tion met in Phoenix and decided to form the Small Bus Specifications Subcommittee.

The subcommittee met in March, April, and May 1974. After the ATA midyear meeting in May, the subcommittee members talked for 1½ days with all the manufacturers. We started out with about 70 people and 15 different manufacturers' representatives. At first I think there was some thought that we were trying to put some manufacturers out of business, i.e., not allow them to bid, but that is exactly the opposite of our wish for a maximum of real competition. We want buses that we can readily maintain and operate, for we cannot market a service unless we have a reliable service.

As a result of the Small Bus Specifications Subcommittee work, we asked for and received quite a few comments from the manufacturers in that 1½-day meeting, and we gave the manufacturers another 6 weeks for their engineers to go over the specifications thoroughly. The manufacturers gave us a lot of positive, helpful suggestions. By July we had summarized the suggestions and met again to put together a final specification for the transit industry. We have had a large response from people interested in using this specification. The first system to request use of that specification through the U.S. Department of Transportation is the one in Tucson, Arizona.

We sent out a questionnaire asking the transit industry for other systems plans for using not only 30-ft (9-m) buses but smaller buses during the next 4 years, and we have told the manufacturers that we will summarize that information and send it to them. The results will also be sent to the transit industry.

I am opposed to putting 2 buses side by side and saying, "This bus is better than that bus" or "These 2 buses are equivalent and let them be bid on an equal basis." If we do that, we will repeat what we did with the 30-ft buses. That was not all the manufacturer's fault, and it was not all UMTA's fault. The manufacturers found it necessary to compete, and competing in this sense meant to have a lower price, which meant in effect to take something out of the bus, either workmanship or material.

We certainly would aspire to do the same type of thing that, according to Chaput, is being done in Canada, i.e., evaluating bus bids on the basis of much more than low price only. I believe this would provide the incentive to bus manufacturers to provide competitive, high-quality, reliable, small buses for the market.

John H. Davidson, Yellow Cab Company, Los Angeles

Operators of para-transit vehicles many times need equipment that may be used at times for dual purposes and at other times for a single purpose with a later change to another use. The question of the need, design, development, production, and use of such a diversified-use vehicle (DUV) has elicited much conversation and some study by users, manufacturers, and governmental agencies.

The comments given here are based on the results of discussions and surveys made in the parcel, light air cargo, and passenger demand-response delivery systems in the United States. The preponderance of replies are from those actively engaged in operating those services. They are not based on theoretical studies or on operating hypotheses. Therefore, the comments are biased toward operation in a present-day, real-world environment.

A diversified-use vehicle is a vehicle that can be readily and efficiently used in the ground transportation of one or more of the following products: able-bodied human passengers, handicapped ambulatory human passengers, handicapped human passengers of restricted movement (wheelchair passengers), local-delivery parcels, and light air-cargo parcels. The DUV can also handle one or more of these products simultaneously, depending on the needs of the service. The U.S. Department of Transportation has designated this topic for study, and requests for proposals relative to study, design, and prototype construction have been distributed.

From the discussion and surveys made within the International Taxicab Association

and discussions with the other users, the following basic points relative to vehicle design have come forth:

1. Unitized construction,
2. 116-in. (295-cm) wheelbase,
3. Front-wheel power steering,
4. Free-float suspension on all 4 wheels of a 4-wheeled vehicle,
5. Conventional oil over air suspension,
6. 4 doors,
7. Power disk brakes for all 4 wheels and 12-in. (31-cm) rotors,
8. 15-in. (38-cm) steel wheels and medium profile tires,
9. 6-cylinder gasoline engine coupled to a 3-speed automatic transmission,
10. Bolt-on panels where possible and none if unitized construction,
11. Capacity for a maximum of driver and 6 forward-facing passengers,
12. Capacity for at least 500 lb (227 kg) of cargo in addition to passengers, and
13. Rear-mounted power plant and transmission.

In short, the design was for a van type of vehicle that had the driver in front, and a luggage and cargo carriage in a rear compartment over a rear-mounted power plant and transmission. To these basic points must be added the safety dictates of the U.S. Department of Transportation relative to side panel strength, front and rear collision protection, internal safety protection for driver and passengers, dual braking systems, and a low-emission power plant.

The present commercial operators of transportation systems are, in many instances, handling the diverse types of products, or traffic, that the DUV could handle. This requires the use of various types of equipment, thus increasing capital and operational costs. At present vehicles that carry able-bodied human passengers may also carry parcels in the baggage area of the vehicle. If passengers have compatible origins and destinations and if legally permitted, some simultaneous use of the vehicle may occur for the transport of both able-bodied and ambulatory passengers and also parcels. But a true diversified-use vehicle is not available for use instead of the array of vehicles now used for these and other services.

The DUV must be competitive in price, have a design that allows the operator to handle the diversified traffic mentioned, and be competitive in operating cost with that of equipment used now. No move has been made by a U.S. automotive manufacturer to supply such a vehicle. Our American automotive economy depends on the mass production of vehicles with similar design and operational characteristics; the providers of such equipment have not found it economically feasible to produce a diversified-use vehicle. The U.S. Department of Transportation's request for proposals relating to study, design, and prototype construction is evidence of concrete action in this regard. The requests for proposals were opened in January 1975. What happens after the prototype construction? It is hoped that there will be sufficient interest displayed by users so that a manufacturing organization, which has an outlet network, will survey the market and secure enough affirmative replies to warrant production of such a vehicle.

The following ground transportation vehicles fulfill certain tasks that can be handled by a DUV.

1. The Checker Cab is a large box, has a conventional power plant and power train, and has a large luggage compartment but lacks the ready accessibility for handling larger amounts of parcels simultaneously with the passenger load and requires considerable conversion to be used for wheelchair passengers.

2. A vehicle also in common use is the conventional van, which is restricted in that passenger ingress and egress are limited as is its ability to handle wheelchair passengers without significant conversion. It has the advantage of being available from numerous manufacturers, has good support systems, as does Checker, and has widely understood construction and maintenance.

3. A drawing of a DUV that was originally developed in Europe in 1936 is a 2 CV Citroen with slab sides, canvas roll-back top, 4 doors, front-mounted power plant and

power train, and removable seats. This is not seriously presented for adoption as a DUV for our uses, but illustrates that this universal need was partially satisfied because of economic conditions a number of years ago by one manufacturer at least. And it still sells worldwide in significant numbers.

4. A prototype urban taxi, developed by the Industrial Design Division of the Detroit Society of Arts and Crafts, has many of the design characteristics that our surveys and discussions have shown are deemed desirable. The prototype is some 4 in. (10 cm) shorter than a VW Beetle, yet accomodates a driver and 5 able-bodied human passengers. It is of unitized construction and has a continental 4-cylinder, front-mounted diesel engine that is coupled to a VW 411 3-speed automatic transmission and housed in a Toronado front end. The rear end is of the conventional Oldsmobile trailing arm type, and all wheels are individually sprung. It is a low profile vehicle with wide profile tires. It complies with all federal safety standards in effect in 1972, the year it was designed and constructed. The estimated cost in 1972 dollars for a production run of 10,000 was $3,700 each. If some 30 in. (76 cm) in luggage space were added at the rear and the rear suspension ability was increased, this design would fit many of the attributes desired.

Discussion

QUESTION: Who maintains the communications equipment? In a computerized operation, who does hardware and software maintenance?

ROBERT AEX: We made a maintenance contract with one of the local communications firms, and it has worked all right. The contract provides emergency service on a parts plus the cost of labor basis, and the costs are reasonable. All of our software was developed for us free of any direct charge by the manufacturer of the equipment itself. We did not have to hire any consultants or put anybody on the staff directly or indirectly.

JOHN DAVIDSON: My rule of thumb is, if you have fewer than 350 mobile units, go outside for maintenance. If you have more than 350, get an in-house technician. We have one operation in which 2 technicians maintain 850 taxicabs, trucks, and buses, and we have 12 bay stations. We give each unit a frequency check and a bench check every 90 days. This is far more than the FCC requires, but it keeps us clean. We have 1 program in the taxicab operation in which we contract with the hardware manufacturer for the software program. We installed a second-generation unit in Los Angeles in the taxicab operation. Included in our contract are any programs that we need within 18 months for record keeping or management control statistics. We do have in-house programs for payroll, general ledger depreciation, schedules, and the like.

IRVING WOOD: How can manufacturers meet demands for both a minibus and DUV vehicle—2 widely divergent types of vehicles?

RONALD SWANSON: There are 2 markets. One market, which is separate from the transit industry, is the private operator who wants a vehicle for many uses. The other small-bus transit market requires a vehicle that has a longer life, is more reliable, and costs less to maintain.

GERALD LUTES: How much does it cost to keep all those records broken down by vehicle, by type, by age, by type of work? How one can keep those from overwhelming the cost of the savings?