

**1.221J/11.527J/ESD.201J TRANSPORTATION SYSTEMS**  
**FALL 2003**

**Assignment #3 – National Canadian Transportation Policy**  
(30 Points)

Assignment 3 Table of Contents

There were several parts to Assignment 3. A general report was required. Along with the general report, there was a requirement for an internal memo from the Minister of Transportation to the Prime Minister. There was also a requirement for a letter from the Prime Minister to the Western Canadian Premiers and a letter from the Prime Minister to the Eastern Canadian Premiers.

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**Instructions**

Answer all parts of the questions below. You may use any books or notes at your disposal. The data and equations given within the assignment will be sufficient to complete all quantitative aspects of the problem. Computer requirements for this assignment are Microsoft Word and Microsoft Excel. You are not required to use all the information provided in the handout. Selecting the information in the narrative that you consider relevant is part of the assignment. Outside sources will not help in your quantitative analysis – the numbers provided in the appendixes for your spreadsheet are adequate (although hypothetical). However, for your write-up and qualitative analysis, if you believe that outside sources will add to your case, you are free to use them. If you need to make assumptions in your analysis – carefully document and justify them.

This is an individual assignment. However, you are permitted to discuss basic concepts and approaches with your fellow classmates, but not with students from previous years.

**The analysis and report must be done on your own.** It is recommended that you first read through the problem carefully to get an idea of the situation as a whole. Before beginning any actual work, review the appropriate materials and plan the necessary steps of your problem-solving strategy.

Remember: One of the main themes of this course is that there are larger demands for limited transportation resources than we can satisfy. As a decision-maker, more often than not, your success depends on how well you defend your choices. You need to support your recommendations by your quantitative analysis and with your persuasive arguments.

## Introduction to the Case Study - Canada



## The United States of America

Canada, a country with a land area of 3,851,063 square miles, but with a population of just 31,902,268 (est. July 2002) has had an interesting and varied history of transportation that has closely paralleled that of the United States due to its proximity to this country. Many of the first settlements were along the St. Lawrence River and Great Lakes Basin; and these eventually grew into Canada's major cities. Montreal, in the French-speaking province of Quebec, is one of the largest Francophone metropolises outside of France with an estimated population of 3.46 million people. Toronto, in the English-speaking province of Ontario is the country's biggest city in terms of population with 4.68 million people. Westward expansion included the city of Winnipeg, along the banks of the Red River in the province of Manitoba (estimated population 677,625). The Canadian government (located in the national capital of Ottawa, Ontario, population 1.64 million) supported westward expansion which culminated with the entire country being linked together by the Canadian National Railroad (CN Rail) in the 19<sup>th</sup> century. The railroad terminates in Vancouver, British Columbia, population 1.98 million. Two small prairie cities inhabit the province of Alberta. The provincial capital of Edmonton, population 937,845 is located closest to the oil-rich area of northern Alberta while Calgary, population 951,395 headquarters most of the major corporations of the province. There are two smaller cities in central Canada as well, Quebec City, population 697,800, is the capital of the province of Quebec, and Windsor, population 208,402, is important due to its proximity to the City of Detroit in the United States, and due to its status as one of Canada's busiest border crossings. Finally, Regina, the capital city of the province of Saskatchewan, has a population of 199,900.

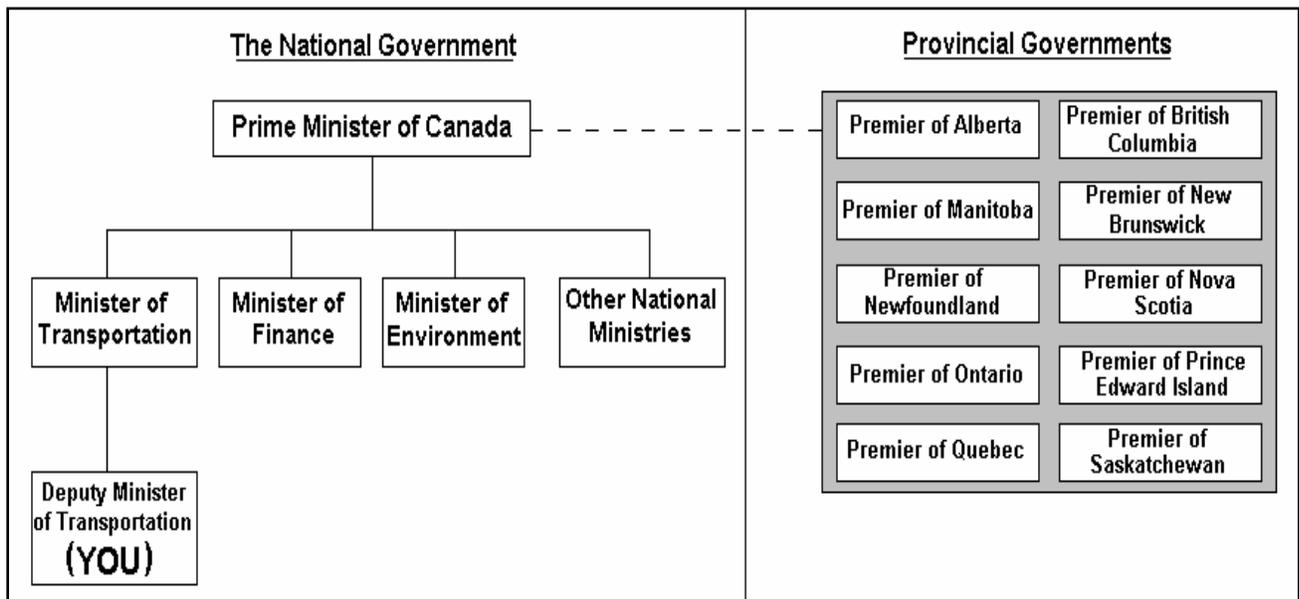
# The Canadian Government

Canada has a national government that represents the entire country and regional governments (in the provinces) that represent different jurisdictions in the country.

The Prime Minister is the leader of the national government of Canada. There are many cabinet ministers (including the Transportation Minister and the Minister of Finance) who work for the Prime Minister. All citizens of Canada elect the national government.

There are ten provinces in Canada. Residents of each province elect their own provincial government. The leader of each province is known as the Premier. The ten Premiers do not work for the Prime Minister.

## Government in Canada



**\*YOU are the Deputy Minister of Transportation\***

## Transportation Issues

It is December, 2002. You are the national<sup>1</sup> Canadian Deputy Minister of Transportation working for Transportation Minister David X. It is the task of you and your staff to advise the Minister of Transportation, the Minister of Finance, and the Prime Minister on a recommended course of action regarding the national transportation plan. There are several transportation issues that need to be addressed.

1. The national highway, the Trans-Canada Highway, wants money for expansion.
2. Canada's publicly owned passenger rail, VIA Rail, wants money for high speed rail development.
3. Canada's major airline, Air Canada, a private company, has filed for bankruptcy protection.
4. Western Canadian farmers want money for freight rail subsidies.

This is a classic case of the Complex, Large, Integrated, Open Systems (CLIOS) problem that a 21<sup>st</sup> Century transportation professional could encounter.

As you learned from Key Point #2, transportation service is part of a broader system – economic, social, and political in nature. This Key Point is very relevant in the context of Canadian national politics since any national transportation decision will take into consideration many political and economic issues specific to Canada. The object of this assignment is to provide a realistic simulation of real-world issues, both transportation and non-transportation related.

This assignment has a quantitative and a qualitative requirement. The quantitative requirement involves analyzing the facts and figures provided to you in appendixes 1 through 5 and using this information in order to study the options. It will be up to you to determine which information is relevant and which is not necessary.

You will then write a qualitative analysis. To help you understand the context of the national environment that you are evaluating, ten newspaper articles highlighting issues involving the major Canadian cities will be provided (as appendixes 6 through 15). Note: All appendices will be distributed to the class, at the first special briefing, Thursday, 02 October 2003.

**Your primary task is to write a report to your boss, the Minister of Transportation, David X.** As the Deputy Minister<sup>2</sup> to Mr. X, you have his full attention and support. The greater challenge is to convince the *Prime Minister* that transportation issues deserve priority on his political agenda. Your mission is to help Mr. X to do just that.

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<sup>1</sup> “National government” and “federal government” are interchangeable.

<sup>2</sup> “Ministry” is the Canadian name for a Department. So, the Department of Transportation in the United States would be called the Ministry of Transportation in Canada. The Secretary of Transportation in the United States would be called the Minister of Transportation in Canada.

Remember, you will have to defend your report to the Minister of Finance (who is strictly interested in the quantitative aspects of your analysis) and more importantly, to the Prime Minister, who is concerned with political factors as well as finances. Your likelihood of success with the Prime Minister will not only include how well you incorporate all of the facts, but also how well you demonstrate an understanding of the political, social, and economic climate under which the country operates.

**Good luck Mister/Madame Deputy Transportation Minister!**

## **Policy Options**

To address the four transportation issues noted in the previous section, the Minister of Transportation has asked you to assess the following projects. Your planning horizon is from 01 January 2003 to 31 December 2012.

1) **Modernizing the Trans-Canada Highway.** In some parts of the country (notably oil-rich Alberta), the Trans-Canada is a new four-lane highway. In other parts of the country, the Trans-Canada is an old two-lane road with no shoulders. We want to consider the feasibility of expanding the Trans-Canada into a modern four-lane highway from coast to coast.

2) **Construction of a high-speed passenger rail link between Quebec City (Quebec), and Windsor (Ontario).** The line would connect the cities of Windsor, Toronto, Ottawa, Montreal, and Quebec City.

3) **Nationalizing Air Canada.** The airline was once owned by the national government, but was privatized in the late 1980's. Ever since privatization and deregulation, the airline industry in Canada has had its share of difficulties. We want to consider the government re-acquiring Air Canada (which is based in the Canadian east (in the City of Montreal) and operates at a national scale) in order to prevent bankruptcy.

4) **Subsidizing railroad rates for western-based manufacturers and farmers.** Freight transportation is significantly more expensive in the Canadian west for several reasons. These reasons include: the dangerous Rocky Mountains of British Columbia, the low population density of the three Prairie Provinces (Alberta, Saskatchewan, Manitoba), and the difficulties accessing major waterways (the eastern provinces have access to the Great Lakes and the St. Lawrence Seaway whereas the Prairie Provinces and the interior of British Columbia are essentially land-locked).

## **Political Factors and other Suggested Projects**

A) The Premier of the Province of British Columbia has requested that if the national government approves the Trans-Canada Highway expansion program that some of that money also be used to help modernize the highway between Vancouver, British Columbia, and Whistler, British Columbia. Whistler is a ski resort just outside of Vancouver. The cost of the highway would be \$797 Million. Although this road is not part of the Trans-Canada Highway, the Premier of British Columbia argues that because Vancouver won the rights to host the 2010 Winter Olympics, the national government should pay for part or all of the work on this road. The Premier argues that the money would be well spent, since the Olympic Games would bring prestige and pride to the entire country. Furthermore, he also argues that the national government would have spent money modernizing Toronto's transportation network if that city had been successful in any one of its three bids to host the Summer Olympics. The Premier of British Columbia suggests that western Canadians would feel alienated if the national government does not fund this highway, when similar projects would have been funded in Toronto. The Premier of British Columbia states that he would need at least \$200 Million no later than 31 December 2009 and another \$597 Million no later than 31 December 2012.

B) The western prairie Premiers (Alberta, Saskatchewan, and Manitoba) received word that the national government is considering construction of the high-speed link between Quebec City and Windsor. They are unhappy, since there are no plans to build any high speed rail in the west. The three Premiers write a joint letter demanding that if a high-speed rail link is built from Quebec City to Windsor, then a rail link ought to be eventually constructed from Edmonton to Calgary. Furthermore, they argue that the costs of such an endeavour would be significantly cheaper than in Ontario since the flat prairie is conducive to easy rail construction as compared with the rugged terrain in eastern Canada.

C) The Premier of the Province of Alberta heard the rumour that the national government might consider nationalizing Air Canada. From his Edmonton office, he sends a letter to the Prime Minister stating that Calgary-based West Jet (a private company) is prospering and that any move by the national government to re-acquire Air Canada would be harmful to one of western Canada's more successful companies. The Premier of Alberta suggests that if the situation were reversed, that the national government would not help an Alberta based airline to the detriment of a Quebec based airline. The Premier of Alberta demands that the national government take a "hands-off" approach and let Air Canada solve its own problems.

The Premier of Alberta also took the opportunity to point out that Alberta has already modernized its portion of the Trans-Canada Highway and did so out of provincial government funds, with no national government support. He insists that if the national government moves forward with its Trans-Canada national highway program, that Alberta be appropriately compensated, since no additional work on the Trans-Canada Highway needs to be done in the province. The Premier of Alberta suggests that

appropriate compensation could come in the form of the high-speed link between Edmonton and Calgary sometime in the future. However, *the Premier* feels that high speed rail would not be considered appropriate compensation if the Windsor to Quebec City link was going to get built anyway, since the Premier would demand that Alberta receive a high speed link as part of *that* program versus compensation for the Trans-Canada Highway program.

D) The Premier of the Province of Quebec also sent a letter to the Prime Minister. In the letter, he reminds the Prime Minister of economic and political instability in his province. Specifically, there has been a strong separatist movement in the province of Quebec that has caused significant problems. The Premier of Quebec states that the loss of Air Canada, one of the few major corporations that did not abandon the city of Montreal (Quebec) and move to Toronto (Ontario) in order to escape the turmoil of the separatist movement would be detrimental to the Quebec economy.

Furthermore, the Premier of Quebec just won the most recent provincial election. He defeated a separatist political party – the Parti Quebecois - in that election. The Premier of Quebec feels that since he just recently defeated the separatist Parti-Quebecois in the last Quebec provincial election, involvement by the national government in helping to preserve Air Canada would be looked upon as an act of good-will by Quebecers. The Premier of Quebec urges the Prime Minister to get involved.

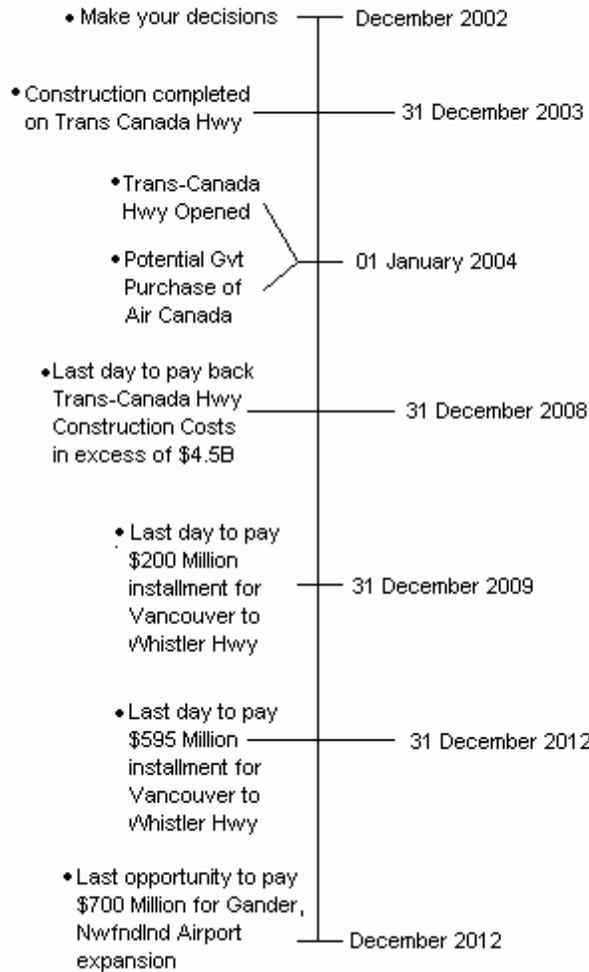
In his letter, the Premier of Quebec also takes the opportunity to remind the Prime Minister that Quebec is very happy with the freight rail arrangement in Canada, and that he supports any national government plan that allows for greater price flexibility and market competition. The Premier of Quebec notes that the St. Lawrence Seaway along with the strong provincial trucking industry provides sufficient competition to the railroads. He feels that freight prices are adequate in Canada, and that no national government money should be used to subsidize western Canadian shippers, when that money would be better suited to the high-speed rail link between Quebec City and Windsor.

E) The western Premiers are displeased when they become aware of the Quebec Premier's letter to the Prime Minister. In their minds, the western farmers and manufacturers are suffering enormously, not only because of low manufacturing and agricultural prices, but also because of high freight transportation costs. They urge the national government to spend money to alleviate this "critical" situation with the freight subsidy. Both the Premier of British Columbia and the Premier of Alberta alert the national government to the fact that a subsidy that would assist the farmers with moving their produce would have positive benefits both in terms of unemployment and GDP for the two provinces.

G) The Premier of the Province of Newfoundland has asked the national government for \$700 Million for a new airport in Gander, Newfoundland. In his opinion, the small provinces along the Atlantic Ocean in eastern Canada (Newfoundland, Nova Scotia, New Brunswick, and Prince Edward Island) have not been included in any of the current

proposed transportation plans. The Premier of Newfoundland reminds the Prime Minister that as a result of fishermen losing their jobs, Newfoundland's economy has experienced many problems. The Premier of Newfoundland suggests that a new airport in Gander, Newfoundland, would help many of the economic difficulties. The Premier of Newfoundland wants the money no later than the end of December 2012.

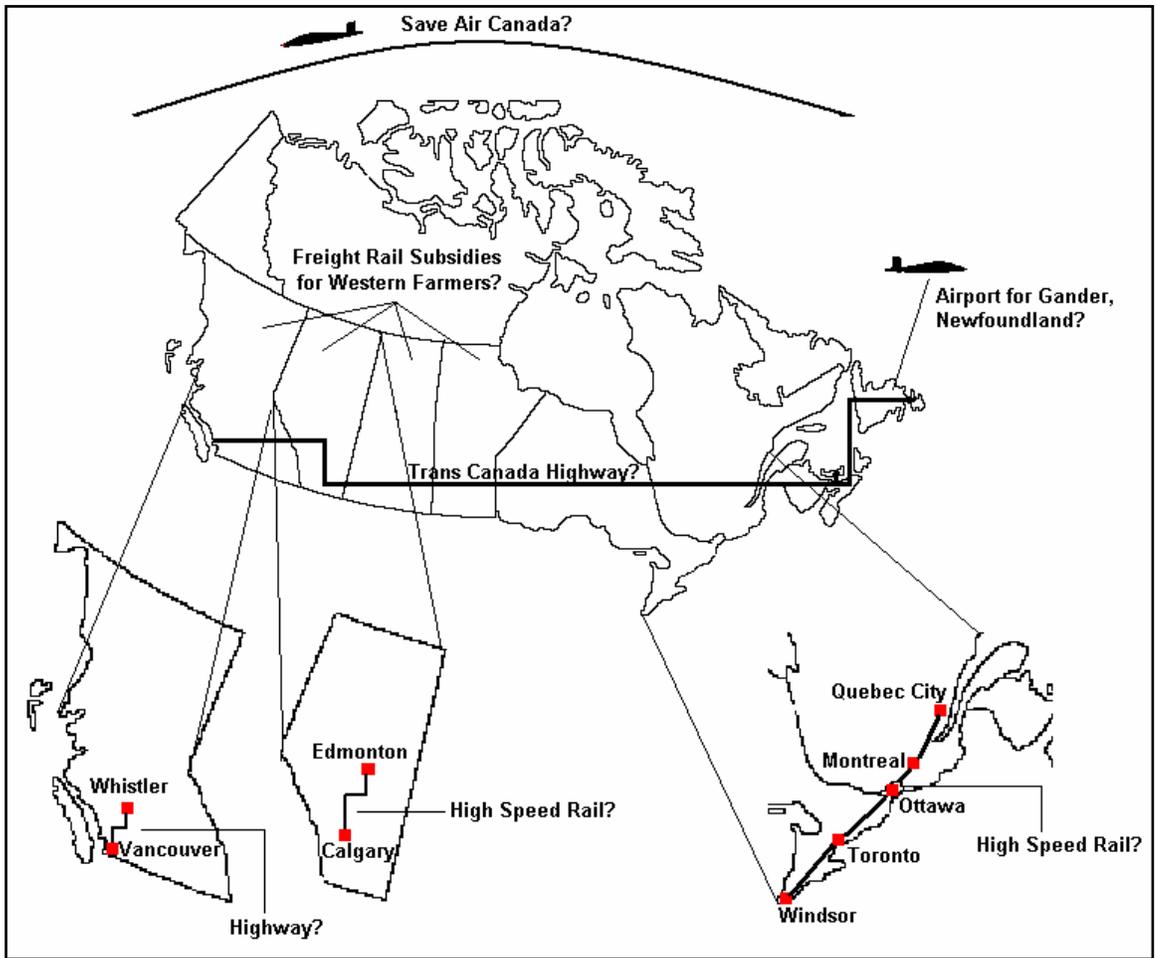
## Timeline of Deadlines



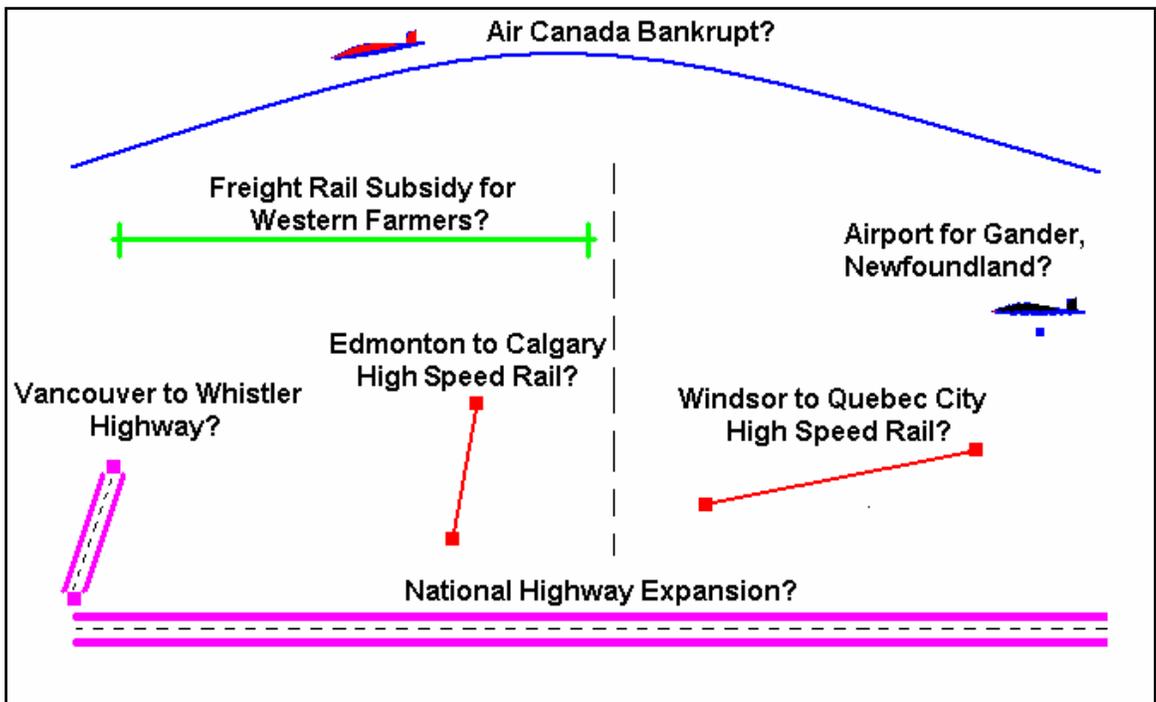
Note: This Timeline provides potential deadlines. Of course, these deadlines only apply if you choose the related projects.

## Diagrams

On the next page, two stylized diagrams are provided for your reference. It would normally be up to you to generate an overall picture of the situation; however in this case, we have done this for you. Note that these diagrams are strictly for reference purposes.



## Canadian Transportation Issues Diagrams



## Specific Tasking

Remember, your report must address all of the above projects and related issues.

1. **The national highway program.** The options are:

- do nothing;
- build the coast-to-coast highway and offer no compensation to Alberta;
- build the coast-to-coast highway and offer compensation to Alberta.

You also need to decide whether to give British Columbia money to build the Vancouver – Whistler Highway. If you decide to give the money, you may use money from the Trans-Canada Highway project to pay British Columbia. Remember the dates that the Premier of British Columbia indicated he would need the money.

If you decide to pursue the Trans-Canada Highway project, construction will start on 01 January 2003. The project would be completed on 31 December 2003, (Canadian construction companies are very efficient☺ ) and the new highway would be considered “open” and fully operational on 01 January 2004.

-You will need to determine if any tolls on the Trans-Canada Highway are required.

The Finance Minister has instructed you that a toll would be **required** if the cost of expanding the highway exceeds \$4.5 Billion. **Any amount over \$4.5 Billion would have to be paid back in five years (i.e. by 31 December 2008).**

-When you have paid back any construction costs in excess of \$4.5 Billion, you must decide whether to keep the toll or to eliminate it.

If you levy a toll, it will be an entrance toll. Basically, a driver will pay a toll to enter the highway. This means that *regardless* of the distance a driver travels, he/she will pay the same toll to enter the highway. If, for example, you decide to charge a \$5.00 entrance toll, a driver would pay \$5.00 whether he drives 3 Miles or 3000 Miles on the highway.

The amount of the toll can change from year to year; however, the Prime Minister insists that the toll be the same no matter where in the country a driver enters the highway.

Notes:

-The Prime Minister has indicated that the Trans-Canada highway program is an all or nothing deal. If the national government builds, it will get involved with coast to coast construction, and will not leave any portion of the highway system as a two lane undivided road.

-One of the political dilemmas that must be faced is the Prime Minister’s insistence that any tolls that are collected from the Trans-Canada Highway be the same across the

country. If you go ahead with this project, and you choose to charge a toll, you must address how you will deal with Alberta. How will Alberta react to not getting any money from the Trans-Canada Highway program, and then its drivers being forced to pay tolls to the national government for a highway that *the province* built from its provincial budget? Would you compensate the province of Alberta for this situation? If so, how would you compensate? If you decide not to compensate the province, how would you justify your decision?

2. **High speed rail.** The options are:

- do nothing;
- build the rail between Quebec City and Windsor but nowhere else;
- build the rail between Quebec City and Windsor and a link between Edmonton & Calgary;
- build the rail between Edmonton and Calgary but nowhere else.

3. **The Air Canada bankruptcy.** The options are:

- do nothing
- nationalize the airline (i.e. government takeover).

Notes:

-The Prime Minister has already rejected any idea of providing a subsidy to a privately owned Air Canada. He feels that if the government gets involved, it would be through national government ownership and nothing else.

-While the Prime Minister believes that Air Canada can be profitable if it just flies one or two of the most lucrative routes, he is committed to it being a nationwide airline and does not want it to be simply a regional carrier. He threatened to pass legislation forbidding Air Canada from cutting any routes.

-As a compromise, Air Canada offered to study how it could maintain itself as a nationwide airline but still cut costs. After considering many factors, including the political climate and the Prime Minister's desires, the executives at Air Canada made a proposal. The proposal was as follows:

Air Canada would fly at least one route out of the city of Edmonton.

Air Canada would fly at least one route out of the city of Calgary.

Air Canada would fly at least one route out of the city of Vancouver.

Air Canada would fly at least one route out of the city of Quebec City.

Air Canada would fly at least TWO routes out of the city of Ottawa.

Air Canada would fly at least TWO routes out of the city of Montreal.

Air Canada would fly at least FOUR routes out of the city of Toronto.

The Prime Minister agreed that this arrangement was acceptable and that it would be the minimum he would tolerate – although he would be pleased if Air Canada would fly even more routes than what was proposed here.

- You need to determine if Air Canada can become profitable again.

- If Air Canada can become marginally profitable, then it will emerge from bankruptcy protection and will continue to operate as a private carrier.

- If Air Canada cannot become profitable, then one of two possibilities can occur:

- A. You recommend that the national government purchase the airline and operate it (you need to determine at what price to purchase, using the information provided to you in the appendixes).

- B. You recommend that the national government not purchase the airline and as a result, allow it to liquidate (no longer exist).

Regardless of what you decide to do with Air Canada, in your report to the Minister of Transportation, you must address the consequences to Canada if the airline were to go bankrupt. The consequences of an Air Canada bankruptcy can be discussed qualitatively.

4. **Freight rates.** There are two schools of thought. The first is to let the free market rule and have rates set by that mechanism. The second is for the government to provide subsidies to the railroads in order for them to charge cheaper rates to western customers.

## **Funding**

The Finance Minister has granted the Ministry of Transportation \$7.5 Billion to be spent however you see fit. The Finance Minister will loan you an additional \$1.0 Billion. The \$1.0 Billion must be paid back in five years (i.e. by 31 December 2008). You can pick any set of projects you want and spend the money however you want. Remember, the only spending constraint imposed by the Finance Minister is that if the Trans-Canada Highway construction cost exceeds \$4.5 Billion, the excess would have to be recovered (within 5 years) by levying a toll.

All of the above issues must be addressed in your report to the Minister of Transportation. You must not only consider the numbers in the appendixes, but also political and economic factors. Your performance will be assessed based on how well you read, research, and present the issues.

## **Deliverables**

1. **Your report as the Deputy Minister of Transportation to the Minister of Transportation.** The expectation of this report is that it is a professional document appropriate for a senior government manager. The format, tone, quality of information, defense of your assumptions and position will all be taken into consideration in evaluating the report. The report must address all the issues (both qualitative and quantitative) presented in the case. (You may print double-sided in order to save paper). The analysis framework in Appendixes 1 – 5 should be taken as given. But you should explain to the Minister of Transportation any weaknesses you see in that framework, so he can be prepared for any questions that come from the Prime Minister's office (The Prime Minister earned an MST from MIT earlier in his career). An appendix with your calculations is required as part of the report.

2. **A single memorandum from the Minister of Transportation to the Prime Minister and to the Minister of Finance.** Put yourself in the role of your boss, the Minister of Transportation. Write a memorandum addressed to both the Prime Minister and the Minister of Finance which should contain a summary of your analysis of the situation, related issues (especially political), defense of your expenditures (which is of special importance to the Minister of Finance), and your recommendations. Limit yourself to a one or two page, single-spaced memorandum.

3. **A single letter from the Prime Minister addressed to the Premiers of Quebec and Ontario.** This letter is from the *Prime Minister's perspective*. The letter should outline your course of action, why you have chosen that course of action, and the ramifications. Of course this letter should be written with an understanding of its *eastern*-based audience and the issues that affect them. Remember, as Prime Minister, you do not necessarily have to agree with the findings of the main report. You may choose to ignore some or all of the report. It is up to you, the Prime Minister, to justify your decision.

4. **A single letter from the Prime Minister addressed to the Premiers of BC, Alberta, Saskatchewan and Manitoba.** This letter is also from the *Prime Minister's perspective*. The same instructions apply to this letter as it did to the letter to the Premiers of Quebec and Ontario. However, this letter is delivered to a *western* audience, so it is important that you, the Prime Minister, write this with respect to the issues that affect the west. In this letter, be certain to tell the western Premiers what you, the Prime Minister, have decided to do regarding the Vancouver – Whistler Highway request, the Edmonton to Calgary High Speed Rail request, and the Alberta Trans-Canada Highway compensation request.

Remember, all the letters you produce will be public. There are NO secrets.

## **How to Proceed**

This assignment has both quantitative and qualitative aspects. You will be assessed on how well you have thought through the issues, defend your assumptions, assimilate the available information, and present your case. This assignment is a gauge of your quantitative skills as well as your abilities to present your arguments *professionally*. Defend your arguments, explain your quantitative approach, and present yourself in a manner befitting to a senior bureaucrat, and the leader of a country. You should be aware that for the sake of simplifying your models, many of the numbers quoted in the newspaper articles in appendixes 5 -16 have been changed. For example, one article mentioned that Air Canada lost \$566 Million in the second quarter. For this assignment, the number will be closer to \$60 Million for the year. The numbers have been adjusted in order to streamline your quantitative work.

## Appendix 1      General Canadian Statistics

Total area: 3,851,063 sq mile

Land area: 3,559,546 sq mile

Water area: 291,516 sq mile

Coastline length: 151,470 miles

GDP: \$800 Billion (1997)

English speaking: 59.3%

French speaking: 23.2%

Other speaking: 17.5%

Vancouver seaport: 72.9 million tons of cargo per year

Halifax seaport: 14.0 million tons of cargo per year

Railway miles: 22,438 miles, 1.435-m gauge (Two transcontinental railroads: CN & CP)

Highway miles: 560,362 miles

Paved Miles: 197,807 miles

Expressways: 10,295 miles

Waterways: 1,864 miles (including Saint Lawrence Seaway)

Market Rule: 51% ownership of shares provides outright control of a company – i.e. 49% of the company is still owned by someone else, but the person who owns 51% controls all the decisions.

Total trade: US 74%, EU 9%, Japan 3% other 16%

Ontario 2003 GDP: 35% of Canadian total

Quebec 2003 GDP: 25% of Canadian total

BC 2003 GDP: 18% of Canadian total

Alberta 2003 GDP: 12% of Canadian total

Note: GDP percentages for each province are expected to remain the same each year after 2003.

### Canadian GDP Index

Note: The GDP index measures the (inflation adjusted) growth of GDP over time. For example, if the year 1990 has an index number of 100, then in 1997, the GDP has grown 10%. To determine the GDP of a specific year, you can use the following example:

Suppose GDP in 1994 is \$5 Billion. Then GDP in 1999, (X), is simply:

$$\frac{105.1}{127.0} = \frac{5 \text{ Billion}}{(X)}$$

1950	20.9	1971	59.3	1992	93.0000
1951	22.7	1972	64.4	1993	97.7000
1952	23.6	1973	71.0	1994	105.100
1953	25.2	1974	72.5	1995	109.300
1954	24.7	1975	66.8	1996	109.700
1955	27.1	1976	72.4	1997	110.000
1956	29.6	1977	74.8	1998	118.300
1957	29.5	1978	79.0	1999	127.000
1958	29.0	1979	81.5	2000	138.500
1959	31.1	1980	79.3	2001	140.700
1960	31.7	1981	82.1	2002	138.900
1961	32.9	1982	73.4	2003	138.200
1962	36.6	1983	77.0	2004	137.500
1963	39.1	1984	86.8	2005	138.875
1964	42.7	1985	91.3	2006	140.250
1965	47.0	1986	92.1	2007	141.625
1966	50.1	1987	96.4	2008	143.000
1967	51.2	1988	102.2	2009	144.375
1968	54.1	1989	104.3	2010	145.750
1969	57.6	1990	100.0	2011	147.125
1970	55.8	1991	92.3	2012	148.500

### Canadian Unemployment Figures

Year	British Columbia	Alberta	Ontario	Quebec
2004	420,000	350,000	1,080,000	720,000
2005	360,000	300,000	900,000	600,000
2006	300,000	250,000	900,000	600,000
2007	360,000	300,000	1,080,000	720,000
2008	420,000	350,000	1,080,000	720,000
2009	300,000	250,000	900,000	600,000
2010	360,000	300,000	1,080,000	720,000
2011	300,000	250,000	900,000	600,000
2012	300,000	250,000	900,000	600,000
Population	3,000,000	2,500,000	9,000,000	6,000,000

Note: These unemployment figures are the “base case”. Depending on the decisions you make, they might change.

Assume the population remains unchanged for your period of analysis.

So, for example, in 2009, the unemployment rate in British Columbia is:

$$\frac{300,000}{3,000,000} = 0.10 = 10\%$$

Note: A 1% (percentage point) reduction in unemployment is calculated as follows:

$$10\% - 1\% = 9\% = 0.9$$
$$0.9 * (3,000,000) = 270,000$$

A 1% reduction in unemployment is **not** calculated as:

$$0.99 * 300,000 = 297,000$$

## Appendix 2 VIA Rail Information

The distance between Windsor, Ontario, and Quebec City, Quebec is 600 Miles.

The distance between Edmonton, Alberta, and Calgary, Alberta is 250 Miles.

Any construction would be completed by 01 January 2004.

The trains would operate at a break-even level. This means that operations costs for the trains would neither be profitable, nor would it cost the government money.

### Construction Costs

Rugged: \$5,000,000.00 per mile (Ontario, Quebec)

Prairie: \$2,000,000.00 per mile (Alberta)

The following information applies to the years 2004 – 2012.

-An Edmonton to Calgary high speed passenger rail line would reduce demand for the Trans Canada Highway by 1% nationwide. (i.e.  $0.99 * (\text{old demand})$ )

-A Windsor to Quebec City high speed passenger rail line would reduce demand for the Trans Canada Highway by 1% nationwide.

-If both the Edmonton to Calgary high speed passenger line and the Quebec City to Windsor high speed passenger rail line were constructed, it would reduce demand for the Trans Canada Highway by 4% nationwide.

-An Edmonton to Calgary high speed passenger rail line would reduce the annual unemployment rate in the Province of Alberta by 4% (percentage points).

-A Windsor to Quebec City high speed passenger rail line would reduce the annual unemployment rate in the Province of Ontario by 4% (percentage points).

-A Windsor to Quebec City high speed passenger rail line would reduce the annual unemployment rate in the Province of Quebec by 4% (percentage points).

### Appendix 3 Building the Trans-Canada Highway



(Note: Map is for visual purposes only and is not to scale)

The above map shows the general layout of the Trans-Canada Highway. The areas marked in red are four lane expressways. The areas marked in black are two lanes. The stretches of highway that are two lanes would be expanded to four lanes should the government proceed with a national highway program. Notice that the province of Alberta has already completed all the work on its highways, and did so out of its provincial government budget – hence the demand by the Alberta Premier for appropriate compensation should the national government earmark money for a national program. Also notice that one significant portion of the highway that is a four (and sometimes six) lane corridor is the stretch from Toronto to Quebec City (circled on the map). What consideration (if any) should be given to this fact when considering the construction of a high-speed rail link?

The actual length of the highway is 4680 miles, all of which are paved. For the purpose of this assignment, 1384 miles of the highway will be considered “completed”, and needs no further upgrade. The remaining 3296 miles would have to be twinned. Advisors in the Transportation Ministry estimate the cost for different terrain as follows:

Mountains: \$2.50 Million per mile  
Rugged: \$1.70 Million per mile

Hills: \$1.25 Million per mile  
 Prairie: \$1.00 Million per mile

For this assignment, the following chart provides the mileage of highway that needs construction and the terrain for each province. Note: for calculation purposes, the terrain applies to the *entire* province.

Province	Miles Incomplete	Miles Complete	Terrain
British Columbia	752	100	Mountains
Alberta	0	600	Prairie
Saskatchewan	464	100	Prairie
Manitoba	350	70	Prairie
Ontario	880	180	Rugged
Quebec	350	250	Rugged
New Brunswick	150	50	Hills
Nova Scotia	100	50	Hills
Prince Edward Island	50	0	Hills
Newfoundland	200	0	Rugged

The economists in your ministry also have estimated the annual demand for the Trans-Canada highway services if a toll is initiated on the new road. The equation they estimated is as follows:

$$Y = 100,000X - 100,000(X^2) + 1.53 * [\text{Population (BC)} + \text{Population (Alberta)} + \text{Population (Ontario)} + \text{Population (Québec)} - \text{Unemployment (BC)} - \text{Unemployment (Alberta)} - \text{Unemployment (Ontario)} - \text{Unemployment (Quebec)}]$$

$$X \in \mathbb{R}^+$$

Where:

Y = Annual demand for the Highway (Actual number of people willing to pay the toll)

X = Toll Charged

Notes:

Remember: If you decide to pursue the Trans-Canada Highway project, construction will start on 01 January 2003. The project would be completed on 31 December 2003, and the new highway would be considered “open” and fully functional on 01 January 2004.

-The number of users on the Trans-Canada Highway has no effect on the demand for air service.

-The number of users on the Trans-Canada Highway has no effect on the demand for passenger rail service.

-A completed Trans-Canada Highway would reduce unemployment in British Columbia, Alberta, Ontario, and Quebec by 2% in the years 2004, 2005, 2006, 2007, and 2008 (compared with the base case).

-A completed Trans-Canada Highway would not affect the unemployment rates in British Columbia, Alberta, Ontario and Quebec in the years 2009, 2010, 2011, and 2012 (compared with the base case).

For example:

British Columbia Unemployment

Year	Old Highway	Percentage	New Highway	Percentage
2004	420,000	14%	360,000	12%
2005	360,000	12%	300,000	10%
2006	300,000	10%	240,000	08%
2007	360,000	12%	300,000	10%
2008	420,000	14%	360,000	12%
2009	300,000	10%	300,000	10%
2010	360,000	12%	360,000	12%
2011	300,000	10%	300,000	10%
2012	300,000	10%	300,000	10%

-Trans Canada Highway tolls can be adjusted from year to year.

-As a separate calculation that has NO EFFECT on the Trans Canada Highway calculations you have done above: Yearly tolls paid by Alberta drivers = 0.40 \* [Yearly total of all tolls collected]

## Appendix 4 Purchasing Air Canada

The brokerage house that would handle a potential national re-acquisition of Air Canada has provided the following information.

Shares outstanding: 2 Billion shares

-20 million shares can be purchased very cheaply. These shares cost \$2.18 each.

-1 billion shares can be bought for \$4.49 each.

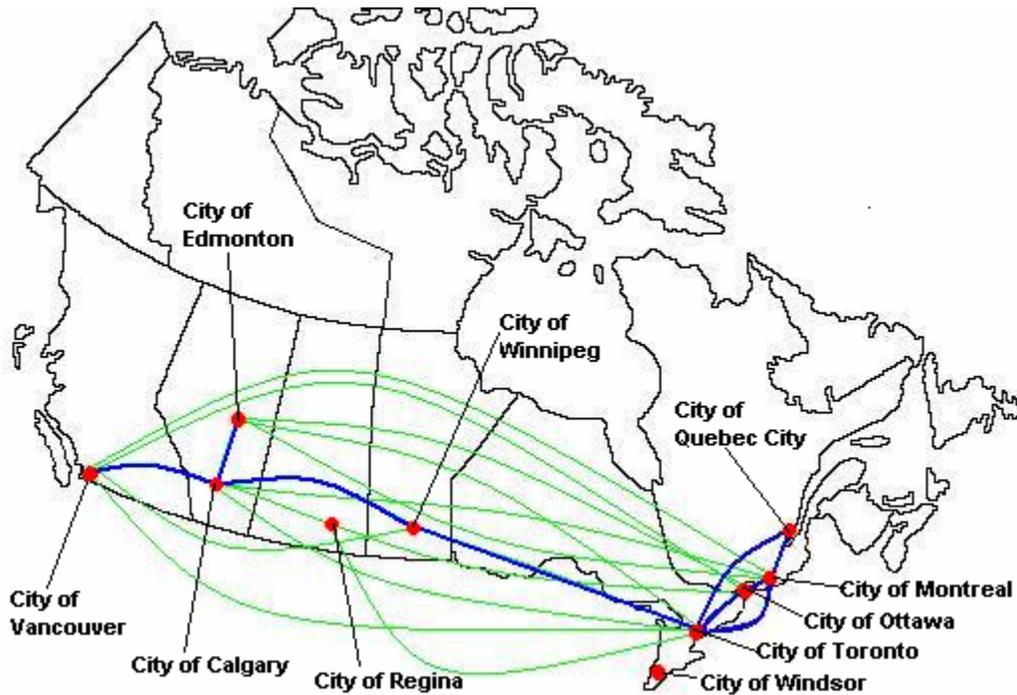
-The remainder of the shares can be purchased for \$8.00 each.

The brokerage firm also offers the government a deal.

The government can purchase 100% of the shares of the company for the low, low price of \$7 Billion. The brokerage firm reminds you that with Air Canada *potentially* losing around \$62 Million in 2004, at that rate it would take almost 8 years before the company would cost the government the maximum \$7.5 Billion in your budget. The brokerage firm highly recommends this deal since if the government were to purchase 100% of the shares on the open market, it would cost much more than \$7 Billion. Transportation ministry advisors agree that this offer is quite lucrative, but they also believe that Canada's 51% corporate ownership rule may allow the government to gain control of the airline at a lower price, if necessary.

If the government purchases Air Canada, the purchase would occur on 01 January 2004.

## Appendix 4B Air Canada Flights



Note: Map is for visual purposes only.

A quick look at the Air Canada booking pages will show all the routes served by the carrier. Air Canada, Air Canada Jazz, and Tango by Air Canada are all smaller companies owned and operated by the parent company. For simplicity sake, this assignment will only focus on the routes served by Air Canada itself, and not its subsidiaries. Furthermore, analysis of the routes will be limited. For example, Air Canada has direct flights from Toronto to the following destinations: Vancouver, Victoria, Kelowna, Calgary, Edmonton, Saskatoon, Regina, Winnipeg, Ottawa, Montreal, Quebec City, Halifax, Gander, St. Johns (Newfoundland), Deer Lake, St. John (New Brunswick), Fredericton, Moncton, and Charlottetown. You will learn advanced techniques in 1.224 Carrier Systems of how to model items such as airplane routes. For the purpose of this assignment, the number of routes will be truncated.

Squares marked in green are one-way, non-stop routes that are serviced by Air Canada. Squares marked in red have no Air Canada Service. The numbers in the squares represent the fares for a one way between two cities. For example, a one way between Vancouver and Toronto is \$246.00.

AIR CANADA	Vancouver	Edmonton	Calgary	Toronto	Ottawa	Montreal	Quebec City
Vancouver to			93	246	275	265	
Edmonton to			68	203.5	227.5	219	
Calgary to	93	68		202	225.5	217.5	
Toronto to	246	203.5	202		90	96	167
Ottawa to	275	227.5	225.5	90		89	
Montreal to	265	219	217.5	96	89		109
Quebec City to				167		109	

The following matrix provides the flight route information about Air Canada's main low-cost competitor, West Jet.

WEST JET	Vancouver	Edmonton	Calgary	Toronto	Ottawa	Montreal	Quebec City
Vancouver to		65.5	93.5	194.5		265	
Edmonton to	65.5		68.5	144.5			
Calgary to	93.5	68.5		144.5	154.5	217.5	
Toronto to	194.5	144.5	144.5				
Ottawa to			154.5				
Montreal to	265		217.5				
Quebec City to							

The number of passengers flying from each city per year is given by the following formulas.

- Number of Passengers flying from Vancouver =  $GDP[BC] * 0.000001$
- Number of Passengers flying from Edmonton =  $(0.5) * GDP[Alberta] * 0.000001$
- Number of Passengers flying from Calgary =  $(0.5) * GDP[Alberta] * 0.000001$
- Number of Passengers flying from Toronto =  $(0.8) * GDP[Ontario] * 0.000001$
- Number of Passengers flying from Ottawa =  $(0.2) * GDP[Ontario] * 0.000001$
- Number of Passengers flying from Montreal =  $(0.9) * GDP[Quebec] * 0.000001$
- Number of Passengers flying from Quebec City =  $(0.1) * GDP[Quebec] * 0.000001$

These passengers can choose between either West Jet or Air Canada.

The number of passengers flying to each city is based on the city's relative population. For example, if X number of people flies out of Vancouver, the proportion of those people flying to Toronto is:

$$[\text{Population of Toronto} / (\text{Sum of population of the six cities not including Vancouver})] * X$$

This formula assumes that either of the airlines fly a certain origin – destination. If neither airline flies a particular route, those passengers don't fly and find some other means of getting to their destination. (Math note: for number of passengers flying: ignore the decimals in the spreadsheet: i.e. set the decimal places to 0 when you format the cells for this column of data).

Passengers choose who they fly with based on:

1. Price
2. Brand loyalty
3. If the airline flies to passenger's destination

Note that this is very similar to the concept of "utility" as outlined in the Transportation Systems Textbook.

Passengers allocate "points" to each airline based on these three equally weighted factors.

#### 1. Price

- If West Jet offers a lower price, it receives 1 point and Air Canada receives 0
- If Air Canada offers a lower price, it receives 1 point and West Jet receives 0
- If both offer the same price, they each receive 1 point
- If one airline flies the route and the other does not fly the route, the airline that flies the route receives a 1, and the airline that does not fly the route receives a 0 in the price category.
- If neither airline flies the route, then each receives 0 points in the price category.

#### 2. Brand loyalty

- West Jet automatically receives 1 point in the western cities of Edmonton, Calgary, & Vancouver. Air Canada receives 0 in these cities for brand loyalty.
- Air Canada automatically receives 1 point in the eastern cities of Toronto, Ottawa, Montreal, & Quebec City. West Jet receives 0 in these cities for brand loyalty.

#### 3. If the airline flies to passenger's destination

- An airline receives 1 point if it flies to the passenger's destination and 0 if it does not. If both airlines fly to a specific destination, then each receives 1 point.

The allocation of passengers between the two airlines is determined by the number of points one airline has in comparison to the other for each origin – destination in question.

The formula is simply:

% of passengers flying West Jet = West Jet Points / (West Jet points + Air Canada points)

% of passengers flying Air Canada = Air Canada Points / (West Jet points + Air Canada points)

Note: If only one airline flies a specific route, then that airline receives 100% of the passengers, regardless of the point system. Of course, if the competing airline in the future decides to fly that route, then the points will determine the percentage of passengers that will fly each airline. If neither airline flies a specific route, then those passengers use alternative means of transportation.

E.g.:

Vancouver to Ottawa:

West Jet 1 point

Air Canada 2 points

West Jet 33% of passengers

Air Canada 67% of passengers

However: Air Canada is the only airline that flies this route! Therefore Air Canada receives 100% of the available passengers – until West Jet decides to compete on that route.

The total annual revenue that each airline receives per route is:

TR = # of passengers flying with airline for specific route \* price per ticket

The total cost that Air Canada incurs is as follows:

-\$50,000 per airplane

-200 passengers per airplane

-Assume full flights, however...

-If you have 405 passengers, then  $405/200 = 2.025$ . Therefore, you must fly 3 airplanes!

The total cost that West Jet incurs is easier. Their total cost is always 90% of their total revenue.

Additional Notes:

-West Jet has announced that for the indefinite future, it will not change any routes or prices – regardless of any actions that Air Canada may take.

-Air Canada prices will not change, but the routes flown can be changed.

-The Air Canada situation has no bearing on the Canadian unemployment rate.

-If Air Canada were to expand its routes, the prices it would charge would be:

Vancouver – Edmonton: \$65.00  
Vancouver – Québec City: \$350.00  
Edmonton – Vancouver: \$65.00  
Edmonton – Québec City: \$350.00  
Calgary – Quebec City: \$350.00  
Ottawa – Quebec City: \$250.00  
Quebec City – Vancouver: \$350.00  
Quebec City – Edmonton: \$350.00  
Quebec City – Calgary: \$350.00  
Quebec City – Ottawa: \$250.00

-For 2004, Air Canada is expected to lose more than \$61.0 Million (under its current route set-up)

-For 2004, West Jet is expected to earn a profit of more than \$4.0 Million

Remember: The agreement with the Prime Minister imposes the following restrictions:

Air Canada would fly at least one route out of the city of Edmonton.

Air Canada would fly at least one route out of the city of Calgary.

Air Canada would fly at least one route out of the city of Vancouver.

Air Canada would fly at least one route out of the city of Quebec City.

Air Canada would fly at least TWO routes out of the city of Ottawa.

Air Canada would fly at least TWO routes out of the city of Montreal.

Air Canada would fly at least FOUR routes out of the city of Toronto.

**\*Note: Excel Solver may not necessarily provide you with the optimal solution! Manual selection of your routes may be beneficial to your calculations.\***

## Appendix 5 Subsidizing the Freight Railroad

There are 150,000 farms in British Columbia, Alberta, Saskatchewan, & Manitoba. This analysis will be limited to the 80,000 farms in Alberta and British Columbia. You may choose to provide subsidies to the freight railroads in order to help western farmers. Remember, any subsidies you provide must be subtracted from the \$7.5 Billion in your budget. Therefore, one of three possibilities could occur.

1. The government does not subsidize the railroads to assist the farmers in offsetting their rail shipping charges. As a result, the unemployment rate of Alberta and of British Columbia remains unchanged (compared with the base case given in appendix 1).
2. The Government subsidizes the railroads for farms in both Alberta and British Columbia. You may subsidize for as few or as many years as you want, and you may set the subsidy at any level you want, *as long as it does not exceed* \$18,750.00 per year for each farm. You may also set different subsidy rates in each province, as long as the maximum rate does not exceed \$18,750.00 per year for each farm in a province.
3. The Government subsidizes the railroads for farms in only one province (either British Columbia or Alberta). You may subsidize for as few or as many years as you want, and you may set the subsidy at any level you want, *as long as it does not exceed* \$18,750.00 per year for each farm. There are 40,000 farms in Alberta. There are 40,000 farms in British Columbia.

The effect of a subsidy on British Columbia's economy is given by the equation:

$$\begin{array}{l} \text{Decrease in unemployment} \\ \text{(Percentage points)} \end{array} = \frac{\text{Subsidy rate per farm (British Columbia)}}{6250}$$

The effect of the subsidy on the economy of Alberta is given by the equation:

$$\begin{array}{l} \text{Decrease in unemployment} \\ \text{(Percentage points)} \end{array} = \frac{\text{Subsidy rate per farm (Alberta)}}{4690}$$