Future vehicles for paratransit service can be derived from existing vehicles to serve a specific purpose or entirely designed and engineered to meet a specific application. Most taxicabs are examples of the former, since they were designed first as private automobiles and were modified as local laws require to serve as taxicabs. This may mean painting the company name on the side or installing a rooftop light, a meter, or a driver-passenger partition.

If paratransit is defined as that collection of transportation services that are less personal than the privately owned and operated automobile and more flexible or more responsive than fixed-route bus transit, then a large number of paratransit services are provided today by vehicles modified to be acceptable for the particular application. In the taxicab example only the London Taxicab and the Checker Taxicab were designed to be taxicabs. Since these designs are several decades old, perhaps a new design could provide all the present attributes, have fewer disadvantages, and cost less to purchase and operate or provide a mix of attributes more consistent with needs of the operators today. Other vehicles modified for their present application include airport limousines from passenger cars, hotel shuttles from light delivery vans, and low-capacity buses from motorized mobile homes.

It is not intended to suggest that modified vehicles are inherently unsatisfactory. In most cases they are reasonable compromises between initial or operating costs and service requirements. Sometimes modification of an existing vehicle is the method used by manufacturers to assess or "test" the demand level of a new, potential market with a smaller investment of capital and less risk than a total new vehicle would require. In many cases, modified vehicles also offer the attractions of interchangeability of parts and serviceability in conventional service shops. From the manufacturer's viewpoint, this would minimize the disruptions of business when new concepts are introduced.

However, in many instances vehicle manufacturers have not responded or were not able to respond when operators recognized either a maturation of the market or an obsolescence of present equipment. The development during the 1930s of an advanced trolley car, the Presidents' Commission Car (PCC), is an example of the latter. It was a worldwide success, and more than 12,000 PCCs were produced and put into transit service. These means to self-develop or attract the development of new, more suitable vehicles depend largely on the profitability of the industry using the vehicles and the industry outlook for future profitability in the eyes of the vehicle manufacturer and the institutions that may finance the vehicles.

When these outlooks deteriorate, then development and introduction of new vehicles are postponed or discontinued or must be undertaken by the government, if it is in the
In the 1950s and 1960s bus transit ridership declined rapidly while automobiles and highways proliferated. According to the American Public Transit Association, annual revenue passenger ridership on mass transit declined continually from a peak of 20 billion in 1946 to only 5.3 billion in 1973. (During this period the national population almost doubled.) This accounts in large part for the fact that no transit bus design has been introduced since 1957.

During the early sixties, the Urban Mass Transportation Administration was created by Congress in recognition of the vital role that transit plays in the functioning and, perhaps, the survival of the nation's urbanized areas. During its first decade, UMTA concentrated on preserving urban transit systems where they existed and creating others where they were needed. Research and development concentrated on characterizing the way existing vehicles, system management, and demand for services interact and result in observed modal splits.

Since the early seventies, the research and development efforts to characterize interactions of services and demand have become more sophisticated. More attention has focused on developing a practical alternative to the automobile mode and economically providing the services that it is least effective (or most socially expensive) in providing. This has led to a growing realization that many types of services are needed to provide automobile flexibility and the scale economies of bus and rail rapid transit. When these services are grouped together, they are called paratransit. Included are the jitneys, discontinued long ago for various reasons, demand-responsive vehicles, short-term rental cars, car pools, subscription buses, and taxicabs. Paratransit is becoming recognized as the most probable means of maximizing the use of existing capital facilities, such as freeways and subways, and the quality of service as perceived by prospective users.

A vehicle for paratransit service requires an optimum mix of vehicle characteristics to be most effective. The seventies will see the introduction of advanced bus designs, an advanced streetcar design, and an advanced subway car design—all developed for the industry through federally funded research and development programs. In a similar way, new designs for paratransit vehicles will be developed and introduced. These designs may be completely new or may be evolutionary improvements to present vehicles.

One clearly mandated requirement for transit (including paratransit) is to provide service (mobility) to elderly and handicapped persons. Guidelines and definitions are still being discussed. It is evident, however, from surveying transit vehicles now used in large numbers that the capability to board, secure, and alight passengers in wheelchairs is missing. For this reason, when Congress authorized the development of a small, urban, low-pollution, fuel-efficient paratransit vehicle, UMTA added to its specification that wheelchair passengers be able to board, alight, and secure themselves without assistance when using this vehicle. Such advanced concepts warrant evaluation through testing of various prototype designs. Such a testing program is planned for the UMTA paratransit vehicle sometime after its delivery in 1976.

Future designs will be based on as thorough an understanding of the services they will provide and the requirements these services impose as is available at the time. Studies to determine the proper basis for design supported the development of the Transbus and the ACT-1 and one that is now under way for a range of paratransit vehicles.

Because paratransit has not been the primary object of specific study by UMTA during the last decade, the study of the requirements for paratransit is broader in scope than those previously mentioned. It will begin by examining and characterizing the paratransit services now operating. It will hypothesize on new services that may be effective in improving mobility of urban residents. The spectrum of possible services needed will be analyzed and evaluated to assess (a) implications in the policy areas of transportation, growth, and land use; (b) vehicle requirements; (c) demand and cost projections; and (d) feasible projects with which to test the accuracy and validity of the conclusions reached in the study. The output from the study will include scenarios to reflect a set of conditions typical to some sections of most urban areas and set forth a rationale for a transportation system, incorporating paratransit elements, that will meet the requirements for that section. The results will describe the section in terms
of street grid, residential density, income per capita, commercial activity, and other demographic factors.

New forms of paratransit service may be suggested, for example, CBD goods delivery in conjunction with downtown loop service or cross-town goods delivery by taxi-cab en route to pick up passenger or by jitney during empty returns to the suburbs. Such services, properly integrated by scheduling and communications, offer the prospect of more rapid goods movement, reduced fuel use by delivery vehicles, and reduced street congestion.

An evaluation of each of the previously mentioned factors will be provided. A general description of vehicle characteristics (5, 10, 20 passengers, light or heavy duty) will be given as will a detailed list of essential or unique functional requirements of the vehicle for the service and conceptual features that satisfy these requirements.

A study of modifications to existing vehicles to meet functional requirements may be warranted. However, if vehicle capabilities are unavailable in present vehicles and are not practically derivable from them, a development program for a new vehicle will be considered.

A design competition based on the commonalities of functional requirements derived from the mission requirements of the scenarios could involve 3 or more contractors. Each would develop a design independently to meet the necessary functional requirements while embodying other features (economy, low cost) deemed desirable by the contractor. After evaluation established the best 2 designs, prototypes could be built to each design. After proving-ground testing and evaluation, one or both could be selected to be engineered for production with improvements seen necessary in testing. An initial group of hand-built production vehicles could then be used in service demonstration and operational debugging prior to tooling for production.

The foregoing sequence may seem lengthy and difficult, but it is necessary because of the absence of private enterprise discriminators and the need for the government to assure itself of successful and economical application of tax dollars in each step of such a project. Another factor to remember about the government role is that, unlike the defense and military design and development programs, these vehicles will be neither produced by or for the government nor owned or operated by the government. This type of program can only bear the expense of making the technology and design data available to prospective manufacturers. If the intended users decide that the design is not applicable or optimum, they may not buy vehicles of that design. In that case, the vehicle will not be put into production by the manufacturer, and accomplishment of the original program objectives will be frustrated.

An illustrative pitfall would be to undertake a vehicle design program to meet only the requirements of today's paratransit services. This would shortchange the future utility of the vehicle at the very time its production would be under consideration. Market projections and probability of introduction become less favorable since the conditions for which it was designed may no longer prevail. Although estimates of future conditions are likely to be imprecise, the omission of proper influence of trend analysis on design parameters is even more likely to result in design and application mismatches.

The way this undesirable course of events can be avoided is to maintain, exercise, and respond to coordination activities with manufacturers, operators, and service users in order to ensure that the final design is relevant to their problems and, equally important, is understood and acceptable to most of them.

In summary, the most productive role of government in realizing a new vehicle for paratransit service is achieved through support of design, development, testing, and demonstration of vehicles whose concepts are derived from valid vehicle requirements. These requirements must reflect, insofar as possible, understanding of the service application characteristics for the time period in the future when the vehicle is to be in production and operating in service.