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UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

November 19, 1984

RELEASED

RESOURCES, COMMUNITY, AND ECONOMIC DEVELOPMENT DIVISION

B-217074

The Honorable Elliott H. Levitas, Chairman
The Honorable Guy V. Molinari, Ranking
Minority Member
Subcommittee on Investigations and Oversight
Committee on Public Works and Transportation
House of Representatives

Subject: New York City Transit Authority's Withdrawal of Its Grumman Flxible Buses (GAO/RCED-85-50)

In your March 15, 1984, letter you expressed concern about New York City Transit Authority's (TA's) withdrawal of its Grumman Flxible Model 870 buses from transit service. You requested that we determine (1) whether the TA complied with Grumman's suggested maintenance schedules, (2) whether other transit systems have had similar safety, breakdown, or other problems with their Model 870 buses, (3) the reliability of the Model 870 bus as compared with other types of buses in the New York fleet, and (4) the conditions under which the buses are now stored. As agreed with your office, we did not analyze whether the Model 870 buses were considered to be safe because at the time we were making our review, the Department of Transportation's Urban Mass Transportation Administration (UMTA) was planning to carry out a study of its own to evaluate the condition of the buses. Also, our undertaking a similar study may have been duplicative. Because of a subsequent agreement with the TA, however, UMTA no longer plans to perform the study.

We found that (1) on the basis of the TA's records, the TA generally met or exceeded Grumman's suggested mileage inspection requirements for the Model 870 buses but did not always adhere to its own more stringent inspection schedules for these buses, (2) the TA's study showed that it had more problems with the Grumman buses than it did with other buses it was operating, and (3) about 60 percent of the other transit systems owning or leasing Model 870 buses that responded to our inquiry said that they generally were satisfied with the overall performance of their Model 870 buses. The TA is currently storing the Model 870 buses in a fenced lot under 24-hour guard at the Brooklyn Army Terminal. The TA has not decided on the ultimate disposition of the buses, but is considering awarding a contract to maintain the buses while they are stored at the Army Terminal.

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BACKGROUND

UMTA administers the federal mass transportation program. This program provides mass transit system development grants to state and local entities for purposes such as bus purchases, bus rehabilitation, bus depot construction, and operating assistance. In using federal funds for such purposes, the transit systems must comply with grant requirements.

On April 6, 1980, the TA purchased 851 Model 870 Grumman Flxible buses, which were delivered between 1980 and 1982. These buses cost $92.2 million, of which UMTA funded 80 percent, or about $74 million. Other transit systems purchased about 3,750 Model 870's. The total federal and nonfederal investment in the approximately 4,600 Model 870 buses is about $460 million. The Model 870 buses have been subject to manufacturer recalls and corrections of defects with the steering column, the bus undercarriage, and other components. According to the TA, because of these and other problems, it temporarily withdrew the entire fleet of Model 870 buses from transit service several times. In February 1984, the TA permanently withdrew its Model 870 fleet from service, stating that it had lost confidence in the safety and reliability of these buses. According to the TA, these buses have fundamental problems that Grumman has been unable to correct.

According to UMTA, the grantee agreement indicated that the TA was obligated to notify UMTA immediately upon or before removing equipment purchased with federal funds from transportation service. The TA did not notify UMTA prior to its withdrawal of the buses. UMTA asserted that under the grant agreement, it had the right to request immediate reimbursement from the TA for the federal interest in the Model 870 buses. To settle UMTA's claim, on September 25, 1984, the TA, its parent organization (the Metropolitan Transportation Authority of New York), and UMTA signed a Memorandum of Understanding transferring federal interest in the Model 870 buses to the TA in exchange for an interest in other TA properties that were or will be purchased without federal assistance. The agreement set the federal interest in the Model 870 buses at $56.4 million. Accordingly, under the agreement, UMTA will obtain a $25.6-million interest in 350 rehabilitated General Motors Corporation buses, a $6.8-million interest in a bus depot that the TA will rehabilitate, and a $24-million interest in 175 new General Motors Corporation transit coaches. According to UMTA and the TA, this settlement fully discharges the TA's obligation to UMTA under the grant agreement used to purchase the Model 870 buses. In the agreement, UMTA relinquished its claim against the TA for the federal interest in the buses. We did not evaluate the adequacy of the agreement.

SCOPE AND METHODOLOGY

In performing our review, we (1) interviewed TA officials, (2) visited six TA bus depots where Model 870 buses were assigned

and maintained and the Brooklyn Army Terminal where these buses are now stored, and (3) met with Grumman officials to discuss the TA's maintenance schedules for its Model 870 buses and asked Grumman to compare them with its recommended maintenance schedules.

We reviewed TA maintenance records for 40 randomly selected Model 870 buses to determine if the TA met Grumman's and its own suggested maintenance schedules. The sample was designed to provide estimates at the 95-percent confidence level with a maximum sampling error of about 5 percent of the average mileage between inspections. We gathered information for this analysis from the TA's inspection forms for the 40 buses and its computerized information system, which include the dates and bus mileage for each inspection. For some of the 40 buses, the TA provided additional data, such as a log of maintenance activities, which showed that other inspections were made but not documented by an inspection form. We used such data in doing our analyses.

For the 40 buses in our sample, we mainly used the TA's inspection forms to identify the dates of all its 3,000- and 24,000-mile inspections. The inspection forms, however, did not include actual bus mileage on the date of the inspection or the mileage was not considered reliable by the TA. Therefore, to determine bus mileage between inspection dates, we used a TA-computerized information system. This system not only shows inspection dates but also computes mileage based on individual trips for each bus. This is done by multiplying the specific mileage for each bus route by the number of trips made on that route by the bus. This calculated mileage was used by the TA to determine when a bus was due for its inspection, and according to the TA, contains the most reliable bus mileage data. While we did not review the computer information system's reliability, we found that it included notifications of inspections which were not documented by an inspection form. For example, the computer information system showed 53 3,000-mile inspections for 22 buses in our sample for which we could not find supporting documentation. Also, for 1 of the 22 buses, the computer system incorrectly showed inspections that had been made to another bus. We did not consider these undocumented notices of inspections in our analysis unless the TA provided additional information to verify that the inspection had actually taken place. In this respect, we excluded inspection intervals that represented 12.7 percent of the mileage for the 40 buses in our sample. This was not enough to materially affect our computations.

Using a random sample enabled us to estimate how frequently the TA actually inspected all the Model 870 buses. Because the TA was not performing maintenance on the withdrawn Model 870 buses at the time of our review, we cannot comment on the adequacy or quality of the inspection program or whether the maintenance was performed.

The TA prepared preliminary information comparing its operating experience with the Model 870 with other types of buses in the New York fleet. We reviewed the supporting data for this information. We did not analyze the maintenance requirements for the other model buses in the TA's fleet or attempt to compare them with the requirements for the Model 870.

Furthermore, we sent inquiries to 63 transit systems identified by UMTA as having purchased Model 870 buses to determine their experience with these buses. We received responses from 55 systems.

As requested by your office, we did not obtain comments on the draft report from UMTA, the TA, or Grumman. But we did discuss the contents with the TA and Grumman.

Except for not obtaining comments and reviewing the TA's computer information system, we made this review in accordance with generally accepted government standards.

THE TA GENERALLY MET GRUMMAN'S SUGGESTED MAINTENANCE SCHEDULES BUT DID NOT MEET ITS OWN SCHEDULING REQUIREMENTS

Grumman provides transit systems with a maintenance manual for the Model 870 buses. This manual contains suggested time and/or mileage intervals at which various maintenance activities should be performed. For example, Grumman suggests that heating and air conditioning systems be inspected every 6,000 miles and that exhaust systems be inspected at intervals to be established by transit systems, on the basis of their individual operating conditions, previous experience, and component failure history. Grumman recommends, however, that transit systems develop their own or modify the suggested schedule according to their own experience and local operating conditions.

Grumman suggests that a number of Model 870 components be inspected at 6,000-mile intervals, with other checks to be made at intervals ranging up to 250,000 miles. Grumman officials told us that on average, it would be sufficient for transit authorities to perform general maintenance of Model 870 buses at 6,000-mile intervals.

TA's inspection program

The TA has developed specific maintenance schedules for the Model 870's. While Grumman suggested bus maintenance intervals based on 8 different time intervals, 12 different mileage

intervals, or operating conditions, the TA generally targeted that bus components be checked or serviced at either 3,000- or 24,000-mile intervals. For example, the TA requires that 29 components such as the fuel systems, wheels, and the engine in its buses (including the Model 870's) be inspected at 3,000-mile intervals; additional inspections and maintenance activities are to be made at 24,000-mile intervals.[1] (See encls. I and II for the TA's 3,000- and 24,000-mile inspection reports). In this respect, the TA has generally established more frequent maintenance inspections than Grumman suggested.

After reviewing the TA's established maintenance schedules and procedures at our request, Grumman advised us that the TA's maintenance program, if followed, would form the basis for a satisfactory maintenance program for the Model 870 buses.

TA's 3,000-mile inspection

For 40 randomly selected Model 870 buses, we reviewed the TA's maintenance records for bus components required to be inspected or serviced every 3,000 miles. By comparing the dates of inspections with mileage information in the TA's computerized information system, we were able to determine how frequently the Model 870 buses were inspected. Our analysis shows that 37.3 percent[2] of the inspections occurred at 3,000-mile intervals or less; that 48.4 percent[3] occurred at 3,001- to 6,000-mile intervals; and that 14.2 percent[4] occurred at greater than 6,000-mile intervals. On average, the buses in the fleet were driven 3,888 miles[5] between inspections.

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[1]TA officials said that normal bus operations preclude inspections precisely at each 3,000- or 24,000-mile interval.

[2]At the 95-percent confidence level, the sampling error is ± 5.6 percent.

[3]At the 95-percent confidence level, the sampling error is ± 4.5 percent.

[4]At the 95-percent confidence level, the sampling error is ± 3.4 percent.

[5]At the 95-percent confidence level, the sampling error is ± 234 miles.

While the TA did not always meet its inspection schedule of every 3,000 miles, our analysis shows that 85.8 percent[6] of the inspections occurred within 6,000 miles. Since our analysis was based on a statistically selected random sample, the average mileage between inspections is representative of the TA's inspection practices for the entire Model 870 fleet.

TA's 24,000-mile inspection

For the same 40 TA buses, our analysis of 24,000-mile inspection forms and additional TA inspection data shows that the TA met its 24,000-mile criteria for 46.8 percent[7] of the inspections, whereas 53.2 percent[7] took place at greater than 24,000-mile intervals. On the basis our analysis, the fleet averaged 27,212 miles[8] between inspections. As stated before, these results are representative of the entire fleet of Model 870 buses.

TRANSIT SYSTEMS WERE GENERALLY SATISFIED WITH MODEL 870 BUSES BUT DID EXPERIENCE SOME PROBLEMS

Fifty-five of the 63 transit systems, including the TA, responded to our inquiries. These transit systems indicated that they own and/or lease a total of 3,953 Model 870 buses. The size of their Model 870 bus fleets ranged from 4 to 850 buses. Sixty-four percent, or 35 of the respondents, said that they were satisfied with the overall performance of their Model 870 buses. Thirteen, including the TA, said that they were dissatisfied with the overall performance, 3 were neither satisfied nor dissatisfied, and 4 did not respond to the question.

Fifteen transit systems, including the TA and 6 of the 9 largest Model 870 users, responded that they had temporarily or permanently removed Model 870 buses from service because they were concerned about operational safety. They had sidelined the buses for several safety reasons including concerns about steering column failures, structurally related problems, and Grumman's recall campaigns. The TA is the only system that said it had permanently removed buses from service because of safety concerns. Two of the 15 systems responded that they permanently removed one bus each from service, but not for safety reasons. Eight of the

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[6]At the 95-percent confidence level, the sampling error is ± 3.4 percent.

[7]At the 95-percent confidence level, the sampling error is ± 10.7 percent.

[8]At the 95-percent confidence level, the sampling error is ± 2,485 miles.

15 systems reported that they were now satisfied with the reliability of the Model 870 buses in their fleet. Six, including the TA, said that they were dissatisfied, and one did not respond to the question.

Thirty transit systems said that they were satisfied with the maintenance required of their Model 870's, while 17 systems, including the TA, were dissatisfied. Three systems expressed neither satisfaction nor dissatisfaction with the maintenance requirements, and five did not respond. On average, 52 transit systems reported that 4,416 miles elapsed between routine maintenance inspections. Therefore, on average they performed routine maintenance inspections less frequently than the TA--4,416 as compared with 3,888 for the TA.

Thirty-two transit systems were satisfied with the costs of operating their Model 870 buses, while 14 systems including the TA, were dissatisfied. Seven systems said they were neither satisfied nor dissatisfied, and two did not respond to the question.

Thirty-seven systems said they were satisfied with the reliability of their Model 870 buses, while 12 systems, including the TA, were dissatisfied. Four systems said they were neither satisfied nor dissatisfied, and two did not respond to the question.

We asked transit systems how many of the Model 870 buses had experienced failures of the same items that were included during Grumman's recall campaigns or predelivery modifications. Several transit systems reported a number of problems. (See encl. III.)

TA'S ASSESSMENT OF ITS MODEL 870 BUSES COMPARED WITH OTHER TYPE BUSES IN ITS FLEET

On April 27, 1984, the TA presented preliminary statistics to the subcommittee comparing the reliability of its Model 870 buses with other types of buses in its fleet. These data were expressed in terms of labor hours to maintain and repair buses, bus availability, and road calls made by service personnel.

For example, TA data for 1982 and 1983 showed that it expended 1,129 labor hours to maintain the average Model 870 bus versus 930 hours for a General Motors bus, which like the Model 870 is an advanced design bus. Further, the TA pointed out that the Model 870 bus was available 76 percent of the time as compared with 84 percent of the time for the General Motors bus. In addition, TA developed road call data for the 2-month period before its withdrawal of the Model 870's. The data showed that the Model 870 buses averaged 2.11 roadcalls a month compared with 1.72 roadcalls for all buses, which includes the Model 870. At the completion of our review, the TA had not finalized its statistics. The TA does not plan any further analysis of these data.

We reviewed the TA's preliminary statistics and confirmed that it is supported by data in the TA's records and fairly compares the Model 870 buses with other TA buses.

TA officials told us that more information is needed to fully determine the degree to which the Model 870 buses are less reliable than other models. For example, they said that other factors such as management time, passenger inconvenience, and loss of revenue should be factored into such analysis. In addition, these officials noted that Grumman had been performing warranty work on the Model 870's. Once the warranty expires such work would be the individual systems' financial responsibility.

BUSES ARE BEING STORED UNDER SECURE CONDITIONS AT THE BROOKLYN ARMY TERMINAL

At the request of the subcommittee, on August 10, 1984, we visited the Brooklyn Army Terminal where the Model 870 buses are now stored to determine how they are being secured. We found that the buses are enclosed in a fenced lot which, according to a TA official, is guarded on a 24-hour basis. There is only one gate, and the guard keeps a log of all visitors. A TA official also told us that the TA has attempted to award a maintenance contract for these buses. However, since the TA considered all the bids it received to be extremely high, it is revising its contract specifications and may readvertise.

As arranged with your office, we do not plan to distribute this report further until 30 days after the date of issuance. However, if its contents are announced earlier, we will then send copies to the agency and other interested parties.

J. Dexter Peach
Director

Enclosures - 3

ENCLOSURE I

NYCTA - MABSTOA
SURFACE MAINTENANCE DEPARTMENT
PREVENTIVE MAINTENANCE WORK SHEET
ALL BUS MODELS

Bus Cleanliness
Interior_____
Exterior_____
Eng. Wash_____
Fore Sig._____

3,000 6,000 9,000

BUS NO.	DATE	TYPE S.O. ( ) 3,000 ( ) 6,000 ( ) 9,000
GARAGE		MILEAGE

Indicate Proper Symbol Next to Each Item ( ) Chd. (x) Adj. Made (o) Rep. Needed (-) Repairs ma

SYM	ITEMS	SYM	ITEMS
( )	1. Fire Extinguisher (Charge & Mounting)	( )	F. Cooling Sys. (Pressurize-Check Leaks, Circulation, Fan Operation, Mounting, Condition & Freezing Point)
( )	2. Starter, Starter Interlock & Controls	( )	G. Exhaust Sys. (Mounting Air Gap & Pipe Extension) Note: Exhaust Smoke
( )	3. Horn, Passenger Signal Including Stop Request Sign	( )	H. Check Throttle Control
( )	4. Lighting System (Int. & Ext.)	( )	14. Alternator & Charging System Volts____ ____
( )	5. Check Dash Lights, Gauges, Test Module & Alarms	( )	15. Engine Idle____ Top RPM_____ Stall Test_____
( )	6. Air System (Leaks, condition of Lines, Hoses & Clamps)	( )	A. Air Box Press_____
( )	A. Air Gov. Cut Out_____Cut In_____	( )	16. Transmission (Mounting & Leaks)
( )	B. Drain Air Tanks & Check Condition of Air & Fuel Tank	( )	A. Controls (Shift Operations and Lights)
( )	C. Check Air Dryer Operation and Purge Cycle	( )	17. Adjust Brakes (Exclude Self Adjusters) Brakes Throw R/F___L/F___R/R___L/R___ Size R/F___L/F___R/R___L/R___
( )	7. Heating, Defroster & A/C System (Rep. Filter Elements)	( )	18. Power Steering Fluid Level & Lines (Steering Gear, Linkage & Column)
( )	A. Vaccum Compartment	( )	19. Suspension, Ride Height, Mounting Bolt King Pins,
( )	B. Windshield Wiper System (Service Washer-Oiler)	( )	20. Chassis, (Frame Cracks & "A" Frame Bushing)
( )	9. Eng. Shut-Off-Normal & Emerg.	( )	21. Rear Axle-Drive Shaft-U Joints-Shop Brake
( )	10. Park & Shop Brake (Operate & Adjustment)	( )	22. Battery (Including Cables & Wiring)
( )	11. Doors & Control Equip. (Check Accelerator Interlock for Front & Rear Doors)	( )	A. Hydrometer Readings (Except for Freedor Batteries) B. 1.____ B. 2.____ B. 3.__
( )	12. Wheels (Inspect & Torque to 500-550 lbs. LR_____ RR_____ LRO_____ RRO_____ LRI_____ RRI_____	( )	B. 4._____ B. 5.____ B. 6.____
( )	13. Engine	( )	23. Lube Bus In Accordance with Current Directives
( )	A. Oil Pressure Idle_____	( )	24. Check & Activate Kneeling System & Interlock
( )	B. Oil Press At 2,000 RPM_____	( )	25. Check & Deploy Wheel Chair Lift
( )	C. Air Intake System (Note Air Restriction Reading_____And Replace Air Filter Element If Required) See Spectrochemical Analysis Results.	( )	26. Check Body Condition, Interior & Exterior Including Roof Vent Operation & Sealing
( )	D. Fuel Sys. Fuel Pressure Idle_____	( )	27. Inspect & Test Front & Side Dest. Signs
( )	E. Fuel Press At 2,000 RPM _____	( )	28. Alcohol Dispenser (Service as needed)
			Oil Added Eng Qts. Conv. Qts.

Special Instructions and Bus Case History Research Notes

ENGINE OIL AND FILTER CHANGES DETERMINED BY SPECTROCHEMICAL ANALYSIS

DEFECTS NOTED DURING INSPECTION

BRAKES STEERING:

ENGINE-TRANSMISSION:

HEATING-COOLING-AIR CONDITIONING:

ELECTRICAL:

BODY-CHASSIS:

OTHER ITEMS:

MAINTENANCE'S SIGNATURE PASS NO. HELPER'S SIGNATURE PASS NO.

MAINTENANCE'S SIGNATURE PASS NO. HELPER'S SIGNATURE PASS NO.

ENCLOSURE II

Mini 24,000 S. O.
870 Flxible & RTS-04

(REVISED)

LOCATION _____ BUS NO. _____

	OK	REMARKS
1. Drain & Refill Conv., Replace Conv. Filter.		
2. Drain & Refill D.U. & Clean Breather.		
3. Replace Air Dryer Desiccant Cartridge and Rebuild Purge Valve Ass'y with Service Kit 86-36-5209. 870 Flx. only.		
4. Replace Circulating Pump Brushes - Check Operation and Repair.		
5. Clean Air Suspension Filter by Soaking Filter.		
6. Replace Power Steering Reservoir Filter & Refill with 10 W. 40 Oil.		
7. Replace Donaldson Air Filter.		
8. Remove & Clean Blower Screen or replace.		
9. Drain and Refill Wiper Oiler with Symbol #69-12-3080.		
10. Replace Auxiliary Heater Filter 870 F x. only.		
11. Check Compressor Cooling Water Inlet Flow at L/S Cyl. Head at Engine Block as per Bulletin #72-22-1.		
12. Remove and Clean Power Steering Fluid Line Filter Element and Magnetic Plug.		
13. Check Mounting Bolt Torque on the Steering Column Bracket.		
14. Check Mounting bolt Torque on the Steering Gear.		

DATE _____

Maintainer's Signature _____ Pass # _____

Maintainer's Signature _____ Pass # _____

Foreman's Signature _____ Pass # _____

NUMBER OF GRUMMAN MODEL 870 BUSES AND NUMBER OF TRANSIT SYSTEMS REPORTING COMPONENT PROBLEMS AFTER RETROFIT CAMPAIGNS OR PREDELIVERY MODIFICATIONS BY GRUMMAN

Type of problem	Number of buses having problems after modification[a]		Number of transit systems reporting[b]
	New York	Other transit systems	
Pan hard rod bracket failures	42	62	7
Steering column failures	398	403[d]	7
A-frame cracking	-	0	0
Trunnion bracket failures	209	7	3
Engine cradle cracking	-	4	2
Fuel line rusting	-	155[e]	4
Chafing of power cables	644[c]	14	3
Wheel well fires	-	8	2

[a]Grumman questioned the responses stating that they were not aware of certain problems reported.

[b]Excludes New York City Transit Authority.

[c]The TA reported cables chafing at the fuel tank 142 times, at the fuel tank bracket 192 times, and at the batteries 310 times.

[d]One system accounted for 279 of the 403 steering column problems.

[e]Another system accounted for 99 of the 155 fuel line rusting failures.