Small Transit Vehicle Industry Study

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EXECUTIVE SUMMARY

The Small Urban & Rural Transit Center's objective for this study is to provide information regarding the current state of the small transit vehicle industry. The supply chain for small transit vehicles has not received the same attention as that of the larger vehicles though it shares some of the same issues. A number of bus manufacturers have entered and left the market over the years, and a number of mergers and changes in ownership have characterized the industry. Federally supported purchases represent the majority of demand for each firm's products within the large bus industry. However, manufacturers of small vehicles serve other customer segments including private shuttle services and privately funded human service transportation. In addition to the issues faced by the large bus manufacturers, small transit vehicle suppliers face unique challenges because of the relatively small size of individual orders and the large number of competitors. Evaluating the complexity of this dynamic industry is a difficult research problem.

Small Transit Vehicle Trends

For many years, federal funding primarily supported the purchase of large buses. In the 30-year period from 1965-1995, nearly 85 % of all federally funded buses were 35-40 feet in length or longer articulated buses. However, in recent years, only about a third of all federally assisted purchases were for large vehicles (FTA 2006). The rapid growth of the small vehicle market is due to three main factors: the initiation and expansion of rural transit systems, the growth of transit-agency supported services for disabled persons as a result of the Americans with Disabilities Act paratransit requirements, and the downsizing of vehicles in urban and smaller urban areas to reduce operational costs and respond to demand pattern fluctuations.

The future for small transit vehicles looks favorable throughout rural and urban landscapes. Rural America is faced with a declining population that is aging as young people are migrating to small urban and urban areas in search of jobs, leaving the elderly in rural communities (Experience Corps 2006). Elderly Americans desire to remain in their homes as long as possible, and if they cannot drive their own vehicle, they will require other transportation to maintain their lifestyle. The cost of relocating the elderly to a small urban or urban setting is much higher than allowing them to remain in their local community and offering transit service as needed (Brown 2005). The housing costs alone for relocating may be double, triple or greater than they are currently, not to mention the psychological impact resulting from a move to an unfamiliar place.

Urban areas have substantial traffic congestion issues. Dockendorf et al. (2002) believe that increased travel costs, due primarily to higher gas prices, will make it more difficult for many metropolitan areas to attract new residents and businesses, leading to a decline in suburban areas. This may prove conducive to resurgence in the growth of the central city, and should be promising for bus transit, both by individuals who may relocate to cities and by suburban residents who are likely to rely more on public transportation than they do now. America has also seen a revival of fixed-guideway transit with the implementation of light-rail systems in many urban areas (Thompson 2003). Small transit vehicles will be able to serve as feeder vehicles to and from new fixed-guideway systems that serve central cities.

Small Transit Vehicle Issues

There are numerous issues that inhibit the small transit vehicle industry from operating at peak efficiency. The three most common issues that presented themselves throughout this research included quality concerns with vehicles, procurement policies at state and local levels, and production fluctuations of small transit vehicles stemming from demand uncertainties of transit agencies. Based on a survey of 63 transit agencies, Hemily and King (2002) found that vehicle reliability and high maintenance costs were both the most frequently cited and highest-ranking concerns with regard to small buses. This indicates the need for a small bus with higher mechanical reliability. More than one-half of respondents operating small buses reported that vehicle reliability was a concern, and 42% reported they had higher maintenance costs than predicted.

Transit providers are faced with varying procurement policies and guidelines based on their location and size of operation. Outside of FTA-defined Urban Zones (UZA's), many transit agencies are given a "shopping list" of vehicle options by their state Department of Transportation (DOT). Agency managers feel there is a lack of information regarding what the vehicles on the list can and cannot do. The problems of excess capacity and uneven demand have also plagued the transit vehicle industry for more than 20 years. Based on an awareness of the problem and attempting to find solutions, FTA convened bus industry summits in 1995 and 2000. Its main objective was to identify issues and to propose changes that would help the manufacturing industry and ultimately the transit agencies and their customers. Recent procurement numbers indicate that, at least within the small transit vehicle section of the industry, the demand for vehicles has begun to stabilize.

Small Transit Vehicle Market Analysis

To gain a better understanding of the market's structure, SURTC analyzed data provided by the American Public Transportation Association (APTA 2005) including more than 20,000 small transit vehicles. At the outset of the analysis, we determined that the most effective method for analyzing the data would be to divide the small vehicle market into three distinct categories of vans, cutaways, and small buses. All three groups represent distinct market segments within the small transit vehicle industry.

SURTC analyzed the total data set (APTA 2005) using three different methods. These included partitioning vehicles by year manufactured, length in feet, and manufacturer. Although similar features do exist, the main factor that distinguishes each market segment is the difference in features of vans, cutaways and small buses that lead to substantial purchase price variations. On average, cutaways cost roughly twice as much as vans to purchase, while small buses cost almost three times as much to purchase compared to cutaways and almost six times more than transit vans.

The differences in vehicle length are quite substantial as well. Although the average van in the dataset was 17 feet in length, many are shorter, only half the length of most small transit buses. Cutaways encompass a large range in length, falling between 19 and 27 feet while most of the small buses ranged by only a couple of feet in length, averaging 27 feet. The breakdown of the average number of seats may be the most telling as to a vehicle's effectiveness in serving a particular community because of seating capacity requirements due to differing ridership volumes. Vans have an average of less than half of the seating capacity compared to small buses while cutaway seating capacities range widely, as they do in length. Many cutaways have seating capacities of 14 or 15 passengers while others had seating capacities of 21 or 22. Small bus seating capacities do not vary by much.

Committee Meeting and Questionnaire Findings

Our main goal within this section was to determine the small vehicle inefficiencies that exist among transit agency managers and the industry manufacturers who serve them. More than 30 transit agency and state procurement specialists provided input as to their perspectives regarding current procurement practices as well as perceived future vehicle needs to meet customer demands. More than 10 different manufacturer representatives also provided input through both questionnaires and committee meetings regarding their current production practices and viewpoints for the future of the industry. The survey was hosted on the Community Transportation Association of America's (CTAA) website.

The main vehicle features that need to be improved, according to transit agencies, are fuel efficiency and service features, such as low-floor vehicles, to meet cliental needs. Manufacturers agreed that these are two of the most demanded features, but they both demand a large price premium. There is currently a very small market devoted to low-floor vehicles so the vehicles that are manufactured cost two or three times more than common small transit vehicles. Alternative fuel vehicles are currently more common than low-floor vehicles and they are not as costly to manufacture.

Recommendations and Conclusions

Based on previous research highlighting small transit vehicle issues, data analysis, and questionnaire results, we have developed some recommendations for the industry. The first involves procurement issues that arise regarding small urban and rural transit agency vehicle procurements. These agencies usually rely on state DOTs to handle many of their vehicle procurement needs, because of a lack of procurement expertise and funding. Transit agency representatives stated that they will ask for a certain make/model of vehicle, but state DOTs will procure another make/model of vehicle to save money (ASTV Stakeholder Meeting 2006). The result is that transit agencies are left with an inferior vehicle that does not serve their cliental effectively. This does not occur in every state, but coordination must be improved, with a focus on quality as well as cost, to benefit the transit user.

The low-bid process for small transit vehicle procurement is another downfall of the current supply chain. The FTA believes that more than just cost should be considered when procuring vehicles, but that hasn't stopped the low-bid process. Although the cost of a vehicle must be one of the key considerations during procurement, it should not be the only variable considered. We recommend that transit agencies and DOT officials consider all factors while planning vehicle procurements.

Another recommendation, based on data analysis of current small transit vehicles, is that the market should be considered as three distinct segments that include vans, cutaways, and small buses. By segmenting the market and considering each segment individually, different approaches can be taken by transit agencies and procurement officials based on the unique characteristics of each segment. This may alleviate some of the tensions and inefficiencies that exist between transit agencies and state procurement officials.

Finally, there seem to be some misunderstandings about how transit agencies and federal and state DOTs view pooled procurement programs. When we surveyed transit agency representatives regarding pooled procurement, they were positive about such a program. However, many also responded that agencies should be able to choose specific features on small transit vehicles that would allow them to operate their systems more effectively. Although some slight variations in vehicle specifications may be allowed, the objective of a pooled procurement program is that vehicles have the same specifications so they are cheaper to manufacture, and thus cheaper to procure. Pooled procurement is ineffective if all of the vehicles are tailored specifically to individual transit agencies, so agency managers must be educated regarding a pooled procurement program. Standardization of vehicles would be beneficial for the small transit industry. It would reduce costs because vehicles could be mass produced, and would also make maintenance more efficient because standardized parts could be used. FTA should develop a 'white book' for small transit vehicle procurement that includes standards for the industry to follow.

1. INTRODUCTION

U.S. transit systems in both urban and rural areas operate more than 100,000 buses and vans to provide mobility for their customers. A majority of these vehicles were partially funded by grants from the Federal Transit Administration (FTA). More than 26% of the FTA partially funded vehicles between 1995 and 2004 were 30-foot or smaller buses while nearly 35% were vans and other small vehicles used for rural and specialized transportation services (FTA 2006). The Small Urban & Rural Transit Center (SURTC) is studying the bus manufacturing supply chain to improve bus procurement efficiencies for small transit vehicles, which is of obvious importance to the FTA and all other parties involved.

1.1 The Research Problem

The supply chain for small transit vehicles has not received the same attention as that of the larger vehicles though it shares some of the same issues. A number of manufacturers have entered and left the market over the years, and a number of mergers and changes in ownership have characterized the industry. However, unlike the large bus industry, where federally supported purchases represent the majority of demand for each firm's products, manufacturers of small vehicles also serve other customer segments including private shuttle services and privately funded human service transportation. In addition to the issues faced by the large bus manufacturers, small bus and van suppliers face unique challenges because of the relatively small size of individual orders and the large number of competitors.

From a transit agency perspective, there is uncertainty related to the quality of small transit vehicles produced as many are manufactured with a low-bid procurement process in mind. Quality inevitably suffers when the major attribute considered for vehicle procurement is price. In this market, manufacturers use cost-cutting techniques to reduce a vehicle's purchase price. Although FTA and others have frowned upon procuring transit vehicles based solely on price, this practice still exists within the small transit vehicle market. Transit agencies are interested in serving their cliental as efficiently as possible, and when they cannot rely on vehicles to perform, their passengers view the agency as unreliable and an agency's reputation is degraded.

1.2 Study Objective

SURTC's objective for this study is to provide FTA with information regarding the current state of the small transit vehicle industry. Also, the recommendations of this research will serve as a general procurement aid for bus manufacturers and transit agencies. We will also present results at conferences throughout the country, providing transit representatives and manufacturers with firsthand knowledge of applicable results. Our ultimate goal of this research is to discover procedures to improve the efficiency of the entire small transit vehicle procurement process.

1.3 Report Organization

We organized this report into five main chapters. In Chapter Two, we discuss recent trends in the small transit vehicle industry. Chapter Three highlights the main issues that presented themselves throughout our research. We conduct data analysis in Chapter Four on more than 20,000 small transit vehicles to gain better insight into the current market structure. Chapter Five discusses questionnaire and committee meeting findings we found applicable to the research problem. Finally, we recommend changes to improve the small transit vehicle supply chain, and this is followed by appendices containing our survey instrument.

2. PAST AND PRESENT SMALL VEHICLE TRENDS

For many years, federal funding primarily supported the purchase of large buses. In the 30-year period from 1965-1995, nearly 85% of all federally funded buses were 35-40 feet in length or longer articulated buses. However, in recent years, only about a third of all federally assisted purchases were for large vehicles (FTA 2006). The rapid growth of the small-vehicle market is due to three main factors: the initiation and expansion of rural transit systems, the growth of transit-agency supported services for disabled persons as a result of the Americans with Disabilities Act paratransit requirements, and the downsizing of vehicles in urban and smaller urban areas to reduce operational costs and respond to demand pattern fluctuations.

Hemily and King (2002) found that small buses are much more intensely used by small urban and rural transit agencies with a fleet size of 1 to 49 buses. Small buses comprise a 64% average of these fleets as compared to less than 20% of a large transit agency fleet. Most, if not all, of these transit agencies are located in either small urban or rural areas which are often better served by small vehicles. Small transit vehicles have lower capital costs and per mile operating expenses and also give agencies added flexibility compared to large transit buses. Low peak demand is another primary reason small transit agencies use small transit vehicles to conduct their day-to-day operations.

Even though rural transit has expanded rapidly in recent years, many areas remain underserved and a significant number of rural and suburban customers still do not have access to regular transit operations because most transit systems are designed and operated to serve urban areas with high population densities. Roughly 40% of all rural residents live in an area with no form of public transportation, and another 28% live in areas with very low levels of transit options. The 2000 census indicated the number of Americans in these areas was over 59 million. Nearly 80% of rural counties have no public bus service, while only about 2% of residents in metro areas lack transit service (CTAA, Atlas of Rural Public Transportation 2005). This confirms there is still plenty of room for the further expansion of rural transit throughout the country and the demand for small transit vehicles will continue to increase as the industry grows.

The use of small transit vehicles in urban settings has changed considerably in recent years. Urban transit systems now use a larger percentage of small buses and vans during non-peak periods throughout their fixed-route schedule. They also assign small buses to downtown circulators, route deviation services, flexible feeder routes, and demand-responsive zone service (Hemily and King 2002). Increased fuel costs have also encouraged urban transit agencies to increase the number of fuel-efficient small vehicles in their fleets.

The future for small transit vehicles looks favorable throughout rural and urban landscapes. Rural America is faced with a declining population that is aging as young people are migrating to small urban and urban areas in search of jobs, leaving the elderly in rural communities (Experience Corps 2006). Many elderly Americans desire to remain in their homes as long as possible, and if they cannot drive their own vehicles, they will require other transportation to maintain their lifestyle. The cost of relocating the elderly to a small urban or urban setting is much higher than allowing them to remain in their local community and offering transit service as needed. The housing costs alone for relocating may be double, triple or greater than they are currently, not to mention the psychological impact resulting from a move to an unfamiliar place. The policy goal of allowing persons to remain in their community of choice as long as they wish bodes well for the continuing expansion of rural transit and increased demand for small transit vehicles (Brown 2005).

Urban areas have substantial traffic congestion issues. Dockendorf et al. (2002) believe that increased travel costs due to higher gas prices will make it harder for many metropolitan areas to attract new residents and businesses leading to a decline in suburban areas. This may prove conducive to resurgence in the growth of the central city, and should be promising for bus transit, both by individuals who may relocate back to cities and by suburban residents who are likely to rely more on public transportation than they do now. America has also seen a revival of fixed-guideway transit with the implementation of light-rail systems in many urban areas (Thompson 2003). Small transit vehicles will be able to serve as feeder vehicles to and from new fixed-guideway systems that serve central cities.

The increased public concern with air pollution is another trend that should be favorable to bus usage. Legislation such as the Clean Air Act and others has shown that many urban areas are not in compliance with pollution standards (EPA 2000). The potential loss of federal transportation funds if an urban area fails to conform to the air pollution standards could create a strong incentive for city planners to rely more on public transportation to meet future mobility needs in their communities. Transit buses, large and small, are beginning to use alternative fuels to reduce emissions. This will help improve bus transit's environmental image with both riders and nonriders, because the public still believes that fossil-fuel-burning transit buses contribute to the pollution problem rather than alleviate it (Dockendorf et al. 2002).

Intelligent Transportation Systems (ITS) are beginning to alleviate certain transit issues. Electronic fare payment, for example, allows transit agencies to abolish flat-fare systems and provide a wide range of fare incentives and options such as time and distance-based fare incentives. This technology will also enable transit providers to better understand who their riders are and where and when they are utilizing their services. Also, the more technology transit providers adopt, the more innovative they appear to potential riders who may not currently consider the bus as a possible means of transportation for their everyday use. While ITS technologies such as Automatic Vehicle Location (AVL) and electronic fare payment are used by most urban transit systems, they have only recently been implemented in rural and small urban systems. As they become more readily available, complaints voiced by many bus transit riders such as "the bus is always late" may be alleviated.

Technologies that affect the bus itself are also contributing to the expansion of transit. Low-floor buses are especially attractive to the growing senior citizen transit market. Steps are often problematic for seniors and handicapped riders to negotiate and low-floor buses eliminate this obstacle, putting less strain on riders with mobility issues and resulting in quicker commutes with fewer complaints. This also alleviates pressure on drivers who may be required to aid passengers getting on and off the bus. Wheelchair lifts are also not required with many low-floor buses; this eliminates the time-consuming process of using a lift to load and unload handicapped passengers.

All of the previous topics have, and should continue to increase the demand for transit services in America. Small transit vehicles continue to play a pivotal role within both small and large transit systems. However, several key issues are inhibiting small transit vehicle performance within transit systems, resulting in inefficient service being provided to riders. A number of these issues are discussed in the following chapter.

3. SMALL TRANSIT VEHICLE ISSUES

Numerous issues inhibit the small transit vehicle industry from operating at peak efficiency. The three most common issues that became evident throughout this research included quality concerns with vehicles, procurement policies at state and local levels, and production fluctuations of small transit vehicles stemming from demand uncertainties of transit agencies. There are various reasons why these issues pose problems to the small vehicle industry as a whole, and they will be addressed in the following discussion.

3.1 Quality Concerns

A 2002 study by Hemily and King on the use of small transit buses (less than 30 feet in length) highlighted many important issues that can be incorporated into the development of a rural bus research plan. Based on a survey of 63 transit agencies, Hemily and King (2002) found that vehicle reliability and high maintenance costs were both the most frequently cited and highest-ranking concerns with regard to small buses (Table 3.1). This indicates the need for a small bus with higher mechanical reliability. More than half of respondents operating small buses reported that vehicle reliability was a concern, and 42% reported they had higher maintenance costs than predicted.

Table 3.1 Survey Responses on Concerns with the Use of Small Buses

	Percent of Responses	
Issue/Concern	Cited as Issue/Concern (%)	Cited as Most Important (%)
Capital Cost of Vehicle	17	3
Customer Acceptance	**39**	14
Maintenance Costs	**42**	13
Operator Acceptance	**33**	6
Safety	12	2
Vehicle Reliability	**53**	**25**
Other	33	16

(Hemily and King 2002)

Customer concern issues highlighted by the survey included poor ride quality, noise, fumes, single door, and crowding. Safety was only cited one time as being the most important concern with the use of small buses. The most frequently cited safety concern was for those standing on a crowded bus; this is of little concern in most small urban and rural areas. Other issues, such as lack of seats and lack of capacity at peak hours also do not occur often for most transit agencies within the rural bus industry.

Transit agencies within the SURTC research states of North Dakota, South Dakota, Minnesota, Montana, Wyoming and Utah have also voiced concerns regarding the performance and efficiency of their small-bus fleets during discussions SURTC has had with transit managers. Steps were also an item of major concern. The fact that small buses do not kneel like larger transit buses makes it difficult for elderly individuals to board and exit buses. Wheelchair issues included tie-down problems and rough rides when a wheelchair is tied down behind the rear axle. Strong preference is given to having wheelchairs secured directly behind the drivers. It is also easier to converse with wheelchair passengers located in the front of the bus and it is much easier to have two wheelchairs on a bus at the same time when they are located in the front of the bus where there is more room to move about.

Large wheelchairs with leg extenders are also a concern; often the only way to have two such wheelchairs on the bus at one time is to be able to secure them in the front of the bus. It should be noted that Q'Straint makes a new tie-down that allows for full circular motion that eases the wheelchair tie-down process for operators. Many buses are now beginning to employ this new product. Consideration should be made to include these new tie-down specifications for a prototype rural transit bus. Most drivers also feel that the side wheelchair door is the only acceptable option for most rural communities. Rear loading of wheelchairs will not work because there are seldom curb cuts that allow for access from the rear when the bus is parked properly.

Ride quality is obviously based largely on the quality of a bus's suspension system. The leaf spring suspension is conventional in most small buses. One surveyed transit fleet manager said an air suspension system would offer superior ride quality and is offered by the International Corporation. A cost/benefit analysis of this suspension system should be analyzed before it is considered for implementation. International is willing to provide demo buses to transit agencies so ride quality can be compared to standard leaf spring suspensions. The Sprinter, which has been discussed as a possible rural bus prototype, incorporates the conventional leaf spring suspension system found in most small transit buses. A survey was sent to CTAA transit agencies to determine what other ride quality problems hinder their small bus operations and need improvement. The survey covers current small agency vehicles along with their areas of interest in new fuels and technologies. Manufacturers were also surveyed to gain a better understanding of their concerns regarding this rural bus initiative.

An obvious reason large transit buses have longer lifetimes than smaller transit vehicles is that they are built with stronger, heavy duty sub assemblies. In smaller vehicles, light truck chassis are used to reduce cost, and thus, wear out sooner. Automobile makers spend huge sums of money testing vehicles before bringing them to market. The big three U.S. vehicle manufacturers (General Motors, Ford and Chrysler) thoroughly test new developments in their vehicles. Conversion companies cannot compete with the testing money spent by the big three and operate by cutting and adding parts to production vehicles.

One agency reported rebuilding several E450 transit conversion vans due to rusted frame rails and crossmembers. It is important for cutaway vehicles to have crossmembers that cover the entire width of the body. Partial crossmembers will inherently cause vibration and instability. Some of these problems come directly from assembly of the converted vehicles. As maintenance issues arise, there is "finger-pointing" and aversion of responsibility from the different companies involved in producing the final vehicle. What the agency needs is a reliable, solid body-on-chassis vehicle, with components that will last a useful amount of time. There are transit vehicles in Europe that have adopted half low-floor configurations. This provides the benefit of increased accessibility at a lower cost than a full low floor vehicle. Vehicles should also be easy to work on so mechanics do not have to be specially trained.

It has been difficult for transit providers to work with the big three manufacturers on maintenance issues. The manufacturers view the operator as a local shop. Even the ability to use diagnostic information stored onboard the vehicle is difficult. This creates a barrier to adopting new technology. Agencies are reluctant to purchase new technologies without knowing if they will have access to long-term maintenance. This is seen as an investment in new technology, and can be risky, especially with new or small companies. A state DOT representative mentioned they do not run a maintenance department. It was also mentioned that using unauthorized parts, even if they are the only available options, will void warranties (ASTV Stakeholder Meeting 2006).

3.2 Procurement Policies

Transit providers are faced with varying procurement policies and guidelines based on their location and size of operation. Many transit agencies are given a "shopping list" of vehicle options by their state Department of Transportation (DOT). Agency managers feel there is a lack of information regarding what the vehicles on the list can and cannot do. This information would be improved by providing agencies with the types of vehicles that would provide the safest and most efficient service options for their respective clients.

Present vehicle requirements also hinder the procurement of vehicles and the coordination of services. For example, Head Start bus requirements that apply to the Multi-Function School Activity Bus (MFSAB) differ greatly when compared to requirements for small public transit vehicles, making coordination virtually impossible. These legal issues must be clearly identified within the procurement parameters to allow for the coordination of public transit services, Head Start and other transportation providers (ASTV Stakeholder Meeting 2006).

Vehicle component problems, which often present greater problems than with the vehicle itself, are often a result of current procurement policy shortfalls. Advanced ITS devices and wheelchair lifts are components that can be problematic. One coordinated provider has a road supervisor who is a retired police officer involved in vehicle inspections, including school bus inspections. They are now having problems purchasing new vehicles and dealing with the state DOT. The road supervisor has significant experience in vehicle specifications, but the DOT employee writing procurement specifications is new to the industry and they are having problems coordinating their efforts.

An example of a problem with state-assigned vehicle procurements is their inconsistencies with wheelchair lifts. When state DOTs purchase vehicles, they may select a different model every year. This forces the maintenance departments across the state to know all the lift models in use. The method of assigning vehicles to agencies is not appropriate either. There is often a long and convoluted process and assignments are not made based upon the type of vehicle or service. Generally, the state purchases the cheapest vehicle available and fills orders across the state solely by number of vehicles needed. Providers try to accomplish as much as possible with the vehicles they have. One group delivers food in its 14 passenger vehicles during its downtime. They are not allowed to buy vehicles designed for Meals-On-Wheels that will also be used for transit. They operate under 5307 because they are in an urban area, but are attempting to accomplish the United We Ride (UWR) objective of coordinating services. A group in Virginia has found that delivering meals to a church parking lot for local distribution can improve the process. Under the state-controlled 5310 funding, providers in Virginia are allowed to add options to vehicles, but they must pay the full cost differential (ASTV Stakeholder Meeting 2006).

In defense of state DOTs, the process of a state DOT filling vehicle orders with the least expensive option is a requirement of the vehicle procurement position. For example, it looks much more feasible on paper to spend $100,000 and procure three transit vehicles for an agency than spending the same amount and only procuring two vehicles. However, the transit agency may receive more "bang for the buck" if they were offered two more expensive vehicles that would meet their specific needs more effectively. This is hard to relay to DOT management as a viable option because they are often unfamiliar with a specific transit agency's clientele and sometimes have a limited understanding of how individual transit agencies function. All of this confusion stems from the current low-bid procurement practices within the small transit industry structure.

It is often suggested that FTA needs to shift its focus away from low-bid procurement. One of the reasons transit agencies and bus manufacturers are successful in Europe is that they focus on quality and needs. Many U.S. manufacturers currently provide only the most cost-effective products while it is obvious that more options are needed to better serve the industry. Manufacturers also need motivation and assistance to get involved with advancements for new vehicle specifications. Many transit agencies also feel that FTA should be more assertive with individual states pertaining to their use of capital funds to improve procurement from a strictly low-bid process to a more sensible process focusing on the needs of transit agencies and riders (ASTV Stakeholder Meeting 2006).

3.3 Demand Uncertainties

The problems of excess capacity and uneven demand have plagued the transit vehicle industry for more than 20 years. Based on an awareness of the problem and attempting to find solutions, FTA convened bus industry summits in 1995 and 2000. Their main objective was to identify issues and to propose changes that would help the manufacturing industry and ultimately the transit agencies and their customers. The data presented in Table 3.2 shows the federally funded bus purchases during a 10-year period from 1995 to 2004. The numbers indicate that, at least within the small transit vehicle section of the industry, the demand for vehicles has remained relatively stable throughout the past few years. For example, the number of federally funded buses purchased from 2001 to 2004 remained stable (2600 to 2900 buses annually). Federally funded van purchases have followed a similar trend.

Table 3.2 Summary of Federally Funded Bus Purchases 1995 - 2004

Year	Total	30 ft. or less	Vans	Other
95	9,002	1,915	3,479	0
96	7,309	1,428	3,016	163
97	7,021	1,702	2,886	199
98	6,541	2,080	2,504	13
99	8,552	2,318	2,939	173
00	11,864	3,050	4,013	82
01	9,571	2,812	3,513	40
02	10,371	2,869	3,793	107
03	9,029	2,840	3,303	67
04	7,333	2,666	2,833	146
Totals	**86,593**	**23,680**	**32,279**	**990**
10 Year Average	**8,659**	**2,368**	**3,228**	**99**
Percent	**100%**	**27.3%**	**37.3%**	**1.1%**

(FTA 2006)

Implementing the proposals garnered during the 2000 bus industry summit may have, at least partially, contributed to the steadying of demand in recent years. A few of the main proposals highlighted during the summit included:

- improve information collection and dissemination to benefit all sectors of the industry,
- increase use of the Internet to facilitate the exchange of procurement information, specifications, planned delivery dates and other critical information,
- improve facilitation of piggybacked procurements, particularly for small agencies which will see the greatest advantage from such arrangements,
- improve multi-year procurement procedures which would lessen the uncertainty of demand patterns, and

- strengthen FTA's commitment to continue its work with industry associations such as APTA and CTAA to continue the dialog on critical issues, in particular: technology deployment, standards, and procurement issues.
  (Bus Summit 2000)

A number of manufacturers have entered and left the market over the years and a number of mergers and changes in ownership have characterized the industry. However, unlike the large bus industry where federally supported purchases represent the majority of demand for each firm's products, manufacturers of small vehicles also serve other customer segments including private shuttle services and privately funded human service transportation. In addition to the issues faced by the large bus manufacturers, small bus and van suppliers face unique challenges because of the relatively small size of individual orders and the large number of competitors.

Booz, Allen and Hamilton (2006) highlighted the tiny market share that small transit vehicles hold in their overall product market. Their research estimated the total units sold in this market category, not including vans, to be roughly 250,000 vehicles annually. With the transit industry accounting for only 3,000 of these vehicles, the transit industry has little to no influence on the design of these vehicles and their components. The majority of these small transit vehicles are used as ambulances, moving vans, hauling trucks, and motor homes.

A similar problem is present within the transit vans market. Booz, Allen and Hamilton (2006) estimated that 1.1 million vans are sold annually. The transit industry only accounts for 3,000 of those. This leads to even less market power for transit vans when compared to small buses. Minivans and conversion vans are most often owned by individual families, school districts, hospitals, and non-profit organizations such as churches and community centers. Many manufacturers have chosen to lessen their focus on the transit industry and rely on more consistent markets, causing a rift between transit agencies and manufacturers. The combination of a small market share and inconsistent demand patterns has made this a necessary alternative for many manufacturers to improve their bottom lines.

3.4 Summary

Discussions with transit managers, state DOT representatives and manufacturers have illustrated the uncertainty and confusion that exists within the entire small transit vehicle supply chain. Many states have different regulations that continue to evolve leading to great uncertainty on the part of transit agencies and manufacturers. The needs of transit agencies have also gone though drastic changes in recent years which alters their vehicle requirements. Manufacturer mergers have left both transit agencies and state DOTs disconnected from their original suppliers. The entire industry presents a complex situation involving many players who all have the same goal in mind, providing high-quality transit service to customers that demand safe, reliable, flexible vehicles. This is no small task and requires coordination and efficiency throughout the entire supply chain. The following chapter will include data analysis of small transit vehicles in the U.S. Analysis will include breakdowns by year, manufacturer, size of vehicle, and other factors to gain a better understanding of the current market structure and where it may be headed in coming years.

4. SMALL TRANSIT VEHICLE MARKET ANALYSIS

The small transit vehicle (less than 30 feet in length) market is a complex, dynamic entity. To gain a better understanding of the market's structure, SURTC analyzed a data set provided by the American Public Transportation Association (APTA 2005) containing more than 20,000 small transit vehicles. At the outset of the analysis, we determined that the most effective method for analyzing the data would be to divide the small vehicle market into three distinct categories: vans, cutaways, and small buses. All three of these groups represent distinct market segments within the small transit vehicle industry. Although we also conducted a total analysis of the data, grouping all three segments together throughout all of the analysis would fail to fully explain the market because vans, cutaways and small buses are very different vehicles designed to perform different operations within an agency's fleet. We compared the three individual segments, as well as the total small transit vehicle dataset, to provide a greater understanding of the manufacturers involved within each division and to highlight the unique attributes that distinguish each vehicle.

4.1 Market Segment Examples

To better describe each market segment, we provide an example vehicle type for each category. The van segment can be represented by the Ford E-Series Wagon (Figure 4.1). Vans are less than 20 feet in length and usually carry 11 to 15 passengers. Some are equipped with either a low-floor or a ramp for wheel-chair accessibility, although this is not a common van feature. A van's power source is almost always fueled by unleaded gasoline, and they are often used for shorter intercity routes bringing passengers into larger communities from rural areas for work, shopping, medical appointments, etc. Vans have become a popular option in recent years for transit agencies attempting to save money on the initial purchase price of a vehicle to utilize on routes that have low peak demand. Most vans are also much less expensive to operate than either cutaways or small buses. Because of their smaller size, they usually get better gas mileage, are more versatile on narrow roads and therefore, easier for drivers to operate.

However, they are not as comfortable for passengers, especially elderly or mobility-impaired individuals who must bend over and maneuver to sit in the rear seats of the van. There are also rollover and additional safety concerns regarding the use of passenger vans. National Highway Traffic Safety Administration (NHTSA) research has shown that 15-passenger vans have a rollover risk that increases dramatically as the number of occupants increases from fewer than 5 to more than 10. In fact, 15-passenger vans (with 10 or more occupants) had a rollover rate in single-vehicle crashes that is nearly three times the rate of those that were lightly loaded (with fewer than 5 occupants). Also, passenger vans cannot transport school children due to safety concerns, and this prohibits their use in coordinating public transportation with school transportation (NHTSA 2005).

Figure 4.1 Ford E-Series Wagon (Ford 2006)

A prime example of a bus representing the cutaway market segment is the ElDorado Aerotech (Figure 4.2). Cutaway bus bodies are mounted on varying sizes of truck chassis and are usually between 19 and 29 feet in length and carry 14 to 30 passengers. Most are equipped with wheelchair lifts as seen in Figure 4.2. They are powered primarily by either gas or diesel engines and are usually the most popular small transit vehicles within agency fleets. Cutaways' primary purpose is to serve the local community carrying both handicapped and non-handicapped riders and provide rides to community centers, grocery stores, medical appointments, etc. Cutaway buses are often the "workhorses" in non-urban communities providing the largest percentage of rides to the clientele. Cutaways do have a shorter useful life than unaltered vehicles, and they also have rough ride and reliability concerns as discussed in the previous chapter.

Figure 4.2 ElDorado Aerotech (ElDorado 2006)

An example of a small transit bus representing the small bus market segment is the Blue Bird Ultra LMB (Figure 4.3). Small transit buses are between 25 and 29 feet in length and carry 22 to 30 passengers. The bus in Figure 4.3 is equipped with a low-floor for ease in entering and exiting the vehicle. Small buses' primary power source is diesel fuel, but some are utilizing hybrid technology to save on fuel costs while lessening harmful fuel emissions. Small transit buses almost always serve more densely populated areas within small urban communities. They are also often utilized during non-peak periods in urban settings to save money, as they are less costly to operate compared to larger transit buses, and they also offer drivers greater maneuverability in highly congested and narrow city streets.

Small transit buses represent the most costly segment of the small transit industry, but because of their traditional transit vehicle look, are often preferred by riders as their choice for public transportation use. They also have a longer useful life than vans and cutaways, lower maintenance costs because of similarities with large transit buses. However, they are less versatile than vans and cutaways due to their larger size and the rear hangover behind their back tires, which is a concern in rural and unpaved, mountainous areas.

Figure 4.3 Blue Bird Ultra LMB (Blue Bird 2006)

4.2 Total Market Analysis

SURTC analyzed the total data set (APTA 2005) using three different methods. These included partitioning vehicles by year manufactured, length in feet, and manufacturer.

We illustrate the year manufactured results in Figure 4.4. This figure shows the model year of vehicles represented in the dataset and illustrates the retiring of vehicles based on their age. The majority of vehicles represented in this figure are vans and cutaways. The Federal Transit Administration's (FTA) existing useful life category for vans is four years/100,000 miles and five years/150,000 miles for cutaways (Booz, Allen and Hamilton 2006). Figure 4.4 illustrates that many vehicles are being used beyond their useful life. All of the vehicles with model years 1999 and prior are beyond their useful life based on the four and five-year useful-life categories, illustrating that more than 20% of the vans and cutaways in the dataset were still active after their useful life had expired.

Vans represent a large segment of the total vehicles manufactured in recent years, showing that many transit agencies are purchasing more vans to provide service within their respective communities. There is expected to be an increase in all small transit vehicles purchased in coming years due to an increasing demand for transit services, a reaction to an aging population that will require improved transportation options (Experience Corps 2006). The increased transit funding within the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) should also allow many agencies to purchase new small transit vehicles to meet this anticipated demand.

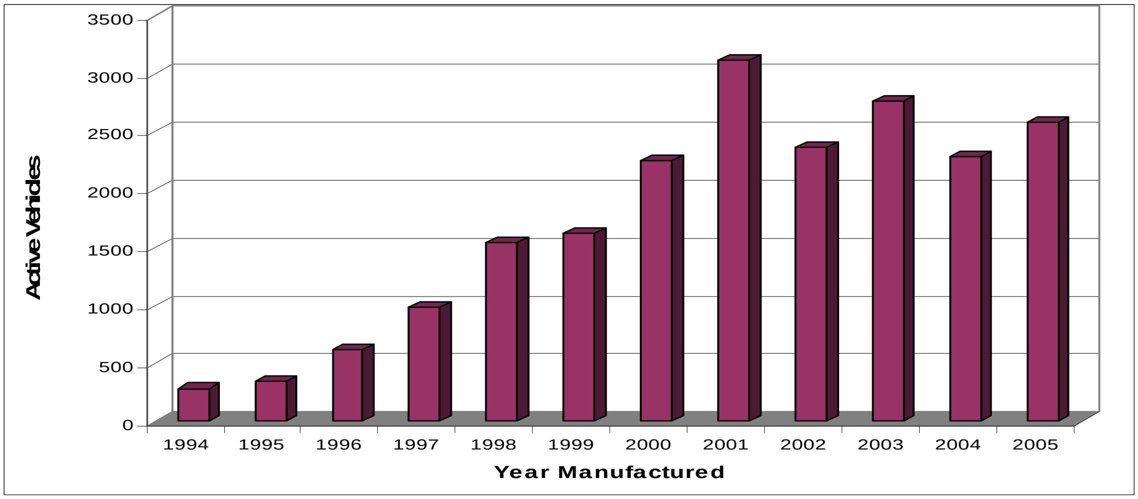

Figure 4.4 Small Transit Vehicles Manufactured by Year (APTA 2005)

We highlight small transit vehicle length in Figure 4.5. This figure is useful in showing the large range in the size of small transit vehicles. It also illustrates the three market segments within the small transit industry. For example, the large number of 16-foot vehicles represents the van segment of the market. The 20-foot vehicles represent the cutaway bus market segment, and the 26-foot and larger vehicles largely represent the small bus market segment. These three lengths of 16, 20 and 25-foot vehicles make up more than half of the lengths present within the dataset representing the most common lengths for small transit vehicles.

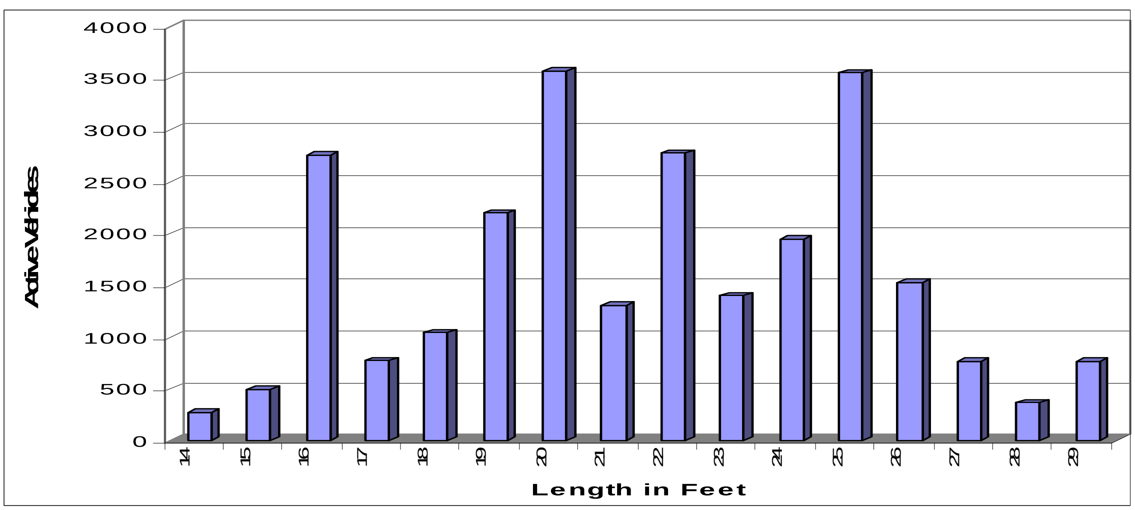

Figure 4.5 Lengths of Small Transit Vehicles (APTA 2005)

We also partitioned the data by manufacturer. This gives insight into which manufacturers are responsible for producing the largest number of vehicles for the entire industry. Figure 4.6 illustrates vehicles produced by manufacturer. ElDorado National is the largest manufacturer of small transit vehicles within the APTA (2005) transit vehicle database, representing nearly 25% of all small transit vehicles produced. This is consistent with ElDorado National's claim on its website which states: "ElDorado National started building commercial buses in 1979 and has since grown to be the largest producer of mid-sized commercial buses in North America with nearly 30% market share" (ElDorado 2006). Note that

ElDorado only converts production chassis for transit use; therefore a vast majority of small transit vehicle drive trains, wheel bases, etc., were designed with little concern for transit applications.

Ford Motor Company and Goshen Coach are second and third in the dataset, accounting for 16 and 12% of small transit vehicles manufactured, respectfully. Figure 4.6 gives a general overview of manufacturers for the entire industry, but it does not consider the three market segments of van, cutaway, and small bus. Each of these three segments represents niche markets within the small transit vehicle industry, and they have little overlap with one another. Therefore, the following discussion will dissect the industry into three separate segments highlighting the different manufacturers, purchase prices and model characteristics that make each segment unique.

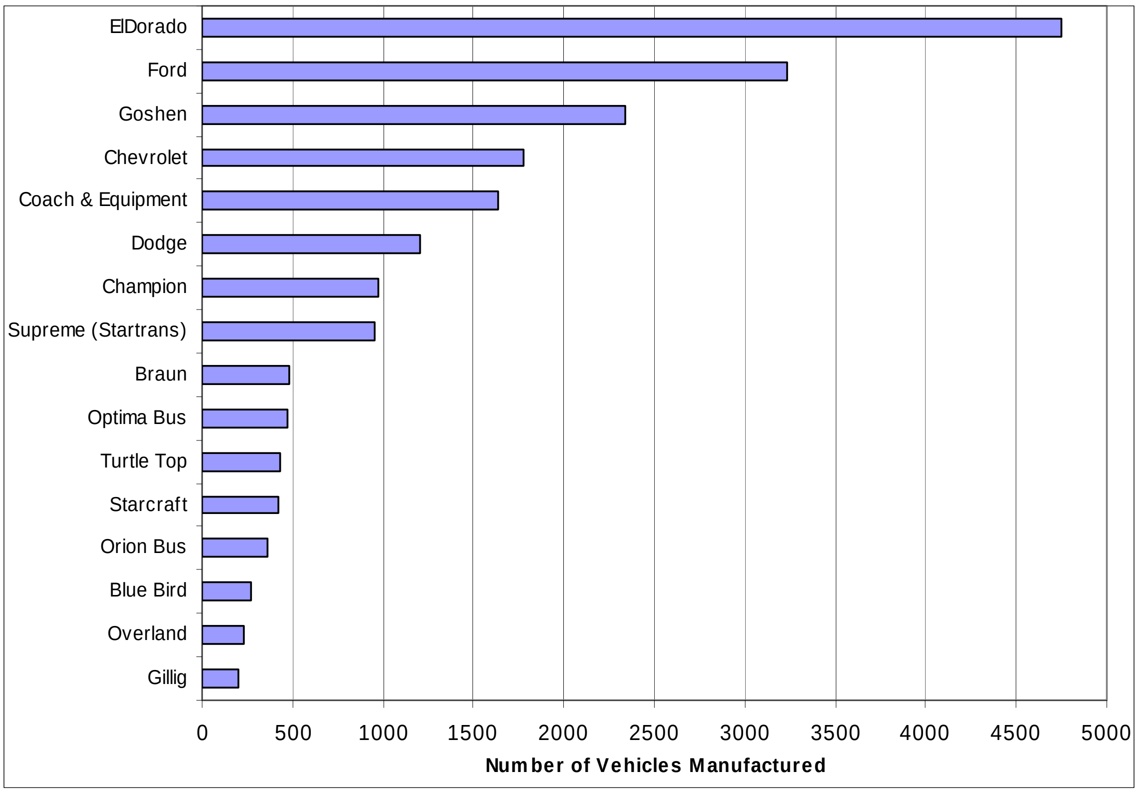

Figure 4.6 Vehicles Produced by Manufacturer (APTA 2005)

4.3 Market Segment Analysis

The three unique market segments within the small transit vehicle industry include van, cutaway, and small bus. Each of these segments is supplied by many different manufacturers. We illustrate the van manufacturers in Figure 4.7. The main players within the van market are the “Big Three” automobile manufacturers, Ford, Chevrolet, and Dodge. They all produce vans similar to the Ford E-Series Wagon discussed in the previous section. ElDorado National and the Braun Corporation purchase vans from one of the “Big Three” automobile manufacturers and modify them with wheelchair ramps/lifts and often raised roofs, making them handicapped accessible. The transit industry holds a very small market share within the van market as they are competing with traditional family van owners whose demand far exceeds that of the transit industry. Thus, they have very little power to change design and pricing mechanisms within the van segment.

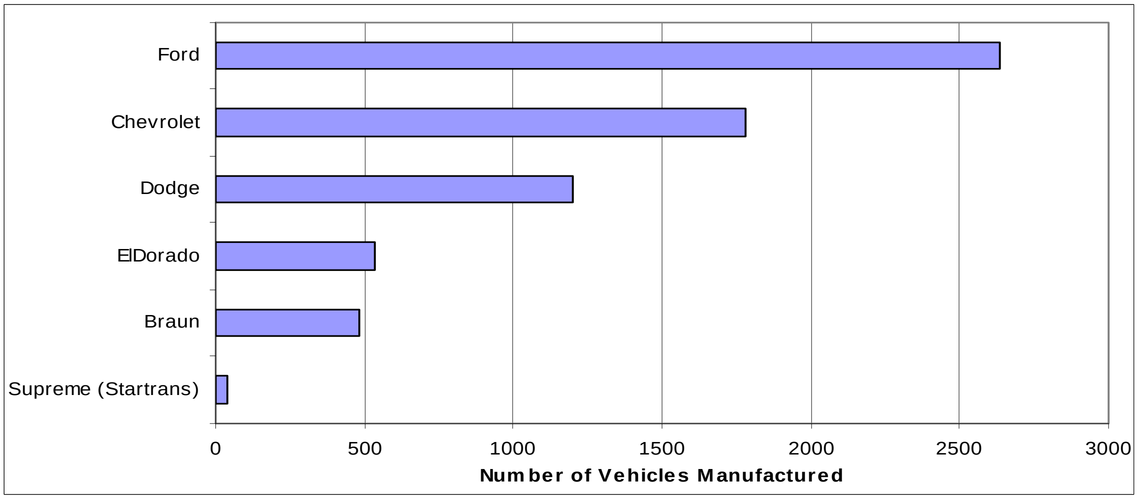

Figure 4.7 Transit Vans Produced by Manufacturer (APTA 2005)

We show the cutaway market manufacturers in Figure 4.8. As mentioned earlier, ElDorado National is the top manufacturer of cutaway buses for the small transit vehicle industry. Within this dataset, ElDorado National represents nearly 35% of active cutaway transit vehicles. Goshen Coach and Coach & Equipment account for 20% and 14% of active cutaway vehicles within this sample. The remaining companies in Figure 4.8 all have a vested interest in this market segment, as they have invested heavily in products to better serve the industry.

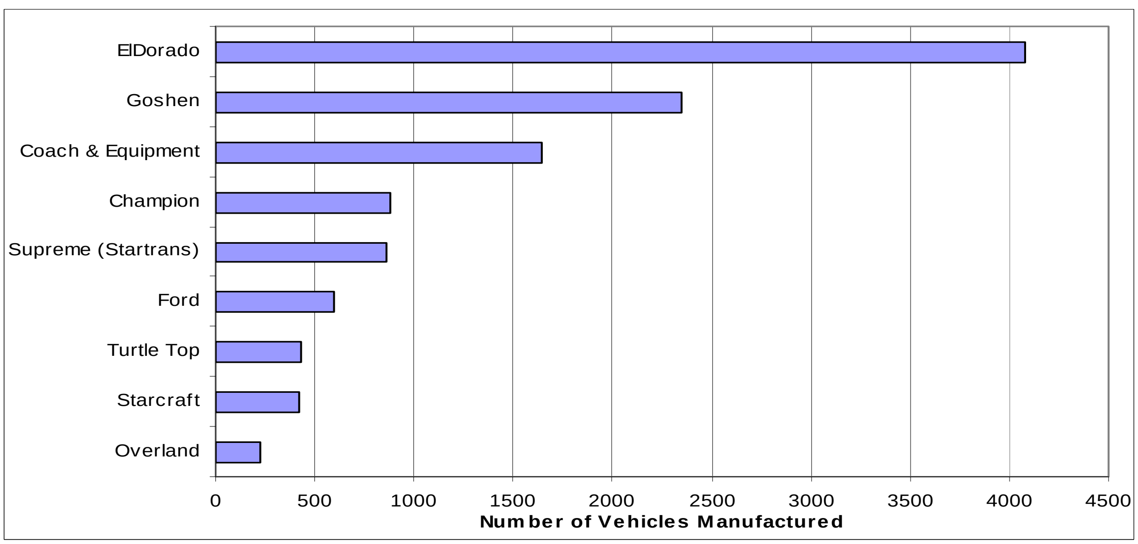

Figure 4.8 Transit Cutaways Produced by Manufacturer (APTA 2005)

In Figure 4.9 we present the major small bus manufacturers in this dataset. The volumes produced within the small bus segment are far less than the van and cutaway segments. Optima Bus Corporation is the leading manufacturer of small buses in Figure 4.9. However, a large number of vehicles manufactured by Optima are trolleys purchased within the small bus segment. This adds yet another dynamic to the industry. The trolley market segment is unique in its own right, serving a special niche of the overall market. Excluding the specialty trolley market, Orion Bus Corporation is the leading manufacturer of small buses within this sample. Orion produces many low-floor buses that are popular in larger communities. The use of ramps in low-floor buses, eliminating the need for steps and wheelchair lifts, allows routes to remain timely and efficient. Blue Bird and Gillig also hold a significant market share within this segment. Gillig's main focus is the large transit bus designed for large metropolitan areas, but they produce small buses as well. Although ElDorado is most prominent in the cutaway segment, they also manufacture small buses and vans. Champion and Startrans also have a presence in the market.

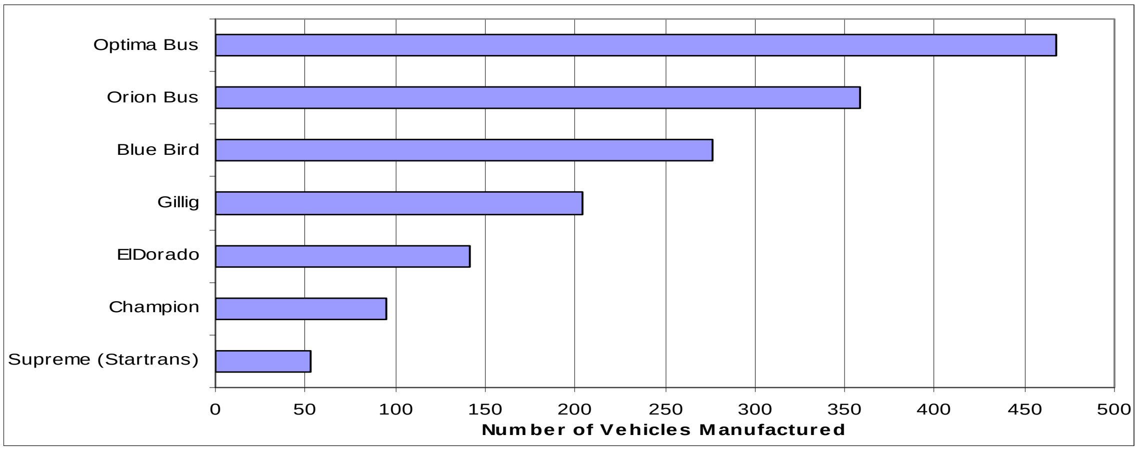

Figure 4.9 Transit Small Buses Produced by Manufacturer (APTA 2005)

SURTC also evaluated the average price of small transit vehicles, the average length and average number of seats per vehicle (Table 4.1). This further illustrates the uniqueness of the three separate small transit vehicle market segments. The average purchase price per vehicle highlights the largest difference between segments. On average, cutaways cost roughly twice as much as vans to purchase, while small buses cost almost three times as much to purchase compared to cutaways and almost six times more than transit vans. The differences in length are quite substantial as well. Although the average van in the dataset was 17 feet in length, many are shorter, only half the length of most small transit buses. Cutaways encompass a large range in length, falling between 19 and 27 feet while most of the small buses ranged only a couple of feet in length averaging 27.

The breakdown of the average number of seats may be the most telling indicator of a vehicle's effectiveness in serving a particular community because of seating capacity requirements related to differing ridership volumes. Vans have an average of less than half of the seating capacity of small buses. Finally, cutaway seating capacities range widely just as they do in length. Many cutaways have seating capacities of 14 or 15 passengers while others had seating capacities of 21 or 22. There is little variation in small bus seating capacities.

Table 4.1 Small Vehicle Market Segment Variations

Small Vehicle Market Segment	Average Price	Average Length	Average Number of Seats	Capital Cost per seat
Vans	$ 32,773	17 Feet	12	$2731
Cutaways	$ 64,596	23 Feet	17	$3800
Small Buses	$180,853	27 Feet	25	$7234

(APTA 2005)

Based on these three simple attributes, it is obvious that comparisons based on the entire small transit vehicle market have limited effectiveness due to the vast differences between the three market segments. We utilized regression analysis to gain a greater understanding of the entire small transit vehicle market as well as the van, cutaway, and small bus segments individually.

4.4 Regression Analysis

The purchase price of a small transit vehicle is usually the determining factor for a transit agency or state DOT in deciding whether to make a procurement. SURTC conducted regression analysis using the APTA (2005) dataset to determine which variables are significant in determining the purchase price of a small transit vehicle. Regression analysis is a tool that we used to compare vehicle factors such as attributes, manufacturers, and locations. Statistically evaluating such factors using regression analysis provides a more comprehensive, quantitative analysis of the market. Rather than looking at all variables independent of each other as in the previous discussion, we used regression analysis to illustrate how variables relate within the same model. For example, if a significant variable were either added or dropped from a particular regression equation, other variable coefficient values are altered.

Because all variables (seating capacity, manufacturer, accessibility options, etc.) must be considered when purchasing a small transit vehicle, regression analysis is an excellent tool that can provide insight into which variables are of importance, and also in determining the magnitude of a specific variable and its potential influence on the price of a vehicle. We conducted four separate regressions. We included all of the small transit vehicles in the dataset in the first regression. We then partitioned the data into segments including vans, cutaways, and small buses, and we ran three additional regressions on these datasets in an attempt to distinguish the three market segments by highlighting different variables that affect the purchase prices of each vehicle differently.

Specifically, we estimated the following relationship:

Vehicle Purchase Price = f (Attributes, Manufacturers, Purchase Locations)

The dependent variable we used was the vehicle purchase price paid per transit vehicle in real dollars. SURTC utilized the purchase price index for small trucks to alter the data (BLS 2006). Attributes included the number of seats in a vehicle, its overall length, width, model year, accessibility, and power source. The manufacturers were the vehicle manufacturers within the industry. To refrain from comparing different companies, manufacturers were coded as Manufacturer A, B, C, etc. The purchase locations included the region of the country where a vehicle was purchased. Figure 4.10 shows how we divided the country into four regions, North, South, East and West for these estimations.

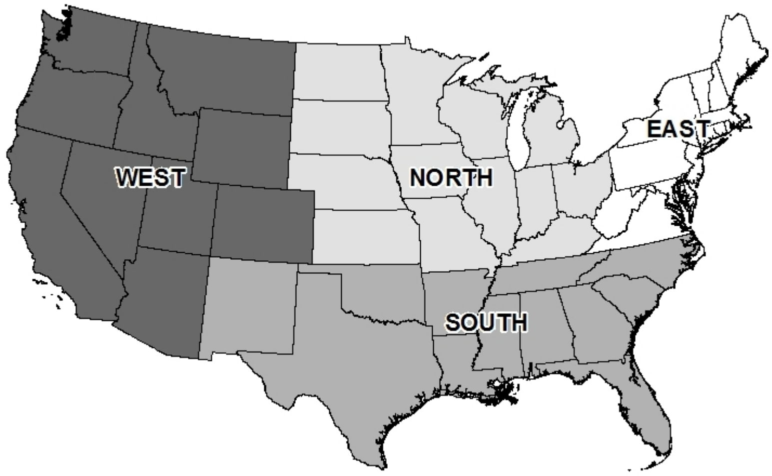

Figure 4.10 Country Regions

SURTC used dummy variables to distinguish different manufacturers, model years, accessibility options, power options, and country regions. We left one variable within each set uncoded as this was the variable to which all other variables were compared. Table 4.2 indicates which variables were not coded within each variable set. The most well-represented variable within each set, with two exceptions, was not coded and served as a means for comparison. Within the accessibility variables, a vehicle having neither a wheelchair lift nor ramp was not coded to emphasize the increase in price when a vehicle has either a lift or ramp. Also, the model year variables do not include a variable for vehicles produced before 1997. We did this to determine whether or not real purchase prices have increased in recent years.

Table 4.2 Dummy Variables Not Coded

Regression	**Model Years**	**Manufacturer**	**Accessibility Option**	**Power Source**	**Purchase Region**
All Data	1990-1997 Models	Manufacturer J	No Lift or Ramp	Diesel	West
Vans	1990-1997 Models	Manufacturer H	No Lift or Ramp	Gas	West
Cutaways	1990-1997 Models	Manufacturer J	No Lift or Ramp	Diesel	West
Small Buses	1990-1997 Models	Manufacturer D	No Lift or Ramp	Diesel	West

We utilized a double-log regression model to analyze the data set. The double-log model resulted in our highest Adjusted R-squared values, compared to other models, which measures the goodness of fit for the regression. The coefficient values in the tables show how a change in an independent variable (i.e., Length in Feet) affects the dependent variable (i.e., Purchase price). The specific model we used to estimate real transit vehicle prices was specified as:

$$\ln \text{Purchase Price}_{ij} = \beta_0 + \beta_1 \ln SEATS + \beta_2 \ln LENGTH + \beta_3 \ln WIDTH + \beta_4\ 97\text{-}99 + \beta_5\ 00\text{-}02 + \beta_6\ 03\text{-}05 + \beta_7 OPTIMA + \beta_8 CHAMPION + \beta_9 GILLIG + \beta_{10} ORION + \beta_{11} STARTRANS + \beta_{12} COACH\&EQUIP + \beta_{13} CHEVY + \beta_{14} FORD + \beta_{15} GOSHEN + \beta_{16} LIFT + \beta_{17} RAMP + \beta_{18} BIODIESEL + \beta_{19} COMNATGAS + \beta_{20} LIQPROPANE + \beta_{21} GAS + \beta_{22} NORTH + \beta_{23} SOUTH + \beta_{24} EAST + \varepsilon$$

where: Purchase Price = price paid per transit vehicle in real dollars

SEATS = number of seats in a transit vehicle

LENGTH = length of transit vehicles in feet

WIDTH = width of transit vehicles in inches

97-99, 00-02, 03-05 = dummies for vehicles manufactured within given timeframe

MAN A, MAN B, MAN C, MAN D, MAN E, MAN F, MAN G, MAN H, MAN I, MAN J = dummies for vehicle manufacturers

LIFT, RAMP = dummies for vehicle accessibility devices

BIODIESEL, COMNATGAS, LIQPROPANE, GAS= dummies for power source

NORTH, SOUTH, EAST = dummies for country region of purchase

Our analysis of the three models partitioned by market segment (vans, cutaways, and small buses) used the same model specification as above, but dropped variables that were not present within their given market segment database.

A main concern we had within these estimations was the presence of heteroskedasticity. Heteroskedasticity occurs when the variance of a regression’s error term is not constant and thus biases the parameter estimates. In the above specification, the variables LENGTH and WIDTH were of particular concern. We found far more variance when comparing the length of a transit vehicle than the width. To account for this, width was measured in inches while length was measured in feet, but a substantial discrepancy still existed. We ran Breusch-Pagan tests run on ordinary least squares (OLS) regressions to determine whether heteroskedasticity was present, and the tests showed significant heteroskedasticity. In an attempt to account for this, we estimated regressions using weighted least squares (WLS) as well as OLS. WLS divides the entire regression equation by a variable that is responsible for the heteroskedasticity and then rerunning the regression on the transformed variables. We used the variable LENGTH which contained the most variability within the models and this we used as the ‘weight’ in calculating WLS regressions.

We show the estimation results as coefficient values for all small transit vehicles in the dataset using WLS and OLS estimates in Table 4.3. The top number in the table is the parameter estimate for a particular variable, and the number in parentheses beneath it represents its standard error. As the table illustrates, we found minimal difference in the parameter estimates using either technique. In both estimations, most variables have their expected signs and are significant at the 5% level, based on t-tests for individual variable significance. Focusing on the WLS results, we found several attribute factors that were significant in affecting small transit vehicle prices. Both the number of seats in a vehicle and its length had a positive correlation with vehicle prices. This showed that as both the number of seats and length of a small transit vehicle increase, the price does as well, ceteris paribus. However, both models showed evidence that as the width of a vehicle increases, the price of the vehicle decreases. For example, the WLS estimation indicates that a 1% increase in the width of a small transit vehicle leads to an approximate .07% decrease in a vehicle's purchase price, other variables remaining constant. This seemed illogical, but upon further assessment of the data, we found that many of the less expensive cutaway vehicles were actually wider than some of the much more expensive cutaways. Cutaways were the most well-represented segment in the entire dataset, and this was believed to account for the unexpected sign.

Table 4.3 WLS and OLS Estimations for Small Transit Vehicles

	Parameter Estimate	
Variable	**WLS**	**OLS**
Intercept	7.162** (0.154)	7.202** (0.157)
Number of Seats	0.242** (0.008)	0.247** (0.008)
Length in Feet	1.000** (0.028)	1.053** (0.029)
Width in Inches	-0.073* (0.038)	-0.120** (0.039)
97 - 99	0.116** (0.012)	0.117** (0.012)
00 - 02	0.098** (0.011)	0.095** (0.011)
03 - 05	0.092** (0.012)	0.089** (0.012)
Manufacturer A	0.782** (0.021)	0.767** (0.020)
Manufacturer B	-0.055** (0.011)	-0.054** (0.010)
Manufacturer C	0.612** (0.028)	0.591** (0.027)
Manufacturer D	0.638** (0.019)	0.620** (0.019)
Manufacturer E	-0.066** (0.010)	-0.064** (0.010)
Manufacturer F	-0.070** (0.012)	-0.072** (0.012)
Manufacturer G	-0.276** (0.012)	-0.279** (0.013)
Manufacturer H	-0.240** (0.010)	-0.240** (0.010)
Manufacturer I	-0.115** (0.008)	-0.118** (0.008)
Lift	0.350** (0.011)	0.352** (0.011)

Ramp	0.680** (0.013)	0.693** (0.013)
Biodiesel	-0.048 (0.030)	-0.051* (0.029)
Compressed Natural Gas	0.234** (0.013)	0.241** (0.013)
Liquid Propane	-0.002 (0.038)	-0.002 (0.037)
Gas	-0.177** (0.007)	-0.174** (0.007)
North	-0.018** (0.007)	-0.022** (0.007)
South	0.081** (0.007)	0.083** (0.007)
East	0.007 (0.007)	0.007 (0.007)
WLS Adjusted R-squared = 0.8436 F = 2243 N = 9979 *significant at the 10% level **significant at the 5% level	OLS Adjusted R-squared = 0.8421 F = 2218 N = 9979	

The manufacturer dummies were all significant at a 5% level and showed their hypothesized signs. Manufacturer J vehicles were not coded within the estimation for manufacturers and thus serve as the variable for comparison. For example, Manufacturer D buses were between 62% and 64% more expensive than Manufacturer J buses, ceteris paribus. This is represented by the coefficient values in Table 4.3 for Manufacturer D. This stood to reason because Manufacturer D produces small buses and Manufacturer J produces primarily cutaways, and cutaways are far less expensive, on average, than small buses (see Table 4.1). Comparing Manufacturer J to Manufacturer H vehicles showed a relative comparison between vans and cutaways, as Manufacturer H manufactures a large quantity of vans for the transit industry. Manufacturer H vehicles cost 24% less than Manufacturer J vehicles illustrating the large price differences between cutaways and vans (see Table 4.1).

The lift and ramp dummies (accessibility variables) show a 35% and 69% increase in price compared to vehicles that have neither a lift nor ramp. Ramps had a greater influence on the purchase price than wheelchair lifts, because all of the vehicles in the dataset that used a ramp were also low-floor vehicles which are consistently more expensive than regular height vehicles. The power source variables showed interesting outcomes as well. While biodiesel and liquid propane vehicles were insignificant in the WLS models, compressed natural gas and regular gasoline vehicles were both significant. Compressed natural gas vehicles were more expensive (23%) than the uncoded diesel vehicles and the gas vehicles were 18% less expensive than diesel powered vehicles. This makes sense, as compressed natural gas buses are traditionally more expensive than their standard diesel counterparts, while gasoline powered small transit vehicles are traditionally the smaller, less costly vehicles such as vans and small cutaway buses.

Finally, SURTC estimated the purchase location dummies based on the map in Figure 4.10. Small transit vehicles purchased in the West were uncoded and thus, used as the comparison variable. Small transit vehicles purchased in the North were estimated to be between 2% and 3% less expensive than vehicles purchased in the West. Also, vehicles purchased in the South were between 7% and 9% more expensive than vehicles purchased in the West, holding all else constant. Small transit vehicles purchased in the East had an insignificant effect on vehicle purchase prices in both models.

We show the estimation results for the van market segment in Table 4.4. Comparing the results of the total small transit vehicle estimations in Table 4.3 with those of the van market segment in Table 4.4 shows some differing outcomes. It is interesting that the magnitude for seat capacity was far lower in the van estimations (0.07) than the total market estimations (0.24), and that the length of a vehicle was not even significant within the van market dataset, ceteris paribus. This indicates that the number of seats in a van along with its length do not have a substantial influence on the price of a van compared to cutaways and small buses. The width of a van, however, has a positive impact on the price, whereas the total market estimations yielded a smaller, negative impact on price.

Table 4.4 WLS and OLS Estimations for Transit Vans

Variable	**Parameter Estimate**	
	WLS	**OLS**
Intercept	8.374** (0.133)	8.373** (0.142)
Number of Seats	0.074** (0.008)	0.061** (0.009)
Length in Feet	0.002 (0.026)	0.034 (0.027)
Width in Inches	0.332** (0.031)	0.319** (0.033)
97 - 99	0.043** (0.011)	0.045** (0.011)
00 - 02	0.057** (0.010)	0.054** (0.010)
03 - 05	0.055** (0.011)	0.038** (0.011)
Manufacturer E	0.142** (0.027)	0.144** (0.028)
Manufacturer G	-0.072** (0.007)	-0.067** (0.007)
Manufacturer J	0.080** (0.009)	0.082** (0.010)
Manufacturer K	0.023** (0.008)	0.029** (0.007)
Manufacturer L	0.070** (0.009)	0.069** (0.010)
Lift	0.406** (0.009)	0.407** (0.009)
Ramp	0.470** (0.010)	0.463** (0.011)
Compressed Natural Gas	0.281** (0.015)	0.272** (0.016)

Table 4.5 WLS and OLS Estimations for Transit Vans (continued)

Variable	Parameter Estimate	
	WLS	**OLS**
Diesel	0.153** (0.010)	0.146** (0.009)
North	0.077** (0.008)	0.073** (0.009)
South	-0.023** (0.008)	-0.024** (0.008)
East	0.004 (0.009)	0.012 (0.009)
WLS Adjusted R-squared = 0.8407 F = 806 N = 2745 *significant at the 10% level **significant at the 5% level	OLS Adjusted R-squared = 0.8328 F = 760 N = 2745	

The year manufactured dummies show predictable outcomes. They are positive and show increasing magnitudes across variables illustrating the trend of increasing purchase prices for transit vans through the years. For example, vans manufactured between 1997 and 1999 are 5% to 6% more expensive than vans manufactured before 1997 (uncoded variable) based on these estimations using the APTA (2005) dataset, holding all else constant. This same trend continues with the 00-02 and 03-05 variables.

Manufacturer H was the uncoded variable we used to compare with the other van manufacturers. While price per vehicle based on manufacturer does not vary substantially within these estimates, it should be noted that Manufacturers J, E, and L accounted for a large percentage of the specialty vans in the dataset. These manufacturers offer low floors and ramps, among other options. This is the primary reason their prices are higher than competitors' prices based on these estimations. Accessibility options such as wheelchair lifts and ramps once again had a substantial influence on price, as expected.

The majority of the transit vans in this dataset were powered by gasoline engines, while diesel and compressed natural gas vehicles were more expensive based on these estimations. The main reason is that many of the larger vans that have higher average purchased prices were powered by diesel engines and compressed natural gas. The purchase location dummy estimates, based on Figure 4.10, indicated that transit vans purchased in the North were roughly 8% more expensive than vans purchased in the West while vans purchased in the South were estimated to be between 2% and 3% less expensive than vans purchased in the West. Transit vans purchased in the East yielded an insignificant result, as they also did with the total vehicle estimates.

We show the estimation results for the cutaway market segment in Table 4.5. These parameter estimates showed similar results compared to the overall small transit vehicle estimations found in Table 4.5 as was expected due to cutaways comprising about 60% of the entire dataset. Results indicated that the number of seats and length of a cutaway vehicle have a significant impact on its purchase price. The price of a cutaway, however, was negatively impacted by an increase in width, according to these estimations. This was the same result that occurred within the overall market estimates. The fact that many cutaway vehicles in the dataset had a higher purchase price than wider, less expensive cutaways was believed to account for this negative sign.

Table 4.6 WLS and OLS Estimations for Cutaways

Variable	**Parameter Estimate**	
	WLS	**OLS**
Intercept	10.125** (0.185)	10.181** (0.187)
Number of Seats	0.131** (0.009)	0.132** (0.009)
Length in Feet	1.034** (0.029)	1.038** (0.030)
Width in Inches	-0.654** (0.043)	-0.670** (0.043)
97 - 99	0.093** (0.014)	0.095** (0.014)
00 - 02	0.103** (0.013)	0.104** (0.013)
03 - 05	0.103** (0.0133)	0.105** (0.013)
Manufacturer B	-0.038** (0.008)	-0.036** (0.008)
Manufacturer E	-0.077** (0.008)	-0.077** (0.008)
Manufacturer F	-0.127** (0.008)	-0.128** (0.008)
Manufacturer H	-0.288** (0.017)	-0.289** (0.017)
Manufacturer I	-0.082** (0.006)	-0.082** (0.006)
Manufacturer M	-0.056** (0.0124)	-0.056** (0.012)
Lift	0.159** (0.016)	0.160** (0.016)
Ramp	0.656** (0.022)	0.655** (0.023)
Biodiesel	-0.023 (0.022)	-0.023 (0.022)
Compressed Natural Gas	0.211** (0.014)	0.210** (0.014)
Liquid Propane	0.109* (0.028)	0.109** (0.028)
Gas	-0.087** (0.006)	-0.089** (0.006)
North	-0.020** (0.006)	-0.021** (0.006)
South	0.002 (0.006)	0.000 (0.006)
East	0.033** (0.006)	0.034** (0.006)

Table 4.7 WLS and OLS Estimations for Cutaways (continued)

WLS Adjusted R-squared = 0.5026 F = 296 N = 6139 *significant at the 10% level **significant at the 5% level	OLS Adjusted R-squared = 0.4993 F = 293 N = 6139

The year manufactured dummies showed similar results compared to the van estimates. Newer cutaways tend to have higher purchase prices than older models. All six manufacturer dummy variables showed negative signs. The uncoded variable, Manufacturer J, is the largest player in the cutaway market and had the highest average prices in the dataset, according to estimates. This goes against the low-bid mentality of the cutaway market. If transit agencies were procuring only low-priced cutaways on a low-bid contract, the manufacturer with the largest market share, Manufacturer J, should not have the highest average priced vehicles. These estimations suggest that Manufacturer J is producing vehicles that demand, and receive, a price premium.

Cutaway accessibility options (wheelchair lifts, ramps) both had a significant positive impact on purchase prices compared to cutaways with no accessibility option. It was interesting to note, however, that ramps have a much greater impact on the purchase price of a cutaway than do lifts (0.67 vs. 0.17), according to these estimations, ceteris paribus. This was most likely attributable to low-floor cutaways that include ramps and demand a substantial price premium compared to standard floor vehicles.

Compressed natural gas and liquid propane powered cutaways both had a significant, positive impact on purchase prices, compared to diesel cutaways, while gas powered cutaways showed a significant, negative impact on cutaway purchase prices. This was expected, as compressed natural gas and liquid propane powered cutaways are considered specialty vehicles which have a higher cost than standard diesel cutaways. Gas powered cutaways, on the contrary, are typically smaller, less expensive vehicles compared to diesel-powered vehicles. Finally, the North and East purchase location dummy variables varied little compared to vehicles purchased in the western U.S. while the South estimate was insignificant. The purchase prices across the three regions varied between 2 and 4% based on the estimated results, all other variables remaining constant.

We highlight estimation results for the small bus market segment in Table 4.6. The length and width variables both have a significant positive impact on the purchase price of small buses. The number of seats in a small bus also has a positive impact, although this estimate was not significant at a 5% level, but it was significant at a 10% level. The width having a positive impact on the price of small buses is the opposite of the negative estimate for width in the cutaway market segment. This illustrates that the increasing width of a small bus does influence its price positively, while the cutaway market does not function in the same way.

Table 4.8 WLS and OLS Estimations for Small Buses

Variable	**Parameter Estimate**	
	WLS	**OLS**
Intercept	5.622** (1.660)	5.499** (1.665)
Number of Seats	0.063* (0.034)	0.067* (0.035)
Length in Feet	0.651** (0.111)	0.668** (0.112)
Width in Inches	0.787** (0.364)	0.798** (0.365)
97 - 99	0.254** (0.023)	0.249** (0.023)
00 - 02	0.106** (0.023)	0.099** (0.023)
03 - 05	0.072** (0.032)	0.066* (0.032)
Manufacturer N	-0.230** (0.033)	-0.233** (0.033)
Manufacturer A	0.192** (0.032)	0.187** (0.032)
Manufacturer B	0.056 (0.045)	0.053 (0.045)
Manufacturer C	0.074** (0.034)	0.073** (0.034)
Manufacturer E	-0.165** (0.056)	-0.159** (0.056)
Manufacturer J	0.022 (0.032)	0.027 (0.032)
Lift	0.263** (0.113)	0.268** (0.112)
Ramp	0.586** (0.113)	0.588** (0.113)
Biodiesel	-0.208** (0.070)	-0.207** (0.070)
Compressed Natural Gas	0.162** (0.028)	0.166** (0.028)
Liquid Propane	-0.566** (0.111)	-0.567** (0.111)
North	-0.012 (0.029)	-0.006 (0.029)
South	0.058** (0.029)	0.065** (0.029)
East	-0.138** (0.027)	-0.130** (0.027)

Table 4.9 WLS and OLS Estimations for Small Buses (continued)

WLS Adjusted R-squared = 0.6670 F = 107 N = 1058 *significant at the 10% level **significant at the 5% level	OLS Adjusted R-squared = 0.6660 F = 106 N = 1058

The year manufactured dummies show that purchase prices actually decrease with newer models compared to older ones. This is the only set of regressions that yield this outcome. These results do not make intuitive sense and are a function of the data. Many small buses in this segment's data manufactured between 1997 and 1999 were more expensive than models manufactured after 2000. This is not an accurate outcome compared to the actual industry, and little attention should be paid to it. It is common knowledge that real small bus prices, as a whole, have increased in recent years.

The uncoded manufacturer dummy for small buses was Manufacturer D. Compared to Manufacturer D, Manufacturers A and C produced the most costly small buses, while Manufacturers N and E produced less expensive products. The parameter estimates for Manufacturers B and J were insignificant. The accessibility features lift and ramp estimate results were consistent with the regression results of the entire dataset and the van and cutaway segments. It is interesting that both biodiesel and liquid propane had a significant negative impact on the purchase price compared to standard diesel small buses. It was hypothesized that liquid propane should have a positive sign as it did in the cutaway results, because it is a specialty vehicle that traditionally has a higher price tag than standard diesel buses. Compressed natural gas buses yielded its predicted significant positive impact on purchase price compared to diesel.

Finally, the purchase location dummy variables show some interesting results. The North variable was insignificant, but the South and East variables showed notable significant differences compared to small buses purchased in the western U.S. (Figure 4.10). A small bus purchased in the South, for example, was estimated to be 5% to 6% more costly than a similar vehicle purchased in the West, while a small bus purchased in the eastern part of the U.S. was estimated to be 13% to 14% less expensive than one purchased in the western U.S., holding all else constant.

4.5 Summary

In this chapter SURTC dissected the small transit vehicle industry into three distinct segments, vans, cutaways and small buses. We conducted data analysis on the three segments, along with the entire market dataset, to serve as a means for comparison. Although similar features do exist, the main factor that distinguishes each market segment is the difference in features of vans, cutaways and small buses that lead to substantial purchase price variations. Therefore, our analysis highlighted the different models and the manufacturers that produce them. We utilized basic regression analysis to further distinguish the three segments, with particular emphasis given to vehicle attributes, manufacturers, and purchase locations. In the following chapter we discuss findings based on survey results from representatives of both transit agencies and manufacturers, along with steering committee meeting input garnered from throughout the industry.

5. COMMITTEE MEETING AND QUESTIONNAIRE FINDINGS

SURTC utilized a combination of steering committee meetings and questionnaires to gain a greater understanding of the small transit industry's current attitude. Our main goal was to determine the small vehicle inefficiencies that exist among transit agency managers and the industry manufacturers who serve them. More than 30 transit agency and state procurement specialists provided input as to their perspectives regarding current procurement practices as well as perceived future vehicle needs to meet customer demands. More than 10 different manufacturer representatives also provided input through both questionnaires and committee meetings regarding their current production practices and viewpoints for the future of the industry.

5.1 Transit Agency and State Procurement Representatives Questionnaire Results

We first asked for the vehicle makeup of a particular transit agency's fleet (see Appendix for complete Small Vehicle Transit Agency Survey). Virtually every make and model of small transit vehicle was represented in the results. As expected, vans and cutaways made up more than 85% of vehicles within represented fleets. The model year of vehicles ranged between 1990 and 2005 with the majority of vehicles manufactured in the past five years. These results represented a wide range of transit agencies from both small and large communities from 25 different states.

Procurement

Our next set of questions dealt with procurement issues. Respondents were asked to indicate if they were planning on procuring new vehicles within the next 12 months and if so, to indicate the number of vehicles they plan to purchase, the vehicle's make and model along with the purchase price. Only six of the 32 respondents indicated that they would not be purchasing vehicles within the next year. Agencies which indicated they would be purchasing vehicles showed a wide range of prospects for perspective procurements. These prospects ranged from vans to various sizes and prices of cutaways and small buses as well. These results illustrate that transit agencies require a variety of vehicles to serve their cliental effectively. The reported vehicle price for all vehicles to be procured ranged from $27,000 to $180,000 per vehicle, showing the tremendous price discrepancies between different small transit vehicles in the industry, as highlighted in the previous chapter.

Next, we asked transit agency representatives to discuss the primary reasons for selecting their cited types of vehicles to be procured in the coming year. As expected, the most common reason respondents are choosing to procure new vehicles is to replace existing vehicles that are beyond their useful life. However, many other reasons for procuring new vehicles were given. These included, among others, the need for vehicles with multiple wheelchair positions, vehicles with more safety features, and vehicles with lower emission levels.

Respondents also indicated that many of their vans and cutaways were only three to five years old, but had been driven between 250,000 and 300,000 miles, and needed to be replaced. FTA's useful life category for most cutaway buses is 5 years/150,000 miles. The fact that many vehicles are not yet five years old, but have already been driven 250,000 miles, 100,000 miles beyond their FTA useful life, shows a discrepancy within the useful life standards as vehicles are often recording 150,000 miles within two to three years of service. These small vehicles drive longer distances more regularly than standard transit buses, mainly due to demand-response, Medicare and paratransit applications. Given that FTA life standards are less for cutaways than standard transit bus, a new category of small transit vehicle may be helpful to identify vehicles that do not follow that standard use pattern. This shows the necessary versatility and range of options for small transit vehicles. Finally, respondents indicated that they are procuring more vans with wheelchair ramps to serve specialty medical needs. One respondent indicated that vans are more economical to operate than 15-passenger cutaways, are easier to maneuver, and cost less. Also, when considering wheelchair accessibility, vans have a ramp so there is no upkeep on a wheelchair lift, and vans ride much quieter than cutaways.

We then asked the reasons why transit agencies would be retiring vehicles in the coming year. The most common response for retiring vehicles was because of their high mileage. Also, the high cost of repairing vehicles, which is related to high mileage, was another main reason given for retirement. A few agencies indicated they would not be retiring vehicles, but are purchasing new vehicles to add to their existing fleet. The new and older vehicles would be used to meet increased demand for transit services in their districts.

The Federal Transit Administration (FTA) is currently conducting a procurement program called the Cooperative Procurement Pilot Program (CPPP). We asked respondents for their opinions about partnering with transit agencies to procure buses through a single, standardized request for proposal (RFP) for buses that share the same specifications, features and design. Many agency representatives indicated they are already involved in a similar program run through their state transit programs. One respondent specified that "it is essential for small transit operators to purchase buses through state procurement pools as we do not have the in-house ability to write specifications, solicit bids, etc." Other agencies indicated they would welcome a pooled procurement program to save time and money while purchasing vehicles. The stipulation for most agencies interested, however, was that they would need to be given options for certain vehicle specifications necessary to run their systems effectively. Their main argument was that each service has its own challenges and needs the ability to tailor vehicles to meet specific needs. Although this is true, partnering to procure buses with the same specifications, features, and design, as the FTA's CPPP program indicates, would not be effective, and would not save agencies procurement dollars if they cannot agree on standard specifications.

We also asked for agency opinions regarding the effect Buy America policies have on their procurement of federally funded transit vehicles. Many of the respondents go through their state transit offices and follow those agencies' guidelines which include Buy America, so it is not an issue for them. The inability to procure Sprinter vans, which currently do not meet Buy America standards, was the main complaint among respondents. Another complaint was that Buy America hinders competition between manufacturers and slows the development of more-high quality small transit vehicles. The other side of the argument is that federal dollars should not be used to buy products manufactured internationally.

Service

Next, we tried to gain a better understanding of transit agency service attributes. We asked respondents to indicate the type of transit bus services their agency offered. All of them offer demand-response (paratransit) service while more than half of respondents also indicated they offer fixed-route service as well. Express transit service was offered by six of the agency respondents. The number of routes by service type offered varied from 1 route to as many as 30, showing a nice range of small and small urban agencies represented within responses. Services also varied widely as one respondent indicated operating 29 fixed-routes, 1 express-route, and no demand-responsive routes while another operated more than 20 demand-response routes and no fixed-routes. These were the extreme results, and others varied within the sample.

We then asked what new services, if any, your transit agency is planning to provide within the next three to five years. Of the 32 responding agencies, 12 indicated they would be starting, or adding to their fixed-route system in the coming years. Seven agencies specified they would be starting commuter service within the next three to five years. Two others indicated they would be adding demand-response service, while one agency would be introducing intercity services within their service region. The continuing expansion of transit services throughout the country is evident based on these results. Vehicles, many of them small transit vehicles, need to be procured to operate these new services effectively. Therefore, expansion of the small transit vehicle industry is likely, and manufacturers who are able to meet the needs of agencies will be successful.

Vehicle Attributes and Technologies

We then asked agency representatives questions regarding transit vehicle attributes and technologies. Respondents were asked to indicate which technologies they would incorporate in their small buses if the cost of such technologies were not a factor. Some agency respondents indicated they already had automatic vehicle location (AVL) devices on their small buses. Other than AVL, technologies were limited within respondents' small bus fleets. Cost of the technologies was specified as the greatest hurdle for incorporating them within respective fleets. For example, one respondent believed they would benefit from technologies such as on-board cameras, electronic fare collection, and obstacle detection devices, but due to limited funding, they could only wish for these advancements. Also, there was concern from rural respondents about whether or not some technologies would work effectively in remote areas. A few other respondents felt that on-board technologies were not necessary because of limited ridership, which would not facilitate the need for such equipment.

SURTC was also interested in determining the current and future demand for buses using alternative fuels. Therefore, we asked transit agencies whether or not they currently use, or plan to use, a power source other than diesel fuel and/or gasoline in their small transit vehicles. Eleven agencies, about a third, responded "yes" to this question. Compressed natural gas (CNG), diesel-electric hybrid, and biodiesel were the three power source alternatives that received positive responses from almost all "yes" respondents. One agency indicated they are using liquefied natural gas (LNG), and will also consider using hydrogen fuel cell buses in the near future. As with on-board technologies, the cost of alternative fuel buses is the biggest concern, primarily among small urban and rural transit systems.

SURTC also wanted to gain a better understanding of the aspects of small transit vehicles that could be improved. Agency representatives were asked to rank their current small fleet vehicles in order of which characteristics they would like to see improved. The seven following characteristics were given as choices:

- Fuel economy
- Operating cost (maintenance, labor, etc.)
- Capital cost
- Reliability
- Accessibility
- Emissions/environmental
- Service (meeting ridership demand)

The characteristic ranked highest for needing improvement was the reliability of small transit vehicles. This was followed by fuel economy and service (meeting ridership demand). Operating costs and accessibility were rated as the next two most-needed improvements while capital cost and environmental features were rated at the bottom of priorities, respectively. Reliability issues have been found to be the major concern with small transit vehicles throughout our research. This was reported as a major concern in Hemily and King's (2002) small vehicle survey report as well. Increased fuel costs in the past year resulting in a need for vehicles with greater fuel economy, and a transit agency's ability to serve its evolving cliental effectively, are understandable concerns as well. It is interesting that environmental factors, such as vehicle emissions, were ranked as the least important characteristic needing improvement by almost half of respondents.

We concluded the questionnaire with two open-ended questions. The first asked transit representatives what improvements they would most like to see offered in transit vehicles designed to serve low-density routes. Common responses included smaller, more fuel-efficient vehicles, more durable vehicles, and vehicles that included advanced technologies such as AVL, etc. Our final question asked respondents whether or not an advanced small transit vehicle development program would be useful for the industry. Almost all responses indicated that such a program would be useful, and the Sprinter van was mentioned by a few agency representatives as a potential vehicle well-suited to serve the rural transit market.

5.2 Small Vehicle Manufacturer Representatives Questionnaire and Committee Meeting Results

SURTC used a combination of questionnaires and committee meetings to develop a greater understanding of the small transit vehicle industry from a manufacturer perspective. We felt that a combination of open-ended questions and discussion would serve this research section more effectively than the approach used in the transit agency section. For example, from a transit agency perspective, we asked specific questions pertaining to their agency, whereas similar information can be obtained regarding manufacturers by researching their websites and conducting data analysis on vehicles already present in the market. This analysis was performed in the previous chapter. Therefore, the following discussion is a compilation of perspectives gathered to compare manufacturer and transit agency viewpoints regarding the small transit industry.

First, we wanted to gain a greater understanding about what manufacturers perceived as missing in the current small transit vehicle market. We asked them to tell us what features small vehicle buyers demand that are not currently present on standard models. The most common deficiencies, according to manufacturers, were a lack of low-floor vehicles and hybrid power source vehicles. This is consistent with transit agency perspectives in the previous discussion. The agencies rated fuel economy and meeting ridership demand as high priority in regards to improvements they would like to see made to current small transit vehicles. A few respondents commented that there are really no standards in the small transit vehicle market, and that most buyers demand different vehicle specifications in their orders. Manufacturers also felt that if buyers changed their procurement practices to pooled procurement with larger order quantities, fixed production costs could be reduced and prices for standardized transit vehicles would be minimized.

Several other comments were made by manufacturers regarding the current make-up of the cutaway market, in particular. One manufacturer stated the reason cutaway vehicles are successful as shuttle buses is because they are built on a light truck chassis, and thus, follow the light truck market. This keeps the cost of cutaways down because the chassis cost is relatively low because of high volume manufacturing (ASTV Stakeholder Meeting 2006). Since there are no low-floor trucks being produced or requested, there is no demand for small, low-floor vehicles outside of the small transit vehicle market.

Although transit agencies would like to procure low-floor cutaway vehicles, they demand a price premium of two to three times the total cost of a traditional cutaway vehicle. Most, if not all, small transit agencies would be unable to afford such a vehicle until it becomes more standard in the market, and the price drops due to higher volume manufacturing and competition for market share between manufacturers. One manufacturer indicated it would need a market demand of 200-300 low-floor vehicles per year, while another indicated it would need a market demand of roughly 500 low-floor vehicles per year to make it worth its time and effort to produce and market (ASTV Stakeholder Meeting 2006).

We then asked manufacturers if they were planning to produce small transit vehicles within the next three to five years that utilize an alternative fuel source. Nearly all respondents indicated that if demand existed, and buyers would be willing to pay the price premium necessary, they would manufacture such vehicles. A few manufacturers have taken a proactive approach in this arena and are introducing either low-floor or alternative fuel buses in the coming year. A few models will be combination low-floor/alternative fuel vehicles. These small transit vehicles will be marketed to larger transit agencies with budgets large enough to afford such procurements.

Manufacturers also include advanced technologies such as AVL, electronic fare collection, and obstacle detection equipment, among others, as they are written into customer specifications. We found that manufacturers are willing to include most anything demanded, but prices increase measurably as more technology features are added. Manufacturers are often leery regarding many technology add-on components. Some believe that these components are on the market before they are completely developed. Therefore, when they are added to a vehicle and do not function properly, manufacturers, not the development company, are left with the cost of fixing such problems.

5.3 Summary

Based on questionnaire and committee meeting findings, SURTC obtained valuable information from both transit agencies and manufacturers of small transit vehicles. The main vehicle features that need to be improved, according to transit agencies, are fuel efficiency, and service features, such as low-floor vehicles, to meet cliental needs. Manufacturers agreed that these are two of the most demanded features, but they both demand a large price premium. There is currently a very small market devoted to low-floor vehicles so the vehicles that are manufactured cost two or three times more than common small transit vehicles. Alternative fuel vehicles are currently more common than low-floor vehicles, and they are not as costly to manufacture. In the following chapter, we will discuss recommendations and conclusions. These will include where we believe the industry is currently heading, and what changes can be made to make small vehicle procurement a more efficient process.

6. RECOMMENDATIONS AND CONCLUSIONS

Based on research highlighting small transit vehicle issues, data analysis, and questionnaire results, we have developed some recommendations for the industry.

1. The first involves issues that arise regarding small urban and rural transit agency vehicle procurements. Because local agencies lack procurement expertise and funding, they usually rely on state DOTs to handle many of their vehicle procurement needs. State DOTs collect procurement requests from numerous small agencies and pool the requests to achieve volume discounts for vehicle procurements. Through our research, we found there is a lack of information exchange between transit agencies and state DOTs throughout this process. Transit agency respondents stated that they will ask for a certain make/model of vehicle, but state DOTs will procure another make/model of vehicle to save money (ASTV Stakeholder Meeting 2006). As a result, transit agencies are left with an inferior vehicle that does not serve their clientele effectively. This does not occur in every state, but coordination must be improved, with a focus on quality as well as cost, to benefit the transit user, which should be the ultimate goal of the entire procurement process. The main problem is the lack of state DOT communication with transit providers. We recommend that state DOTs change their perspective towards small vehicle standards and create groups of transit agencies to develop necessary specifications for vehicle procurements.

2. The low-bid process for small transit vehicle procurement is another downfall of the current supply chain. The FTA believes that more factors than cost should be considered when procuring vehicles, but that hasn't stopped the low-bid process. Although the cost of a vehicle must be a key consideration during procurement, it should not be the only variable considered. John Ruskin, a 19th century English author, had the following to say about the low-bid process:

> "The common law of business balance prohibits paying a little and getting a lot...it cannot be done. There is hardly anything in the world that some man cannot make a little worse and sell for a little cheaper, and the people who consider price only, are this man's lawful prey" (Ruskin, 1860).

All entities involved in the process, whether they are transit agencies or state transit departments, have a certain budget, and they want to get the most they can with their limited resources. However, to not consider the quality or the effectiveness of a vehicle within a certain market, can be a fatal mistake. We recommend that transit agencies and DOT officials consider all factors while planning vehicle procurements.

3. Based on data analysis of current small transit vehicles, we recommend that the market be considered as three distinct segments that include vans, cutaways, and small buses. Often, small transit vehicles are lumped together for analysis while major differences exist within the market. We illustrated this in the data analysis chapter as we found substantial variations in the price, size, and function of vans, cutaways, and small buses. By segmenting the market into three segments and considering each segment individually, different approaches can be taken by transit agencies and procurement officials based on the unique characteristics of each segment. This may alleviate some of the tensions and inefficiencies that exist between transit agencies and state procurement officials. Because there has been no coordination of small transit vehicles, the market has become very diverse and includes a huge range of vehicles and applications. Defining groups of small vehicles used in transit, and optimizing vehicles within each group will aid in eliminating confusion and duplication within the market.

4. Finally, there seems to be some misunderstandings about how transit agencies and federal and state DOTs view pooled procurement programs. When we surveyed transit agency representatives regarding pooled procurement, they were positive about such a program. However, many also responded that agencies should be able to choose specific features on small transit vehicles that would allow them to operate their systems more effectively. Although some slight variations in vehicle specifications may be allowed, the objective of a pooled procurement program is that vehicles have the same specifications so they are cheaper to manufacture, and thus cheaper to procure. Pooled procurement is ineffective if all of the vehicles are tailored specifically to individual transit agencies. Also, small transit vehicles are much easier to repair if standardized parts are available, which is another advantage of mass producing vehicles within a pooled procurement program. Many agencies want the cost benefits of pooled procurement, but are unwilling to accept the standardization necessary to receive these benefits. State and federal DOTs must educate transit agency officials to alleviate these misunderstandings. Standardization of vehicles would reduce costs for the small transit industry by mass producing vehicles that meet agency needs. Maintenance departments could also utilize standardized parts to lower their costs as well. Also, maintenance personnel would not be required to learn many different vehicle parameters, as standardization would alleviate such intricacies in the market. FTA should develop a white book for small transit vehicle procurements that includes standards for the industry to follow.

Our research has analyzed the small transit vehicle market from varying points of view. We began by discussing the current and future evolution of the market. We followed this with an overview of issues that have arisen in recent years pertaining to small transit vehicle procurement. Next, we used data analysis, including regression analysis, to gain a better understanding of the current small transit vehicle market make-up. Finally, we used a combination of questionnaires and committee meetings to understand transit agency and manufacturer perspectives regarding the overall market as well as its smaller intricacies. We realize that we have just scratched the surface of small transit vehicle market dynamics and further research would be helpful. A detailed look into state DOT procurement techniques as well as advanced technologies in small transit vehicles would serve as interesting and useful research follow ups. The demand for small transit vehicles should continue to grow in coming years. Research objectives should be designed to educate and update individuals responsible for the well-being of the entire industry.

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APPENDIX. SMALL TRANSIT VEHICLE SURVEYS

Small Vehicle Transit Agency Survey

The Small Urban & Rural Transit Center (SURTC) at North Dakota State University in conjunction with the Federal Transit Administration (FTA) are examining the current small transit vehicle market to determine how well current vehicles meet transit agency needs. The results of this survey will be combined with recommendations obtained through stakeholder meetings to decide whether there are issues that need to be addressed in the small transit vehicle market. We appreciate any input you are able to provide. Please include comments to assist us in fully addressing this topic.

Please note that all responses will be kept confidential and will be used solely for the purposes of the Federal Transit Administration.

Transit Agency: ____

Name & Title: ____

Phone:_________________ E-mail:_______________________________Date: _________

1). Which of the following vehicles does your transit agency operate, and what is the approximate number/make/model of each vehicle type in your fleet?
(Feel free to provide inventory sheets and continue with question 2)

Vehicle Type	Number of Vehicles	Make / Model(s)	Seat Capacity	Length	Mileage
Small Transit Bus (Less than 30 ft.in length)					
Van					
Other small vehicle (Less than 30 ft. in length)					

2). Is your agency planning on purchasing new vehicles in the next 12 months?

□ Yes **(Continue with question 3)**
□ No **(Skip to question 5)**

3). If Yes, what type, how many, and at what cost?

Vehicle Type	Number of Vehicles	Make / Model	Price
Small Transit Bus (Less than 30 ft.in length)			
Van			
Other small vehicle (Less than 30 ft. in length)			

4). Please discuss the primary reasons for selecting the cited types of vehicles your agency procured, or plans to procure, this year. (e.g. replace vehicles, unique features, cost, etc.)

5). If **No,** please discuss the primary reasons for not purchasing new vehicles this year.

6). How many **transit vehicles** have or will be retired in 2006? Please discuss the primary reasons for retiring these vehicles.

7). What type(s) of transit bus service does your agency offer? Please check all that apply and indicate the number of routes by service type.

Type of Service	**Number of Routes**
□ Fixed-Route	
□ Demand Response (Paratransit)	
□ Express	
□ Other, please specify	

8). What new service, if any, is your transit agency planning to provide in the next 3 to 5 years? Please check all that apply.

Type of Service	**Number of Routes**
□ Fixed-Route	
□ Commuter	
□ Express	
□ Other, please specify	

9). If cost were not an issue, what technologies would you like to incorporate in your small bus fleet (e.g. Automatic Passenger Counters (APC), Automatic Vehicle Location (AVL), electronic fare collection, obstacle detection devices, etc.)?

10). Does your agency currently use, or plan to use in the next 5 to 7 years any power source other than diesel and /or gasoline for your small buses/vans?

11). If **no,** what are your reasons for **not** using an alternative fuel source?

12). If **yes,** please check all that apply and indicate the number of small buses/vans.

Power Source	**Transit Buses**	**Vans**
□ Compressed Natural Gas (CNG)		
□ Liquefied Natural Gas (LNG)		
□ Diesel-Electric Hybrid		
□ Diesel-Gasoline Hybrid		
□ Biodiesel		
□ Hydrogen fuel-cell		
□ Other, please specify		
□ Plan to use alternative fuel but have not decided		

13). FTA is conducting a pilot **pooled procurement** program called the Cooperative Procurement Pilot Program (CPPP). What is your opinion about partnering with other transit agencies to procure buses through a single and standardized RFP for buses that share the same specifications, features and design?

14). How does the **Buy America policy** affect you agency's procurement process for federally funded procurement of vehicles?

15). What are the most significant challenges that your agency is currently facing with regard to procurement of vehicles?

16). Rank the following 7 aspects of current fleet vehicles in order of how much you would like to see them improved, from highest priority (1) to lowest priority (7).

___ Fuel Economy

___ Operating Cost (maintenance, labor, etc.)

___ Capital Cost

___ Reliability

___ Accessibility

___ Emissions/Environmental

___ Service (meeting ridership demand)

___ Other:

17). What improvements would you most like to see offered in transit vehicles for low density routes?

18). How likely might your agency be to adopt new technologies or vehicle specifications?

1	2	3	4	5
Not at all likely			Very likely	

19). In your opinion, would a specialized advanced small transit vehicle developmental program be useful? If you feel there are already vehicles suited to this market, please describe.

Additional Comments:

Small Transit Vehicle Manufacturer Survey

The Small Urban & Rural Transit Center (SURTC) at North Dakota State University in conjunction with the Federal Transit Administration (FTA) are examining the current small transit vehicle market to determine how well current vehicles meet transit agency needs. The results of this survey will be combined with recommendations obtained through stakeholder meetings to decide whether there are issues that need to be addressed in the small transit vehicle market. We appreciate any input you are able to provide. Please include comments to assist us in fully addressing this topic.

Please note that all responses will be kept confidential and will be used solely for the purposes of the Federal Transit Administration.

Manufacturer: ____

Name & Title: ____

Phone: ____________ Email: _______________________ Date: _________

1). Small Buses (Less than 30 feet) and Vans Manufactured

Bus/Van Model	**Altoona Bus Testing (yes or no)**	**Fuel Options**	**Standard Purchase Cost Range**

2). What specific bus/van features do small bus/van buyers demand that are not present on standard models?

3). What steps do you take to improve your relationship with small bus/van purchasers?

4). Have your production practices changed in recent years to meet customer demand?

5). Do you currently, or plan to in the next 3 to 5 years, manufacturer small buses/vans that use an alternative fuel source?

6). What types of technologies do you offer on your small buses/vans (e.g. APC, AVL, electronic fare collection, obstacle detection devices, etc.)?

7). Annual small bus/van sales volume ($)

Year	**Annual Sales Volume**
2000	
2001	
2002	
2003	
2004	
2005	

8). Annual small bus/van sales volume by vehicle type ($)

Year	**Vehicle Type**				
2000					
2001					
2002					
2003					
2004					
2005					

9). Location of small bus/van production facilities (please list below)

Facility	Location
1	
2	
3	

10). Annual small bus/van production volume by facility (units)

Location	2000	2001	2002	2003	2004	2005

11). Annual small bus/van production volume by vehicle type (units)

Year	Vehicle Type				
2000					
2001					
2002					
2003					
2004					
2005					

12). Annual number of small bus/van warranty claims

2000	2001	2002	2003	2004	2005