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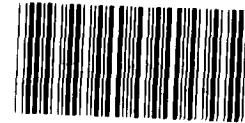
General Accounting Office

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The Urban Mass Transportation Administration's Involvement In Bus Specifications And Testing

The Urban Mass Transportation Administration (UMTA), Department of Transportation, views its role in the bus procurement process primarily as a source of funding for State and local transit authorities. Although UMTA issued specifications for the advanced design bus, it never conducted tests or requested test results to demonstrate that the buses purchased with Federal funds met specifications. These buses experienced a number of problems after they were put into operational service.

The problems experienced with advanced design buses can result from shortcomings in either the vehicle's design or the manufacturer's quality control. GAO presents alternative ways UMTA could take a more direct role in testing bus performance and in inspecting the manufacturer's production process.



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

COMMUNITY AND ECONOMIC
DEVELOPMENT DIVISION

B-203443

The Honorable John L. Burton
Chairman, Subcommittee on Government
Activities and Transportation
Committee on Government Operations
House of Representatives

Dear Mr. Chairman:

As requested in your December 1, 1980, letter and discussions with your office, we have solicited viewpoints of Urban Mass Transportation Administration officials, bus manufacturers, and transit operators on bus specifications, testing, and warranties. This report provides the information we obtained and offers some ideas about alternatives for the Federal Government's role in procuring buses.

At your request, we did not take the additional time needed to obtain agency comments on the matters discussed in this report.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of the report. At that time, we will send copies to interested parties and make copies available to others upon request.

Sincerely yours,

A handwritten signature in cursive script that reads "Henry Eschwege".

Henry Eschwege
Director



D I G E S T

Through its capital grant program, the Department of Transportation's Urban Mass Transportation Administration (UMTA) plays a major role in shaping the Nation's mass transit systems by funding 80 percent of the cost of transit buses.

GAO obtained views of representatives of UMTA, bus manufacturers, and six transit authorities on

--the rigidity of Federal bus specifications and the difficulty local transit authorities have in deviating from the specifications,

--the adequacy of manufacturers' vehicle warranties, and

--the adequacy of vehicle testing and UMTA's level of involvement in testing to ensure that buses purchased meet performance specifications.

GAO was also asked to present alternative ways of ensuring that vehicles purchased with Federal funds are reliable and meet performance requirements.

FEDERAL ADVANCED DESIGN BUS SPECIFICATIONS

UMTA makes grants of 80 percent of project cost to transit authorities to help them acquire transit equipment such as buses. UMTA has issued specifications for the type of bus (an advanced design bus) that was primarily being purchased with these funds in recent years.

The advanced design bus specifications limit transit authorities' options and permit no deviations without UMTA's approval. UMTA generally will not approve a deviation if it will

be exclusionary (that is, one of the manufacturers cannot accommodate the change) because competition will be reduced. However, UMTA officials said that after competitive selection they will usually allow a change from the specifications if both the transit authority and the manufacturer agree. Three of the six transit authorities GAO contacted never attempted to get UMTA's approval to deviate from the specifications, and another transit authority sought specification changes only after contract award.

In May 1981, UMTA was studying the problems and issues surrounding the Federal bus specifications before deciding whether to rescind or modify the specifications. Officials GAO contacted differed on whether the specifications should be rescinded, but most of the transit authorities contacted wanted more flexibility in selecting options than the specifications provide. (See ch. 2.)

PROBLEMS WITH ADVANCED DESIGN BUSES AND THE ADEQUACY OF BUS WARRANTIES

Five transit authorities GAO contacted had purchased Grumman Flexible advanced design buses and all five experienced serious bus problems. The most serious problem has been cracks in the buses' undercarriage.

In January 1981, the Grumman Flexible Corporation announced that the cracks in part of the undercarriage of its buses could cause a safety problem. The corporation said it intends to reinforce all of its buses at its own expense and has voluntarily doubled the structural warranty on its buses.

Transit authorities GAO contacted were satisfied with their advanced design bus warranties, and they generally considered the manufacturer's performance in resolving warranty problems to be adequate. (See ch. 3.)

TESTING OF ADVANCED DESIGN BUSES

Generally, the only substantive testing of advanced design buses has been carried out by bus manufacturers. UMTA did not test the advanced design bus and did not require any testing by the manufacturers or the transit authorities

to demonstrate that buses purchased with Federal funds met specifications. In GAO's survey, four of the five transit authorities who purchased advanced design buses said they did no testing beyond the required postdelivery testing. That testing is basically limited to identifying obvious defects. (See ch. 4.)

Given the cracking problem in the undercarriage of Grumman Flexible buses, most of the transit officials GAO contacted thought the Flexible bus should have undergone more testing. These officials also said that additional bus testing is needed and the Federal Government should have a greater role in the testing. (See ch. 4.)

OBSERVATIONS AND ALTERNATIVES

GAO was requested to present some alternatives for ensuring that transit buses meet required performance levels. However, because of time constraints, GAO has not evaluated the potential effects and costs of these alternatives. Consequently, these alternatives are not offered as recommendations but as ideas for further investigation and consideration. These alternatives are directed at a more active role for UMTA in two areas of bus testing--testing of bus performance and inspection of the manufacturer's production process.

Bus Performance Testing

UMTA could require every bus model being offered for purchase with UMTA funding to undergo performance testing and make the test results available to the transit industry. The tests would be designed and conducted under the supervision of UMTA and representatives of the transit industry. The use of the test results would depend on whether or not UMTA's advanced design bus specifications are retained, made optional, or rescinded.

--If the specifications remain in force, bus models that fail to meet one or more of the performance requirements could, depending on the seriousness of the performance shortfall, either be designated by UMTA as ineligible for purchase with Federal funds or UMTA could require that the manufacturer's bid price in a price-competitive procurement be penalized by a predetermined price offset to reflect the vehicle's failure

to meet required performance levels. A manufacturer whose vehicle did not meet all of the performance requirements could correct the deficiencies and have the vehicle retested.

--If the specifications are made optional or eliminated, then UMTA 's actions would be limited to disseminating the results of performance testing so transit operators would have relative performance data on competing bus models for their use in making bus procurement decisions.

Inspection of Manufacturer's
Production Process

UMTA could sponsor and fund a quality control inspection procedure for the transit industry rather than funding such efforts by each individual transit authority as it now does. Under this approach the quality control of an individual manufacturer's production process could be uniformly monitored against standards established jointly by the transit industry and UMTA.

AGENCY COMMENTS

As requested, GAO did not take the additional time needed to obtain agency comments on the matters discussed in this report.

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ABBREVIATIONS

GAO	General Accounting Office
UMTA	Urban Mass Transportation Administration

CHAPTER 1

INTRODUCTION

The Chairman, Subcommittee on Government Activities and Transportation, House Committee on Government Operations, in a December 1, 1980, letter asked us to look at the Urban Mass Transportation Administration's (UMTA's) involvement in bus procurements and testing. The request was discussed with the chairman's office and it was agreed that we would obtain views of representatives of UMTA, bus manufacturers, and transit authorities concerning

- the adequacy of transit vehicle testing and manufacturers' vehicle warranties and
- the rigidity of UMTA bus specifications and the ability of transit authorities to deviate from the UMTA specifications to better meet local needs and conditions.

On February 27, 1981, we briefed the chairman's office on the results of our work and agreed to summarize the information we had obtained in a report. We also agreed to include in the report (1) opinions expressed about UMTA's level of involvement in compliance testing to ensure that buses purchased with Federal funds meet performance specifications and (2) observations about alternative ways of ensuring that vehicles purchased with Federal funds are reliable and meet performance requirements.

UMTA FUNDING OF TRANSIT BUSES

The bus is the mainstay of the transit industry. Of the 279 urbanized areas in the country (according to the 1970 census), 265 provide mass transit service. About 95 percent of the areas providing mass transit service do so through bus transit alone. Buses carried about 74 percent of all transit passengers in the United States in 1978--the latest figure available.

The Urban Mass Transportation Act of 1964, as amended, provides funds for the purchase of buses and other equipment through its grant programs. UMTA administers these programs and makes grants to State and local public agencies. UMTA funds capital grants at 80 percent of net project cost. From 1965 through the end of fiscal year 1980, an UMTA official said funding had been used to purchase 43,370 buses. UMTA estimated that its grant funds could be used to purchase about 3,000 buses in fiscal year 1981.

BACKGROUND ON ADVANCED DESIGN BUSES

In the late 1960s, UMTA became interested in developing a new urban transit bus to replace the "new look" buses that were in use and which had not had any major design changes since 1959.

This interest led to an UMTA-funded research and development program in 1971 to develop a new and standardized urban transit bus, referred to as Transbus. Three U.S. manufacturers, General Motors Corporation, Flxible Company, and AM General were each awarded a contract to develop a Transbus prototype for UMTA.

In 1971 General Motors Corporation, which had been working to develop an advanced design bus, stopped its advanced design bus development because of the Transbus effort. During that same year the Flxible Company began work to develop an advanced design bus. In May 1973, General Motors decided to resume its efforts to develop an advanced design bus. In March 1975, General Motors announced that it would start production of the bus. The advanced design buses being developed by General Motors and the Flxible Company were being designed to incorporate some but not all of the features called for in Transbus.

In April 1976, a consortium of local transit agencies submitted a proposed bid package to UMTA which included a set of proposed specifications for an advanced design bus. At the time UMTA was considering the consortium's specifications to purchase 365 to 418 advanced design buses, General Motor's bus was the only advanced design bus available. UMTA modified and concurred with the specifications which were advertised for bid in June 1976.

In August 1976, AM General Corporation, one of three major U.S. full-size bus manufacturers, filed a suit against the Department of Transportation. AM General alleged that UMTA violated the Urban Mass Transportation Act's prohibition against the use of grant funds to support procurements utilizing exclusionary or discriminatory specifications. The court found AM General's claim unfounded. The court concluded that AM General had sufficient notice of UMTA's policies with respect to the possible funding of advance design buses to develop a competitive product. However, AM General chose not to modify its bus so it could bid and, subsequently, left the bus market.

In late 1976, Flxible Company was still proceeding with its version of the advanced design bus. UMTA officials were concerned that because of differences between the Flxible and General Motor's buses, transit authorities might issue exclusionary specifications that would favor one design over the other and thus reduce competition. To prevent this from happening UMTA developed and in April 1977 issued specifications under which both companies advanced design buses could compete.

In May 1977 the Secretary of Transportation stated that after September 30, 1979, all buses purchased with Federal funds would have to meet the specifications developed for Transbus. The implementation of this requirement would make the General

Motors and Flxible advanced design buses ineligible for purchase with UMTA grant funds after September 30, 1979. In January 1979, Transbus bids were requested for the first time; however, no bids were received by the May bidding deadline. The U.S. manufacturers said they could not bid because of the technical aspects of the procurement requirements and for certain business reasons.

In August 1979 the Acting Secretary of Transportation suspended the September 30, 1979, effective date of the Transbus procurement requirement. As a result, the advanced design buses remained eligible for purchase with UMTA grant funds. In recent years the majority of buses being purchased with UMTA funding have been of the advanced design type according to UMTA's Acting Director of Program Management.

Since UMTA's advanced design bus specifications were first used in August 1977 to purchase buses with UMTA grant funds the following has occurred.

- Grumman acquired Flxible Company, and became the Grumman Flxible Corporation.
- Until mid-1980 the only manufacturers who had bid in response to the advanced design bus specifications were Grumman Flxible and General Motors. UMTA's Acting Director of Program Management said another manufacturer, Neoplan, began submitting bids in July 1980.
- Bus prices have increased dramatically. In 1977, an advance design bus cost about \$96,000, by early 1981 the price of this bus had increased to about \$150,000.

OBJECTIVES, SCOPE, AND METHODOLOGY

In keeping with the subcommittee's request, our objective was to obtain views of UMTA, bus manufacturers, and transit authorities regarding bus testing, warranties, and UMTA specifications. We discussed these topics with and obtained the views of officials from:

- UMTA's Office of Program Management and Office of Bus and Paratransit Technology;
- General Motors Corporation, the manufacturer of an advanced design bus;
- Grumman Flxible Corporation, the manufacturer of an advanced design bus;
- the American Public Transit Association, the national association of the transit industry; and

--six transit authorities--one each in California, Connecticut, Georgia, Texas, Virginia, and Wisconsin.

We also reviewed relevant documents and supporting information available at UMTA's headquarters in Washington, D.C.

As agreed to by the subcommittee Chairman's office the scope of our work was limited, and the information presented in this report does not represent an indepth study of the issues addressed. As requested, the report presents some ideas for alternatives to UMTA's present level of involvement in the bus procurement process. These ideas, however, are not being offered as recommendations but as alternatives to be considered for further study and investigation. The limited work scope and brief time in which to report did not allow us to fully investigate and assess the implications of implementing the options.

CHAPTER 2

INFLUENCE AND FLEXIBILITY OF FEDERAL

ADVANCED DESIGN BUS SPECIFICATIONS

In April 1977, UMTA issued advanced design bus specifications to assure competition. The specifications were based on the design plans of the General Motors and Flexible advanced design buses. Issuance of the specifications has encouraged advanced design bus purchases but has limited transit authority options for meeting local needs. Now the Secretary of Transportation is considering eliminating the specifications or making their use optional.

FEDERAL ACTIONS HAVE INFLUENCED TRANSIT AUTHORITIES TO PURCHASE ADVANCED DESIGN BUSES

The two primary types of transit buses are the advanced design bus and the new look 1/ bus. Federal specifications were issued only for the advanced design bus which is the only type of full-size transit bus being manufactured by major U.S. firms (General Motors and Grumman Flexible). If a transit authority wants advanced design buses, it has to use the Federal specifications. If a transit authority wants new look buses, it has to purchase them from a small U.S. manufacturer or a foreign manufacturer after writing their own specifications. Federal bus specifications along with the legislative "Buy America" provision, have influenced transit authorities to purchase advanced design buses.

U.S.-manufactured products are given preference by the Surface Transportation Assistance Act of 1978, which contains a Buy America provision. The requirement generally provides that Federal funds in excess of \$500,000 cannot be obligated unless materials and supplies are of U.S. origin. For a product to be considered of U.S. origin, the cost of its domestic components must exceed 50 percent of the cost of all of its components and final assembly must take place in the United States. One of four instances in which this provision can be waived by UMTA is if the supplies are not available in the United States.

UMTA program management officials said they have approved and never discouraged the purchase of new look buses from foreign manufacturers. However, officials of the American Public Transit Association told us that many transit authorities were under the impression that Federal money was to be used only for advanced design buses.

1/The new look is a 1959 designed standard bus.

Four of six transit authorities we contacted said they purchased advanced design buses because of the Federal specifications or the Buy America provision. For instance, a Virginia transit official said his transit authority thought that advanced design buses were the only type the Federal Government was funding because of the Federal specifications. A Connecticut transit official said advanced design buses were the only bus being produced by U.S. manufacturers and his transit authority thought the Buy America provision prevented them from purchasing the new look buses.

FEDERAL SPECIFICATIONS LIMIT LOCAL
OPTIONS BUT WAIVERS MAY BE GRANTED

The advanced design bus specifications limit transit authority options, and no deviations from the specifications are permitted without UMTA approval. UMTA usually allows changes to the specifications if the change can be made by both U.S. manufacturers and, therefore, does not adversely affect competition.

UMTA's advanced design bus technical specifications include general, body, and chassis requirements. Examples of general bus requirements are dimensions which specify bus lengths of 35 or 40 feet and weights of not more than 26,000 pounds. Body requirements include floor heights not more than 34 inches above the street, passenger doors which can be completely opened or closed in 1 to 1.5 seconds, and sealed side windows. Chassis requirements include the bus being capable of a top speed of 60 mph on a straight level road and engine operation for 300,000 miles without major failure or deterioration.

Transit authority options are limited in the specifications. However, the specifications do list for transit authority selection special requirements, including color and destination signs and 16 alternative configurations. Following are examples of standard and alternate configurations.

<u>Configuration</u>	<u>Standard</u>	<u>Alternate</u>
Dimensions	102" width 40' length	96" width 35' length
Steps	White step edge	Yellow step edge
Rear doors	Driver-controlled	Passenger-controlled
Roof ventilators	None	Two
Seating	Hard	Padded, cushioned
Interior climate control (note a)	Air conditioning Auxiliary heaters Stepwell heaters	No air conditioning No auxiliary heaters No stepwell heaters

a/The standard interior climate control system was a specification requirement but an addendum to the specification in December 1980 provided an alternative.

Transit authorities cannot change the specifications before bid opening or after contract award without UMTA's concurrence. An UMTA program management official said no record of the number or types of specification waivers granted is available, but UMTA will generally grant waivers as long as they are not exclusionary to a manufacturer. For example, if a transit authority wanted a specification waiver so that they could specify a full sliding window, UMTA would not approve it since both U.S. manufacturers do not presently have a full sliding window. However, an UMTA program management official said once the contract is awarded the transit authority can negotiate a change with the manufacturer and, if successful, UMTA would probably approve it.

Three transit authorities we contacted never attempted to get a specification waiver and another sought changes to the specification only after contract award. The fifth transit authority, which is one of the largest in the country, said it had no problem getting deviations from the specification approved as long as it provided adequate justification. The remaining transit authority went out for advanced design bus bids without seeking any waivers from the specifications. A low bid of \$132,000 per bus was received in October 1979 and caused the transit authority to decide to purchase new look buses from a foreign manufacturer. The authority's new look bus specifications deleted many features that were required on advanced design buses, such as energy absorbing bumpers and air conditioning. The authority purchased new look buses after it received a low bid of \$103,000 per bus.

UMTA's Acting Director of Program Management said many transit authorities want optional features when they purchase new look buses. He also said that current prices for new look and advanced design buses are about the same when the buses are similarly equipped.

FEDERAL ADVANCED DESIGN BUS SPECIFICATIONS MAY BE RESCINDED

On March 25, 1981, the New York Times reported that the Secretary of Transportation intended to rescind the Federal bus specifications. The article quoted the Secretary as saying "the Federal Government should not be in the bus business to the degree we were and are."

As of early May 1981, the advanced design bus specifications had not been rescinded. UMTA was studying the problems and issues surrounding the specifications. According to the Acting Director of UMTA's Office of Program Management, the study is considering making the Federal specifications optional.

Acting Directors and their staffs from UMTA's Offices of Bus and Paratransit Technology and Program Management had the following comments about the specifications.

- The specifications protect U.S. manufacturers against foreign manufacturers.
- While the specifications once served to assure competition, they now artificially constrain new manufacturer's from bidding since the specifications are based on the General Motors and Grumman Flexible buses.
- If the specifications did not exist, exclusionary specifications would probably proliferate. Before the specifications, transit authorities would require a number of minor component modifications that could rule out manufacturers and drive up the cost of the bus.
- More simplified and flexible Federal specifications are needed to take into account local needs.

Representatives of General Motors and Grumman Flexible advised us that the specifications have been advantageous in many ways, for example, they provided for a safer bus in the event of a collision, disallowed transit authority pet options, and established a neutral bidding environment. These officials also said that the specifications do not prevent other manufacturers from bidding.

The officials differ on the continued need for the specifications. A Grumman Flexible Vice President believes their elimination would disrupt the market and cause bus prices to go out of control because of the number of unique changes transit authorities would want. He said the company supports some degree of bus standardization and is against custom designing buses for transit authorities partly because of the risk associated with unproven equipment. He also said that without the Federal specifications, bus competition would be expected to increase and the Buy America provision would not adequately protect U.S. manufacturers. He based this opinion partly on the fact that two foreign bus manufacturers have opened plants in the United States and buses that are final assembled at these plants could be considered of U.S. origin.

The Public Transportation Director of General Motors said the advanced design bus specifications should be revised to encourage manufacturers to improve their bus and to give local officials more options. In fact, General Motors believes there would be more of an incentive to improve buses and a more competitive market if the Federal specifications did not exist. Officials of the American Public Transit Association told us that they generally favor eliminating the Federal specifications.

Five of the transit authorities we contacted had purchased advanced design buses and three of them favored revising the specifications. The common reason for transit authorities wanting the

specifications revised was to give them more flexibility in selecting options, such as windows that open. Two transit authorities did note that over time the specifications have been revised to give transit authorities more options. For instance, a December 1980 addendum to the specifications made air conditioning, auxiliary heaters, and stepwell heaters optional. As the Acting Director of UMTA's Office of Program Management explained, some cities do not need a heater on the steps to prevent water from freezing.

CHAPTER 3

PROBLEMS EXPERIENCED WITH ADVANCED DESIGN

BUSES AND THE ADEQUACY OF BUS WARRANTIES

Transit authorities have had problems with advanced design buses, such as cracked undercarriages and air conditioning system failures, which the manufacturers are working to resolve under the terms of their warranties. However, some unresolved issues still exist.

PROBLEMS EXPERIENCED WITH ADVANCED DESIGN BUSES

Transit authorities have experienced considerable maintenance and reliability problems with Grumman's advanced design buses. The most serious problem has been cracks in the Grumman Flexible buses' undercarriage.

Five of the six transit authorities we contacted had purchased Grumman's advanced design buses and all five claimed serious bus problems. Some of the problems mentioned were (1) frequent air conditioning and transmission failures, (2) doors that fall off their tracks, (3) windows that pop out, (4) fuel tanks that drop off the bus while it is in motion, and (5) cracks in the bus undercarriage.

Two of the transit authorities had also purchased General Motors advanced design buses. One of these transit authorities said it had fewer problems with its General Motors buses than with its Grumman buses. The other transit authority said its General Motors buses (1) had frequent air conditioning system failures, (2) have inadequately designed doors, and (3) require excessive amounts of fuel because they are so heavy. The latter transit authority said that General Motors has corrected the air conditioning problem and reduced the bus weight, which has improved fuel consumption a little bit.

Comparing advanced design buses with their predecessors, transit officials claimed advanced design buses

- have fewer seats so more buses, drivers, and mechanics are required to carry the same number of people and

- have redesigned brakes which require replacement of brake linings three to five times more frequently.

The most serious problem has been the cracks in the Grumman Flexible buses' undercarriage. The bus' chassis, unlike automobiles and other buses, is built with a series of assemblies manufactured separately and joined to the vehicle. Four major assemblies which make up much of the bus undercarriage have developed cracks.

In January 1981, the Grumman Flexible Corporation announced a safety problem may exist in some of its advanced design buses. The safety problem is caused by the cracks in part of the undercarriage called the trunnion. If the trunnion should break, the bus could be difficult to control. The corporation notified all 27 cities using the bus and developed inspection procedures for identifying which of over 2,600 buses might be affected so that the others can be safely operated until reinforced. The Corporation said it intends to reinforce all of its buses at its own expense.

Some transit authorities found undercarriage cracks around the time of the corporate announcement. But a Georgia transit official said his authority has had undercarriage cracking problems since 1979 and Grumman Flexible was aware of it. A Grumman Flexible official acknowledged the company was aware of the authority's problem as early as 1979, but said it was thought to be an engineering anomaly and an isolated case.

The problem was discovered recently in New York City buses and received wide publicity. New York started receiving Grumman Flexible buses in the summer of 1980, found undercarriage cracks by November, and withdrew all of their over 600 buses from service in December 1980 because of undercarriage cracks. As of early May 1981 all of New York's Grumman buses were still out of service.

UMTA IS AWARE OF BUS PROBLEMS BUT DOES NOT
ASSUME BUS PERFORMANCE RESPONSIBILITIES

Although UMTA provides transit authorities with 80 percent of the funding to purchase buses and knows that serious problems exist with some buses, it generally does not assume any bus performance responsibilities and does not attempt to identify the extent to which problems being experienced by individual transit authorities are occurring industrywide.

The Acting Directors of UMTA's Offices of Bus and Paratransit Technology and Program Management and their staffs said they are aware of some problems with advanced design buses. For example,

- undercarriage cracking on Grumman Flexible buses,
- transmissions having to be rebuilt every 25,000 to 30,000 miles on General Motors and Grumman Flexible buses,
- brakes wearing out every 7,500 to 10,000 miles on General Motors and Grumman Flexible buses,

--doors falling off on General Motors' buses, 1/ and

--bus windows falling out on Grumman Flexible buses.

According to UMTA's Acting Director of Program Management, when UMTA becomes aware of a bus problem, it asks the manufacturer what it is doing about it. However, he said corrective action would not be documented in UMTA's files, and UMTA officials may not know what corrective action has been taken.

UMTA generally would not be aware of all the problems with advanced design buses because it does not follow through to see how buses are performing once they have been purchased. An acting UMTA program director said he does not believe bus performance could be assessed by asking transit authorities how the buses are performing because so many variables, such as topography and maintenance practices, influence bus performance. This official said that transit authorities usually only notify UMTA of a bus problem when they consider it to be a serious one. He said transit authorities generally prefer to work directly with manufacturers to avoid bad publicity and a poor working relationship.

One serious problem UMTA was aware of was the undercarriage cracks in Grumman Flexible buses. UMTA considered sponsoring a stress test of the undercarriage before Grumman Flexible Corporation acknowledged the problem. Also, because this was a potential safety problem, UMTA began an inquiry in January 1981 to obtain information about structural problems from transit authorities having the Grumman Flexible bus as well as from the manufacturer. The safety issue caused the National Highway Traffic Safety Administration to require the manufacturer to submit quarterly defect information reports to the Safety Administration until all defective buses have been fixed.

ADVANCED DESIGN BUS WARRANTIES AND
MANUFACTURER RESOLUTION OF PROBLEMS
ARE CONSIDERED ADEQUATE

Advanced design bus warranties are comparable to or better in some respects than warranties for predecessor buses. Transit authorities were satisfied with their advanced design bus warranties, and, for the most part, they considered the manufacturer's performance adequate. However, whether transit authorities will be satisfied with Grumman Flexible's warranty performance in correcting the undercarriage problem is uncertain as the buses are still being repaired. Also, the company has not decided whether

1/Transit authorities we contacted claimed Grumman Flexible doors fell off their tracks.

it should assume liability for costs transit authorities incurred when they withdrew buses from service.

The advanced design bus specifications contain warranty requirements that are in addition to any statutory remedies or warranties imposed on the manufacturer. The specification provides that the complete bus be warranted and guaranteed to be free from defects for 1 year or 50,000 miles, whichever comes first after acceptance. Specific subsystems and components are further warranted to be free from defects as illustrated by the following examples

<u>Item</u>	<u>Whichever occurs first</u>	
	<u>Years</u>	<u>Mileage</u>
Engine	2	200,000
Transmission	2	100,000
Basic body structure	3	150,000

We reviewed the warranty received by the transit authority that had purchased the new look buses, and the complete bus warranty was essentially the same as the warranty for advanced design buses. However, the warranty for the engine and major components was not as good; it only covered a period of 2 years or 100,000 miles, whichever occurs first.

The five transit authorities contacted that purchased advanced design buses were satisfied with their warranties. Two said the warranty was good and another said it was serving the authority well. American Public Transportation Association officials consider the advanced design bus warranty to be a standard type of warranty offered by manufacturers. They noted that additional warranty protection would eventually be paid for by the transit authorities in the form of higher bus prices.

For the most part, the transit authorities contacted considered the manufacturer's warranty performance adequate. One transit authority did say it would like more timely resolution of warranty claims, but this was considered to be solely an issue between the authority and the manufacturer. Another transit authority said several serious problems have not yet been adequately resolved by Grumman Flexible, but the manufacturer's performance was adequate.

Grumman Flexible has voluntarily extended the 3-year, 150,000-mile basic body structure warranty to 6 years, or 300,000 miles, because of the undercarriage cracking problem. A Grumman

Flxible official said that undercarriage work at the company's expense is underway but not on the New York City buses. In New York, Grumman Flxible and the transit authority jointly appointed a three-member panel of experts to formulate a program for tests, sign-off, and certification that the reinforcing program would eliminate similar failures. One major test of the engine cradle had not been completed yet (early May 1981).

Grumman Flxible's target date for completing undercarriage reinforcements of all its buses is the end of August 1981. This completion date, however, depends on the results of the engine cradle test because Grumman Flxible has promised other transit authorities their bus reinforcements will be nothing less than the New York bus reinforcement. Thus, it is possible that Grumman Flxible buses may need additional work.

Another issue that has not been resolved is who is responsible for additional costs incurred when transit authorities leased buses to replace their Grumman Flxible buses removed from service. Some transit authorities believe Grumman Flxible is liable; however, in early May 1981, a Grumman Flxible attorney said the company had not reached a decision on the issue.

CHAPTER 4

TESTING OF ADVANCED DESIGN BUSES

Substantive testing of the advanced design buses has been limited primarily to those tests conducted by the respective bus manufacturer. UMTA did not perform any tests to ensure that the General Motors or Grumman Flexible advanced design buses met UMTA's specification performance requirements. Testing by transit authorities, when the buses are delivered, is generally limited to identifying obvious defects. Many transit officials said additional bus testing is needed and the Federal Government should have a greater role.

UMTA DOES NOT ASSUME RESPONSIBILITY FOR TESTING BUSES

UMTA generally does not assume any responsibility for testing buses and does not require any testing to demonstrate that the buses being funded meet the requirements of its specifications.

Officials of UMTA's Office of Program Management said that UMTA does not accept responsibility for vehicle testing because it (1) does not have the staff for certifying a product, (2) does not want to get involved in local transit authority issues, and (3) is concerned about Federal liability if they essentially certified a product and a problem developed. The Acting Director of Program Management illustrated UMTA's lack of involvement with vehicle testing by noting that UMTA did not receive or even ask for the results of manufacturers' tests of the advanced design buses.

UMTA's Acting Director of Bus and Paratransit Technology said his office would want to get involved in a testing assistance role only. He said an example of this role would be if a transit authority requested UMTA assistance for testing unproven technology, the Office of Bus and Paratransit Technology could provide consultant support for developing a test plan but not conducting the tests.

UMTA did fund advanced design bus specification compliance testing by two transit authorities. However, neither transit authority or UMTA has made the testing results public. UMTA's Acting Director of Program Management said UMTA has never asked the transit authorities for the test results.

The absence of UMTA-sponsored tests and the unavailability to transit authorities of data for tests already conducted means that transit authorities are purchasing advanced design buses without adequate information about how well the buses perform in relation to UMTA's specification performance requirements.

UMTA SPECIFICATION REQUIREMENTS FOR TESTING AND INSPECTION

UMTA's advanced design bus specifications state that the procuring transit authorities should be represented at the bus manufacturer's plant by inspectors. These inspectors are suppose to monitor the manufacture of buses, approve predelivery acceptance tests, and release buses for delivery.

The predelivery tests are conducted by the manufacturer and may be witnessed by the transit authority inspectors. The tests include visual and measured inspections, as well as testing the bus' total operation. Total bus operation is evaluated during road tests, and the specifications provide that each bus should be driven at least 15 miles during road tests.

According to American Public Transit Association officials, there are problems with the way transit authorities perform the required inspection at the manufacturers' plants. The problems occur because some transit systems do not have the qualified personnel to effectively conduct inspections, and as a result inspections by transit authorities are inconsistent. The association said both General Motors and Grumman Flxible have complained that the level of inspection at their factories by different transit systems has been erratic and without criteria. A Grumman Flxible official said some transit authority inspectors visit a bus manufacturing plant to inspect production and end up trying to redesign the bus.

Another responsibility the advanced design bus specifications assign to the purchasing transit authority is conducting postdelivery tests. The specifications provide that transit authorities may conduct acceptance tests on each bus delivered to identify defects that have become apparent between the time of bus release and delivery.

Five transit authorities we contacted had purchased advanced design buses. Four of the five said they did not perform any testing beyond the postdelivery testing called for in the specifications. One transit authority said its postdelivery testing is limited to discovering obvious problems, such as bus damage in transit. Another transit authority said it just visually inspects new buses and no real testing is ever done because it just does not have the capability to certify that a bus meets performance requirements.

ADVANCED DESIGN BUS TESTING PERFORMED BY BUS MANUFACTURERS

Substantive testing of advanced design buses has been left to the manufacturers. Both manufacturers have conducted varied tests.

A General Motors' official said testing of their advanced design buses included dynamic and shaker tests as well as testing at proving grounds in Michigan and 8 to 10 weeks of operational testing in San Antonio, Texas. The dynamic testing was conducted by bouncing a moving bus up and down. The shaker tests were conducted by lifting the bus off the ground on four pads with each pad shaken up and down in simulation of a city's street conditions so that critical stress points could be examined.

A Grumman Flexible official said their advanced design bus underwent dynamic testing, and the whole bus structure was evaluated through a shaker test that emulated actual city street conditions. He said their advanced design bus was tested to one and a half million miles at Riverside, California, in the early 1970s. Also, the official said the company sold a bus to New York City in anticipation of winning a large order, and this bus ran on New York streets for about 1 year. New York had a consultant inspect the bus and the only structural problem the consultant found was that the area around the window seams needed to be reinforced.

OPINIONS ABOUT THE ADEQUACY AND NEED FOR MORE TESTING

Most of the transit officials we contacted thought that the Grumman Flexible bus should have undergone more testing. Also, these officials generally said that additional bus testing was needed and that the Federal Government should have a greater role in such testing.

Officials in UMTA's Office of Bus and Paratransit Technology said the structural testing of Grumman Flexible's advanced design bus was not as much as it should have been or it would have disclosed the undercarriage structural problem. These officials believe vehicle testing is best handled by the manufacturer and the purchasing transit authorities. However, since many transit authorities are small and do not have any bus testing expertise, they believe it essentially has to be up to the Federal Government to make sure that buses are adequately tested.

American Public Transit Association officials said, given the underframe structural problems with Grumman Flexible buses, more testing should have been done. These officials said the association supports additional testing and recently submitted two unsolicited testing/inspection proposals to UMTA for funding.

Its first proposal (December 1980) was to develop, organize, and implement a uniform bus inspection program for transit buses. The second proposal (January 1981) was to develop, organize, and implement a specification compliance testing program for transit buses. An UMTA project manager in the Office of Bus and Paratransit Technology said the uniform bus inspection proposal was rejected because UMTA considers bus inspections to be a local

issue. UMTA's Acting Director of Bus and Paratransit Technology said the specification compliance testing proposal will be considered after it has been rewritten by the association.

Five transit authorities we contacted thought the undercarriage problems with the Grumman Flexible buses could have been discovered earlier through testing. Three of the four transit authorities expressing an opinion on the need for additional bus testing thought the Federal Government should have a stronger role. These officials said:

--The Federal Government should play a stronger role in assuring that transit vehicles are adequately tested. The Federal Government should grant approval to transit authorities to procure buses only after testing has proved the vehicle reliable and safe.

--The Federal Government pays 80 percent of the cost of a bus, yet it has never qualified or certified advanced design buses. Since transit authorities do not have the capability to test and determine that a vehicle meets performance specifications, it has to be the responsibility of the Federal Government.

--It was assumed that the Federal Government had test results showing advanced design buses were reliable. Examining test results to verify bus reliability is an appropriate role for the Federal Government.

The fourth transit authority said bus qualifying tests are good but they are also restrictive and may force a manufacturer out of the market.

The Public Transportation Director of General Motors said the company has conducted comprehensive advanced design bus testing and stressed that its buses have not had a structural problem like Grumman Flexible's. This official said bus manufacturers should be the ones to certify whether they are able to meet Federal specifications. He further said that Federal bus involvement should be lessened.

Grumman Flexible thought that it had conducted adequate testing of its bus. Grumman's analysis of its test results did not indicate that the buses would have the structural problem experienced. It considers the problem to be unexpected fatigue failure which is difficult to predict. In hindsight, a Grumman Flexible official said more operational testing should have been done. He said the Federal Government needs to be involved in bus testing and in assuring uniform bus inspections.

CHAPTER 5

OBSERVATIONS AND ALTERNATIVES

In discussing our work with the chairman's office, we were asked to provide the subcommittee with our observations and ideas about alternatives to the present situation regarding the bus procurement process and UMTA's role in it. This section discusses a different role that UMTA might play in this process and some alternative ways that this might be done. The requirement that we provide the subcommittee with a report by the end of May 1981 considerably limited the scope and depth of our work, and as a result, we were not able to fully consider and evaluate the implications, costs, and potential effects of the alternatives presented. Consequently, the alternatives are not being offered as recommendations but rather as ideas for investigation and consideration.

OBSERVATIONS

UMTA views its role in the bus procurement process as primarily a source of funding. Although UMTA issued advance design bus specifications, it never conducted or requested test results to demonstrate that the advance design buses it was funding met its specifications. If such testing evidence had been available, some of the problems experienced with advanced design buses might have been identified and corrected before the buses were placed into service.

The problems being experienced with advanced design buses can result from shortcomings in either the vehicle's design or the manufacturer's quality control. Although advanced design buses are being purchased with 80 percent Federal funds against UMTA established specifications, UMTA has not conducted, or required the manufacturers to conduct, tests that would determine if the advanced design buses meet its specification performance requirements. Also, UMTA does not conduct any tests or inspections of the manufacturers' production process and quality control procedures.

UMTA considers transit authorities responsible for ensuring that the buses they buy meet its specification performance requirements. UMTA also considers the transit authorities responsible for adequately testing and inspecting the buses they are buying and the manufacturing process under which they are produced. UMTA will, as part of its capital grant funding, fund 80 percent of the costs of such testing. Two large transit authorities did test the performance of the advanced design buses to measure vehicle performance against the requirements of the specifications. However, the results of these tests are not available to other transit authorities or the American Public Transit Association because the test results have never been made public by the two transit authorities and UMTA has never requested the results of the tests even though 80 percent of the costs of the tests was funded by UMTA.

Under this situation, each transit authority would have to conduct its own performance testing to determine that the vehicles being purchased meet the performance requirements of the specifications. However, most transit authorities have not conducted performance tests and many transit authorities do not have the capability to conduct such testing. Furthermore, such testing by each purchasing transit authority could be considered duplicative and an inefficient use of Federal funds.

ALTERNATIVES

The alternatives discussed point to a more direct role for UMTA in performance testing and will be affected by UMTA's pending decision about retaining its advanced design specifications or making them optional.

Alternative for performance testing if UMTA specifications are continued

If the specifications are continued, UMTA could require that the performance of each vehicle design being considered for purchase with UMTA funding be tested to determine its performance against the specifications. Such tests would be conducted when the vehicle is first going to be offered for purchase to the transit industry. The results of the tests would be made available industrywide.

One way that UMTA could accomplish this would be to require the vehicle manufacturer to design and conduct the tests under UMTA and transit industry supervision. Another way would be for UMTA to sponsor a third-party organization to conduct tests that would be designed in conjunction with the transit industry and the manufacturer. If the tested vehicle did not meet one or more of the performance requirements, several options could be considered. The vehicle could, depending on the seriousness of the performance shortfall, be designated as ineligible for purchase with Federal funds or the manufacturer's bid price in a price-competitive procurement could be penalized by a predetermined price offset to reflect the vehicle's failure to meet required performance levels.

A manufacturer whose vehicle did not meet all of the performance requirements could work to correct the performance shortfalls and have the vehicle retested.

Alternatives for performance testing if UMTA specifications are made optional

If UMTA makes its advanced design bus specifications optional, it might still either require the manufacturer or fund a third-party organization to conduct specified performance testing of the vehicle against the specifications. As in the first situation the testing would be conducted under the supervision

of UMTA and industry representatives and the test results would be made available to all transit operators for their use in making bus procurement decisions.

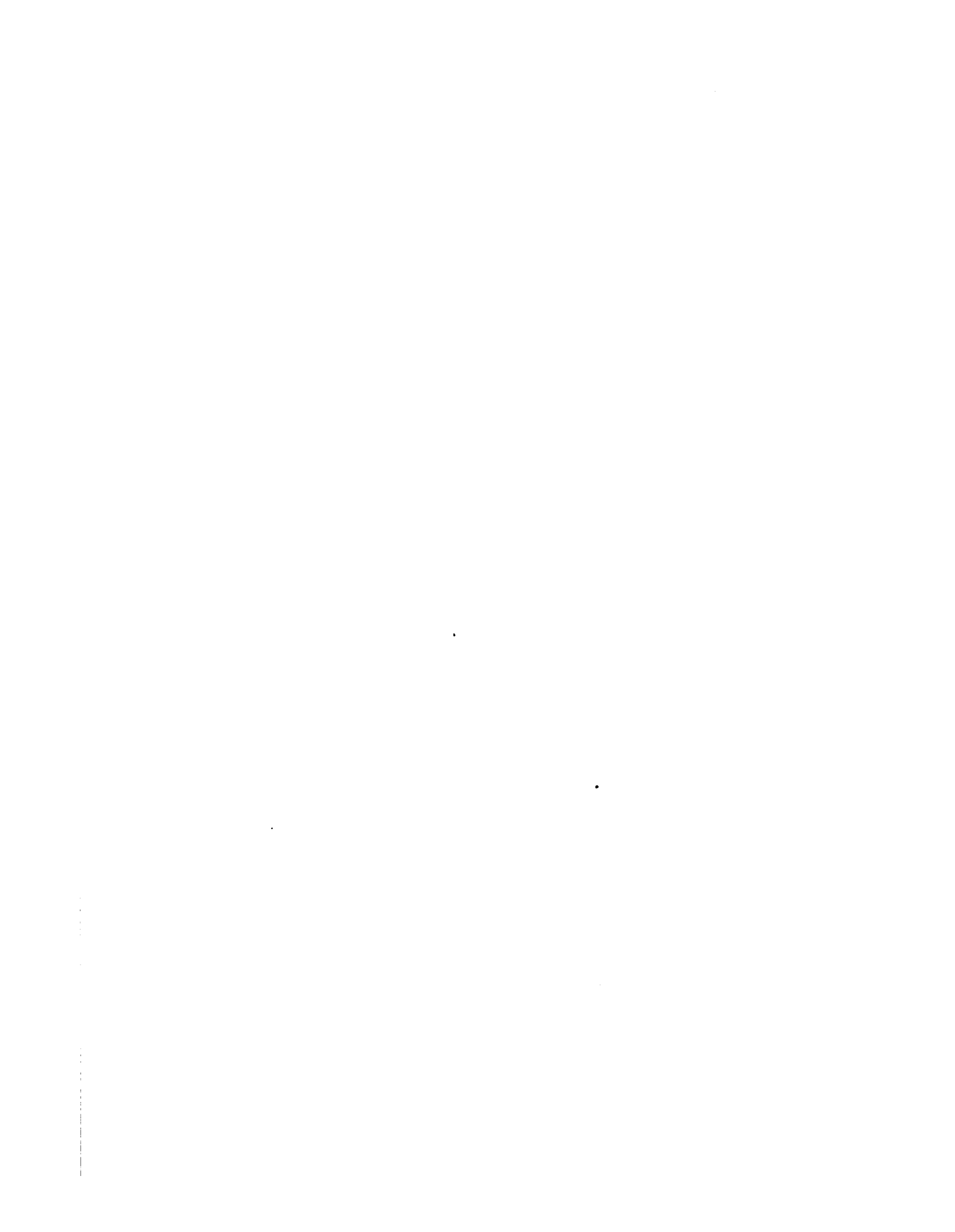
Alternative for performance testing
if UMTA specifications are rescinded

Even if UMTA rescinds its advanced design bus specifications, it could still play a role in vehicle performance testing. This role would consist of UMTA working with the transit industry and the manufacturer to design standardized performance tests that would be required for all bus designs before they could be purchased with UMTA funds. The results of these tests would be provided to all transit authorities so that they would be able to compare the relative performance of competing bus designs in making bus procurement decisions. As in the previous situations, these tests could be conducted by either the manufacturer or a third-party organization under the supervision of UMTA and industry representatives.

Alternative for quality control
inspections

UMTA assumes no responsibility for and places no requirements on the manufacturer's quality control process. In its advanced design bus specifications, UMTA assigns responsibility for ensuring the adequacy of the manufacturer's quality control process to the individual purchasing transit authorities. Many transit authorities lack the capability to adequately satisfy this responsibility. Also, having each purchasing transit authority perform quality control inspections could be considered duplicative and inefficient.

An alternative might be for UMTA to fund a quality control inspection procedure for the transit industry rather than funding the activity by individual transit authorities as it now does. Under this approach the adequacy of an individual manufacturer's production and quality control process could be uniformly inspected and monitored against standards established jointly by the industry and UMTA. If an individual transit authority wanted to do something more extensive, it would be free to do so at its own expense.





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