The Intercity Bus in Ontario - Long Term Trends and Future Options

Harry Valentine

July 2016

The Government of Ontario seeks input in regard to improving future intercity bus services across the province. While such an initiative has merit, the development transportation sector has been influenced by evolving trends that have crossed over many modes of both passenger and freight transportation. These trends could suggest future development of intercity bus transportation.

Table of Contents

Brief History:

The history of intercity transportation begins on the waterways. Passenger transport vessels remained relatively small until the development of trans-oceanic steam-powered ships during the latter 19th century. Such ships dominated international transportation until viable intercontinental passenger aircraft appeared. Passenger ships transformed from long-distance transportation vehicles into tourist vehicles and short distance ferry vessels. The development of the high-pressure steam engine gave rise to the development of railway passenger trains that replaced horse drawn stagecoaches. At the present day, rural passenger train services that were once common across North America have disappeared.

Competition from rural and local intercity buses captured the ridership once carried by the rural and local trains. Except that rural and local intercity bus services are following rural and local intercity passenger trains into obscurity. At the present day, some local intercity bus services operated by regulatory requirement along secondary highways, travel with few and sometimes zero passengers. At present, the main market for intercity buses is express service between main pairs of cities, commuter service around large metropolitan areas and the tourist, excursion and sightseeing markets. Future rural and local intercity bus services require new ideas.

Economic Long-term Trend:

A long-term trend began some 500-years ago in long distance transportation after boat builders in China developed sailing vessels that were 4-times the length as European sailing vessels. The super-size vessels carried trade, commerce and passengers. It was several centuries before the British ship building industry constructed vessels of equivalent and greater size. Such development revealed the previously unknown possibility of ‘economy-of-scale’ that allowed a larger vehicle to carry greater payload at lower cost per unit of weight, unit of volume or per passenger.

The concept of ‘economy of scale’ spread to the airline industry with the development of the Boeing 707 that carried more passengers at higher altitude, at greater speed and at lower cost that preceding aircraft. About a decade later, Boeing developed the model 747 that carried close to double the number of passengers at lower ticket cost as the smaller model 707 on long-haul flights. The most recent development in large passenger aircraft is the Airbus A380 that offers competitive ticket prices on several major long haul international flights.

The Boeing 707 Market Precedent:

In his treatise entitled *Entrepreneurship and Innovation*, management professor Peter Drucker wrote of the initial skepticism that surrounded Pan-Am's introduction of the Boeing 707 to trans-North Atlantic service. Critics pointed out that there were barely enough passengers to fill existing propeller aircraft and passenger ships on that plied that route. Nevertheless, within 10-years of its initial cost-competitive trans-North Atlantic flight, passenger volumes had increased 10-fold. The introduction of the Boeing 707 had created a new market for a new, fast and cost-competitive service. A comparable scenario occurred in the UK intercity bus service after the mid 1980's.

When discussions began in Canada during the early 1980's about high-capacity intercity buses, regulators claimed that the market did not warrant the application of such technology, given industry ridership levels. However, MegaBus has successfully applied the Boeing 707 market precedent to intercity bus transportation by offering much lower bus fares aboard much larger, high capacity buses. The market responded and the big buses usually operate close to full capacity on most departures.

Population Trends:

The growth of population and changes in population distribution impacts on transportation economics. Following the end of WW2, the nature of production and related employment opportunities caused a segment of the population to shift from rural areas toward cities and metropolitan areas. As a result, population grew faster in metropolitan areas such as Toronto and Montreal than in smaller, more distant towns and villages. The stagnation and even decline of population in rural regions affected the intercity passenger transportation industry in the form of declining ridership aboard rural passenger trains and rural bus services that were gradually withdrawn.

Future population growth trends would likely be an extension of the existing long-term trend. In recent years, there has been much metropolitan population growth in the Greater Toronto Area, the Ottawa area as well as the Montreal area. Busways and commuter passenger train lines that extend across the metropolitan areas enhance the attractiveness of such regions. Entrepreneurs seeking an educated and capable workforce along with convenient access to business supplies will seek to establish businesses in such regions while private citizens will choose to in attractive communities located close to opportunities of meaningful employment.

Rural Service Cancellations:

The slow and gradual withdrawal of rural and local intercity bus services that began after 1970 has in recent years has become a cause of concern following applications by Greyhound Canada to withdraw from several multi-stop long distance routes across Canada. Except that the trend has also occurred across the USA and many

other developed countries. Car ownership is higher amongst rural residents today that during the early post WW2 years when rural intercity trains and buses still provided services. Stagnant rural population growth and convenience of increased car ownership in rural areas makes rural bus services obsolete.

Rural populations are insufficient to economically sustain multiple scheduled departures of intercity buses. Flexibly scheduled carpools and vanpools advertised via the internet or on community notice boards may be able to fill the void left by cancellations of regularly scheduled intercity bus services. The future of rural intercity passenger transportation may come to depend on informal vanpools and carpools where local vehicle owners are also the service providers. Formal economic regulation of such services is impractical. It may be more productive for concerned government officials to encourage rural carpooling and vanpooling that may connect with scheduled buses at bigger towns.

High Capacity Intercity Buses:

The mid 1980's introduction of 3-axle double decker buses to the 600-km London – Glasgow intercity service was duplicated in many other nations including South America where double decker intercity buses are the most numerous types of buses at major intercity terminals (https://www.youtube.com/watch?v=OcBfbzzxUzM) In the UK and in North America, the Stagecoach Group used the capacity double decker intercity motor coaches to offer bargain rate bus fares between several pairs of large cities. The 'economy of scale' allowed MegaBus to realize a profit while offering tickets at of bargain prices, as occurs on the Montreal – Kingston – Toronto – Niagara Falls route.

There may be scope to apply the MegaBus precedent of lower ticket prices aboard higher capacity along other several intercity bus routes inside Ontario as well as trans-border bus routes such as Montreal – Ottawa. Except that Greyhound may be reluctant to operate the identical double decker coaches as MegaBus. Greyhound and Coach Canada also own and operate different models of the same size of buses built by MCI and by Prevost. It is unlikely that Greyhound would want to operate an intercity version of the Dennis double decker that is in the GO Transit bus fleet.

Articulated Intercity Buses:

During the late 1940's, Kaiser Industries (USA) built an articulated intercity bus for Continental Trailways. During the middle 1950's, Continental Trailways operated 2-models of articulated intercity buses built by Kassbohrer of Ulm, Germany, on the

Pueblo –Denver service. During the 1980's, Volvo articulated intercity buses were tested in the UK on the 600-km London – Glasgow service, also in Australia on the Melbourne – Sydney service. In Canada, Prevost built a few articulated intercity buses, the model H5-60 that was discontinued due to poor sales. Articulated intercity buses were very briefly used on the Sao Paulo – Rio de Janeiro service.

Double decker intercity buses replaced their articulated counterparts that carried passengers in the trailer sections, on all of these routes. The only 2-section intercity buses being used on major routes worldwide, involve a conventional bus towing a luggage trailer. In Brazil, the gross combination length of the 2-unit assembly approaches 23-metres. At the present time, a 6-axle, rear-engine, trailer driven, double decker, 2-section articulated bus built to a length of 23-metres by *Marcopolo* is believed to be undergoing tests in Brazil. The 5th axle is a single powered axle with double reduction gearing and articulation midpoint located above axle #4.

Intermodal Competition and Subsidies:

The issue of intermodal competition between intercity buses and passenger trains has repeatedly been raised since the early 1950's, when the railcar builder Budd developed the self-propelled rail diesel car (RDC). However, the RDC never lived up to its expectations. After Transport Canada created VIA Rail Canada and between 1980 and 2005, intercity bus operators frequently complained about "predatory pricing practices along major intercity routes" in Ontario and Quebec. The complaints also involved the degree of direct subsidy to VIA Rail and "indirect or hidden subsidy to the intercity bus industry".

However, the intercity bus is a minor to insignificant presence along major highways compared to the hundreds and thousands of large trucks that travel on the same highways. MegaBus Canada's fare levels suggest possible market coexistence between intercity buses and VIA Rail. The short-haul commuter airline industry serves the same major city-pairs as does the bus industry across Ontario and Quebec while the level of airport fees suggests possible indirect subsidies. Federal regulation forbids VIA Rail from earning revenue by carrying small parcel and post office freight, therefore the direct subsidy to cover train operating costs.

Transportation Efficiency Bill:

The future of North American intercity bus technology will depend on the American Congress and how it will amend the Transportation Efficiency Bill that has been before the House of Assembly. Sections of the Bill call for extended length of semitrailers and even extended length of buses. At the present day in South America, the longest intercity buses are built to a length that is 2-seat rows longer than their North American counterparts. Also, the longest single-jointed 2-section articulated city

transport buses in South America that operate on busways, are built to a length of 23-metres (https://www.youtube.com/watch?v=zg7SrgRoJrE).

If Ontario is seriously interested about improving the efficiency and attractiveness of intercity bus transportation, then Ontario officials would need to recognize the merit of low ticket prices attracting additional ridership aboard high capacity buses. Across the USA, several states (Arizona, Vermont, North Dakota and South Dakota) allow passage to non-articulated buses built to lengths in excess of 45-feet, as does all of South America. Ontario could seek the cooperation of Quebec and New York State to revising bus length laws so as to improve intercity transportation energy efficiency between several pairs of major cities.

Bus Transit-ways and Intercity Buses:

The City of Ottawa developed dedicated busways to increase the performance of municipal transit services. However, Ottawa invited the intercity carrier, Voyageur to also utilize the busway upon arrival and departure from Ottawa. During AM peak hour arrivals and PM peak hour departures, the intercity buses and commuter buses bypass traffic congestion on Ottawa's main east-west highway, saving both time and fuel. The most extensive municipal busways exist in several large South American cities, where some cities sell permits to owners of intercity buses to allow access along the busways between an outlying area and the city centre.

It may be many decades before cities such as Montreal, Toronto and Hamilton have busways that complement subway, LRT and commuter train lines. Commuter buses and possibly intercity buses could, through negotiation with authorities, gain passage along such future busways. Such development would greatly reduce travel time as intercity and commuter buses bypass chronic traffic congestion on the highways around major cities, upon arrival and departure from downtown areas. Intercity buses presently serve suburban transit terminals at Toronto, Ottawa and Montreal on both inbound and outbound journeys.

Hub-and-Spoke Networks:

While the airline industry is credited for developing 'hub-and-spoke' transportation networks that connect shorter regional routes to main long-haul routes, intermodal 'hub-and-spoke' networks occur in other modes of long-distance freight and passenger transportation. Such a network connects trucks, railways and ships in international container transportation. In most large cities internationally, 'spokes' of local municipal and regional transit routes connect to 'hubs' of intercity passenger train and intercity bus terminals. Such connections are evident at Toronto, Montreal, Mexico City, Buenos Aires, New York City and London (UK). Population increase in metropolitan areas internationally enhances intercity bus ridership along main routes.

In the Greater Toronto Area, the regional 'spoke' network extends beyond the City of Toronto to include outlying areas served by GO Transit which in turn connects to other municipal transit systems within its service region. The suburban passenger train network around Montreal and interlining with neighbor municipal transit systems forms another 'spoke' that connects to both intercity rail and intercity bus terminals. Together with recent and ongoing population growth around metropolitan areas, intercity trains and buses that serve big cities have gained access to larger population bases, while population growth at distant smaller communities has stagnated.

Commuter Bus Services:

During weekday rush hours and even through the day at some metropolitan areas, a combination of both publically owned and privately owned buses operate spoked networks of daily commuter bus services that connect outlying areas to large cities. The comparatively short distances of these routes and their travel duration from first passenger pick-up to final drop-off is comparable to some cross-town city transit bus, streetcar or subway train routes. While commuter routes share some common characteristics as intercity routes, they share much in common with city transit routes where regular riders travel at the same departure times.

The discussions on the future of intercity buses services on Ontario may need to consider the future classification of commuter routes that essentially carry the same people on the same vehicles, between the same points of origin and destination, at the same daily time on weekdays. Intercity buses that operate between cities usually carry different people every day and whose travel habits and schedules are very different o passengers who ride on hush hour commuter buses. Commuter bus routes could be reclassified and regulated as peak-hour city transit bus routes that operate over extended distances.

Possible Market Evolution:

Future trends in intercity bus transportation would evolve from long term trends that began long ago. Ridership along rural and local long-distance routes on secondary highways has been declining and will continue to decline. However, population growth in metropolitan areas increases the size of the market that will travel between major metropolitan areas. Intercity bus operators that provide service between major cities could borrow from the precedent established by MegaBus and operate much higher capacity buses while reducing fare levels. There may be scope to operate even higher capacity buses at even more attractive fare levels.

Along rural and local routes, government officials and intercity passenger transport regulatory bodies could allow van-size vehicles to provide intercity services between small towns located along secondary highways, also between small towns and nearby big cities. Overseas, a taxi-van industry provides both local and intercity

transportation in many developing nations, using vehicles that carry 9 to 14-passengers. Such vans usually operate independently of any formal economic regulation while providing flexibly routed and flexibly scheduled intercity passenger transportation services. Ontario may consider allowing such services to develop between small towns, or between small towns and a large city.

Toronto Bus Terminal:

The intercity bus terminal at Toronto is an old facility that served the industry during the 1930's when 29-seat front-engine coaches carried the passengers. There have been occasions when intercity buses were called to Toronto Union Station following a disruption on the intercity railway lines that forced the cancellation of intercity passenger trains. Though not designed as a bus terminal, Union Station was able to accommodate the needs of travelers and park and load coaches along Front Street (and along York Street). The GO Transit bus terminal was formerly located 'across the road' from the intercity bus terminal.

Relocating the intercity bus terminal to Union Station would impose minimal inconvenience to patrons who transfer to and from Toronto Transit subway trains, courtesy of TTC Union station. Patrons seeking to transfer between intercity buses and any of GO Transit buses and commuter trains or the intercity trains would more easily be able to make such transfers, compared to having to carry luggage aboard TTC vehicles. The difference in ticket price between the intercity buses and intercity trains would minimize intermodal competition, especially if more bus companies adopted the MegaBus business model.

Bus Dimension Regulations:

The early intercity buses that entered service after WW were essentially stretched cars without a central aisle, like an extended-length limousine with multiple doors and carried 12 to 16-passengers. By 1930, the intercity bus featured a single door near the driver, had a central aisle and carried 29-people in 7-rows of seats. Length laws were revised around 1950 to allow 35-ft buses that offered 41-seats to supersede the earlier 32-ft buses that offered 37-seats. The introduction of the Eagle bus by Continental Trailways in the USA and the split-level 'Scenicruiser' bus by Greyhound saw passage granted to 40-ft buses.

Bus width restrictions were revised from 96-inches to 102-inches and discussions about higher capacity city transport buses saw regulations revised to allow passage to 60-ft articulated buses. By early 1990's, bus length regulations were revised to grant passage to 45-ft buses. Several American jurisdictions such as North Dakota, South Dakota, Utah, Colorado, Nevada and Vermont allow passage to non-articulated buses of greater length. Several jurisdictions across South America and Europe allow passage to non-articulated buses built to a length of 15-metres. It is unknown as to

when Congress will pass the American Transportation Efficiency Bill that supports higher capacity buses.

Future Bus Dimensions:

The width and height of intercity buses will undoubtedly remain at 102-inches (2.6m) maximum width by 4.0-metres height that can through underpasses in the vicinity of Toronto Union Station. While the longest single-jointed articulated busway buses in South America measure 23-metres length, the North American intercity industry as well as intercity bus companies worldwide, have shown very little interest in articulated long-distance buses. The longest prototype non-articulated intercity bus in Brazil is a 17-metre, 5-axle vehicle with twin-front-steering and twin powered rear axles, with a self-steering axle placed immediately behind the powered set.

The precedent of the 45-ft semi-trailer allowed intercity buses to be lengthened to 45-ft and the precedent of the 53-ft semi-trailer on the North American road system provides a basis to extend the length restriction for intercity buses to 53-ft. South American and several European countries allows passage to non-articulated intercity buses of 15m length, 50-ft when the towing hitch is included. Rear overhang regulations in some European jurisdictions allow for 3.6m between the 2nd rear axle and the outer edge of the rear bumper. Proven commercial duty, front steering axle technology exists to turn extended length buses.

Intercity Bus Efficiency:

Ontario seeks to improve both the efficiency and the attractiveness of intercity bus transportation. The majority of passengers aboard intercity buses will travel along main routes and between major cities. Using the old measurements, the Van Hool model TD 925 double decker bus will travel 10-miles (16-km) on an imperial gallon (4.54-litres) of diesel fuel while carrying 80-passengers (plus their luggage) while travelling at the posted speed limit on level road. The maximum fuel economy of 800-passenger-miles per gallon far exceeds that of economy cars that deliver a fuel economy of 50-miles per gallon and carry 4-passengers (200-passenger-miles per gallon).

At peak efficiency, single level coaches could deliver 500-passenger-miles per gallon on diesel fuel when travelling at capacity between main cities. While plug-in electrically rechargeable cars, school buses transit buses are commercially available, such technology is unavailable on intercity buses. A recent scientific breakthrough promises to increase the number of battery recharges from between 300 and 1000-recharges to 20,000-recharges. However, commercial availability of extreme extended-life electrical storage batteries may be a decade into the future. At such time, the option of plug-in electrically rechargeable city transit, commuter and intercity buses may become available.

Improving Bus Efficiency:

When North American transport regulators allowed passage to 45-ft length buses along main highways, semi-trailers of 45-ft length had been in operation along the same highway network for several years. Extending the length allowance for intercity buses allowed for the addition of 1 to 2-seat rows (4 to 8-additional passengers) aboard a single level coach and marginally increasing bus overall efficiency. The replacement of earlier 2-stroke diesel engines with more efficient 4-stroke engines with higher torque at lower engine speed significantly improved fuel efficiency, as did the change from 4 and 5-speed gearboxes to automated 12-speed gearboxes.

MegaBus has shown that the combination of a higher capacity bus and lower bus fares can increase ridership aboard most scheduled departures. There may be further scope to further lower travel prices aboard even larger buses, a possibility that results from MegaBus online bus tickets at times being sold out a few days prior to departure. For several years, the North American truck industry has operated semi-trailers of 53-ft length and proven that such a dimension can operate on both the intercity road network and on main municipal roads. Future intercity buses could be built to 53-ft length.

Winter Mobility:

An earlier generation of North American built 2-axle intercity buses carried double the amount of weight on the dual-tire rear powered axle as the front steering axle. These buses had sufficient traction to remain mobile in all but the most severe winter snow storms. On modern 3-axle vehicles, the weight carried by the non-powered rear trailing axle exceeds the weight carried by the front steering axle, with 45% of total vehicle weight being carried by the powered axle. The result is less traction on snowbound winter roads, with modern buses being at higher propensity to getting stuck.

However, an innovation from MAN of Germany could apply temporary traction to the non-powered 3rd axle (https://www.youtube.com/watch?v=yYVBTnV5NCA) to help improve bus mobility on snowbound roads. Such a feature would become essential on extended length, 4-axle buses with twin front axle steering. To improve winter traction on their articulated 5-axle model H5=60 bus, Prevost installed 2-axle (tandem) drive propulsion. North American axle spacing and overhang regulations does allow for a triple rear axle installation that could be adapted to an extended length, 4-axle intercity bus with 2 x powered tandem rear axles followed by a self-steering trailing axle.

Improved Amenities:

High-capacity intercity buses across South America operate with a 2-person crew and provide a refreshment service for passengers. Some South American intercity operators borrow precedent from the airlines industry and provide onboard meals for passengers on select services on select routes. In some cases, a crew member calls ahead to a roadside restaurant and prepared, pre-ordered meals are picked up during a brief stop and loaded into a section of the luggage compartment, courtesy to vehicle regulations that allow South American buses to tow much larger luggage trailers (23-m combined length) than North American jurisdictions (60-ft combined length).

In intercity bus operations where 1-person crew operation predominates, passengers bring their own refreshments and snacks. It is possible that the MegaBus concept of lower ticket prices aboard larger buses could be extended to many other intercity bus routes across Ontario as well as trans-border routes. The only time that amenities could be offered would be if the buses consistently operate at less than full capacity. Then the space may be converted from passenger seating to offering refreshments, or to offer more comfortable accommodations aboard the buses.

Intergovernmental Negotiations:

Several of the main intercity bus terminals in Ontario are also the terminals for interprovincial and cross-border bus routes. Such routes include Ottawa – Montreal, Toronto – Kingston – Montreal, Toronto – London – Windsor – Detroit and Toronto – Niagara Falls – Buffalo – New York City. Efforts to improve the efficiency of intercity bus transportation in Ontario would benefit from intergovernmental negotiation with the Province of Quebec, State of New York and possibly State of Michigan. Semi-trailers of 53-ft length travel on their roadways and they may be willing to recognize that length as the precedent to allow passage to intercity buses of the same length.

Prior to the change of intercity bus length restriction from 40-ft to 45-ft, New York State for many years earlier allowed passage to buses of 45-ft. Quebec has main routes (Montreal – Quebec City, Montreal – Sherbrooke and Montreal – Three Rivers) along which 50-ft or 53-ft intercity buses could provide service. Such intercity buses could provide service on such New York State links such as NYC – Albany, NYC – Syracuse, NYC – Rochester and NYC – Buffalo as well as the trans-border routes that extend to Toronto and Montreal. Quebec would likely be supportive if prototypes of future buses were built in Quebec.

American Straight Truck Precedent:

While most of North America restricts the length of straight trucks to 40-ft or 12.5m, a group of (10) south-central neighboring states in the USA with Texas as the hub, allow passage to straight trucks built to a length of 45-ft. Other states such as

North Dakota (55-ft), South Dakota (50-ft) and Nevada (65-ft) allow passage to straight trucks that are longer than 40-ft. If a trio of jurisdictions with Ontario as the hub could provide passage to extended length non-articulated intercity buses, other neighbor jurisdictions may join in and extend the operating range of such buses.

Prevost Basis for Longer Bus:

The Prevost Car division of Volvo offers model XL- 45 bus that could become the basis of a future 50-ft intercity bus. This model offers the longest bus wheelbase in North America, 28-ft between front steering axle and driving axle and 29-ft between steering axle and equivalent rear axles' mid-point. Converting both rear axles to powered axles would place the equivalent midpoint at 30-ft from the front axle. The rear overhang precedent by Setra, Neoplan and Van Hool places the power axle at 14-ft ahead of the outer edge of the rear bumper, with a self-steering trailing axle at 120-inches.

Precedent in the semi-trailer industry with triple rear axle sets places the central axle at 144-inches from rear of vehicle. Applying this precedent to a bus would place the central rear axle at 144-inches with a self-steering trailing axle behind the powered - tandem set with tandem midpoint 14-ft to rear of vehicle. A ZF steering gearbox would relocate the 'Pitman arm' closer to the vehicle centre and increase right hand turn wheel cut angle. The 50-ft extended bus would use the same powertrain as the XL-45 and offer 8-additional seats. Tandem rear power would improve winter mobility.

Prevost Volvo Technology:

Many years ago, the corporate owner of Prevost Car developed a tight-angle front axle steering system for buses. The layout was based on tight-angle steering technology developed for industrial fork-lift trucks and that is used on 'picker trucks' that move containers at intermodal terminals. Extending a concept 4-axle Prevost 50-ft bus to 53-ft would extend the vehicle wheelbase. The longest wheelbase that has operated on Canadian trucks is 33-ft between forward steering axle and tandem midpoint, in the Alberta oil industry. Prevost engineers would need to advise if a 53-ft single level bus could operate with a single front axle.

Many precedents in the commercial vehicle industry suggest easy introduction of extended length, non-articulated intercity buses. Prior to the Prevost XL-45, Eagle-015 featured a wheelbase of 28.5-ft between front axle and drive axle, preceded by General Motors PD4903 at 26.75-ft. In the truck industry, Peterbilt offered double-bunk highway tractors with 26-ft wheelbase between steering axle and tandem midpoint on vehicles that pulled semi-trailers. Several designs of lowbed semi-trailers that travelled on highways featured midpoint axle spacing of 35-ft and clearing majority of ramps. There have been a few ramp incidents (https://www.youtube.com/watch?v=fpZKwb1Mq1E) involving bus rear bumpers striking ground.

Higher Capacity Double Decker:

Volvo in collaboration with *Marcopolo* and with *Busscar* offers a 4-axle 15m double decker intercity bus (https://www.youtube.com/watch?v=bby4G2WtKxA) with single axle propulsion to the South American market, except that Northern winter operation would require dual axle power. A change in North American intercity bus length regulations could open the door for a competing intercity double decker bus that could provide greater passenger capacity at more competitive ticket prices. While present length regulations 'protect the market' for the Van Hool model 925 double decker bus, extending bus length regulations could literally invite Prevost – Volvo into the intercity double decker market.

Given precedents of steering technology developed by Volvo, Prevost engineers would need to determine the maximum length of a concept intercity double decker bus that combines a single front axle that conforms to axle weight requirements, with triple rear axles. A wheelbase of 32.5-ft would place the main door behind the front axle and provide superior stability on snowbound roads. It is possible that a 5-axle bus with twin front steering could be built to a length of 56-feet or 17m and offer competitive ticket prices along main routes as well as additional amenities to enhance intercity bus travel.

Ontario Double Decker Roll-over:

The City of Ottawa was the scene of 2-incidents involving Dennis Motors double decker buses overturning (http://www.cbc.ca/player/play/2320038391) on snowbound winter roads. At the time, both buses were empty and were caught by a powerful crosswind that pushed the front of the bus off the Ottawa busway and toward a ditch, where the buses rolled over. Ontario GO Transit operates the same make of double decker bus on commuter routes in the Greater Toronto Area. The Dennis bus is a city transit bus with an extended front overhang that features dual stream door.

The original 1930's rear-engine North American double decker intercity buses built by Pickwick for Greyhound's San Francisco – Los Angeles overnight service had very short front overhangs, with driver seat above the left side wheel well. Greyhound's GX-1 (https://www.youtube.com/watch?v=tPKkVxKeKtE) double decker bus of the around 1950 used the same layout, with passenger entrance door located to the rear of the right front wheel. Industry experience suggest that an extended length rear-engine double decker bus with a short front overhang, extended length of wheelbase and sufficient weight on the front axle should provide greater crosswind stability on snowbound winter roads.

CCMTA:

The Canadian Conference of Motor Transport Administrators (CCMTA) that determine vehicle axle weight and dimension allowances would need to evaluate future of intercity bus services in Canada in regard to vehicle dimension regulations. Precedent of using higher capacity buses at lower fare levels has resulted in larger buses operating near capacity on several main routes, suggesting scope for even larger buses to carry more passengers at even lower ticket prices. CCMTA has the precedent of 53-ft semi-trailers to use as the basis of extended length buses.

Revising length regulations of non-articulated intercity buses could improve energy efficiency while long-term precedent suggests that larger numbers of travelers could purchase tickets at even lower prices. Single-joint, 2-section articulated buses of 23-m (75.5-ft) length are already in passenger service in South America. Future 'plug-in' electric buses could carry 'extreme-extended-life' rechargeable storage batteries and passenger luggage in the trailer section. Such an option would require longer trailers and revision to articulated bus length regulations.

American Bus Market:

The forthcoming American election would influence future developments in intercity bus transportation. If a Democrat is elected, the transportation bill would be subject to further debate on the basis of improved energy efficiency. A Republican would respond to the business case of travelers paying lower fares aboard larger buses that carry greater numbers of passengers. A long-term in-service demonstration of extended-length conventional single-level intercity buses in the combination of Ontario, Quebec and New York State could provide the basis for future widespread acceptance of such buses across the USA, followed by changes in vehicle size regulations.

Conclusions:

- A long-term trend has occurred in several segments of the transport sector involving progressively bigger commercial transportation vehicles larger payloads at lower cost-per-unit-of-volume or at lower cost-per-unit-of-weight
- The trend covers the intercity passenger transportation sector and involves larger commercial aircraft carrying greater passenger loads at lower cost-per-passenger, also MegaBus double decker buses
- There is likely scope along other main intercity bus routes to apply the precedent involving larger buses carrying greater passenger loadings at lower ticket cost per passenger
- The greater volume of intercity bus travelers either travel between main cities or on semi-express routes that connect between main cities

- The greatest gains in improving intercity bus energy efficiency is to be realized along the main routes that connect between main cities
- Rural route ridership has declined over a period of many years and could respond to loosely regulated or regulation-free transportation services involving small, private vehicles.
- Ontario may need to seek the cooperation of Quebec and New York State in the quest to improve intercity bus energy efficiency. A Quebec based bus builder builds a proven vehicle that could be built to greater length
- There are multiple precedents from the commercial transportation sector that serve as a basis to extend length restrictions on articulated and non-articulated intercity buses. While MegaBus operates the Van Hool model 925 in North American intercity service, the operate the larger model 927 on several overseas city –pairs with departures at full capacity during peak travel periods. Except that the model 927 does not conform to North American axle weight and rear overhang regulations.

About the Author:

Harry Valentine holds an engineering degree from Carleton University, where he also undertook post graduate studies and research into transportation economics. He has work in various capacities in both passenger and freight transportation. He is widely published internationally on transportation related issues and matters.