

State of New York
Office of the State Comptroller
Division of Management Audit

**METROPOLITAN TRANSPORTATION
AUTHORITY**

**REBUILT PARTS AND REBUILDING
OPERATIONS**

REPORT 95-S-111



H. Carl McCall
Comptroller



State of New York Office of the State Comptroller

Division of Management Audit

Report 95-S-111

Mr. E. Virgil Conway
Chairman
Metropolitan Transportation Authority
347 Madison Avenue
New York, NY 10017

Dear Mr. Conway:

The following is our report on rebuilt parts and rebuilding operations at the rail agencies of the Metropolitan Transportation Authority.

This audit was performed pursuant to the State Comptroller's authority as set forth in Section 5, Article X of the State Constitution. We list major contributors to the report in Appendix A.

*Office of the State Comptroller
Division of Management Audit*

August 1, 1996

Executive Summary

Metropolitan Transportation Authority Rebuilt Parts and Rebuilding Operations

Scope of Audit

On June 1, 1965, the New York State Legislature created the Metropolitan Transportation Authority (MTA). It is a public benefit corporation operating, maintaining, and improving public transportation in New York City and the adjacent suburban areas. The MTA's Board of Directors governs all of its agencies and affiliates. The Governor appoints the members of the Board. The MTA's three primary rail agencies are the New York City Transit (NYCT), the Long Island Rail Road (LIRR), and the Metro-North Railroad (Metro-North). They rebuild most of the component parts for their respective train fleets at their own maintenance facilities, involving approximately 1,150 workers. Together, they expend more than \$100 million each year to rebuild thousands of different items.

Our audit addressed the following questions about the parts-rebuilding operations of these three MTA rail agencies for the period January 1, 1994 through September 30, 1995:

- ! Has the NYCT, LIRR, and Metro-North management established information systems that can measure the cost-effectiveness of their parts-rebuilding operations?
- ! Has the MTA provided adequate leadership ensuring the NYCT, LIRR, and Metro-North management conduct their parts-rebuilding operations economically, effectively, and efficiently?

Audit Observations and Conclusions

We found that the NYCT, LIRR, and Metro-North management have not established information systems that would enable them to decide whether their current rebuilding practices are cost-effective. For example, none of the agencies can systematically determine the per-unit cost of rebuilding specific train parts. We believe all three could achieve substantial savings and improve efficiency if they established compatible information systems for gathering the parts-rebuilding costs, which they could then share with each other, along with other data about their rebuilding operations. The MTA should provide leadership in this effort, providing a forum for the exchange of information and services. We identified several possible opportunities for savings when we examined a judgmental sample of parts rebuilt by in-house staff at each agency during 1994 and the first nine months of 1995. We estimated the NYCT could have saved \$665,000 by using the rebuilding services of commercial vendors or the LIRR, and Metro-North could have saved \$90,000—for just one item—if the LIRR had rebuilt it instead of a commercial vendor. (See pp. 5-8)

Improvements could also result from better monitoring of employee productivity. Each agency should develop valid performance standards and measures for monitoring, identifying, and reviewing productivity variances. For example, at the NYCT, we found production variances that may have resulted in unfavorable labor costs variances of as much as \$1 million; at Metro-North, we noted that management has not accounted for \$600,000 in labor expenditures. The LIRR did not have an information system that we could examine. (See pp. 9-12)

Available data appear to support our concerns about the agencies' rebuilding activities. Although we acknowledge significant differences among the various rail car models and operating environments, certain data available at the agencies reveal wide disparities, as indicated in the following table, that should be considered:

	Average Cost to Rebuild a Car	Mean Distance Between Failure
NYCT	\$10,791	56,270 miles
Metro-North	\$17,710	37,764 miles
LIRR	\$24,564	28,480 miles

As in our previous audits, we noted that the recently-constructed Hillside Maintenance Complex, where most of the LIRR's rebuilding activities take place, was underutilized. We also observed that Metro-North's procurement practices needed to be improved. We recommend that the LIRR and Metro-North management consider the possibility of adopting certain NYCT initiatives, such as the use of prepackaged rebuilding kits. (See pp. 13-18)

Comments of Agency Officials

We provided draft copies of this report to MTA, NYCT, LIRR, and Metro-North officials for their review and formal comment. However, although we granted a 30-day extension to the standard 30-day period to respond, MTA, NYCT, LIRR and Metro-North officials did not provide us with a formal response to the draft report. Nonetheless, in preparing this report, we have considered comments that MTA, NYCT, LIRR and Metro-North officials provided at the audit's closing conference and in their responses to the preliminary findings that we provided to them during the course of the audit.

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Introduction

Background

On June 1, 1965, the New York State Legislature created the Metropolitan Transportation Authority (MTA). It is a public benefit corporation operating, maintaining, and improving public transportation in New York City and the adjacent suburban areas. MTA affiliates include the New York City Transit (NYCT) and its subsidiaries, the Manhattan and Bronx Surface Transit Operating Authority (MaBSTOA), and the Staten Island Rapid Transit Operating Authority (SIRTOA); the Long Island Rail Road (LIRR); the Metro-North Railroad (Metro-North); the MTA-Bridges and Tunnels; and the MTA-Long Island Bus. The MTA's Board of Directors governs all of the MTA agencies and affiliates. The Governor appoints the Board members. The following three agencies operate rail systems in the metropolitan area:

- ! NYCT - Links four of the five boroughs of New York City.
- ! LIRR - Connects Penn Station in Manhattan and Flatbush Avenue in Brooklyn with various points in Queens, Nassau and Suffolk counties.
- ! Metro-North - Connects Grand Central Terminal in Manhattan with the suburban communities in Westchester, Dutchess, Putnam, Orange and Rockland counties in New York State and New Haven and Fairfield counties in Connecticut.

The most recent operational data available from 1994 vary considerably for each agency's rail operations, as detailed in the following table:

	No. of Rail Cars	No. Of Passengers*	No. Of Employees	Operating Income*	Operating Expenses*	Operating Deficit*
NYCT	5,801	1,100	45,609	\$1,900	\$4,200	\$(2,300)
LIRR	1,205	73	6,145	319	688	(369)
Metro-North	847	62	5,762	281	503	(222)
* In Millions						
<i>(Operating deficits were funded by Federal and State subsidies, surpluses generated from the MTA-Bridges and Tunnels operations, and special taxes authorized by the State Legislature.)</i>						

Despite this wide range of sizes in the fleets maintained by the agencies—from 847 rail cars to 5,801—all three fleets require constant parts-

replacement and rebuilding activities. This work is usually performed in-house at the agencies' own maintenance facilities. The NYCT employs 803 workers at nine shops to staff its parts-rebuilding operation, which spends \$62 million to rebuild more than 1,600 parts. The LIRR employs 240 workers at nine support shops and spends \$30 million to rebuild more than 800 parts; while Metro-North employs 93 workers at 11 shops and spends \$15 million to rebuild more than 1,300 parts.

Audit Scope, Objectives and Methodology

We audited selected aspects of the parts-rebuilding operation at each agency for the period January 1, 1994, through September 30, 1995. Our objectives were to determine whether: (1) each agency had established an information system for measuring the cost-effectiveness of its operation; and (2) the MTA was providing adequate leadership to ensure that the agencies conducted their parts-rebuilding operations economically, effectively, and efficiently. To accomplish our objectives, we reviewed pertinent agency records, interviewed agency officials and employees, contacted commercial vendors, used reference materials as we deemed necessary, and physically observed parts-rebuilding activities.

Except as we discussed in the following paragraph we conducted our audit according to generally accepted government auditing standards. Such standards require that we plan and do our audit to adequately assess those operations of the three agencies which we include in our audit scope. Further, these standards require that we understand the agencies' internal control structures and their compliance with those laws, rules and regulations that are relevant to the operations we include in our scope. An audit includes examining, on a test basis, evidence supporting transactions recorded in the accounting and operating records and applying such other auditing procedures as we consider necessary in the circumstances. An audit also includes assessing the estimates, judgments, and decisions made by management.

MTA and NYCT management did not provide us with written representations that they had complied with applicable laws, rules and regulations; disclosed all known or suspected irregularities involving their employees; and provided all related records requested by the audit team. Except for any effect that management's failure to provide appropriate representations may have had on the audit, we believe our audit provides a reasonable basis for our findings, conclusions, and recommendations.

We use a risk-based approach when selecting activities to be audited. This approach focuses our audit efforts on those operations that we have identified through a preliminary survey as having the greatest probability for needing improvement. Consequently, by design, finite audit resources are used to identify where and how improvements can be made. Thus, we devote little audit effort to reviewing operations that may be relatively efficient or

effective. As a result, our audit reports are prepared on an "exception basis." This report, therefore, highlights those areas needing improvement and does not address activities that may be functioning properly.

Comments of Agency Officials

We provided draft copies of this report to MTA, NYCT, LIRR, and Metro-North officials for their review and formal comment. However, although we granted a 30-day extension to the standard 30-day period to respond, MTA, NYCT, LIRR and Metro-North officials did not provide us with a formal response to the draft report. Nonetheless, in preparing this report, we have considered comments that MTA, NYCT, LIRR and Metro-North officials provided at the audit's closing conference and in their responses to the preliminary findings that we provided to them during the course of the audit.

Within 90 days after final release of this report, as required by Section 170 of the Executive Law, the Chairman of the MTA and the Presidents of the NYCT, LIRR, and Metro-North shall report to the Governor, the State Comptroller, and the leaders of the Legislature and fiscal committees, advising the steps taken to implement the recommendations herein, and where they did not implement recommendations, the reasons therefor.

Comparing Costs of Rebuilding Options

We found that the MTA's three primary rail agencies do not have information systems for determining the per-unit cost of rebuilding their train parts. The respective managements do not consider such systems a high priority, since in-house staff rebuilds most of their parts. As a result, the decision to pay commercial vendors to rebuild some train parts, rebuild them in-house, or purchase them new is not based on cost considerations. Instead, the decision depends on the agency's technical ability to do the job, the availability of the required equipment, the age of the fleet, the availability of original equipment manufacturers, and some provisions of applicable collective bargaining agreements that limit the use of contractors for rebuilding work. We believe management could save millions of dollars if the agencies would set up information systems that could help them determine the per-unit cost of rebuilding parts in-house, and then compare these costs with other options (i.e., hiring a commercial vendor to rebuild the parts or buying new items).

Because parts-replacement decisions are often based on management's concern that vendors should meet certain standards of quality, management could also include performance and reliability data in this information system. This might include the MDBF (the mean distance that a train travels between failures), which each agency uses in determining quality of performance.

The Federal Accounting Standards Advisory Board (FASAB), which was formed jointly by the U. S. General Accounting Office (GAO), Treasury Department and Office of Management and Budget, has called for government agencies to use better cost accounting information. According to FASAB, managers—as the primary users of cost information—are responsible for carrying out program objectives with the resources entrusted to them. Reliable and timely information can help managers ensure that an agency's resources are being spent to achieve expected results and outputs, and can alert them to waste and inefficiency.

Our audit found that none of the three MTA rail agencies has a system for capturing the per-unit cost of rebuilding its train parts. We noted that all three of the agencies use in-house staff to do most of their rebuilding efforts. NYCT has all but 25 items rebuilt in-house; LIRR rebuilds all but three of its component parts in-house, and Metro-North has 281 component parts rebuilt by outside vendors. However, management is making these choices without the benefit of analysis; management has no systematic way of evaluating possible cost-effective options. Right now, management does not base the decision on cost considerations at Metro-North or NYCT; it is based on the agency's technical ability to do the job or on the availability of the required equipment.

For the LIRR, provisions of collective bargaining agreements with its employees' unions prohibit the agency from contracting out certain types of work to commercial vendors. The agreements state, "In order to preserve the amicable relationship which has existed with respect to the contracting out of work ... it is agreed that the past practice with respect thereto shall continue ... It is understood that the carrier would be subject to penalty if work normally or customarily performed by electricians or machinists is contracted out." In contrast, such agreements between NYCT and Metro-North and their employees are less restrictive; they allow the agencies to contract with commercial vendors if it would be less costly than doing the work in-house.

To determine whether the current practice of rebuilding in-house is the most cost-effective, we selected a judgmental sample of rebuilt parts and calculated their per-unit costs. We focused on the parts that required the greatest amount of time and effort from personnel in the rebuilding shops, and worked with agency officials to develop methodology for estimating per-unit costs. We multiplied the agencies' standard labor hours (the time they estimated is necessary to rebuild each part) by the agencies' standard labor hourly rate, and added in the cost of materials (not available for Metro-North) to calculate the cost of rebuilding each sampled part. We then multiplied this calculated cost by the agencies' internal overhead rates to arrive at the estimated per-unit cost of each sampled part. We acknowledge that the methodology used by the agencies to determine their standard labor hours are not based on empirical evidence and work scopes might differ amongst agencies. However, it was the only data available to estimate the labor hours needed to rebuild the sampled parts. It is also important to consider that an agency's internal overhead rate contains fixed, semi-fixed and variable components. To the extent that the overhead rates are fixed or semi-fixed, the potential cost-savings identified in this report are overstated. We compared each of the per-unit costs that we calculated with other costs, such as:

- ! the actual cost of purchasing the same train parts new through the purchasing departments of either the NYCT, LIRR, or Metro-North;
- ! the cost of awarding the work to commercial vendors who could rebuild the same train parts; and
- ! the estimated cost for the other two rail agencies to rebuild the same component parts.

We acknowledge significant differences among the various rail car models and operating environments. However, in several cases, our comparisons showed that all three MTA rail agencies could probably realize substantial cost savings either by hiring commercial vendors to rebuild their parts or by paying one of the other two MTA agencies to rebuild them. For example:

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- ! In 1994, NYCT rebuilt 481 tread brake units at an estimated internal per-unit cost of \$718.44. A commercial vendor told us it would charge an average price of \$588 for rebuilding the same unit. At that price, we estimated that the NYCT might have saved \$63,000 if it had used the commercial vendor.
 - ! NYCT spent \$9,413 per unit to rebuild 102 cam controllers in the same year. We estimated that if a commercial vendor had rebuilt the items at the quoted price of \$7,000 per unit, management could have saved an additional \$246,000.
 - ! Again in 1994, the NYCT rebuilt 241 compressor units at an estimated cost of \$4,732, while the LIRR's estimated per-unit cost to rebuild the same unit was just \$3,256. If the NYCT had used the LIRR to rebuild these compressors, savings of \$356,000 might have been realized.
 - ! LIRR currently spends about \$1,800 per unit to rebuild a motor condenser, although they can purchase a new one from a commercial vendor for \$225. If the LIRR had purchased its estimated annual requirement of 150 condensers from this vendor instead, it could have saved \$236,000 annually.
 - ! It costs the LIRR \$142 per unit to rebuild pawl assemblies, which are component parts of the rail car propulsion systems. We found that the same item can be purchased new for \$84 each. Based on projected usage during our audit period, the LIRR might have saved \$24,500 by purchasing pawl assemblies from commercial vendors.
 - ! Rebuilding a variable load valve costs the LIRR \$148 each, although the original equipment manufacturer (OEM) gave us a rebuilding estimate that ranged between \$75 and \$125 per item. If the average cost of rebuilding this valve had been \$100 per unit, contracting with the OEM might have resulted in savings of about \$24,000 compared with doing the work in-house.
 - ! In 1994, Metro-North paid a commercial vendor \$2,300 per unit to rebuild 155 air-conditioning compressors, a total expenditure of \$356,500. We estimated that the LIRR could rebuild the same unit at an internal per-unit cost of just \$1,717, saving \$583 per unit. Overall, we estimated that Metro-North might have saved \$90,365 by having these compressors rebuilt by the LIRR instead of an outside contractor.
 - ! Between January 1994 and October 1995, Metro-North used a commercial vendor to rebuild the air compressors on its New Haven
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line. We estimated that the railroad might have saved at least \$79,000 by having the compressors rebuilt at its own Harmon Equipment Maintenance Facility in Croton, NY.

NYCT officials contend that an additional one-time investment in a larger inventory may be required to generate the cost-savings we identified. They point out that there would be additional expenses for preparing the request-for-proposals and for monitoring the terms of the contracts. Based on our sample, we conclude that rebuilding train parts in-house may not always be the most cost-effective method of replacement. However, to make an informed decision in the matter, these agencies should develop a comprehensive information system that will make it clear just how much it will cost to rebuild a specific part in-house. The information obtained from such a system would make it possible to consider all available parts-replacement options and the associated cost-benefits of each. According to LIRR officials, they are in the process of setting up a system that will provide accurate on-line labor and material information.

Recommendations

1. Establish an information system that will track the cost of rebuilding individual train car parts and the performance reliability of each rebuilt part.
2. Use the cost data generated by the information system to analyze all available parts-replacement options.
3. Review the stipulations in current collective bargaining agreements that limit managerial flexibility in choosing parts-replacement options. In the future, negotiate the right to make the most cost-effective choice.

Monitoring Shop Employee Productivity

We determined that none of the three MTA rail agencies has an adequate system for monitoring employee productivity. Metro-North has a system known as the Productivity Index System; however, it does not include all staff or account for all staff time. Neither the NYCT nor the LIRR formally monitors employee productivity. In such cases, there can be no assurance that the productivity level of staff assigned to parts-rebuilding operations is adequate; nor is it possible to determine whether the shops are operating with the proper staffing levels. The basic philosophy of all three agencies' management is that an adequate inventory of parts is to be maintained at all times.

Government officials and employees are accountable to the public for their activities. They should use public resources efficiently, economically and effectively; and establish and maintain effective controls to ensure that they meet appropriate goals and objectives. To meet these objectives, NYCT, LIRR, and Metro-North management should each have a system for measuring the productivity of their shop employees. Such a system should include performance standards developed from appropriate methodologies or standards accepted by the industry (i.e., the average amount of time required by an individual or group of employees to complete a job [standard hours]). To determine adequate staffing-level requirements, management should establish such standard hours for each agency.

We noted that NYCT officials were using standard hours to budget production of support shops. They explained that the standards they use to budget production in the shops are based on observations by shop supervisors, not on industry standards. As a result, the "standards" NYCT management is using, have not been corroborated independently as reliable and accurate measures of employee productivity, and cannot assure the NYCT management that it is staffing its shop operation at a proper level. To determine the effect of basing its staffing levels on such informally-derived standards, we reviewed 1994 production reports for two of the NYCT's largest support shops. To calculate the shop employees' productivity level, we compared actual output with budgeted production based on the standard hours currently accepted by the shop supervisors. We determined that the actual output fell short of the budgeted production, as the following table shows:

	(A) Budgeted Production Hours	(B) Actual Production Hours	(A) - (B) Production Hours Under Budget
Pneumatic Shop	219,716	194,484	25,232
Electric Shop	114,608	101,746	12,862
Total	334,324	296,230	38,094

NYCT officials said that they were not aware of such unfavorable variances, because they did not compare actual total output with total budgeted production. As a result, these two shops alone may be incurring more than \$1 million (38,094 hours x \$28.76 hourly rate) in unnecessary labor costs each year because its employees are not productive enough. Since payroll costs are the major expense incurred by the NYCT's rebuilding operation (\$41 million of the entire \$62.6 million expenditure), officials should initiate measures for monitoring production and investigating the variances, and take appropriate corrective action. Agency officials contend that the statistics show a productivity rate of 89 percent, when applied against the standard. They said a higher level of productivity might not be attainable.

Other industries have improved productivity through empowering their own employees, by organizing workers in quality circles and soliciting from those groups suggestions for ways to define standards and improve productivity. Such a tactic may prove effective in the rail agencies' parts-rebuilding shops as well.

In our audit report No. 87-S-57, which we issued in August 1988, we reported that the "LIRR does not have formal performance standards for all Operations Workshops with which to measure the productivity of its employees." In response, the LIRR's President replied that the establishment of productivity standards to measure performance was well underway. He said that when the LIRR moved into its new facility, the Hillside Maintenance Complex (Complex), technological changes would help the phase-in of performance standards that would measure productivity in the shops. To date, some four years after the Complex opened, management has formulated no such standards. Instead, overall production requirements are monitored by a software package known as "MACOLA," which tracks material needs and generates production reports.

MACOLA tracks total production and the inventory levels of rebuilt parts. It also has an inventory requirement plan based on what is termed a "build to quantity" policy, which directs employees to maintain inventory levels equal to the average amount used in a two-week period. When the inventory falls

below the "build to quantity" level, shop personnel are supposed to rebuild additional units to restore the inventory to its appropriate level. The LIRR's management claims that labor unions could use standard hours measuring the productivity of its shop employees to set a maximum limit on their members' productivity - in effect, making the employees unproductive. Therefore, to avoid potential labor unrest, LIRR management told us they have not applied formal standard hours to parts-rebuilding activities. As a result, there is little assurance that LIRR employees are working at a satisfactory level of productivity. In fact, when we compared the three agencies' costs of rebuilding their respective rail cars, we noted that, although it cost the LIRR up to 2.5 times as much per car for rebuilding its cars, the trains failed at twice the rate per mile of trains of the NYCT. Moreover, since standard hours are essential in establishing staffing levels, the LIRR management has little assurance that they staff the shops properly.

Implementing the MACOLA system is a step in the right direction. However, management should establish individual time standards for employees, and a system should be instituted that will enable LIRR management both to measure the productivity in the shops and to assure themselves that staffing levels are the most cost-effective. Periodically, management should review production reports that compare actual production with the standards, investigating any variances and accounting for them.

Metro-North also has attempted to monitor the productivity of many of the parts-rebuilding shops. According to Metro-North officials, industrial engineers in the Productivity Engineering and Production Unit established standard hours in 1986. They did time-and-motion studies and determined standard hours for the rebuilding of train parts. Using this measurement device, Metro-North monitors worker productivity for certain support shop activities and employees, and compares actual production with the expected production. The results (reports) are posted in the shops, reviewed by Metro-North's management, and submitted to the President of the railroad.

However, the reports do not account for periods when no work is done because equipment has broken down, employees are in training, employees are not assigned to rebuilding work, etc. or when support shop personnel are out and not replaced. Moreover, not all shop personnel—including 11 sheet metal workers, two laborers, and two lathe operators—are covered in these reports. Metro-North management expressed concern about the need to account only for the periods when employees are assigned to rebuilding work, and not for other periods that are still essential to an assessment of the overall productivity level of the entire staff. For example, in 1994, we estimated that as much as 17.7 percent of the time budgeted for rebuilding work at the Harmon Facility was not accounted for totaling \$500,000. If vacation relief positions (budgeted positions to cover employee leaves) had been considered, this percentage could have increased to 21.6 percent, adding up to almost

\$600,000 worth of unaccounted time. Therefore, we question the overall usefulness of the Metro-North reports in justifying the staff levels in the support shops.

Management at the LIRR, NYCT, and Metro-North should ensure that the standard hours they have established for production is valid and meaningful, and that they are based on the performance of all the employees in all their shops. Such time standards have a significant impact on overall staffing decisions, and, consequently, on total labor costs. In fact, in 1994, labor costs were \$17.5 million of the LIRR's \$30 million parts-rebuilding costs, \$41 million of the \$62.6 million NYCT spends for rebuilding parts, and \$5 million of Metro-North's \$15 million parts-rebuilding expenditures. If they are to control labor costs, management needs accurate information on how many hours are required to rebuild each individual train car component. Such information may also be used in a more refined "activity-based costing" (ABC) technique in which the ultimate cost of an item is calculated by taking into account all of the economic resources required to produce it.

Recommendations

4. Develop a system to adequately monitor employee productivity.
5. Establish productivity standards for each support shop based on industry standards or other measuring devices accepted by the transit industry.
6. Compare actual production results with a production budget based on these accepted standards, and analyze the reasons for variances.

Leadership by Metropolitan Transportation Authority

We believe that all three of the MTA's primary rail agencies could achieve substantial savings and improve efficiency if they established compatible information systems for gathering the parts-rebuilding costs. They could then share this information with each other, along with other data concerning their rebuilding operations. The MTA should provide leadership in this effort, coordinating a forum for the exchange of information and services.

All three MTA rail agencies either rebuild or obtain many of the same types of replacement train parts (air brakes, tread brakes, air compressors, air-conditioning units, armatures, traction motors, etc.). The manufacturer and/or design may vary, but the parts generally operate with the same technology. In addition, some train cars (M-1 and M-3) used by the LIRR and Metro-North are the same type. Despite these similarities, the agencies' replacement policies are inconsistent; some parts are either rebuilt in-house or purchased rebuilt by one agency, while the others purchase the same parts new. The three agencies also make limited use of each other as outside rebuilding sources. Furthermore, they are not fully using their own rebuilding shops; improper procurement practices continue; and management has not explored initiatives to improve the effectiveness and efficiency of the rebuilding operations.

Performance Indicators

We acknowledge significant differences among the various rail car models and the types of operating environments that influence costs at the three agencies. However, certain data reported by the agencies reveal wide disparities that should be investigated. For example, the following table of 1994 data shows the average replacement cost per unit of rolling stock and the MDBF reported for each system. The MDBF depends heavily on the quality of parts used to maintain the train fleets. The table shows that the agency spending the least per car to rebuild component parts (NYCT) had the best operational performance; whereas the LIRR, which spent the most per car to rebuild component parts, reported the worst performance.

Agency	Rebuilding Cost	Rolling Stock	Per-Car Cost	Mean Distance Between Failure
NYCT	\$62.6 million	5,801	\$10,791	56,270 miles
Metro-North	\$15 million *	847	\$17,710	37,764 miles
LIRR	\$29.6 million	1,205	\$24,564	28,480 miles
* estimated for 1995				

We also noted variances between the LIRR and Metro-North in the ratio of their support shop staffs to the size of their train fleets, as indicated in the following table:

Train Cars per Employee			
Support Shop	LIRR (1)*	Metro-North (2)*	Percentage Difference $\frac{(2) - (1)}{(1)}$
Truck and Tread Brake	37.66	47.06	25.0%
Wheel	46.35	52.94	14.2
Contact or Armature	63.42	62.74	(1.1)
Tin or Sheet Metal	86.07	70.58	(18.0)
Administrative	133.89	282.33	110.9
<i>*NYCT operates similar shops; they should make a similar comparison with these agencies.</i>			

Based on these staffing levels, Metro-North shop workers may be 18.0 percent less productive to 110.9 percent more productive than their LIRR counterparts, depending on the function in question. LIRR officials stated that the scope of the work performed at their shops is not always comparable to those of Metro-North. Nonetheless, we believe that MTA, LIRR, Metro-North and NYCT officials should coordinate efforts to formally assess the reasons for such variances.

Use of the Hillside Maintenance Complex

In our audit report No. 93-S-59, which we issued in October 1994, we recommended that the LIRR solicit work for its Complex from other railroads because the facility was underutilized. For instance, several Complex shops were operating at rates that were less than half their capacity, i.e., Motor, 31

percent; Truck, 32 percent; Wheel, 32 percent; Air-conditioning, 36 percent; Compressor, 38 percent; and Air Brake, 42 percent.

We noted that just a small part of the \$6 million in rebuilding work performed by outside vendors for Metro-North in 1994 was done by the LIRR. Management awarded many contracts for the 281 parts rebuilt by outside vendors that year without using competitive bidding. Therefore, the LIRR could not have bid on the work.

To determine how much money management could save if they used the Complex more fully, we compared the LIRR's estimated in-house rebuilding costs for an item currently listed under a Metro-North contract with the price the agency was actually paying. We found that in 1994 Metro-North had paid a commercial vendor \$2,300 per unit to rebuild 155 air-conditioning compressors—a total expenditure of \$356,500. In contrast, we estimated that the LIRR could have rebuilt the compressors at a per-unit cost of \$1,717, resulting in a potential cost savings of \$583 each ($\$2,300 - \$1,717 = \583). If management had hired the LIRR to rebuild the compressors instead, Metro-North might have saved \$90,365.

To make the Complex financially viable, the LIRR management should move aggressively to solicit work not only from constituent MTA agencies, but also from other rail and surface transit agencies such as Port Authority Trans-Hudson, New Jersey Transit, etc. However, in competing in an open bidding system, the LIRR would have to improve the performance of its rebuilding operations as we describe in this report. In comparison to the two other MTA agencies, the LIRR's MDBF is the lowest, while overall, its rebuilding costs are the highest per car. To secure contracts from its sister agencies, LIRR management must meet its prospective customers' specifications related to quality, and develop performance standards for its own operations that will enable those quality standards to be met.

Procurement Practices

Section 1265-a of the Public Authorities Law requires agencies to use competitive bidding when they select vendors for purchase contracts valued at more than \$10,000. We noted that Metro-North often bypassed the required competitive procurement process in both 1994 and 1995. Payments in 1994 for parts rebuilt by commercial vendors, without being competitively bid, totaled \$2.6 million; for the first nine months of 1995, such payments totaled \$660,000. Several of these parts, and the amounts Metro-North paid for them during those periods, are:

Part Description	1994 Payments	1995 Payments
Traction Motor D57	\$436,248	\$ 17,680
Engine 16-567	220,312	*
Semi Compressor	204,700	151,800
Auxiliary Reactor	147,264	*
FL-9 Head Engine	129,708	22,760
Motor Generators	127,293	30,319
25 Cell Battery	115,625	*
Pantograph	104,510	*
Air Compressor	100,441	68,506
Air Compressor	89,647	69,400
D-2Main Generator	29,372	*
<i>* Payments were less than \$10,000</i>		

Metro-North recently solicited competitive bids for the rebuilding of the D57 Traction Motors, 16-567 Engines, FL-9 Head Engines, and D-2 Main Generators. We acknowledge this use of competitive bidding as a positive step. Management should take similar action with all new purchase contracts likely to result in payments of more than \$10,000 annually. Metro-North management indicated that because they emphasize quality in their replacement of train parts, they were apprehensive about the quality of work that could be obtained when they awarded contracts to the lowest bidder. However, we noted that when Metro-North awarded the Head Engine rebuilding work on a competitive basis, it cost almost \$50,000 less than the amount paid for similar work in the previous two years.

Initiatives to Improve Rebuilding Operations

As part of this audit, we also sought to identify practices that might have enabled the three MTA rail agencies to do their rebuilding operations more economically, effectively and efficiently. NYCT officials identified the use of prepackaged kits to rebuild train parts, as one such practice. They explained that when they use kits, all replacement parts for a particular rebuilding operation are readily available for use by the shop mechanics.

According to NYCT officials, such kits are helpful to the rebuilding shops because shop mechanics no longer have to waste time gathering materials for a specific job. They said the use of kits also provided better control over parts because they give shop mechanics only what they need for a specific overhaul. In addition, they said it helped prevent errors in part distribution that make it necessary for a mechanic to return to a storeroom for replacements.

These officials stated that their frequent use of kits began with the NYCT's Scheduled Maintenance System (SMS) program. Since many components on the SMS require standard, basic overhauls at regular mileage intervals, they say introduction of the kits has speeded up the rebuilding process.

Items to be repaired or rebuilt under this program generally contain Bills of Material (BOMs), which list all parts that need to be replaced. As of August 1995, BOMs were included in 162 items; of these, 90 percent (145) are being rebuilt with the use of kits. Officials at both the LIRR and Metro-North indicate that their rebuilding operations use kits on a more limited basis.

NYCT officials estimated that approximately 60 percent of the kits they use are assembled in-house, while equipment manufacturers package the remaining 40 percent. Although they acknowledged that NYCT is incurring additional costs to prepare the kits, they argued that the resulting benefits and cost-savings outweigh the extra expense. They added that kits assembled by manufacturers are the most economical, since most manufacturers mark up the price of kits only slightly more than the cost of individual items.

A December 1994 report by an outside engineering consulting firm employed by NYCT to review its use of kits pointed out the many advantages of the practice. The engineering firm said that the use of kits saves mechanics' time because they make fewer trips to the storeroom. They also pointed out that it saves time for storeroom personnel, as well. In addition, the report said, the use of kits requires the Procurement Department to cut fewer purchase orders; improves worker productivity through increased standardization of work procedures; helps improve employee morale; and reduces inventory. It named some organizations that have developed a framework for helping other transit authorities decide whether to adopt the practice, and whether to have the kits prepared internally or externally; and recommended that NYCT develop such a decision-making framework to help management choose the best option.

We believe both the LIRR and Metro-North should do a similar review to determine how their rebuilding shops could use kits in a cost-effective manner.

Recommendations

To the MTA:

7. Oversee the rebuilding operations of the three rail agencies, monitor the performance indicators, and determine the reason for the variances.
8. Conduct a study to identify cost savings that could result from full use of the LIRR's Hillside Maintenance Complex.
9. Review all Metro-North contracts with replacement-part commercial vendors to determine whether having the work completed by the LIRR would be more beneficial and cost-effective.
10. Determine the extent to which the use of kits could be beneficial to the rebuilding operations at Metro-North and the Long Island Rail Road.

To Metro-North:

11. Award all purchase contracts valued at more than \$10,000 competitively to the lowest responsible bidder that responds to publicly-advertised solicitations.

Major Contributors to This Report

David R. Hancox
Carmen Maldonado
Abraham Markowitz
Brian Mason
Santo Rendon
Mitch Schmeltzer
John Lang
Sal D'Amato
Marc Geller
Ron Gerstein
Victoria Saks
Marticia Madory