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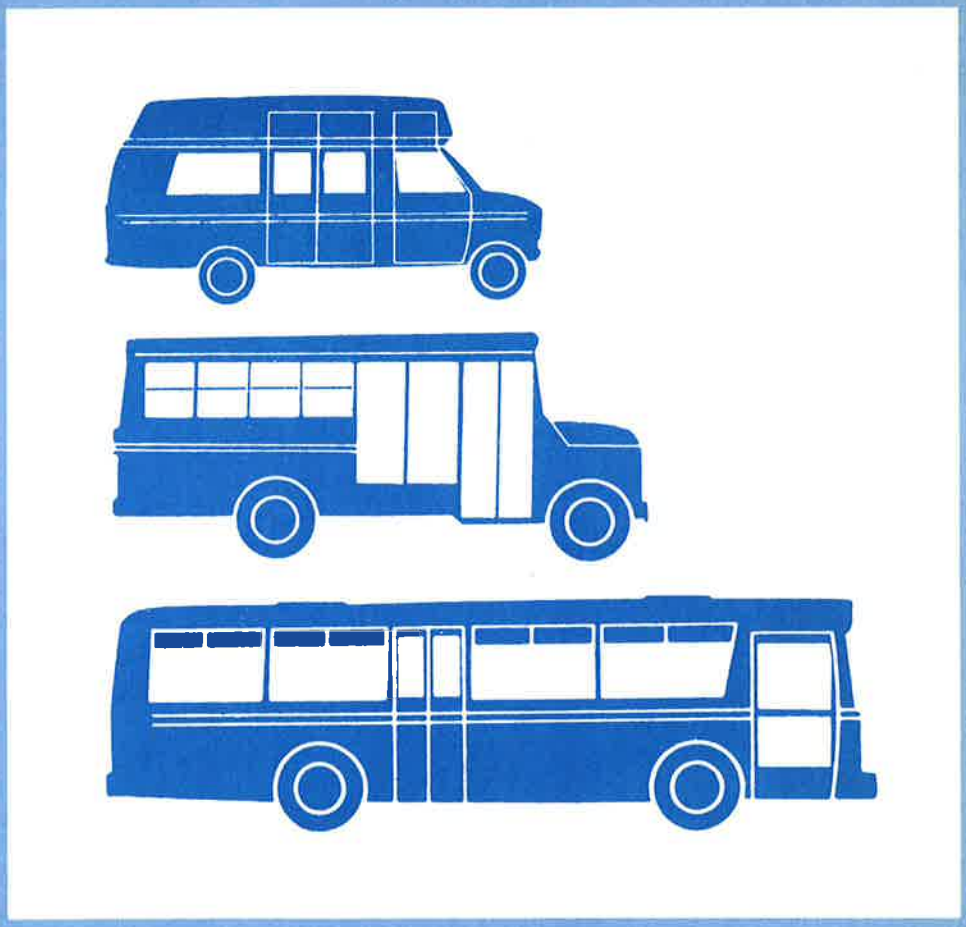
U.S. Department
of Transportation

**Urban Mass
Transportation
Administration**

Small Transit Vehicles
Conference Summary

Prepared by:
Dynatrend Incorporated

October 1982



Technical Assistance - an UMTA Program

NOTICE

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Small Transit Vehicles
Conference Summary

Fort Worth, Texas
May 18 – 19, 1982

Prepared by:
Dynatrend Incorporated
21 Cabot Road
Woburn MA 01801

October 1982

Office of Technical Assistance
Office of Bus and Paratransit Systems
Washington DC 20590

PREFACE

The small transit vehicle (less than the standard 35-foot bus) has been increasingly used by both large and small transit properties in a variety of service environments. In spite of this growth in the use and supply of small transit vehicles, several problems remain in their availability and operation. Moreover, transit operators, state and local govenment officials, manufacturers and the U.S. DOT (UMTA) have not had the opportunity to meet and exchange information on small transit vehicles. This Conference Summary documents one of the first meetings of these individuals to exclusively review and discuss the small transit vehicle.

The Panelists for each of the five sessions represent key resources in the small transit vehicle field. Their individual presentations and the ensuing discussions with conferees are summarized herein. Key references related to each presentation are documented and each panelist's mailing address is contained in the attendance roster enclosed in the Appendix to this document.

Another major facet of the conference was a vehicle display held concurrently with the Conference. Over twenty-three manufacturers of small transit vehicles had models from their product line available for inspection by conference attendees. Representatives of each manufacturer in attendance are contained in the attendance roster.

The Conference Agenda and Arrangements were developed by the Conference Chairman, Ramon A. Lopez, Chief of the Urban Mass Transportation Administration's (UMTA) Office of Bus and Paratransit Systems New Vehicles and Facilities Division and Glen E. Ford, the UMTA Regional Administrator for Region 6. Support to the Conference was provided by James Dumke at the Transportation Systems Center in Cambridge, Massachusetts.

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1.0 INTRODUCTION

1.0 INTRODUCTION

The Small Transit Vehicles Conference was convened in Fort Worth, Texas on May 19, 1982 by the Conference Chairman Ramon A. Lopez, Chief of the Urban Mass Transportation Administration's (UMTA) Office of Bus and Paratransit Systems New Vehicles and Facilities Division. The conference, sponsored by UMTA and the Region 6 UMTA Administrator, Glen E. Ford, with the cooperation of the Federal Highway Administration was held to meet two objectives. The primary objective was to provide UMTA with a current estimate of the development and technical assistance efforts needed to improve the economy and performance of small transit vehicles (smaller than the 35 foot standard bus). Secondly, the conference was to serve as a forum in which transportation service providers, state and local government officials, and vehicle and component manufacturers could gain a better understanding of the needs for and availability of small transit vehicles.

This Conference Summary Report provides a summary of the conference sessions. Rather than present a full transcript of each panel and the ensuing discussion, the salient features of panelist's presentations and the topics addressed in discussions are included. This document follows the sequence of the final Conference Agenda. After a review of the remarks made by Mr. Lopez, summary notes from the following panels are presented:

- Vehicles for Fixed Route Service
- Vehicles for Special Transportation Service
- Procurement of Small Vehicles
- Maintenance and Rehabilitation
- Special Equipment

Following the final panels' notes, a set of conference conclusions and directions for future work in this area are presented. These conclusions represent the viewpoints of panelists, conferees, the sponsors and organizers (Transportation Systems Center) of the conference.

Finally, an appendix lising conference attendees is included to foster continued interaction of participants active in one or more aspects of the small transit vehicle field.

2.0 UMTA'S CURRENT SMALL BUS AND PARATRANSIT PROGRAM

RAMON A. LOPEZ, CHIEF, NEW VEHICLES AND FACILITIES DIVISION
OFFICE OF BUS AND PARATRANSIT SYSTEMS

2.0 UMTA'S CURRENT SMALL BUS AND PARATRANSIT PROGRAM - RAMON LOPEZ

The Urban Mass Transportation Administration has a variety of activities underway with the cooperation of the transit industry to address the need for and problems of small transit vehicles. This conference offers a unique opportunity to improve the dialogue between the major organizations concerned with small transit vehicles. Mr. Lopez, in introducing the objectives of conference, highlighted the activities of UMTA in the field.

A major undertaking by the DOT and the transit industry is the New Bus Equipment Introduction Program known as the NBEIP[1]. Under this cooperative program UMTA and several transit operators are attempting to assess the following factors for several domestic and foreign transit vehicles:

- Fuel Efficiency
- Accessibility
- Reliability
- Maintenance Costs

Of special interest to this conference is the UMTA decision to award two of the first four grants in the NBEIP to agencies which proposed to test small buses. Each agency will evaluate ten small transit vehicles through a comprehensive testing program within regular transit service. These tests are designed to generate assessments of such varying vehicle characteristics as:

- Diesel Propulsion
- Accessibility features such as low floors and wide doors
- Heavy Duty Suspension and Chassis
- Disk Brakes

The Central Ohio Transit Authority in Columbus, Ohio and the Michigan Department of Transportation in Lansing, Michigan were the agencies selected to participate in this program and are represented by panel members at this conference.

[1] See Section 5.0 for reference.

Another major program aimed at the small transit vehicle market is the Paratransit Vehicle Program. The program stemmed from industry concern over the need for a vehicle which could efficiently meet the needs of operators providing a variety of transportation services. For example, the following applications were all envisioned for such a vehicle:

- Private Taxis
- Shared Ride Taxi
- Elderly and Handicapped Service
- Subscription Service
- Jitney Service

The program resulted in the development of two prototype vehicles[2]. Currently, the vehicles are being tested in Cleveland, Ohio and Miami, Florida to gain data on their utility and cost to operators of paratransit systems.

A number of other UMTA bus projects are in various stages of development. These are primarily directed at improving components of standard transit buses. However, many of the technologies will also be useful to heavy-duty small transit vehicles. The present roster of projects includes:

- Scania Bus Demonstration
- First Article Revenue Service Testing
- Bus Rehabilitation
- Advanced Air Conditioning for Buses
- Evaporative Cooler
- Air Conditioning Improvement
- Air Conditioning Modification
- Bus Subsystem Improvements
- Bus Brake Retarders
- Bonded Brake Linings
- Transmission Improvements

[2]See reference in Section 5.0.

- V730 Fault Detection
- Structural Evaluation
- Methanol Powered Bus
- Battery Bus Evaluation
- Alternative Fuel Study
- Bus Noise Reduction Kits
- Stored Hydraulic Energy Propulsion
- U.S. Transit Bus Manufacturing Industry
- Technology of Articulated Transit Buses

It was noted that each of these programs was characterized by its pragmatic focus, financial participation of transit operators, cooperation with transit properties and coordination with APTA's Bus Technology Liaison Board.

Mr. Lopez indicated that with the new approaches to financing transit now being considered or implemented, it was apparent that more capital investments would be made by properties. Furthermore, the capital stock of properties would require better utilization to maintain financial goals and objectives.

Four roles for UMTA in this new environment are evolving:

1. UMTA can aid in assessing how technology or information on vehicle components, operating equipment or techniques and maintenance equipment and practices can be transferred to enable properties to get more for their dollar.

2. UMTA can assist the industry through cost sharing to stimulate innovative practices.

3. UMTA can function as a bus transit "Information Manager".

4. UMTA can aid in introducing new equipment without adversely impacting operators.

Mr. Lopez concluded his remarks by reviewing the future direction and funding of UMTA development programs. He indicated that fewer dollars would be spent on direct research and development grants in favor of greater emphasis on cooperative agreements with the industry. Moreover, more funds would be devoted to improving bus subsystems technology. Instead of introducing new vehicles, the future will result in an upgrading of existing buses by overcoming specific problems experienced by the industry.

3.0 PANEL SESSIONS

SMALL VEHICLES FOR FIXED ROUTE TRANSPORTATION SERVICES

Moderator: James Reading, General Manager, Central Ohio Transit Authority (COTA)

Panelists: Kamel Boctor, Manager, Technology Development Unit, Michigan Department of Transportation (MDOT)

Clyde (Skip) Massey, Jr., Director, Brownsville Urban System, Brownsville, Texas

Frank Varker, Varker and Associates, Trumball, Connecticut

Summary of Presentations

The panel members focused their presentations on the definition and explanation of the factors determining the type of small transit vehicles needed for fixed route service. Additionally, the status of the current market of small transit vehicles was reviewed and the key aspects of conducting a life-cycle cost analysis of vehicles for fixed route service defined.

Under the New Bus Equipment Introduction Program (NBEIP), sponsored by UMTA, the Central Ohio Transit Authority (COTA) and Michigan Department of Transportation will each purchase ten small buses to assess the ability of each vehicle to meet the fuel efficiency, accessibility, reliability and maintenance objectives of operators of small vehicles. These types of small vehicles are increasingly being used in a number of transportation services including fixed route, feeder service, downtown shuttles and demand responsive service. The Program will also provide maintenance and operating cost data for life cycle cost comparisons.

The uncertainties of the market for these vehicles has restricted the amount of choice in design options and limited continuity in the market. Instead of producing a heavy duty small transit vehicle, the manufacturing community has adapted vehicles in their product line for transit use. This has impacted the

reliability of service and extended maintenance budgets. Although twice as many light duty small vehicles could be purchased as heavy duty vehicles, operating costs offset this advantage.

Another panelist delineated the factors which should mold the selection of a small transit vehicle. First, the cost of operation should be evaluated. Ninety percent of all operating costs are represented by personnel, fuel, insurance, and maintenance. A small transit bus and the design of a fixed route itself should be performed around these parameters. Second, manueverability must be assessed. The street system over which the vehicles operate now and in the future should be reviewed to identify such factors as turning radii and traffic load. Third, the public acceptance of a vehicle must be reviewed. Without the backing of the public the vehicles will operate at less than their optimal capacity. Finally, durability is a major consideration. Operators should set goals for their vehicles in terms of years of service and/or miles. A vehicle is mismatched for its service if it deviates significantly from anticipated goals.

The lack of a number of models and sizes of vehicles specifically designed for fixed route service was underscored by a panelist. The smaller vehicles have evolved not from the design table, but rather specific features have been attached to an existing design which was not intended for transit use. Any significant advances in this field will require that buses be designed more from a statement of needs from the operators.

Michigan DOT categorized small vehicles into medium-sized buses (25-30 passenger seating capacity), small buses (18-24 passengers), and modified vans (less than 18 passengers). It has elected to specify a heavy-duty diesel powered, accessible small bus (18-24 passengers) for procurement and testing under the New Bus Equipment Introduction Program. This is the market which has been dominated by body-on-chassis adaptations. The Michigan decisions are based on life-cycle cost estimates and statewide needs for a variety of services.

Conferees were informed of an upcoming contract for a manual which will enhance the ability of transit operators to acquire and operate small transit vehicles. This manual will eliminate the current information gap in small vehicles needs and specifications development. For example, the following service and operating environment factors will be addressed:

- Maximum and average load
- Type of service
- Grades
- Dwell time
- Weather
- Frequency and degree of acceleration and braking
- Wheelchair (lift requirements)
- Fare collection equipment

This data and a variety of other information will enable operators to better estimate capital and operating costs and arrive at solutions to problems currently experienced in their operation of small transit vehicles. The contract for the manual will be sponsored by UMTA and managed by the Transportation Research Board under the National Cooperative Transit Research and Development Program.[3]

Discussion Topics

Several topics were discussed with panel members including the definition of light versus heavy duty transit vehicles. One definition offered was based on the number of service miles between a major engine overhaul. Typically, a light duty vehicle will operate for 150,000 miles before an overhaul while heavy duty vehicles will operate for 400,000 miles.

Another panelist discussed rustproofing options for transit vehicles. Buyers of vehicles should investigate the processes used by different manufacturers

[3]See Section 5.0, References.

and evaluate them against their environmental conditions. Rustproofing requirements should then be placed in the specification to insure that they are addressed by each bidder.

The availability of 18-24 passenger vehicles was reviewed. Several manufacturers noted that their product lines included vehicles of this type. They noted that buyers interested in heavy duty buses will incur an increased price in vehicles of this type.

SMALL VEHICLES FOR SPECIAL TRANSPORTATION SERVICES

Moderator:. Steve Klika, Central Oklahoma Transportation and Parking Authority

Panelists: Dr. Sandra Rosenbloom, Center for Transportation Research, University of Texas at Austin
John Schaeffer, Manager, Mobility Impaired Transportation Service (MITS), Fort Worth, Texas
Jim Head, Manager, Transit Division, Arkansas State Highway and Transportation Department

Summary of Presentations

The panel members concentrated their presentations on the types of equipment required for special transportation services, which typically provide mobility for elderly and/or handicapped clients; the problems they have encountered within their own experiences; and the improvements needed in small vehicles and their components to ensure safe, economical, and effective special transportation services.

Equipment issues to be considered when selecting a small vehicle for special transportation service include:

- Safe and convenient entry and exit

  - interior ceiling height: 72-74 inches
  - doorway height: no known recommendation
  - aisle width: 32 inches (wheelchairs, crutches), 19 inches (walkers), 16 inches (ambulatory)
  - height of entry step: 7-13 inches
  - seating arrangement: perimeter seating safest on modified vans and body-on-chassis vehicles, but often unsatisfactory to clients

- Wheelchair lifts*

  - electro-mechanical vs. electro-hydraulic
  - sufficient load capacity for wheel chair, user, and escort: >450 pounds
  - placement on side of vehicle: good for urban, curbside service
  - placement on rear of vehicle: less prone to accidental damage
  - inside storage: reduces seating capacity, less prone to accidental damage
  - outside storage: does not interfere with seating arrangement

- Securement devices*

  - passenger restraint and wheelchair securement
  - impact on seating arrangement
  - effect largely psychological

- Air conditioning

  - factory installed: often ineffective
  - add-on: double warranty problem, electrical system difficulties
  - mounted on roof vs. installed on back of or beneath vehicle: less prone to damage on roof

- Spare tire and wheel

  - mounted conveniently out of passenger's way
  - especially important in rural areas

Common problems encountered in the procurement and operation of special transportation service vehicles, as cited by the panelists, include differing interpretations of vehicle specifications between vehicle consumers and sup-

*Discussed in more detail by the Panel on special equipment, page 22.

pliers; technical problems with components such as air conditioning, lifts, and electrical systems; and service delays due to the difficulty of finding replacement parts or maintenance facilities for non-standard vehicle components.

In order to avoid or mitigate the impacts of such problems, the following items of advice were passed on to service providers and others involved in procuring special service vehicles:

- Match the vehicle to the particular type of service for which it will be used and to the physical environment in which it will be operated, subject to budget constraints.

- Make no assumptions with regard to manufacturer responses when writing specifications - specify requirements clearly and in detail. Feel free to include such items as complete lists of parts and the addresses of replacement parts suppliers and maintenance facilities.

- Specify simple and/or standardized vehicle components and subsystems whenever possible.

- Consider the manufacturers' or dealers' reliability, availability, and cooperation in addition to their products.

Discussion Topics

The discussion following the panel presentations focused primarily on 1) the appropriate state and federal roles in the small vehicle purchase process; 2) sources of information on vehicle characteristics, engineering difficulties, and the process of developing specifications; and 3) the tradeoff between purchaser satisfaction and restrictive specifications.

Views on the first subject ranged from support for development at the federal level of standard specifications and/or vehicle prototypes, to the feeling that such standardization would be overly restrictive for individual opera-

tions providing various levels and types of services in different climates and physical environments. The concept of a set of voluntary industry standards was proposed as a possible solution - avoiding some of the complexities experienced in standard transit bus procurements. Engineering societies such as the Society of Automotive Engineers were suggested as a possible resource.

With regard to sources of information and assistance in the process of writing specifications, those suggested during the discussion include: State DOT's, UMTA, other operators, and the American Public Transit Association (APTA)[4]. Recent Technology Sharing[5] and Michigan DOT publications[6] were cited as good starting points for preparing contract documents.

As for the issue of restrictive specifications, it was felt that while it is possible to write specifications that are detailed enough to ensure the procurement of a suitable vehicle, it is oftentimes difficult to do so. The advice from experienced agencies was universally in favor of detailed, thorough specifications. However, other operators noted that managers in public transit agencies came from a variety and professional fields and seldom have experience in preparing automotive specifications.

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[4] See Reference in Section 5.0.

[5] Ibid.

[6] Ibid.

PROCUREMENT OF SMALL TRANSIT VEHICLES

Moderator: Frank Sherkow, Deputy Director, Iowa Department of Transportation, Public Transit Division

Panelists: Berenda Akins, Executive Director, Texarkana Human Development Center
Paul Carter, South Carolina Governor's Office, Division of Transportation
John Wolfe, Vice President, NTE Transit Management and Consulting Company, Inc.
Bernard Ruble, Principal Transit Planner, Rhode Island Public Transit Authority

Summary of Presentations

The panelists, representing the perspectives of state DOT's, service providers, and transit management consultants, discussed procurement methods and procedures that they have found to be useful and effective.

Iowa DOT, acting as either purchaser and initial title-holder (Section 18, 16(b)(2) vehicles), or as purchasing agent (Section 3 vehicles), employs a procurement process that emphasizes three elements: 1) comprehensive coordination from the beginning of the process among Iowa DOT's purchasing office, the Public Transit Division, the vehicle recipient, and the Federal Highway Administration; 2) an "approved equals" process; and 3) coordinated vehicle inspection and acceptance by Iowa DOT, FHWA, and the recipient. Normally, the approved equals process gives vendors the opportunity to propose particular components or equipment as substitutions for those included in the specifications; the agency must then approve or disapprove the proposed substitutions on a case by case basis, document decisions, and inform other vendors, all during the actual procurement process. Iowa's version reduces this time and staff burden by beginning with the distribution of a preliminary specification package to all prospective bidders. Comments and substitutions are solicited and considered at that time and then combined in a final specification pack-

age, which includes all approved equals. Iowa DOT also publishes a vehicle specifications brochure containing standard specifications and data from vendors, and holds statewide open bids that run for a specific period of time but are not associated with any particular procurement.

The Governor's Office, Division of Transportation in South Carolina has had success with holding bidders' conferences for all potential bidders to answer questions and to afford suppliers the opportunity to introduce any new equipment for the State's consideration. South Carolina also goes to bid annually to procure standard transportation equipment, which saves the local operators time and money in the procurement process.

More advice from the panelists on the subject of procurement and specifications included:

- Share information with each other and draw on the resources of state DOT's, universities, and U.S. DOT publications for aid.

- Require in the specification certification by the manufacturer of the vehicle's performance under the particular conditions that will apply to its operation.

- Utilize performance bonding to ensure that the manufacturer provides the equipment as described in the bid within a specified time period.

- Explain equipment problems to the supplier or original manufacturer (of a lift, for example) - it may be possible to obtain an extended warranty.

- Include a period for vehicle testing following delivery in the specification.

- Specify parts that are interchangeable between vehicles whenever possible.

- Use conversations with drivers, maintenance records, and transportation reports as sources of information on vehicle problems and suggestions for improvements.

- Items to include in specifications for special transportation service vehicles: fire extinguisher, first aid kit, seat belts, and infant seating with child-proof seat belts.

- Beware of over-sophisticated equipment.

One topic of special interest to the audience was the use of life cycle costing in vehicle procurement. Wording in the Fiscal Year 1982 Appropriations Act requires UMTA to be assured that life-cycle costs are evaluated by grantees prior to awarding procurement contracts assisted by funds from Section 16(b)(2) as well as Sections 3 and 5 of the Urban Mass Transportation Act. It is no longer adequate to "consider" life-cycle costs.[7] Nevertheless, little experience and very little data exist for operators to use in these evaluations. The Rhode Island Public Transit Authority (RIPTA) is in the process of issuing its second life cycle costing procurement for Advanced Design Buses, with the benefit of lessons learned during the first experience. Some of those lessons are also applicable to small vehicles. They include:

- Provide manufacturers with instructions as to how to respond to a life cycle costing bid request, e.g., what kinds of data and information are required.

- Consider requesting: information on special maintenance tools and/or training, especially for new products, and parts and service availability during anticipated vehicle life; technical publications, service and operating manuals; names of properties currently using the same type of vehicle; and a list of the bidder's deviations from the specifications.

[7] See Section 5.0, References.

- Do not compare the performance and maintenance characteristics of new vehicles to those already in operation by the property/agency.

- Request separate technical and price bids - lock sealed price bids away while evaluating technical bids, then open.

Discussion Topics

The questions asked of the panelists dealt primarily with life cycle costing issues, such as ways to estimate the fuel economy of body-on-chassis vehicles, the components of vehicle performance and maintenance that should be included in life cycle costing calculations, and methods of dealing with invalid data obtained during the bidding process.

Regarding body-on-chassis vehicles, the engine manufacturer might be able to supply information on fuel economy; if not, it would be useful to locate other operators who are currently using the type of vehicle in question under similar conditions, and ask about the gas mileage that the vehicle is achieving. A computer program[8] has been developed at TSC for truck and bus fuel economy estimates.

The operating cost components that RIPTA includes in its life cycle costing calculations are: fuel economy, oil consumption, preventive maintenance costs, and the frequency and cost of transmission and engine overhauls, brake realignment, and repairs to air conditioning and electrical systems.

Data validity is a problem in the life cycle costing procurement procedure that the property or agency must deal with. The use of separate technical and price bids give the buyer a period of time in which to evaluate manufacturers' data. Also, a regional/national testing facility to generate data for vehicle evaluations was suggested in addition to the need for a central repository on vehicle data especially for unsatisfactory equipment.

[8]See Section 5.0 for reference.

MAINTENANCE & REHABILITATION OF SMALL TRANSIT VEHICLES

Moderator:. Wayne Hale, VIA-San Antonio, Texas

Panelists: J. Bass Dyer, Pacific Bus Rebuilders, Los Angeles, California
Loretta Sharpe, Regional Transportation Program Inc.,
Portland, Maine
David Marsh, CCA Transportation, Smithville, Texas

Summary of Presentations

The panelists addressed several of the maintenance and rehabilitation issues facing operators of small transit vehicles. Beginning with the procurement process, panelists stressed the need to include maintenance requirements in the specifications for vehicles and then develop and implement actual programs based on the vehicle's needs. Additionally, it was noted that maintenance is an on-going function and not an area that can be deferred or minimized if service is to be reliable and productive. Also, the economics of rehabilitating equipment were discussed and several factors driving the rehabilitation decision delineated.

The key maintenance concerns presented by the panelists included:

- All maintenance functions should be scheduled and performed to avoid "surprises" in an operational setting.
- Maintenance inspections should be performed on a regular basis to catch problems early.
- Drivers should be involved in the maintenance decision process and be encouraged to report vehicle problems.
- A timely information system is required to define maintenance schedules especially on vehicles with little long term maintenance histories in other properties.

- Alternatives to conventional in-house maintenance should be investigated to aid in controlling cost.

- Transit property maintenance staff and equipment can be contracted out to local shops during off-peak hours.

A wide variety of vehicles and models have been introduced into the market. Operators noted some of their experiences with these:

- The body on chassis transit vehicle was not designed to perform and last in a manner similar to conventional transit coaches. Operators should recognize this fact when procuring equipment.

- Even with comprehensive maintenance programs and a skilled staff, many small transit vehicles remain costly to maintain. Maintenance costs per mile on five different small transit vehicles ranged from $.03 per mile to $.11 per mile.

- Frequently, passengers have developed strong vehicle preferences based on vehicle performance and reliability.

Panelists noted how some of the common pitfalls in the maintenance of small transit vehicles can be overcome. These include:

- Develop a procurement process which enables the operator to evaluate proposed equals prior to actual bidding. The approved equals should reflect the needs of the property and final responsibility for the functioning of the approved equals should rest with the vehicle supplier.

- A pre-acceptance vehicle audit to identify deficiencies before they become maintenance problems was suggested.

- Similarly, a pre-bidders conference was suggested to inform prospective bidders of the property's needs. Too often the manufacturer

does not have a complete understanding of the transit operator's needs when entering the bid process. Each manufacturer should know the environment in which the vehicle is expected to operate.

Recognizing that some properties are operating with a portion of their fleet at or near the point of replacement, some of the key factors in evaluating bus rehabilitation were cited. Operators were encouraged to assess the economics of rehabilitation and recognize that even with vehicle rehabilitation as an option, preventive maintenance programs should not be deferred. The rehabilitation of small transit vehicles is relatively new. Properties should be aware that rehabilitation is not always cost effective for body on chassis vehicles. A general rule of thumb for rehabilitation of large transit coaches which operators of small vehicle should be aware of is that rebuilding costs should not be more than 50% of the cost of a new bus. Operators were also encouraged to give special attention to their specifications and contracts for bus rehabilitation. Often the rebuilding process uncovers defects not thought to be present. These can impact both the total cost and schedule of the rehabilitation process.

Discussion Topics

The discussion following the panelists' presentations focused on the trade-offs between vehicle cost and durability/maintainability. It was noted that if small transit vehicles were constructed to the same level of durability found in large transit coaches their cost would increase dramatically. Given that transit operators are seeking lower cost small transit vehicles the manufacturing sector has little incentive to develop a full-line of heavy duty small transit vehicles.

Another topic discussed involved the need for a standard small bus specification. Although guidance on specification development was cited as being a need many conferees indicated that a standard specification would probably be detrimental.

SPECIAL EQUIPMENT

Moderator: Harry D. Reed, III, Director of Public Transit
Louisiana Department of Transportation and Development

Panelists: O.J. Collins, Division of Continuing Education, East Central University, Ada, Oklahoma
Russell Thatcher, 16(b)(2) Coordinator, Massachusetts Executive Office of Transportation and Construction
Jerry Wilson, President, Fort Worth Cab and Baggage Company

Summary of Presentations

Special equipment on small transit vehicles is generally utilized in an effort to make transportation services more accessible for elderly and/or handicapped individuals. Equipment most often included in this category are wheelchair lifts and securement devices; the panelists discussed not only the need for and required characteristics of these types of equipment, but also for communications systems, air conditioning, handrails, and driver sensitivity training.

Following is a list of lift characteristics that should be included in vehicle and equipment specifications:

- Sufficient load capacity: California specs, 600 pounds; Massachusetts and Michigan specs, 750 pounds.
- Adequate platform dimensions: at least 30 x 42 inches; Michigan, 32.5 x 42.5 inches; Massachusetts 32 X 44 inches.
- Front and side barriers: Massachusetts, 3 inches minimum, 3-6 inches preferred for front barrier.
- Safe manual back-up system in case of equipment or power failure.

- Enclosed moving parts.
- Slip-resistant platform.
- Padding on upper frame and hazardous surfaces inside the vehicle.

The most effective securement systems consist of two separate elements - wheelchair securement and passenger restraint. Wheelchair securement devices should be adjustable to fit varying track widths and tire sizes, and wherever operationally feasible, wheelchairs should be secured in a forward or rear-facing position (rear-facing is best but not well liked by passengers). Convertibility is another desired feature in securement devices; for example, flip-down seats over wheelchair tie-downs allow ambulatory passengers to use the space if no wheelchair passengers are on board.

Low-cost yet effective types of mobile communications available for use in transit vehicles include citizens' band radio; voice and tone driver paging systems; and two-way voice systems, both vehicle-based and hand-held. One- and two-way digital systems are more costly and serve as complements rather than alternatives to voice systems, but provide direct data collection between the vehicle and the dispatch center, and can eliminate the need for driver logs. Also available are trunked and repeater radio systems that offer private line service free of interference, and mobile hand-held telephone systems.

Discussion Topics

A major source of discussion following the panel presentations was the testing performed on the safety of wheelchair securement and passenger restraint devices: what group or agency should be responsible for conducting such tests, which groups have done so in the past, and what the results of those tests have been.

Tests performed by UMTA (in conjunction with the Paratransit Vehicle Program) and by Texas A&M University for the Veterans' Administration using devices

such as wheelchair locks, T-bar restraints, breast harnesses, seat belts, and strap tie-down devices have yielded mixed results. In the VA/Texas A&M tests, the securement devices withstood the impact of the crash test while the wheelchairs themselves were destroyed and the instrumented dummies that were used "died". A breast harness was found to be effective, but no such device is currently being manufactured. In the UMTA tests, the wheelchairs were held secure with little or no deformation, and the only fatality or serious injury that resulted would have happened to any passenger seated in the rear of the vehicle and wearing a lap belt.[9/10]

Strap tie-down devices have also been found to be safe, but they are somewhat complex and leave little or no room for driver error in securing the wheelchair, in addition to taking up comparatively more room in the vehicle than other types of devices.

[9/10] See reference in Section 5.0.

4.0 SUMMARY AND CONCLUSIONS

4.0 SUMMARY AND CONCLUSIONS

Although the use of small transit vehicles has a long history, recent interest in them stems from today's operators' need to meet service objectives such as:

- Reducing operating costs
- Improving accessibility
- Improving fuel economy
- Meeting local transportation needs

Small vehicles once looked at as being primarily dedicated to paratransit services are now being used in fixed route, feeder service and shuttle service to name but a few. Moreover, small transit vehicles are being bought and put into revenue service by operators of transit systems that vary in size and characteristics. In addition to rural operators with fleets of five to ten vehicles, properties in major urban areas are finding a need for small transit vehicles.

The transit community has found that the inventory of small transit vehicles produced by manufacturers fluctuates widely, providing vehicles of different size, type and availability. Many vehicles remain modifications of designs not originally developed for transit service. Consequently, operators have experienced extreme variations in operating and maintenance costs.

These problems can be partially overcome through a more comprehensive and carefully managed procurement process. Experienced operators strongly advise purchasers of new vehicles to define the parameters of their operating environment and translate each into a specification for a vehicle. In addition to a more effective vehicle, operating costs are likely to benefit from this extra effort in the determination of needs and development of specifications. Through the use of such techniques as pre-bid conference cycles to define specific "approved equals" components, and rigorous vehicle acceptance procedures, operators and manufacturers will better understand each other's needs and improved small transit vehicles will be produced and used.

Life cycle costing procedures, now mandatory as a result of recent legislation for Sections 3, 5 and 16(b)(2) operators, require evaluation of operating and maintenance costs in making vehicle selections. However, cooperation between industry, operators and government is needed to improve the quality of data going into the process and evaluation of the results.

Transit operators emphasized the importance of both early consideration of maintenance needs in the procurement process and a rigorous maintenance program. Scheduled maintenance should be performed and supported by a timely and complete data base. Explicitly addressing maintenance requirements in the specification, on the basis of such data, has been found to result in the selection of a vehicle consistent with the needs of the operator. To date, maintenance costs have varied considerably between and within manufacturers' equipment lines. The volatility of the market is one reason for this phenomenon. Operators do not expect light duty and heavy duty small transit vehicles to have similar operating and maintenance requirements. The trade-offs, however, between durability and costs are difficult to support because of a general lack of quantitative data.

In light of the specialized services small transit vehicles are called upon to perform, they are often filled with specialized equipment. Wheelchair lifts, ramps and communications equipment are examples of the special equipment found on small vehicles. The wealth of experience with this equipment offers operators a significant body of information from which local requirements can be drawn. Unfortunately, the information is not readily available to properties. Transit operators also warned against specifying nonessential requirements as the additional cost may not be offset by benefits.

Principal recommendations of the Conference were as follows:

1. Participants voiced a strong need for more frequent opportunities to exchange information on vehicles. Specifically, the exchange of specifications, performance data and information on the availability of small vehicles will aid all interested parties.

2. In addition to an up-to-date manual and a specification interchange program, a Small Transit Vehicles Clearinghouse should be established to serve as a central source of current data, especially for the maintenance and fuel economy information necesary for life cycle costing analysis.

3. Transit operators expressed a need for a verifiable testing program for small vehicles and special equipment. The diversity in equipment and the continued introduction of new equipment result in the vehicle operator bearing the bulk of the risk. Test results would enhance decision-making and shrink the amount of in-service experience needed to properly evaluate special equipment.

4. Although technical assistance is a major need of operators, the roles of the various organizations potentially participating in this process has yet to be defined. Furthermore, technical assistance needs must be better defined if the assistance is to be of value to the recipient.

   - The level of technical assistance needed by operators varies considerably from agency to agency. Some operators of specialized vehicles do not have the technical/automotive expertise necessary to comply with technical advice. Others have experienced maintenance and engineering departments.

   - Technical assistance is required by all agencies to accurately assess the trade-offs between light and heavy duty transit vehicles.

   - Technical assistance is also needed in the area of matching checklists for specification content.

5. The desirability of voluntary industry standards warrants further debate, including a discussion of the roles that state and local governments and UMTA can play in that process.

In conclusion, conferees encouraged more forums dealing with small transit vehicles. Greater insight into vehicle subsystems and costs are viewed as essential given the fiscal options facing transit operators. Bringing operators, manufacturers, state and local governments and UMTA together to focus on the topic will ultimately improve the quality of the small transit vehicle.

5.0 REFERENCES

5.0 REFERENCES

1. Federal Register, Vol 46, No. 247, Thursday, December 24, 1981, page 62599. For further information contact John Ridgley, URT-21 Urban Mass Transportation Administration, 400 7th Street, SW, Washington, DC 20590; Telephone: (202)426-8483.

2. Paratransit Vehicle Program Fact Sheet. This 4 page brochure is available from Office of Technology Sharing, USDOT Transportation Systems Center, Kendall Square, Cambridge, MA 02142. Send a self-addressed mailing label.

3. Research Project Title: Small Transit Buses: A Manual for Improved Purchasing, Use, and Maintenance. Project Number 30-1. Project is scheduled to start Oct-Nov 1982 and be completed in 21 months. Project Engineer at TRB is: Mr. R. Ian Kingham, Transportaton Reseach Board, 2101 Constitution Avenue, NW, Washington, DC 20418, Telephone: (202)334-3224

4. APTA has initiated a bus specification exchange project designed to provide copies of current specifications which have been used successfully. For information contact: Ms. Tandy Stevens, Information Center, American Public Transit Association, 1225 Connecticut Avenue, NW, Washington, DC 20036, Telephone: (202)828-2848.

5. Small Transit Vehicles: State-of-the-Art Overview, August 1981, is no longer available from the Office of Technology Sharing at TSC. Copies may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, Stock No. 050-000-00204-7 ($7.00).

6. Equipment and Maintenance Requirements for Light-Weight Accessible Bus Operations, prepared by Michigan State University, May 1980. Available from Office of Technology Sharing, USDOT Transportation Systems Center, Kendall Square, Cambridge, MA 02142. Send a self-addressed mailing label.

7. UMTA Circular 4220.1, dated 4-15-82 and DOT Order 46009B* (Change 1) cover requirements for implementing life-cycle costing. These new requirements will be provided to grantees through the UMTA Regional Offices.

8. Documentation of A Computer Program (HEVSIM) For Heavy Duty Fuel Economy and Performance Simulation developed at TSC is available through NTIS in three volumes: PB82-163-759, PB82-163-767, and PB82-163-775. This program is relatively sophisticated and would not be cost-effective to set up for use by one transit operator. For technical information contact Russell Zub (617)494-2056 at TSC.

9. A summary of test results, equipment, and manufacturers, a sample specification, and a reference list is included in Wheelchair Securement Systems in Transit Vehicles: A Summary Report, August 1981. This technology sharing report may be obtained from the Office of Technology Sharing at TSC. Please enclose a self-addressed mailing label.

10. CALTRANS, under UMTA Contract CA-06-0098 has performed sled and crash tests of several varieties of wheelchair securement and passenger restraint systems. The final report is not yet available. Robert M. Smith (916) 322-1420 is the contact person at CALTRANS, Division of Mass Transportation, 1120 N Street, Sacramento, CA 95814.

*Also refer to Federal Register.

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