

**POTENTIAL OPTIONS FOR IMPROVING THE
DISTRIBUTION OF ASIAN SOURCED RETAIL FREIGHT
ARRIVING THROUGH THE PORT OF HALIFAX**

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1 Background

Increased congestion at the Port of Vancouver has prompted many Canadian shippers to consider the Port of Halifax as a secondary entry point for their imported Asian goods. However, it is believed that if Halifax is to serve as a truly competitive entry point, then certain inefficiencies with the existing inland distribution network will need to be addressed.

Currently, over 80 percent of all import containers (including both industrial and retail freight) arriving at the Port of Halifax leave the Maritime Provinces.¹ When consideration is limited specifically to retail freight, this percentage is believed to be even higher. This is because virtually all retail freight must first be moved to centralized distribution centers in Ontario and Quebec, so it can be sorted. From there, any freight destined for Maritime stores is later returned on an

¹ Moreira, P. "China Syndrome Aids Port of Halifax". Special to the Globe and Mail. December 12th, 2005.

as-needed basis by either road or rail. This practice is viewed to be inefficient, as Maritime destined retail freight arriving at the Port of Halifax often ends up traveling a significant amount of unnecessary distance to and from Central Canada. There are also additional costs incurred for the relocation of 40-foot ocean containers from Central Canada back to the port. The remainder of this paper looks at two potential options for improving the efficiency of this practice:

- 1) increasing the capacity of transload facilities in Halifax; and
- 2) using A-trains (instead of 53' semi-trailers) to move retail goods from distribution centers (DCs) to store locations throughout the Maritime Provinces.

2 Increasing Transload Capacity

The primary function of a transload facility is to transfer freight from 40-foot ocean containers into 53-foot domestic containers, resulting in more efficient inland distribution. Unlike distribution centers, transload facilities are rarely used to distribute freight directly to individual stores. This typically only occurs when there are multiple containers of the same item that can be consumed by no more than a handful of stores.

Transloading can improve the efficiency of inland distribution in many ways, such as by:

- Reducing the number of containers to be moved inland;
- Lowering costs associated with the relocation of empty ocean containers;
- Shortening turnaround times for 40-foot ocean containers; and
- Allowing freight to be sorted according to inland DC location.

A survey of major Canadian retailers (conducted as part of this research) identified a lack of transload capacity in Halifax as a primary source of inefficiency. Currently, the vast majority of 40-foot containers arriving at the Port are transferred directly to CN Rail to be transported to Central Canada. There are a few exceptions, however, as Canadian Tire has recently begun transloading some of their

freight at a new Dartmouth-based facility operated by Consolidated Fastfrate Ltd.

2.1 Measuring Efficiency Gains

A 40-foot ocean container can hold up to 20 pallets of freight, while a 53-foot container can accommodate up to 30 pallets. Thus, in terms of palletized loads, three 40-foot containers can be consolidated into two 53-foot containers. The result is a 33 percent reduction in the number of containers to be transported inland.

In 2005, an estimated 39,000 twenty-foot-equivalent-units (TEU) of Asian imports moved through the Port of Halifax. This translates into approximately 19,500 40-foot ocean containers. If these containers were all transloaded into 53-foot units, the number of containers transported inland could have been reduced by up to 6500 units. Since most deep-well rail cars can be adjusted to accommodate both 40-foot and 53-foot containers, a 33 percent reduction in transported containers provides a nearly proportional reduction in rail costs to shippers.

In addition to the cost savings attributed to reducing the number of transported containers, transloading also provides retailers with a reduction in costs incurred for the relocation of empty containers. After 40-foot ocean containers have been emptied at their inland destinations, they must ultimately be returned to the port to be picked up by their respective ocean carriers. If there are no export loads to fill these containers (which is often the case), then these containers must be returned empty to the port. Retailers typically incur the costs associated with this relocation.

Transloading would allow ocean containers to be emptied near the port, meaning that the costs associated with the repositioning of empty containers would be drastically reduced. Ocean carriers would also benefit from this type of operation, since their containers would be returned to them much sooner.

Another opportunity for improved efficiency offered by transloading is the ability to sort freight according to inland DC location. A

container load of Asian freight is typically stuffed according to commodity type, rather than by its final destination. As a result, it is quite common for a single container to include goods destined for multiple distribution centers. Under the existing practice, containers are only sorted after they arrive at an inland distribution center in Ontario or Quebec. This is perceived to be inefficient as retailers incur significant costs during the relocation of freight between DCs.

Transloading in Halifax would provide an opportunity for freight to be immediately sorted according to distribution center. This would have a positive impact on efficiency as the inland movement of multiple-DC containers would be effectively eliminated.

3 Using LCVs to Distribute Retail Freight

Despite their potential for improving the efficiency of freight transportation, the operation of long combination vehicles (LCVs) is currently prohibited across most provincial jurisdictions. The primary exceptions are in Alberta, Saskatchewan, and Quebec, where a variety of LCV configurations are permitted to operate on designated multilane arterial corridors. At 130 feet in length, it is not surprising that operation is limited to multilane highway facilities.

With the completion of twinning on the Trans-Canada Highway between Longs Creek and Grand Falls (November 2007), a continuous four-lane arterial corridor now exists that extends from Halifax all the way to Quebec border near Edmundston, NB. Also, the New Brunswick Department of Transportation has identified the twinning of Route 1 between Saint John and St. Stephen as a priority for the near future. Upon completion, this will allow for complete four lane arterial access between Halifax and the United States border (see Figure 1).

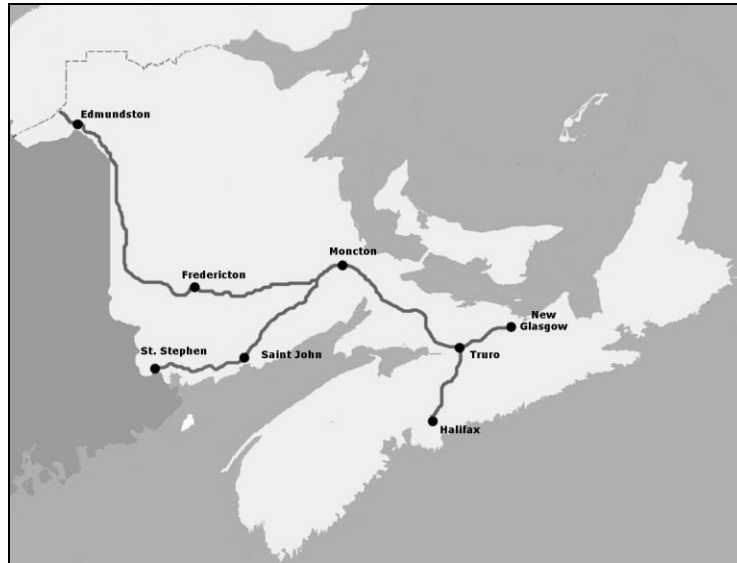


Figure 1: Potential LCV Corridor in the Maritimes

These projects have combined to spark interest amongst trucking companies in the region, who are now exploring the use of LCVs as a means of improving the overall efficiency of freight transportation throughout the Maritime Provinces. Specific interest has been expressed in operating Turnpike doubles under the A-train configuration. This particular configuration allows a single tractor to haul two 53-foot trailers simultaneously.

The research contained in this paper attempted to measure the potential efficiency gains that could be achieved if A-trains were used (instead of semi-trailers) to haul retail freight from distribution centers to various store locations across the Maritime Provinces. These efficiency gains were evaluated for the following two future scenarios:

1. If A-trains are used to haul retail freight originating from a proposed retail distribution center in Halifax.
2. If A-trains are used to haul retail freight originating from existing retail distribution centers in Ontario and Quebec.

3.1 Measuring Efficiency Gains

Efficiency gains were estimated by comparing the operation of a single A-train configuration of a turnpike double with the two semi-trailer configurations required to transport an equivalent volume of freight. It should be noted that all estimates were developed for a single linehaul direction only and therefore do not reflect costs/savings associated with the backhaul portion of a trip.

For each linehaul, the following indicators were used to measure improved efficiency: percent reduction in tractor miles, percent reduction in fuel consumption, and percent increase in cost savings. The rationale used to obtain measures for each of these indicators is discussed in the following paragraphs.

Reduction in Tractor Mileage

The ability to haul two trailers with a single tractor drastically reduces the number of tractor miles required to move a given amount of freight. In cases where the entire linehaul can be completed using an A-train configuration, the associated reduction in tractor mileage would be nearly 50 percent. Even when only a portion of the linehaul can be completed by A-trains, a substantial reduction in tractor mileage can still be achieved.

The first step in determining the percent reduction in tractor miles was to establish the number of tractor miles that would be traveled using both the A-train and semi-trailer configurations. The approximate highway mileage for each linehaul was obtained using Microsoft Streets and Trips®. For two semi-trailer configurations, the associated number of tractor miles was simply taken as twice the linehaul distance. Determining the associated tractor miles for A-train configurations was slightly more complicated, as their operation was assumed to be limited to multilane arterial highways. Thus, each linehaul was divided into two portions: a portion that could be completed using A-trains and a portion that had to be completed using semi-trailer configurations. The total tractor mileage associated with using A-trains was then determined as the mileage on the A-train portion plus twice the mileage on the semi-trailer portion. Figure 2

depicts how the percent reduction in tractor miles was calculated for a specific linehaul between Halifax, NS and Bathurst, NB.

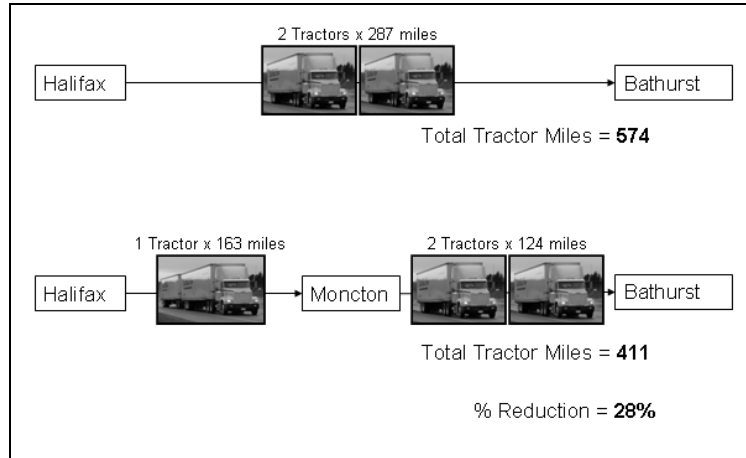


Figure 2 - Example of Determining the Percent Reduction in Tractor Miles

Reduction in Fuel Consumption

The reduction in fuel consumption provided by A-trains was tied directly to the reduction in tractor mileage. It was assumed that a standard 53-foot semi-trailer configuration consumes approximately one gallon of fuel for every seven miles traveled. This consumption rate would then increase to one gallon for every six miles traveled if a second 53-foot trailer is added². Thus, the number of tractor miles can be cut in half with only a 17 percent increase in fuel consumption. Overall, this translates into a 42 percent reduction in the amount of fuel required to haul two loads with a single tractor as opposed to using two (assuming A-trains are used over the entire linehaul). Figure 2 provides an illustration of this reduction over an arbitrary distance of 100 miles.

² Discussions with Sunbury Transport (2006)



		Total Fuel Consumed
Option A	2 tractors @ 7mpg 	$2 \times \left(\frac{100 \text{ miles}}{7 \text{ mpg}} \right) = 28.6 \text{ gal.}$
Option B	1 tractor @ 6mpg 	$1 \times \left(\frac{100 \text{ miles}}{6 \text{ mpg}} \right) = 16.7 \text{ gal.}$
		Total Reduction = 42%

Figure 3: Reduction in Fuel Provided by A-train Use

Increased Cost Savings

Sunbury Transport Ltd. estimated the operating costs per mile incurred by an A-train configuration to be approximately 21% higher than that of a semi-trailer configuration. Thus, when the cost of a single A-train unit is compared to the cost of the two semi-trailer configurations required to haul an equivalent volume of freight over the same distance, A-trains provide up to a 40 percent reduction in operating costs per mile. This estimate was based on Sunbury’s existing A-train operation between Saint John, NB and Dieppe, NB. Contributing to the higher costs were such factors as increases in tractor pay, maintenance costs, fuel consumption, licensing fees, and insurance payments.

While A-trains provide a considerable savings in terms of “over the road” costs, a portion of these savings are typically offset by additional shunting costs at either end of the linehaul. Since A-trains usually have limited access on urban streets, the two loads must often be shunted individually to and from destinations within larger municipalities. Shunting costs vary depending on the expected time required to move each load, as drivers are typically paid a pro-rated hourly wage for these movements.

For the purposes of this research, an average shunting cost of \$30 per trailer movement was used. On trips where the entire linehaul could be completed by A-train, it was assumed that both trailers would require shunting at either end. This resulted in an average fixed shunting cost of \$120 being applied. On trips where A-trains could only be used over the initial portion of the linehaul, it was assumed that no shunting would be required at the destination end. Instead, the shunting costs associated with these two movements were replaced by a \$30 cost to account for disassembly of the A-train unit at some intermediate location. Thus, a fixed cost of \$90 was applied to each trip where A-trains could only be used over a portion of the linehaul.

3.2 Results

Efficiency gains were measured on a per linehaul basis for Halifax and Central Canadian-based distribution.

Halifax-Based Distribution

Table 1 summarizes the potential efficiency gains associated with using A-trains for distributing freight from Halifax to several key municipalities across New Brunswick and Prince Edward Island. Each of the destinations in the lightly shaded area was assumed to have direct access to the LCV corridor, and therefore movements to these municipalities benefited from the largest gains in efficiency. Since the entire linehaul could be completed by A-train, the number of tractor miles required to move two loads to any of these municipalities from Halifax was effectively cut in half. Even though tractor miles were reduced by 50 percent, the corresponding reduction in fuel consumption on these trips would only be 42 percent since a tractor's fuel efficiency drops from 7 mpg to 6 mpg when it is hauling two trailers. Finally, the percent cost savings on these movements was found to range between 21 and 33 percent. The fixed shunting costs associated with A-train operations meant that cost savings increased proportionately with linehaul distance, thus these savings were found to be largest on longer linehaul movements.

Destinations in the darker shaded area would not have direct access to the LCV corridor, and subsequently would require a portion of the linehaul be completed by semi-trailer configurations. For these

destinations, the percentage reduction in tractor miles ranged from 23-34 percent and fuel consumption was reduced by 19-29 percent. Finally, the estimated cost savings on these movements ranged from 12-17 percent.

Table 1: Efficiency Gains on Linehaul Movements from Halifax

Destination	% Cost Savings	% Fuel Reduction	% Tractor Miles Reduction
Edmundston	33%	42%	50%
Fredericton	28%	42%	50%
Moncton	21%	42%	50%
Saint John	28%	42%	50%
St. Stephen	30%	42%	50%
Campbellton	12%	19%	23%
Bathurst	15%	24%	28%
Miramichi	17%	28%	34%
Summerside	15%	26%	31%
Charlottetown	13%	29%	34%

Central Canadian-Based Distribution

The majority of retailers seem convinced that establishing a centralized distribution centre in Halifax to service the Maritime Provinces will not be a feasible option in the foreseeable future. This ultimately means that at least a portion of Maritime-destined freight will continue to be moved over-the-road from centralized DCs in Ontario and Quebec. Under these circumstances, an opportunity would still exist for using A-trains to improve the overall efficiency of these movements. With the exception of a 66-mile stretch between Edmundston, NB and Riviere-du-Loup, QC, the primary truck route between major distribution centers in Ontario and Quebec and Maritime stores can accommodate A-trains.

Intuitively, the potential efficiency gains obtained on individual movements will vary depending on the origin and the destination of

the linehaul (i.e. the locations of both the centralized DC and the stores). For this research, Cornwall, ON, was selected as a representative origin since it is home to the primary Wal-Mart DC used to supply all Maritime stores. Bathurst, Charlottetown, Fredericton, Halifax, Moncton, and Sydney were selected as destinations due to their geographical diversity.

A total of four future scenarios were evaluated involving the use of A-trains to move freight from Cornwall:

- (a) A-trains operate over the entire linehaul (this assumes that Route 185 between Edmundston and Riviere-du-Loup is eventually twinned);
- (b) A-trains operate between Cornwall and Riviere-du-Loup, as well as from Edmundston to Maritime stores;
- (c) A-trains operate between Cornwall and Riviere-du-Loup only; and
- (d) A-trains operate between Edmundston and Maritime stores only.

Table 2 presents the range of potential efficiency gains that were determined for selected destinations under these four scenarios. As expected, scenarios (a) and (b) offered the largest efficiency gains for

Table 2: Efficiency Gains on Linehaul Movements from Central Canada

Destination	% Cost Savings	% Fuel Reduction	% Tractor Miles Reduction
Bathurst	19-25%	25-30%	30-36%
Charlottetown	12-31%	15-33%	21-43%
Sydney	11-30%	14-37%	15-41%
Fredericton	8-34%	13-42%	15-50%
Moncton	13-35%	17-42%	21-50%
Halifax	13-36%	16-42%	20-50%

all linehaul movements, since a greater portion of the total trip can be completed by A-trains. Similarly, efficiency gains for scenario (c) were highest for destinations nearest to the Quebec border (Bathurst and Fredericton in New Brunswick), while efficiency gains for scenario (d) were highest for destinations furthest from the Quebec border (Halifax and Sydney in Nova Scotia).

As shown, substantial efficiency gains can be achieved on all linehaul movements regardless of which scenario eventually unfolds.

3.3 Conclusions

If the Port of Halifax is to become a viable long-term alternative to west coast ports as a gateway for Asian retail freight, a more efficient and effective inland transportation network has to be established. Increasing the capacity of transload facilities near Halifax and using A-trains to haul retail freight between distribution centers and store locations were both found to offer significant potential benefits in this regard.

Increasing transload capacity near Halifax would allow goods to be transferred from 40-foot containers to 53-foot containers for shipment by either A-trains or CN Rail to Central Canadian and American markets. The largest potential efficiency gains offered by transloading include a 33 percent reduction in the number of containers transported inland, as well as the ability to sort freight according to inland destination. Timely turnover of 40-foot ocean containers would also be improved, and the associated cost for returning empty containers to ocean vessels would be avoided. Wasteful movements of Maritime-destined freight to and from Central Canada could also be eliminated.

The operation of A-trains would potentially provide a significant improvement in the efficiency and effectiveness of the inland transportation by allowing two 53-foot containers to be moved simultaneously over a network of multilane LCV highway corridors between Halifax and the major markets. For markets in the Maritimes that can be most directly serviced by long combination vehicles, estimated efficiency gains were as follows: approximately 20 to 33

percent cost savings, about 42 percent reduction in fuel consumption and 50 percent reduction in tractor miles. Other maritime markets partially served by a potential LCV corridor could realize in the order of half of these efficiency gains.

A-trains were also found to offer the following potential efficiency gains on movements between Central Canada and the Maritimes: approximately 8 to 35 percent cost savings, in the order of 13 to 42 percent fuel reduction and about 15 to 50 percent reduction in tractor miles. These efficiency gains depend on the extent of the LCV highway corridor network established throughout the Maritimes and Central Canada.