

FINAL REPORT

**ESTIMATION OF THE UNIT COSTS
OF AIRCRAFT USE IN CANADA**

TP 14663E

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OF AIRCRAFT USE IN CANADA**

**Prepared for
Transport Canada
by
Moncrieff Management Limited**

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1. INTRODUCTION AND EXECUTIVE SUMMARY

Transport Canada has initiated, in collaboration with Provincial and Territorial transport departments, a project called the Full Cost Investigation (FCI), which is intended to estimate the total financial and social costs of transport by all of the major modes, to reveal the total amounts of resources consumed by transport, and the impacts on the environment, health and well-being. It is intended also to make comparisons among alternative modes of transport, showing the resources consumed and other environmental and social impacts for realistic alternatives. For passenger transport, these will include comparing private car/light truck with urban public transit and the various public intercity modes – air, bus and train; while for freight transport they will include realistic comparisons and combinations of truck, rail, waterway and air.

The initial work underway at Transport Canada, (Phase 1), is compiling the financial costs at the national level, to produce conceptual “national financial accounts”, including the costs of the network infrastructure and transport services. These will distinguish the basic modes, but will not allocate infrastructure costs by vehicle type. Phase 2 of the project will then estimate the same financial costs at the provincial/territorial level.

Subsequently, in Phase 3 of the project, infrastructure costs will be allocated by vehicle type, in sufficient detail to at least enable the comparisons among modes envisaged in the “conceptual national accounts”. Because aviation activity is distinguished down to the level of passenger and freight aircraft, Phase 1 and Phase 2 data, along with carrier activity data, will be sufficient to allocate costs on an average passenger-kilometre basis after the allowance for a percentage of costs to be allocated to general aviation activity has been deducted. Phase 4 of the project will estimate the social costs associated with vehicle activity. Finally, in Phase 5 of the work outlined in the Work Plan, marginal costs will be estimated and compared among the modes. It is envisioned that the marginal costs will be presented on the basis of a number of vehicle configurations and typical routes in Canada.

In support of this program, Transport Canada has requested assistance in determining unit costs levels for civil aircraft usage in Canada. This report provides that information.

1.1 Data Sources

In addition to publicly available sources, such as Statistics Canada and the annual reports of publicly traded corporations (Air Canada, Jazz, Cargojet and WestJet), the support of the airlines was elicited by means of a questionnaire regarding operational data (cost data tends to be closely held, and unpublished). Three airlines, WestJet, Jazz and Calm Air provided comprehensive responses, and these were used to test the validity of, and modify if necessary, results based on publicly available information. As well, confidential cost data maintained by Transport Canada was consulted, to verify the accuracy of responses from other sources, but this information was not used directly. In order to maintain confidentiality, individual responses have not been identified in this report, and rounded numbers were used to represent more than one carrier.

While the main results are summarized in this report, much of the detailed information is contained on spreadsheets which have been appended to the study.

1.2 Route Selection

In conjunction with the steering committee, eleven passenger routes and five all-cargo routes were selected as being representative of the system as a whole. As some of these routes were flown by more than one carrier and/or aircraft type, a total of twenty-four unique route/aircraft/airline combinations, covering the full gamut of Canadian air transportation, ranging from Vancouver - Victoria to Toronto - Vancouver, and Winnipeg - Churchill. Details are shown in Section 2.

1.3 Operational Factors

Before developing the overall cost structure, it was necessary to determine a wide variety of operational parameters related to the equipment utilized, and the routes served. For every route/aircraft/airline combination examined, the following operational factors were determined:

- Maximum take-off weight.
- Available seats (which could vary among airlines for the same aircraft type).
- Estimated baggage volume and weight.
- Estimated volume and weight available for cargo.
- Block time.
- Block fuel consumption
- Annual aircraft utilization.
- Annual flight and cabin crew utilization.
- Load factors.
- Available seat-kilometres and tonne-kilometres.
- Revenue passenger-kilometres and tonne-kilometres flown.

Detailed results are shown in Section 3.

1.4 Derivation of Airline Cost Elements

The detailed results are shown in Section 4, for each route/aircraft/airline combination, based on the following cost element classification. To maintain consistency with external data sources, the classification system was defined as being similar to that of Transport Canada. The cost elements examined individually were as follows:

- Flight Operations
 - Flight Crew.
 - Fuel and Oil.
 - Landing, navigation and miscellaneous fees.
 - Airport Charges.
 - Air Travellers Security Charge.
 - Navigation fees.
 - Hull insurance.
 - Miscellaneous flight operations expenses.
- Maintenance, flight equipment.
- In-flight service.
 - Cabin crew.
 - Passenger food supplies.
 - Passenger liability insurance.
 - Miscellaneous in-flight service expenses.
- Aircraft and traffic servicing.
- Commissions.
- Aircraft Ownership Costs.
- Indirect Operating Costs.

1.5 Analysis of Marginal Costs

The detailed analysis is explained in Section 5. In the very short term (defined as the addition of one or two passengers to an existing flight), marginal costs ranged from about 5% to 25% of average. The major difference was the treatment of reimbursable fees such as AIFs and the ATSC, which, although technically costs to the airlines, are generally recouped from the passenger as a fare supplement. When these costs are excluded, short-term marginal costs, expressed as a per cent of average, are quite low.

In the medium term (defined as a seasonal shift in scheduling patterns), the marginal cost ratio is much higher, generally in the 40% to 90% range, expressed as a per cent of average. Again, some the difference is explained by the treatment of reimbursable fees. However, in the case of all-cargo airlines operating fuel-inefficient B727-200F aircraft, fuel is treated as fully marginal in this instance, and fuel represents by far the largest cost element. Among passenger airlines, the highest ratio was closer to 75%.

Most of the aircraft under consideration are narrow-bodied equipment, with limited available cargo capacity once passenger baggage has been accounted for. In general, the maximum level of cargo revenue tended to be less than 10% of passenger revenue potential. In the very short term, as marginal cargo costs are about 10% of average costs, and cargo only represents about 10% potential revenue, it would appear that marginal cargo costs are negligible with respect to narrow-bodied passenger aircraft. However, with wide-bodied equipment such as the B767, cargo potential (and therefore marginal costs) is quite a bit higher.

Sensitivity analysis was run with respect to both passenger and cargo load factors, as well as fuel and airport/navigation fees, comparing changes in the unit cost structure to both input changes in terms of units (e.g., one additional passenger, or an increase in fuel cost of one cent per litre), and percentages (a 1% load factor or cost increase).

1.6 Backcast to 2000

In order to provide a basis of comparison with other modes, the costs in the preceding sections, which were standardized to 2005, were “backcasted” to 2000, under the assumption that the same fleet would have been in operation¹. In general, average costs for each element were determined for 2000, and the appropriate percentage applied to the 2005 results. This presented some difficulties with regard to aircraft valuation, because there were some asymmetrical changes following the events of September 11, 2001. However, it was assumed that, in general, the equipment operated by the airlines in 2000 would have been newer than it was in 2005, and therefore its value would have been a proportionately greater percentage of its original cost².

While fuel was substantially more expensive in 2005, labour costs were generally lower, and the overall cost differences tended to be in the 5% to 15% range. However, average load factors increased by about five percentage points during that period, so that a cost comparison on an rpk basis actually showed little change. The major difference was with the cargo airlines, where fuel price increases were the overriding factor, and overall cost increases were in the 35% to 50% range.

1.7 Level of Confidence

As discussed in more detail in the body of this report, it was necessary to relay primarily on publicly available information to construct the detailed cost analysis, and the quality of this data varied considerably. As an example, the unit cost of fuel is published periodically by both Statistics Canada and individual airlines, while the fuel burn over a specific route can be accurately simulated. Thus, the fuel cost per trip can be estimated reasonably accurately. On the other hand, an element such as “miscellaneous in-flight service expense” is not consistently defined among airlines, and is generally calculated as a residual value after more specific items have been removed. The estimated values for this element will therefore be less accurate than fuel cost. In order to give the reader a rough assessment of the Consultant’s confidence in the data, Table 1.1 lists the cost elements identified in Section 1.4, and assesses them against the Consultant’s estimate of data accuracy.

¹ This assumption is largely correct for most airlines and aircraft types. The major anomaly is WestJet, which upgraded during this period from one of the most fuel-inefficient aircraft (B737-200) to one of the most efficient (B737-700).

² For example, the Air Canada A320 fleet would have had an average age of about 8 years in 2000, rather than the 13 in 2005.

TABLE 1.1
ESTIMATE OF DATA ACCURACY

PRIMARY ELEMENT	SECONDARY ELEMENT	ESTIMATED ACCURACY
Flight operations	Flight crew	good
	Fuel and oil	excellent
	Landing, navigation and miscellaneous fees	excellent
	Hull insurance	good
	Miscellaneous flight operations expenses	fair
Maintenance, flight equipment		good
In-flight service	Cabin crew	good
	Passenger food supplies	fair
	Passenger liability insurance	fair
	Miscellaneous in-flight service expenses	fair
Aircraft and traffic servicing		good
Commissions		good
Aircraft Ownership Costs		good
Indirect Operating Costs		fair
Source: Consultants analysis		

On an overall basis, it is believed that the results are reasonably accurate. They have been spot-checked against fare levels and, in general, the lowest available fares are below full cost levels, but well above marginal costs. Higher fare categories appear to exceed full cost levels, which is the expected relationship.

2. ROUTE, AIRLINE AND AIRCRAFT TYPE SELECTION

As per the terms of reference, it was initially decided to select eight routes for both passenger and cargo services, with the specific routes to be included based on the following criteria:

- Routes with substantial air traffic and modal competition.
- Routes with water-based modal competition.
- Remote routes.
- Routes operated by small aircraft.
- Predominantly cargo routes.
- Geographical diversity

Following discussions with the Steering Committee, it was suggested that, as the passenger routes were considered to be of greater importance than the cargo routes, the selection should be biased in favour of passengers, and eventually it was determined to select eleven passenger routes, and five with all-cargo services. Following further discussions with the Steering Committee, the routes selected for analysis are shown in Table 2.1. Airport distances are taken from the NavCanada web site.

TABLE 2.1
SELECTED ROUTES

JUSTIFICATION	ROUTE	DISTANCE (km.)	PASSENGERS	CARGO
Traffic and Modal Competition (land)	Ottawa - Montréal	152	included	
	Calgary - Edmonton	246	included	
	Toronto - Montréal	507	included	Included (YHM/YMX)
	Moncton - Montréal	706	included	Included (YMX)
	Halifax - St. John's	880	included	
	Toronto - Regina	2,026	included	
	Toronto - Vancouver	3,343	included	Included (YHM)
Modal (ferry) Competition	Vancouver - Victoria (excludes float aircraft)	64	included	included
Remote	Winnipeg - Churchill	1,002	included	
Small Aircraft	Regina - Saskatoon	239	included	
	Toronto - Sarnia	230	included	
Predominantly Cargo	Hamilton - Winnipeg	1,515		included
Source: Consultants analysis. Note that some Toronto cargo services operate from Hamilton, and some Montréal cargo services operate via Mirabel.				

2.1 Passenger Routes

The eleven passenger routes encompass a wide variety of airlines and aircraft types. Although not all airlines and aircraft serving these routes were selected for detailed analysis, those chosen provide a wide range of service options. The following airlines were included, ranging from the largest in Canada, to some of the smallest:

- Air Canada
- WestJet
- Jazz
- Calm Air
- Transwest
- Air Georgian

The aircraft types selected range from The Boeing 767-200, a wide-bodied aircraft with 207 seats in domestic service, to the BAe Jetstream 31, with only 16 installed seats. A complete listing of passenger routes, airlines and aircraft types, is shown in Table 2.2. Although the Boeing 737-200 has now been withdrawn from service, the analysis for one route, Toronto - Montréal, was included to allow a comparison with more modern equipment.

TABLE 2.2
DETAILS OF SELECTED PASSENGER ROUTES

ROUTE	DIST. (km.)	AIRLINES	AIRCRAFT	SEATS
Vancouver - Victoria	64	Jazz	DH3	50
Ottawa - Montréal	152	Jazz	DH1 DH3	37 50
Regina - Saskatoon	239	Transwest Air	J31 SF3	16 34
Toronto - Sarnia	230	Air Georgian	BEH	18
Calgary - Edmonton	246	Jazz WestJet	DH3 73W	50 136
Toronto - Montréal	507	Air Canada WestJet WestJet	320 73W 73S	140 136 120
Moncton - Montréal	706	Jazz	CRJ	50
Halifax - St. John's	880	Air Canada WestJet	320 73W	140 136
Winnipeg - Churchill	1,002	Calm Air	SF3	34
Toronto - Regina	2,026	Jazz	CR7	75
Toronto - Vancouver	3,343	Air Canada WestJet	762 73W	207 136
Sources: Consultants analysis of OAG and airline web sites				

2.2 Cargo Routes

The selection of cargo routes encompasses a much smaller choice of both airlines and aircraft types. There are only two major all-cargo operators in Canada: Cargojet and Kelowna Flightcraft, and both have standardized on the Boeing 727-200F for services across Canada.

The detailed cargo route listing is shown in Table 2.3.

TABLE 2.3
DETAILS OF SELECTED CARGO ROUTES

ROUTE	DIST. (km.)	AIRLINES	AIRCRAFT
Vancouver - Victoria	64	Kelowna Flightcraft	72F
Hamilton - Montréal (YMX)	544	Cargojet	72F
Moncton - Montréal (YMX)	724	Kelowna Flightcraft	72F
Hamilton - Winnipeg	1,515	Kelowna Flightcraft Cargojet	72F 72F
Hamilton - Vancouver	3,347	Cargojet	72F
Sources: Consultants analysis of OAG and airline web sites			

3. DERIVATION OF OPERATIONAL FACTORS

As many of the cost estimates developed in this report are based on unit factors of one sort or another, it is important to standardize the assumptions regarding these factors, so that fair comparisons can be made.

3.1 Aircraft Weights, Seating Capacities, and Cargo Space

Aircraft weights will affect such diverse factors as fuel burn (and therefore fuel cost) and landing fees. Although aircraft may carry a common type designator, there are often variations within types, some of which may be substantial. For example, the Air Canada A320 fleet consists of two sub-types, the -211 and the -214, and the -211 has two different engine types, leading to three possible take-off weight specifications. For the routes and aircraft types selected in Section 2, only the most common variant was used in the cost calculations. The maximum gross take-off weights and seating capacities of these specific aircraft are listed in Table 3.1.

TABLE 3.1
AIRCRAFT CHARACTERISTICS

	MGTOW (kg.)	SEATS	CARGO VOLUME (cu. m.)
Boeing 767-233	152,000	207 (AC)	87
Boeing 727-200F (Cargojet)	89,358	na	118
Boeing 727-200F (Kelowna)	83,689	na	118
Airbus A320-200	75,500	140 (AC)	44
Boeing 737-700	70,000	136 (WS)	27
Boeing 737-200	52,390	120 (WS)	25
Canadair CRJ-200	38,329	75 (AC)	12
Canadair CRJ-700	24,040	50 (AC*)	9
DHC-8-300	18,643	50 (AC*)	9
DHC-8-100	15,649	37 (AC)	8
Saab 340	13,154	34 (MO, 9T)	8
Beech 1900C/D	7,766	18 (AC*)	5
BAe Jetstream 31	6,950	16 (9T)	4
Sources: CCAR, Airline web sites, Aircraft Manufacturers' web sites, Flight International			

The nominal cargo volumes noted above will be utilized for passenger baggage, mail and cargo. Table 3.2 provides a calculation of the available space for cargo and mail by deducting the volume required for 15 kg. of passenger baggage per person at average load factors (see Section 3.6) in Southern Canada, and 30 kg. in the north. Densities are assumed to be 170 kilograms per cubic metre for passenger baggage, and 158 kilograms per cubic metre for cargo¹.

¹ Passenger baggage densities have been extracted from various airline operating manuals. Cargo density is based on data from Boeing, for large aircraft. However, it should be noted that small packages, which may represent a substantial proportion of cargo on passenger flights, will be significantly less dense, reducing the aircraft cargo weight capability even further.

TABLE 3.2
AVAILABLE CARGO CAPACITY

	TOTAL VOLUME (cu. m.)	BAGGAGE WEIGHT (kg.)	BAGGAGE VOLUME (cu. m.)	CARGO VOLUME (cu. m.)	CARGO WEIGHT (kg.)
Boeing 767-200	87	2,484	14.61	72.39	11,437
Boeing 727-200F (Cargojet)	118	na	na	118.00	18,644
Boeing 727-200F (Kelowna)	118	na	na	118.00	18,644
Airbus A320-200	44	1,680	9.88	34.12	5,391
Boeing 737-700	27	1,632	9.60	17.40	2,749
Boeing 737-200	25	1,440	8.47	16.53	2,612
Canadair CRJ-200	12	788	4.63	7.37	1,164
Canadair CRJ-700	9	525	3.09	5.91	934
DHC-8-300	9	525	3.09	5.91	934
DHC-8-100	8	389	2.29	5.71	903
Saab 340A/B	8	663	3.90	4.10	648
Beech 1900C/D	5	176	1.03	3.97	627
BAe Jetstream 31	4	156	0.92	3.08	487
Sources: Manufacturers' specifications					

3.2 Block Time Estimates

Block time estimates are based on a variety of sources, including airline responses to the questionnaire, computer simulations by manufacturers, and actual airline scheduled times. As these will vary by direction due to winds and ATC considerations, the values shown in Table 3.3 are based on the average of both directions, as well as the average of summer and winter winds.

TABLE 3.3
BLOCK TIME ESTIMATES

ROUTE	DIST. (km.)	AIRLINES	AIRCRAFT	BLOCK TIME (hrs:min)
Vancouver - Victoria	64	Jazz	DH3	0:25
Ottawa - Montréal	152	Jazz	DH1/DH3	0:41
Regina - Saskatoon	239	Transwest Air	J31 SF3	0:48 0:45
Toronto - Sarnia	230	Air Georgian	BEH	0:52
Calgary - Edmonton	246	Jazz WestJet	DH3 73W	0:54 0:47
Toronto - Montréal	507	Air Canada WestJet WestJet	320 73W 73S	1:13 1:13 1:15
Moncton - Montréal	706	Jazz	CRJ	1:26
Halifax - St. John's	880	Air Canada WestJet	320 73W	1:32 1:32
Winnipeg - Churchill	1,002	Calm Air	SF3	2:35
Toronto - Regina	2,026	Jazz	CR7	3:05
Toronto - Vancouver	3,343	Air Canada WestJet	762 73W	4:45 4:46
Vancouver - Victoria	64	Kelowna Flightcraft	72F	0:16
Hamilton - Montréal (YMX)	544	Cargojet	72F	1:10
Moncton - Montréal (YMX)	724	Kelowna Flightcraft	72F	1:13
Hamilton - Winnipeg	1,515	KFC, Cargojet	72F	2:07
Hamilton - Vancouver	3,347	Cargojet	72F	4:20
Sources: Airline and manufacturer simulations, and consultants analysis				

3.3 Block Fuel Estimates

Block fuel estimates are based on responses to the airline questionnaires, and manufacturers' computer simulations. Fuel burns are "actual" from the airlines (where given) or from the manufacturers, weighted to reflect deterioration due to aircraft age (3% per 10-year period). As with block times, the summary in Table 3.4 is based on the average of both directions, carrying typical loads.

TABLE 3.4
BLOCK FUEL ESTIMATES

ROUTE	DIST. (km.)	AIRLINES	AIRCRAFT	BLOCK FUEL (pounds)
Vancouver - Victoria	64	Jazz	DH3	414
Ottawa - Montréal	152	Jazz	DH1 DH3	731 831
Regina - Saskatoon	239	Transwest Air	J31 SF3	475 893
Toronto - Sarnia	230	Air Georgian	BEH	685
Calgary - Edmonton	246	Jazz WestJet	DH3 73W	1,021 3,068
Toronto - Montréal	507	Air Canada WestJet WestJet	320 73W 73S	5,422 5,047 8,400
Moncton - Montréal	706	Jazz	CRJ	3,137
Halifax - St. John's	880	Air Canada WestJet	320 73W	7,473 7,218
Winnipeg - Churchill	1,002	Calm Air	SF3	2,390
Toronto - Regina	2,026	Jazz	CR7	10,681
Toronto - Vancouver	3,343	Air Canada WestJet	762 73W	45,987 22,475
Vancouver - Victoria	64	Kelowna Flightcraft	72F	3,075
Hamilton - Montréal (YMX)	544	Cargojet	72F	11,725
Moncton - Montréal (YMX)	724	Kelowna Flightcraft	72F	12,680
Hamilton - Winnipeg	1,515	KFC, Cargojet	72F	21,975
Hamilton - Vancouver	3,347	Cargojet	72F	42,010
Sources: Airline and manufacturer simulations, and consultants analysis				

3.4 Aircraft Utilization

Aircraft utilizations are based on information received from responding carriers, which was then extended to cover the others, based on publicly available information from such sources as airline annual reports, and the Consultants' qualitative assessment of current trends. These are summarized in Table 3.5.

TABLE 3.5
ANNUAL AIRCRAFT UTILIZATION

	AIRLINE	ANNUAL UTILIZATION (hours)
Boeing 767-200	Air Canada	3,860
Airbus A320-200	Air Canada	3,500
Boeing 727-200F	Cargojet	1,500
Boeing 727-200F	Kelowna	1,500
Boeing 737-700	WestJet	4,350
Boeing 737-200	WestJet	3,000
Canadair CRJ-200	Jazz	2,650
Canadair CRJ-700	Jazz	3,680
DHC-8-300	Jazz	2,490
DHC-8-100	Jazz	2,460
Saab 340B	Calm Air/Transwest	2,000
Beech 1900C/D	Air Georgian	2,000
BAe Jetstream 31	Transwest	2,000
Sources: Airline questionnaire responses, airline annual reports, Consultants' estimates		

3.5 Crew Utilization

Crew utilizations are projected based on the responses to the airline questionnaire, as well as from available Statistics Canada data, and airline annual reports.

3.5.1 Flight Crew

As of the end of 2005, Air Canada (mainline) employed 2541 pilots for a fleet of 201 aircraft, operating approximately 10.6 hours per day. Assuming that almost all crews are two-man (some long-haul flights operate with multiple crews), then 1270 crews account for 777,669 annual flying hours, or about 612 annual hours per crew. The actual figure for a two-man domestic crew should be slightly more.

WestJet reports annual averages exceeding those of Air Canada, whereas Jazz's were slightly lower.

For the purposes of this report, crew utilization for WestJet is estimated at an average of 750 annual hours, Air Canada at about 625 hours, and Jazz at 575. Smaller airlines,

with a much simpler crew rostering system, and a simpler route structure, have been estimated at the level of 900 annual hours.

3.5.2 Cabin Crew

Based largely on individual airline submissions, it has been assumed that WestJet utilizations will be about 675 annual hours, Air Canada at about 625 and Jazz at about 600. The smaller airlines are projected at a 900 hour rate.

3.6 Load Factors

Table 3.6 shows the passenger load factors experienced for both the full year 2005 and the first quarter of 2006 for Air Canada, Jazz and WestJet. Neither Calm Air nor Transwest publish load factors on a regular basis. For the purposes of this project, it would seem reasonable to use an 80% load factor for Air Canada and WestJet, 70% for Jazz, and, in the absence of other information, 65% for the other passenger carriers², with the actual passenger loads rounded to the nearest whole number.

TABLE 3.6
AIRLINE LOAD FACTORS

AIRLINE	DOMESTIC LOAD FACTOR (%)		
	YEAR 2004	YEAR 2005	1Q 2006
Air Canada (mainline)	77	81	79
Jazz	64	71	71
WestJet	70	75	79
Sources: Consultants analysis of airline news releases.			
Note that data for WestJet and Jazz includes transborder services.			

For cargo flights, the limiting factor tends to be volume rather than weight, with aircraft often “cubing out”: the cargo hold is filled on a volume basis, but at less than the maximum possible weight. Actual loads tend to be closely guarded information. The only publicly available data obtained by the consultant was in the June 1, 2005 prospectus for the Cargojet Income Fund. In that document, Cargojet stated that in 2004, they transported an average of 226.8 tonnes on each business night, or 59,130 tonnes annually. This load was carried on 5,458 flights, for an average of 10.8 tonnes per flight. As noted in Table 3.2, the weight capacity of their aircraft is 18.6 tonnes, yielding an estimated weight load factor of 58%. In the absence of any additional information, this figure is used as a surrogate for all of the air cargo routes.

² Smaller airlines would tend to operate with a less sophisticated revenue management system than the larger ones, and would also have fewer flights and seats on which to try to allocate traffic.

3.7 Aircraft-kilometre, Passenger-kilometre and Seat-kilometre Estimates

Based on the above information, the level of productive capacity can be estimated for each of the passenger routes under consideration, as per Table 3.7.

TABLE 3.7
PASSENGER ROUTE PRODUCTION AND CAPACITY

ROUTE	DIST. (km.)	AIRLINES	A/C	SEATS	ASK (000)	LF (%)	RPK (000)
Vancouver - Victoria	64	Jazz	DH3	50	3.20	70	2.24
Ottawa - Montréal	152	Jazz	DH1 DH3	37 50	5.62 7.60	70 70	3.95 5.32
Regina - Saskatoon	239	Transwest Air	J31	16	3.82	65	2.39
Toronto - Sarnia	230	Air Georgian	BEH	18	4.37	65	2.76
Calgary - Edmonton	246	Jazz WestJet	DH3 73W	50 136	12.30 33.46	70 80	8.61 26.81
Toronto - Montréal	507	Air Canada WestJet WestJet	320 73W 73S	140 136 120	70.98 68.95 60.84	80 80 80	56.78 55.26 48.67
Moncton - Montréal	706	Jazz	CRJ	50	35.30	70	24.71
Halifax - St. John's	880	Air Canada WestJet	320 73W	140 136	123.20 119.68	80 80	98.56 95.92
Winnipeg - Churchill	1,002	Calm Air	SF3	34	34.07	65	22.04
Toronto - Regina	2,026	Jazz WestJet WestJet	CR7 73W 73S	75 136 120	151.95 275.54 243.12	70 80 80	107.38 220.83 194.50
Toronto - Vancouver	3,343	Air Canada WestJet	762 73W	207 136	692.00 454.65	80 80	554.94 364.39
Source: Consultants analysis							
As passenger loads have been rounded to the nearest whole number, the number of ASKs multiplied by the load factor may not exactly equal the number of RPKs.							

A similar table has been constructed for cargo flights as noted below (Table 3.8).

TABLE 3.8
CARGO ROUTE PRODUCTION AND CAPACITY

ROUTE	DIST. (km.)	AIRLINES	A/C	CAPACITY (tonnes)	LF (%)	RTKs (000)
Vancouver - Victoria	64	Kelowna Flightcraft	72F	18.6	58	690
Hamilton - Montréal (YMX)	544	Cargojet	72F	18.6	58	5,869
Moncton - Montréal (YMX)	724	Kelowna Flightcraft	72F	18.6	58	7,811
Hamilton - Winnipeg	1,515	KFC, Cargojet	72F	18.6	58	16,344
Hamilton - Vancouver	3,347	Cargojet	72F	18.6	58	36,107
Source: Consultants analysis						

4. DERIVATION OF COST ELEMENTS

The cost elements discussed below are subdivided into “direct” and “indirect” components. However, as discussed earlier, the categorization is not exact, and actually represents a wide spectrum with differing degrees of “marginality”. Aircraft ownership costs were calculated separately (Section 4.2) and for the moment, have not been categorized as either “direct” or “indirect”.

4.1 Direct Operating Costs (DOCs)

The direct operating cost elements listed below are those with the greatest level of “marginality”, in that a large percentage of them will not be incurred if a particular service is withdrawn.

4.1.1 Flight Operations

Flight operations expenses consists of flight crew wages, salaries and benefits; aircraft fuel and oil; landing, navigation and miscellaneous fees; aircraft hull insurance; and a miscellaneous category to cover other minor expenses.

4.1.1.1 Flight Crew

Neither individual airlines nor their unions are willing to reveal the details of their labour agreements. The latest available general information comes from Statistics Canada, through 2004 (Table 4.1). There are approximately 20 Level I and II airlines. Specific employment data is available for Air Canada and Jazz, and has been estimated for WestJet (Table 4.2)¹. As roughly two-thirds of Level I and II pilots are accounted for by Air Canada, Jazz, and WestJet, the Statistics Canada data should not be too far wrong as a general average. Note that the Statistics Canada data indicate that average wages have been falling since 2002, and for 2004, they had dropped from almost \$108,000 in the first quarter of the year, to about \$102,000 in the fourth. Anecdotal evidence suggests that they have not been rising since then.

TABLE 4.1
FLIGHT CREW EMPLOYMENT (National)

	EQUIVALENT FULL-TIME EMPLOYEES				
	2000	2001	2002	2003	2004
Employees (Level I/II)	6,326	6,872	6,603	6,444	6,186
Employees (Level III)	2,498	2,151	2,083	2,111	2,347
Average Wage (Level I/II)	\$111,000	\$111,000	\$113,000	\$107,000	\$105,000
Average Wage (Level III)	\$39,000	\$ 42,000	\$ 45,000	\$ 44,000	\$ 46,000
Source: Statistics Canada					

¹ Information provided by WestJet indicates that in July, 2006, they employed 640 pilots, which substantiates the estimate of 600 for 2005.

TABLE 4.2
FLIGHT CREW EMPLOYMENT (By Airline)

AIRLINE	EQUIVALENT FULL TIME EMPLOYEES			
	2002	2003	2004	2005
Air Canada (mainline)	3,100	2830	2,563	2,541
Jazz	na	na	1,028	1,135
WestJet	na	na	na	600
Total Level I/II	6,603	6,444	6,186	na
Sources: Airline annual reports, Statistics Canada. WestJet numbers estimated				

Current typical pilot salary levels were obtained for a sampling of Canadian airlines, as noted in Table 4.3. It is probably fair to assume that pay scales for the Transwest SF340 are the same as for Calm Air, while smaller aircraft will be slightly below these figures.

TABLE 4.3
TYPICAL FLIGHT CREW WAGE SCALES

AIRLINE	HOURLY PAY RATE			
	Captain	F/O	2/O	Crew
Air Canada, B767	\$190	\$125		\$315
Air Canada, A320	\$165	\$110		\$275
WestJet ²	\$130	\$ 90		\$220
Cargojet B727F	\$110	\$ 60	\$ 45	\$215
Kelowna B727F	\$110	\$ 75	\$ 55	\$240
Jazz (all aircraft)	\$ 85	\$ 55		\$140
Calm Air SF340	\$ 65	\$ 40		\$105
Source: Airlinepilotcentral.com				
WestJet rate based on monthly salary divided by an 80 hour guarantee. Cargo-jet rate based on 85 hour month. Rates based on a combination of day/night flying, and for 5-10 years seniority.				

Multiplying the above hourly rates by the crew utilizations calculated in Section 3.5 gives an imputed average salary for WestJet of \$83,000 and for Air Canada of between \$86,000 and \$98,000. This is consistent with the assumption that airline restructuring has dropped pay scales from the 2004 data reported by Statistics Canada.

Finally, airline expense submissions to Transport Canada were examined to determine the appropriate ratio for total flight crew costs (including expenses and benefits) to basic wages. Although there was a fairly wide range of reported percentages³, it was clear that they have been dropping substantially over the past few years, and a typical 10-20% is a not unreasonable estimate for 2005 conditions. As a typical average, 15% was

² The WestJet pay scale rises sharply in the first three years, with a first officer with three years seniority earning about twice the salary of a new hire. In addition to a stock option program, pilots can purchase company shares with a value up to 20% of their salary, which will then be matched by the company on a 1:1 basis.

³ The data does not always appear accurate, as, occasionally, the reported "wage, expense and benefit" total is less than the "salary" total.

added to the flight crew costs calculated above to account for these benefits and expenses.

The revised totals can be applied to average block times for each route (Table 3.3) to yield flight crew costs for each route, as per Table 4.4.

TABLE 4.4
FLIGHT CREW COST ESTIMATES

ROUTE	DIST. (km.)	AIRLINES	AIRCRAFT	AVERAGE ONE-WAY FLIGHT CREW COST
Vancouver - Victoria	64	Jazz	DH3	\$ 67
Ottawa - Montréal	152	Jazz	DH1 DH3	\$ 110 \$ 110
Regina - Saskatoon	239	Transwest Air	J31 SF3	\$ 86 \$ 91
Toronto - Sarnia	230	Air Georgian	BEH	\$ 95
Calgary - Edmonton	246	Jazz WestJet	DH3 73W	\$ 144 \$ 196
Toronto - Montréal	507	Air Canada WestJet WestJet	320 73W 73S	\$ 382 \$ 308 \$ 316
Moncton - Montréal	706	Jazz	CRJ	\$ 229
Halifax - St. John's	880	Air Canada WestJet	320 73W	\$ 485 \$ 388
Winnipeg - Churchill	1,002	Calm Air	SF3	\$ 312
Toronto - Regina	2,026	Jazz	CR7	\$ 496
Toronto - Vancouver	3,343	Air Canada WestJet	762 73W	\$1,721 \$1,204
Vancouver - Victoria	64	Kelowna Flightcraft	72F	\$ 71
Hamilton - Montréal (YMX)	544	Cargojet	72F	\$ 288
Moncton - Montréal (YMX)	724	Kelowna Flightcraft	72F	\$ 334
Hamilton - Winnipeg	1,515	Kelowna Flightcraft	72F	\$ 582
Hamilton - Winnipeg	1,515	Cargojet	72F	\$ 521
Hamilton - Vancouver	3,347	Cargojet	72F	\$1,071
Sources: Consultants analysis				

4.1.1.2 Fuel and Oil

Fuel costs have increased substantially over the past two years. Table 4.5 charts this rise, for those airlines who publish public annual reports⁴. Note that the average price for all Level I and II airlines is heavily weighted by Air Canada's costs. For the purposes of this analysis, fuel costs for Air Canada (including Jazz) and WestJet have been defined as equivalent to 2005 actual values. It was assumed that the smaller airlines would be paying still higher rates, although certainly well below that of the Level III average, and a price of 70 cents was assumed to be typical for 2005.

⁴ These reported costs tend to be inclusive of the effects of long-term contracts and/or hedging practices, and may not fully represent the short-term effects of fuel price fluctuations.

TABLE 4.5
AIRLINE FUEL COST

AIRLINE	SYSTEM AVERAGE FUEL COST (¢/litre)			
	2003	2004	2005	1Q 2006
Air Canada	37.1	46.2	60.0	
WestJet	39.2	49.2	64.1	67.1
Total, Levels I and II	38.1	45.6	na	na
Total, Level III	60.1	61.4	na	na
Sources: Statistics Canada, Consultants analysis of airline reports.				
Air Canada price includes fuel handling and fuel hedging expenses.				

These rates can be applied to block fuel consumption for each route (Table 3.4) to yield fuel costs for each route, as per Table 4.6. Based on airline submissions to transport Canada, oil costs have been assumed to be insignificant on modern turbine-powered aircraft.

TABLE 4.6
FUEL COST ESTIMATES

ROUTE	DIST. (km.)	AIRLINES	AIRCRAFT	AVERAGE ONE-WAY FUEL COST
Vancouver - Victoria	64	Jazz	DH3	\$ 144
Ottawa - Montréal	152	Jazz	DH1	\$ 255
			DH3	\$ 290
Regina - Saskatoon	239	Transwest Air	J31	\$ 194
			SF3	\$ 364
Toronto - Sarnia	230	Air Georgian	BEH	\$ 239
Calgary - Edmonton	246	Jazz	DH3	\$ 357
		WestJet	73W	\$ 1,145
Toronto - Montréal	507	Air Canada	320	\$ 1,894
		WestJet	73W	\$ 1,884
		WestJet	73S	\$ 3,135
Moncton - Montréal	706	Jazz	CRJ	\$ 1,096
Halifax - St. John's	880	Air Canada	320	\$ 2,611
		WestJet	73W	\$ 2,694
Winnipeg - Churchill	1,002	Calm Air	SF3	\$ 974
Toronto - Regina	2,026	Jazz	CR7	\$ 3,732
Toronto - Vancouver	3,343	Air Canada	762	\$16,067
		WestJet	73W	\$ 8,389
Vancouver - Victoria	64	Kelowna Flightcraft	72F	\$ 1,253
Hamilton - Montréal (YMX)	544	Cargojet	72F	\$ 4,779
Moncton - Montréal (YMX)	724	Kelowna Flightcraft	72F	\$ 5,169
Hamilton - Winnipeg	1,515	KFC, Cargojet	72F	\$ 8,957
Hamilton - Vancouver	3,347	Cargojet	72F	\$17,124
Sources: Consultants analysis				

4.1.1.3 Landing, Navigation and Miscellaneous Fees

With the exception of basic airport fees, most of these charges, although paid by the airline, are reimbursed by the passenger through fare surcharges. In the case of the airport improvement fees, the airline will generally retain between 4% and 7% of the charge as an administration fee.

4.1.1.3.1 Airport Charges

Airport charges are normally broken down into at least three components:

- a landing fee, based on the gross weight of the aircraft. The charge rate per tonne generally increases with aircraft size and weight.
- a terminal charge, based on the number of installed seats in the aircraft.
- an airport improvement fee, based on the number of departing passengers. This generally ranges between \$5 and \$15 per departing passenger.

In addition to these three basic categories, some airports also charge separately for other elements such as the use of loading bridges or cargo stands, provision of airport security services (not to be confused with the Air Travellers Security Charge), etc.

Airport charges were obtained from each of the airports included in this study.

4.1.1.3.2 Air Travellers Security Charge (ATSC)

The ATSC is a federal government charge for the provision of airport security services. Effective July 1, 2006, the domestic rate of charge is \$4.95 per chargeable enplanement (tax included) to a maximum of \$9.90 per trip.

4.1.1.3.3 Navigation Fees

Nav Canada charges are based on two components:

- an enroute charge, based on the distance travelled and the square root of the weight of the aircraft.
- a terminal charge, based on the weight of the aircraft to the 0.85 power.

4.1.1.3.4 Cost Calculation for Airport, Security and Navigation Fees

Because most of the above fees are airport-specific, the route cost calculations in this report are based on the average of the two directional totals, modified by the passenger load factors developed in Section 3.6. The total costs have been summarized in Table 4.7.

TABLE 4.7
AIRPORT, SECURITY AND NAVIGATION FEE COST SUMMARY

ROUTE	AIRCRAFT	TOTAL COST (50% OF ROUND TRIP)				
		Airport (excl. AIF)	AIF	ATSC	Nav Can	Total
Vancouver - Victoria	DH3	\$244	\$263	\$173	\$251	\$931
Ottawa - Montréal	DH1	\$166	\$390	\$129	\$220	\$905
	DH3	\$219	\$525	\$173	\$255	\$1,172
Regina - Saskatoon	J31	\$57	\$50	\$50	\$118	\$275
	SF3	\$103	\$110	\$109	\$196	\$518
Toronto - Sarnia	BEH	\$201	\$180	\$59	\$77	\$517
Calgary - Edmonton	DH3	\$243	\$438	\$173	\$270	\$1,124
	73W	\$972	\$1,363	\$540	\$797	\$3,671
Toronto - Montréal	320	\$2,238	\$1,680	\$554	\$937	\$5,409
	73W	\$2,100	\$1,635	\$540	\$877	\$5,151
	73S	\$1,653	\$1,440	\$475	\$691	\$4,259
Moncton - Montréal	CRJ	\$238	\$262	\$173	\$415	\$1,089
Halifax - St. John's	320	\$1,015	\$1,400	\$554	\$1,065	\$4,035
	73W	\$969	\$1,363	\$540	\$1,000	\$3,871
Winnipeg - Churchill	SF3	\$158	\$165	\$109	\$301	\$733
Toronto - Regina	CR7	\$1,089	\$663	\$262	\$880	\$2,894
Toronto - Vancouver	762	\$4,307	\$2,490	\$822	\$2,920	\$10,538
	73W	\$2,220	\$1,635	\$540	\$1,744	\$6,138
Vancouver - Victoria	72F	\$434			\$889	\$1,323
Hamilton - Montréal (YMX)	72F	\$710			\$1,087	\$1,797
Moncton - Montréal (YMX)	72F	\$610			\$1,098	\$1,708
Hamilton - Winnipeg	72F (KW)	\$708			\$1,363	\$2,071
	72F (W8)	\$748			\$1,422	\$2,170
Hamilton - Vancouver	72F	\$637			\$2,053	\$2,691
Sources: Airport authorities, Nav Canada, Canada Revenue Agency.						
Numbers may not add due to rounding						

4.1.1.4 Aircraft Hull Insurance

Typical hull insurance rates are on the order of 1% of nominal aircraft value, which is calculated in Table 4.18. The proration by route has been based on aircraft hours, with the ratio equal to the route block time divided by the annual utilization for that particular aircraft type as calculated in Section 3.4. Detailed costs on a route basis are shown in Table 4.8

TABLE 4.8
HULL INSURANCE COST ESTIMATES

ROUTE	BLOCK TIME (min.)	AIRLINES	AIRCRAFT	AVERAGE ONE-WAY HULL INS. COST
Vancouver - Victoria	64	Jazz	DH3	\$ 7
Ottawa - Montréal	152	Jazz	DH1 DH3	\$ 7 \$ 11
Regina - Saskatoon	239	Transwest Air	J31 SF3	\$ 2 \$ 4
Toronto - Sarnia	230	Air Georgian	BEH	\$ 10
Calgary - Edmonton	246	Jazz WestJet	DH3 73W	\$ 14 \$ 67
Toronto - Montréal	507	Air Canada WestJet WestJet	320 73W 73S	\$ 65 \$ 105 \$ 3
Moncton - Montréal	706	Jazz	CRJ	\$ 79
Halifax - St. John's	880	Air Canada WestJet	320 73W	\$ 82 \$ 133
Winnipeg - Churchill	1,002	Calm Air	SF3	\$ 36
Toronto - Regina	2,026	Jazz	CR7	\$ 209
Toronto - Vancouver	3,343	Air Canada WestJet	762 73W	\$ 89 \$ 411
Vancouver - Victoria	64	Kelowna Flightcraft	72F	\$ 2
Hamilton - Montréal (YMX)	544	Cargojet	72F	\$ 9
Moncton - Montréal (YMX)	724	Kelowna Flightcraft	72F	\$ 8
Hamilton - Winnipeg	1,515	Kelowna Flightcraft	72F	\$ 14
Hamilton - Winnipeg	1,515	Cargojet	72F	\$ 15
Hamilton - Vancouver	3,347	Cargojet	72F	\$ 32

Sources: Consultants analysis

4.1.1.5 Miscellaneous Flight Operations Expense

An examination of airline submissions to Transport Canada suggests that the miscellaneous flight operations expenses category will add approximately 3% to the sum of the previous cost elements. Total flight operations expenses, on a route basis, are summarized in Table 4.9.

TABLE 4.9
TOTAL FLIGHT OPERATIONS EXPENSE ESTIMATES

ROUTE	AIRLINES	AIRCRAFT	TOTAL FLIGHT OPERATIONS EXPENSES
Vancouver - Victoria	Jazz	DH3	\$ 1,184
Ottawa - Montréal	Jazz	DH1 DH3	\$ 1,315 \$ 1,630
Regina - Saskatoon	Transwest Air	J31 SF3	\$ 573 \$ 1,006
Toronto - Sarnia	Air Georgian	BEH	\$ 887
Calgary - Edmonton	Jazz WestJet	DH3 73W	\$ 1,687 \$ 5,232
Toronto - Montréal	Air Canada WestJet WestJet	320 73W 73S	\$ 7,983 \$ 7,672 \$ 7,945
Moncton - Montréal	Jazz	CRJ	\$ 2,569
Halifax - St. John's	Air Canada WestJet	320 73W	\$ 7,429 \$ 7,298
Winnipeg - Churchill	Calm Air	SF3	\$ 2,117
Toronto - Regina	Jazz	CR7	\$ 7,552
Toronto - Vancouver	Air Canada WestJet	762 73W	\$29,267 \$16,627
Vancouver - Victoria	Kelowna Flightcraft	72F	\$ 2,729
Hamilton - Montréal (YMX)	Cargojet	72F	\$ 7,080
Moncton - Montréal (YMX)	Kelowna Flightcraft	72F	\$ 7,435
Hamilton - Winnipeg	Kelowna Flightcraft	72F	\$11,974
Hamilton - Winnipeg	Cargojet	72F	\$12,014
Hamilton - Vancouver	Cargojet	72F	\$21,545

4.1.2 Maintenance, Flight Equipment

Maintenance costs were based on a detailed analysis of aircraft types, utilization and cycle times by type, the airlines' schedules of maintenance checks, and the number of man-hours per check required. Industry figures, when used, have been corrected to reflect carriers in-house labour rate (where known). Maintenance burden was taken as 100%. These basic figures were then adjusted to reflect the age of the typical aircraft in the fleet. The summary by route is shown in Table 4.10.

TABLE 4.10
MAINTENANCE COST ESTIMATES

ROUTE	DIST. (km.)	AIRLINES	AIRCRAFT	AVERAGE ONE-WAY MAINTENANCE COST
Vancouver - Victoria	64	Jazz	DH3	\$ 199
Ottawa - Montréal	152	Jazz	DH1 DH3	\$ 308 \$ 326
Regina - Saskatoon	239	Transwest Air	J31 SF3	\$ 277 \$ 345
Toronto - Sarnia	230	Air Georgian	BEH	\$ 308
Calgary - Edmonton	246	Jazz WestJet	DH3 73W	\$ 425 \$ 836
Toronto - Montréal	507	Air Canada WestJet WestJet	320 73W 73S	\$1,564 \$1,313 \$ 850
Moncton - Montréal	706	Jazz	CRJ	\$ 755
Halifax - St. John's	880	Air Canada WestJet	320 73W	\$1,984 \$1,654
Winnipeg - Churchill	1,002	Calm Air	SF3	\$1,188
Toronto - Regina	2,026	Jazz	CR7	\$1,727
Toronto - Vancouver	3,343	Air Canada WestJet	762 73W	\$7,230 \$5,134
Vancouver - Victoria	64	Kelowna Flightcraft	72F	\$ 193
Hamilton - Montréal (YMX)	544	Cargojet	72F	\$ 872
Moncton - Montréal (YMX)	724	Kelowna Flightcraft	72F	\$ 903
Hamilton - Winnipeg	1,515	KFC, Cargojet	72F	\$1,575
Hamilton - Vancouver	3,347	Cargojet	72F	\$3,237
Sources: Consultants analysis				

4.1.3 In-Flight Service

The category of in-flight services includes cabin crew salaries, expenses and benefits; passenger food supplies; passenger liability insurance, and a catch-all category for miscellaneous expenses. Effectively, these categories apply only to passenger airlines, and the accompanying tables do not include Kelowna Flightcraft or Cargojet.

4.1.3.1 Cabin Crew

Current regulations require that airlines provide one flight attendant for each unit of forty or fewer passengers, for aircraft over 19 seats. Effectively, due to the complexities of crew rostering, this means one attendant per forty seats, and the costs have been estimated under that assumption. This requirement, related to aircraft types, is summarized in Table 4.11.

TABLE 4.11
FLIGHT ATTENDANTS REQUIRED PER AIRCRAFT

AIRCRAFT TYPE	SEATS	REQUIRED NO. OF FLIGHT ATTENDANTS
Boeing 767-233	207	6
Airbus A320-200	140	4
Boeing 737-700	136	4
Boeing 737-200	120	3
Canadair CRJ-700	75	2
Canadair CRJ-200	50	2
DHC-8-300	50	2
DHC-8-100	37	1
Saab 340B	34	1
Beech 1900C/D	18	0
BAe Jetstream 31	16	0
Sources: Canadian Civil Air Regulations, Consultants' analysis		

As with pilots, individual airlines are not willing to reveal the details of their labour agreements. For 2004, Statistics Canada reports that Level I and Level II airlines employed 9,948 "other flight personnel" at an average salary of \$44,623. This is an increase in employees from 9,478 in 2003, but the average salary dropped from \$47,122. As with flight crew, the three largest airlines represent about three-quarters of all employment by level I and II airlines (Table 4.12).

TABLE 4.12
FLIGHT ATTENDANT EMPLOYMENT

AIRLINE	EQUIVALENT FULL TIME EMPLOYEES			
	2002	2003	2004	2005
Air Canada (mainline)	6,789	5,898	5,837	6,010
Jazz			513	620
WestJet ⁵				1,300
Total Level I/II	9,158	9,478	9,948	na
Sources: Airline annual reports, Statistics Canada				

For study purposes, based on the above averages, and the differences in flight crew wages among the various aircraft types and airlines, the typical annual salaries for cabin crews were estimated as per Table 4.13, below, for each of the airline/aircraft combinations under consideration.

⁵ As of July, 2006, WestJet employed about 1,375 flight attendants. The 1,300 estimate for 2005 is based on the equivalent ratio for flight crew (Section 4.1.1)

TABLE 4.13
ESTIMATED CABIN CREW WAGES

	AIRLINE	UNIT CABIN CREW ANNUAL WAGE
Boeing 767-200	Air Canada	\$55,000
Airbus A320-200	Air Canada	\$50,000
Boeing 737-700	WestJet	\$40,000
Boeing 737-200	WestJet	\$40,000
Canadair CRJ-700	Jazz	\$40,000
Canadair CRJ-200	Jazz	\$35,000
DHC-8-300	Jazz	\$30,000
DHC-8-100	Jazz	\$30,000
Saab 340	Calm Air/Transwest	\$25,000
Sources: Consultants' estimates		

These averages can be applied to annual crew utilization (Section 3.5.2) and average block times for each route (Table 3.3) to yield cabin crew costs for each route, as per Table 4.14. As with pilots, the wages were augmented by 15% to cover expenses and benefits. This ratio has been declining with time.

TABLE 4.14
CABIN CREW COST ESTIMATES

ROUTE	DIST. (km.)	AIRLINES	AIRCRAFT	AVERAGE ONE- WAY CABIN CREW COST
Vancouver - Victoria	64	Jazz	DH3	\$ 24
Ottawa - Montréal	152	Jazz	DH1	\$ 39
			DH3	\$ 79
Regina - Saskatoon	239	Transwest Air	J31	\$ 0
			SF3	\$ 24
Toronto - Sarnia	230	Air Georgian	BEH	\$ 0
Calgary - Edmonton	246	Jazz	DH3	\$ 103
		WestJet	73W	\$ 211
Toronto - Montréal	507	Air Canada	320	\$ 445
		WestJet	73W	\$ 332
		WestJet	73S	\$ 256
Moncton - Montréal	706	Jazz	CRJ	\$ 191
Halifax - St. John's	880	Air Canada	320	\$ 564
		WestJet	73W	\$ 418
Winnipeg - Churchill	1,002	Calm Air	SF3	\$ 83
Toronto - Regina	2,026	Jazz	CR7	\$ 473
Toronto - Vancouver	3,343	Air Canada	762	\$2,884
		WestJet	73W	\$1,297
Sources: Consultants analysis				

4.1.3.2 Passenger Food Supplies

For domestic services, passenger food expenses have been dropping slightly, but revenues related to these services have risen sharply. Effectively, the industry can be subdivided into airlines which do not serve food (to any great extent) such as WestJet and Jazz, and those who do (such as Air Canada), although supplementary fees may be charged. Although these costs are usually examined on a per passenger basis, food service is more substantial on longer-haul flights, so a per-rpk standard is probably more accurate. On that basis, the 2004 reported range is roughly between one-fiftieth of a cent and one-half of a cent, and even that is expected to drop further.

For 2005 costing purposes, it was assumed that WestJet represented the lowest category, at about 0.0005 cents per rpk, while, for domestic services, the other airlines clustered at about 0.003 cents per rpk. For airlines without flight attendants, the cost was assumed to be zero. The individual route costs were low enough that an additional table in this text was believed to be unwarranted. However, the costs have been included in the overall in-flight service totals.

4.1.3.3 Passenger Liability Insurance

Passenger liability insurance costs have quite a bit of year-to-year variation, but in general, seem to be typically on the order of thirty cents per enplaned passenger. Again, while a table showing individual route charges was not included in this text, the costs were included in the in-flight totals.

4.1.3.4 Miscellaneous In-Flight Service Expenses

An examination of airline submissions to Transport Canada shows a wide range of residual cost values, including some shifts between years for the same airline which are simply not credible. It is the belief of the consultant that there has been some shifting of expense categorization within the in-flight cost sector. Nonetheless, on average, it would appear that the sum of the preceding elements should be increased by about 30% to reach an appropriate category total. Overall in-flight service expenses, on a route basis, are summarized in Table 4.15.

TABLE 4.15
TOTAL IN-FLIGHT SERVICE COST ESTIMATES

ROUTE	DIST. (km.)	AIRLINES	AIRCRAFT	AVERAGE ONE-WAY CABIN CREW COST
Vancouver - Victoria	64	Jazz	DH3	\$ 54
Ottawa - Montréal	152	Jazz	DH1	\$ 77
			DH3	\$ 137
Regina - Saskatoon	239	Transwest Air	J31	\$ 4
			SF3	\$ 60
Toronto - Sarnia	230	Air Georgian	BEH	\$ 5
Calgary - Edmonton	246	Jazz	DH3	\$ 181
		WestJet	73W	\$ 335
Toronto - Montréal	507	Air Canada	320	\$ 843
		WestJet	73W	\$ 510
		WestJet	73S	\$ 401
Moncton - Montréal	706	Jazz	CRJ	\$ 359
Halifax - St. John's	880	Air Canada	320	\$1,162
		WestJet	73W	\$ 648
Winnipeg - Churchill	1,002	Calm Air	SF3	\$ 202
Toronto - Regina	2,026	Jazz	CR7	\$1,054
Toronto - Vancouver	3,343	Air Canada	762	\$5,978
		WestJet	73W	\$1,966
Sources: Consultants analysis				

4.1.4 Aircraft and Traffic Servicing

The aircraft and traffic servicing function effectively covers those functions incidental to preparing an aircraft, its passengers and crew for flight, monitoring it while en route, and managing the arrival process after it has landed.

Employment and salary data for this classification is shown in Table 4.16, below. Both employment and wages for the major carriers have been shrinking quickly, while the trend for the smaller carriers has been the reverse. As these personnel cannot be assigned to a specific flight, their costs must be allocated. For the most part, they relate to the departure and arrival of passengers and flights, rather than the enroute portion, so it would seem appropriate that the allocation be on the basis of enplaned passengers.

TABLE 4.16
AIRCRAFT AND TRAFFIC SERVICING EMPLOYMENT

	EQUIVALENT FULL TIME EMPLOYEES				
	2000	2001	2002	2003	2004
Employees (Level I/II)	17,805	16,801	14,055	12,559	11,748
Employees (Level III)	713	712	607	712	755
Wages (000) (Level I/II)	\$787,797	\$810,546	\$674,756	\$602,271	\$543,231
Wages (000) (Level III)	\$15,650	\$15,981	\$14,824	\$18,820	\$19,849
Average Wage (Level I/II)	\$44,246	\$48,244	\$48,008	\$47,955	\$46,240
Average Wage (Level III)	\$21,950	\$22,445	\$24,422	\$26,433	\$26,290
Passengers (000) (Level I/II)	44,605	43,149	38,618	39,273	42,980
Passengers (000) (Level III)	2,220	2,164	1,901	2,249	2,583
Wage per Pax (Level I/II)	\$17.66	\$18.78	\$17.47	\$15.34	\$12.64
Wage per Pax (Level III)	\$7.05	\$7.38	\$7.80	\$8.37	\$7.68
Source: Consultants analysis of Statistics Canada data					

As there is no hard publicly available data on cost per airline, there are assumptions that must be made:

- The cost trend is continuing downwards, so 2005 averages should be below those for 2004.
- Dispatch, control and handling costs for international services will be higher than average, and this will affect Air Canada much more than the other airlines.
- Unit costs will be higher for the very small airlines, who will be unable to take advantage of economies of scale.
- Airlines within the Air Canada system will be able to take advantage of Air Canada services in this area.

Based on these trends, and an analysis of the carrier-specific Transport Canada data base, the following per passenger ratios have been assumed for traffic and servicing wages and salaries, including benefits:

- \$15 for Transwest and Calm Air
- \$10 for Air Canada
- \$5 for WestJet, Jazz and Air Georgian

Unfortunately, not all airlines handle these expenses with their own staff, and effectively “purchase” these services from others⁶, which would reduce the wage and salary totals, but increase the “purchased services” total. Again, an analysis of the available Transport Canada data suggests the following per-passenger costs for non-salary elements of aircraft and traffic servicing:

- \$20 for Air Canada and WestJet.
- \$10 for Jazz and Air Georgian.
- None for Calm Air and Transwest.

The sum of these two categories provides the following per-enplaned-passenger total for the airlines under consideration:

- \$30 for Air Canada.
- \$25 for WestJet.
- \$15 for the other passenger airlines.

Cargo airlines do not experience passenger traffic servicing costs. There will be some aircraft servicing costs, however, but these must be allocated against a different operational parameter. Based on limited available information, it would appear that a charge of about two cents per tonne-km is reasonable. It would be preferable to use enplaned tonnes as the independent variable, but this number is not reported for charter services, which make up the bulk of the carriage for both Cargojet and Kelowna Flightcraft.

The total cost of aircraft and traffic serving expenses by route is shown in Table 4.17.

⁶ For example, passenger handling at Toronto for Jazz is provided by Air Canada.

TABLE 4.17
AIRCRAFT AND TRAFFIC SERVICING COST ESTIMATES

ROUTE	DIST. (km.)	AIRLINES	AIRCRAFT	AVERAGE ONE-WAY COST
Vancouver - Victoria	64	Jazz	DH3	\$ 525
Ottawa - Montréal	152	Jazz	DH1 DH3	\$ 390 \$ 525
Regina - Saskatoon	239	Transwest Air	J31 SF3	\$ 150 \$ 330
Toronto - Sarnia	230	Air Georgian	BEH	\$ 180
Calgary - Edmonton	246	Jazz WestJet	DH3 73W	\$ 525 \$2,725
Toronto - Montréal	507	Air Canada WestJet WestJet	320 73W 73S	\$3,360 \$2,725 \$2,400
Moncton - Montréal	706	Jazz	CRJ	\$ 525
Halifax - St. John's	880	Air Canada WestJet	320 73W	\$3,360 \$2,727
Winnipeg - Churchill	1,002	Calm Air	SF3	\$ 330
Toronto - Regina	2,026	Jazz	CR7	\$ 795
Toronto - Vancouver	3,343	Air Canada WestJet	762 73W	\$4,980 \$2,725
Vancouver - Victoria	64	Kelowna Flightcraft	72F	\$ 14
Hamilton - Montréal (YMX)	544	Cargojet	72F	\$ 122
Moncton - Montréal (YMX)	724	Kelowna Flightcraft	72F	\$ 162
Hamilton - Winnipeg	1,515	KFC, Cargojet	72F	\$ 339
Hamilton - Vancouver	3,347	Cargojet	72F	\$ 749
Sources: Consultants analysis				

4.1.5 Commissions

Airline commissions have been consistently declining over the past decade, from 7-8% of total expenses (excluding fuel) in 2000, to 3-4% in 2004. This has been the result of a major push towards internet booking, in conjunction with corresponding reductions in travel agent remunerations formulae. As all passenger airlines, even the smaller ones, now have on-line reservations capability, this ratio should not vary greatly among airlines. Accordingly, the current level of commissions has been set at 3.0% for all passenger carriers in 2005. Commissions are not broken out as a line item for all-cargo carriers, and are instead included in the promotion and sales total under indirect costs (Section 4.3). Total commission cost estimates are shown in Table 4.18.

TABLE 4.18
COMMISSION COST ESTIMATES

ROUTE	DIST. (km.)	AIRLINES	AIRCRAFT	AVERAGE ONE-WAY COST
Vancouver - Victoria	64	Jazz	DH3	\$ 68
Ottawa - Montréal	152	Jazz	DH1 DH3	\$ 69 \$ 88
Regina - Saskatoon	239	Transwest Air	J31 SF3	\$ 34 \$ 59
Toronto - Sarnia	230	Air Georgian	BEH	\$ 44
Calgary - Edmonton	246	Jazz WestJet	DH3 73W	\$ 94 \$ 302
Toronto - Montréal	507	Air Canada WestJet WestJet	320 73W 73S	\$ 516 \$ 394 \$ 311
Moncton - Montréal	706	Jazz	CRJ	\$ 126
Halifax - St. John's	880	Air Canada WestJet	320 73W	\$ 501 \$ 373
Winnipeg - Churchill	1,002	Calm Air	SF3	\$ 132
Toronto - Regina	2,026	Jazz	CR7	\$ 303
Toronto - Vancouver	3,343	Air Canada WestJet	762 73W	\$ 1,339 \$ 725
Sources: Consultants analysis				

4.2 Aircraft Ownership Costs

Aircraft ownership costs were considered as neither a direct nor an indirect cost, for the purposes of the initial cost analysis. Conventionally, an aircraft lease is considered a direct cost, while depreciation of owned aircraft is not. Yet both elements basically represent the same concept. Individual airlines have a variety of aircraft-specific ownership and lease arrangements for their fleet, the details of which are generally not public knowledge. While the accounts in the annual reports will show lease payments and depreciation in total, they will rarely be broken down among individual aircraft. Accordingly, it was believed best to adopt the consistent approach of determining the current market value for each of the aircraft under consideration, and then calculate the nominal depreciation charge. This methodology has the advantage of applying a consistent procedure across a wide variety of aircraft types, so that differences in accounting requirements will be eliminated. Table 4.19 lists the typical current market values utilized. These values are based on an aircraft in average condition for its age (mid-life/mid-time maintenance status), certified for Canadian operations. However, individual values can vary substantially from the stated figure.

TABLE 4.19
CURRENT MARKET VALUE

AIRLINE	TYPE	AGE	VALUE	
			US\$ mm	CDN\$ mm
AC	A320	13	16.9	18.8
AC	B767-200	19	6.5	7.2
AC*	CRJ-200	4	13.2	14.7
AC*	CRJ-705	1	22.5	25.0
AC*	DHC8-100	18	2.2	2.4
AC*	DHC8-300	16	3.5	3.9
ZX	B1900D	9	2.1	2.3
MO	SF340B	13	2.5	2.8
WS	B737-700	2	33.8	37.6
WS	B737-200	28	0.7	0.8
9T	Jetstream 31	18	0.4	0.4
9T	SF 340A	19	1.0	1.1
KW	B727-200F	31	0.9	1.0
W8	B727-200F	27	1.0	1.1

Sources: Canadian Civil Aircraft Register, Airliner Price Guide, Avmark Newsletter, and other industry publications. "Age" is the fleet average age in years for the airline and type combination listed

Depreciation policies vary widely by airline. At present, the policies of the major publicly traded airlines can be summarized as follows:

- Air Canada: straight-line 20-25 years to 10-15% residual value.
- Jazz: straight line 20-30 years to 20% residual value.
- Cargojet: amortized on a declining balance basis at 7½% per year.
- WestJet: not explicitly stated, but approximately equivalent to 5% per year.

In order to provide a consistent policy, it is proposed that all aircraft be depreciated on a straight line basis to a 15% residual value over the following periods:

- aircraft newer than 5 years old; 20 years.
- aircraft 5-10 years old; 15 years.
- aircraft older than 10 years; 10 years.

The computed annual depreciation values are summarized in Table 4.20, while the depreciation per flight matrix is shown in Table 4.21. The allocations are based on the average block times (Table 3.3) as a percentage of annual utilization (Table 3.5), for each individual airline/aircraft type combination.

TABLE 4.20
ANNUAL DEPRECIATION

AIRLINE	TYPE	AGE	VALUE (CDN\$ mm)	ANNUAL DEPRECIATION (CDN\$ 000)
AC	A320	13	18.8	1,598
AC	B767-200	19	7.2	612
AC*	CRJ-200	4	14.7	625
AC*	CRJ-705	1	25.0	1,063
AC*	DHC8-100	18	2.4	204
AC*	DHC8-300	16	3.9	332
ZX	B1900D	9	2.3	130
MO	SF340B	13	2.8	238
WS	B737-700	2	37.6	1,598
WS	B737-200	28	0.8	68
9T	Jetstream 31	18	0.4	34
9T	SF 340A	19	1.1	94
KW	B727-200F	31	1.0	85
W8	B727-200F	27	1.1	94
Sources: Consultants analysis				

TABLE 4.21
DEPRECIATION COST ESTIMATES

ROUTE	DIST. (km.)	AIRLINES	AIRCRAFT	AVG ONE-WAY DEPR. COST
Vancouver - Victoria	64	Jazz	DH3	\$ 55
Ottawa - Montréal	152	Jazz	DH1	\$ 56
			DH3	\$ 91
Regina - Saskatoon	239	Transwest Air	J31	\$ 13
			SF3	\$ 35
Toronto - Sarnia	230	Air Georgian	BEH	\$ 56
Calgary - Edmonton	246	Jazz	DH3	\$ 119
		WestJet	73W	\$ 285
Toronto - Montréal	507	Air Canada	320	\$ 552
		WestJet	73W	\$ 447
		WestJet	73S	\$ 28
Moncton - Montréal	706	Jazz	CRJ	\$ 336
Halifax - St. John's	880	Air Canada	320	\$ 700
		WestJet	73W	\$ 563
Winnipeg - Churchill	1,002	Calm Air	SF3	\$ 307
Toronto - Regina	2,026	Jazz	CR7	\$ 890
Toronto - Vancouver	3,343	Air Canada	762	\$ 753
		WestJet	73W	\$1,748
Vancouver - Victoria	64	Kelowna Flightcraft	72F	\$ 15
Hamilton - Montréal (YMX)	544	Cargojet	72F	\$ 73
Moncton - Montréal (YMX)	724	Kelowna Flightcraft	72F	\$ 68
Hamilton - Winnipeg	1,515	Kelowna Flightcraft Cargojet	72F	\$ 119
			72F	\$ 131
Hamilton - Vancouver	3,347	Cargojet	72F	\$ 270
Sources: Consultants analysis				

4.3 Indirect Operating Costs

Indirect operating costs consist of the following categories:

- Promotion and sales, excluding commissions (which is considered a direct cost), but including advertising, publicity and other promotional expenses.
- Maintenance of ground property and equipment, inclusive of depreciation.
- General administration expenses, including such elements as building rental, communications, and a variety of other categories which cannot be directly associated with operational parameters.

As with certain other parameters discussed above, there is a wide variation among airlines, as well as a wide year-to-year variation for the same airline. In general the sum of these expense categories has ranged between 10% and 30% of total expenses exclusive of fuel, with two clusters: around 15% for airlines with limited overheads, such as WestJet and Jazz, and about 25% for the more full service airlines. These percentages are considered to be a reasonable averages. Indirect operating costs are summarized on a route basis in Table 4.22.

TABLE 4.22
INDIRECT COST ESTIMATES

ROUTE	DIST. (km.)	AIRLINES	AIRCRAFT	AVG ONE-WAY IOC
Vancouver - Victoria	64	Jazz	DH3	\$ 342
Ottawa - Montréal	152	Jazz	DH1 DH3	\$ 346 \$ 442
Regina - Saskatoon	239	Transwest Air	J31 SF3	\$ 286 \$ 491
Toronto - Sarnia	230	Air Georgian	BEH	\$ 219
Calgary - Edmonton	246	Jazz WestJet	DH3 73W	\$ 472 \$ 1,512
Toronto - Montréal	507	Air Canada WestJet WestJet	320 73W 73S	\$ 4,308 \$ 1,972 \$ 1,553
Moncton - Montréal	706	Jazz	CRJ	\$ 631
Halifax - St. John's	880	Air Canada WestJet	320 73W	\$ 4,175 \$ 1,865
Winnipeg - Churchill	1,002	Calm Air	SF3	\$ 1,101
Toronto - Regina	2,026	Jazz	CR7	\$ 1,516
Toronto - Vancouver	3,343	Air Canada WestJet	762 73W	\$11,160 \$ 3,624
Vancouver - Victoria	64	Kelowna Flightcraft	72F	\$ 300
Hamilton - Montréal (YMX)	544	Cargojet	72F	\$ 594
Moncton - Montréal (YMX)	724	Kelowna Flightcraft	72F	\$ 600
Hamilton - Winnipeg	1,515	Kelowna Flightcraft Cargojet	72F 72F	\$ 891 \$ 900
Hamilton - Vancouver	3,347	Cargojet	72F	\$ 1,531

Sources: Consultants analysis

4.4 Total Operating Costs

Total operating costs are the sum of the three elements discussed above: direct costs, depreciation and indirect costs. Note that these totals do not include interest, which is not an operating cost in airline accounting practice. These costs are summarized in Table 4.23.

TABLE 4.23
TOTAL OPEARATING COST ESTIMATES

ROUTE	AIRLINES	AIRCRAFT	ONE-WAY TOT. COST	PER PAX	PER RPK (cents)
Vancouver - Victoria	Jazz	DH3	\$ 2,427	\$ 69	108
Ottawa - Montréal	Jazz	DH1	\$ 2,560	\$ 98	65
		DH3	\$ 3,240	\$ 93	61
Regina - Saskatoon	Transwest Air	J31	\$ 1,338	\$ 134	56
		SF3	\$ 2,326	\$ 106	44
Toronto - Sarnia	Air Georgian	BEH	\$ 1,699	\$ 142	62
Calgary - Edmonton	Jazz	DH3	\$ 3,503	\$ 100	41
	WestJet	73W	\$ 11,227	\$ 103	42
Toronto - Montréal	Air Canada	320	\$ 19,127	\$ 171	34
	WestJet	73W	\$ 15,033	\$ 138	27
	WestJet	73S	\$ 13,488	\$ 140	28
Moncton - Montréal	Jazz	CRJ	\$ 5,300	\$ 151	21
Halifax - St. John's	Air Canada	320	\$ 19,311	\$ 172	20
	WestJet	73W	\$ 15,127	\$ 139	16
Winnipeg - Churchill	Calm Air	SF3	\$ 5,378	\$ 244	24
Toronto - Regina	Jazz	CR7	\$ 13,837	\$ 261	13
Toronto - Vancouver	Air Canada	762	\$ 60,708	\$ 366	11
	WestJet	73W	\$ 32,548	\$ 299	9
				PER REV. TONNE	PER RTK (cents)
Vancouver - Victoria	Kelowna Flightcraft	72F	\$ 3,251	\$ 301	471
Hamilton - Montréal (YMX)	Cargojet	72F	\$ 8,740	\$ 810	149
Moncton - Montréal (YMX)	Kelowna Flightcraft	72F	\$ 9,168	\$ 850	117
Hamilton - Winnipeg	Kelowna Flightcraft	72F	\$ 14,898	\$ 1,381	91
	Cargojet	72F	\$ 14,960	\$ 1,387	92
Hamilton - Vancouver	Cargojet	72F	\$ 27,333	\$ 2,534	76

Source: Consultants analysis

It is difficult to provide a valid comparison of the relative importance of the various cost elements, because there is a wide variety of routes and aircraft types involved. Fixed costs will be far more important on short routes, such as Vancouver - Victoria, than on transcontinental ones. By the same token, modern aircraft, such as the B737-700 are far more fuel efficient than older ones, such as the B727-200F. In order to partially account for these differences, Table 4.24 provides a comparison, normalized to total operating costs, for a selection of routes covering the total range of city-pairs examined.

TABLE 4.24
RELATIVE IMPORTANCE OF COSTS

COST ELEMENT	PER CENT OF TOTAL		
	YVR-YYJ AC* DH3	YHZ-YYT AC A320	YYZ-YVR WS B73W
Flight crew	2.8%	2.5%	3.7%
Fuel and oil	6.0%	13.5%	25.8%
Landing, navigation and miscellaneous fees	38.4%	20.9%	18.9%
Hull insurance	0.3%	0.4%	1.3%
Miscellaneous flight operations expenses	1.4%	1.1%	1.5%
Maintenance, flight equipment	8.2%	10.3%	15.8%
Cabin crew	1.0%	2.9%	4.0%
Passenger food supplies	0.3%	1.5%	0.6%
Passenger liability insurance	0.4%	0.2%	0.1%
Miscellaneous in-flight service expenses	0.5%	1.4%	1.4%
Aircraft and traffic servicing	21.6%	17.4%	8.4%
Commissions	2.8%	2.6%	2.2%
Aircraft Ownership Costs	2.3%	3.6%	5.4%
Indirect Operating Costs	14.1%	21.6%	11.1%
Total Operating Costs	100.0%	100.0%	100.0%

4.5 Cost of Capital

In airline analysis, interest expense or other components of the cost of capital are not usually considered to be part of operating expenses. Capital assets themselves are normally split into two components: flight equipment and ground property and equipment. For flight equipment, imputed asset values have been determined in Section 4.2, and therefore a nominal cost of capital can be easily calculated. Unfortunately, data for ground property and equipment, while available for some carriers, is not available for all, and the accounting treatment can differ substantially among them.

On an industry-wide basis, Table 4.25 analyzes Statistics Canada balance sheet data for Levels I and II airlines for 2001 - 2004. As Air Canada filed for reorganization in April 2003, the data for the last two years (particularly 2004) may be unrepresentative of a more normal state of affairs. Although there appear to be inconsistencies in year-to-year valuation, it is clear that flight equipment represents by far the largest component of the asset base (exclusive of investments and other monetary assets).

TABLE 4.25
CAPITAL ASSET ANALYSIS

ASSET (\$ 000,000)	2001	2002	2003	2004
Operating property and equipment*	5,496	5,264	5,345	6,015
Accumulated depreciation	2,214	2,355	2,463	544
Net operating property and equipment	3,282	2,909	2,882	5,471
Non-operating property and equipment	487	497	705	155
Accumulated depreciation	232	223	378	30
Net non-operating property and equipment	255	274	327	125
Total property and equipment	5,983	5,761	6,050	6,170
Accumulated depreciation	2,446	2,578	2,841	574
Net total property and equipment	3,537	3,183	3,209	5,596
Net operating property and equipment as a per cent of total	93%	91%	90%	98%
Source: Consultants analysis of Statistics Canada data.				
*Operating property and equipment includes aircraft operated under capital leases.				

Again, it should be noted that the accounting treatment of aircraft will vary according to the form of ownership involved. There are three basic types of aircraft ownership.

- The aircraft is owned and operated by the airline. Its value, adjusted for depreciation, is shown on the airline's balance sheet.
- Capital (or finance) lease. This is a long-term lease, at the conclusion of which the airline has the option of purchasing the aircraft at an agreed-upon price. Generally, the lease payments will total more than 90% of the aircraft value. This form of lease is also included in the airline's balance sheet.
- Operating lease. Generally a lease whose term is short (usually from two to seven years) compared to the economically useful life of the aircraft. These lease costs are normally expensed, and are not included in the balance sheet.

As noted in Section 4.2, in order to provide consistent comparisons, it has been assumed that all aircraft are owned, and carried on the airline's books at current market value. This assumption will allow the costing analysis to be carried out in a uniform manner.

The value of the flight equipment operated on the sample routes has been estimated in Table 4.19. In order to maintain parity with the valuation of other modes, a cost of capital range of between 6.0% to 8.6% has been utilized. When applied to the flight equipment value, these percentages will yield an annual cost of capital per aircraft. This cost can then be factored by annual aircraft utilizations (Table 3.5) and individual route block times (Table 3.3) to yield a cost of capital estimate for each route. These calculations have been summarized in Table 4.26.

TABLE 4.26
COST OF CAPITAL ESTIMATES

ROUTE	AIRLINES	AIRCRAFT	ONE-WAY TOTAL COST		PER ASK (cents)		PER RPK (cents)	
			LOW	HIGH	LOW	HIGH	LOW	HIGH
Vancouver - Victoria	Jazz	DH3	\$39	\$56	1.22	1.75	1.75	2.51
Ottawa - Montréal	Jazz	DH1	\$40	\$57	0.70	1.01	1.00	1.43
		DH3	\$64	\$92	0.84	1.21	1.21	1.73
Regina - Saskatoon	Transwest Air	J31	\$10	\$14	0.25	0.36	0.40	0.57
		SF3	\$25	\$35	0.30	0.44	0.47	0.67
Toronto - Sarnia	Air Georgian	BEH	\$60	\$86	1.37	1.96	2.17	3.11
Calgary - Edmonton	Jazz	DH3	\$84	\$120	0.68	0.98	0.97	1.39
	WestJet	73W	\$402	\$576	1.20	1.72	1.50	2.15
Toronto - Montréal	Air Canada	320	\$389	\$558	0.55	0.79	0.69	0.98
	WestJet	73W	\$631	\$904	0.92	1.31	1.14	1.64
	WestJet	73S	\$20	\$29	0.03	0.05	0.04	0.06
Moncton - Montréal	Jazz	CRJ	\$474	\$680	1.34	1.93	1.92	2.75
Halifax - St. John's	Air Canada	320	\$494	\$708	0.40	0.57	0.50	0.72
	WestJet	73W	\$795	\$1,140	0.66	0.95	0.83	1.19
Winnipeg - Churchill	Calm Air	SF3	\$217	\$311	0.64	0.91	0.98	1.41
Toronto - Regina	Jazz	CR7	\$1,257	\$1,801	0.83	1.19	1.17	1.68
Toronto - Vancouver	Air Canada	762	\$532	\$762	0.08	0.11	0.10	0.14
	WestJet	73W	\$2,468	\$3,537	0.54	0.78	0.68	0.97
					PER ATK (cents)		PER RTK (cents)	
Vancouver - Victoria	Kelowna Flightcraft	72F	\$10	\$15	0.87	1.24	1.50	2.15
Hamilton - Montréal	Cargojet	72F	\$51	\$74	0.51	0.73	0.87	1.25
Moncton - Montréal	Kelowna Flightcraft	72F	\$48	\$69	0.36	0.51	0.62	0.89
Hamilton - Winnipeg	Kelowna Flightcraft	72F	\$84	\$121	0.30	0.43	0.52	0.74
	Cargojet	72F	\$93	\$133	0.33	0.47	0.57	0.81
Hamilton - Vancouver	Cargojet	72F	\$191	\$273	0.31	0.44	0.53	0.76
Source: Consultants analysis								

Finally, capital costs (both depreciation, and the cost of capital from Tables 4.21 and 4.26) were grossed up by 10% in order to account for the allocation of the non-operating asset costs to the selected routes. This percentage was determined by a rough assessment of the 2001-2003 average from Table 4.25.

4.6 Total Costs

Finally, the costs of capital have been added to the operating cost totals from Table 4.23 to yield an estimate of aggregate airline modal costs, as per Table 4.27.

TABLE 4.27
TOTAL COST ESTIMATES

ROUTE	AIRLINES	AIRCRAFT	ONE-WAY TOTAL COST		PER ASK (cents)		PER RPK (cents)	
			LOW	HIGH	LOW	HIGH	LOW	HIGH
Vancouver - Victoria	Jazz	DH3	\$2,476	\$2,494	77	78	111	111
Ottawa - Montréal	Jazz	DH1	\$2,609	\$2,628	46	47	66	67
		DH3	\$3,320	\$3,350	44	44	62	63
Regina - Saskatoon	Transwest Air	J31	\$1,350	\$1,355	35	35	56	57
		SF3	\$2,357	\$2,369	29	29	45	45
Toronto - Sarnia	Air Georgian	BEH	\$1,770	\$1,798	41	41	64	65
Calgary - Edmonton	Jazz	DH3	\$3,607	\$3,647	29	30	42	42
	WestJet	73W	\$11,698	\$11,890	35	36	44	44
Toronto - Montréal	Air Canada	320	\$19,610	\$19,796	28	28	35	35
	WestJet	73W	\$15,772	\$16,072	23	23	29	29
	WestJet	73S	\$13,513	\$13,523	22	22	28	28
Moncton - Montréal	Jazz	CRJ	\$5,855	\$6,081	17	17	24	25
Halifax - St. John's	Air Canada	320	\$19,925	\$20,160	16	16	20	20
	WestJet	73W	\$16,059	\$16,438	13	14	17	17
Winnipeg - Churchill	Calm Air	SF3	\$5,647	\$5,750	17	17	26	26
Toronto - Regina	Jazz	CR7	\$15,308	\$15,907	10	10	14	15
Toronto - Vancouver	Air Canada	762	\$61,368	\$61,621	9	9	11	11
	WestJet	73W	\$35,437	\$36,614	8	8	10	10
					PER ATK (cents)		PER RTK (cents)	
Vancouver - Victoria	Kelowna Flightcraft	72F	\$3,264	\$3,268	274	275	473	473
Hamilton - Montréal	Cargojet	72F	\$8,804	\$8,828	87	87	150	150
Moncton - Montréal	Kelowna Flightcraft	72F	\$9,228	\$9,251	69	69	118	118
Hamilton - Winnipeg	Kelowna Flightcraft	72F	\$15,003	\$15,043	53	53	92	92
	Cargojet	72F	\$15,075	\$15,119	53	54	92	93
Hamilton - Vancouver	Cargojet	72F	\$27,333	\$27,569	44	44	76	77
Source: Consultants analysis								

5. ANALYSIS OF MARGINAL COSTS

Section 4 developed the way in which airline costs can be built up, and estimated their current levels. This section examines cost composition, and the manner in which they should be assessed with respect to their short-term and long-term behaviour.

In an analysis of comparative transportation modes, it is generally accepted that *marginal costing* is usually recommended when travel would have occurred regardless of the number of passengers or the load carried, whereas *average costing* is used in circumstances where the travel does not take place unless there is specific demand for such services. The full cost calculations in Section 4 are effectively average costs; full costs averaged over a particular route segment. As a determination of marginal costs often requires a definition of both the time period under consideration (a longer time period will increase marginal costs as a percentage of average costs) and the extent of the deviation from average (a small deviation will incur a lower relative marginal cost level than a larger one). In the extreme case, very short-term marginal costs are close to zero, while longer-term ones approach the average level.

From a conceptual point of view, it may be best to define the costs in terms of concrete examples. Two have been used and costed in this report.

- Very short-term marginal costs. These relate to the addition one or two passengers to an existing flight, with no change to schedules.
- Medium-term marginal costs. These would allow for shifts in schedules as the airline adapts to changing traffic patterns, but no change to overall fleet size or composition.

5.1 Very Short-Term Marginal Costs

The smallest practical case would be the addition of a single passenger to an existing flight on a one-time basis. There would be no net effect on aircraft size, type or schedule frequency. The effect on costs would be as follows:

- Flight operations: no change except for fuel (a very slight increase) and any per-passenger terminal or other third-party charges.
- Maintenance of Flight Equipment: no change.
- In-flight service: no change except for consumables (food, etc.). Liability insurance will not change, as there is not a specific per person charge.
- Aircraft and Traffic Servicing: no change.
- Commissions: the average should be charged.
- Aircraft ownership costs: no change.
- Indirect operating costs: no change.

These costs can be easily calculated¹, and are summarized in Table 5.1, with the marginal cost calculated as a percentage of the average full cost. The two percentages in the right-hand column are based on different treatments of the reimbursable airport and security fees. While technically a cost to the airlines, they are recouped as surcharges on the airline tickets. In fact, the airlines retain a handling fee in the range of 4 - 8% of the AIF. For the purposes of this analysis, however, this fee has not been deducted from the marginal cost.

TABLE 5.1
VERY SHORT-TERM MARGINAL COST ANALYSIS

ROUTE	AIRLINES	AIRCRAFT	MARGINAL COST AS % OF AVG.	
			A	B
Vancouver - Victoria	Jazz	DH3	22.7	4.3
Ottawa - Montréal	Jazz	DH1	25.4	5.2
		DH3	26.6	5.0
Regina - Saskatoon	Transwest Air	J31	12.9	5.5
		SF3	15.7	6.3
Toronto - Sarnia	Air Georgian	BEH	19.5	5.4
Calgary - Edmonton	Jazz	DH3	23.1	5.5
	WestJet	73W	21.9	4.9
Toronto - Montréal	Air Canada	320	17.3	5.6
	WestJet	73W	19.8	5.3
	WestJet	73S	21.3	7.1
Moncton - Montréal	Jazz	CRJ	16.1	7.9
Halifax - St. John's	Air Canada	320	17.0	6.8
	WestJet	73W	18.9	6.3
Winnipeg - Churchill	Calm Air	SF3	12.9	7.3
Toronto - Regina	Jazz	CR7	16.6	9.9
Toronto - Vancouver	Air Canada	762	15.8	10.2
	WestJet	73W	14.7	7.9
Vancouver - Victoria	Kelowna	72F	7.7	7.7
Hamilton - Montréal (YMX)	Cargojet	72F	10.9	10.9
Moncton - Montréal (YMX)	Kelowna	72F	11.3	11.3
Hamilton - Winnipeg	Kelowna	72F	12.0	12.0
	Cargojet	72F	12.0	12.0
Hamilton - Vancouver	Cargojet	72F	12.5	12.5
The "A" cost calculation is the marginal cost as a percentage of the average cost, including reimbursable fees such as the AIF. The "B" cost calculation excludes these fees.				
Source: Consultants analysis				

¹ The exception is marginal fuel cost, which will be a function of aircraft type, passenger load, and sector distance. This calculation has been simplified by assuming that an aircraft's payload will typically amount to about 20% of its take-off weight. This means that only 20% of the fuel burn is attributable to passengers, so that, for example, the addition of 1 passenger to a 50 passenger load would increase the hypothetical fuel burn by 2% of 20%, or 0.4%.

5.2 Medium-Term Marginal Costs

Medium-term marginal costs might relate to such changes as a seasonal flight pattern shift. In general, the overhead structure will not be affected, but more direct cost components will be. The detailed effects on costs would be as follows:

- Flight operations: these would be fully chargeable.
- Maintenance of Flight Equipment: this would also be fully chargeable.
- In-flight service: also fully chargeable.
- Aircraft and Traffic Servicing: not chargeable.
- Commissions: the average should be charged.
- Aircraft ownership costs: not chargeable.
- Indirect operating costs: not chargeable.

These costs can also be easily calculated, and are summarized in Table 5.2, with the marginal cost calculated as a percentage of the average full cost. As with Table 5.1, the two percentages in the right hand column are based on different treatments of the reimbursable airport and security fees.

TABLE 5.2
MEDIUM-TERM MARGINAL COST ANALYSIS

ROUTE	AIRLINES	AIRCRAFT	MARGINAL COST AS % OF AVG.	
			A	B
Vancouver - Victoria	Jazz	DH3	62.0	43.6
Ottawa - Montréal	Jazz	DH1	69.1	48.8
		DH3	67.3	45.8
Regina - Saskatoon	Transwest Air	J31	66.4	59.0
		SF3	63.2	53.8
Toronto - Sarnia	Air Georgian	BEH	73.2	59.1
Calgary - Edmonton	Jazz	DH3	68.2	50.6
	WestJet	73W	59.7	42.6
Toronto - Montréal	Air Canada	320	57.0	45.3
	WestJet	73W	65.8	51.3
	WestJet	73S	70.5	56.3
Moncton - Montréal	Jazz	CRJ	71.9	63.6
Halifax - St. John's	Air Canada	320	57.4	47.2
	WestJet	73W	65.9	53.4
Winnipeg - Churchill	Calm Air	SF3	67.7	62.1
Toronto - Regina	Jazz	CR7	76.9	70.2
Toronto - Vancouver	Air Canada	762	72.2	66.6
	WestJet	73W	75.1	68.3
Vancouver - Victoria	Kelowna	72F	89.9	89.9
Hamilton - Montréal (YMX)	Cargojet	72F	91.0	91.0
Moncton - Montréal (YMX)	Kelowna	72F	90.9	90.9
Hamilton - Winnipeg	Kelowna	72F	90.9	90.9
	Cargojet	72F	90.8	90.8
Hamilton - Vancouver	Cargojet	72F	90.7	90.7
The "A" cost calculation is the marginal cost as a percentage of the average cost, including reimbursable fees such as the AIF. The "B" cost calculation excludes these fees.				
Source: Consultants analysis				

5.3 Joint Costing of Belly Cargo

The use of one particular cost allocation method, rather than another, depends on a number of factors – purpose of the analysis, evaluation of short or long-run costs, available data, etc., quite apart from either legal or taxation requirements. For this particular study, an analysis of marginal operating costs was a "primary objective of this study" according to the Terms of Reference. Allocation of other costs, such as overhead, administrative, depreciation, financing and social costs are beyond the scope of this study.

As noted above, marginal costing is the logical method to use in the evaluation of the costs of belly cargo carriage.

As already indicated, belly cargo can generate additional revenues with increasing volumes of the cargo hold. For many of the small aircraft described above in Table 3.2, the carriage of cargo is an insignificant portion of passenger traffic on these routes. On the other hand, for the operators of larger aircraft, the cubic capacity of the cargo hold pre-

sents an opportunity for both substantial additional revenues and also some additional costs (fuel, staffing, etc.) incurred in transporting this freight. However, as even these larger aircraft are configured primarily for passenger traffic, and cargo carriage is incidental to these services, there are a number of costs, such as airport charges, that are incurred whether cargo is carried or not. For this reason, apportioning part of these expenses to cargo traffic should be excluded. Marginal costing could then be applied to actual incremental costs of carrying cargo.

Table 5.3 compares the potential passenger revenues from those routes where both passenger and cargo aircraft were costed. For the purposes of this comparison, Hamilton and Toronto were considered to be co-terminals. Unit cargo revenue potential was assumed equal to the full cost of operating an all-cargo aircraft at a typical 58% load factor, based on the per tonne costs from Table 4.23. Potential cargo revenue on passenger aircraft was estimated by multiplying the available weight for cargo as calculated in Table 3.2, by the unit cost (assumed equivalent to revenue) per tonne, also at a 58% load factor. Passenger revenue was also assumed equal to total cost taken from Table 4.23.

TABLE 5.3
MARGINAL CARGO REVENUE ANALYSIS

ROUTE	AIRLINES	AIRCRAFT	REV/ TONNE	AVAIL TONNES	CARGO REV	PAX REV	CARGO REV AS % OF PAX
Vancouver - Victoria	Jazz	DH3	\$ 301	0.93	\$ 162	\$ 2,427	7
Toronto/Hamilton - Montréal	Air Canada	320	\$ 810	5.39	\$ 2,532	\$ 19,127	13
	WestJet	73W	\$ 810	2.75	\$ 1,292	\$ 15,033	9
	WestJet	73S	\$ 810	2.61	\$ 1,226	\$ 13,488	9
Moncton - Montréal	Jazz	CRJ	\$ 850	0.93	\$ 458	\$ 5,300	9
Toronto/Hamilton - Vancouver	Air Canada	762	\$ 2,534	11.44	\$16,814	\$ 60,708	28
	WestJet	73W	\$ 2,534	2.75	\$ 4,042	\$ 32,548	12
Source: Consultants analysis							

For most of the aircraft under consideration, potential cargo revenues are less than 10% of those for passengers. The A320, which is a slightly wider aircraft than the Boeing 737 series, can increase this total to a little over 10%. Only wide-body aircraft, such as the B767, seem to have a cargo capacity which can generate a substantial revenue stream compared to passengers.

The additional revenues are earned at virtually no extra cost for outputs, like fuel and staffing. As noted in Table 5.1, the short-term marginal costs of carrying cargo are roughly 10% of the average costs. On most domestic routes (Table 5.3) potential cargo revenue is only roughly 10% of passenger revenue. Therefore, the short-term marginal costs of carrying cargo on domestic passenger aircraft are about 1%, which should really be considered negligible. The marginal revenue potential, however, compared to almost no marginal costs, makes the carriage of cargo on passenger aircraft quite a profitable venture.

5.4 Cost Sensitivity

The sensitivity of costs to changes in various parameters were tested by varying load factor and several cost elements, and evaluating the changes to the cost structure.

5.4.1 Load Factors

Changes to load factors will not affect total costs, or costs normalized on a capacity basis, but will affect cost per passenger (or tonne), and cost per rpk (or rtk). Sensitivity of these costs were based on changes of both one passenger, and one percentage point of load factor. Note that the calculation includes the marginal cost of carrying the additional passenger (or tonne). The results are shown in Table 5.4.

TABLE 5.4
COST SENSITIVITY TO CHANGE IN LOAD FACTOR

ROUTE	AIRLINES	AIRCRAFT	% CHANGE IN UNIT COST	
			LF + 1 PAX	LF + 0.01
Vancouver - Victoria	Jazz	DH3	2.1	1.2
Ottawa - Montréal	Jazz	DH1	2.8	1.2
		DH3	2.0	1.1
Regina - Saskatoon	Transwest Air	J31	7.9	1.4
		SF3	3.7	1.4
Toronto - Sarnia	Air Georgian	BEH	6.2	1.4
Calgary - Edmonton	Jazz	DH3	2.1	1.2
	WestJet	73W	0.7	1.0
Toronto - Montréal	Air Canada	320	0.7	1.1
	WestJet	73W	0.7	1.0
	WestJet	73S	0.8	1.0
Moncton - Montréal	Jazz	CRJ	2.3	1.2
Halifax - St. John's	Air Canada	320	0.7	1.1
	WestJet	73W	0.7	1.0
Winnipeg - Churchill	Calm Air	SF3	3.8	1.4
Toronto - Regina	Jazz	CR7	1.5	1.2
Toronto - Vancouver	Air Canada	762	0.5	1.1
	WestJet	73W	0.8	1.1
			LF + 1 TONNE	LF + 0.01
Vancouver - Victoria	Kelowna	72F	7.8	1.6
Hamilton - Montréal (YMX)	Cargojet	72F	7.6	1.6
Moncton - Montréal (YMX)	Kelowna	72F	7.5	1.6
Hamilton - Winnipeg	Kelowna	72F	7.5	1.6
	Cargojet	72F	7.5	1.6
Hamilton - Vancouver	Cargojet	72F	7.4	1.6
Per cent change columns are absolute values. Actual unit cost change due to a passenger or cargo increase are negative.				
Source: Consultants analysis				

5.4.2 Cost Factors

Similar sensitivity tests can be performed on various cost factors. One of the most obvious is fuel. Table 5.5 shows the changes in total costs relative to a one cent per litre increase in the cost of fuel. Note that changes to the cost of fuel affect WestJet proportionately more than Air Canada, even though the B737-700 is more fuel-efficient than the A320, because Air Canada is burdened with a higher cost structure in other areas, and fuel as a per cent of the total is proportionately less. As well, the proportion rises with increasing range, and is also notably higher for the cargo carriers, who have a lower non-fuel cost structure.

TABLE 5.5
TOTAL COST SENSITIVITY TO CHANGE IN THE COST OF FUEL

ROUTE	AIRLINES	AIRCRAFT	FUEL AS % OF TOT COST	% CHANGE IN COST	
				Fuel + 1¢/L	Fuel + 1%
Vancouver - Victoria	Jazz	DH3	6.0	0.10	0.06
Ottawa - Montréal	Jazz	DH3	10.0	0.17	0.10
		DH1	9.0	0.15	0.09
Regina - Saskatoon	Transwest Air	J31	14.5	0.21	0.14
		SF3	15.6	0.22	0.16
Toronto - Sarnia	Air Georgian	BEH	14.1	0.23	0.14
Calgary - Edmonton	Jazz	DH3	10.2	0.17	0.10
	WestJet	73W	10.2	0.16	0.10
Toronto - Montréal	Air Canada	320	9.9	0.17	0.10
	WestJet	73W	12.5	0.20	0.13
	WestJet	73S	23.2	0.36	0.23
Moncton - Montréal	Jazz	CRJ	20.7	0.34	0.21
Halifax - St. John's	Air Canada	320	13.5	0.23	0.14
	WestJet	73W	17.8	0.28	0.18
Winnipeg - Churchill	Calm Air	SF3	18.1	0.26	0.18
Toronto - Regina	Jazz	CR7	27.0	0.45	0.27
Toronto - Vancouver	Air Canada	762	26.5	0.44	0.26
	WestJet	73W	25.8	0.40	0.26
Vancouver - Victoria	Kelowna	72F	38.6	0.55	0.39
Hamilton - Montréal (YMX)	Cargojet	72F	54.7	0.78	0.55
Moncton - Montréal (YMX)	Kelowna	72F	56.4	0.81	0.56
Hamilton - Winnipeg	Kelowna	72F	60.1	0.86	0.60
	Cargojet	72F	59.9	0.86	0.60
Hamilton - Vancouver	Cargojet	72F	62.7	0.90	0.63
Source: Consultants analysis					

Another major point of issue is the level of charges and fees paid by the airlines. Even though some of these are reimbursable in terms of fare supplements, they still represent a significant cost component. The variation of costs as these fee levels change is shown in Table 5.6. Fees include landing and terminal charges, security fees, airport improvement fees and NavCan charges.

TABLE 5.6
TOTAL COST SENSITIVITY TO CHANGES IN AIRPORT AND NAV FEES

ROUTE	AIRLINES	AIRCRAFT	FEES AS % OF TOT COST	% CHANGE IN COST
				Fees + 1%
Vancouver - Victoria	Jazz	DH3	38.4	0.38
Ottawa - Montréal	Jazz	DH3	35.3	0.35
		DH1	36.2	0.36
Regina - Saskatoon	Transwest Air	J31	20.5	0.21
		SF3	22.3	0.22
Toronto - Sarnia	Air Georgian	BEH	30.5	0.30
Calgary - Edmonton	Jazz	DH3	32.1	0.32
	WestJet	73W	32.7	0.33
Toronto - Montréal	Air Canada	320	28.3	0.28
	WestJet	73W	34.3	0.34
	WestJet	73S	31.6	0.32
Moncton - Montréal	Jazz	CRJ	20.6	0.21
Halifax - St. John's	Air Canada	320	20.9	0.21
	WestJet	73W	25.6	0.26
Winnipeg - Churchill	Calm Air	SF3	13.6	0.14
Toronto - Regina	Jazz	CR7	20.9	0.21
Toronto - Vancouver	Air Canada	762	17.4	0.17
	WestJet	73W	18.9	0.19
Vancouver - Victoria	Kelowna	72F	40.7	0.41
Hamilton - Montréal (YMX)	Cargojet	72F	20.6	0.21
Moncton - Montréal (YMX)	Kelowna	72F	18.6	0.19
Hamilton - Winnipeg	Kelowna	72F	13.9	0.14
	Cargojet	72F	14.5	0.15
Hamilton - Vancouver	Cargojet	72F	9.8	0.10
Source: Consultants analysis				

6. BACKCAST TO 2000

Backcasting the cost information is problematical, primarily because both the airlines and the aircraft types serving these routes have changed since 2000. Table 6.1 lists the routes utilized for the 2005 analysis, together with the corresponding route/aircraft combinations from July, 2000.

TABLE 6.1
COMPARISON OF SERVICE: 2000 AND 2005

ROUTE	2005		2000	
	AIRLINES	AIRCRAFT	AIRLINES	AIRCRAFT
Vancouver - Victoria	Jazz	DH3	Air B.C. Cdn Regional	DH3 DH3
Ottawa - Montréal	Jazz	DH1 DH3	Air Nova	DH1 DH3
Regina - Saskatoon	Transwest Air	J31 SF3	Athabaska	BE1
Toronto - Sarnia	Air Georgian	BEH	Air Georgian	BEH
Calgary - Edmonton	Jazz WestJet	DH3 73W	Air B.C. WestJet	DH3 73S
Toronto - Montréal	Air Canada WestJet WestJet	320 73W 73S	Air Canada Canadian	320 73S
Moncton - Montréal	Jazz	CRJ	Air Nova	142
Halifax - St. John's	Air Canada WestJet	320 73W	Air Canada Air Nova	D9S 142
Winnipeg - Churchill	Calm Air	SF3	Calm Air Keewatin	SF3 PL2
Toronto - Regina	Jazz	CR7	Canadian	73S
Toronto - Vancouver	Air Canada WestJet	762 73W	Air Canada Canadian	762 763

Sources: Consultants analysis of OAG

In order to provide a consistent basis for the analysis, it was believed appropriate to hypothesize that if the current service pattern had been the same in 2000, then a realistic comparison can be made between 2000 and 2005 data by only changing the unit costs (e.g., the price of fuel) and operational factors (e.g., load factor) where necessary. The sections which follow detail these changes.

6.1 Changes to Operational Factors

As the aircraft and routes were not altered, there are no differences in aircraft weights, capacities, block time or block fuel estimates. However, aircraft and crew utilizations, as well as airline load factors, have changed over the past five years.

6.1.1 Aircraft Utilization

In 2000, WestJet reported an average utilization of 2,300 hours per year, which is substantially less than what they are reporting today. However, they were only operating obsolescent B737-200 aircraft at the time, which had a low acquisition cost, but high operating costs. Had they been flying the B737-700 in 2000, it is believed that they would have found it necessary to operate the aircraft at current utilization levels in order to be profitable. For the purposes of a backcast to 2000, therefore, no changes to utilization levels have been made.

Air Canada averaged 11.1 hours utilization, as opposed to 10.6 hours in 2005, which is a relatively insignificant difference. Based on this limited information, and the belief that the utilization figures for the smaller airlines in 2005 are also reasonably representative of those in 2000, no changes were made to overall utilization estimates.

6.1.2 Flight Crew

In 2000, the newly consolidated Air Canada/Canadian combination employed 3,086 pilots, flying 241 aircraft. Assuming a two-man crew, and 11.1 hours daily aircraft utilization, implies a flight crew utilization of 633 annual hours, which is almost the same as that experienced in 2005 (612 hours). Based on this limited data, it was not believed that any changes to this parameter was warranted for the year 2000 backcast.

6.1.3 Cabin Crew

No additional information has been uncovered regarding cabin crew utilization, so these figures have not been changed from 2005 levels, based on the same assumptions as those for flight crew.

6.1.4 Load Factors

For the year 2000, Air Canada (newly merged with Canadian) reported a system average mainline load factor of 72.4%, while WestJet averaged 76.2%, well below the imputed current imputed average of 80%. To maintain system-wide commonality, load factors for 2000 have been estimated at five percentage points below those for 2005 (see Section 3.6) for all carriers. There is inadequate information to allow for an estimate of cargo load factors for 2000.

6.2 Changes to Cost Factors

While there have been limited changes to operational factors, costs have changed significantly since 2005, and a backcast to 2000 requires changes to almost all of the cost factors. Note that no allowance for inflation has been made; the year 2000 costs will be in year 2000 dollars.

6.2.1 Flight Operations

For 2000, Statistics Canada reported that pilot wages for level I and II carriers averaged \$111,100, compared to an estimated \$102,000 in 2005. Based on this average, flight crew wages for 2000 have been increased by 9% from 2005 levels.

For the year 2000, Statistics Canada reported an average turbine fuel cost to Level I and II carriers of 39.6 cents, compared to 45.6 cents in 2004, a 15% increase (later years have not yet been released). However, from 2004 to 2005, both Air Canada and WestJet reported a 30% increase. The combination of these two factors suggest that fuel prices increased by almost exactly 50% over the five-year period, so fuel cost estimates for 2000 have been reduced by 33% below the 2005 analysis.

The category of landing, navigation and miscellaneous fees has certainly risen sharply since 2000, with reported increases per enplaned passenger on both Air Canada and WestJet averaging about 60%. As the ATSC was only introduced in 2002, this represented a substantial portion of the increase. Accepting the Air Canada and WestJet figures as being representative of the industry, the total level of year 2000 charges in this category have been reduced to 62.5% of the year 2005 level.

Hull insurance rates have been maintained at the same percentage of aircraft value, but, as noted below, there has been a change to aircraft valuations. Miscellaneous expenses have been kept at the same percentage of the flight operations total.

6.2.2 Maintenance, Flight Equipment

Statistics Canada reports that, for Level I and II carriers, maintenance of flight equipment expenses per hour flown increased by 13.25% between 2000 and 2004. Data for 2005 is not yet available, but given the extent to which airline costs are under pressure, no additional increase has been assumed. This cost category for the year 2000 has therefore been reduced by 12% from 2005 levels.

6.2.3 In-flight Service

Statistics Canada reports that in 2000, the average wage for "other flight personnel" was \$42,100. By 2003, this had risen to over \$47,000, but had dropped to \$44,600 in 2004, with a further decline anticipated for 2005. To compensate for these shifts, the 2000 wage level was set 5% below that for 2005.

As noted in Section 4.1.3.2, passenger food expense is a relatively minor cost item, and available data shows only minor increases with time on a unit basis. For these reasons, no changes have been made for year 2000 estimates. Passenger liability insurance is also a minor cost element, and no clear year-to-year trends are apparent, so this element has also not been changed. As well, the miscellaneous cost percentage has been maintained at 2005 levels.

6.2.4 Aircraft and Traffic Servicing

Wages in this category have been subject to sharp downward pressure over time, and the cost per passenger for Level I and II carriers has decreased from \$17.66 in 2000 to \$12.64 in 2004, a reduction of 28.5%. As noted earlier, the 2005 averages were assumed to be lower still. For the purposes of calculating year 2000 costs, it has been assumed that unit costs have dropped by 30%, so that the unit ratio for the year 2000 has been increased by 43% from 2005 levels.

6.2.5 Commissions

As noted in Section 4.1.4, commissions have been reduced sharply since the year 2000. For that year, based on Transport Canada cost data, it has been estimated that commissions averaged 7.5% of total expenses excluding fuel.

6.2.6 Aircraft Ownership Costs

The methodology employed has assumed the same fleet for the year 2000 as for 2005. The corollary of this assumption is that all of the aircraft were five years younger in 2000, and their value was therefore higher, at least as a percentage of the original purchase cost. Although there are differences by aircraft type, a recent study¹ has estimated that the value of a typical five-year-old aircraft is about 17-23% below its new value, and that of a ten-year-old aircraft about 36-44% below its new value, with narrow-body short-haul aircraft clustered at the lower end of the range, and longer-haul aircraft, such as the A340 or Boeing 777 at the higher end. Given the similarity of the five and ten-year percentages, the average aircraft value (and therefore the annual depreciation rate) was inflated by 18% to represent approximate year 2000 costs.

6.2.7 Indirect Operating Costs

The indirect cost ratio has been maintained at the same percentage of total expenses exclusive of fuel, as it was for the year 2005.

6.2.8 Total Operating Costs

The total 2000 operating costs are summarized in Table 6.2, together with the 2005 totals as a point of reference. However, passenger load factors increased between 2000 and 2005, so the costs per rpk will have changed as well. Table 6.3 compares the average costs per passenger and per rpk for the various passengers routes, and per tonne and per rtk for the cargo routes.

¹ The Airline Monitor. *Aircraft Values and Prices*. November, 2003.

TABLE 6.2
TOTAL COST ESTIMATES, 2000 and 2005

ROUTE	AIRLINES	AIRCRAFT	ONE-WAY TOTAL COST	
			2000	2005
Vancouver - Victoria	Jazz	DH3	\$ 2,297	\$ 2,427
Ottawa - Montréal	Jazz	DH1	\$ 2,314	\$ 2,560
		DH3	\$ 2,957	\$ 3,240
Regina - Saskatoon	Transwest Air	J31	\$ 1,295	\$ 1,397
		SF3	\$ 2,173	\$ 2,326
Toronto - Sarnia	Air Georgian	BEH	\$ 1,557	\$ 1,456
Calgary - Edmonton	Jazz	DH3	\$ 3,224	\$ 3,503
	WestJet	73W	\$ 10,927	\$ 11,227
Toronto - Montréal	Air Canada	320	\$ 18,330	\$ 19,127
	WestJet	73W	\$ 13,832	\$ 15,033
	WestJet	73S	\$ 11,908	\$ 13,488
Moncton - Montréal	Jazz	CRJ	\$ 5,247	\$ 5,300
Halifax - St. John's	Air Canada	320	\$ 18,999	\$ 19,311
	WestJet	73W	\$ 14,231	\$ 15,127
Winnipeg - Churchill	Calm Air	SF3	\$ 4,972	\$ 5,378
Toronto - Regina	Jazz	CR7	\$ 11,942	\$ 13,837
Toronto - Vancouver	Air Canada	762	\$ 53,274	\$ 60,708
	WestJet	73W	\$ 28,809	\$ 32,548
Vancouver - Victoria	Kelowna Flightcraft	72F	\$ 2,147	\$ 3,251
Hamilton - Montréal (YMX)	Cargojet	72F	\$ 6,098	\$ 8,740
Moncton - Montréal (YMX)	Kelowna Flightcraft	72F	\$ 6,443	\$ 9,168
Hamilton - Winnipeg	Kelowna Flightcraft	72F	\$ 10,627	\$ 14,898
	Cargojet	72F	\$ 10,640	\$ 14,960
Hamilton - Vancouver	Cargojet	72F	\$ 19,799	\$ 27,333
Source: Consultants analysis				

TABLE 6.3
TOTAL UNIT COST ESTIMATES - 2000 and 2005

ROUTE	AIRLINES	AIRCRAFT	ONE-WAY UNIT COST			
			2000		2005	
			PER PAX	PER RPK	PER PAX	PER RPK
Vancouver - Victoria	Jazz	DH3	\$ 70	109¢	\$ 69	108¢
Ottawa - Montréal	Jazz	DH1	\$ 96	63¢	\$ 98	65¢
		DH3	\$ 90	59¢	\$ 93	61¢
Regina - Saskatoon	Transwest Air	J31	\$ 129	54¢	\$ 140	58¢
		SF3	\$ 109	45¢	\$ 106	44¢
Toronto - Sarnia	Air Georgian	BEH	\$ 130	56¢	\$ 146	64¢
Calgary - Edmonton	Jazz	DH3	\$ 98	40¢	\$ 100	41¢
	WestJet	73W	\$ 107	44¢	\$ 103	42¢
Toronto - Montréal	Air Canada	320	\$ 175	34¢	\$ 171	34¢
	WestJet	73W	\$ 136	27¢	\$ 134	27¢
	WestJet	73S	\$ 132	26¢	\$ 140	28¢
Moncton - Montréal	Jazz	CRJ	\$ 159	23¢	\$ 151	21¢
Halifax - St. John's	Air Canada	320	\$ 181	21¢	\$ 172	20¢
	WestJet	73W	\$ 140	16¢	\$ 139	16¢
Winnipeg - Churchill	Calm Air	SF3	\$ 249	25¢	\$ 244	24¢
Toronto - Regina	Jazz	CR7	\$ 244	12¢	\$ 261	13¢
Toronto - Vancouver	Air Canada	762	\$ 344	10¢	\$ 366	11¢
	WestJet	73W	\$ 282	8¢	\$ 299	9¢
			PER REV TONNE	PER RTK	PER REV TONNE	PER RTK
Vancouver - Victoria	Kelowna Flightcraft	72F	\$ 199	311¢	\$ 301	471¢
Hamilton - Montréal (YMX)	Cargojet	72F	\$ 565	104¢	\$ 810	149¢
Moncton - Montréal (YMX)	Kelowna Flightcraft	72F	\$ 597	82¢	\$ 850	117¢
Hamilton - Winnipeg	Kelowna Flightcraft	72F	\$ 984	65¢	\$ 1,381	91¢
	Cargojet	72F	\$ 985	65¢	\$ 1,387	92¢
Hamilton - Vancouver	Cargojet	72F	\$ 1,833	55¢	\$ 2,534	76¢
Source: Consultants analysis						

APPENDIX A
ABBREVIATIONS

A/C	Aircraft
AC	Air Canada (mainline)
AC*	Air Canada Jazz
AIF	Airport improvement fee
ASK	Available seat-kilometres
ATC	Air traffic control
ATSC	Airport Travellers Security Charge
ATK	Available tonne-kilometres
BEH	Beech 1900D
BE1	Beech 1900
CCAR	Canadian Civil Aircraft Register
CRJ	Bombardier Regional Jet -100/200
CR7	Bombardier Regional Jet -700
DH1	Bombardier Dash 8-100
DH3	Bombardier Dash 8-300
DOC	Direct operating cost
D9S	McDonnell-Douglas DC9-30
F/O	First Officer
FCI	Full Cost Investigation
IOC	Indirect operating cost
J31	British Aerospace Jetstream 31
KFC	Kelowna Flightcraft
KW	Kelowna Flightcraft
LF	Load factor
MGTOW	Maximum gross take-off weight
MO	Calm Air
OAG	Official Airline Guide
PAX	Passenger
PL2	Pilatus PC-12
RPK	Revenue passenger-kilometres
SF3	Saab/Fairchild SF340
WS	WestJet
W8	Cargojet
YHM	Hamilton
YMX	Montréal/Mirabel
ZX	Air Georgian
142	British Aerospace 146-200
2/O	Second Officer
320	Airbus A320
72F	Boeing 727-200 freighter conversion
73S	Boeing 737-200
73W	Boeing 737-700
762	Boeing 767-200
763	Boeing 767-300
9T	Transwest Air

APPENDIX B

GLOSSARY OF TERMS

Airport distances - The great circle distance between two airports. For airline statistical purposes, these distances are used as the basis for the derivation of all seat and tonne-kilometre calculations, regardless of the distance actually flown.

Available seat (tonne)-kilometres - The number of seats (payload weight) available for sale multiplied by the distance between the originating and terminating airports.

Belly cargo - Cargo carried in the baggage compartment of aircraft configured for passenger service.

Block fuel - The fuel consumed by an aircraft on a route, computed from engines-on to engines-off.

Block time - The elapsed time of a flight, computed from engines-on to engines-off.

Hull Insurance - Insurance to cover physical damage to the aircraft.

Level I, II and III Airlines - A Statistics Canada definition of airline size. Level I carriers transport more than 1,000,000 revenue passengers or 200,000 tonnes of revenue goods per year. Level II carriers transport between 100,000 and 1,000,000 revenue passengers or between 30,000 and 200,000 tonnes of revenue goods per year. Level III carriers are those with annual gross revenues of \$1,000,000 or more which do not qualify for Levels I or II¹.

Load factor - The number of passengers (or cargo load) carried calculated as a per cent of the number of available seats (or available cargo capacity).

Maintenance burden - all overhead or general expenses which are specifically identified with activities involved in periodic maintenance operations.

Maximum (gross) take-off weight - The maximum allowable weight at which an aircraft is permitted to take off. This weight is normally used as a standard when computing weight-based charges such as landing fees and air navigation charges.

Revenue passenger - a passenger from whom an airline receives remuneration. In Canadian terminology, specific exemptions are only made for airline employees and infants, from whom a "token service charge" is levied. Frequent flier redemptions are included in the "revenue passenger" category.

Revenue passenger (tonne)-kilometres - The actual number of revenue passengers (revenue payload) carried on a specified flight multiplied by the distance between the originating and terminating airports.

Utilization - The number of block hours per month or per year flown by an aircraft or flight personnel.

¹ This is a summary of a somewhat more complex definition.