified a number of areas where Amtrak can improve the reasonableness or validity of its data and assumptions by conducting additional and more detailed analyses. As discussed below, these changes could have a significant impact on the projected fleet requirements and the financial resources needed to satisfy the requirements.

Determining Rolling Stock Requirements

The strategy's high-level growth and operational assumptions may not be precise enough to project Amtrak's future demand for rolling stock and the financial resources required to meet that demand. The strategy's assumption of a projected average annual growth rate of 2 percent for its total fleet of passenger cars is a reasonable first step and may be appropriate for determining a rough estimate of future equipment needs. However, a more detailed route-by-route analysis of ridership growth that considers existing passenger load factors would generate a far more precise estimate. In the absence of an overall network strategy, the Fleet Strategy adopts several other assumptions (such as no changes in routes, service levels, schedules, or frequencies) that, if revisited, could significantly affect fleet and financial requirements. Without a more detailed analysis, the Fleet Strategy may not identify the appropriate number and types of equipment needed for growth on each of its routes.

Use of Multi-level Passenger Cars

The Fleet Strategy does not fully explore the potential benefits of operating additional multi-level passenger cars. Both nationally and internationally, multi-level cars are becoming increasingly attractive to passenger rail operators because of their higher capacity and the financial and operational advantages they offer over single-level cars. Although Amtrak's strategy acknowledges the potential advantages, it does not include plans to incorporate a higher percentage of multi-level cars into its fleet than currently exists. The strategy anticipates potential customer resistance, although our work shows that Amtrak could mitigate this resistance. We estimate that if Amtrak were able to replace all of its single-level cars with a seat-equivalent number of multi-level cars, the benefits could amount to between $174 million and $679 million (depending on the amount of luggage space provided) over the economic life of the equipment.

Equipment Availability

The Fleet Strategy may overestimate future fleet requirements because it does not factor in the benefits of higher equipment utilization through improved fleet reliability and availability. Amtrak set goals to improve the availability of its fleet in its FY 2010–2014

Five-Year Financial Plan. However, it did not account for these availability improvements when projecting future fleet requirements in the Fleet Strategy. If Amtrak achieves its availability targets in the Five-Year Financial Plan, it could reduce its fleet requirements and therefore procurement and overhaul investments by $520 million.[3] In addition, if Amtrak could further improve the availability of its equipment to the levels achieved by some of the better European operators, it could reduce its capital investments by an additional $505 million.

Economic Useful Life of Amtrak's Rolling Stock

Amtrak's Fleet Strategy does not use a sophisticated model that fully considers financial, operational, and strategic factors in determining the economic useful life of its rolling stock. The strategy uses a time-based criterion (age) to plan rolling stock retirements. Based on our benchmarking with European passenger rail operators, we learned that other railroads determine the best time to replace rolling stock assets using decision processes based on financial, operational, and strategic factors. Using these factors in their decision models results in European operators keeping their equipment in service considerably longer than Amtrak plans in its Fleet Strategy. Especially for passenger coaches, equipment overhauls—that only cost a fraction of the price of a new coach—may be an attractive alternative to buying new coaches. If Amtrak were able to keep its equipment in service, for example, 10 years longer than assumed in the Fleet Strategy, it could reduce its capital investment requirements by $1.6 billion over the 30-year-planning period.

Plan for Replacing and Enhancing Acela Express

Although the Acela Express service is one of Amtrak's main revenue drivers, the Fleet Strategy does not provide a clear and well-supported plan for the replacement and enhancement of the Acela fleet. The Fleet Strategy identifies factors that Amtrak needs to consider in developing the best option for replacing and enhancing the Acela fleet, but recognizes that Amtrak is still short of sufficient information to make firm decisions. While the strategy identifies two different courses of action that Amtrak could pursue, neither option appears to satisfy Amtrak's expressed desire to meet forecast growth in demand; further, information to determine whether the equipment purchases would be economical to the taxpayer is insufficient. A clear strategic focus for the Acela service and an operational and financial assessment of the alternatives would provide Amtrak the information needed to reach an informed decision on the requirements for replacing and expanding the Acela fleet.

Fleet Procurement Approach

Amtrak's Fleet Strategy plans annual delivery rates of 65 single-level and 35 multi-level cars. Based on our research, these quantities appear to be lower than needed for some

[3] The overhaul investments were calculated over each piece of equipment's economic lifetime. We did not evaluate if Amtrak's targets were realistic nor the impact of potential future funding decreases on their achievability.

manufacturers to most efficiently operate their production lines. In addition, Amtrak's plan of ordering relatively small car quantities could prevent it from taking advantage of lower unit prices generally associated with larger orders. Taken together, Amtrak's approach will likely lead to higher unit costs. The unit price of Amtrak's equipment acquisitions will be a major factor in determining Amtrak's total capital funding requirements over the 30-year planning period. For example, each 10-percent change in the unit price of cars, locomotives, and train sets would have a $1.4-billion impact on the capital-funding requirement for the program. Amtrak states that its present approach is intended to provide support for a competitive supplier base, but the Fleet Strategy does not provide sufficient evidence to show that the likely higher unit costs would be offset by the benefits gained.

Fleet Planning Process

Particularly considering the short time period available to meet the congressional deadline, Amtrak did a commendable job of developing its Fleet Strategy, and plans to continually refine and update it. Yet the strategy was not developed as part of a systematic process integrated with other strategic plans and activities. Amtrak could improve its fleet planning process by addressing the opportunities to improve the strategy discussed in this report as part of a more systematic and integrated process for preparing future strategy updates.

Recommendations

This report contains seven recommendations designed to improve Amtrak's Fleet Strategy and the fleet planning process.

We briefed Amtrak management on our findings and recommendations on January 11, 2011. These officials stated that they were in the process of revising the Fleet Strategy and would try to incorporate as many of our recommendations as possible into the revision.

Management Comments and OIG Analysis

In commenting on a draft of this our report, Amtrak's President and CEO stated that management agreed with all of our recommendations. He noted that Amtrak addressed some of our recommendations in the recently published FY 2011 Fleet Strategy Plan and they identified plans to address the remaining recommendations in future strategy updates. In addition, Amtrak will strengthen the fleet strategy planning process by ensuring that future plan updates incorporate more precise estimates based on strategic planning activities and business processes for the company as a whole and for each line of business. Management also began efforts to recruit a fleet strategy manager who will be responsible for the further development of the fleet strategy process and annual updates of the plan.

Management's comments, which are contained in Appendix I, are responsive to our recommendations. Management actions to improve the strategic planning process and recruit a fleet strategy manager should lead to further improvements in future updates of the plan.

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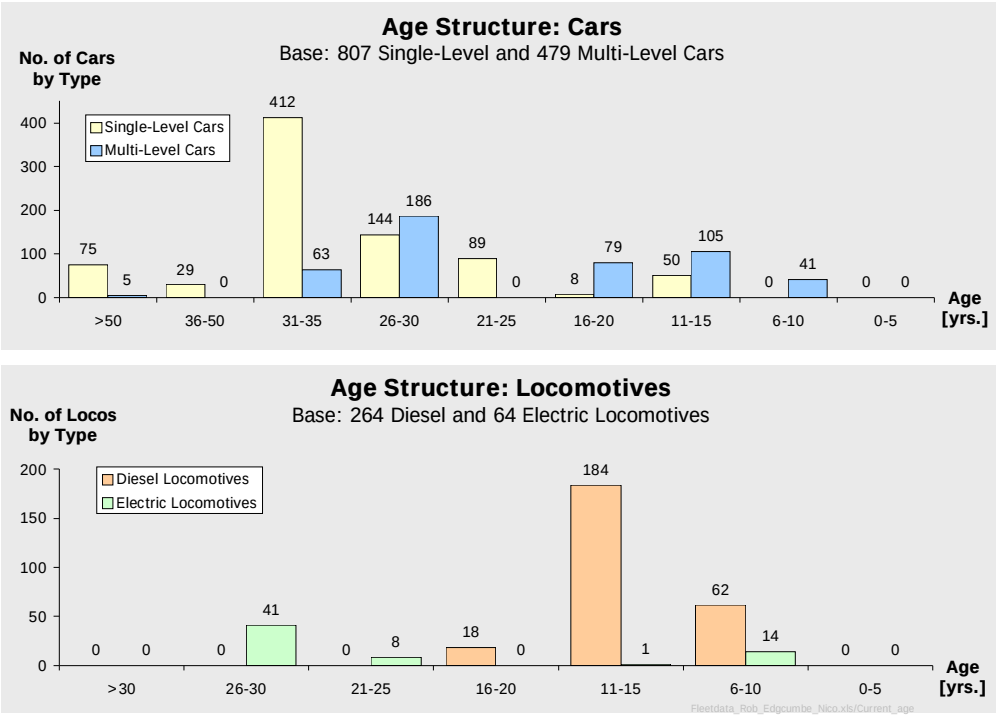
BACKGROUND

In FY 2009, the National Railroad Passenger Corporation (Amtrak) carried more than 27 million passengers over 21,000 route miles to more than 500 destinations in 46 states, the District of Columbia, and 3 Canadian provinces—an average of about 75,000 riders per day on up to 300 daily Amtrak trains.

At the end of FY 2009, Amtrak owned and maintained an active fleet of rolling stock consisting of 1,286 passenger cars, 328 locomotives, and 22 train sets (of which 20 are high-speed train sets). The fleet's current replacement value is about $7.5 billion, based on the Fleet Strategy's assumptions on replacement prices.



Source: Amtrak Fleet Strategy

Most passenger cars were procured in the 1970s to mid 1990s (see above figures).[4] Amtrak procured most of the electric locomotives (AEM-7) in the early 1980s while most of the diesel locomotives were procured relatively recently; the last locomotive was delivered in 2001.

[4] Does not include the Acela Express train sets delivered 1999–2000.

In 2010, Amtrak signed two contracts to order new equipment. In July 2010, it awarded CAF-USA a contract to manufacture 130 single-level cars to replace and supplement Amtrak's fleet for its long-distance routes.[5] In October 2010, Amtrak awarded an equipment order to Siemens for 70 electric locomotives for the Northeast Corridor (NEC).

[5] Similar to the Viewliner model, the cars include 25 sleeping cars, 25 diners, 55 baggage cars, and 25 baggage/dormitory cars.

FINDINGS AND RECOMMENDATIONS

ROLLING STOCK REQUIREMENTS

Fleet Strategy Uses High-level Assumptions That May Not be Precise Enough to Project Future Rolling Stock Demand and Financial Resources Needed to Meet Demand

The Fleet Strategy assumes a projected average annual growth rate of 2 percent in passenger car fleets on all of its routes to determine Amtrak's future needs for rolling stock. This approach is a reasonable first step and may be appropriate for developing a rough estimate of future equipment needs. However, to generate a more precise estimate, Amtrak needs to conduct a more detailed, route-by-route analysis of ridership growth. That analysis also needs to consider the existing ridership load on each route because current load factors have a significant influence on future equipment requirements. The strategy assumed few, if any, changes to routes, train frequencies, or the make-up of train sets. These operational assumptions also significantly affect fleet requirements and need to be analyzed. Without a much more detailed analysis of route-by-route operations and alternatives to meeting ridership growth, the Fleet Strategy may not identify the appropriate numbers and types of equipment needed for growth on each of its routes. A more detailed analysis could lead to significantly different projections in fleet and financial requirements than those identified to date in the Fleet Strategy.

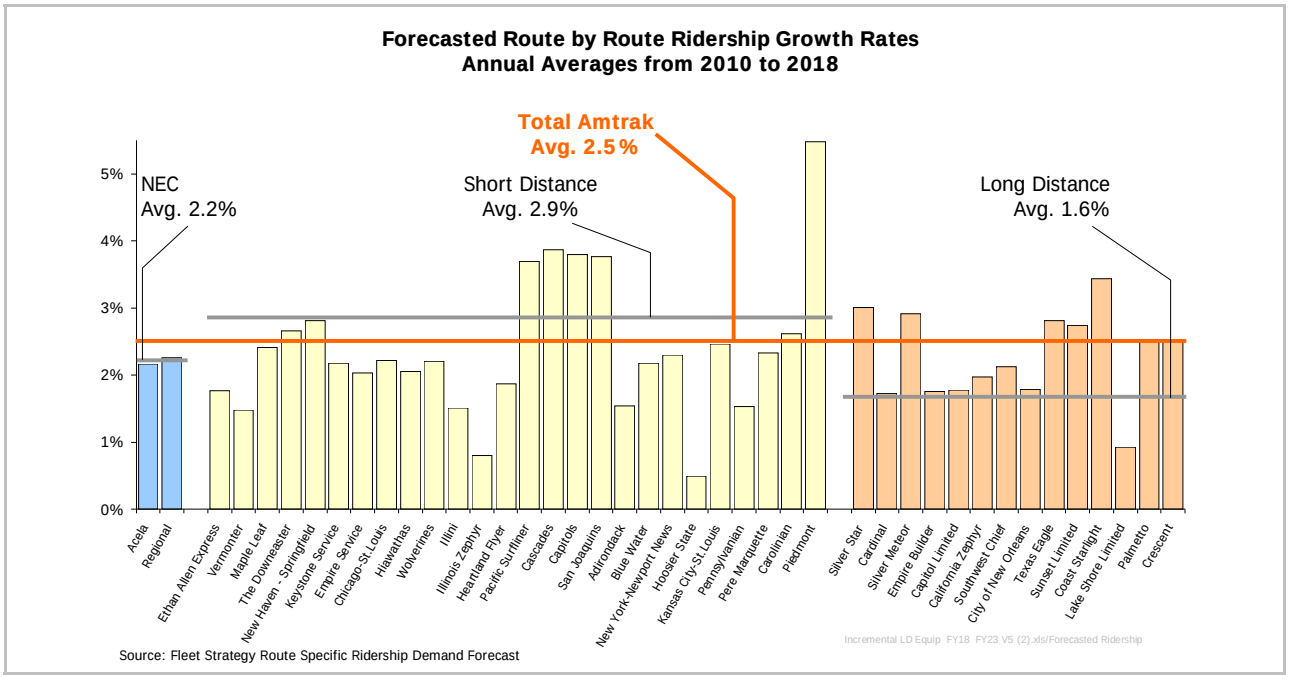
Two-Percent-Growth Rate is Less than Amtrak's Route-Specific Demand Projections; Could Have Significant Impact on Fleet Requirements

Ridership demand is the primary factor that determines fleet requirements. Each route has its individual characteristics (population density and growth, household income, alternative transportation modes, etc.) that determine current and future demand. The travel demand patterns for each individual existing and new route needs to be considered when estimating fleet requirements.

To account for the uncertainty associated with future ridership and revenue, standard practice simulation models should be performed that represent the worst case, best case, and likely case scenarios to assess different values of internal and external parameters influencing ridership demand (economic growth, income, gas prices, etc.). To illustrate, gas price changes have a significant impact on Amtrak's ridership: the average gas price in 2008 was $3.47 per gallon and, according to Amtrak, accounted for 1.45 million additional riders on Amtrak's system—

compared with 2007 when the average gas price was $2.66 per gallon.[6] Analyzing various scenarios enables management to understand the effects of possible changes in these factors and prepare for their consequences. Without reliable ridership demand forecasts, fleet requirement predictions may not be accurate.

Amtrak's Fleet Strategy and its draft implementation plan acknowledge that a detailed analysis is required to more accurately estimate long-term fleet requirements. As part of the process of developing the Fleet Strategy, Amtrak prepared route-by-route ridership projections. The figure below illustrates the projected average growth in ridership demand from 2010 to 2018 for each of its existing train routes, along with averages for each line of business and the overall total.[7]



According to the Fleet Strategy, Amtrak was working on a comprehensive route analysis to project future ridership demand. However, to complete the Fleet Strategy in time to include it with the FY 2011 Grant and Legislative Request, Amtrak chose to project future fleet requirements based on a flat 2-percent-per-year growth of its total car fleet.

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[6] The cross-gas-price elasticity (indicates how much ridership demand changes because of gas price changes) of Amtrak train ridership demand in that period was 0.18 percent, which confirms other research projects, such as *The Impact of Rising Gasoline Prices on U.S. Public Transit Ridership*, Christopher Blanchard, Duke University, Durham, N.C., 2009. See also *The Effects of Rising Gas Prices on Transit Ridership*, Jeremy Mattson, Small Urban and Rural Transit Center of Upper Great Plains Transportation Institute at North Dakota State University, Fargo, N.D.

[7] Based on data used in the Amtrak Fleet Strategy, Attachment 1. These forecasts are not consistent with forecast data used for Acela Express in the Fleet Strategy, Table 8, p. 42.

Existing and Optimal Load Factors for Each Route and Service Need to be Considered when Planning Future Rolling Stock Needs

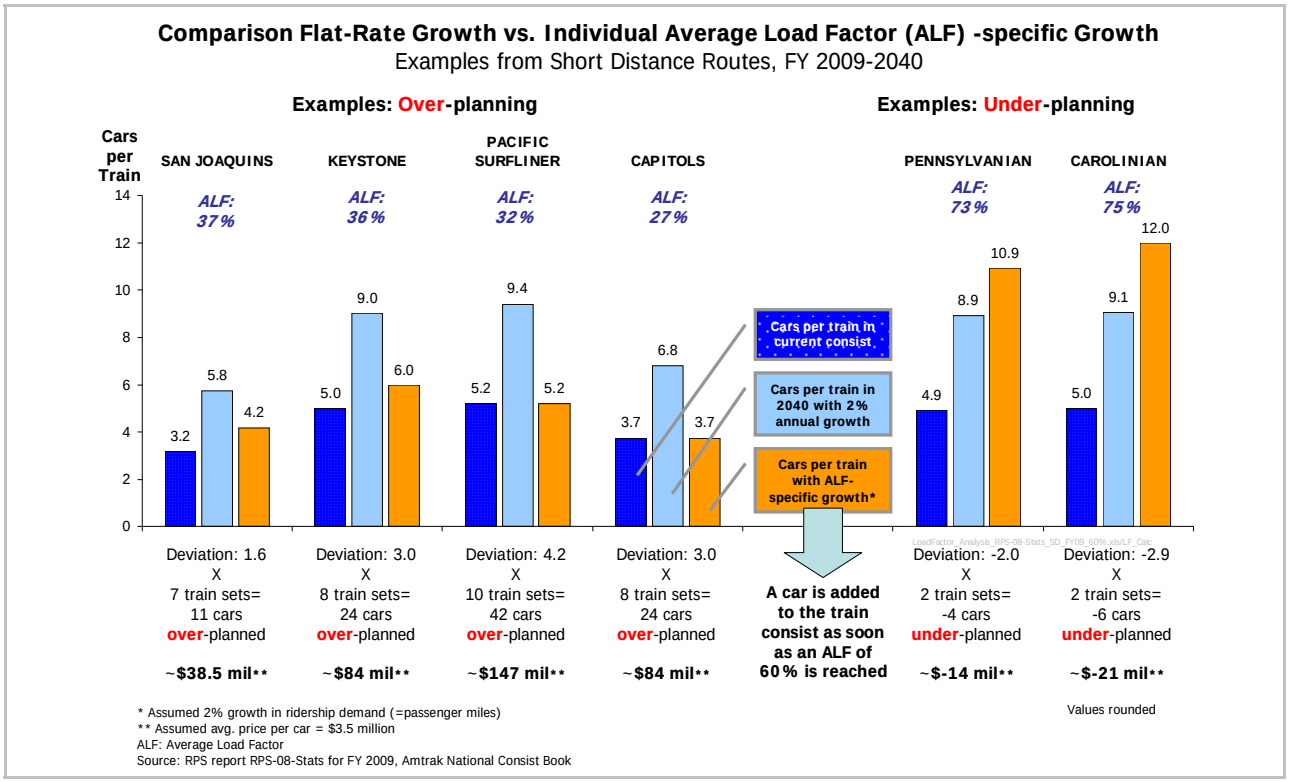
Although 2 percent annual growth rate appears to be a conservative assumption compared with Amtrak's overall growth projection of 2.5 percent until 2018, it does not take into account actual passenger loads—an important factor in determining when additional equipment will be needed.

The load factor is a measure of how much of the available seat capacity is being used by passengers and is defined as the number of passenger-miles traveled as a percentage of the total seat-miles available. Services currently having low load factors might accommodate future demand growth without adding any cars or trains. Services currently having high load factors might require immediate capacity adjustments to accommodate existing demand and the projected growth. Therefore, considering the current and optimal load factors is of central importance within the fleet planning process.

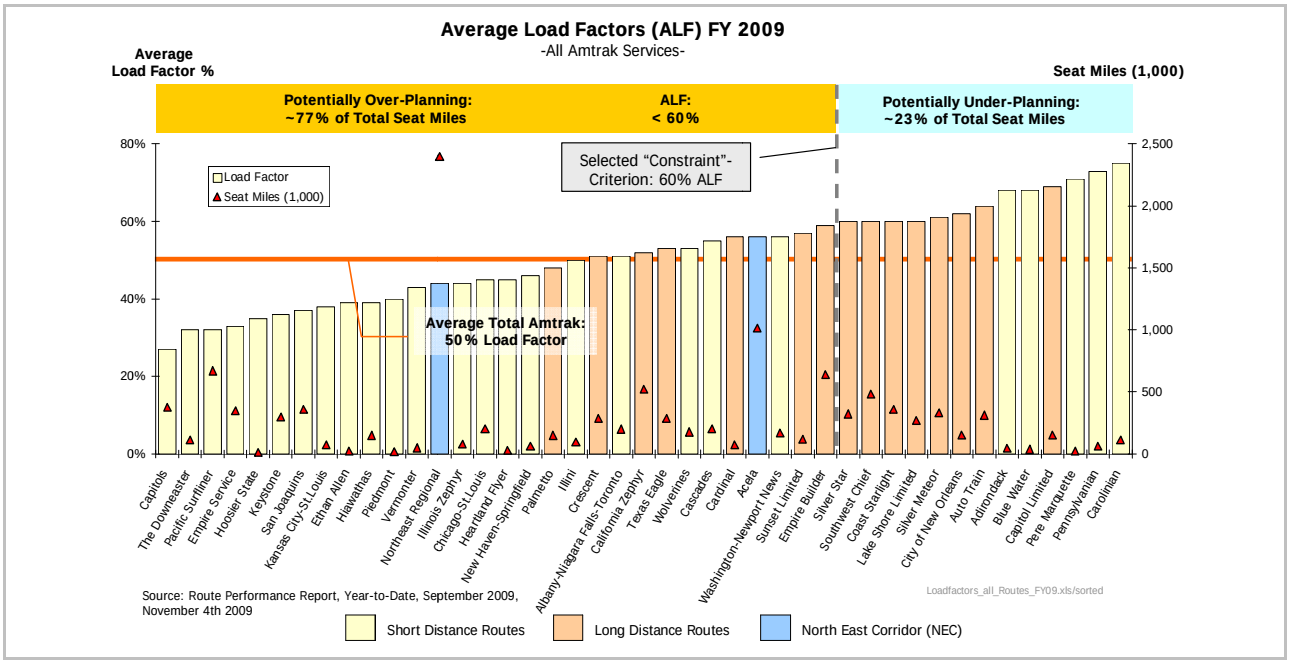
For example, we compared existing route-specific load factors to the 2-percent-flat-rate growth of the car fleet to determine the impact on requirements. The comparison assumed that ridership demand (in passenger miles) increases at a 2-percent annual rate, and that an additional car is added to the consist[8] as soon as an average load factor of 60 percent is reached.[9]

The financial impact of over-planning and under-planning[10] on six selected routes that we analyzed is significant, as shown in the following figure. For four routes, with a lower average existing load factor, the Fleet Strategy over-plans by more than 100 cars—a purchasing value of more than $350 million. Conversely, for the two routes with a higher average existing load factor, the effect of under-planning is about ten cars ($35 million).

[8] Consist: The makeup or composition of a train of cars, their number and specific identity.
[9] For this analysis, we used a 60 percent average load factor as an indicator of a capacity-constrained condition.
[10] As used here, over-planning means that the strategy's approach plans for more seat capacity than needed for meet demand. Accordingly, under-planning means that Amtrak plans for less capacity than needed to meet demand.



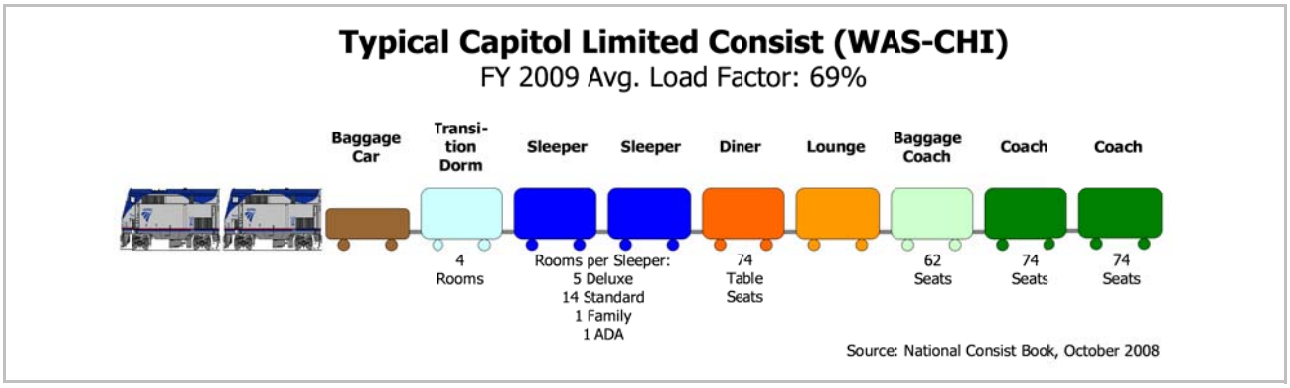
Assuming that over-planning and under-planning will balance out and that consequently the 2-percent growth rate will provide a reasonable estimate of equipment needs may not be valid. Specifically, the following figure shows that existing average load factors are below an assumed constraint-level of 60 percent for 30 of Amtrak routes. These routes provided 77 percent of all seat miles travelled in FY 2009. In other words, only 23 percent of the FY 2009-provided seat miles were on routes that are currently capacity-constrained. Using the 2-percent-flat-rate growth assumption on the routes that are not capacity-constrained could lead to over-estimating equipment needs, potentially increasing costs by hundreds of millions of dollars.



Assumption that Additional Cars Can be Added to Existing Trains May Not be Realistic, Given Train Configuration Requirements

Operational considerations related to the types of equipment needed to provide optimal service on individual routes can also affect fleet requirements. Trains can be made up of a combination of coach, sleeper, café, diner, lounge, and baggage cars. To accommodate future demand, certain consist requirements and restrictions may occur that need to be considered when planning a route-specific expansion of capacity.

The following illustration shows a typical consist of the Capitol Limited:



In FY 2009, the Capitol Limited service had an average load factor of 69 percent—the highest average load factor of any long-distance Amtrak train.[11] Expanding capacity by adding one or more cars raises various issues that Amtrak has not addressed in its Fleet Strategy, among them:

- Are there operational or infrastructure-related constraints that would prohibit running a longer train?
- Would the power of two locomotives still be sufficient to pull the train without significantly affecting travel time?
- Would one diner car have sufficient capacity to serve all passengers?
- Would the baggage capacity be sufficient?
- How would the overall financial performance change?

Amtrak's proposal to add more coaches or sleepers to existing trains without considering all of these issues could lead to suboptimal estimates.

Assumption of No Locomotive Growth May be Unrealistic

Requirements for locomotives need to be based on projected train consists and schedules. Planning for additional seat capacity also means potentially adding locomotives if additional trains are run or longer (heavier) trains need additional propulsion power.

Based on the 2-percent annual growth in Amtrak's car fleet and the assumptions discussed, the Fleet Strategy projects a need for an increase in the single-car fleet from 807 cars in 2009 to 1,433 in 2040—a 78-percent growth over the 30-year planning period. Similarly, the strategy projects that the need for multi-level cars will increase from 479 to 851 over that same 30-year period. The strategy projects no need for an increase in diesel locomotives, which remain at the current level of 264, and only a relatively small increase in electric locomotives, from 64 to 70.

Based on the growth rate assumptions used in the Fleet Strategy, we would expect a demand for more locomotives, given that the number of cars is increasing significantly. The current ratio of cars per locomotive is 3.9; this would grow to 6.8 in 2040. Without a detailed analysis of power requirements, the danger exists that Amtrak could end up short of locomotives.

Conclusion

Amtrak's Fleet Strategy is a reasonable first step and may be appropriate for determining a rough estimate of future needs for rolling stock. Without a detailed analysis of the assumptions, Amtrak may not have the information needed to ensure that it is procuring the appropriate numbers and types of rolling stock required on each of its routes. A more detailed analysis of assumptions

[11] *Amtrak Monthly Performance Report* for September 2009.

could lead to significantly different projections in fleet and financial requirements than those identified in the Fleet Strategy.

Recommendation

We recommend that the President and CEO ensure that future strategy updates include a more detailed process to determine future rolling stock requirements. Specifically, this would include:

- route-specific ridership demand forecasts incorporating service extensions and new services, in addition to existing service;
- the identification of external factors that significantly influence ridership demand, sensitivity analyses to measure their impact, and alternative strategies to accommodate potential changes in demand;
- equipment-type-specific load factors (for example, sleeper v. coach cars);
- the consideration of possible consist alternatives and changes in train frequencies; and
- an analysis of the locomotive requirements needed to support future car fleet requirements.

Management Comments and OIG Analysis

Management responded as follows:

> "Management agrees with the recommendation. Amtrak has taken a conservative position regarding the growth assumptions in assuming 2-percent growth per annum. We acknowledge that a more detailed growth model delivers more precise forecasts. In fact, Amtrak already has detailed studies of potential ridership demand by route and these are regularly updated. As the Fleet Strategy Plan evolves and is updated, we will bring those into the assumptions to refine the need."

We consider management's comments to be responsive to our recommendation.

MULTI-LEVEL PASSENGER CARS

Fleet Strategy Does Not Fully Explore Benefits of Operating Additional Multi-level Passenger Cars

Both nationally and internationally, multi-level passenger cars are becoming increasingly attractive to passenger rail operators because of their higher capacity and the financial and operational advantages they offer over single-level cars. Although Amtrak's Fleet Strategy acknowledges the potential advantages, it does not incorporate a higher percentage of multi-level cars into its fleet than currently exists. While the Fleet Strategy expects potential customer resistance to the increased use of multi-level cars, our work shows that Amtrak could mitigate this resistance.[12] We estimate that if Amtrak replaced all of its single-level cars with a seat-equivalent number of multi-level cars, the benefits could amount to between $174 million and $679 million (depending on the amount of luggage space provided) over the economic life of the equipment.

Other Passenger Rail Operators are Expanding their Use of Multi-level Passenger Cars

Many passenger rail operators, both domestic and foreign, have recently placed orders for significant numbers of multi-level passenger cars, including the following:

- New Jersey Transit in July 2010 approved an order from manufacturer Bombardier for 100 double-deck commuter cars.
- In 2009, the German railroad company Deutsche Bahn and manufacturer Bombardier signed a contract for 800 multi-level cars to add to the 2,000 multi-level cars they already operate.
- From 2008 to 2010, the Swiss railroad SBB ordered 74 multi-level EMU[13] train sets, consisting of close to 400 multi-level cars, from Stadler Rail AG.

Multi-level Cars Provide More Seat Capacity at Lower Cost

Many financial and operational benefits are associated with operating multi-level cars because they typically provide significantly more seats than a single-level car. If a multi-level car contains 33 percent more seats than a comparable single-level car, then three multi-level coach cars can carry the equivalent number of passengers as four single-level coach cars. Reducing the number of cars needed provides many benefits:

- **Lower procurement costs**: Using the cost estimates from Amtrak's Fleet Strategy, four single-level cars will cost $14 million, versus three multi-level cars costing $13.5 million.

[12] In some cases, Amtrak's state partners have shown resistance toward the use of multi-level cars. For these state services, Amtrak may not be the ultimate decision-maker.
[13] EMU: electric multiple unit—train consisting of self-propelled coaches, using electricity as the propulsion power.

- **Lower maintenance costs**: The maintenance cost for four single-level cars will be higher than for three multi-level cars. Although maintenance of seats and flooring will be comparable, three multi-level cars have 33 percent fewer trucks, wheels, and HVAC[14] systems requiring maintenance than four single-level cars.
- **Lower infrastructure costs:** A train made up of single-level cars will require longer platforms and station track space than one with multi-level cars. This could require more capital investment to upgrade infrastructure to adapt to longer trains. In addition, using trains with multi-level cars could prevent or at least delay investments in rail infrastructure to enhance track capacity.
- **Lower operating costs:** Three multi-level cars are lighter than four single-level cars because they have fewer trucks, wheels, and HVAC systems; therefore, they require less locomotive power, reducing energy costs.

From a strategic point of view, if multi-level cars can meet Amtrak's needs, it makes sense to employ as many multi-level cars as possible.

Despite the potential financial and operational benefits, Amtrak's Fleet Strategy does not take advantage of the opportunity to replace its single-car fleet with multi-level cars. Rather, Amtrak plans to replace its car fleet one for one—both single-level and multi-level cars.

Amtrak Could Mitigate Operational Barriers to the Increased Use of Multi-level Cars

During our interviews, we were told that multi-level cars may not be considered feasible for Amtrak because of the following:

- Clearance envelope restrictions in the Northeast Corridor (NEC) tunnels do not allow Amtrak to operate its current multi-level cars.
- Multi-level cars in service by commuter railroads do not offer sufficient and convenient passenger luggage space.
- Passenger movements in multi-level cars are more difficult because of climbing and descending stairs.
- Trains with multi-level cars may require longer trip times due to potentially slower speeds and longer dwell times.

[14] Heating, ventilation, and air conditioning.

As part of our review of the Fleet Strategy, we contracted with LTK, an experienced transportation engineering and consulting company, to evaluate the feasibility and practicability of using multi-level coaches in the NEC.[15] We assumed that the NEC is the most restrictive route for the use of multi-level cars; therefore, if the concerns could be resolved for the NEC, they would also be resolved on other Amtrak routes.

LTK's assessment covered various areas critical to running multi-level cars on the NEC, such as

- dynamic clearance envelope restrictions;
- existing Amtrak service standards (seating, legroom, luggage storage, aisle widths, ADA[16] accommodations, food service, passenger environmental conditions, etc.);
- relative impact of multi-level cars on running time, power usage, and locomotive power requirements; and
- potential seat capacity gains.

LTK's evaluation found that existing multi-level cars, such as those operated by New Jersey Transit and the Atlantic City Express Service (ACES),[17] could operate on Amtrak routes in the NEC with no major structural modifications and still provide approximately 33 percent more seats per car.

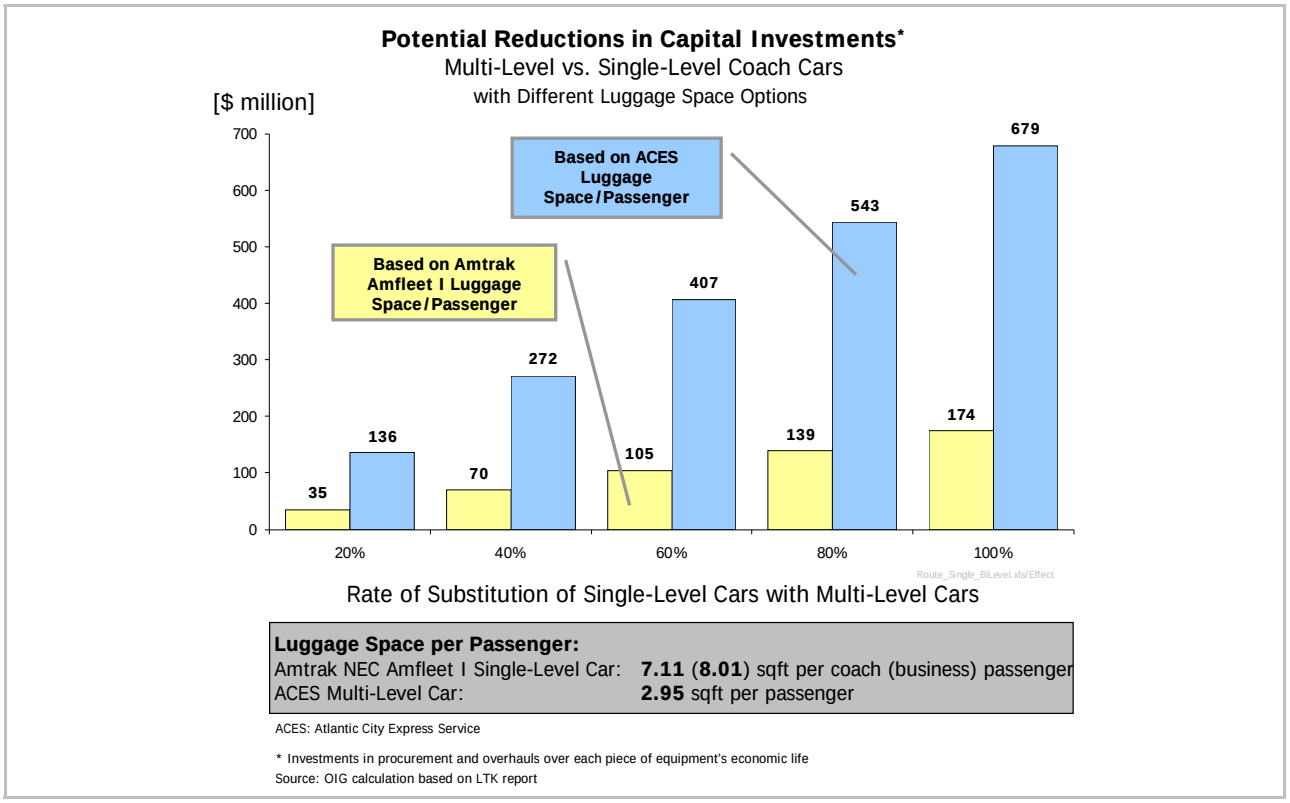
Amtrak Could Reduce its Capital Investments by Using More Multi-level Cars

The financial benefit of procuring multi-level coach and business class cars instead of single-level cars is substantial. Specifically, if Amtrak replaced all single-level cars with multi-level cars providing the same amount of seat capacity, Amtrak could reduce its capital investments by

- up to $174 million if the multi-level cars provided the equivalent luggage space per passenger currently provided on Amfleet cars, or
- up to $679 million if the multi-level cars offered equivalent luggage space per passenger as currently provided on ACES trains.[18]

The following figure illustrates how Amtrak could realize the financial benefits of multi-level cars by replacing single-level cars at various substitution rates.

[15] LTK Engineering Services: *AMTRAK NEC NORTHEAST REGIONAL, Alternate Passenger Coach Study*, September 28, 2010.
[16] Americans with Disabilities Act.
[17] ACES trains run between New York City and Atlantic City and are operated by New Jersey Transit.
[18] Amtrak currently does not have a set standard for luggage space per passenger. Instead, we used the luggage space currently provided by Amfleet I and ACES cars. For details, see the LTK report.



Although not included in the figure above, we estimate that Amtrak could achieve additional savings through reduced maintenance, infrastructure, and operating costs. For example, LTK calculated the difference in energy consumption on selected NEC Regional trains if Amtrak reconfigured the trains with multi-level cars. This calculation showed that NEC Regional trains equipped with multi-level cars could be 11 percent to 13 percent more energy efficient on a kilowatt-hour-per-seat basis. Given that Amtrak spent about $35 million in 2007 on electric traction power for NEC Regional trains, the energy savings attributable to a conversion to multi-level cars could be significant and would also support one of Amtrak's strategic goals—to increase energy efficiency.

Conclusion

Using a higher percentage of multi-level cars in its fleet could provide Amtrak with more seat capacity at lower cost. Not only would a greater use of multi-level cars reduce the capital investments required, but their increased use would also support Amtrak's goals of improved financial performance and energy efficiency.

Recommendation

We recommend that the President and CEO ensure that future strategy updates consider increasing the use of multi-level passenger coaches wherever practical and feasible.

Management Comments and OIG Analysis

Management responded as follows:

> "Management agrees with the recommendation. The 2010 Fleet Strategy Plan identified the need to investigate greater use of multi-level equipment to replace existing single level cars. The FY 2011 version of the Fleet Strategy Plan has taken this topic further discussing bi-level cars for use in state supported services contingent on the agreement with the states that financially support those services. The OIG report also discussed introduction of multi-level cars on NEC services. This was also specifically addressed in the FY 2011 version of the Fleet Strategy Plan. Amtrak has significant concerns about introducing this type of equipment on these services. These concerns and options will be analyzed by the new fleet strategy manager with written findings developed no later than December 31, 2011."

We consider management's comments to be responsive to our recommendation.

EQUIPMENT AVAILABILITY

Amtrak's Fleet Strategy May Overestimate Future Fleet Requirements because it Does Not Factor in Benefits of Higher Equipment Utilization through Improved Reliability and Availability

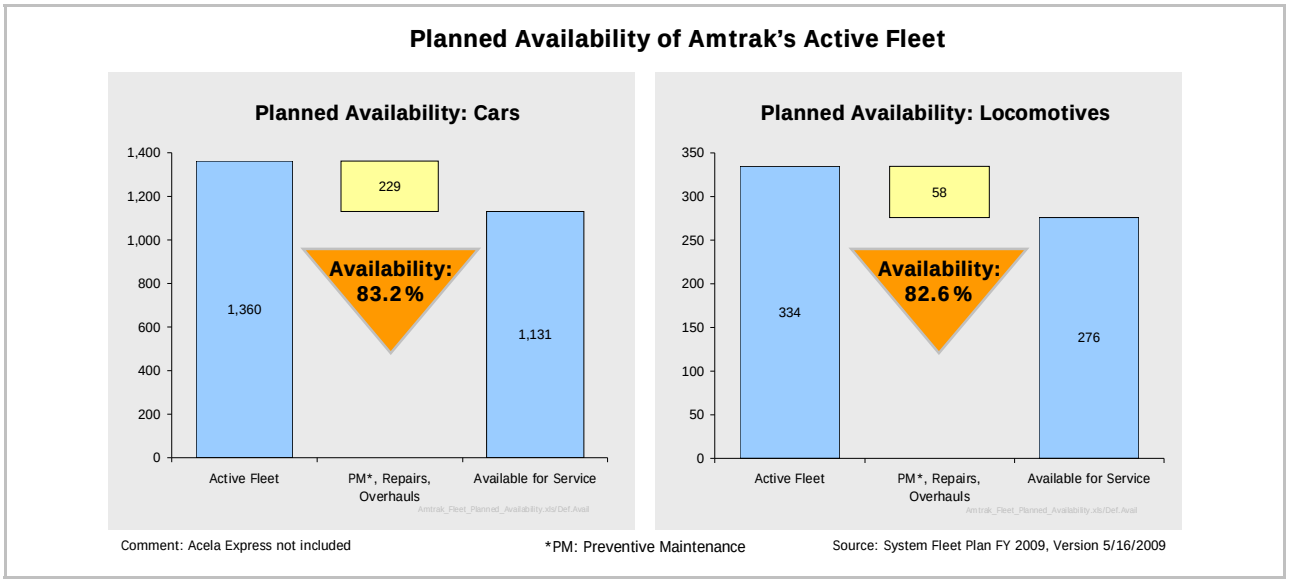
Amtrak set goals to improve the availability of its fleet in its FY 2010–2014 Five-Year Financial Plan. However, it did not account for these availability improvements when projecting the future fleet requirements in the Fleet Strategy. If Amtrak achieves its availability targets in the Five-Year Financial Plan, it could reduce its fleet requirements and therefore procurement and overhaul investments[19] by $520 million. In addition, if Amtrak improved availability of its equipment to the levels achieved by some of the better European operators, it could almost double that total savings.

Amtrak Has Made Progress in the Past 5 Years in Improving Fleet Availability

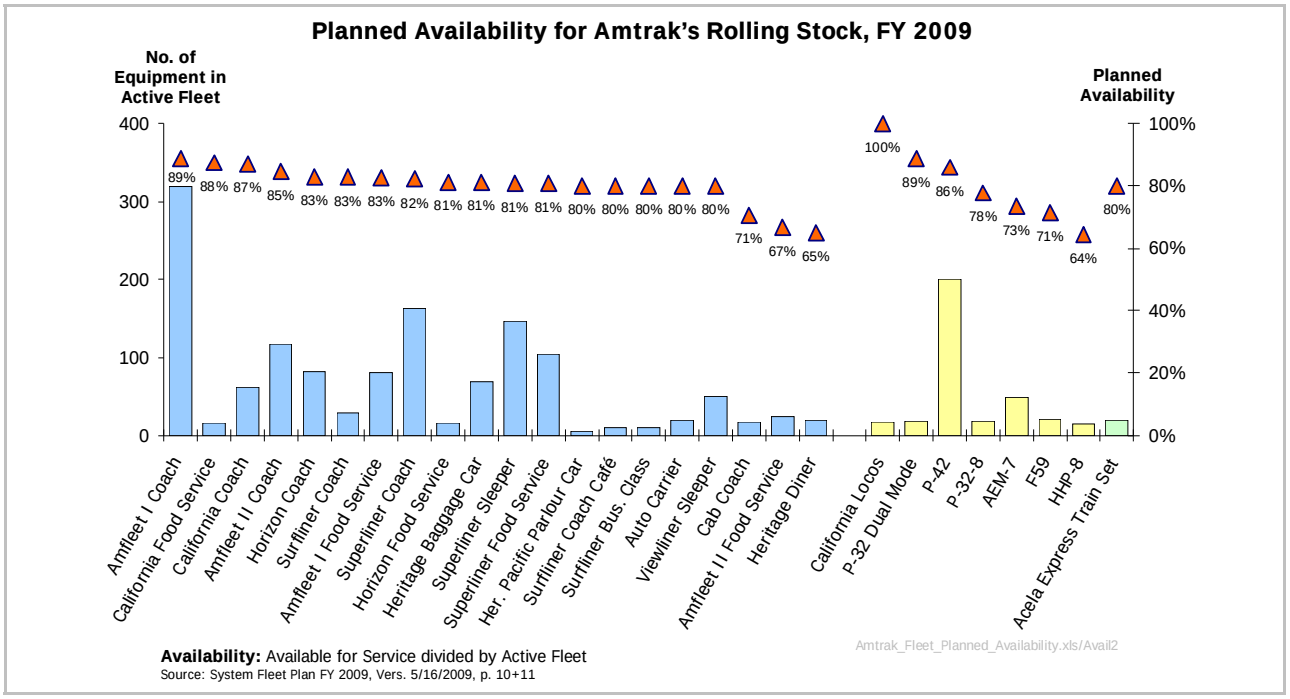
The total amount of equipment required for Amtrak's operations is determined by adding the number of cars and locomotives needed to provide service plus an extra number of each type of car and locomotive to account for those that are expected to be out of service for maintenance reasons. Consequently, Amtrak's overall fleet size requirement is partly determined by the reliability and availability of its equipment.

For FY 2009, Amtrak planned that about 83 percent of its active car and locomotive fleet would be available for service at peak times, with the rest in workshops for preventive maintenance, repair, or overhaul work, as shown in the figure below.

[19] The overhaul investments were calculated over each piece of equipment's economic lifetime. We did not evaluate if Amtrak's targets were realistic nor the impact of potential future funding decreases on their achievability.



This planned availability is determined based on information from Amtrak's Mechanical Department on the number of each type of equipment it expects to be unavailable for service due to planned and unplanned maintenance requirements. Unplanned maintenance requirements are normally based on historical equipment reliability and performance data. For example, HHP-8 locomotives have been historically unreliable; therefore, only 64 percent of the fleet is planned for service on any given day. The planned availability in FY 2009 for each type of car and locomotive varies from 64 percent to 100 percent, as shown below.



If Amtrak can improve maintenance practices or make equipment more reliable, more equipment can be available for service. Improvements that Amtrak has made in maintenance practices in response to past OIG recommendations clearly demonstrate that significant improvements in fleet availability can be achieved.

Following are some recent examples in which Amtrak has improved equipment reliability. Each case required dedicated effort to study current procedures and then identify ways to streamline and improve the efficiency of maintenance practices:

- Responding to recommendations in a 2005 OIG report, Amtrak implemented Reliability Centered Maintenance on the Acela fleet. This allowed a change in maintenance practices that resulted in an increase of 10 percent in equipment available for service (two additional train sets per day).
- In 2006, following the recommendations of an OIG consultant, Amtrak improved the process used to conduct scheduled maintenance on Amfleet I coaches at Ivy City. This resulted in a 2.9-percent improvement in availability (ten coaches per day).
- In 2009, in response to a similar OIG study, Amtrak improved the process used to conduct scheduled maintenance on Superliner cars in Chicago. This resulted in a 4.1-percent improvement in availability (nine cars per day).

Amtrak Can Further Improve Fleet Availability, and Plans to Do So

In its FY2010–2014 Five-Year Financial Plan, Amtrak has set goals to improve its equipment availability.[20] The plan states that by 2014, Amtrak plans to increase its car availability by 2.3 percent, its diesel locomotive availability by 3.5 percent, and its electric locomotive availability by 4.3 percent.[21] However, Amtrak did not consider the impact of these planned improvements in equipment availability in its Fleet Strategy.

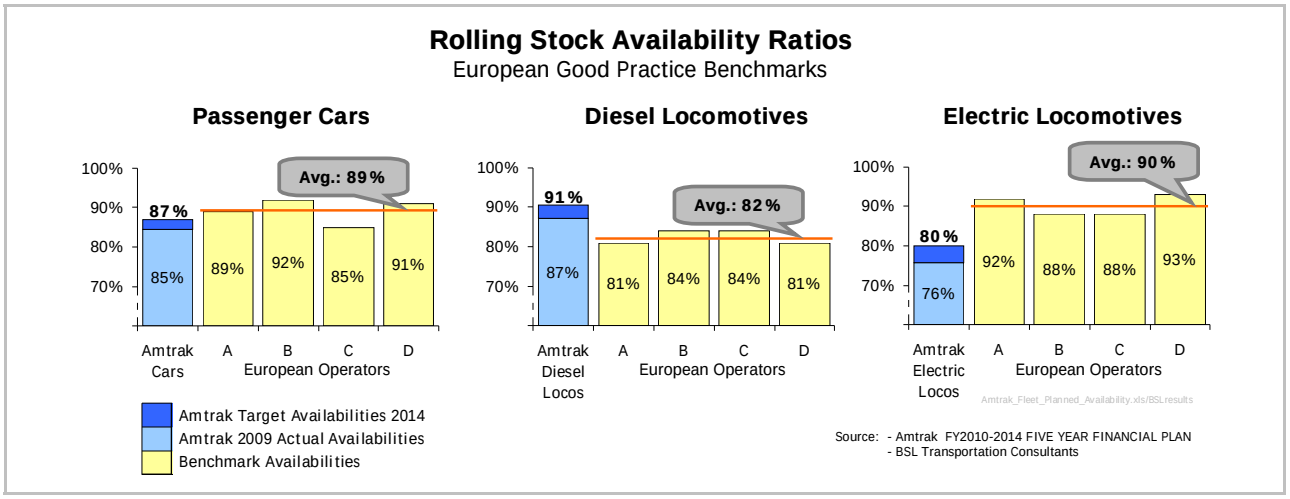
If the Fleet Strategy incorporated the projections from the five-year plan, Amtrak could reduce its projections for new equipment by 53 cars and 25 locomotives and still keep the same amount of equipment available for service.[22] This accounts for the potential reduction of $520 million in procurement and overhaul costs over the life of these additional pieces of equipment.

Additionally, based on our benchmarking of European passenger rail operators,[23] Amtrak may well have opportunities to achieve even greater equipment availabilities for its car and electric locomotive fleets, thus further reducing the amount of equipment needed. We obtained

[20] FY 2010–FY 2014 Five-Year Financial Plan, September 23. 2009, p. 22. We did not evaluate if Amtrak's targets were realistic nor the impact of potential future funding decreases on their achievability.
[21] Amtrak projects these increases in average actual availabilities. These will generally be higher than the planned availabilities mentioned in the system fleet plan. However, a 1-percent increase in average actual availability should result in a 1-percent increase in planned availability. This assumption is reflected in the rest of this finding.
[22] These numbers reflect that Amtrak will replace some of the locomotives twice during the 30-year period.
[23] BSL Transportation Consultants, *Benchmarking Fleet Availability*, September 2010.

equipment availabilities from a number of European operators regarded as having good maintenance practices that result in high levels of equipment availability.

As shown by the comparisons in the figure below, Amtrak's availability rate for its diesel locomotives exceeds that of the European operators, but those operators have better availability rates for cars and electric locomotives.



These benchmarks may have been achieved under different financial and operating circumstances (for example, service levels, schedules, technical condition and age of fleet, maintenance practices) than Amtrak is operating under. Further analysis would be necessary to understand how the rates were achieved and whether they could be used as realistic goals for Amtrak fleets.

If Amtrak could achieve the average availabilities for cars and electric locomotives reported by these European operators, it could further reduce its procurement needs by another 52 cars and 14 electric locomotives (an additional $505 million in procurement and overhaul costs that could be saved over the life of these additional pieces of equipment).[24]

Conclusion

A small improvement in rolling stock availability has a substantial impact on the amount of equipment needed to deliver current and future services. The Fleet Strategy does not consider Amtrak's goals for improving the availability of its fleet that could reduce equipment requirements and associated costs. There may also be additional opportunities to further reduce the amount of equipment out of service by analyzing maintenance practices used by some European passenger railroads.

[24] Because Amtrak's availability for diesel locomotives is above the European benchmarks, there are no additional savings with this type of equipment.

Recommendation

We recommend that the President and CEO ensure that future strategy updates consider Amtrak's planned equipment availability and reliability improvements and incorporate their impact into equipment estimates. He should also ensure that future strategy updates incorporate the impact of any additional equipment availability improvements.

Management Comments and OIG Analysis

Management responded as follows:

> "Management agrees with the recommendation. Equipment availability is a factor that should be considered in the planning process. We will further investigate if and how the availability targets will have an impact on the number of equipment required to run future services."

We consider management's comments to be responsive to our recommendation.

ECONOMIC USEFUL LIFE OF AMTRAK'S ROLLING STOCK

Amtrak's Fleet Strategy Does Not Use a Sophisticated Model That Fully Considers Strategic, Financial, and Operational Factors in Determining The Economic Useful Life of Rolling Stock[25]

Amtrak's Fleet Strategy uses a time-based criterion to plan rolling stock retirements. Through our benchmarking with European passenger rail operators, we learned that other railroads determine the best time to replace rolling stock assets using decision processes based on financial, operational, and strategic factors. Using these factors in their decision models has led European operators to keep their equipment in service considerably longer than Amtrak plans. If Amtrak were able to keep its equipment in service, for example, 10 years longer than assumed in the Fleet Strategy, it could reduce its capital investment requirements by $1.6 billion over the 30-year-planning period.

Amtrak Based Economic Life of its Equipment on a Consensus Opinion of Marketing and Mechanical Departments

In our interviews, we were told that the economic life determinations of Amtrak's rolling stock fleet shown in the following table were established based on the consensus opinion of Marketing and Mechanical Department staff after taking into consideration data on capital availability and the equipment's anticipated maintainability, reliability, and customer acceptance.

Fleet Strategy's Economic Life Assumptions

Type of Equipment	Economic Life [Years]
Single-Level Coaches	30
Multi-Level Coaches	30
Tier I Train Sets	25
Tier II Train Sets	20
Electric Locomotives	25
Diesel Locomotives	20

Source: Amtrak Fleet Strategy — Fleetdata_Rob_Edgcumbe_Nico.xls/Summary

[25] We use the common term "economic useful life" to express the economically best time to retire an asset. Amtrak's Fleet Strategy uses the expression "commercial life" in the equivalent sense.

Amtrak recognizes that it needs to make its replacement decisions in a more sophisticated manner. The draft Fleet Strategy Implementation Plan recommends the development of a rolling stock life-cycle-cost (LCC) model, which is a common method of calculating the equipments' total cost of ownership. Amtrak can use this LCC model to help determine optimal asset replacement times.

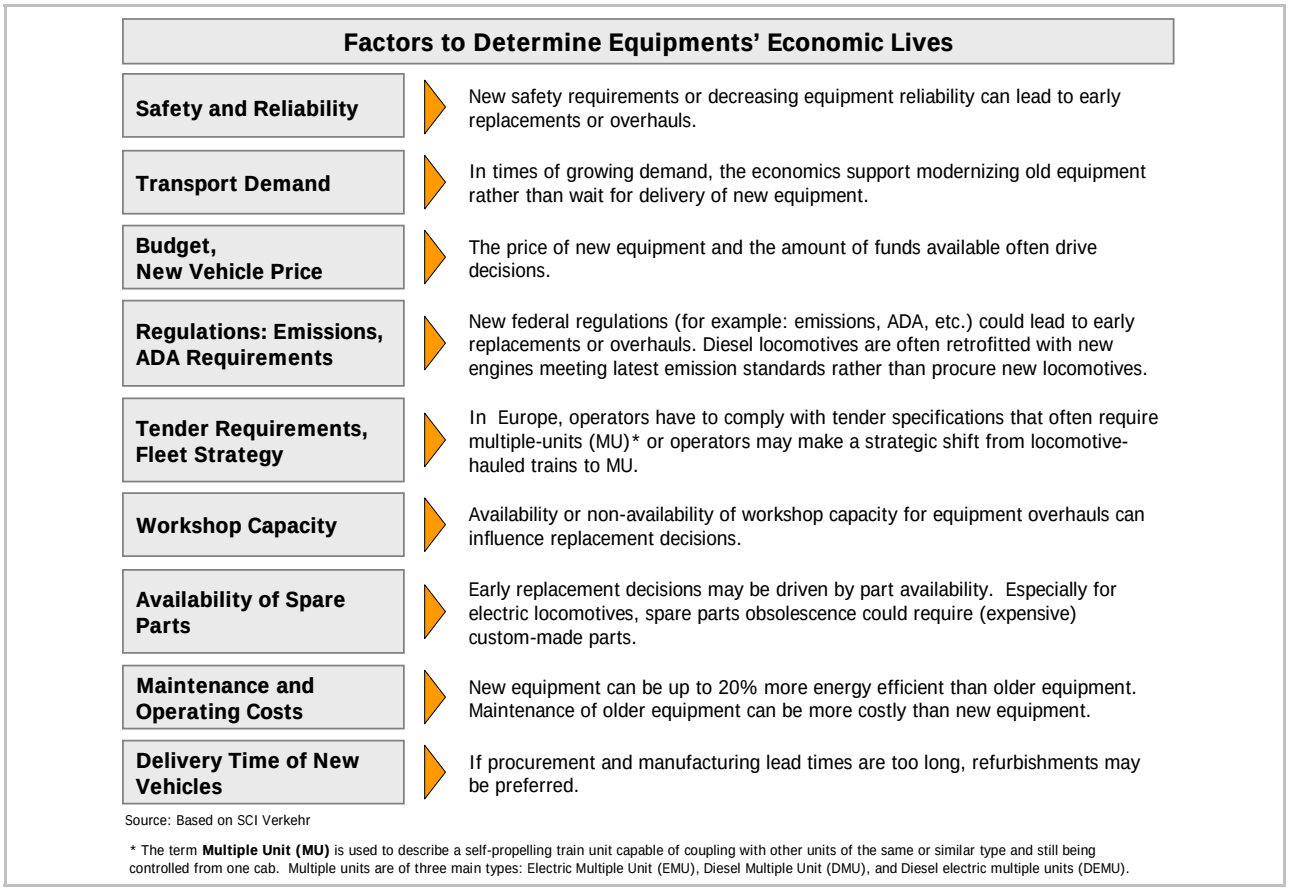
Other Passenger Railroads use Multiple Criteria to Make Rolling Stock Replacement Decisions

To assess Amtrak's method of determining the economic useful life assumptions used in the Fleet Strategy, we contracted with SCI Verkehr GmbH[26] to provide information on the criteria European railroads use to make rolling stock retirement decisions.[27]

SCI learned through its research and interviews that European rail passenger operators use a variety of strategic, financial, and operational factors to define the best time to replace their rolling stock. SCI also found that the operators did not use the number of years and miles operated as the primary factors in determining when to retire equipment.

The following table lists some of the criteria used by the European operators in their assessments of when to retire equipment.

[26] SCI Verkehr GmbH is an independent consultant for the transportation sector with broad international experience in railroad fleet strategy, asset value analysis, and rail equipment asset lives.
[27] SCI Verkehr GmbH, *Replacement of Locomotive and Passenger Coach—Identification of Economical Useful Life,* August 2010.



Factors to Determine Equipments' Economic Lives	
Safety and Reliability	New safety requirements or decreasing equipment reliability can lead to early replacements or overhauls.
Transport Demand	In times of growing demand, the economics support modernizing old equipment rather than wait for delivery of new equipment.
Budget, New Vehicle Price	The price of new equipment and the amount of funds available often drive decisions.
Regulations: Emissions, ADA Requirements	New federal regulations (for example: emissions, ADA, etc.) could lead to early replacements or overhauls. Diesel locomotives are often retrofitted with new engines meeting latest emission standards rather than procure new locomotives.
Tender Requirements, Fleet Strategy	In Europe, operators have to comply with tender specifications that often require multiple-units (MU)* or operators may make a strategic shift from locomotive-hauled trains to MU.
Workshop Capacity	Availability or non-availability of workshop capacity for equipment overhauls can influence replacement decisions.
Availability of Spare Parts	Early replacement decisions may be driven by part availability. Especially for electric locomotives, spare parts obsolescence could require (expensive) custom-made parts.
Maintenance and Operating Costs	New equipment can be up to 20% more energy efficient than older equipment. Maintenance of older equipment can be more costly than new equipment.
Delivery Time of New Vehicles	If procurement and manufacturing lead times are too long, refurbishments may be preferred.

Source: Based on SCI Verkehr

* The term **Multiple Unit (MU)** is used to describe a self-propelling train unit capable of coupling with other units of the same or similar type and still being controlled from one cab. Multiple units are of three main types: Electric Multiple Unit (EMU), Diesel Multiple Unit (DMU), and Diesel electric multiple units (DEMU).

The methods used by the European railroads show that different factors might be relevant for different types of equipment. For example, the useful life of electric locomotives may be limited because the technical obsolescence of major components makes overhauls or refurbishments unreasonably expensive. However, because passenger coaches have a basic mechanical structure (body and truck) and relatively simple parts, it is easier and less costly to refurbish them. A full-scale modernization can extend the life of a passenger car for 15 to 20 years.

Financial Models May Help in Defining Rolling Stock's Economic Useful Life

There are a number of analytic techniques available to help management decide on the most economical approach to replacing existing assets with newer assets. An asset's "economic useful life" is defined as "… the time period that maximizes the annual worth of the existing asset or upon the time period when the annual worth of a new asset becomes greater than that of the present asset for one or more years."[28] This approach helps ensure that management optimizes its return on capital investments by specifically taking into consideration all costs associated with the particular asset, including capital investment, cost of operation and maintenance, and cost of

[28] John R. Canada, *Intermediate Economic Analysis for Management and Engineering,* 1972. SCI gave a similar definition: "Economical useful lifetime is reached at the time a vehicle has to be replaced, but the costs of modernization and operating costs for further usage of the old vehicle exceed life-cycle cost for a new vehicle."

declining quality. The cost of declining quality quantifies the difference in customer appeal, reflected in revenue loss, between the new and existing asset.

Other Passenger Railroads Operate their Rolling Stock Much Longer than Called for in Amtrak's Fleet Strategy Plan

A comparison of Amtrak's projections in the Fleet Strategy with the information provided by SCI shows that Amtrak plans to retire its rolling stock much sooner than other major passenger rail operators.

Locomotives

The following table shows that Amtrak plans to retire its diesel and electric locomotives considerably earlier than the European operators. However, from the perspective of cumulative miles operated, Amtrak's proposal on when to retire locomotives is much closer to when European railroads have historically retired their locomotives. [29]

Comparison of Locomotive Retirement Ages and Mileage
Amtrak Plans vs. Actual European Railroads

	Retirement Ranges	
	Age [Years]	**Mileage** [Million Miles]
Diesel Locomotives		
Germany	25-44	2.3-2.7
Italy	39-41	N/A
France	30-37	N/A
Austria	35-47	2.5-2.7
Sample Range	**25-47**	**2.3-2.7**
Assumption in Amtrak's Fleet Strategy	**20**	**2.6***
Electric Locomotives		
Germany	34-49	2.4-2.9
Italy	45-58	2.6-2.9
France	37-48	2.5-2.9
Austria	33-50	2.5-2.8
Sample Range	**33-58**	**2.4-2.9**
Assumption in Amtrak's Fleet Strategy	**25**	**2.8***

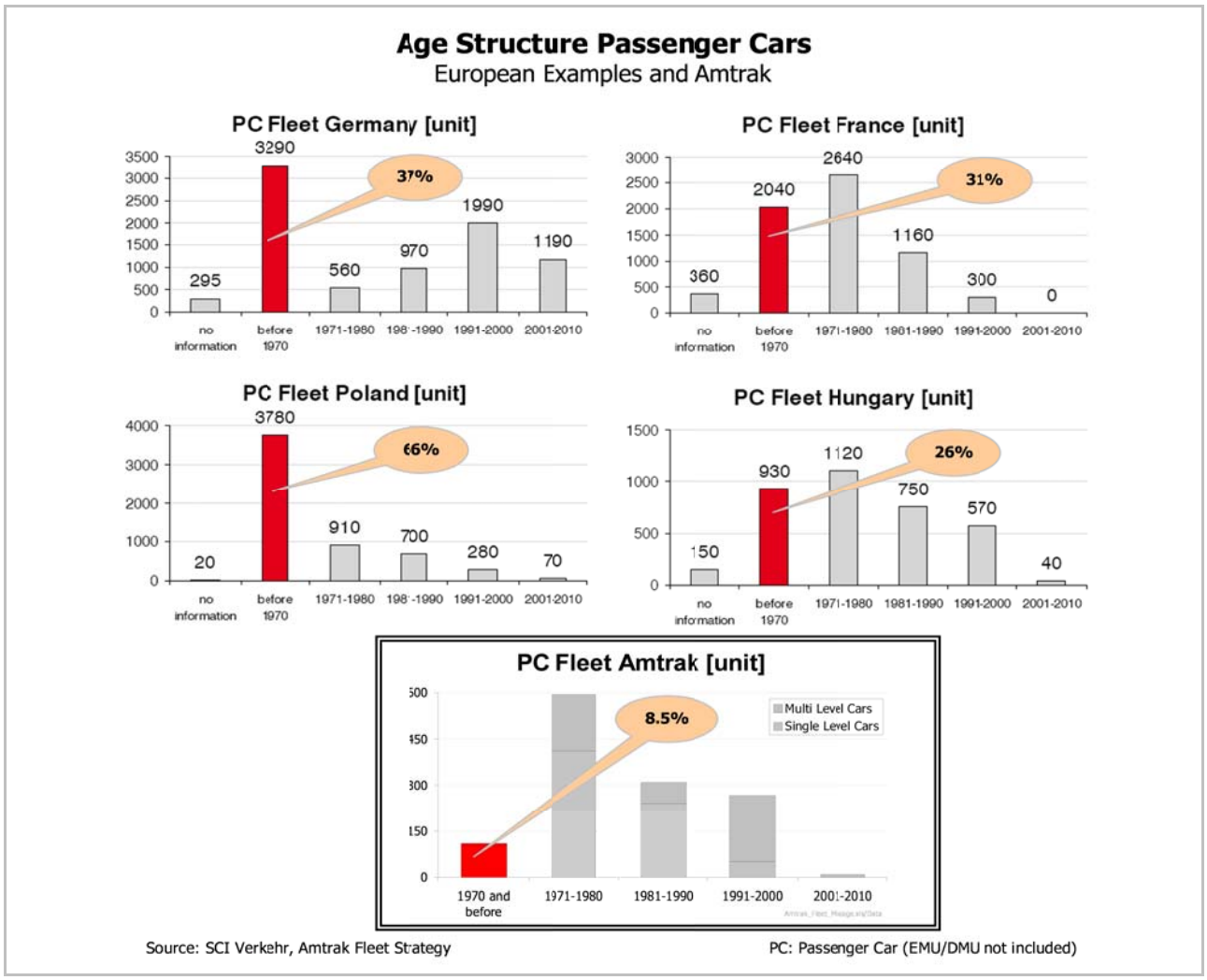
Amtrak_Fleet_Mileage.xls/Age_Comparison

* Based on planned retirement age and average actual miles operated per unit-year
Source: Amtrak Fleet Strategy, SCI Verkehr

[29] This observation does not apply for European Electric Multiple Units (EMU) train sets that operate significantly higher annual mileages. See also the discussion regarding high-speed train sets in the next finding section on the Acela Express.

Passenger Coaches

The European railroads appear to operate their passenger cars significantly longer than Amtrak plans to in its Fleet Strategy. As illustrated in the following tables, the European passenger car fleets have a significantly higher percentage (26 percent to 66 percent) of older cars (40 years old—built before 1970) than the Amtrak passenger car fleet (8.5 percent).



SCI learned that European railroad passenger cars are typically kept in service 30 to 60 years before they are retired. The reason that the European railroads have a larger percentage of older cars may be related to their willingness to reinvest funds to refurbish their equipment or to budgetary restrictions for procuring new equipment. In a recent media interview, the CEO of German railroad Deutsche Bahn announced the plan to invest in a major overhaul of all of their 1,500 InterCity cars. The cars are on average 32 years old and are expected to remain in revenue

service for another 10–15 years.[30] In addition, Canadian VIA Rail announced that it is reinvesting in rail passenger cars and rail diesel cars that are already at least 50 years old and it expects to operate them for another 20 years.[31,32]

High-Speed Train Sets

Amtrak plans to replace the existing Acela Express train sets much sooner than the European railroads plan to retire their high-speed train sets. For example, as shown in the following table, Germany's Deutsche Bahn plans to operate its InterCity Express (ICE) train sets between 24 and 31 years before retiring them, while Amtrak plans to retire the Acela Express train sets after 20 years of service.

Economic Life Assumptions ICE Trains

Deutsche Bahn High-Speed Trains	Max. Speed [mph]	Begin of Service	Planned Retirement	Expected Service Life [Years]
ICE 1	165	1991	2020	29
ICE 2	165	1996	2025	29
ICE 3	205	1999	2030	31
ICE T	143	1999/2004	2028	24/29

Source: Based on *bahntech, Das Technikmagazin der Deutschen Bahn*, 02/2008

Retirement_ICE.xls/ICE

Deutsche Bahn operates various versions of its high-speed train ICE. The first German high-speed train (ICE 1) started operation in 1991 and went through a major refurbishment in 2005 after having traveled 4 million to 5 million miles per train set, which equates to approximately 320,000 miles per year.[33] For comparison purposes, in FY 2009, each Amtrak Acela train set

[30] Deutsche Bahn CEO Rüdiger Grube in an interview with German newspaper *Tagesspiegel*, June 13, 2010.
[31] http://www.viarail.ca/en/about-via-rail/media-room/latest-news/1397/30-october-2009-via-rail-canada-to-boost-famed-transcontinental-train's-accessibility-and-appeal, and http://www.viarail.ca/en/about-via-rail/media-room/latest-news/1487/29-march-2010-government-of-canada-and-via-rail-invest-in-rail-service-jobs-in-moncton.
[32] Studies show that new equipment may have a small uplift in ridership demand, but correlations between demand uplift and attributes contributing to this demand change appear highest for seat comfort, seat layout, and ride smoothness (correlations higher than 0.80). These attributes can also be found in refurbished equipment. See details in R. Sheldon, C. Heywood, Accent, UK; A. Meaney, N. Robins, Oxera, UK; M. Wardman, ITS, University of Leeds, UK in *Estimating the Demand Impacts of New Rolling Stock*, 2006; M. Wardman, G. Whelan, ITS, University of Leeds, UK in *Rolling Stock Quality—Improvements and User Willingness to Pay*, 1998.
[33] Source: *Modernisierung des ICE 1 (Teil 1),* VORAUS (Zeitschrift der Gewerkschaft Deutscher Lokomotivführer, Ausgabe März 2006).

traveled on average about 167,000 miles. Before each major refurbishment, Deutsche Bahn conducted a technical assessment of the equipment to ensure that the technology would be viable for the expected additional lifetime of another 15 years. Deutsche Bahn expects to retire this series of train equipment after 29 years and over 9 million miles of service.[34]

Conclusion

The economic useful life of the Amtrak fleet has a significant impact on both the timing of equipment purchases and the overall capital funding requirement for the company. The impact can be estimated by comparing the average annual capital expenses[35] of Amtrak's rolling stock fleet using the economic useful life in the Fleet Strategy with an economic useful life that is, for example, 10 years longer. Extending the economic useful life of Amtrak's fleet of passenger cars and locomotives by 10 years could reduce its average annual capital expenses by $55 million. Over the 30-year planning period, this would reduce capital expenses related to rolling stock by $1.6 billion.[36]

Recommendation

We recommend that the President and CEO ensure that future strategy updates are based on an economic evaluation model that uses strategic, operational, and financial factors (including replacement costs, operating expenses, overhaul and upgrading expenses, maintenance expenses, and revenue/ridership impact of each relevant equipment alternative) to determine the optimal retirement age for Amtrak's rolling stock.

[34] Assuming 320,000 miles per year, as performed to date.
[35] The average annual capital expense of an asset is calculated as the total cost of asset acquisition and overhauls during the life of the asset divided by the asset life.
[36] These estimates are based only on the current fleet of cars and locomotives and do not include increased operational expenses.

Management Comments and OIG Analysis

Management responded as follows:

> "Management agrees with the recommendation. We have already started developing an evaluation model to determine the economic useful life of our different types of equipment. We want to focus not just on an optimal replacement time based on cost analyses, but also to consider the impact of additional revenue generated by attractive, new cars and locomotives and other factors that are identified during strategic planning activities for each line of business. Some of the necessary data to build a comprehensive model still needs to be collected, so we expect to start with a relatively simple model that will be improved over the next years."

We consider management's comments to be responsive to our recommendation.

FLEET PLAN FOR ACELA EXPRESS

Amtrak's Fleet Strategy Does Not Provide Sufficient Analysis to Support Recommendation to Replace and Enhance Acela Express Fleet

Although the Acela Express service is one of Amtrak's main revenue drivers, the Fleet Strategy does not provide a clear and well-supported plan for the replacement and enhancement of the Acela fleet. The Fleet Strategy identifies factors that Amtrak needs to consider in developing the best option for replacing and enhancing the Acela fleet, but recognizes that Amtrak is still short of sufficient information to make firm decisions. While the strategy identifies two different courses of action that Amtrak could pursue, neither satisfies Amtrak's expressed desire to meet forecast growth in demand, and information is insufficient to determine whether the equipment purchases would be economical to the taxpayer. In order to reach an informed decision on the options for replacing and expanding the Acela fleet, Amtrak should identify a clear strategic focus for the Acela service and conduct an operational and financial assessment of the alternatives.

Acela Express is an Important Revenue Driver and Demand Projections Show Continued Growth, but the Fleet Strategy is Not Linked to a Clear Strategic Focus for this Service

The Acela Express is Amtrak's premier passenger service on the NEC, with multiple daily trains between Washington, D.C., New York, and Boston. Amtrak operates this high-speed rail service using 20 train sets consisting of six passenger cars and two power cars per set. Introduced in 1999, this service now accounts for about 25 percent of Amtrak's total ticket revenue.[37] The Fleet Strategy document outlines the expected ridership demand for Acela and projects an average annual growth of 3.2 percent from 2009 to 2030.[38]

However, the Fleet Strategy is not specifically linked to the main business goal that Amtrak wants to achieve with the Acela service. Some high-level questions that could help clarify what aspects of the service may need to be considered in developing fleet requirements include:

- Does Amtrak want to focus on maximizing ridership on Acela trains irrespective of financial performance [maximize public service]?
- Does Amtrak want to focus on maximizing Acela's operational profit [reduce Amtrak's operational subsidy] irrespective of capital funding?

[37] Based on *FY 2009 Monthly Performance Report,* p. C–1**.**

[38] Amtrak Fleet Strategy, p. 42. The ridership demand forecasts were provided by Amtrak's Market Research Department, which uses a forecasting model developed by AECOM. This model uses a set of external variables (population, employment, income) and service variables (travel time, travel cost, frequency, on-time performance), which are updated regularly to account for changes. For purposes of this section, we did not review Amtrak's demand forecast methodology. These forecast data are not consistent with the forecasts used in Attachment 1 to the Fleet Strategy. (See footnote 7.)

- Does Amtrak want to focus on maximizing Acela's operational profit plus maximizing the benefits from capital investments in Acela assets (rolling stock, infrastructure, etc.) [minimize total Amtrak subsidy, both operational and capital]?

As with all of Amtrak's business activities and decisions, costs and revenue should be chief considerations. Not only is "improving financial performance" a strategic goal of the company,[39] Amtrak also stated in its Fiscal Year 2011 Grant and Legislative Request that it is "…our plan to…purchase equipment in a manner that is economical to the taxpayer…."[40]

A clearly defined strategic focus for the Acela service would assist Amtrak in determining the best alternative for replacing and enhancing the fleet.

The Fleet Strategy Contains Two Different Courses of Action for Acela Express, but Neither Contains Sufficient Information for Making an Informed Decision on How to Proceed

The Fleet Strategy and its draft implementation plan effectively identify factors that Amtrak needs to consider in developing the best option for replacing and growing the Acela fleet.

However, recognizing that Amtrak is "still short of sufficient information to make firm decisions,"[41] the strategy contains two potential courses of action for Amtrak to pursue in replacing and enhancing the Acela fleet. We have evaluated the two potential courses of action for the Acela fleet by assessing if the alternatives:

- satisfy Amtrak's forecast growth in demand, and
- procure equipment in a manner that is economical to the taxpayer.

The **first course of action,** on page 42 of the Fleet Strategy, recommends that Amtrak

- procure 40 additional Acela cars in 4 years (2014) to lengthen each of the existing 20 train sets by two cars, for a total of eight cars per set;
- procure two additional train sets in 2014 with eight cars per set, each powered by two Acela power cars or two HHP-8 locomotives; and
- replace the whole Acela fleet in 2020.[42]

[39] Amtrak's New Mission, October 2009, p. 5.
[40] Fiscal Year 2011 *Grant and Legislative Request,* March 22, 2010, p. 2.
[41] Amtrak Fleet Strategy, p. 44.
[42] The Fleet Strategy is not specific about the capacity of the Acela fleet after the 2020 replacement. We assume for this evaluation that the Acela fleet replacement in 2020 will consist of 20 train sets with eight cars each. Also, the first course of action does not mention that the two Acela train sets procured in 2014 would have to be replaced again in 2034.

In total, this approach provides approximately 3,414 additional seats, which is an increase in seat capacity of 57 percent.[43] The approximate procurement cost for the 40 additional cars and two complete new train sets would be $256 million based on the Fleet Strategy's pricing assumptions. An additional $960 million would be necessary to replace the 20 Acela train sets (with eight cars each) in 2020.

The **second course of action**[44] is contained in the Fleet Strategy's procurement plan (Attachment 2 of the Fleet Strategy) and recommends that Amtrak

- procure five new Acela train sets with six cars each in 2014–2015, and
- replace the current 20 train sets in 2019–2020.

This approach provides approximately 1,495 seats, a capacity increase of 25 percent. The approximate procurement cost for the five new train sets would be $200 million, based on the pricing assumptions in the Fleet Strategy. The procurement cost for replacing 20 train sets in 2019–2020, with six cars each, would require an additional $800 million. The cost for this course of action is included in the Fleet Strategy's estimate of a total funding requirement of $23 billion.

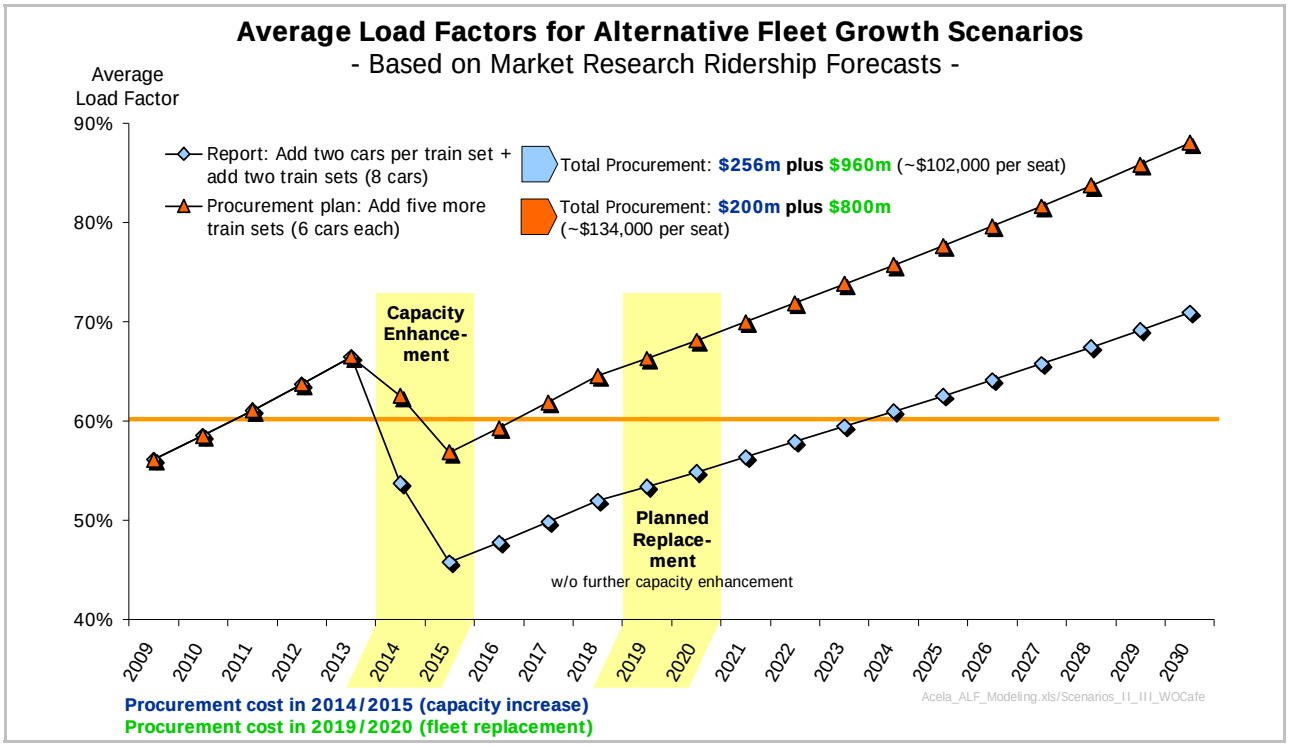
Although both courses of action plan to replace the current Acela fleet around 2020, there is no plan to procure any additional capacity at that time.[45]

The Fleet Strategy did not reconcile the discrepancy between the course of action in the text of the report and the one in the procurement plan, so we evaluated both.

Does the Fleet Strategy Satisfy Amtrak's Forecast Growth in Demand?

To assess at a high level how well the two courses of action for Acela satisfy the forecast demand, we calculated and graphed the average Acela load factors based on Amtrak's projected demand (in passenger miles) and capacity (in seat miles) in the Fleet Strategy over the next 20 years (see figure below).

[43] This assumes that the new consist contains six business cars, one first class car, and one café car. In case of two first class cars and five business cars, the increase in capacity would be 2,866 seats (48 percent).
[44] Amtrak told us that the first course of action was the preferred option.
[45] The procurement plan also does not consider replacing the five train sets being introduced 2014–2015 (second course of action) after they have reached their expected economic life around 2035.

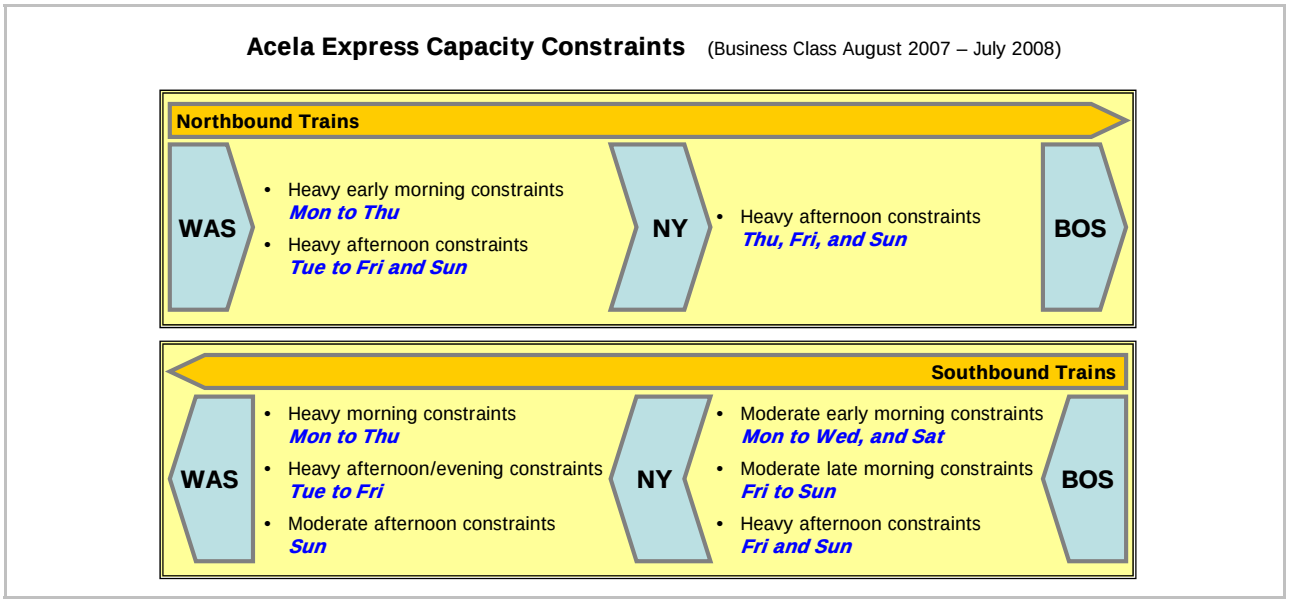


In 2008 Amtrak management expressed concerns with Acela capacity constraints.[46] At that time, Acela's average load factor was 63 percent.[47] Therefore, for this high-level analysis, we are using a 60 percent load factor to indicate a capacity-constrained condition. As shown in the figure above, the option of procuring five complete additional train sets (orange line) keeps the average load factor below 60 percent only for about 2 years. The option to procure 40 new cars[48] and two train sets (blue line) provides significantly more capacity than needed in the early years but then also fails to provide sufficient capacity to meet the demand after 2024.

Based on this high-level analysis, neither of the Fleet Strategy's recommended courses of action appears to satisfy the forecast demand through 2030. Moreover, this analysis was based on maintaining the average load factor below 60 percent, when in reality the demand for Acela seats is not constant and varies by season, day of week, time of day, direction of travel, and location within the NEC.

For example, the following illustration shows capacity constraints (when ridership demand exceeded Acela's seat capacities and passengers had to be turned away) in Business Class for Acela trains from August 2007 to July 2008.

[46] Testimony before the House Committee on Transportation and Infrastructure on October 29, 2008, where details of the Acela peak load factors for July 2008 were discussed.
[47] *Amtrak Route Performance Report* for July 2008, p. C-4A.
[48] We assume that the two cars that are added per train set have Business Class seating.



Given the constraints shown in the figure above, adding capacity uniformly to all trains would not be very efficient because trains that never reach their maximum capacity will carry most of the extra seats. A more efficient use of new capacity would be to focus the additional seats at the peak periods by adding more cars or train sets at those times.

Does the Fleet Strategy Replace and Enhance the Acela Fleet in a Manner that is Economical to the Taxpayer?

Both courses of action discussed in the Fleet Strategy require significant financial investments for fleet procurements. The investment cost estimates are $1.2 billion for the first course of action and $1.0 billion for the second. However, the strategy lacks sufficient information with which to determine which course of action is more economical. In addition, unanswered questions remain that could have a material impact on the estimates.

The **first course of action**—adding two cars per existing train set and replacing the whole Acela fleet in 2019–2020—would mean that the additional cars would run for only 5–6 years before replacement. This is far shorter than their expected economic life.

In addition, the two additional train sets planned under this course of action would have to be very similar to the current Acela technology,[49] if they are to be delivered in 2014. If the additional two train sets were to remain in service after the old Acela equipment is replaced in 2020, Amtrak could be required to continue to maintain two different versions of the Acela trains. This assumes that the Acela II will utilize a completely new generation of technology.

[49] A deadline of 2014–15 to deliver new Acela train sets does not allow time for new equipment design. Thus, only the technologically relatively old Acela could be manufactured and delivered, if even it could be.

Retaining two different Acela train sets would require stocking and maintaining two sets of repair parts and tools, along with maintenance expertise on both train sets.

This course of action would also require additional capital investments in Acela maintenance facilities and infrastructure because the facilities and infrastructure are sized for six-car consists.

The **second course of action**—procuring five additional train sets in 2014–2015—does not address whether sufficient NEC infrastructure slots are available to run these trains, given that the peak demand occurs when most other operators (MARC, NJT, SEPTA,[50] Metro North, Long Island Railroad, etc.) are also using existing track capacity. If additional investments are needed to expand the NEC infrastructure capacity, they would be critical factors in a financial assessment of this course of action.

Further, running these additional sets with the replacement fleet in 2020 could require Amtrak to stock and maintain two sets of repair parts and tools, along with maintenance expertise on both types of equipment, which requires more maintenance staff than for a homogenous fleet.

The Fleet Strategy does not contain an operational and financial assessment of the two courses of action that could be used to simulate cost and revenue performance for various schedule and capacity options to reach an informed decision on how to proceed.

Conclusion

The Fleet Strategy's plan for Acela Express' replacement and expansion lacks a disciplined and detailed approach to identify the best operational and economic solution to satisfy projected ridership demand. Such an approach would compare the different options using operational and financial assessments that simulate cost and revenue performance for various schedule and capacity options, considering all of the relevant factors in the context of a strategic focus for Acela service.[51]

Recommendation

We recommend that the President and CEO ensure that future strategy updates include the results of an Acela Express replacement and expansion plan that is linked to a clear strategic focus for the service and considers alternatives in the context of strategic goals, forecast demand and revenue scenarios, cost performance, and other relevant factors.

[50] Maryland Area Regional Commuter, New Jersey Transit, Southeastern Pennsylvania Transportation Authority.
[51] This exercise would calculate the net present value of expected revenue and cost flows over a predefined time period. Cost would include all relevant positions to operate the service, including all capital investments and operating expenses.

Management Comments and OIG Analysis

Management responded as follows:

> "Management agrees with the recommendation. In fact, Acela enhancement and replacement plans have been further addressed in the FY 2011 version of the Fleet Strategy Plan. This work has been aligned with the larger vision for Acela that has been developed and continues to be refined within Amtrak by the recently appointed Vice President—High Speed Rail."

We consider management's comments to be responsive to our recommendation.

ROLLING STOCK ACQUISITION APPROACH

Fleet Strategy's Acquisition Approach Will Likely Result in Higher Equipment Prices and Maintenance Expenses; Amtrak Has Not Demonstrated that the Benefits Will Offset Potential Increased Costs

Our research indicates that the quantities of cars called for in Amtrak's Fleet Strategy for annual delivery—65 single-level and 35 multi-level cars—appears to be lower than needed for some manufacturers to most efficiently operate their production lines. Further, Amtrak's plan of ordering relatively small car quantities could prevent it from taking advantage of lower unit prices generally associated with larger orders. Taken together, Amtrak's approach will likely lead to higher unit costs. The unit price of Amtrak's equipment acquisitions will be a major factor that determines Amtrak's total capital funding requirements over the 30-year planning period. For example, each 10-percent change in the unit price of cars, locomotives, and train sets, would have a $1.4 billion impact on the capital-funding requirement for the program. Amtrak states that this approach is intended to provide support for a competitive supplier base, but the Fleet Strategy does not provide sufficient evidence to show that the likely higher unit costs would be offset by the benefits gained.

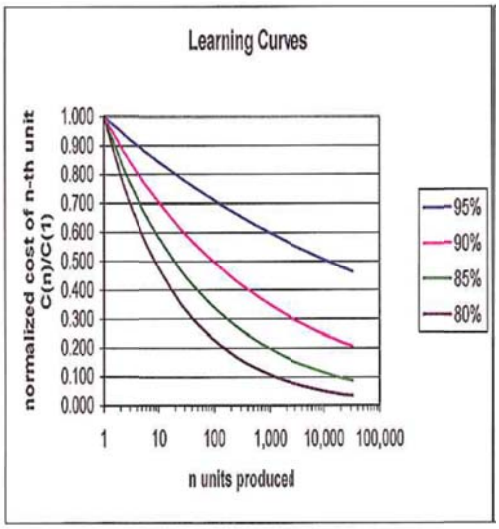
Procurement Approaches Can Influence Procurement Prices

Amtrak can influence the cost of acquiring new equipment through its approach to the procurements. For example, Amtrak can attempt to reduce the prices of manufacturers' proposals by

- specifying large quantities of equipment per order, enabling manufacturers to realize efficiencies and economies of scale; and
- defining production and delivery rates that will allow manufacturers to achieve efficient manufacturing cost performance.

Placing Large Equipment Orders Enables Manufacturers to Offer Lower Unit Prices

Manufacturing costs consist of variable production costs (for example, for labor and material) and fixed costs (for research and development, production engineering, etc.). Larger orders allow fixed costs to be spread out over more units, resulting in lower overall unit costs. Large order quantities also enable manufacturers to purchase components (for example, HVAC[52] systems) in bulk orders, with better unit pricing than small orders.



In addition, one of the major factors affecting efficiency in the manufacturing industry is the learning curve. According to this concept, illustrated in the figure to the right, the number of labor hours required to complete a unit of production will decrease by a constant percentage each time the manufacturer doubles its production quantity. This figure illustrates how the cost of a unit of production varies for various learning rates and units of production.[53]

To illustrate the potential impact of the size of the production order on unit costs, the following figure has been prepared using the NASA Learning Curve Calculator.[54] The blue line, which represents the marginal production cost of each car, demonstrates the impact of the learning curve on production unit costs. The orange line demonstrates the impact of both the learning curve and spreading fixed costs on the total average cost of each car. A higher order size results in significantly lower unit costs—a lost opportunity if Amtrak plans for relatively small order sizes.

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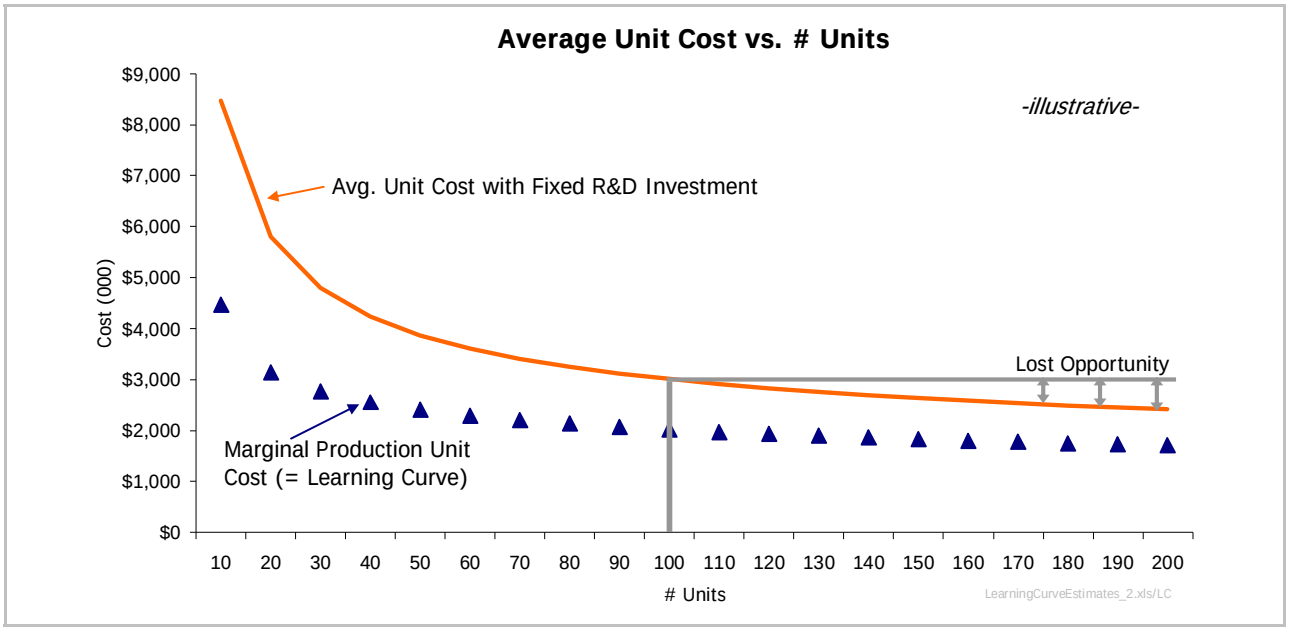
[52] Heating, ventilation, and air conditioning.

[53] The concept of the learning curve was introduced to the aircraft industry in 1936 when T.P. Wright published an article in the February 1936 *Journal of the Aeronautical Sciences*. The concept of the learning curve is still applicable to the manufacturing industry, and to the rolling stock manufacturing industry in particular. Discussions of this concept with an active rolling stock manufacturer revealed that its management definitely agreed that there was a learning curve associated with the manufacturing and assembly of rail passenger equipment.

[54] http://cost.jsc.nasa.gov/learn.html. The learning curve model uses a percentage of 85, which is appropriate for major manufacturing processes such as aerospace and shipbuilding, and is pegged to the $3.5 million unit price for single-level cars in Amtrak's Fleet Strategy.



We asked LTK to study past rail car orders to see if this concept is reflected in reality. Although other factors may also influence unit prices, LTK's review of recent procurements confirmed that larger car orders generally resulted in lower unit prices.[55]

Matching Delivery Rates to the Manufacturer's Production Line Capacity May Result in Higher Efficiency and Lower Unit Costs

Manufacturers of rail passenger cars use production lines to build and assemble body shells and components. To determine the production rates of current manufacturers, we visited the Kawasaki plant in Yonkers, N.Y. Interviews with key management and first-line supervisors revealed that the assumed delivery and production rates in Amtrak's Fleet Strategy (maximum of 65 single-level cars per year) are significantly lower than the most efficient capacity of any of the plant's production lines (100–120 cars per year). If a manufacturer had to build only 65 cars per year on a production line with this capacity, it would either have to run the line at a slower speed and less efficient rate, or start and stop the line during the year. Consequently, production costs will be higher.

In a June 2010 report, *Transit Rail: Potential Rail Car Cost-Saving Strategies Exist*,[56] the Government Accountability Office (GAO) addressed railcar manufacturing costs. GAO reported "once there is a break in production, expenses are incurred because manufacturers and component suppliers may need to reconfigure or retool their production line before they can begin producing rail cars and their component parts." The report offered this example:

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[55] LTK Engineering Services: *AMTRAK NEC NORTHEAST REGIONAL, Alternate Passenger Coach Study*, September 28, 2010, p. 44.
[56] U.S. Government Accountability Office, *Transit Rail: Potential Rail Car Cost-Saving Strategies Exist*, GAO-10-730 (Washington, D.C., June 30, 2010).

> VRE [Virginia Railway Express] was able to purchase cars for $1.6 million per car from an active production line, but then later paid $2.2 million per car "because the manufacturer had to restart the production line for this car design."

The unit price of Amtrak's equipment acquisitions will be a major factor that determines Amtrak's total capital funding requirements over the 30-year planning period. Each 10-percent change in the unit price of cars, locomotives, and train sets, would have a $1.4 billion impact on the capital-funding requirement for the program.

Amtrak May Incur Additional Operating Costs if it Procures from Many Manufacturers

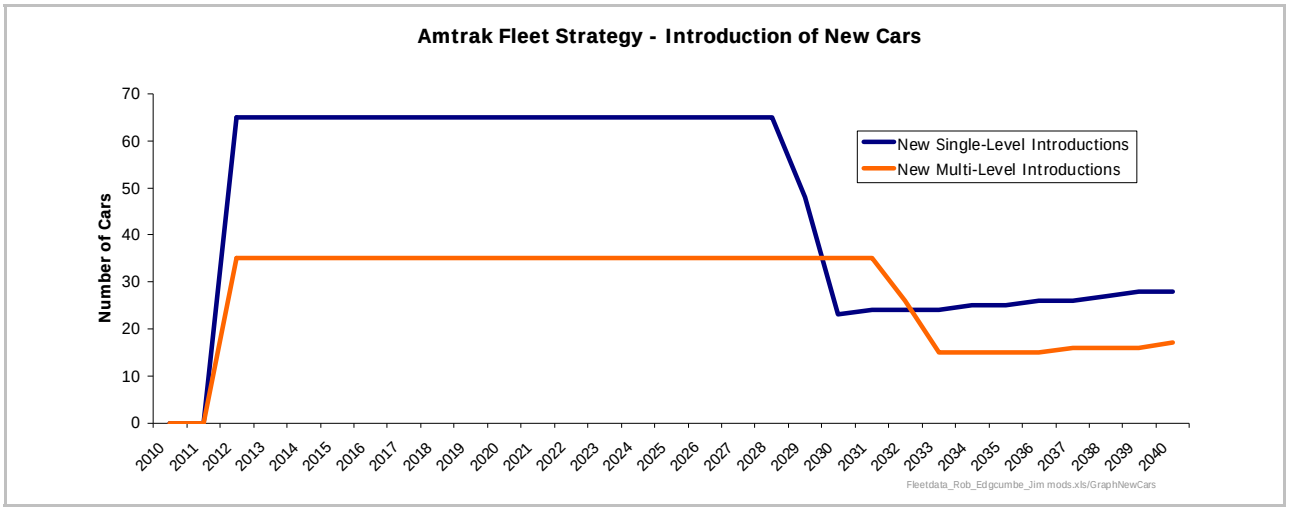
In addition to potentially higher unit procurement costs, Amtrak's procurement plan could also significantly affect the operating and maintenance expenses of the rolling stock fleet if multiple manufacturers produce Amtrak's equipment. It is usually desirable to own and operate a standardized equipment fleet. By owning and operating a non-standardized fleet produced by multiple manufacturers, Amtrak may incur higher operating expenses in the future for a number of reasons, including the following:

- Duplicate inventories of parts and equipment components will be required.
- Additional training will be required to familiarize maintenance crews with the multiple types of equipment, components, and systems.
- The efficiency of servicing and maintaining the equipment will suffer.

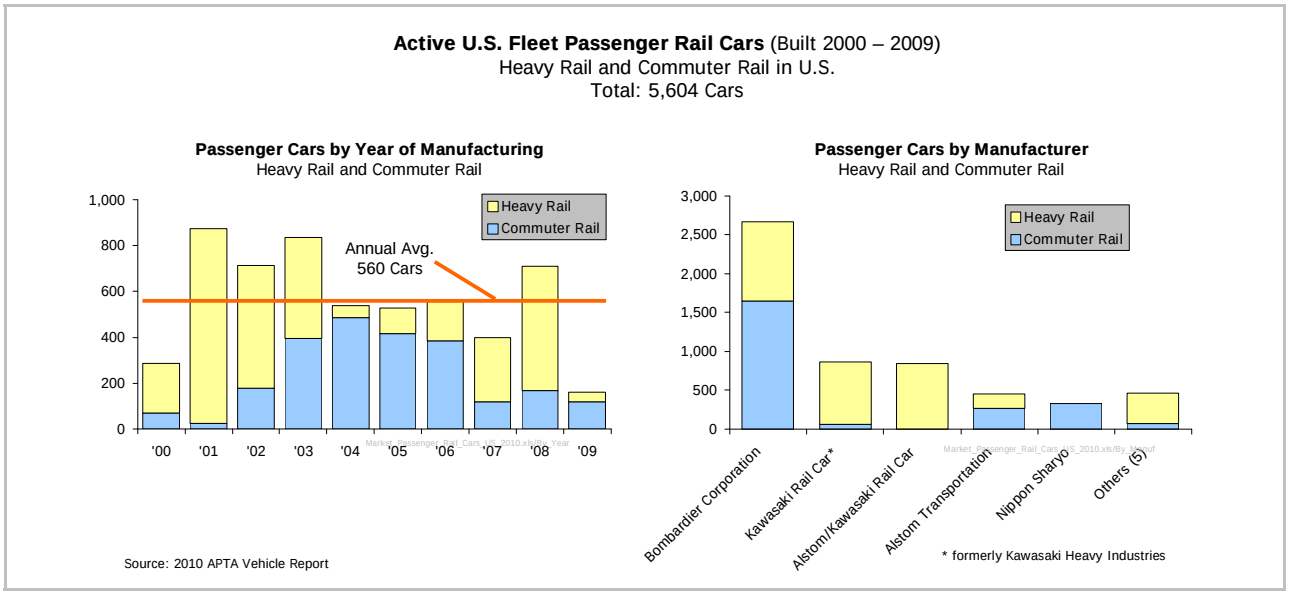
Amtrak's Fleet Strategy Plans to Support a Competitive Passenger Rail Car Supplier Base

One of the goals of Amtrak's Fleet Strategy is "to support a competitive supplier base and avoid the boom and bust cycles seen in the past."[57] The Fleet Strategy plans to accomplish this objective by placing relatively small procurement orders, opening these procurement orders to competitive bids, and spreading out the equipment deliveries over an extended period of time (2011-2040), as illustrated in the following figure.[58]

[57] Amtrak Fleet Strategy, p. 35
[58] If Amtrak implements our recommendation to operate more cars that are multi-level, it would procure more multi-level and fewer single-level cars.



To assess the impact of Amtrak's plans on the rail car manufacturing industry in the United States, we gathered data on the number of current active passenger rail cars built between 2000 and 2009 for all U.S. public transportation agencies operating Heavy Rail and Commuter Rail equipment. [59] We considered manufacturers for Commuter Rail and Heavy Rail passenger cars as the ones most likely to build intercity passenger rail cars. The left side of the figure below shows that from 2000 to 2009, an average of 560 cars per year were delivered to U.S. public transportation agencies.



[59] Source of data and definitions of Commuter Rail and Heavy Rail: APTA 2010 PUBLIC TRANSPORTATION FACT BOOK, 61st Edition, April 2010, published by the American Public Transportation Association.

Based on the data from 2000 to 2009, the Fleet Strategy's plan to have 100 cars delivered every year would represent an average increase of 18 percent in the passenger rail car market. However, Amtrak does not explain how this amount would be sufficient to create significant increased competition among existing market players or attract new manufacturers to enter the market.

As seen in the above-described passenger rail market from the manufacturers' perspective (right-side figure above), there are already multiple firms in the market, with three dominant manufacturers: Bombardier, Kawasaki, and Alstom. We expect that a considerable amount of competition already exists in this market.

Conclusion

The procurement approach can have a significant impact on manufacturers' production costs and consequentially equipment prices. Amtrak plans for relatively small order quantities and annual delivery rates that will likely lead to higher equipment prices. While Amtrak states that this approach is intended to provide support for a competitive supplier base, the Fleet Strategy does not provide sufficient evidence to show that the likely higher unit costs would be offset by the benefits gained.

Recommendation

We recommend that the President and CEO ensure that future strategy updates clearly demonstrate how Amtrak's procurement approach results in the most cost-effective use of its funds while advancing support for a competitive supplier base.

Management Comments and OIG Analysis

Management responded as follows:

> "Management agrees with the recommendation. The description of the current procurement approach has been more clearly outlined in the FY 2011 version of the Fleet Strategy Plan. Actual acquisitions will be batched as appropriate and delivery rates will be negotiated for best value.
>
> "Management believes that the combination of the refinements made to the FY 2011 Fleet Strategy Plan and the definition of the requirements at the acquisition stage will meet the needs of gaining best value for use of Amtrak's funds."

We consider management's comments to be responsive to our recommendation.

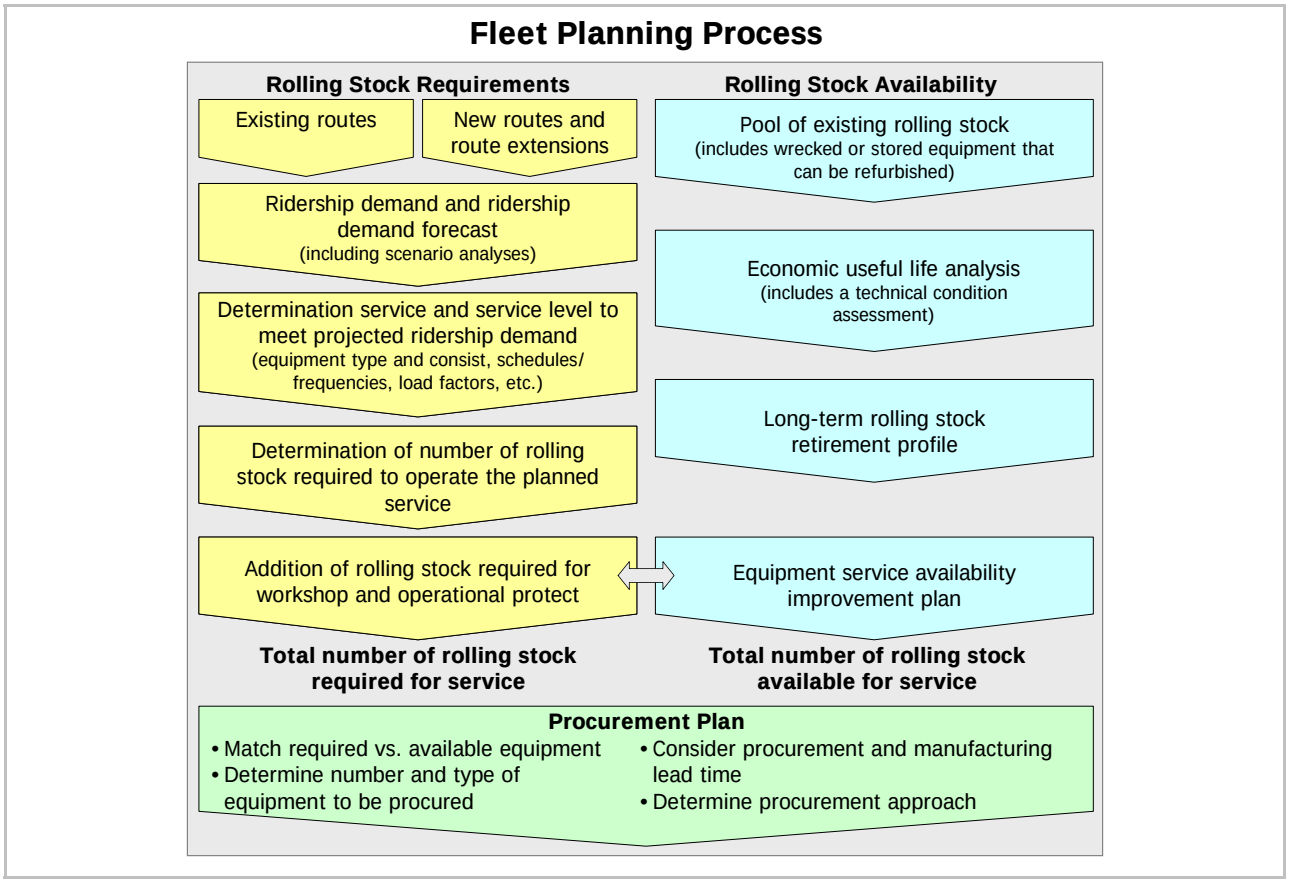
INTEGRATION OF SYSTEMATIC FLEET PLANNING PROCESS INTO AMTRAK'S OVERALL STRATEGY

Amtrak Did Not Develop the Fleet Strategy as Part of an Overall Fleet Planning Process that was Integrated with Other Strategic Plans and Activities

Amtrak did a commendable job of developing its Fleet Strategy, particularly considering the brief time frame available to meet the congressional deadline, and it plans to continually refine and update the strategy. However, the strategy was not developed as part of a systematic process integrated with other strategic plans and activities. Using a systematic and integrated process for future updates would help ensure that the Fleet Strategy best meets Amtrak's needs in the most cost-effective way.

A Comprehensive Model Would Help Amtrak Implement a Systematic Process for Fleet Planning

Based on our review of the Fleet Strategy and research into equipment planning processes and practices, we have outlined a model, shown in the figure below, of an overall process that could be used for long-term equipment planning.



This model includes the key factors that should be considered and is organized into three main sections:

- **Rolling Stock Requirements.** These determine how much and what kind of equipment is required to run planned services. As discussed, the demand for rolling stock depends heavily on the projected ridership demand on existing routes, but also on plans for new routes. According to the route-specific ridership demand patterns, existing load factors, and other surrounding circumstances, the service levels are selected, train schedules are developed, and suitable equipment types are identified. This then determines the number of pieces of equipment necessary to run the service. To account for mechanical and operational issues, an additional percentage of equipment is added.
- **Rolling Stock Availability.** This determines how much of the existing fleet is available for the planned services and when it is economically reasonable to retire the equipment. Based on the determination of the equipment's optimal economic useful life and the existing pool of rolling stock, a long-term retirement profile is developed. The availability improvement plan is taken into consideration.
- **Procurement Plan.** This determines when and how much of what type of equipment should be procured, and the most economical procurement approach for Amtrak and the taxpayer. Finally, after long-term rolling stock requirements and availability have been

matched, a procurement plan is developed for the different types of equipment. It also considers procurement and manufacturing lead time and the optimally economical procurement approach (under the specific circumstances).

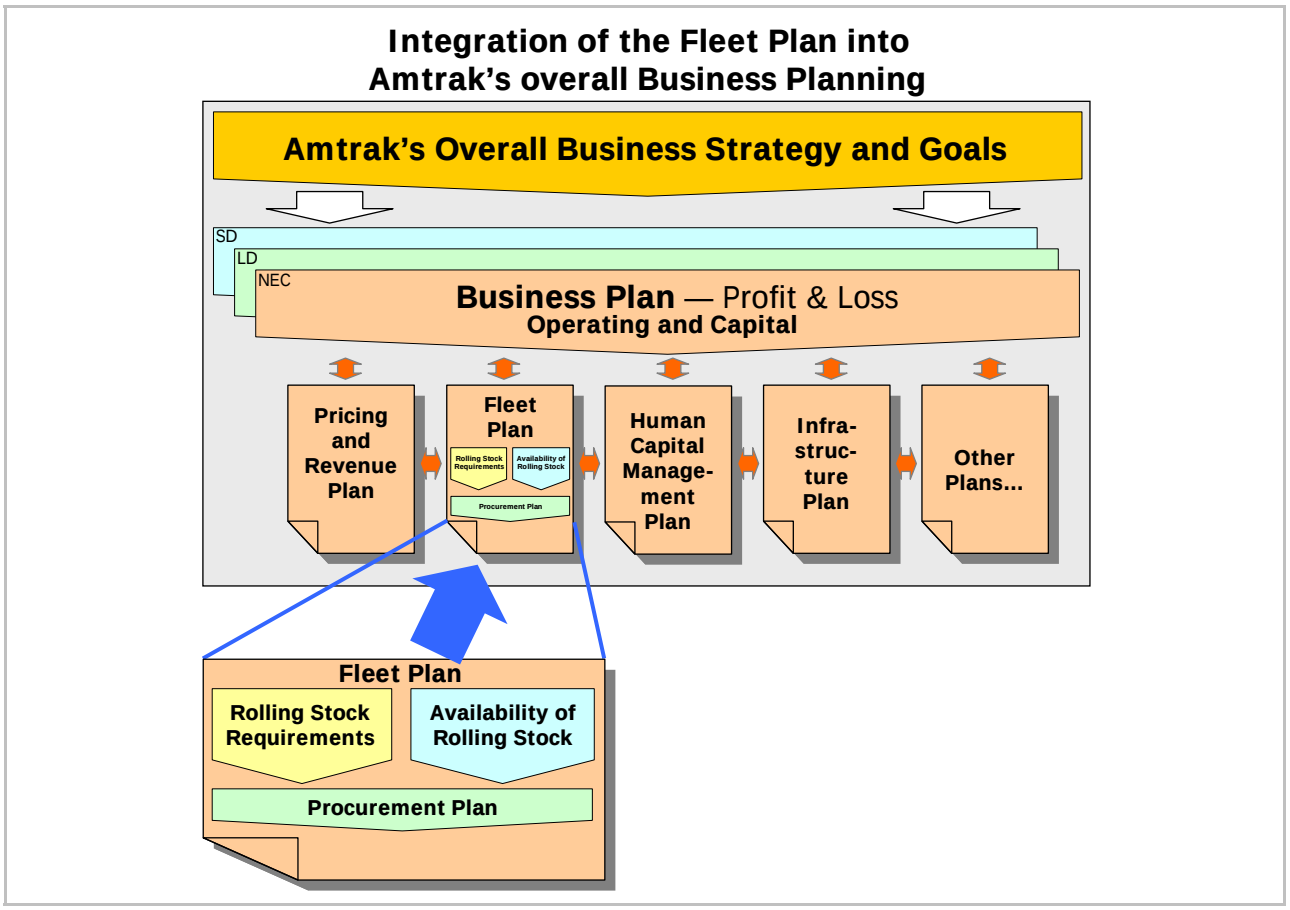
The process should be applied to each route and service and is ultimately aggregated and consolidated. On an annual basis, this plan should be revised with the latest updates on strategic focus, adjustments in demand projections, and improvements in the planning methodology.

The Fleet Planning Process Needs to Be Linked to Other Strategic Plans and Activities Embedded in Amtrak's Overall Strategy

The fleet plan needs to be an integrated part of an overall business plan that incorporates all of the individual plans necessary to run passenger rail services. As discussed throughout Amtrak's Fleet Strategy and this report, the Fleet Strategy supports and depends on many other Amtrak strategies and plans, including the following:

- **Business Strategy and Goals.** The plan for new procurements depends heavily on Amtrak's network strategy. Amtrak has not yet finalized this strategy; therefore, questions have yet to be answered about new service developments and future changes to existing services that are necessary to properly project fleet requirements. In addition, the states will decide in the future on equipment purchases for their state services (existing and potential). The Fleet Strategy at this point plans for replacing all existing equipment used in Amtrak's state services but cannot take for granted that all states will ask Amtrak to procure rolling stock to run their services. As states solidify their future plans for rail services, the impact on Amtrak's fleet requirements should be integrated into the Fleet Strategy.
- **Infrastructure Plan.** Decisions on the number of cars that Amtrak can add to a train to accommodate growth are limited by the space available on platforms, in stations, yards, and maintenance facilities. However, the Fleet Strategy is not integrated with the long-term facility and station master plans. In addition, new train services (frequencies and new routes) depend heavily on available access to track infrastructure. Currently, infrastructure capacity constraints exist on both the NEC and host railroad routes. Therefore, any new frequencies and routes will need to be coordinated with the infrastructure expansion plans.
- **Human Capital Management Plan.** Amtrak employees need to have the knowledge, skills, and abilities to meet requirements associated with new equipment procurements. New generations of rolling stock will use new technologies that may require expertise that maintenance and operations staffs may not currently possess. In addition, there may not be a sufficient number of employees with expertise in major procurements and project management to implement the Fleet Strategy and equipment procurements. To ensure that human capital requirements are properly addressed, the Fleet Strategy should be linked to a comprehensive Human Capital Management Plan.

Embedding the Fleet Strategy into an overall business planning process, such as the one shown in the following figure, would help Amtrak ensure that the fleet plan is properly integrated with Amtrak's overall strategy and other plans.



These business plans start on a route level, roll up to business lines, and finally aggregate to a corporate-wide business plan supporting Amtrak's strategic goals. The business plans provide the methodology for revenue as well as capital and operating cost planning to assess the financial performance of different service, revenue, and cost scenarios. This would enable Amtrak to select the economically best solution out of various possible and feasible service options.

Conclusion

A more sophisticated and detailed planning process is needed to help ensure that the estimates and assumptions in the Fleet Strategy are accurate and reliable. In addition, a more integrated planning approach will help to ensure that the Fleet Strategy is tied to other strategic plans and activities. Therefore, embedding a sophisticated and detailed fleet planning process into the corporate planning process is essential to improving the quality of Amtrak's planning.

Recommendation

We recommend that the President and CEO ensure that future updates of the Fleet Strategy are based on a more systematic and iterative planning process, one that is integrated with Amtrak's overall strategy and linked to other strategic plans and activities. This should include a financial assessment to identify the most economical solution for Amtrak and the taxpayer.

Management Comments and OIG Analysis

Management responded as follows:

> "Management agrees with the recommendation. We are in the process of strengthening the fleet strategy planning process and have begun recruiting a fleet strategy manager. We will also ensure that fleet planning is appropriately integrated with other strategic planning activities and published documents. Some of the more detailed analyses contained in the report recommendations, such as use of multi-level cars, improved availability opportunities, replacement vs. overhaul decisions, and economic useful life decisions will be part of the strategic planning process for the company as a whole and each line of business. We will ensure that the results of those analyses are reflected in our annual fleet strategy updates."

We consider management's comments to be responsive to our recommendation.

Appendix I

COMMENTS FROM AMTRAK'S PRESIDENT AND CEO

NATIONAL RAILROAD PASSENGER CORPORATION
60 Massachusetts Avenue, NE, Washington, DC 20002
tel (202) 906-3960, fax (202) 906-2850

Memo

AMTRAK

Date March 28, 2011
To Ted Alves, Inspector General

From Joseph Boardman
Department President and CEO
Subject OIG Evaluation Report E-11-2: Evaluation of Amtrak's FY2010 Fleet Strategy
cc Mario Bergeron, Chief Mechanical Officer
Stephen Gardner, VP – Policy and Development
DJ Stadtler, Chief Financial Officer
Al Engel, VP – High Speed Rail
Emmet Fremaux, VP – Marketing and Product Development
Jessica Scritchfield, Internal Controls Officer

Message This letter is in response to Office of Inspector General ("OIG") evaluation report number E-11-2 "Evaluation of Amtrak's FY 2010 Fleet Strategy: A Commendable High-Level Plan That Needs Deeper Analysis and Planning Integration," dated March 4, 2011.

Management thanks the OIG for its report and for this opportunity to respond to its content. We appreciate the overall conclusion within the report that the Fleet Strategy Plan is overall a good document and a significant step forward in the planning of Amtrak's fleet requirements. In identifying a number of specific areas for further discussion, we are glad to see that the OIG concludes at the very beginning that the report is a valuable addition to the overall strategic planning process.

Amtrak has been very active on the fleet planning process since the first issue of the Fleet Strategy Plan in February 2010. We have recently issued the FY 2011 version of the plan updated with the developments that have taken place over the last year. We have defined a fleet management process and ownership structure and have commenced the recruitment process for a fleet strategy manager who will be responsible not only for maintaining the Fleet Strategy Plan but also the business processes that support the plan. We expect the new fleet manager to be on-board no later than June 2011.

We appreciate that the OIG gave us some advance information on the content of this report as we were in the final stages of completing the FY 2011 version. We were able to incorporate some of the comments in finalizing the FY 2011 version where appropriate. However, given the timing of this report, it was not possible to cover all of the issues directly. We will address the remaining comments starting with the FY 2012 version of the Fleet Strategy Plan.

It is worthwhile to state the position the Fleet Strategy Plan takes within the overall equipment acquisition process since this relates to a number of specific points within the OIG report. The Fleet Strategy Plan is the top level view of equipment needs and the funding requirements associated with those needs. It provides a 30-year time horizon for Amtrak's requirements and aggregates the overall needs throughout that timeframe. Responding to your recommendation number 7 to integrate the fleet planning process with other strategic plans and activities, we will ensure that future fleet plan updates incorporate more precise equipment estimates based on strategic planning activities and business processes for the company as a whole and for each line of business.

The seven broad recommendations identified in the OIG report are as follows:

1. Determining rolling stock requirements based on demand
2. Use of multi level cars
3. Equipment availability
4. Economic life policy
5. Acela enhancement/replacement
6. Fleet procurement approach
7. Fleet/strategy planning processes

Below is a brief response to each of those areas.

Recommendation 1:

We recommend that the President and CEO ensure that future strategy updates include a more detailed process to determine future rolling stock requirements. Specifically, this would include:

- route-specific ridership demand forecasts incorporating service extensions and new services, in addition to existing service;
- the identification of external factors that significantly influence ridership demand, sensitivity analyses to measure their impact, and alternative strategies to accommodate potential changes in demand;
- equipment-type-specific load factors (for example, sleeper v. coach cars);
- the consideration of possible consist alternatives and changes in train frequencies; and
- an analysis of the locomotive requirements needed to support future car fleet requirements.

Management Response:
Management agrees with the recommendation. Amtrak has taken a conservative position regarding the growth assumptions in assuming 2% growth per annum. We acknowledge that a more detailed growth model delivers more precise forecasts. In fact, Amtrak already has detailed studies of potential ridership demand by route and these are regularly updated. As the

Fleet Strategy Plan evolves and is updated, we will bring those into the assumptions to refine the need.

Recommendation 2:

We recommend that the President and CEO ensure that future strategy updates consider increasing the use of multi-level passenger coaches wherever practical and feasible.

Management Response:
Management agrees with the recommendation. The 2010 Fleet Strategy Plan identified the need to investigate greater use of multi-level equipment to replace existing single level cars. The FY2011 version of the Fleet Strategy Plan has taken this topic further discussing bi-level cars for use in state supported services contingent on the agreement with the states that financially support those services. The OIG report also discussed introduction of multi level cars on NEC services. This was also specifically addressed in the FY2011 version of the Fleet Strategy Plan. Amtrak has significant concerns about introducing this type of equipment on these services. These concerns and options will be analyzed by the new fleet strategy manager with written findings developed no later than December 31, 2011.

Recommendation 3:

We recommend that the President and CEO ensure that future strategy updates consider Amtrak's planned equipment availability and reliability improvements and incorporate their impact into equipment estimates. He should also ensure that future strategy updates incorporate the impact of any additional equipment availability improvements.

Management Response:
Management agrees with the recommendation. Equipment availability is a factor that should be considered in the planning process. We will further investigate if and how the availability targets will have an impact on the number of equipment required to run future services.

Recommendation 4:

We recommend that the President and CEO ensure that future strategy updates are based on an economic evaluation model that uses strategic, operational, and financial factors (including replacement costs, operating expenses, overhaul and upgrading expenses, maintenance expenses, and revenue/ridership impact of each relevant equipment alternative) to determine the optimal retirement age for Amtrak's rolling stock.

Management Response:
Management agrees with the recommendation. We have already started developing an evaluation model to determine the economic useful life of our different types of equipment. We want to focus not just on an optimal replacement time based on cost analyses, but also to consider the impact of additional revenue generated by attractive, new cars and locomotives and other factors that are identified during strategic planning activities for each line of business. Some of the necessary data to build a comprehensive model still needs to be collected, so we expect to start with a relatively simple model that will be improved over the next years.

Recommendation 5:

We recommend that the President and CEO ensure that future strategy updates include the results of an Acela Express replacement and expansion plan that is linked to a clear strategic focus for the service and considers alternatives in the context of strategic goals, forecast demand and revenue scenarios, cost performance, and other relevant factors.

Management Response:
Management agrees with the recommendation. In fact, Acela enhancement and replacement plans have been further addressed in the FY 2011 version of the Fleet Strategy Plan. This work has been aligned with the larger vision for Acela that has been developed and continues to be refined within Amtrak by the recently appointed Vice President – High Speed Rail.

Recommendation 6:

We recommend that the President and CEO ensure that future strategy updates clearly demonstrate how Amtrak's procurement approach results in the most cost-effective use of its funds while advancing support for a competitive supplier base.

Management Response:
Management agrees with the recommendation. The description of the current procurement approach has been more clearly outlined in the FY 2011 version of the Fleet Strategy Plan. Actual acquisitions will be batched as appropriate and delivery rates will be negotiated for best value.

Management believes that the combination of the refinements made to the FY2011 Fleet Strategy Plan and the definition of the requirements at the acquisition stage will meet the needs of gaining best value for use of Amtrak's funds.

Recommendation 7:

We recommend that the President and CEO ensure that future updates of the Fleet Strategy are based on a more systematic and iterative planning process, one that is integrated with Amtrak's overall strategy and linked to other strategic plans and activities. This should include a financial assessment to identify the most economical solution for Amtrak and the taxpayer.

Management Response:
Management agrees with the recommendation. We are in the process of strengthening the fleet strategy planning process and have begun recruiting a fleet strategy manager. We will also ensure that fleet planning is appropriately integrated with other strategic planning activities and published documents. Some of the more detailed analyses contained in the report recommendations, such as use of multi-level cars, improved availability opportunities, replacement vs. overhaul decisions, and economic useful life decisions will be part of the strategic planning process for the company as a whole and each line of business. We will ensure that the results of those analyses are reflected in our annual fleet strategy updates.

Appendix II

EVALUATION METHODOLOGY

To review Amtrak's Fleet Strategy, we used a combination of qualitative and quantitative techniques. We conducted a comprehensive set of interviews with key Amtrak employees and contractors involved in the preparation of the strategy. We interviewed people who provided critical support data, made policy and program decisions, and/or prepared the written strategy document. The information obtained through these interviews, in combination with the information in the Fleet Strategy itself and other supporting documents, identified the specific data and assumptions Amtrak used to support the projected investment of $23 billion.

To assess the reasonableness of the data and assumptions, we analyzed the supporting data to determine its accuracy and relevance, considered the applicability of the assumptions, and reviewed available literature to identify the typical processes used to support major asset replacements. In reviewing rolling stock retirement criteria, we benchmarked Amtrak's methodology against typical asset-replacement ages and decision drivers for equipment replacements from European railroads by using the services of SCI Verkehr, a German company specializing in international railroad rolling stock consulting. On the question of whether it is feasible and practical to run multi-level cars on Amtrak's Northeast Corridor, we asked LTK Engineering Services to study the issue and provide us with a report analyzing the relevant concerns. To understand equipment availabilities achieved by other passenger rail operators, we used benchmark data provided by BSL Transportation Consultants. Finally, to obtain information on rail car manufacturing practices, we visited Kawasaki's plant in Yonkers, New York.

Appendix III

OIG TEAM

This evaluation was carried out and the report written under the direction of Calvin Evans, Assistant Inspector General for Inspections and Evaluations (I&E). Team members included Nico Lindenau (Director I&E), and Jim Simpson (Chief I&E).

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Amtrak OIG's mission is to

- 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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