Rethinking TCAT: Enhancing the Efficiency and Sustainability of Bus Service in Tompkins County

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Objective

The objective of this project is to propose modifications to Tompkins Consolidated Area Transit that would improve service by reducing crowding and increasing average passenger speed. Most importantly, these service improvements will economize on fuel and reduce emissions, one of the most serious pitfalls of bus transit.

Introduction

Since the postwar period, public transportation usage in the United States has been in steady, sometimes precipitous decline. National public transportation ridership reached its peak in 1946 but in recent years has seen substantial gains in market share among commuters. This recent uptick occurred in response to skyrocketing fuel prices before the 2008 financial crisis. There are significant environmental implications of the use of public transportation. While passenger vehicles and other equipment used in mass transit are more taxing on energy and the environment on a per vehicle-mile basis, they are far more efficient and clean per passenger-mile traveled.

Arguably, electrified heavy rail is the “greenest” form of mass transit. These systems operate most effectively in dense urban centers, and are capable of moving a tremendous number of people at a relatively high speed. They are directly responsible for negligible emissions and when indirect emissions from the power usage come into play, heavy rail is still very environmentally sound on a per passenger-mile traveled basis.

Neglecting a long history of conflicting couched interests, it is merely important to state that prevailing interests precluded rail transit from occupying the prominent place in American
mobility for which it is suited. The United States is also sparser in terms of development than other parts of the industrialized world.

**Buses in the United States**

For better or worse, the national trend was to eliminate electrified streetcars and replace them with buses, which are today the prevailing mode of public transportation. In 2005, buses accounted for over 55 percent of vehicle-miles traveled and nearly 63 percent of vehicle-hours in operation. ¹

In addition to being the most common form of public transportation, buses are also the cheapest. Until recently, fuel costs were very low, and the costs of labor, capital and maintenance for buses are far below those of other fixed-route modes of transportation. Buses are also the most frequently replaced/updated with an average lifespan of 7.5 years.²

Numerous countervailing factors make buses somewhat problematic to the “pollution solution” paradigm, whereby they are considered “green” simply because they fall under the transit umbrella. While buses do indeed remove many automobiles from the road, they are significantly less efficient than light, heavy and commuter rail. If all modes were required to move the national ridership via bus, then vehicle-miles traveled by transit would double.

More so than any other major mode of transit, buses are dependent on fossil fuels, particularly diesel. They are the least efficient mode of transit per passenger-mile and the biggest aggregate user of diesel in transit, consuming more than 500 million gallons of diesel gasoline in 2005. The advent of hybrid electric technology along with buses which run on compressed

¹ American Public Transportation Association, 17.
² APTA, 19.
natural gas (CNG) and liquefied natural gas (LNG) has increased in popularity, and has served to make a rapidly increasing dent in diesel use.

**Bus Rapid Transit**

Bus Rapid Transit (BRT) is a type of limited-stop service characterized by the use of technology to expedite bus flow. These can take the form of dedicated lanes, exterior fare collection, traffic signal priority and other forms of intelligent transportation systems. BRT systems have been widely successful outside the United States and are starting to emerge in US cities. In Curitiba, a city in southern Brazil, an extensive BRT system connects all major points in the city, and 70 percent of the population commutes via bus. There are land use controls that keep development along transit corridors, and the system uses pay-before-entering fare collection\(^3\).

BRT experiences a throughput akin to rail transit with capital costs that are marginally higher than buses. They require policy changes, often the removal of street parking. As valuable as the techniques used are, the implementation of such a system is probably not meant to occur in Ithaca until some growth has been experienced; such a mode would require more density. Few of Ithaca’s streets would benefit from a priority bus lane, and buses do not run frequently enough to capitalize on free-flow speeds during peak hours. The best fixture of BRT that is adaptable are the huge vehicles. While bi-articulated buses (which carry Curitiba’s express routes) are not legal in the United States, 60-foot articulated buses would manage capacity well, and will be covered later in this paper.

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\(^3\) McKibbin, Bill, "Curitiba" in *Hope: Human and Wild: True Stories of Living Lightly on the Earth*, 79.
Limited Stop Bus Services

Many transit agencies have Limited Stop bus lines that duplicate an existing local route but make about a quarter as many stops. It operates very similarly to bus rapid transit: getting people to where they are going much faster than the local bus, but it does not have any of the infrastructure required by BRT routes. It also allows for focus points: Pyramid Mall, Cornell and Ithaca Commons would be on a limited stop version of the TCAT 30 line. It has been very successful in New York City on the Fifth/Madison corridor, with three of the four lines offering limited stop service. These buses are more heavily traveled than their local contemporaries and help keep traffic flowing along the busy East Side corridors. Some limited stop buses can be candidates for conversion into a BRT system, and New York City Transit has been at the forefront in converting Limited routes into their +SelectBus system. The one existing +SelectBus route that exists and two of the four additional ones planned for the immediate future will all replace limited stop routes.

TCAT and Ithaca, A History

Tompkins County was originally served by two separate companies: Ithaca Transit and Cornell University Transit. These companies were founded in the 1960s and expanded service in the 1970s to encompass all of Cornell Campus and the vast majority of the City of Ithaca. In the early 1980s, the county government founded Tomtran, operating suburban bus service from
Ithaca and Cornell to the outlying suburbs of Dryden, Trumansburg, Newfield, and Lansing. These three companies merged over the course of the mid to late 1990s into the not-for-profit bus company today known at Tompkins Consolidated Area Transit. Since then, TCAT has become an integral part of Ithaca, NY, providing bus service to native Ithacans and IC and Cornell Students. Cornell’s OmniRide program introduces freshmen and first year transfers to the bus system for free, allowing new students to familiarize themselves with the system before making a decision as to whether or not they want to keep a car on campus.

**Planned Route Expansions**

First and foremost, we would like to add a pair of limited stop routes. One of these would run from the Commons to the Airport via the Bus Terminal, Route 13, and Ithaca Mall. Its primary function would be to connect with flights from Ithaca-Tompkins Regional Airport, making the airplane more accessible to Ithaca. Connections with buses at the Commons pulse-point and the Ithaca Bus Terminal allow the Airport to have a much wider reach than it currently has. Not every bus would go to the airport, and some would run express from the Commons to the Mall and back, as Ithaca Mall’s parking lot can also function as a Park-and-Ride.

The other limited stop route in the city of Ithaca would be based off of Route 30. This would ideally turn into a BRT route and would run limited stop service from Ithaca College to Ithaca Mall through the Commons and Cornell, running express through Collegetown and Cayuga Heights. This would make stops at major hubs on IC
campus, then run express across the valley to the Sage/Statler bus stop the RPCC bus stop, and then express to Ithaca Mall. Bus stops for both of these routes would receive additional markings besides the current TCAT bus stop signs indicating the presence of the premium service. They would run with articulated buses which will be specified later in the article.

Another service is a downtown circulator route that would use smaller buses than the major routes but run more frequently. This route would run up State Street from the bus terminal to the Commons and then loop around the Commons before returning to the bus terminal. While the Commons itself gets a lot of bus service, the rest of Downtown Ithaca is served only by the few buses that run through it on their way to the outer suburbs. Having a circulator bus will bring increased connectivity within the downtown area and hopefully bring business back to the Commons.

While the current suburban service operated by TCAT is generally as good as it needs to be, there are definitely some areas that could use expansion, specifically out of county services that don’t really exist in the TCAT system. Recently it was announced that TCAT would take over operation of the Schuyler County to Ithaca commuter service from current contractor First Transit. This route runs from Odessa through Watkins Glen and down NY-79 into Ithaca. This is the first of what should be many out-of-county expansions that TCAT makes. The most important one is currently not served by any company at all. There is a very tight link between Cortland and Ithaca, yet there is no thru bus service between the two cities. An express route to Ithaca from Cortland County would be very beneficial in bringing these two cities and their respective universities closer together and ease congestion on the crowded NY-13 corridor. Other routes could include further expansion into Tioga County and routes into Chemung and Steuben Counties as well.
With all of these service improvements, TCAT will need some serious fleet expansion, but it will also have to take into account impending EPA regulations on two-stroke diesel engines with regards to fleet replacements. TCAT owns and operates sixteen Bus Industries of America Orion 01 buses inherited from its predecessors. All of those buses are equipped with Detroit Diesel 6v92TA two stroke diesel engines and do not comply with 2010 EPA air quality regulations. A new bus order would have to include at least sixteen heavy duty forty-foot low floor buses to replace the Orions, plus additional buses for fleet expansion.

TCAT has tested an articulated bus and they found that there were no restrictions to operations of articulated buses in the Ithaca area. To sustain the limited stop routes, these high-capacity articulated buses will almost certainly be needed. An initial order for four buses with an option for six more will probably be enough to sustain the limited stop routes, and the order should be integrated into the 40-ft bus order to keep down costs.

As for fuels, depending on foreign oil for diesel fuel just isn’t sustainable anymore. Hybrids are a good way to increase efficiency and keep down pollution, but it still uses a diesel engine and is not always efficient at the higher speeds seen on some of the outlying routes. Natural gas powered buses do not have the same problems that diesel powered buses have. They burn cleaner and the fuel can be found easily in the United States and does not need to be imported from overseas. In the long run, TCAT should also look at using renewable energy sources, such as biodiesel and hydrogen.

In order to operate the most efficiently, the fleet needs to be deployed in a smart manner. Hybrids run more efficiently when making frequent stops and starts like is found in city traffic and on Cornell Campus. Therefore, the six hybrids should be used mainly on city and campus routes. Diesel buses are more efficient at higher speeds, and should therefore be used on more
suburban routes to the outer parts of Tompkins County and neighboring counties as well. Both North American Bus Industries of Anniston, Alabama and New Flyer Industries of Winnipeg, Manitoba provide a full range of buses from the 30-35 foot buses that would be needed for the downtown circulator to the 60 foot buses that would be needed for the limited stop service.

**Traffic Mitigation**

In order for these improvements to maximize passenger speed per passenger-mile, some steps need to be made to improve overall traffic flows in Ithaca. One significant nexus of traffic congestion is the Cornell University campus. Currently, along Tower Road, there is only one traffic signal at the Thurston Avenue Bridge. It is understandable that stop signs are used, since they give pedestrians the greatest degree of freedom. As dense as the campus is on a given day of instruction, the priority goes to the pedestrians of the Cornell community, as it should. Midday traffic snarls also have a deleterious effect on bus service, however. We therefore propose a partial signalization at the intersections of Campus Road and East Avenue. A traffic light that is synchronized with the one at Central Avenue and Campus Road would largely eliminate the delay between the Carpenter Hall and Statler Hall stops, which serve a large number of routes.

Another major improvement would be brought about by introducing a roundabout at the convergence of Triphammer, N Triphammer, Hanshaw, Upland and Pleasant Grove Roads. A traffic circle, if placed here would sort traffic and allow buses to possess an advantage in merging through the circle. Instead of multiple vehicles queuing at the various stop signs, a unified circle would cut delay for all modes. Neither of these solutions would be incumbent on TCAT, and would require local action by the Department of Transportation. Nonetheless, these steps are examples of actions that would greatly improve the speed of bus service.
Conclusion

In the United States, transportation is one of our leading sources of emissions. Most of this is due to single-occupancy private vehicles. Here in Ithaca, TCAT serves to mitigate the choice of driving alone by providing uniquely convenient transit options for an Upstate New York city of its size. If we take a step forward in making bus service more prominent in the modal split, then we have a responsibility to take one step further to ensure that these buses are convenient, efficient, and clean. While such measures may seem negligible, they are part of a greater movement beyond Ithaca. If public transportation increases in popularity throughout the US, especially in smaller cities, it will result in a net decrease in emissions. It will not necessarily yield a decrease in the share of emissions generated by public transit. If we can bring about a second net decrease, one in the emissions of bus transit nationwide, then it would make a significant, coordinated step towards cleaner air and greener cities, regardless of size or density.
Bibliography


Images courtesy of John Simpson