Operating Costs of Trucks In Canada 2005

Prepared for the Economic Analysis Directorate

Transport Canada Transports Canada

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EXECUTIVE SUMMARY

This 2005 edition of *Operating Costs of Trucks in Canada* is the latest edition in a report series sponsored by Transport Canada since 1972. Prior editions are available from Transport Canada. The most recent prior edition is the 2003 study.

The current report presents activity based cost estimates for truck operations in various North American jurisdictions:

- Every Canadian Province as well as Yukon and the Northwest Territories.
- Five US Regions.
- A Longer Distance Inter-provincial Canadian East-West Corridor.
- Three Longer Distance International Canada-US Corridors (West – Central – Eastern).

Cost levels reflect 2005 mid year or annual weighted average prices for trucking industry inputs in major population centers within each region for a mid-size trucking operation (25 to 500 vehicles in a fleet).

In addition to investigating trucking operations, the report also compares door-to-door truck transportation services to rail intermodal Container on Flat Car (COFC) and Trailer on Flat Car (TOFC) services for short, medium distance and long distance transportation.

Major Trucking Industry Input Cost and Price Comparisons

Key factors that changed trucking industry costs from 2003 to 2005 are:

- Canada's currency has been revalued upward by 13.5% compared to US currency, a compound annual increase of 6.5% per year.
- International prices for crude oil have been rising substantially, driving annual diesel fuel cost escalation at a 12% compound annual rate of increase in Canada and a 26.2% compound annual rate of increase in the US.
- Wage increases have trended upward since 2003, partially reflecting a shortage of skilled drivers, at a 2.65% compound annual increase for US based drivers and a 4.9% compound annual increase for drivers in Canada.

Resulting from the foregoing and other input cost changes, overall operating costs of trucks have risen over the past two years as follows:

- Canadian regional trucking costs have increased since 2003 at a 2.8% annual compound increase rate.
- US trucking costs from 2003 to 2005 increased even more substantially than Canadian costs, however when restated in equivalent Canadian $ terms, they remained relatively constant between the two years. This reflects the 13.5% upward revaluation of the Canadian dollar, in relation to the US dollar, for this time period.

The case study trend comparisons in question are for similar vehicle configurations operating at the same relative level of productivity. Thus cost trends do not directly reflect possible productivity gains that may be occurring through increasing average

payload utilization or by increasing the average annual utilization of vehicles (hours worked, or kilometres traveled per vehicle) by the trucking industry.

More specific underlying component cost trends for equipment purchase; wages, fuel and licensing components are provided in the main body of this report.

Detailed presentation of the case study methodology and assumptions follows in Chapters 1, 2 and 3 of the report, with summarized results of the various case study investigations presented in Chapter 4.

A detailed breakdown of specific cost components is provided in each of the case files for each province and region. These include:

- Intra-regional cases, include each province or US region. eg. BC, ALTA, etc.
- A set of Canadian long distance cases. CANEW which represents Canada-East-West, and
- Six International corridor long distance cases (INWESTCA, INEASTCA, AND INCENTCA for Canadian operators on these corridors) and (INWESTUS, INEASTUS, AND INCENTUS for US based operators on these corridors) as well as
- The two axle urban truck cases are in the file STRAIGHT.

The detailed case study files were provided to Transport Canada. These are available under separate cover.

Comparing Rail Intermodal and Direct Truck

Door to door transit times, transport costs and over-all logistics costs were compared for direct trucking and rail intermodal service on three corridors. For the short corridor, Toronto to Montreal (547 km), all costs were lower for direct truck. On the intermediate distance corridor, Toronto to Winnipeg (2084 km), transport costs for rail intermodal were lower – however total logistics costs (including provision for additional inventory needs and time value cost for money) favored truck if the trailer/container load was valued at $75,000. Winnipeg to Toronto slightly favored truck both in terms of transport costs or the time value aspects. The longer corridor, Toronto to Vancouver (4342 km), substantially favours rail intermodal services for both transport costs as well as over-all logistics costs.

1.0 INTRODUCTION

1.1 Goals and Purpose

Since 1972, Transport Canada has sponsored the assembly and publication of *Operating Costs of Trucks In Canada.*

Initially, there was a desire to understand how standardized vehicle configuration operating costs compared between Canadian provincial and territorial regions. Later, this interest was expanded to consider the United States -- reflecting the need to understand comparative economics for trucking inside Canada's largest trade partner as well as for the significant commercial trucking links between the two countries.

By periodically updating the original study, Transport Canada has monitored trends in trucking costs. For this reason, the project has been updated -- either every one or two years -- since 1972, with results published and distributed to interested parties. The most recent prior edition was prepared for year 2003 and can be obtained from Transport Canada. Please refer to that agency's website at http://www.tc.gc.ca.

Because it aids trucking economic study, this report has been widely circulated and used by diverse groups including managers of fleets seeking unit cost performance benchmarks, shippers rationalizing their trucking costs, and consultants doing feasibility planning studies. Highway officials have used the quantified hourly and mileage truck costs to evaluate detour delay or additional routing costs or for assessing operational benefits from better route infrastructure that reduces truck delay.

This report gives the most recent study update to 2005 cost levels.

In this project, the activity based case studies reflect specific trucking situations that vary as follows. We consider:

- Operating region (province, territory, US region or trade corridor)
- Type of vehicle and commodity
- Utilization (per trip payload and annual productive distance per vehicle)
- Trip haul distance
- Comparison to owner operator trucking or rail intermodal for line haul, and
- Current industry best practices (driver, vehicle technology, travel speeds, etc).

1.2 Vehicle and Freight Configurations Investigated

Operating costs for eleven very common vehicle types are included in this report's case studies. These have been carefully selected as a representative motor carrier sector sample in terms of freight and equipment types commonly encountered in all regions of Canada. Following Figure 1 illustrates the freight equipment configurations chosen for investigation.

Figure 1: Equipment Configurations For Case Studies

Five Axle Semi Trailer (Van)

Five Axle Semi Trailer (Flat deck or Lowboy)

Five Axle Semi Trailer (Liquid Tank)

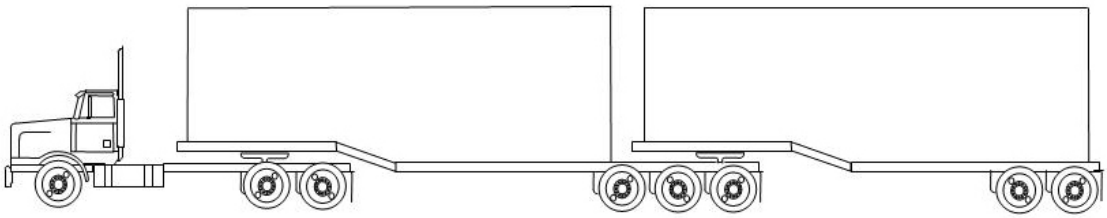
Figure 1: Equipment Configurations For Case Studies

Five Axle Semi Trailer (Dry Bulk)

Six Axle Tridem Semi Trailer (Van)

Six Axle Tridem Semi Trailer (Flat Deck)

Figure 1: Equipment Configurations For Case Studies



Eight Axle Super-B Train (Van Body Configuration)

Eight Axle Super B-Train (Flat Deck)

Eight Axle Super B-Train (Liquid Tank)

Figure 1: Equipment Configurations For Case Studies

Eight Axle Super-B Train (Dry Bulk)

Two Axle Straight Truck (Van)

1.3 Current Issues In Trucking

The methodology and basic case studies investigated in 2005 conform to the most recent prior study edition -- *2003 Operating Costs of Trucks In Canada*.

Since that edition, we note the following key factors that reflect in changes to truck operating costs:

- ***Driver Shortage*** -- Although a shortage of drivers has been forecast for many years, our 2005 interviews of trucking companies indicate that this situation now significantly constrains fleets when they wish to expand.

- ***Fuel Cost Escalation*** -- Since the early 1970's oil embargo, there have been periods when fuel prices have increased more significantly than general inflation in other trucking costs. In this same period, there have also been times of fuel price abatement. Following Figure 2 shows the dramatic world crude oil price rise since 2002, that has translated into trucking diesel fuel price increases and ultimately, cost increases for users of trucking services. Since world crude prices are generally benchmarked as US dollars per barrel of West Texas Intermediate Crude, the significant relative rise in value of the Canadian dollar has partially abated this effect for Canadian truckers, in comparison to fuel cost increase in the US (see reference: http://www.eia.doe.gov/emeu/international/oilprice.html , March 2005 Internet)

Average Annual WTI Crude Price U.S. $/ Barrel
Source: United States Energy Administration EIA Website

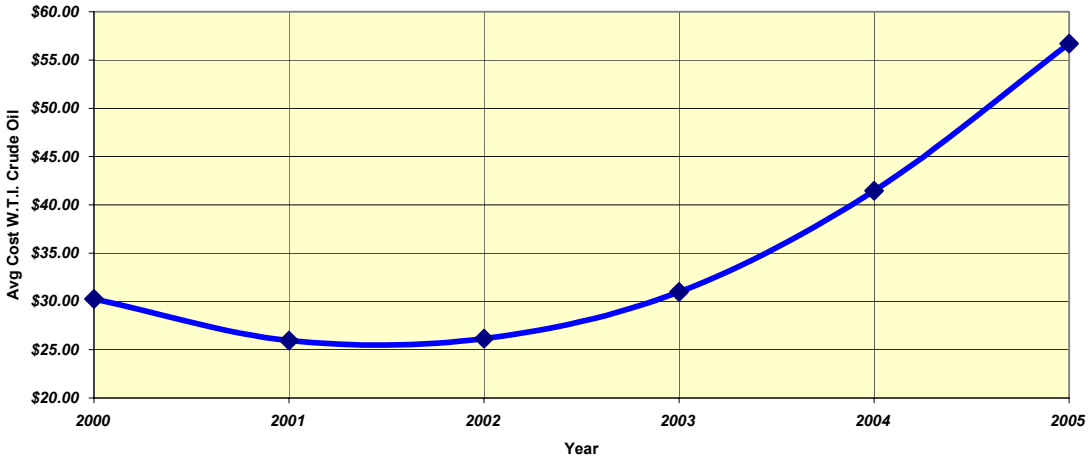


Figure 2: World Crude Oil Price Trends (Average Annual Basis)
(Source: US Energy Administration Published Statistics)

- ***Foreign Currency Adjustment --*** In relation to the US Dollar, Canada's currency has revalued significantly upward since 2003. According to Bank of Canada sources (basis http://www.bankofcanada.ca/en/rates/exchange_avg_pdf.html March 2006 Internet), the annual average US to Canadian dollar ratio has dropped from 1.40146 to 1.21163. This two-year 13.5% shift impacts relative Canadian to US based truck operating costs on trade corridors, as well as many of the costs for trucking inputs traded between the two countries. The recent currency exchange trend for *Operating Costs of Trucks In Canada* is illustrated in following Figure 3.

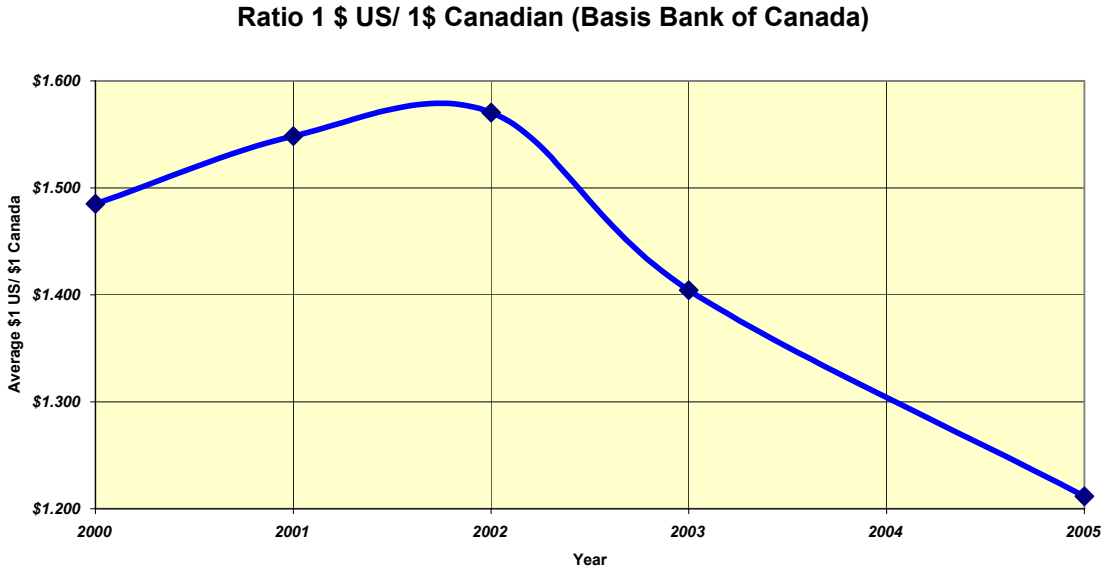


Figure 3: US to Canadian Currency (Annual Exchange Rate)
(Source: Bank of Canada Published Statistics)

2.0 COST TRENDS

As noted previously, since this study has been repeated frequently since 1972, key component costs for wages, fuel, and equipment purchase, together with over-all truck operating cost results, can be compared for trends over time.

When making these historic comparisons, some care must be exercised with older data because of the evolution of larger vehicle sizes and weights that took place between 1972 and the late 1980's / early 1990's when Canadian vehicle sizes and dimensions were adjusted (increased) following the extensive RTAC studies. These operational changes were reflected in *Operating Costs of Trucks in Canada*, which thus saw several adjustments to specific equipment and commodity case studies, prior to 1993.

Since 1993, there has been relative stability in permitted Canadian trucking industry weights and dimensions. Consequently, the study's equipment, commodity and case study configurations have remained uniform over that time. This permits cost trending against a relatively uniform operational base, since that year -- by comparing inputs and the cost results from the study series.

The cost trends in Sections 2.1 and 2.2 have been developed using 1993 as the index base year (1993 cost index set = 100).

2.1 Cost Component Trends

Wages

Wage costs are an important component of over-all trucking costs. Furthermore, with the widely publicized driver shortage, one might expect recent trends for this cost component would exhibit some significant increase -- compared to prior year to year wage cost adjustments.

Following Figure 4 illustrates the driver wage trend comparing this study to prior recent studies of *Operating Costs of Trucks in Canada*. For trends prior to year 2000, please consult historic study report editions.

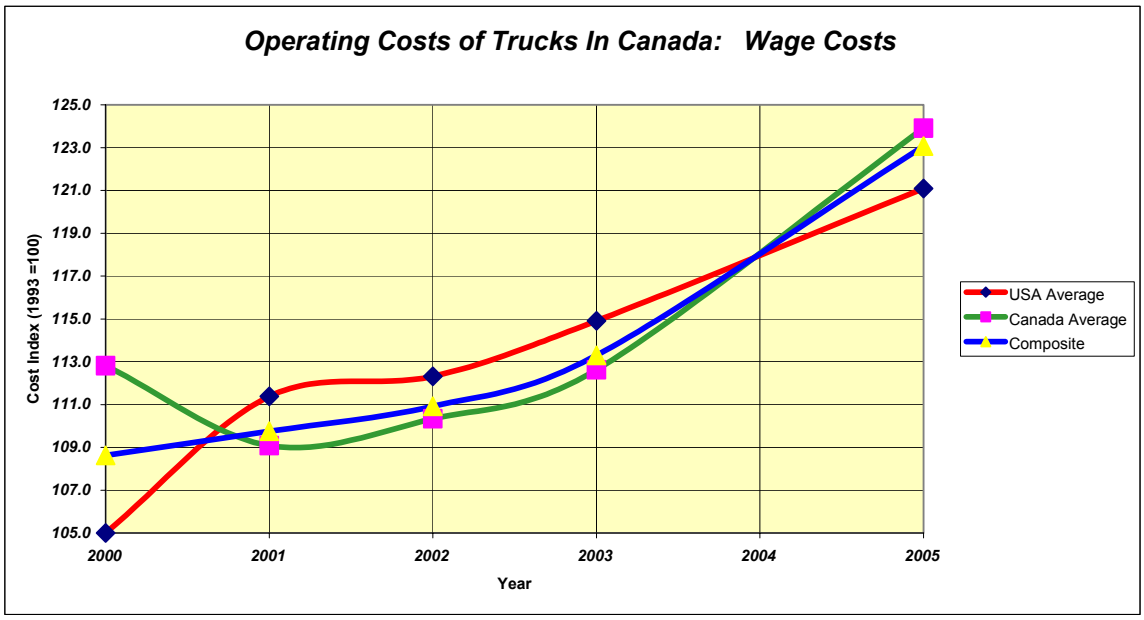


Figure 4: Trends in Driver Wage Levels (Operating Costs of Trucks Survey)

Between 2003 and 2005, a higher rate of increase in driver wage costs for Canadian based motor carrier fleets than for US fleets is noted. Nevertheless, when the over-all wage index level is compared to index year 1993 = 100 for both countries, this recent situation is perhaps only a slight correction from periods when moderately higher rates of wage increase had occurred in the US Comparing the graph's slope for the past two years to the 2000 to 2003 timeframe, the previously discussed driver shortage may be creating a slightly increasing wage level for drivers. This trend shows up in the cost index for both Canada and US regions. In terms of adjusting our driver wage cost base for the study, the results showed approximately a 2.65% compound annual rate of increase for US based drivers and a 4.9% compound annual rate for drivers in Canada.

Fuel

A second critical cost factor for trucking is the cost of fuel.

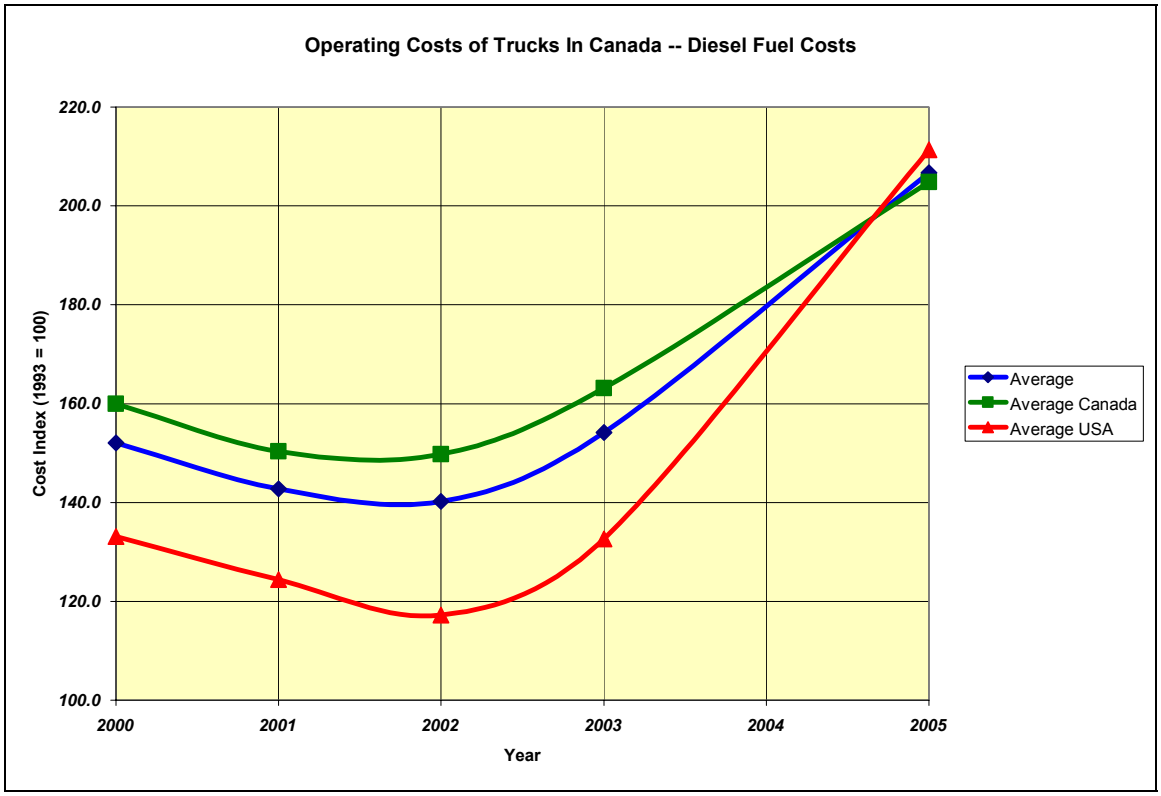


Figure 5: Fuel Cost Trends Comparing this Study to Prior Years

Figure 5 illustrates the composite cost trend for diesel fuel purchase by trucking fleets over the past five editions of *Operating Costs of Trucks in Canada*, indexed to 1993=100.

Note the significant rate of cost increase since 2002, reversing an earlier trend for this cost component. Comparing price fluctuation in Canada to the US, we note a more significant rate of increase in the cost index for the US since 2002. Annual rates of cost escalation in the index between 2003 and 2005 amount to a 12% compound annual rate of increase in Canada and a 26.2% compound annual rate of increase in the US.

Note the similarity between US costs in Figure 5 and earlier Figure 2. As diesel fuel prices in both Canada and the US tend to track world crude oil price levels, the principal reason for the apparent higher rate of cost escalation for trucker fuel in the US, when compared to Canada, seems to be the relative loss in value of the US currency, compared to Canada, since 2003 (see earlier Figure 3).

Note that in relation to the 1993 fuel cost levels for the industry, the cost index for fuel is now relatively the same for Canada and the US, at approximately double the price found in *1993 Operating Costs of Trucks In Canada* (both indices just greater than 200).

Equipment Purchase

Equipment purchase costs experienced moderate change between 2003 and 2005, with the most interesting characteristic noted in Figure 6, below, comparing power unit and trailer indexed costs.

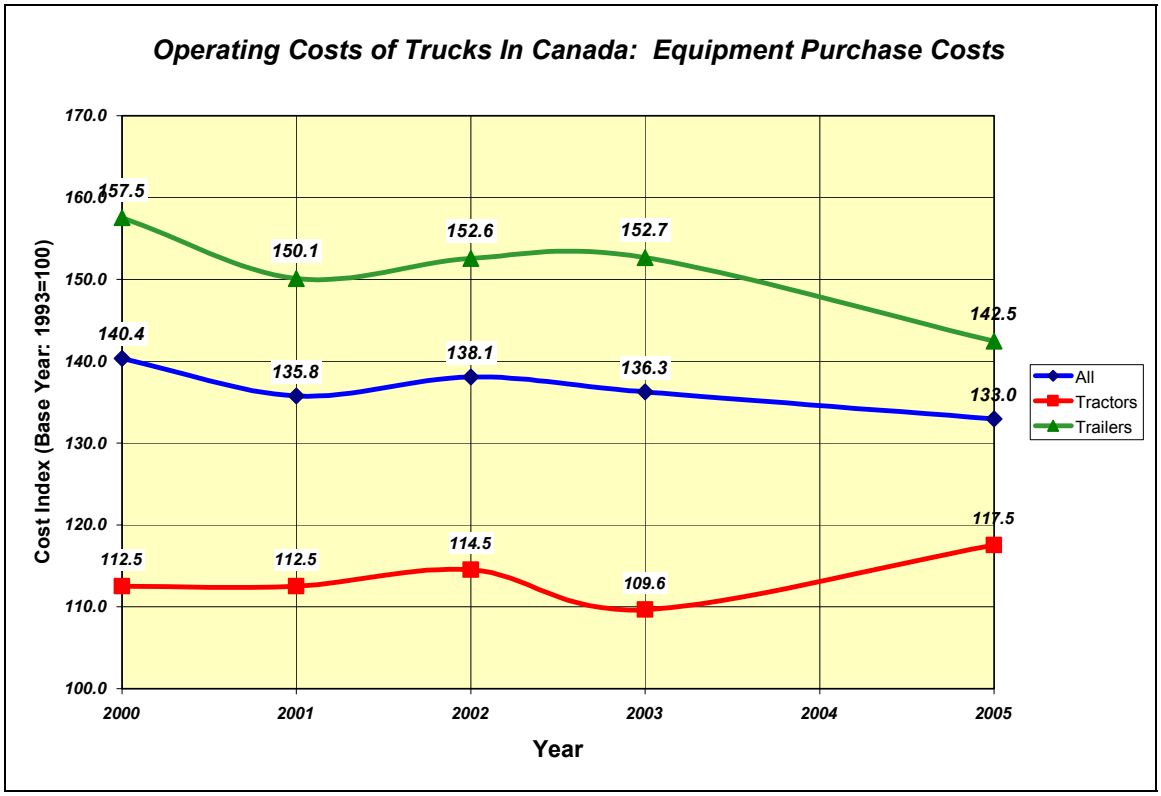


Figure 6: Index of New Equipment Purchase Costs

When compared to cost levels in the 1993 base year, we note that power unit costs have over-all escalated significantly less than trailers, and they still experienced a moderate 3.5% compound annual cost increase from 2003 to 2005.

Trailer costs, on the other hand, had escalated significantly more than power units, since 1993 -- and from 2003 to 2005 posted an annual compound cost decrease of 3.4%.

One should note that the composite cost levels in *Operating Costs of Trucks In Canada* are biased toward Canadian cost levels (as we evaluate more configurations for 12 Canadian regions versus only 5 US regions). In terms of trailer pricing, our discussions with truckers attributed the Canada / US currency exchange rate shift from 2003 through 2005 as having the greatest impact -- resulting in the slight over-all decrease. This has apparently impacted new trailer pricing more significantly than it has impacted new power unit pricing -- perhaps due to higher percentage US component content in trailers than for tractors.

License Costs

As illustrated in Figure 7, license cost escalation has been moderate, over the years, for truckers in both Canada and the US.

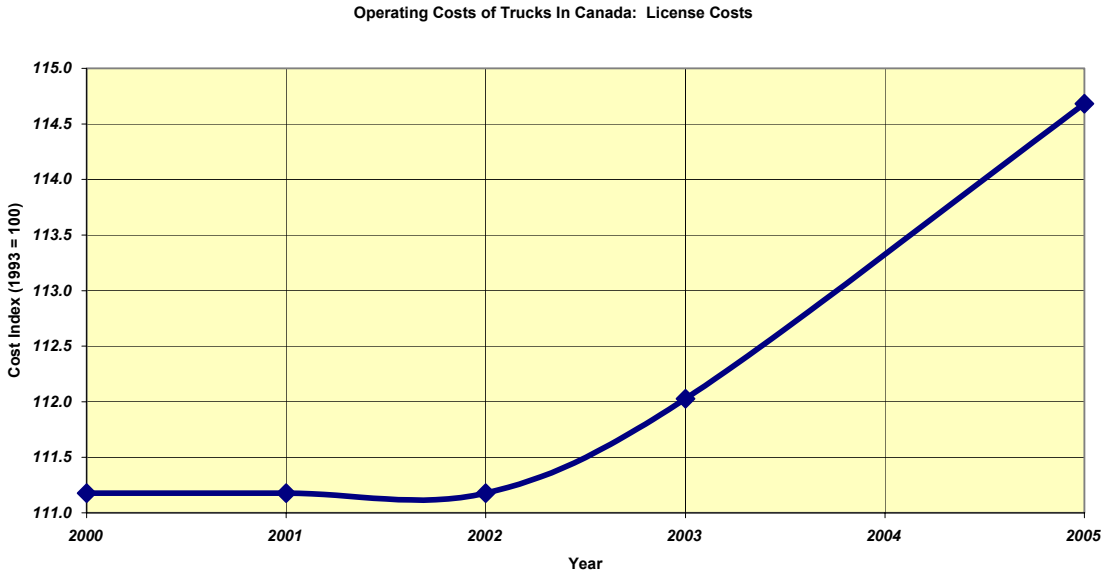


Figure 7: License Cost Trends

From 2003 to 2005, most jurisdictions did not alter their licensing fees for truckers -- however a moderate increase was noted in the Provinces of Nova Scotia and New Brunswick. Compared to the index level of 1993 = 100, one can see that over-all license registration costs have only moderately changed for truckers over the past 13 years.

2.2 Resulting Over-All Truck Operating Costs

In addition to examining critical component cost trends, repetition of this study since 1972 permits comparison of truck unit operating costs over time.

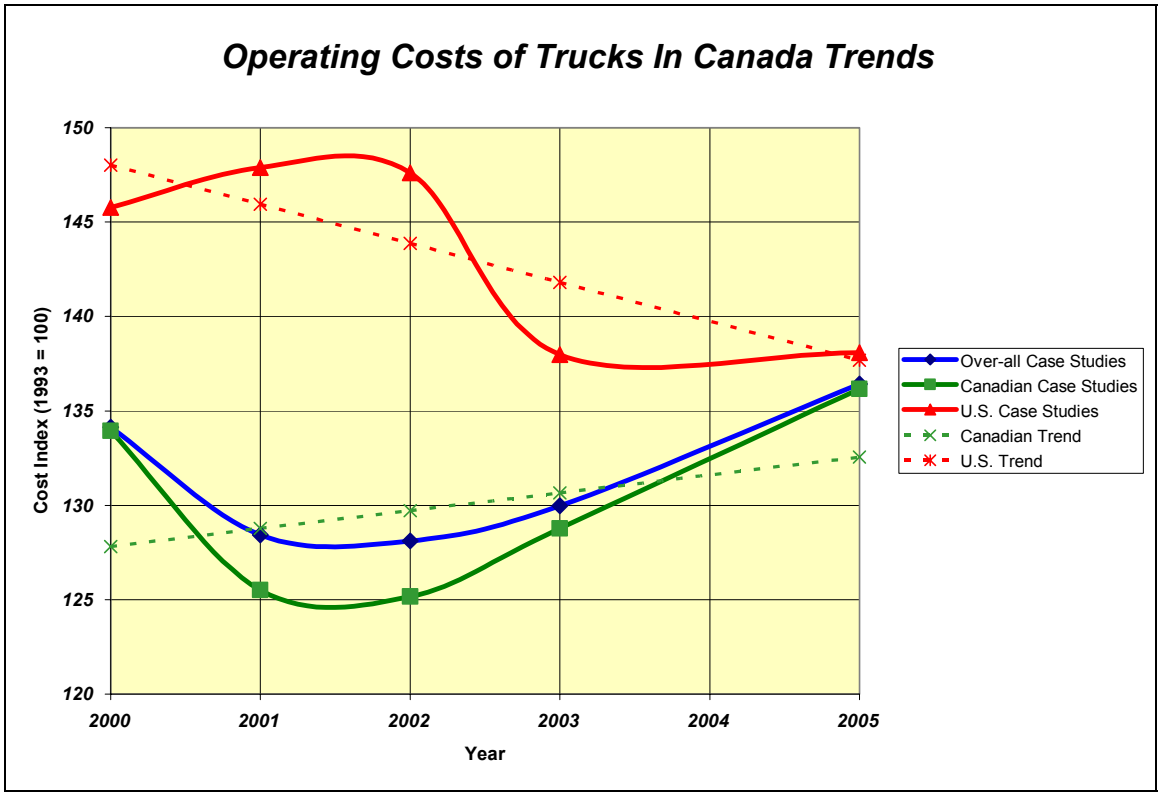


Figure 8: Comparison of Last 5 "Operating Costs of Trucks In Canada" Results
(Note US Costs graphed have been converted to Canadian $ currency, prior to indexing)

When comparing the truck cost index since 1993, results for the current study in both Canada and the US are an index value of 137 (about 36 to 38% higher than costs in 1993). The period from 2003 to 2005 saw a relative convergence in the indexed trucking cost levels for Canada and the US -- a factor we are inclined to attribute to the currency exchange rate adjustment, previously discussed.

Note that in Figure 8 we are graphing results for US trucking costs expressed in Canadian $ equivalent terms -- a factor which makes the relative comparison of Canadian and US cost levels very dependent on the exchange rate difference between the two countries.

In comparison to the 2003 study, we see that Canadian truck cost levels show a 2.8% annual compound increase in cost, yet US costs from 2003 to 2005 (in equivalent Canadian $ terms) are relatively constant. As noted in Figure 3, this time period saw a relative upward adjustment of the Canadian dollar -- compared to US -- of 13.5% over the two years (or a compound annual rate of 6.5%).

Efficiency of the Trucking Industry

The Economic Analysis Directorate of Transport Canada monitors the productivity of all transportation modes in Canada as part of that agency's annual report to parliament. The compiled statistics, based on evaluations of Statistics Canada and other available sources of information, are found in the Appendix volume to the annual report and in various other publications cited on the Transport Canada website. The information posted by Transport Canada tends to show cents per tonne-km trucking revenues (which relate directly to the rate paid by shippers) at approximately the same level in year 2005 as in 1993. If this information were indexed to a base year of 1993=100, for comparison to our study, the index would be approximately 100.

Comparing this surrogate for rates paid by truck users, to the unit per truck operating cost index of 137 shown in Figure 8, one sees a 37% efficiency increase by the trucking industry over 12 years, or roughly a compound rate of efficiency gain of 2.6 % per year. Without making a detailed analysis, which is beyond the scope for this study, one might speculate that the gain reflects such measures as increasing vehicle payloads, greater proportional use of larger (more cost efficient) vehicle configurations and a reduced percentage of empty kilometres traveled by trucks.

2.3 Cost Proportions By Component

Inter-City Line Haul Trucks

Indexed unit cost comparisons in section 2.1 for wages, fuel, equipment purchase and license costs are placed in better context when compared to how much each represents as a relative proportion of total trucking costs. The following figures summarize these proportions from our 2005 cost investigations.

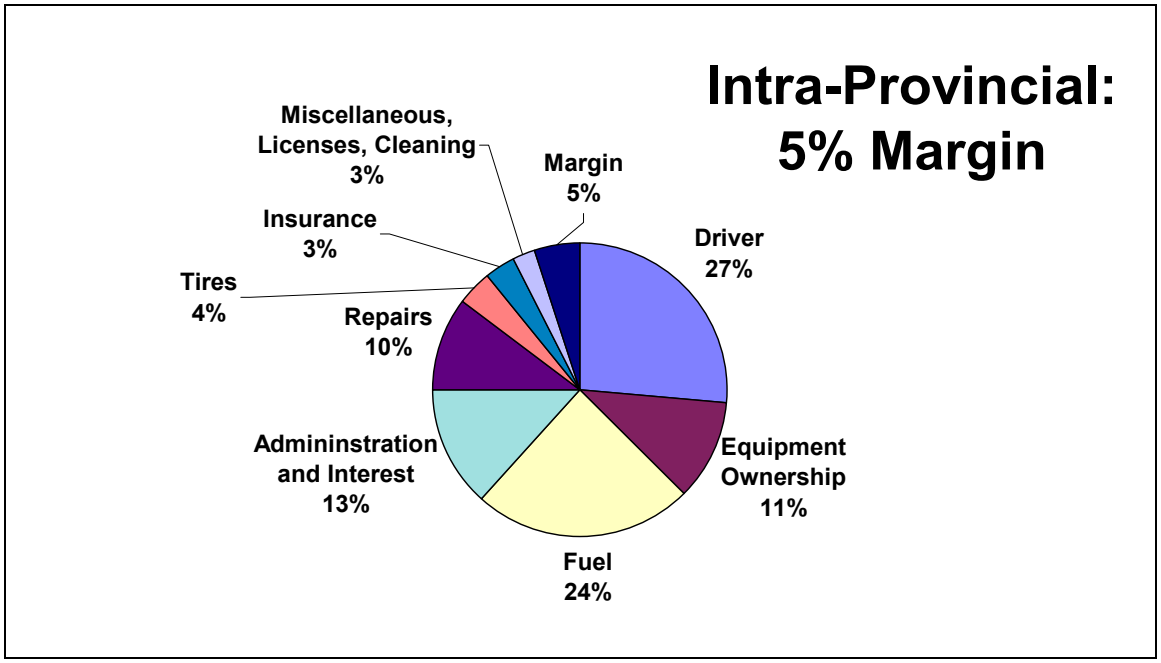


Figure 9: Component Costs For 2005 Canadian Intra Provincial Case Studies

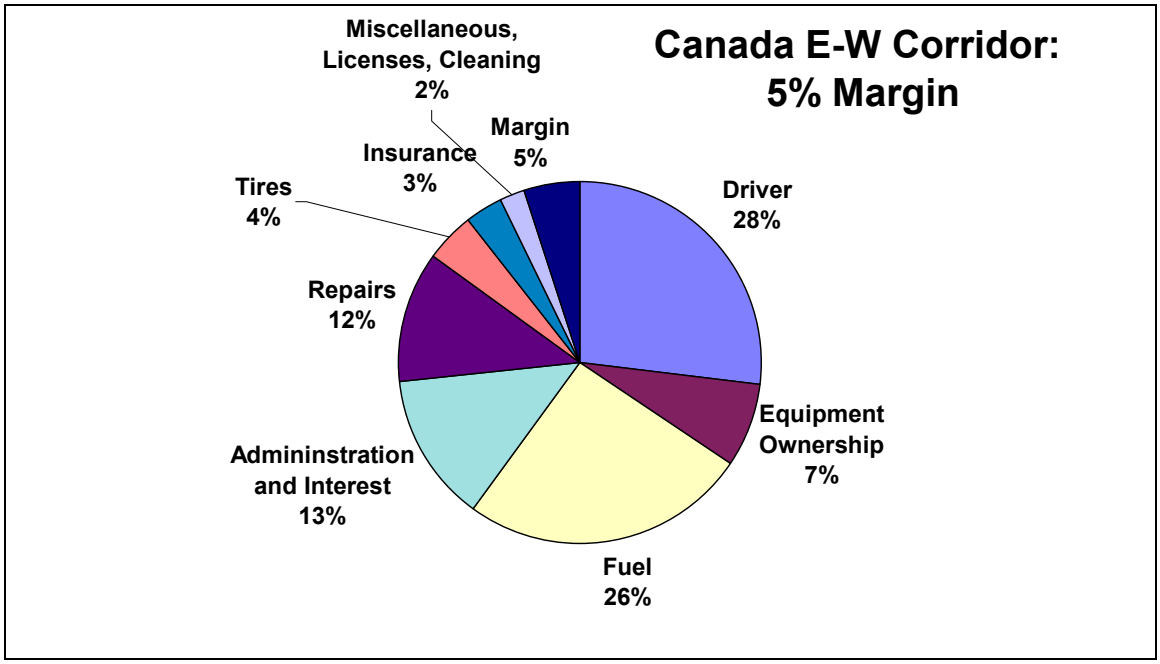


Figure 10: Component Costs For 2005 Canadian Inter Provincial Case Studies*

Comparing the (*longer distance) Canadian East - West Corridor component costs (Figure 10) to the intra provincial cases (Figure 9), the most significant difference noted relates to the relatively smaller proportion of Equipment Ownership costs for the longer distance cases (7% of costs in Figure 10 versus 11% in Figure 9). This difference reflects generally higher average kilometres traveled per year (better equipment utilization). Other costs that increase substantially with mileage (for example fuel and repair costs) are, on the other hand, proportionately greater for the inter-provincial case.

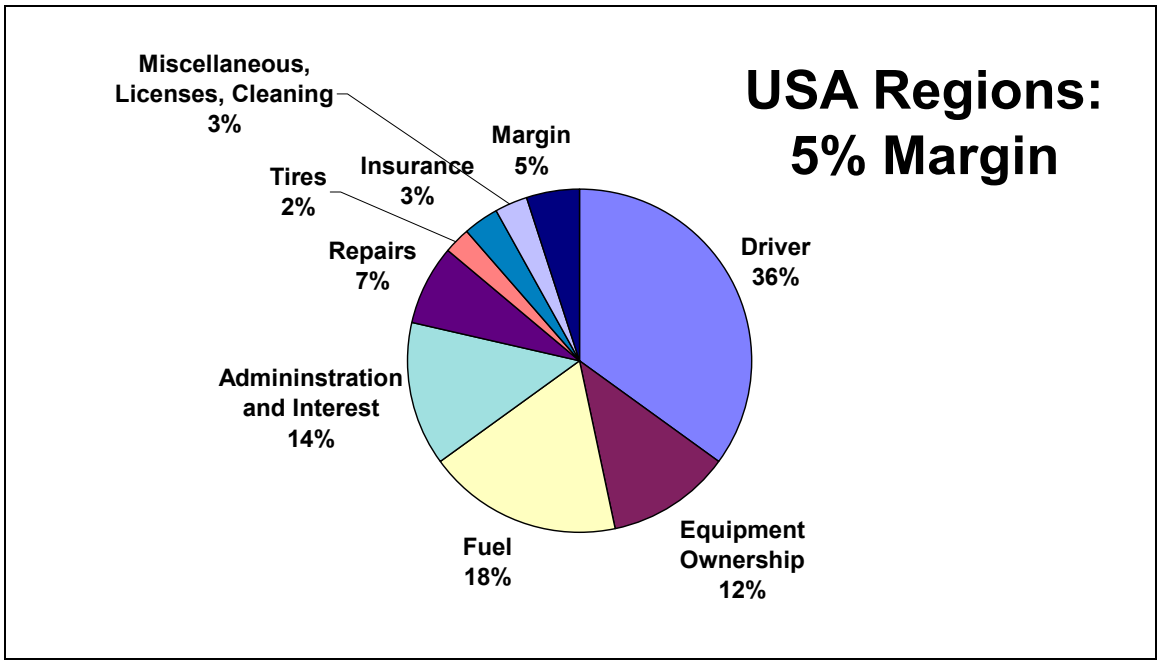


Figure 11: Component Costs For 2005 US Intra Regional Case Studies

Preceding Figure 11 shows cost shares from the US Intra Regional Cases. When comparing to Canadian Intra Provincial Case Studies (earlier Figure 9), we note that in US, Driver Cost share is a higher proportion of over-all cost (36% versus 27% in Canada), and Administration and Interest Cost share (driven by higher US interest rates than in Canada) is slightly higher in US.

Lower US proportional costs for Fuel (18% versus 24%), Repairs (7% versus 10%) and Tires (2% versus 4%) when compared to Canada may partially reflect the use of lower gross vehicle weight truck configurations (5 axle semi trailer) in the US than the heavier Tridem (6 axle semi trailer) and Super-B Train (8 axle) configurations in Canada. This factor may also partially explain the higher proportion for US based Driver Cost share, mentioned previously, since larger configurations are more efficient with respect to labour productivity than are semi-trailer units.

Summarizing the findings concerning cost share, across all the line haul cost cases investigated for 2005, key components of truck cost are as follows:

Cost Component	Cost Share Range
Driver	27 to 36 %
Fuel	18 to 24 %
Administration and Interest	13 to 14 %
Equipment Ownership	7 to 12 %
Repairs	7 to 12 %
Insurance	3 %
Tires	2 to 4 %
Miscellaneous (Licenses, Cleaning, etc.)	2 to 3 %
Margin	5 %

Urban Straight Trucks

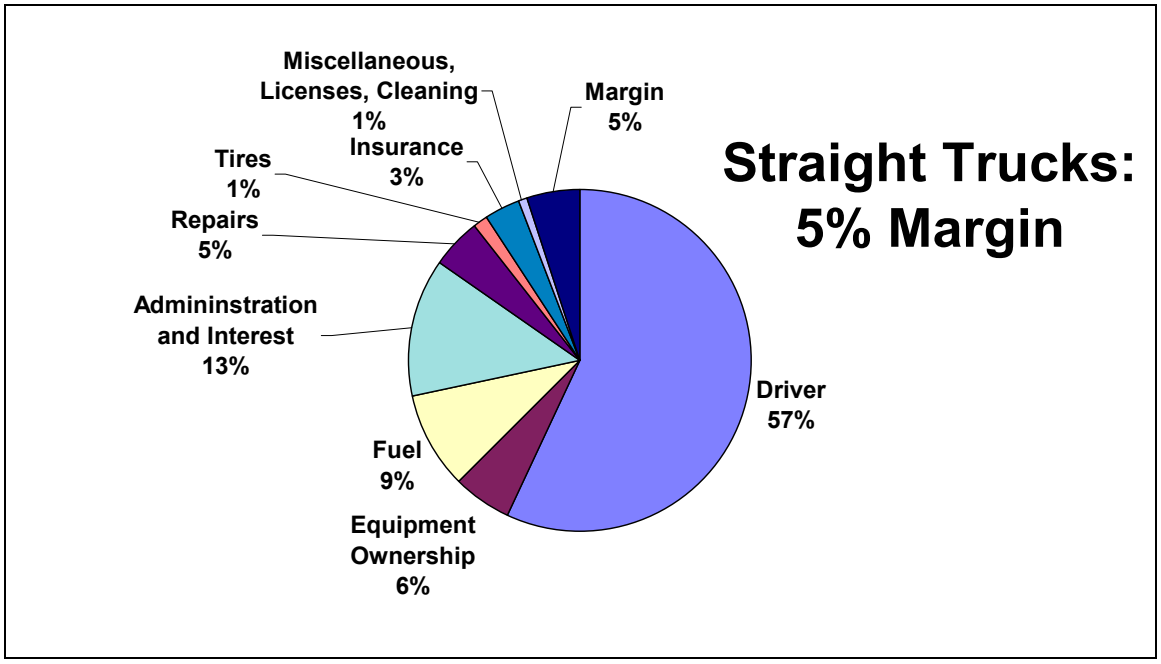


Figure 12: Component Cost Shares For Urban Straight Trucks

The cost proportions shown in Figure 12 for two axle urban straight trucks are significantly different than the preceding results for line haul combinations.

We note a high driver wage cost proportion (57%) compared to the 27 to 36% share for the larger tractor and trailer combination units. Yet equipment ownership, repairs, tires and fuel consumption show smaller proportions than for linehaul. This reflects urban conditions where the vehicles spend more of their work day parked at terminals and at various customer premises, rather than moving over the road. This reflects in a proportionally significant driver cost, yet lesser proportions of cost for repairs, tires and fuel.

3.0 APPROACH

3.1 Overview

The approach used for the 2005 updated study is the same methodology used since 1972, and widely accepted by the trucking industry and private fleets, for evaluating operating costs to provide trucking services to users.

Documentation of this approach has been widely described in prior editions of *Operating Costs of Trucks in Canada*. Furthermore, this method has been presented by the author to open industry seminars, called the “Know Your Truck Costs” series, sponsored by the Canadian Industrial Transportation League (now CITA), the Propane Gas Association of Canada, the Alberta Motor Transport Association and the British Columbia Trucking Association. In this context, the method has been widely exposed to industry and generally accepted in these forums.

We follow essentially an activity based approach, that itemizes each case study's distance travelled, operating speeds, fuel consumption rates, and all additional work hours not driving (i.e. waiting time, loading / unloading time) where drivers and equipment are "on duty".

The foregoing activity measurements result in specified resource needs and costs for over the road operation of trucks. These vehicle related resource costs include driver costs, fuel costs, repairs, tires, equipment ownership and licensing. The latter two costs are proportional to the number of vehicles needed to haul a given volume of freight, within a given timeframe.

In addition to the direct hauling activity related costs, provision is made for assignable indirect costs for the fleet business. These include over-all administrative activity (management and supervision, billing and accounting, information technology, sales and marketing, and provision of business premises for operating the fleets), interest costs for moneys invested in equipment and for working capital of the business, insurance costs and an operator profit margin.

Whether the trucking operation is for-hire, or part of a private fleet, providing an operator profit margin in the assessment of over-all operating cost (or user cost) covers the costs associated with the fleet business owner earning a "return on investment". -- either an operating margin to cover return for investment in a for-hire fleet, or for "opportunity cost" when a firm invests monies in a private fleet operation. In 1972, industry profit margins of for-hire trucking were generally significantly higher than is common today -- hence earlier *Operating Costs of Trucks In Canada* editions set operator profit at 10% of revenues.

Currently, operator margins tend to be lower, perhaps averaging from 2.5 to 5% of revenues for industry leading fleet operations. Exceptional trucking operators can still earn margins around 10% -- for example these are comparable to margins reported by

express transportation companies operating a premium service (eg. Trucking division of UPS, according to *Transport Topics' Top 100 For 2*004, for example).

As compared to the earlier studies, the current study compares three levels of margin: 10%, 5% and 2.5% operator profit margin -- enabling the user to tailor the costs to their understanding of the particular trucking market being benchmarked.

To enumerate all of the foregoing cost components, we employ an Excel based costing spreadsheet that calculates annual component costs for a single vehicle -- operated as part of a fleet operation -- for each of the vehicle configurations shown in Figure 1. Costs are enumerated as total and component costs of the vehicle for a year, costs per hour, and costs per kilometre.

The calculation is a specific instance of the same methodology that is commonly used by fleet operators to work out costs, hence rates to quote customers for undertaking specific trucking activity. The author of this study has employed this methodology and used it to develop custom applications to consult within the for-hire trucking industry, and with operators of private trucking fleets, to undertake feasibility studies, quote new business, and benchmark cost efficiency of fleet operations.

Input Unit Costs

In order to implement this methodology for *Operating Costs of Trucks In Canada* a database of factor costs for wages, fuel, tires, repairs, equipment purchase and other cost inputs is maintained -- and these costs must reflect the various case study specifics identified at the end of Section 1.1.

For updating the database to 2005 from the values used in the prior study, five basic sources of information were consulted:

1) Truck Fleet Supplier Quotations (Equipment, tires, fuel).

2) Fleet Operator Expert Consultation in all Regions.

3) Literature Review on the Subject of Driver Costs (rates of pay, working conditions, benefits, bonuses, etc.) including web references and employment advertisements.

4) Regulatory Agency Publications (vehicular size and weight restrictions, license fees, fuel taxation, sales taxes, etc.)

5) Review of published literature and Internet sources such as Statistics Canada, US Department of Energy, Natural Resources Canada, Bank of Canada and other data sources.

For US Regions, unit costs for inputs were obtained in US $. These were then converted to equivalent Canadian $ costs using the average 2005 exchange rate of 1$ Cdn = 82.53 cents US (see earlier discussion accompanying Figure 3).

For operations on international Canada - US corridors, most costs were based on the assumed home country of domicile for the trucker, except that fuel costs were based on

US cost levels (reflecting ability to purchase fuel in US, taxed at US rates, for both truckers regardless of domicile).

3.2 Vehicle Configurations and Equipment Life Cycle

For the vehicle configurations illustrated in Figure 1, vehicle specifications can vary considerably for even a single equipment type. Such variations can reflect in significantly different costs for vehicle purchase, vehicle repairs and fuel consumption.

These significant variations are present, when considering the trucking industry as a whole. Specific fleet operators will be using their own chosen specifications, engine sizes and other equipment selection preferences. The "mix" of vehicles on the road will reflect all of these differences, together with a mix of vehicle ages -- since not all vehicles are brand new.

In order to better standardize *Operating Costs of Trucks In Canada,* some general vehicle specifications have been developed -- and these are reviewed every time that the study is updated -- by asking equipment suppliers and fleet owners whether the assumed basic specifications are still "representative" of what the majority of the industry chooses to operate.

Power Unit Configurations

- For the regional case studies, cabs were assumed to be NOT sleeper equipped (for purposes of estimating tare weight and purchase costs)
- For the longer distance corridor cases (Canadian East-West and International Canada-US Corridors), additional costs were added (and weight) to the basic power unit specifications to reflect a sleeper equipped power unit.
- TRACTOR FOR A FIVE AXLE SEMI CONFIGURATION: Conventional configuration, Caterpillar C-13 Series Engine, 380 HP, 13 Speed Transmission, 40,000 lbs rear end, air ride suspension, 11R24.5 tires, 209” wheel base, 12,000 lbs front axle, GVW approximately 80,000 lbs, Canada 87,100 lbs. Tractor Tare Weight: 7620 kg
- TRACTOR FOR A SIX AXLE SEMI CONFIGURATION: Conventional configuration, Detroit Series 60 Engine, 430 HP, 18 Speed Transmission, 46,000 lbs rear axle, air ride suspension, 12,000 lbs front axle, 195” to 210” wheel base, 11R24.5 tires, 4.56 gear ratio, GVW approx 100,000 lbs. Tractor Tare Weight: 7938 kg
- TRACTOR FOR AN EIGHT AXLE SUPER B TRAIN CONFIGURATION: Conventional configuration, Caterpillar C-15 Series Engine, 475 HP, 18 speed transmission, 46,000 lbs rear axle, air ride suspension, 12,000 lbs front axle, 209” wheel base, 11R24.5 tires, 4.56 gear ratio, GVW approx. 140,000 lbs. Tractor Tare Weight: 7938 kg

Trailer Configurations

- FIVE AXLE SEMI VAN CONFIGURATION: Interior post insulated van, 1 1/8" - 1 ½" insulation, double doors at rear with 5 hinges per door, anti - rack door locks, vents front and back, air ride suspension, steel disk wheels, hardwood floors, undercoated, rear gear black finish, aluminium panels, prefinished white, 2 rows of cargo E-track. Trailer Tare Weight: 6,418 kg
- FIVE AXLE SEMI FLAT DECK CONFIGURATION: Outside rail construction with stake pockets and rub rail, load winches at 3'-0" centres, air suspension, steel disc wheels, hardwood floor, 1 colour epoxy finish. Trailer Tare Weight: 5,897 kg
- FIVE AXLE BULK LIQUID TANKER (MC307) 6000 Imperial gallons, type 316L Stainless Steel 2 B finish, bright annealed jacketing, 5" insulation compressed to 4", dimple style hot wall, 20" manway, fort vale super vent, 1" pressurization package, 2 x 20' - 0" S.S. hose trays, spring suspension, steel disk wheels, 1 colour epoxy finish, walkaround spill dam, curbside ladders, stainless steel fenders, aluminium catwalk, single compartment. Trailer Tare Weight: 5,942 kg
- FIVE AXLE BULK DRY TANKER CONFIGURATION: Aluminium dry bulk, solimar aerators (3 per hopper), 4" hot air discharge line, 6" discharge valves, 3" top air line, 20" fill covers, hot air hose (4") spring air suspension combination, steel disk wheels, 2 x 20'-0" hose trays, 2200 cu ft, radial tires. Trailer Tare Weight: 9,616 kg
- SIX AXLE TRIAXLE VAN SPECIFICATION: Interior post insulated van, 1 1/8" - 1 ½" insulation, double doors at rear with 5 hinges per door, anti-rack door locks, vents front and back, air suspension, steel disk wheels, hardwood floors, undercoated, rear gear black finish, aluminium panels prefinished white, 2 rows cargo E-track. Trailer Tare Weight: 8006 kg
- SIX AXLE TRIAXLE FLAT DECK SPECIFICATION: Outside rail construction with stake pockets and rub rail, load winches at 3' 0" centres, air suspension, steel disk wheels, hardwood floor, 1 colour epoxy finish. Trailer Tare Weight: 6804 kg
- EIGHT AXLE SUPER B VAN SPECIFICATION: Interior post insulated van, 1 1/8" - 1 ½" insulation, double doors at rear with 5 hinges per door, anti - rack door locks, vents front and back, air suspension, steel disk wheels, hardwood Floors, undercoated, rear gear black finish, aluminium panels prefinished white, 2 rows cargo E-track. Trailer Tare Weight: 12,247 kg
- EIGHT AXLE SUPER B FLAT DECK SPECIFICATION: Outside rail construction with stake pockets and rub rail, load winches at 3' 0" centres, air suspension, steel disc wheels, hardwood floor, 1 colour epoxy finish. Trailer Tare Weight: 8845 kg
- EIGHT AXLE SUPER B LIQUID TANK (MC 306) SPECIFICATION: Aluminium petroleum RTAC B-train, 4 compartment, double bulkheads, 20" fill covers, 4" air internal valves, 4" openable bottomload adapters, 63,500 litre capacity, four 20'-0" hose trays, prepared for vapour recovery, optic overfill sensors, 36"x30"x28" fitting box (aluminium). Trailer Tare Weight: 10659 kg
- EIGHT AXLE SUPER B DRY BULK SPECIFICATION: Aluminium dry bulk, solimar aerators (3 per hopper), 4" hot air/discharge line, 8" discharge valves, 2" top air line, 20" fill covers, hot air hose (4"), spring suspension, steel disc wheels, 2 x 20'-0" hose trays, radial tires. Trailer Tare Weight: 9980 kg

- TWO AXLE STRAIGHT TRUCK (VAN) SPECIFICATION: 2 Axle Diesel Powered Straight Truck Cab and Chassis, 24 Foot Insulated Van Box. No Reefer, Rear Doors, GVW approx. 14,600 kg

Equipment Life Cycle

Whether a fleet operator buys a new or used vehicle, and how long it is retained, is a business decision reflecting the owner's business strategy and the trucking market segment served. For example, an agricultural producer often purchases older used equipment and retains it for many years -- reflecting low average annual mileage characteristics of this hauling, the fact that hauling is very "local" to the home base, etc.

For most for-hire line haul trucking operations, the "standard" life cycle management strategy is as follows:

- For median utilization of 100,000 miles per year (160,000 km), operators will purchase new power units and retain them in line haul trucking service for 5 years. After 500,000 to 750,000 miles, (or 800,000 to 1.2 million km) the power unit will either be sold, or "retired" for use as an urban pick up and delivery unit, or a yard tractor.
- Under the same utilization scenario, trailers will be purchased new and operated for an average of 8 years.

3.3 Assumptions

The presented case studies give annual costs to operate a single vehicle; however the costs were developed assuming the vehicle is part of a medium sized trucking fleet. For this reason, indirect costs for administration, interest, insurance and operator margin have been allocated to the single vehicle based on normal percentages for these cost components within trucking businesses in Canada and the US.

Terminalling Productivity Assumptions

For developing truck operating costs as impacted by terminalling (load-unload) productivity, truck equipment ownership costs during wait time are excluded from analysis for the reason that the basic equipment utilization criteria, namely total kilometres traveled annually, implicitly already accounts for these costs. In other words, it is less feasible for an operator to realize a high number of kilometres annually as the proportion of equipment time spent loading and unloading increases.

Terminal productivity does directly influence driver wages and burden costs because whether the drivers are physically involved in commodity handling, they must be paid the representative hourly rate during the time involved for waiting to be loaded or unloaded.

For this study, terminal handling performance is based on:

- Dry Freight in Combination Units: One origin-destination per trip is assumed, which reduces the time required to handle one payload. Realistically, the rate of loading-unloading varies with consignment type; however observation indicates

that 4,500 kg per man-hour is representative of dry freight loading/unloading performance. Assuming an adequate availability of manpower, a handling time criteria of three hours for 27,270 kg has been applied to all applicable cases. That is, the driver will be on the job, but not driving, three hours for a 27,270 kg dry freight payload.

- Bulk Commodities: A study of various bulk operations indicates that the following load/unload rates reflect a good average for bulk commodities: 40,900 kg in 1 hour and 15 minutes; 22,700 kg in 45 minutes; 9,100 kg in 15 minutes.
- Dry Freight in Van Straight Trucks The time spent loading and unloading freight was assumed to be 1 man hour per 1600 kg of consignment.

The above mentioned handling performances are used in the analysis to estimate the total time necessary during the operations to handle the commodities. During this time the driver is paid on an hourly rate basis. The same handling performances have been applied throughout.

We are also assuming that the only handling cost to the truck operator is the wages and burden he must pay to the driver on duty during loading and unloading. The handling facilities and manpower are considered not to be under the trucker's management, or if so, that the costs for this operation are recovered against a “handling charge” and not included in the trucking cost.

Truck Operations Productivity and Cost Factors

- Intra Regional Base Case Trip Distances: The combination units are assigned a round trip distance of 320 kilometres since they are assumed to be involved in predominantly "terminal-to-terminal" highway service. Urban two axle units are assigned a trip distance of 100 kms. These common trip distances tend to reflect average common operational factors within the industry -- recognizing there are shorter and longer distance market segments, for specific operations.
- Longer Distance Canada East-West Corridors & Canada-US International Corridor Distances: Optionally, costs are compared for trips of 160km, 400 km, 800 km, 1600 km and 3200 km in length. These corridor operations are applied to the line haul combination units and not to straight truck applications.
- Annual Operating Distance: Annual operating distance is a convenient efficiency index that reflects factors such as seasonality, hauling distance, traffic congestion, or urban / inter-urban operation. This factor is also readily monitored and understood by fleet operators. For this study, three annual utilization scenarios were undertaken -- designed to reflect Low, Median, and High annual utilization. For line haul combination trucks, the scenarios reflect:
  - Low Annual Utilization (80,000 km per year, or 50,000 miles per year)
  - Median Annual Utilization (160,000 km per year, or 100,000 miles per year)
  - High Annual Utilization (240,000 km per year, or 150,000 miles per year)
- In the case of the urban two axle trucks, the utilization levels were 40,000 km; 80,000 km and 120,000 km annually for Low, Median and High cases.
- For longer distance corridors, annual kilometre utilization reflects available hours and the use of long distance sleeper team operations.
- Base scenarios evaluated in this study reflect paved road operations, with adjustment factors discussed for gravel road operations.

- Scenarios reflect annual average seasonal hauling conditions, with discussion of predominantly winter operating costs handled through adjustment factors.
- Average payload size was determined by applying the general density characteristics of the commodity type to the gross vehicle weight and with regard to the vehicle tare weight.
- Main population centres of each region were assumed as the base of operation for assessing local costs such as fuel, wages, etc.

Region	Assumed Population Centre
British Columbia	Vancouver
Alberta	Calgary / Edmonton
Saskatchewan	Regina / Saskatoon
Manitoba	Winnipeg
Ontario	Toronto
Quebec	Montreal
New Brunswick	Moncton, St John
Nova Scotia	Halifax / Dartmouth
Prince Edward Island	Charlottetown
Newfoundland	St John's
North West Territories	Yellowknife
Yukon	Whitehorse
US Great Lakes Region	Chicago, Detroit
US North East Region	New York, Philadelphia, Boston
US Midwest Region	St Louis, Kansas City
US South Region	New Orleans, Houston, Mobile
US West Region	Los Angeles, San Francisco, Denver

- The life cycle policies discussed in Section 3.2 were used to assess equipment performance and maintenance cost levels -- to make the scenarios representative of the average vehicle in an actual fleet. Hence maintenance costs reflect averages for tractors in the first five years of their life and trailers in their first eight years.
- For assessing vehicle write off costs, depreciation was related to purchasing new equipment and depreciating power over 5 years and trailers over 8 years.

3.4 Cost Components

A unit cost review was undertaken by Logistics Solution Builders, to update all unit cost components for this project to 2005 average cost levels.

As noted previously, this update of *Operating Costs of Trucks In Canada* is built partially upon the regularity of updates -- hence the study was commenced using the data base of unit cost information compiled over the years, in previous studies, as a starting point of inquiry. This permitted us to seek information concerning absolute levels of cost, but

also to understand changes over the past two years -- down to the regional and specific equipment configuration level of inquiry.

Data sources consulted for these efforts included review of published literature and web based information concerning the trucking industry, contact with trucking associations, discussions with approximately thirty for-hire trucking businesses and contact with trailer manufacturers and dealers, power unit suppliers, tire suppliers and a major oil company's national fleet sales department.

3.4.1 Driver Costs

Samples of 2005 hourly and distance base wage rates for drivers in regions were obtained from:

- Discussions with fleet operators in all the regions.
- Reference to available collective bargaining results published in internet references and trade publications.
- Review of corporate web-sites, many of which publish driver compensation information.
- Review of newspaper classified advertisements and web-based driver recruitment sites for carriers and driver pools.
- Review of transportation and other wage statistics from Statistics Canada, the US Department of Labor, Published Teamsters Wage Rates, and US County and State Wage Survey Statistics.

Considering these sources, and in light of the driver wage database from the prior study, Logistics Solution Builders developed our best estimate for average driver wages applicable for the hauling cases in our study.

The 2005 base wage costs used were as follows:

REPRESENTATIVE DRIVER WAGES ACROSS CANADA (mid 2005)

	BULK COMMODITY						GENERAL COMMODITY					
	5-Axle Vehicles per hr $	5-Axle Vehicles per km cents	6-Axle Vehicles per hr $	6-Axle Vehicles per km cents	7/8-Axle Vehicles per hr $	7/8-Axle Vehicles per km cents	5-Axle Vehicles per hr $	5-Axle Vehicles per km cents	6-Axle Vehicles per hr $	6-Axle Vehicles per km cents	7/8-Axle Vehicles per hr $	7/8-Axle Vehicles per km cents
British Columbia	$18.75	27.03	$19.75	27.76	$21.75	29.21	$19.25	27.38	$20.25	28.21	$22.25	29.87
Alberta	$16.50	23.30	$16.83	24.03	$17.50	25.48	$17.00	23.30	$17.50	24.03	$18.50	25.48
Saskatchewan	$16.00	22.99	$16.33	23.72	$17.00	25.17	$16.50	22.99	$17.00	23.72	$18.00	25.17
Manitoba	$15.50	22.99	$15.75	23.72	$16.25	25.17	$16.00	22.99	$16.50	23.72	$17.50	25.17
Ontario	$18.00	24.23	$18.50	25.06	$19.50	26.72	$18.50	24.23	$19.17	25.65	$20.50	27.07
Quebec	$17.50	23.92	$18.00	24.75	$19.00	26.41	$18.00	24.23	$18.67	24.95	$20.00	26.41
New Brunswick	$15.00	21.13	$15.33	21.96	$16.00	23.61	$15.50	21.13	$16.00	21.96	$17.00	23.61
Nova Scotia	$15.00	21.13	$15.33	21.96	$16.00	23.61	$15.50	21.13	$16.00	21.96	$17.00	23.61
P.E.I.	$14.50	20.51	$14.83	21.44	$15.50	23.30	$15.00	20.51	$15.50	21.44	$16.50	23.30
Newfoundland	$15.00	21.75	$15.33	22.58	$16.00	24.23	$15.50	21.75	$16.00	22.58	$17.00	24.23
Yukon	$18.50	24.86	$19.50	25.58	$21.50	27.03	$19.00	25.48	$20.08	25.99	$22.25	27.03
N.W.T.	$16.50	23.30	$16.83	24.03	$17.50	25.48	$17.00	23.71	$17.50	24.30	$18.50	25.48

U.S. DRIVER WAGES FOR FIVE-AXLE SEMI CONFIGURATION (mid 2005) in Canadian $/hr and cents/km

	BULK COMMODITY		GENERAL COMMODITY	
	5-Axle Vehicles per hr $	5-Axle Vehicles per km cents	5-Axle Vehicles per hr $	5-Axle Vehicles per km cents
U.S. North East (NY,NJ, Mass)	$23.02	30.12	$24.84	31.62
U.S. Great Lakes (Ill,Mich)	$23.02	30.12	$24.84	31.62
U.S. Midwest (Nebr,Kans,Okl)	$21.51	28.99	$23.32	30.87
U.S. South (Ark, Alab, Geo)	$20.29	28.61	$22.42	30.12
U.S. West. (Wash, Oreg, Calif)	$21.51	30.12	$23.32	31.62

Costs For Driving Activity

Driving costs are influenced by distance, hours and tonnage associated with a haul. Larger highway vehicles are costed on the basis of calculating driver wages on either a per-kilometre rate, or an hourly rate -- whichever is highest. This is standard procedure and results in most cases in line-haul pavement kilometres being rated on a distance basis and urban and gravel kilometres paid on an hourly basis, due to slower vehicle speed.

Urban straight truck operations are costed on an hourly pay basis.

Costs For Loading and Unloading Time

Cost for driver time resulting from loading and unloading of payloads is included using the appropriate hourly rate.

Wage Burden Costs

In addition to paying base hourly and mileage wages for driving and loading / unloading work performed, a wage burden percentage is applied to cover costs associated with non worked paid time (eg. Vacation and Statutory Holidays), driver benefits such as pensions, medical premiums, etc. that are provided by the employer. Burden percents used have been developed from analysis and consultation with fleet operators.

3.4.2 Fuel Costs

Fuel costs are a result of the influence of distance traveled, vehicle fuel consumption, and of course fuel prices. To support *Operating Costs of Trucks In Canada*, Logistics Solution Builders maintains a database of realistic fuel consumption rates for each case study hauling scenario. These are based on, and updated with, consultation of fleet operators, discussions with distributors of power units to the industry and review of published literature on fleet energy management benchmarks and targets.

In relation to pricing, we reviewed average annual 2005 fleet discounted fuel pricing in the most heavily populated areas of each region. Costs included provincial and state tax as well as Canadian excise tax on fuels.

Price levels used in our study are on the following page.

ESTIMATED TRUCKER FUEL COSTS BY PROVINCE (avg 2005)

	Diesel			
	Est. Purchase cents/litre (with fuel taxes)	Tank Wagon cents/litre (without fuel taxes)	Provincial Fuel Tax cents/litre	Federal Fuel Tax cents/litre
British Columbia	95.8	72.8	15.0	4
Alberta	84.6	71.6	9.0	4
Saskatchewan	90.4	71.4	15.0	4
Manitoba	88.2	72.7	11.5	4
Ontario	85.6	67.3	14.3	4
Quebec	95.7	75.5	16.2	4
New Brunswick	99.4	78.5	16.9	4
Nova Scotia	92.6	73.2	15.4	4
P.E.I.	93.1	72.6	16.5	4
Newfoundland	101.2	80.7	16.5	4
Yukon	95.5	84.3	7.2	4
N.W.T.	99.6	86.7	8.9	4

U.S. Cost Information based on U.S. DEPT OF ENERGY REPORTS

	Diesel Purchase $ CDN/ U.S. GALLON	Equivalent CDN cents/litre
U.S. NorthEast (basis NY)	2.919	77.1
U.S. Great Lakes (Michigan)	2.862	75.6
U.S. Midwest (Nebraska)	2.862	75.6
U.S. Southern (Texas)	2.855	75.4
U.S. Western (Calif,Colo)	3.115	82.3

Note US costs have been expressed in equivalent Canadian dollars based on the average exchange rate, previously discussed.

3.4.3 Repair Costs

Repair costs used in our study represent expected costs of parts, lubricants, oil, and labour associated with the maintenance and repair of the particular equipment type. Our database on repair costs was updated in consultation with equipment dealerships, fleet managers, and reference to US Bureau of Commerce and Statistics Canada Industrial Price Indices.

We have assumed that repairs were undertaken under efficient shop management and that a prudent preventive maintenance system was employed that was compatible with equipment manufacturer recommended service intervals, warranties and other best practices.

3.4.4 Cleaning Costs

The cost of cleaning tractors, flatdeck trailers and van freight trailers has minimal effect on total operating costs.

Annual costs of cleaning bulk tanks vary with the type of commodity carried and the quantity of different bulk commodities transported during the year. An average of tank trailer cleaning costs was developed from discussions with various bulk tank truck carriers as well as a review of prices charged at commercial tank cleaning facilities.

3.4.5 Transport Costs

The transport cost category is a miscellaneous category to reflect all those factors that may be attributed to extra equipment that are not normally viewed as part of a vehicle's standard configuration. This may represent special pumps, hoses, safety equipment, dunnage, small tools, chains, tarping, heaters* or refrigeration* equipment. These costs will vary with area of operation and also with the specific type of product hauled.

**Note: Starred items are not included for this analysis, but such items would normally be included in the category "transport costs", when evaluating these specialized trucking applications.*

3.4.6 Tire Costs

Tire unit costs in our database were updated by Logistics Solution Builders through consultation with suppliers of tires, our knowledge base from prior related fleet studies, and reference to industrial price indices published by Statistics Canada and the US Bureau of Commerce. Actual in-service costs for trucking tires are a reflection of the following factors:

- Number of tires for the particular vehicle and cost of new tires purchased in each region.
- Life of a tire in each service application, considering road surface conditions.

- Cost of retreading, when retreading is desirable, and life of a retread tire for each region.

3.4.7 Depreciation Costs

"Normal" depreciation is used based on the 2005 equipment purchase cost obtained from dealer quotations. That is, one percent a month for trailers over a trailer life of eight years and 79.2 percent for tractors over a tractor life of five years. This assumption relates equipment write-off to current replacement cost rather than an arbitrary "book value" determination.

Equipment values used for this study, inclusive of applicable provincial and state sales taxes, are tabulated below:

Power Units

Purchase Cost of Power Units (mid 2005)				
	Tractor For Five Axle Semi Combination	Tractor For Six Axle (triaxle) Semi Combination	Tractor For Eight Axle Semi Combination	Straight Truck Two Axle Dry Freight Van
B.C.	$121,910	$129,400	$134,750	$82,689
Alberta	$114,000	$121,000	$126,000	$77,279
Saskatchewan	$121,910	$129,400	$134,750	$82,689
Manitoba	$121,910	$129,400	$134,750	$82,689
Ontario	$123,040	$130,600	$136,000	$85,621
Quebec	$122,475	$130,000	$135,375	$85,621
New Brunswick	$114,000	$121,000	$126,000	$77,279
Nova Scotia	$114,000	$121,000	$126,000	$77,279
P.E.I.	$125,300	$133,000	$138,500	$85,007
Nfld	$114,000	$121,000	$126,000	$77,279
Y.T.	$114,000	$121,000	$126,000	$77,279
NWT	$114,000	$121,000	$126,000	$77,279
U.S. North East	$119,943	$124,544	$129,802	$81,507
U.S. Great Lakes	$116,968	$121,454	$129,802	$81,507
U.S. Midwest	$116,968	$118,201	$128,514	$81,507
U.S. South	$113,994	$118,365	$123,361	$81,507
U.S. West	$118,753	$123,308	$128,514	$81,507

Footnote: Add $5000 for Sleeper

Trailer Units

Purchase Costs For Trailers (mid 2005)					
	Trailer For Five Axle Combination Semi Van	Trailer For Five Axle Combination Flat Deck	Trailer For Five Axle Combination Bulk Liquid Tanker	Trailer For Five Axle Combination Bulk Dry Tanker	Trailer For Six Axle Combination Triaxle Van
B.C.	$29,960	$24,610	$75,970	$101,260	$36,380
Alberta	$28,000	$23,000	$71,000	$93,800	$34,000
Saskatchewan	$29,960	$24,610	$75,970	$100,310	$36,380
Manitoba	$29,960	$24,610	$75,970	$100,310	$36,380
Ontario	$30,240	$24,840	$76,680	$102,540	$36,720
Quebec	$30,100	$24,725	$76,325	$102,075	$36,550
New Brunswick	$28,000	$23,000	$71,000	$95,100	$34,000
Nova Scotia	$28,000	$23,000	$71,000	$95,100	$34,000
P.E.I.	$30,800	$25,300	$78,100	$104,400	$37,400
Nfld	$28,000	$23,000	$71,000	$95,100	$34,000
Y.T.	$28,000	$23,000	$71,000	$94,750	$34,000
NWT	$28,000	$23,000	$71,000	$94,750	$34,000
U.S. North East	$30,000	$25,000	$77,000	$102,000	$35,000
U.S. Great Lakes	$30,000	$25,000	$77,000	$102,000	$35,000
U.S. Midwest	$30,000	$25,000	$77,000	$102,000	$35,000
U.S. South	$30,000	$25,000	$77,000	$102,000	$35,000
U.S. West	$30,000	$25,000	$77,000	$102,000	$35,000
	Trailer For Six Axle Combination Triaxle Flat Deck	Trailer For Eight Axle B Train Van	Trailer For Eight Axle B Train Flat Deck	Trailer For Eight Axle B Train Bulk Liquid Tanker	Trailer For Eight Axle B Train Bulk Dry Tanker
B.C.	$29,960	$62,060	$42,800	$178,550	$167,850
Alberta	$28,000	$58,000	$40,000	$167,000	$157,000
Saskatchewan	$29,960	$62,060	$42,800	$178,550	$167,850
Manitoba	$29,960	$62,060	$42,800	$178,550	$167,850
Ontario	$30,240	$62,640	$43,200	$180,200	$169,400
Quebec	$30,100	$62,350	$43,000	$179,375	$168,625
New Brunswick	$28,000	$58,000	$40,000	$167,000	$157,000
Nova Scotia	$28,000	$58,000	$40,000	$167,000	$157,000
P.E.I.	$30,800	$63,800	$44,000	$183,500	$172,500
Nfld	$28,000	$58,000	$40,000	$167,000	$157,000
Y.T.	$28,000	$58,000	$40,000	$167,000	$157,000
NWT	$28,000	$58,000	$40,000	$167,000	$157,000
U.S. North East	$30,000	$62,000	$42,000	$181,000	$170,000
U.S. Great Lakes	$30,000	$62,000	$42,000	$181,000	$170,000
U.S. Midwest	$30,000	$62,000	$42,000	$181,000	$170,000
U.S. South	$30,000	$62,000	$42,000	$181,000	$170,000
U.S. West	$30,000	$62,000	$42,000	$181,000	$170,000

GST has been excluded since fleet operators will claim offsetting GST credits.

3.4.8 License Costs

Canadian license costs reflect the provincial or territorial charges for licensing the vehicle configurations studied as found in the *Truck License & Tax Manual: A Guide to Canadian Regulations,* 2005 edition published by J.J. Keller and Associates.

US license costs are based on registration of a Five Axle Tractor Semitrailer Combination to the accepted interstate highway standard of 80,000 lbs (36,364 kg) gross vehicle weight. The registration costs are based on selected state jurisdictions, within each region, and applicable charges were secured from *Trucking Permit Guide,* 2005 edition published by J.J. Keller and Associates.

Two axle tractors were assumed licensed at 14,600 kg in all jurisdictions.

Resulting annual license costs for our case studies were as follows:

VEHICLE LICENSING FEES AND WEIGHTS (2005)

	GVW/GCW (kgs)	No. of Axles	($) Annual Fee for Power Unit	($) Annual Fee for Trailer
U.S. North East				
basis NY	36,287	5	$6,783 $0.0585/laden mi $0.015/empty mi	$28
	15,500	2	$702	
U.S. Great Lakes States				
basis Mich.	36,287	5	$2,678	$47
	15,500	2	$901	
U.S. Midwest				
basis Nebr.	36,287	5	$2,217	$7
	15,500	2	$659	
U.S. Southern				
basis Ark.	36,287	5	$2,302	$24
	15,500	2	$348	
U.S. Western Rocky Mtn.				
basis Wash.	36,287	5	$2,777	$44
	15,500	2	$419	

** Note: Values shown are in CDN EQUIVALENT $ and include U.S. Federal Heavy Vehicle Use Tax of $550 (U.S.) per year (resident)*

VEHICLE LICENSING FEES AND WEIGHTS (2005)

	GVW/GCW (kgs)	No. of Axles	($) Annual Fee for Power Unit	($) Annual Fee for Trailer
British Columbia	39,500	5	2229	30
	46,500	6	2799	30
	63,500	8	3905	60
	14,600	2	607	
Alberta	39,500	5	1809	20
	46,500	6	2377	20
	62,500	8	3314	40
	14,600	2	463	
Saskatchewan	39,500	5	2378	32
	46,500	6	2495	32
	62,500	8	4041	64
	14,600	2	656	
Manitoba	39,500	5	2236	$10 / 5 yrs
	46,500	6	2780	$10 / 5 yrs
	62,500	8	4048	$20 / 5 yrs
	14,600	2	501	
Ontario	45,000	5	1869	$35 / Life
	54,000	6	2280	$35 / Life
	63,500	8	2722	$70 / Life
	14,600	2	549	
Quebec	45,500	5	2162	42
	55,500	6	2961	42
	59,000	8	2961	84
	14,600	2	696	
New Brunswick	41,500	5	2141	16
	49,500	6	2534	16
	62,500	8	3129	32
	14,600	2	757	
Nova Scotia	40,500	5	2096	35
	53,000	6	2505	35
	58,500	8	2991	70
	14,600	2	767	
P.E.I.	40,600	5	1558	$65 / 5 yrs
	49,700	6	1884	$65 / 5 yrs
	62,500	8	2655	$130 / 5 yrs
	14,600	2	564	
Newfoundland	40,500	5	1898	25
	49,500	6	2325	25
	62,500	8	2940	50
	14,600	2	692	
Yukon Territory	43,800	5	1128	$1 / month
	53,300	6	1428	$1 / month
	63,500	8	1728	$2 / month
	14,600	2	240	
N.W.T.	39,500	5	1135	20
	46,500	6	1338	20
	63,500	8	1831	40
	14,600	2	410	

3.4.9 Indirect Costs: Administration, Interest, and Insurance

Administration and interest on working capital costs have been applied to the hauling cases based on average industry levels for fleets and taking account of normal interest charges applicable to trucking businesses in Canada and the US during 2005. The applicable percentage amounted to 12.5% of revenue for Canadian trucking businesses and 13% of revenue for US based trucking businesses.

The Canada / US interest rate difference reflects information gained from the Bank of Canada Internet site concerning Chartered Bank Prime Interest Rates and US Prime Rates Charged by Banks during 2005 -- with borrowing rates adjusted to reflect expected credit treatment of reasonably creditworthy trucking enterprises having clean financial performance abstracts.

Interest costs for financing equipment purchase reflects an assumed borrowing cost of 5.25% in Canada (7.75% in the US), loan payback period equivalent to equipment life, and an assumed 75% of equipment purchase costs financed (25% down payment required).

Insurance rates, as a percent of revenue, reflect recent risk and claims performance of the trucking industry, historically a value between 3% and 3.5% of revenue.

The following table summarizes these indirect cost factors for the 2005 study.

Cost Item	Canada Based Trucking Enterprises	US Based Trucking Enterprises
Administration and Interest on Working Capital (% of Revenue)	12.50%	13.00%
Insurance Costs (% of Revenue)	3.20%	3.20%
Annual Borrowing Rate For Equipment Purchase Financing (Annual %)	5.25%	7.75%

3.4.10 Operator Profit Margin

Early editions of *Operating Costs of Trucks In Canada,* provided for operator profit margin at the (then normal) level of 10 percent of revenue. Since Canadian trucking industry entry deregulation in the 1980's, profit levels have eroded and it is very common for well managed trucking enterprises to earn margins between 2.5% and 5% of business revenue. Specialized fleets can still earn higher levels of margin (for example time sensitive express operations such as the land based trucking divisions of international courier / freight forwarding businesses, but these are arguably not strictly trucking "pure plays", and their financial returns are certainly exceptional).

To aid in applying the case studies investigated to specific business circumstances, *Operating Costs of Trucks In Canada* now calculates over-all trucking costs using three alternative levels of margin: 10%, 5% and 2.5% of revenue.

For readers who are uncertain of which margin to assume for a specific hauling situation, a median approach is recommended -- basing evaluations using the 5% margin cases provided.

For each of the three alternate levels of profitability, the expected internal rate of return on investment that the trucking fleet generates is computed, as follows.

Internal Rate of Return on Investment Calculation

The calculation used to estimate this internal rate of return is to evaluate the equivalent interest earned from a cash flow series as follows:

Beginning of time period:	A negative cash flow equal to monies spent for equipment purchase
Each time period (year):	A positive cash flow equal to margin earned plus depreciation and interest on equipment purchase
End of time period:	A positive cash flow equal to monies realized as salvage on equipment disposal.

The resulting calculation is a computation of the “cash flows” (since depreciation accrual is a “non cash item” in any given year) associated with the investment and is independent of borrowed money -- hence representing a measure of the “internal rate of return” for investing money in the trucking asset.

A reader might be tempted to look at the calculated “rates of return” in this report and feel that these rates are quite high. It must be remembered, however, that the “rate of return” that is appropriate for an investment of capital also reflects the “risk factor” in owning the asset. Trucking has been historically viewed as a higher risk investment than owning shares in enterprises such as “utilities” or “bonds” -- reflecting what is usually a very competitive market situation in the trucking industry. As a result, the rates of return displayed by the model are generally appropriate for investment in trucking as viewed by the financial community.

It is also appropriate to consider the specialization or competitive factors that apply to given trucking markets (availability of capital). Many non specialized sectors (eg. Flatdeck hauling, Agricultural trucking) may provide a lower rate of return on investment than more specialized trucking equipment due to the low degree of specialization of the investment in trailer equipment and competitive factors associated with having many suppliers of these services. On the other hand, very specialized trucking services that involve expensive (single purpose) equipment (eg. A trailer for compressed gases such as anhydrous ammonia or N.G.L.’s) may dictate a higher rate of return to attract capital investment in the enterprise.

4.0 FINDINGS

This report section sets out in summary form, the results from applying the methodology and information gathered for 2005 *Operating Costs of Trucks In Canada*, as described in Section 3, to the hauling case studies for year 2005.

Note that readers seeking more detailed specific component cost information about the case studies will need to refer to the specific regional or corridor hauling case analyses -- available under separate cover.

4.1 Basic Cost Findings

All costs tabulated in the following are in cents per kilometre.

	British Columbia			Alberta		
Configuration	**10% Profit Margin Total Costs (c/km)**	**5% Profit Margin Total Costs (c/km)**	**2.5% Profit Margin Total Costs (c/km)**	**10% Profit Margin Total Costs (c/km)**	**5% Profit Margin Total Costs (c/km)**	**2.5% Profit Margin Total Costs (c/km)**
5 Axle Semi Unit (Van)						
80,000 km	210.0	198.9	193.8	181.9	172.3	167.9
160,000 km	186.1	176.3	171.8	159.9	151.4	147.6
240,000 km	178.2	168.8	164.5	152.5	144.5	140.8
5 Axle Semi Unit (Flat Deck)						
80,000 km	215.9	204.5	199.3	188.0	178.1	173.5
160,000 km	192.7	182.6	177.9	166.5	157.8	153.7
240,000 km	185.0	175.3	170.8	159.4	151.0	147.1
5 Axle Bulk Liquid Tanker						
80,000 km	214.3	203.0	197.8	187.7	177.8	173.2
160,000 km	184.8	175.1	170.6	160.4	152.0	148.1
240,000 km	175.0	165.8	161.6	151.3	143.4	139.7
5 Axle Bulk Dry Tanker						
80,000 km	220.6	209.0	203.7	193.4	183.3	178.6
160,000 km	188.2	178.3	173.7	163.4	154.8	150.8
240,000 km	177.3	168.0	163.7	153.4	145.3	141.6
6 Axle (Triaxle) Semi Unit (Van)						
80,000 km	244.3	231.5	225.6	211.5	200.4	195.2
160,000 km	218.2	206.7	201.4	187.2	177.3	172.8
240,000 km	209.4	198.4	193.3	179.1	169.7	165.3
6 Axle (Triaxle) Semi Unit (Flat Deck)						
80,000 km	242.5	229.8	223.9	210.7	199.6	194.5
160,000 km	217.1	205.7	200.4	187.2	177.3	172.8
240,000 km	208.7	197.7	192.6	179.3	169.9	165.5
8 Axle Super B Train Unit (Van)						
80,000 km	275.7	261.2	254.5	237.0	224.6	218.8
160,000 km	244.6	231.7	225.8	208.3	197.3	192.3
240,000 km	234.3	221.9	216.2	198.7	188.2	183.4
8 Axle Super B Train Unit (Flat Deck)						
80,000 km	286.8	271.7	264.7	245.5	232.5	226.6
160,000 km	258.1	244.5	238.2	218.9	207.4	202.1
240,000 km	248.5	235.4	229.4	210.0	199.0	193.9
8 Axle Super B Bulk Liquid Tanker						
80,000 km	282.8	268.0	261.1	247.0	234.0	228.0
160,000 km	237.6	225.1	219.3	205.0	194.2	189.2
240,000 km	222.5	210.8	205.4	191.0	180.9	176.3
8 Axle Super B Bulk Dry Tanker						
80,000 km	280.5	265.7	258.9	244.7	231.9	225.9
160,000 km	236.5	224.1	218.3	203.9	193.2	188.2
240,000 km	221.9	210.2	204.8	190.3	180.3	175.7

	Saskatchewan			Manitoba		
Configuration	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)						
80,000 km	184.5	174.8	170.3	182.0	172.4	168.0
160,000 km	160.6	152.1	148.2	158.2	149.8	146.0
240,000 km	152.6	144.6	140.9	150.2	142.3	138.7
5 Axle Semi Unit (Flat Deck)						
80,000 km	187.1	177.2	172.7	186.6	176.8	172.3
160,000 km	163.8	155.2	151.2	163.5	154.9	150.9
240,000 km	156.0	147.8	144.0	155.8	147.6	143.8
5 Axle Bulk Liquid Tanker						
80,000 km	187.9	178.0	173.4	187.7	177.9	173.3
160,000 km	158.3	150.0	146.2	158.3	150.0	146.2
240,000 km	148.5	140.7	137.1	148.5	140.7	137.1
5 Axle Bulk Dry Tanker						
80,000 km	194.0	183.8	179.1	193.9	183.7	178.9
160,000 km	161.5	153.0	149.1	161.5	153.0	149.1
240,000 km	150.7	142.7	139.1	150.7	142.8	139.1
6 Axle (Triaxle) Semi Unit (Van)						
80,000 km	210.2	199.2	194.1	210.3	199.2	194.1
160,000 km	184.3	174.6	170.1	184.2	174.5	170.0
240,000 km	175.6	166.4	162.1	175.4	166.2	161.9
6 Axle (Triaxle) Semi Unit (Flat Deck)						
80,000 km	209.2	198.2	193.1	209.3	198.3	193.2
160,000 km	184.1	174.4	169.9	183.9	174.3	169.8
240,000 km	175.7	166.5	162.2	175.5	166.3	162.0
8 Axle Super B Train Unit (Van)						
80,000 km	235.8	223.4	217.6	235.5	223.1	217.3
160,000 km	204.6	193.8	188.8	204.3	193.6	188.6
240,000 km	194.2	184.0	179.2	193.9	183.7	179.0
8 Axle Super B Train Unit (Flat Deck)						
80,000 km	243.3	230.5	224.6	243.0	230.2	224.3
160,000 km	214.5	203.2	198.0	214.2	202.9	197.7
240,000 km	204.9	194.1	189.1	204.6	193.8	188.8
8 Axle Super B Bulk Liquid Tanker						
80,000 km	248.7	235.6	229.5	248.3	235.3	229.2
160,000 km	203.3	192.6	187.7	203.0	192.3	187.4
240,000 km	188.2	178.3	173.7	187.9	178.0	173.4
8 Axle Super B Bulk Dry Tanker						
80,000 km	246.2	233.3	227.3	245.9	233.0	227.0
160,000 km	202.2	191.5	186.6	201.9	191.3	186.4
240,000 km	187.5	177.6	173.1	187.2	177.4	172.8

	Ontario			Quebec		
Configuration	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)						
80,000 km	191.5	181.4	176.8	192.9	182.8	178.1
160,000 km	167.8	159.0	154.9	169.1	160.2	156.1
240,000 km	159.9	151.5	147.6	161.1	152.6	148.7
5 Axle Semi Unit (Flat Deck)						
80,000 km	201.9	191.3	186.4	206.4	195.6	190.5
160,000 km	178.8	169.4	165.1	183.2	173.6	169.1
240,000 km	171.2	162.2	158.0	175.5	166.2	162.0
5 Axle Bulk Liquid Tanker						
80,000 km	195.8	185.5	180.8	200.8	190.2	185.3
160,000 km	166.5	157.7	153.7	171.3	162.3	158.1
240,000 km	156.7	148.5	144.7	161.5	153.0	149.0
5 Axle Bulk Dry Tanker						
80,000 km	202.4	191.7	186.8	207.3	196.4	191.3
160,000 km	169.9	160.9	156.8	174.6	165.4	161.2
240,000 km	159.0	150.7	146.8	163.8	155.1	151.2
6 Axle (Triaxle) Semi Unit (Van)						
80,000 km	230.1	218.0	212.4	235.9	223.5	217.7
160,000 km	204.1	193.4	188.4	209.4	198.4	193.3
240,000 km	195.5	185.2	180.4	200.6	190.1	185.2
6 Axle (Triaxle) Semi Unit (Flat Deck)						
80,000 km	229.4	217.3	211.7	235.1	222.8	217.0
160,000 km	204.2	193.5	188.5	209.5	198.4	193.3
240,000 km	195.8	185.5	180.7	200.9	190.3	185.5
8 Axle Super B Train Unit (Van)						
80,000 km	244.6	231.7	225.8	248.8	235.7	229.6
160,000 km	214.3	203.0	197.8	218.3	206.9	201.6
240,000 km	204.2	193.5	188.5	208.2	197.2	192.2
8 Axle Super B Train Unit (Flat Deck)						
80,000 km	257.5	243.9	237.7	256.0	242.5	236.3
160,000 km	229.5	217.5	211.9	227.9	215.9	210.4
240,000 km	220.2	208.6	203.3	218.5	207.0	201.7
8 Axle Super B Bulk Liquid Tanker						
80,000 km	255.8	242.4	236.1	260.6	246.9	240.6
160,000 km	211.2	200.1	195.0	216.0	204.6	199.3
240,000 km	196.3	186.0	181.2	201.1	190.5	185.6
8 Axle Super B Bulk Dry Tanker						
80,000 km	253.4	240.1	233.9	258.2	244.6	238.4
160,000 km	210.1	199.1	194.0	214.9	203.6	198.3
240,000 km	195.7	185.4	180.6	200.4	189.9	185.0

Configuration	New Brunswick			Nova Scotia		
	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)						
80,000 km	182.3	172.7	168.3	177.8	168.5	164.2
160,000 km	160.0	151.6	147.7	155.6	147.4	143.6
240,000 km	152.5	144.5	140.8	148.1	140.3	136.7
5 Axle Semi Unit (Flat Deck)						
80,000 km	187.6	177.8	173.2	183.2	173.6	169.1
160,000 km	166.0	157.2	153.2	161.5	153.0	149.1
240,000 km	158.7	150.4	146.5	154.3	146.2	142.4
5 Axle Bulk Liquid Tanker						
80,000 km	188.3	178.4	173.8	184.3	174.6	170.2
160,000 km	160.8	152.3	148.4	156.8	148.6	144.8
240,000 km	151.6	143.6	140.0	147.7	139.9	136.3
5 Axle Bulk Dry Tanker						
80,000 km	194.4	184.1	179.4	190.4	180.4	175.7
160,000 km	163.9	155.3	151.3	159.9	151.5	147.6
240,000 km	153.8	145.7	141.9	149.8	141.9	138.3
6 Axle (Triaxle) Semi Unit (Van)						
80,000 km	212.9	201.7	196.5	208.2	197.3	192.2
160,000 km	188.5	178.5	174.0	183.8	174.1	169.7
240,000 km	180.3	170.8	166.5	175.7	166.4	162.2
6 Axle (Triaxle) Semi Unit (Flat Deck)						
80,000 km	212.0	200.8	195.7	207.3	196.4	191.4
160,000 km	188.3	178.4	173.8	183.7	174.0	169.5
240,000 km	180.4	170.9	166.5	175.8	166.5	162.3
8 Axle Super B Train Unit (Van)						
80,000 km	234.5	222.2	216.5	229.8	217.7	212.1
160,000 km	205.9	195.1	190.1	201.3	190.7	185.8
240,000 km	196.4	186.1	181.3	191.8	181.7	177.0
8 Axle Super B Train Unit (Flat Deck)						
80,000 km	241.5	228.8	222.9	232.9	220.7	215.0
160,000 km	215.1	203.8	198.6	206.6	195.7	190.7
240,000 km	206.3	195.5	190.5	197.8	187.4	182.6
8 Axle Super B Bulk Liquid Tanker						
80,000 km	247.8	234.8	228.7	241.9	229.1	223.3
160,000 km	205.9	195.1	190.1	200.1	189.6	184.7
240,000 km	192.0	181.9	177.2	186.2	176.4	171.8
8 Axle Super B Bulk Dry Tanker						
80,000 km	245.5	232.6	226.6	239.6	227.0	221.2
160,000 km	204.9	194.1	189.1	199.0	188.6	183.7
240,000 km	191.3	181.3	176.6	185.5	175.8	171.3

Configuration	Prince Edward Island			Newfoundland		
	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)						
80,000 km	179.9	170.5	166.1	191.7	181.6	177.0
160,000 km	156.1	147.9	144.1	169.6	160.7	156.6
240,000 km	148.1	140.3	136.7	162.2	153.7	149.8
5 Axle Semi Unit (Flat Deck)						
80,000 km	184.9	175.1	170.6	194.8	184.6	179.8
160,000 km	161.7	153.2	149.3	173.3	164.2	160.0
240,000 km	154.0	145.9	142.1	166.2	157.4	153.4
5 Axle Bulk Liquid Tanker						
80,000 km	187.7	177.9	173.3	196.9	186.5	181.7
160,000 km	158.1	149.8	146.0	169.5	160.6	156.5
240,000 km	148.3	140.5	136.9	160.4	152.0	148.1
5 Axle Bulk Dry Tanker						
80,000 km	194.3	184.1	179.4	202.9	192.2	187.3
160,000 km	161.5	153.0	149.1	172.6	163.6	159.4
240,000 km	150.6	142.7	139.0	162.6	154.0	150.0
6 Axle (Triaxle) Semi Unit (Van)						
80,000 km	210.9	199.8	194.6	222.7	211.0	205.6
160,000 km	184.8	175.1	170.6	198.5	188.0	183.2
240,000 km	176.1	166.8	162.6	190.4	180.4	175.7
6 Axle (Triaxle) Semi Unit (Flat Deck)						
80,000 km	209.7	198.7	193.6	221.7	210.1	204.7
160,000 km	184.5	174.8	170.3	198.2	187.8	183.0
240,000 km	176.0	166.8	162.5	190.4	180.4	175.7
8 Axle Super B Train Unit (Van)						
80,000 km	237.2	224.7	218.9	244.6	231.7	225.8
160,000 km	206.4	195.6	190.5	216.1	204.8	199.5
240,000 km	196.2	185.8	181.1	206.7	195.8	190.8
8 Axle Super B Train Unit (Flat Deck)						
80,000 km	239.5	226.9	221.1	253.0	239.7	233.5
160,000 km	211.2	200.1	194.9	226.7	214.8	209.3
240,000 km	201.7	191.1	186.2	218.0	206.5	201.2
8 Axle Super B Bulk Liquid Tanker						
80,000 km	249.7	236.6	230.5	260.4	246.7	240.4
160,000 km	204.4	193.7	188.7	218.7	207.2	201.9
240,000 km	189.3	179.3	174.7	204.8	194.0	189.0
8 Axle Super B Bulk Dry Tanker						
80,000 km	247.2	234.2	228.2	258.1	244.5	238.3
160,000 km	203.2	192.5	187.6	217.6	206.2	200.9
240,000 km	188.6	178.6	174.1	204.1	193.4	188.4

Configuration	Yukon			Northwest Territories		
	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)						
80,000 km	205.7	194.9	189.9	196.7	186.4	181.6
160,000 km	184.3	174.6	170.1	175.3	166.1	161.8
240,000 km	177.1	167.8	163.5	168.1	159.3	155.2
5 Axle Semi Unit (Flat Deck)						
80,000 km	211.4	200.3	195.1	200.0	189.5	184.6
160,000 km	190.6	180.5	175.9	179.1	169.7	165.4
240,000 km	183.6	174.0	169.5	172.2	163.1	158.9
5 Axle Bulk Liquid Tanker						
80,000 km	206.4	195.5	190.5	199.8	189.3	184.4
160,000 km	179.7	170.2	165.9	173.1	164.0	159.8
240,000 km	170.8	161.8	157.7	164.2	155.6	151.6
5 Axle Bulk Dry Tanker						
80,000 km	212.4	201.2	196.0	205.8	195.0	190.0
160,000 km	182.8	173.2	168.8	176.2	166.9	162.7
240,000 km	173.0	163.9	159.7	166.3	157.6	153.5
6 Axle (Triaxle) Semi Unit (Van)						
80,000 km	240.3	227.7	221.8	223.8	212.0	206.6
160,000 km	216.8	205.4	200.2	200.4	189.9	185.0
240,000 km	209.0	198.0	192.9	192.6	182.5	177.8
6 Axle (Triaxle) Semi Unit (Flat Deck)						
80,000 km	240.1	227.4	221.6	223.4	211.7	206.2
160,000 km	217.3	205.9	200.6	200.8	190.2	185.3
240,000 km	209.7	198.7	193.6	193.2	183.0	178.3
8 Axle Super B Train Unit (Van)						
80,000 km	266.1	252.1	245.7	259.3	245.6	239.3
160,000 km	238.7	226.2	220.4	231.8	219.6	213.9
240,000 km	229.6	217.5	211.9	222.6	210.9	205.5
8 Axle Super B Train Unit (Flat Deck)						
80,000 km	272.1	257.7	251.1	258.5	244.9	238.6
160,000 km	246.8	233.9	227.9	233.2	220.9	215.3
240,000 km	238.4	225.9	220.1	224.7	212.9	207.5
8 Axle Super B Bulk Liquid Tanker						
80,000 km	267.4	253.3	246.8	259.5	245.9	239.6
160,000 km	226.7	214.8	209.3	218.7	207.2	201.9
240,000 km	213.2	202.0	196.8	205.2	194.4	189.4
8 Axle Super B Bulk Dry Tanker						
80,000 km	265.2	251.3	244.8	257.3	243.7	237.5
160,000 km	225.8	213.9	208.4	217.7	206.3	201.0
240,000 km	212.6	201.4	196.3	204.5	193.8	188.8

Configuration	U.S. Northeast 10% Profit Margin Total Costs (c/km)	U.S. Northeast 5% Profit Margin Total Costs (c/km)	U.S. Northeast 2.5% Profit Margin Total Costs (c/km)	U.S. Great Lakes 10% Profit Margin Total Costs (c/km)	U.S. Great Lakes 5% Profit Margin Total Costs (c/km)	U.S. Great Lakes 2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)						
80,000 km	213.2	202.0	196.8	207.7	196.8	191.7
160,000 km	184.6	174.9	170.4	183.0	173.3	168.9
240,000 km	175.0	165.8	161.6	174.7	165.5	161.3
5 Axle Semi Unit (Flat Deck)						
80,000 km	220.6	209.0	203.6	215.4	204.0	198.8
160,000 km	192.5	182.4	177.7	191.2	181.2	176.5
240,000 km	183.2	173.5	169.1	183.2	173.5	169.1
5 Axle Bulk Liquid Tanker						
80,000 km	207.3	196.4	191.4	201.1	190.5	185.6
160,000 km	172.5	163.4	159.2	170.2	161.2	157.1
240,000 km	160.9	152.4	148.5	159.8	151.4	147.6
5 Axle Bulk Dry Tanker						
80,000 km	214.3	203.0	197.8	208.1	197.1	192.0
160,000 km	176.1	166.9	162.6	173.8	164.7	160.4
240,000 km	163.4	154.8	150.8	162.4	153.9	149.9

Configuration	U.S. Midwest 10% Profit Margin Total Costs (c/km)	U.S. Midwest 5% Profit Margin Total Costs (c/km)	U.S. Midwest 2.5% Profit Margin Total Costs (c/km)	U.S. South 10% Profit Margin Total Costs (c/km)	U.S. South 5% Profit Margin Total Costs (c/km)	U.S. South 2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)						
80,000 km	195.5	185.2	180.5	194.6	184.4	179.6
160,000 km	171.2	162.2	158.0	170.7	161.7	157.5
240,000 km	163.1	154.5	150.5	162.7	154.1	150.2
5 Axle Semi Unit (Flat Deck)						
80,000 km	201.9	191.3	186.4	200.9	190.4	185.5
160,000 km	178.2	168.8	164.5	177.6	168.3	164.0
240,000 km	170.3	161.4	157.2	169.8	160.9	156.8
5 Axle Bulk Liquid Tanker						
80,000 km	189.7	179.7	175.1	189.4	179.4	174.8
160,000 km	159.2	150.8	147.0	159.3	150.9	147.1
240,000 km	149.0	141.2	137.6	149.3	141.4	137.8
5 Axle Bulk Dry Tanker						
80,000 km	196.6	186.3	181.5	196.3	186.0	181.2
160,000 km	162.8	154.3	150.3	162.9	154.3	150.4
240,000 km	151.6	143.6	139.9	151.8	143.8	140.1

Configuration	U.S. West 10% Profit Margin Total Costs (c/km)	U.S. West 5% Profit Margin Total Costs (c/km)	U.S. West 2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)			
80,000 km	210.2	199.1	194.0
160,000 km	185.1	175.3	170.9
240,000 km	176.7	167.4	163.1
5 Axle Semi Unit (Flat Deck)			
80,000 km	217.2	205.8	200.5
160,000 km	192.7	182.5	177.9
240,000 km	184.5	174.8	170.3
5 Axle Bulk Liquid Tanker			
80,000 km	204.4	193.7	188.7
160,000 km	173.2	164.0	159.8
240,000 km	162.7	154.2	150.2
5 Axle Bulk Dry Tanker			
80,000 km	211.4	200.3	195.1
160,000 km	176.8	167.5	163.2
240,000 km	165.3	156.6	152.5

2 Axle Straight Truck Configuration Summary

Province:	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
British Columbia			
40,000 km	355.3	336.6	328.0
80,000 km	330.2	312.9	304.8
120,000 km	321.9	304.9	297.1
Alberta			
40,000 km	312.9	296.5	288.9
80,000 km	289.7	274.4	267.4
120,000 km	281.9	267.1	260.2
Saskatchewan			
40,000 km	307.6	291.4	283.9
80,000 km	282.4	267.6	260.7
120,000 km	274.1	259.6	253.0
Manitoba			
40,000 km	304.6	288.6	281.2
80,000 km	279.7	265.0	258.2
120,000 km	271.4	257.1	250.5
Ontario			
40,000 km	340.1	322.2	314.0
80,000 km	314.3	297.8	290.1
120,000 km	305.7	289.6	282.2
Quebec			
40,000 km	335.7	318.0	309.8
80,000 km	309.7	293.4	285.9
120,000 km	301.0	285.2	277.9
New Brunswick			
40,000 km	294.8	279.3	272.1
80,000 km	271.0	256.8	250.2
120,000 km	263.1	249.3	242.9
Nova Scotia			
40,000 km	292.0	276.6	269.5
80,000 km	268.2	254.1	247.6
120,000 km	260.3	246.6	240.2
P.E.I.			
40,000 km	290.2	274.9	267.9
80,000 km	264.5	250.6	244.2
120,000 km	256.0	242.5	236.3
Newfoundland			
40,000 km	298.1	282.4	275.2
80,000 km	274.5	260.0	253.3
120,000 km	266.6	252.5	246.1
Yukon			
40,000 km	343.0	325.0	316.6
80,000 km	320.2	303.3	295.5
120,000 km	312.5	296.1	288.5
N.W.T.			
40,000 km	323.7	306.6	298.8
80,000 km	300.5	284.7	277.4
120,000 km	292.8	277.4	270.3
U.S. North East			
40,000 km	441.2	417.9	407.2
80,000 km	415.6	393.7	383.6
120,000 km	407.0	385.6	375.7
U.S. Great Lakes			
40,000 km	453.0	429.2	418.2
80,000 km	427.1	404.6	394.2
120,000 km	418.4	396.4	386.2
U.S. Midwest			
40,000 km	409.2	387.7	377.7
80,000 km	383.7	363.5	354.2
120,000 km	375.2	355.4	346.3
U.S. South			
40,000 km	404.9	383.5	373.7
80,000 km	379.8	359.9	350.6
120,000 km	371.5	352.0	342.9

4.2 Gravel and Winter Operations

Gravel Road Operations

Operating costs are higher for trucks operated on gravel surfaces than for paved roads. Factors that influence these costs include specific surface conditions of the road and the driving skill used to operate the route.

In earlier editions of *Operating Costs of Trucks In Canada*, all the base case scenarios were evaluated for both paved and gravel route scenarios. In these evaluations, the following adjustments to cost for paved route scenarios were determined:

- Driver Costs: 8% - 12% increase over paved road operations. This usually reflects payment at an hourly wage, rather than by the kilometre -- reflecting greater travel time associated with lower speeds (even 8 kph slower for good quality all weather gravel roads).
- Repair Costs: 20% increase over paved road operations - for both tractors and trailers. The need for maintenance is more common than for paved surfaces, as service, parts replacement, and oil and lubrication are needed more frequently.
- Tire Costs: 70% increase over paved road operations - for power units pulling trailers; 65% increase over paved road operations - for trailers. This factor can vary depending on the nature of gravel surface, driving habits of the driver, and type of tire operated on the vehicle.
- Fuel Costs: Over an operating year statistically there was not an appreciable difference in fuel consumption of vehicles operating over gravel and paved roads - assuming the equipment is identical. Expected loss factors associated with additional “wheel slip” on gravel surfaces are apparently compensated by lower speeds of operation on the gravel route.

Winter Trucking Operations

In earlier editions of *Operating Costs of Trucks In Canada*, key factors associated with a winter only trucking operation were noted as:

- A 20 percent climb in fuel consumed per kilometre output reflecting a combination of reduced traction, increased accessory demands, and increased idle / warm up times.
- A 30 percent increase in per kilometre tire costs on the power unit reflecting reduced traction and costs for winter tires.
- A 20 percent increase in per kilometre repair costs on the power unit.

Applying these factors in detail to the Canadian case studies, prior editions of this study developed a set of Winter Trucking Unit Cost Adjustment Factors (C_w) by which basic annual average costs from our case studies could be factored using the formula:

$$\text{Winter Cost} = \text{Base Case Cost} \times C_w$$

where:

Configuration / Product	C_w
Five and Six Axle Semi Trailers / Dry Freight	1.055
Five and Six Axle Semi Trailers / Bulk Commodities	1.064
Seven and Eight Axle Trains / Dry Freight	1.051
Seven and Eight Axle Trains / Bulk Commodities	1.059

e.g. - For a five-axle bulk liquid unit in Alberta (160,000 kilometres/year on paved), the average annual 2005 operating cost is 160.4 cents/kilometre (10% margin).

The "winter-only" cost would be 160.4 cents/kilometre x 1.064, or 170.7 cents/kilometre.

4.3 Longer Haul Trucking In Canada

Longer trip distances and more loaded miles increase trucking productivity. In Canada, because of population / industrialization patterns, most business activity takes place just north of the Canada-US border. Hence the most important long distance hauling corridor is the East-West corridor -- roughly paralleling the Trans Canada Highway / Yellowhead Highway routes.

As noted previously in Sections 2.3 and 3.3, in addition to intra-regional case studies, we also modeled inter provincial east-west hauling corridors in Canada for a variety of hauling distances between 160 km and 3200 km in trip length, namely:

- 160 km (100 miles)
- 400 km (250 miles)
- 800 km (500 miles)
- 1600 km (1000 miles)
- 3200 km (2000 miles)

Although the intra-regional cases reflected non-sleeper equipped vehicles, for longer distance corridors, power unit tare weight and purchase price reflected a sleeper equipped power unit and, for longer distance trips, wages were reflective of a “team driving situation”.

The following results were obtained for these case studies in 2005.

Province : Canada East-West Corridor

Long Distance Hauling Case

One Way Distance (km)	Configuration and Annual Distance in (km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)			
160	240,000	157.8	149.5	145.7
400	283,168	148.5	140.7	137.1
800	301,557	144.6	137.0	133.5
1600	312,205	147.9	140.1	136.6
3200	317,269	146.6	138.9	135.3
	5 Axle Semi Unit (Flat Deck)			
160	240,000	165.3	156.6	152.6
400	298,835	150.2	142.3	138.7
800	325,772	143.4	135.8	132.4
1600	341,717	140.0	132.6	129.2
3200	349,691	138.2	131.0	127.6
	5 Axle Bulk Liquid Tanker			
160	240,000	155.3	147.1	143.4
400	259,394	154.1	145.9	142.2
800	266,877	151.8	143.8	140.1
1600	271,249	150.7	142.7	139.1
3200	273,015	150.1	142.2	138.6
	5 Axle Bulk Dry Tanker			
160	240,000	157.6	149.3	145.5
400	259,933	156.0	147.8	144.0
800	267,636	153.7	145.6	141.9
1600	272,130	152.5	144.5	140.7
3200	273,958	151.9	143.9	140.2
	6 Axle (Triaxle) Semi Unit (Van)			
160	240,000	187.4	177.5	173.0
400	307,839	167.6	158.8	154.7
800	340,215	159.2	150.8	146.9
1600	359,693	154.9	146.8	143.0
3200	369,664	152.8	144.8	141.1
	6 Axle (Triaxle) Semi Unit (Flat Deck)			
160	240,000	187.5	177.6	173.1
400	309,603	167.0	158.2	154.2
800	343,091	158.4	150.0	146.2
1600	363,306	154.0	145.9	142.2
3200	373,699	151.9	143.9	140.2
	8 Axle Super B Train Unit (Van)			
160	240,000	207.6	196.7	191.7
400	314,323	182.5	172.9	168.5
800	350,866	172.4	163.3	159.1
1600	373,132	167.2	158.4	154.4
3200	384,707	164.7	156.0	152.0
	8 Axle Super B Train Unit (Flat Deck)			
160	240,000	220.4	208.8	203.4
400	334,218	185.7	175.9	171.4
800	384,918	172.3	163.2	159.0
1600	417,180	165.6	156.9	152.8
3200	434,698	162.2	153.7	149.8
	8 Axle Super B Bulk Liquid Tanker			
160	240,000	196.7	186.4	181.6
400	270,612	189.7	179.7	175.1
800	282,942	185.5	175.7	171.2
1600	290,034	183.4	173.7	169.3
3200	293,207	182.3	172.7	168.3
	8 Axle Super B Bulk Dry Tanker			
160	240,000	196.1	185.7	181.0
400	271,047	188.9	179.0	174.4
800	283,577	184.7	175.0	170.5
1600	290,783	182.6	173.0	168.5
3200	294,016	181.6	172.0	167.6

4.4 Canadian and US International Corridors

Western Corridor Analysis

Evaluations shown in 4.3 for long haul Canadian corridors are repeated for the Canada - US Western region involving hauls between B.C./Alberta and US western states of California, Oregon, Washington, Nevada, Montana, Wyoming, Colorado, Arizona, and New Mexico.

Computed unit costs, assuming a BC based trucker, are as follows:

Province : International West: Canada Based

One Way Distance (km)	Long Distance Hauling Case Configuration and Annual Distance in (km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)			
160	240,000	176.4	167.1	162.8
400	285,505	164.2	155.6	151.6
800	305,098	158.9	150.5	146.7
1600	316,472	156.2	148.0	144.2
3200	321,929	154.9	146.7	143.0
	5 Axle Semi Unit (Flat Deck)			
160	240,000	182.9	173.3	168.8
400	298,835	165.7	157.0	152.9
800	325,772	158.6	150.3	146.4
1600	341,717	160.6	152.2	148.3
3200	349,691	158.8	150.4	146.6
	5 Axle Bulk Liquid Tanker			
160	240,000	170.3	161.3	157.2
400	259,394	167.3	158.5	154.5
800	266,877	165.0	156.3	152.3
1600	271,249	163.8	155.2	151.2
3200	273,015	163.3	154.7	150.7
	5 Axle Bulk Dry Tanker			
160	240,000	172.6	163.5	159.3
400	259,933	169.3	160.4	156.3
800	267,636	166.9	158.1	154.0
1600	272,130	165.6	156.9	152.9
3200	273,958	165.0	156.3	152.3

In event that this same corridor was hauled by a US Western based trucker, the unit costs (in Canadian dollar equivalent) would be:

Province : International West: USA Based Long Distance Hauling Case One Way Distance (km)	Configuration and Annual Distance in (km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)			
160	240,000	177.1	167.8	163.5
400	281,202	163.4	154.8	150.9
800	298,597	157.1	148.8	145.0
1600	308,650	153.9	145.8	142.0
3200	313,394	152.3	144.3	140.6
	5 Axle Semi Unit (Flat Deck)			
160	240,000	184.5	174.8	170.3
400	292,491	165.2	156.5	152.5
800	315,829	156.9	148.7	144.9
1600	329,506	156.5	148.3	144.5
3200	336,221	154.4	146.3	142.5
	5 Axle Bulk Liquid Tanker			
160	240,000	163.0	154.4	150.5
400	256,991	160.9	152.4	148.5
800	263,501	158.4	150.1	146.2
1600	267,343	157.1	148.8	145.0
3200	268,838	156.5	148.3	144.5
	5 Axle Bulk Dry Tanker			
160	240,000	165.5	156.8	152.8
400	257,537	163.1	154.5	150.5
800	264,266	160.4	152.0	148.1
1600	268,227	159.1	150.7	146.8
3200	269,782	158.4	150.1	146.2

Note that for this corridor, the US and Canadian based truckers are roughly on par in terms of cost competitiveness.

This situation, which differs from the two other Canada – US corridor comparisons, is significantly caused by higher component costs for trucking in the B.C. lower mainland region than for other Canadian regions. Note that this same economic difference has resulted in Alberta based carriers dominating Canadian East – West trans-mountain corridor hauling, at the expense of higher cost B.C. based fleets.

While the high B.C. truck operating cost situation has been noted in prior editions of *Operating Costs of Trucks In Canada*, for this year the significant value gain of the Canadian dollar to US currency has made costs in B.C. directly comparable to US truck operating costs.

Central Corridor Analysis

Evaluations shown in Section 4.3 for long haul Canadian corridors are repeated for the Canada - US Central region involving hauls between Ontario, Manitoba and US Gulf Coast States of Texas, Louisiana and all intermediate points.

Unit costs, for a Canadian based trucker are as follows:

Province : International Central: Canada Based Long Distance Hauling Case				
One Way Distance (km)	Configuration and Annual Distance in (km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)			
160	240,000	145.7	138.0	134.5
400	268,857	139.9	132.5	129.1
800	280,395	136.6	129.5	126.1
1600	287,034	135.0	127.9	124.6
3200	289,971	134.2	127.1	123.9
	5 Axle Semi Unit (Flat Deck)			
160	240,000	156.6	148.4	144.6
400	292,491	142.4	134.9	131.5
800	315,829	136.4	129.2	125.9
1600	329,506	138.7	131.4	128.0
3200	336,221	137.1	129.9	126.5
	5 Axle Bulk Liquid Tanker			
160	240,000	147.1	139.4	135.8
400	256,991	145.2	137.5	134.0
800	263,501	143.2	135.7	132.2
1600	267,343	142.2	134.7	131.2
3200	268,838	141.7	134.2	130.8
	5 Axle Bulk Dry Tanker			
160	240,000	149.5	141.6	138.0
400	257,537	147.2	139.4	135.8
800	264,266	145.1	137.4	133.9
1600	268,227	144.0	136.4	132.9
3200	269,782	143.5	136.0	132.5

By comparison, a US based carrier would have the following cost structure:

Province : International Central: USA Based Long Distance Hauling Case One Way Distance (km)	Configuration and Annual Distance in (km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)			
160	240,000	175.1	165.9	161.6
400	281,202	160.4	152.0	148.1
800	298,597	153.7	145.6	141.9
1600	308,650	150.3	142.4	138.8
3200	313,394	148.7	140.8	137.2
	5 Axle Semi Unit (Flat Deck)			
160	240,000	183.2	173.5	169.1
400	292,491	162.5	153.9	150.0
800	315,829	153.7	145.6	141.9
1600	329,506	153.2	145.1	141.4
3200	336,221	150.9	143.0	139.3
	5 Axle Bulk Liquid Tanker			
160	240,000	160.1	151.7	147.8
400	256,991	157.6	149.3	145.5
800	263,501	155.0	146.8	143.1
1600	267,343	153.6	145.5	141.8
3200	268,838	153.0	144.9	141.2
	5 Axle Bulk Dry Tanker			
160	240,000	162.7	154.1	150.2
400	257,537	159.8	151.4	147.5
800	264,266	157.0	148.7	144.9
1600	268,227	155.6	147.4	143.6
3200	269,782	154.9	146.7	143.0

For this corridor, the specific unit costs are lower for the Canadian based operator than for his US counterpart, reflecting the impact of exchange rates and specific cost component differences between the two countries.

Eastern Corridor Analysis

Evaluations shown in Section 4.3 for long haul Canadian corridors are repeated for the Canada - USEastern region involving hauls between Quebec and the Maritime Provinces and US Southern States of Florida, Alabama, Georgia and all intermediate points.

Unit costs for the Canadian based operator on these routes are as follows:

Province : International East: Canada Based

Long Distance Hauling Case

One Way Distance (km)	Configuration and Annual Distance in (km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)			
160	240,000	136.7	129.5	126.2
400	275,703	130.5	123.6	120.4
800	290,408	127.1	120.5	117.4
1600	298,872	125.5	118.9	115.8
3200	302,769	124.6	118.1	115.0
	5 Axle Semi Unit (Flat Deck)			
160	240,000	142.7	135.2	131.7
400	292,491	131.5	124.6	121.4
800	315,829	126.5	119.9	116.8
1600	329,506	129.2	122.4	119.2
3200	336,221	127.8	121.1	118.0
	5 Axle Bulk Liquid Tanker			
160	240,000	136.7	129.5	126.1
400	256,991	135.5	128.4	125.1
800	263,501	133.8	126.8	123.5
1600	267,343	133.0	126.0	122.8
3200	268,838	132.6	125.6	122.4
	5 Axle Bulk Dry Tanker			
160	240,000	138.8	131.5	128.1
400	257,537	137.3	130.1	126.8
800	264,266	135.6	128.5	125.2
1600	268,227	134.7	127.6	124.3
3200	269,782	134.3	127.2	123.9

By comparison, a US based carrier on the same corridor, would have the following cost structure.

Province : International East: USA Based Long Distance Hauling Case One Way Distance (km)	Configuration and Annual Distance in (km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)			
160	240,000	175.4	166.2	161.9
400	281,202	160.7	152.3	148.4
800	298,597	154.1	146.0	142.2
1600	308,650	150.7	142.8	139.1
3200	313,394	149.1	141.3	137.6
	5 Axle Semi Unit (Flat Deck)			
160	240,000	183.2	173.5	169.1
400	292,491	162.6	154.0	150.1
800	315,829	153.9	145.8	142.1
1600	329,506	153.4	145.3	141.6
3200	336,221	151.2	143.2	139.6
	5 Axle Bulk Liquid Tanker			
160	240,000	161.1	152.7	148.7
400	256,991	158.5	150.2	146.3
800	263,501	155.9	147.7	143.9
1600	267,343	154.5	146.4	142.6
3200	268,838	153.9	145.8	142.0
	5 Axle Bulk Dry Tanker			
160	240,000	163.7	155.1	151.1
400	257,537	160.6	152.2	148.3
800	264,266	157.9	149.6	145.7
1600	268,227	156.5	148.2	144.4
3200	269,782	155.8	147.6	143.8

The (substantial) cost premium of a US over a Canadian operator is due primarily to the Canada / US exchange rate as well as the competitive comparison of New Brunswick based operators (and cost levels) to those of North Eastern US (New York / New Jersey).

4.5 Owner Operator Trucking Options

In this service option, the motor carrier firm provides all administrative services (including marketing, operations management, documentation, accounting, invoicing, etc.), generally "dispatches and manages" the haul from it's field branch locations, and (usually) provides the trailer unit to use for the haul.

In a less common hauling situation, the owner operator also is responsible for providing the trailer to be used for the haul. For example, many "produce haulers" provide both a power unit and a refrigerated van trailer and this type of arrangement is also sometimes seen for flat deck equipment. As noted previously, the more usual service option is where the owner operator provides the power unit and the carrier provides the trailer.

The power unit (and driver) is a sub-contracted service, independently owned, and hired by the carrier to provide tractor service in connection with the haul.

Advantages to the carrier in using this type of service option, as opposed to a company owned unit and a company driver are as follows:

- Fleet capacity flexibility. The carrier can more readily adapt to short term increases and decreases in traffic volumes, without maintaining an excessive capital investment. If the owner operator is successful in obtaining additional work that is complementary to the carrier's activity -- efficiency benefits accrue to all concerned.
- Simplicity. Often, use of owner operators will diminish the need for many administrative and maintenance functions. Some companies are known to operate selected "branch terminals" with 100 percent owner operator power, thereby eliminating the need to provide maintenance and other services that might be required to operate a small fleet in that market location.
- Cost productivity. Many owner operators are more efficient than company driven units because the operator has a greater "stake" or "incentive" to keep utilization high. These "savings" can make for a more efficient operation. Further, the owner operator has a direct incentive to care for his unit.

Difficulties or disadvantages to use of owner operators include:

- Non-Standardization. It is more difficult, if not impossible, to provide "standard" equipment and service using owner operators compared to company power. The market is generally in a state of flux that sees owner operators move about between assignments with various carriers. In some situations, owner operator equipment is to a company "standard" -- even down to being painted in company colors. These are usually the exceptional situations.
- Service Reliability. When a company driver "resigns", the carrier needs to locate a replacement. When an owner operator "resigns", a replacement driver and truck must also be found. Thus, in situations where high service availability / reliability of dedicated transport equipment is required, the "basic fleet" should generally consist of company units, with an additional percentage that can be owner operator. This provides a useful "gauge" for the company units' cost efficiency performance, yet assures dedicated customer service by the "core fleet".
- Customer Contact. For hauls where considerable driver-customer contact is required (eg. driver provides order taking and other "sales/service" functions), it is usually better to have a carrier employee act as representative for the firm, than to have a "sub-contracted" driver-owner do these functions.

Owner Operator Compensation

The "price" for owner operator services is somewhat more complicated than is the "wage market" for drivers as depicted in Chapter 3.

In order to understand "pricing", it is first important to know what is being provided by the owner operator and what is being provided by the carrier. This can vary from carrier to carrier, owner operator to owner operator, and also with the given haul / distance / commodity situation.

For example, in some instances the carrier supplies fuel and maintenance services to the owner operator at a reduced price (reflecting corporate discounts and preventive maintenance standards). In addition, the carrier or the owner operator may pay for the licenses, permits, and tolls incurred in hauling. Another question to be understood is "who provides what portion of the required insurance?" In some applications, the power unit must be provided with extra equipment such as blowers, pumps, hydraulic lift equipment. These can be either owner operator or carrier supplied and will be reflected in the "price". In other situations, the owner operator may have the option of joining and participating in a company benefit program.

After addressing the issue of "what the compensation covers", there are numerous "units of compensation" in common use. In a review of compensation agreements for a major carrier in Canada, it was found that the same carrier had agreements in place that required payment to owner operators using "$ per trip", "$ per hour", "cents per mile", "$ per unit quantity hauled", and "percent of haul revenue". Each of these was specific to a particular hauling market/product situation. In addition to "basic payment for the service", there were also a variety of "incentive" systems such as a flat payment per load for backhaul (to cover additional load / unload time delay involved) plus a "cents per mile" bonus for return miles with backhaul involved.

All of this information serves to illustrate the difficulties that will need to be addressed if a national "survey" of owner operator "costs" or "pricing" is ever undertaken to develop useful and reliable information about this segment of the industry.

If a reader wishes to make adjustments for the trucking cost examples in this report, the owner operator compensation amounts need to be substituted for the tractor power unit costs (and any other required cost lines included in the base case, such as insurance, or licenses, as applicable).

In conclusion, care must be taken in evaluating owner operator costs, and in comparing these with the base case situations presented in this report -- that tend to reflect fleet company operations, not the owner operator market. In doing any such comparisons, it is important to consider all cost components (such as licenses, insurance, transport, fuel, repairs, wage benefits/burdens) and who is responsible for each. Further, the owner operator compensation schedule must be known for the specific haul in question. It is not easy to generalize "costs" or "prices" for this market, as owner operator compensation schedules are variously set in terms of $/trip, $/hr, cents/mile, $/unit quantity hauled, or as a percent of haul revenue.

4.6 Use of Rail Intermodal For Line Haul Trucking

Aided by the advent of efficient double stack railway cars for moving domestic containers, railway intermodal transportation has gained significant popularity in competition with line haul trucking -- especially for longer distance corridors.

Key advantages from this service include:

- Transportation Cost savings: For longer distance corridors, railway intermodal service has proven itself to be very cost competitive -- yet it provides "door to door" service to shippers who often have no direct access to rail trackage.
- Integration with International Overseas Shipping: Many railway intermodal services start out as overseas ocean deliveries to Canada, followed by long distance linehaul to inland destinations, with delivery completed by truck at destination.
- Driver / Owner Operator Shortage: With significant shortages of drivers, compounded by the fact that many drivers prefer not to haul long distances (away from home overnight), rail intermodal is a strategic way for fleets to alleviate some of their capacity concerns by using the rail linehaul service to augment their driver pool capacity to move goods.

Given these factors, which have increased significantly in relative importance since 1985, *Operating Costs of Trucks In Canada* has for several years reviewed costs for direct trucking versus intermodal services for the following transportation corridors:

- Toronto to Montreal
- Toronto to Winnipeg
- Toronto to Vancouver

The following discussion compares these corridors in terms of time, distance and logistics costs.

Intermodal and Trucking Time Comparisons

						Normal Scheduled Service				Savings by Truck			
		Transit Time (Hr)	Headway (Hr)	Pick	Deliver	Best Door to	Average Door to	Worst Door to	Truck Transit	Least Savings	Average Savings	Most Savings	Lane Distance
Origin	Dest	Avg	Avg	Up / (Hr)	(Hr)	Door (Hr)	Door (Hr)	Door (Hr)	Time (Hr)	(Hr)	(Hr)	(Hr)	(Mi)
Toronto	Montreal	21:00:00	24:00:00	2:00:00	2:00:00	25:00:00	37:00:00	49:00:00	6:00:00	19:00:00	31:00:00	43:00:00	340.1
Montreal	Toronto	17:00:00	24:00:00	2:00:00	2:00:00	21:00:00	33:00:00	45:00:00	6:00:00	15:00:00	27:00:00	39:00:00	340.1
Toronto	Winnipeg	66:00:00	24:00:00	2:00:00	2:00:00	70:00:00	82:00:00	94:00:00	38:00:00	32:00:00	44:00:00	56:00:00	1294.7
Winnipeg	Toronto	67:00:00	24:00:00	2:00:00	2:00:00	71:00:00	83:00:00	95:00:00	38:00:00	33:00:00	45:00:00	57:00:00	1294.7
Toronto	Vancouver	140:00:00	24:00:00	2:00:00	2:00:00	144:00:00	156:00:00	168:00:00	87:00:00	57:00:00	69:00:00	81:00:00	2698
Vancouver	Toronto	131:00:00	24:00:00	2:00:00	2:00:00	135:00:00	147:00:00	159:00:00	87:00:00	48:00:00	60:00:00	72:00:00	2698

Note: Analysis by Logistics Solution Builders Based on Published Rail Schedules (Internet) and Consultations with Carriers

Information Updated: 26/03/2006

Note that for all three corridors, it would appear that the “headway” (interval between scheduled train services) is 24 hours, that is – service is generally once per business day.

In the foregoing table, the estimated door to door transit times for intermodal services (shown as “best”, “average” and “worst”) reflect the following assumptions:

- The “best” door to door time that will be achieved is when the shipper knows the rail schedule and dispatches the load “just in time” to catch that day’s train. In the receiving city, it is assuming that the delivery unit “meets” the train and is loaded expeditiously. Assuming minimal queuing / delays at the terminal, this best time will equal the scheduled train transit time, plus the pick up time, plus the delivery time.
- The “worst” door to door time was estimated on the basis that the shipper dispatches the load and “just misses the train”. Hence, this column adds the train headway time to the foregoing scenario…in this case, an additional 24 hours. In this scenario, it is still assumed that the delivery city truck “meets” the train, once the shipment is en-route.
- The value shown for “average” transit time, door-to-door, is exactly half way between the two values, previously listed.

Assuming a pickup and delivery time at each end of the rail journey of 2 hours (including delays/transfer time at the intermodal yard), we can see from the preceding analysis table that “on average”, the door-to-door trucking service is expected to be faster than rail intermodal service, simply based on “headway” and published transit times for the service – for all the corridors.

The shown tabulated door-to-door transit time for direct trucking was computed by Logistics Solution Builders using preferred roads on “all Canadian routings”. Note that mileage via the US is shorter, from Toronto to Western Canada, although border clearance delays and uncertainties mitigate against using this option. We further assumed a single driver obeying “hours of service” regulations. Just for comparison, a “team driven” truck should be able to transit from Toronto to Vancouver, over the same route, in a time somewhat under 3 days.

Thus, by neglecting the speed of travel of team drivers, and by assuming negligible “wait time” for transfer in the terminals, the foregoing analysis should be considered favorable to rail -- in reality, an “expedited truck service” would be faster than shown and an intermodal rail service would be expected to be “in transit” somewhat longer than tabulated in our three scenarios.

Rail Intermodal TOFC (Trailer on Flat Car) Evaluations

TOFC Service Group 15 costs (rail yard to rail yard movement) have been secured to aid the comparison between TOFC and direct trucking services for the three corridors. Service Group 15 is "exclusive" of costs for local trailer pick up and delivery to customer premises from the railway intermodal yards, that must be "added", together with "trailer ownership costs", to compute the total transportation costs "door to door". The Service Group 15 TOFC costs that were secured for the corridors in question are as follows:

All values in $ per trailer load one-way

Service Group 15 Cost For Corridor	48 Foot or 53 Foot Trailer
Toronto – Montreal / Montreal -- Toronto Confidential Quotation (Carrier)	$775
Toronto – Winnipeg Winnipeg – Toronto Confidential Quotation (Carrier)	$3,000 $1,631
Toronto – Vancouver Vancouver – Toronto Confidential Quotation (Carrier)	$3,600 $3,600

Using this information, together with long distance Canadian East-West trucking corridor information in this report, the economic cost of TOFC services can be compared with general freight trucking services.

In addition, assuming a pick up and delivery round trip time of 2 hours at each major delivery centre (for a low utilization truck), the hourly costs in the base case may be used to estimate local pick up and delivery costs to apply to the TOFC option. Hourly equivalent "trailer ownership costs" (depreciation and licenses) can also be estimated.

In addition, on the basis of estimated transit time, and the value of a trailer load shipment, applying “time value of money” and “required inventory” calculations, a full “logistics cost” borne by a shipper, for their supply chain, can be computed for using either TOFC or “door to door” trucking service.

Although the value of a shipment can vary widely, for purpose of analysis, Logistics Solution Builders made use of the reported average value of a highway shipment as determined recently by the Ohio Department of Transportation in a detailed commodity transportation survey, adjusted to Canadian dollars and adjusted for inflation (from the survey year 1998) using CPI. The value used by us for our calculations was $75,000 Cdn. for our representative sample trailer load of freight.

Time Value of Shipment Determination

The time value of money determination, under the foregoing scenario reflects two components of cost:

- The first component of cost is the dollar value of shipment ownership, discounted using an assumed annual interest rate for time value of money, divided by 365 to represent a daily cost of shipment ownership, and further divided by 24 to represent the ownership costs per hour associated with delays to a shipment. Essentially, this cost component reflects the time value of money tied up owning a shipment for additional time, in transit, between the source and destination.

(Hourly time value of money cost = Value of shipment x annual interest rate divided by (365 x 24) 8760 hours per year.

- The second component of cost is the dollar cost for additional inventory that must be maintained, at the destination, to "cover" delays in receiving "re-stock inventory", if a slower mode of transportation is used for replenishing stocks. Essentially, this cost -- when restated back to a "per shipment" basis, is independent of the annual number of shipments involved…and it can be derived by dividing the value of a single shipment by the number of hours in a year (i.e.

(Hourly shipment inventory cost = Value of a shipment divided by (365 x 24) 8760 hours per year.)

The foregoing calculations are provided at the bottom of the following table, in terms of the hourly "time value" for a typical $75,000 shipment.

Logistics Cost Comparisons of Intermodal TOFC and Direct Trucking Options

The following analysis tabulates the full logistics costs for the TOFC and direct truck options, respectively for these corridors, under the "best", "worst" and "average" travel time assumptions for intermodal services door to door.

Comparison of Logistics Costs For T.O.F.C. and Direct Trucking

T.O.F.C.						T.O.F.C.					
1) Toronto to Montreal	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**	**1) Montreal to Toronto**	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**
Rail Transit Cost (Terminal to Terminal)		$775		=	$775.00	Rail Transit Cost (Terminal to Terminal)		$775		=	$775.00
Pickup in Toronto:	2:00:00		$101.86	=	$203.72	Pickup in Montreal:	2:00:00		$102.62	=	$205.24
Trailer Ownership En Route (Avg Case):	33:00:00		$0.89	=	$29.23	Trailer Ownership En Route (Avg Case):	29:00:00		$0.89	=	$25.69
Trailer Ownership En Route (Best Case):	21:00:00		$0.89	=	$18.60	Trailer Ownership En Route (Best Case):	17:00:00		$0.89	=	$15.06
Trailer Ownership En Route (Worst Case):	45:00:00		$0.89	=	$39.86	Trailer Ownership En Route (Worst Case):	41:00:00		$0.89	=	$36.32
Delivery in Montreal:	2:00:00		$102.62	=	$205.24	Delivery in Toronto:	2:00:00		$101.86	=	$203.72
Time Value of Shipment (Avg Case)	37:00:00		$9.01	=	$333.41	Time Value of Shipment (Avg Case)	33:00:00		$9.01	=	$297.37
Time Value of Shipment (Best Case)	25:00:00		$9.01	=	$225.28	Time Value of Shipment (Best Case)	21:00:00		$9.01	=	$189.23
Time Value of Shipment (Worst Case)	49:00:00		$9.01	=	$441.55	Time Value of Shipment (Worst Case)	45:00:00		$9.01	=	$405.50
TOTAL LOGISTICS COST/TRAILER (ONE WAY)						**TOTAL LOGISTICS COST/TRAILER (ONE WAY)**					
	37:00:00	**Average Case**			**$1,546.61**		33:00:00	**Average Case**			**$1,507.02**
	25:00:00	**Best Case**			**$1,427.84**		21:00:00	**Best Case**			**$1,388.26**
	49:00:00	**Worst Case**			**$1,665.37**		45:00:00	**Worst Case**			**$1,625.78**

DIRECT TRUCKING COST						DIRECT TRUCKING COST					
1) Toronto to Montreal	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**	**1) Montreal to Toronto**	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**
547.3	km @	$1.41		=	$770.25	547.3	km @	$1.41		=	$770.25
Time Value of Shipment (Avg Case)	6:00:00		$9.01	=	$54.07	Time Value of Shipment (Avg Case)	6:00:00		$9.01	=	$54.07
TOTAL LOGISTICS COST/TRAILER (ONE WAY)					**$824.32**	**TOTAL LOGISTICS COST/TRAILER (ONE WAY)**					**$824.32**
Savings In Comparison to Rail	**31:00:00**	**Avg Rail Scen.**			**$722.29**	**Savings In Comparison to Rail**	**27:00:00**	**Avg Rail Scen.**			**$682.70**
Savings In Comparison to Rail	**19:00:00**	**Best Rail Scen.**			**$603.52**	**Savings In Comparison to Rail**	**15:00:00**	**Best Rail Scen.**			**$563.94**
Savings In Comparison to Rail	**43:00:00**	**Worst Rail Scen.**			**$841.05**	**Savings In Comparison to Rail**	**39:00:00**	**Worst Rail Scen.**			**$801.46**

Comparison of Logistics Costs For T.O.F.C. and Direct Trucking

T.O.F.C.						T.O.F.C.					
2) Toronto to Winnipeg	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**	**2) Winnipeg to Toronto**	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**
Rail Transit Cost (Terminal to Terminal)		$3,000		=	$3,000.00	Rail Transit Cost (Terminal to Terminal)		$1,631		=	$1,631.00
Pickup in Toronto:	2:00:00		$101.86	=	$203.72	Pickup in Winnipeg:	2:00:00		$96.77	=	$193.55
Trailer Ownership En Route (Avg Case):	78:00:00		$0.89	=	$69.10	Trailer Ownership En Route (Avg Case):	79:00:00		$0.89	=	$69.98
Trailer Ownership En Route (Best Case):	66:00:00		$0.89	=	$58.47	Trailer Ownership En Route (Best Case):	67:00:00		$0.89	=	$59.35
Trailer Ownership En Route (Worst Case):	90:00:00		$0.89	=	$79.73	Trailer Ownership En Route (Worst Case):	91:00:00		$0.89	=	$80.61
Delivery in Winnipeg:	2:00:00		$96.77	=	$193.55	Delivery in Toronto:	2:00:00		$101.86	=	$203.72
Time Value of Shipment (Avg Case)	82:00:00		$9.01	=	$738.91	Time Value of Shipment (Avg Case)	83:00:00		$9.01	=	$747.92
Time Value of Shipment (Best Case)	70:00:00		$9.01	=	$630.78	Time Value of Shipment (Best Case)	71:00:00		$9.01	=	$639.79
Time Value of Shipment (Worst Case)	94:00:00		$9.01	=	$847.05	Time Value of Shipment (Worst Case)	95:00:00		$9.01	=	$856.06
TOTAL LOGISTICS COST/TRAILER (ONE WAY)						**TOTAL LOGISTICS COST/TRAILER (ONE WAY)**					
	82:00:00	**Average Case**			**$4,205.28**		83:00:00	**Average Case**			**$2,846.18**
	70:00:00	**Best Case**			**$4,086.52**		71:00:00	**Best Case**			**$2,727.41**
	94:00:00	**Worst Case**			**$4,324.04**		95:00:00	**Worst Case**			**$2,964.94**
DIRECT TRUCKING COST						**DIRECT TRUCKING COST**					
2) Toronto to Winnipeg	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**	**2) Winnipeg to Toronto**	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**
2083.6	km @	$1.40		=	$2,920.10	2083.6	km @	$1.40		=	$2,920.10
Time Value of Shipment (Avg Case)	38:00:00		$9.01	=	$342.42	Time Value of Shipment (Avg Case)	38:00:00		$9.01	=	$342.42
TOTAL LOGISTICS COST/TRAILER (ONE WAY)					**$3,262.52**	**TOTAL LOGISTICS COST/TRAILER (ONE WAY)**					**$3,262.52**
Savings In Comparison to Rail	**44:00:00**	**Avg Rail Scen.**			**$942.76**	**Savings In Comparison to Rail**	**45:00:00**	**Avg Rail Scen.**			**($416.35)**
Savings In Comparison to Rail	**32:00:00**	**Best Rail Scen.**			**$823.99**	**Savings In Comparison to Rail**	**33:00:00**	**Best Rail Scen.**			**($535.11)**
Savings In Comparison to Rail	**56:00:00**	**Worst Rail Scen.**			**$1,061.52**	**Savings In Comparison to Rail**	**57:00:00**	**Worst Rail Scen.**			**($297.58)**

Comparison of Logistics Costs For T.O.F.C. and Direct Trucking

T.O.F.C.						T.O.F.C.					
3) Toronto to Vancouver	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**	**3) Vancouver to Toronto**	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**
Rail Transit Cost (Terminal to Terminal)		$3,600		=	$3,600.00	Rail Transit Cost (Terminal to Terminal)		$3,600		=	$3,600.00
Pickup in Toronto:	2:00:00		$101.86	=	$203.72	Pickup in Vancouver:	2:00:00		$111.67	=	$223.33
Trailer Ownership En Route (Avg Case):	152:00:00		$0.89	=	$134.65	Trailer Ownership En Route (Avg Case):	143:00:00		$0.89	=	$126.68
Trailer Ownership En Route (Best Case):	140:00:00		$0.89	=	$124.02	Trailer Ownership En Route (Best Case):	131:00:00		$0.89	=	$116.05
Trailer Ownership En Route (Worst Case):	164:00:00		$0.89	=	$145.28	Trailer Ownership En Route (Worst Case):	155:00:00		$0.89	=	$137.31
Delivery in Vancouver:	2:00:00		$111.67	=	$223.33	Delivery in Toronto:	2:00:00		$101.86	=	$203.72
Time Value of Shipment (Avg Case)	156:00:00		$9.01	=	$1,405.74	Time Value of Shipment (Avg Case)	147:00:00		$9.01	=	$1,324.64
Time Value of Shipment (Best Case)	144:00:00		$9.01	=	$1,297.60	Time Value of Shipment (Best Case)	135:00:00		$9.01	=	$1,216.50
Time Value of Shipment (Worst Case)	168:00:00		$9.01	=	$1,513.87	Time Value of Shipment (Worst Case)	159:00:00		$9.01	=	$1,432.77
TOTAL LOGISTICS COST/TRAILER (ONE WAY)						**TOTAL LOGISTICS COST/TRAILER (ONE WAY)**					
	156:00:00	**Average Case**			**$5,567.44**		147:00:00	**Average Case**			**$5,478.37**
	144:00:00	**Best Case**			**$5,448.68**		135:00:00	**Best Case**			**$5,359.60**
	168:00:00	**Worst Case**			**$5,686.20**		159:00:00	**Worst Case**			**$5,597.13**

DIRECT TRUCKING COST						DIRECT TRUCKING COST					
3) Toronto to Vancouver	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**	**3) Vancouver to Toronto**	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**
4341.9	km @	$1.39		=	$6,030.72	4341.9	km @	$1.39		=	$6,030.72
Time Value of Shipment (Avg Case)	87:00:00		$9.01	=	$783.97	Time Value of Shipment (Avg Case)	87:00:00		$9.01	=	$783.97
TOTAL LOGISTICS COST/TRAILER (ONE WAY)					**$6,814.68**	**TOTAL LOGISTICS COST/TRAILER (ONE WAY)**					**$6,814.68**
Savings In Comparison to Rail	**69:00:00**	**Avg Rail Scen.**			**($1,247.24)**	**Savings In Comparison to Rail**	**60:00:00**	**Avg Rail Scen.**			**($1,336.32)**
Savings In Comparison to Rail	**57:00:00**	**Best Rail Scen.**			**($1,366.01)**	**Savings In Comparison to Rail**	**48:00:00**	**Best Rail Scen.**			**($1,455.08)**
Savings In Comparison to Rail	**81:00:00**	**Worst Rail Scen.**			**($1,128.48)**	**Savings In Comparison to Rail**	**72:00:00**	**Worst Rail Scen.**			**($1,217.55)**

Note(s)											
			Basis Value of Shipment		**$75,000**						
			Time Value of Money		**5.25%**						
		Equals Annual Time Value of Shipment			$3,937.50						
		Equals Daily Cost (Divided by 365)			$10.79						
Equals Hourly Time Value of Money Cost (Divided by 24)					**$0.45**						
	Basis Shipments Per Week (Annual Volume)				52						
		Annual Value of Shipments			$3,900,000						
		Equals Daily Value of Shipments			$10,684.93						
		Equals Hourly Value of Shipments			$445.21						
		Hourly Shipment Inventory Cost			**$8.56**						
TOTAL SHIPMENT INVENTORY COST (HOURLY)					**$9.01**						

In the foregoing analysis, it would appear that TOFC is only cost competitive with trucking for the longer distance corridors (Winnipeg and Vancouver to Toronto) in the eastbound direction of travel for moving a $75,000 shipment door to door.

This results primarily because of the relatively high tariff for westbound TOFC movements from Toronto, coupled with the “time value of shipment” cost computed under our assumptions.

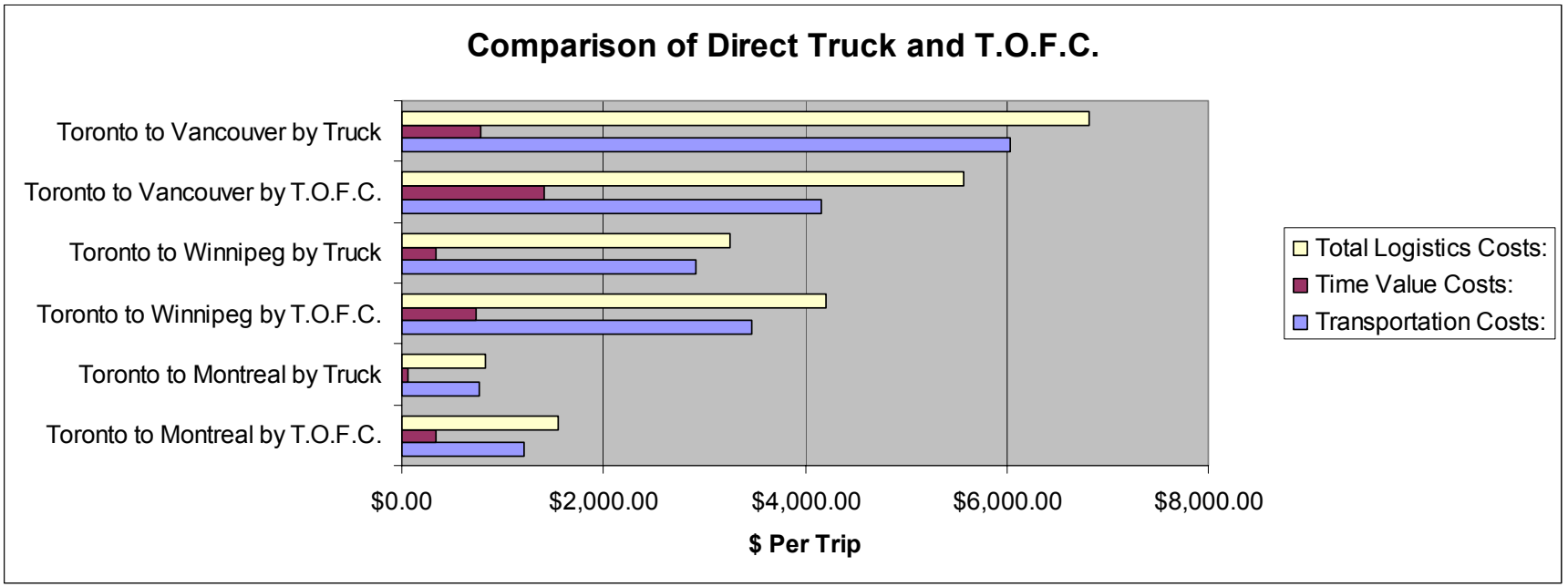
Note that in situations where the shipment value is less than the assumed $75,000 value, or where there are no additional inventories required on the part of the shipper or consignee (i.e. not for regularly occurring replenishment of a commercial process), the competitiveness of the rail intermodal services can be adjusted to be better than shown in the previous table by adjusting the “time value” entries shown in it.

Conversely, for a higher valued shipment (greater than $75,000 per trailer load), on a regularly occurring basis, the time value components would need to be adjusted upward, thus showing a greater advantage to direct trucking than depicted.

Graphically, the following two graphs illustrate comparatively, for Toronto originated, and for Toronto destined shipments, the over-all, direct transportation charges, and “time value costs” comparisons of the two alternatives.

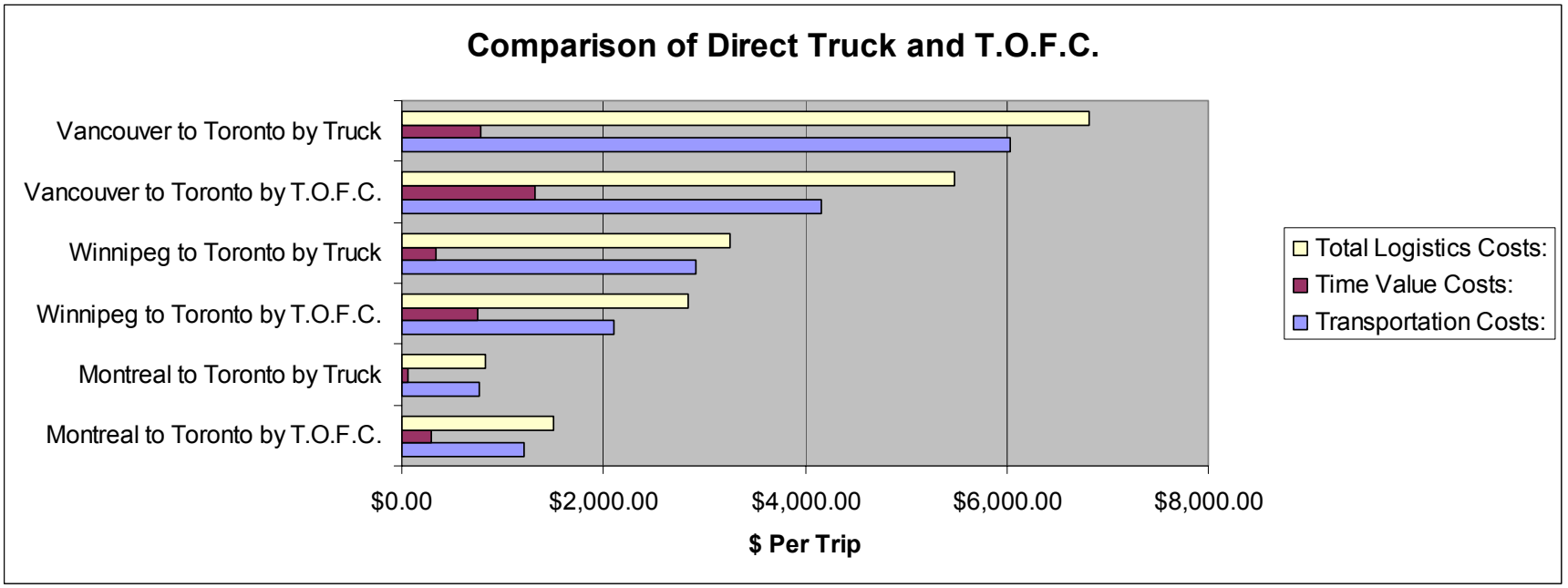
Toronto Outbound by T.O.F.C.

	Toronto to Montreal by T.O.F.C.	Toronto to Montreal by Truck	Toronto to Winnipeg by T.O.F.C.	Toronto to Winnipeg by Truck	Toronto to Vancouver by T.O.F.C.	Toronto to Vancouver by Truck
Transportation Costs:	$1,213.20	$770.25	$3,466.37	$2,920.10	$4,161.70	$6,030.72
Time Value Costs:	$333.41	$54.07	$738.91	$342.42	$1,405.74	$783.97
Total Logistics Costs:	$1,546.61	$824.32	$4,205.28	$3,262.52	$5,567.44	$6,814.68
Line Haul Costs:	$775.00	$770.25	$3,000.00	$2,920.10	$3,600.00	$6,030.72
Pick Up/Dely Costs:	$438.20	$0.00	$466.37	$0.00	$561.70	$0.00



Toronto Inbound by T.O.F.C.

	Montreal to Toronto by T.O.F.C.	Montreal to Toronto by Truck	Winnipeg to Toronto by T.O.F.C.	Winnipeg to Toronto by Truck	Vancouver to Toronto by T.O.F.C.	Vancouver to Toronto by Truck
Transportation Costs:	$1,209.65	$770.25	$2,098.25	$2,920.10	$4,153.73	$6,030.72
Time Value Costs:	$297.37	$54.07	$747.92	$342.42	$1,324.64	$783.97
Total Logistics Costs:	$1,507.02	$824.32	$2,846.18	$3,262.52	$5,478.37	$6,814.68
Line Haul Costs:	$775.00	$770.25	$1,631.00	$2,920.10	$3,600.00	$6,030.72
Pick Up/Dely Costs:	$434.65	$0.00	$467.25	$0.00	$553.73	$0.00



In general, we see that TOFC is competitive with direct trucking in terms of transportation costs for the Toronto-Vancouver (both ways) and Winnipeg-Toronto corridors -- although time value costs tend to favour direct trucking.

In consultation with industry sources, it was noted that there is a preference to use containers rather than trailers for intermodal services on longer corridors because:

- Use of double stack railcars enables significant rail cost savings, reflected in a more competitive rate structure than for TOFC.
- Trailers shipped by TOFC service experience significantly increased maintenance costs due to premature anchor pin corrosion on the brakes, increased incidence of wheel bearing damage, damage to air bags on the trailer air ride suspensions, etc. arising from the service characteristics of shipping trailers by this mode.
- Carriers who are significantly involved in intermodal service (eg. TransX, Yanke, Vitran, and Canadian Freightways) now have developed significant volumes of intermodal transportation business, sufficient for them to maintain their own fleet of domestic intermodal containers.

Container on Flat Car comparisons, on the same corridors, are developed in more detail following.

Rail Intermodal C.O.F.C. (Container on Flat Car) Evaluations

Use of intermodal container on flat car service is increasing for domestic traffic in Canada. A significant stimulant is the introduction of "double stack" container services which, after provision for investment in new container handling infrastructure (capital) is estimated to represent a net savings for shippers of between 10 and 20 percent.

Figure 13 on the following page illustrates the line haul movement of double stack containers.

The Service Group 15 Intermodal COFC costs secured by Logistics Solution Builders for the corridors in question are as follows:

All values in $ per trailer load one-way

Service Group 15 Cost For Corridor	48 Foot or 53 Foot Domestic Container
Toronto – Montreal / Montreal - Toronto Confidential Quotation (Carrier)	$775
Toronto – Winnipeg Winnipeg – Toronto Confidential Quotation (Carrier)	$2,150 $1,120
Toronto – Vancouver Vancouver – Toronto Confidential Quotation (Carrier)	$2,650 $2,585

Using this information, together with long distance Canadian East-West trucking corridor information in this report, the economic cost of COFC services can be compared with general freight trucking services.

Figure 13: Double Stack Container Technology

Employing a similar calculation method to that described for evaluating door-to-door TOFC shipments, the tabular results of Logistics Solution Builders logistics cost analysis follow:

Comparison of Logistics Costs For C.O.F.C. and Direct Trucking

C.O.F.C.						C.O.F.C.					
1) Toronto to Montreal	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**	**1) Montreal to Toronto**	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**
Rail Transit Cost (Terminal to Terminal)		$775		=	$775.00	Rail Transit Cost (Terminal to Terminal)		$775		=	$775.00
Pickup in Toronto:	2:00:00		$101.86	=	$203.72	Pickup in Montreal:	2:00:00		$102.62	=	$205.24
Container Ownership En Route (Avg Case):	37:00:00		$1.04	=	$38.54	Container Ownership En Route (Avg Case):	33:00:00		$1.04	=	$34.38
Container Ownership En Route (Best Case):	25:00:00		$1.04	=	$26.04	Container Ownership En Route (Best Case):	21:00:00		$1.04	=	$21.88
Container Ownership En Route (Worst Case):	49:00:00		$1.04	=	$51.04	Container Ownership En Route (Worst Case):	45:00:00		$1.04	=	$46.88
Delivery in Montreal:	2:00:00		$102.62	=	$205.24	Delivery in Toronto:	2:00:00		$101.86	=	$203.72
Time Value of Shipment (Avg Case)	37:00:00		$9.01	=	$333.41	Time Value of Shipment (Avg Case)	33:00:00		$9.01	=	$297.37
Time Value of Shipment (Best Case)	25:00:00		$9.01	=	$225.28	Time Value of Shipment (Best Case)	21:00:00		$9.01	=	$189.23
Time Value of Shipment (Worst Case)	49:00:00		$9.01	=	$441.55	Time Value of Shipment (Worst Case)	45:00:00		$9.01	=	$405.50
TOTAL LOGISTICS COST/Container (ONE WAY)						**TOTAL LOGISTICS COST/Container (ONE WAY)**					
	37:00:00	**Average Case**			**$1,555.92**		33:00:00	**Average Case**			**$1,515.71**
	25:00:00	**Best Case**			**$1,435.28**		21:00:00	**Best Case**			**$1,395.07**
	49:00:00	**Worst Case**			**$1,676.55**		45:00:00	**Worst Case**			**$1,636.34**

DIRECT TRUCKING COST						DIRECT TRUCKING COST					
1) Toronto to Montreal	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**	**1) Montreal to Toronto**	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**
547.3	km @	$1.41		=	$770.25	547.3	km @	$1.41		=	$770.25
Time Value of Shipment (Avg Case)	6:00:00		$9.01	=	$54.07	Time Value of Shipment (Avg Case)	6:00:00		$9.01	=	$54.07
TOTAL LOGISTICS COST/Container (ONE WAY)					**$824.32**	**TOTAL LOGISTICS COST/Container (ONE WAY)**					**$824.32**
Savings In Comparison to Rail	**31:00:00**	**Avg Rail Scen.**			**$731.60**	**Savings In Comparison to Rail**	**27:00:00**	**Avg Rail Scen.**			**$691.39**
Savings In Comparison to Rail	**19:00:00**	**Best Rail Scen.**			**$610.96**	**Savings In Comparison to Rail**	**15:00:00**	**Best Rail Scen.**			**$570.75**
Savings In Comparison to Rail	**43:00:00**	**Worst Rail Scen.**			**$852.23**	**Savings In Comparison to Rail**	**39:00:00**	**Worst Rail Scen.**			**$812.02**

Comparison of Logistics Costs For C.O.F.C. and Direct Trucking

C.O.F.C.					
2) Toronto to Winnipeg	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**
Rail Transit Cost (Terminal to Terminal)		$2,150		=	$2,150.00
Pickup in Toronto:	2:00:00		$101.86	=	$203.72
Container Ownership En Route (Avg Case):	82:00:00		$1.04	=	$85.42
Container Ownership En Route (Best Case):	70:00:00		$1.04	=	$72.92
Container Ownership En Route (Worst Case):	94:00:00		$1.04	=	$97.92
Delivery in Winnipeg:	2:00:00		$96.77	=	$193.55
Time Value of Shipment (Avg Case)	82:00:00		$9.01	=	$738.91
Time Value of Shipment (Best Case)	70:00:00		$9.01	=	$630.78
Time Value of Shipment (Worst Case)	94:00:00		$9.01	=	$847.05
TOTAL LOGISTICS COST/Container (ONE WAY)					
	82:00:00	**Average Case**			**$3,371.60**
	70:00:00	**Best Case**			**$3,250.97**
	94:00:00	**Worst Case**			**$3,492.23**

C.O.F.C.					
2) Winnipeg to Toronto	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**
Rail Transit Cost (Terminal to Terminal)		$1,120		=	$1,120.00
Pickup in Winnipeg:	2:00:00		$96.77	=	$193.55
Container Ownership En Route (Avg Case):	83:00:00		$1.04	=	$86.46
Container Ownership En Route (Best Case):	71:00:00		$1.04	=	$73.96
Container Ownership En Route (Worst Case):	95:00:00		$1.04	=	$98.96
Delivery in Toronto:	2:00:00		$101.86	=	$203.72
Time Value of Shipment (Avg Case)	83:00:00		$9.01	=	$747.92
Time Value of Shipment (Best Case)	71:00:00		$9.01	=	$639.79
Time Value of Shipment (Worst Case)	95:00:00		$9.01	=	$856.06
TOTAL LOGISTICS COST/Container (ONE WAY)					
	83:00:00	**Average Case**			**$2,351.65**
	71:00:00	**Best Case**			**$2,231.02**
	95:00:00	**Worst Case**			**$2,472.29**

DIRECT TRUCKING COST					
2) Toronto to Winnipeg	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**
2083.6	km @	$1.40		=	$2,920.10
Time Value of Shipment (Avg Case)	38:00:00		$9.01	=	$342.42
TOTAL LOGISTICS COST/Container (ONE WAY)					**$3,262.52**
Savings In Comparison to Rail	**44:00:00**	**Avg Rail Scen.**			**$109.08**
Savings In Comparison to Rail	**32:00:00**	**Best Rail Scen.**			**($11.56)**
Savings In Comparison to Rail	**56:00:00**	**Worst Rail Scen.**			**$229.71**

DIRECT TRUCKING COST					
2) Winnipeg to Toronto	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**
2083.6	km @	$1.40		=	$2,920.10
Time Value of Shipment (Avg Case)	38:00:00		$9.01	=	$342.42
TOTAL LOGISTICS COST/Container (ONE WAY)					**$3,262.52**
Savings In Comparison to Rail	**45:00:00**	**Avg Rail Scen.**			**($910.87)**
Savings In Comparison to Rail	**33:00:00**	**Best Rail Scen.**			**($1,031.50)**
Savings In Comparison to Rail	**57:00:00**	**Worst Rail Scen.**			**($790.24)**

Comparison of Logistics Costs For C.O.F.C. and Direct Trucking

C.O.F.C.						C.O.F.C.					
3) Toronto to Vancouver	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**	**3) Vancouver to Toronto**	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**
Rail Transit Cost (Terminal to Terminal)		$2,650		=	$2,650.00	Rail Transit Cost (Terminal to Terminal)		$2,585		=	$2,585.00
Pickup in Toronto:	2:00:00		$101.86	=	$203.72	Pickup in Vancouver:	2:00:00		$111.67	=	$223.33
Container Ownership En Route (Avg Case):	156:00:00		$1.04	=	$162.50	Container Ownership En Route (Avg Case):	147:00:00		$1.04	=	$153.13
Container Ownership En Route (Best Case):	144:00:00		$1.04	=	$150.00	Container Ownership En Route (Best Case):	135:00:00		$1.04	=	$140.63
Container Ownership En Route (Worst Case):	168:00:00		$1.04	=	$175.00	Container Ownership En Route (Worst Case):	159:00:00		$1.04	=	$165.63
Delivery in Vancouver:	2:00:00		$111.67	=	$223.33	Delivery in Toronto:	2:00:00		$101.86	=	$203.72
Time Value of Shipment (Avg Case)	156:00:00		$9.01	=	$1,405.74	Time Value of Shipment (Avg Case)	147:00:00		$9.01	=	$1,324.64
Time Value of Shipment (Best Case)	144:00:00		$9.01	=	$1,297.60	Time Value of Shipment (Best Case)	135:00:00		$9.01	=	$1,216.50
Time Value of Shipment (Worst Case)	168:00:00		$9.01	=	$1,513.87	Time Value of Shipment (Worst Case)	159:00:00		$9.01	=	$1,432.77
TOTAL LOGISTICS COST/Container (ONE WAY)						**TOTAL LOGISTICS COST/Container (ONE WAY)**					
	156:00:00	**Average Case**			**$4,645.29**		147:00:00	**Average Case**			**$4,489.82**
	144:00:00	**Best Case**			**$4,524.66**		135:00:00	**Best Case**			**$4,369.18**
	168:00:00	**Worst Case**			**$4,765.93**		159:00:00	**Worst Case**			**$4,610.45**

DIRECT TRUCKING COST						DIRECT TRUCKING COST					
3) Toronto to Vancouver	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**	**3) Vancouver to Toronto**	**Hours**	**$ Cost**	**$ / Hour**		**Item Cost $**
4341.9	km @	$1.39		=	$6,030.72	4341.9	km @	$1.39		=	$6,030.72
Time Value of Shipment (Avg Case)	87:00:00		$9.01	=	$783.97	Time Value of Shipment (Avg Case)	87:00:00		$9.01	=	$783.97
TOTAL LOGISTICS COST/Container (ONE WAY)					**$6,814.68**	**TOTAL LOGISTICS COST/Container (ONE WAY)**					**$6,814.68**
Savings In Comparison to Rail	**69:00:00**	**Avg Rail Scen.**			**($2,169.39)**	**Savings In Comparison to Rail**	**60:00:00**	**Avg Rail Scen.**			**($2,324.87)**
Savings In Comparison to Rail	**57:00:00**	**Best Rail Scen.**			**($2,290.03)**	**Savings In Comparison to Rail**	**48:00:00**	**Best Rail Scen.**			**($2,445.50)**
Savings In Comparison to Rail	**81:00:00**	**Worst Rail Scen.**			**($2,048.76)**	**Savings In Comparison to Rail**	**72:00:00**	**Worst Rail Scen.**			**($2,204.23)**

Note(s)			
		Basis Value of Shipment	**$75,000**
		Time Value of Money	**5.25%**
		Equals Annual Time Value of Shipment	$3,937.50
		Equals Daily Cost (Divided by 365)	$10.79
		Equals Hourly Time Value of Money Cost (Divided by 24)	**$0.45**
		Basis Shipments Per Week (Annual Volume)	52
		Annual Value of Shipments	$3,900,000
		Equals Daily Value of Shipments	$10,684.93
		Equals Hourly Value of Shipments	$445.21
		Hourly Shipment Inventory Cost	**$8.56**
		TOTAL SHIPMENT INVENTORY COST (HOURLY)	**$9.01**

In this analysis, the longest distance corridor (Toronto to Vancouver) shows a distinct advantage to use of containerized intermodal services – both in terms of direct transportation costs and even when "time value" costs for shipments (in both directions) are included. The intermediate distance (Toronto to Winnipeg) is even very close after considering time value aspects of the shipments.

This illustrates why there is a significant market for shipping freight using this method over such distances. The introduction of C.O.F.C. services, in the "double stack" configuration, has greatly increased the "mode share" for this very efficient long distance door-to-door service.

Clearly, only very high value / expedited shipments would be moved by direct trucking for these distances.

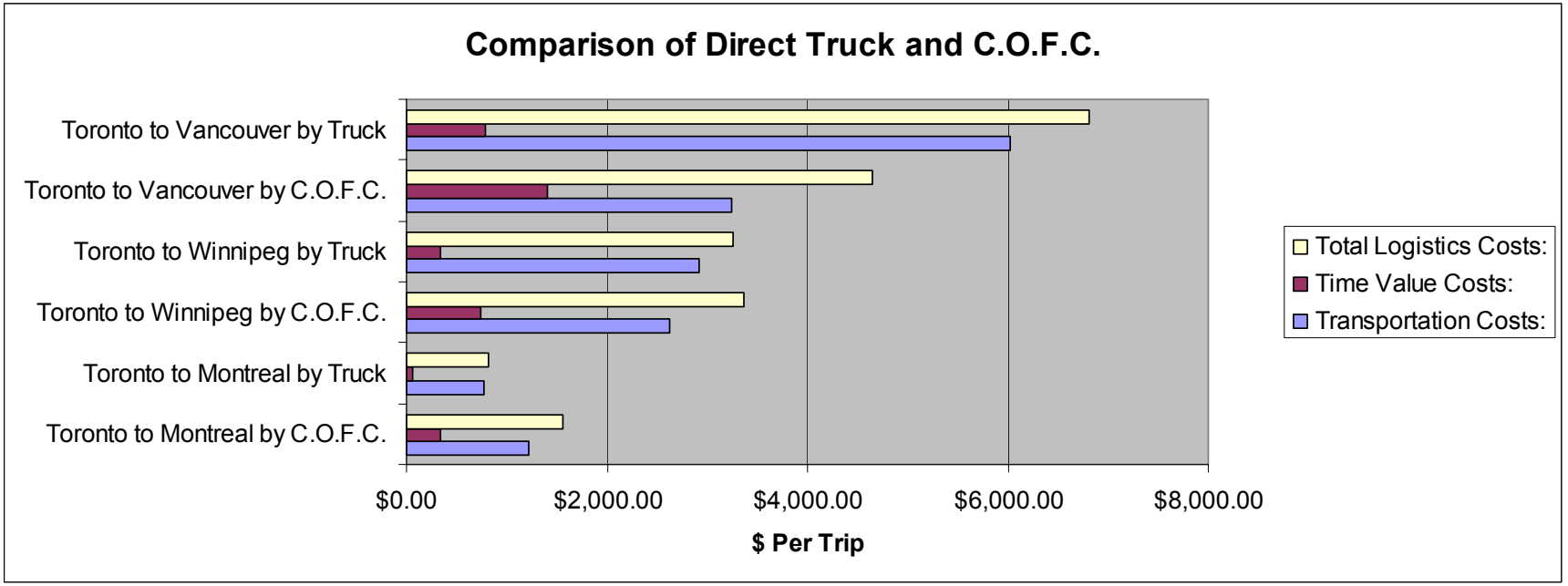
An interested reader, can, through adjusting the value of the shipment used for the "time value of shipment" computation at the bottom, develop sensitivity to the comparisons tabulated.

Note also, when comparing the COFC results to TOFC, there are significant cost advantages for using COFC rail intermodal services.

Graphically, COFC and direct trucking door-to-door compares as follows:

Toronto Outbound by C.O.F.C.

	Toronto to Montreal by C.O.F.C.	Toronto to Montreal by Truck	Toronto to Winnipeg by C.O.F.C.	Toronto to Winnipeg by Truck	Toronto to Vancouver by C.O.F.C.	Toronto to Vancouver by Truck
Transportation Costs:	$1,222.51	$770.25	$2,632.69	$2,920.10	$3,239.56	$6,030.72
Time Value Costs:	$333.41	$54.07	$738.91	$342.42	$1,405.74	$783.97
Total Logistics Costs:	$1,555.92	$824.32	$3,371.60	$3,262.52	$4,645.29	$6,814.68
Line Haul Costs:	$775.00	$770.25	$2,150.00	$2,920.10	$2,650.00	$6,030.72
Pick Up/Dely Costs:	$447.51	$0.00	$482.69	$0.00	$589.56	$0.00



Toronto Inbound by C.O.F.C.

	Montreal to Toronto by C.O.F.C.	Montreal to Toronto by Truck	Winnipeg to Toronto by C.O.F.C.	Winnipeg to Toronto by Truck	Vancouver to Toronto by C.O.F.C.	Vancouver to Toronto by Truck
Transportation Costs:	$1,218.34	$770.25	$1,603.73	$2,920.10	$3,165.18	$6,030.72
Time Value Costs:	$297.37	$54.07	$747.92	$342.42	$1,324.64	$783.97
Total Logistics Costs:	$1,515.71	$824.32	$2,351.65	$3,262.52	$4,489.82	$6,814.68
Line Haul Costs:	$775.00	$770.25	$1,120.00	$2,920.10	$2,585.00	$6,030.72
Pick Up/Dely Costs:	$443.34	$0.00	$483.73	$0.00	$580.18	$0.00