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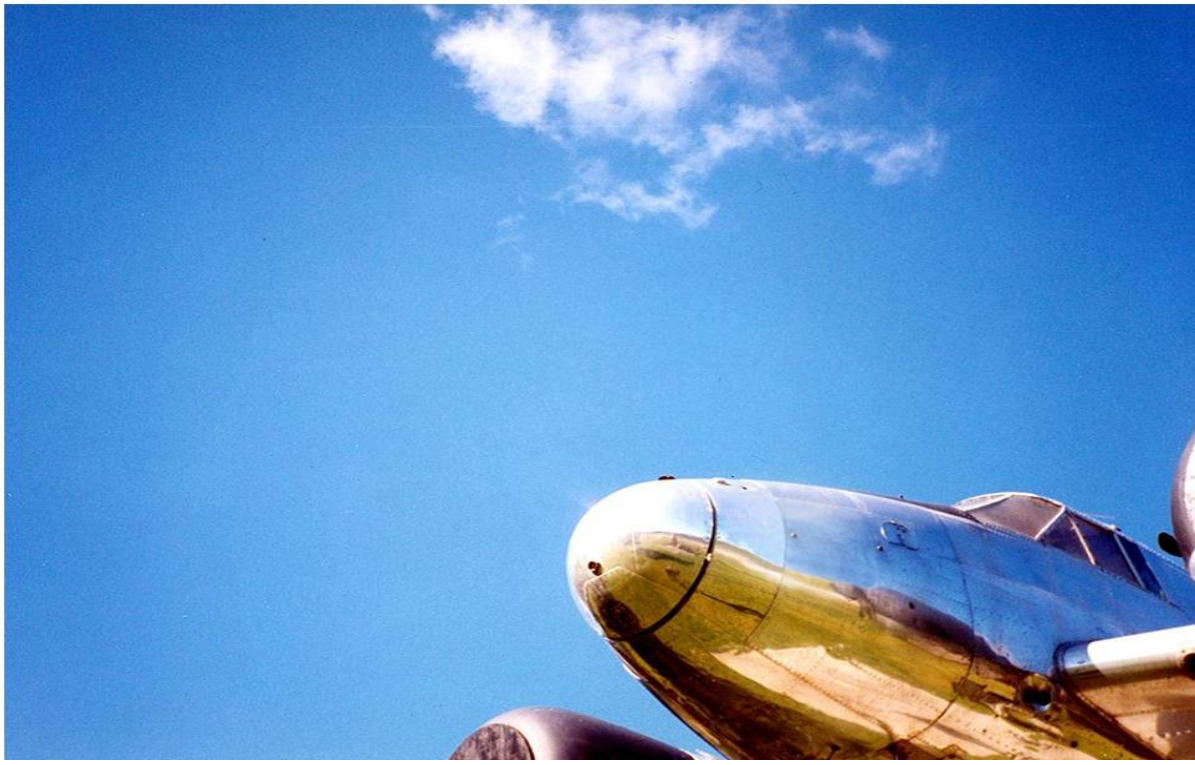


The Strategic and Economic Impact of the Canadian Aerospace Industry

October, 2010
Executive Summary

1 Introduction

Deloitte & Touche LLP ("Deloitte") was retained by the Aerospace Industries Association of Canada ("AIAC") to assist in analyzing the contribution of the Canadian aerospace industry to the Canadian economy.

This executive summary provides excerpts of the highlights of our report. A full version of the report prepared by Deloitte will be available at www.aiac.ca. Readers are cautioned to refer to the details in the full report for additional context and important limitations with respect to the data used and conclusions drawn.

This analysis consists of three related but distinct phases and corresponding reports:

- **Phase 1:** provides a synopsis of the Canadian aerospace industry based on a statistical analysis of the 2009 AIAC annual membership survey ("the AIAC Survey"). This report also includes a discussion of the membership's outlook for the sector.
- **Phase 2:** evaluates the contribution of the aerospace industry to the Canadian economy by quantifying the direct, indirect, and associated impacts of the aerospace industry on measures such as expenditure and investment, employment, and gross domestic product ("GDP"). This report uses macroeconomic and sectoral data, including the AIAC Survey results from Phase one, to parameterize Deloitte's input-output model and generate numerical results. To further highlight the different ways in which the socioeconomic impacts of the aerospace industry can be felt in the broader economy, this report also presents four case studies drawn from specific development programs in the aerospace industry.
- **Phase 3:** provides a 10 year market growth forecast and competitive analysis for the global aerospace industry. This report includes a global market analysis, an analysis of external market drivers as well as an analysis of the trends in the Canadian and international markets which could positively and negatively affect the aerospace industry in the short term (1-2 years) and the long term (10 years). Also, a global report card is presented to highlight the strengths, weaknesses, opportunities, and threats facing the Canadian aerospace industry. To highlight some of the opportunities and challenges faced by the aerospace industry, this report concludes by examining four scenarios that relate the long term aerospace forecast to policy-relevant issues facing the domestic aerospace industry.

2 Phase 1: Profile of the Canadian Aerospace Industry

2.1 Introduction

In order to determine key industry statistics on the Canadian aerospace industry, AIAC has conducted an annual survey of Canadian aerospace companies since 2001. In 2009, the AIAC Survey also included qualitative questions regarding the impact of the recent economic crisis, the outlook of the Canadian aerospace industry, and factors which are expected to drive supply and demand within the Canadian aerospace industry over the next three years. The 2009 AIAC Survey was issued in March, 2009.

Deloitte was engaged by AIAC to provide support in the statistical analysis of the 2009 AIAC Survey responses, with the aim of deriving industry wide statistics and determining key industry trends. The report contains a brief overview of the global aerospace industry and presents the results of the AIAC Survey.

2.2 Current global environment

The size of the global aerospace industry, which includes both military and civil sectors, is estimated to be approximately US$382 billion in 2009. This includes all components of the value chain ranging from aircraft and aircraft parts ("A&AP") to aircraft maintenance, repair, and overhaul ("MRO"). The global civil aerospace sector ("CAS") is estimated to comprise 46% (US$176 billion) of aerospace industry revenue, while the military aerospace sector ("MAS") constitutes approximately 54% (US$205 billion) of total revenue in 2009.[1]

The recent financial crisis and the associated declines in both passenger and air freight volumes led to capacity cuts at major airlines (primarily through the retiring of aircrafts or deferring new aircraft deliveries). In 2010, airlines have seen a positive recovery in passenger traffic with a brief slowdown caused by the air space closures following the eruption of an Icelandic volcano in April 2010. The volcanic eruption resulted in over 100,000 flight cancellations spread over six days in European markets.[2]

Despite the financial crisis, commercial order backlogs remain strong. Two of the large commercial airline manufacturers, Boeing and Airbus, have a combined order back-log of 8,500 aircraft - representing seven years of production activity for each company. In 2009, Boeing and Airbus netted 142 and 271 new orders respectively; Airbus and Boeing reported increases in cancellation rates to just below 3% in 2009.[3]

2.2.1 Overview of the global civil aerospace market

CAS manufacturing is still concentrated in the developed world with North America controlling 48.5% of revenue and Europe controlling 43.0% of revenue. However, a shift in the industry is underway towards low-cost high-GDP areas including Asia-Pacific and Latin America. In 2009, CAS manufacturing revenue came predominantly from the world's 500 major airlines at 78.5%, followed by freight, at 10%, and other end-users at 11.5%.[4] The top three civil aerospace manufacturing industry revenue producing countries in

[1] DataMonitor, "Global – Aerospace and Defense." December 2009.

[2] The Financial, "IATA Expects Airlines to Post Profit in 2010", July 2, 2010.

[3] Scotiabank Global Economic Research Industry Tends - Aerospace, April 20 2010.

[4] IBISWorld Global Civil Aerospace Products Manufacturing, February 2010.

2009 were the United States ("US"), France, and Canada. The world's ten largest civil aerospace companies, as reported by IBIS World, are:

Table 1: Top 9 global civil market leaders

Rank	Company	Country	Percentage of Total Civil Manufacturing Revenues
1	EADS	Netherlands	34.5%
2	Boeing	US	23.6%
3	United Technologies	US	8.8%
4	General Electric	US	7.4%
5	Bombardier	Canada	6.1%
6	Rolls-Royce	UK	5.5%
7	Embraer	Brazil	3.8%
8	Honeywell	US	3.4%
9	Textron	US	3.4%
10	Other	n/a	3.3%

Source: IBIS World

2.2.2 Overview of the global military aerospace market

With respect to the MAS, key customer groups are the various departments within the military establishments in each country. In the US, these are the US Department of Defense ("DoD"), the US Air Force, the US Army, the US Navy and the US Marine Corps. In Europe and the US, current procurement trends show that governments give preference to multiple-award, indefinite-delivery, indefinite quantity omnibus contracts for integrated solutions, following rigorous bigger pre-qualification. Specific to US law, 50% of the content of US weapon systems must be made domestically. Through the Defense Development Sharing Program, the US DoD and the Canadian Department of Defence Production ("CDDP") collaborate to provide for the defense of both countries. The programs allow Canadian companies to perform research and development ("R&D") for the US armed forces and allow for increased interchangeability between Canadian and US defense equipment. Canada also enjoys certain exemptions with regard to US International Traffic in Arms Regulations ("ITAR").[5]

2.3 Canadian aerospace industry: profile and recent developments

The following section is based on Deloitte's statistical analysis of the 2009 responses to the AIAC Survey, and is intended to provide an overview of the size and composition of the Canadian aerospace industry.

2.3.1 Current Canadian aerospace industry overview

AIAC is the national trade association which represents the interests of over 500 Canadian aerospace manufacturing and service companies. AIAC has 79 direct members, with most other aerospace-related companies belonging to aerospace industry provincial associations. Table 2 below shows the distribution of these companies across Canada.

[5] First Research, "Aerospace Products and Parts Manufacture." 2010.

Table 2: Membership of Canadian Aerospace Industry Associations

	Province	Members
Aerospace Industries Association of Canada	All	79
Ontario Aerospace Council	Ontario	130
Aerospace Quebec Association	Quebec	135
Aerospace & Defence Industries Association of Nova Scotia	Nova Scotia	22
Aerospace & Defence Industries Association of Newfoundland and Labrador	Newfoundland & Labrador	14
SASK Aerospace & Defence Inc.	Saskatchewan	6
Aerospace Industry Association of B.C.	British Columbia	40
Aviation Alberta	Alberta	34
Manitoba Aerospace	Manitoba	29
New Brunswick Aerospace and Defence Association	New Brunswick	30
Aerospace Prince Edward Island	Prince Edward Island	8

Source: AIAC

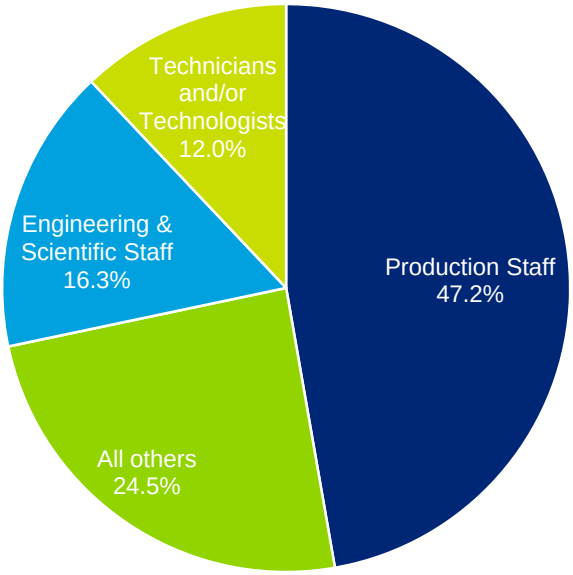
2.3.2 Size of the Canadian aerospace industry

In 2009, the Canadian aerospace industry is estimated to have generated C$22.2 billion in revenues. The Canadian aerospace industry is dominated by a small group of large companies; the 14 largest aerospace companies in Canada generated C$16.1 billion in revenues in 2009. This represents close to three-quarters of total Canadian aerospace revenues.

The aerospace industry is a significant source of employment within Canada; it employed an estimated 78,965 people in 2009, with a corresponding payroll cost of approximately C$4.6 billion. Again, the 14 largest aerospace companies in Canada generate the majority of aerospace jobs, totalling 40,738 jobs (51.6% of total aerospace employment) and C$3.0 billion in payroll (64.9% of total aerospace payroll).

The types of jobs generated by the Canadian aerospace industry can be broken up into four categories; engineering and scientific staff, production staff, technicians and/or technologists, and all others. Of these four groups, production staff is the largest category of employment (an estimated 47.2% of the Canadian aerospace workforce). The following graph illustrates the relative proportions of each category of employment.

Figure 1: Canadian aerospace employment by category [6]



2.3.3 Forecast 2010 revenues and employment

The estimated forecast for Canadian aerospace revenues in 2010 is C$24.1 billion and the estimated forecast for employment is 82,956 jobs. The majority of the increases in revenue and employment are expected to be generated by the group of 448 aerospace companies that are not direct members of AIAC, with the 14 largest aerospace companies in Canada predicting a modest decrease in both aerospace revenues and employment, year-over-year ("YoY") decreases of 0.7% for both measures. Of the respondents to the AIAC Survey ("survey respondents"), 62.5% forecast higher revenues in 2010 than 2009, while 23.4% forecast lower revenues in 2010 than 2009, and 14.1% of survey respondents did not believe their revenues would either increase or decrease in 2010.

2.3.4 Application of Canadian aerospace products and services

In contrast to the global aerospace industry (which as previously discussed is primarily dominated by the MAS), Canada's aerospace industry primarily operates within the CAS. In 2009, an estimated 83.4% of revenues generated by the Canadian aerospace industry were in the CAS, compared to only 16.6% of revenues generated within the MAS. This is not surprising as Canada's military spend relative to the rest of the world remains small. In 2009, Canada spent US$20.5 billion on military expenditures or 1.3% of GDP (0.03% of global GDP) versus 4.3% (1% of global GDP) in the US.[7]

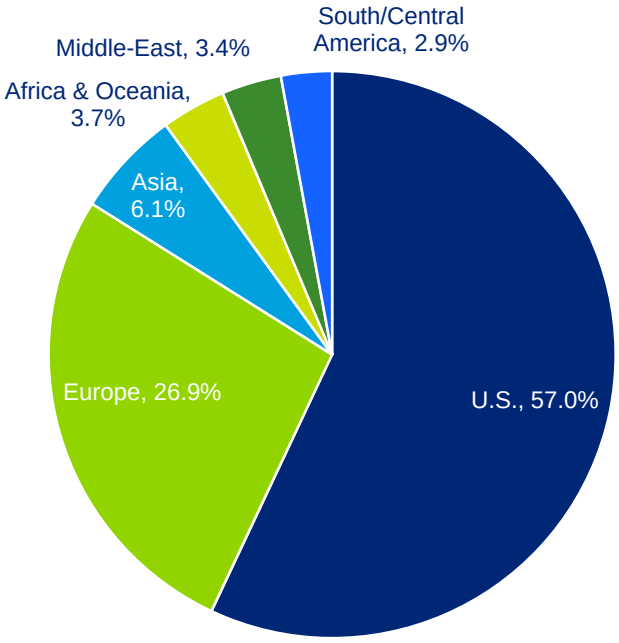
[6] Source: the AIAC Survey (2009)

[7] SIPRI. "SIPRI military expenditure database" [online database], accessed from http://www.sipri.org/research/armaments/milex/research/armaments/milex/milex_database in July & August 2010.

2.3.5 Final markets for Canadian aerospace products and services

The Canadian aerospace industry is largely export based, with an estimated C$17.3 billion in revenue (or 77.9% of total aerospace revenues) generated from sales to foreign markets in 2009. Overall the largest foreign market for Canadian aerospace products and services is the US, accounting for an estimated C$9.9 billion in revenues (or 57.0% of total industry exports). The following graph illustrates the geographic composition of Canadian exports to foreign markets.

Figure 2: Distribution of 2009 Canadian aerospace exports by final market[8]



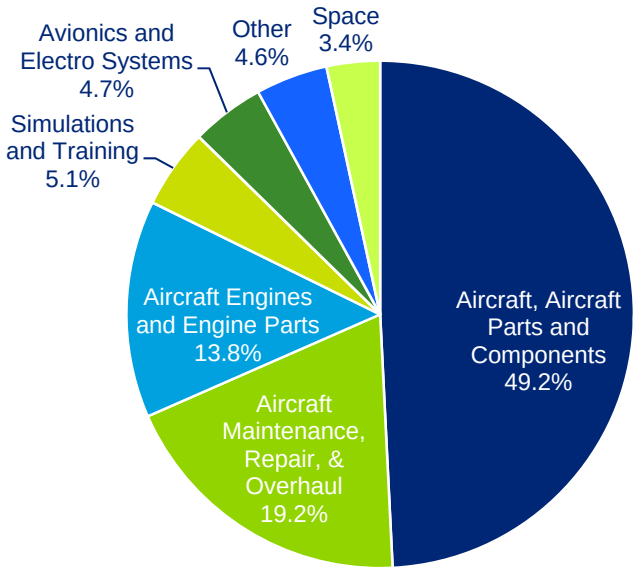
2.3.6 Size of sub-sectors of the Canadian aerospace industry

The largest sub-sector of the Canadian aerospace industry is the manufacturing of A&AP, which generated revenues of approximately C$11.0 billion in 2009, this being 49.2% of estimated 2009 total aerospace revenues. The following graph shows the relative sizes of the various sub-sectors in the Canadian aerospace industry.[9]

[8] Source: the AIAC Survey (2009)

[9] Only selected companies and sub-sectors from the space industry are included in this analysis of the Canadian aerospace industry.

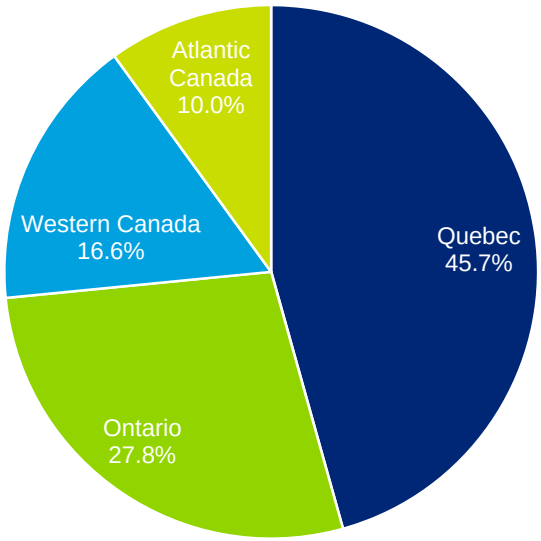
Figure 3: **Distribution of 2009 Canadian aerospace revenues by sub-sector**[10]



2.3.7 Regional breakdown of the Canadian aerospace industry

The majority of 2009 aerospace revenues are reported in Quebec (an estimated C$11.5 billion or 51.9% of revenues) and Ontario (an estimated C$6.4 billion or 28.9% of revenues). Similarly to aerospace revenues, the majority of aerospace employment is reported in Quebec (an estimated 45.7% of employment) and Ontario (an estimated 27.8% of employment). The regional distribution of employment is illustrated in the following graph.

Figure 4: Canadian aerospace 2009 employment by region[11]



[10] Source: the AIAC Survey (2009)

[11] Source: the AIAC Survey (2009)

Consistent with these findings, the majority of aerospace payroll is received by employees in Quebec (C$2.3 billion or 49.0% of payroll), followed by Ontario (C$1.4 billion or 29.2% of payroll), Western Canada (C$0.6 billion or 13.0% of payroll), and Atlantic Canada (C$0.4 billion or 8.8% of payroll).

2.3.8 Investment in the Canadian aerospace industry

Investment in the Canadian aerospace industry is geared towards R&D and investments in physical capital or property, plant, and equipment ("PPE"). In 2009 the Canadian aerospace industry invested an estimated total of C$1.9 billion in R&D and PPE, of which R&D comprised 72.7% (C$1.4 billion) and PPE comprised 27.3% (C$0.5 billion).

2.3.9 Comparison of 2009 to previous years' results

Based on the results reported by AIAC for 2008, 2009 registered a drop in industry revenue of approximately 6% (from the C$23.6 billion in 2008 to the C$22.2 billion in 2009). A similar decline was apparent in exports and employment, which dropped by approximately 10% and 5%, respectively. These trends are broadly consistent with recent macroeconomic conditions in Canada and recent developments at the level of the global aerospace industry.

2.4 Canadian industry's view of the future

The AIAC Survey also sought to gather the views of members on the industry outlook. Thus, a set of qualitative questions focused on key industry trends such as the state of global competition, the role of the Canadian government in the industry, challenges facing the Canadian industry, and the general business conditions within the Canadian industry. The results from these qualitative questions are described below.

Almost half of survey respondents expect to lose a significant proportion of their business to developing aerospace markets.

Industry experts believe that, going forward, the global aerospace industry will continue to expand in developing countries such as China and India, which are expected to grow both as suppliers within the global aerospace supply chain and as consumer markets.[12] On the public policy side, there is a clear drive by these countries to expand their position in the civil aerospace industry, primarily in response to the belief that Asia-pacific will be the largest market for air transport aircraft in the next 10 years.[13]

To assess the impact the growing eminence of developing countries like Brazil, Russia, India, and China (the "BRIC countries") or Mexico might have on the Canadian aerospace industry, AIAC asked survey respondents whether they expected to lose a significant proportion of their business to firms operating in countries such as the BRIC countries or Mexico over the next three years. In response to this, 48.5% of the survey respondents acknowledged that they expect to lose a significant proportion of their business to other countries.

This trend appears to be of greater concern for companies operating within Ontario, where 54.5% of survey respondents believe that they will lose a significant portion of their business overseas over the next three years. Conversely, this concern is not as evident in Quebec, where 36.8% share the above concern.

Given the predictions of faster growth in emerging markets, the AIAC Survey aimed to evaluate whether there remains substantial room for growth for the aerospace industry within Canada, and a significant majority of survey respondents agree that there is. The responses to this question vary significantly by size of survey respondent. Overall smaller companies believe their prospects for growth within the Canadian market are greater than that of larger companies.

[12] Global Manufacturing Industry, "Compass 2010: Global Aerospace and Defense Outlook", 2010.

[13] AeroStrategy, "Aerospace Globalization 2.0: Implications for Canada's Aerospace Industry", November 2009.

Almost 90% of respondents believe that greater government funding would result in aerospace job growth. The vast majority of companies also expect to experience a material financial burden due to substantial pressure to become more environmentally responsible.

The role of government in the aerospace industry is widely recognized as being of strategic importance. A 2009 study by aerospace consultant, AeroStrategy LLC, suggests that another developing trend globally, and one with implications for Canada, is the growing collaboration between aerospace companies and foreign governments to create high value aerospace clusters within their respective countries.[14] This means that global competition faced by the Canadian aerospace industry will continue to increase due to foreign competitors' collaboration with their own domestic governments, such as the Mexican government's investment in a National Public Aero Trade School.[15]

To assess the role played by the Canadian government in the key area of financing, the AIAC Survey asked whether Canadian aerospace companies believe that the Canadian government provides adequate financing to the aerospace industry relative to that received by foreign competitors from their governments. The majority of survey respondents do not believe that the Canadian government is doing enough in providing funding, with close to two-thirds (65.7%) indicating that governmental funding is not adequate when compared to other countries.

Crucially, the AIAC Survey shows that 89.2% of survey respondents believe that increased funding from the Canadian government would result in a greater number of jobs within the Canadian aerospace industry. This result was consistent across all geographic locations. However, a significantly higher number of large companies indicate that additional funding would generate more jobs than small companies (96.7% versus 79.3%, respectively).

Government policies on education and training programs, as well as environmental regulations are also important factors for the Canadian aerospace industry. The work force employed in the aerospace industry is highly skilled and requires specific training within the sciences and engineering professions. As such, for the industry's success, it is important to maintain an evolving skilled workforce with a strong technological knowledge base.

Supply and demand within the global aerospace industry is also impacted by environmental regulations and related efforts to fight climate change.[16] Thus, the AIAC Survey aimed to assess whether the Canadian aerospace industry is trending towards making a "green shift". Overall, 93.9% of survey respondents feel substantial pressure to become more environmentally responsible over the next three years, and almost three quarters of survey respondents (73.8%) believe that this shift will result in a material financial burden.

Over 80% of respondents believe that business conditions will improve significantly over the next three years as the economic crisis recedes.

In 2009, net of cancellations, only 413 airplanes were ordered, which is rather low by historical standards. These cancellations are in large part a result of the global economic downturn. Despite this depressed number of orders, the global aerospace industry still produced 979 aircraft in 2009, a consequence of an existing six-year backlog.[17] As is apparent from the relatively low level of net aircraft orders in 2009, the global economic downturn has created business conditions that have negatively impacted the global aerospace industry.

However, the AIAC Survey found that 80.6% of survey respondents believe that the global economic downturn was coming to an end and that, over the next three years, there will be a significant improvement of business conditions. Geographically, 100% of survey respondents which operate primarily in B.C. believe business conditions will improve substantially, compared to 77.3% in Ontario, 75% in Manitoba, and 68.4% in Quebec.

[14] AeroStrategy, "Aerospace Globalization 2.0: Implications for Canada's Aerospace Industry", November 2009.

[15] *Ibid.*

[16] Standard & Poor's Industry Surveys, "Aerospace & Defense", February 11, 2010.

[17] Deloitte Touche Tohmatsu (DTT) Global Manufacturing Industry, "Compass 2010: Global Aerospace and Defense Outlook", 2010.

2.4.1 Future drivers of demand and supply

The AIAC Survey also aimed to identify future drivers of demand and supply in the Canadian aerospace industry over the next three years.

Survey respondents indicated that important factors driving demand are the price of fuel and technological innovations. As the price of fuel increases, the costs associated with manufacturing aerospace products increases. However, technical innovation within the aerospace industry will lead to the production of more fuel efficient aircraft and equipment, causing a rise in demand for new aerospace products. Many consumers, such as airlines, wish to upgrade their fleets to more efficient technology in order to lower their operating costs in the long run. The same is true for consumers who prefer more fuel efficient aircraft and equipment due to environmental concerns, and governments who are more focused on substantial reductions in emissions.

Other key drivers of demand include the overall profitability of airlines, growth in emerging markets, in particular the rising middle class of countries like China, as well as the overall level of military activity and the defence budgets that are set by governments, in particular that of the US.

The most common driver of supply for Canadian companies, as indicated by survey respondents, is access to a cost efficient supply chain. Survey respondents highlight the importance of the continued maturation of the supply chain in low cost, developing countries. It is pointed out by survey respondents that for Canadian companies to maintain their competitive advantage against emerging economies, they need to specialize and move up at least one level of complexity in the global supply chain.

While the access to lower cost inputs from developing nations is beneficial to Canadian aerospace companies, the growth of the aerospace industry within countries such as Mexico and the BRIC countries puts Canadian aerospace companies under increased pressure.

Another key driver of supply in the Canadian aerospace industry relates to the availability of two key inputs of production: a qualified workforce and access to capital. Many survey respondents highlighted the need for a suitably trained, skilled, and experienced workforce. They also indicated that, the aging of the Canadian workforce is a critical issue impacting the level of supply within the industry, as it will decrease companies' access to a qualified workforce.

3 Phase 2: Impact of the Canadian Aerospace Industry

3.1 Introduction

Phase Two provides a summarized description and market outlook for the global and Canadian aerospace industries, economic impact projections for the industry at national and regional levels, a highlight of industry associated impacts and four case studies on select industry topics:

- **Market / description outlook:** A summary of the global aerospace industry and Canadian aerospace industry is presented, including key statistics, global / regional distribution of activity and future outlook for the industry and its sub-sectors.
- **Economic Impact:** Economic impact and the nature of impacts to be evaluated are defined, and the economic impact model, Statistics Canada input-output multipliers utilized and methodology / additional sources utilized are described. The contributions of the aerospace industry to the Canadian economy are essentially identified by quantifying the direct, indirect and induced impacts of the aerospace industry on measures such as expenditure and investment, employment and GDP. Findings are presented at a national and regional / provincial level; regions include Atlantic Canada (comprising Newfoundland and Labrador, Nova Scotia, Prince Edward Island and New Brunswick), Quebec, Ontario and Western Canada (comprising Manitoba, Saskatchewan, Alberta and British Columbia). Impacts are identified in terms of general Canadian aerospace industry impacts at a national and regional level, and in terms of specific 2009 and 2010 projections of economic impact, GDP contribution, economic value added, employment, income, and government revenue resulting from Canadian aerospace industry activity. Impacts associated with two alternative future growth scenarios are also discussed.
- **Associated Impacts:** The Canadian aerospace industry is further highlighted through discussion on the various ways in which the socioeconomic impacts of the aerospace industry can be felt in the broader economy.

Case Studies: Four case studies are presented, which demonstrate the value and impact which the Canadian aerospace industry has had, and will continue to have on the Canadian and global economies. These case studies involve the following:

1. The Canadarm - demonstrates a high level of industry innovation and technological growth, a major national contribution to the US / Canadian space programs, as well as spin-off activity leading to technological advancement in other industries;
2. The Q400 - an example of a nationwide supply chain, supporting the production of a leading regional aircraft;
3. StandardAero - a leading Canadian maintenance, repair and overhaul firm with a valuable partnership with the Department of National Defence / Canadian Forces; and
4. Composites Atlantic – illustrates the potential growth of the Canadian aerospace industry across all regions of Canada, with the support of strategic government investment.

3.2 Geographic distribution of aerospace industry in Canada

The Canadian aerospace industry spans the entire country, with companies, research centres and post-secondary institutions with programs focusing on the sector located in each province.[18] These "centres of aerospace excellence" and industry clusters include the following:

- Nova Scotia;
- Prince Edward Island;
- Quebec;
- Ontario;
- Manitoba;
- Saskatchewan;
- Alberta; and
- British Columbia.

The following table summarizes the regional distribution of revenues, employment, and payroll across Canada:

Table 3: Regional distribution of revenue, employment, and payroll

	Central Estimate (C$ million)
Revenue	
Atlantic Canada	1,251
Quebec	11,511
Ontario	6,415
Western Canada	3,019
Industry total	**22,196**
Employment	
Atlantic Canada	7,902
Quebec	36,054
Ontario	21,935
Western Canada	13,073
Industry total	**78,965**
Payroll	
Atlantic Canada	410
Quebec	2,269
Ontario	1,355
Western Canada	600
Industry total	**4,633**

Source: the AIAC Survey (2009). Regional numbers may not sum to industry totals due to rounding error

[18] www.investincanada.gc.ca/eng/industry-sectors/aerospace/aerospace-map.aspx

3.3 Economic impact

3.3.1 General industry impact

In its simplest terms, the Canadian aerospace industry generates significant benefits on the Canadian economy. The key impacts that the aerospace industry has at the national and regional level are outlined below:

National

- In general, for each additional C$100 million of output generated by the Canadian aerospace industry:
  - Output in the rest of the Canadian economy (i.e., its indirect impact) would be expected to increase by approximately C$45.6 million. Including induced impacts, output in the rest of the Canadian economy would be expected to increase by almost C$75.0 million.
  - Employment would be expected to increase by some 355 direct jobs (FTEs) in Canada. Including indirect and induced impacts, total employment would be expected to increase by 675 jobs (FTEs) across the country.
- The Canadian aerospace industry is projected to have directly accounted for some C$10.4 billion in GDP in 2009, representing approximately 6.9% of Canada's total manufacturing GDP. Including indirect and induced GDP impacts, the industry is projected to have accounted for some C$17.5 billion in GDP.

Atlantic Canada

- In general, for each additional C$100 million of output generated by the aerospace industry in Atlantic Canada:
  - Output in Atlantic Canada's regional economy (i.e., its indirect impact) would be expected to increase by approximately C$13.8 million. Including induced impacts, total output in Atlantic Canada would be expected to increase by almost C$36.8 million.
  - Employment would be expected to increase by some 630 direct jobs (FTEs) in Atlantic Canada. Including indirect and induced impacts, total employment in the Atlantic region would be expected to increase by almost 1,070 jobs (FTEs).
- The aerospace industry in Atlantic Canada is projected to have directly accounted for some C$0.55 billion in GDP in 2009 within Atlantic Canada. Including indirect and induced GDP impacts, the aerospace industry in Atlantic Canada is projected to have accounted for some C$0.94 billion in GDP.

Quebec

- In general, for each additional C$100 million of output generated by the aerospace industry in Quebec:
  - Output in the rest of the provincial economy (i.e., its indirect impact) would be expected to increase by approximately C$28.3 million. Including induced impacts, total output in the provincial economy would be expected to increase by some C$54.1 million.
  - Employment would be expected to increase by some 310 direct jobs (FTEs) within the province. Including indirect and induced impacts, total employment in the province would be expected to increase by almost 570 jobs (FTEs).
- The Quebec aerospace sector is projected to have directly accounted for more than C$4.3 billion in GDP in 2009. Including indirect and induced GDP impacts, the aerospace industry in Quebec is projected to have accounted for almost C$7.5 billion in GDP.

Ontario

- In general, for each additional C$100 million of output generated by the aerospace industry in Ontario:

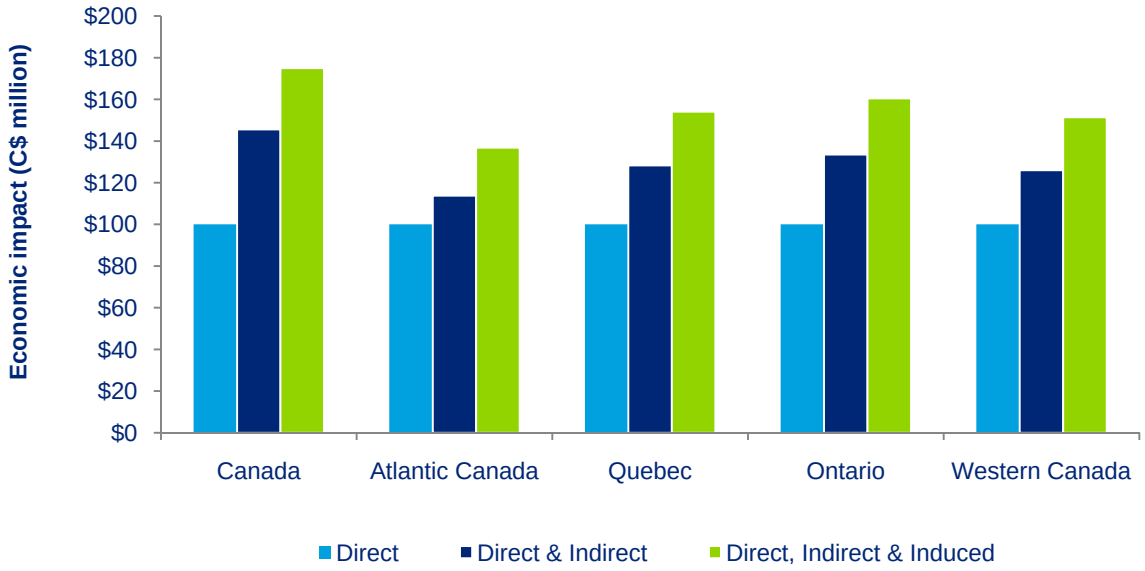
- Output in the rest of the provincial economy (i.e., its indirect impact) would be expected, in general, to increase by approximately C$33.5 million. Including induced impacts, total output in the provincial economy would be expected to increase by some C$60.5 million.
- Employment is increased by some 340 direct jobs (FTEs) within the province. Including indirect and induced impacts, total employment in the province would be expected to increase by over 970 jobs (FTEs).

- The Ontario aerospace sector is projected to have directly accounted for more than C$3.8 billion in GDP in 2009. Including indirect and induced GDP impacts, the aerospace industry in Ontario is projected to have accounted for almost C$6.2 billion in GDP.

Western Canada

- In general, for each additional C$100 million of output generated by the aerospace industry in Western Canada:
  - Output in Western Canada's regional economy (i.e., its indirect impact) would be expected to increase by approximately C$26.0 million. Including induced impacts, total output in Western Canada would be expected to increase by almost C$51.4 million.
  - Employment would be expected to increase by 430 direct jobs (FTEs) in Western Canada. Including indirect and induced impacts, total employment in the Western Canadian region would be expected to increase by over 820 jobs (FTEs).
- The aerospace industry in Western Canada is projected to have directly accounted for some C$1.4 billion in GDP in 2009 within Western Canada. Including indirect and induced GDP impacts, the aerospace industry in Western Canada is projected to have accounted for some C$2.3 billion in GDP.

Figure 5: Impact of an additional C$100 million on total economic output[19]



[19] Source: Deloitte

3.4 Impact assessment

3.4.1 Canada

The Canadian aerospace is projected to have had the following impacts on the national economy:

- In 2009, $22.2 billion in total economic output was generated. Including indirect and induced impacts, economic impact totalled C$38.8 billion. In 2010, total economic output is projected to be C$42.2 billion.
- In 2009, C$10.4 billion in total GDP was generated. Including indirect and induced impacts, GDP totalled C$17.5 billion. In 2010, total GDP contribution is projected to be C$19.0 billion.
- In 2009, C$11.8 billion in economic value add was generated. Including indirect and induced impacts, C$21.3 billion was generated. In 2010, total economic value added is projected to be C$23.1 billion.
- In 2009, 78,000 FTE's were supported. Including indirect and induced impacts, 150,200 FTE's were supported. In 2010, a total of 163,000 FTE's are expected to be supported.
- In 2009, C$1.5 billion in revenue was generated to federal and provincial governments. This level of support is divided between revenue to the federal government (C$978.6 million) and Canada's various provincial governments (C$493.2 million). In 2010, total government tax revenue is projected to increase to C$1.6 billion.

3.4.2 Regional impact outlook

At the regional (in the case of Western Canada and Atlantic Canada) and provincial level (in the case of Ontario and Quebec), the aerospace industry is estimated to have had the following impacts:

Table 4: 2010 projected regional impacts (C$ billion)[20]

	Atlantic Canada	Quebec	Ontario	Western Canada
Total economic output	$2.38	$19.27	$11.18	$4.93
Total GDP contribution	$1.02	$8.18	$6.70	$2.53
Total economic value added	$1.36	$11.09	$4.48	$2.40
Total government revenue	$0.10	$0.67	$0.32	$0.13
Total employment (FTE's)	14,500	71,200	67,700	26,900

3.5 Associated impacts

3.5.1 Talent development and deployment

Canada's universities and colleges have internationally recognized programs to train and provide the environment to conduct research in aerospace engineering, aerospace manufacturing engineering, aviation and aircraft maintenance engineering. According to several Canadian universities, there is a demand for such talent and skill sets, and as such, the future development of such programs is expected to continue. Many of these institutions are located near several major clusters of aerospace firms / organizations in Canada, supporting research collaboration activities.

[20] Include direct, indirect and induced impacts.

3.5.2 Fostering critical innovation and technology

Investing in aerospace and defence promotes significant technology development within the Canadian economy. Not only does this investment promote the development of aerospace and defence technology, but it also helps promote development in other sectors of the Canadian economy. In this regard, the aerospace and defence industry is at the forefront of developing and utilizing new technologies. Aerospace technology spin-offs that have found important commercial application include:

- the first single-chip pacemaker;
- aluminum pistons for automotive applications; and
- non-destructive evaluation technologies.

The aerospace sector has invested an average of C$873 million annually in R&D between 1994 and 2003, representing an average of approximately 8% of industry sales and accounting for an average of 14% of all manufacturing R&D. Total cumulative R&D investment over the 10-year period totalled C$8.7 billion. In 2004, three of Canada's top 20 industrial R&D performers were aerospace and defence firms.

Furthering investment towards research and innovation development in aerospace will not only draw on the talent and skills that Canada has, but it will also showcase and build upon the potential of Canada as an industry leader.

3.5.3 Economic cluster development

Centres or clusters of aerospace excellence can be found in all corners of the country. Research by Michael Porter of the Harvard-based Institute for Strategy and Competitiveness has helped to define economic clusters in the modern era and provide insight into their advantages and their important role within an economy. Clusters “represent an important forum in which new types of dialogue can and must take place among companies, government agencies, and institutions such as universities”.[21]

Several Canadian clusters are among the top ranked in North America. Compared to many other locations, Canada’s three largest cities, Toronto, Montreal and Vancouver, also provide access to large pools of potential employees experienced in the manufacturing of aerospace components. Canadian cities, such as Winnipeg and Calgary, compare favourably with cities of similar size in North America, in areas such as the presence of related industries or clusters.

3.5.4 Fostering environmental sustainability

In keeping with the industry’s push towards addressing climate change, building environmentally sustainable or green technologies are a major focus of many firms, researchers, institutions and government agencies operating in aerospace fields.

3.5.5 Strengthening Canada's security

The products and services produced by the aerospace industry are used in support of the federal government's defence and national security requirements. The sector also allows Canada to contribute to international cooperation, peace and security through partnerships with its allies to develop and procure defence technology.

3.6 Case Studies

As part of demonstrating the value and impact which the Canadian aerospace industry has had and will continue to have on the Canadian and global economies, as well as on society in general, Deloitte undertook four “case study” examinations of aspects / features of the industry. These case studies, selected to represent a broad geographic and / or technological cross-section of the industry, involve the following:

[21] Porter, Michael E. (2000). Location, Competition, and Economic Development: Local Clusters in a Global Economy.

3.6.1 The Canadarm

Canada's commitment to participate as an international partner on both the shuttle and space station programs has provided long-term access to space missions and related technology development for Canadian astronauts and researchers. The Canadarm is now recognized as one of Canada's greatest technological achievements, and a great source of national pride.

The Canadarm has resulted in a number of significant benefits, including economic impacts, such as major investment, employment and exports, as well a number of associated qualitative impacts such as contributions to space missions, spin-off technology development, continued Canadarm technology advancement and growing / utilizing university research and development resources.

3.6.2 The Q400

Bombardier's Q400 is considered a globally successful, Canadian-produced, technologically-advanced regional aircraft. With 86 different Canadian suppliers, up to 10,500 Canadians employed through its production and support, and with two major Canadian airlines as customers, in addition to a large global consumer base, the Q400 constitutes a national achievement within the aerospace industry.

Additionally, the Q400 has the potential for further technological advancement, through the development of Bombardier's Q400 NextGen airliner, which utilizes enhanced technologies and reduces operating costs further. The Q400 will also be utilized in a significant biofuel test program in 2012, funded through various Canadian government agencies. Such a test will potentially emphasize Canada as a leader in developing green technology in the aviation industry, and is critical to achieving the environmental efficiency targets that the aviation industry is working towards on a global scale.

3.6.3 StandardAero

StandardAero is one of the largest independent maintenance, repair and overhaul, and aviation service businesses in the world, and one of Manitoba's largest aerospace firms. StandardAero has experienced continued, significant success, and has consistently been recognized as one of the top growing companies in Western Canada in recent years. With the help of its longstanding relationship with the Department of National Defence / Canadian Forces, StandardAero has been able to grow significantly and build its international profile, as well as facilitate technological advancements in aerospace that may potentially provide significant financial returns to Canada.

3.6.4 Composites Atlantic

Composites Atlantic Ltd. ("CAL") is a leading aerospace company in Atlantic Canada, and is recognized as a fast growing leader in the design, testing, certification and manufacturing of advanced composites for the aerospace, space, defence, and commercial industries.

Through the support of various strategic investments from the Government of Canada, CAL continues to advance its technologies and extend its market breadth in the aerospace and defence industries. Programs such as the Atlantic Innovation Fund provide CAL the opportunity to further its advanced composites innovation and technology development. Through the Department of National Defence / Canadian Force's significant, multi-national Joint Strike Fighter program participation, CAL will potentially contribute its skills and technologies to a major national defence initiative, while expanding its own knowledge, innovation and future business growth potential.

4 Phase 3: Global Aerospace Market Outlook and Forecast

4.1 Introduction

Phase 3 provides a 10-year global market forecast from 2010 to 2020 and a forecast for the Canadian aerospace industry. In particular, the Phase 3 report includes four primary components:

- **Market outlook:** The market outlook analyzes external market drivers and trends in the Canadian and international markets which could positively and negatively affect the aerospace industry in the short- and long-term. Significantly more importance is placed on the civil aerospace sector because of its importance to the Canadian aerospace industry. The military sector is highly tied to government spending and national security concerns create significant barriers to entering global markets, limiting the opportunities offered to Canadian companies. The report focuses on examining the global industry trends and assumes that Canada is going to face the same market conditions as the rest of the world. The reason for this global focus is twofold: first, the Canadian industry is geared heavily towards exports and is therefore dependent on global market conditions; and second, the Canadian industry was analyzed in-depth as part of the Phase 1 and Phase 2 reports.
- **Comparative analysis:** The importance of the aerospace sector to the Canadian economy is introduced. A report card is developed to evaluate the Canadian economy relative to global competitors based on a set of quantitative and qualitative metrics. The aerospace industries of other countries are briefly profiled with a focus on government participation in R&D and innovation.
- **Market forecast:** Global aerospace market revenues, segmented by sector, sub-sector, and region, are forecasted from 2010 to 2020. The implications of this forecast on the Canadian economy are highlighted and the forecast is used to analyze which sub-sectors and regions are of strategic importance to the Canadian aerospace industry. A net-present-value ("NPV") model is also applied to estimate the total size of aerospace revenues generated over the ten year forecast.
- **Policy Scenarios:** The scenarios analyze the impact of the future growth of the aerospace industry, based on the aforementioned trends, on Canada's current employment market, current R&D investment, and future growth opportunities within emerging markets.

4.2 Civil aerospace sector

4.2.1 Key trends

Deloitte identified a number of key trends that are expected to have a significant impact on the global CAS:

1. Positive long term growth is expected as economies emerge from the recent financial crisis

Passenger air travel is highly correlated with GDP. The correlation between world GDP and passenger air travel means that a 1% rise in a country's GDP translates into an increase in air travel demand of 1% in developed countries and 2.5% in developing countries.[22] The International Monetary Fund ("IMF") expects global GDP to increase by 4.6% in 2010 and 4.3% in 2011.[23]

[22] Airbus, "2009-2028 Global Forecast", 2009.

[23] IMF, "World Economic Outlook Update: Restoring Confidence without Harming Recovery", July 2010.

2. Airline profitability

The success of the CAS is linked to the success of the airline industry. The IATA reports that international air passenger and cargo traffic is now approaching pre-recession levels, and that 2010 will be a year of positive growth for air traffic during the recovery.[24] In the long-term, airline profitability will be driven by growth in developing markets. Airline profitability may also be positively impacted by increasingly liberalized air transport markets in Asia-Pacific and Africa. However, a long-term risk remains for airline profitability due to increased fuel and non-fuel costs.

3. Increased use of more green technologies

Manufacturing activity in the CAS will be driven by an aging global aircraft fleet, particularly in North America and Europe. A key technological trend related to the next generation aircraft fleet is the shift towards technologies that are more fuel efficient, technologies which produce fewer emissions, aircraft which operate more quietly, and technologies that are generally more sustainable from a lifecycle perspective. Increased R&D investment is expected to continue among major manufacturers.

According to Bombardier, it is expected that by 2020 aircraft nitrous oxide emissions and noise levels will be reduced by 80% and 50% respectively.[25] Further, projections by third parties confirm that the long term trend in aircraft design is towards a greener aircraft. [26] The rate of increase in fuel efficiency has been steadily declining as current technologies mature. One way companies are coping with increasing R&D costs is to outsource R&D functions to developing countries, such as India.[27]

4. MRO activity increases as companies shift to new geographies

Over 50% of airlines say that they have under-invested in MRO activity and expect significant investment increases in the future.[28] Oliver Wyman anticipates aerospace MRO spending increases of approximately 6% annually through 2013, increased outsourcing of labour intensive MRO activity towards low-cost labour regions, and a focus by airlines on driving cost savings through leaner and upgraded technology programs.[29]

5. Long term pilot and workforce shortages

One of the largest issues that the commercial aerospace industry faces is pilot and workforce shortages. The following are among the factors that have contributed to the labour shortage:

- The growing demand for pilots due to increased passenger activity in emerging markets;
- The “stop-loss” programs instituted by the US military to prevent pilot departure; and
- The financial crisis led to a temporary short-lived softening of labour demand.

The pilot population is aging; the average age of a pilot for commercial US planes in 2009 was approximately 44 years old, and the average age of a pilot in airline transport was approximately 49 years old.[30] It is estimated that the demand for pilots will reach approximately 125,411 by 2028, while the supply is forecast to be only 80,983, a shortfall of approximately 44,428.[31]

[24] IATA, “Economics Briefing”, April 2010.

[25] Bombardier, “Commerical Aircraft Market Forecast 2009-2028”, 2009.

[26] KTH Engineering Sciences, "Cost/Weight Optimization of Aircraft Structures", 2008

[27] Deloitte subject matter expertise, internal communication, 2010.

[28] Oliver Wyman, MRO survey, 2009.

[29] *Ibid.*

[30] IATA, “Average Age by Active Pilots by Category”, 2009.

[31] Journal of Aviation Management and Education. “International supply and demand for US trained commercial airline pilots”, 2009.

6. Continued growth in the civilian Space sub-sector

Globally, the space sub-sector was relatively unscathed by the financial crisis and is expected be a strong source of growth going forward. Third-party forecasts estimate 1,800 new satellite launches by the CAS through 2028.[32]

Other global CAS trends identified and outlined in the Phase 3 report include:

- New aircraft models entering production;
- Emerging markets becoming manufacturing competitors and sources of passenger growth; and
- Regulatory shifts as economies emerge from the financial crisis;

4.3 Military aerospace sector

4.3.1 Key trends

Deloitte identified a number of key trends that are expected to have a significant impact on the global MAS:

1. Governments are focused on deficit reduction

The global financial crisis has forced governments to focus on deficit reduction. Governments in the US and Europe are major customer for the Canadian MAS and therefore, an understanding of US and European deficit spending is crucial to understanding the future of the Canadian MAS. Defence budgets in the US and Europe are forecast to continue experiencing downward pressures as spending shifts to other domestic priorities. On the other hand, defense spending reductions in the US have been historically difficult to enact due to national security concerns.

2. Aging military aircraft and platforms

After years of delaying the procurement of new aircrafts, the MAS sector is facing aging fleets, resulting in aircrafts that are becoming increasingly expensive to maintain and operate. In 2008, the US Air Force fleet was, on average, 24 years old. [33] It is expected that aircraft procurement may increase even though overall defense spending is expected to remain flat or decrease.

3. Growth of emerging market military spending

Emerging markets, especially India and China, are expected to be significant sources of military revenues for the industry while partially offsetting potential declines in developed markets. European and US aerospace companies are beginning to recognize India as a country of growing strategic importance because it represents an untapped market and high potential for engineering and manufacturing partner.

Additional MAS trends identified and outlined in the Phase 3 report include:

- Rebalancing of US military forces;
- Increasing merger and acquisition activity; and
- Winding down of combat operations in Iraq and Afghanistan.

[32] Teal Group, “Teal Mission Model Counts 2,033 Space Payloads through 2028”.

[33] Defence Industry Daily, “Aging Array of American Aircraft Attracting Attention” [online article], accessed from http://www.defenceindustrydaily.com/aging-array-of-american-aircraft-attracting-attention-0901/ on July 22 2010.

4.4 Importance to the Canadian economy

Canada ranks second among the top five aerospace countries based on aerospace revenues, and industry employment.[34] Therefore, Canada relies more heavily on the aerospace industry for revenue and employment than most other major aerospace countries.

Table 5: Top 5 countries by aerospace manufacturing revenue

Country	Rank based on revenue normalized by GDP[35,36]
Canada	**2**
France	1
United States	3
UK	4
Germany	5

Table 6: Top 5 countries by aerospace employment

Country	Rank based on employment normalized by population[37,38]
Canada	**2**
France	1
United States	3
UK	4
Germany	5

R&D spending by the aerospace sector also plays a critical role in the Canadian economy. Three aerospace companies - Pratt & Whitney Canada, Bombardier, and CAE - sit on Research Infosource's list of nineteen Canadian companies who spent over C$100 million on R&D in 2009. Further, aerospace companies accounted for a tenth of the total R&D spending among the Canadian companies surveyed by Research Infosource.[39]

[34] Ranking takes size of economy (through GDP) and population into account when ranking

[35] Revenue data from: Aerostrategy, "Aerospace Globalization 2.0: Implications for Canada's Aerospace Industry", November 2009.

[36] GDP data from: International Monetary Fund, "World Economic Outlook" [online database], accessed from http://www.imf.org/external/data.htm#data in August 2010.

[37] Industry employment data collected from OneSource based on industry NAICS codes.

[38] Population data from: International Monetary Fund, "World Economic Outlook" [online database], accessed from http://www.imf.org/external/data.htm#data in August 2010.

[39] Research Infosource, "Canada's Top 100 Corporate R&D Spenders List 2009 Analysis", 2009.

4.5 Canada's competitive standing

4.5.1 International competitors

Traditional aerospace markets continue to develop their aerospace industries through significant R&D investment, public private partnerships, and favourable business environments and public policies. Emerging markets are aggressively developing their domestic aerospace industries. China has made serious investments towards creating a competitive domestic aircraft manufacturer with the first commercial aircraft scheduled for delivery in 2011. Opinions remain mixed on the competitiveness of the emerging market manufacturers, however Embraer illustrates that the possibility of success exists.

The European Union in particular has heavily promoted knowledge transfer networks and collaborative R&D projects. Countries in Europe have also made green technology a priority and have begun to set concrete goals for the industry backed by specific funding. As far back as 2001, the European Commission stated that approximately C$140 billion in funding is required from the public and private sector if Europe is to reach its 2020 goals for the aerospace industry.[40] As an example of the movement towards this goal, Germany's LuFo program provides funding of approximately US$380 million specifically for green technology development between 2009 and 2013. [41]

Smaller countries can significantly grow their aerospace industries through smart policies. Singapore is an example of a country that, with a 2008 GDP equal to approximately 12% of Canada's, has become a global hub for high-tech MRO activity because of its favourable business environment, flexible workforce, and strategy of collaborative public / private planning which is industry led and focused on industry's self-identified needs.

[40] European Commission, "Vision 2020", 2010.

[41] European Commission, "EU Competitiveness Report", December 2009.

4.5.2 Global aerospace report card

The global aerospace report card developed as part of Phase 3 is given below:

Table 7: Deloitte's aerospace industry report card

	Sales	Sales growth	R&D intensity	Public R&D investment	Exports	Employment	Companies	Government programs
Developed markets								
Canada	A	C	C	C	D ↑	B	B	D
France	A	A	A	C	A ↑	A	B	A
Germany	B	B	A	B	D ↑	D	C	A
Japan	D	-	-	-	D ↓	D	-	C
UK	B	D	C	B	D ↑	D	A	B
US	A	B	C	B	B ↑	B	-	B
Emerging markets								
Brazil	C	-	-	-	C ↑	-	-	D
China	D	-	-	-	D ↓	-	-	C
India	D	-	-	-		-	-	D
Russia	D	-	-	-	D ↑	-	-	B

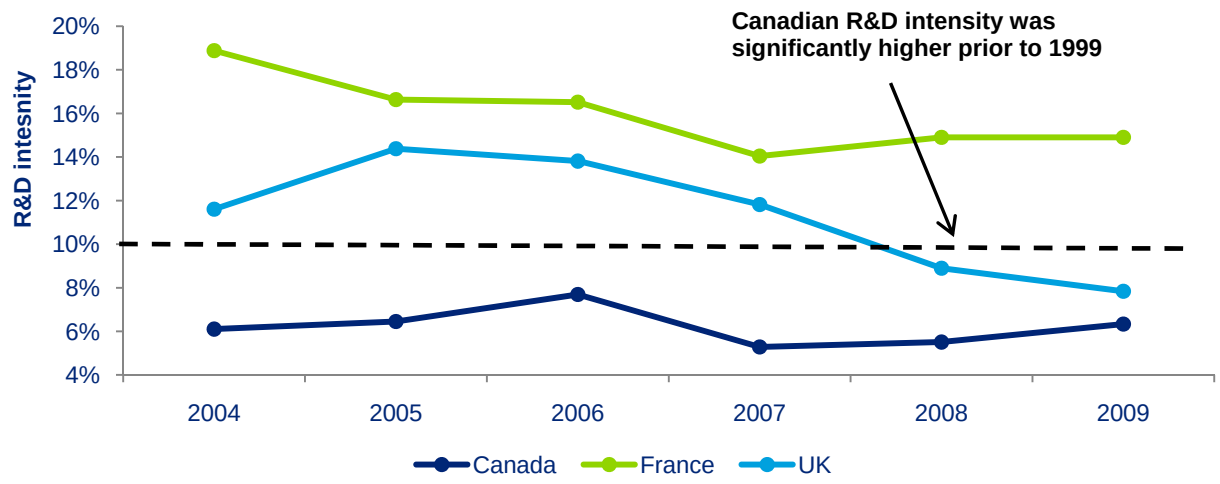
↓ Indicates the country is a net importer ↑ Indicates the country is a net exporter

Source: Deloitte analysis. The rankings range from "A" (strongest) to "D" (weakest). Rankings are derived using a set of qualitative and quantitative measures outlined in the Phase 3 report.

The Deloitte report card shows Canada performing in line with the US but slightly behind France and Germany. Canada ranks among the top countries in many of the measures examined, including sales, employment, and number of aerospace companies. Canada's weakest performance was in R&D spending and sales growth. Canada earned a D with respect to government programs because of the decline in R&D investment intensity over the last ten years. For Canada, increasing investment in R&D and innovation will be critical given the forecasted competition in the regional aircraft market, one of Canada's core competencies. However, in the past 10 to 15 years R&D intensity in Canada has actually declined to approximately 6% from over 10% prior to1999.[42]

[42] AIAC, "Major Future Platforms", June 2009.

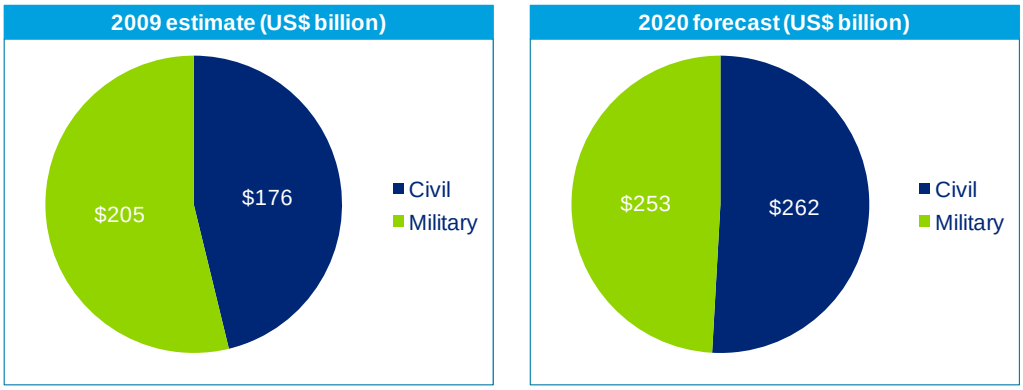
Figure 6: Canada's historical R&D intensity[43]



4.6 2010-2020 global aerospace market forecast

It is estimated that the global CAS will generate 51% of global aerospace revenues by 2020, overtaking the global MAS, at 49%, as the dominate source of revenue. The shift is forecast to be most pronounced in Latin America, Europe, and Asia-Pacific where global CAS market share gains are estimated to be 12%, 9%, and 9% respectively.

Figure 7: Global aerospace market estimate for 2009 and 2020



In 2020, global revenue is forecast to be approximately US$262 billion for the global CAS and approximately US$253 billion for the global MAS. A summary of market forecasts by sub-sector is outlined below:

[43] Source: The following industry associations: AIAC (Canada), BDLI (France), and SBAC (UK).

Figure 8: Global CAS sub-sector estimate for 2009 and 2020[44]

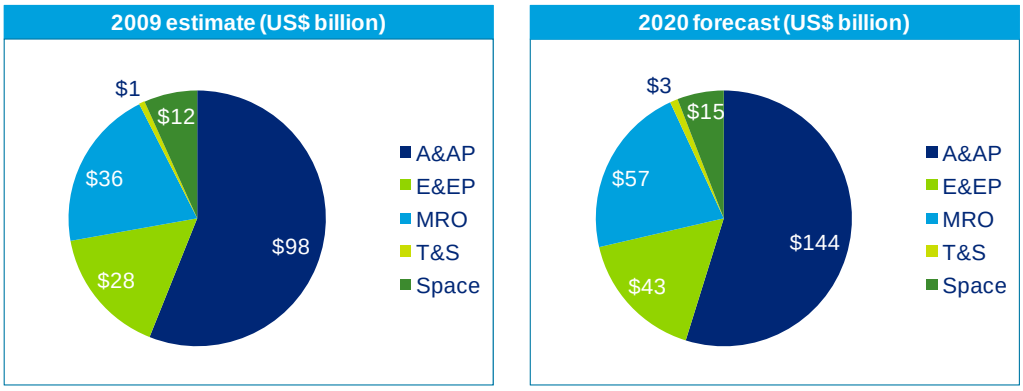
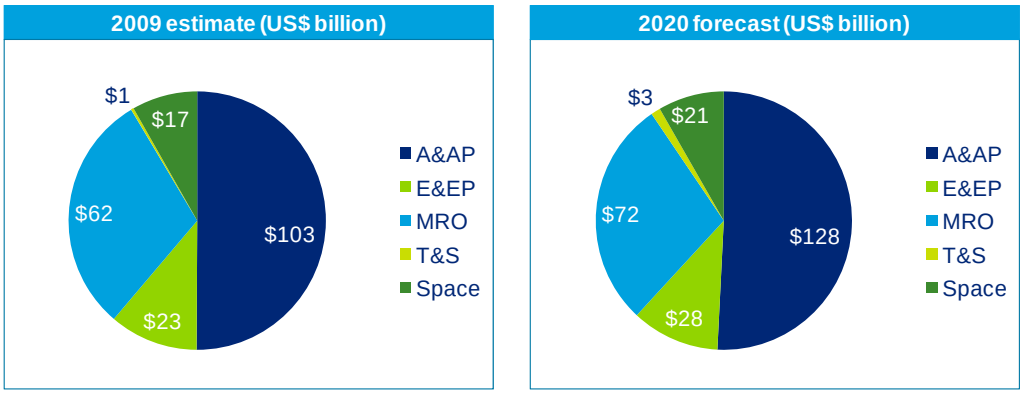


Figure 9: Global MAS sub-sector estimate for 2009 and 2020



The forecast highlighted that global MAS revenue is highly dependent on the assumed trend in military spending in Europe and North America. If North America and Europe follow pre-9/11 military spending patterns, which would lead to a decline in spending, global MAS revenue is expected to fall by approximately US$57 billion, thereby increasing the relative importance of the global CAS as a source of global revenue. Reductions in MAS revenues observed in North America and Europe equaled approximately 73% and 23% respectively under a reduced military spending scenario.

[44] T&S = Training and simulation sub-sector, E&EP = Engine & engine part manufacturing sub-sector.

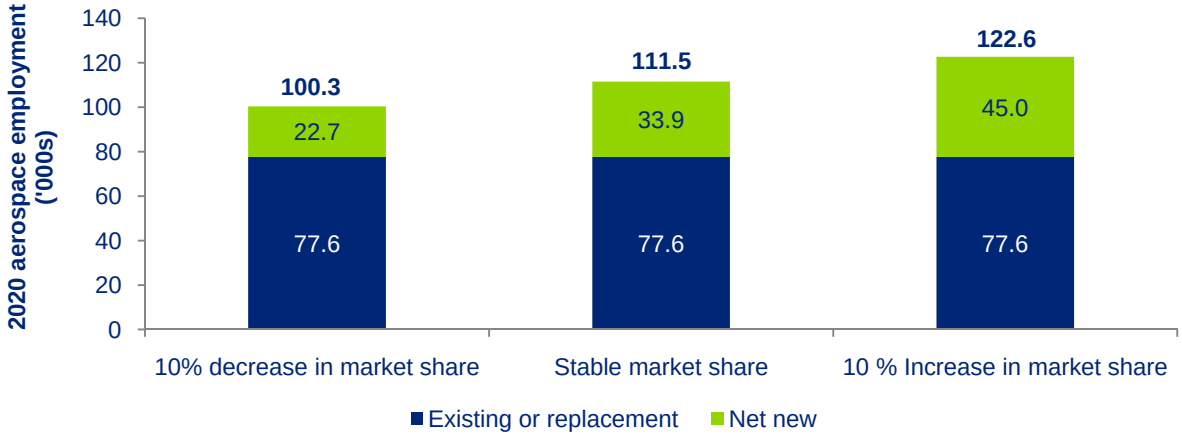
4.7 Policy scenarios

4.7.1 Canada has the potential to double aerospace employment by 2020

A US study showed that the majority of aerospace jobs require a bachelor's degree or higher and that aerospace employees earn nearly 50% more, on average, than the median manufacturing wage.[45] Therefore, aerospace jobs are highly lucrative and presumably offer greater ancillary benefits to other parts of the economy (due to higher levels of disposable income, etc.).

Increasing retirement rates in the aerospace workforce are an underlying risk factor for the entire global industry. Success will be driven in large part by the degree by which the industry increases training and retains retiring workers, in addition to aligning with universities and colleges to fill the pipeline with the required skills and talent.

Figure 10: Estimated employment in the Canadian aerospace industry under three growth scenarios[46]



Significant growth in Canada's global market share would be required to double industry employment, to approximately 158 thousand, by 2020. At current employment intensity (i.e., productivity), Canada's share of the global aerospace market would need to grow by approximately 55% with global CAS market share growing from 10% to 14% and global MAS market share growing from 2% to 3%.[47]

To gain market share the industry may need to become more productive and less labour intensive. Growth in global CAS market share from 10% to 20% and growth in global MAS market share from 2% to 4% would be required if the industry were to increase labour productivity to match that of Germany.

Associated with an increase in market share and employment in 2020 is a required increase in R&D spending of approximately US$1-2 billion. Deloitte estimates that approximately US$4-7 billion of additional R&D investment would be required if Canada were to match the current R&D intensity of France or Germany.

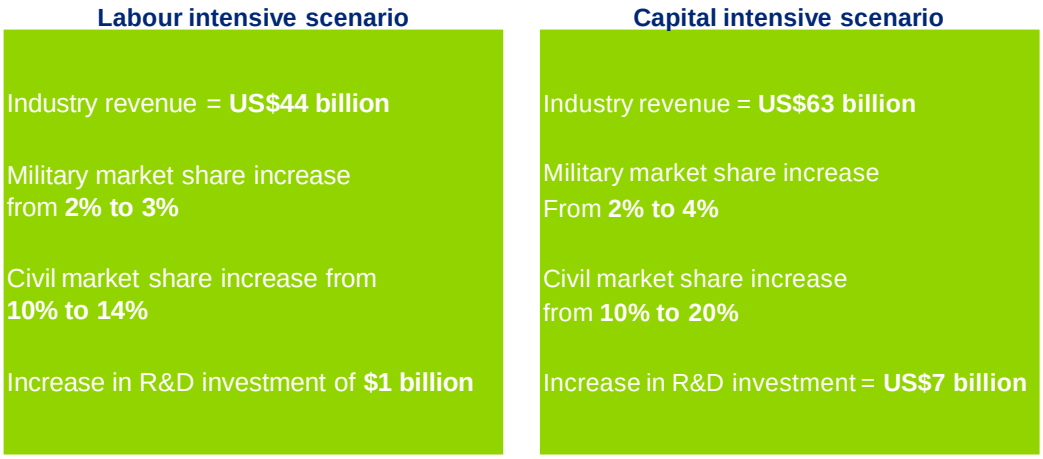
The figure below summarizes the results under a "labour intensive" scenario where labour productivity and R&D intensity in 2020 is at Canada's current levels and a "capital intensive scenario" where labour productivity and R&D intensity in 2020 is at higher levels seen in many European aerospace markets:

[45] Bureau of Labor Statistics, "Career Guide to Industries: Aerospace Product and Parts Manufacturing", 2009-2009 edition.

[46] Assumes the amount of revenue generated per employee remains constant.

[47] This assumes that the current mix of MAS and CAS activity remains constant (i.e., 80-85% of revenues coming from the CAS).

Figure 11: Requirements for doubling the Canadian aerospace labour force by 2020 depend heavily upon the required labour productivity and R&D intensity



A spectrum exists between the two scenarios. The strategic decisions by government and the aerospace sector on where Canada sits on the spectrum will dictate the amount of jobs created, and the type and magnitude of investment required.

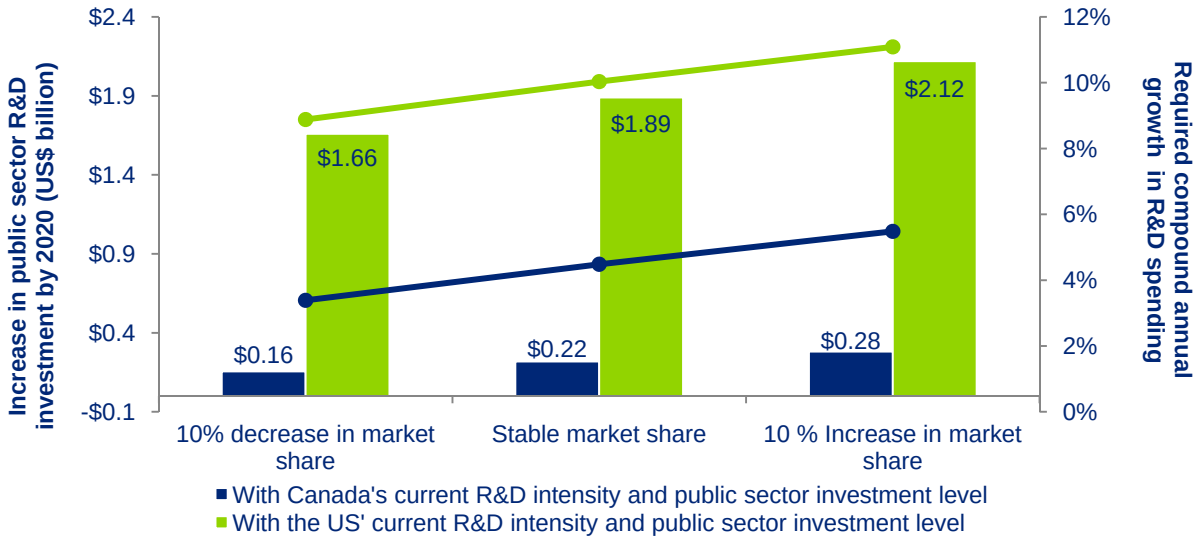
4.7.2 R&D investment remains critical towards driving innovation and ensuring Canada's overall global competitiveness

Current Canadian public and private sector R&D spending is lower than that of France and Germany and total Canadian R&D spending is lower than that of the US. Based on the competitive market analysis, Canada's R&D intensity may need to increase to the levels seen in other countries.

This scenario predicts that significant R&D investments are required from both the public and private sector if Canada wishes to use R&D investment as a mechanism to grow market share. R&D funding would need to increase by US$1.8 billion over current levels (US$1.5 billion from the private sector and US$0.3 billion from the public sector) if Canada were to increase market share by 10% while increasing R&D intensity to pre-1999 levels.

In this study, virtually all countries examined receive a significant share of R&D funds from the public sector. To match the US public sector, Canada's R&D spending would need to increase substantially. Public sector R&D funding would need to increase by US$1.3 billion to be in line with the US's 72% of R&D funding from the public sector under a status quo scenario. Further, US$1.9 billion in public sector R&D funding would be required if Canada were to also increase R&D intensity to the level seen in the US.

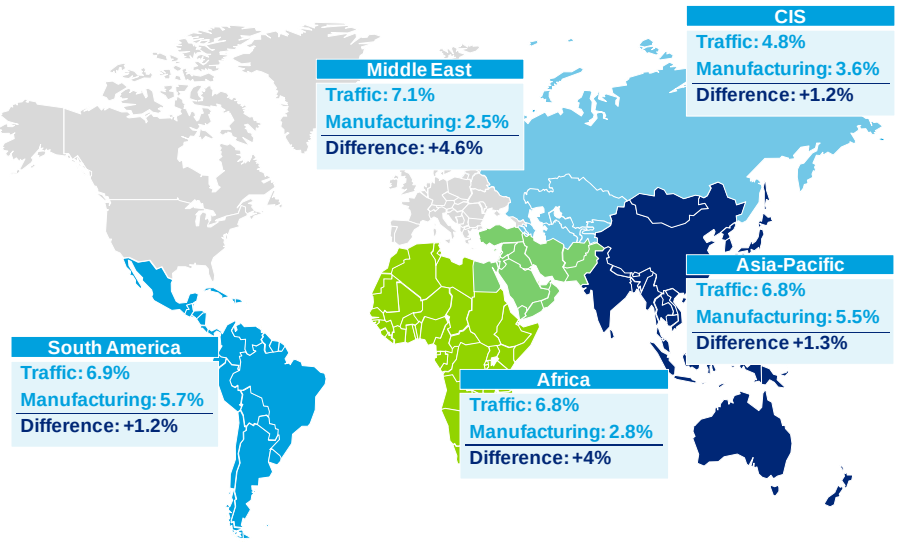
Figure 12: Public sector R&D spending under three growth scenarios[48]



4.7.3 Emerging markets will be an opportunity for Canada if the Canadian aerospace industry can reconfigure itself to capture this growth

Emerging markets represent an opportunity for the Canadian aerospace industry because domestic demand in emerging markets for aerospace products will outstrip domestic supply leaving a net opportunity for Canada if aggressive emerging market strategies are adopted. It is expected that developed countries will drive their future revenue growth from the differential between passenger growth and aircraft manufacturing growth in developing marketing. This gap represents an opportunity for the Canadian aerospace industry and a basis for shaping trade policies.

Figure 11: Estimated passenger traffic and manufacturing growth for 2010 to 2020 for developing markets[49]



[48] Canadian case assumes current Canadian R&D investment pattern and US case assumes current US R&D investment pattern.

[49] Traffic growth is estimated using RPK forecasts aggregated from major aircraft and engine manufacturers. Manufacturing growth is estimated using the growth of manufacturing revenue observed in the forecast.

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Jennifer is a Senior Manager within the Performance Enhancement Advisory Practice. She has over 12 years of experience working in commercial due diligence, marketing and corporate strategy both in consulting and in industry, nationally and internationally. Jennifer advises clients on urgent and critical business issues. Jennifer has worked in Hong Kong, Europe, Central Asia, Canada and the US.

Most recently at Deloitte, Jennifer advised government on the business viability of the automotive industry during the 2008 financial crisis. She also advises private equity on acquisition or divestiture deals in areas of retail, infrastructure and telecom, and assists clients on utilizing digital / social media strategies to grow their business.

Her industry experience also includes: Mergers and Acquisitions / Treasury for AT&T Asia / Pacific in Hong Kong; the European Marketing Group for Hewlett Packard Europe in Stuttgart, Germany; and Universal Studios in Canada in the area of national marketing. While at Bell Internet, Jennifer led the launch of the Bell WiMAX high speed internet services in Canada, the fastest take to market launch at Bell Internet.

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