

METROPOLITAN TRANSIT AUTHORITY FLEET MANAGEMENT

Introduction

The Metropolitan Transit Authority's (MTA) mission is, "to provide safe, reliable, efficient, customer friendly public transit and alternatives to driving alone". To execute this mission, they operate a fleet of approximately 200 transit and maintenance vehicles. This equipment will be detailed later in this report. A staff of 86 maintenance personnel is employed to support MTA operations.

The MTA fleet management and maintenance facility is located adjacent to their headquarters area. MTA is located in a 170,000 square foot building in an industrial area east of downtown Nashville. The annual budget for vehicle maintenance is approximately \$4,897,000.

The MTA recently underwent a performance audit that was a helpful starting point for our review. TCI's role was to examine the fleet maintenance issues and opportunities not addressed in the previous audit and to determine if there are other opportunities for operational enhancements.

Executive Summary

In general, we found the MTA fleet maintenance group to be showing mixed results. The last three years have been spent improving a maintenance situation that was acknowledged to be quite poor. It appears from the MTA performance audit report and MTA financial information that \$4,000,000 – \$6,000,000 was spent on bringing the fleet's mechanical maintenance level to an acceptable level.

Management was responsive to TCI's visit and to any suggestions that we had. The items listed below will be commented on in the body of the report.

More specifically:

- As noted in the MTA performance audit report, the fleet is older than peer transit fleets.
- The fleet has not been replaced at a normal or planned replacement rate.
- Maintenance costs remain at a high level. The pre-audited results for FY 2001 indicate that cost per active transit vehicle (buses, trolleys, and "ACCESSRIDE" vehicles) was \$27,482, assuming light vehicle maintenance of \$60,000, or \$3,000

per vehicle. This compares to the peer group target, as quoted in the MTA performance audit report, of \$25,000.

- The organization does almost all of its repair and component rebuild work internally. This is a key issue in the union contract.
- The organization is using the Turley maintenance software package. Utilization of the system is relatively complete. However, the MTA maintenance organization is not using certain key features – notably inventory replenishment, targets and reports.
- Preventative maintenance (PM's), as a percent of labor hours spent, is not accurately captured by the Turley system. A retrieval from the Turley system indicated that less than 9% of labor hours are spent on PM's. This calculation does not reflect an accurate assessment of labor hours.
- Fleet management reporting needs improvement.
- The parts inventory is large. In spite of recent reductions, the inventory remains large and turns less than once per year.
- In spite of the large inventory, parts availability is still a complaint for the mechanics.
- An outdated process hampers the procurement activity. As pointed out in the MTA performance audit report, more use should be made of Metro contracts or contracts established by MTA. A Metro purchasing person is assigned to MTA, but there is not much interface between MTA purchasing and Metro Finance.
- The maintenance facility being used is relatively well equipped. While the building is larger than required, the parking and marshalling areas are tight.
- The maintenance staff was expanded in recent years to reduce the previously mentioned maintenance backlog. TCI believes that staffing should be examined in light of current and future fleet and service requirements.
- The MTA operates with a lean administrative staff. This point was clearly made in the MTA performance audit report and confirmed by TCI. The organization needs to devote more resources to improving the systems and support to maintenance and parts procurement.
- MTA currently uses 93-octane level fuel for gasoline powered vehicles. TCI suggests converting to 87-octane.

- The MTA uses miles per average road call as a key measure. TCI agrees that this is an excellent measure. Road calls create both high costs and poor service. During recent months MTA has experienced a high number of road calls within certain sub fleets. Although the MTA performance audit concluded that road calls were within acceptable industry standards, TCI believes a process review of road call causes and solutions would help reduce this average.
- TCI recommends that the MTA consider taking fuller advantage of Metro-wide programs. Examples would include the on-line surplus property sale operation, the procurement card process, and, in the long term, the fuel purchase program.

Summary of Financial Implications:

Listed below are some of the potential annual savings:

Conversion to 87 grade unleaded gasoline	\$10,000
Continued reduction of parts inventory	\$25,000
(potential reduction in capital carrying costs)	
Reduction of maintenance labor	\$40,000 per position
Reduction of parts purchased as bus fleet is fully	\$268,000
maintained, standardized and replaced on a consistent basis	

1.1 Overview of MTA Fleet Management and Maintenance

As previously mentioned, the MTA fleet management and maintenance group is located in the same building as their headquarters.

The building is a former airframe manufacturing plant. The maintenance operation has access to most of the 170,000 square feet. The location is well configured for the task with suitable egress, ventilation, and overhead space. MTA fleet maintenance operates seven days per week, 24 hours per day. The majority of activity takes place during the normal workday. Maintenance activity is monitored by the Turley system.

The fleet consists of fixed route transit buses, trolleys, “ACCESSRIDE” wheel chair accessible buses, and a light service fleet. The equipment inventory, consisting of approximately 200 vehicles, will be discussed more in **Section 1.7, Fleet Assets and Replacement.**

1.2 Management Issues/Policies and Procedures

MTA fleet management and maintenance has made substantial progress in reducing their maintenance backlog, and upgrading the fleet. In addition, the use of the Turley system provides solid capabilities for managing operations. Considerable effort has been expended in implementing this system.

- However, management improvement opportunities remain. Primarily, management reports are not fully developed or deployed.
- The information system is not fully implemented or utilized.

Below are recommendations relative to management reporting:

- (1) **Current Situation:** **Lack of maintenance reporting**
- Finding:** The monthly report now in use by maintenance management does not, in our opinion, contain sufficient information. For example, one report lists all parts in inventory item by item. Normally, summary reports, such as turnover, fill rate, and total value, would be used to track inventory.
- Recommendation:** Using the guidelines below, management should determine the critical areas for measurement. Support should be given to MTA maintenance in developing reports and collecting information. The expectations and reports should be shared across the board, including users, staff and appropriate members of MTA management. Some key measures captured by larger fleet operations include:
- Downtime :**
The number of vehicles, machinery or Equipment **out of service** at a given point in time divided by the number of vehicles in the fleet, expressed in percentage format. A norm for MTA would be 6-8%.

Utilization (labor):

The amount of direct, billable time recorded by service employees compared to the total amount of time available for work expressed in a percentage format. A norm for MTA would be 75%.

Turn-around Time:

The elapsed time beginning when a vehicle (or equivalent) is delivered to a maintenance facility for repairs or servicing and ending when the repairs or servicing is completed and the user is notified that repairs are completed. A norm for MTA would be 70% within two days.

Repeats/Come-backs:

Instances where repairs to vehicles, machinery or equipment were not made in a satisfactory manner; necessitating a second request for repairs for a similar labor code.

Preventive Maintenance (PM) vs. Corrective Maintenance:

The ratio of job orders for vehicles, machinery or equipment that are written for scheduled maintenance as opposed to job orders that are written for corrective or unscheduled repairs, divided by the total repairs and expressed as a percentage. A norm for MTA would be 50%.

Preventive Maintenance Compliance:

The percentage of on-time arrivals for scheduled preventive maintenance (PM), expressed as within 3 days or 500 miles of the scheduled maintenance date or mileage interval.

Cost Per Piece of Equipment:

Annual department costs divided by the number of vehicles.

Vehicles per Mechanic:

The number of mechanics divided by the total equipment. Norms for MTA would be three fixed route buses per mechanic, 68 light vehicles per mechanic, and 7 ACCESSRIDE or trolleys per mechanic.

In the case of the MTA maintenance effort, we would suggest starting with the measurements that are easy to obtain and understand. Our suggestions would include cost per equipment item, PM compliance, and a status report that shows equipment out of service and turnaround time. TCI also concurs with the MTA performance audit report that average miles per road call is a valuable measure for transit operations.

1.3 Maintenance Metrics

As mentioned in the previous section, a key element in responsive fleet management and maintenance is the use of management reports and metrics to measure performance. Over the years, TCI has developed certain metrics and standards that are useful benchmarks. It is useful to track these measures on a historical basis.

The Facilities and Purchasing Manager is the resident expert on the Turley system. He was very helpful to TCI and provided many reports and retrievals. The information provided allowed us to verify data in the MTA performance audit report, and to make the observations in this section.

The Turley system provided a calculation for labor utilization. For the period of our review, the system was being developed and could not be relied upon to produce accurate information.

During the TCI visit, the Trolley fleet was not fully utilized. At no time were more than ten trolleys in service. This would indicate a trolley fleet size of 12, utilizing a spares ratio of 20% per FTA guidelines. As staffing and productivity levels are analyzed, the fleet size must be considered.

The table below estimates **mechanic staffing** requirements, based on TCI norms and the most effective fleet level. These staffing targets are for personnel who support the fleet, including mechanics and other personnel who maintain the vehicles on a daily basis.

**Table 4: MTA Fleet Management Group
Vehicle/Mechanic Ratios**

Vehicle Type	Number of Active Vehicles	Units Per Mechanic	Estimated Number of Mechanics and Helpers: Active Fleet
Light	20	68	1
Fixed route buses	128	3	43
ACCESSRIDE and trolleys	48	7	7
Total	196	3.8	51

A review of July work orders indicated that on a typical day the shop completed 65 work orders. This indicates that mechanics are completing slightly more than one work order per day. This is another indicator that efficiency could be improved.

Another important metric measures cost per vehicle. This analyzes the effectiveness of the organization in dollars, rather than manpower.

The **cost per vehicle** calculation poses difficulty. The MTA transit fleet, as previously stated, consists of three types of vehicles and is relatively old, and the reserve fleet receives relatively low usage.

The following table provides an estimated target cost per vehicle:

**Table 7: MTA Fleet Management Group
Cost Per Vehicle Target Calculation**

Type	Industry Maintenance Cost/Vehicle	Vehicles in Active Use	Targeted Annual Cost-Active Use Vehicles
Fixed Route	\$25,000	128	\$3,200,000
ACCESSRIDE	10,000	36	360,000
Trolley	10,000	12	120,000
Light Vehicles	1,200	20	24,000
Total		196	\$3,704,000

Recent annual expenditures for maintenance have ranged from \$4,900,000 to \$5,200,000. The table above shows room for substantial cost reductions. The MTA performance audit

report indicated that these costs should be coming down, given that the previous two years included catching up on a lot of deferred maintenance. In addition, the MTA performance audit identified extremely high material expenses (252.8% of peer average) per vehicle.

As noted in the MTA performance audit, the metrics mentioned above all indicate an opportunity for cost and labor reductions. Because we were not able to assess the actual roles of staff assigned to vehicle maintenance in order to determine an accurate count of the number of personnel that would be classified as “mechanics” for federal reporting purposes, we are not making specific recommendations with regard to target staffing levels.

(2) Current Situation: Vehicle Maintenance Staffing

Finding: Both the TCI and MTA performance audit maintenance cost analyses indicate that a reduction in maintenance staffing levels is possible.

Recommendation: Consider staff reductions. Also, target for review all functional areas that will help reduce requirements for staff. Examples are hours and shifts, amount of work sent outside, parts fill rates, reduction in road calls, age and complexity of the fleet, etc.

Cost Implications: Each reduction in maintenance staff should create at least \$40,000 in savings per position.

(3) Current Situation: Excess Vehicle Inventory

Finding: The fixed route bus, trolley and light vehicle fleets need a utilization review for downsizing. TCI was given a vehicle inventory, which apparently contained buses in the salvage process.

Recommendation: Reduce and salvage, unless there are plans to expand service in the near future. Follow the FTA guidelines that suggest a maximum reserve fleet of 20%. Work with Metro Finance to utilize the on-line surplus property auction capabilities, and to move vehicles off site when salvaged.

Cost Implications: Cash should be obtained for each item salvaged. Valuable marshalling and parking space will be released.

- (4) Current Situation: Potential Cost Reductions**
- Finding:** The MTA has invested \$4,900,000 to \$5,200,000 per year in maintenance expenses in over the last three years. This appropriate expense was dictated by a backlog of maintenance. The fleet is now in better condition, and maintenance budgets and actuals should be reduced.
- Recommendation:** Set goals over the next three years to reduce spending in both labor and parts. Use the TCI report and the MTA performance audit to set appropriate goals.
- Cost Implications:** If parts spending alone was reduced to the peer level reported in the performance audit (\$8,000 per vehicle) the savings would be \$268,000.

TCI used system information to calculate the **work order turnaround time**. The table below summarizes that calculation:

**Metropolitan Transit Authority
Work Order Turnaround
May 1-August 6, 2001**

	Number of Work Orders	Per Cent
Less than 2 days	3,020	55.5%
2 days and over	2,419	44.5%
Total	5,439	100%

TCI norms suggest that 70% of all work orders should be complete in 2 days (day of receipt plus one day).

The Turley system was also used to calculate the relationship between preventative (PM) and corrective maintenance. When we compared the labor hours spent on these two functions, we found that only 8.8% of the maintenance effort was directed towards preventative action. MTA management points out that their PM and inspection process is closely monitored by the Federal Transit

Administration (FTA) and found to be in full compliance. Furthermore, it was management's position that the system was not tracking all work orders generated by inspections. TCI experience dictates that at least 50% of shop effort should be focused on **preventive maintenance**. The MTA PM program will be further discussed in **Section 1.8, Maintenance Operations**.

1.5 Information System

Timely and accurate management and maintenance information is an essential ingredient in successful fleet management and maintenance. Today's best fleet management and maintenance information packages provide barcode data entry on a real time basis and allow quick access to both current and historical data that is needed by technicians and management for proper decision-making.

MTA is employing the Turley system as their maintenance operating system. TCI has observed this system during other audits. We find it to be satisfactory as a maintenance system.

The MTA is not utilizing all aspects of the system and is still growing in the utilization of the system. We support this ongoing effort, and will comment on specific areas for growth in other sections of this report. MTA management should ensure that resources are devoted to this continued growth.

(5) **Current Situation: Maintenance System and Reporting Still in Development**

Finding: The Turley system needs further deployment and refinement, particularly in the inventory and reporting areas, including accurate tracking of PM labor.

Recommendation: MTA management needs to provide the technical resources to implement these improvements.

Cost Implications: Minor. This can be done with existing staff.

1.5 Inventory Management

The Facilities and Purchasing Manager supervises the parts function of MTA fleet maintenance. It is located inside the garage area, and occupies several fenced areas and rooms. The parts are stored in well-utilized bins and are appropriately labeled.

The Turley system is used to inventory and charge out parts. In addition, the parts area has started to bar code the various stock locations.

Since receipt of the MTA performance audit report, efforts have been made to consolidate and secure the inventory. Efforts are also under way to reduce inventory and to salvage any obsolete parts. In fact, the inventory has been reduced by \$500,000.

Much work in the inventory area remains to be done. The value of inventory is approximately \$1,850,000, and includes over 12,000 line items. Purchases for the last fiscal year totaled approximately \$1,600,000. The inventory turns **less than once a year**.

While we did not perform a detailed study, TCI attributes the high inventory level to obsolete parts, the number of different bus models in the fleet, the lack of proper reorder points within the Turley system, and the lack of aggressive targets. In addition, there is no detailed management reporting that measures inventory management performance progress.

TCI consultants spoke with several mechanics during our audit. One of their complaints was the lack of parts. So, we find clear and compelling symptoms – slow turning inventory, complaints about fill rates, and a lack of detailed reporting.

TCI also reviewed the procurement area. We found this to be cumbersome. We agree with the MTA performance audit report and its recommendations relative to purchasing. TCI observed the purchasing agent securing quotes on many items that should have been bought on contract. Use of contracts and purchase cards would simplify the process tremendously. Turnaround time on parts would be much faster.

TCI agrees with the decision to defer implementing the MTA performance audit recommendation that parts be outsourced.

The MTA is purchasing 93-octane non-leaded gasoline. This is not needed for the vehicles in their fleet.

TCI reviewed recent inventory reports, as well as the results of the recent physical inventory. The reports form the basis for solid inventory management, and the post-audit inventory adjustments were reasonable for the size of the inventory.

- (6) Current Situation: Inventory Too High and Turning Too Slow**
- Finding:** The inventory is turning less than once per year. Information is not available on fill rate for parts. The Turley system is not fully utilized for inventory control.
- Recommendation:** Continue to salvage all unneeded or not usable parts. Implement reorder points within the Turley system. Measure fill rate on parts requests. Report information and set targets.
- Cost Implications:** Reducing the inventory by an additional \$500,000 would reduce capital carrying costs by \$25,000 per year (assuming a cost of capital of 5%).
- (7) Current Situation: Purchase of 93-Octane Unleaded Fuel**
- Finding:** 87-octane is sufficient for the fleet.
- Recommendation:** Convert to the purchase of 87-octane.
- Cost Implications:** This should save the MTA over \$10,000 per year with no impact on performance or repairs.
- (8) Current Situation: Purchasing Process is Cumbersome**
- Finding:** The purchasing process relies too heavily on purchase orders, obtains too many quotes and takes too long.
- Recommendation:** Use Metro contracts, develop MTA contracts, and implement purchase cards.
- Cost Implications:** Although not readily quantifiable, this would improve labor utilization in the parts, procurement and maintenance areas.

1.6 Financial Information

The pre-audited expenses relating to vehicular maintenance for the fiscal year ended June 30, 2001 total \$4,897,000. They can be separated into major components as follows:

- Labor Related Expenditures.....\$3,106,000
- Tires\$52,000
- Outside Repair\$40,000
- Automotive Parts.....\$1,624,000
- Shop Supplies.....\$75,000

Some costs normally seen in a fleet maintenance budget are not included in the MTA budget. Most noticeably, building and utility costs are not included.

1.7 Fleet Assets and Replacement

As mentioned TCI reviewed the equipment inventory information contained in the MTA performance audit report, as well as MTA fixed asset and maintenance records. Table one shows the age and mix of the fleet:

Table 1: MTA Equipment Aging

	Equipment Units	Median Age
Fixed Route Buses	148	1997
ACCESSRIDE	36	1995
Trolleys	16	1988
Light Vehicles	20	1991
Total	220	

As pointed out by the MTA performance audit report, the MTA is in the process of updating the ACCESSRIDE fleet. In fact, seventeen new vehicles have recently been placed in service.

The fixed route fleet has a bi-modal distribution. While the median age is 1997, a detailed review of the inventory indicates that there are no buses in the fleet from the model years 1992-95. Over 50% of the fleet is model year 1991 or older. TCI supports MTA management in their efforts to modernize and standardize the fleet.

The light vehicle fleet is quite old. A review of this fleet might indicate needs for salvage or replacement. Additionally, based on TCI's current observations over a ten-day period, the trolley fleet rarely uses more than ten trolleys at the peak. MTA management is reviewing trolley usage and the size of the fleet for proper utilization.

TCI observed that MTA was not utilizing Metro's on-line surplus property sale operation. The Metro system is available on an ongoing basis to process surplus property. This eliminates the need for surplus property to age for months and to remain as assets, while awaiting the next auction.

- (9) **Current Situation:** **Fleet Replenishment**
- Finding:** Over 50% of the fixed route fleet is relatively old. No detailed replacement plan has been formally adopted yet. The light vehicle fleet **averages** 10 years of age.
- Recommendation:** Fund capital replacements on an annual basis consistent with industry standards.
- Cost Implications:** To be developed with a capital replacement plan.
- (1) **Current Situation:** **Delay in Salvage Operations**
- Finding:** Metro on-line surplus property auction process is not currently in use by MTA.
- Recommendation:** Utilize the Metro surplus process.
- Cost Implications:** Although not readily quantifiable, faster sales and less deterioration of equipment between auctions will produce positive financial results.

1.8 Maintenance Operations

Fleet Condition and Reliability

One reliable measure of fleet maintenance readiness is the frequency of breakdowns or service calls. We reviewed the breakdown history and found a large number of breakdowns associated with braking systems. The MTA should continue to track, analyze and reduce road calls.

Each breakdown should be researched as to reason, and action steps should be implemented to address identified problems. Mechanics *and* drivers must become more accountable to preventing costly and disruptive breakdowns.

Fleet appearance diminishes as inadequate attention and efforts are directed to minor body touch up and repair. Buses are dispatched with peeled paint, scratches, and unpainted wheels. Painted, ready-to-install wheel and tire combinations should be maintained in inventory. Minor touch up work should be incorporated into the preventative maintenance program. Fuel and wash supervisors should monitor and report new damage daily. Clean, damage-free buses will instill stronger pride in drivers and mechanics, as well as better representing the Transit Authority to Metro customers, visitors and residents.

(2) Current Situation: Enhance Fleet Appearance

Finding: Buses are dispatched daily with appearance defects.

Recommendation: Develop a new process and checklist to improve appearance. Set targets to rotate buses out of service and to complete minor appearance repairs. Consider combining this with the scheduled, deep cleaning process. Photographs should be used to establish and communicate minimum appearance standards.

Cost Implications: Some minor costs for supplies will be incurred, but with low labor utilization, no extra labor costs should be incurred.

Maintenance Facility

The maintenance garage space is adequate for the assigned fleet; however, the facility and grounds are not well maintained. Trash is allowed to linger in and near work areas. Walls need cleaning and painting. Old parts and materials are not properly stored. Several work area fans are in use without required belt guards. We recommend that cleaning and reorganizing the garage would have a positive impact on morale and productivity.

(3) Current Situation: Work Area Fans Without Guards

Finding: Fans should be guarded.

Recommendation: Put guards in place.

Cost Implications: Minor, less than \$1,000.

- (4) **Current Situation:** **Garage and Parking Areas Not Cleaned Up**
- Finding:** The garage floor and marshalling areas are not well organized and have too many items sitting around.
- Recommendation:** Clean up and re-organize on a scheduled basis.
- Cost Implications:** None.

Replacement and Rebuilt Parts

The parts and supplies acquisition, management, and inventory procedures are not efficient or economical, and do not meet the day-to-day fleet needs. Several issues contribute to the current situation.

Few, if any, annual contracts are currently in use. Filters, belts, and other routine service parts are bid too frequently, resulting in excessive administrative time and effort. Contracts should be established for routine and repeat maintenance parts.

Due to union agreements, the parts room must accept and dispense components rebuilt in house. These parts are without warranties and, in many instances, are much more expensive than exchange programs with reputable outside sources. Also, parts staff must devote time, energy, and space to locate and acquire many small sub-components required for in-house rebuilding rather than simply exchanging complete components. The garage should acquire and use more outside components.

Fleet maintenance software is not utilized to manage order points, automatically reorder, track warranties, or control inventory balances. The TURLEY software is in place, but is not fully utilized in a comprehensive, well-designed and user-friendly parts management system that is fully integrated with the repair order process and with management reporting. Parts personnel should be retrained with the software and given a schedule to implement the processes available.

- (5) **Current Situation:** **Rebuilding Too Many Components**
- Finding:** Too much labor and inventory is invested in rebuilt components.
- Recommendation:** Set a target to begin purchasing more components. Additionally, opportunities for performance based outsourcing should be identified and implemented.

Cost Implications: Although not readily quantifiable, this would reduce labor and inventory costs. Purchased component parts would have the added benefit of a warranty.

End of Shift Refueling

The end of shift refueling process is slow, inefficient, and subject to frequent data errors. A manual system of notation is used to record bus fuel and mileage data. Much time is wasted, and a single illegible notation or incorrect keystroke renders reports and analysis useless. MTA management has recently experimented with automating entry of fuel dispensed. Unfortunately, the trial did not work.

At the time of our site visit one of two fuel dispensers was discharging less than nine gallons of fuel per minute and was causing a considerable backup in the fuel lane. This problem had existed for several days but was not resolved.

Buses are cleaned nightly and deep cleaned every 35 days. The schedule is consistent with typical practice and seems reasonable.

In the past MTA used upholstered seats, rather than plastic. This has a significant impact on maintenance costs. TCI supports their decision to specify plastic seats on new purchases.