Robert P. Aex, Rochester-Genesee Regional Transportation Authority, New York

On October 11, 1971, the demand-responsive transportation system in Batavia, New York, began operations. Initially, the system used three 23-passenger Flxible Flxettes and one 10-passenger Ford Courier. The small 10-passenger vehicle was a Ford Econo-Line body with a plastic bubble top to give adequate head room for standing.

Because of the heavier-than-anticipated demand for subscription home-to-work service and home-to-school service, it became apparent after a week of operation that the small Ford Courier could not be efficiently used in subscription service. Therefore, a fourth 23-passenger Flxette was ordered and was put into service in February 1972. Subsequently, the Ford Courier was disposed of and the fleet of 4 Flxettes has operated since the spring of 1972.

With minor variations, each Batavia vehicle travels about 600 miles (960 km) per week during the busy season from September 15 to April 15 and totals about 23,000 miles (36 800 km) each year. A preventive maintenance program was established whereby each vehicle has a maintenance check every 1,000 miles (1600 km). Because the shop operates on a 5-day workweek, 1 vehicle is in the shop about every other day each week for preventive maintenance, which includes lubrication and inspection of brakes and other critical areas.

In connection with filing an application to UMTA for new vehicles, a careful analysis was made of the out-of-revenue-service time of the vehicles and the cost of vehicle maintenance (Table 2). The cost of vehicle maintenance includes interior and exterior washing. For the total 76,383 miles (122 213 km), maintenance cost is 10.6 cents/mile (1.6 km).

An analysis of the maintenance and repair jobs on the 4 vehicles for the 12-month period is given in Table 3. Brake adjustments, relining, and so forth have contributed

Table 2. Out-of-service time and maintenance costs.

Bus	Hours Out of Revenue Service		Maintenance Costs (dollars)
	Number	Percent	
1	272	13.0	1,744
2	119	5.7	1,866
3	203	9.7	1,751
4	209	10.0	2,736
Total			8,097

Table 3. Maintenance and repair jobs.

Item	Bus 1	Bus 2	Bus 3	Bus 4	Total
Brakes	15	28	27	21	91
Ignition	8	4	5	4	21
Lights	–	7	5	1	13
Wheels	1	3	2	5	11
Suspension	2	3	3	2	10
Exhaust	3	2	–	4	9
Instruments	–	1	2	4	7
Steering	2	–	–	3	5
Carburetor	2	–	1	1	4
Air conditioning	–	4	–	–	4
Cooling system	–	2	1	–	3
Transmission	–	1	1	3	5
Engine (valve job)	1	–	2	2	5
1,000-mile (1600-km) check	13	27	23	20	83
Miscellaneous	5	–	3	1	9
Total	52	82	75	71	280

significantly to the vehicle downtime. However, the engine valve jobs are obviously mechanical failures of more significance. Similarly, the extent to which the transmissions of these vehicles have been rebuilt within a period of 3 years is equally significant.

Heavy and frequent use of brakes is required in DRT service. Friction and resulting heat warp the brake drums, causing excessive wear. Our experience with the small fleet in Batavia indicates that brakes must be relined every 5,000 miles (8000 km). Brake drums must be replaced at about each 10,000 miles (16 000 km). The heat also has an adverse effect on the brake return springs, which must be replaced at about 5,000 miles (8000 km).

Valve failure is the principal weakness in the automobile type of gasoline engines used in most of the small vehicles. These vehicles have chassis originally intended for motor homes or recreation vehicles. The manager of the Batavia garage reports that the engines in the Batavia fleet are not able to stand up under the heat and strain imposed on a 360 to 390-in.^{3} (5900 to 6400-cm^3) engine manufactured for automobiles. Frequent valve jobs are the result of this weakness.

Excessive heat caused by the frequent stops and starts in DRT service requires a better system for the cooling of the transmission oil. Here again, the standard heavy-duty transmissions, which are used in the chassis of small vehicles, cannot withstand the heat generated by DRT service. The result is frequent transmission jobs.

After 2 years of experience with this vehicle maintenance program, the management of the Batavia DRT system recommended, and the Board of Directors approved, a vehicle replacement program that calls for new vehicles after 75,000 miles (120 000 km) or 3 years of service. This decision was made in the belief that it is more economical to trade in this body-on-chassis type of vehicle at that point than to maintain it in service.

However, the decision relates to the chassis rather than to the body. The program establishes the life of the body as 6 years, and the bodies are remounted on new chassis.

The limiting factor on the chassis in Batavia is the durability of the component parts: engine, transmission, rear end, suspension, and brakes. Batavia vehicles operate in extreme weather conditions during the winter and are subjected to harsh corrosive effects of salt used on the highways. Body life in other places, therefore, might be more than 6 years.

Capital costs in 1974 were about $4,500 for the chassis and $15,500 for the body—an initial total of about $20,000. The capital cost for 2 chassis and 1 body during a period of 6 years, with about 150,000 miles (240 000 km), develops a favorable depreciation rate of $0.163/mile (1.6 km).

John B. Schnell, American Public Transit Association

I will first discuss the maintenance and operating costs for 3 fleets of buses in the city of Detroit for the fiscal year ending June 30, 1973. One is a fleet of small buses, another is a 1968 fleet of full-sized, 40-ft (12-m) diesel-powered buses, and another is a 1972 fleet of full-sized vehicles. The total maintenance cost is 34.71 cents/mile for the small vehicles, 7.54 cents/mile for the 1968 fleet of large vehicles, and 4.23 cents/mile for the 1972 vehicles. Depreciation increases the costs to 38 cents/mile for the small fleet, 5.39 cents/mile for the 1968 fleet, and 8.71 cents/mile for the 1972 fleet, giving a total cost per mile of 31 cents for the 1972 fleet, 36 cents for the 1968 fleet, and 19 cents for the small vehicles.

Many operators of small systems in small cities have said to us at the American Public Transit Association and to the U.S. Department of Transportation: "We do not need a big vehicle, and besides to operate a smaller vehicle is much cheaper." Well, certainly the cheaper operation of a small vehicle has yet to be substantiated, but logically the smaller vehicle should burn less fuel and have lower maintenance costs.

We all want competition, but I believe we have had make-believe competition in the past. In March 1974, the Bus Technology Committee of the American Transit Associa-