

Travel Task Force Report: Public Transportation and Future Technology Impacts on Travel

Introduction

Reliable and frequent public transportation and intercity travel services are now and will continue to be vital for economic development in the Capital District. The continued shift in employment opportunities toward suburban locations will require new transit routes and services that can link inner city residents to jobs. These same service improvements could also introduce new riders to transit as it will likely serve communities that have been auto oriented in the past. Also, the potential for high speed rail and continued growth at the Albany International Airport could lead to new economic development opportunities and improved access to major cities in the United States and around the world.

Improvements in public transportation and intercity travel are also inherently linked to available technology, which could impact the direction and form these services take. Even more critical is the impact technology will have on the future surface transportation system. Intelligent transportation systems (ITS) such as electronic toll collection, traveler information systems and transit priority systems have already been implemented to some extent in the Capital District. A number of other ITS tools, many focused on motor vehicle safety, are currently being tested and by 2030 are likely to be implemented throughout the country. Technological advances will also impact the design of vehicles, potentially leading away from conventional fuels toward new alternative fuels and even new methods of transportation. What follows is a description of public transportation and technology now and into the future and how changes might impact Capital District market groups.

Background

Intercity Travel

The Capital District is at the crossroads of a variety of transportation systems that link the region to major markets around the world. With respect to public transportation and commercial mass transit, Amtrak, the airlines and intercity bus services such as Greyhound are the major providers of intercity transportation. Aside from the wide variety of destinations offered by these services, they also make intercity travel possible for all income levels and for all levels of mobility. They are also vital in supporting continued economic growth in the region. Recent major investments in the Albany International Airport and the Rensselaer Amtrak Station and commitments to new rail facilities in Saratoga Springs and Schenectady demonstrate the importance of reliable and attractive intercity transportation services to the region.

Through the 1980's and early 1990's, the then Albany County Airport was nearly an embarrassment to the region as it offered travelers a negative first impression of the area. As the economy remained stagnant during this time, many viewed a revitalized airport as an essential component of regional economic development. This resulted in major investments that transformed the facility into a first class, regional mini-hub for rural northeastern airports. Changes specifically included a new terminal, new parking facilities including surface lots and parking garages, new on-site shuttle services, a new name (Albany International Airport) and the attraction of new airlines to the Albany market such as Southwest. All of this gave the traveling public an overwhelmingly positive first impression of Albany and the region the Airport serves.

A strong national economy through the mid and late 1990's, a new terminal and new airlines resulted in passenger increases at the airport. According to the Airport's recent passenger boarding data (known as enplanements), the low point was in 1996 when enplanements were just over 1.01 million [1]. Enplanements peaked at the airport in 2001 at around 1.52 million. This trend would have likely continued if the terrorist attacks of September 11th, 2001 had not occurred. The attacks, coupled with an economic slowdown, hit the aviation industry hard. Many of the major carriers have filed for or are on the brink of bankruptcy and have had to reduce flight schedules thereby impacting enplanements. As a result, overall enplanements at Albany dropped from 1.52 million in 2001 to 1.48 million in 2002.

Fortunately for Albany, Southwest Airlines managed to avoid many of the difficulties other airlines have faced and has in fact continued to gain in market share. In September 2002, after many years of dominance, Southwest overtook USAirways as the most dominant carrier at Albany. By March 2003, Southwest had 25.1 percent of the market share while USAirways, plagued by internal operations and maintenance problems, had 21.7 percent of the market [2]. The success of Southwest and its low fares has kept Albany competitive with other airports in the northeast during the economic crisis of the major carriers. Southwest has also opened Albany up to new markets in the nation, in particular Austin, Texas which could be vital as Sematech reaches full operation in Albany.

Although the airlines saw nationwide growth in the 1990's, passenger rail continued to decline as infrastructure deteriorated and Amtrak continued to have economic problems. Despite national trends, the proximity of the Capital District to other major cities has allowed passenger rail to remain competitive with car and air travel. The regional hub for rail travel is the Rensselaer Amtrak Station, reconstructed in the early 2000's. The Rensselaer Station handled over 630,600 passengers in 2001 and is one of the nation's top 20 busiest for Amtrak [3]. Many of these passengers travel between Albany and New York City but Amtrak also serves Montreal, Toronto, Boston and Vermont. Along with Rensselaer, Amtrak also operates out of Schenectady and Saratoga Springs. Saratoga is opening a new station in 2003 and Schenectady is pursuing an inter-modal station to be completed in the late 2000's. These and other investments continue to demonstrate the Capital District's support for rail travel.

Although Capital District residents accept and use Amtrak more than in many larger regions, the problems Amtrak faces nationally with respect to government subsidies continue to put its future in jeopardy. The main issue is that subsidies have not been large enough to allow Amtrak to provide the service required, and in fact demanded, by supportive Congressmen. This has resulted in a number of routes that are not cost effective, including many of the cross country routes that serve smaller communities and have low ridership. “Of its 41 routes, 14 lose \$110 or more per passenger, six lose more than \$210, and one – the Sunset Limited – loses \$347 for every passenger it carries between Orlando and Los Angeles” [4]. Although Amtrak has been criticized for not being more efficient in its operations, an unrestricted company might have cut unprofitable routes long ago, something Amtrak is currently unable to do.

Congress and the Bush administration are currently reviewing their options for how to deal with Amtrak’s financial situation. The Bush Administration developed a plan that would dismantle Amtrak, turning over pieces of the system to states that would then contract with private carriers to provide the service with no government subsidies. This would potentially end many cross country routes and limit passenger rail to high volume corridors on the east and west coasts. However Congress seems to be focusing on upgrading Amtrak and providing over \$1 billion in subsidies [5]. Despite the uncertainty, few dispute the need for some form of passenger rail, which was clearly demonstrated after the terrorist attacks. In the weeks following the attacks, Amtrak saw its ridership increase 15 percent nationwide as the aviation industry struggled to return to service [6]. Regardless of what happens to Amtrak, it is highly unlikely that passenger rail will completely disappear from the Capital District in the future due to the vital service it provides and the rail investments already made.

Intercity bus services such as Greyhound and Adirondack Trailways also provide a great deal of transportation not only at a lower cost but to destinations that can not be reached by Amtrak and the airlines. The largest intercity bus provider is Greyhound Lines, Inc. which serves over 2,600 destinations throughout the U.S. Their mission is “to provide the opportunity for anyone to travel throughout North America with safety, dignity and convenience” [7]. According to facts provided on their website, 68 percent of Greyhound passengers make less than \$35,000 per year and only one-third have a college degree. Because their customer base is largely lower income individuals (including students and other young people), their services are vital to providing safe and efficient intercity transportation.

In the Capital District, Greyhound has a large presence with a number of local stops, many more than Amtrak offers. Larger terminals are found in downtown Albany and Schenectady with the Albany terminal providing 24 hour service. Other major local stops include the University at Albany, downtown Saratoga Springs and the Albany Airport. Service is also provided to other local communities (such as Clifton Park and Troy) en route to major destinations in the northeastern U.S. and Canada. These major destinations include Montreal, Vermont, Boston, Buffalo, Binghamton and New York City. Adirondack Trailways also serves many of the same local communities as Greyhound. These services not only provide affordable transportation but also serve

rural sections of New York State to link residents with jobs and other services. Without intercity buses, many individuals would struggle to find rides from others or would be forced to not travel at all, reducing any opportunity for a higher quality of life.

Transit

Federal legislation in the 1990's (ISTEA and TEA-21) created new funding opportunities for transit, generating renewed interest in public transportation as a solution to increasing traffic congestion. By 2001, transit ridership (rail and bus) had grown 23 percent nationwide since 1995. This increase is greater than the nationwide increases in population (4.5 percent), highway use (11.8 percent) and domestic air travel (12 percent) [8]. Although the projects generating the most attention have been commuter or light rail, traditional bus services have also made tremendous gains. These gains have been made due to the availability of federal funds and due to a philosophical shift in how transit providers operate. Some of these philosophical changes have been new strategic missions, a focus on the customer, collaboration with other transit partners and the introduction of information technology.

In the Capital District, a number of the more visible and high cost projects have been associated with intercity air and rail travel. However, tremendous investments have also been made in regional public transportation. The primary provider of public transit is the Capital District Transportation Authority (CDTA). CDTA's service improvements through the 1990's included a new, 100 percent accessible bus fleet, exclusive contracts with regional universities, greater welfare-to-work participation, the use of electronic fare cards and new suburban shuttle services. CDTA also improved many of its high volume stops with new bus shelters, electronic schedule boards and the addition of benches and other stop amenities. These improvements led to ridership increases and by 2001-02, CDTA's ridership reached 12.1 million passengers representing a 3.4 percent increase over 2000-01 [9].

Unfortunately, ridership gains were followed by decline in 2002-03 when ridership dropped by about 2 percent from the previous year [10]. Some of the reasons cited for this slip include driver shortages, maintenance problems and unreliable service on the street. The low point in 2002-03 was in December and January when 1.4 percent of scheduled runs had to be cancelled, which is an unacceptable number according to CDTA [11]. In an effort to reverse this downward trend, CDTA switched gears and decided to reorganize to better serve its customers. Some of the steps being taken include a complete restructuring of CDTA's organization chart, the hiring of new drivers and additional training for maintenance personnel with less than one year of service. CDTA hopes to be operating at an acceptable level of service by the fall of 2003.

CDTA has also embarked on a number of initiatives which could have long term implications. Suburban shuttle services were introduced in 1996 and have been gaining in popularity ever since, contributing to CDTA's overall ridership increases. The shuttles provide flexible, on-demand transit service that links riders from fixed routes to workplaces and shopping centers. The total number of rider trips on the Shuttlebug, Shuttlebee, and Shuttlefly was about 22,810 in June 2002, up from 19,496 in June 2001

[12]. Many riders use the shuttles to access suburban jobs that might not otherwise be available to them. A survey conducted in 2002-03 by CDTA on its shuttles found that 68.8 percent of riders make less than \$25,000 a year while 82.6 percent do not have a car available to them [13]. Their popularity and the increasing demands for flexible transit service in suburban areas could lead to additional shuttle services in the future.

Another initiative CDTA is pursuing is the commuter bus service in the Northway corridor between Albany and Saratoga Counties. Capital District commuter bus transportation has generally been provided by private carriers with support from government subsidies. In the Northway corridor, this service had been provided by Upstate Transit which had over 177,500 riders in 2001 [14]. Upstate Transit recently made a deal with CDTA to take over the service. That deal calls for CDTA purchasing buses from Upstate Transit who will then lease the buses from CDTA for \$1 in return for operating the service and maintaining the buses [15]. This arrangement will allow CDTA to better market the service, coordinate the routes with CDTA's existing fixed routes and create route schedules that make sense for commuters. As the region continues to move away from commuter rail as a solution to Northway congestion, service improvements to commuter buses could lead to long term ridership gains.

Finally, CDTA provides special transportation services to the physically and mentally disabled and to Medicaid recipients. Through its STAR (Special Transit Available by Request) para-transit service, CDTA offers on demand, door-to-door service for those whose disabilities prevent them from using the fixed route transit system. The potential rider must live within three quarter miles of an existing CDTA bus route and can only request the service during that route's hours of operation. Access Transit was set up by CDTA on behalf of Schenectady and Rensselaer counties to broker Medicaid transportation with the long term goal of brokering all medical trips for the elderly and disabled, regardless of medicaid eligibility. Trips are arranged on STAR or fixed route CDTA buses, ambulettes or taxis. Although these services have increased the mobility of many individuals, they are costly services to run. However, for better or worse, these services are likely to gain in popularity as the population ages and more individuals retire in place.

Technological Advances

Intelligent Transportation Systems (ITS) use advanced computer and communications technology to reduce travel time, improve safety and increase the efficiency of travel. TEA-21 authorized almost \$1.3 billion over its six year program for ITS development and deployment [16]. The following highlights some of these technologies.

- intelligent traffic signals (for motor vehicles and pedestrians)
- automatic toll collection
- traveler information systems
- in-vehicle information and warning systems
- advanced transit systems (including collision avoidance systems, automatic vehicle locator systems and real-time passenger information systems)
- intelligent commercial vehicle systems (including truck inspection and border crossing systems)

Through the 1990's and the early 2000's, ITS had many successful implementations in the Capital District. Partnering with the New York State Police, NYSDOT established a Traffic Management Center (TMC) in Albany which monitors the operation of the regional interstate system and major arterials such as Alternate Route 7. The TMC collects traffic data from in-pavement detectors and cameras and distributes important information to travelers via permanent and variable message signs and highway advisory radio. When an incident or breakdown occurs on the system, HELP (Highway Emergency Local Patrol) trucks are deployed and, if necessary, state police are dispatched and message signs are updated to provide travelers the information they need. This system has helped to clear accidents faster and reduced the impact of incident related delays on regional highways. The Thruway Authority also has its own ITS system with a statewide operations facility located in Albany.

Another recent implementation of ITS technology is through the NY 5/Wolf Road ITS Signal project. This project represents a coordinated effort between NYSDOT, the Cities of Albany and Schenectady, the TMC and CDTA. The goal of the project is to coordinate the 76 traffic signals so that traffic flows better on Route 5, allowing CDTA's buses to keep to their schedules [17]. New signal hardware was recently installed at key intersections, especially where green time could be shifted away from side streets to Route 5. Signal timings were coordinated and the TMC was provided an override capability in the Albany section should a major incident occur on I-90. CDTA will also be utilizing a transit signal priority (TSP) system by installing global positioning system (GPS) units on its buses to lengthen the green time at 32 of the busiest signalized intersections in the corridor [18].

Perhaps the most visible and most successful of the ITS implementations in New York State is E-ZPass electronic toll collection. E-ZPass toll collection began on the New York State Thruway in 1993, went system wide by 1997 and led to the development of a multi-state consortium of regional toll agencies that use E-ZPass technology today [19]. In 2003, more than half of the paid trips on the Thruway were paid with E-ZPass. Capital District commuters and truckers are among the many travelers to benefit from E-ZPass which shaved a great deal of time off commutes, especially during the peak summer months. The technology is versatile and E-ZPass tag holders can also use them to pay parking fees at the Albany International Airport and soon at the Rensselaer Amtrak Station. The Thruway is now looking to implement high speed E-ZPass lanes at various toll plazas on its system to further decrease travel time.

Technological advances have also created new opportunities for alternative fuels and innovative transportation systems. Although many prototype alternative fuel vehicles have been in development over the last decade, vehicle manufacturers are now beginning to market these vehicles to the general public in what could be the first generation of such vehicles in the United States. In model year 2001, for example, seven compressed natural gas (CNG), two CNG/gasoline bi-fuel, two hybrid, nine electric and four flexible fuel (roughly 85 percent ethanol, 15 percent gasoline) vehicles were on the market from seven different manufacturers [20]. The hybrid gasoline-electric vehicles such as Toyota Prius and Honda Insight have seen the greatest market penetration in New York State as

they do not need special refueling stations or other infrastructure that other alternative fuel vehicles require. One optimistic projection indicates that hybrid vehicles could make up as much as 20 percent of the total automotive sales in the United States by 2010 [21].

New forms of transportation are also on the market such as the Segway Human Transporter (HT). According to the manufacturer, “the Segway HT is the first self-balancing, electric-powered transportation device. With dimensions no larger than the average adult body and the ability to emulate human balance, the Segway HT uses the same space as a pedestrian, and can go wherever a person can walk” [22]. The Segway may be most appropriate for trips that are too long for walking and too short to justify driving. These technologies are in their infancy and their potential to transform transportation through 2030 would seem to be limitless.

Vehicle navigation technologies are also being developed and one that is already on the market is the OnStar hands free wireless communication system. This system, paid for through a monthly fee, provides 24 hour a day information and assistance to drivers by pressing a single button inside the vehicle [23]. Pressing the button will connect the driver to a call center where trained advisors will assist with anything from directions to serious emergencies. The key to the system is the use of Global Positioning System technology which pinpoints the location of the vehicle. Some OnStar packages also allow the driver to use it as a hands free wireless phone. Many auto makers are now offering OnStar as part of standard packages on high end vehicles and as an option on other vehicles. Some of the auto makers offering the system include Acura, Chevrolet, Volkswagen and HUMMER. Other companies such as Lincoln offer customers their own vehicle navigation systems that provide many of the same benefits as OnStar.

Clearly, there have been a number of public transportation and technology improvements in the last ten or so years. History has shown that technology, perhaps more than anything else, has helped to shape the entire regional transportation system including the evolution in street systems and vehicle types. By 2030, new systems, technologies or techniques could be implemented that have not even been envisioned, perhaps radically changing how we live our lives in the Capital District. The following represents a first cut at what technologies might take hold in the region in the future, recognizing that additional, perhaps significant, changes are likely to occur that can not be foreseen.

The Region in 2030:

Intercity Travel

Air travel will likely evolve over time as new technology and new business models change the way the airline industry operates. Already, commercial airlines serving the Albany International Airport are changing the aircraft used to serve Albany’s routes, often using smaller, regional jets than turboprops or larger jets. The terminal is also expected to reach capacity in the next few years as it was designed to handle only 1.6 million passengers. Discussions are already underway to expand the terminal to a capacity of 2 million passengers if business travel increases and Southwest as well as smaller, regional airlines increase their investment in the region [24]. Other plans include

additional parking facilities, longer runways to accommodate heavier and larger aircraft and a new direct access road from the Northway at a new Exit 3. The airport is obviously working hard to remain competitive and attractive for all forms of air travel in the future while also anticipating future population and economic growth in the region.

As discussed previously, Amtrak's future remains uncertain and even if current issues are resolved, uncertainty is likely to continue. However, regional investments would seem to indicate that passenger rail will continue to operate in some form well into the future. The grand vision for New York is high speed rail through the Empire Corridor from New York City to Buffalo via Rensselaer. Under Governor Pataki's plan, older turbotrains would be rebuilt to travel at speeds of 125 MPH in order to cut travel time between NYC and Albany to less than two hours [25]. The \$185 million plan includes signal and track improvements such as the installation of a second track between Albany and Schenectady. It is hoped that implementation of high speed rail in upstate New York would lead to additional economic development opportunities.

The implementation of high speed rail has hit some stumbling blocks. Construction of a second track between Albany and Schenectady seems to be stalled, perhaps indefinitely. Owned by CSX Corporation, this heavily traveled section of track serves both passenger and freight operations and has often been the site of many delays. Although the earlier stumbling block between the state and CSX regarding rail property taxes has been resolved, Amtrak's financial situation may make construction of a second track impossible in the near future. The lack of a second track coupled with a fight between the state and Amtrak over the quality of rebuilt turboliners, continues to delay high speed rail. Although these issues are stumbling blocks today, it is very likely that they will be resolved at some point in the future so that by 2030, high speed rail will be fully implemented in the Empire Corridor and perhaps in a number of other corridors throughout New York.

Future rail travel in the Capital District is also likely to include scenic trains. Warren County is the lead on a project to develop scenic rail between Saratoga Springs and North Creek New York, near Gore Mountain. The Adirondack Park Agency is currently reviewing the proposal for its impacts on the environment and until they issue an approval, the project will be delayed. Another source of delay for the project is Saratoga County. No agency, local government or even the County has been willing to take the lead as the project sponsor. Without a sponsor, federal dollars can not be directed toward implementation of the project. Warren County is currently awaiting a decision from the Town of Hadley which has been asked to be the sponsor of the Saratoga County portion of the project. As with high speed rail, if and when today's issues are resolved, scenic rail could increase economic activity in upstate New York in the future.

Transit

The development of the *New Visions* plan in the 1990's led to an in-depth investigation of future transit issues in the Capital District. These issues were articulated by the Transit Futures Task Force in its *Transit Futures Report* and the Special Transportation Needs Task Force in its *Special Transportation Needs Summary Report*, both published in 1995.

At the same time, CDTC led an effort referred to as the *Fixed Guideway Transit Feasibility Study*. This study attempted to identify future transit options for the Capital District in corridors that could potentially capture a large number of riders. The technical analysis in all of these reports led to a number of transit supportive actions that were recommended in the *New Visions* plan. The transit objectives include redesigning the system to meet 21st century needs, renewing the bus system with new buses and smaller feeder buses, integrating services for those with special needs and providing “best bus” service in the NY 5 corridor.

The recommendation for “best bus” service in the NY 5 corridor was further explored in the *NY 5 Land Use and Transportation Study* completed in 2002. This study resulted in a preferred future for the NY 5 corridor that involves revitalizing communities and enhancing transportation opportunities along the corridor. A key transit recommendation was the development of a Bus Rapid Transit (BRT) system. According to the Federal Transit Administration, “BRT combines the quality of rail transit and the flexibility of buses. It can operate on exclusive transitways, high occupancy vehicle (HOV) lanes, expressways, or ordinary streets. A BRT system combines intelligent transportation systems technology, priority for transit, cleaner and quieter vehicles, rapid and convenient fare collection, and integration with land use policy” [26]. The advantage of BRT is that it provides rail like service at much lower construction and operating costs than rail.

The BRT concept for the NY 5 corridor is being further developed in additional planning and design studies. Phase 1 of the BRT is scheduled to begin in 2003 with completion in the fall of 2004. This study will include the conceptual design of street modifications, stations, terminals and priority transit measures. A future second phase will more fully develop these concepts so that the project can go to the engineering design stage. According to estimates made in the NY 5 Study, a fully implemented NY 5 BRT and all of its required road modifications and stations could occur in the next 20 years. It is hoped that by changing the image of buses, giving buses priority over motor vehicles and creating transit friendly communities, new riders will be attracted, access will be improved and congestion will be reduced, which would all support economic growth in the Capital District and the NY 5 corridor. A successful implementation on Route 5 could serve as a model and lead to the development of additional BRT corridors throughout the Capital District by 2030.

There are other public transportation concepts that could impact the region, if implemented. One such concept is an automated rapid transit system. Automated rapid transit systems are characterized by having driverless vehicles that run continuously on fixed routes separated from traffic with stations off the mainline of travel. The vehicles are small and can travel at relatively high speeds. CyberTran has developed its own automated rapid transit system and is looking to install a pilot system between the Rensselaer Amtrak Station and the Empire State Plaza with hopes of developing a regional system in the future. Other concepts that have been met with varying levels of interest include commuter rail, dedicated bus lanes on the Northway or other light rail transit options. Although none of these concepts are currently planned for

implementation, they all represent potential opportunities that may become more realistic in the future as regional conditions and needs change.

There is no doubt that in thirty years, public transportation will have to evolve to meet the needs of a much different society. The future of public transportation in the Capital District is intrinsically tied to the available financial resources and the future regional land use scenario. Providing more rural and suburban transit could require substantial changes in how CDTA and other human services agencies operate, especially if the populations being served, such as the elderly, are traveling outside of the traditional morning and afternoon peaks. Also, walkable, compact communities are much easier to serve with transit than disconnected residential subdivisions on large lots or exurban or rural homes. For rural and suburban transit service to be cost effective, communities need to consider the future development pattern and where these nodal points might be. Even more critical is the need for transit providers and human service agencies to coordinate their services for more efficient utilization of the transportation fleet.

Future Technology

Future advances in ITS and technology could take forms not yet envisioned, especially with respect to transportation. To demonstrate support for ITS and technology, the Bush Administration's proposal for SAFE-TEA (the reauthorization of TEA-21) includes over \$1.7 billion for ITS development, representing a 20 percent increase over TEA-21 levels [27]. The goals of the ITS program are to "reduce traffic congestion, improve transportation system reliability, provide better customer service to users of the highway system, and improve safety and security by providing financial incentives to transportation agencies to invest in proactively monitoring and managing the performance of the transportation system" [28]. Of particular importance is the security aspect of ITS which involves protecting critical infrastructure, increasing the role of the TMC in emergencies and enhanced border controls.

In New York, the DOT has been actively pursuing a number of ITS initiatives through its New York Moves program. Those that may potentially impact the Capital District include an integrated incident management system, enhanced travel information, a road weather information system and perhaps a 511 information line. The region is also planning an ITS test bed for the Rensselaer Technology Park and additional arterial signal coordination projects [29]. The Thruway Authority is attempting to increase the reach of its E-ZPass system by participating in ITS America's Task Force on Interoperability [30]. The Interoperability Task Force is attempting to make E-ZPass operable throughout the U.S., Canada and Mexico. This would be especially beneficial to truckers as they could use one E-ZPass transponder for their entire long-haul trip. Down the road, E-ZPass may also be used for bypassing weigh stations, accessing freight terminals and for pre-clearances at border crossings and safety checks. It may also allow high occupancy toll lanes to be more easily developed.

These potential system level initiatives are being complemented by a number of vehicle related initiatives at the federal level that are beginning to trickle down to consumers. One such project is the Intelligent Vehicle Initiative (IVI) supported by USDOT and

other federal agencies. The IVI is looking to develop vehicle-based driver assistance products that would prevent hazardous driving from causing crashes. The major program areas include rear-end collision avoidance, lane change and merge collision avoidance, road departure collision avoidance, intersection collision avoidance, vision enhancement, vehicle stability, driver condition warning and safety-impacting services [31]. Although these technologies are in their infancy, experimentation with some of them is already occurring in expensive cars such as the parking assist on Lincoln Town Cars. By 2030, technology will likely have evolved such that these systems are part of the standard vehicle packages sold in the United States, potentially saving millions of lives.

Advanced technology is going beyond safety and navigation systems (OnStar) in motor vehicles, it is also allowing auto companies to develop more efficient and potentially more practical alternative fuel vehicles. As mentioned earlier, a number of alternative fuel vehicles are currently on the market, some showing great promise. In the future, hybrid vehicle technology will be expanding into other vehicle types and by 2004 will include SUVs and light trucks. One technology currently in development but showing promise is the hydrogen fuel cell. Developed from technology used on the Space Shuttle, fuel cells work by using the chemical energy of hydrogen and oxygen to create electricity without the traditional fuel combustion process [32]. As manufacturers gain more experience with alternative fuels and consumers find them to be reliable, it is not out of the question that by 2030 a new vehicle fleet could be fully integrated in the U.S.

For the Capital Region, and New York State as a whole, the first large scale integration of alternative fuel vehicles will come from the State's automotive vehicle fleet. In 2001, Governor Pataki issued Executive Order No. 111 which directs agencies and departments over which the Governor has executive authority to be sensitive to the environmental impacts of agency activities and to take steps to reduce that impact. The Executive Order stipulates that by 2005, at least 50 percent of new light-duty vehicles acquired by the state should be alternative fuel vehicles [33]. This requirement would increase 10 percent each year until 2010 when all new light-duty vehicles purchased must be alternative fuel. Although there is no specific requirement for phasing in alternative fuel heavy-duty vehicles, the Order does require agencies to implement strategies that support use of alternative fuel vehicles or improve the efficiency of the vehicle fleet.

Air quality and safety have been and continue to be concerns for transit providers. Throughout the 1990's, alternative fuel buses have been slowly integrated into a number of transit fleets around the country. Some of the bus fuel technologies currently being developed, and in some cases used, are hybrid-electric, fuel cells and compressed natural gas (CNG). Here in the Capital District, the Albany International Airport has begun using CNG vehicles as part of their shuttle fleet with great success. The Airport currently has two CNG shuttles in operation, has received funding for two more and has a long term goal of using CNG vehicles for the entire fleet. Also, the Airport is beginning to purchase bio-diesel plows and other heavy equipment for use on Airport property. Unfortunately, CDTA has thus far been unwilling to integrate alternative fuel vehicles into its fleet. However, as the next generation of fuel efficient buses evolves along with

safety technologies such as collision avoidance systems, CDTA may be more willing to embrace new vehicle types when the bus fleet is replaced in the future.

CDTA has instead focused on developing and implementing ITS technologies that will help them better serve their customers. These technologies include computer aided dispatch, use of Global Positioning Systems to track bus locations, automatic passenger counters, transit signal priority systems and queue jumpers. Queue jumpers are relatively new to CDTA and in June 2003, the intersection of Fulton and 3rd Streets in the City of Troy became the first upstate New York intersection to incorporate the technology. A transit signal priority system was recently installed on NY 5 and Wolf Road and is proposed for the Washington Avenue and Western Avenue corridors. The overall goal of both technologies is to allow buses to better keep to their schedules by giving them an advantage over cars. Other technologies that might be implemented in the future include web-based trip planning systems, electronic fare and multi-trip ticketing systems and real-time arrival and departure information.

Although much of this discussion has focused on motor vehicles, ITS products of the future are not limited to them. Technologies are also being developed to support bicyclist and pedestrian safety. There are many advances particularly occurring with respect to pedestrian crossing technology including automated pedestrian detection systems countdown timers and audible signals. Pedestrian detection systems include technologies such as infrared scanners, microwave and pressure sensitive sensors as alternatives to the typical pedestrian call button. Most of these technologies are still being tested in the U.S. although some have been implemented more broadly in Europe. Bicyclists are also likely to benefit from ITS technology through the use of global positioning systems to provide location information and real-time route data. These technologies are likely to become more prevalent in the future but certainly any technology that can be added to motor vehicles to help drivers detect pedestrians and bicyclists would probably offer great safety benefits.

Market Groups

The impact of future public transportation and technology improvements on Capital District market groups will likely be tremendous. Everyone in the region is likely to receive some benefits but the groups potentially receiving the most benefits will be those with the greatest transportation needs. An aging population in suburban and rural areas will require transportation providers to refocus resources in order to meet their needs. At the same time, the mobility impaired, low income and non-driver groups could also be included in these new services. The discussion that follows represents a brief articulation of the potential public transportation and technology changes that may impact the travel of Capital District market groups.

Couples and Singles without Dependents

Intercity Travel: Couples and singles without dependents are generally the most mobile of the market groups, especially for those with higher incomes. Without the constraint of

children or dependent adults, leisure and business travel can be quite extensive. These individuals generally select their mode for long distance travel by speed and cost, resulting in air being the preferred mode for most households. When airfares at the Albany Airport are not competitive with others, some in this group may even drive two to four hours to neighboring airports if the savings justify the parking costs and the drive time, especially for larger groups. However, the presence of discount airlines such as Southwest in Albany will likely continue to make air travel competitive with other modes for some time to come. Regardless of whether the individual is a college student or an empty nester, if they can afford air travel, they will choose it for long distance trips.

Rail and long distance buses are much less convenient than air due to their longer travel times. However, Amtrak service to New York City is particularly heavily used by this group, more than to any other destination. College students particularly benefit from Amtrak as they may not be allowed to have cars on campus, reducing their ability to drive to school. Couples and singles without dependents will also benefit from the implementation of high speed rail, as long as it does not become cost prohibitive. Long distance bus travel may be competitive with students and lower income individuals in this group. The great disadvantage of this form of travel is the long travel times, generally making them unattractive to the majority of households in this group.

Air, rail and bus travel can open up endless destinations for all income levels in this market group. If these individuals continue to be willing or able to pay for higher speed services, then they are likely to be doing so more frequently in the future than they are today. However, for those that can not afford the air or rail fares and do not want to waste the time on the bus, driving will remain the primary option for some intercity travel in the future, as long as travel times are not negatively impacted by congestion.

Transit: Those without dependents have the greatest flexibility in terms of how and when they travel. Aside from income, personal schedules and location choices are the primary factors that dictate local mode choice. For higher income individuals, especially the empty nesters, it will be difficult to get them out of their cars and onto transit without additional incentives (such as financial or travel time benefits). That said, transit is vital for the younger members of this group who are generally in school and either do not have cars or the schools they attend make it inconvenient to use or park cars. Transit is also vital to those that live in more urban areas or have lower incomes. In the future, workers may be willing to embrace the travel time benefits of BRT service on regional arterials or through an enhanced commuter service on the Northway, especially if congestion rises regionally due to new jobs or population growth.

Technology: All market groups will see some benefits from future technologies, whether they are direct or indirect. ITS will likely provide great benefits for drivers through real-time travel information, reduced travel time from more efficient roads and through safety systems such as collision avoidance. Some ITS products, such as the in-car driver assist products, will not offer the same level of benefit to this group as for other groups such as the elderly. Those that use transit will also benefit from the technology improvements

such as real-time schedules, which can help students and workers reach their destinations on time.

New forms of transportation and alternative fuel vehicles are more likely to be embraced by the members of this group than other groups, for those that can afford them. The members of this group in the future will have been raised with environmental awareness and will certainly be aware of the national dependence on foreign oil. They are also technologically savvy and the younger generation in particular will be more likely to embrace high tech alternative fuel cars. With auto makers beginning to market alternative fuel cars to the younger segment of this market group, these individuals may help to prove the reliability of the technology so that it can be marketed to all Americans in the future.

Couples and Singles with Dependents (Children and Dependent Adults)

Intercity Travel: For those with dependents, intercity travel by air, rail and bus is much more expensive and more difficult to accomplish due to the larger household sizes involved. These households may also be limited by ailing dependents that are unable to travel long distances. As a result, those with dependents make few intercity leisure trips using non-auto modes given the economy of traveling by car with multiple family members. However, the increased presence of discount airlines in Albany could open up longer distance trips to families that could not afford them before. Also, business travel is likely to follow the same pattern as for those without dependents, which is focused on the fastest mode at the best price. Future business travelers will certainly benefit from discount airlines and high speed rail. Unfortunately, singles with dependents will remain especially burdened financially and are not likely to travel great distances using non-auto modes aside from business travel.

Transit: For higher income households with dependents, transit is generally not viewed as a desirable mode of transportation, a view that is not likely to change without other changes in transportation policy. Dependents place high demands on these households making it difficult to convince many to use traditional transit routes that are inflexible and often do not link to services such as child or health care. Singles are especially burdened while using transit and for those that can afford it, they will more likely use cars. Despite the limitations of transit, lower income households do benefit from the connection to jobs, shopping and schools and will use transit when possible. Regardless of who is using it, future improvements in transit technology will provide great benefits to all transit users.

Technology: This group will benefit from some of the general technological advances that will impact all the market groups. One area in which this group will particularly benefit is in the travel time savings generated from ITS technology on the road system. Because every second counts in the busy schedules of those with dependents, getting the most up to date traffic and weather information, having an enhanced incident management system and coordinating traffic signals to improve traffic flow will all benefit those that need to be available for dependents.

Couples and singles with dependents need reliable transportation that is also functional for larger families. If alternative fuel vehicle technology proves to be reliable and performs well in larger vehicle types, then the members of this group may begin to buy into them. Until then, the members of this group are likely to stick with conventional cars until alternative fuel vehicles become more main stream.

Independent Elderly

Intercity Travel: The independent elderly are likely to remain very active in retirement in the next 30 years. Because this group is likely to be so large in the future, their travel needs will certainly be coming to the forefront of policy discussions. The future activities of the independent elderly will likely range from leisure travel to volunteerism to part-time jobs. Leisure travel will also increase in the future and they will likely use the most efficient, reliable and user friendly modes for long distance travel. For trips closer to home, charter bus travel will remain competitive for those with lower incomes or for those that would rather not drive. However, as with other market groups, the wealthier elderly will inevitably be more mobile in the future than those with lower incomes that will likely make few or no long distance intercity trips.

Transit: With more independent elderly in the region retiring in place, particularly in the suburbs, transit will have to adapt to meet their needs in order to gain new riders. Because most of the independent elderly have spent their lives driving, maintaining the ability to drive will be their top priority. However, as the driving ability of the elderly changes with age, transit needs may increase. Two issues transit will have to overcome for these individuals to use it is the lack of knowledge on the part of the independent elderly about transit and the long travel time transit is generally associated with compared to cars. Already, senior and suburban shuttles are proving that flexible door-to-door type service can be successful in suburban communities and BRT may also help transit compete better with cars in some corridors. It is possible that the independent elderly may choose to use such services in the future more than they are today, especially if they are perceived to be safe.

Technology: As the independent elderly no longer commute, many of the travel time benefits gained through ITS deployment will not directly benefit them. More critical will be the improvements in vehicle technology that may allow the elderly to continue driving safely much later in life. Future vehicles are likely to have advanced safety technologies such as parking assist systems, collision avoidance systems, vision enhancement devices and a whole host of other warning devices. Navigation systems are also likely to be heavily used by the members of this group and they may also embrace reliable, alternative fuel vehicles once the technology is proven. Again, the majority of the independent elderly will only benefit if these technologies remain affordable as part of the standard packages on all motor vehicles. Lower income elderly may not be able to afford many of the advanced safety systems unless they are part of an affordable car package. Despite income limitations, maintaining the ability to drive will be of great importance to the elderly in the future and technology will likely allow them to do that.

Dependent Elderly

Intercity Travel: Dependent elderly have very low mobility rates when compared to other market groups. Physical and financial limitations are the major contributors to this lack of mobility. As a result, intercity travel is almost non-existent for this group.

Transit: Physical limitations reduce the ability of this group to use fixed route transit. They are more likely to use flexible door-to-door services such as STAR or Access Transit to reach medical appointments, perhaps the only travel these individuals will have in a given week. The dependent elderly in suburban and rural communities pose particular problems for transit providers and other providers of medical trips due to their great distances and travel costs. However, it is likely that the demands for these services will increase in the future, further straining the financial resources of providers. Those not living in their own homes will not use public transit as assisted living facilities will provide their transportation and take care of their personal needs on site.

Technology: Because the dependent elderly do not drive and make few trips at all on the regional transportation system, they will not receive many direct benefits from ITS or other technologies. However, they will receive indirect benefits from potentially cleaner air and reduced oil dependence through the use of alternative fuel vehicles. In 2030, many of the shuttle services used by assisted living facilities are likely to use alternative fuels. Improved vehicle technologies may also help the elderly remain independent later in life as they maintain their ability to drive despite physical limitations. It is unclear how far technology will go with respect to driving but due to the relative importance of driving to the elderly, it may happen that only the most severely impaired individuals will have to stop driving completely.

Mobility Impaired

Intercity Travel: The Americans with Disabilities Act (ADA) has greatly impacted air, rail and intercity bus travel by requiring that these services are accessible for all travelers. That said, their level of accessibility has often come into question. Although airport terminals are generally fully accessible, aircraft, trains, and buses are often not leading to a variety of difficulties, especially while boarding. Boarding problems are exacerbated by poor station designs, especially for passenger rail. Hotel shuttles, taxis and rental car companies often have no or a limited number of accessible vehicles. Although these difficulties have not kept the mobility impaired from traveling they have made travel far more challenging than for the average passenger. New vehicle and station designs are beginning to address some of the problems but it will be some time before entire fleets and their terminals or stations are fully accessible. More consideration needs to be given to the mobility impaired in the future.

Transit: CDTA's 100 percent accessible bus fleet and its STAR para-transit service have greatly increased the mobility of the mobility impaired. However, many challenges remain for these individuals, especially in areas where the pedestrian environment is poor or in suburban and rural areas where transit services are limited. The potential for BRT

could also cause challenges for the mobility impaired as they may have difficulty reaching stations that are widely spaced in the corridors they serve. CDTA would like to see most of its mobility impaired customers use their fixed route service with only those that can not access the fixed routes using the para-transit service. Unfortunately, customers prefer the para-transit service due to its flexibility and door-to-door nature. In the future, CDTA or other transportation providers may have to find additional resources to expand para-transit services to more suburban and rural locations, perhaps linked with potential services for the elderly to be more cost effective.

Technology: Technology will certainly provide a number of benefits to the mobility impaired in the future. New vehicle technologies, if affordable, could allow many individuals with mild impairments to drive even easier than they are today. It may also be possible to have computers do the majority of the driving, offering those with more severe mobility impairments a freedom they never had in the past. The question that remains, as with the dependent elderly, is how far technology will go to allow those with impairments to drive. Even if the majority in this group never drive, they will benefit from the many system level ITS and technology improvements that will effect all the market groups such as more efficient arterials and easier to use transit.

Low Income

Intercity Travel: Household income is perhaps the most critical factor influencing mobility. As touched upon throughout the market group discussion, those with the greatest levels of mobility generally have the highest incomes. For low income households, intercity travel may not be possible to any great extent. Long distance buses are the most affordable option for many trips but they have the disadvantage of being time consuming and inconvenient to use. So, when these households have to travel long distances they usually travel in a car, even if it means renting one. Business travel is also not likely for low income households as they typically are working in more localized service or manufacturing jobs that do not require travel. For the most part, the travel of low income households is limited to the Capital District region. However, discount airlines are making some flying more affordable for those who have to travel great distances to visit family although the financial burden on these individuals remains high.

Transit: Transit for low income households is often vital for reaching jobs, school or other activities, especially for those that do not own cars. Transit is also a critical element of welfare-to-work programs. The current problem with transit is that only those that live in urban areas are well served and even then the routes are limited to a few suburban corridors where the jobs are. Shift jobs or jobs in suburban areas far from urban centers are often out of reach due to inflexible transit schedules and lack of service. Low income households also face the challenge of reaching child or health care services on inflexible buses. As a result of these challenges, many low income households end up purchasing cars despite their high cost.

Transit service in the future will need to include adjusted routes and off-peak schedules to eliminate this mismatch between jobs and workers. The implementation of BRT service

could increase the efficiency of transit in corridors heavily used by lower income individuals and their feeder routes could better link workers with jobs. Suburban shuttle services have proven to be particularly effective in connecting urban residents with suburban jobs, a practice likely to be expanded in the future. It is also possible that shuttles, or some form of them, will link rural low income households with suburban jobs that they may not otherwise be able to reach.

Technology: Technological advances will help to improve the mobility of low income households. Some of the benefits will likely include cleaner air from cleaner vehicles, improved pedestrian safety through advanced crossing signals, improved transit technology that provide real-time schedules and have transit priority features and more efficient road systems that reduce travel time for all road users. However, many of the future safety features on cars may not be available to lower income households because they can not afford them as options. Lower income households also tend to drive older cars which are not likely to contain many of the safety features. Consideration must be given to keeping future technologies affordable so that lower income households are not left behind as has happened in the past.

Non-Drivers

Intercity Travel: For those that can not drive, air, rail and buses will be essential for traveling between cities. Obviously, the amount of travel and which mode these individuals will use is inherently tied to their income. Lower income individuals will likely use buses for longer distance travel but when necessary, will likely be forced to pay for air or rail travel to visit distant family members. The presence of discount airlines in the region will certainly help ease the burden for some individuals. However, for those that have a license but can not afford a car, long distance trips will likely be made by renting cars, especially for larger groups. Higher income individuals that do not drive will be able to easily pay for longer distance trips by air, rail or bus. However, their mobility may be limited by other factors such as physical impairments.

Transit: As with lower income households, transit is vital to those that do not drive. If there is no car in the household or the individual can not drive for physical or other reasons, transit will provide the link to jobs, school or other activities. As more individuals live and even retire in more remote areas, non-drivers may be better served by transit in the future, especially if para-transit or other door-to-door services increase to serve the mobility impaired and the elderly. BRT and other technologies that increase the efficiency and reliability of transit will be particularly beneficial to those that do not drive in the future.

Technology: Obviously, personal transportation technologies will not directly help those that do not drive, unless they allow someone with a physical impairment to drive that could not drive before. Technology will also benefit the elderly that may have been forced to give up driving in the past. The greatest benefits are likely to be gained through technology improvements that decrease travel times on transit and make transit easier to use, improve the efficiency of the regional road network and create a safer road system

for those that walk or ride bicycles. However, affordability of transportation will continue to be a critical theme for those that do not own cars and new technologies may continue to keep cars financially out of reach for many.

Conclusion

The future transportation system is likely to undergo a number of changes brought on by changes in technology. Technology will inevitably make intercity travel faster, transit more efficient and cars easier and cleaner to drive. Many of the public transportation and technology improvements currently in development are likely to be implemented in the next ten to twenty years. These improvements will support and enhance the regional economy by creating a more efficient and reliable transportation system. Looking out to 2030, additional transportation system or technology improvements could be developed that have not yet been imagined. However, transportation providers must tailor these systems to meet the needs of the future residents of the Capital District.

As the market group discussion clearly illustrates, all residents will receive some benefits from technology and public transportation improvements. The trick will be to encourage more people to use them. Those that are likely to receive the greatest benefits are those with the greatest needs including the elderly, mobility impaired and lower income households. It will be difficult for transit providers to ignore the special service requirements of these households in the future, especially with ever increasing suburban and rural populations. Although all inequities will not be erased, technology will certainly help level the playing field between those that depend on public transportation and those that can afford private transportation. However, technology does have its own set of drawbacks and questions remain as to how far it will go when it comes to creating vehicles that can nearly drive themselves. In the end, the future transportation system is likely to offer more travel options for individuals at all income levels and stages of life than ever before.

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