North American Transportation

Statistics on Canadian, Mexican, & United States Transportation

Prepared for
The North American Transportation Summit

The Bureau of Transportation Statistics
The U.S. Department of Transportation

Draft, March 1994
Revised, May 1994

North American Transportation

Statistics on Canadian, Mexican,
& United States Transportation

Prepared for
The North American
Transportation Summit

The Bureau of Transportation Statistics
The U.S. Department of Transportation

Draft, March 1994
Revised, May 1994

Acknowledgements

North American Transportation: Statistics on Canadian, Mexican, and United States Transportation was prepared by Arthur L. Webster II of EXP Associates Inc. under a contract to the Bureau of Transportation Statistics, U.S. Department of Transportation. Additional text was provided by John W. Fuller of The University of Iowa.

The information center of the Canadian Embassy to the United States, Statistics Canada, Transport Canada, and several Canadian trade associations provided extensive data and assistance. Statistics on Mexico's transportation system were gathered from Mexican publications provided by the Library of Congress and the Office of International Highway Programs of the U.S. Federal Highway Administration.

U.S. Department of Transportation
Federico Peña, Secretary

Bureau of Transportation Statistics
400 Seventh Street, S.W., Room 2104
Washington, D.C. 20590
Voice: 202-366-DATA
Fax: 202-366-3640
Statistical Information: 800-853-1351

T.R. Lakshmanan, *Director*
Robert A. Knisely, *Deputy Director*
Rolf R. Schmitt, *Associate Director for Analysis and Data Development*
Philip N. Fulton, *Associate Director for Data User Services.*

Rolf R. Schmitt, *Editor-in-Chief*
Terry D. Feinberg, *Managing Editor*
Nita J. Congress, *Editor*

Table of Contents

Figures and Tables

Figures

Tables

Introduction

This document describes the transportation system of North America with comparable statistics for Canada, Mexico, and the United States. It was published to stimulate further efforts to describe and understand the continental transportation system, especially as the use of that system is fundamentally altered by the North American Free Trade Agreement.

North American Transportation: Statistics on Canadian, Mexican, and United States Transportation contains extensive data on the size and scope, use, employment, fuel consumption, and economic role of each country's transportation system. Many of these data are for 1990, the most recent year for which information for all three countries was generally available. Time series data for 1987 to 1991 are included where possible.

The data presented in this report are compilations and estimates, and are not necessarily official statistics of the Canadian, Mexican, or United States governments. Information in some of the categories is incomplete, and not all of the countries are represented in every table or discussion. Also, some data may not be strictly comparable as transportation statistical materials are prepared differently in each country. In cases where values are missing or questionable, clearly indicated estimates have been included. Data sources and estimation methods are documented in appendix A.

Statistics are provided in both metric and U.S. measures when appropriate. Monetary values are given in U.S. dollars unless otherwise indicated.

The Bureau of Transportation Statistics commissioned this report for the North American Transportation Summit with the hope of inspiring future trilateral research on the continental transportation system. Readers are urged to forward their comments and suggestions on this report to the Bureau of Transportation Statistics so that future volumes can be increasingly useful to decisionmakers and the public.

Canada, Mexico, and the United States: Overview

Land and Water Areas

The territories of the North American countries consist of land, inland waterway, and territorial ocean areas. (See table 1.) The land areas of Canada and the United States are almost equal—about nine million square kilometers (about three and a half million square miles). Canada, however, is much larger than the United States when inland waterways are considered: It has nearly four times the freshwater area of lakes and rivers than does the United States. Mexico has about one-tenth the freshwater surface of Canada, and about three-eighths that of the United States. Mexico contains 10 percent of all the North American land area, while Canada and the United States equal approximately 40 percent each. All three countries have major territorial ocean water areas of about three million square kilometers (about one million square miles) each.

Table 1 County Areas

	Total Area	Land Area	Freshwater Area	Territorial Water Area
Square Miles				
Total	11,168,317	7,097,717	371,085	3,699,515
Canada	5,160,031	3,558,428	291,604	1,310,000
Mexico	1,916,192	756,136	30,119◄	1,129,937
United States	4,878,348	3,539,289	79,481	1,259,578◄
Square Kilometers				
Total	30,959,324	20,339,497	1,039,016	9,580,811
Canada	13,363,179	9,215,430	755,180	3,392,569
Mexico	4,962,453	1,958,201	78,000◄	2,926,252
United States	12,633,691	9,165,866	205,836	3,261,990◄
Percentages				
Total	100.00	100.00	100.00	100.00
Canada	43.16	45.31	72.68	35.41
Mexico	16.03	9.63	7.51◄	30.54
United States	40.81	45.06	19.81	34.05◄

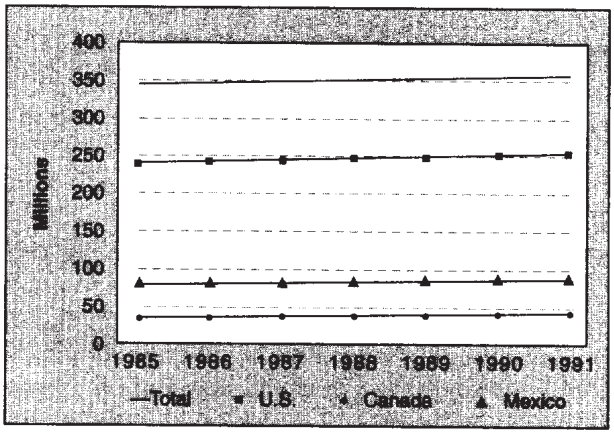
◄ Denotes estimate

Sources: U.S.: *Statistical Abstract of the United States, 1992* by the U.S. Department of Commerce. Mexico: *Mexico 1992* by the Mexico City Chamber of Commerce and Consultores Internacionales, S.C. Canada: *The Canadian Yearbook, 1991* and phone contact with Statistics Canada. The Mexican freshwater and U.S. territorial water areas are estimates based on National Geographic Society maps.

Populations

North American populations ranged in 1990 from almost 27 million in Canada, to 81 million in Mexico, to 250 million in the United States. (See figure 1.) Mexico has a younger population than the other two countries. It also has a population growth rate twice that of its northern neighbors (about 2 percent annually). About 30 percent of Mexico's population was considered economically active (i.e., employed) in 1990, compared with about 49 percent in the United States and about 50 percent in Canada.

Figure 1. Country Populations

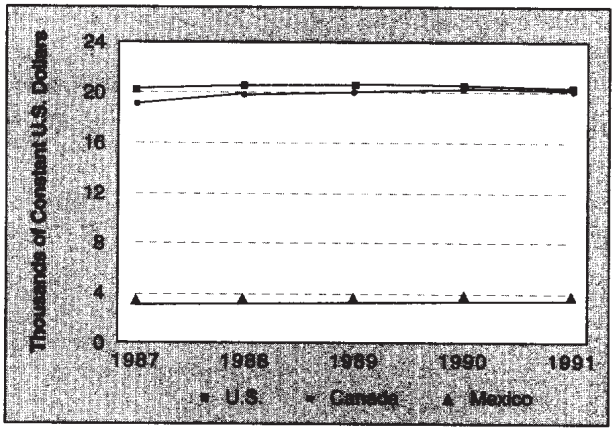


The three countries' differences in population and size result in different transportation needs and supply characteristics. Canada, the most sparsely populated country of the three, contains fewer than three persons per square kilometer of land area; the U.S. figure is just over 27—almost 10 times higher—while Mexico has more than 41 persons per square kilometer, nearly twice the density of the United States.[1]

Economies

Gross domestic product (GDP) is the total output generated by labor and other productive resources within a country's borders, valued at market prices. The per capita GDP for Canada and the United States are quite similar— slightly over $20,000 (in constant 1990 U.S. dollars)[2] in 1991. (See figure 2.) Mexico's per capita GDP is about 13 percent that of the other two countries.

Figure 2. Country per Capita GDP



Endnotes

1. Note, however, that North American populations are much less dense than those found in many European and Asian countries.

2. In order to compare the monetary units of the three countries in a meaningful manner, the Canadian dollar and Mexico peso were converted to constant 1990 U.S. dollars using 1990 exchange rates. Constant dollars, as opposed to current dollars, take inflation into account and therefore adjust for changes in the purchasing power of currencies over time.

Comparative National Statistics: 1990

Transportation Bill[1]

The *transportation bill* refers to the market value of all purchases of transportation services and facilities; it includes all domestic expenditures made by an economy for transportation purposes. Although the transportation bill does not reflect several significant nonmarket costs,[2] it is a useful indicator of a country's transportation expenditures, and transportation analysts closely follow changes in the bill and its components.

In 1990, the United States and Canadian transportation bills were, when examined on a per capita basis, similar. (See table 2.) The U.S. bill of $4,014 per person was only 18 percent higher than the Canadian bill estimated at $3,376. It is difficult to estimate a comparable Mexican transportation bill; available statistics indicate a per capita bill of $448—this figure is roughly 13 percent of the Canadian bill and 11 percent of the U.S. bill.

Table 2 Total and per Capita Transportation Bills: 1990

	Canada	Mexico	U.S.	Total
Total millions U.S. dollars	101,521	36,208◄	974,800	1,112,529◄
Per Capita U.S. Dollars	3,817	446◄	3,901	3,110◄
Total millions Can. dollars	118,475	42,255◄	1,135,913	1,296,643◄
Per Capita Canadian Dollars	4,454	520◄	4,545	3,624◄
Total billion pesos	285,477	101,839◄	2,741,138	3,128,454◄
Per Capita 1,000 Pesos	10,732	1,253◄	10,969	8,745◄
Population (Millions)	26.6	81.2	249.9	357.7

◄ Denotes estimate

Although the total transportation bills of Canada and the United States are similar, their relative distributions of expenditures among transportation modes differ markedly. (See table 3.) In both the Canadian and U.S. bills, domestic transport accounted for 96 to 97 percent of all transport expenditures. However, of the five domestic modes for which data are presented—highway, aviation, rail, water, and transit (including highway transit vehicles), the U.S. shares are greater for the highway and aviation modes while Canadian shares are larger for rail, water, and transit.[3]

Compared with domestic expenditures, the purchase of international freight and passenger services is relatively less important. The patterns of international transport expenditure do differ between the two countries, however. For example, as calculated from data in table 3, Canadians spend over a third more per capita (37 percent more) than do U.S. residents on the various types of international transportation. In particular, Canadian expenditures are higher for air transport: The Canadian figure of $110 per person is more than one and a half times the per capita U.S. expenditure of $69 per year. (Table 3.) The United States, with its more industrialized economy, spends 31 percent more per capita than does Canada on import and export shipments via water transport.

Table 3 Transportation Bills by Mode: 1990

	Millions of U.S. Dollars			Millions of Canadian Dollars		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	90,436	1,010,371	1,091,324	105,539	1,177,424	1,273,700
Domestic[1]	86,497	978,403	1,055,418	100,943	1,140,118	1,231,798
Highway[2]	69,621	817,448	879,132	81,248	953,962	1,025,947
Aviation	5,362	80,679	84,496	6,258	92,349	98,607
Rail	6,056	36,754	42,810	7,067	42,891	49,958
Water[3]	2,973	22,845	25,818	3,470	26,786	30,256
Transit	2,485	20,678	23,162	2,900	24,131	27,030
International	3,939	31,968	35,906	4,596	37,306	41,903
Aviation	2,930	17,244	20,174	3,419	20,124	23,543
Water	1,009	14,724	15,732	1,177	17,183	18,360

	Millions of U.S. Dollars per Capita			Millions of Canadian Dollars per Capita		
	Canada	U.S.	Total	Canada	U.S.	Total
Total per Capita	3,400	4,043	3,947	3,968	4,712	4,607
Domestic	3,252	3,915	3,817	3,795	4,562	4,455
Highway	2,617	3,271	3,180	3,054	3,817	3,710
Aviation	202	323	306	235	370	357
Rail	228	147	155	266	172	181
Water	112	91	93	130	107	109
Transit	93	83	84	109	97	98
International	148	128	130	173	149	152
Aviation	110	69	73	129	81	85
Water	38	59	57	44	69	66

	Percentages		
	Canada	U.S.	Total
Domestic	95.64	96.84	96.71
Highway	76.98	80.91	80.56
Aviation	5.93	7.99	7.74
Rail	6.70	3.64	3.92
Water	3.29	2.26	2.37
Transit	2.75	2.05	2.12
International	4.36	3.16	3.29
Aviation	3.24	1.71	1.85
Water	1.12	1.46	1.44

Notes:

1. Exludes animal-drawn vehicles, bicycles, off-road vehicles, air cushion vehicles, and other transportation for which statistics could not be found.
2. Excludes transit buses which are accounted for under Transit.
3. Exludes transit ferries, which are accounted for under Transit. Also excludes the costs of operation of about 113,000 U.S. fishing vessels and approximately 58,000 Canadian ones, for which no cost information coud be found.

Table 4 Total and per Capita by Mode: 1990

	Person-Miles, Millions				Person-Kilometers, Millions			
	Canada	Mexico	U.S.	Total	Canada	Mexico	U.S.	Total
Total	269,708◄	175,744◄	3,251,232	3,696,684◄	433,961◄	282,772◄	5,231,232	5,947,965◄
Highway[1]	249,610	158,725◄	2,854,568	3,262,903◄	401,623	255,388◄	4,593,000	5,250,011◄
Aviation[2]	16,448	6,459	360,934	383,842	26,466	10,393	580,743	617,602
Rail[3]	3,171	10,483	25,253	38,907	5,102	16,867	40,632	62,601
Water[4]	479◄	77◄	10,477◄	11,033◄	770◄	124◄	16,857◄	17,752◄
Total/population	10,139◄	2,163◄	13,010◄	10,333◄	16,314◄	3,480◄	20,933◄	16,626◄

	Percentages			
	Canada	Mexico	U.S.	Total
Total	100.00	100.00	100.00	100.00
Highway[1]	92.55◄	90.32◄	87.80	88.27◄
Aviation[2]	6.10	3.68	11.10	10.38
Rail[3]	1.18	5.96	0.78	1.05
Water[4]	0.18◄	0.04◄	0.32◄	0.30◄

Notes

◄ Denotes estimate

1. Includes private and commercial, but excludes crews of freight vehicles and buses. U.S. and Canadian figures both based on U.S. car and small-truck occupancy rates and percent and personal versus business trucks. Mexican figures were estimated based on vehicle registrations, bridge and toll station counts, fuel consumption figures, and typical fuel consumption rates by class of vehicle. The Mexico estimates assume an average of 14,627 km (9,069 mi.) per year per car and 16,700 km (10,354 mi.) per two-axle truck per year (both figures are less than those of Canada or the United States). A small vehicle occupancy rate of two people was assumed greater than that for Canada or the United States, which have smaller average family sizes. The Mexican figures assume roughly 33,000 and 19,300 transit buses plus intercity buses.
2. Includes revenue passengers plus estimate of noncommercial passengers.
3. Fare-paying passengers figure includes light and heavy rail transit. Mexican figures assume 7.87 kilometer (4.89 mile) average trip length per Mexico City subway passenger.
4. These figures are mainly ferryboat statistics. Canadian figures assume a 22.8 kilometer (14.2 mile) average passenger trip distance. The U.S. figure assumes 97.44 million passenger-kilometers (60.56 million passenger-miles) per ferry (experience of 119 urban ferries). The Mexican figure assumes a 33.8 kilometer (21 mile)-per-passenger average trip length.

Domestic Passenger Travel

Data on passenger travel, as measured by person-distance, are not exact for the three countries. In particular, a number of assumptions were made to estimate person-distance travel by highway. (See table 4.)

The predominant mode of passenger travel in all three countries is by highway. Highway travel constitutes over 90 percent of the passenger-kilometers in both Canada and Mexico, and about 88 percent in the United States. At the other end of the spectrum, the least common mode of passenger travel in the three countries is water transport. Mainly accomplished via urban ferryboats, this transport mode is quite minor, accounting for only a third of a percent in the United States, for example.

Between these extremes are some striking differences among the countries regarding the other modes of passenger travel. First, domestic air travel in the United States (measured by the proportion of person-kilometers of travel) is nearly double that in Canada and triple that in Mexico. This difference is greater than would be expected when expenditures for air transport are compared. For instance, U.S. per capita expenditures on domestic air travel are only 38 percent higher than in Canada. Perhaps this difference suggests longer distance U.S. air trips or lower U.S. airfares; some of the difference could be accounted for if Canadian expenditures on air freight were far higher than U.S. per capita air freight expenditures.

Table 5 Total and per Capita Freight Movement by Mode: 1990

	Ton-Miles, Millions				Tonne-Kilometers, Millions			
	Canada	Mexico	U.S.	Total	Canada	Mexico	U.S.	Total
Total	413,054◄	123,957◄	4,843,245◄	5,380,256◄	603,190◄	181,017◄	7,072,673◄	7,856,880◄
Highway[1]	204,745◄	98,963◄	2,952,181◄	3,255,889◄	298,993◄	144,518◄	4,311,120◄	4,754,631◄
Aviation[2]	375	37◄	9,064	9,476◄	548	54◄	13,236	13,838◄
Rail	170,080	24,941	1,071,000	1,266,021	248,371	36,422	1,564,000	1,848,792
Water[3]	37,854	16◄	811,000	848,870◄	55,279	23◄	1,184,317	1,239,619◄
Total/population	15,528◄	1,526◄	19,381	15,039◄	24,985◄	2,455◄	31,184	24,198◄

	Percentages			
	Canada	Mexico	U.S.	Total
Total	100.00	100.00	100.00	100.00
Highway[1]	49.57◄	79.84◄	60.95◄	60.52◄
Aviation[2]	0.09	0.03◄	0.19	0.18
Rail	41.18	20.12	22.11	23.53
Water[3]	9.16	0.01◄	16.74	15.78◄

Notes

◄ Denotes estimate

1. The Canadian and Mexican road estimates were determined by multiplying estimated vehicle-kms by average freight loads for each truck type. Canadian vehicle-km for large trucks were derived from Canadian surveys of for-hire trucking firms. U.S. experience was used for small trucks (greater than 2-axle). Mexican values were estimated using Mexican point counts of traffic by vehicle type, fuel consumption, and registered trucks; and U.S. experience on distance traveled and average load for different vehicle types.
2. The Mexican value assumes cargo traveled the same average distance as passengers, 859 kilometers (532.6 miles).
3. The Mexican figure assumes an average trip distance per unit weight of 400 kilometers (248 miles).

The proportionate share of rail passenger-kilometers of travel is lowest for the United States. The Canadian relative market share of rail is 50 percent higher than that of the United States; the Mexican share is four times that of Canada.

Domestic Freight Transport

Freight movement is often measured in terms of weight-distance (tonne-kilometers or ton-miles)—that is, the weight of the freight transported multiplied by the distance moved.[4] Data are available on this measure for highway, aviation, rail, and water transport (see table 5); similar data are not available for pipeline movement of crude oil and petroleum products.

The major freight mode as measured in terms of weight-distance is highway transport. In each of these three countries, trucks are responsible for more haulage than any other mode. Trucks are particularly pervasive in Mexico and the United States, where they account for about 80 percent of each country's total weight-distance of carriage. The comparable Canadian figure is considerably lower—just about 50 percent. Rail transport is responsible for 41 percent of Canada's total weight-distance of carriage; this mode makes up 20 percent of Mexico's freight share and 22 percent of the United States'. In all three countries, air freight weight-distances are quite small, accounting for less than one-fifth of 1 percent for the continent as a whole. Water weight-distances are similarly minimal for Mexico and relatively minor for Canada (9 percent of the total); in the United States, inland and intercoastal water transport of freight accounts for a far greater proportion of all freight movement—about 17 percent of the whole.

Table 6 **Vehicles by Mode: 1990**

	Number				Number per 1,000 Population		
	Canada	Mexico	U.S.	Total	Canada	Mexico	U.S.
Total, all modes	23,484,582	13,011,707	255,795,003	292,291,292	882.88	160.24	1,023.59
Highway	20,977,034	12,257,223	238,369,806	271,604,063	788.61	150.95	953.86
Cars	12,622,038	6,209,449	143,453,040	162,284,527	474.51	76.47	574.04
Motorcycles	331,075	218,698	4,259,462	4,809,235	12.45	2.69	17.04
Buses, Total	75,845	80,658	610,765	767,268	2.85	0.99	2.44
Transit	10,931	19,300◄	59,753	89,984◄	0.41	0.24	0.24
School	29,897	538,158	508,261	n/a	1.12	0.00	2.03
Intercity	3,717	35,211	19,491	58,419	0.14	0.43	0.08
Other buses	31,301	26,147	23,260	80,708	1.18	0.32	0.09
Trucks, Total	3,936,115	2,833,880	44,717,887	51,487,882	147.97	34.90	178.94
2-Axle, 4-Tire	3,579,579◄	1,728,373◄	38,863,550	44,171,501◄	134.57	21.29◄	155.52
Other units	269,253◄	841,059◄	4,614,028	5,724,341◄	10.12	10.36◄	18.46
Truck tractors	87,283◄	264,448◄	1,240,309	1,592,040◄	3.28	3.26◄	4.96
Aviation	16,121	2,898	218,640	237,659	0.61	0.04	0.87
Air Carrier aircraft	641	196◄	6,483	7,320◄	0.02	n/a	0.03
Other aircraft	15,480	2,702◄	212,157	230,339◄	0.58	0.03◄	0.85
Rail	128,313	49,680	1,242,171	1,420,164	4.82	0.61	4.97
Locomotives	3,719	1,677	23,499	28,895	0.14	0.02	0.09
Passenger cars	1,088	993	1,996	4,077	0.04	0.01	0.01
Freight cars	123,137	47,010	1,212,261	1,382,408	4.63	0.58	4.85
Commuter cars	369	n/a	4,415	4,784	0.01	n/a	0.02
Water	2,360,936	698,761	15,952,222	19,011,919	88.76	8.61	63.83
Recreation boats	2,300,000	660,440◄	15,800,000	18,760,440◄	86.47	8.13◄	63.23
Fishing vessels	58,329◄	37,793◄	113,000	209,122◄	2.19◄	0.47◄	0.45
Barges	587	n/a	30,966	31,553	0.02	n/a	0.12
Towboats/tugs	378	120	5,210	5,708	0.01	n/a	0.02
Ferries & passenger	216	0◄	1,116	11,342◄	0.01	n/a	n/a
Deep sea & Great Lakes	550	80	470	1,100	0.02	n/a	n/a
Other	876	318	1,460	2,654	0.03	0.00	0.01
Transit[1]	2,178	3,145	12,164	17,487	0.08	0.04	0.05
Heavy railcars	1,379	2,304	10,419	14,102	0.05	0.03	0.04
Light railcars	527	29	913	1,469	0.02	n/a	n/a
Trolleys	272	812	832	1,916	0.01	0.01	n/a

Notes

◄ Denotes estimate

n/a Not available for this report

1. Mexican vehicles are for Mexico City only. Transit buses and commuter railcars are included above as highway or rail vehicles.

Vehicles

With nearly 300 million transportation vehicles among them in 1990, the North American nations are not far from having one vehicle for every one of their combined 358 million residents. (See table 6.) The vehicles are mainly cars—about 162 million—and trucks—about 51 million. Collectively, the three countries also have some 19 million boats and ships, over one million rail vehicles, and over a quarter million aircraft. However, there are substantial differences in the relative distributions of vehicles among the three countries. For example, Mexico has about 151 highway vehicles per thousand population, versus 789 in Canada and 954

in the United States. There are some five rail vehicles per thousand people in both Canada and the United States, and not quite one per thousand in Mexico. Also, the two more northerly countries have relatively more water vessels and aircraft than does Mexico.

Fuel Consumption

Most North American transportation is petroleum-fueled, although some transit vehicles (as well as some cars, vans, and intercity rail lines) are powered by electricity. Per capita petroleum use in Canada is almost 2,000 liters (525 gallons); U.S. per capita use is 18 percent more—2,364 liters (625 gallons). (See table 7.) Mexico, with its smaller per capita auto and truck fleet, consumes 493 liters (130 gallons) per person. Electricity use per capita for transportation is about the same in both the United States and Canada; Mexico consumes less than half the electricity per capita than do the other two countries.

Table 7 Fuel Consumption by Mode: 1990

	Gallons, Millions				Liters, Millions			
	Canada	U.S.	Mexico	Total	Canada	U.S.	Mexico	Total
Total	13,975	156,104	10,584	180,662	52,895	590,854	40,060	683,809
Highway[1]	11,572	131,879	9,995◄	153,446◄	43,800	499,164	37,831◄	580,794◄
Aviation[2]	1,310	17,495	209◄	19,014◄	4,960	66,219	791◄	71,969◄
Rail	552	3,364	143◄	4,059◄	2,089	12,733	540◄	15,362◄
Water	541	3,365	238◄	4,143◄	2,046	12,738	899◄	15,683◄
	Kilowatt Hours, Millions							
	Canada	U.S.	Mexico	Total				
Transit[3]	612	4,837	719◄	6,168◄				
	Gallons per Capita				Liters per Capita			
	Canada	U.S.	Mexico	Total	Canada	U.S.	Mexico	Total
Petroleum	525	625	130◄	505◄	1,989	2,364	493◄	1,912◄
	Kilowatt Hours per Capita							
	Canada	U.S.	Mexico	Total				
Electricity	23.01	19.36	8.85◄	17.24◄				

Notes

◄ Denotes estimate

1. Highway includes transit buses.
2. Aviation includes domestic and international flights.
3. Transit includes only electric vehicles. Mexican data are for Mexico City in electric vehicles only.

Transportation Employment

In all three countries, vehicle operation engages the largest number of people employed in transportation-related occupations. (See table 8.) Moreover, the proportions of people employed as vehicle operators are quite similar for all three countries, ranging from about 20 per thousand in Mexico to about 22 in Canada and around 25 in the United States. Within the operation area, however, there are large differences by mode. For example, about four people out of every thousand persons in Mexico are employed in the taxi industry; fewer than one in a thousand are so employed in Canada or the United States. Approximately three people per thousand in both Canada and the United States are employed in commercial air travel, compared to fewer than one per thousand in Mexico. Also, about one person per thousand in either Mexico or the United States is employed in rail operation, versus about three in Canada.

Besides operation, the other areas of transportation employment are transportation equipment manufacturing, construction, government, and various commercial transport service fields. In all, 55 out of every thousand Canadians are employed in some aspect of transportation; 52 out of every thousand people in the United States are so employed. The comparable Mexican figure is 25, largely because Mexico has very little transportation equipment manufacturing, less road and

Table 8 Transportation Employment: 1990

	Employment (in thousands)				Employment per 1,000 Population		
	Canada	Mexico	U.S.	Total	Canada	Mexico	U.S.
Manufacturing*	295	90◄	2,238	2,624◄	10.97	1.11◄	8.96
Highway equipment	227	67◄	985	1,279◄	8.43	0.82◄	3.94
Aviation equipment	47	14◄	692	753◄	1.76	0.18◄	2.77
Rail equipment	6	380◄	374		0.22	0.00◄	1.50
Water equipment	15	9◄	187	211◄	0.55	0.11◄	0.75
Construction	96	18◄	211	325◄	3.58	0.22◄	0.84
Highway and rail	96	18◄	211	325◄	3.58	0.22◄	0.84
Operation	589	1,658◄	6,311	8,559◄	21.90	20.42◄	25.26
Private highway	217◄	776◄	2,738◄	3,731◄	8.05◄	9.56◄	10.96◄
For-hire highway	204	760◄	2,420	3,384◄	7.58	9.36◄	9.69
Trucks	105	383◄	1,590	2,078◄	3.91	4.71◄	6.36
Buses	78	83◄	797	957◄	2.89	1.02◄	3.19
Taxis	21	295◄	33	349◄	0.78	3.63◄	0.13
Commercial air	70	21◄	741	833◄	2.60	0.26◄	2.97
Rail	70	82	277	430	2.61	1.01	1.11
Water	16	4◄	50	70◄	0.59	0.05◄	0.20
Electric transit	12	14◄	84	110◄	0.46	0.17◄	0.34
Other commercial	332	198◄	3,521	4,052◄	12.36	2.44◄	14.09
Government	171	55◄	780	1,006◄	6.36	0.68◄	3.12
Total transport	1,484	2,020◄	13,061	16,565◄	55.17	24.87◄	52.27
National employment	14,905	24,063◄	117,914	156,882◄			
Transportation/national	9.96%	8.39%◄	11.08%	10.56%◄			

Notes

◄ Denotes estimate

* Includes manufacture of transportation equipment that may be exported.

Table 9 Transportation Fatalities by Mode: 1990

	Canada 1990	Mexico[1] 1990	U.S. 1990	Total 1990
Total, all transportation	3,551	5,500◄	46,986	56,037◄
Highway	2,917	5,500◄	44,475	52,892◄
Aviation	87	n/a	838	925◄
Rail	103	n/a	599	702◄
Water	390	n/a	919	1,309◄
Other	54	n/a	155	209◄
National population, millions	26.6	67.7◄	249.9	344◄
Transportation fatalities per million population	133	81◄	188	163◄

Notes
◄ Denotes estimate
n/a Not available for this report.
1. No data were available on Mexico's fatalities or federal interest roads. Fatality statistics were also not available for the other transportation modes.

rail construction, and offers only about one-fifth the employment of the other two countries in transport services.

Transportation Fatalities

The U.S. fatality rate of 188 per million population for 1990 is substantially higher than the Canadian figure of 133. (See table 9.) This disparity is due to fewer highway fatalities in Canada; deaths in other modes are either the same as for U.S. residents, or higher—as with rail and water transport. Since 1987, highway deaths per capita have fallen in the United States and Canada; available evidence suggests that Mexican road fatalities may have been increasing.

Endnotes

1. In this report vehicular transport includes recreational boating and excludes pipelines. Methods different from other U.S. publications are used to calculate the bill for categories such as general aviation and private trucking. In order to enhance consistency among the national data sources, definitions for some categories—especially in aviation—also differ.

2. Among the nonmarket impacts that the transportation bill does not address are
- uncompensated air, water, and noise pollution;
- the cost of time expended for transportation purposes by transport users and private operators (e.g., transit riders and auto drivers);
- related uncompensated accident loses and storage or inventory costs; and
- potential alternative earnings from capital used for transportation vehicles and facilities.

On the other hand, the transportation bill double-counts certain effects. Specifically, it includes every transport expenditure made, even if a particular expenditure is an intermediate input to the production of final demand (e.g., part of a good's production cost or part of labor's value-added).

3. Some of these differences in modal shares between the Canadian and U.S. transportation bills are quite large. As calculated from the data in table 3, Canada spends about 85 percent more per capita on rail freight and intercity passenger movement than does the United States; the United States spends 38 percent more per capita on domestic air freight and passenger services than does Canada.

4. Tonne is the metric weight of 1,000 kilograms (2,205 pounds); ton is the U.S. statutory or "short" ton measure of 907.2 kilograms (2,000 pounds). Besides the tonne-kilogram indicator, other commonly reported freight output measures are

(1) using the tonne or ton as an indicator of the freight generated for haulage (this measure does not take into account the distance hauled or the value of service)

(2) monetary payment—the revenue received by the freight haulers (this must be estimated when freight is hauled by private carrier rather than a for-hire carrier).

Transborder and Other International Transportation Statistics

Nondomestic transportation in North America is either (1) transborder trade and transport among the three countries or (2) international transportation beyond North American borders. Both transborder and international transport involve the movement of either freight or passengers.

Of the three countries, Canada's economy is by far the more internationalized. In monetary terms, the Canadian foreign trade sector equals about 42 percent of that country's gross domestic product. The Mexican relationship for export and import trade combined is approximately 25 percent of GDP; the U.S. figure is the lowest at about 16 percent. (See table 10.)

Expenditures on international passenger travel were less important by far in all three countries than were import and export expenditures for goods. Money spent by travelers to and from the three countries was equivalent to about 7 percent of the Mexican GDP, about 3 percent of the Canadian, and under 1½ percent of the U.S.

Transborder Passengers

Along the Canadian-U.S. and U.S.-Mexican borders, same-day travel both by car and on foot dominates the number of border crossings.[1] For example, more than half of the Canadian-U.S. border crossings are estimated to be same-day round-trips by car. These short-term crossings by motor vehicle, bicycle, boat, transit, or on foot—while significant—are not included in the data tabulations compiled by national authorities, and are not addressed here.

Longer term border crossings and other international passenger trips for all three countries totaled almost 96 million in 1990. (See table 11.) The majority (about 53 million, or approximately 55 percent) of these trips were transborder—i.e., North American trips made by residents of the three countries. A remaining 43 million trips to and from Canada, Mexico, and

Table 10 Foreign Travel and Trade Exports and Imports as a Percentage of GDP

	Exports (as a percentage of GDP)			Imports (as a percentage of GDP)		
	Travel	Trade	Total	Travel	Trade	Total
Canada	2.16	21.60	23.76	1.04	20.32	21.36
Mexico	3.54	11.37	14.91	3.18	13.25	16.43
United States	0.70	7.14	7.84	0.74	8.98	9.72

Table 11 Transborder and International Passenger Trips: 1990

	To: Canada	Mexico	U.S.	Rest of World	Subtotals	Per 1,000 Capita
From:						
Canada	—	783,804◄	17,262,000	2,472,587	20,518,391	771
Mexico	600,000◄	—	6,768,000	4,751,786◄	12,119,786◄	149◄
United States	12,668,000	14,900,000	—	15,990,000	43,558,000	174
Rest of World	3,256,391◄	1,329,143◄	15,059,000	—	19,644,534◄	n/a
Subtotal	16,524,391	17,012,947◄	39,089,000	23,214,373◄	—	n/a
Per 1,000 Population	621	209◄	156	n/a	n/a	—

Data are for trips longer than one day.
◄ Denotes estimate
n/a Not available for this report.

the United States involved travel to and from other continents by North Americans and residents of other countries.

Per capita statistics show that Canadians take the most overnight trips relative to their population—771 per thousand persons annually—compared with 174 for Mexicans and 149 for U.S. residents. In terms of trips made *to* the individual countries, 621 trips per thousand Canadians are made to Canada annually by residents of other countries; 209 trips are made to Mexico per thousand Mexicans; and 156 trips are made to the United States per thousand U.S. citizens.

Some modal detail for passenger trips is available for 1990.

- About 63 percent of U.S. residents traveling to and from Canada for more than a day crossed the border by car, 19 percent used air, 7 percent came by water, 5 percent each used either a bus or "other land" transport, and fewer than a half percent went by rail.
- About 68 percent of Canadians crossing the border to or from the United States crossed by car, 23 percent went by air, 3 percent each used either a bus or "other land" transport, 2 percent used water transport, and fewer than 1 percent used rail.
- Data were not available for all transportation modes used in crossing the U.S.-Mexican border, but Mexican data indicate that about 71 percent of all longer term tourists to the country flew, while about 29 percent arrived by various surface transport modes.

Table 12 Transborder and International Passenger Trip Expenditures: 1990

	Expenditures in Millions of Canadian Dollars					
To:	Canada	Mexico	U.S.	Rest of World	Subtotals	Per Capita
From:						
Canada	—	511◄	6,640	7,356	14,507	545
Mexico	467◄	—	4,673	4,403◄	9,543◄	117◄
United States	4,083	7,001	—	34,045	45,129	181
Rest of World	2,407	1,045◄	36,043	—	39,495◄	n/a
Subtotal	6,958	8,556◄	47,356	45,804	—	n/a
Per Capita	262	105◄	189	n/a	n/a	—
	Expenditures in Billions of Pesos[1]					
To:	Canada	Mexico	U.S.	Rest of World	Subtotals	Per Capita
From:						
Canada	—	1,231◄	16,008	17,734	34,973	1,315
Mexico	1,125◄	—	11,265	10,616◄	23,006◄	283◄
United States	9,844	16,878	—	82,075	108,797	435
Rest of World	5,804◄	2,519◄	86,892	—	95,214◄	n/a
Subtotal	16,773	20,627◄	114,165	110,425	—	n/a
Per Capita	631	254◄	457	n/a	n/a	—
	Expenditures in Millions of U.S. Dollars					
To:	Canada	Mexico	U.S.	Rest of World	Subtotals	Per Capita
From:						
Canada	—	438◄	5,690	6,303	12,431	467
Mexico	400◄	—	4,004	3,773◄	8,177◄	101◄
United States	3,499	5,999	—	29,173	38,671	155
Rest of World	2,063◄	895◄	30,885	—	33,843◄	n/a
Subtotal	5,962	7,332◄	40,579	39,250	—	n/a
Per Capita	224	90◄	162	n/a	n/a	—

Notes
◄ Denotes estimate
n/a Not available for this report
1. July 1, 1990, controlled exchange rate was used to convert pesos to U.S. dollars.

On a per capita basis, the typical traveler from Canada outspends people traveling from the United States or Mexico more than three times over, spending $467 per trip compared with $155 and $101, respectively. (See table 12.) Travelers from other countries in Canada for longer than a day spent more on the average ($224) than travelers in the United States ($162) or in Mexico ($90). For Canada and Mexico, average expenditures per capita are greater for their residents traveling abroad than for foreign nationals traveling in their countries. The difference between these expenditures was quite large for Canada: travelers to Canada averaged less than half the amount spent by travelers from Canada ($224 versus $467 per capita). For the United States, per capita spending was just about even, with residents spending $155 abroad and travelers to the United States spending $162 per trip.

Freight Transport

Data are available on transborder and international freight movements in terms of (1) the weights moved and (2) the value of shipments, per unit of weight and per capita for each North American country. Data are also available on dollars spent on freight transport by air, water, and land from 1989 to 1992.

Very little freight is shipped between Canada and Mexico. (See table 13.) The United States ships approximately equal weights of commodities to both Mexico and Canada, and receives relatively equal amounts of freight from each country as well. The volume of U.S. imports from both Canada and Mexico, however, is about double the amount of the U.S. exports to either.

These relative relationships might be expected from freight flows that consist primarily of raw materials to the United States and of processed or manufactured goods from the United States to its neighbors. This assumption is supported by the fact that shipments to Mexico from Canada

Table 13 Transborder and International Freight Movements: 1990

U.S. Tons, Million

To: / From:	Canada	Mexico	U.S.	Rest of World	Subtotals	Per 1,000 Capita
Canada	—	1◄	98	127	226◄	8.489
Mexico[1]	4◄	—	89	88	182◄	2.238
United States	52	45	—	364	408	1.631
Rest of World	44	40	390	—	815	n/a
Subtotal	101◄	87◄	577	580	—	n/a
Per Capita Tons	3.795	1.068	2.309	n/a	n/a	—

Metric Tonnes, Million

To: / From:	Canada	Mexico	U.S.	Rest of World	Subtotals	Per 1,000 Capita
Canada	—	1◄	89	115	205◄	7.703
Mexico[1]	4◄	—	81	80	165◄	2.031
United States	47	41	—	331	370	1.480
Rest of World	40	37	354	—	740	n/a
Subtotal	92◄	79◄	524	526	—	n/a
Per Capita Tonnes	3.444	0.969	2.095	n/a	n/a	—

Notes

◄ Denotes estimate

n/a Not available for this report

1. U.S.-Mexican figures are for 1991.

and the United States are of a higher value than are the shipments those countries receive from Mexico. (See table 14.) Furthermore, shipments from the United States to Canada are of a higher value by weight than those received from Canada.

Although Canada and Mexico are important trading partners for the United States, the weight of their combined commodity shipments to the United States is only about one-third that of all U.S. freight imports. Shipments to both these countries from the United States accounts for about a quarter of U.S. exports worldwide.

International freight movements per capita are far greater for Canada than for either Mexico or the United States. Canada's 1990 per capita freight weight was about eight tonnes (over eight tons), compared to about two tonnes (slightly over two tons) for Mexico and around one and a half tonnes (over one and a half tons) for the United States. From a dollar standpoint, Canada's per capita exports are three times the value of those of the United States—$4,673 in 1990 versus $1,575—and about 15 times the value of Mexico's per capita exports ($330). (See table 15.) Canada was a net exporter in 1990 by a small margin, importing $4,389 per capita. The other two North American countries were net importers, with negative trade balances.

Modal Trends in Freight Transport

Land transport, particularly by motor carrier, is the primary means of moving freight between the three North American countries. (See table 16.) Air transport is the second major mode, as measured by shipment value, for shipments from the United States to Canada; water transport is the second major mode for freight moved from Canada to the United States.

Canada-U.S. Freight Movement. Between 1989 and 1992, total United States-to-Canada trade increased more than 3 percent in constant dollars. From 1989 to 1991, the value of goods shipped by water declined by more than half, although there was a small increase from 1991 to 1992. The value moved by truck rose about 9 percent from 1990 to 1992. Rail and "other" transport (which included oil pipeline movement) declined during the same period.

The value of freight moving in the opposite direction—i.e., from Canada to the United States—was approximately the same in 1992 as in 1989. Air movements rose in value 41 percent over the period, accounting for about 5 percent of the total by all modes by 1992. The value of goods carried by water transport rose between 1989 and 1992, accounting for almost 11 percent of the mode's total by 1992. Track and rail transit declined: The rail value in 1992 was only 65 percent of its 1989 value.

Table 14 Transborder and International Freight Value by Weight: 1990

	Value/Ton, U.S. Dollars				
	To: Canada	Mexico	U.S.	Rest of World	Subtotals
From:					
Canada	—	624◄	936	254	550◄
Mexico	338◄	—	213	72	148◄
United States	1,586	624	—	775	965
Rest of World	731	58	987	—	n/a
Subtotal	1,157◄	361◄	858	n/a	—

◄ Denotes estimate
n/a Not available for this report

Table 15 Transborder and International Freight Value: 1990

Millions, U.S. Dollars[1]

	To: Canada	Mexico	U.S.	Rest of World	Subtotals	Per Capita
From:						
Canada	—	562	91,372	32,362	124,297	4,673
Mexico	1,498	—	18,997	6,343	26,838	330
United States[1]	82,967	28,375	—	282,250	393,592	1,575
Rest of World	32,283	2,335◄	384,942	—	544,727◄	n/a
Subtotals	116,748	31,272	495,311	320,956	—	n/a
Per Capita	4,389	385	1,982	n/a	n/a	—

Millions, Canadian Dollars[2]

	To: Canada	Mexico	U.S.	Rest of World	Subtotals	Per Capita
From:						
Canada	—	656	111,556	37,767	149,979	5,638
Mexico	1,748	—	22,169	7,402	31,320	385
United States[1]	96,822	33,114	—	329,386	459,322	1,838
Rest of World	37,675	2,725◄	449,227	—	489,627◄	n/a
Subtotal	136,245	36,494	582,953	n/a	—	n/a
Per capita	5,122	449	2,333	n/a	n/a	—

Billions, Pesos[3]

	To: Canada	Mexico	U.S.	Rest of World	Subtotals	Per Capita
From:						
Canada	—	1,617	262,832	93,091	357,539	13,441
Mexico	4,309	—	54,645	18,246	77,200	950
United States[1]	238,655	81,621	—	811,892	1,132,167	4,530
Rest of World	92,863	6,716◄	1,107,286	—	1,566,906◄	n/a
Subtotal	335,826	89,954◄	1,424,762	923,229	—	n/a
Per capita (thousands)	12,625	1,107	5,701	n/a	n/a	—

Notes
◄ Denotes estimate
n/a Not available for this report
1. U.S. export figures include silver ore and bullion.
2. 1990 exchange rate of 1.167 Canadian dollars per U.S. dollar used.
3. July 1990 market exchange rate of 2,876.75 pesos per U.S. dollar used.

Mexico-U.S. Freight Movement. In 1989 and 1990, slightly more freight (as measured by freight value) moved from Mexico to the United States than in the opposite direction. This relationship was reversed in 1991 and 1992: U.S.-to-Mexico freight value was $2 billion greater in 1991, and $5 billion greater in 1992, than the value of freight transported from Mexico to the United States.

The primary mode of movement in both directions is motor carriage, the second most important mode is air transport for shipments from the United States to Mexico and water transport for shipments from Mexico to the United States. The value of freight bound to Mexico by air is nearly three times the value of freight moved north from Mexico to the United States. On the other hand, the value of freight moved north to the United States by water transport is about three times the value of that moved south from the United States to Mexico.

Canada-Mexico Freight Movement. Data for freight values moved between Canada and Mexico were not available for 1989. Between 1990 and 1992, these freight flows increased. In all cases, however, Canada-to-Mexico flows were worth much less than freight values from Mexico to Canada. A north-south "land bridge" appears to exist between the two counthes. In 1992, this bridge accounted for motor carriage of some $1.4 billion of goods northward and

Table 16 Transborder and International Freight Value by Mode

	1989	1990	1991	1992
	U.S. to Canada by Mode, Millions 1990 U.S. Dollars			
Aviation	4,816	6,036	5,637	5,987
Water	3,633	1,938	1,433	1,447
Land	73,210	74,992	74,818	76,975
Highway	n/a	63,712	66,884	69,227
Rail	n/a	8,233	7,564	7,415
Other	n/a	3,047	370	332
Total	n/a	81,660	82,967	81,888
	Canada to U.S. by Mode, Millions 1990 U.S. Dollars			
Aviation	1,412	3,315	3,984	4,254
Water	5,540	9,675	10,008	9,750
Rail	24,674	16,914	15,109	16,207
Highway	57,568	53,257	49,905	53,060
Other	2,841	8,211	8,573	8,948
Total	92,035	91,372	87,580	92,219
	U.S. to Mexico by Mode, Millions 1990 U.S. Dollars			
Aviation	1,170	1,378	1,484	2,011
Water	1,687	1,527	1,452	1,751
Highway	23,194	25,470	29,067	34,247
Total	26,051	28,375	32,002	38,010
	Mexico to U.S. by Mode, Millions 1990 U.S. Dollars			
Aviation	259	572	634	755
Water	4,873	5,764	5,059	4,983
Highway	23,233	23,836	24,245	27,204
Total	28,365	30,172	29,938	32,941
	Canada to Mexico by Mode, Millions 1990 U.S. Dollars			
Aviation	n/a	84	50	52
Water	n/a	87	118	194
Highway	n/a	206	210	269
Rail	n/a	133	62	87
Other	n/a	n/a	n/a	n/a
Total	n/a	510	440	601
	Mexico to Canada by Mode, Millions 1990 U.S. Dollars			
Aviation	n/a	58	58	52
Water	n/a	126	159	67
Highway	n/a	890	1,297	1,390
Rail	n/a	403	579	503
Other	n/a	22	72	135
Total	n/a	1,499	2,165	2,147

n/a Not available for this report

nearly $300 million of goods southward. The value of rail flows was much smaller, with $500 million in goods moving north and about $90 million moving south from Canada to Mexico. Water shipments were valued at approximately $100 to $200 million annually in each direction for 1990, 1991, and 1992. Water was second in importance to motor carriage for movements from Canada to Mexico, but third in importance—behind highway and rail—for northbound movement between the two countries.

Endnote

1. Transit is also important in a few instances; San Diego's new light rail line carries much tourist traffic.

Modal Profiles: 1990

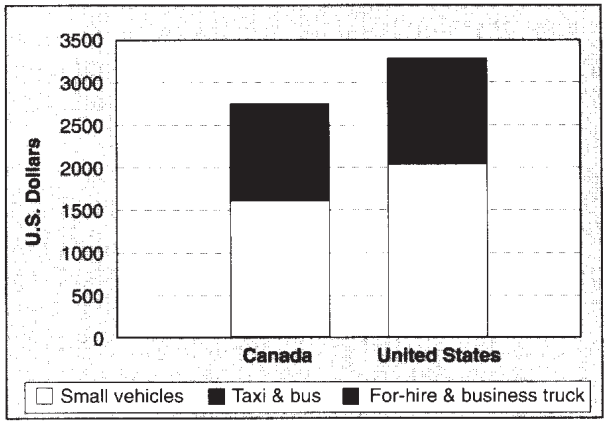
This section presents an overview of each of the main modes of transportation—highway, aviation, rail, water, and transit—for each of the North American countries. The most recent year for which some comparable data items exist is 1990; consequently, these modal profiles are for that year. (Trend analyses by mode and country for the years 1987 to 1991 are in the following section of this report.) In general, available 1990 transportation data are limited for Mexico; therefore, data on Mexico have not been included here. In some cases, data have been estimated (see appendix A for a discussion of how these estimates were derived); in other cases, where a lack of information precluded development of estimates, no data have been provided for the particular variable.

Highway

The highway mode consists of public roads and streets; automobiles, vans, trucks, motorcycles, and buses[1] operated by transportation companies, other businesses, governments, and households; garages, truck terminals, and other facilities for motor vehicles.

Highway Bill. For both the United States and Canada, most national transportation expenditures are made for highway transport of people and freight. Canadian highway expenditures per capita in 1990 were $3,126, about 89 percent of the U.S. per capita figure of $3,517. (See figure 3 and table 17.) Highway expenditures—the highway bill—can be grouped into several major categories, including vehicle capital and operating costs for autos and small trucks, amounts spent on for-hire truck services, expenditures for operating business trucks (private trucking), expenditures for purchased passenger services of highway vehicles (taxis and buses), and amounts spent for highway construction and upkeep. The key expenditure category in both Canada and the United States is the capital and operating cost of small vehicles: this was $43 billion in 1990 in Canada (52 percent of that country's entire highway bill) and $518 billion in the United States (59 percent).

Figure 3. Highway bills per capita



Canada and the United States differ in their highway expenditures in several respects. Canada spends substantially more on bus transit ($128 per person) than does the United States ($36); Canadian government support for transit buses is also more ($42 per person versus $24). Similarly, Canada spends $13 per person on intercity buses; the United States spends only $7.50.

On the other hand, some major items in the countries' highway bills are markedly similar. For-hire trucking receipts were almost $11 billion in Canada, or 13 percent of the highway bill. In the United States, the figure was $117.5 billion, also about 13 percent. (Per capita expenditures in the two countries for for-hire trucking are $407 in Canada and $470 in the United States.) Business truck expenditures in Canada were $14 billion, or 17 percent of the highway bill; the corresponding U.S. figure was $157 billion, or about 18 percent. (Per capita expenditures are $530 in Canada and $630 in the United States). Canadians spends $19 per person on taxis and $31 on school buses: the United States spends $23 and $30, respectively.

Table 17 Total and per Capita Highway Bills: 1990

	Millions of U.S. Dollars			Millions of Canadian Dollars		
	Canada	U.S.	Total	Canada	U.S.	Total
Highway Bill:	83,139◄	879,281	962,420◄	97,022◄	1,026,121	1,123,143◄
Small vehicles	42,857	518,026	560,883	50,013	604,537	654,550
Capital Costs	18,153	215,800	233,953	21,184	251,839	273,023
Operating Costs	24,704	302,226	326,930	28,829	352,698	381,527
Taxi revenue	505	5,818	6,323	589	6,790	7,379
School bus expense	823	7,605	8,428	960	8,875	9,835
Intercity bus revenue	346	1,876	2,222	404	2,189	2,593
Other bus revenue	144	1,321	1,464	168	1,541	1,709
Bus transit revenue	3,404	8,903	12,307	3,972	10,390	14,362
For-hire truck revenue	10,826	117,511	128,337	12,634	137,135	149,769
Business truck expense	14,097	157,354	171,451	16,452	183,632	200,084
Government highway expenditures	5,860◄	60,867	66,728◄	6,839◄	71,032	77,871◄
Additional government highway revenues	4,277◄	0	4,277◄	4,991◄	0	4,991◄

	U.S. Dollars			Canadian Dollars		
	Canada	U.S.	Total	Canada	U.S.	Total
Highway bill per capita	2,745.0	3,275.0	3,224.0	3,203.0	3,823.0	3,762.0
Small vehicles	1,611.1	2,072.9		1,880.2	2,419.2	
Capital costs	682.4	863.5		796.4	1,007.8	
Operating costs	928.7	1,209.4		1,083.8	1,411.4	
Taxi revenue	19.0	23.3		22.1	27.2	
School bus expense	30.9	30.4		36.1	35.5	
Intercity bus revenue	13.0	7.5		15.2	8.8	
Other bus revenue	5.4	5.3		6.3	6.2	
Bus transit expense	128.0	35.6		149.3	41.6	
For-hire truck revenue	407.0	470.2		475.0	548.8	
Business truck expense	530.0	629.7		618.5	734.8	

◄ Denotes estimate

Both the Canadian and U.S. governments provide substantial financial support to their countries' highways. The $6 billion spent by the Canadian government is 7 percent of the highway bill and $220 per person; U.S. support is also about 7 percent and is $226 per person. However, Canadian governments collect $10.1 billion, or $381 per person, from highway users. U.S. collections are $61 billion, or $226 per person. In Canada, the user fee receipts exceed the amounts expended on highways by $4.3 billion. In the United States, payments exceed revenues by $7.9 billion.

Extent of Public Roads. The United States has over six million kilometers (almost four million miles) of public roads. (See tuble 18.) Canada, with a land area roughly the size of the United States, contains 22 percent as much public road distance. However, in relation to its far smaller population. Canada has over twice as much public road distance as does the United States.

Table 18 Extent of Public Roads: 1990

	U.S. Miles			Kilometers		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	853,490	3,880,151	4,733,641	1,373,496	6,244,208	7,617,704
Major highways	5,786	55,648	61,434	9,312	89,553	98,865
Other paved	221,273	2,203,497	2,424,770	356,088	3,546,020	3,902,108
Unpaved	626,431	1,621,006	2,247,437	1,008,096	2,608,635	3,616,731
	U.S. Miles/Million Population			Kilometers/per Million Population		
	Canada	U.S.	Total	Canada	U.S.	Total
Total public	32,086	15,527	17,120	51,635	24,987	27,550
Major highways	218	223	222	350	358	358
Other paved	8,319	8,818	8,770	13,387	14,190	14,113
Unpaved	23,550	6,487	8,128	37,898	10,439	13,080

A very small proportion of Canadian or U.S. public roads are multilane and of a high capacity (such as the U.S. Interstate Highway System) suited for large volumes of traffic. These major highways constitute only about 1 percent of U.S. facilities and about 7 percent of Canadian. Many public roads—73 percent of Canada's and 42 percent of those in the United States—are narrow; unpaved; have soil, gravel, or stone surfaces; or nonsurfaced.

Number of Vehicles. There are over 200 million highway vehicles registered in Canada and the United States combined. (See table 19.) This total averages to 76 vehicles per 100 people—slightly more in the United States (77) and slightly less in Canada (64). The two countries follow a similar pattern in terms of registered trucks and cars: there are fewer per capita of every kind of vehicle in Canada than in the United States. In the overall category of highway buses, the per capita numbers are nearly identical for the two countries. However, the United States has about twice as many school buses per capita as does Canada, and far fewer buses in every other classification.

In addition to the on-road vehicles listed in the table, some Canadian provinces register snowmobiles and powered farm and construction equipment. In 1990, there were 630,000 snowmobiles registered, or about twice the number of motorcycles as were registered in Canada.

Table 19 Highway Vehicles: 1990

	Number			Vehicles/Million Population		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	16,953,190	193,057,376	210,010,566	637,338	772,539	759,532
Cars	12,622,038	143,453,040	156,075,078	474,513	574,042	564,467
Motorcycles	331,075	4,259,462	4,590,537	12,446	17,045	16,602
Straight trucks	3,848,832	43,477,578	47,326,410	144,693	173,980	171,162
2-Axle, 4-Tire	3,579,579	38,863,550	42,443,129	134,571	155,516	153,501
Other	269,253	4,614,028	4,883,281	10,122	18,463	17,661
Truck-tractors	87,283	1,240,309	1,327,592	3,281	4,963	4,801
Buses	63,962	626,987	690,949	2,405	2,509	2,499
Transit	10,931	59,753	70,684	411	239	256
School	29,897	508,261	538,158	1,124	2,034	1,946
Intercity	3,717	19,491	23,208	140	78	84
Other buses	31,301	23,260	54,561	1,177	93	197

Highway Vehicle Use. The average distances traveled by a highway vehicle in Canada and in the United States are very similar—about 18,500 kilometers (11,500 miles), although automobiles in Canada travel about 4 percent farther than does the average U.S. car. A significant difference exists, however, in truck travel comparisons. The U.S. distance for straight trucks is about 17 percent greater than the Canadian, the U.S. distance for truck-tractors is about 22 percent more. (See table 20.)

The amount of highway travel per capita was estimated for Canada using U.S. vehicle occupancy rates. (See table 21.) The estimate suggests an average person-miles of highway use of 12,000 in Canada and 14,000 in the United States.

Table 20 Highway Vehicle-Distances: 1990

	Miles, Millions			Kilometers, Millions		
	Canada	U.S.	Total	Canada	U.S.	Total
Vehicle-Distance	192,418	2,243,909	2,436,327	309,600	3,610,450	3,920,050
Cars	138,193	1,513,184	1,651,377	222,353	2,434,713	2,657,066
Motorcycles	743◄	9,557	10,300	1,195◄	15,377	16,573
Straight trucks	46,644	615,892	662,536	75,051	990,970	1,066,021
Truck-tractors	5,559	96,367	101,926	8,944	155,055	163,999
Buses	1,278	8,909	10,187	2,057	14,335	16,392
Transit	383	2,153	2,536	616	3,465	4,081
School	302	4,962	5,264	486	7,983	8,469
Intercity	250	1,244	1,494	402	2,002	2,404
Other buses	344◄	550◄	893◄	553◄	884◄	1,437◄

	Miles per Capita			Kilometers per Capita		
	Canada	U.S.	Total	Canada	U.S.	Total
Vehicle-Distance	7,234	8,979	8,811	11,639	14,448	14,177
Cars	5,195	6,055	5,972	8,359	9,743	9,610
Motorcycles	28◄	38	37	45◄	62	60
Straight trucks	1,754	2,465	2,396	2,821	3,965	3,855
Truck-tractors	209	386	369	336	620	593
Buses	48	36	37	77	57	59
Transit	14	9	9	23	14	15
School	11	20	19	18	32	31
Intercity	9	5	5	15	8	9
Other buses	13◄	2◄	3◄	21◄	4◄	5◄

	Miles per Vehicle			Kilometers per Vehicle		
	Canada	U.S.	Total	Canada	U.S.	Total
Vehicle-Distance	11,350	11,623	11,601	18,262	18,701	18,666
Cars	10,949	10,548	10,581	17,616	16,972	17,024
Motorcycles	2,244◄	2,244	2,244	3,611◄	3,610	3,610
Straight trucks	12,119	14,166	13,999	19,500	22,793	22,525
Truck-tractors	63,688	77,696	76,775	102,475	125,013	123,531
Buses	19,986	14,209	14,744	32,157	22,863	23,723
Transit	35,045	36,038	35,885	56,387	57,986	57,738
School	10,102	9,762	9,781	16,254	15,707	15,737
Intercity	67,171	63,847	64,379	108,078	102,730	103,586
Other buses	10,976◄	23,629◄	16,370◄	17,661◄	38,018◄	26,340◄

◄ Denotes estimate

Table 21 Highway Person-Distances: 1990

	Person-Miles, Millions			Person-Kilometers, Millions		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	320,564◄	3,613,105	3,933,669	515,787◄	5,813,486	6,329,273
Cars	240,169◄	2,629,796	2,869,965	386,433◄	4,231,341	4,617,774
Motorcycles	1,085◄	13,953	15,038	1,745◄	22,451	24,196
Straight trucks	59,885◄	757,242	817,127	96,354◄	1,218,402	1,314,757
Truck-tractors	5,559◄	96,367	101,926	8,944◄	155,055	163,999
Buses	13,866◄	115,747	129,613	22,310◄	186,237	208,547
Transit	3,758◄	21,127	24,885	6,047◄	33,993	40,040
School	3,866◄	63,509	67,375	6,220◄	102,186	108,406
Intercity	6,242◄	31,111	37,353	10,043◄	50,058	60,101
	Person-Miles per Capita			**Person-Kilometers per Capita**		
	Canada	U.S.	Total	Canada	U.S.	Total
Average Total	12,051◄	14,458	14,227	19,390◄	23,263	22,891
Cars	9,029◄	10,523	10,380	14,528◄	16,932	16,701
Motorcycles	41◄	56	54	66◄	90	88
Straight trucks	2,251◄	3,030	2,955	3,622◄	4,876	4,755
Truck-tractors	209◄	386	369	336◄	620	593
Buses	521◄	463	469	839◄	745	754
Transit	141◄	85	90	227◄	136	145
School	145◄	254	244	234◄	409	392
Intercity	235◄	124	135	378◄	200	217

◄ Denotes estimate

Highway Fuel Consumption. Available information on fuel consumption by highway vehicles shows that Canadian and U.S. vehicles use, on average, the same quantity of fuel—683 gallons per vehicle. (See table 22.) The average car driven by a Canadian consumes about 10 percent more fuel than the average car driven by a U.S. resident (554 gallons versus 505). U.S. trucks, both large and small, consume more fuel than do Canadian trucks; they also average more travel than their Canadian counterparts.

Almost all fuel used in highway travel is petroleum-based, mainly gasoline or diesel. Some alcohol fuels are consumed. Gasohol (an ethanol blend) constituted under 6 percent of U.S. consumption 1990 fuel consumption. A few U.S. vehicles are fueled by liquid natural gas; some are electric-powered. In Canada, propane or liquid natural gas is an important fuel for buses, accounting for over 4 percent of the fuel consumption of urban buses and about 16 percent of that of school buses.

Highway Employment. The number of persons employed in highway transportation activities are markedly similar in Canada and the United States when measured either as a proportion of total national employment (8½ percent in Canada and 8.3 percent in the United States) or in terms of the number of people employed in highway-related occupations per thousand population (40 in Canada and 39 in the United States). In both countries combined, nearly 11 million people—one out of every 11 people in the countries' workforces—are employed in highway-related activities. (See table 23.)

These highway employees work in several broad categories of activity: highway vehicle operation, sales of vehicles and accessories, highway equipment manufacture, wholesale sales of vehicles and accessories, and highway construction/repair. The first category is the largest,

Table 22 Highway Fuel Consumption: 1990

	Annual Gallons Millions			Annual Liters Millions		
	Canada	U.S.	Total	Canada	U.S.	Total
Fuel	11,572	131,879	143,451	43,800	499,164	542,964
Cars	6,991	72,435	79,426	26,460	274,167	300,627
Motorcycles	15◄	191	206	56◄	725	781
Straight Trucks	3,197	40,479	43,677	12,102	153,215	165,317
Tractors	1,205	17,577	18,782	4,562	66,528	71,089
Buses	164	1,197	1,360	620	4,529	5,149
Transit	79	568	646	297	2,149	2,446
School	53	472	525	201	1,787	1,987
Other buses	32◄	157◄	189◄	122◄	594◄	716◄

	Gallons per Vehicle			Liters per Vehicle		
	Canada	U.S.	Total	Canada	U.S.	Total
Fuel per Vehicle	683	683	683	2,584	2,586	2,585
Cars	554	505	509	2,096	1,911	1,926
Motorcyles	45◄	45	45	170◄	170	170
Straight Trucks	831	931	923	3,144	3,524	3,493
Tractors	13,808	14,171	14,147	52,262	53,638	53,548
Buses	2,562	1,908	1,969	9,697	7,224	7,452
Transit	7,182	9,500	9,141	27,185	35,957	34,601
School	1,773	929	976	6,711	3,516	3,693
Other buses	924◄	3,669◄	2,433◄	3,496◄	13,887◄	9,208◄

	Gallons per Capita			Liters per Capita		
	Canada	U.S.	Total	Canada	U.S.	Total
Fuel per Capita	435.0	527.7	518.8	1,646.6	1,997.5	1,963.7
Cars	262.8	289.9	287.3	994.7	1,097.1	1,087.3
Motorcycles	0.6◄	0.8	0.7	2.1◄	2.9	2.8
Straight Trucks	120.2	162.0	158.0	455.0	613.1	597.9
Tractors	45.3	70.3	67.9	171.5	266.2	257.1
Buses	6.2	4.8	4.9	23.3	18.1	18.6
Transit	3.0	2.3	2.3	11.2	8.6	8.8
School	2.0	1.9	1.9	7.5	7.2	7.2
Other buses	1.2◄	0.6◄	0.7◄	4.6◄	2.4◄	2.6◄

◄ Denotes estimate

accounting for 54 percent of the 9.8 million U.S. highway employees and 40 percent of those in Canada. Vehicle and accessory sales represents the second largest category of employment, accounting for 29 percent of U.S. highway employment and 24 percent of Canadian. The manufacture of cars and trucks is the next largest employment category. Although only 10 percent of the U.S. highway workforce is so employed, 21 percent of all Canadian highway workers are involved in this activity.

The final two categories are quite small in both countries, with wholesale sales of motor vehicles employing 5 percent of the workers in both Canada and the United States, and highway construction and repair accounting for 9 percent of the Canadian and 2 percent of the U.S. highway workforces. Although the numbers of people in this last category are small (about 300,000 for both countries combined), the large percentage difference is surprising. It could suggest relative expansion or improvement of the Canadian highway system, more use of capital

Table 23 Highway Employment: 1990

	Employment (thousands)			Percent of Total Highway Employment		
	Canada	U.S.	Total	Canada	U.S.	Total
Total Employment	1,068	9,777	10,844	100.00	100.00	100.00
Highway Transportation Equipment Manu.	227	985	1,212	21.25	10.08	11.18
Motor vehicles	51	315	365	4.76	3.22	3.37
Truck and trailer bodies	16	64	80	1.49	0.65	0.73
Motor vehicle parts & acc.	64	396	460	5.99	4.05	4.24
Highway & Bridge Construction & Repair	96	211	307	9.02	2.16	2.83
Highway Operations	431	5,274	5,705	40.37	53.94	52.61
Private trucking	217	2,738	2,955	20.30	28.01	27.25
For-hire trucking	105	1,590	1,696	9.86	16.27	15.64
Bus intercity and rural	4	24	28	0.35	0.25	0.26
Urban transit-Bus	39	162	201	3.62	1.66	1.85
School buses	31	579	611	2.93	5.93	5.63
Other bus	4	31	35	0.37	0.31	0.32
Taxis	21	33	54	1.97	0.34	0.50
14% Post Office Employment	10	115	126	0.97	1.18	1.16
Motor Vehicle & Acc. Wholesale	57	446	504	5.36	4.57	4.64
Motor Vehicle & Acc. Retail	256	2,861	3,117	24.00	29.26	28.74
Tires, batteries, & accessories	42	359	401	3.96	3.67	3.70
Gas & service stations	70	636	706	6.58	6.51	6.51
Car dealers	88	944	1,031	8.23	9.65	9.51
Car repair	47	727	774	4.42	7.44	7.14
Car & truck rental	9	195	204	0.80	1.99	1.88
Total National Employment	12,572	117,914	130,486			
Hwy Employment/National Employment (%)	8.492	8.291	8.311			
Highway Employment per 1,000 population	40.14	39.12	39.22			

equipment by the United States at the expense of highway construction and maintenance labor, or fewer people employed in the United States because of reduced maintenance and repair of the U.S. system.

Highway Fatalities. About 44,000 U.S. residents were killed in highway crashes in 1990; this figure has been declining annually in recent years. (See table 24.) In Canada, 3,600 people died in 1990. The death rate in the United States is higher than in Canada relative to the countries' respective populations—178 deaths per million in the United States versus 135 in Canada. Viewed in relation to the number of vehicles, the fatality statistics in the two countries are more similar—212 deaths per million vehicles in Canada compared to 230 in the United States. The higher U.S. rates are not surprising. Canada has relatively fewer motor vehicles, and they are driven less frequently on an annual basis than is the case in the United States. This information suggests that Canadian exposure rates, or the Canadian highway accident potential, would be less than that of the United States.

Table 24 Highway Fatalities: 1990

	Number of Fatalities			Percent of Fatalities		
	Canada	U.S.	Total	Canada	U.S.	Total
Total Highway	3,603	44,475	48,078	100.00	100.00	100.00
Occupants	2,917	37,134	40,051	80.96	83.49	83.30
Cars	n/a	24,092	n/a	n/a	n/a	n/a
Trucks	n/a	9,306	n/a	n/a	n/a	n/a
Motorcyclists	258	3,244	3,502	7.16	7.29	7.28
Buses	n/a	55	n/a	n/a	n/a	n/a
Other or unknown	n/a	437	n/a	n/a	n/a	n/a
Pedestrians	580	6,482	7,062	16.10	14.57	14.69
Pedalcyclists	106	859	965	2.94	1.93	2.01
Highway fatalities per million population	135	178	174			
Highway fatalities per million vehicles	212	230	229			

n/a Not available for this report

Aviation

The aviation, or air, mode consists of airways and airports; airplanes; helicopters; and other flying craft for carrying passengers and cargo.

Aviation Bill. The most important part of the aviation bill is expenditures for air carrier services. (See table 25.) Revenues from carrying domestic passengers are over half the total bill in the United States and a lesser amount (44 percent) in Canada; in both countries, however, this is the largest single figure in the respective aviation bills. The second most important category in the aviation bill, other civil aviation, refers to the business and recreational operations of private and corporate aircraft (known as general aviation). The aviation bill also contains expenditures on airports and airways and on government aviation research and development.

On a per capita basis, Canadians spend less on aviation than U.S. residents—$288 versus $350. Air carrier revenues for international passenger services are higher in Canada by a substantial margin—$98 versus $55 per person.

Airports and Airways. Both Canada and the United States have numerous airports—about 6,000 and 17,000, respectively.[2] However, the majority of these facilities are suited for use only in times of good visibility. Also, many are private and not regularly open to the public. The subset of airports in both countries that are open to the public, and the still smaller subset of airports suitable for use by passenger air carriers (i.e., flying craft with more than 30 seats), are totaled in table 26. Canada has many more airports relative to its population than does the United States; however, in relation to the countries' nearly equal land area, the U.S. numbers are almost twice that of Canada.

For safe operation, air transport also requires airways involving navigation equipment and air traffic control systems. Both the United States and Canada have radar control systems, although more of the U.S. air space is covered by traffic control than is the case for Canada. Commercial air carriers almost always fly under air traffic control conditions, but such control is not necessary for all aircraft operations. Fewer than half of all U.S. general aviation flights are made under air traffic control.

Number of Aircraft. Canadian airlines and general aviation both have fewer active aircraft and fewer active aircraft per capita than does the United States. (Table 26.) Canadian air carriers appear to operate fewer jet and piston aircraft per capita than do U.S. air carriers, but more than twice as many turboprop aircraft per capita. The Canadian air carrier fleet averages far fewer

Table 25 **Total and per Capita Aviation Bills: 1990**

	Millions of U.S. Dollars			Millions of Canadian Dollars		
	Canada	U.S.	Total	Canada	U.S.	Total
Aviation Bill:	7,666	90,699	96,819	8,946	104,042	112,988
Air carriers	7,026	76,874	83,901	8,200	89,712	97,912
Domestic passenger revenue	3,344	49,506	52,850	3,903	57,774	61,676
Domestic freight revenue	458	10,100	10,558	535	11,787	12,321
International passenger rev.	2,617	13,632	16,249	3,054	15,909	18,962
Intl. freight revenue	313	3,612	3,925	365	4,215	4,581
Other flying operations	32	n/a	32	37	n/a	n/a
Air carrier subsidy	262	24	286	306	28	334
Other civil aviation	637	11,943	12,580	743	13,938	14,681
Expense	637◄	10,398◄	11,035◄	743◄	12,134◄	12,877◄
Private aviation subsidy	n/a	1,545	1,545	n/a	1,803	1,803
Govt. operations minus revenue	3	1,881	1,884	4	2,195	2,199
Federal	3	661	664	4	771	775
State or province & local	n/a	1,220	1,220	n/a	1,424	1,424
Government average R & D	3	889	892	3	1,037	1,040

	U.S. Dollars			Canadian Dollars		
	Canada	U.S.	Total	Canada	U.S.	Total
Aviation Bill per Capita	288	363	350	336	416	409
Air carriers	264	308	303	308	359	354
Dom. passenger revenue	126	198	191	147	231	223
Dom. freight revenue	17	40	38	20	47	45
International passenger revenue	98	55	59	115	64	69
International freight revenue	12	14	14	14	17	17
Other flying operations	1	0	1	0	n/a	n/a
Air Carrier subsidy	10	0	1	12	0	1
Other civil aviation	24	48	45	28	56	53
Expense	24◄	42◄	40◄	28◄	49◄	47◄
Private average subsidy	n/a	6	6	n/a	7	7
Govt. operations minus revenue	n/a	8	7	n/a	9	8
Federal	0	3	2	0	3	3
State or province & local	n/a	5	4	n/a	6	5
Government average R & D	0	4	3	0	4	4

◄ Denotes estimate

n/a Not available for this report

seats per aircraft than the U.S. fleet. Per capita, Canada has fewer operational general aviation aircraft than the United States of each type except rotary wing aircraft.

Aircraft Use. The U.S. aviation mode carries more passenger- and more weight-distance, on both an absolute and per capita basis, than does Canadian aviation. (See table 27.) Canadian air passenger domestic travel per capita is less than half that of the United States; however, its international air travel per capita is more than twice that of the United States. As with per capita passenger travel, domestic goods air travel per capita is less than half that of the United States. Canadian and U.S. international goods travel per capita are similar.

Aviation Fuel Consumption. Canadians consume far less aviation fuel per capita than do U.S. citizens. (See table 28.)

Table 26 **Extent of aviation system: 1990**

	Number			Number/Million Population		
	Canada	U.S.	Total	Canada	U.S.	Total
Fixed-wing public airports	2,500	5,078	7,578	94	20	27
Certificated air carrier airports	400	650	1,050	15	3	4
	Number			**Aircraft/Million Population**		
	Canada	U.S.	Total	Canada	U.S.	Total
Total aircraft	16,121	218,640	234,761	606	875	849
Fixed wing	14,639	204,159	218,798	550	817	791
Rotary wing	950	7,481	8,431	36	30	30
Other	532	7,000	7,532	20	28	27
Air Carrier Aircraft*	641	6,483	7,124	24	26	26
Fixed wing	641	6,402	7,043	24	26	25
Jet	263	4,277	4,540	10	17	16
Turbo	318	1,191	1,509	12	5	5
Piston	60	934	994	2	4	4
Rotary wing	n/a	81	81	0	0	0
General aviation aircraft*	15,480	212,157	227,637	582	849	823
Fixed wing	13,998	197,757	211,755	526	791	766
Other commercial	2,937	32,830	35,767	110	131	129
Private	10,880	161,909	172,789	409	648	625
Other general aviation	181	3,018	3,199	7	12	12
Rotary wing	950	7,400	8,350	36	30	30
Other	532	7,000	7,532	20	28	27

Notes

n/a Not available for this report

* Canada and the U.S. classify aviation somewhat differently. For comparison purposes, the following definitions were used:
- Canadian air carriers are Level I and Level II Canadian air carriers, other civil aviation is "General Aviation."
- U.S. air carriers include regional and commuter airlines, "General Aviation" excludes all regional and commuter aircraft. Under general aviation, "other commercial" includes: instructional, aerial application, air taxi, and other work. Private aviation includes: corporate, business and personal flying.

Table 27 Aviation Person- and Weight-Distances: 1990

	Person-Miles Millions			Person-Kilometers Millions		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	42,590	476,034	518,625	68,528	765,939	834,467
Total domestic	16,448	360,934	377,383	26,466	580,743	607,209
Air carrier*	15,356	344,800	360,156	24,708	554,783	579,491
Other civil aviation	1,092◄	16,134	17,226◄	1,758◄	25,960	27,717◄
International air carrier	26,142	115,100	141,242	42,062	185,196	227,258

	Person-Miles per Capita			Person-Kilometers per Capita		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	1,601	1,905	1,876	2,576	3,065	3,018
Total domestic	618	1,444	1,365	995	2,324	2,196
Air carrier*	577	1,380	1,303	929	2,220	2,096
Other civil aviation	41◄	65	62	66◄	104	100
International air carrier	983	461	511	1,581	741	822

	Ton-Miles Millions			Tonne-Kilometers Millions		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	1,202	17,760	18,962	1,755	25,935	27,690
Domestic air carrier*	375	10,420	10,795	548	15,217	15,765
International air carrier	827	7,340	8,166	1,207	10,718	11,925

	Ton-Miles per Capita			Tonne-Kilometers per Capita		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	45	71	69	66	104	100
Domestic air carrier*	14	42	39	21	61	57
International air carrier	31	29	30	45	43	43

Notes

◄ Denotes estimate

* Level I, II, III, & IV Canadian air carriers; U.S. includes larger regional-commuter carriers.

Aviation Employment. The largest categories of employment in air transportation are aviation equipment manufacture and aviation operations (mainly air carrier services). These categories constitute 93 percent of the one and a half million U.S. air employees and 94 percent of the 125,000 Canadian air employees. (See table 29.) Aircraft and engine manufacturing is a relatively more important aspect of U.S. air employment than of Canadian. In Canada, the reverse is true, and the majority of those in air transport work in aviation operations.

Aviation Fatalities. Aviation fatality rates per capita are similar for Canada and the United States. (See table 30.) In both countries, general aviation accounts for the majority of aviation fatalities.

Table 28 Aviation Fuel Consumption: 1990

	Gallons, Millions			Liters, Millions		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	1,310	17,495	18,805	4,960	66,219	71,179
Air Carrier *	1,253	16,254	17,507	4,744	61,522	66,265
Turbine fuel	1,217	16,251	17,468	4,605	61,510	66,115
Gasoline	37	3	40	139	11	150
Other civil aviation	84◄	1,241	1,325	318◄	4,697	5,015
Turbine fuel	57◄	843	900	216◄	3,191	3,407
Gasoline	27◄	398	425	102◄	1,506	1,608

	Gallons per Capita			Liters per Capita		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	49	70	68	186	265	257
Air Carrier *	47	65	63	178	246	240
Turbine fuel	46	65	63	173	246	239
Gasoline	1	0	0	5	0	1
Other civil aviation	3	5	5	12	19	18
Turbine fuel	2	3	3	8	13	12
Gasoline	1	2	2	4	6	6

◄ Denotes estimate

* Canadian Air Carriers include international and domestic level I, II, III, and IV carriers. U.S. air carriers include international and domestic air carriers, excluding small Regional and Commuter Carriers.

Table 29 Aviation Employment: 1990

	Employment (thousands)			Percent of Total Aviation Employment		
	Canada	U.S.	Total	Canada	U.S.	Total
Grand Total	125	1,537	1,662	100.00	100.00	100.00
Aviation equipment manufacturers	47	692	739	37.89	44.99	44.46
Aviation operations	70	741	811	56.02	48.23	48.82
Air carriers*	56	546	603	45.12	35.53	36.25
Other air carrier	4	92	96	3.49	5.97	5.79
Other commercial	9◄	103◄	113◄	7.41◄	6.73◄	6.78◄
Airports and Services**	8	104	112	6.09	6.78	6.73
Total national employment	12,572	117,914	130,486			
Aviation empl./national employment (%)	0.993%	1.304%	1.274%			
Aviation empl. per 1,000 population	4.69	6.15	6.01			

◄ Denotes estimate

* Canada and the U.S. classify aviation differently. Canadian Air Carriers as used above include: scheduled and unscheduled Level I, II, III and IV carriers. The U.S. air carrier figure represents all air carriers including Regional and Commuter Carriers.

** The federal government in Canada owns and operates about 100 civil airports. The figures shown exclude Canadian governmental employees.

	Fatalities			Fatalities/Million Population		
	Canada	U.S.	Total	Canada	U.S.	Total
Total aviation	87	838	925	3.27	3.35	3.35
Air carriers*	0	43	43	0.00	0.17	0.16
General aviation*	87	795	882	3.27	3.18	3.19

* Canada and the U.S. classify aviation somewhat differently. For comparison purposes, the following definitions were used:
–Canadian air carriers are Level I and Level II Canadian air carriers, other civil aviation is "General Aviation."
–U.S. Air Carriers include regional and commuter airlines. "General Aviation" excludes all regional and commuter aircraft. In general aviation, "other commercial" includes: instructional, aerial application, air taxi, and other work. Private aviation includes: corporate, business and personal flying.

Rail

The rail mode consists of freight and passenger (including commuter) railroads. Commuter rail statistics are also presented in the transit mode profile of this section.

Rail Bill. Although the U.S. railroad bill is over six times that of Canada's, Canadians spend over one and a half times as much per capita on rail services overall—and freight rail in particular—as do U.S. residents. (See table 31.) Both U.S. and Canadian intercity rail passenger services are supported by their respective governments. Even when this government support is included, Canadians continue to pay more per capita than do U.S. residents for intercity rail passenger services.

Extent of Rail Service. Canada and the 48 contiguous states of the United States have an interconnected network of railroads; the Alaskan Railroad is connected to the rest of the network by seagoing barges which carry rail cars. Although Canada and the United States have similar land areas, the United States has over three times the amount of track as does Canada. (See table 32.) Per capita, however, Canada has more than twice the amount of track as does the United States. Canadian rail track figures include 844 kilometers (796 miles) of mainline track owned and operated by Canadian railroads in the United States. These lines extend as far south as Louisville, Kentucky.

Canadian rail passenger services operate on about 12,900 kilometers (about 8,000 miles) of track, compared with U.S. operations which are over 38,600 kilometers (about 24,000 miles) of track. On the other hand, Canada's far smaller population spread over approximately the same land area as the United States means that there are more persons per track distance in the United States than in Canada. Canada has three times as much track as does the United States relative to its population.

Intercity rail passenger service is dominated by the quasi-public corporations, Amtrak and Rail Via Canada. In both Canada and the United States, most of the trackage used for passenger services is maintained and operated by freight railroads.

Number of Vehicles. Canada has more freight locomotives and fewer freight cars per capita than does the United States. (See table 33.) Canada averages about 40 cars per locomotive; the United States averages about 52. Canada has 11 times as many intercity rail passenger locomotives per capita as does the United States; it also has more than five times the number of intercity rail passenger cars. Canada averages about four intercity rail passenger cars per intercity rail locomotive compared to six for the United States.

Rail Vehicle Use. Canada has roughly one and a half times the freight travel per capita—and per freight car—as does the United States. (See table 34.) Canada's greater rail freight output, as measured by weight-distance of freight per freight car—is probably due to the transportation

Table 31 **Total and per Capita Rail Bills: 1990**

	Millions of U.S. Dollars			Millions of Canadian Dollars		
	Canada	U.S.	Total	Canada	U.S.	Total
Railroad Bill	6,056	36,754	42,810	7,067	42,891	49,958
Freight revenues	5,130	30,056	35,186	5,987	35,075	41,062
Subsidy	141	2,434	2,575	165	2,840	3,005
Federal	141	1,188	1,329	165	1,386	1,551
Other	n/a	1,246	1,246	n/a	1,454	1,454
Intercity passenger revenues	188	1,719	1,907	219	2,006	2,225
Federal subsidy*	378	584	963	442	682	1,124
Commuter pass. revenue	45◄	952	997◄	52◄	1,111	1,163◄
Subsidy	39◄	986	1,025◄	45◄	1,151	1,196◄
Other revenues	134	n/a	134	156	n/a	156
Unallocated subsidy	1	22	23	1	25	26

	U.S. Dollars			Canadian Dollars		
	Canada	U.S.	Total	Canada	U.S.	Total
Railroad Bill per Capita	228	147	155	266	172	181
Freight revenues	193	120	127	225	140	149
Subsidy	5	10	9	6	11	11
Federal	5	5	5	6	6	6
Other	n/a	5	5	n/a	6	5
Intercity passenger revenue	7	7	7	8	8	8
Federal subsidy*	14	2	3	17	3	4
Commuter pass. revenue	2	4	4	2	4	4
Subsidy	1	4	4	2	5	4
Other revenue	5	0	0	6	n/a	1
Unallocated subsidy	0	0	0	0	0	0

Notes
◄ Denotes estimate
n/a Not available for this report
* Reflects only Canadian VIA rail subsidy, there may be others.

Table 32 **Extent of Rail System: 1990**

	Miles			Kilometers		
	Canada	U.S.	Total	Canada	U.S.	Total
National rail track operational	53,996	177,274	231,270	86,880	285,234	372,114
Track per million population	2,030	709	836	3,266	1,141	1,346
Intercity passenger services*	8,390	24,000	32,390	13,500	38,616	52,116
per million population	315	96	117	508	155	188
Commuter service*	n/a	5,895	n/a	n/a	9,486	n/a
per million population	n/a	24	n/a	n/a	38	n/a

n/a Not available for this report
* Part of the national rail track.

characteristics of much of the freight (bulk shipments of dense agricultural and mineral products) and the long distances commodities are often transported to the coasts for export.

Rail Fuel Consumption. Petroleum-based fuel accounts for the vast majority of energy used in both the Canadian and U.S. rail systems. (See table 35.) Freight rail, as opposed to passenger rail, accounts for most of this consumption in both countries. The U.S. per capita consumption of electricity for rail passenger service far exceeds that of Canada; this is because the Northeast Corridor is an electrified rail passenger line.

Rail Employment. Per capita, Canada has almost three times the number of rail freight operations employees and about two times the number of intercity rail passenger service employees as does the United States. (See table 36.) The United States has over twice as many commuter rail employees as does Canada.

Rail Fatalities. Interestingly, although U.S. rail activity per capita is less than that in Canada, rail fatalities per capita are greater in the United States than in Canada (See table 37.)

Table 33 **Rail Vehicles: 1990**

	Vehicles			Vehicles per Million Residents		
	Canada	U.S.	Total	Canada	U.S.	Total
Total rail vehicles	128,156	1,242,171	1,370,327	4,818	4,971	4,956
Freight locomotives	3,426	23,181	26,607	129	93	96
Freight cars	123,137	1,212,261	1,335,398	4,629	4,851	4,830
Intercity passenger locomotives	293	318	611	11	1	2
Intercity passenger cars	1,088	1,996	3,084	41	8	11
Transit commuter cars	212◄	4,415	4,627◄	8◄	18	17◄

◄ Denotes estimate

Table 34 **Rail Person- and Weight-Distances 1990**

	Ton-Miles			Tonne-Kilometers		
	Canada	U.S.	Total	Canada	U.S.	Total
Freight, millions	170,080	1,071,000	1,241,080	248,371	1,564,000	1,812,370
Per freight car	1,381,226	883,473	929,371	2,017,028	1,290,151	1,357,176
Per capita	6,394	4,286	4,489	9,337	6,259	6,555
Intercity passenger millions	1,246	6,125	7,371	2,004	9,855	11,859
Per passenger car	1,144,961	3,068,637	2,389,986	1,842,243	4,937,437	3,845,488
Per capita	47	25	27	75	39	43
Transit commuter, millions	305◄	7,082	7,387◄	491◄	11,395	11,886◄
Per commuter car	1,438,208◄	1,604,077	1,596,477◄	2,314,076◄	2,580,960	2,568,732◄
Per capita	11◄	28	27◄	18◄	46	43◄

◄ Denotes estimate

Table 35 Rail Fuel Consumption: 1990

	Diesel Gallons Equivalent			Diesel Liters Equivalent		
	Canada	U.S.	Total	Canada	U.S.	Total
Total rail, millions	552	3,403	3,955	2,089	12,881	14,970
Petroleum	552	3,364	3,916	2,089	12,733	14,822
Electric	0	39	39	0	148	148
Freight, millions	518	3,227	3,746	1,962	12,215	14,177
Diesel	485	3,227	3,712	1,835	12,215	14,051
Crude	33	0	33	126	0	126
Electric	0	0	0	0	0	0
Per capita petroleum	19	13	14	74	49	51
Passenger, millions	34	176	210	127	666	793
Intercity passenger, millions	27	90	117	103	341	444
Diesel	27	82	109	103	311	413
Electric	0	8	8	0	31	31
Commuter passengers	7	86	92	25	325	349
Diesel	7	55	61	25	207	232
Electric	0	31	31	0	117	117
Passengers per capita petroleum	1	1	1	5	2	2
Passengers per capita electric	0	39	39	0	148	148

Table 36 Rail Employment: 1990

	Employees (thousands)			Employees per million Capita		
	Canada	U.S.	Total	Canada	U.S.	Total
Total Rail	76	651	727	2,863	2,606	2,631
Rail equipment manufacturers	6	374	380	226	1,497	1,374
Rail operations	70	277	347	2,638	1,109	1,256
Rail freight	64	232	296	2,415	927	1,071
Rail passengers	6	45	51	223	182	186
Intercity	5	24	29	183	96	104
Commuter	1	21	22	39	86	81
Percent of National Employment	0.61	0.55	0.56			

Table 37 Rail Fatalities: 1990

	Fatalities			Fatalities per million Capita		
	Canada	U.S.	Total	Canada	U.S.	Total
Total Rail*	103	1297	1400	3.87	5.19	5.06
Rail	56	599	655	2.11	2.40	2.37
Grade crossing	47	698	745	1.77	12.79	2.69

* Includes rail-rail collisions, persons struck on track and "other."

Water

The water mode consists of navigable rivers, canals, the Great Lakes, the St. Lawrence Seaway, the Intercoastal Waterway, ocean shipping channels; ports; commercial ships and barges, fishing vessels, urban ferries, and recreational boats.

Water Bill. The total per capita expenditures on water transportation in Canada and the United States are similar. (See table 38.) According to industry figures, domestic boating represents the largest water expenditure item per capita in both countries. Canadians spend 36 percent more on domestic boating per capita than do U.S. residents. Canada spends less per capita on domestic water for-hire services than does the United States.

Extent of Water System. Of the two countries, the United States has the more extensive inland and intracoastal waterway system. Specifically, it has more than 32.180 kilometers (20,000 miles) of inland and intracoastal waterways with channel depths exceeding three meters (about nine feet). This system serves barge and other shallow draft vessels; extensive parts of it can handle multibarge floats. Canada's inland waterways are limited primarily to the Great Lakes–St. Lawrence River system, which serves oceangoing vessels as well as lakers and shallow draft vessels.

Vessel Fleets. Canada's commercial shipping fleet consists of 1,731 vessels; the U.S. fleet contains 37,762 vessels. (See table 39.) The composition of these fleets differs substantially. Canada has eight times the U.S. number of ocean-going ships, and 12 times the Great Lakes fleet, as measured in relation to population. The U.S. barge fleet, on the other hand—which is used primarily for inland waterway operation—is almost six times the size of Canada's fleet per capita.

Both countries have large numbers of recreational boats and fishing vessels, but on a per capita basis, Canada's fishing fleet exceeds the size of the U.S. fleet by a factor of almost five. The numbers of recreational boats—canoes, sailboats, rowboats, and powerboats—are more nearly equal. The U.S. figure of about 6 per 100 residents is about 73 percent of Canada's about 9 per 100.

Water Vehicle Use. Canadian domestic freight travel per capita is less than half that of the United States, although Canada spends more on such travel per capita. (See table 40.) Per capita, Canada may have more than twice the U.S. water freight export travel and almost three-quarters of its freight import travel.[3]

Water Fuel Consumption. The fuels consumed by boats and ships are gasoline (mainly for recreational boats) and diesel fuel (used primarily by commercial inland waterway and ocean-going vessels). Overall, gasoline use is about the same per capita in both Canada and the United States. (See table 41.) Canada, however, consumes more diesel fuel—a finding in line with that country's relatively larger commercial fleet. The per capita diesel fuel consumption in Canada is almost twice that of the United States.

Water Employment. The number of Canadian commercial water employees per capita is about three times that of the United States. (See table 42.) This large difference might be partially due to Canada's larger fleets of both Great Lakes and oceangoing vessels per capita, and larger international freight travel per capita.

Water Fatalities. Canadian water fatalities per capita are greater than those in the United States. (See table 43.) This difference is only partially accounted for by the larger number of recreational boats per capita in Canada.

Table 38 Water Bill

	Millions of U.S. Dollars			Millions of Canadian Dollars		
	Canada	U.S.	Total	Canada	U.S.	Total
Water Bill	3,982	37,677	41,659	4,647	43,969	48,616
Domestic	2,618	22,472	25,090	3,055	26,225	29,280
For-hire & business	599	8,772	9,371	699	10,237	10,936
Freight	476	7,156	7,631	555	8,351	8,906
Pass. including ferries	123	915	1,038	144	1,068	1,211
Federal subsidies		702	702		819	819
Boating[1]	1,971◄	13,700◄	15,671◄	2,300◄	15,988◄	18,288◄
International	1,009◄	14,724◄	15,732◄	1,177◄	17,183◄	18,360◄
International freight[2]	992◄	13,118◄	14,110◄	1,158◄	15,309◄	16,466◄
International passengers	17	1,375	1,391	19	1,604	1,624
Federal subsidy	n/a	231	231	n/a	270	270
Unallocated subsidies	355	481	836	415	561	976
Federal	355◄	*	355◄	415◄	*	415◄
State or province & local	**	481	481◄	**	561◄	561◄

	U.S. Dollars per Capita			Canadian Dollars per Capita		
	Canada	U.S.	Total	Canada	U.S.	Total
Water Bill	150	151	151	175	176	176
Domestic	98	90	91	115	105	106
For-hire & business	23	35	34	26	41	40
Freight	18	29	28	21	33	32
Passengers incl. ferries	5	4	4	5	4	4
Federal subsidies		3	3		3	3
Boating	74◄	55◄	57◄	86◄	64◄	66◄
International	38	59	57	44	69	66
International freight	37	52	51	44	61	60
International passenger	1	6	5	1	6	6
Federal subsidy		1	1	0	1	1
Unallocated subsidies	13	2	3	16	2	4
Federal	13◄	*	1◄	16◄	*	2◄
State or province & local	**	2◄	2◄	**	2◄	2◄

Notes

◄ Denotes estimate

n/a Not available for this report

* U.S. subsidies are all allocated

** The author did not find a source for Canadian provincial and local expenditures.

1. Boating figures are from the boat manufacturing trade associations in Canada and the United States.
2. Represents the shipping cost of imports only, which are generally paid for by U.S. or Canadian Interests.

Table 39 Extent of Water System: 1990

	Number			Vessels/Million Population		
	Canada	U.S.	Total	Canada	U.S.	Total
Vessels	2,360,720	15,951,106	18,311,826	88,749	63,830	66,227
Recreation boats	2,300,000	15,800,000	18,100,000	86,466	63,225	65,461
Canoes	667,000	2,300,000	2,967,000	25,075	9,204	10,731
Sailboats	230,000	1,300,000	1,530,000	8,647	5,202	5,533
Rowboats	253,000	2,200,000	2,453,000	9,511	8,804	8,872
Outboards	1,035,000	7,900,000	8,935,000	38,910	31,613	32,315
Inboards	115,000	2,100,000	2,215,000	4,323	8,403	8,011
Fishing vessels	58,329	113,000	171,329	2,193	452	620
>5 tons	18,341	36,000	54,341	690	144	197
Motorboats	38,000◄	75,000	113,000	1,429◄	300	409
Other	1,988	2,000	3,988	75	8	14
Commercial Shipping Fleet	1,731	37,762	39,493	65	151.3	143
Barges	587	30,966	31,553	22	124	114
Towboats/tugs	378	5,210	5,588	14	21	20
Ferries & passenger	216	1,116	1,332	8	4	5
Great Lakes fleet	108	77	185	4	0.31	1
Ocean-going	442	393	835	17	2	3
Other	876	1,460	2,336	33	6	9
For-hire	350	n/a	n/a	13	n/a	n/a
Private	74	n/a	n/a	3	n/a	n/a
Government	452	n/a	n/a	17	n/a	n/a

◄ Denotes estimate
n/a Not available for this report

Table 40 Water Person- and Weight-Distances: 1990

	Person-Miles, Millions			Person-Kilometers, Millions		
	Canada	U.S.	Total	Canada	U.S.	Total
Domestic ferries	564◄	2,902◄	3,466◄	908◄	4,669◄	5,576◄
	Person-Miles, Millions			**Person-Kilometers, Millions**		
	Canada	U.S.	Total	Canada	U.S.	Total
Domestic ferries	21◄	12◄	13◄	34◄	19◄	20◄
	Ton-Miles, Millions			**Tonne-Kilometers, Millions**		
	Canada	U.S.	Total	Canada	U.S.	Total
Domestic marine freight	37,854	811,000	848,854	55,279	1,184,317	1,239,596
Per capita	1,423	3,245	3,070	2,078	4,739	4,483
International marine freight[1]	1,024,614◄	5,435,180◄	6,459,794◄	1,496,262◄	7,937,086◄	9,433,348◄
Exports	793,666◄	2,543,180◄	3,336,847◄	1,159,005◄	3,713,849◄	4,872,854◄
Imports	230,948◄	2,892,000◄	3,122,948◄	337,257◄	4,223,236◄	4,560,494◄
Total per capita	38,519◄	21,749◄	23,363◄	56,250◄	31,761◄	34,117◄
Exports per capita	29,837◄	10,177◄	12,068◄	43,572◄	14,861◄	17,623◄
Imports per capita	8,682◄	11,573◄	11,295◄	12,679◄	16,900◄	16,494◄

◄ Denotes estimate

Table 41 Water Fuel Consumption: 1990

	Gallons, Millions			Liters, Millions		
	Canada	U.S.	Total	Canada	U.S.	Total
Total domestic water	540.5	3,365.4	3905.9	2,045.9	12,738.1	14,784.0
Diesel	390.2	2,065.0	2,455.2	1,476.8	7,816.0	9,292.8
Gasoline	150.4	1,300.4	1,450.8	569.1	4,922.0	5,491.2
	Gallons			**Liters**		
	Canada	**U.S.**	**Total**	**Canada**	**U.S.**	**Total**
Total per capita	20.32	13.47	14.13	76.91	50.97	53.47
Diesel	14.67	8.26	8.88	55.52	31.28	33.61
Gasoline	5.65	5.20	5.25	21.40	19.70	19.86
	Gallons, Millions			**Liters, Millions**		
	Canada	**U.S.**	**Total**	**Canada**	**U.S.**	**Total**
International residential & other	1,193.1◄	6,326.0◄	7,519.1◄	4,515.7◄	23,944.0◄	28,459.7◄
	Gallons			**Liters**		
	Canada	**U.S.**	**Total**	**Canada**	**U.S.**	**Total**
Residential & other per capita	44.85◄	25.31◄	27.19◄	169.76◄	95.81◄	102.93◄

◄ Denotes estimate

Table 42 Water Employment: 1990

	Employees, in thousands			Employees per million capita		
	Canada	U.S.	Total	Canada	U.S.	Total
Total marine	42	348	390	1,586	1,391	1,410
Manufacturing & repair*	15	187	202	556	750	731
Ships	13	136	148	481	542	536
Boats	2	52	54	75	208	195
Marine operations	16	50	66	602	201	239
Services to marine	11	110	122	429	441	439
Percent of national employment	0.34	0.29	0.30			

Notes
* Manufacturing and repair statistics are industry totals and may include production for export or related business activities (for example, sales to the navy or coast guard).

Table 43 Water Fatalities: 1990

	Fatalities			Fatalities per Million Capita		
	Canada	U.S.	Total	Canada	U.S.	Total
Total water	390	919	1309	14.66	3.68	4.73
Water transport*	3	54	57	0.11	0.22	0.21
Recreational boating	387◄	865	1252	14.55◄	3.46	4.53

Notes
◄ Denotes estimate
* In Canada ferry boats only. The recreational boat value is the total less the water transport.

Transit

The transit mode is generally defined as urban and rural public transportation services—including commuter trains, ferry service, heavy rail (rapid rail) and light rail (streetcar) transit systems, and local transit buses—and taxis. Some aspects of the transit system are also discussed in other modal profiles in this section.

Transit Bill. In both Canada and the United States, federal, provincial/state, and local government support defrays a larger percentage of transit operating expenses than of any other mode of transportation. This support accounts for more than half the cost of providing transit service in both nations. (See table 44.)

Canada spends more per capita on transit than does the United States; its governmental units spend less on both operating and capital expenses per capita. Total government capital support per capita is 75 percent that of the United States. Provincial and local governments paid almost all the government capital support in Canada. The U.S. federal government pays a larger percentage of transit capital subsidies than does Canada's.

Extent of Transit System. Transit services in the United States and Canada exist in both metropolitan and raral areas. They are, however, particularly concentrated in metropolitan areas, where they can serve the majority of both countries' populations.[4] Canada has 77 transit systems; the United States has 787. In Canada, rapid rail and commuter rail transit are concentrated in two metropolitan areas—Toronto and Montreal. The United States has 12 heavy rail and 14 commuter rail systems; two of each of these serve New York. In fact, transit serving New York City accounts for more than 29 percent of U.S. total unlinked annual transit trips and an even greater percentage of the nation's transit passenger-distance.

Number of Vehicles. Canada has almost one and a half times as many active transit vehicles of every type—with a few exceptions, notably commuter rail vehicles—as does the United States on a per capita basis. (See table 45.) In general, Canada has relatively more light rail vehicles than the United States; the United States has significantly more commuter rail vehicles than Canada.

Transit Vehicle Use. In line with Canada's greater per capita transit bill (particularly revenue per capita) and greater per capita transit vehicle figures, Canada has much more transit travel per capita than does the United States.[5] (See table 46.) Per unit of transit travel, Canada has less expense, pays less government support, and receives more from fares than does the United States. (See table 47.) In both nations, the farebox revenues per unit of travel are substantially less than the cost of driving a car, and the total expenses (revenue plus government support) are substantially greater. Canada's farebox recovery ratio is higher than that of the United States. Canadian transit passengers pay relatively more than do the supporting governmental units.

Transit Fuel Consumption. In both the United States and Canada, the transit mode has tended to reduce overall transportation oil consumption. (See table 48.) In both countries, this mode provides roughly a third more passenger travel per unit of energy than does the automobile. Also in both countries, a larger percentage of the energy fueling transit—as opposed to fueling the automobile—comes from sources other than oil. Canada, with its more extensive use of transit, uses more transit fuel per capita than does the United States. Diesel and gasoline account for larger proportions of Canada's transit fuel than of U.S. transit fuel.

Transit Employment. The quarter of a million transit employees in Canada and the United States are employed predominantly in urban bus operations. (See table 49.) In fact, those who work for bus systems constitute 75 percent of all transit employees. The second most predominant transit employment is in heavy rail systems (such as those operated in New York City, Washington, D.C., and Montreal). The 51,000 people employed by these systems in both countries make up 20 percent of all transit workers.

Overall, Canada has more transit employees per capita than does the United States: one and a half per thousand population, compared to fewer than one (0.85). Per capita employment in the two countries is about equal for heavy rail systems. Canada has far greater relative employment in light rail and trolley systems (a not surprising development, given that these systems are much more common in Canada than in the United States). The United States has about two and a half times Canada's per capita employment in commuter rail operations. (Commuter rail systems exist in many eastern U.S. cities as well as in the Chicago area; they have recently been reestablished in California.)

Transit Fatalities. Transit fatalities in both Canada and the United States tend to be small. (See table 50.)

Table 44 Total and per Capita Transit Bills: 1990

	Millions of U.S. Dollars			Millions of Canadian Dollars		
	Canada	U.S.	Total	Canada	U.S.	Total
Transit bill	2,485	20,678	23,162	2,900	24,131	27,030
Total subsidy	1,361	14,752	16,113	1,589	17,216	18,804
Operating	2,095	15,742	17,837	2,445	18,371	20,815
Total revenue	1,123	5,885	7,008	1,311	6,867	8,178
Total subsidy	971	9,816	10,788	1,133	11,456	12,589
Motor bus[1]	1,444◄	9,421	10,865◄	1,685◄	10,994	12,679◄
Revenue	774◄	3,008	3,782◄	904◄	3,510	4,414◄
Subsidies	670◄	6,413	7,083◄	781◄	7,484	8,265◄
Heavy rail	387◄	3,825	4,212◄	452◄	4,464	4,915◄
Revenue	208◄	1,741	1,948◄	242◄	2,032	2,274◄
Subsidies	179◄	2,084	2,264◄	209◄	2,432	2,642◄
Light rail	125◄	237	362◄	146◄	277	422◄
Revenue	67◄	83	149◄	78◄	96	174◄
Subsidies	58◄	155	212◄	67◄	180	248◄
Trolleybus	56◄	109	164◄	65◄	127	192◄
Revenue	30◄	46	76◄	35◄	53	88◄
Subsidies	26◄	63	89◄	30◄	73	103◄
Commuter rail	83◄	1,939	2,022◄	97◄	2,262	2,360◄
Revenue	45◄	952	997◄	52◄	1,111	1,163◄
Subsidies	39◄	986	1,025◄	45◄	1,151	1,196◄
Ferryboat[2]	n/a	171	171	n/a	200	200◄
Revenue	n/a	56	56	n/a	65	65◄
Subsidies	n/a	116	116	n/a	135	135◄
Other[3]	n/a	41	41	n/a	48	48◄
Revenue	n/a	26	26	n/a	30	30◄
Subsidies	n/a	15	15	n/a	17	17◄
Capital subsidies	390	4,936	5,325	455	5,760	6,215
Federal	28	2,873	2,900	32	3,352	3,385
State or province	241	697	938	281	813	1,094
Local	121	1,177	1,298	141	1,373	1,515
Other assistance	n/a	189	189	n/a	221	221

	Canada	U.S.	Total
Subsidy percent of bill	54.78	71.34	69.57
Percent of total subsidy by:			
Federal	7.13	58.20	54.46
State or province	61.79	14.12	17.61
Local	31.08	23.85	24.38
Other assistance	0.00	3.84	3.55

	U.S. Dollars per Capita			Canadian Dollars per Capita		
	Canada	U.S.	Total	Canada	U.S.	Total
Transit bill per capita	93	83	84	109	97	98
Ops. & cap. subsidy	51	59	58	60	69	68
Operating expense	79	63	65	92	74	75
Total revenue	42	24	25	49	27	30
Total subsidy	37	39	39	43	46	46
Capital subsidies	15	20	19	17	23	22
Federal	1	11	10	1	13	12
State or province	9	3	3	11	3	4
Local	5	5	5	5	5	5
Other assistance	n/a	1	1	n/a	1	1

Notes

◄ Denotes estimate

n/a Not available for this report

1. Canadian figures include articulated buses. U.S. figures include response buses.
2. Canadian governments own and operate a number of ferryboats. They are accounted for in the water profile. The U.S. includes only those ferry operations subsidized by the federal government transit program, a small part of the total.
3. Canadian statistics included an "other" category without defining what it included. Therefore the revenues and costs for the category cannot be estimated.

Table 45 **Transit Vehicles: 1990**

	Number			Vehicles/Million Population		
	Canada	U.S.	Total	Canada	U.S.	Total
Total active vehicles	14,442	93,231	107,673	542.93	373.07	430.86
In-common types[1]						
Total active vehicles	13,997	75,293	89,290	526.20	301.29	357.30
Motor buses	10,560	58,714	69,274	396.99	234.95	277.21
Heavy railcars	1,379	10,419	11,798	51.84	41.69	47.21
Light railcars	527	913	1,440	19.81	3.65	5.76
Trolley-buses	272	832	1,104	10.23	3.33	4.42
Commuter rail	369	4,415	4,784	13.87	17.67	19.14
Unique to nation[2]						
Total active vehicles	445	17,938	18,383	16.73	71.78	66.48
Vanpool	n/a	929	929	n/a	3.72	3.36
Demand response	n/a	16,741	16,741	n/a	66.99	60.55
Ferryboats	n/a	108	108	n/a	0.43	0.39
Cable cars	n/a	44	44	n/a	0.18	0.16
Inclined plane	n/a	10	10	n/a	0.04	0.04
Aerial tramway	n/a	2	2	n/a	0.01	0.01
Auto-guideway	n/a	104	104	n/a	0.42	0.38
Type unknown	445	n/a	445	16.73	n/a	1.61

Notes
n/a Not available for this report
1. Types of vehicles defined as transit in both nations.
2. For the U.S., vehicles belonging to types of transit service not defined in Canadian statistical sources. These services account for about 5 percent of total U.S. transit expenditures. For Canada, vehicles reported as "other" account for roughly 3 percent of the total reported transit vehicles.

Table 46 **Transit Person-Distances: 1990**

	Passenger-Miles millions			Passenger-Kilometers millions		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	6,201	41,143	47,344	9,978	66,199	76,177
Motor buses	3,774◄	20,981	24,755◄	6,072◄	33,758	39,830◄
Heavy rail	1,288◄	11,475	12,763◄	2,072◄	18,463	20,535◄
Light rail	333◄	571	904◄	536◄	919	1,454◄
Trolley-buses	110◄	193	303◄	176◄	311	487◄
Commuter rail	698◄	7,082	7,780◄	1,123◄	11,395	12,518◄
Other	n/a	841	841◄	n/a	1,353	1,353◄
	Passenger-Miles per U.S. Dollar			**Passenger-Km per Canadian Dollar**		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	233◄	165	171◄	375◄	265	276◄
Motor buses	142◄	84	90◄	228◄	135	144◄
Heavy rail	48◄	46	46◄	78◄	74	74◄
Light rail	13◄	2	3◄	20◄	4	5◄
Trolley-buses	4◄	1	1◄	7◄	1	2◄
Commuter rail	26◄	28	28◄	42◄	46	45◄
Other	n/a	3	3◄	n/a	5	5◄

◄ Denotes estimate
n/a Not available for this report.

Table 47 Transit Revenues: 1990

	Average Operating Revenues per Passenger-Mile			Average Operating Revenues per Passenger-Kilometer		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	0.18◄	0.14	0.15	0.13	0.10	0.11
Motor buses	0.21◄	0.14	0.15◄	0.15	0.10	0.11◄
Heavy railcars	0.16◄	0.15	0.15◄	0.12◄	0.11	0.11◄
Light railcars	0.20◄	0.14	0.17◄	0.15◄	0.10	0.12◄
Trolley-buses	0.27◄	0.24	0.25◄	0.20◄	0.17	0.18◄
Commuter rail	0.06◄	0.13	0.13◄	0.05◄	0.10	0.09◄
Ferries	n/a	0.19◄	n/a	n/a	0.23	n/a
Other	n/a	0.33◄	n/a	n/a	0.38	n/a

	U.S. Dollars Avg. Subsidy/Pass.-mi.			Canadian Dollars Avg. Ops. Revenue/Pass.-km		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	0.40	0.50	0.49	0.29	0.36	0.35

	U.S. Dollars Avg. Expense/Pass.-mi.			Canadian Dollars Avg. Ops. Expense/Pass.-km		
	Canada	U.S.	Total	Canada	U.S.	Total
Total	0.58	0.65	0.64	0.42	0.47	0.46

◄ Denotes estimate
n/a Not available for this report

Table 48 Transit Fuel Consumption: 1990

	Gallons Equivalent Millions			Liters Equivalent Millions		
	Canada	U.S.	Total	Canada	U.S.	Total
Total fuels	113.73	844.88	958.61	430.46	3,197.88	3,628.34
Gasoline	3.98	33.91	37.89	15.06	128.33	143.40
Diesel	94.45	615.95	710.40	357.48	2,331.38	2,688.86
Natural gas or propane	0.24	0	0.24	0.92	0	0.92
Electricity	15.06	195.02	210.08	56.99	738.17	795.16
Fuels by mode	113.73◄	844.88	958.61◄	430.46◄	3,197.88	3,628.34◄
Motor buses	94.43◄	597.06	691.49◄	357.43◄	2,259.87	2,617.30◄
Gasoline	3.98◄	33.91	37.89◄	15.06◄	128.33	143.40◄
Diesel	90.21◄	563.15	653.36◄	341.45◄	2,131.53	2,472.98◄
Natural gas or propane	0.24◄	0	0.24◄	0.92◄	0	0.92◄
Heavy rail, electricity	9.53◄	131.13	140.66◄	36.07◄	496.32	532.39◄
Light rail, electricity	3.53◄	11.14	14.67◄	13.37◄	42.15	55.52◄
Trolley-buses, electricity	0.52◄	2.93	3.45◄	1.98◄	11.08	13.05◄
Commuter rail	5.71◄	102.51	108.22◄	21.61◄	388.02	409.63◄
Diesel	4.24◄	52.68	56.92◄	16.03◄	199.40	215.43◄
Electricity	1.47◄	49.83	51.31◄	5.58◄	188.62	194.20◄
Other, diesel	n/a	0.12	0.12◄	n/a	0.45	0.45◄

	Gallons Equivalent per Capita			Liters Equivalent per Capita		
	Canada	U.S.	Total	Canada	U.S.	Total
Total transit fuel	4.28	3.38	3.47	16.18	12.80	13.12
Gasoline and diesel	3.70	2.60	2.71	14.01	9.84	10.24
Other	0.58	0.78	0.76	2.18	2.95	2.88
%"Other" fuels of total	13.45	23.08	21.94	n/a	n/a	n/a

	Passenger-Miles/Gallon			Passenger-Kilometers/Liter		
	Canada	U.S.	Total	Canada	U.S.	Total
All fuel	54.53	48.70	49.39	23.18	20.70	20.99

◄ Denotes estimate
n/a Not available for this report.

Table 49 Transit Employment: 1990

	Employees			Employees per Million Population		
	Canada	U.S.	Total	Canada	U.S.	Total
Transit Employees	39,585◄	212,357	251,942◄	1,488◄	850	911◄
Motor buses[1]	27,042◄	162,189	189,231◄	1,017◄	649	684◄
Heavy railcars	4,801◄	46,102	50,903◄	180◄	184	184◄
Light railcars	2,202◄	4,066	6,268◄	83◄	16	23◄
Trolley-buses	1,008◄	1,925	2,933◄	38◄	8	11◄
Commuter rail	956◄	21,443	22,399◄	36◄	86	81◄
General & administration	3,576	10,633	14,209	134	43	51◄
Unique to nation[2]	n/a	17,870	n/a	n/a	72	n/a
Demand response	14,159	57	n/a	n/a	n/a	n/a
Vanpool	78	0	n/a	n/a	n/a	n/a
Ferries	2,813	11	n/a	n/a	n/a	n/a
Misc.	n/a	820	n/a	n/a	3	n/a

Notes
◄ Denotes estimate
n/a Not available for this report.
1. Data varies from province to province in Canada, and from state to state in the U.S.
2. The U.S. has federal programs for classes of transit not defined in the Canadian statistical sources. Demand response is defined as: non-fixed-route service using vans or buses with passengers boarding or alighting at prearranged times and locations. Vanpool is defined as a service in which passengers share a van with a passenger designated as the "driver." The origin-destination pattern is generally fixed, but changes as passengers change. Canadian ferry statistics are covered in the marine profile. In the U.S. miscellaneous includes San Francisco's cable cars, four inclined plane systems, the Roosevelt Island aerial tramway in New York City, the Seattle monorail, and seven automated guideway systems. Neither Statistics Canada or the Canadian Urban Transit Association sources defined their "other" class.

Table 50 Transit Fatalities: 1990

	Fatalities			Fatalities per Million Capita		
	Canada	U.S.	Total	Canada	U.S.	Total
Total Transit						
Heavy rail	n/a	69	n/a	n/a	0.28	n/a

n/a Not available for this report.

Oil Pipeline

The pipeline mode covers crude oil, petroleum product, and gas trunk lines. The pipeline industry, which transports oil and petroleum products, is an important—if specialized—freight mode.[6] Unfortunately, data for this mode are incomplete and, in some cases, unavailable.

The oil pipeline bill for operations in Canada and the United States totaled $9.2 billion in 1990. (See table 51.) This amount is approximately equal to the domestic water transportation bill of $9.4 billion. Pipelines are capital-intensive, employing a rather small number of people—22,000; this figure is less than a third the number employed in water operations and about the same as the number employed in commuter rail services. The geographic extent of pipelines is great: The approximately 378,000 kilometers (235,000 miles) of crude oil and oil products pipelines for the two countries exceed the about 371,000 kilometers (231,000 miles) of their railroads.

On a per capita basis, the data for Canada and the United States are quite similar, with a per capita pipeline bill for Canada of $31, versus $34 in the United States. The extent of the total pipeline system in terms of the countries' respective populations is equal within a few percentage points. Per capita employment is 74 per thousand in Canada and 80 per thousand in the United States.

Table 51 Oil Pipeline Overview: 1990

	U.S. Measures			Canadian Measures		
	Canada	U.S.	Total	Canada	U.S.	Total
Transport Bill						
(millions of dollars)	838	8,387	9,225	978	9,788	10,765
Extent (miles/kilometers)	21,795	213,535	235,330	35,073	343,578	378,651
Crude[1]	18,594	125,553	144,147	29,923	202,015	231,938
Product	3,200	87,982	91,182	5,150	141,563	146,713
Ton-miles or tonne-kilometers						
(in millions)	70,302	584,000	654,302	121,770	1,011,542	1,133,312
Average yield, cents	1.19	1.48	1.41	0.80	0.97	0.95
Employment	1,959	20,000	21,959	1,959	20,000	21,959
Average salary	47,258	43,632	43,956	55,151	50,919	51,296
Fatalities	n/a	3	n/a	n/a	3	n/a
Oil pipeline per capita						
Bill, (dollars)	31	34	33	37	39	39
Extent, miles or kilometers, per million	819	854	851	1,319	1,375	1,369
Crude*	699	502	521	1,125	808	839
Product	120	352	330	194	566	531
Performance ton-miles or						
Cubic M-km, per million	2,643	2,337	2,366	4,578	4,048	4,099
Employment, per million	74	80	79	74	80	79
Fatalities, per million	n/a	0.012	n/a	n/a	0.012	n/a

Notes

n/a Not available for this report.

* includes trunk and gathering lines.

Endnotes

1. This includes local transit buses.
2. These figures include heliports, STOLports, and seaports as well as conventional airports.
3. These international freight travel figures are estimates using 1992 Canadian statistics; the U.S. figures are based on U.S. tonnages, loaded and unloaded, multiplied by Canadian average distances for exports and imports.
4. About 61 percent of all Canadians (16.7 million) live in 25 metropolitan areas. Roughly 78 percent of U.S. citizens (193 million) live in 335 metropolitan areas.
5. Note that the travel estimates for the individual modes of Canadian transit were based in part on U.S. travel-per-vehicle experience. The estimate totals do conform, however, to reported Canadian totals on revenue, expenses, trips, and fares.
6. Natural gas pipelines constitute an additional specialized freight mode; these are not covered in this report, however.

Modal Trends: 1987–91

This section presents limited time series data for each transportation mode for 1987 through 1991.

Highway

(Statistics supporting the trends described below appear in tables 52a and b for Canada, tables 53a and b for Mexico, and tables 54a and b for the United States.)

Between 1987 and 1991, Canada's road system improved. Specifically, while the amount of its public roads remained fairly constant, the extent of its paved public roads increased at a faster rate than did its population. In 1990, the number of highway deaths per capita in Canada dipped, dropping from about 100—the level reached in 1987 through 1989—to a low of 92.

Over the 1987–91 period, many improvements were made to Mexico's highway profile. For example, its motorway distance tripled between 1987 and 1991. It has had about one-twentieth the paved highway miles per capita of Canada and one-fifteenth that of the United States. Additionally, the number of highway vehicles per capita in Mexico increased each year at a much faster rate than in either Canada or the United States: 15 percent, compared to 3 percent for Canada and under 1 percent for the United States. Despite this growth, however, Mexico had fewer than one-fifth the per capita number of cars of either Canada or the United States by 1991.

The United States has had about a third less paved highway distance per capita than Canada; it has had less motorway (freeways and other expressways) distance per capita as well. As in Canada, the U.S. rate of growth in paved highways was greater than its population growth over the 1987-91 period. U.S. highway vehicles and vehicle travel per capita increased in each of these years. Average freight haulage per capita by large for-hire firms varied during the period, but tended upward at a rate many times greater than that for the population. In spite of these increases, highway fuel consumption and fatalities were less in 1991 than in 1987.

Per capita for-hire freight carrier haulage varied within a narrow range in all three nations. Canada appears to have had a higher ratio than either Mexico or the United States; these two countries had similar ratios.

Automotive fuel consumption trends differed among the three nations.

- In 1990, Canada's total per capita fuel consumption was 78 percent of that for the United States, while Mexico's was roughly 31 percent of U.S. consumption. In the 1987-90 period, Canada's gasoline consumption increased 11 percent, while its diesel consumption increased 23 percent. This difference in growth may be partially explained by differences in the ways the two fuels are taxed by the Canadian government.
- Mexican fuel statistics represent total production rather than highway consumption; assuming that Mexico does not export gasoline or diesel fuels (although it does export crude oil), it is reasonable to use these production statistics as an indicator of consumption. On this basis, Mexican gasoline consumption seems to have increased about 14 percent, and diesel consumption by almost 20 percent. Judging by the numbers of highway vehicles in Mexico, it appears that most of the country's gasoline and diesel fuel continues to be consumed by highway travel.
- U.S. gasoline consumption increased 2 percent; its diesel fuel consumption rose 12 percent.

Table 52a **Highway Trends: Canada (Metric)**

	1987	1988	1989	1990	1991
Highways, km	1,717,873◄	1,620,238	1,611,542	1,637,262	n/a
Motorways	n/a	14,796	14,660	14,985	n/a
National main roads	124,459	130,844	131,064	132,246	n/a
Secondary roads	250,812	131,564	134,054	134,297	n/a
Other roads	1,342,602	1,343,034	1,331,764	1,355,734	n/a
Paved roads, km	498,183	513,615	512,470	573,042	n/a
Paved roads per 1,000 capita	19.4	19.8	19.5	21.5	n/a
Vehicles[1]	15,864,388	17,152,184	16,719,529	16,981,130	17,223,039
Cars	11,772,506	12,986,001	12,811,318	12,622,038	13,061,084
Motorcycles	448,094	400,317	377,997	359,015	351,231
Buses[2]	59,266	59,834	62,494	63,962	64,208
Trucks	3,584,522	3,706,032	3,467,720	3,936,115	3,746,516
Vehicles per 1,000 capita	619	662	637	638	631
Vehicle-km, million	n/a	n/a	n/a	303,401	n/a
Cars	202,958◄	225,697◄	224,172◄	222,353◄	n/a
Motorcycles	n/a	n/a	n/a	1,195	n/a
Buses	n/a	n/a	n/a	2,057◄	n/a
Trucks	n/a	n/a	n/a	77,796◄	n/a
Vehicle km per capita	n/a	n/a	n/a	11,402◄	n/a
Vehicle-km per car	17,240	17,380◄	17,498	17,661◄	n/a
Vehicle-km per truck	n/a	n/a	n/a	19,789◄	n/a
Truck tonnes, million[4]	169	177	162	149	n/a
Truck tonne-km, million[4]	57,320	57,888	54,405	54,700	n/a
Average load tonnes[4]	6.0	5.9	5.2	5.6	n/a
Tonne trip length, km[4]	339	327	336	367	n/a
Tonne-km per capita[4]	2,238	2,234	2,073	2,056	n/a
Fuel liters, million	35,646	40,331	40,747	41,103	40,470
Gasoline	28,576	31,718	32,038	31,766	31,212
Diesel	7,029	8,528	8,640	8,646	8,328
Other	41	84	69	690	931
Fuel liters per capita	1,391	1,557	1,553	1,545	1,483
Road fatalities[4]	4,285	4,153	4,260	3,957	3,626
Fatalities per million capita	167	160	162	149	133

Notes

◄ Denotes estimate

n/a Not available for this report

1. Includes "Other Road Motor Vehicles" (ambulances, fire trucks, etc.) as trucks. There were 66,712 of these reported for 1991. Mopeds were included with motorcycles.
2. All registered buses, including school, intercity, transit, and other.
3. Only for-hire truck freight carriers with revenues exceeding one million Canadian dollars.
4. Unsure if the figure includes highway-rail grade crossing fatalities.

Table 52b **Highway Trends: Canada (U.S. Measures)**

	1987	1988	1989	1990	1991
Highways, miles	1,377,069◄	1,325,989	1,319,873	1,373,496	n/a
Motorways	n/a	9,194	9,110	9,312	n/a
National main roads	77,339	81,306	81,443	82,178	n/a
Secondary roads	155,855	81,754	83,301	83,452	n/a
Other roads	834,293	834,561	827,558	842,453	n/a
Paved roads, miles	309,571	319,161	318,449	356,088	n/a
Paved roads per 1,000 capita	12.1	12.3	12.1	13.4	n/a
Vehicles[1]	15,864,388	17,152,184	16,719,529	16,981,130	17,223,039
Cars	11,772,506	12,986,001	12,811,318	12,622,038	13,061,084
Motorcycles	448,094	400,317	377,997	359,015	351,231
Buses[2]	59,266	59,834	62,494	63,962	64,208
Trucks	3,584,522	3,706,032	3,467,720	3,936,115	3,746,516
Vehicles per 1,000 capita	619	662	637	638	631
Vehicle-mi, million	n/a	n/a	n/a	188,533◄	n/a
Cars	126,118	140,248	139,301◄	138,170◄	n/a
Motorcycles	n/a	n/a	n/a	743◄	n/a
Buses	n/a	n/a	n/a	1,278◄	n/a
Trucks	n/a	n/a	n/a	48,342◄	n/a
Vehicle-mi.per capita	n/a	n/a	n/a	7,085◄	n/a
Vehicle-mi.per car	7,898,468	10,800	10,873◄	10,975◄	n/a
Vehicle-mi.per truck	n/a	n/a	n/a	12,297◄	n/a
Truck tons, million[3]	153	161	147	135	n/a
Truck ton-mi., million[3]	39,257	39,646	37,261	37,463	n/a
Average load tons[3]	6.6	6.5	5.7	6.2	n/a
Ton trip length, mi.[3]	211	203	209	228	n/a
Ton-km per capita[3]	1,532	1,530	1,420	1,408	n/a
Fuel gallons, million	9,418	10,655	10,765	10,859	10,692
Gasoline	7,550	8,380	8,465	8,393	8,246
Diesel	1,857	2,253	2,283	2,284	2,200
Other	11	22	18	182	246
Fuel gallons per capita	368	411	410	408	392
Road fatalities[3]	4,285	4,153	4,260	3,957	n/a
Fatalities per million capita	104	100	101	92	n/a

Notes

◄ Denotes estimate

n/a Not available for this report

1. Includes "Other Road Motor Vehicles" (ambulances, fire trucks, etc.) as trucks. There were 66,712 of these reported for 1991. Mopeds were included with motorcycles.
2. All registered buses, including school, intercity, transit, and other.
3. Only for-hire truck freight carriers with revenues exceeding one million Canadian dollars.

Table 53a **Highway Trends: Mexico (Metric)**

	1987	1988	1989	1990	1991
Highways, km	233,339	235,033	237,057	239,235	242,294
Motorway	939	1,106	1,231	1,761	3,166
National main roads	45,204	45,338	45,379	45,743	45,805
Secondary roads	59,622	57,426	57,894	61,108	61,230
Other roads	127,574	131,163	132,553	130,623	132,093
Paved roads, km	79,335	81,321	82,022	82,775	n/a
Paved roads per 1,000 capita	1.04	1.04	1.03	1.02	n/a
Vehicles	8,006,958	8,346,025	8,792,379	9,342,685	9,977,410
Cars	5,372,270	5,582,336	5,856,841	6,209,449	6,601,559
Motorcycles	221,059	218,207	218,698	218,698◄	218,698◄
Buses	77,859	78,467	79,147	80,658	83,014
Trucks	2,335,770	2,467,015	2,637,693	2,833,880	3,074,139
Vehicles per 1,000 capita	105	107	110	115	121
Vehicle-km, million	50,719◄	51,283◄	52,146◄	n/a	n/a
Cars	34,114◄	34,840◄	35,224◄	n/a	n/a
Motorcycles	1,413◄	1,309◄	1,270◄	n/a	n/a
Buses	539◄	519◄	523◄	n/a	n/a
Trucks	14,653◄	14,615◄	15,129◄	n/a	n/a
Vehicle-km per capita	662◄	656◄	654◄	n/a	n/a
Vehicle-km per car	6,350◄	6,241◄	6,014◄	n/a	n/a
Vehicle-km per truck	6,273◄	5,924◄	5,736◄	n/a	n/a
Truck tonnes, million[1]	296	290	310	315	n/a
Truck tonne-km, million[1]	101,483	102,921	107,243◄	107,243◄	108,884
Average load tonnes					
Tonne trip length, km	343	355	346	341	n/a
Truck tonne-km per capita	1,325	1,317	1,346	1,320	n/a
Fuel liters million[2]	31,682	32,125	35,259	40,108	41,306
Gasoline	19,602	20,371	22,892	25,101	25,149
Diesel	12,080	11,754	12,367	15,007	16,157
Other	n/a	n/a	n/a	n/a	n/a
Fuel liters per capita	414	411	442	494	n/a
Road fatalities[2]	4,695	4,863	5,133	5,500	5,700
Fatalities per million capita	61	62	64	68	69

Notes

◄ Denotes estimate

n/a Not available for this report.

1. For-hire freight carriers, but survey parameters unknown.

2. Fatalities on roads of federal interest (red roads).

Table 53b **Highway Trends: Mexico (U.S. Measures)**

	1987	1988	1989	1990	1991
Highways, miles	144,997	146,050	147,307	148,661	150,561
Motorways	583	687	765	1,094	1,967
National main roads	28,090	28,173	28,199	28,425	28,463
Secondary roads	37,049	35,685	35,975	37,973	38,048
Other roads	79,274	81,505	82,368	81,169	82,083
Paved roads, miles	49,299	50,533	50,968	51,437	n/a
Paved roads per 1,000 capita	0.6	0.6	0.6	0.6	n/a
Vehicles	8,006,958	8,346,025	8,792,379	9,342,685	9,977,410
Cars	5,372,270	5,582,336	5,856,841	6,209,449	6,601,559
Motorcycles	221,059	218,207	218,698	218,698◄	218,698◄
Buses	77,859	78,467	79,147	80,658	83,014
Trucks	2,335,770	2,467,015	2,637,693	2,833,880	3,074,139
Vehicles per 1,000 capita	105	107	110	115	121
Vehicle-miles, million	31,517◄	31,867◄	32,404◄	n/a	n/a
Cars	21,198◄	21,650◄	21,888◄	n/a	n/a
Motorcycles	878◄	813◄	789◄	n/a	n/a
Buses	335◄	323◄	325◄	n/a	n/a
Trucks	9,105◄	9,082◄	9,401◄	n/a	n/a
Vehicle-miles per capita	411◄	408◄	407◄	n/a	n/a
Vehicle -miles per car	3,946◄	3,878◄	3,737◄	n/a	n/a
Vehicle-miles per truck	3,898◄	3,681◄	3,564◄	n/a	n/a
Truck tons, millions[1]	326	319	341	347	n/a
Truck ton-miles, millions[1]	69,503	70,488	73,448◄	73,448◄	74,572
Average load tons[1]					
Ton trip length, miles[1]	213	221	215	212	n/a
Truck ton-miles per capita	907	902	922	904	901
Fuel gallons, millions	10,783	10,934	12,000	9,994	17,557
Gasoline	6,672◄	6,933◄	7,791◄	6,441	10,913◄
Diesel	4,111◄	4,001◄	4,209◄	3,553	6,644◄
Other	n/a	n/a	n/a	n/a	n/a
Fuel gallons per capita	141	140	151	123	n/a
Road fatalities[2]	4,695	4,863	5,133	5,500	5,700
Fatalities per million capita	61	62	64	68	n/a

Notes

◄ Denotes estimate

n/a Not available for this report.

1. For-hire freight carriers, but survey parameters unknown.
2. Fatalities on roads of federal interest (red roads) only.

Table 54a **Highway Trends: United States (Metric)**

	1987	1988	1989	1990	1991
Highways, km	6,233,299	6,228,669	6,237,290	6,243,163	6,257,882
Motorways	83,214	83,964	84,361	84,865	85,187
National main roads	568,685	569,774	570,412	571,485	583,742
Secondary roads	700,580	701,954	701,820	702,111	704,877
Other roads	4,880,820	4,872,977	4,880,697	4,884,702	4,884,076
Paved roads, km	3,496,881	3,525,427	3,630,103	3,633,521	3,660,861
Paved roads per 1,000 pop.	14.4	14.4	14.7	14.5	14.5
Vehicles	183,871,730	188,981,016	191,693,742	193,057,376	192,548,972
Cars	137,208,090	141,251,695	143,025,658	143,453,040	142,955,623
Motorcycles	4,917,131	4,584,284	4,433,195	4,259,462	4,177,037
Buses	602,055	615,669	625,040	626,987	631,279
Trucks	41,144,454	42,529,368	43,609,849	44,717,887	44,785,033
Vehicles per 1,000 capita	757	771	775	772	762
Vehicles-km, million	3,093,217	3,259,876	3,373,197	3,455,304	3,495,092
Cars	2,180,726	2,300,139	2,377,730	2,438,230	2,467,672
Motorcycles	15,295	16,285	16,687	15,377	14,767
Buses	8,557	8,795	9,105	9,216	9,240
Trucks	888,639	934,657	969,675	992,481	1,003,413
Vehicle km per capita	12,738	13,303	13,638	13,825	13,832
Vehicle-km per car	15,894	16,284	16,624	16,997	17,262
Vehicle-km per truck	17,212	17,423	17,209	15,494	14,717
Person-km, million	4,401,554◄	4,700,672◄	4,884,506◄	4,925,741◄	4,950,957◄
Cars & personal trucks	4,364,547◄	4,663,504◄	4,845,890◄	4,888,734◄	4,913,146◄
Person-km per car-km	1.60◄	1.59◄	1.51◄	1.52◄	1.52◄
Bus[1]	37,007	37,168	38,616	37,007	37,812
Total Person-km per capita	18,126◄	19,182◄	19,748◄	19,709◄	19,593◄
Truck tonnes, million[2]	528	533	535	701	635
Truck tonne-km, million[2]	276,066	263,109	294,231	327,531	391,757
Average load tonnes[2]	12.07	12.34	14.07	13.25	13.16
Tonne trip length, km	523	494	550	467	617
Truck tonne-km per capita	1,137	1,074	1,190	1,311	1,550
Fuel liters million	483,527	491,618	499,108	498,042	486,843
Gasoline	411,438	415,655	418,744	417,047	408,585
Diesel	72,089	75,963	80,365	80,995	78,258
Other	n/a	n/a	n/a	n/a	n/a
Fuel liters per capita	1,991	2,006	2,018	1,993	1,927
Road fatalities[3]	46,385	47,093	45,555	44,528	41,462
Fatalities per million capita	191	192	184	178	164

Notes

◄ Denotes estimate

n/a Not available for this report.

1. Intercity bus only.
2. For-hire freight carriers only.
3. Does not include highway-rail grade crossing fatalities.

Table 54b Highway Trends: United States (U.S. Measures)

	1987	1988	1989	1990	1991
Highways, miles	3,873,372	3,870,495	3,876,501	3,880,151	3,889,299
Motorways	51,709	52,175	52,422	52,735	52,944
National main roads	353,381	354,058	354,454	355,121	362,798
Secondary roads	435,340	436,194	436,111	436,512	438,084
Other roads	3,032,942	3,028,068	3,024,787	3,027,150	3,035,473
Paved roads, miles	2,172,962	2,190,700	2,255,746	2,257,870	2,274,859
Paved roads per 1,000 Pop.	8.95	8.94	9.12	9.03	9.00
Vehicles	183,871,730	188,981,016	191,693,742	193,057,376	192,548,972
Cars	137,208,090	141,251,695	143,025,658	143,453,040	142,955,623
Motorcycles	4,917,131	4,584,284	4,433,195	4,259,462	4,177,037
Buses	602,055	615,669	625,040	626,987	631,279
Trucks	41,144,454	42,529,368	43,609,849	44,717,887	44,785,033
Vehicles per 1,000 capita	757	771	775	772	762
Vehicle-miles, millions	1,921,204	2,026,059	2,096,456	2,144,362	2,172,214
Cars	1,355,330	1,429,579	1,477,769	1,513,184	1,533,668
Motorcycles	9,506	10,121	10,371	9,557	9,178
Buses	5,318	5,466	5,659	5,719	5,743
Trucks	551,050	580,893	602,657	615,902	623,625
Vehicle-miles per capita	7,915	8,266	8,474	8,580	8,596
Vehicle-miles per car	9,878	10,119	10,330	10,562	10,726
Vehicle-miles per truck	10,695	10,827	10,694	9,628	9,145
Person-miles, millions	2,735,126◄	2,920,998◄	3,035,232◄	3,060,855◄	3,077,040◄
Cars & personal trucks	2,712,130◄	2,897,901◄	3,011,236◄	3,037,859◄	3,053,540◄
Person-miles per car-mile	1.60◄	1.59◄	1.51◄	1.52◄	1.52◄
Bus[1]	23,000	23,100	24,000	23,000	23,500
Total person-miles per capita	11,263◄	11,920◄	12,271◄	12,247◄	12,175◄
Truck tons, millions[2]	582	587	589	773	699
Truck ton-miles, millions[2]	189,070	180,196	201,511	224,317	268,304
Average load, tons[2]	13.30	13.60	15.50	14.60	14.50
Ton trip length, miles[2]	325	342	349	389	391
Truck ton-miles per capita[2]	779	735	815	898	1,062
Fuel gallons, millions	127,748	129,886	131,865	131,583	128,624
Gasoline	108,702	109,816	110,632	110,184	107,948
Diesel	19,046	20,070	21,232	21,399	20,676
Other	n/a	n/a	n/a	n/a	n/a
Fuel gallons per capita	526	530	533	526	509
Road fatalities[3]	46,385	47,093	45,555	44,529	41,150
Fatalities per million capita	191	192	184	178	163

Notes

◄ Denotes estimate

n/a Not available for this report.

1. Intercity buses only.
2. Only for-hire freight carriers having revenue greater than one million U.S. dollars.
3. Excludes highway-rail grade crossing fatalities.

Aviation

(Statistics supporting the trends described below appear in tables 55a and b.)

Between 1987 and 1990, Canada's passenger-distance of air travel rose per capita. It experienced a decline in 1991; this was perhaps related to business cycles. In the United States, passenger-distance rose slightly in every year for which data are shown (1987 through 1990; data are not available for 1991). Weight-distance of air freight per capita also rose in the United States over the 1987-90 period, increasing from 51 in 1987 to 65 in both 1989 and 1990.

Mexico steadily increased its number of public airports during this period—from 1,757 in 1987 to 2,149 in 1991. The country's passenger-distance of air carrier service rose every year (except 1988); however, given Mexico's continued population growth, Mexican passenger-distance declined steadily per capita, dropping from 256 in 1987 to 237 in 1991.

Rail

(Statistics supporting the trends described below appear in tables 56a and b.)

During the 1987-91 period, both Canada and the United States have gradually abandoned railroad track. Additionally, Canada's freight travel and freight travel per capita decreased from 1988 through 1990. Canadian rail passenger travel increased through 1989, but dropped 37 percent in 1990. Decreased government subsidization of rail passenger service may partially explain this dramatic decrease.

The length of Mexico's tracks has remained about the same. Freight cars, freight travel, and freight travel per capita, however, have steadily declined. Since 1989, freight travel per freight car has also decreased. Mexico's rail passenger travel declined in 1987 and 1988, and stayed at this reduced level in 1989 and 1990. Per capita rail passenger travel decreased each year.

U.S. rail freight travel grew each year, but its freight travel per capita has been relatively flat since 1989. Passenger travel increased each year, but per capita passenger-distance was roughly the same in 1990 and 1991. U.S. rail fatalities declined in 1990 and 1991.

Water

(Statistics supporting the trends described below appear in tables 57a and b.)

Canada's coastwise (i.e., movement along east and west coasts) loadings and international freight handled per capita showed a downward trend from 1988 on. Available data show that fuel and fatalities decreased during the period.

Mexico's coastwise freight loadings per capita tended upward between 1988 and 1991. The international freight handled per capita varied without showing a robust trend for the period.

Both U.S. coastwise freight loadings and international freight handled per capita tended downward after 1988. U.S. fuel consumption tended upward, while fatalities declined.

Transit

(Statistics supporting the trends described below appear in table 58. Note that Mexico's transit figures are for Mexico City alone; transit figures for Canada and the United States are national totals.)

Per million metropolitan residents, Mexico City had six times the number of electric vehicles as the United States, and almost three times as much as Canada. Mexico City's total transit vehicles exceeded those of the United States by three to one, and those of Canada one and a half times over.

Canada's transit fleet was relatively constant; the U.S. fleet decreased from 1989 to 1991. Mexico City's fleet decreased also, but it increased the number of heavy railcars in its fleet.

Table 55a **Aviation Trends: Canada, Mexico, and the United States (Metric)**

Canada	1987	1988	1989	1990	1991
Public airports	n/a	n/a	n/a	n/a	2,500
Air carrier aircraft[1]	n/a	n/a	n/a	641	561
Passenger-km millions[1]	53,053	61,612	63,619	66,770	57,431
Pass-km per aircraft (thousands)[1]	n/a	n/a	n/a	104,165	102,373
Pass-km per capita	2,071	2,378	2,425	2,509	2,104
Tonne-km, millions[1]	1,755	1,612	n/a	n/a	n/a
Tonne-km per capita[1]	n/a	n/a	n/a	66	59
General aviation aircraft[2]	n/a	n/a	n/a	13,998	15,894
Fuel, liters, millions[1]	n/a	n/a	n/a	4,744	4,177
Gasoline	n/a	n/a	n/a	139	112
Jet fuel	n/a	n/a	n/a	4,605	4,065
Fuel liters per capita	n/a	n/a	n/a	178	153
Aviation fatalities[3]	97	95	150	87	373

Mexico	1987	1988	1989	1990	1991
Public airports	1,757	1,854	1,906	2,149	2,318
Air Carrier aircraft[1]	n/a	n/a	n/a	n/a	691
Passenger-km millions[1]	27,444	27,156	29,503	31,567	34,250
Pass-km per aircraft (thousands)	n/a	n/a	n/a	n/a	49,566
Pass-km per capita	358	351	370	389	414
Tonne-km, millions[1]	n/a	n/a	n/a	n/a	n/a
Tonne-km, per capita	n/a	n/a	n/a	n/a	n/a
General aviation aircraft[2]	n/a	n/a	n/a	n/a	n/a
Fuel, liters, millions[3]	n/a	n/a	n/a	n/a	n/a
Gasoline	n/a	n/a	n/a	n/a	n/a
Jet fuel	n/a	n/a	n/a	n/a	n/a
Fuel liters per capita	n/a	n/a	n/a	n/a	n/a
Aviation fatalities[3]	n/a	n/a	n/a	n/a	n/a

United States	1987	1988	1989	1990	1991
Public airports	4,984	5,043	5,084	5,078	n/a
Air carrier aircraft[1]	5,200	5,600	5,700	6,700	n/a
Passenger-km millions[1]	668,070	699,114	721,427	762,022	n/a
Pass-km per aircraft (thousands)	128,475	124,842	126,566	113,735	n/a
Pass-km per capita	2,751	2,853	2,917	3,049	n/a
Tonne-km, millions	17,977	20,861	23,527	23,654	n/a
Tonne-km per capita	74	85	95	95	n/a
General aviation aircraft[2]	217,200	210,300	219,700	212,200	n/a
Fuel, liters, millions[3]	57,960	61,113	63,664	66,219	n/a
Gasoline	1,510	1,506	1,503	1,518	n/a
Jet fuel	56,449	59,606	62,161	64,701	n/a
Fuel liters per capita	239	249	257	265	n/a
Aviation fatalities[3]	1,163	1,153	1,151	838	976

Notes

n/a Not available for this report

1. Nation's air carrier aircraft in domestic and international (Canada Level I and II except Level I-IV for fuel) service except Mexico. For Mexico the number includes aircraft of 32 foreign airlines.
2. All aircraft less air carrier aircraft.
3. All aviation.

Table 55b **Aviation Trends: Canada, Mexico, and the United States (U,S, Measures)**

Canada	1987	1988	1989	1990	1991
Public airports	n/a	n/a	n/a	n/a	2,500
Air carrier aircraft[1]	n/a	n/a	n/a	641	561
Passenger-miles, millions[1]	32,973	38,292	39,539	41,491	35,688
Passenger-miles per aircraft, thousands	n/a	n/a	n/a	64,728	63,614
Passenger-miles per capita	1,287	1,478	1,507	1,559	1,307
Ton-miles, millions[1]	n/a	n/a	n/a	1,202	1,104
Ton-miles per capita	n/a	n/a	n/a	45	40
General aviation aircraft[2]	n/a	n/a	n/a	15,480	15,894
Fuel, gallons, millions[1]	n/a	n/a	n/a	1,253	1,104
Gasoline	n/a	n/a	n/a	37	30
Jet fuel	n/a	n/a	n/a	1,217	1,074
Fuel gallons per capita	n/a	n/a	n/a	47	40
Aviation fatalities[3]	97	95	150	87	373

Mexico	1987	1988	1989	1990	1991
Public airports	1,757	1,854	1,906	2,149	2,318
Air carrier aircraft[1]	n/a	n/a	n/a	n/a	691
Passenger-miles, millions[1]	17,057	16,818	18,336	19,619	21,287
Passenger-miles per aircraft, thousands	n/a	n/a	n/a	n/a	30,805
Passenger-miles per capita	223	218	230	242	257
Ton-miles, millions	n/a	n/a	n/a	n/a	n/a
Ton-miles per capita	n/a	n/a	n/a	n/a	n/a
General aviation aircraft	n/a	n/a	n/a	n/a	n/a
Fuel, gallons, millions	n/a	n/a	n/a	n/a	n/a
Gasoline	n/a	n/a	n/a	n/a	n/a
Jet fuel	n/a	n/a	n/a	n/a	n/a
Fuel gallons per capita	n/a	n/a	n/a	n/a	n/a
Aviation fatalities[2]	n/a	n/a	n/a	n/a	n/a

United States	1987	1988	1989	1990	1991
Public airports	4,984	5,043	5,084	5,078	n/a
Air carrier aircraft[1]	5,200	5,600	5,700	6,700	n/a
Passenger-miles, millions[1]	415,208	434,502	448,370	473,600	n/a
Pass-miles per aircraft, thousands	79,848	77,590	78,661	70,687	n/a
Pass-miles per capita	1,710	1,773	1,813	1,895	n/a
Ton-miles, millions[1]	12,312	14,287	16,113	16,200	n/a
Ton-miles per capita	51	58	65	65	n/a
General aviation aircraft[2]	217,200	210,300	219,700	212,200	n/a
Fuel, gallons, millions[3]	15,313	16,146	16,820	17,495	n/a
Gasoline	399	398	397	401	n/a
Jet fuel	14,914	15,748	16,423	17,094	n/a
Fuel gallons per capita	63	66	68	70	n/a
Aviation fatalities[3]	1,163	1,153	1,151	838	976

Notes

n/a Not available for this report.

1. Nation's air carrier aircraft in domestic and international (Canada Level I and II except Level I-IV for fuel) service except Mexico. For Mexico the number includes aircraft of 32 foreign airlines.
2. All aircraft less air carrier aircraft.
3. All aviation.

Table 56a **Rail Trends: Canada, Mexico, and the United States (Metric)**

Canada	1987	1988	1989	1990	1991
Track operated, km	94,184	91,344	89,104	86,880	n/a
Vehicles	126,160	139,225	n/a	127,944	n/a
Locomotives	3,855	3,836	n/a	3,719	n/a
Freight cars	121,379	134,156	n/a	123,137	n/a
Passenger cars	926	1,233	n/a	1,088	n/a
Tonne-km, millions	285,455	293,835	280,779	268,737	n/a
Tonne-km per freight car	2,351,762	2,190,249	n/a	2,182,424	n/a
Tonne-km per capita	11,143	11,341	10,700	10,099	n/a
Passenger-km, millions	2,709	2,989	3,178	2,004	n/a
Passenger-km/passenger car	2,925,131	2,424,304	n/a	1,841,912	n/a
Passenger-km per capita	106	115	121	75	n/a
Fuel, liters millions	2,317	2,329	2,167	2,064	n/a
Rail fatalities	106	111	141	103	n/a

Mexico	1987	1988	1989	1990	1991
Track operated, km	26,287	26,399	26,361	26,361	26,361
Vehicles	58,352	51,886	50,341	49,680	47,808
Locomotives	1,757	1,742	1,737	1,677	1,700
Freight cars	55,918	49,401	47,603	47,010	45,196
Passenger cars	677	743	1,001	993	912
Tonne-km, millions	40,475	41,177	38,570	36,417	33,732
Tonne-km per freight car	723,828	833,526	810,243	774,665	746,349
Tonne-km per capita	528	527	484	448	407
Passenger-km, millions	5,828	5,619	5,383	5,404	n/a
Passenger-km/passenger car	8,608,272	7,562,853	5,378,022	5,442,095	n/a
Passenger-km per capita	76	72	68	67	n/a
Fuel, liters, millions	n/a	n/a	n/a	n/a	n/a
Rail fatalities	n/a	n/a	n/a	n/a	n/a

United States	1987	1988	1989	1990	1991
Track operated, km	244,846	237,863	238,243	234,880	231,347
Vehicles	1,315,990	1,268,625	1,241,901	1,241,853	1,219,088
Locomotives	21,325	23,190	23,108	23,181	22,908
Freight cars	1,288,129	1,238,941	1,212,364	1,212,261	1,189,660
Passenger cars	6,536	6,494	6,429	6,411	6,520
Tonne-km, millions	1,419,241	1,501,008	1,530,211	1,563,794	1,572,554
Tonne-km per freight car	1,101,785	1,211,525	1,262,171	1,289,981	1,321,852
Tonne-km per capita	5,844	6,125	6,187	6,257	6,223
Passenger-km, millions	8,553	9,149	9,512	9,862	10,056
Passenger-km/passenger car	1,308,666	1,408,804	1,479,609	1,538,255	1,542,370
Passenger-km per capita	35	37	38	39	40
Fuel, liters, millions	12,207	12,474	12,888	12,726	11,827
Rail fatalities	1,165	1,199	1,324	1,297	1,194

n/a Not available for this report.

Table 56b **Rail Trends: Canada, Mexico, and the United States (U.S. Measures)**

Canada	1987	1988	1989	1990	1991
Track operated, miles	58,526	56,761	55,369	53,987	n/a
Vehicles	126,160	139,225	n/a	127,944	n/a
Locomotives	3,855	3,836	n/a	3,719	n/a
Freight cars	121,379	134,156	n/a	123,137	n/a
Passenger cars	926	1,233	n/a	1,088	n/a
Ton-miles, millions	195,500	201,240	192,298	184,051	n/a
Ton-miles per freight car	1,610,659	1,500,042	n/a	1,494,683	n/a
Ton-miles per capita	7,632	7,767	7,328	6,917	n/a
Passenger-miles, millions	1,683	1,857	1,975	1,245	n/a
Passenger-miles/passenger car	1,817,676	1,506,463	n/a	1,144,564	n/a
Passenger-miles per capita	66	72	75	47	n/a
Fuel, gallons, millions	8,769	8,814	8,202	7,813	n/a
Rail fatalities	106	111	141	103	n/a

Mexico	1987	1988	1989	1990	1991
Track operated, miles	16,335	16,404	16,381	16,381	16,381
Vehicles	58,352	51,886	50,341	49,680	47,808
Locomotives	1,757	1,742	1,737	1,677	1,700
Freight cars	55,918	49,401	47,603	47,010	45,196
Passenger cars	677	743	1,001	993	912
Ton-miles, millions	27,720	28,201	26,416	24,941	23,102
Ton-miles per freight car	495,730	570,859	554,914	530,547	511,154
Ton-miles per capita	362	361	331	307	279
Passenger-miles, millions	3,621	3,492	3,345	3,358	n/a
Passenger-miles/passenger car	5,349,180	4,699,557	3,341,903	3,381,718	n/a
Passenger-miles per capita	47	45	42	41	n/a
Fuel, gallons, millions	n/a	n/a	n/a	n/a	n/a
Rail fatalities	n/a	n/a	n/a	n/a	n/a

United States	1987	1988	1989	1990	1991
Track operated, miles	152,173	147,833	148,069	145,979	143,783
Vehicles	1,315,990	1,268,625	1,241,901	1,241,853	1,219,088
Locomotives	21,325	23,190	23,108	23,181	22,908
Freight cars	1,288,129	1,238,941	1,212,364	1,212,261	1,189,660
Passenger cars	6,536	6,494	6,429	6,411	6,520
Ton-miles, millions	972,000	1,028,000	1,048,000	1,071,000	1,077,000
Ton-miles per freight car	754,583	829,741	864,427	883,473	905,301
Ton-miles per capita	4,003	4,195	4,237	4,285	4,262
Passenger-miles, millions	5,316	5,686	5,912	6,129	6,250
Passenger-miles/passenger car	813,341	875,577	919,583	956,013	958,589
Passenger-miles per capita	22	23	24	25	25
Fuel, gallons, millions	3,225	3,296	3,405	3,362	3,125
Rail fatalities	1,165	1,199	1,324	1,297	1,194

n/a Not available for this report.

Table 57a **Water Trends: Canada, Mexico, and the United States (Metric)**

Canada	1987	1988	1989	1990	1991
Ports	n/a	n/a	n/a	n/a	n/a
Coastal tonnes loaded, millions	n/a	70	62	60	n/a
National ships	n/a	n/a	n/a	n/a	n/a
Foreign ships	n/a	n/a	n/a	n/a	n/a
Coastal tonnes per capita	n/a	2.70	2.36	2.27	n/a
Int'l trade tonnes handled, millions	227	250	239	232	234
National ships	n/a	n/a	n/a	45	39
Foreign ships	n/a	n/a	n/a	187	195
International tonnes per capita	8.86	9.65	9.12	8.73	8.57
Fuel liters, millions	n/a	n/a	n/a	1,521	1,491
Fatalities	n/a	n/a	n/a	390	200

Mexico	1987	1988	1989	1990	1991
Ports	85	85	85	85	n/a
Coastal tonnes loaded, millions	51	53	56	57	58
National ships	39	40	40	42	n/a
Foreign ships	15	16	17	17	n/a
Coastal tonnes per capita	0.67	0.68	0.71	0.71	0.71
Int'l trade tonnes handled, millions	107	104	103	108	n/a
National ships	4	3	2	3	n/a
Foreign ships	103	102	101	106	n/a
International tonnes per capita	1.37	1.31	1.27	1.31	n/a
Fuel liters, millions	n/a	n/a	n/a	n/a	n/a
Fatalities	n/a	n/a	n/a	n/a	n/a

United States	1987	1988	1989	1990	1991
Ports	n/a	n/a	n/a	n/a	n/a
Coastal tonnes loaded, millions	294	295	274	266	n/a
National ships	294	295	274	266	n/a
Foreign ships	0	0	0	0	0
Coastal tonnes per capita	1.21	1.20	1.11	1.06	n/a
Int'l trade tonnes handled, millions	760	833	800	797	n/a
National ships	n/a	n/a	n/a	n/a	n/a
Foreign ships	n/a	n/a	n/a	n/a	n/a
International tonnes per capita	3.13	3.40	3.24	3.19	n/a
Fuel liters, millions	32,783	33,223	34,137	36,886	40,361
Fatalities	1,036	946	896	865	924

n/a Not available for this report.

1. Commercial shipping only. For Canada, on Canadian ships only. U.S. fuel includes sales to foreign ships.
2. All water includes recreational boating.

Table 57b **Water Trends: Canada, Mexico, and the United States (U.S. Measures)**

Canada	1987	1988	1989	1990	1991
Ports	n/a	n/a	n/a	n/a	n/a
Coastal tons loaded, millions	n/a	77	68	67	n/a
National ships	n/a	n/a	n/a	n/a	n/a
Foreign ships	n/a	n/a	n/a	n/a	n/a
Coastal tons per capita	n/a	2.98	2.60	2.50	n/a
Int'l trade tons handled, millions	250	276	264	256	258
National ships	n/a	n/a	n/a	50	43
Foreign ships	n/a	n/a	n/a	206	214
International tons per capita	9.77	10.63	10.05	9.62	9.44
Fuel gallons, millions[1]	n/a	n/a	5,755	5,643	n/a
Fatalities[2]	n/a	n/a	n/a	390	200

Mexico	1987	1988	1989	1990	1991
Ports	85	85	85	85	n/a
Coastal tons loaded, millions	56	59	62	63	64
National ships	42	44	44	46	n/a
Foreign ships	16	18	19	18	n/a
Coastal tons per capita	0.74	0.75	0.78	0.78	0.78
Int'l trade tons handled, millions	118	115	114	119	n/a
National ships	4	3	2	3	n/a
Foreign ships	114	112	111	116	n/a
International tons per capita	1.51	1.44	1.40	1.44	n/a
Fuel gallons, millions	n/a	n/a	n/a	n/a	n/a
Fatalities	n/a	n/a	n/a	n/a	n/a

United States	1987	1988	1989	1990	1991
Ports	n/a	n/a	n/a	n/a	n/a
Coastal tons loaded, millions	324	325	302	293	n/a
National ships	324	325	302	293	n/a
Foreign ships	0	0	0	0	0
Coastal tons per capita	1.33	1.33	1.22	1.17	n/a
Int'l trade tons handled, millions	838	918	882	878	n/a
National ships	n/a	n/a	n/a	n/a	n/a
Foreign ships	n/a	n/a	n/a	n/a	n/a
International tons per capita	3.45	3.75	3.57	3.51	n/a
Fuel gallons, millions[2]	8,661	8,778	9,019	9,745	10,663
Fatalities[2]	1,036	946	896	865	924

Notes

n/a Not available for this report.

1. Commercial shipping only. For Canada, on Canadian ships only. U.S. fuel includes sales to foreign ships.
2. All water includes recreational boating.

Table 58 **Transit Trends: Canada, Mexico, and the United States**

Canada	1987	1988	1989	1990	1991
Active vehicles	12,912	12,978	12,694	12,945	n/a
Heavy rail	1,449	1,439	1,652	1,381	n/a
Light rail	516	524	593	532	n/a
Trolley	513	523	488	472	n/a
Motor bus	10,434	10,492	9,961	10,560	n/a
Electric vehicles	2,478	2,486	2,733	2,385	n/a
Metropolitan population (thousands)	16,210	16,463	16,716	17,054	16,358
Nation's population, (thousands)	25,617	25,909	26,240	26,610	27,296
Percent of Metro population	63.28	63.54	63.70	64.09	59.93
Elec veh./million metro population	153	151	163	140	n/a
Transit veh./million metro population	797	788	759	759	n/a

Mexico City	1987	1988	1989	1990	1991
Active vehicles	10,817	10,643	9,969	9,329	6,946
Heavy rail	2,242	2,304	2,304	2,304	2,424
Light rail	17	17	17	29	24
Trolley	1,115	1,159	812	812	638
Motor bus	7,443	7,163	6,836	6,184	3,860
Electric vehicles	3,374	3,480	3,133	3,145	3,086
Metropolitan population (thousands)	n/a	n/a	n/a	8,237	n/a
Nation's population (thousands)	76,600	78,120	79,700	81,249	82,800
Percent of Metro population	n/a	n/a	n/a	10.1	n/a
Elec. veh./million metro population	n/a	n/a	n/a	382	n/a
Transit veh./million metro population	n/a	n/a	n/a	1,133	n/a

United States	1987	1988	1989	1990	1991
Active vehicles	74,622	74,652	70,905	70,878	70,012
Heavy rail	10,168	10,539	10,506	10,419	10,170
Light rail	766	831	755	913	1,058
Trolley	671	710	725	832	919
Motor bus	63,017	62,572	58,919	58,714	57,865
Electric vehicles	11,605	12,080	11,986	12,164	12,147
Metropolitan population (thousands)	187,292	189,413	192,726	n/a	n/a
Nation's population, (thousands)	242,836	245,057	247,343	249,924	n/a
Percent of Metro population	77.13	77.29	n/a	77.11	n/a
Elec. veh./million metro population	62	64	n/a	63	n/a
Transit veh./million metro population	398	394	n/a	368	n/a

n/a Not available for this report.

Appendix A: Sources and Methods

Canada Mexico, and the United States: Overview

U.S. Population, employment, land and water areas, and gross domestic product (GDP) data are from the Bureau of the Census (1992). The Canadian population, employment, and GDP figures are from Canadian Department of Finance (1992). Canadian areas are from Statistics Canada (1991). Canada's territorial water area was obtained by telephone from Environment Canada. Mexican population GDP, employment, exchange rates, and inflation rates are from Consultores Internacionales, S.C. (1992).

Multimodal Transportation Statistics: 1990

Transportation Bill. The 1990 Canadian and U.S. transportation bills are made up of statistics from each modal profile; the 1992 U.S. total is taken from BTS (1994). See the individual profiles for the sources and methods used. The 1990 Mexican total and for-hire transportation bill were roughly estimated as described in table A-1.

Table A–1 Mexico's Transit Transportation Bill: 1990

		Pesos Billion	Canadian Million[6]	U.S. Dollars Million[6]
A.	GDP[1]	678,923	281,698	241,386
B.	Transport & Commo %[1]	6.760%	n/a	n/a
C.	Transport % of Trans. & Commo.[2]	53.400%◄	n/a	n/a
D.	= A*B*C; Mexico for hire transport value added to GDP[3]	24,508◄	10,169◄	8,714◄
E.	Ratio for-hire "Bill" to value added[4]	2.310◄	n/a	n/a
F.	= D*E, Mexico for-hire transportation bill	56,614◄	23,490◄	20,129◄
G.	Ratio total Transport Bill/GDP5	15.000%◄	n/a	n/a
H.	= G*A, Mexico total transportation bill	101,839◄	42,255◄	36,208◄
I.	= H-F, Mexico non-for-hire bill	45,225◄	18,765◄	16,079◄
J.	= H/Pop., Bill per capita (1,000 Pesos, dollars)	1,253◄	520◄	446◄

Notes

◄ Denotes estimate

n/a Not available for this report.

1. Published figures "Mexico 1992" Camera Nacional de Comercio de la Ciudad de Mexico.
2. 1990 U.S. experience.
3. The transport sector in GDP typically includes only for-hire transportation. Personal and non-for-hire transport such as private and business use cars and trucks, are considered part of the industry that owns operates them or are part of final demands. Furthermore, GDP is the sum of value added by each sector. Value added is largely the value of labor added by the sector. It does not include inputs purchased from other sectors.
4. Ratio is 1990 U.S. experience; source: "Survey of Current Business," U.S. Dept. of Commerce.
5. This ratio is typical of 15 European nations and of Canada.
6. July 1990 exchange rate of 2,812.6 pesos per U.S. dollar and an average 1990 exchange rate of 1.167 Canadian dollars per U.S. dollar were used.

Domestic Passenger Travel. The Canadian and U.S. figures are from the individual 1990 modal profiles. The highway figures are greater than the U.S. totals published in the Federal Highway Administration (FHWA) annual report, Highway Statistics and by the Canadian Royal Commission on National Passenger Transportation (1992). It appears that FHWA used an incorrect preliminary auto occupancy rate in its calculations, which was apparently later used by the Canadian Royal Commission. The Mexican figures were estimated as described in "Domestic Freight Transport," below.

Domestic Freight Transport. The Canadian and U.S. figures are from the individual 1990 modal profiles. For Mexico, estimates were developed for vehicles by type, vehicle distance by vehicle type, fuel consumption by vehicle type (for all modes), and highway person-distance and

weight-distance. A major input for these estimates was data on the number of 1990 highway vehicles by type; these data did not, however, include details on truck and bus types. Based on these data and other inputs (noted below), the Mexican estimates were derived as follows.

1. To determine the relative percentages of various types of trucks, 1989 vehicle count data by vehicle type (Mexico Secretaria de Communicaciones y Transportes 1989) were weighted inversely to the average distance traveled per vehicle by type. U.S. experience regarding the percentage of trucks in each class using diesel fuel or gasoline was used to further categorize trucks by class. The resulting highway vehicle mix is shown in column A of table A-2.
2. U.S. annual highway fuel consumption rates per vehicle for 1985[1] (Research and Special Programs Administration 1993; these rates are listed in column B of table A-2) were then multiplied by the number of vehicles to yield estimated Mexican fuel consumption by mode for 1990. (See column A*B of table A-2.)

As a check, estimates were developed of fuel consumption by the other modes. Mexican weight-distances and passenger-distances from the modal profiles were multiplied by the

Table A–2 Domestic Freight Weight-Distance: 1990

	A Mexico 1990 Vehicles	B U.S. 1985 Gallons/Year per Vehicle	A*B Estimated Mexico 1990 Million Gallons	C U.S. 1985 Million Vehicles	C*A Estimated Mexico 1990 Million Vehicle-Miles	D Estimated Mexico 1990 Million Person-Miles	E Estimated Mexico 1990 Million Ton-Miles
Motorcycles	218,698	50	11	1,669	365	752	n/a
Cars	6,209,449	591	3,670	9,141	56,761	113,521	n/a
Total trucks	2,833,880	n/a	5,787	n/a	43,101	36,078	283,301
2-Axle 4-Tire	1,728,373	846	1,462	10,437	18,039	36,078	n/a
3&4 A unit gasoline	731,864	1,715	1,255	11,962	8,755	n/a	98,963
3&4 A Unit diesel	109,195	1,715	187	11,962	1,306	n/a	14,765
Combo diesel	264,448	10,899	2,882	56,725	15,001	n/a	169,572
Buses gasoline	33,016	1,311	43	10,145	335	8,374	n/a
Bus tran & IC, diesel	54,511	8,879	484	36,859	2,009	264,599	n/a
Highway gasoline	8,921,400	n/a	6,441	n/a	84,254	158,725	98,963
Highway diesel	428,154	n/a	3,553	n/a	18,316	264,599	184,338
Total highway	9,349,554	n/a	9,995	n/a	102,570	423,324	283,301
RR diesel	n/a	n/a	143	n/a	n/a	n/a	n/a
Ton-miles	24,941	88	n/a	n/a	n/a	n/a	n/a
Pass.-miles	3,358	54	n/a	n/a	n/a	n/a	n/a
Water, diesel	n/a	238	n/a	n/a	n/a	n/a	n/a
Aviation, jet fuel	n/a	209	n/a	n/a	n/a	n/a	n/a
Aviation, gasoline	n/a	5	n/a	n/a	n/a	n/a	n/a

	Estimate	Product
Total Gasoline	6,655	6,632
Total Diesel	3,934	3,965
Total Petrol	10,589	10,597

1990 U.S. fuel consumption rates per weight- and passenger-distances (Research and Special Programs Administration 1993, FHWA annual series). For purposes of this analysis, it was assumed that half the fuel used in Mexican international aviation was

purchased in Mexico. Total fuels consumed by type were summed and compared with the actual amounts of fuels produced in Mexico (Consultores Internacionales, S.C., 1992); these are listed in the Estimate and Product columns at the bottom of table A-2. The estimated gasoline figure was 0.3 percent higher, and the diesel fuel estimate was 0.7 percent lower, than the actual figures. The estimated total for petroleum-based transport fuels was the same as the actual figure to three decimal places.

3. Next, estimates were calculated for Mexico's 1990 vehicle miles by vehicle type. To do so, Mexican vehicle estimates were multiplied by the corresponding U.S. distance-per-vehicle (column C of table A-2). (See column C*A of table A-2.)
4. Highway person-distances were estimated by multiplying the car and two-axle, four-tire truck figures by an assumed average occupancy rate of two (column D of table A-2). The U.S. 1990 experience was an average occupancy rate of 1.8 (ORNL forthcoming), but Mexico has a larger average family size than does the United States: this would probably translate into a larger average occupancy rate. Weight-distances were estimated by multiplying truck distances by an average load based on the experience of U.S. Interstate Commerce Commission motor freight carriers, classes I and II (regression analysis was taken from American Trucking Association data). (See column E of table A-2.)
5. Data on the number of U.S. trucks and truck-miles and fuel type for 1987 are from Bureau of the Census (1987b).

Vehicles. The Canadian and U.S. figures are from the 1990 modal profiles. The figures for Mexico came in part from the 1987-91 modal profiles, supplemented by statistics from Mexico Secretaria de Communicaciones y Transportes (1989). Allocation of total trucks to truck classes was done as described in "Domestic Freight Transport," above. Mexican fishing boats were estimated by multiplying the ratio of weights of Mexican and U.S. catches by the U.S. fleet. Mexican recreational boats were estimated by multiplying the U.S. fleet by the ratio of the Mexican per capita GDP to the U.S. per capita GDP.

Fuel Consumption. The Canadian and U.S. fuel use figures were summed from the individual 1990 modal profiles. The estimates of the 1990 Mexican petroleum fuel use figures were derived as discussed in "Domestic Freight Transport," above. Electricity used by Mexican transit vehicles was estimated using Canadian and U.S. annual consumption per vehicle figures multiplied by the numbers of operating Mexican vehicles. Caution should be exercised in comparing the use of electricity and petroleum-based fuels. U.S. electricity generation and distribution efficiency is approximately 29 percent (ORNL 1993). If that power efficiency figure is applied to Canada and Mexico, the kilowatt-hour consumption by mode of transit should be multiplied by 3.45 to estimate the power that must be generated for transit operations.

Transportation Employment. The employment statistics presented understate the total employees in transportation. They do not include business (other than for-hire transport business) and government car drivers, bus drivers, and vessel crews. They also do not include people employed by the fishing industry, although a portion of commercial fishing operations involves getting to the fishing site and returning with the catch.

Canadian and U.S. figures are from the 1990 modal profiles. In general, they are based on officially reported statistics. Comparable official statistics did not exist for Mexico. With the exception of rail employment, the Mexican figures are rough estimates based on the Canadian or U.S. experience as described in the remainder of this section.

The Canadian highway manufacturing figure was multiplied by the 1988 ratio of Mexican to Canadian motor vehicle production: 1990 Mexico, 600,000 vehicles; 1989 Canada, 2,043,104

vehicles (MVMA 1989). The Canadian aviation manufacturing employment (which includes parts) was multiplied by the ratio of the Mexican air vehicle fleet to that of the Canadian. Mexico manufactures (and reconditions) rail vehicles for its national railroad; however, the employees involved in this activity were probably included in the overall employee count for the railroad. Canadian water manufacturing employment was multiplied by the ratio of Mexican water vehicles to Canadian.

The Canadian construction figure was multiplied by the Mexican to Canadian ratio of paved road distance.

Mexican operating employment statistics were estimated as follows. Canadian bus, air carrier, water, and electric transit employment were multiplied by the ratio of the relevant Mexican to Canadian vehicle fleets. Total Canadian employees per truck were multiplied by the number of Mexican trucks to estimate total Mexican trucking employees. The Mexican taxi operator estimate was based on Mexico City experience multiplied by an estimated Mexican metropolitan population. Consultores Internacionales, S.C. (1992), reports 1,045 employees in Mexico's transport storage and communications sector in 1990. The U.S. experience (BE A monthly series) was that 53 percent of transport and communications employees were in transportation. Multiplying the Mexican employment figure by the U.S. experience yielded an estimated 554,000 employees in Mexican for-hire transportation. After subtracting out employment in the other commercial modes, the residual was an estimate of Mexican for-hire truck employment; subtracting this amount from total Mexican truck employees yielded estimated private or business use truck employment.

The "other commercial" transportation employee in table 8 includes retail and wholesale trade, brokers, agents and forwarders, and airport and water services. The Canadian highway-related figures were multiplied by the Mexico/Canada ratio of highway vehicles. The Canadian aviation-related numbers were multiplied by the Mexico/Canada ratio of public airports. The Canadian water-related values were multiplied by the Mexico/Canada ratio of total weight handled (domestic and international). Canadian transport-related employees were multiplied by the Mexico/Canada ratio of paved road distance.

Transportation Fatalities. These figures came from the individual 1990 modal profiles and the 1987–91 modal trend profiles.

Transborder and Other International Transportation Statistics

Traveler and expenditure statistics between the United States and other countries are from table 408, U.S. Travel to Foreign Countries—Travelers and Expenditures: 1984 to 1991, and table 409, Foreign Travel to the United States—Travelers and Receipts: 1984 to 1991 in Bureau of the Census (1992). Traveler statistics between Canada and the rest of the world are from International Travel Section (annual series), specifically the 1990 and later editions. Canada to Mexico travelers are rough estimates based on data in Aviation Statistics Centre (1991). Traveler and travel expenditures between Mexico and the rest of the world are based on table 9.4 in Consultores Internacionales, S.C. (1992).

There is no standard valuation of imports and exports between countries. Therefore, various inputs were used to determine a valuation. These inputs included each nation's total value of imports and exports, U.S. and Canadian export values, and Mexican export values to the United States. Trade and weight values between the United States and other nations are from table 1335 in Bureau of the Census (1992). Value of trade flows between the United States, Mexico, and Canada are from tables 2-2 through 2-5 in FHWA (1993). U.S. weight flows between the United

States and Canada are based on data in Agricultural Marketing Service (1991). Data on value of trade between Canada and other countries are from Statistics Canada's by-country import and export reports. Mexican trade values are from Consultores Internacionales, S.C. (1992). Additional detail on Canada-U.S. trade flows by mode is from Statistics Canada (annual series [f], [g], and 1990b).

Modal Profiles: 1990

Highway. In both Canada and the United States, there is a lack of statistics on the number, use, and costs of trucks operated by firms that are not primarily involved in for-hire trucking. An initial step in developing the highway profile was estimating statistics in these areas for both Canada and the United States.

For Canada the process involved the following. First, total truck registrations (with "other road motor vehicles" included as per Statistics Canada annual series [e]), were allocated to various truck types and types of operation, maintaining the integrity of the total truck and Statistics Canada survey samples. The fiscal and operating statistics of for-hire carriers were summed and used. The straight trucks and tractor sums of for-hire carriers (from Statistics Canada annual series [g], including owner operators) were subtracted from the total registered trucks. Statistics Canada (annual series [g]) contained statistics on total owner-operators and on use of owner-operator vehicles by for-hire carriers. Subtraction of the for-hire owner-operator vehicles from the total owner-operator vehicles yielded an estimate of the owner-operator vehicles used by not-for-hire firms. Statistics Canada (annual series [g]) has some survey statistics of private (not-for-hire) trucking including straight trucks and tractors owned and purchased as purchased transportation from owner-operators. The ratio of total owner-operators to the sample of private owner-operators was multiplied by the private sample truck figures to yield estimated Canadian totals. The total private (not-for-hire) trucks were subtracted from the remainder of total registered trucks less for-hire trucks. The substantial remainder apparently included vehicles such as farm utility trucks and personal-use vehicles. Statistics Canada indicated (by phone) that there were more than 500,000 farm trucks that were not in the Canadian sample (Statistics Canada annual series [g]). U.S. experience in 1987 for the same classes and types of vehicles (using data from Bureau of the Census 1987[b] and American Trucking Association [annual series]) was used to allocate the remainder among vehicle types. (See table A-3.) The trucks by type and user class were multiplied by annual average travel

Table A–3 Estimated Canadian Trucks

	Total Thousands	Percent	1990 Private Business Thousands	1990 Private Personal Thousands	1990 For-Hire Carrier Thousands	1990 For-Hire Operator Thousands
Total Trucks	3,936.1	100.0	1,201.5	2,643.9	58.5	32.2
Single Unit	3,848.8	97.8	1,181.2	2,643.9	14.5	9.2
2 Axle	3,579.6	90.9	936.2	2,624.1	12.5	6.7
>2 Axle	269.3	6.8	245.0	19.7	2.0	2.5
Tractor	87.3	2.2	20.3	0.0	44.0	23.0

Note
Farm trucks and "Other motor vehicles" included in "Private Business."

distances rates, fuel use, loads hauled, and revenue or expense rates. The averages were from survey data (Statistics Canada annual series [g]) or from U.S. experience (Bureau of the Census 1987[b]).

Canadian highway bill estimates were then made for small vehicles, which included cars (but not taxis) and personal-use two-axle, four-tire trucks. The number of cars came from national registrations (Statistics Canada annual series [e]); the number of personal-use trucks are from the process outlined above. Annual capital and operating costs per vehicle, taken from Statistics Canada (1990a), were multiplied by the number of small vehicles. Taxi revenues are from Statistics Canada (1989); this source also provided the estimate of the number of taxis subtracted from the small vehicle fleet. Bus revenues, except for transit buses, are from Statistics Canada (annual series [c]). Transit bus revenues, and most other transit statistics, were estimated by allocating the totals for all transit modes from Statistics Canada (annual series [c] and American Public Transit Association (1992) to individual transit modes using U.S. cost and operating experience. For-hire truck revenues came from Statistics Canada (annual series [g]).

Business truck expenses were estimated in two parts. The first part covered business trucks included in the Canadian private truck surveys (Statistics Canada annual series [g]). The expenses reported in the survey were multiplied by the owner-operator ratios previously described. The second part covered farm trucks and "other motor vehicles" not accounted for in the private truck surveys. These trucks were divided into two-axle and greater-than-two-axle classes based on U.S. experience. The average annual operating cost per vehicle-distance is from Statistics Canada (1990a); this was divided by 0.7 and multiplied by the number of vehicles to yield the estimate. (The 0.7 value, which was based on U.S. experience, was used to account for driver costs.) Greater-than-two-axle vehicles were multiplied by U.S. vehicle-distance per year (Bureau of the Census [1987b]); the result was multiplied by U.S. cost per vehicle-distance experience (GSA [annual series]), divided by 0.7. The 1987 Canadian government expenditure and revenue figures from Transportation Association of Canada (1988) were increased to account for 1987-90 inflation. The figures may be in error, since the Canadian tax system has changed since 1987. IRF (1991) is another source for governmental road expenditures, but it does not provide as much detail. Data were not available on motorcycle costs.

Canadian road distance data are from IRF (1991), and were checked against a less complete set of figures in the 1990 edition of Statistics Canada (annual series [g]). Canadian vehicle, vehicle-distance, and motor fuel consumption figures were estimated in the same general way as revenues and costs. No separate accounting was made for Canadian motor vehicle travel in the United States, since data were unavailable to allow for such estimation. The 1989 survey of for-hire trucking firms with revenues greater than $1 million in Canadian dollars (Statistics Canada annual series [g]) showed that in 1989, 4.8 percent of the fuel that the trucks in the survey consumed was purchased in the United States.

Total fuel consumption estimates are slightly greater than those in Statistics Canada (annual series [d]), which do not include foreign fuel. Person-distance data were estimated by multiplying U.S. average occupancy per unit distance by the corresponding Canadian vehicle distance. Canadian business weight-distance figures were estimated by multiplying the ratio of Canadian to U.S. vehicle-distance by vehicle type by the corresponding U.S. weight-distances.

Canadian highway-related for-hire employment statistics are from Labour Division (1990). Business trucking labor was estimated by multiplying the number of employees in the Canadian private truck survey (Labour Division 1990) by the ratio of survey expenses to total expenses (estimated as previously described). The resulting estimate of 216,000 employees apparently

understates the total. Statistics Canada (1993) shows 347,000 employees (truck drivers and forepersons in motor carrier operations and motor transport operating occupations not elsewhere covered). Subtracting the for-hire truck employees (Statistics Canada annual series [g]) from this number yields a remainder (apparently private and government truck employees) of 242,000. Statistics Canada (1993) shows an additional 189,000 employees in materials handling and related occupations (longshore workers, stevedores, and freight handlers were subtracted from the total). A large proportion of these must also be involved in the handling of truck freight.

The estimates are understated for highway employees for other reasons. Many people that operate vehicles for business purposes do not identify their occupation as motor vehicle operators although a significant part of their work hours are devoted to such operation. These people probably include police and security officers, military personnel, fire truck and ambulance drivers, farmers, newspaper delivery and garbage collection vehicle operators, route sales workers, and drivers of many other types of utility or service vehicles. There are more than 455,000 persons in such occupations, but data are not available regarding how much of their working hours are spent in motor vehicles.

Canadian road fatalities are from Transport Canada (1991b). The U.S. highway bill for small vehicles, taxis, and school buses is from Eno Transportation Foundation (annual series). The Eno Foundation develops the small vehicle costs by supplementing statistics from BEA (monthly series); its estimates of auto debt interest are based on financing statistics from Bureau of the Census (1992); its car registration and operators permit fees are from FHWA (annual series). The totals are then multiplied by 1.15 to account for business use of small vehicles. Eno estimates taxi costs by multiplying taxi personal consumption expenditures from BEA (monthly series) by 1.45 to account for business as well as personal use. Eno estimates school bus costs by multiplying school bus miles as published by the National Safety Council.

Intercity bus and "other bus" revenue are from an undistributed report on a membership survey by the American Bus Association. Bus transit expenses are from American Public Transit Association (1992). For-hire truck revenues are from Bureau of the Census (1990). Business truck costs were estimated as follows. Total 1990 unit trucks and tractors from FHWA (annual series) were multiplied by the ratios of business-to-total developed from Bureau of the Census (1987[b]). Vehicle-distance of each type for 1990 (also from FHWA annual series) were then multiplied by the ratio of private to total trucks to estimate vehicle-distance by type. The vehicle-distances for each type were then multiplied by average operating cost-per-vehicle from GSA (annual series), divided by 0.7 to account for driver costs. Total (federal, state, and local) 1990 road-oriented revenues and costs are from Office of Economics (1991).

The highway-distance statistics are from IRF (1991), and were reproducible from statistics in FHWA (annual series). Vehicle, vehicle-distance, and fuel consumption statistics are from FHWA (annual series). Person-distances were estimated by multiplying the vehicle-distances by vehicle type by corresponding national vehicle occupancy rates from the FHWA 1991 National Personal Transportation Survey. Weight-distance statistics were estimated by multiplying truck vehicle-distances by an average national load based on American Trucking Association (annual series) statistics.

Employment statistics—except for private tracking, urban transit, and school buses—are from the Department of Labor's Bureau of Labor Statistics (BLS) (annual series). Private truck employees are from table 22 in BLS (annual series). Bus transit employment data are from American Public Transit Association (1992). School bus employees were estimated by multiplying the number of school buses by an average number of employees per bus; that

average was estimated from unpublished American Bus Association statistics. The employment estimates understate total highway employment for the same reasons as described above for Canada. Data on fatalities are from Research and Special Programs Administration (annual series).

Aviation. The air carrier items in the Canadian aviation bill are from Statistics Canada (annual series [a] and a 1990 quarterly service update). Private aviation expenses were estimated by multiplying U.S. cost by the ratio of Canadian to U.S. active private aircraft. The Canadian private aircraft statistics are from Aviation Statistics Centre (annual series). Government services and facilities minus revenue figures are from Transport Canada (1991a). They apparently include TDC aviation-oriented research. No data were available on provincial or local aviation revenues and costs.

Canadian airport statistics are from Statistics Canada (1989). Canadian aircraft statistics are from Statistics Canada (annual series [a]) and Aviation Statistics Centre (annual series). Air carrier fuels are also from Statistics Canada (annual series [a]). General aviation fuels were estimated by multiplying the ratios of Canadian to U.S. general aviation aircraft by type by the U.S. values. Employment data are from Labour Division (1990). Transport Canada (1991b) is the source of fatality statistics.

U.S. aviation bill statistics are from Eno Transportation Foundation (annual series). The Eno foundation uses *Air Carrier Financial Statistics,* published by the U.S. Department of Transportation, as its main source of air carrier data. The foundation developed general aviation capital costs from values published by the Aerospace Industries Association. The total industry domestic billings were multiplied by 1.25 to reflect a 25-percent markup in sales; the value of imports was added to this total. Operating costs are based on historical operating cost per aircraft hour ratios, updated to account for inflation, multiplied by current hours. The reliability of the operating cost figures, 65 percent of the total, is questionable, but other data were not available. Revenues and costs of government programs are from Office of Economics (1991), as modified by the cost allocation percentages in Office of Aviation Policy and Plans (1991). This source allocates 62 percent of Federal Aviation Administration outlays to air carriers, 26 percent to general aviation, and 12 percent to public purposes (such as military aviation).

U.S. airport and aircraft statistics are from Bureau of the Census (1992), which attributes its statistics to the U.S. Departnent of Transportation, Federal Aviation Administration. Domestic air carrier passenger and weight-distance are from Eno Transportation Foundation (annual series); the corresponding international statistics are from Research and Special Programs Administration (1993). U.S. "other civil aviation" passenger-distances were estimated so as to correspond with Canadian aviation definitions. This process was based on data from Office of Management Systems (1990). Fuel consumption figures were reported in FAA (1991). Aviation employment data are from BLS (annual series). Aviation fatalities are from Research and Special Programs Administration (annual series).

Other sources consulted for aviation data include Aviation Statistics Centre (1991), Policy and Coordination (1992a and 1992b), Statistics Canada (1991a), and Transport Canada's Aerodrome Certification and Enforcement (phone contact).

Rail. Except for a few specific items, all the Canadian financial and operating statistics are from Statistics Canada (1990b). Additional subsidy statistics are from Transport Canada (1991a). Employment data came from Labour Division (1990); fatality statistics are from Transport Canada (1991b).

In general, the U.S. rail freight and Amtrak revenue and operating statistics are from Eno

Transportation Foundation (annual series). The revenues are from the table of Revenues of Federally Authorized Domestic Carriers, not from the freight and passenger bill tables. Commuter rail expenses and operating statistics are from American Public Transit Association (1992). Governmental outlays and revenues are from Statistics Canada (annual series [g]). Employment statistics are from BLS (annual series); fatality statistics are from Research and Special Programs Administration (annual series).

Water. Even though they may not typically be classed as transportation, recreational boating and some portion of fishing vessel expenses should be considered part of the water bill since they use government-provided services and facilities (ports, harbors, waterways, water navigation and communications, search and rescue services, policing and regulatory activities, etc.). Therefore, recreational boating is included in the water bills discussed. Fishing is not, however, because there was no meaningful way to allocate fishing financial statistics between transport activity (i.e., getting to the fishing area and returning with any catch) and the act of fishing. In 1990, the U.S. commercial fishing fleet catch of 4.9 million tons was valued at about $3.6 billion; the industry employed about 274,000 (Bureau of the Census 1992, tables 1149-57). If the entire U.S. catch were included in the water bill, it would increase it by roughly 91/2 percent. Canadian occupation statistics indicate that there are roughly 43,000 persons employed in fishing (Canadian Royal Commission on National Passenger Transportation 1992); this is about 16 percent of the U.S. figure. Multiplying this figure by the U.S. catch value yields a 1990 Canadian catch value of roughly $567 million ($662 million in Canadian dollars). If this amount were added to Canada's water bill, it would increase it by about 17 percent.

Except for boating, the Canadian water bill domestic and international statistics are from Statistics Canada (annual series [f]). The boating expenditure figure is from Allied Boating Association of Canada (annual series); the association's 1990 figure, which is rather large, was based on numbers of boats by type multiplied by unit costs. The estimates of unit cost involved annualized boat sales values, and available operating cost information. The Statistics Canada estimate of boats may be high. Statistics Canada (annual series [b]) reports 1,780,000 boats owned by households in 1990; Statistics Canada (annual series [f] reports 2,300,000 boats. However, the former figure excludes business-owned boats. The unallocated federal support figures are from Transport Canada (1991 a).

The Canadian boating fleet statistics are from Allied Boating Association of Canada (annual series). The number of Canadian fishing fleet vessels of over five tons and of "other" fishing vessels are from a September 1, 1993, letter from Peter J. Ady, Superintendent of Ship Registration and Tonnage Measurement, Canadian Coast Guard. The number of motorboat fishing fleet vessels was estimated by multiplying the U.S. figure by the ratio of Canadian to U.S. vessels over five tons. There may be double counting between the recreation boat and fishing vessel statistics. The remaining water fleet statistics are from Statistics Canada (annual series [f]).

Canadian water freight-distance was estimated by multiplying the 1992 tonnages loaded by the ratio of 1990 to 1992 tonnages loaded by average trip lengths. The figures, which exclude fishing fleet estimates, are from a July 6, 1993 letter from Richard Hinchcliff, Director, Statistics and Forecasts, Transport Canada; and Statistics Canada (annual series [f]).

Domestic diesel fuel and gasoline consumption for shipping is also from Statistics Canada (annual series [f]); 9.2 million liters of lubricating oil and 1.7 million liters of "other fuel" were excluded. Recreational boat gasoline was added to the shipping fuels. It was estimated by multiplying the average U.S. consumption per inboard and outboard motorboat (FHWA annual series, Bureau of the Census 1992) by the number of Canadian motorboats. Canadian residual

fuel consumption was estimated by multiplying the ratio of Canadian to U.S. international ton-mileage by the U.S. water residual fuel consumption.

Canadian water employment statistics are from Labour Division (1990); they apparently do not include any of the 43,000 persons in the fishing industry. If these persons were included, they would more than double total Canadian employment in water operations.

Total water fatalities are from Transport Canada (1991b). Water transport fatalities are limited to ferryboat fatalities as reported in Canadian Royal Commission on National Passenger Transportation (1992). The recreational boating figure is the total minus the ferryboat figure; to the extent that there were water shipping fatalities, the recreational boat statistic may be in error.

The U.S. domestic for-hire freight and passenger bills, and the international water passenger bill were estimated by multiplying the 1987 figures (Bureau of the Census 1987a) by the ratio of the 1990 industry payroll to the 1987 payroll (BLS annual series). The domestic water support figures are from Office of Economics (1991). U.S. boating expenditures are reported in Bureau of the Census (1992), table 395. The international freight figures are from Eno Transportation Foundation (annual series), which attributes these figures to the Bureau of Economic Analysis. Federal support of international shipping data are from Maritime Administration (annual series). The unallocated state and local government support figures are from Office of Economics (1991).

U.S. vessel statistics are from three sources—Bureau of the Census (1992), table 395 for recreational boats; Bureau of the Census (1992), table 1150 for fishing vessels; and Office of Trade Analysis and Insurance (1991) for other vessels.

International weight-distances for imports and exports were estimated by multiplying the U.S. tons unloaded and loaded from Water Resources Support Center (annual series) by the Canadian average import and export distances (from July 6, 1993, letter from Richard Hinchcliff, Director, Statistics and Forecasts, Transport Canada). Water fuel consumption figures are from Research and Special Programs Administration (1993), which reports its sources as the U.S. Department of Energy, Energy Information Administration, for residual and diesel fuels and the Federal Highway Administration for gasoline. Water employment data are from BLS (annual series); these figures exclude all 274,000 people employed in the fishing industry. If these people had been included, the water operations employment figure would be about six and a half times larger than it is. Water fatalities statistics are from Research and Special Programs Administration (annual series).

Additional sources consulted for water mode data include Coast Guard (1990) and Maritime Administration (1989).

Transit. Total nationwide transit figures all variables and for the numbers of vehicles operated by mode are from Statistics Canada (annual series [c]) and American Public Transit Association (1992); Canadian fuel consumption and operating and capital subsidies are in Statistics Canada (annual series [c]); data on vehicle miles, operating revenue, operating expense, and employees are in American Public Transit Association (1992). All the U.S. financial and operating statistics, except for governmental subsidies, came from American Public Transit Association (1992). The governmental subsidies are from Office of Economics (1991a).

Canadian by-mode estimates of the variables were estimated from the totals and the numbers of vehicles, using U.S. per vehicle experience. The summed estimated totals were within several percentage points of the reported totals. The matrix of variables was then multiplied by the ratio of the reported totals to the estimated totals.

Oil Pipeline. The Canadian oil pipeline data are from Energy Section (1991); cubic meters

have been converted to tonnes and tons, and cubic meter kilometers have been converted to tonne-kilometers and ton-miles. U.S. data are from Eno Transportation Foundation (annual series). The foundation bases its estimates on statistics collected by the U.S. Department of Energy, Federal Energy Regulatory Commission.

Modal Trends: 1987-91

The beginning set of statistics in each mode is from IRF (1991). Where similar, more authoritative statistics from those previously described were available, they were used. Many of the statistics for Mexico came from Consultores Internacionales, S.C. (1992).

Endnote

1. The year 1985 was selected because the average age of Mexico's highway fleet is probably older than that of the United States.

Appendix B: References

Agricultural Marketing Service, U.S. Department of Agriculture. 1991. Study conducted by Keith Klindworth. Washington, DC.

Allied Boating Association of Canada/Canadian Marine Manufacturers Association. Annual series. *Canadian Boating Facts.*

American Public Transit Association. 1992. *1992 Transit Fact Book.*

Aviation Statistics Centre. Annual series. *Civil Aircraft Activity in Canada.*

———. 1991. *Air Charter Statistics, 1991.*

American Trucking Association. Annual series. *Financial and Operating Statistics, Motor Carrier Annual Report, Results of Operations of Class I and II Motor Carriers of Property Regulated by the Interstate Commerce Commission.*

Bureau of the Census, U.S. Department of Commerce. Annual series. *Motor Freight and Transportation and Warehousing Survey.* Washington, DC.

———. 1987a. *Census of Transportation, Geographic Area Series, Selected Transportation Industries, Summary.* Washington, DC.

———. 1987b. *1987 Census of Transportation, Truck Inventory and Use Survey.* Washington, DC.

———. 1990. *Motor Freight and Transportation and Warehousing Survey.* Washington, DC.

———. 1992. *Statistical Abstract of the United States, 1992.* ISBN 0-16-038080-4. Washington, DC: U.S. Government Printing Office.

Bureau of Economic Analysis, Economics and Statistics Administration (BEA). Monthly series. *Survey of Current Business.* Washington, DC: U.S. Department of Commerce.

Bureau of Labor Statistics (BLS). Annual series. *Employment and Earnings.* Washington, DC: U.S. Department of Labor.

Bureau of Transportation Statistics (BTS). 1994. *Transportation Statistics Annual Report 1994.* Washington, DC: U.S. Department of Transportation.

Canadian Department of Finance. 1992. *Economic Reference Tables, August 1992.*

Canadian Royal Commission on National Passenger Transportation. 1992. *Directions.* Four volumes.

Coast Guard. 1990. Boating Statistics 1990. Washington, DC: U.S. Coast Guard.

Consultores Internacionales, S.C. 1992. *Mexico 1992: Abstract of Statistics and Data on Mexico.* Mexico City: Camara Nacional de Comercio de la Ciudad de Mexico.

Energy Section, Industry Division. 1991. *Oil Pipeline Transport.* Statistics Canada.

Eno Transportation Foundation, Inc. Annual series and supplements. *Transportation in America.* Lansdowne, VA.

Federal Aviation Administration (FAA). 1991. *FAA Aviation Forecasts, Fiscal Years 1991-2002.* Washington, DC: U.S. Department of Transportation.

Federal Highway Administration (FHWA). Annual series. *Highway Statistics.* Washington, DC: U.S. Department of Transportation.

———. 1993. *Assessment of Border Crossings and Transportation Corridors for North American Trade.* Draft report to the U.S. Congress. Washington, DC: U.S. Department of Transportation.

General Services Administration (GSA). Annual series. *Federal Motor Vehicle Fleet Report.* Washington, DC.

International Road Federation (IRF). 1991. *World Road Statistics 1987-1991.* Geneva, Switzerland.

International Travel Section; Education, Culture, and Tourism Division. Annual series.

International Travel, National and Provincial Counts, October - December. Statistics Canada.

Labour Division. 1990. *Employment, Earnings and Hours: December 1990 Preliminary Data.* Statistics Canada.

Maritime Administration. Annual series. *MARAD.* Washington, DC: U.S. Department of Transportation.

———. 1989. *Domestic Waterborne Trade of the United States, 1987-1989.* Washington, DC: U. S. Department of Transportation.

Mexico Secretaria de Communicaciones y Transportes. 1989. *Anuario Estadistico 1989.* Mexico.

Motor Vehicle Manufacturers Association of the United States, Inc. (MVMA). 1989. *MVMA Motor Vehicle Facts and Trends, '89.*

Oak Ridge National Laboratory (ORNL). 1993. *Transportation Energy Data Book: Edition 13.* Prepared for the U.S. Department of Transportation. ORNL-6743.

———. Forthcoming. *1990 Nationwide Personal Transportation Survey.* Washington, DC: Federal Highway Administration.

Office of Aviation Policy and Plans. 1991. *Allocation and Recovery of Federal Airport and Airways Costs, 1991.* Washington, DC: U.S. Department of Transportation, Federal Aviation Administration.

Office of Economics. 1991. *Federal, State, and Local Transportation Financial Statistics, Fiscal Years 1981–1991.* Washington, DC: U.S. Department of Transportation, Assistant Secretary for Policy and International Affairs.

Office of Management Systems. 1990. *General Aviation Pilot and Aircraft Activity Survey.* Washington, DC: U.S. Department of Transportation, Federal Aviation Administration.

Office of Trade Analysis and Insurance. 1991. *Vessel Inventory Report.* As of July 1991. Washington, DC: U.S. Department of Transportation, Maritime Administration.

Policy and Coordination. 1992a. *TDC Operational Plan 1992-92 to 1993-94.* Transport Canada, Transportation Development Centre.

———. 1992b. *Transport Canada Aviation Forecasts 1992-2005.* Transport Canada, Economic Analysis.

Research and Special Programs Administration. Annual series. *Transportation Safety Information Report, Annual Summary.* Washington, DC: U.S. Department of Transportation.

———. 1993. *National Transportation Statistics Annual Report: Historical Compendium.* Washington, DC: Bureau of Transportation Statistics.

Statistics Canada. Annual series [a]. *Canadian Civil Aviation.*

———. Annual series [b]. *Household Facilities and Equipment.*

———. Annual series [c]. *Passenger Bus and Urban Transit Statistics.*

———. Annual series [d]. *Road Motor Vehicles, Fuel Sales.*

———. Annual series [e]. *Road Motor Vehicles, Registrations.*

———. Annual series [f]. *Shipping in Canada.*

———. Annual series [g]. *Trucking in Canada.*

———. *Fuel Consumption Survey.*

———. 1989. "Service Bulletin. Surface and Marine Transport, Vol. 7, No. 6, Article Taxicab Industry Study 1989."

———. 1990a. *Family Expenditure in Canada, 17 Metropolitan Areas 1990.*

———. 1990b. *Rail in Canada. 1990.*

———. 1991a. *Air Passenger Origin and Destination, Canada-United States Report, 1991.*

———. 1991b. *The Canadian Yearbook 1991.*
———. 1993. *Employment Income by Occupation.*
Transport Canada. 1991a. *Rapport Annuel 1990-1991.*
———. 1991b. *Road Safety Annual Report, 1991.*
Transportation Association of Canada. 1988. *National Highway Policy Study: Steering Committee Report—Phase 2.*
Transportation Development Centre, Policy and Coordination (TDC). 1991. *TDC Operational Plan 1991-92 to 1993-94.* Transport Canada.
Water Resources Support Center. Annual series. *Waterborne Commerce of the United States.* Washington, DC: U.S. Army Corps of Engineers.

Bureau of Transportation Statistics
U.S. Department of Transportation
400 Seventh Street, S.W., Room 2104
Washington, D.C. 20590