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SIMILARITIES AND DIFFERENCES IN THE INSTITUTIONAL  
FRAMEWORK OF BRAZIL AND CANADA:  
GOVERNMENTS AS FACILITATORS OF  
PRIVATE ORGANIZATIONS IN THE AEROSPACE INDUSTRY

THESIS PRESENTED TO  
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AS EVALUATION OF ACTIVITY  
ENP7966 – THESIS

BY  
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To Maria Géria and Darcy

For being so patient,  
for never doubting my abilities,  
for encouraging and inspiring me:

thank you.

## Abstract

This comparative study is focused on the relationships between the institutional environment and the development of the aerospace industry in Brazil and Canada. Based on the theories of Douglass North and a model designed by Jone Pearce (2001), we identified the governments of both countries as **hostile** or **supportive** as a consequence of their **erratic** or **predictable** actions towards the private sector. We also took into consideration the ability of each country to enforce their legal frameworks, a characteristic that will make a government **weak** or **strong**. In order to compare two countries as distinct as Brazil and Canada, we selected six different aspects of the institutional framework of both countries that are essential to the development of high-technology sectors, such as aerospace: intellectual property rights; research & development; government procurement; investments in infrastructure and higher education; financing of external sales; and industry regulation (together with other aspects of the legal framework). Once we decided which aspects of the institutional environment were more important to the development of the aerospace industry in Brazil and Canada, we compared how those aspects impacted in the development of Embraer and Bombardier, the powerhouses of the industry in each country and two leading forces in the global aerospace market.

Based on structured interviews with representatives of the Brazilian and Canadian governments, industry associations, private corporations, and scholars, we compared the government programs and actions that have the highest impact in the development of the aerospace sector and we point out which initiatives could serve as a model in the further economic development of Brazil and Canada.

**Keywords:** institutional framework, aerospace industry, Brazil, Canada, industrial policies

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## List of Abbreviations

ABDI	Brazilian Agency for Industrial Development
AIAB	Aerospace Industries Association of Brazil
AIAC	Aerospace Industries Association of Canada
ANAC	National Agency of Civil Aviation (Brazil)
AQA	Association Québécoise de l'aérospatiale
BNDES	Brazilian Development Bank
CAMAQ	Comité sectoriel de main-d'œuvre en aérospatiale (Quebec)
CCC	Canadian Commercial Corporation
CFI	Canadian Foundation for Innovation
CIA	Central Intelligence Agency (United States)
CIDA	Canadian International Development Agency
CNI	National Confederation of Industry (Brazil)
CRA	Canada Revenue Agency (SR&ED Tax Credit)
CRIAQ	Consortium for Research and Innovation in Aerospace in Quebec
CSA	Canadian Space Agency
CTA	Brazilian General Command for Aerospace Technology
CTA	Centre Technologique en Aérospatiale (Quebec)
DDSA	Defence Development Sharing Agreement
DFAIT	Department of Foreign Affairs and International Trade (Canada)
DIPP	Defence Industrial Productivity Program (Canada)
DPSA	Defence Production Sharing Agreements
EADS	European Aeronautic Defence and Space Company N.V.
ECAs	Export Credit Agencies and Investment Insurance Agencies
EDC	Export Development Canada
FAA	Federal Aviation Administration (United States)
FINEP	Brazilian Innovation Agency
FIPAs	Foreign Investment Promotion and Protection Agreements
FMP	Future Major Platforms (Canada)

FTA	Free Trade Agreement
GATT	The General Agreement on Tariffs and Trade
IC	Industry Canada
INPI	National Industrial Property Institute (Brazil)
IRB	Industrial and Regional Benefits (Canada)
ITA	Aeronautical Institute of Technology (Brazil)
JAA	Joint Aviation Authority
MCT	Ministry of Science and Technology (Brazil)
MD	Ministry of Defence (Brazil)
MDEIE	Ministry of Economic Development, Innovation and Export Trade – Quebec
MDIC	Ministry of Development, Industry Foreign and Trade (Brazil)
MNEs	Multinational Enterprises
MRE	Ministry of Foreign Affairs (Brazil)
MRO	Maintenance, Repair and Overhaul
MTA	Metropolitan Transportation Agency (United States)
NADSF	National Aerospace & Defence Strategic Framework
NAFTA	North American Free Trade Agreement
NASA	National Aeronautics and Space Administration (United States)
NATO	North Atlantic Treaty Organization
NRCAN	Natural Resources Canada (Canmet Energy)
NRC-IAR	National Research Council’s Institute for Aerospace Research (Canada)
NSERC	Natural Sciences and Engineering Research Council of Canada
OECD	Organisation for Economic Co-operation and Development
OEMs	Original Equipment Manufacturers
OSME	Office of Small and Medium Enterprises (Canada)
PDP	Productive Development Policy (Brazil)
PEIAB	Program for the Expansion of the Brazilian Aerospace Industry
ProEx	Financing Program for Brazilian Exports
PRO-REG	Program for the Strengthening of the Institutional Capacity for Regulatory Management (Brazil)
PWC	Pratt & Whitney Canada

RCMP	Royal Canadian Mounted Police
RECOF	Industrial Bonded Warehouse Customs Regime Initiative (Brazil)
RETAERO	Special Tax Incentives for the Brazilian Aerospace Industry Program
RFB	Brazil Revenue Agency (Receita Federal do Brasil)
RIA	Regulatory Impact Analysis
S&T	Innovation and Science and Technology Cooperation Arrangements (Canada)
SADI	Strategic Aerospace and Defence Initiative (Canada)
SGF	Société générale de financement (Quebec)
SMEs	Small and Medium Enterprises
SR&ED	Scientific Research and Experimental Development (Canada)
TC	Transport Canada
TPC	Technology Partnerships Canada Program
UnB	University of Brasília
UNICAMP	Campinas State University (Brazil)
UQAM	Université du Québec à Montréal
WTO	World Trade Organization

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# 1 Introduction

## 1.1 Institutions and Economic Development

The purpose of this study is to investigate how the actions of governments combined with the institutional environment of a given country can affect the development, behaviour and performance of independent organizations and contribute to the establishment and expansion of a specific industry, contributing to the improvement of the social and economical conditions of the country. In our study, we compare the development of the aerospace sectors of Brazil and Canada and how their institutional frameworks contributed to the success of Embraer and Bombardier, two world-class, major players within the industry.

Since its inception, aircraft manufacturing is a business that has been and still is highly connected to state support: military aircraft is of strategic importance to national defence policies; while civil aviation companies were created, in most cases, as state-run monopolies aimed at regional transportation and domestic integration – especially in continental countries like Brazil and Canada. In the specific case of Brazil, the aerospace industry was never a priority until the 1950s: only after the World War II the Brazilian government came to understand the importance of aircraft manufacturing to the country's defence strategies. Embraer was created and received all the necessary support from the government in the years of the military government, later establishing itself as a world leader in the regional jets market. In its turn, the Canadian aerospace industry benefited from its proximity to the United States, supplying finished aircraft and their systems and sub-systems to both civil and military operations to the neighbouring nation. Also, as a member of the North Atlantic Treaty Organization (NATO), Canada is in a privileged position to promote its military products, including those of the aerospace industry (Malerba and Mani, 2009; Celli Junior, 2010).

Governments also have a keen interest in the development of the aerospace industry as the sector is known for its massive investments in R&D, state of the art technology, and constant innovation. Economically, the industry is a strong source of revenues, both by means of the well-paid jobs it creates and the sales of its products and services. The high investments in R&D and innovation are usually replicated in other industrial sectors, generating more revenues to the country. Aerospace products are complex, sophisticated and expensive goods, and in the case of Brazil and Canada, they account for a considerable share of their exports and are of strategic importance to their foreign trade policies (Sherry and Sarsfield, 2002; Silva, 2008; Malerba and Mani, 2009).

However rewarding the industry may be, international competition is tough and less than a dozen countries managed to develop a strong, competitive aerospace industry. As we present in this study, there are considerable barriers to entry in the industry and high financial risks associated with the development of every new model of an aircraft. In addition, aircraft are expensive products, with sales being often financed with the support of national governments. In this context, states can play a decisive role in the development and survival of national industries. A competitive national industry is considered to be part of the wealth-generating blood of a nation. The creation, revitalization, and decline of national industries both indicate and affect a country's economic health. Such is the importance of Bombardier and Embraer to Canada and Brazil that the financial support programs to the development and export of their aircraft generated a sour dispute between the countries within the World Trade Organization (WTO) starting in the 1990s (Griffiths and Zammuto, 2005; ABDI, 2008; Malerba and Mani, 2009, Celli Junior 2010).

The government support to the economic development of a country can be usually seen as a reflection of its institutional framework. In his book *American Industrial Policy*, Nester (1997) poses the following questions:

What is the government's proper role in the economy? Do free or managed markets best promote economic development? Who can best pick industrial winners and losers, the government or the private sector?

According to Nester (1997), these questions are as old as the American Republic, and to this day, there is no consensus on whether governments should design policies that invested in education, infrastructure, the development of strategic industries, and the improvement of reciprocal trade relations with foreign countries in order to achieve economic development. On the other hand, Thomas Jefferson was said to advocate “that the government that governs least governs best; markets rather than officials should determine the nation’s economic fate.” As the debate never reached an agreement, the questions shifted over the years not to the issue of whether governments should develop the economy, but rather how and where it should do so. And at least over the last 200 years, governments have never been more active in defining to which directions the economy should go: they have enacted a series of tariffs, invested in major infrastructures such as roads, railways, airports, ports and canals; gave away public land to homesteaders and entrepreneurs; promoted or inhibited trade; conquered and developed new territories; imposed an income tax; passed antitrust laws; and experimented with central banks. It is undeniable that all of these actions contributed to the economic development of some regions, industries, firms, technologies, families, and individuals more than others. The fact that national governments have been preoccupied with the generation of national competitive advantage is generally considered uncontroversial. It is a well known fact that in advanced industrialized nations, hundreds of issues are addressed in a public policy process every year. Such vast number of directives can easily create an environment of uncertainty for economic organizations and may substantially increase the transaction costs of doing business (Nester, 1997; Hillman and Hitt, 1999; Griffiths and Zammuto, 2005).

Every nation has policies aimed at its economic development. Industrial policies can be comprehensive or fragmented, and government officials may or may not admit the practice. As industrial policies are hardly unique and are in fact, a tool virtually used by every government around the world, the theoretical starting point of our study is the works of Douglass North (1990, 1991, 2005) in which the author discusses the concepts of the “new institutional economics” and their implications on transaction costs and property

rights; and on public choice and political economics, for example. As we discuss it on Section 3.1 – “The Perspectives of Douglass North and Jone Pearce on New Institutional Economics,” the institutional framework is essential to economic development as it provides a set of laws, rules, and regulations that will mediate the interrelations between the different agents of the political, economic and social systems. The focus of our study is on the institutional framework, as we understand that it is as important to the economic development as the classic industrial policies designed by national governments (Nester, 1997; Hillman and Wan, 2005).

To complement the views of North (1990, 1991, 2005), which can be easily related to the realities of an industrialized country such as Canada, we also analyze the institutional framework organizational model presented by Pearce (2001). The author designed a model based on her studies of China and former communist states of Eastern Europe. As opposed to the theories of North and his focus on well-established, solid institutional frameworks of Western democracies, the Pearce (2001) model seeks to understand the effects of institutional changes in developing countries, which could be more easily adapted to the reality of Brazil and the modernization process of its institutions in the last 25 years, combined with the development of the local aerospace industry (Silva, 2008).

Given the limitations of our study and the impracticability of a complete comparison of the governmental structures of Brazil and Canada, we limited ourselves to the comparison of some aspects of the institutional framework of both countries, especially those connected to the three dimensions of government characteristics that facilitate independent organizations in the Brazilian and Canadian aerospace industries, according to the model proposed by Pearce (2001), presented in the figure below:

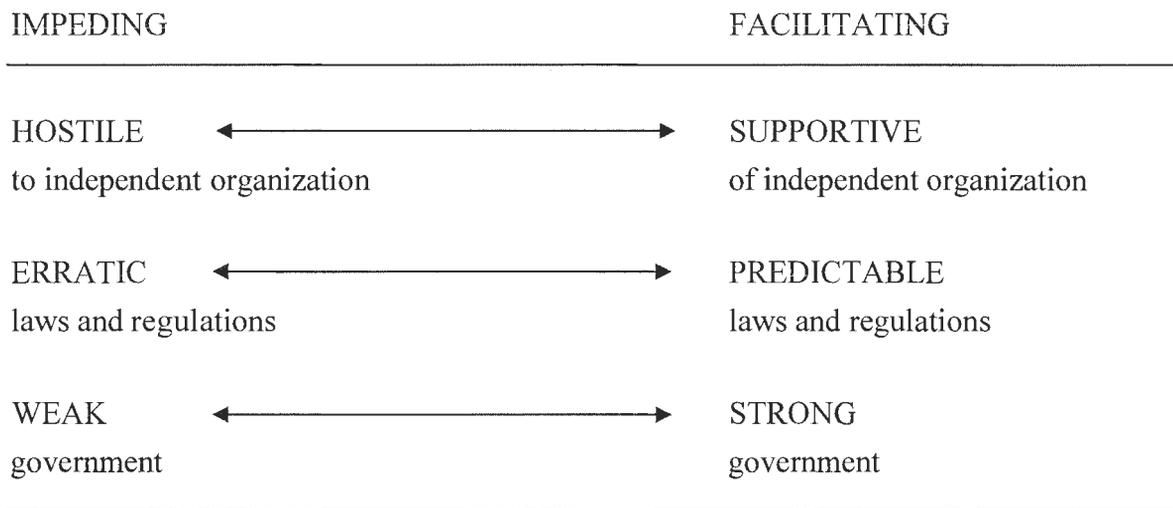


FIG. 1 – Dimensions of Government Characteristics Facilitating or Impeding Independent Organization  
Source: Pearce (2001)

In our efforts to determine how the governments of Brazil and Canada are positioned within the Pearce (2001) model, as a reflex of the institutional framework of each country, our study investigated the impact of the following characteristics on the development of the aerospace industry: 1) investments in infrastructure, 2) legislation on intellectual property rights, 3) investments in research and development (R&D), 4) government procurement, 5) financing mechanisms and export credits, and 6) regulation and the legal framework. These characteristics were the focus of the questionnaire presented to industry representatives, government officials and researchers who are knowledgeable of the aerospace industry in Brazil and Canada. We chose to explore these specific characteristics as we understand that they are strongly connected to the three dimensions of the Pearce (2001) model and reflect how the institutional environment of a country is facilitative or non-facilitative of independent economic organizations. The questionnaire was meant to investigate the recent evolutions in the Brazilian and Canadian institutional frameworks and the specific impact they had in the behaviour of the aerospace industry in both countries.

In our study, we compare the development of Embraer and Bombardier, the major players of the Brazilian and Canadian aerospace industries, as an example of how the institutional framework can be a determinant in the success of an independent organization. Embraer is both an important symbol of Brazil's new technology and a flagship enterprise with deep public resonance. Bombardier, for its part, represents a significant and solid achievement of the Canadian aerospace sector, especially when one considers the country's past decision not to pursue aerospace achievements, as the Avro Arrow case suggested (Dosman and Frankel, 2002). Pearce (2001) defines independent organizations as "those that operate independently of direct government dictate. They are not components of government, nor do they exist to achieve government-determined objectives." When compared to Brazil, the government structure of Canada is rather different – perhaps the most important difference is that Brazil is a presidential republic; even though both countries are federalist states. However well defined are the differences and similarities between the institutional framework and government structures of Brazil and Canada, understanding them is fundamental to the improvement of bilateral relations and the development of mutual cooperation projects in different areas such as trade, democracy, environment, industrial development, international aid, etc. While Canada is a developed nation and Brazil a developing one, they are still remarkably similar in several primordial respects. Both countries are important producers and exporters of commodities and, in spite of their comparative advantage in these sectors, public policies reflect their desire to move up the value-added ladder. Similarly, both countries have a relatively narrow set of global competitive firms in high-technology sectors (Goldstein and McGuire, 2004).

Based on the establishment and growth of the aerospace industry in Brazil and Canada, this comparative study seeks to examine the institutional framework of both countries and the implications in their economic development and it is meant to offer a small contribution to a better understanding of both countries. As means of comparing the stature of each country and their economic power, some of the main economic indicators of both countries are presented in the Table 1, below:

Indicator	Brazil	Canada
Area	8,514,877 sq km	9,984,670 sq km
Population	203,429,773 (July 2011 est.)	34,030,589 (July 2011 est.)
GDP (PPP)	\$2.172 trillion (2010 est.)	\$1.33 trillion (2010 est.)
GDP Real Growth Rate	7.5% (2010 est.)	3.1% (2010 est.)
GDP per head	\$10,800 (2010 est.)	\$39,400 (2010 est.)
Public Revenues	\$464.4 billion	\$605.7 billion
Public Expenditures	\$552.6 billion (2010 est.)	\$677.7 billion (2010 est.)
Public Debt	60.8% of GDP (2010 est.)	34% of GDP (2010 est.)
Inflation rate (consumer prices)	4.9% (2010 est.)	1.6% (2010 est.)
Exports of Goods and Services	\$199.7 billion (2010 est.)	\$406.8 billion (2010 est.)
Imports of Goods and Services	\$187.7 billion (2010 est.)	\$406.4 billion (2010 est.)
Current Account Balance	-\$52.73 billion (2010 est.)	-\$40.21 billion (2010 est.)
Unemployment rate	7% (2010 est.)	8% (2010 est.)

Table 1 – Brazil vs. Canada: Geography and Economic Indicators  
Source: The CIA World Fact Book, 2011

Brazil and Canada have some similar characteristics in their economic profile: both countries rely heavily on foreign trade to finance their public expenses and both countries are major exporters of commodities – which mean that both are vulnerable to the price oscillations of raw materials and agriculture products. Brazil and Canada also have similar challenges to overcome in order to achieve sustained economic growth and social development (The Conference Board of Canada, 2009; The Economist Intelligence Unit, 2009).

## 2 The Problem to be Investigated

The start point of the problem to be investigated was the development of two independent economic organizations: Embraer in Brazil and Bombardier in Canada, and the role that governments in each country play in the aerospace industry. After comparing the main players of the aerospace industry in both countries, this study attempted to answer the following question: **what are the main aspects of the institutional framework of Brazil and Canada that have impacted in the development of independent economic organizations in the aerospace industry of each country?** This question can be divided into two key elements: 1) the institutional frameworks of Brazil and Canada, and 2) the connection between the institutional framework and the development of the aerospace industry.

The first element of the question addresses the main differences in the organization of each country in issues related to infrastructure, intellectual property rights, private investment, monopolies, legislation on aerospace regulation, labour and taxation; and law enforcement, among others. Based on the governmental structures of both countries in such issues, **the first objective of the question is to identify the aspects of each government that qualify them as facilitative or nonfacilitative of the independent organization**, in close connection with the three dimensions (hostile or supportive; erratic or predictable; weak or strong) presented in the model proposed by Pearce (2001).

The second element of the question is connected to the strategies that each company developed to take advantage of the opportunities and to deal with the constraints presented by the governments of Brazil and Canada and how such strategies influence in their performance. Based on the experiences of the main players of the aerospace industry in each country, **the second objective of the question is to examine how organizations in the aerospace industry of Brazil and Canada relate to their institutional environment in order to enhance their positions in terms of business performance, profitability, market share, and other indicators of economic development.**

In an attempt to answer these questions, our study first explores the role of Brazilian and Canadian institutions in the development of the aerospace industry of each country, according to the perspective of Douglass North (1990, 1991, 2005). In a second moment, as part of the process of identifying the main differences between the institutional frameworks of Brazil and Canada, in accordance to the dimensions of government characteristics facilitating or impeding independent organization presented in the Pearce (2001) model, our study determines how each country fits within the model. Finally, comparing the interactions between government agencies and private organizations – resulting from the institutional frameworks of both countries, combined with an analysis of the consequences of such interactions to the development of their aerospace industries – allow us to determine how facilitative or nonfacilitative of the independent organization each government is.<sup>1</sup>

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<sup>1</sup> Our study analyzes the development of the aerospace industry through the development of Embraer and Bombardier, two major players in the aerospace industry with worldwide operations. An important aspect to consider when companies engage in international trade is how multinational organizations will react to the different institutional frameworks in the different countries where they do their businesses. Rodriguez et al. (2006) suggest that multinational enterprises (MNEs) should be primarily concerned with three main factors that can interfere in their performance in a foreign country: (1) politics, (2) corruption, and (3) corporate social responsibility. It is clear that multinationals sometimes have the power to influence national governments to promote changes in the institutional framework, so that institutions are more in line with the interests of the MNEs. However, in accordance with the objective of our study and for the practical reason to limit the scope of our research, the study does not focus on the interactions between MNEs and governments, even though there are considerable foreign investments in the aerospace industry in Brazil.

### 3 Conceptual Framework

#### 3.1 Government Policies and Economic Development

In order to investigate the determinants of the institutional framework that had the potential to facilitate the development of independent organizations in Brazil and Canada, the theoretical starting point of our study was based primarily on the works of Jone Pearce (2001) on the actions of governments as facilitative or nonfacilitative of the independent organization, and those of Douglass North on the new institutional economics (1990, 1991, 2005). In this section, we first discuss how governments and their policies can contribute to the expansion of the business environment and economic development. Then, we present the perspectives of Douglass North on New Institutional Economics and how the institutional framework can be the reflex of a country's position towards businesses. Finally, we discuss the viewpoints of Jone Pearce on the embrace of government and how these concepts relate to the aerospace industry in Brazil and Canada.

The classic industrial policy debate is as old as the Industrial Revolution itself. In his 1776 book *Wealth of Nations*, Adam Smith argued that governments should confine themselves to three essential duties for government: (1) defence – the duty of protecting the society from violence and invasions, (2) justice – the duty of establishing an exact administration of justice, and (3) the general welfare – the duty of “erecting and maintaining certain public institutions, which can never be done in the interest of any individuals, or small number of individuals,” while allowing entrepreneurs to supply goods and services demanded by the populace. In 1891, David Ricardo and his book *Political Economy* expanded Smith's ideas and diffused the concept of “comparative advantage” whereby states, in the same manner of individuals, specialize in making or marketing the things which they can best make or market, and then trading those products for other things they need from other countries. Smith and Ricardo shared similar views regarding business cycles of growth and depression, believing that they were a natural part of economic

development. That position was challenged by John Maynard Keynes, who in 1936 argued that business cycles could be smoothed out by government spending. Keynes believed that if depressions were caused by low demand for goods and services, governments could stimulate a depressed economy by spending more and cutting taxes. When the demand for a good or service was too high, inflation was expected to rise. In this case, governments could curb inflation by cutting back their own spending and raising taxes. As a result, modern governments have accepted the “neoclassical economic” idea that the economy can be fine-tuned by manipulating taxes, interest rates, and government spending (Nester, 1997; Hillman, Keim and Schuler, 2004; Murtha and Lenway, 1994). As a result, Robert Reich, cited by Nester (1997) states that

Every major industry in America is deeply involved and dependent on government. The competitive position of every American firm is affected by government policy. No sharp distinction can validly be drawn between private and public sectors within this or any other industrialized country; the economic effects of public policies and corporate decisions are completely intertwined.

The classic industrial policies can be justified as they are believed to contribute to the economic development of a nation far more rapidly than it would otherwise have occurred. A government’s industrial strategy can be defined as its plans to allocate resources with intent to meet long-term national economic objectives, including growth, international competitiveness, GDP expansion, improvements in national security and state legitimacy. Governments also use industry policy to facilitate investment strategies or encourage specific industrial activities. Therefore, governments can provide the strategic outlook so often lacking in business, while the effects of government policies can determine the competitive position of businesses and have an impact in their performance. Since one of the most important functions of the state is to facilitate economic development and improve general welfare, industrial activity is regarded as the cornerstone of national economic development. In this sense, all states practice a variety of industrial policies, albeit under different names and in different forms. States can be committed to country-specific governance capabilities, that when combined with national factor endowments, influence

the international economic strategies that governments can support and implement. Governments can be influenced by and influence the range of strategic choices and actions that managers face every day through the state's policies concerning such issues as industrial relations, international trade, and access to resources. As a consequence, when states get involved in industries through the development of institutions (especially the ones that coordinate economic activity, such as licensing and regulatory agencies, legislation on IP, and multilateral enforcement among a community of traders), the result is positively associated with economic competitiveness. In addition, the ability of a government to implement and maintain consistent industrial strategies are largely predetermined and conditioned to state organizational structures, functional political institutions, and society's expectations regarding the appropriate economic role of the public sector (Lenway and Murtha, 1994; Murtha and Lenway, 1994; Hillman and Keim, 1995; Nester, 1997; Hillman and Hitt, 1999; Hillman, Keim and Schuler, 2004; Spencer, Murtha and Lenway, 2005; Griffiths and Zammuto, 2005; Dixit, 2009).

Under a different perspective, governments and their policies can also be critical sources of uncertainty and have control over limited, critical resources that will affect a firm's competitive environment and government policy. Critics of industrial policies state that they have two potential downsides. First is protectionism, which can cause domestic prices to rise, with the potential to hurt not only consumers but producers as well (whose high-priced components may make finished goods uncompetitive in foreign markets). Second, states may retaliate and a trade war could erupt as the one that happened in the 1930s, although this possibility is considered unlikely to happen again (Murtha and Lenway, 1994; Nester, 1997; Hillman, Keim and Schuler, 2004).

At the macroeconomic level, government intervention is crucial in developing an appropriate business environment, as key institutions are usually created via state intervention. The formation of a legal framework is a good example that emphasizes the need for state intervention: in the invisible hand model, governments restrict themselves to a limited number of activities, such as providing public goods, regulating markets and

enforcing the law, leaving most allocation decisions to private organizations. At the microeconomic level, however, a state can be interventionist but also unorganized, having a larger number of bureaucrats pursuing personal agendas, opening a door to corruption and other negative distortions of the system. As a consequence, it is important to differentiate between a government's influence in implementing a 'friendly' business environment – which can be achieved notably through an adequate legal framework and law enforcement base, and the intervention of a government in the functioning of private organizations (Griffiths and Zammuto, 2005; Venard, 2009).

On a macroeconomic level, it is generally accepted that political intervention leads to the transformation of the institutional environment. In order to build the appropriate elements of an optimal institutional framework (laws and regulations, public policies, law enforcement, quality of markets, etc.), there will always be a need for state intervention. However, such intervention should be limited and governments should allow private organizations the freedom to make decisions within an adequate, fully functional institutional framework. When governments are involved in the development of an industry, the result is a state/industry linkage that is coordinated. As a result, institutional arrangements and capabilities will exist, defining the shape and maintenance of a national industrial competitiveness. On the other hand, when governments have little involvement in industry decision making, the institutional framework will rely on market forces or corporate policies instead (Griffiths and Zammuto, 2005; Venard, 2009).

### 3.2 The Perspective of Douglass North on New Institutional Economics

As the mainstream economic theories evolved, authors such as Harold Demsetz, Avner Greif, Claude Menard, Ronald Coase, Elinor Ostrom, Oliver Williamson and Douglass North worked within a modified neoclassical framework, considering both efficiency and distribution issues, in contrast to more traditional, old or original

institutional economics, which are usually perceived as critical of the mainstream neoclassical economics. The works of Douglass North can be a primal source to the understanding of the “new institutional economics” and they have influenced the writings of dozens of researchers and scholars around the world. The importance of the new institutional economics is that it combines concepts from various social science fields such as politics, sociology, management, law, and history with those of traditional economics. There are four broad fields of research that characterize the new institutional economics: (1) transaction costs and property rights, (2) public choice and political economics, (3) economic history, and (4) belief and knowledge systems (ideology). These four fields are important to explain the development of institutions and their impact on the economic growth of a nation. The concepts related to the field **public choice and political economics** are of particular interest to our study, as they are connected to the actions of a given government and their impact in the development of independent economic organizations (Gauthier and Gomez, 2005).

As the commercial transactions between nations and different regions of the world grew in volume, complexity, and different degrees of specialization, they required the existence of a solid institutional framework that facilitated and encouraged exchanges. Over the centuries, commercial negotiations and their enforcement in different parts of the world entailed typically the development of standardized weights and measures, units of account, mediums of exchange; and the establishment of notaries, consuls, merchant law courts, and enclaves of foreign merchants protected by foreign princes in return for revenue. As costs of transactions increased, it became common for nations to impose trade barriers in order to protect their interests. Following the advancements of global trade in modern days, improvements in the costs of exchange were considered to contribute to a greater development of trade and the overall productivity of an economic system (North, 1991; Gauthier and Gomez, 2005). However, Coase (1998), cited by Gauthier and Gomez (2005), says that one of the main factors influencing the costs of exchange is the institutions of a country:

(...) the costs of exchange depend on the institutions of a country: its legal system, its political system, its social system, its educational system, its culture, and so on. In effect it is the institutions that govern the performance of an economy.

To better understand the importance of institutions for the economic development, North (1991, 2005) points out the differences between two key concepts: that of **institutions** and that of **organizations**:

Institutions are the rules of the game – both formal and informal rules and their enforcement characteristics. Together they define the way the game is played.

If institutions are the rules of the economics game, organizations are the players. Organizations refer to groups of individuals engaged in activities with a common objective, a particular goal.

Rodrik (1999), cited by Onodera (2008) defines institutions as

a set of humanly devised behavioural rules that govern and shape the interactions of human beings, in part by helping them to form expectations of what other people will do.

And the same author goes on to discuss five types of market supporting institutions: property rights; regulatory institutions; institutions for macroeconomic stabilisation; institutions for social insurance; and institutions of conflict management (Onodera, 2008).

Institutions can be divided into a set of formal constraints and informal constraints. Examples of formal constraints include: constitutions, laws, regulations, property rights, charters, bylaws, statute and common law; together with enforcement characteristics, such as sanctions. Resulting from co-ordinate repeated human interaction, informal rules can be exemplified as extensions, elaborations, and modifications of formal rules; socially sanctioned norms of behaviour (taboos, customs and traditions); internally enforced standards of conduct, such as norms, conventions, and codes of conduct. Formal and informal institutions bind elites from business and government together. The element that will bring both sets together is the mechanism intended to ensure that these two types of constraints are enforced. Furthermore, institutions have the potential to prohibit, permit or

require specific types of action (political, economic or social) that are necessary for reducing transaction costs, for optimizing the flows of information, and for defining and enforcing property rights. Institutions can also encompass organizational entities, procedural devices, and regulatory frameworks. Other authors, such as Griffiths and Zammuto (2005) suggest that national governments and a sound institutional environment play an important role in fostering the competitive capabilities of industries and firms. In this sense, national governments play an active role in the creation of an **institutional governance system** that support and encourage national competitive advantage, which is the result of mechanisms of coordinated adjustment set in place by the state. Such an institutional governance system consists not only of government involvement in an industry or just an industry structure; rather, it is something that incorporates both. In a broader sense, institutions can also be linked to various different measures of institutional quality to development outcomes from various angles and disciplines. As far as economic development is concerned, good institutions ensure two desirable outcomes: the existence of relatively equal access to economic opportunity, which offers a “level playing field;” and the guarantees to those who provide labour and capital that they will be appropriately rewarded and their property rights will be protected (North, 1991; Jütting, 2003; Hillman, Keim and Schuler, 2004; North, 2005; Griffiths and Zammuto, 2005; IMF, 2005; Malerba and Mani, 2009).

Organizations can serve to several different purposes: political (political parties, legislatures, regulatory bodies), economic (firms, trade unions, cooperatives, etc.), or educational (universities, schools, vocational training centers, etc.). Whether their immediate objective is profit maximizing (in the case of economic organizations) or improving re-election prospects (for political parties), organizations are committed to an ultimate objective: their survival in a world of scarce resources and tight competition. As distinct national policies and institutional framework can assist or hinder firm competitiveness and firm access, economic institutions are usually closely connected to political institutions. Political institutions determine the incentives of the executive and

define the distribution of political power, including the ability to adequate economic institutions and the distribution of resources. For their part, economic institutions also shape political institutions, as they contribute to determine the relative affluence of various groups of society. Effective economic institutions are likely to be paired with good political institutions. When the political power is broadly shared and subject to checks and balances, the risk that those with political power will take advantage of their position is minimized. In addition, the institutional settings within which political organizations (such as interest groups and political parties) and the government interaction will have an impact in the types of policies chosen in democracies. As a matter of fact, all democracies have a similar formal institution, based in the use form of majority voting as the decision rule for most public policy decisions. In such systems, most public policy decisions result from a process of collective decision making and they rely on constitutions and other institutions of government that are designed for organizing the collective decision making process. In our study, we take into consideration the formulation processes of public policies that have an impact in the aerospace industry in Brazil and Canada and base our classification of each nation as facilitative or non-facilitative of independent economic organizations on the interactions between the state and the industry in both countries (Hillman and Keim, 1995; Griffiths and Zammuto, 2005; IMF, 2005; North, 2005).

The evolution of modern commercial transactions meant that a larger amount of resources are needed to define and enforce exchange agreements. Industrialization, urbanization, and integration into a global economy created a new set of socioeconomic problems with which individuals and basic social groups could not cope. In the context of individual wealth-maximizing behaviour, when only asymmetric information about the valuable attributes of what is being exchanged (or the performance of agents) is available, transaction costs can be regarded as a critical determinant of economic performance. As a result, institutions and the effectiveness of their enforcement will determine the cost of transacting. Therefore, the importance of effective institutions lays on the benefits of cooperative solutions or the costs of defection. In other words, institutions have the power

to reduce transaction and production costs per exchange, augmenting the potential gains from trade. In modern days, governments have at least four broad economic duties: maintaining economic growth, full employment, stable prices, and a positive balance of payments. As a result, both political and economic institutions are essential parts of an effective institutional matrix, together with other variables such as the local setting and the behaviour of human actors (North, 1991; Nester, 1997; Jütting, 2004).

The issue of how the actions of a government can facilitate the development of independent economic organizations is controversial and it is closely linked to the debate of the advantages of free markets versus the role of positive government direction in the growth process. Together with **institutional determinants**, **economic determinants** and **cultural heritage** are the fundamental determinants of economic growth. Aiming at the objectives of the research, our study focuses only on the influences of the **institutional determinants** to the overall constitution of the institutional framework of Brazil and Canada and how they contributed to the development of the aerospace industry in each country (North, 1991, 2005).<sup>2</sup>

Another component of an analysis of institutional frameworks and economic development is the conformity levels for the institutions, especially the legal framework, by the economic organizations of both countries. Organizations can interact with institutions (the rules of the game) in two different ways: they will either conform to the rules in place or try to circumvent them. If the rules are not clear or incomplete, there will be a possibility

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<sup>2</sup>Besides the institutional framework – which provides the set of laws, rules, and regulations that will mediate the interrelations between the different players of the political, economic, and social systems, North (2005), points out to the importance of demographic features to economic development, as a reflex of the quantity and quality of human beings available in a given work market. Demographics are influenced by the rates of fertility, mortality, embodied human capital, and occupational distribution characteristics. Finally, the stock of knowledge, including scientific knowledge and its dissemination will also play a significant role in the economic development. In order to observe the purpose of our research, out of the three fundamental determinants listed above, we focus only on the importance of the **institutional framework** to the development of the aerospace industry in Brazil and Canada.

for the organizations to interpret them incorrectly, trying to obtain the maximum level of advantage from their transactions. Rules can be regarded as incomplete due to two main causes: an imperfect information system and a limited cognitive capacity of individuals involved in the transactions. To fully understand the importance of the institutional framework in the development of independent economic organizations, it is important to examine the dynamics of the evolution of both organizations and institutional frameworks (Chabaud et al., 2005).<sup>3</sup>

As the economic organizations in the aerospace industry in Brazil and Canada engage in more complex transactions with commercial partners in different parts of the world and seek the financial support from foreign investors, it is imperative that the governments of both countries promote the stability and reliability of their institutions. As North (1991) points out, a sound institutional matrix consists of an interdependent web of institutions and the resulting political and economic organizations that are characterized by massive increasing returns. Thus, the very own existence of private organizations depend on the opportunities provided by a healthy institutional framework. Such opportunities provide for independent economic organizations to evolve; and in a virtuous-cycle effect, it is normally expected that development is directed towards the promotion of productivity-raising activities and freer markets. Instead, in the case of the aerospace industry, private profitability is usually enhanced by the creation of monopolies, by the restriction of entry and factor mobility, combined with political organizations that establish property rights aiming at the redistribution of income, instead of augmenting it. In this more widespread model, it is imperative, or at least desirable, that the judiciary branch be strong and

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<sup>3</sup> According to Chabaud et al. (2005), organizations can and usually try to influence some modifications in the structure of the institutions to better serve their purposes. Organizations such as private firms, unions, professional associations, media, etc., can use several different strategies (lobbying being the most common) to influence the positions of the public opinion and cause it to promote the institutional changes, so that institutions are more adequate to their interests. Although we understand that private organizations can influence and may try to adjust the institutional framework to their needs and purposes, the focus of our research is on how governments and the institutional frameworks can and will influence private organizations, and not the other way around.

independent, so that the contracts can be respected and the level of interference of the executive and legislative branches in the commercial transactions is minimized (North, 1991; Hillman and Wan, 2005; Chabaud et al., 2005).

Another factor that has an impact in the business-government interface is the form of government: in our case, a parliamentary versus a presidential-congressional form of government. The executive branch plays a greater role in the formulation of new legislation in parliamentary democracies (such as in Canada), as opposed to a political regime in which there is a clearly separation of power between the executive and the legislative branches (such as in Brazil). In a parliamentary system, the effort to formulate the general policies that are of business interests is usually part of a party's election agenda. When new legislation is developed, the ministry of the executive branch becomes an important venue for business-government interaction. However, this does not mean that all new government policies in a parliamentary system derive from the election agendas of the winning parties: some policy proposals can be initiated by career bureaucrats in individual ministries. Parliaments are also capable of originating legislative proposals on their own, and business groups often meet with members of parliament. In such a system, policies originating in the parliament are required to meet with the approval of the leaders of the executive branch, even if one specific policy is not formulated as part of the government's agenda (Hillman and Keim, 1995).

In a presidential-congressional system, there are essentially four substantially autonomous institutions: Congress, the President, the judicial branch, and the bureaucracy. In such a system, the pursuit of coherent, consistent, and stable policies formulated out of these autonomous institutions may pose a complex governance challenge to the country. In case of weak party discipline within the institutions, the result can be the conflict inherent in a variety of interests. In general, presidents do have policy agendas and usually submit legislation to Congress. Nevertheless, most presidents have far less control over how Congress vote or modify their proposals than leaders of governments in most parliamentary systems. In presidential systems, the lack of strong party discipline may reflect on the

members of Congress, who will be subject to a greater disparity of interest group pressures. As consequence, this poor party discipline complicates the public policy formulation process, since many important policies originate in the legislature. When members of Congress are subject to fragmented special interests and left without some sort of overarching directive, such as party positions, the policies originating in the legislature may be incoherent and inconsistent (Hillman and Keim, 1995).

### 3.3 The Perspective of Jone Pearce and the Embrace of Government:

The theories of Douglass North and the New Institutional Economics can be more easily associated with the institutional frameworks of developed countries, with solid democratic traditions and stable and strong governments. On the other hand, Jone Pearce (2001) states that the New Institutional Economics theories do not fully explain how organizations and organizational behaviour function if governments are non-supportive, erratic or weak, while suggesting that if non-supportive, erratic, and weak governments cannot provide protection, some substitute is to be found if complex organization is to take place. For many years, several authors in various fields of social science suggested that there are connections between institutions and the structure and behaviour of organizations. The “new institutionalism” authors attempted to provide fresh answers to old questions about how social choices are formulated, mediated, and established by institutional arrangements (Venard, 2009). In our case, the views of North on institutional frameworks and economic development are more in line to the government of Canada and its support to the local aerospace industry; while the views of Pearce can be more easily identified with the Brazilian framework and its support to the local aerospace industry. As part of the investigative process required to understand the importance of the institutional framework for the optimal development of independent economic organizations, it is necessary to analyze how governments can interfere – either promoting or presenting obstacles – in the

ways in which organizations do business and how they prepare themselves to respond to institutional constraints. As governments have the power to legislate, the decision to make a course of action profitable or illegal is in their hands. Pearce (2001) suggests that

Governments facilitate the establishment and enforcement of the fundamental understandings necessary to action: who is entitled to what uses (use rights); who may legitimately sell products, land, and equipment (ownership rights); and what actions are acceptable (contract law).

In this sense, facilitating governments will work towards a stable and predictable environment, with laws and regulations that they are capable of enforcing. One of the main difficulties that organizations and investors willing to expand their commercial operations in developing countries – or more precisely, countries where governments are nonfacilitative – is that these organizations have no idea on how to react to a nonfacilitative environment. One of the main reasons for this lack of knowledge is that these organizations have been historically operating in a facilitative environment. But what is it that facilitative governments do that has such a positive impact in their economic development? According to Pearce (2001)

a primary role of government is to facilitate effective complex organization. Among other organizational effects, strong facilitative governments create legal infrastructures and enforce regimes that allow sufficient advance planning to enable participants to judge whether personal and financial investments are worthwhile, and to rely on more impersonal coordination.

This does not mean that efficient independent organizations will only flourish in a facilitative environment. Even when governments lack the capacity to enforce their own laws and regulations – and as a consequence, are not facilitative of independent organization – people do not stop their entrepreneurial ambitions because such efforts are not made easier by the governments. Instead, they will make the best use of their resources and personal networks to overcome the difficulties they face as entrepreneurs (Pearce, 2001).

Even though governments can occasionally act in ways that are nonfacilitative of independent organization, they are necessary because they have the power to establish

stable structures for human interaction and therefore, reduce the levels of unpredictability in a business environment. As the complexity of trade negotiations between nations increase, organizations will look for a stable environment, with fair rules and regulations, in hopes that contracts will be respected and that they will not be cheated in their transactions. It is here that governments can make a difference in the economic development: when a government enforces a formal legal system that can handle more complex disputes and guarantee the rights of an organization, people will feel more confident to invest more and expand their businesses (Pearce, 2001).

As the model presented in the introduction of our report shows, the practices of a government that can facilitate or impede the development of independent organizations can be clustered into three dimensions:

1. **Government hostility to independent organizations**, which can be presented either as a central strategy (as in a communist regime) or in a partial and subtle manner (when the state controls access to a critical resource). The variations in the capacities of governments to intervene can be linked to the fact that some governments do not have sufficient control over their own officials to ensure reliable enforcement. As result, these governments fail to enforce their laws and this incapacity can be doubly costly: both in the absence of a vital facilitating function and in the unpredictability of erratic, partial enforcement. Weak governments are subject to pressure groups, whereas strong states have the ability to remake societies and cultures. The strength or weakness of a state can explain differences in national industrial competitiveness, particularly as demonstrated through governments that favour corporatist institutional regimes (e.g. Sweden, Denmark, Finland, Germany, and Japan). When a government is weak or erratic, there is a threatening environment for those seeking to organize. Such environment favours the existence of unpredictable government officials who may expropriate private

organizations, levy unexpected taxes and fees, and even possibly threaten their personal safety. In addition, emerging markets can also have problems with inadequate financial disclosure and an absence of intermediary institutions (investment bankers, venture capitalists, and an active business press). On the other hand, facilitative governments support private organizations by providing useful information, which can benefit credit and capital suppliers through the offer of extensive databases and regulatory bodies, which can allow a more accurate assessment of risks. In addition, the gradual reduction of national barriers to trade can facilitate commerce among nations. Regarding the policies that can facilitate economic development, governments can bring new initiatives or repeal and reinterpret old ones. In any case, even when governments qualify as “facilitative” of independent organizations, the possibility that they will follow through on any given policy never approaches 100 per cent (Pearce, 2001; Griffiths and Zammuto, 2005; Spencer, Murtha and Lenway, 2005; Onodera, 2008; Venard, 2009).;

2. **Government unpredictability**, which is the translation of the establishment of laws and regulations, the enforcement of property rights, and the stability in the provision of public goods. The transparency and predictability of the institutional environment can be linked to policy reforms that encourage and facilitate resource reallocation by the private sector. The predictability of a nation concerning its business-government interface can be associated with the stability/instability of the following factors: 1) the locus where business-government interactions take place, 2) the tactics and strategies employed by businesses to influence public policy decisions, and 3) the frequency with which the same actors from business and government institutions have repeat dealings with each other. Additionally, a government can influence firms as they are subject to rules institutionalized and legitimized by the

state. Governments define institutional frameworks that influence organizations by establishing rules, inspecting the conformity of firms and handing out rewards or punishing those who fail to follow the rules (Hillman and Keim, 1995; Pearce, 2001; Griffiths and Zammuto, 2005); and

3. **Government weakness**, which is characterized by the inability of a government to maintain a stable and reliable enforcement of its legal framework, leading to abuse of power and corruption. The strength of an institutional framework can be defined through the strength of certain variables, such as the quality of its **legal framework**, the quality of **law enforcement**, and the quality of the **financial markets**. The legal framework is an important variable in the analysis of institutional framework because the existence of a common legal environment can virtually affect all aspects of an organization's structure, behaviour and performance. A solid legal framework is crucial not only for the protection of contracts and private property, and it also has the power to discourage officials to prey on private property and solicit bribes. While a strong legal framework is important, laws are useless if not combined with a strong enforcement mechanism. For this reason, an effective institutional framework can be positively linked to the ability of a government to enforce its laws, especially in its ability to influence corruption. Besides the laws, the legal framework also encompasses the creation of regulatory institutions that monitor competition, securities markets, banking, trade, patents and all other economic sectors that require business law enforcement. Regarding the financial system, its importance to the institutional environment lies on fact that an institutional framework should be partly based on an evaluation of the quality of its financial markets. As a consequence, it is possible to differentiate between various countries and their institutional framework by analysing the characteristics of their different types of financial institutions.

If access to capital is easier in a given country, it should also be easier for firms in such country to finance their activities and, consequently, invest in a new economic project such as product development or the creation of a foreign subsidiary; as such activities will be easier to fund (Venard, 2009).

As the topics presented above suggest, governments can interfere in several different ways in the creation of independent organizations and the economic development of a country. It is usually accepted that economic development depends on a sound institutional and governance framework, one that favours structural reform while enhancing public understanding and acceptance of reform measures. In addition, a regulatory and competition environment allows transformation within firms as well as entry and exits across sectors. It is undisputable that the right regulatory framework and effective competition environment were paramount in the development of many industrial sectors. Ideally, as part of facilitative institutional framework, governments should foster a healthy regulatory and competition environment, which will allow transformation within firms as well as facilitating mergers and shifts in corporate culture, while keeping regulatory barriers on enterprises to the necessary minimum, while promoting economic development and trade through domestic regulation. The performance of the aerospace industry in both countries presents concrete examples of how national institutions can influence the growth of a specific industry in particular, and the economic development as a whole.

As we discussed in this section, the role of governments in economic development is undeniable: from the original debate about classic industrial policies to the concepts of New Institutional Economics and the government embrace of independent economic organizations, governments have always attempted to optimize their resources and promoted economic growth. Figure 2 summarizes how the debate has evolved over the years:

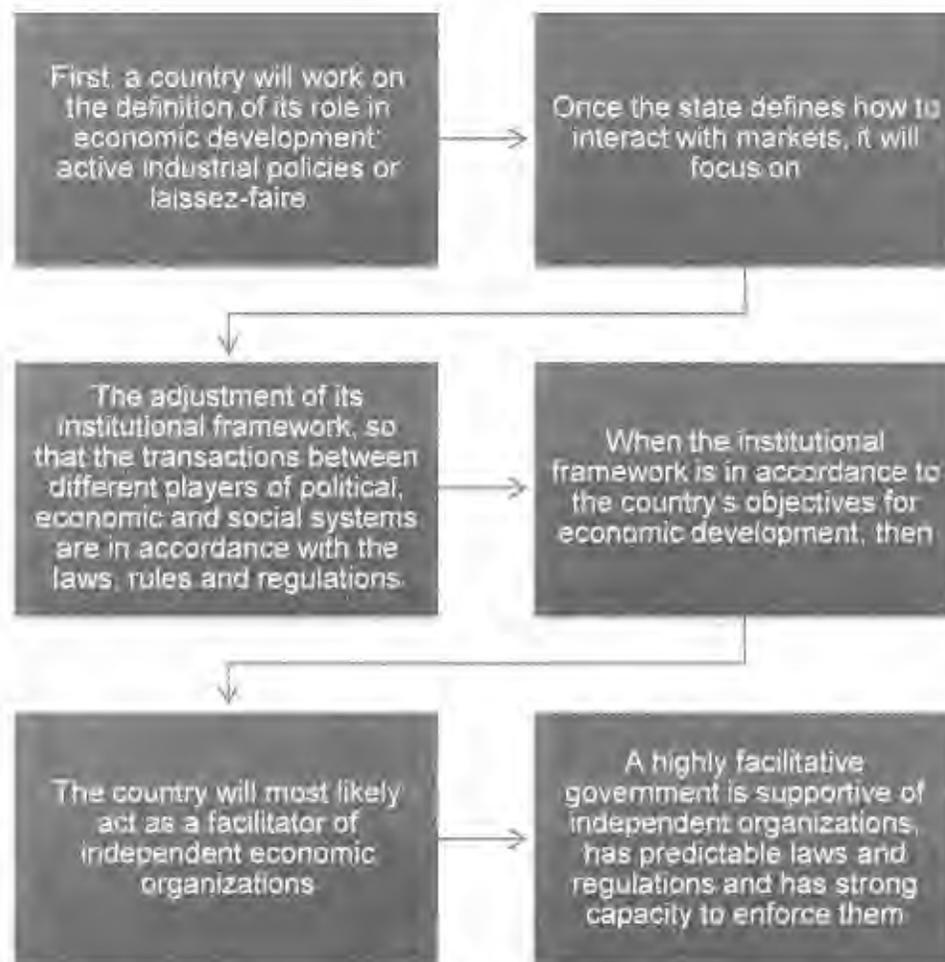


FIG. 2 – The Role of Governments in Economic Development

Source: the author, 2012

## 4 Methodology

The main objective of our study is to compare the relationship between the development of the aerospace industries and the institutional frameworks of Brazil and Canada. Based on the theories of Douglass North and the model proposed by Pearce (2001), we attempt to determine how each country is facilitative or nonfacilitative of independent organizations in the aerospace industry, as the institutional framework of each country is compared to the model. The comparison is based on governments being hostile or supportive of private organizations; having erratic or predictable laws and regulations; and having weak or strong governments. In order to illustrate how governments can play a crucial role in the economic development of a country, we compare how the different institutional frameworks and governmental support of each country influenced in the development and behaviour of Embraer and Bombardier, the leading forces of the aerospace industry in Brazil and Canada. As we chose a comparative methodology for our research, we took into account the views of authors such as Hillman and Keim (1995), according to whom

Differences in business-government relations across countries can be better understood by examining the institutions through which business and government interact with particular attention to what North called “formal constraints – such as rules that individuals devise and informal constraints – such as conventions and codes of behaviour.

As part of the process of comparison of the institutional frameworks of Brazil and Canada and how they played a role in the development of the aerospace industry in each country, we investigate the circumstances that were decisive to the establishment of Embraer and Bombardier as leading forces in the regional aviation market. Each company is the main player of the aerospace industry in their country of origin and each has obtained different types of governmental support or incentives over the past 30 years. In addition, the comparison of the impacts of the institutional framework in the development and growth only of the main player in each country served to narrow the scope of our research. For that same reason, we only considered the evolution and transformations that happened in the

Brazilian and Canadian institutional frameworks between the 1980s and the present date. In this period, Embraer was privatized, Bombardier ventured in the aerospace industry, and the globalization of the world economy combined with the 9/11 attacks brought profound transformations to the aerospace industry worldwide.

In order to compare how the governments of Brazil and Canada acted to facilitate the development of these two independent organizations, our study considered the evolution of the institutional frameworks of Brazil and Canada in the past three decades and as a consequence, of the institutional changes; which in turn, help us to determine how each country is positioned in the scale of three dimensions proposed by Pearce (2001). According to this scale, a government can be **hostile** or **supportive** to independent organizations; offer an **erratic** or **predictable** environment for laws and regulations; and be **weak** or **strong** in their ability to enforce their laws and regulations. These three dimensions served as the basic parameters to the comparison between the two countries.

To illustrate how hostile or supportive each government is, our study compares the impact of the **investments of Brazil and Canada in infrastructure**, including transportation, energy, education, R&D, and the like in the aerospace industry over the past ten years. Investments in basic infrastructure are a key-factor to the economic development of a country, as the existing infrastructure will determine whether independent economic organizations will succeed or not in said country. Economic organizations will feel confident to invest in a country if they perceive that their investment is being matched by the governmental support, presented in this case, in the form of the necessary infrastructure to operate a lucrative business operation. This analysis uses a **qualitative approach** to compare the impact of investments promoted by each country in the improvements of their infrastructure in the past decade.

Regarding the classification of a government as erratic or predictable, the study analyzes and **compares the main characteristics of the legal frameworks of Brazil and Canada dealing with private organizations in the aerospace industry**, in order to

determine how predictable the legislation of each country is, especially the laws and regulations that deal with **intellectual property rights, private investment (including FDI), civil aviation regulation, labour, and taxation**. Although these five areas are not the only determinants to the development of independent economic organizations, clear and predictable laws and regulations in these fields are crucial to the success of any economic organization. This comparison uses a **qualitative approach** to establish the differences between the legal frameworks of Brazil and Canada in five different fields of the law.

Finally, in order to determine how weak or strong each government is, our study compared **the law enforcement mechanisms of the judiciary systems of Brazil and Canada** and the associated penalties for breaking the law. The study focused especially on the enforcement of the laws and regulations concerning the five areas of the legal framework listed above. This comparison uses a **qualitative approach** to identify the different law enforcement mechanisms and the associated penalties for breaking the law in Brazil and Canada.

Some of the limitations in comparative analyses of institutional frameworks result from the lack of variations in governments and all the confounding societal features to allow the isolation of governmental effects. Alternatively, abrupt and definitive governmental changes would permit the isolation of government effects from those of other societal institutions (Pearce, 2001; Onodera, 2008).

The **qualitative methodology** of our study was based on the **field research approach**. As part of our research, we have met with representatives from governmental agencies, business associations, researchers and the private sector in both Brazil and Canada in order to collect the primary data that was required to answer the question presented in Section 2 of this document “The Problem to be Investigated.” The study used primary and secondary data collected from the organizations listed below, both in Brazil and Canada. Government representatives interviewed for this study were selected based on their knowledge of the industry and the role their agencies play in the development of the

industry in both countries. Other sources of information included representatives of the aerospace industry, such as Bombardier; industry associations, and universities, all of whom connected to the industry. To collect the primary data, the study used structured interviews with selected collaborators, as opposed to applying questionnaires to a large sample of respondents. As the focus of the study was on the institutional frameworks of Brazil and Canada and their impact in the development of the aerospace industry, we believe that the structured interviews with representatives of the key organizations listed in this section adequately provide the data required to answer the question presented in Section 2 of this report.

We interviewed 17 representatives from 12 different organizations, including government agencies, industry associations, universities, and one private organization within the industry. In a snowball sampling effect, some of the collaborators referred us to other key contact people within the industry, both in Brazil and Canada. The list of selected organizations, in both countries, which collaborate with our research, is presented below:

In Brazil:

- Two representatives from ANAC – National Agency of Civil Aviation;
- Two representatives from MDIC – Ministry of Development, Industry Foreign and Trade;
- One representative from BNDES – Brazilian Development Bank;
- One representative from ABDI – Brazilian Agency for Industrial Development;
- One representative from UnB – University of Brasilia; and
- One former executive from Embraer.

In Canada:

- One representative from Bombardier;
- Three representatives from Industry Canada;

- Two representatives from AIAC – Aerospace Industries Association of Canada;
- One representative from AQA – Association Québécoise de l’aérospatiale;
- One representative from MDEIE – Ministry of Economic Development, Innovation and Export Trade – Quebec; and
- One representative from UQAM – Université du Québec à Montréal.

Besides Bombardier and the government agencies listed above, the industry associations were a useful source of information, as they provided a broader point of view of the interactions between the industry and the governments of Brazil and Canada. All organizations were selected based on their decisive role in the aerospace industry of both countries. After several attempts, it was not possible to meet with representatives from Embraer, the Brazilian Ministry of Justice’s agency responsible for overseeing mergers and acquisitions, and the Brazilian Association of the Aerospace Industries (AIAB) in Brazil. In Canada, it was not possible to establish a contact with AéroMontréal, the Montreal’s aerospace cluster association, and the National Research Council’s Institute for Aerospace Research. As pointed out in the research project of our study, we used secondary sources of information to minimize the lack of the primary sources that were unavailable to the study.

The structured interviews took place in Brazil and Canada, between July and December 2010. The structured questionnaire was prepared with the collaboration of Professors César Garzon, PhD (ENAP Montréal) and Tomás de Aquino Guimarães, PhD (University of Brasília). Both Professors offered their input on the relevance of each question in the context of our research and in the adaptation of the questionnaire to the different realities of Brazil and Canada. Professor César Garzon approved the final version of the questionnaire in June 2010. The final questionnaire first presented the problem to be investigated; and then it presented the four objectives of the research. The next step was to make a brief presentation and explain the context of the research and ask for the interviewees’ permission to record the interviews. The questionnaire had 11 questions and

at the end of each interview, the researcher asked for the interviewees to make comments or remarks on topics that they thought that could be valuable to the research. At this point, some of the interviewees indicated the names and contact information of other people who could collaborate with our project. The questionnaire was originally elaborated in Portuguese and then it was translated into English and French. A copy of the questionnaire is presented at the end of this report, in Appendix B (in English only). All the interviews were conducted face to face with the respondents and they all agreed to have the interviews recorded. The interviews were conducted in Portuguese, English and French. On average, each interview lasted between 45 minutes and 1 hour. We transcribed the audio recordings of the interviews, summarized them, and translated the Portuguese and French transcriptions into English. The summary of the interviews is presented in Appendix C, at the end of this report.

Secondary quantitative data, archival and other secondary source material were obtained from official government sources or representatives of the aerospace industries of Brazil and Canada. Other relevant sources of secondary information include data, documents and reports prepared by the International Monetary Fund (IMF), the Organisation for Economic Co-operation and Development (OECD), and other organizations connected to the aerospace industry.

In order to collect data that could serve as an example of governmental initiatives aiming at the further development of industrial activity in both countries, this research also used official publications prepared by the governments of Brazil and Canada, in addition to documents and reports published in both countries by representatives of the aerospace industry and the industry-related organizations. A list of selected documents used for this purpose is presented on Appendix A: “Selected Bibliographic References.”

After the data collected in the course of the interviews were transcribed, we analyzed how the answers of the interviewees related to the bibliography and the institutional frameworks of Brazil and Canada. This analysis took into consideration the

scope of the research and the limitations of the number of aspects used in the comparisons between Brazil and Canada. To validate the opinions of the interviewees, we compared how similar or different the answers to each question were, and how they relate to government policies and official documents, in addition to other documents presented in Section 8 – Bibliography. To corroborate and illustrate how vital aspects of the institutional environment of each country impact on the aerospace industry, we often cited the opinions and answers of individual interviewees in our analysis in Section 6 – Governmental Support to the Aerospace Industry.

## **5 National Institutional Frameworks and the Aerospace Industry**

Brazil and Canada are unique countries, with their continental dimensions, generous natural resources, freely elected democratic governments, and a long tradition as non-belligerent countries. There are several similarities and differences in the institutional frameworks of the two countries that contributed to the different stages of development of their aerospace industries. In this section, we first discuss the recent changes in the institutional frameworks of Brazil and Canada. In Section 5.3, “The Aerospace Industry,” we present the main characteristics of the global aerospace industry; while discussing some specific details of regional aviation, as both Embraer and Bombardier are competing in this subdivision of the industry.

In Section 5.4, “The Brazilian Aerospace Industry,” we present a brief history of the aerospace sector in Brazil, the main characteristics of Embraer and the local supply chain. The Canadian counterpart, including the history and characteristics of Bombardier and the local supply chain are presented in Section 5.5, “The Canadian Aerospace Industry.”

### **5.1 Recent Developments in the Brazilian Institutional Framework**

Brazil went through profound political, social, and economic changes between the 1980s and the mid-2000s: in 1985, there was a pacific government transition from the military dictatorship that ruled the country for 25 years to a democratic government; a new constitution was promulgated in 1988 and a direct presidential election was held in 1989. The elected president took office in 1990 only to be impeached in 1992, caught in an elaborate corruption scheme that had contacts in most of the Federal Government agencies. The 1980s was known as the “lost decade,” as hyperinflation destroyed the purchase power of the middle class. It was only in 1994 that Fernando Henrique Cardoso, then the Ministry of Finance, presented the “Plano Real,” an economic plan designed to control the inflation and bring some normality to the country’s economy, allowing Brazil to go from

hyperinflation to single digit annual inflation rates. In 1995 Cardoso took the office as the President of Brazil and promoted extensive economic reforms: after the World War II, the Brazilian government promoted a comprehensive import substitution program, stimulating high growth rates. However, this growth was unsustainable and the program was heavily based on state monopolies and a closed economy. During the Cardoso administration, Brazil privatized hundreds of public enterprises that the state had no longer financial resources to maintain or expand (The Conference Board of Canada, 2008; Lattimore and Kowalski, 2008).

The newly democratic regime that started in 1985 promoted major changes in the legal framework of Brazil. The constitution that was promulgated in 1988 marked the starting point of general economic reforms, which besides the privatization of key sectors of the economy included major liberalization policies in investment and foreign trade. The privatizations marked the end of state monopolies in oil and gas, electricity and mining, telecommunications, banking services, transportation, and many other businesses. The economic reforms promoted by the government were somehow compromised by a number of external and internal economic shocks, preventing the country to experience a high sustained economic growth. When compared to China and India, the economic growth in Brazil over the past fifteen years can be regarded as modest, setting the country to be in a transition position. However, the role of the government in this economic development is undeniable and the policy continuity resulted in the establishment of stability in macroeconomic indicators and the balance of payments, together with steady employment growth and improvements in the income distribution (Lattimore and Kowalski, 2008).

The economic reforms initiated in the 1980s had the effect to reinvigorate the trading relationships of Brazil with the rest of the world. In 1988, the participation of trade in the country's GDP was 14 per cent, while in 2006, that figure was 30 per cent. The annual inflation rate was around 3 per cent in 2006, while growth was in the 4-5 per cent range in recent years. In spite of the government efforts to enhance economic development and to promote industrial activity, GDP growth is still struggling with slow rates. During

the years of the import substitution program (from mid 1950s through mid 1980s), real GDP growth averaged 5.9 per cent, while the average since 1989 is 2.2 per cent. One possible explanation for the weak GDP growth is that the country is still in the process of adjustment to the more liberal environment resulting from the economic reforms, together with recent global economic shocks. Another possibility is that the overall investment in research and development is too low in some sectors of the economy (with the notorious exceptions of agriculture and aircraft) and therefore, productivity growth is being held back. In general terms, recent economic analysis shows that Brazil's trade performance is modest, especially when compared to other emerging countries (Hausman, 2008)

The recent economic reforms promoted by the Brazilian government have coincided with a marked rise in the relative prices of products based on natural resources. In addition, a more open trading environment in Brazil has caused the country's trade mix to change. Brazil has recently registered an increase in the exports of primary sector goods at the expense of some non-food manufactures. It is important to remark that the international competitiveness of certain sectors of the economy, such as machinery and equipment remains strong. In addition, Brazil has a growing ethanol industry, which is considered of great importance as the world struggles with the transition to alternative energy sources. The country is also a strong player in the export of soy beans, and of iron ore – a commodity in increasingly high demand by China, one of Brazil's main trade partners. Together with continued fast growth in emerging economies, this factor can continue to provide consumers with the benefits from inexpensive imports and growing exports for the competitive sectors of Brazil. The share of the agriculture sector in Brazil's GDP is considered to be somewhat small, but the sector is of particular importance, since Brazil is a major world producer of beef, coffee, soya, sugar, and wheat (The Conference Board of Canada, 2008; Lattimore and Kowalski, 2008).

However important the changes in the trade and trade-related policies are, the government of Brazil still has some major challenges ahead in order to remove all the constraints on the tradable sector. Some main problems to be corrected include the

necessary infrastructure improvements of port and airport systems and facilities, together with the road and railroad systems. Another major challenge is the value-added taxation system that continues to be biased against exporters. Finally, the high payroll taxes and the complex labour legislation tend to reduce the competitiveness of businesses and simultaneously reduce employment incentives. Recent empirical research indicates that Brazil should liberalise even further, if it wants to improve income distribution, productivity across the tradable sectors and international competitiveness (Lattimore and Kowalski, 2008).

With further support from the Brazilian government – in the form of additional reforms aiming at the facilitation of the independent organization, a more predictable set of laws and regulations, and a strong government capable of enforcing its laws, service sectors and traditional exporters could gain even more in global, highly competitive business environment. According to Brazil's National Confederation of Industry (CNI), there are urgent issues that need to be addressed by the public administration, so Brazil could offer an improved environment for the further industrial development of the country. CNI considers that the institutional development of the country is directly connected to its growth: in order to grow more, Brazil needs to break the vicious cycle resulting from partial and inconclusive institutional reforms. In an environment of economic growth, it is easier to promote institutional improvements that can facilitate even further the development of the country. Some of the issues that need to be addressed are: financial support for entrepreneurial innovation, fiscal incentives and direct support to research and development, property rights and improvement of the patenting system, the public policies concerning the access to foreign markets, the development of different policies for specific sectors of the economy, the improvement of the technological services infrastructure, and the development of industrial policies that include SMEs (CNI, 2005).

## 5.2 Recent Developments in the Canadian Institutional Framework

Similar to Brazil, Canada is a country of continental dimensions, rich in natural resources. The country became a self-governing dominion in 1867, while retaining ties to the British crown. Economically and technologically, the nation has developed in close parallel with the United States, the neighbour to the South across an unfortified border. The economies of the two countries are closely integrated: in 2008, the U.S. economy absorbed 75.5 per cent of all goods exported by Canada, and it was the source of 63.4 per cent of its imported goods. In 2008, the country GDP amounted to U.S. \$ 1,499.5 billion (market exchange rate), which positions Canada as the 11<sup>th</sup> largest economy in the world (Central Intelligence Agency, 2010).

Canada is an affluent, high-tech industrial society in the trillion-dollar class, with seats in the G7 and the G20, and membership in all major international organizations. The country has a market-oriented economic system, a sophisticated pattern of production, and high living standards. Profiting from the economic growth of the United States since World War II, Canada has experienced impressive growth of the manufacturing, mining, and service sectors, all of which contributing to transform the nation from a largely rural economy into one primarily industrial and urban . Almost 58 per cent of Canadians speak only English; while 22 per cent speak only French, most of whom are in Quebec. This language and cultural differences leaves Canada with a serious fault line, even though current support for sovereignty in Quebec is soft. Additional source of political concern is the public demands for quality improvements in health care and education services (The Conference Board of Canada, 2009; The Economist Intelligence Unit, 2009).

After signing the 1989 U.S.-Canada Free Trade Agreement (FTA) and the 1994 North American Free Trade Agreement (NAFTA) (which includes Mexico), the country experienced a dramatic increase in trade and economic integration with the U.S., its main trade partner. Canada is the largest foreign supplier of energy to the United States, and exports include oil, gas, uranium, and electric power. Canada also has great natural

resources, a skilled labour force, and a modern capital plant, which reflects in solid economic growth. The government also plays an important role in this growth, since a prudent fiscal management resulted in consecutive balanced budgets from 1997 to 2007. (The Conference Board of Canada, 2008; OECD, 2009)

After the global economic downturn of 2007-2008, Canada experienced slow economic growth, combined with the U.S. housing slump, plunging auto sector demand, and a drop in world commodity prices. From October 2008 to August 2009, the economy shed an estimated 400,000 jobs. Foreign trade continues to depend on the U.S. economy, although revenues originated from raw materials were expected to increase in the years following the economic crisis, due to a price appreciation of commodities. After contracting by 2.7 per cent in 2009, the real GDP was forecast to grow by 3.2 per cent in 2011 (The Conference Board of Canada, 2009, OECD 2010).

Although governments play a decisive role in the economic growth of a country and can as a consequence, benefit from higher revenues in a healthy economic environment, in 2009, Canadian public finances deteriorated for the first time since the mid-1990s. Even though the planned capital spending by all levels of government managed to boost real GDP growth to 3.6 per cent in 2010, earlier tax cuts and a stimulus package budgeted at CAD \$46.6bn hit public finances hard. As a consequence, the recent string of fiscal surpluses came to an end in 2009. Recent tax cuts together with the cyclical decline in revenues and the stimulatory spending measures had the potential to cause the general government deficit to rise significantly. The government deficit was expected to remain high in 2010, when the stimulus measures were scheduled to start being withdrawn. The stimulus package was viewed as a legitimate effort to tackle unfavourable economic conditions, but it had the side effect of decreasing government revenues sharply. The resulting deficit at the federal and provincial levels of government is considerable and there is a concern about its overall effectiveness, as governments struggle to rebalance their books (The Economist Intelligence Unit, 2009; The Conference Board of Canada, 2009; OECD, 2009; OECD, 2010).

Regarding the stimulus package promoted by the Canadian government, especially in light of the aging population of Canada, it is crucial that the country enters the second half of the next decade with reduced levels of net public debt (Dodge, 2010). As Quebec alone concentrates between 55 and 60 per cent of the Canadian aerospace industry, a snapshot of Quebec's overall business environment and support to the development of the aerospace industry should reflect the potential for growth of Canada's aerospace industry.

The Ministry of Economic Development, Innovation and Export Trade of Quebec (MDEIE) is the agency responsible for supporting economic development, innovation, and exports in the province. In addition, MDEIE supports R&D programs that can have a positive impact on the scientific, social and cultural development of Quebec. The Ministry recognizes that the private sector is the main force of economic development, while stating that private firms must take their fair share of risks when investing in economic projects. In addition, Quebec understands that economic development should benefit all citizens of the province, a clear statement that the redistribution of wealth remains as one of the priorities of the provincial government. In addition, the Quebec government states that the development of public infrastructures contributes to sustainable economic development, which is reflected in the province's commitment to invest in research, technology and transport infrastructures, professional and technical training programs, and energy infrastructures (MDEIE, 2010).

On the other hand, in a report published in August 2011, the Quebec Employers Council (Conseil du patronat du Québec) states that Quebec is losing its overall competitiveness when compared to other Canadian provinces (Alberta, British Columbia, and Ontario) and the OECD countries. The Council publishes an annual survey encompassing 21 indicators of economic competitiveness, regrouped in five main categories: 1) availability and quality of the labour force; 2) cost of the labour force; 3) regulation; 4) public finances; and 5) overall business environment. On average, Quebec received a grade C on the indicators included in the survey, while the other provinces had an average grade of B- (Ontario and BC) or B (Alberta). According to the Council, in terms

of human resources management, Quebec is lagging behind in areas such as the percentage of young adults who do not have a secondary diploma; the proportion of adults who have a degree in an area related to their employment; and the economic integration of immigrants. In addition, labour costs in Quebec are higher than in the other three provinces, placing Quebec in 15th place in a list of 26 provinces/OECD countries surveyed by the Council (Hill Times, 2010; Conseil du patronat du Québec, 2011).

The province is also lagging behind in terms of public finances, as the Council points out that the tax burden and level of public debt are considered to be harmful to the economic growth of Quebec. In addition, Quebec also should address issues such as the perceived low entrepreneurship intensity; a low number of registered patents; poor investments in information and communication technologies; and low global productivity. On the other hand, Quebec is well placed in terms of investments and maintenance of its infrastructure and investments in R&D. Even though the report does not specify the concerns of different economic sectors (e.g. the aerospace industry) in terms of the efficiency of public policies aiming at economic development, it is important to stress that the Council reflects the needs and values of private organizations doing business in Quebec; which include the aerospace sector (Conseil du patronat du Québec, 2011).

### 5.3 The Aerospace Industry

According to Lima et al. (2005) and Ferreira (2009), the aerospace industry can be usually divided into three different industrial sectors:

- 1) **Aeronautic** – this sector comprises companies that operate in the following fields: design and manufacture of aircraft (airplanes and helicopters) and aircraft parts; aircraft engines and engine parts; avionics and electronic systems; maintenance, repair, and overhaul; simulators and training; and design and manufacture of space ships;
- 2) **Defence** – this sector is dedicated to the development and production of weapons: missiles, rockets, radars and their parts and systems. The sector also produces several defence and communications systems (both the ones integrated in aircraft and the ones installed in land facilities) and their integration into defence networks; and
- 3) **Space** – this sector deals with the development and manufacture of space vehicles: satellites and their on-board equipment, probe rockets and their parts and systems, besides other specialized services.

These three sectors have a common technological base that relies upon aerodynamics, resistance of materials, thermodynamics, and electronics. The industry is characterized by intensive innovation and the duality (civilian and military) of its purpose. Heavy investments in innovation explain why aerospace is usually connected to other industrial systems based on scientific advancements, while the duality of purpose explains why aerospace is considered one of the most strategic industries of all productive structures, in a global scale. The launch of a new aircraft is seen as an act of innovation, and it successively restructures the market. The enormous cost of launching new models, associated with forbidding risks crucially affect the market conduct and its performance. As a result, analyses that do not take the central importance of innovation into account can hardly be deemed adequate. Large original equipment manufacturers (OEMs) usually

integrate numerous technologies and systems, originating from various fields and industries, combining them into ever more efficient and capable means of air transport. A modern jet aircraft combines millions of components, incorporating a wide range of seemingly unrelated technologies: materials, propulsion, electronics, hydraulics, aerodynamics, among others. The many constituent systems found in a new jet aircraft are individually extremely complex. The current cost to develop a new commercial jet aircraft is estimated to be approximately \$4-\$6 billion in upfront R&D expenditure (Tyson, 1993; Ferreira, 2009).

The relevance of the state in the aerospace industry can be understood as the presence of the state is crucial in determining the investment levels in regards of both the demand and in support of technological development. Public demand is crucial for the defence and space sectors. In all countries that are major producers of weapons, the defence sector (including the military segments of the aeronautic and space sectors) seeks primarily to meet the demands of its armed forces. The exports of the defence sector, which can be categorized as weapons, need the support, or at least the acquiescence of the state. As a result, larger nations see a domestic aircraft industry as an integral part of their defence strategies. In the space sector, demand for scientific equipment is virtually restricted to public orders. In the commercial area, the state can influence the demand through the selective protection of market segments (Tyson, 1993; Lima et al., 2005; Ferreira, 2009; Hira and De Oliveira, 2007; De Oliveira, 2009).

Aircraft production is one of the most technologically complex sectors, and it requires heavy financial investment, usually in different conditions of business cycles. In addition, the industry is known for constantly developing technological applications and supporting high levels of well-paid employment. For these reasons, the state is committed in supporting the development and introduction of new technologies in the aerospace industry. Besides the direct support for R&D through the establishment of research centers, the state can offer long-term loans at low interest rates to finance the development of new projects in science and military equipment. It can also offer incentives and tax subsidies for

commercial projects, besides financing investments and the expansion of production capacity and marketing. Moreover, the state is the main coordinator agent of the assets restructuring process (mergers, acquisitions and strategic alliances) of the industry, both at the national and international levels (Tyson, 1993; Lima et al., 2005; Ferreira, 2009; De Oliveira, 2009).

Aerospace has always relied upon heavy governmental subsidies in order to continue to improve technology. However, in the past decades, the business environment of the industry has evolved into four main areas: deregulation, consolidation of international competition (including mergers and acquisitions), reduction of government support, and commercial disputes on the WTO (Hira and De Oliveira, 2007; De Oliveira, 2007). In addition, the aerospace industry is of vital importance to the governments of Brazil and Canada, as the well-documented disputes between the two countries illustrates. According to Goldstein and McGuire (2004), as far as the WTO disputes are concerned, both governments are supportive of their industries:

Through the latter part of the 1990s and dragging on into the first years of the new millennium, Brazil and Canada engaged in a remarkably bitter and lengthy trade dispute concerning government support for their respective national aerospace industries.

There are some particular characteristics of the aerospace industry that can justify the concerns of national governments to support the development of the industry. The aerospace industry plays a strategic role in national economy and security of a country. The industry is also known for:

1. High economic concentration and expressive barriers to entry: it is not uncommon for an OEM to risk all of its liquid assets in the development of a new product;
2. Intensive use of scientific and technological research (exemplified in the high investments in R&D);
3. The technological complexity of its products;

4. Dominance of large conglomerates as the main players;
5. National (or at least, regional) control of firms, despite the global characteristic of the industry;
6. The establishment of partnerships, especially in the space division (e.g. NASA and CSA joint projects);
7. Imperfect competition (the top ten global players account for 85 per cent of all profits);
8. Tight profit margins, even though the industry generates significant revenues;
9. The return on investments is generated on long-term: it can take up to 6 years between the launching of a new aircraft and the first delivery of the finished product. The average ROI period for investments in new aircraft platform is between 10-12 years, and high levels returns are projected over a 30-40 period; and
10. Intense participation of governments, both at the civil and the defence sectors (De Souza, 2007; Ferreira, 2009; AIAC, 2010).

As a consequence, competition is limited in each sector of the industry (large civilian aircraft, regional aircraft, business jets, helicopters, etc). Aircraft production requires massive economies of scale and sophisticated supply lines, which in most cases results in natural oligopolies. The high barriers to entry are in part caused by the requirements of the industry in high capital commitments to design and produce aircraft, highly skilled and concentrated workforce and its heavy regulations in terms of performance and safety. In addition, manufacturers have to constantly deal with inconsistent orders (both because of competition and business cycles); the constant necessity to improve the models as well as the production of many variants of each generation of aircraft. Also, production capacity should be flexible enough to be changed quickly to meet the sales, as virtually every unit is custom produced. As a result, since the 1960s, only one entirely new manufacturer of aircraft – Embraer – was capable of

entering in the civil jet aircraft market (Niosi and Zhegu, 2005; Hira and De Souza, 2007; De Souza, 2007). Figure 3 shows how the industry structure creates cost pressures on manufacturers:

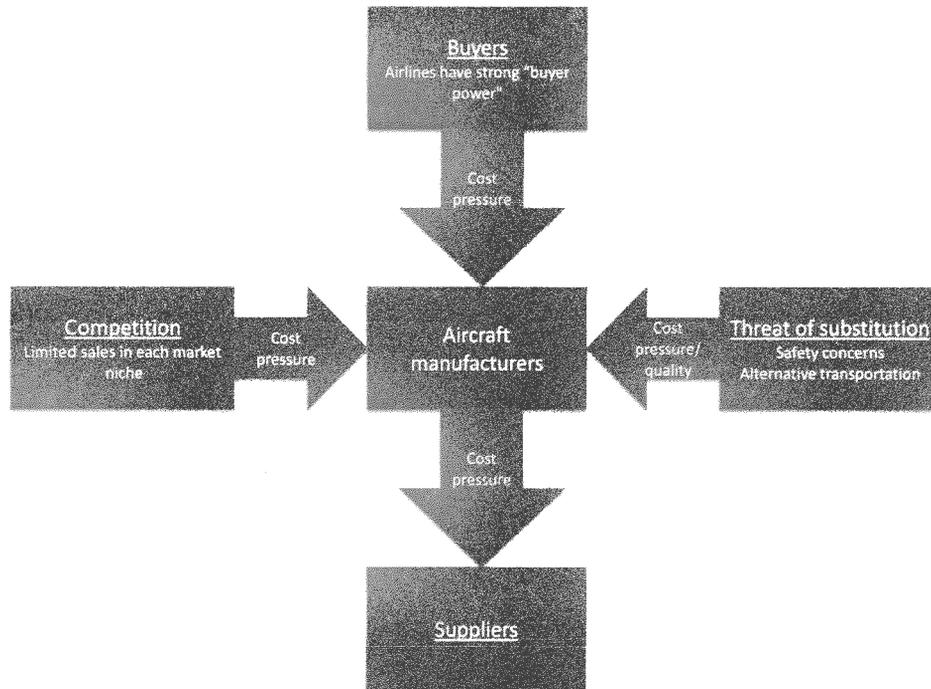


FIG. 3 – Aerospace Industry Structure and Cost Pressures

Source: Sherry and Sarsfield, 2002

In order to survive, the few established business in the industry have to face strong competition and observe the unique dynamics of the industry. Niosi and Zhegu (2005) argue that

Aerospace is a high value-added sector, strongly affected by scale and timing. The industry success depends on rapid technological progress; government support for corporate R&D is essential. Their activity depends on components and parts which can be widely dispersed in terms of both industry and location.

The aerospace sector will tend to concentrate in regions where a pool of skilled and semi-skilled labour is available, which translate into regions with strong presence of

universities, research centers and laboratories, both public and private. Moreover, the availability of skilled personnel, combined with the development of a specialized supply chain resulted in the concentration of the industry in a few regional aircraft clusters, located in cities such as Montreal, Toronto, Seattle, Toulouse, and in a certain way, São José dos Campos. The industry is highly concentrated in North America, which controls 48.5 per cent of total revenues, and Europe, which accounts for 43 per cent of world revenue. A recent trend in the industry is the shift of production towards low-cost high-GDP areas, such as Asia-Pacific and Latin America. In 2009, commercial airlines accounted for 78.5 per cent of the aerospace industry revenues, followed by freight, at 10 per cent, and other end-users at 11.5 per cent (Niosi and Zhegu, 2005; Bernardes, 2010; Deloitte & Touche LLP, 2010).

The strong “buyer power” that the airlines exhibit over aircraft manufacturers compounds the sales pressure on cost. In general, airlines do not operate as independent buyers, even though there are a large number of commercial airlines and aircraft leasing agencies that are very active in the world market. In addition, airline demand for new equipment is heavily influenced by energy prices and economic growth. As a consequence, the requirements of the airlines tend to be quite similar in terms of what aircraft each air company needs and when they them to be available. These shifts in the demand for types and quantities of aircraft tend to be synchronized and effectively mimic the behaviour of a single buyer (Sherry and Sarsfield, 2002).

In order to illustrate the current dynamics of the competition in the aerospace industry, Niosi and Zhegu (2005) state that

In the last 10 years, civil aircraft original equipment manufacturers (OEMs) have been competing for orders from airline companies, whose revenues have been declining. The four major civil aircraft prime contractors are EADS/Airbus and Boeing (for planes over 100 seats) and Bombardier and Embraer for regional jets.

Even though the international aircraft market has a global dimension, it is characterized by a concentrated oligopoly worldwide. Today, no country has an internal

market that is both dynamic and large enough to singularly finance the high costs of developing a new aircraft. Only a few global players can afford such costs, and they tend to organize themselves into large aerospace conglomerates, focused on the different sectors of the industry: aeronautic, defence, and space. As the development of new aircraft is a highly capital-intensive and risky venture, military orders have been essential to maintaining basic stability in the industry. Commercial aircraft production is strategic in the traditional defence context because of spillovers between commercial and military operations. Scope economies and technological innovation are deeply intertwined in both sides of the industry. All commercial airframe manufacturers are also major military contractors, and both sides of the industry share an overlapping pool of subcontractors and component suppliers. The collaborations between the military and civil divisions of the industry are remarkable: while defence equipment focus on performance and flexibility; the commercial sector focus on cost and reliability – resulting in overall high technology and innovation, the trademarks of the industry. As a consequence, it is no accident that the democratic countries which are the biggest sellers of defence equipment are also the major producers of commercial aircraft (Tyson, 1993; Sherry and Sarsfield, 2002; Niosi and Zhegu, 2005).

To remain competitive and cost-effective, several large OEMs have taken advantage of economies of scale and the risk/cost sharing benefits of merging or outsourcing. As a result, a majority of the components in modern aircraft are designed and manufactured by vendors in the supply chain. The consolidation of the industry's supply chain has decreased costs. From the perspective of the large OEMs, the mergers reduced the number of suppliers, eliminating the costs of managing and executing contracts. In addition, the mergers also reduced the cost of the components, as they provided products already integrated by suppliers and eliminated duplication of general administrative costs that were previously included in the cost of each individual component. A more integrated supply chain meant eliminating duplicate equipment and processes and utilizing shared parts inventories, which is believed to be a source of cost reduction (Sherry and Sarsfield, 2002; Niosi and Zhegu, 2005).

These mergers also reflected in the way large OEMs place themselves in the industry, as the world market became more and more competitive in recent decades. Figure 3 shows that some major players of the industry opted to merge or acquire other companies, while others went out of business (Sherry and Sarsfield, 2002; Niosi and Zhegu, 2005). As a result, the industry became more and more concentrated between 1980 and 2008:

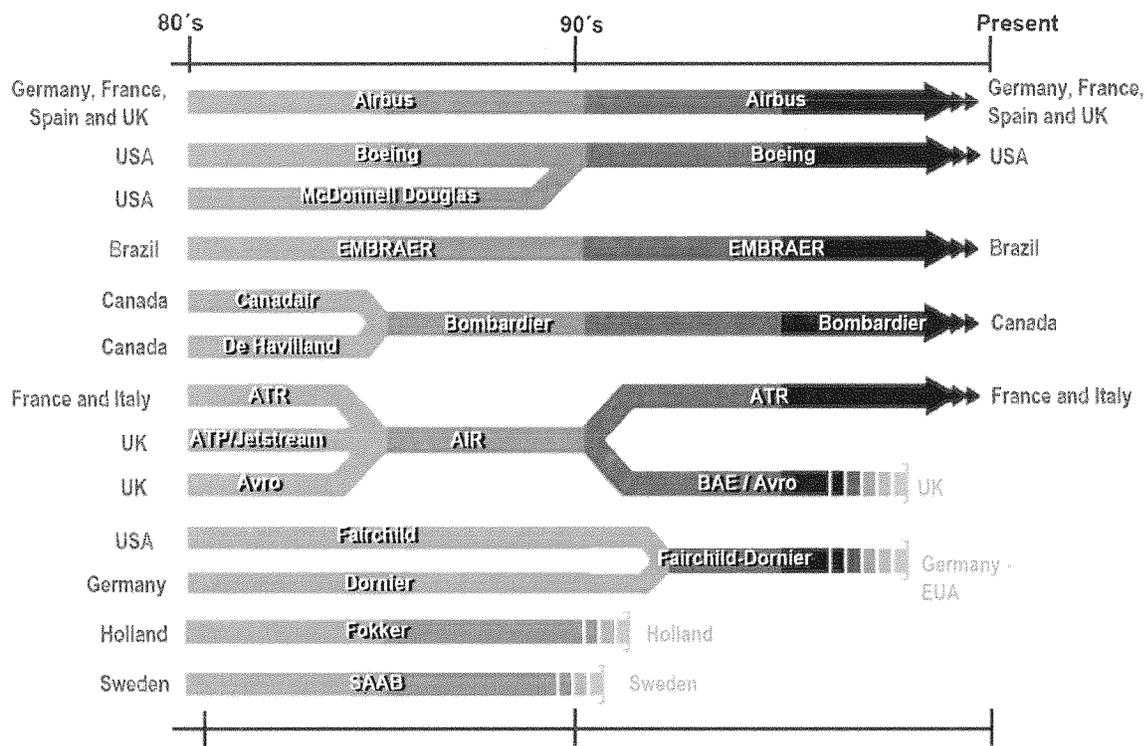


FIG. 4 – Concentration of the World Civil Aircraft Industry (1980-2008)

Source: ABDI & UNICAMP, 2008

The growing technological complexity of the industry, which is reflected in its high R&D costs, has been forcing the large manufacturers into the specialization of tasks: large players will concentrate on designing and assembling new aircraft, while their suppliers will handle the production of structural components and parts, such as fuselage and wings. The implication of such arrangement is that the further development of the aerospace industry will depend increasingly on a strong supply chain and the capacity of the large players to coordinate such diverse supply chain (ABDI & UNICAMP, 2008).

In the 1980s, the industry developed a new characteristic that is now progressively widespread: **the industrial offset agreements**, which are aimed at transferring part of an aircraft production to a country with less technological capacity. Such agreements were designed as a way to force the relocation of the economic activity from the selling country to the one purchasing the aircraft. Thus, major buyers managed to impose purchasing conditions, such as partnerships in the manufacturing of new aircraft, which suppliers could not ignore. In the end, the offset agreements triggered an international transfer of production skills from one nation to another, allowing competitors to build new production capabilities. These offset agreements are the result of strong competitive pressures and the bargaining power from buyers. De Souza (2007), citing Pritchard (2002) states that the agreements were originally conceived by Douglas, when it subcontracted the assembly of the wings and fuselage for the DC-9 and DC-10 in Canada and Italy, which resulted in substantial sales to these countries. Therefore, the offset agreements are meant to support a sale that would not take place in the absence of a compensatory scheme (Hira and De Souza, 2007; De Souza, 2007).

Concerning the organization of the aerospace industry, Figure 5 shows the hierarchy divisions within the industry, which are generally referred to as “tiers”:

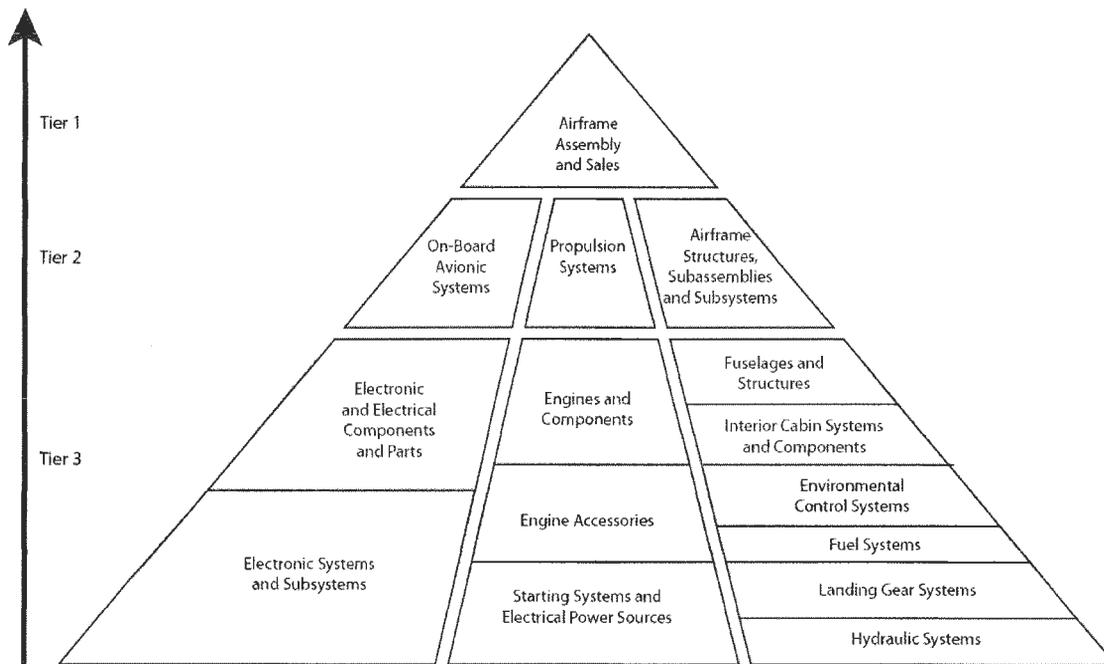


FIG. 5 – The Subdivisions of the Aerospace Industry  
 Source: Niosi & Zhegu (2005)

OEMs are located at the top of the pyramid and are usually referred to as Tier 1. OEMs include the main aircraft assemblers, such as EADS/Airbus, Bell Helicopter Textron, Boeing, Bombardier, Embraer, and Eurocopter. There are significant entry barriers in this tier, as a reflex of high costs of developing a new aircraft, technical training and the complexity of post-sales services. Even though OEMs have a relatively low volume of production, an aircraft is a highly complex product: a Boeing 747 has approximately six million individual parts, while a modern aircraft has on average over 100 kilometres of cables (Lima et al., 2005; Niosi and Zhegu, 2005).

Tier 2 encompasses manufacturers of propulsion systems (General Electric, Pratt & Whitney, Snecma, and Rolls-Royce), on board avionics (Honeywell, Sextant Avionique), airframe structures and subassemblies such as landing gear, nacelles, and hydraulic systems (Messier-Dowty, Héroux-Devtek). Developing costs at this tier are also high: developing a new engine can cost up to U.S. \$1 billion. This segment also encompasses the maintenance,

repair and overhaul (MRO) services, which are essential in the industry, considering that the lifespan of an aircraft is 25-40 years. Differently from the rest of the industry, MRO services tend to expand in economic crisis, as customers tend to postpone the purchase of new aircraft and invest more on the maintenance of their current fleet (Lima et al., 2005; Niosi and Zhegu, 2005; ABDI and UNICAMP, 2009).

Tier 3 is composed of producers of electronic subassemblies, hydraulic systems, and fuselage parts. Even though Tier 3 is at the base of the pyramid, this division of the industry is a highly concentrated group of producers, with only a handful of manufacturers dominating each segment (Lima et al., 2005; Niosi and Zhegu, 2005).

Besides these 3 tiers, hundreds of small and medium enterprises (SMEs) complete the supply chain of the aerospace industry, offering parts and components to be assembled by tier 2 and 3. In general, large aerospace clusters are consisted of one or more OEMs surrounded by hundreds of SMEs, which supply parts and components to the tiers at the upper levels of the industry pyramid, besides rendering maintenance, repairing, and alignment services to aircraft. With large OEMs outsourcing their design and manufacturing activities to companies in Tier 3 in order to reduce the cost of components, the origin and rate of flow of innovation and technology development in the industry has radically changed in recent years. As a result, R&D – a key determinant of sustainable competitive advantage, is now performed by fragmented vendors in the lower end of the supply chain (Sherry and Sarsfield, 2002; Lima et al., 2005; Niosi and Zhegu, 2005).

The clusters within the industry are highly specialized. The main components of an aircraft (fuselages, wings, engines, avionics, landing gear, etc) are high-value parts that can be easily shipped from one cluster to another at relatively low transportation costs. As a consequence, civil aircraft assembly is concentrated in a few clusters (Montreal, Seattle, Toulouse, and São José dos Campos). The production of engines is concentrated around GE's plants in the U.S. (in Ohio and Massachusetts), and in Montreal as well. Seattle is a cluster for engineering and production of large commercial aircraft, since Boeing is located

in that area. The companies located in the Toulouse cluster are major suppliers of EADS/Airbus and ATR. This points out to the dominance of large OEMs in the clusters, acting as a magnet for suppliers and other SMEs within the industry. Another characteristic of the industry is that its clusters display strong international connections rather than local ones, which also reflects in the inter-firm competition, which takes place around the world, not within the cluster (Niosi and Zhegu, 2005).

In 2009, the estimated global size of the aerospace industry was U.S. \$382 billion, including both military and civil sectors. The value includes all components of the value chain ranging from aircraft and aircraft parts; and aircraft maintenance, repair, and overhaul. The global civil aviation aerospace sector accounts for 46 per cent (U.S. \$ 176 billion) of the whole industry, while the military aerospace sector comprises the other 54 per cent (U.S. \$205 billion) of the 2009 total revenue. In the civil aviation segment of the industry, aircraft manufacturers account for 59 per cent of total revenues, followed by manufacturers of engines and engine parts (22.5 per cent), and airplane part and equipment manufacturers (18.5 per cent) (Deloitte & Touche LLP, 2010).

The industry relies heavily on capital (e.g. the financing of aircraft sales); extremely qualified workers (e.g. engineers, researchers of new materials, specialized technicians); infrastructures (e.g. energy, transportation); and technology (R&D centers), all of which expose it to a wide variety of economic risks and in which development and availability governments play a central role. In addition, since aerospace is a global industry, macroeconomic disturbances in any part of the world are most likely to influence the businesses of the industry in all continents. As the civil aviation industry is closely connected to the performance of the airline companies, its sales were hurt in the recent financial crisis. On the other hand, the military and defence industry continued to profit from the rising threat of global terrorism and remained a lucrative niche for its players, who also benefit from high barriers to entry. Considering the 2009 global revenue, the three main countries in the civil aerospace industry are the United States, the European Union, and Canada (Lima et al., 2005; Deloitte & Touche LLP, 2010).

Table 2 shows the top 9 global civil market leaders in 2009:

Rank	Company	Country	Civil Manufacturing Revenues (U.S. \$ million)	Percentage of Total Civil Manufacturing Revenues
1	EADS/Airbus	E.U.	43764	34.5%
2	Boeing	U.S.	29897	23.6%
3	United Technologies	U.S.	11195	8.8%
4	General Electric	U.S.	9414	7.4%
5	Bombardier	Canada	7761	6.1%
6	Rolls-Royce	UK	6997	5.5%
7	Embraer	Brazil	4834	3.8%
8	Honeywell	U.S.	4325	3.4%
9	Textron	U.S.	4325	3.4%
10	Other	n/a	4198	3.3%

Table 2 – Top Global Civil Market Leaders  
Source: Deloitte & Touche LLP (2010)

The military aerospace market is concentrated at the various departments within the military establishments in each country. The defence market is usually seen as unpredictable and even unstable within the industry, and its development depend basically on governmental procurement decisions (Lima et al., 2005). Even though defence purchases and military investments in R&D have been decisive the development of the aerospace industry in most countries, the focus of our study is on the civil aerospace industry.

Deloitte & Touche LLP (2010) points out that in terms of industry development, the main drivers of the civil aerospace industry are:

- GDP;
- Renewal and expansion of active fleet;
- Long term pilot and workforce shortages;

- Industry expansion in emerging markets;
- Changes in rules and regulations;
- Changes in technologies and intensity in R&D;
- Aircraft deliveries and backlogs, together with the risks of order cancellations.

In terms of industry development and production costs, an expansion in orders is a major driver of investments in modernization and growth of the installed productive capacity. Expansion in the civil aerospace sector is directly connected to general economic growth and favorable financing conditions. Expansion in the defence and space sectors is connected to the interest of governments in renewing and expanding military equipment and advancements in space exploration programs. Regarding production costs, they are incurred both directly (R&D) and indirectly, as sunk costs are common in the initial phases of the technological learning curve. Sunk costs usually decrease after a new aircraft is fully assembled; as the workforce assimilates the required skills and the number of aircraft produced increases. It is estimated that production costs decrease by 20 per cent when production is doubled, while labour requirements are estimated to drop by 30 to 40 per cent. This is one of the main drivers for major players to have a strong presence worldwide (De Souza, 2007; Ferreira, 2009).

### 5.3.1 Regional Aviation

Bombardier and Embraer both compete for the leading position in the regional and business aircraft segment of the industry. For the aerospace industry, regional aviation became more important in the late 1980s, as the world market for the civil aviation changed radically when large airlines shifted from point-to-point to hub-and-spoke networks, which required large aircraft only for the service of major airports, whereas regional aircraft fed the lines around the hub. For companies as Bombardier and Embraer, this change in the civil aviation industry inaugurated the era of regional jets. As passengers expressed their preferences for regional jet aircraft instead of propeller-driven machines, sales of regional

jet aircraft soared, and that was the genesis of the Brazil-Canada dispute on the WTO (Goldstein & McGuire, 2004; Lima et al., 2005; Niosi and Zhegu, 2005; ABDI & UNICAMP, 2008).

As competition in each niche of the industry is fierce, aircraft manufacturers are obliged to consider each sale a “must win,” not only because of revenue generated by the sale and market share, but for the sustained revenue from spares and maintenance over the lifespan of the aircraft. Each successful sale is also considered to increase the probability of future sales to any given airline by virtue of the economies of scale that the airline can achieve by operating a fleet of aircraft with the same (or similar) engines and other aircraft system components. As a result, the Bombardier and Embraer follow the maxim of the industry, “don’t abandon a market to the competitors,” seeking creative ways to finance and serve each airline’s specific needs at almost any cost (Sherry and Sarsfield, 2002).

In 2008, Bombardier had annual revenues of U.S. \$10 billion, while Embraer amassed U.S. \$ 6.3 billion in that same year. Even though Bombardier and Embraer are a quasi-duopoly in the regional aircraft segment, there are several other players competing in that niche: Textron, General Dynamics, Onex Corp, and Dassault, for example. Competition is expected to recrudescence in the coming years, as the Chinese and the Russian governments were backing two new companies to enter the regional aircraft market in late 2010 (Deloitte & Touche LLP, 2010).

Considering annual revenue, large commercial aircraft, the segment in which Boeing and EADS/Airbus compete, dominate world sales: in 2009 large aircraft had an estimated U.S. \$60.8 billion in revenue, against U.S. \$15.5 billion of regional and business aircraft. Large aircraft are also predominant in the world’s commercial airline fleet: in 2008, 83.7 per cent of the 18,800 aircraft were large commercial aircraft, against 16.3 per cent of regional aircraft (ABDI, 2010; Deloitte & Touche LLP, 2010).

The economic crisis that started in 2007 had an extremely negative impact on the regional and business aircraft segment: order volumes for business aircraft dropped by 38 per cent in 2008. Other factors that have a negative impact in the performance of the regional segment are:

1. The economic and environmental efficiency requirements that are pushing airlines to larger aircraft – as a result of more passengers in each route, air carriers will likely replace smaller regional aircraft with larger models. The consumption of fuel (and the autonomy of an aircraft), combined with the emissions of air pollutants can also determine the size of the aircraft in a regional carrier's fleet;
2. The congestion at major airports that is driving demand away from the smallest planes – as the busier the airport, the higher the prices charged for their services, which most likely will drive away regional carriers; and
3. The trend of fractional ownership arrangements in the business market – despite the maintenance and fuel costs, more businesses and individuals can afford to buy a “percentage” of an aircraft and have the rights to use it for a certain number of hours a year. In this model, regional airlines are more exposed to the risk of losing customers than the larger ones (ABDI & UNICAMP, 2009; Deloitte & Touche LLP, 2010).

## 5.4 The Brazilian Aerospace Industry

The genesis of the Brazilian aerospace industry is tightly connected to the reorganization and development of the Brazilian Air Force in the 1940s. During the World War II, Brazil had to reconsider the efficiency of its aerial defence system, which was scattered between the three armed forces – each of them with their own aircraft, controlled independently from a central command. In 1941, with the technical support of the United States government, Brazil created the Brazilian Air Force. One of the objectives of the Air Force was the constitution of a national aerospace industry and mastering of the technology necessary for that achievement (Forjaz, 2005; Silva, 2008).

As Brazil lacked most of the infrastructure in transportation, communications, and energy, the Air Force knew that it would be almost impossible to develop the aerospace industry at that stage of country's economic development. Instead, the government opted to develop an aeronautics engineering school and a research center on aeronautics technology. In 1946, the then Brazilian Ministry of Aeronautics (which was merged into the Ministry of Defence, together with the Ministries of the Army and the Navy in 2001) created the Brazilian General Command for Aerospace Technology (CTA), a research facility aimed at the improvement of the Brazilian Air Force operations. In 1948, the Ministry created the Aeronautical Institute of Technology (ITA), a higher education and training facility with emphasis in aerospace science and technology, funded by the Federal Government. Even though Brazil lacked a minimal industrial infrastructure at the time, the establishment of CTA and ITA marked the initial investment in the training of high qualified aeronautic engineers, an investment that would generate new specializations in aerospace electronics, mechanics, and infrastructure in Brazil (Forjaz, 2005; Silva, 2008).

In 1950, CTA was transferred to São José dos Campos; a city located 100 kilometres Northeast of São Paulo, which would later become the Brazilian aerospace cluster. The establishment of CTA and ITA in São José dos Campos was essential not only to the development of the Brazilian aerospace industry but also to the economic

development of the Vale do Paraíba region, where the city is located (De Souza and Da Costa, 2010). In the 1950s and 1960s, CTA and ITA became reference centers in high technology in Brazil and both institutions assisted in the creation of several private businesses, including Embraer (Forjaz, 2005). In 1964, a *coup d'État* and the military regime that would be in power for the next 25 years intensified the development of the Brazilian aerospace industry: the military not only had control over the Federal Government budget but they also had more freedom to increase the investments in military equipment and defence (Pinto, Migon and Montoro, 2007; Silva, 2008).

In 2006, North America was the main importer of the Brazilian aerospace industry, as the destination of 49.4 per cent of the Brazilian aerospace production (to the amount of U.S. \$1.84 billion), followed by Asia and the Middle East, which imported 23.1 per cent of the Brazilian production (at U.S. \$863 million), the European Union at 22.3 per cent (U.S. \$835 million), while the rest of the world bought 5.2 per cent of production (U.S. \$194 million). For these reasons, the Brazilian government consider the aerospace in general and Embraer in particular to be a key element in the economic, technological and geopolitical development of the country (ABDI and UNICAMP, 2008; ABDI and UNICAMP, 2009). Figure 6 shows the segmentation of revenues in 2007 (in percentage of revenues):

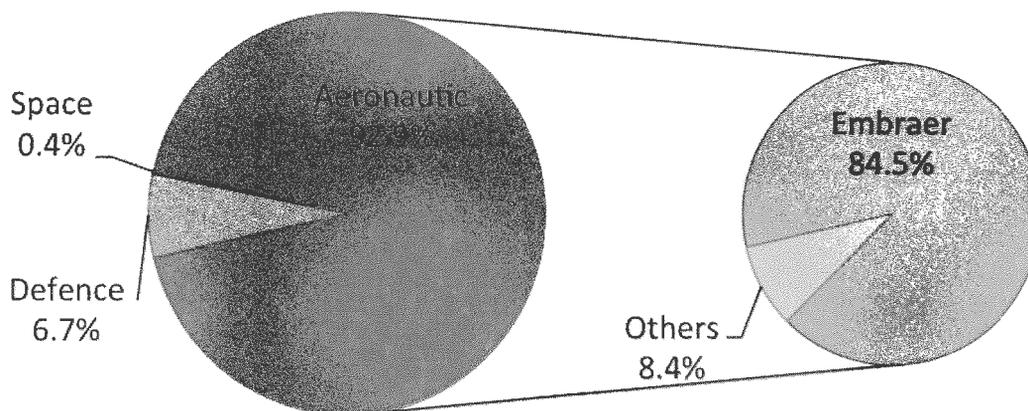


FIG. 6 – The Brazilian Aerospace Industry: Segmentation of Revenues, 2007  
Source: Ferreira (2009)

Today, aerospace is considered to be the only high technology industry in which Brazil has a recognized competency in the global market. The Brazilian share of the world market is modest, as its aerospace industry is concentrated in the regional aviation market. In addition, the industry is centered in only one major player – Embraer, but this is not perceived as a deficiency: it actually allows Embraer to have an active insertion in the global market. Embraer is seen as well regarded company in a high visibility industry, which is an excellent marketing tool for Brazil abroad. On the other hand, this could also be interpreted as a deficiency of the industry, since only Embraer has the necessary business scale to be competitive in the world market (Ferreira, 2009). Despite this problem, the industry is considered to be strategic to the economic development of the country as it is a source of both high level jobs and solid commercial surpluses, despite its high coefficient of imports (ABDI and UNICAMP, 2008).

#### 5.4.1 Embraer: The Main Player of the Brazilian Aerospace Industry

Embraer is today the main player of the Brazilian aerospace industry, concentrating 84.5 per cent of the annual revenues of the sector in 2007. The company was established in São José dos Campos in 1969, under the military regime and when it was conceived, it was focused on a strong connection between three main characteristics of the aerospace industry idealized by the military: higher education, technological research, and the industrialization of the country. Originally, the company was state-owned, but it was traditionally governed by private law and for a long time, it was directed by a competent independent manager with important connections with government officials. As the company always had close ties with the Ministry of Aeronautics, the bureaucratic red tape was avoided from the very beginning. Further governmental support was provided through a series of mechanisms, including favouring the firm in public procurement and government financing support. In addition, Brazilian corporations were allowed to invest up to 1 per cent of their due income taxes each year into buying Embraer shares, providing a much needed injection of capital (Goldstein and McGuire, 2004; Hira and De Oliveira, 2007; Ferreira, 2009).

The development of Embraer was based on the acquisition of the know-how necessary to create an industrial program aiming at specific national and international market niches. The company also aimed at obtaining knowledge resulting from local research, international agreements for technology transfer, external consulting services and licensing agreements. Embraer's technological advancement also benefitted from the demands and propositions of the Ministry of Aeronautics. Unlike the implementation of the Brazilian auto industry (where transnational corporations were at the highest level of industrial activity), Embraer was conceived as a state company with the exclusive mandate to be the final assembler of aircraft resulting from an endogenously aeronautic project. As Embraer was created by the military in an attempt to provide Brazil with the ability to develop and build aircraft – including military equipment, its first product was a military plane, the Xavante, which was unveiled in 1971. So, in a sense, the military guaranteed Embraer a learning curve and served as a testing ground for the company's aircraft. In addition, the government insisted that all public sector planes had to be purchased from Embraer and that air travel within Brazil should take place on Embraer planes (Frischtak, 1994; Bernardes, 2000; España, 2004; Hira and De Oliveira, 2007; Bragion, 2010).

The Xavante was a trainer, attack and reconnaissance aircraft developed by Aermacchi, an Italian aerospace company. At the early stages of Embraer, the strategy of the Brazilian government was to establish licensing agreements with foreign manufacturers that later involved outsourcing relationships, joint ventures, equity participations and finally, direct investment by Embraer in foreign countries and the establishment of risk-sharing partnerships with foreign manufacturers. The partnership with Aermacchi was later expanded in 1985, with the development of the AMX program, which was a joint venture between Embraer, Aermacchi and Alenia, another aerospace firm from Italy. The AMX was emblematic to the development of Embraer as it gave the company access to advanced technologies in airborne electronics, system and data integration and aerodynamics. The aircraft was integrated by the Brazilian and Italian air forces (España, 2004; Silva, 2008).

In the 1990s, Brazil started a major privatization program and institutional reform aiming at the modernization and opening of the Brazilian market to the world economy. Between 1991 and 2006, the Brazilian government sold over 40 state-owned companies in sectors as different as telecommunications and mining and aerospace. As a result of the world recession following the 1991 Gulf War, the aerospace industry was affected with serious financial problems. In 1994, after reporting a loss of U.S. \$337 million, the company was approaching bankruptcy. As a consequence, the government considered selling a stake of Embraer to a foreign aerospace company in order to save the company, as the high level of debt of Embraer did not encourage the government to offer a rescue package that would effectively restructure its balance sheet. In December 1994, a group of investors that includes a union, the Brazilian Holding and Investment Bank Bozano Simonsen SA (a leading financial conglomerate in Brazil), and two large semi-public pension funds (PREVI and SISTEL) bought a controlling stake of 60 per cent of Embraer. The government, who retained 6.8 per cent of the company's stock, injected new capital and assumed the debt, estimated at U.S. \$700 million. In 1999, a French consortium of four aerospace companies (Aerospatiale-Matra, Dassault Aviation, Snecma, and Thomson-CSF) acquired a combined participation of 20 per cent of Embraer stake, valuing the company at approximately U.S. \$1 billion (Frischtak, 1994; España, 2004; Goldstein and McGuire, 2004; Silva, 2008).

Besides promoting major layoffs (resulting in the dismissal of about one third of its 5,500 employees), the new administration promoted some changes in the company culture in 1995, trying to integrate the technological and industrial focus of the state-run company with new entrepreneurial vision of the new controllers. From that point on, the company would: a) be focused on results; b) embrace a new **entrepreneurial culture**, together with new finance and management competences; c) introduce the concept of the *Global Enterprise*; d) develop a new organization, **client oriented, agile and responsible**, making use of the **best practices** and available resources, and e) build a new **relationship with the**

**employees, based on a clear, open and transparent communication** (España, 2004; AIAC, 2009)

In 1998, after giving financial losses for 11 consecutive years, Embraer returned to profitability. In 2000, the company earned U.S. \$297 million on estimated revenues of U.S. \$2.4 billion. Foreign trade is a crucial element to the success of the company, as exports make up 90 per cent of total sales of Embraer. The company is also the biggest Brazilian exporter, accounting for 3.5 per cent of total Brazilian sales abroad in 1999 (Goldstein and McGuire, 2004).

Embraer went through a comprehensive corporate restructuring in 2006, and became the first large Brazilian company to have its capital thoroughly dispersed. As part of the restructuring process, the following guidelines were approved: a) no shareholder or group of shareholders would be entitled to control over 5 per cent of the votes, which discouraged the concentration of shares in the hands of a few controllers; b) foreign shareholders, either individually or in groups, would have their rights limited to 40 per cent of the total votes, in order to secure the national character of the company; and c) any shareholder or group of shareholders are prohibited from acquiring a stake of 35 per cent or more of Embraer, except under cases with express authorization of the Federal Government (who is the holder of the company's golden share), and subject the completion of a takeover bid. This restructuring was considered to be a clever way of Embraer to continue using the international stock market to capitalize without ceasing to be a Brazilian corporation. The golden share retained by the government gives it a seat on the board and veto rights over a change in control of the company, and the Brazilian government can interfere on merge/acquisitions operations and issuances of new securities. The veto power was justified for decisions related to matters of national security, but Embraer claims that the government has no effective power to interfere in day-to-day operations (Gomes et al., 2005; Hira and De Oliveira, 2007; ABDI & UNICAMP, 2008).

In 1990, when the company was at its peak, it had 12,700 employees. In 1995, after the privatization, the number of employees was down to 3,600. In 1998, when the company was once again profitable, the number of employees raised to 6,737 (including 2,788 who were working in the company's overseas facilities). In 2011, Embraer had 17,250 direct employees and a net profit of U.S. \$86 million. As for the Brazilian aerospace industry as a whole, it employed over 22,600 people as of December 2010 and it generated exports to the amount of U.S. \$4,99 billion (ABDI and UNICAMP, 2008; ABDI and UNICAMP, 2009, AIAB 2011).

Embraer is now the world leader in the segment of commercial aircraft with 70-120 seats; and until the unveiling of Bombardier's CSeries, it was the sole manufacturer of aircraft with 90 to 115 seats. The company has plants and offices in Brazil, the United States, France, Portugal, China, and Singapore and its business areas include the commercial aviation market, defence systems, and the executive aviation market. In addition, it is generally agreed that Embraer's decision to focus on underserved market niches proved to be a great opportunity for learning, as the manufacturing of agricultural spray planes and the military training planes proved to consolidate the company's position worldwide. The company's decision to export, back in the 1980s, forced the Brazilian government to provide increasing amounts of public finance and public support towards exports (including the Financing Program for Brazilian Exports – ProEx; subsidies and marketing assistance). On the other hand, Embraer today has little need to seek for government financial support to invest in R&D. The company is one of the few Latin American firms to have succeeded in leveraging foreign technology and indigenous managerial expertise for international success. The recent successes of Embraer made it possible for the company to shift part of its focus to the defence market, in a search to expand its businesses even further. The Brazilian government is aware that the company generates hard currency receipts, develops indigenous technology, and induces foreign companies to invest in Brazil (Silva, 2008; ABDI and UNICAMP, 2009). As of today, the company manufactures the following aircraft:

<b>TARGET MARKET</b>	<b>GENERAL CHARACTERISTICS</b>
Regional Jets	Regional aviation is the main market of Embraer, who produces two different jet families: <ul style="list-style-type: none"> <li>● ERJ 135/145XR (35-50 seats)</li> <li>● EMB 170/195 or E-Jets (70-122 seats)</li> </ul>
Executive Aviation	Embraer has recently entered this market, adapting regional jets and unveiling a family of small executive jets: <ul style="list-style-type: none"> <li>● Lineage 1000 (13-19 seats + 3 crew)</li> <li>● Legacy 450/650 (7-14 seats + 2-3 crew)</li> <li>● Phenom 100/300 (6-10 seats)</li> </ul>
Defence Systems	Turboprop and jet fighters for advanced training and light attack, aerial surveillance and electronic war: <ul style="list-style-type: none"> <li>● EMB 314 Super Tucano</li> <li>● AMX/A-1M</li> <li>● ISR Systems - Special Mission Aircraft (Surveillance)</li> <li>● KC-390 - Military airlift and tanker aircraft</li> </ul>
Agricultural Aircraft	Ipanema is the main agricultural aircraft in Brazil: with 1,100 units sold, it represents about 75% of the Brazilian fleet in this segment. <ul style="list-style-type: none"> <li>● Ipanema</li> </ul>

Table 3 – Embraer: Markets and Aircraft, 2011  
Source: Ferreira (2009), AIAC (2010), Embraer 2011

One of the weaknesses of Embraer is that even though the company is considered to be a strong contender in terms of product design, it still lacks manufacturing capacity, which is a consequence of its technological deficiencies. There is also a good potential to improve exports of military equipment. If Embraer were to work closely with military institutes in the development of new defence products, the new technologies could later be transferred to the civilian industrial base, which would translate into high value products. It is quite accepted within the industry that investments in military technology usually return in the form of stronger sales – and exports of the civil sector (ABDI and UNICAMP, 2008; ABDI and UNICAMP, 2009).

### 5.4.2 The Brazilian Aerospace Supply Chain

The supply chain is considered to be a weak point of the aerospace industry in Brazil, as it is estimated that 95 per cent of Embraer's suppliers are located outside Brazil. International suppliers are responsible for over 60 per cent of the final cost of an Embraer aircraft, while the company accounts for 38 per cent of that cost. These figures could be an indicator of the reduced importance of local knowledge flows and it reinforces the fact that, in terms of business placement, most of Embraer suppliers are in higher positions within the industry than Embraer itself. In terms of employment, the weakness of the supply chain can be also translated into the concentration of jobs within the industry: 80 per cent of the employees work in one of the four major players of the local aerospace industry – an indication of the weak presence of large manufacturers (especially in the upper tiers) in Brazil (Niosi & Zhegu, 2005; ABDI and UNICAMP, 2008; Malerba and Mani, 2009; ABDI, 2010; Bragion, 2010).

As Embraer is the only OEM in Brazil and the leading player of the Brazilian industry, the analysis of the local supply chain is in many regards, the analysis of the Embraer supply chain. Over the years, Embraer has drastically changed its relationship with suppliers. In the 1980s, the company had more than 500 different suppliers, not a single risk-sharing partner and had all work share done in-house. In the 1990s, the number of suppliers had dropped to 350, while 4 different risk-sharing partners produced structures and interiors for the company. In the 2000s, the company only had 22 direct suppliers, 16 risk sharing partners and was outsourcing the structures, interiors and systems packages of its aircraft. In order to survive in the new environment, smaller firms within the supply chain are improving their innovative capabilities by strengthening their basic technological capabilities, improving production and process. In addition, they are also upgrading to intermediate and advanced levels of innovative capability. SMEs within the industry see the relationships with Embraer, foreign buyers and Brazilian research institutions as the main source of knowledge for the technological learning processes (Malerba and Mani, 2009; ABDI, 2010; AIAC, 2010).

In the 1980s, the supply chain had a high degree of verticalization of manufacturers and suppliers, while today there is a process of de-verticalization and specialization: suppliers are responsible for manufacturing subcomponents, which are assembled into components by risk partners who supply them to manufacturers, who in turn are responsible for the integration of all systems, subsystems and the main parts. As the lengthy development process and test stages of an aircraft combined with the safety certification process can take up to five years to be completed, major OEMs decided to share the risk of developing a new aircraft with their suppliers: risk partners will invest in the development of specific parts and systems and will only receive the return on their investments when (and if) the aircraft sale is finalized and the product is delivered (Lima et al., 2005; Pinto, Migon and Montoro, 2007; Hira and De Oliveira, 2007).

Embraer states that in the future, the supply chain will be characterized by competition among productive chains, large horizontalization and risk sharing. In such model, suppliers would be responsible for manufacturing components; the next level of suppliers would be responsible integrating subsystem and manufacturing components; then system integrators would be responsible for integrating systems and manufacturing modules, which would then be passed to the large OEMs (manufacturers) who would integrate the main systems and manufacture some modules of the final aircraft (Lima et al., 2005; Hira and De Oliveira, 2007).

In such production arrangement, there is no space for partners who have limited or weak technological and financial capacities, a fact that contributed to exclude the majority of the Brazilian suppliers as risk partners. As a consequence, almost all of the risk-sharing partners of Embraer are foreign companies with well established positions in the international industry and they were chosen for two main reasons: these foreign companies were considered to be useful for gaining access to Northern markets and they helped to establish the quality of the product as well. Embraer first invited these partners to take part in the design and development of the ERJ-145 and E-Jets families, and the partners contributed financially and technology to these project areas. In order for this strategy to

work, it is imperative that all components and subsystems can be assembled to perfection, so that the final assembly is reduced to the task of joining or fitting parts and pieces (Hira and De Oliveira, 2007; De Souza, 2007; Figueiredo et al., 2008; ABDI and UNICAMP, 2008; Ferreira, 2009, ABDI, 2010).

In 2000, Embraer launched the Program for the Expansion of the Brazilian Aerospace Industry (PEIAB), a program to encourage its foreign suppliers and partners to establish units in Brazil, aiming at the strengthening of the local supply chain. The idea was to aggregate value to the national industry, speeding up the development of joint projects and the delivery of aircraft parts and pieces. As a result, several risk-sharing partners installed plants in the São José dos Campos area, including Aernnova, Sobraer, Latécoère, C&D Interiors, Parker Hannifin and Pilkington Aerospace. This business model gave Embraer the ability to specialize in the design, integration, marketing and the production of selected components, which reduced R&D costs and allowed the company to continually learn from long-term relationships with technological leaders in specific production areas (Hira and De Oliveira, 2007; Figueiredo et al., 2008; ABDI and UNICAMP, 2008; Ferreira, 2009, ABDI, 2010).

The partners that established units in Brazil did not transfer all the production phases to the country; instead, they concentrated on the last phases, importing semi-finalized components to be assembled in Brazil. On the other hand, these subsidiaries are all considered to be medium and large players in the global industry, manufacturing aircraft structures, interiors, aeronautic engines, avionics, landing gears, and hydraulic and electronic systems. The risk partnerships are considered an integral part of Embraer's strategy, and they even set the mark for global integration of supply chain in the industry, which was followed by even Boeing. The current strategy at Embraer is to reduce the number of suppliers: if the company had 350 suppliers in the ERJ-145 family, that number was reduced to 22 in the ERJ 170/190 project (Lima et al., 2005; Hira and De Oliveira, 2007; ABDI and UNICAMP, 2008; Figueiredo et al., 2008; Ferreira, 2009).

On the other hand, as a result of the risk partnership model, the local supply chain remains underdeveloped: the levels of value-added and local manufacturing are quite low and there is a high level of external dependence on technology and finance. Apart from the multinationals (that co-design and help finance a project) and the suppliers of systems, parts, and services for the planes (which are 98 per cent foreign), at the bottom of the supply chain pyramid are the subcontractors, who are outsourced small businesses with 100 per cent national capital, with fewer than 50 employees. They are highly specialized and have high technological capacity in engineering services, machining, surfaces processing, and chemical treatment. These companies focus their activities on the needs for products and services of Embraer and its risk partners, which generally account for more than 90 per cent of their revenues. As a result, the performance of subcontractors is completely tied to the expansion of the Embraer operations (Hira and De Oliveira, 2007; Pinto, Migon and Montoro, 2007; Figueiredo et al., 2008).

## 5.5 The Canadian Aerospace Industry

The Canadian aerospace industry is extremely diverse and is considered to be one of the strongest pillars of the country's manufacturing sector and economy. Canada is a well established market that designs and manufactures regional passenger jets and turboprops, executive jets, helicopters, jet engines, avionics, advanced composites and many other products and services that range from flight training to maintenance, repair and overhaul. In 2009, the revenues of the Canadian aerospace industry amounted to CAD \$22.1 billion, while export sales in that same year generated CAD \$17.2 billion in revenues (which accounted to 78 per cent of total industry revenues). As for the domestic figures, sales in Canada totalled CAD \$4.8 billion. The geographical proximity to the American aerospace market – the world's largest, places Canada in a unique position: the United States remains as the single most important market for Canadian aerospace goods and services, with sales to the amount of CAD \$9.8 billion (57 per cent). As a result of such a close relationship, Transport Canada and the FAA work closely together, and there are several important

bilateral trade agreements dealing with manufacturing, procurement, and maintenance of aerospace products and services, including the Defence Production Sharing Agreements (DPSA), the Defence Development Sharing Agreement (DDSA), and the Canada-U.S. airworthiness bilateral, which was put in place to allow Canadian businesses to repair and maintain U.S.-registered aircraft (Technopolis, 2004; EDC, 2006; AIAC, 2010; CAARHA, 2010).

It is estimated that 83.4 per cent of the Canadian aerospace production has the civil market as its final customer, while the military accounts for 16.6 per cent of the production. In 2009, there were 78,965 people directly employed by the industry. In 2008, the investments in R&D and capital improvements amounted to CAD \$1.93 billion, with investments in R&D accounting for 73 per cent (CAD \$1.4 billion), while investments in capital improvements accounted for 27 per cent (CAD \$0.53 billion) (AIAC, 2010; CAARHA, 2010).

Canada has an estimated 5 per cent share of the global aerospace industry, and its highest overall share is in aircraft and parts (6 per cent), a fact that is largely attributed to Bombardier's position as a leading business and regional jet OEM. Canada also has a 5 per cent share of the aircraft engine & parts segment, on the strength of Pratt & Whitney Canada, the leading small propulsion OEM; as well as engine module suppliers such as Magellan Aerospace. In electrical systems & components – which major forces include CMC Electronics, Honeywell, L3, and Thales – Canada has a relatively lower share (at 4 per cent). Finally, in maintenance, repair & overhaul (MRO), simulation and training, Canada has a 5 per cent share and boasts several world-class firms including Aveos, CAE, Cascade Aerospace, L3 MAS, IMP Aerospace, and Standard Aero. In addition to these companies, there are several OEM service centers in Canada. Such diversity is a key Canadian advantage, as SMEs within the industry are considered to be good at supporting the domestic Tier 1 manufacturers. In addition, such capabilities mean that they are capable of working internationally in their own right. As a result, Canada is strong in creating special applications aircraft – such as maritime patrol planes, and therefore filling specific

niche markets around the world. The Canadian aerospace industry has achieved renowned world leadership in many sub-sectors, including space and defence; and Canada is a key international supplier of high-technology in these sectors. The achievements in defence are particularly notable given the small size of the country's domestic market for defence products (EDC, 2006; AeroStrategy, 2009; AIAC, 2010; Investissement Québec, 2010; CAARHA, 2010).

Figure 7 presents a geographical distribution of the Canadian aerospace industry:

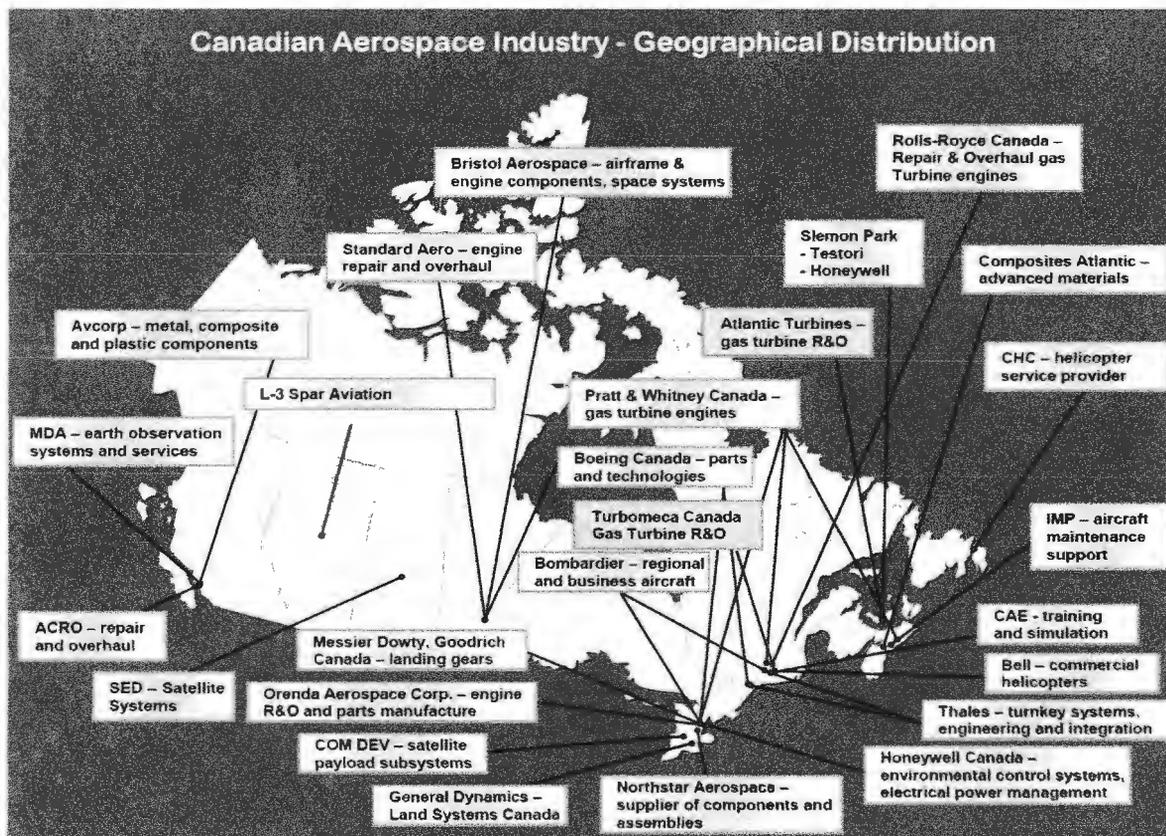


FIG. 7 – Geographical Distribution of the Canadian Aerospace Industry  
Source: CAMAQ, 2010

### 5.5.1 Bombardier: The Main Player of the Canadian Aerospace Industry

For Canada, Bombardier is no less important than Embraer is to Brazil: headquartered in Montreal, Bombardier has today 29,500 employees worldwide as follows: 48 per cent in Europe, 33 per cent in Canada, 13 per cent in the U.S., and 6 per cent in the rest of the world. Bombardier's Aerospace division generated revenues of CAD \$8.6 billion in 2010. The company states that 96 per cent of its revenues are generated outside Canada. Today, the Bombardier family owns 60 per cent of the company, and Bombardier emerges as a global player in the aerospace industry (Goldstein and McGuire, 2004; Bombardier, 2011).

The company was created in 1907 by Joseph-Armand Bombardier and achieved its first commercial success in 1937 with the launch of the B7 snowmobile. In 1948, in a demonstration of how governments can influence in the success of a business, the Quebec government passed legislation requiring all highways and local roads to be cleared of snow, which resulted in the sales of the Bombardier snowmobiles to fall by nearly half in one year. The company diversified its production in 1953, by introducing the Muskeg Tractor, an all-terrain vehicle used in the resource and construction industries to move heavy loads over swamp and snow. The unveiling of the Ski-Doo snowmobile in 1959 further consolidated the commercial success of the company, which grew constantly until the 1973 oil crisis (MacDonald, 2001; Bombardier, 2011).

In 1969, the company listed its shares on the Montreal and Toronto Stock Exchanges. As business increased, the company devised a new way to facilitate the Ski-Doos sales, through the creation, in 1972, of a financing subsidiary to provide inventory financing for its dealers. This situation would change drastically the next year, when the gas shortages forced the company to cut the production of its snowmobiles by half; but the crisis presented the company's management team a new business opportunity: by redeploying the company's excess manufacturing capacity, Bombardier acquired mass

transit technologies and applied its manufacturing know-how to build rolling stock (MacDonald, 2001; Bombardier, 2011).

In 1981 the company changed its name to Bombardier Inc. and was awarded an order for 180 subway cars from transit authorities in Mexico City. After expanding its businesses to rail transit and establishing a solid presence in Europe, Bombardier decided to diversify once again in 1986, entering the aerospace industry through a series of acquisitions, including state-owned Canadair. In that same year, the company was awarded a CAD \$1.7 billion multiyear contract to service CF-18 jets, a fighter jet used by the Royal Canadian Air Force and produced by McDonnell Douglas (MacDonald, 2001; Hadekel, 2004; Bombardier, 2011).

Canadair was a leading aircraft manufacturer of civil and military aircraft, including the Challenger wide body business jets and the CL-215 amphibious firefighting aircraft. The acquisition of Canadair was made possible with the support of the Federal Government, who absorbed CAD \$1.2 billion of Canadair's CAD \$1.35 billion debt. In 1991, Bombardier launched the 50-seat Canadair Regional Jet (CRJ) program, which was poised to revolutionize regional air travel. A 70-seat version followed in 1997 (CRJ700), an 86-seat version in 2000 (CRJ900) and a 100-seat version in 2007 (CRJ1000). After the acquisition of Canadair, Bombardier purchased Short Brothers (Great Britain) in 1989, which helped to reinforce its aerospace capabilities and established a European presence in the industry. In 1990, Bombardier acquired the Learjet Corporation, which gave the company access to the American aerospace industry and the most complete range of business jets on the market. Bombardier promptly launched the Learjet 60 aircraft, the first midsize business jet, which would rank as the top-selling aircraft in its class four years later. In 1992 the company acquired the de Havilland Canada division from Boeing. De Havilland was the manufacturer of the Twin Otter aircraft and Dash turboprop airliner. De Havilland's Dash 8 turboprop and the CRJ Series established Bombardier as one of the world leaders in regional aircraft (Goldstein and McGuire, 2004; MacDonald, 2001; Hadekel, 2004; Bombardier, 2011).

In 1991, Bombardier launched the Bombardier 415 amphibian, an advanced firefighting aircraft, and in 1998 expanded its turboprop portfolio by launching the 70-seat Dash 8 Series 400 turboprop, renamed Q400. The next year Bombardier launched the Bombardier Continental Business Jet, an all-new transcontinental super midsize business jet, which was renamed Challenger 300 in 2002. In 1996, the company was reorganized into five groups: Bombardier Aerospace, Bombardier Transportation, Bombardier Recreational Products, Bombardier Capital, and Bombardier Services (which was later disbanded). A new version of the Canadair Regional Jet, the 70-seat Canadair Regional Jet 700 was launched in 1997, the same year the company was awarded a CAD \$2.8 billion multiyear contract for the training of NATO pilots in Canada. Another change in the high management came in 1999, when Robert E. Brown was appointed to replace Laurent Beaudoin as the President and CEO of Bombardier. Beaudoin remained as the company's Chairman. The next year, Bombardier signed with Delta Connection carriers to provide 94 Canadair Regional Jet aircraft, a contract worth as much as CAD \$2.7 billion. In 2002, Bombardier launched the Bombardier Global 5000 super-large business jet; while in 2003, the company added the Global Express XRS ultra long-range business jet, an aircraft that combines superior transatlantic speed with the largest cabin in the super-large segment. The Challenger 605 intercontinental business jet and Learjet 60 XR midsize business jet were unveiled in 2005. Also in 2005, Bombardier launched the Challenger 800 Series corporate shuttles, an evolution of its flagship Challenger. In 2006, Bombardier established a manufacturing facility in Querétaro, Mexico, dedicated to its aerospace business. Following the 9/11 attacks, the world's airline industry went into a tailspin. As part of its strategy to deal with the industry's crisis, Bombardier restructured, narrowed its focus and sold several of its assets. The company sold its recreational products business segment to focus on core business operations in aerospace and transportation. In 2007, Bombardier launched the CRJ1000 regional jet, the new aircraft of the CRJ Series. In that same year Bombardier also introduced the next generation of its regional jets, the CRJ NextGen family, which featured improved operating costs, an all-new cabin and increased use of composite materials (MacDonald, 2001; Hadekel, 2004; Bombardier, 2011).

Regarding the competition of its jets with Embraer, the CRJ700 (70 seats) and the CRJ900 (86 seats) are considered to be the direct competitors of Embraer's ERJ-170 and ERJ-175. In this segment, Bombardier took advantage from the fact that its models were released before the Embraer aircraft, which allowed them to be ahead in the sales campaign. On the other hand, the Bombardier models are based on stretched platforms of older models, some of which with over 25 years since their launch, so in certain ways they are non-optimized models and are considered to be technologically outdated in several aspects. This may play a role in the competitiveness of the company, as it reported a negative net order of 53 business jets in 2009, while booking 15 net new orders for commercial aircraft in that period (Lima et al., 2005, The Conference Board of Canada, 2009).

Bombardier was also a key player in the establishment of an aerospace cluster in Canada. The company is regarded as a 'flagship firm,' since it contributes to the success of the industry with both valuable monetary sense as a buyer and seller and also for being a leader in the sector. In this regard, Bombardier's activities and strategy have the potential to affect the performance and competitiveness of the entire network of suppliers. The good results of the company, coupled with strong competitive positions in commercial and virtual flight simulators and landing gears contributed to place Canada among the five top aerospace industries in the world. In 2000, there were 250 aerospace manufacturing and service sector companies in Canada, employing 90,000 people and generating over CAD \$20 billion in sales. Another indicator of the relevance of the aerospace industry is the investment on research and development and new infrastructure: in 1999, the industry invested more than CAD \$2 billion, which equals to approximately 12 per cent of the total revenue and 15 per cent of all manufacturing R&D in Canada. For all of these reasons, defending the aerospace cluster is a high priority for the Canadian government and its industrial and trade policies (Goldstein and McGuire, 2004, Hadekel, 2004; Smith and Ibrahim, 2006).

As the WTO disputes between Canada and Brazil in 2001 showed, the Canadian government is fully committed in its support to Bombardier. In fact, the government commitment to Bombardier proved to be so strong that some critics stated that the Federal Government was going too far in its support to the company, and that the close ties between the company and the government influenced Ottawa's willingness to be aggressive. The fact is that Ottawa has always been a supporter of Bombardier, as exemplified in 1981, when the Metropolitan Transportation Agency (MTA) in New York announced the purchase of 1,150 subway cars from Bombardier. The sale was made possible with the financial backing of EDC, who offered a 15-year U.S. \$750 million loan at a rate of 3 to 5 per cent below what it cost to raise. The transaction was highly questioned in Canada, but the Federal Government committed its support to Bombardier nonetheless. Then, in 1997, the Federal Government took the company's defence in an investment dispute in Mexico and, once again the low-interest loans offered to help close Bombardier sale to Air Wisconsin, which generated complaints from opposition leaders and taxpayer advocates. It is not surprising that a firm like Bombardier, which is characterized by a very high asset specificity, R&D intensity and job immobility, may, and most likely will, forcefully engage in political lobbying. As a matter of fact, the relationship between Bombardier and the Federal Government has been described as 'co-dependent' and 'only in that kind of relationship would the government respond as willingly as it has.' It is not surprising that Bombardier is a major contributor to all major Canadian political parties. As Elections Canada data for the study period showed, Bombardier was one of the largest corporate donors to the Liberal party – and was the largest non-financial sector donor in 1998, 1999 and 2000, when the party had the majority in the Canadian Parliament (Pasquero, 1988; Goldstein and McGuire, 2004).

As presented in the table below, Bombardier is the manufacturer of the following aircraft:

<b>TARGET MARKET</b>	<b>GENERAL CHARACTERISTICS</b>
Regional Jets	Bombardier is a leading force in the regional aviation segment and the company produces three different jet families: <ul style="list-style-type: none"> <li>● C Series (100-149 seats)</li> <li>● CRJ Series (60-99 seats)</li> <li>● Q Series Turboprop (70-80 seats)</li> </ul>
Executive Aviation	The executive aviation market was the aerospace industry entry door for Bombardier, the manufacturer of the following executive jets: <ul style="list-style-type: none"> <li>● Learjet 40 XR (6 seats + 1 crew)</li> <li>● Learjet 45 XR &amp; Learjet 60 XR (8 seats + 1 crew)</li> <li>● Learjet 85 (8 seats + 2 crew)</li> <li>● Challenger 300 (8 seats + 1 crew)</li> <li>● Challenger 605 and Challenger 850 (13-14 seats + crew)</li> <li>● Global 5000, 6000, 7000, 8000 (8-19 seats + 2-4 crew)</li> </ul>
Amphibious Aircraft	Amphibious aircraft are used on firefighting missions, humanitarian relief, maritime search and rescue, surveillance, and personnel transport. Bombardier manufactures the following amphibious aircraft: <ul style="list-style-type: none"> <li>● Bombardier 415</li> <li>● Bombardier 415 MP</li> </ul>

Table 4 – Bombardier: Markets and Aircraft, 2011  
Source: Bombardier (2011)

### 5.5.2 The Canadian Aerospace Industry Supply Chain

The Canadian supply chain is responsible for aircraft systems and subsystems, structural components, and aircraft parts for OEMs in Canada, the U.S., Europe, and Brazil, besides offering maintenance, repair and overhaul services. Canadian aerospace businesses are also leading players in the areas of flight simulation, visual systems, communication systems for satellites, and systems integration. Bombardier is the main OEM in Canada, and a leading player in the regional aircraft sector. Pratt & Whitney Canada (PWC) is another main player of the Canadian aerospace sector: it specializes in designing,

developing, manufacturing and maintaining aircraft engines. PWC has approximately 50 per cent of the world market of small and medium engines (Bernardes, 2010; CAARHA, 2010). Regarding the dynamics between OEMs and SMEs, Figure 8 shows how their relationship has evolved:

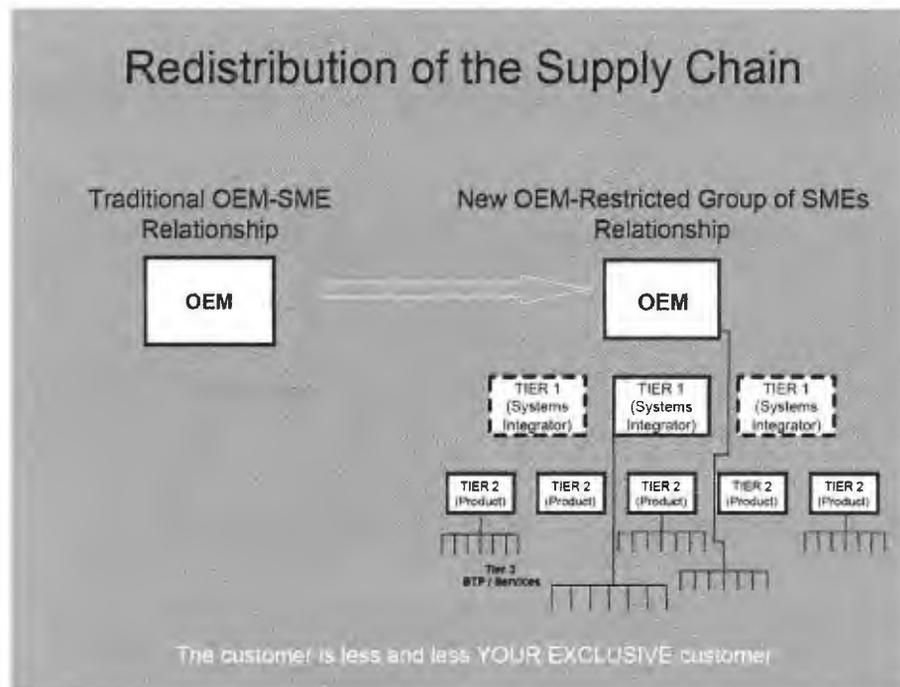


FIG. 8 – Redistribution of the Canadian Aerospace Supply Chain  
Source: CAMAQ 2010

In the past two decades, the Canadian OEMs started to employ similar risk-sharing techniques as those used in Brazil. SMEs in the tiers 2 and 3 of the chain are more and more required to take technical and financial risks and they also need to develop new capacities:

- a) more value-added parts and pieces;
- b) higher investments in engineering and R&D for the conception, development and qualification of products;
- c) technical support and continuous improvement; and

d) continuous cost reduction (CAMAQ, 2010).

Moreover, SMEs (Tier 3, which comprises most of the industry) in the supply chain are now required to align the value chain to a global reality, as Bombardier and Pratt & Whitney Canada have both modified their value chains to leverage opportunities created by their worldwide presence. Bombardier is building the C-Series fuselage in China, the wings for the same aircraft in Northern Ireland, and expanded its manufacturing capability in Mexico. By forces of the market, the company has also built up a global product support network. Pratt & Whitney Canada has done much the same – through its parent company, PWC leverages a network of global engineering centers and continues to expand its highly regarded global product support network. This is the strategy of both firms to continually search for new opportunities to improve their competitiveness. The next step in this globalization process is to determine whether Bombardier could conduct more of its engineering activities via engineering centers in low cost regions or whether Pratt & Whitney Canada could pursue more manufacturing in low cost regions. Both OEMs must balance these issues with the desire of the Canadian governments to maximize aerospace employment in the country (EDC, 2006; AeroStrategy, 2009; AIAC, 2010).

Quebec is the main hub of the Canadian aerospace industry, and Montreal is its main cluster. In 2009, Quebec had 234 aerospace companies (4 OEMs, 14 companies in Tier 2, and 216 SMEs), which generated 40,200 direct jobs and CAD \$12,4 billion. When considering world sales, the cluster puts Quebec in the 6<sup>th</sup> position in the industry, after the USA, France, Germany, the U.K., and Japan. Quebec concentrates 60 per cent of total production of the Canadian aerospace industry, 90 per cent of its sales, almost 80 per cent of total employment, and 70 per cent of all investments in R&D made by the industry in 2007. The high expenses in aerospace R&D place the sector in first place among all industrial activity in Quebec. However, the reserves of innovative technology resulting from the investments in R&D made in the 1960s and 1970s are considered to be now depleted, after the dramatic growth of the industry in the 1980s and 1990s. Members of the industry consider that the current level of investment in R&D is inadequate to support

future growth. On the other hand, the industry is a main source of dividends to the province: as 80 per cent of the Quebec production is exported, it was the second most important manufacturing sector of Quebec in 2008. In 2006, the Ministry of Economic Development, Innovation and Export Trade (MDEIE) of Quebec estimated that over 10,000 engineers and scientists were employed by the aerospace industry in the province, while in general terms, the industry employed 1 out of 200 people in Quebec (while in the Montreal area, that number was 1 out of 95 people). In terms of revenue, employees of the Quebec aerospace industry received salaries 30 per cent higher than those employed by other manufacturing sectors (MDEIE, 2009; MDEIE, 2010; AIAC, 2010; Investissement Québec, 2010).

In terms of geographical concentration, the Montreal cluster houses 98 per cent of the aerospace activity in Quebec, and it places the city among the largest aerospace centers of the world, together with Seattle and Toulouse (MDEIE, 2009). Figure 9 presents how the Quebec supply chain is divided:

## Supply Chain of the Quebec Aerospace Industry

### Industry Structure in 2009

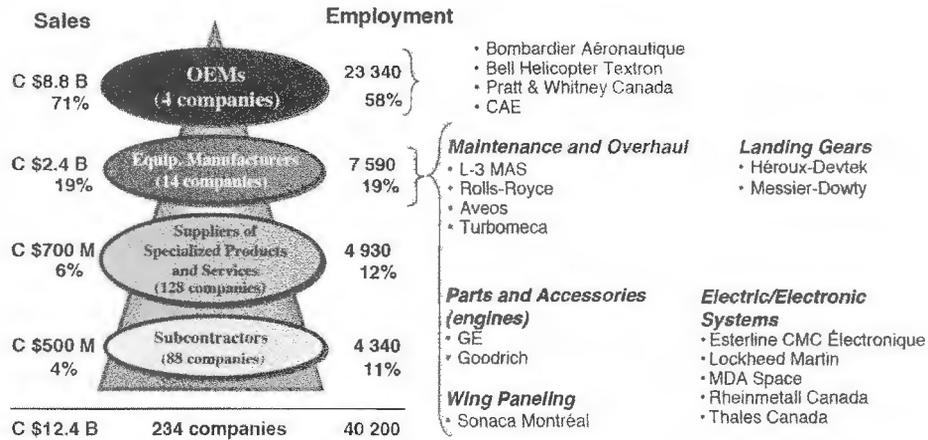


FIG. 9 – The Supply Chain of the Aerospace Industry in Quebec  
Source: MDEIE, 2009

Figure 10 shows how the industry is distributed in the different administrative regions of Quebec:

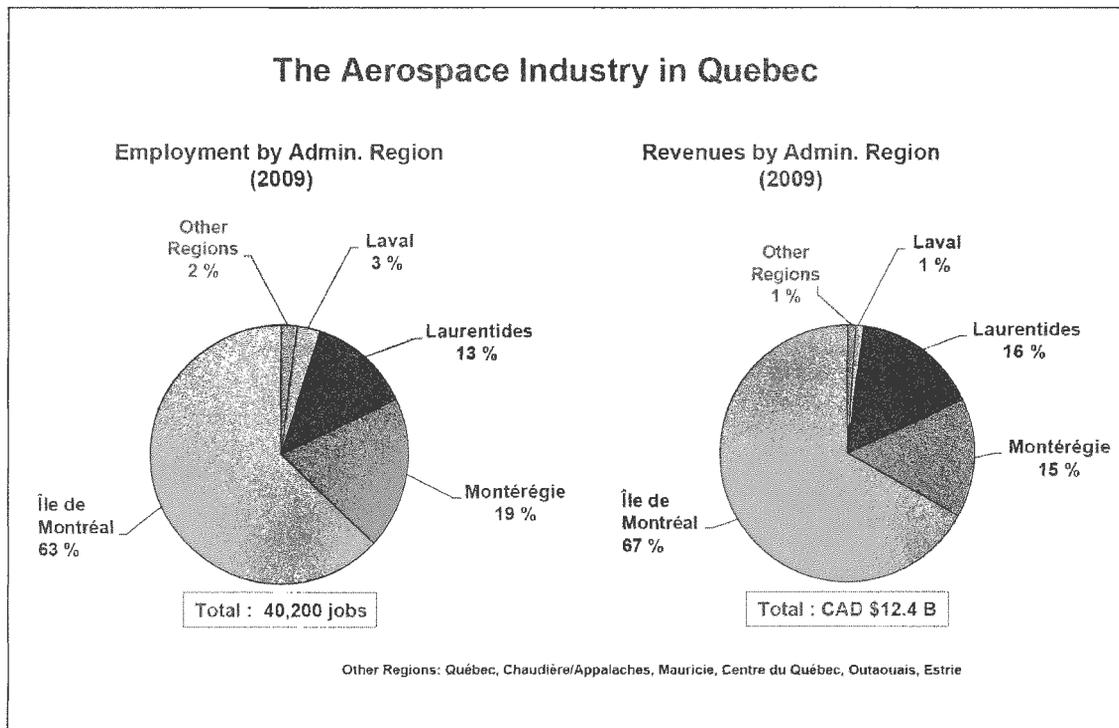


FIG. 10 – The Aerospace Industry in Quebec: Employment and Revenues, 2009  
 Source: MDEIE, 2009

As presented in this section, despite the differences in their institutional environment and different levels of economic development between the two countries, Brazil and Canada managed to position themselves as major players of the global aerospace industry. The aerospace industry has some unique characteristics that demand specific conditions of the institutional environment and specific types of government support. Both Brazil and Canada understand the economic advantages of housing the aerospace industry in their territories. As a result, both countries try to adapt their institutional environment to needs of the industry, as we discuss in the next section.

## **6 Governmental Support to the Aerospace Industry**

### **6.1 The Government Embrace of the Aerospace Industry**

In general terms, an “industrial policy” can be defined in two major ways. The first is a comprehensive, long-term government plan for developing the entire economy. The second is connected to the means by which a government attempts to develop a specific industry. As presented in our report, it is a well-known fact that every nation has industrial policies, whether they are comprehensive or fragmented, or whether government officials admit the practice or not.

Considering the dynamics between the aerospace industry and national governments, Griffiths and Zammuto (2005) state that national industrial competitive advantage relies on an institutional framework that can intervene in the economy, encourage broader systems of product and process innovation, and encourage economic and industrial learning. The aerospace industry model of competitiveness could be linked to a redefinition of the state strength/weakness dichotomy by focusing on the capabilities that governments have to implement or act out desired policies in coordination with the industry’s firms. As the economic conditions associated with a country’s institutional framework play a crucial role in structuring industrial competitiveness, in the aerospace industry, some national governments choose to support their local aerospace businesses through the implementation of one or more of the following variables: 1) a reliance on a mixture of large and small privately owned firms, 2) public/private sector research initiatives, 3) the presence of government regulatory agencies designed for coordination, and 4) inter-organizational structures. The presence of these variables in a coordinated institutional environment, combined with governance capabilities and their supporting infrastructures create a favourable business environment and a strengthened national industrial competitiveness. Such coordination is important because capitalizing on such a high-innovation and value-adding industry requires the development of specific capabilities

between the state and the industry. It is equally important that these governmental policies are coherent with institutional practices and that they are connected to the social needs of the country (Griffiths and Zammuto, 2005).

Based on these variables, we analyze in this section how the Brazilian and Canadian institutional frameworks are favourable to the aerospace industry; the various public policies and programs designed for that purpose, and the interactions between public and private players of the industry. As a part of our analysis, we seek to understand how these variables contributed to the development of Embraer and Bombardier. In Sections 6.2 and 6.3, we discuss specific aspects of the Brazilian and Canadian institutional frameworks in support of the local aerospace industries.

To a certain extent, the commercial aircraft industry is considered to violate every assumption of the competitive paradigm: the industry is defined by huge scale and scope economies, tremendous risk, and dramatic technological change. As a result, the market is inherently imperfect, there is no presumption that market outcomes are optimal, and government intervention can have lasting effects in industry structure and performance. As a result, starting in the 1970s, governments of the main aerospace industry countries progressively started to finance smaller portions of the industry's project costs, as a consequence of either reduced military budgets or restrictions resulting from the high costs of the projects themselves or even international trade disputes. This reality created pressures for change in the traditional model, which in part is the cause of the risk partnership model that is now being widely used in the industry. However, it is quite clear that the development of the aerospace industry is closely connected to governmental central planning, defence strategies, and financial support. In the case of Brazil, as the country's aerospace industry consolidated its position in the world market, Embraer exemplifies the important implications for national policies concerning the proper role of government in fostering "national champions." In the 1980s, Embraer took advantage of the military investments and subsequently government purchases of the AMX aircraft to strengthen its position and become more independent. After the AMX project, military funded projects

virtually disappeared and the public policies concerning defence investments are now perceived as weak. Considering the regional aviation market, one of the reasons for the high competitiveness of both Embraer and Bombardier in this segment has been the active participation of government agencies dedicated to support exports of their aerospace industries. The Brazilian and the Canadian governments offered attractive financing conditions to the export of regional aircraft, which generated elevated efficiency gains (both operational and financial) to the air transportation industry, especially in the United States (Tyson, 1993; España, 2004; Lima et al., 2005; De Souza, 2007; Bragion, 2010).

Another major key trend in the industry is the growing government/industry collaboration to create aerospace clusters. Governments are motivated to collaborate because the industry creates high value jobs and exports in an era of increasingly mobile capital and human resources. In addition, some nations support the industry for its ties with national security strategies and the belief that a healthy aerospace sector creates a positive, high technology image. The relationship between governments and the industry can take several forms: in some instances governments serve as catalysts to promote aerospace investment to foreign investors. This takes the form of serving as information clearinghouses, streamlining administration, and offering tax incentives. Examples of such collaboration are the aerospace promotion efforts of U.S. states of Alabama, Kansas, New Mexico, North Carolina, and Mississippi. In a deeper level of collaboration, governments participate in joint planning actions with the industry, identifying strategic technologies, cluster requirements or gaps, and human resource needs. Governments can also play an important role in implementing plans via research funding and training. Finally, governments can directly invest capital into a company or program (AeroStrategy, 2009; AIAC, 2010; The Hill Times, 2010).

With the advancements of Russia, China and Japan in the regional aviation market, Brazil and Canada should prepare for new competition: Canada's pioneering role in creating the regional jet sector is now 15 years old and besides Embraer, Bombardier faces several new competitors in this segment. To maintain their positions within the industry

may require additional funding, ambition, and capability from the governments of both countries. One or more of the countries listed above may eventually join Embraer and Bombardier as successful aircraft OEMs, which could erode the Brazilian and Canadian market position. And the odds of this scenario are increased with EADS/Airbus and Boeing apparently slipping development of a next-generation single-aisle aircraft due to 2020 or beyond. Besides the emergence of new competitors, government-industry coordination will grow in importance because of the increasing mobility of labour and capital within the industry. Most capability expansion is via joint venture, which means that potential investors are looking for in-country partners. From the institutional framework point of view, investors are looking for streamlined administration, transparency, the rule of law, human resources, and technology. Governments and firms have a finite set of resources, which means that coordinated strategic planning is increasingly important (AeroStrategy, 2009; The Hill Times, 2010).

Governments should also consider functional specialization as a successful strategy for the industry: while most governments are focused on building national champions or supporting development of a new program on home territory, the globalization of the industry means that value creation and employment will increasingly migrate to functional clusters such as India/Russia for engineering/R&D or Mexico for manufacturing, or Singapore for MRO. In the case of Canada, which markets itself as a knowledge-industry country, aerospace has managed to attract only a few R&D centers from non-Canadian firms (AeroStrategy, 2009; The Hill Times, 2010).

In the topics presented below, we discuss how specific characteristics of the institutional framework can influence in the development of the aerospace industry:

1. **Intellectual Property Rights** – Good institutional arrangements concern property right allocations between public and private sectors, and inter-organizational transactions allocations between authoritative planning and market institutions of governance. Aerospace companies are not usually active in the

publication of scientific papers, nor license technology. Instead, the industry is more characterized by corporate secrecy, rather than the registration of patents (Murtha and Lenway, 1994; Niosi and Zhegu, 2005). In addition, Onodera (2008), states that

Property rights have several effects on economic development: 1) fixing the economic potential of assets and allowing property to be used as collateral greatly enhancing capacity to invest; 2) integrating dispersed information into one system (price) creating new opportunities to create surplus value through transactions; 3) increasing accountability and cutting down transaction costs; 4) making assets fungible and divisible; 5) networking people and improving the flow of communications about assets and their potential; and 6) protecting transactions.

As emerging countries are becoming more and more active in the global aerospace industry, with production of parts and components outsourced to countries as distinct as Mexico, Brazil, Russia, and China, the main challenge facing large OEMs in North America and Europe is to have proper IP regulations and enforcement mechanisms to guarantee that their investments in other countries are viable options to expand the industry and will be respected in the duration of the contracts (AeroStrategy, 2009). Through **intellectual property rights**, governments can influence in the development of the aerospace industry by having **predictable or erratic** laws and regulations on IP; and by having **weak or strong** enforcement mechanisms to protect the rights of patent owners.

2. **Investments in R&D** – One of the preferred ways of governments to support local aerospace industries is through the financing of R&D projects. Compared to other high-tech industries, governmental funding of R&D programs, especially in defence, is considered to be elevated. Partnerships between public and private R&D initiatives, both domestic and international are seen as a key competitiveness factor within the industry. As a result, international R&D partnering in aerospace and defence is well above the average, compared to other high-tech industries: between 1990 and 1998, aerospace had the highest

international partnering index of all industrial sectors. On the other hand, the role of government laboratories and university facilities in the development of the industry is secondary; instead, it is usually the large OEMs that attract or change these institutions according to their needs. Governments justify official support to R&D in aerospace in light of so-called “market-failures.” These include the market’s ability to capture fully the benefits of its investments and the opportunity cost of such an uncertain type of investment. As a result, it is believed that the level of R&D investment in the industry is always below what would be considered appropriate from the perspective of optimal economic development and quality of life. So governmental support to R&D aims to reduce the so-called market-failures. Public-funded R&D programs most likely focus on particular subject areas that are deemed to have a strategic or critical quality. In order to minimize the risk of investing the taxpayers’ money in works of limited quality and utility, official R&D programs tend to be used to encourage firms within the industry to participate in programs of work that may generate further advances in knowledge, methodologies and innovation in materials, compounds, etc, that have relevance to a wider audience. However, critics of such programs point out to the question of the lack of transparency in matters of official funding of R&D activities, especially the programs designed to finance the development of new aircraft. In several cases, government support for R&D in aerospace is integrated with the national aerospace R&D program. As a result, these investments tend to blur with pre-competitive research expenditure. In addition, governments organize national aerospace R&D programs (such as Canada’s former Technology Partnerships Canada – TPC program), which operate basically offering assistance on a competitive and cost-shared basis for pre-competitive and industrial research projects. Another critic of public funding of R&D is a reflex of the consolidation of the supply chain in the industry. The supply chain consolidation has had a positive effect on investments in R&D, as the resultant larger organizations usually have sufficient critical mass to fund

internal R&D projects that wouldn't be otherwise funded by smaller firms that could not afford R&D laboratories. In conclusion, some critics of public R&D funding believe that federal R&D spending has had limited effects in the supply chain. Instead, governments should intensify the coordination of their R&D and communicating requirements throughout the supply chain (Sherry and Sarsfield, 2002; Goldstein and McGuire, 2004; Niosi and Zhegu, 2005). Through **investments in R&D**, governments can influence in the development of the aerospace industry mainly by being **hostile or supportive** of R&D initiatives (e.g. financial support to R&D centers, investments in public research facilities, grants to universities, tax breaks for private investments in R&D, etc.) and by investing in **higher education and human resources training initiatives**.

3. **Government Procurement** – The manufacturers of civil aircraft in all countries holding a strong position in the world industry have all been major defence contractors, at least at critical moments of their development. This massive inflow of federal government contracts has provided profits that were mostly likely applied in the development of commercial aircraft. Historically, government contracts provided the safety net to catch a plummeting commercial airframe company in critical moments, as large backlogs of these contracts provided steady income during periods when commercial activity was depressed. Besides the acquisition of defence equipment, governments can also influence in the aerospace industry through the acquisition of civil aircraft. However, the 1979 GATT agreement on Trade in Civil Aircraft prohibits government support for this type of activity, at least for the signatories of the agreement. On the other hand, only 24 countries are signatories to the agreement, including almost all major aircraft manufacturing countries, with the notorious exception of Brazil. In addition, the WTO agreement on trade in civil aircraft eliminates duties on civil aircraft, including engines sub-assemblies and parts; and it defines several non-tariff obligations for the signatories, including:

- Government-directed procurement actions and mandatory subcontracts: the Agreement provides that purchasers of civil aircraft can freely choose suppliers on the basis of commercial considerations. In addition, governments will not require purchases from a particular sources, in order to avoid government mandated offsets;
- Sales-related inducements: the Agreement states that governments should not attach political or economic inducements (positive or negative connections to government actions) as an incentive to the sale or lease of civil aircraft; and
- Certification requirements: the Agreement provides that the regulatory certification of civil aircraft, including operating and maintenance procedures, will be non-discriminatory as provided by the provisions of the separate Agreement on Technical Trade.

Even though there is no publicly-recorded cases in recent years of a government directing its national carrier, or agents, to purchase a specific civil aircraft, traditionally, governments were the owners of national airlines (or were among the major stockholders of them), and are in a convenient position to impose their conditions on the OEMs. These conditions are usually based on the geopolitical ambitions of each government. Defence aircraft and aerospace equipment are excluded from the 1979 GATT agreement on Trade in Civil Aircraft (for obvious reasons), and in several countries, defence procurement policies include “buy national” requirements and offset arrangements (Tyson, 1993; Technopolis, 2004; Niosi & Zhegu, 2005, Bernardes, 2010). Through **government procurement**, governments can influence in the development of the aerospace industry by being **hostile or supportive** of local aerospace firms when they acquire defence

equipment, aircraft for official fleets, and pieces, parts and maintenance services for government fleets.

4. **Infrastructure** – Large OEMs of the industry have the ability to attract hundreds of SMEs to a certain region and form a cluster. For that reason, policymakers should be focused on policies designed to shape the competitive position of the industry in which OEMs are located and invest in public infrastructure that will support them and facilitate their continued development and growth. In general terms, extensive and efficient infrastructure is considered to be an essential driver of competitiveness for all economic sectors. As in any other industry, aerospace infrastructure needs are critical for ensuring the effective functioning of the sector, in addition to determining the location of economic activity and the kinds of activities and accessory industries that can develop in a particular economy. Well-developed and functional infrastructure can reduce the effects of distance between regions, resulting in the full integration of the national market and connecting it at low costs to other markets in different countries and regions. In addition, extensive and effective infrastructure networks have a significant impact in economic growth, besides reducing income inequalities and poverty in a variety of ways. Effective transport infrastructures for goods, people, and services (such as quality roads, railroads, ports, and air transport) enable private firms to get their goods and services to market in an effective manner, and facilitate the movement of workers to the most appropriate jobs. Economic development also depends on electricity supplies that are free of interruptions and shortages, giving businesses and factories the ability to work continuously. Finally, the private sector also relies on a solid and extensive telecommunications network that allows for rapid and free flow of information, which can increase overall economic efficiency as it ensures that businesses can communicate and make decisions taking into account all available relevant information (Smith and Ibrahim, 2006; World Economic Forum, 2010). Through **investments in infrastructure**, governments can influence in the

development of the aerospace industry by being **hostile or supportive** to investments that facilitate sales of aircraft (e.g. airports, telecommunications, power generation, transportation, etc.). In addition, governments can facilitate the development of the industry if the laws and regulations for new investments in infrastructure (including PPPs), are **predictable** and contracts are respected – key factors in the decision making process of private investors in multi-billion dollar infrastructure projects.

5. **Financing and Export Credits** – While governments are prohibited from directing civil aircraft purchases, providing financing for customers through the provision of export promotion support and through export financing is an important part of the aerospace business. In addition, governments operate Export Credit Agencies and Investment Insurance Agencies (ECAs) to provide government-backed loans, guarantees and insurance to private firms seeking to expand business abroad, especially in developing countries and emerging markets, where commercial and political risks are considered too high for conventional corporate financing. ECAs are mostly national, public or publicly-mandated agencies that usually support companies from their home country. In the aerospace sector, such support to exports is offered by the Ex-Im Bank in the U.S. and its European counterparts (COFACE, Hermes, and ECGD) to their aerospace industries. In Brazil, the Brazilian Development Bank (BNDES) is the federal government agency that supports the external sales of Embraer aircraft, while Export Development Canada (EDC) is the Canadian counterpart for the sales of Bombardier products. The OECD agreement Arrangements on Guidelines for Officially Supported Export Credits (which is not legally binding) governs policies on export credits and seeks to prevent countries from competing to offer the most favourable financing terms for exports, neutralising public finance as a source of competitive advantage in global markets (Technopolis, 2004; Lima et al., 2005; EDC, 2006; Hira and De Oliveira, 2007; ABDI and UNICAMP, 2009). Through **financing and ECAs**, governments can

influence in the development of the aerospace industry by being **hostile or supportive** of financing mechanisms that can boost the sales and exports of aerospace products. In addition, the **tax system** affecting private businesses can be hostile or supportive, depending on how **weak** or **strong** the enforcing mechanisms to collect taxes are. By observing international rules and regulations and international agreements on financial assistance to national businesses (e.g. the WTO rulings on the Embraer versus Bombardier disputes), governments can promote the sales of their aerospace industries. If buyers perceive that the laws and regulations controlling financing programs and ECAs are **predictable**, they will feel confident enough to place their orders with a certain manufacturer. In close connection to the financing mechanisms and ECAs, the more predictable the laws and regulations governing a country's **foreign trade** (and the stronger the country's enforcement of its legislation), the more attractive the country will be to foreign investors and international buyers of aerospace products.

6. **Regulation and Legal Framework** – Regulatory agencies in the federal and state/provincial levels make important decisions that affect the rules by which businesses operate. The quality of the regulatory bodies is paramount to economic development. Clear and stable rules and regulations reassure the confidence of investors in the viability of their business plans. Simple rules and the encouragement to self-regulation or co-regulation can boost entrepreneurship; while excessive and superfluous rules asphyxiate businesses and eliminate job creation. In the United States, federal regulation of the airline industry through 1980s proved to be an indirect, unintentional, and yet significant source of public support for the development of the civilian aircraft industry. As a consequence of tighter regulatory restrictions on entry and price competition, U.S. airline carriers competed with one another on service and quality, both of which enhanced by procurement of new generations of aircraft models. As a result, the regulated, large U.S. domestic market provided a strong base of demand for technological innovation by the

aircraft producers. Finally, it is worth to note that there is a growing concern within the industry about tighter regulations and new legislation on the reduction of mono-nitrogen oxide emissions and noise generated by aircraft, besides regulations on safety requirements. These new regulations have already prompted major OEMs to invest in the development of new “green aircraft,” generating large investments in R&D and the promise of more fuel-efficient aircraft (Tyson, 1993; Hillman, Keim and Schuler, 2004; CNI 2005; Deloitte & Touche LLP, 2010). **Regulation** is an important aspect of the governmental relationship with the aerospace sector because it adds value to the industry and it is an element of competitiveness. Civil aviation deregulation, which has an immediate impact on the aerospace industry, gained momentum in the past decade (especially in developing economies) through the liberalization of air transportation rights to increase foreign ownership levels and eventually remove cabotage restrictions between economies. In the past twenty years, the largest impacts in civil aviation deregulation have taken place in Central Europe, through the rapid increase in available seats; while China has been organizing deregulation efforts since 1990. China’s central government has reduced tariffs on business jets and approvals of flight plans have been reduced from three to four weeks to a few hours. In addition, safety certification is used as a marketing tool by most OEMs, since it guarantees the quality of their products and processes, allowing the OEMs to overcome technical barriers to foreign trade (ABDI & UNICAMP, 2008, Bragion, 2010, Deloitte & Touche LLP, 2010). Through **erratic or predictable regulations**, governments can influence in the development of the aerospace industry, as new safety or environmental (emissions) regulations can determine the lifespan of an aircraft or the additional costs for OEMs to adapt their products to the new regulations. In addition, if a government is perceived as **strong**, it will have better mechanisms to enforce its regulations than one perceived as **weak**. The same principles apply to the **labour legislation**, together with the overall functioning of the **judicial system**, all factors that can facilitate or impede the development of an industry or economic sector. As the judicial system and the

taxation and labour rules and regulations of each country will generally be equally applied to all industrial sectors, we will analyze the impact they have in the local aerospace industries in sections 6.2.2 – The Brazilian Institutional Environment and the Aerospace Industry; and 6.3.2 – The Canadian Institutional Environment and the Aerospace Industry.

In addition to these factors, we point out a study called “Support to Dutch policy makers in assessing the extent to which there is an ‘International level playing field in aerospace sector,’” published in 2004 by the consultancy group Technopolis. In this study, Technopolis compared government actions that could facilitate or impede the development of the aerospace industry in seven countries that are reference in the industry: the Netherlands, Belgium, Canada, France, Germany, Italy and Spain. The study investigated how these countries relate to various international treaties overseen by the European Union, the OECD and the WTO in order to support their aerospace industries. The benchmarks of the study were:

1. Government facilitation in the development of new civil aircraft;
2. Various forms of government assistance to aerospace-related R&D;
3. Fiscal measures to encourage research and innovation;
4. Government involvement in the procurement of aircraft; and
5. Regional programs and initiatives (Technopolis, 2004).

The relevance of this study lies in the fact that the benchmarks listed above can be linked to the six characteristics of the institutional environment used in our study. The benchmarks “Government facilitation in the development of new civil aircraft,” “Various forms of government assistance to aerospace-related R&D,” and “Fiscal measures to encourage research and innovation” are directly connected to **Intellectual Property Rights** and **Investments in R&D**, and indirectly connected to **Infrastructure**, as governments can justify investments in research centers and higher education as improvements in the country’s overall infrastructure. The benchmark “Government involvement in the

procurement of aircraft” is connected to “**Government Procurement and Financing & Export Credits Agencies.**” Finally, “Regional programs and initiatives” is directly connected to **Investments in R&D and Infrastructure** (e.g., the regional support of the Quebec government to establish the Montreal aerospace cluster), and it is indirectly connected to **Regulation and Legal Framework**, as governments need adjust their legislations in order to establish regional programs and initiatives to facilitate the development of the industry.

The study concluded that each country had unique policies to facilitate the development of the industry in light of the different benchmarks, regardless the size of their aerospace sectors. The variations in government actions facilitating the development of the industry in each country are linked to factors such as the structure of the national industries (especially the presence of OEMs and other suppliers on Tier 1) and the national policies on defence. It is usually very hard to prove that the countries are providing subsidies in contravention of the various international treaties governing aerospace production and trade, even though there is some space (the grey areas) within the terms of the international agreements for host governments to assist manufacturers to varying degrees. The fairness of one particular mechanism is considered especially hard to determine: the different national customs regarding the application of interest rates to loans and the repayment of launch investments. This type of official financial assistance has been always considered to be somewhat opaque to all parties who are not directly involved with the transactions; and the lack of public transparency applies to all five variables analyzed by Technopolis in different degrees (Technopolis, 2004).

All seven countries compared in the study have some forms of investment schemes to facilitate the launch of new aircraft, evidencing the governmental support for the development of the industry. The countries also give financial support to R&D programs, offering assistance on a competitive and cost-shared basis for pre-competitive and industrial research. In addition, four countries fund national aeronautical laboratories, while Canada has a national research center specialized in aeronautics. The study also found that,

with the exception of Germany, all countries operate an R&D tax credit system of some kind, with differences in terms of their level of assistance, scope and implementation. Another form of governmental assistance to the industry is the procurement of aircraft and export promotion programs. Even though the directed procurement of civil aircraft is prohibited by the 1979 GATT agreement, there is no way of quantifying the volume of assisted sales. While governments cannot direct purchases, their ownerships or indirect connections with national carriers mean that they have several options to interfere in the success of their national industries. Governments can also provide dedicated national financing agencies and major financial support by providing export guarantees and insurance amounting to hundreds of millions of dollars every year; while government procurement policies influence military sales. Local content policies (for security reasons) are another common practice within the industry (Technopolis, 2004). Even though Brazil was not part of the study, there is good reason to believe that the country has similar programs in place to facilitate the development of the local aerospace industry. One good example is the financial programs organized by BNDES to assist in the sales and export of Embraer aircraft, which is similar to the programs analyzed in the Technopolis study.

Table 5 summarizes the importance of each component of the institutional framework in relation to the three dimensions of the Pearce model (Hostile or Supportive, Erratic or Predictable, and Weak or Strong) and how they contribute to facilitate or impede the development of the aerospace industry:

Factor	Hostile - Supportive	Erratic - Predictable	Weak - Strong
Regulation and Legal Framework	+	++	++
Infrastructure	++	++	-
Intellectual Property Rights	-	++	++
Financing and Export Credits	++	+	-/+
Government Procurement	++	-/+	-
Investments in R&D	++	-/+	--

++	+	-/+	-	--
Very Important	Important	Moderately Important	Of Little Importance	Unimportant



Table 5: Factors Influencing the Institutional Environment According to the Pearce Model

According to the system presented in the table above, in the case of the aerospace industry, it is very important that the regulatory and legal frameworks are predictable and that the enforcement mechanisms to protect IP, for instance, are strong. It is very important that the State shows a willingness to make investments in infrastructure and that these investments are predictable. Predictable IP legislation, combined with strong enforcement mechanisms are very important qualities to the industry. As for financing and export credits, while a supportive is very important to the development of the industry, it is only moderately important that the State is strong or weak in this regard. Ideally, the industry would work with a supportive government in terms of government procurement, in a fairly predictable environment. Finally, it is very important that the government is supportive of R&D investments, while it not important, in terms of R&D, that the government is weak or strong.

## 6.2 The Brazilian Framework Supporting its Aerospace Industry

In this section, we present a brief overview of the Brazilian industrial policies and the role of federal agencies and industry associations in the development of the local aerospace industry. Then, we discuss how specific aspects of the Brazilian institutional framework and the country's public policies have an impact in the development and performance of the aerospace industry based on the Pearce (2001) model. The importance of each characteristic of the Brazilian institutional environment to the development of the local aerospace industry is weighted as hostile or supportive, erratic or predictable, and weak or strong. The discussion is based both on the documents indicated in Section 8 – Bibliography, and on selected comments from the collaborators who were interviewed in the course of our research (as listed in Section 4 – Methodology).

### 6.2.1 Brazilian Industrial Policies and the Aerospace Industry

In 2005, the Brazilian National Confederation of the Industry (CNI) published a report called “Strategic Mapping of the Industry: 2007-2015”, in which it outlined the main elements that the private sector would need the most in order to promote economic growth. According to the report, Brazil has some basic institutional flaws that compromise the development of the country: the State is constantly draining resources from the private sector; the domestic interest rates are unrealistic; the infrastructure is inadequate; the taxation system is excessive and inefficient; and the judicial system is ineffective. In order to correct these deficiencies, Brazil needs to modernize its institutional environment and promote a structured and stable regulatory environment. The country also needs to invest in a quality health care system and design an educational system that is aligned with the needs of society; and foster entrepreneurship to be better prepared to meet the challenges of the global economy (CNI, 2005).

Aware of these problems and in an attempt to consolidate the public policies for the industrial sector, the Brazilian Ministry of Development, Industry and Foreign Trade

(MDIC) has designed a program called “Productive Development Policy – PDP” in 2008. The central object of the policy is to support the national industry so that the recent expansion cycle in Brazilian industrial activity is sustainable. There are four main points in the program, which are considered vital to the improvement and future successes of the Brazilian industries: 1) expand the investment of Brazilian firms in capital goods; 2) expand the innovation capacity and the private investment in R&D among Brazilian firms; 3) improve the export capacity of Brazilian firms; and 4) strengthen Brazilian SMEs. As part of the program, MDIC determined that important Brazilian industrial sectors, such as aerospace, mining and ironworks, and bio fuels (ethanol) should be positioned amongst the five top players in the global market. The current view at MDIC is that aerospace is a sector that already has international projection and competitive capacity, so the policy aims at consolidating and expanding the leading position of Brazil. The importance of the PDP program for the aerospace industry is that MDIC is attempting to centralize and coordinate the efforts of several federal agencies involved in economic development and the private firms of the industrial sector. As part of the coordination efforts, MDIC is working together with ABDI to design specific policies for the aerospace sector (MDIC, 2010).

The Brazilian Federal Government recognizes the importance of the aerospace sector to the country’s economic development, and from the industry’s inception, the government has supported civil aircraft manufacturing in all stages of its development, most notably through funding R&D; joint government-private ownership, corporate funding at main markets loan rates; protection of the home market; and export development policies. However, there are questions about to what extent the Brazilian SMEs in the industry have built up technological capabilities to continue supplying Embraer. For a fact, the MDIC and ABDI consider the supply chain to be one of the weakest elements of the Brazilian aerospace industry, and as a result, companies at the bottom of the pyramid have been engaging in consolidation operations in recent years as a mean to overcome the high dependency on Embraer interests and the low production scale of the local supply chain. In 2003, 15 companies in the São José dos Campos cluster formed the High Technology

Aeronautics (HTA) consortium, aiming at increasing businesses with foreign OEMs. Even though the creation of the consortium consolidated the position of the companies, it was not enough to overcome the shortcomings of small and medium-sized subcontractors. Most companies that took part in the consortium operate in “family business” model; their production lines are regarded as outdated and lacking complexity. In addition, the small scale of their operation makes it impossible for them to negotiate better deals in the acquisition of raw materials, which is even more troubling given their chronic lack of working capital and limited access to short and long term financial lines. One possible way that SMEs found to diversify their business was to supply parts and pieces to other industrial sectors, especially oil and gas (Gomes et al., 2005; Lima et al., 2005; ABDI and UNICAMP, 2009; Ferreira, 2009; Malerba and Mani, 2009).

## 6.2.2 The Brazilian Institutional Environment and the Aerospace Industry

Considering the official position of the Brazilian government for the development of the local aerospace industry and the information obtained in the course of the interviews with key government officials and industry representatives, we briefly discuss some elements of the Brazilian institutional framework that have an impact in the development of the local aerospace industry:

1. **Intellectual Property Rights** – Brazil has no tradition in patent deposit and the number of Brazilian patents registered in Brazil and abroad is inexpressive; a fact that was pointed out by more than one interviewee. One of the reasons is that the National Industrial Property Institute (INPI) does not have the adequate infrastructure to process all the patents and trademarks of Brazilian companies. A second reason is that the Ministry of Justice and the Public Ministry (the District attorney) lack the necessary knowledge to settle IP disputes. There is no national culture of patent registration, as companies and researchers are not aware of the economic, technological, and scientific benefits of IP. As a result, the investment of private companies in R&D and innovation is insufficient to guarantee their

competitiveness in the long run. However, one interviewee pointed out that ABDI and the Ministry of Science and Technology are currently studying measures to increase awareness of IP within the industry and ways to improve the current legislation on IP. In addition to these problems, according to CNI (2007), piracy and copyright infringements are ever more frequent and disrupt the normalcy of economic transactions. Finally, there is no consensus between the government agencies (federal and state levels) and the private sector about the property rights of patents created with government support. However, ABDI proposed that INPI should prepare a study demonstrating what aerospace companies could do to reinforce IP protection in Brazil. In addition, one interviewee pointed out that the industry could benefit from policies that enhance the abilities of SMEs to bring innovation and generate new patents, as SMEs play a crucial role in the industry but lack some expertise and the capacity to innovate (CNI, 2005; CNI, 2007; ABDI, 2010).

2. **Investments in R&D** – Brazilian companies know that they need to invest heavily in R&D if they are to be competitive in the world market. The current investments in R&D are not enough to bring Brazil to the same level of the most dynamic and technologically advanced countries. The Brazilian government and the CNI have developed a policy to invest 2 per cent of the country's GDP in R&D, from 2010 on. According to CNI, one of the problems of the policy is that the access to the funds is limited to very few agencies, such as the Brazilian Innovation Agency (FINEP – which is part of the Ministry of Science and Technology) and BNDES (which is under the umbrella of MDIC). Another problem is that the cost of borrowing money from the government is considered to be very high; and there is a very limited number of private banks that lend money for the acquisition of new machinery and equipment. The access to R&D funds is specially limited to SMEs. As a result, it is estimated that 90 per cent of all R&D expenses are funded by the

companies themselves. One interviewee stated that Brazil still lacks an encouraging institutional environment for technological development that applies not only for large companies, but also for SMEs – while industry associations suggest that the government should implement a strong policy on R&D financing to remedy this situation. The existing legislation and programs on tax breaks to fund R&D initiatives have sensibly changed between 1995 and 2005, and such instability is a reflex of the fiscal limitations of the Brazilian state and the inconsistency of public policies supporting R&D and innovation. Another recurrent request, according to the same source, is that the government should simplify the bureaucratic procedures for companies applying for R&D financing funds. In addition, some members of the industrial sector consider that the agencies regulating patent registration, IP granting, and technical standardization (all under the umbrella of the Ministry of Science and Technology) are underfunded, understaffed, and politically weak, even though there were improvements in their services in the past decade. Part of these deficiencies can be also linked to the lack of basic infrastructure for standardization, which is a result of a vicious cycle: the lack of infrastructure and technical services for tests and instrument calibration means that technical norms are not thoroughly applied and observed. And because the norms are not fully applied, the low demand makes it difficult for the agencies to justify higher investments in basic industrial technology. Another problem is that part of the investments in basic industrial technology is concentrated in agencies with high technical and scientific capacities, which are not necessarily able to reproduce their achievements in commercial scale. This deficiency is a reflex of the poor relationship between private firms and Brazilian universities and research centers (CNI, 2005; CNI, 2007).

As part of the **Investments in R&D**, we also consider the public policies and investments in **Education and Human Resources Training** to have an impact in the industrial activity, including aerospace. In Brazil, there is a lack of qualified personnel and the development of training programs is a major challenge of the

industry. To achieve further economic development, Brazil needs to invest in training programs not only for technicians (e.g. IT) but also in higher education programs in technology (engineering, computer science, chemistry, physics, etc). CNI suggests that high technology sectors, such as aerospace, should coordinate with state and Federal Governments, universities and research centers in order to address their needs of qualified professionals and technicians. Brazil should invest more in post-graduate specializations for engineers and promote educational agreements and exchange programs with foreign universities. Entrepreneurship should also be a regular part of the curriculum of professionals working in high technology sectors. According to one interviewee, if Brazil is to further expand its economic development in a sustainable manner, HR training, reinforcement of the educational system, and more investments in R&D are paramount to the future success of industrial activities. In this regard, when compared to Canada, Brazil lacks huge investments in HR training (CNI, 2005; CNI, 2007).

3. **Government Procurement** – In terms of R&D, the Brazilian legislation that deals with government procurement is perceived as an obstacle to the advancements of R&D and innovation. In general terms, CNI suggests that the main piece of legislation on the subject (Lei de Licitações – 8666/93) focuses only on the lowest price as the determinant of government acquisitions, even in purchases for defence equipment, which can compromise other determining factors of government procurement. In addition, Brazil has no official policy on government procurement (such as the United States and the Buy America Act or the Small Business Act) and there is a lack of central planning for government procurement. In addition, according to one interviewee, Brazil has no official policies for defence acquisitions, while other government representative suggests that Brazil should have similar mechanisms to the “Buy American Act” to further propel the national industry (CNI, 2005; CNI 2007).

4. **Infrastructure** – Infrastructure is considered to be a critical variable for industry productivity and Brazil has a chronic problem investing in new infrastructure and maintaining what is in place. The productivity of Brazilian firms has been significantly affected by the country's poor transportation infrastructure: there are problems in the supply of transportation services of all modes, combined with the poor and insufficient infrastructure of Brazilian ports and airports. The institutional framework of the transportation systems is still based on obsolete, low concurrence regulatory marks of the 1960s and 1970s. CNI suggests that Brazil should improve its regulatory framework and encourage the establishment public-private partnerships to modernize its logistics infrastructure and bring more private investments to the expansion of the country's infrastructure. Besides transportation, Brazil lacks investments in energy generation, especially electricity and natural gas, which compromise the ability of private firms to expand production (CNI, 2010). In general terms, interviewees stated that the aerospace industry does not rely heavily on physical infrastructures; with the exception of airport infrastructure, which is considered to be a key determinant of the regional aviation expansion and should have an important impact in Embraer's sales. Brazil's airport infrastructure is considered to be faulty, but the Federal Government is now promising to make heavy investments to adequate the airports to the 2014 FIFA World Cup and the 2016 Rio de Janeiro Olympic Games. Federal Government representatives suggested in their interviews that the government should improve the legislation to encourage the establishment of PPPs in order to accelerate the necessary investments to improve the country's infrastructure. According to one respondent, there is also room for investments in the development of regional hubs in smaller cities and the further integration of Brazilian air routes with other South American countries. Finally, one interviewee pointed out that the São José dos Campos aerospace cluster is located in an area with relatively good infrastructure, easy access to the main Brazilian international airport, and it is closely located to the

main universities, training centers and R&D facilities in São Paulo, the main industrial hub and the economic center of Brazil.

5. **Financing and Export Credits** – BNDES and the Financing Program for Brazilian Exports (ProEx) were crucial in financing sales for Embraer, as way to compensate the country's weak financial system, high interest rates, currency and hyperinflation crises, and the lack of access to commercial credit. In 2008, 11 per cent of Embraer's sales were completed through BNDES credit lines, while in 2009 approximately 39 per cent of the sales were financed through BNDES. According to a government representative, financial support from BNDES to aircraft exports is an indicator of the government's commitment to the aerospace sector. The interviewee also pointed out that the Brazilian government constantly monitors and compares the types of financial support other governments offer to their aerospace companies in order to design similar strategies to further boost Brazilian aircraft exports. According to another interviewee, one of the reasons Brazil supports Embraer exports is that all other major aircraft manufacturers (Bombardier, Boeing, and EADS/Airbus) do the same thing; while, and in his perception, the Brazilian government sees the WTO disputes over the issue as a natural part of the game (Lima et al., 2005; Hira and De Oliveira, 2007; ABDI and UNICAMP, 2009).

Regarding the financial mechanisms created to strengthen the local aerospace supply chain, MDIC, together with BNDES developed the Pró-Aeronáutico in 2007, a program targeting the further development of SMEs in the São José dos Campos area. The purpose of the program is to expand the aerospace supply chain through production and export of engineering services, together with aeronautic parts, components, and systems. As one interviewee stated, the Federal Government understands that the only way to consolidate the supply chain is to enhance the gains of scale and be globally competitive. In this regard, federal agencies are now designing policies to encourage the mergers and acquisitions of SMEs within the

national supply chain. Moreover, the program aims at the specialization of aerospace personnel and the signature of international cooperation agreements in the area of safety accreditation of products made in Brazil. BNDES offers financial support to SMEs willing to invest in the establishment or expansion of their businesses, rehabilitation, modernization, innovation and technological development, acting either through long-term financing or by subscription of the company securities. However, as the interviewee suggests, the Federal Government policies for upgrading the SME suppliers to the aeronautic sector should also take into consideration instruments for strengthening their technological capabilities. In addition, they should focus on stimulating the upgrading in the SMEs to completely new and more advanced technologies while forcing them to improve their relations with research institutions and further develop and implement engineering, project management and design procedures in Brazil. Finally, the same interviewee states that government policies should also focus on the diffusion of the innovation culture in the aerospace sector through the successful cases of SMEs within the supply chain that have accumulated innovative capabilities, instead of focusing mainly on Embraer or on foreign buyers (BNDES, 2007; Figueiredo et al., 2008; Malerba and Mani, 2009).

As a subdivision of **Financing and Export Credits**, we analyze the impact of the Brazilian **taxation system** on the local aerospace industry. In general, besides the lack of transparency, the Brazilian taxation system is considered to be ineffective and obsolete by the private sector. Regarding the taxes applied to imported goods, which apply to a large part of aircraft parts and systems, Brazil has a tariff escalation policy: raw materials and intermediary goods have lower taxes; capital goods have a moderate level of taxation, and consumer goods have higher taxes applied to them. On average, capital goods have a 14 per cent import tax associated to them. However, in cases when Brazil does not produce similar capital goods, it is possible to import them free of tax. CNI considers that the credit breaks for the

acquisition of capital goods and other changes in the tax legislation are positive steps in the expansion of industrial activity in the country. Embraer and other exporting companies in the aerospace industry are eligible to apply for the RECAP, a program that offers special tax breaks for the purchase of capital goods by exporting companies. As Brazil has launched special taxation programs for several industrial sectors (including automobiles, railways and trains, the naval industry, and microelectronics), that are considered of key importance to the economic development of the country, the aerospace industry states that a similar program should be designed to encourage the further development of the industry in Brazil. As one government representative stated, changes in the taxation system have the most impact in the industry than any other aspects of the institutional environment – and Brazil has a history of suddenly changing its tax system whenever the government budget is unbalanced (e.g. the Provisional Contribution on Financial Transfers (CPMF), a tax that was collected between 1997 and 2007. The tax was created as an emergency fund to public health initiatives in Brazil). Another interviewee stated that the current taxation system tends to favour companies of Tier 1, while penalizing the final purchaser of the aircraft (who pays most of the taxes). The interviewee also stressed that most companies in Tier 1 are from foreign countries and they most likely benefit from tax incentives in their home countries. According to another interviewee, another flaw of the Brazilian tax system is that taxes are collected over all stages of production, which have a heavy impact in the final price of products. A third government representative stated that Brazil is currently working closely with the OECD and WTO to correct fiscal discrepancies in the aerospace sector and equalize it with other major players within the industry. In addition, one respondent from a fourth government agency states that “it does not make sense to have heavy taxes on labour in a country that needs to create more jobs.” As a result, the industry sees the taxation system as unpredictable and hostile to the business environment, while the government is strong in its capacity to collect taxes (Rios and Velloso, 2005; CNI, 2005; CNI, 2010).

Another aspect of the institutional environment that is connected to **Export Credits** is the local **Foreign Trade Legislation**. The legal requirements involving the notarization of foreign documents for companies willing to do business in Brazil is considered to be excessive and it has high costs attached to it, which is harmful to the country's foreign trade. Brazil has yet to sign several international agreements on foreign trade (e.g. the Hague Apostille Convention). If Brazil were to sign international trade agreements and further liberalize foreign trade, private firms would benefit from a stronger legal framework and simplified bureaucratic requirements, which should also be more cost-effective. Another benefit associated with the signature of international trade agreements would be a competitiveness improvement of Brazilian companies in the global market. Besides the legal impediments for exporting firms, one government representative states that Brazilian exports are hurt due to the country's structural problems in terms of customs inspection, lack of qualified personnel, excessive red tape, and complex regulations on exports. In addition, there is no official policy to promote the participation of SMEs in the country's exports and the coordination between the government and potential exporting firms is weak. Brazil should also invest in the development of a strong image for its industry, in order to stress the intrinsic characteristics of Brazilian products, such as quality, diversity, innovation, design, and cultural identity, which are a fundamental fact in the development of an export culture. Regarding FDI, one interviewee stated that Brazil has adequate legislation to attract foreign investment, but in the end, each company will choose the foreign partners with whom it wants to establish joint-ventures (CNI, 2005; Palermo, 2005).

6. **Regulation and Legal Framework** – The main regulating body in the industry is the National Agency of Civil Aviation (ANAC) and it usually follows the recommendations of the Joint Aviation Authority (JAA) and the Federal Aviation Administration (FAA), as indicated by one of the interviewees. The main piece of legislation regulating the industry is the Brazilian Code of Aeronautics (Lei

7565/86). As one respondent pointed out, Brazil has no specific policies governing foreign carriers flying to the country and Brazilian carriers flying abroad. As the representatives from ANAC stated in their interviews, the agency symbolizes the Brazilian government message to the aerospace industry (and more specifically to the civil aviation sector) that the country has a stable institutional environment. Also, they stated that the government wants to reinforce that the sector has a transparent and a stable regulatory environment to operate and stressed the fact that Brazil has today a much better institutional environment than it had ten years ago.

The current Brazilian regulatory framework only started to take shape in the 1990s, after the privatization of several public companies that used to provide services ranging from telecommunications to mining and gas exploration. As a consequence, the country is still adjusting to the model of regulatory agencies. In 2003, the Federal Government created an Inter-Ministerial Workgroup to analyze and evaluate the role of regulatory agencies in the face of the country's current institutional framework. In the Workgroup's report to the Office of the President, the Brazilian government outlines the role of the regulatory agencies as the following:

- I. The Federal Government expects the total investment in the country's GDP to continue to grow in the next years;
- II. The Federal Government has the responsibility to create the adequate environment to encourage investments;
- III. The presence of regulatory agencies is indispensable for the success of private investments;
- IV. According to the current legal framework of Brazil, it is the Federal Government who must assure the scope and quality of services offered to all Brazilian citizens, so the role of the several regulatory agencies is vital to the proper function of the county's public services;

- V. Stronger regulatory agencies can contribute to lower capital costs for the infrastructure sector (and investments in infrastructure) in Brazil;
- VI. The government should encourage economic regulation, not necessarily through regulatory agencies, especially in sectors that are not related to infrastructure development, such as the pharmaceutical industry;
- VII. The Brazilian model for its regulatory agencies should be aligned with those of other developed nations, where agencies are eminently responsible for the formulation of sector policies;
- VIII. In addition to the role of regulatory agencies, economic regulation should be constantly improved, aiming at the establishment of a competitive environment for all economic activities;
- IX. The development of social control mechanisms for the agencies is the next step to the optimal functioning of the regulatory model. Such mechanisms should include public consultations in order to address controversial regulations; the appointment of representatives from consumer rights organizations to observe the public consultation process in the agencies; the establishment of ombudsman offices in all agencies; the increased transparency of rules and contracts between agencies and companies; and the establishment of accountability mechanisms between the agencies and the Brazilian Congress;
- X. Contracts establishing good management practices and high performance goals can be combined with social control instruments in order to implement “transparency goals” as a tool to the improvement of regulatory effectiveness;
- XI. The Brazilian government believes that regulatory agencies can work as tools to avoid certain deficiencies of the markets, but the State should not directly interfere in private economic activities as a result of pressures from interest groups or aggressive lobby activities. Regulatory agencies should primarily focus on the activities requiring heavy, long-term investments in

infrastructures, such as the building of dams and energy generation (Presidência da República Federativa do Brasil, 2010).

Even though the recent debates on regulatory issues in Brazil have mainly concentrated on the role of the regulatory agencies, broader discussions have highlighted the need to build regulatory capacities inside the administration in the medium and long terms. The Brazilian Federal Government, through the Chief of Staff, the Ministry of Finance and the Ministry of Planning, Budget and Management, is setting up the Program for the Strengthening of the Institutional Capacity for Regulatory Management (PRO-REG), aiming at the improvement of the regulatory system and coordination among the institutions that participate in the regulatory process. Among other objectives, the PRO-REG seeks to establish an oversight body for regulatory quality and the introduction of a Regulatory Impact Analysis (RIA) as a policy tool to support decision making (OECD, 2008).

The modernization of the regulatory mechanisms in Brazil also seeks to improve the regulatory processes, making them more structured. Regulatory legislation, as other laws in Brazil, is not necessarily prepared in accordance with quality control mechanisms, although formal procedures are used to prepare new legislation. It is important to notice that accessibility of laws and regulations to citizens has improved with electronic portals. On the other hand, the legal framework remains complex and uncertain, despite the consolidation instruments that have been introduced to reduce the number of existing laws. Simplifying the legal framework and making the process more transparent, effective and accountable are challenges requiring special attention from the Federal Government. In addition, legal certainty is needed to improve compliance and reduce the involvement of the judiciary (OECD, 2008).

In the case of the aerospace industry, an example of how governments can facilitate business is the recently approved “Portaria Secex Number 10.” The Federal

Government passed this piece of legislation in 2009, determining that ANAC was no longer required to approve the import of aerospace products, except those that have been refurbished and tools to be used by firms of the sector. This measure eliminated one bureaucratic step in the imports of the industry, as other federal agencies are still in charge of enforcing customs regulations that apply to all industrial sectors in Brazil. CNI considers the establishment of the regulatory agencies starting in the 1990s as a positive step for the modernization of the economy. However, even though the institutional framework is fairly new, it already needs to be updated and improved. There is a perception that some agencies still lack independence, transparency, a precise delimitation of their functions, financial autonomy and technical expertise. There is also a certain scepticism about the selection of the regulatory agencies' board of directors and the integrity of their mandates. Regarding the regulation of civil aviation, Brazil is following the world trend to deregulate civil aviation. Brazil has an extremely high and largely repressed demand for air travel, and the country's airport infrastructure needs massive amounts of investments in order to serve the ever growing number of passengers they receive every year. So, it is clear to the Brazilian government that in order to enhance competition, the improvement of air travel services at competitive prices, and the expansion of the number of routes served by air companies, the country needs to modernize the framework regulating air traffic. However, Brazil is still reluctant to sign international agreements and be part of an "open skies" network mainly because the country is concerned about the level of competitiveness of Brazilian air companies and the possibility of jobs cuts resulting from the deregulation of the sector (Pasin and Lacerda, 2003; CNI, 2004; CNI, 2005; ABDI, 2010; Braigon, 2010).

Another aspect of **Regulation and Legal Framework** that affects all industrial activity in Brazil (including aerospace) is the local **labour legislation**. The Brazilian labour legislation is perceived to be extremely rigid, and it is an enormous obstacle

to the economic growth of the country. The basis of the current labour legislation dates back to the 1940s and it has hardly changed ever since: as they are, Brazilian labour laws do not reflect the changes of the institutional framework, and are considered to be outdated, excessively extensive, and paternalist. The legal framework imposes hiring costs of over 100 per cent of those applied to direct salaries under the form of compulsory, non-negotiable taxes; and there are several restrictions for temporary contracts. In a study conducted in 2005, the World Bank affirms that labour regulations in Brazil are less favourable to business than in most of the 145 countries included in the study. The three main problems of the legislation are: 1) difficulties in hiring new employees; 2) inflexible working hours; and 3) difficulties in dismissing employees. In addition, there are strong restrictions for evening and weekend shifts, and all employees are entitled to paid annual leave that exceeds 21 days after 1 year in the job. In order to compensate for the indirect costs of hiring new employees, businesses tend to offer lower salaries, which in turn translate into low morale and low productivity. As a result, Brazil has a high number of unregistered workers, who have no legal guarantees or are self-employed; and there is an accentuated discrimination against women and younger workers in the job market. Industrial sectors complain that the current framework hurts business growth, technological advancement, and higher productivity. As one interviewee summarizes it, the Brazilian labour legislation is obsolete and it is almost impossible to change it, since society is not ready to discuss major changes in labour rights, such as paid annual leave and the establishment of temporary contracts of work (Saisse, 2005).<sup>4</sup>

Finally, we consider that the Brazilian **Judicial System** is another aspect of **regulation and legal framework** that can have an important impact on private businesses, including the aerospace industry. According to one government

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<sup>4</sup> There are no specific labor regulations for the aerospace industry in Brazil. The topics discussed in this section reflect the framework that applies to all industries and workers in the country.

representative, Brazil still needs to make adjustments in the stability of its legal framework, as private firms still lack confidence in the country's property rights, law enforcements (especially regarding respect to contracts), and the predictability of the judicial system. Legal counselling and other legal expenses are considered to be excessively high, but they are considered to be an integral part of doing business in Brazil. According to another respondent, there is a general perception that the interference of the Executive Branch on the Judiciary Branch is excessive. The private sector also feels that the Judiciary is excessively slow, which favours the maintenance of irregularities in the system and the disregard to legitimate rights. The inordinate possibilities of appealing of a legal decision (a well-known, widely used mechanism to postpone the payment of a court's rule or settlement), also contribute to the weakness of contracts. Besides the overall perception that there are excessive and unnecessary bureaucratic procedures in the legal system, the Labour Courts are also perceived as having excessive normative powers over private businesses. Brazil also needs to reinforce and expand its alternative dispute resolution and mediation systems (CNI, 2005).

Table 6 summarizes the importance of each component of the Brazilian institutional framework in relation to the three dimensions of the Pearce (2001) model (Hostile or Supportive, Erratic or Predictable, and Weak or Strong) and how they contributed to facilitate or impede the development of the aerospace industry in Brazil:



Figure 11 shows the different actors influencing in the Brazilian aerospace industry:



FIG. 11 – Public and Private Organizations of the Brazilian Aerospace Industry

Figure 12 shows the different actors influencing in the Brazilian aerospace industry by field of action:

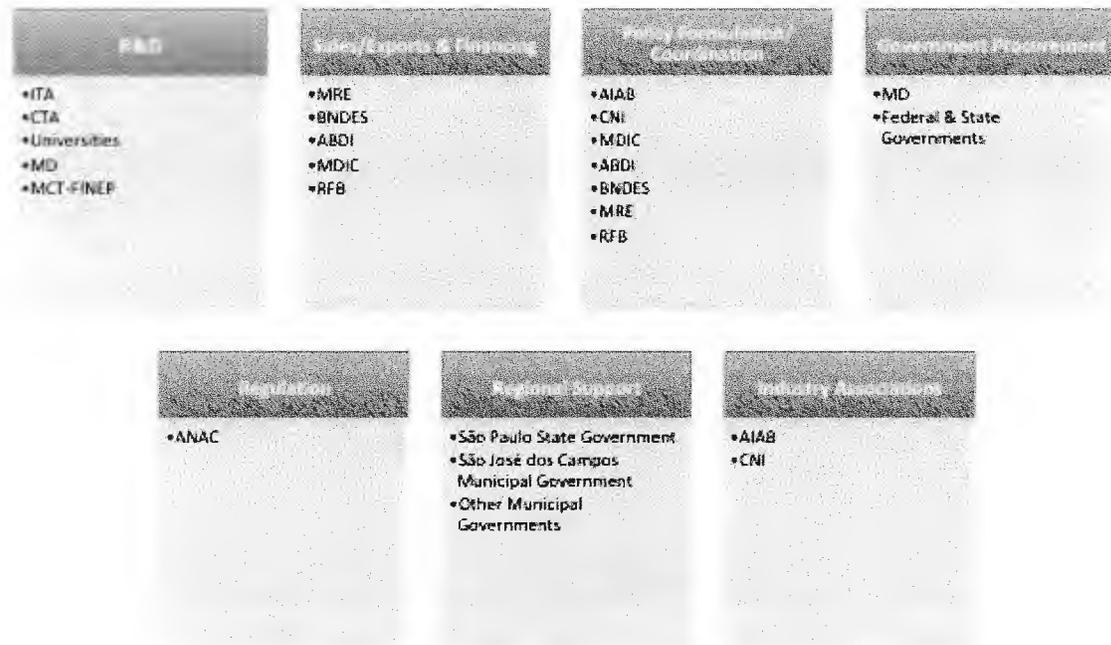


FIG. 12 – Public and Private Organizations of the Brazilian Aerospace Industry by Field of Action.

### 6.3 The Canadian Framework Supporting its Aerospace Industry

In this section, we present a brief overview of the Canadian industrial policies and the role of federal agencies and industry associations in the development of the local aerospace industry. Then we discuss how specific aspects of the Canadian institutional framework and the country's public policies have an impact in the development and performance of the aerospace industry, based on the Pearce (2001) model. The importance of each characteristic of the Canadian institutional environment to the development of the

local aerospace industry is weighted as hostile or supportive, erratic or predictable, and weak or strong. The discussion is based both on the documents indicated at Section 8 – Bibliography, and on selected comments from the collaborators who were interviewed in the course of our research (as listed in Section 4 – Methodology).

### 6.3.1 Canadian Industrial Policies and the Aerospace Industry

Traditionally, Canadian industrial and trade policies have always struggled to balance conflicting pressures: on one hand there is a small domestic market and the resultant dependence on exports; on the other hand, there is a reluctance to embrace fully American laissez-faire principles. As a result, Canadian industrial policy is considered to be aimed at harnessing the best features of markets and protecting citizens against the worst. Canada is a country whose popular culture is highly americanized, so political institutions and practices assume great importance. However, it is important to note that greater acceptance of state intervention in the economy is one the few things that differentiates Canada from the United States – to the point that

if markets were entirely open and there was little difference in the organizing principles of the U.S. and Canada, the existence of separate countries would no longer be required (O'Brien, 1997, cited by Goldstein and McGuire, 2004).

There are, of course, dissonant opinions: as one government representative stated, the Canadian government makes a clear distinction between the attributions of the public and private sectors. In the words of the respondent, there is very limited direct government influence over private businesses in the aerospace sector – and given the limited access to Canadian government officials in our research, we assume that this is the official position of the Federal Government towards the industry. In any case, the Aerospace Industries Association of Canada (AIAC) considers that government actions to facilitate the development of the industry are justifiable from the point of view that governments recognize the benefits to be reaped from such investments. Governments know that the

investments in the aerospace industry are usually followed by an increase in trade; both by OEMs and the suppliers of parts and pieces in the industry's supply chain. AIAC also considers that the industry does not operate in a laissez-faire market place. Aerospace is subject to extensive government control and influence, with matters of national security and politics always in the balance, in addition to international trade concerns. The industry is also unique in the sense that much of aerospace technology has both civilian and military applications, so it is hard to determine to what extent defence programs are used to support cutting-edge R&D in the industry. In the end, the industry recognizes that this proximity with the government served to give private firms a competitive advantage in global commercial markets (AIAC, 2010). Despite the clear separation between government and private firms in the aerospace industry, another interviewee suggested that subsidies and other forms of financial support offered to the industry (mainly through the Federal Government) give the government some power to negotiate business decisions, especially in terms of keeping production lines (and jobs) in Canada, instead of relocating them to developing countries.

Another example of governmental actions to facilitate the development of the industry was displayed when the Federal Government felt compelled to complain against Embraer at the WTO as Bombardier's market position was seen as a crucial element in the decision. According to one Canadian official who deals with policies supporting the sector, under no circumstances could Canada accept a situation where Bombardier lost market share unfairly, especially in a market it had created. In order to support Bombardier; the Federal Government automatically accepted the risk that a number of industry's members – especially the SMEs that may be the most interested in selling components to Embraer – could be hurt by the WTO disputes (Goldstein and McGuire, 2004).

Another initiative of the Federal Government to support the aerospace industry is the National Aerospace & Defence Strategic Framework (NADSF), which was established in 2005 to define the blueprint for conjoint actions between the government and other industry stakeholders to enhance the global competitiveness of Canada in the global

aerospace market. The NADSF is a 20-year comprehensive policy aimed at creating the right conditions that can make Canada a preferred location from which to serve global aerospace markets. In this program, the Federal Government identified seven areas where it could take a leadership role in working with other stakeholders to improve its support to the industry:

1. Strategic Initiatives and Major Platforms;
2. Technology Development and Commercialization;
3. Human Resources and Skills Development;
4. Trade Development and Market Access;
5. Sales Financing;
6. Security and the Environment;
7. Public Procurement (AIAC, 2010).

The importance of the NADSF to industry is that it is perceived as a mechanism to document the Federal Government's objectives and policy intentions supporting the Canadian aerospace sector. However, AIAC understands that for the further development of the industry, Federal Government support should be mainly focused on three priority areas:

1. Levering industry investments in technology development, product mandates and strategic platforms;
2. Levering procurement to capitalize on the capabilities of Canadian-based firms; and
3. Providing adequate export financing under appropriate terms and conditions (AIAC, 2010).

These three areas translate the expectations of members of the Canadian aerospace industry in terms of government actions to facilitate the further development of the industry, as the sector expects the Federal Government to 1) consolidate its programs to

invest in new aerospace technology; 2) provide universal access to refundable Scientific Research and Experimental Development (SR&ED) investment tax credits; 3) adopt a strategic approach to defence and national security procurement that includes a predisposition to further invest in Canadian solutions; and 4) establish a standalone aircraft sales financing framework (Technopolis, 2004; AIAC, 2010).

The main government agency involved with the sector, Industry Canada, considers that the Canadian aerospace industry will face challenging issues in the next two decades, connected to increasing prices of oil and environmental pressures to reduce emissions and aircraft noise. In addition, other threats to the Canadian industry are the intense foreign competition, combined with lagging productivity resulting from sub-par levels of investment in R&D and infrastructure; the high value of the Canadian dollar; a decline in the Canadian content of domestic production and exports; and scarce capital for investing in new manufacturing equipment and technology development. Another problem, according to industry representatives, is that Canada's public investment in aerospace has declined rapidly since the late 1990s, while many of the other major aerospace players have been increasing their support to the aerospace industry. In order to maintain their positions within the industry, Canadian aerospace businesses will have to meet the requirements of the civil aviation industry. In a report prepared by IC, major airline companies stated that they will seek to acquire innovative aircraft that will present the following characteristics: 1) light weight, with lower combustible consumption; 2) more reliable and with less maintenance costs; and 3) longer lifespan (EDC, 2006; CAMAQ, 2010; AIAC, 2010).

It is important to note that the private sector is also committed to articulate strategies to strengthen the industry: as a mean to support the industry in an evolving global context, the Aerospace Industries Association of Canada (AIAC), together with several governmental agencies, launched the Future Major Platforms (FMP) initiative in 2008. Representatives of the industry and the government agreed to work together through the FMP initiative to improve Canada's position within the industry by: 1) identifying the major commercial platforms that offer the best opportunities for Canadian firms; 2)

identifying priority technologies necessary to participate on the identified future major platforms; 3) providing recommendations to align existing support mechanisms to facilitate technological development, with the understanding that no new funding is available; and 4) developing and implementing “capture plans” to assist Canadian companies in becoming suppliers to these platforms. Even though the program was initially created to support the commercial aerospace sub-sector, both the AIAC and the Federal Government expect to replicate the lessons learned from the FMP process in other segments of the industry, such as MRO; military; helicopter; and space and unmanned aerial vehicles (AIAC, 2010; CAARHA, 2010; The Hill Times, 2010).

Even though there are several governmental programs to support the aerospace industry, the Federal Government considers that Canada still has a limited number of OEMs and mid-level companies, which forces companies in Tier 1 to buy foreign systems. As a consequence, in order to reinforce the supply chain, Tier 2 needs more development. Such limitation in the number of Tier 1 system integrators means that the Canadian industry, in general, is unable to respond to the demand of OEMs to fund and manage large work packages. As a result, the Canadian industry was not considered competitive enough in a recent call on bids to supply major work packages for the Embraer family of business aircraft, due in large part to the industry’s inability to respond to the scope of the work offered. Members of the industry advocate that integrators with world class capabilities still need to receive further support from the government, especially through the SADI program. This applies to the complete development cycle – from product development to production and full training capacity (EDC, 2006; AeroStrategy, 2009; AIAC, 2010).

While it is undeniable that the Canadian government is committed to support the industry, given the numerous successful programs and initiatives organized by public agencies, both the government and the industry know that the current level of support is not adequate. For example, SMEs claim that public policies have paid too much attention to the demands of large OEMs, and as a consequence, structural problems beneath the final assembly level have not received the proper attention from the Federal Government. In fact,

members of the industry and government representatives are well aware that money from the SADI program tends to go to the bigger players of the industry, so the government is now studying ways to improve SMEs access to SADI and review its repayment conditions (Goldstein and McGuire, 2004; The Hill Times, 2010).

Figure 13 shows how the Canadian Federal Government supports the aerospace industry:

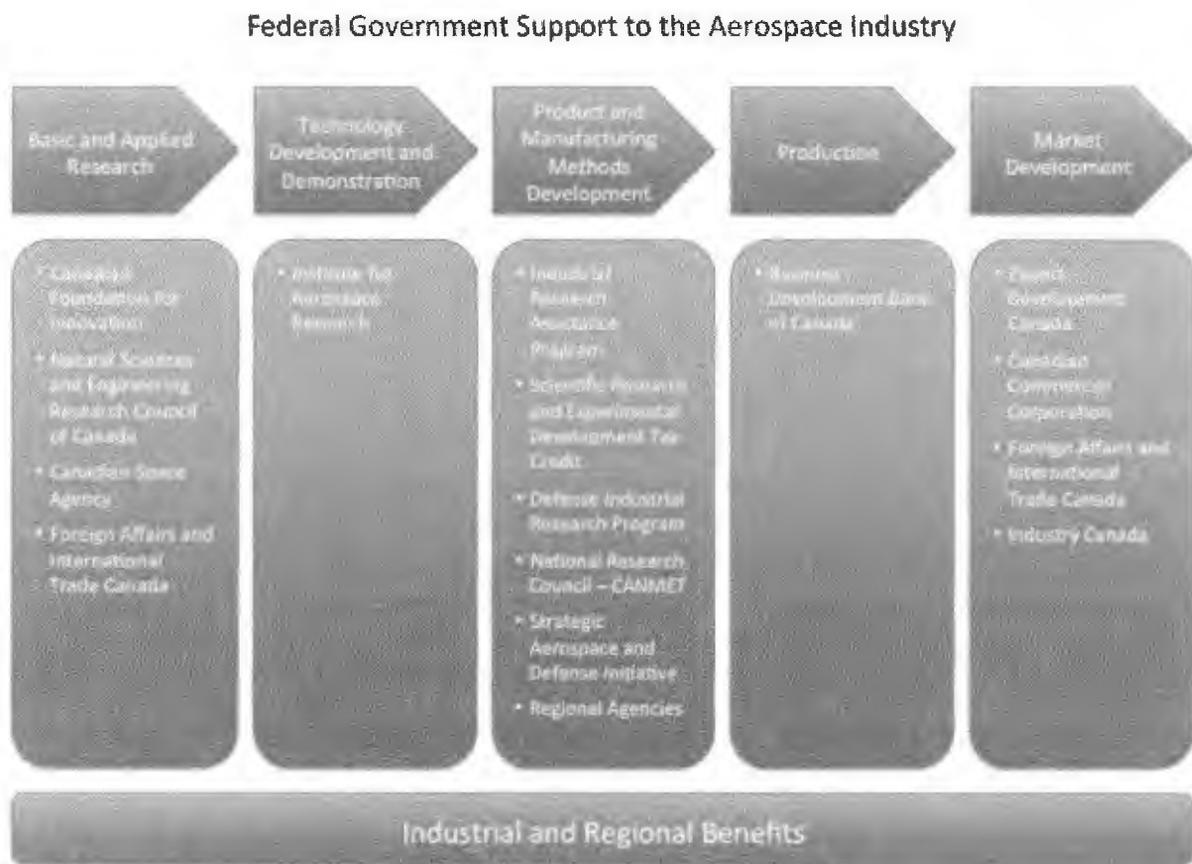


FIG. 13 – Federal Government Support to the Canadian Aerospace Industry  
Source: AIAC, 2010

As Figure 13 shows, the Federal Government support to the industry tends to concentrate in the areas of basic and applied research and product and manufacturing

methods development. As a result, there is a lack of private and public investment in technology demonstration. As the AIAC (2010) points out,

Technology demonstration is defined as a project that demonstrates how technology may be operationally integrated and exploited for a specific end-use application, or range of applications. Technology demonstration programs aim to accelerate the maturation of advanced technologies and enable the development of the next generation products.

This lack of investment in technology demonstration is essential to understand why continued investment in basic and applied research does not necessarily (and often does not) lead to commercialization. In addition, the limited capacity of the Canadian industry at the critical Tier 1 system integrator level can be directly linked to the lack of investment in technology demonstration. To remedy this perceived lack of investment in the aerospace industry, AIAC states that private businesses, government and academia should develop a partnership and provide sizeable injections of R&D funding through existing financial mechanisms. Such partnerships could offer tremendous new opportunities for the Canadian aerospace industry that are within its reach. AIAC states that funding programs must be substantial to meet the sizeable demands of developing new aircraft and reap the potentially high rewards over 30 to 40 years. As an example of the benefits of such programs, AIAC points out that the repayments on the CRJ aircraft program generated CAD \$99 million on a loan of CAD \$45 million. As a result, members of the industry suggest that Canadian Federal Government should increase aerospace funding through SADI, NRC-IAR, and a special fund for Technology Demonstration Project by a total of CAD \$400 million over four years. AIAC argues that such investment would ensure the Canadian aerospace industry's continued position as a world leader and as an important contributor to Canada's technological advancement and economic prosperity (AIAC, 2010; The Hill Times, 2010).

### 6.3.2 The Canadian Institutional Environment and the Aerospace Industry

In addition to the official programs presented above, there are specific aspects of the Canadian institutional environment that contribute to the success of the local aerospace industry, as we discuss in the following topics:

1. **Intellectual Property Rights** – IP Rights in the context of collaborative networks in the aerospace industry often remains at the university level. As the representatives from AIAC suggest, possible solutions could include pre-established IP agreements (e.g. CRIAQ) and allow that creative ideas come from businesses, other partners and co-inventors. The two sectors should work together to find a solution that is satisfactory to both parties. In addition, the industry suggests that the Federal Government should expand the scope of the SR&ED tax credit to include IP protection expenses involved in eligible R&D projects.

According to AIAC, the current legislation on IP touching aerospace determines that when the Canadian government partially or wholly fund R&D initiatives in the industry, the IP developed is deemed to be the property of the Ministry or the Canadian Government. One problem of this arrangement is that it limits the free flow of IP and puts some restrictions to Canadian companies compared to their partners and competitors in other nations – as new aerospace programs are shifting and are increasingly being developed as a collaborative effort between multiple partners from different countries (especially by a small number of large Tier 1 and 2 OEMs and system providers). These restrictions differ from the European Union treatment of IP, as in Europe aerospace companies are actually encouraged to share IP rights amongst members and partners, based on their participation in each project. As a result, Canadian aerospace companies (in addition to the subsidiaries of European parent companies doing business in Canada) are at a disadvantage position, when compared to their partners in Europe. In addition, AIAC states that Canadian subsidiaries of large multi-nationals in the United States consider that the IP framework is essential to the development of a long term sustainable advantage, and for that reason, they should resist any attempts to limit the free flow of IP between subsidiaries in Canada and other jurisdictions. As a result, there have been several examples of Canadian subsidiaries of U.S. parent companies refusing to participate in the Strategic Aerospace and Defence Initiative (SADI) recent

programs due to its IP restrictions. According to the representatives from AIAC, one of the main limitations of the programs is that some of its IP clauses are becoming all too prevalent, which is a factor that limits the ability of the industry to innovate. According to AIAC, the Strategic Aerospace and Defence Initiative (SADI) template agreement should be modified to ease restrictions on IP ownership.

2. **Investments in R&D** – Regarding the investment in R&D and innovation, the Canadian government recognizes that governments of major global aerospace players understand the need to share in the risk/reward nature of the industry, so they work closely with their industries to position them for success. Since the 1970s, the governments of the U.S. and those of the European Union provide billions of dollars every year in repayable and non-repayable support for aerospace and defence R&D. As a result, the Canadian government launched the Strategic Aerospace and Defence Initiative (SADI) in 2007 in an attempt to fill the gap in terms of R&D funding in Canada, even though the country does not have the level of financial resources of other leading aerospace countries. Besides the SADI program, the Federal Government support for the aerospace industry is coordinated through several instruments that support a broad spectrum from basic research to product development. Such programs are managed by:

1. The Natural Sciences and Engineering Research Council of Canada (NSERC), which has invested over CAD \$4 million in university-industry collaborative projects over the past ten years;
2. The National Research Council (NRC); which has created the Institute for Aerospace Research (NRC-IAR), an agency that employs close to 370 researchers and technicians and has managed to leverage CAD \$28 million of A-base funding into a program that is considered to be highly relevant to the industry; and

3. The Industrial and Regional Benefits (IRB), which provides the framework for using federal (defence) procurement as a lever to promote industrial and regional development objectives of the Federal Government (AIAC, 2010).

The NRC-IAR is the most important national grant-awarding body in the area of fundamental research. NRC-IAR facilities include 8 wind tunnels, 8 research aircraft, full-scale structural test rigs, engine test cells, etc. In 2004, the historical investment cost was estimated to be at CAD \$80 million, and the estimated replacement cost was CAD \$600 million. The Institute has 4 major departments: 1) the Aerodynamics Laboratory; 2) the Structures, Materials, and Propulsion Laboratory; 3) the Flight Research Laboratory; and the Aerospace Manufacturing and Technology Centre (located at the campus of the Université de Montréal). Most income of the NRC-IAR comes from services to business; while ties with industry are strong: Pratt & Whitney Canada has its own test facilities at the Ottawa IAR site for years now. IAR services are priced based on a “straight fee for service base,” comprised of a personnel and overhead component. The rates are the same for every customer, including the government and private firms within the industry, both Canadian and foreign. This pricing policy was based on a government decision that government research institutes must not compete with the private sector.

Compensation packages of researchers working within the IAR are based on regular comparisons of the rates of researchers in all domains in industry and academia, and the rates are of the same magnitude as outside organizations (Technopolis, 2004).

The Technology Partnership Canada (TPC) program, which was funded by the Federal Government, identified three target sectors (aerospace, biotechnology, and environmental technologies) to receive 25-30 per cent of the costs of developing new products reimbursed through a system of royalty payments. The TPC program was superseded by the current SADI initiative. However, according to AIAC, the main difference between both programs is that the TPC took elements of risk into account when evaluating the performance of projects, while SADI does not take

“risk” into account. As a result, contract terms have become more onerous and the definition of eligible expenses has narrowed, which is considered to reduce the effectiveness of the program. According to representatives from AIAC, Canadian companies are, as a consequence, at disadvantage compared to competitors across the world. Besides the SADI program, the Federal Government is promoting the **Innovation and Science and Technology (S&T) Cooperation Arrangements** as important tools to forge S&T partnerships with India, China, the EU, Japan, Korea, Brazil, and Israel. According to a representative from Bombardier, the R&D support offered by the Canadian government to the industry is crucial to the development of the industry and it makes the sector feel confident that a combination of private and public R&D funding will reinforce Canada’s position within the global market in the future.

The government of Quebec has also established initiatives to support research activities within the local aerospace industry: companies doing R&D in Quebec can have a tax credit of 20 per cent on the salary expenditures of R&D. For a Canadian controlled private company, the credit is 40 per cent for the first CAD \$2 million of annual wages paid in Quebec. The credit reduces linearly for assets totalling between CAD \$25 million and CAD \$50 million to 20 per cent, and it is refundable for all companies. In addition, as a means to attract foreign researchers to Canada, non-nationals working for a corporation conducting R&D in Quebec are eligible for a provincial tax holiday for up to a maximum of five years, which means that the researchers only pay the federal portion of their income tax (Technopolis, 2004; MDEIE, 2010). These initiatives show a great level of commitment of the provincial government towards the industry, as a representative from UQAM stated that Quebec invests more in R&D (through tax credits) than some countries (Technopolis, 2004; MDEIE, 2010).

In addition, the Quebec government is also committed to fund R&D projects in the aerospace industry through its Société générale de financement (SGF). The Quebec

government is especially concerned with the credit access of SMEs to fund their R&D initiatives. According to a representative from MDEIE, investments in education and R&D are advantage factors in Quebec and the challenge of the provincial government is to keep up the trend and train enough people each year. When compared to other Canadian provinces and the OECD countries, Quebec's expenses in R&D place the province in high places: first place among four provinces (when compared to Alberta, British Columbia and Ontario) and in seventh position, when compared to 32 OECD countries. Finally, MDEIE understands that investments in R&D must be constant and they are long-term investments, so governmental support should not be unusual, especially if one considers the fact that aerospace is a source of high income jobs (Goldstein & McGuire, 2004; Government of Canada, 2010; AIAC, 2011, Conseil du patronat du Québec, 2011).

As in the analysis of the Brazilian institutional framework, we consider the public policies and investments in **Education and Human Resources Training** as part of the **Investments in R&D**. The Canadian government (at federal and provincial levels) has important programs to support the aerospace industry, including the college centers for technology transfer. Two examples of such initiatives are the Technology Center in Aerospace (CTA) and the Consortium for Research and Innovation in Aerospace in Quebec (CRIAQ). At the moment of its creation, in 2002, CRIAQ regrouped 20 private companies (including 14 SMEs), one research center and 9 universities, and its mandate was to coordinate the collaboration between universities and the industry's pre-competitive R&D initiatives. Since its inception, CRIAQ has managed 31 research projects involving over 200 researchers and specialists. The success of Canada's aerospace industry is largely based on a strong partnership between government, private firms and academia. As a result, the Canadian post-secondary education system had to adapt to have the right capacities to partner effectively with the industry. However, according to the

representatives from AIAC, some challenges exist, as for example, the alignment of research objectives among collaborators can be a challenge. Universities should be provided with additional funding to enhance the activities of their university-industry collaboration offices and laboratories. In Quebec, McGill University, École Polytechnique de Montréal, Laval University, Concordia University, University of Sherbrooke and École de Technologie Supérieure have developed a joint program in the field of aeronautics and space technology leading to a Masters in Aerospace Engineering (Technopolis, 2004; MDEIE, 2010; AIAC, 2010). Regarding the availability of trained professionals, when compared to Alberta, British Columbia and Ontario, Quebec is lagging behind, as the province has the highest percentage of youngsters and adults who do not have a high school diploma and are not attending school (11.9 per cent). The province is also lagging behind in terms of workers who are currently employed in their original fields of expertise, employment opportunities for middle-age workers, and economic integration of immigrants. The province also ranks in fourth place when the comparison is focused on labour costs (considering the minimum wage and labour taxes); and labour legislation (orientation of labour laws, influence and leverage of certain unions; and level of bureaucracy/paperwork associated with regular employment or job openings) (Conseil du patronat du Québec, 2011).

Still on the topic of strategic planning, future demographic changes (especially retirement), the Quebec government sees these changes as a factor of concern to the industry. In fact, most of the interviewees in Canada agree that demographic changes may pose a threat to the industry in the near future, as aerospace requires high-skilled employees. According to the interviewees, recent statistical trends suggest that Canada may not be able to meet the demands of Canadian industries for high-skilled professionals.

3. **Government Procurement** – In order to further develop its major policy for the sector, Industry Canada has prepared a study in 2006, in which the Federal Government tries to identify the main trends and challenges that the aerospace industry would face between 2006 and 2016. In this study, the government suggests that the sales of military equipment, including aircraft, would grow in importance to the industry. The United States will absorb most of the sales in this segment, but the Canadian Forces would also play an important role as a buyer, even though the sales of military equipment to the Canadian government are traditionally regarded as modest in the global market. As a result, the Canadian aerospace industry has a unique characteristic: unlike other major players of the aerospace industry, Canada has only a small domestic military aviation subsector, and has consequently directed most of its resources into civil aviation. According to the representatives from AIAC, the government is aware that public procurement can determine the future of the industry: the re-equipping of the Canadian Forces will open up further potential. The Hercules fleet that is serving the military today was designed in the 1950s, so the government knows that once-in-a-generation purchases like that are unique opportunities for Canada to enhance the capabilities of its aerospace industry. On the other hand, AIAC considers that there is an absence of a long-term defence procurement strategy, which undermines Canada's ability to sustain and grow a solid defence industrial base. As it is, current policies are considered not to take into account the full socio-economic implications of current procurement strategies, or the sovereignty implications of a weak or irrelevant defence industrial base (EDC, 2006; The Conference Board of Canada, 2009; AIAC, 2010; CAMAQ, 2010; CAARHA, 2010).

The Federal Government also launched the “Canada First Defence Policy,” in an effort to transform the domestic defence industry in a key partner in Canada's defence and national security policies. On the same basis, the government uses its “Advantage Canada” program to identify the leveraging of defence procurement

spending as a means to accelerate the pace of technology innovation and reap economic spin-off benefits. According to the representatives from Industry Canada, these programs recognize the need for Canada to have a healthy, vibrant, and innovative domestic defence industrial sector that can be both responsive to the country's military needs and, at the same time, globally competitive. Another initiative from the Federal Government is the Defence Industrial Productivity Program (DIPP), which is credited as to have largely contributed to the creation and expansion of a solid base of defence, space and aerospace suppliers in Canada, with obvious repercussions in the procurement of aeronautical and space equipment. However, members of the industry state that Canada still lacks a strategic approach to defence and national security procurement. A consistent defence procurement strategy would bring potential to Canadian firms to develop and retain technologies and industrial capabilities deemed vital to supporting national economic, security and defence objectives. AIAC suggests that ideally, a more collaborative defence strategy should align Canada's defence industrial capability and Canada's military requirements; maintain other benefits to Canada and the defence sector in terms of competitiveness, skills development, employment, exports and intellectual property assets; and ensure economic growth and long-term prosperity (AeroStrategy, 2009; AIAC, 2010; The Hill Times, 2010).

4. **Infrastructure** – The good infrastructure available in Canada was a crucial factor in the development of the Montreal aerospace cluster. For the government, the establishment of the cluster is perceived as a good source of income, as the industry attracted large economic investments, besides generating high-paid jobs. In addition, the government of Canada invests largely in R&D infrastructure facilities that are extensively used by the local aerospace industry, including rich tax credits and a national Institute for Aerospace Research (Deloitte, 2010). As one respondent stated, the Canadian investments in infrastructure are similar to those of other OECD countries, while representatives from Industry Canada stated that there is a

good infrastructure network that is part of the Canadian quality of life. Regarding the maintenance of the existing infrastructure, there is a shared responsibility between the federal and the provincial governments, while the Economic Action Plan is part of a federal initiative to improve the general infrastructure of the country. The interviewees agree that the aerospace industry has no specific needs in terms of physical infrastructure; and the Federal Government sees it that no industry is favoured in terms of investments in infrastructure. At the provincial level, Quebec is aware that there should be more investments in new infrastructures and the province is committed to renew its aging public structures, while its great power generation capacity continues to be a point of advantage to the industry – and even though the costs of building new hydro plants are increasing, aerospace is not an energy-intensive industry. The telecommunications infrastructure is not an issue for the sector.

According to a representative from the Federal Government, Canada funds public infrastructure and does not provide funding for industry or company-specific infrastructure investments. Therefore, the Federal Government does not provide funding for specific aerospace-related infrastructures. As the funding goes towards general public infrastructure, such as roads, bridges, ports, airports, schools, universities, etc, the benefits from those investments are available to all industrial sectors. Of course, the aerospace industry and aerospace firms benefit from this investment to the extent that they utilize this public infrastructure network, but this is the same as for other firms and industrial sectors.

As part of **Infrastructure**, we also consider investments made in **Regional Support to the Aerospace Industry and to SMEs**. In this sense, it is interesting to observe that besides the provincial governments, the Canadian Federal Government also has specific programs to support SMEs in the aerospace industry. In 2005, the Federal Government created the Office of Small and Medium Enterprises (OSME) with the mandate to address the needs and perspectives of SMEs selling to the government.

In the case of the aerospace industry, the OSME encourages and assists SMEs to participate in the procurement processes of the Federal Government; improves links between supply and demand, influencing change within government acquisitions; and conducts studies of the economic impacts of procurement between the Federal Government and the private sector. The agency is committed to reduce barriers to participation in procurement in three key areas:

1. Complexity: the idea is to simplify the procurement process, streamlining and keeping plain-language documents, which are self-contained and self-explanatory.
2. Criteria: aiming at avoiding unnecessary criteria, while recognizing the need for legitimate requirements.
3. Capacity: making systemic changes to address the specific challenges SMEs face due to their size rather than their ability.

Besides the OSME, the Canadian Federal Government has a webpage to assist SMEs interested in doing business with the government. The page ([buyandsell.gc.ca](http://buyandsell.gc.ca)) is the main location for industry suppliers and government buyers to find information they need for doing business. Other source of governmental assistance is the Canada Economic Development for Quebec Regions, a federal agency that supports SMEs in the province. In 2009 the agency awarded CAD \$737,600 to the Quebec Aerospace Association (AQA) in non-repayable funds to continue its work to strengthen Quebec's aerospace enterprises (Government of Canada, 2010; OSME, 2011).

Regarding foreign competition, Industry Canada considers that the emergence of Brazil, Russia, China, and India as source of low-cost manufacturing is putting competitive pressures on the Canadian aerospace supply chain. As a result, in order to enhance their participation in the global industry Canadian SMEs should invest in: 1) the development of new advanced, composite materials; 2) new

manufacturing and maintenance techniques, including laser welding; 3) advanced machining techniques aimed at high-density materials; 4) the development of monolithic products, with a reduced number of parts; and 5) automation and robotics to enhance manufacturing techniques, including nanotechnologies. In addition, the SMEs should invest in collaborative engineering processes with OEMs, including the virtual design of aircraft. In terms of investments in R&D, Canadian aerospace companies keep current R&D expenditures at 6 per cent of revenues, which is considerably below the rate of intensity (R&D expenditures/sales) that the industry experienced in the 1990s (it peaked at 12 per cent of revenues in 1997) as a result of weakened profit margins and the strengthening of the Canadian dollar. Over the past ten to fifteen years, the investment in R&D has remained relatively constant, at approximately CAD \$1 billion per annum (The Conference Board of Canada, 2009; CAMAQ, 2010; The Hills Times, 2010; AIAC, 2010).

Apart from the Federal Government, some provincial governments also have regional programs to facilitate the development of the aerospace industry in their provinces. MDEIE has a special program to support feasibility studies for an investment project in aerospace in the province. The program offers financial contributions to companies wishing to implement a project to invest in Quebec. The program can finance up to 40 per cent of the cost of expert services for feasibility studies for a maximum grant of CAD \$100,000. The eligible sectors are: manufacturing, recycling, business services, research and industrial development and scientific services. The Quebec government has also developed special programs to support aerospace SMEs to expand their businesses. MDEIE is committed to assist SMEs to develop more complex aerospace products, diversify and expand the number of products and services they produce and the clients they serve. The provincial government also wants aerospace SMEs to be more active in Quebec's foreign trade, especially by assisting Quebec companies to attend the

Bourget and Farnborough aerospace exhibits and other international events. MDEIE is also committed to coordinate the dialogue between the Federal Government and the local aerospace industry, reinforcing partnerships to finance the development of new products, the sales of aircraft, and the purchase of defence equipment (MDEIE, 2006; Investissement Québec, 2010).

Since the aerospace industry relies heavily on the availability of a high qualified workforce, the government of Quebec considers that **training high qualified workers** is a major challenge to overcome. According to a representative from the provincial government, the specialized training centers located in Quebec could successfully provide the necessary workers for its aerospace industry in recent years. But the real challenge is to assure that these training centers will be able to match the demand for qualified workers in Quebec in the near future (MDEIE, 2006).

According to a representative from the Quebec government, CRIAQ is a perfect example of the provincial support to the industry, as it is a forum to facilitate the communication between government, universities, and industry members. CAMAQ is also a very effective forum, focusing exclusively on HR and training issues that concern the industry. The province also recognizes the importance of AIAC, AQA, and AéroMontréal as indispensable elements in the dialogue between government and industry. As the provincial government does not get directly involved in the decision making process of private companies, these industry associations are an open channel to understand what the government can do to improve the business environment for aerospace in Quebec. Of course MDEIE is aware that it has a small staff dedicated to the aerospace sector, but they claim to be a very active and very effective team. In addition, MDEIE's offices overseas are also committed to support the export of parts and aircraft made in Quebec.

In addition to Quebec, Ontario also operates several fiscal measures to support and encourage R&D activities within the aerospace industry, including the following programs:

- a) The Ontario Innovation Tax Credit, which offers 10 per cent fully refundable tax credit for Canadian controlled private companies;
- b) The Ontario Business-Research Institute Tax Credit, which offers 20 per cent tax credit for corporations that enter into approved contracts with eligible Ontario research institutes; and
- c) The Ontario Super Allowance, an additional tax incentive which permits accelerated write-off of research-related costs. The benefit consists of two portions: the base amount, which is an average of the R&D expenditures of the previous three years, and an incremental portion, which is the amount that exceeds the base amount in a given fiscal year (Technopolis, 2004).

Besides the support programs for the aerospace industry in Quebec and Ontario, where most of the Canadian industry is located, the Western Economic Diversification Canada agency is committed to support the development of the sector in Western Canada, especially in the fields of repair and manufacturing of regional and commercial aircraft; maintenance, repair and overhaul of small gas turbine engines; and provision of parts and service for flight simulators. Western Canada concentrates 14 per cent of the country's industry. British Columbia, Alberta, Saskatchewan and Manitoba provincial governments are firmly committed to bring more aerospace businesses to their provinces, advocating that firms could benefit from generous R&D tax treatments and low operating and business costs (Western Economic Diversification Canada, 2011).

5. **Financing and Export Credits** – In Canada, Export Development Canada (EDC) plays a similar role of other Export Credit Agencies (ECAs), offering financing and credit insurance solutions for Canadian companies within the industry. A typical

EDC loan to aerospace firms is repaid over eight to 17 years, at commercial rates.

As the EDC's Transportation Team (2006) points out:

“All the major aircraft producers in the world seek government support, so this is not unique to the Canadian industry. It is simply something that needs to be done because of the high cost of the items involved. Private lenders are certainly a significant part of it, but they may not have the risk capacity that EDC was created to deliver.”

As sales financing capacity is regarded as an important competitive discriminator in global aerospace markets, especially for the sales of aircraft, the Federal Government decided to play a vital role in working with commercial lenders to create such financing capacity through EDC. The agency states that the aerospace sector represents its largest loan exposure, having accounted for more than CAD \$7.5 billion, in 2009, out of its CAD \$30 billion in loan receivables. In 2008, EDC supported nearly CAD \$5 billion in business in the aerospace industry, which accounted for approximately 20 per cent of the industry total. EDC provides insurance and financing support for the full range of aerospace exports, including propulsion, helicopters, simulators, aerospace parts and services. The majority of EDC's exposure in the aerospace industry is secured by mortgages on aircraft operated by 26 of the world's largest airlines and their regional affiliates. In the case of Bombardier, EDC started working with the company in the early 1980s, when Bombardier first ventured into mass transit products. Historically, EDC financing support to Bombardier ranged from 35-40 per cent of the company's commercial aircraft sales. EDC also has financially supported other aerospace giants such as CAE, Pratt & Whitney, and Bell Helicopter. According to the representatives from AIAC, however deeply involved with the sector, the Federal Government should intensify the role of EDC in the aerospace industry through the establishment of a new Aircraft Sales Financing Framework that should fully exploit EDC's financing capacity as an instrument of public policy in addressing “capacity gaps” in the commercial banking sector. In order to do so, the Federal Government should: 1) concentrate the current financing instruments into one structure (EDC is the agency

with most expertise for this task); 2) ensure that financing capacity is adequate to meet market demands, while explaining internal government capacity constraints; 3) provide a clear policy framework and supporting criteria for assessing financing requests, one that meets the manufacturer's sales strategies; and 4) delegate the management of individual transactions to the new structure/entity resulting from the consolidation of the sales financing strategy. On the other hand, the Canadian government considers that other export credit agencies are assisting aerospace sectors at historically high levels, which increases the pressure on both EDC and other Canadian government financing programs. However, the fact the government feels compelled to invest more in the development of the aerospace industry can pose a challenge in the public relations front: taxpayers may not always perceive the public investments in private companies as a government priority and may pose obstacles to the financing programs (e.g. Canada Account) (Technopolis, 2004; EDC, 2006; EDC, 2010; AIAC, 2010).

Also part of the **Financing and Export Credits** affecting the aerospace industry is **Taxation**. In this aspect, Canadian firms struggle with two main challenges to their ability to compete globally: lagging productivity performance and a strong currency buoyed by high energy prices. A tax reform is necessary to allow manufacturing sectors (including aerospace) to achieve real growth in machinery and equipment investment. Firms within the industry are using their cash to acquire new technology, much of which is imported at highly competitive prices, to become more efficient. Some possible areas of a tax reform would include eliminating capital taxes, cutting corporate income tax, smoothing corporate tax rate increases for small businesses, allowing accelerated capital cost allowance to lapse after three years, introducing an environmental technology investment tax credit, and retaining federal interest deductibility for investments abroad. According to representatives from the Federal and Quebec governments, the taxation system is not a major concern for the local aerospace industry, as they point out that Canada has one of

the lowest new investment tax rates of the G7 countries (Conference Board of Canada, 2008). As one respondent stated, taxation levels will always be considered high among private firms (especially when compared to the U.S.). AIAC has been expressing these concerns to the government, but they have not yet been addressed. In any case, the industry understands that the tax system will not change in the near future and the private sector is well adjusted to the current system. On the other hand, the SR&ED program of tax incentives is considered to be the largest source of federal support for industrial R&D and it is applicable to tiered tax credit covering wages, materials, new capital equipment (not used equipment, nor land/buildings), contracted research and some overheads. There are provincial variations in the application of the program (Technopolis, 2004; AIAC, 2010).

At the provincial level, the 2010 report “*Bulletin de la prospérité du Québec*,” published by the Quebec Employers Council, uses the indicator Effective Marginal Tax Rates on Investment (MTRI) to compare the impact of taxes on new investments in different provinces of Canada and in the OECD countries. The index compares the effect of all charges and tax rules that affect the return on investment. It takes into account the capital tax, the sales tax, tax on corporate income, rules and depreciation rates, and methods of accounting for inventories. Quebec’s MTRI was 20.9 per cent in 2009, ranking the province second among Canadian provinces (Alberta was in the first position), and ninth in a list of 20 countries. According to Quebec’s Ministry of Finance, in 2012, the province’s MTRI will be reduced to 13.3 per cent, due to an 18 to 15 per cent decrease of tax rate on corporate income at the federal level combined with Quebec’s tax abolition on capital. These measures will place Quebec in the first position among Canadian provinces. In 2009, companies investing in Quebec – including the ones in the aerospace industry, benefited from a MTRI that was both one of the lowest in Canada and one of the best in the OECD countries (Conseil du patronat du Québec, 2011).

Finally, another aspect of **Financing and Export Credits** that has an impact in the development of the aerospace industry, is Canada's **Foreign Trade Legislation**: besides the North American Free Trade Agreement (NAFTA) and several Free Trade Agreements signed between Canada and several countries (including talks with Japan and the European Union), the country continues to push for freer trade through the WTO in the Doha Development Round. The Federal Government uses its **Global Commerce Strategy** and the **Foreign Investment Promotion Strategy** to boost Canadian commercial engagement in global value chains. Other tools include the **Foreign Investment Promotion and Protection Agreements (FIPAs)**, which provide the protection and predictability that foreign investors need when investing in Canada. As the representatives from AIAC stated, the Federal Government can influence through free trade agreements that can benefit the industry. As a large exporter, Canada could always benefit from free trade agreements; therefore, the establishment of new trade agreements is always a factor of concern to the AIAC members (Government of Canada, 2010).

6. **Regulation and Legal Framework** – Transport Canada is the main regulatory body of the civil aviation industry in Canada. Regarding the general regulation of economic activity, the Federal Government approved in April 2007 the Cabinet Directive on Streamlining Regulation; which is a key component of the current Federal Government focus on improving regulation in Canada. The directive oversees the development, implementation, evaluation, and review of regulatory initiatives and it follows these underlying principles: 1) protection and advancement of the public interest; 2) promotion of a fair and competitive market economy; 3) a decision-making process based on evidence; 4) the creation of accessible, understandable, and responsive regulation; 5) the advancement of the efficiency and effectiveness of regulation; and 6) the requirement of timelines, policy coherence, and minimal duplication (The Conference Board of Canada, 2008).

The Federal Government determined that the directive applies to all federal departments and agencies, providing a broad approach to streamlining both existing and future regulations in Canada. Federal departments and agencies are required to identify interested parties and publish regulatory proposals. Once the proposals are published, they should be available for 30 days to receive comments (75 days if international trade is affected). Public policy issues and objectives must be clearly stated. Then, the regulatory instruments that achieve the policy objectives, reflect the risks involved, and minimize unintended influences are the ones to be most likely to be selected. The selected regulatory instruments should be based on national or international standards and be coordinated with other federal departments. Ideally, the benefits and costs of proposed regulations are to be considered and quantified, with regulations focused on achieving the maximum net benefit to the Canadian economic development (Conference Board of Canada, 2008).

As the representatives from Bombardier and AIAC stated, Transport Canada (TC) has a high standard regulatory framework and the sector considers it to be a reinforcing message of the safety associated with the Canadian industry. As the industry sees it, it is important to comply with safety requirements, even if it means complying with some bureaucratic steps. The same interviewees say that sometimes the industry feels that the safety regulations are not reviewed as dynamically as they should, but in general, the government does a fair job within the regulatory agencies and in general, the industry has a good relationship with TC. The industry is closely following the new regulations on the so-called “green aircraft,” and the implications that tighter environmental regulations may have in the businesses of private firms.

Regarding the civil aviation industry, according to a representative from the Quebec government, recent changes in the market suggest that foreign airlines will be allowed to serve domestic routes in North America and Europe. The provincial government has little power to interfere in the industry regulation, as the regulatory



Figure 14 shows the different actors influencing in the Canadian aerospace sector:



FIG. 14 – Public and Private Organizations of the Canadian Aerospace Industry

Figure 15 shows the different actors influencing in the Canadian aerospace sector by field of action:

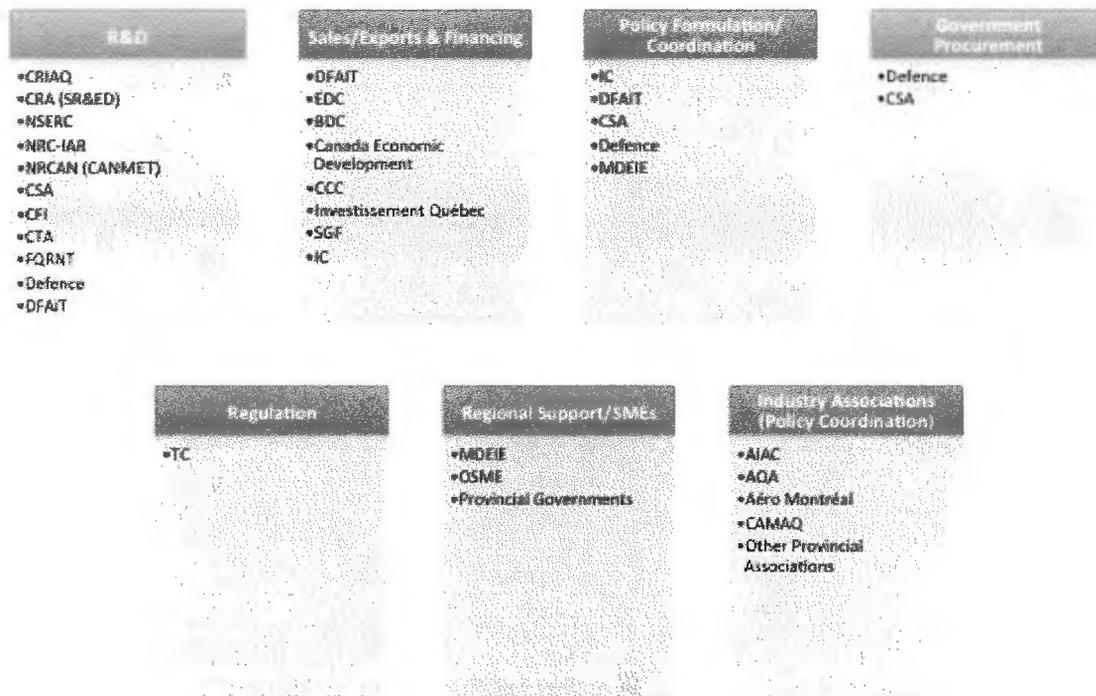


FIG. 15 – Public and Private Organizations of the Canadian Aerospace Industry by Field of Action

As presented in this section, governments can and do support their aerospace industries through different policies and mechanisms. The main forms of government actions that can have an impact in the aerospace industry are associated with the institutional framework of the following areas: intellectual property right; incentives for R&D; government procurement; national defence strategies; investments in infrastructure; sales financing and export credits; safety and civil aviation regulations; environmental regulations; free trade agreements; taxation (e.g. tax breaks on R&D initiatives); HR training and education; and labour legislation. As both Brazil and Canada have adapted their institutional environments to accommodate some of their national aerospace industries needs, both countries managed to develop several firms that are highly competitive in the world market.

## 7 Discussion & Conclusions

Brazil and Canada are two of the largest countries in the world, and at first sight, they come from a similar historical background: both countries were settled by European colonial empires; both initially explored for the riches associated with their natural resources. Both countries share a diverse, multi-cultural population – a product of constant waves of immigration, who were brought either by force or in search of a better life. To fully understand and precisely determine all the variables that put Brazil and Canada in their different stages of development – including the differences in the political, economical and social realities of each country – is beyond the scope of our research project and it would most certainly be an incomplete attempt even if it were part of our research objectives. However, when we analyzed some specific aspects of the institutional environments of Brazil and Canada and the impact of these variables in the development of the local aerospace industries, we get a sense that the World Economic Forum's Global Competitiveness Index is an effective tool that can be linked to different stages of economic development between two countries. In our case, the differences in the institutional environment of Brazil and Canada are reflected in the position each country holds in the 2010-2011 rank: while Canada appears in the 10<sup>th</sup> position, Brazil holds the 58<sup>th</sup> position (WEF, 2010).

Such differences can be also seen through the positions Brazil and Canada hold in the Government-Business Efficiency Gap Index, an annual indicator compiled by the IMD World Competitiveness Center in Switzerland. The index compares how countries rank in terms of government and business efficiency, separately. Then, IMD calculates the gap between the public and the private sectors of each country and the resulting gap shows where countries stand in their relative competitiveness: the closer the gap is to zero (government efficiency close to business efficiency), the higher the country is placed in the rank. The index is calculated based on analysis made by leading scholars and IMD's own research and experience, using in their methodology data from each country covering the

national environment of four main factors: 1) Economic Performance; 2) Government Efficiency; 3) Business Efficiency; and 4) Infrastructure. In 2011, Brazil had the highest gap between government and business efficiencies (-26) of all 59 countries surveyed by IMD and was placed in the last position of the rank (the least competitive country). Canada, on the other hand, had a gap of only -1 and it was placed in the 7<sup>th</sup> position. This asymmetry validates in a certain way the findings of our research: while government and private businesses are more in tune and work closely to each other in Canada, there is a large gap and an irregularity in their relationship in Brazil – a gap that is holding back the full potential for economic growth and social development of the country (IMD, 2012).

The different levels of development present themselves not only through official reports from government agencies or international organizations, research publications or news coverage. In the course of our research, we spoke to government officials, representatives from the private sector, and members of the academia. First, we will present the summary of our findings regarding the interactions of the institutional environment and the aerospace industry in **Brazil**. Based on the responses of all interviewees concerning each of the six characteristics of the institutional environment, we considered in our comparison (1 – Financing and export credits; 2 – Government procurement; 3 – Infrastructure; 4 – Intellectual property rights; 5 – Investments in R&D; and 6 – Regulation and legal framework), we present a brief summary of the Brazilian institutional environment and how they affect the local aerospace industry. To give the reader a better idea of how the institutional environment plays a role in the development of the industry, we complement our summary with comments selected from the transcripts of the interviews. Then, a similar analysis is presented regarding the interactions of the institutional environment and the aerospace industry in **Canada**.

In general terms, interviewees consider that Brazil has an institutional environment that is stable and does not pose any threats to the aerospace industry. As one respondent – a major officer within the MDIC's office coordinating federal policies for the industry – states it, the Federal Government is now mainly concerned with the further expansion of

the local aerospace supply chain. With the emergence of Helibrás (a helicopter manufacturer) as another major OEM in Brazil, the government is confident that firms in Tiers 2 and 3 will be able to diversify their production lines and bring further investments to the supply chain. The government also understands that however stable the institutional environment is, the private sector will always be susceptible to the macroeconomic environment, both internal and external – and the exchange rate will always be a source of concern, as the local industry depends extensively on imported parts.

When asked about the effectiveness of public policies aiming at the industrial development of Brazil, the interviewee from the University of Brasília pointed out that the Federal Government current industrial policy aims at the development of 32 different industrial sectors, covering all major industries in the country. Besides being an almost impossible task (supporting 32 industries at the same time), the interviewee claims that the policies are in fact out of synch with the private sector and its needs. In different interviews, even the officials at MDIC stated that such an ambitious policy is completely unrealistic. The government officials advocate that aerospace should not be considered as a simple industry, as it also has a significant impact on defence and national security policies. Instead, there should not be a distinction between civil and military aviation, in terms of governmental support to aerospace, with the Ministry of Defence working closely with MDIC and ABDI to develop their future policies and programs affecting the industry.

Despite all the efforts from the Brazilian Federal Government to facilitate the development of the local aerospace industry, one interviewee – a professor who has done extensive research on the industry supply chain – has a more pungent vision of the public policies for the sector. The professor states that although they are valid and well-intentioned, the public policies for the sector are still very limited. ABDI, the agency coordinating all the government efforts to support the industry, has limited resources, limited personnel, and limited operational freedom. As a result, the agency produces several reports that are positive in their form, but with little practical use for the private sector.

Regarding the Brazilian **Intellectual Property Rights** environment, there is a consensus among interviewees that IP is not a priority issue to the local aerospace industry, while agreeing that the country needs to improve its IP legislation.

Factor	Current Situation
Intellectual Property (erratic or predictable legislation; weak or strong mechanisms to fight piracy)	Brazil has an erratic and weak IP environment: agencies controlling patent registration, IP granting, and standardization are underfunded, understaffed and politically weak. The country has no tradition in patent deposit and piracy and copyright infringements are quite common.

As for the **investments in R&D** affecting aerospace in Brazil, there is a strong dependence on public funding for R&D and the development of defence equipment/aircraft. In addition, the R&D funds are concentrated in the São José dos Campos cluster, while Embraer remains the main investor in R&D in the industry. But refreshing as it is that Embraer does not depend on government funds for R&D, the company still depends on public credit lines to export its aircraft, as discussed in our report.

Factor	Current Situation
Investments in R&D (hostile or supportive of investments in R&D, education and human resources training)	Brazil has a hostile R&D environment: there is a lack of public R&D funding, the cost of borrowing money is high, there is a lot of bureaucracy involved in public funding, and there are limited private sources of money for R&D. There is little coordination between universities and the industry. The country is also hostile in terms of education and HR training for the aerospace industry: Brazil has weak policies in higher education and technical courses. There are few educational options for technicians and as a consequence, the country lacks qualified personnel. There is little international integration in education and a lack of investment in HR training.

When asked about the importance of **government procurement** to the development of the local industry, all interviewees agree that the Brazilian government played a decisive role in the early days of Embraer and the establishment of the São José dos Campos cluster. Examining the history of the Brazilian aerospace industry, it is undeniable that, in its inception, the sector received full support from the Federal Government. State support of high-tech firms is pivotal to their success throughout their lifespan. Embraer considers that the support from the Brazilian government has been fundamental and allowed the company to exist. In its early years, Embraer had stable and consistent state support, as the government was its most important customer. Through the years, the relationship between the company and the government reflected the changes in global conditions and the evolution of the aerospace industry. Embraer realized that, in order to continue its growth, it was necessary to develop a global systems integration approach.

The government support was also present in the form of an autonomous centralized training and research facility, with a clear mission. The establishment of the Aeronautical Institute of Technology (ITA) as a separate entity from the Ministry of Aeronautics with the sole purpose of developing the aircraft industry was a proof of the government's commitment to the new industry. As a result, Brazil set up the foundation of aerospace engineering training, focusing on a concrete mission of creating a competitive aircraft industry. This did not mean that Embraer was created with the sole purpose of producing military equipment. The decision of the Brazilian government to produce civil aircraft also played a decisive role in the development of the local aerospace industry, as after the privatization, Embraer became a major exporter of civil aircraft. Over the years, the company learned how to use the tools and the influence offered by the Brazilian government to establish itself as one of the world's main aircraft manufacturers. As one respondent put it, even though Embraer does not produce all parts and pieces of its aircraft in Brazil, what the company has achieved is much more remarkable: developing an incredibly well organized and efficient product line, based on the design of extremely complex products; outsourcing the production of several parts and pieces to contractors all

over the world and then assembling the final products to perfection, as the main civil aviation regulatory agencies in the world attest their compliance to safety regulations.

Factor	Current Situation
Government Procurement (hostile or supportive of locally manufactured products and services)	Although the Brazilian government was essential to the establishment of the local aerospace industry, the country now has a more hostile position towards the industry than the one it had in the past, as government procurement is solely dictated by the lowest price, even for defence equipment. The industry states that the current policy does not favour investments in R&D. In addition, Brazil has no official policies for defence acquisitions.

Regarding **infrastructure, support to SMEs and development of regional aerospace clusters**, the Brazilian institutional environment does not favor the local aerospace industry. Brazil has an increasingly failing transportation infrastructure and yet there is little coordination in the government investments to improve the quality and capacity of local airports – an investment that could have a positive impact in the local aerospace industry. According to one interviewee, the aerospace industry, as most of the private sector in Brazil, deals with the government following a simple logic: “if the government cannot help us, it should at least do not disturb us. If the government is really willing to support the sector, it should concentrate its efforts in the further development of regional aviation both domestically and within South American countries, especially through the establishment of transportation hubs in smaller cities of Brazil.” Instead, MDIC and ABDI are committed to support the further development of the local supply chain, a strategy that will not likely happen for one simple reason: the lack of scale and the absence of another larger OEM within the local industry. Even with the emergence and further development of Helibrás, it is very unlikely that the local supply chain (which is formed mostly by SMEs) will ever be as large and competitive as that of the United States, Canada or Europe. As an example, the interviewee cites the acquisition of Celma, a local manufacturer that was bought by GE in 2006 with the promise that GE would make extensive investments in the country to manufacture turbines locally. Instead, according to

the interviewee, GE actually dismantled the manufacturing line of Celma and decided to concentrate the local resources on MRO services for turbines manufactured abroad. To make matters worse, the two main air companies (GOL and TAM) do not operate any Embraer aircraft and they probably will not buy them in the future, not even with official support, as both companies prefer to keep maintenance costs down operating a few models from EADS/Airbus and Boeing.

Factor	Current Situation
Infrastructure (hostile or supportive of investments to improve infrastructures, promote the development of regional aerospace clusters and to promote the creation of SMEs)	Brazil has a hostile environment for private businesses in terms of infrastructure. The country has chronic deficiencies in transportation infrastructure, which is dated and inadequate. There are limited investments in energy generation, and there are few investments in PPPs. Legislation concerning investments in infrastructure lacks transparency, and as a consequence, few investors feel confident enough to fund new projects. The country still has a great pent up demand for infrastructures. Regarding SMEs & the development of regional aerospace clusters: apart from isolated initiatives from the São Paulo state government, Brazil has no policies on regional support to aerospace. SEBRAE is a federal agency designed to support SMEs, but the country has no specific programs for aerospace.

Concerning the **financing mechanisms and export credits** (including **taxation and foreign trade legislation**) initiatives impacting the local aerospace industry, all interviewees share similar opinions about the role of BNDES in the international success of Embraer: the Brazilian government is supportive of the local industry in terms of financial mechanisms and exports credits. In addition, the Brazilian Agency for Industrial Development (ABDI) is currently coordinating a task force together with BNDES to strengthen the Brazilian supply chain, with specific credit lines: 1) for aerospace companies willing to export (in the pre-shipment and post-shipment operations, and facilitating sales in foreign markets); and 2) financing development of aerospace products and services based on the risk-partnership model. The original program was completed in June 2010 with a budget of BRL \$100 million and it was set to be renewed, depending on industrial cooperation agreements within the sector. Other measures coordinated by ABDI Aerospace

Industry team include the offer of fiscal incentives for the establishment of local dealers of aerospace raw materials; the further development of RETAERO (the Special Tax Incentives for the Brazilian Aerospace Industry), which aims at the modernization of fiscal and customs procedures applied to the sector. The idea behind RETAERO is to eliminate fiscal asymmetries between the Brazilian industry and its foreign competitors. ABDI also understands that a better customs framework for the industry can facilitate and improve the insertion of Brazilian aerospace products and services in the global market, but the agency recognizes that the legislation concerning the industry still has to be altered (ABDI, 2010).

In addition, MDIC is committed to sign specific free-trade agreements for the aerospace industry with other South American countries. The Ministry has also organized studies for the aerospace industry aiming at the improvement of the fiscal legislation and customs procedures that affect the industry, together with the design of strategic financing of programs and projects for the sector. The Brazilian Federal Government has also designed specific mechanisms to reduce taxes in different stages of production and to reduce import taxes for members of the industry, such as the Recof Initiative (which roughly translates as the “Industrial Bonded Warehouse Customs Regime Initiative”), and the exemption of the PIS/Pasep and Cofins import taxes for the whole manufacturing stages of aircraft. Even though these financial incentives (together with the ProEx program) are the subject of trade disputes between Brazil and Canada at the WTO, the general understanding in Brazil is that these measures were put in place to compensate the losses in the industry resulting from the country’s heavy tax system, the lack of transparency of the regulatory environment, and other structural deficiencies that translate into high interest rates for credit operations. In addition, Brazil considers that Canada was equally favoring Bombardier, only in a more efficient manner, as part of its tax breaks for R&D programs and EDC financial support for sales (BNDES, 2007; Figueiredo et al., 2008; Celli Junior, 2010; MDIC, 2010).

On a positive note, one representative from ABDI said that the WTO disputes with Canada served to educate the industry on how to seek legal assistance on international forums: both the government and the private sector are now better prepared for future disputes. The industry became more aware of international law and now seeks constant assistance from the government in the resolution of international disputes, including the assistance of the Brazilian Ministry of Foreign Affairs (MRE), which was deeply involved in the Embraer-Bombardier case and has extensive knowledge in international agreements. In addition, as the same interviewee points out, Brazil is now a well-established democracy: there is more awareness concerning the fight against corruption; there is freedom of press and people are more informed today than ever.

Factor	Current Situation
Financing and Export Credits (hostile or supportive mechanisms to internal and external sales of the industry; erratic or predictable tax system; hostile or supportive foreign trade legislation)	The Brazilian government is supportive of the industry when it comes to export credits: BNDES financing plays a vital role in the sales of Embraer, especially in its exports. Regarding taxation, the country has an erratic tax system and the government is surprisingly strong when it comes to tax collecting, as Brazil has a heavy tax system and the Federal Revenue Agency is one of the strongest agencies in the country. The tax system lacks transparency, taxes are collected over all stages of production, and changes in the legislation are not always clear nor discussed at length before being approved. Regarding foreign trade legislation, while the presence of the government is strong in terms of foreign trade legislation, excessive bureaucracy and complex regulations make it difficult for Brazilian companies to export. There are also structural problems and bottlenecks in the country's port, airports, roads and railway systems, which all jeopardize the country's foreign trade.

When it comes to **regulation and legal framework**, Brazil has a strong **regulatory system**, even though the country is still adjusting its regulatory model and some regulatory agencies still lack a clear mandate, a consistent budget and an independent board of directors. Regarding the country's **legal framework**, some interviewees share the perception that the performance of the Judicial Branch and the current mechanisms of law enforcement have limited impact in the performance and further development of the local

aerospace industry. One interviewee pointed out that the Judicial Branch is undergoing some major structural reforms, including high investments in IT, aiming at the modernization of the judicial system. On the other hand, even though there have been recent improvements, most interviewees recognize that Brazil still has a long way ahead fighting organized crime and corruption; and improving the offer of public services, including public safety. The interviewees also share a point of view regarding the industry and the Judicial Branch: they point out that the aerospace has little concerns over the deficiencies of the judicial system, and as far as the government agencies dealing with the Aerospace Industries Association of Brazil (AIAB) are concerned, the industry never brought any negative feedback to the government about the judicial system.

Nevertheless, as one interviewee appropriately put it, the negative impact of a weak Judicial Branch cannot be measured by taking only one specific industry into consideration, as a weak justice system is never limited to one industry. In general, private firms will charge more for their products and services in order to compensate for the high legal costs of doing business in Brazil. According to a representative from the Federal Government, the weak legal system (combined with poor law enforcement) and the heavy taxation system are the main obstacles for business expansion in the country. In addition, as another government official sees it, the main problem of the Brazilian judicial branch is that it is very slow. A legal dispute in a Brazilian court can take over 10 years to be ruled, with numerous possibilities to appeal from a decision. In addition, corruption within the system is another matter of concern, with several cases of economic power influencing a legal decision reported in the last decade. As a result, citizens and companies sometimes do not even bother to seek legal assistance to solve their disputes. For companies, the problem is even worse, as the legal bureaucracy associated with opening and closing a business in Brazil hurts the economic activity.

Concerning the poor law enforcement in Brazil, some interviewees pointed out that since the country is a federative republic, part of that responsibility lays in the hands of State Governments, who do not necessarily coordinate their law enforcement efforts with

the Federal Government. In addition, the same lack of coordination applies for education and health care policies within the country. Finally, interviewees also agree that the country needs to improve the control of its borders with neighbouring countries and customs services.

Factor	Current Situation
Regulation and Legal Framework (erratic or predictable laws and rules; weak or strong law enforcement mechanisms)	When it comes to the regulatory agencies, Brazil offers a supportive environment for businesses, as most regulatory agencies are fairly independent. ANAC follows the determinations of the FAA and JAA. However, regulatory agencies still lack transparency and a precise delimitation of their functions. Brazil still needs to integrate its civil aviation industry in a global scale - the country is closed to foreign carriers in the domestic routes. Regarding labour legislation: the cost (in form of taxes, benefits and social contributions) of creating a new job is estimated to be at almost 100% of the salary to be paid for that position. It is difficult to hire new workers, the working hours are not flexible, and it is costly to dismiss workers. As a result, there are a high number of unregistered and autonomous workers, with limited access to benefits, including pensions.

The fact that Embraer established itself as one of the main OEMs in the global aerospace market despite all the deficiencies of the Brazilian institutional environment is remarkable. As pointed out by Pearce (2001), when faced with environment challenges, independent organizations can operate independently of direct government dictate. While most organizations depend on and reflect the government directives applying to the place where they do business, independent organizations – as exemplified by Embraer operating in Brazil – are free to set their own goals and objectives, rather than pursue those imposed on them by governments. After its privatization, Embraer managed to succeed in a nonfacilitative environment in part because the company decided to cover the gaps of the institutional environment in Brazil: the company established risk partnerships with foreign investors (managing some of the risk associated with financing new aircraft models), invested heavily in R&D, and focused on exports rather than domestic sales as its main source of income. While it is undeniable that the Brazilian government offers valuable

support to the external sales (through BNDES), there is little doubt of Embraer's own merits in succeeding in a business environment that is fairly hostile and erratic, dealing with a government that can be both quite strong (e.g. the tax collection system) or disappointingly weak (e.g. the judicial system).

The success of the Embraer business model is quite obvious – the company was developed and supported by the Brazilian government over several decades, only to grow larger and stronger after it was privatized. However, there is one question we should ask ourselves: does the Brazilian government have the ability to replicate that model to other industries, or is Embraer (and by extrapolation, the Brazilian aerospace industry) a one and only example of a truly competitive business initiative supported by the Federal Government? If the answer to that question is positive, the further development of Helibrás and the production of a genuine Brazilian helicopter should not pose a major challenge to the Brazilian government. Ideally, the Federal Government should examine the Embraer example closely, in order to replicate the positive initiatives and avoid past mistakes to support other industries in Brazil.

Considering the current environment and business conditions for the industry, one may say that the Brazilian aerospace sector is strong and competitive in the international market, even though there is a lack of public policies for the sector, credit lines, and support to local suppliers. The Brazilian supply chain is weak and its improvement is not perceived as government priority, although the official position may tell otherwise. There should be stronger policies regarding government purchases from the local industry, further development of the supply chain, credit lines, support to SMEs, and attraction of foreign investment.

In **Canada**, the institutional environment of Quebec and the rest of Canada also had a decisive role in the development of the local aerospace industry. During the interviews with representatives of government agencies, industry associations, the private sector and

academia, a unanimous opinion among the interviewees presented itself: Canada has a very stable institutional framework and a very solid, stable business environment.

Representatives from the private sector agree that both Quebec and Canada have an institutional environment that is favourable to business. Representatives from Bombardier, AQA and AIAC all stated that government at the federal and provincial levels show great commitment and offer strong support to the industry, translating in a relationship of mutual trust. The private sector feels that government policies for the industry are consistent, stable and comply with international regulations, while a good institutional framework gives credibility to both the government and the industry. However, one interviewee stated that while supportive of the industry, the level of public support to Canadian aerospace is moderate. The same interviewee stated that the resolve of the Chinese government to enter the aerospace industry is a good example of strong government support to the development of a specific economic sector. Besides China, both Embraer and Bombardier see the determination of the governments of other countries (e.g. Russia, Japan) in entering in the regional aviation market as a considerable threat to their market positions and a challenge to their de-facto duopoly.

In terms of **Intellectual Property** rights, the representatives from the Federal Government state that the private sector is in general satisfied with the current legislation on IP – in addition to being satisfied with the legislation on foreign direct investment, and mergers and acquisitions (e.g. the Competition Act, the Investment Canada Act, etc). As a result, these issues are not a source of concern within the industry. However, according to a representative from Bombardier, the IP legislation still requires some fine-tuning, as the industry would like the Canadian legislation to be more integrated with that of the U.S. In any case, the sector feels that the government is supportive of the local industry in IP disputes involving Canadian firms.

Factor	Current Situation
Intellectual Property (erratic or predictable legislation; weak or strong mechanisms to fight piracy)	Canada has a predictable legislation on IP rights. One issue that the industry would like to be improved is IP in the context of collaborative networks often remains at university level, as there is a lack of pre-establish IP agreements. Canada is a strong state when it comes to combating IP rights infringements.

Besides a stronger institutional environment, the Canadian aerospace industry benefits from a more organized government structure supporting the industry, especially in terms of **investments in R&D and the higher education system**. This is an industry that thrives on high technology and innovation, and the Bombardier example shows that high investments in R&D always pay off. The Canadian government should continue its support to the industry – especially through its R&D programs, by expanding and making them available to the SMEs at the base of the producer’s pyramid.

Factor	Current Situation
Investments in R&D (hostile or supportive of investments in R&D, education and human resources training)	Canada has a supportive government in terms of investments in R&D: the SR&ED program is a good tool to finance R&D activities in the industry, with provincial variations across Canada. There are many R&D programs coordinated by federal and provincial governments, universities, the industry, and research centers. Public funding is considered to be crucial to the R&D initiatives of the industry. CTA and CRIAQ are successful examples of federal and provincial initiatives to support training and educational programs for the industry. Rapid demographic changes associated with the retirement of baby-boomers pose an HR challenge to the industry.

While there is no question of the importance of **government procurement** to the development of the industry and the supportive position of the Canadian government, interviewees suggested that the amount spent by the Federal Government in defence equipment is modest, compared to other OECD countries. However, the Canadian aerospace industry does profit from the defence purchases of other governments, especially the U.S., through partnerships with U.S. suppliers of defence equipment. Respondents

agree that contracts between the government and private businesses are respected in Canada, even though private firms know that official procurement can be withdrawn in times of government transitions. In fact, it has happened in the past and it is not unlikely to happen again, but companies are aware that these are the rules of the game. Similar responses were collected both from federal and provincial officials, reflecting the perceived stability of Quebec to the rest of Canada.

Factor	Current Situation
Government Procurement (hostile or supportive of locally manufactured products and services)	The Canadian government is supportive of the local aerospace industry in terms of government procurement. The Federal Government expects to re-equip the Canadian Forces in the near future, replacing its older Hercules fleet. The private sector considers that government procurement still has to improve its strategic coordination to offer further support to the local industry.

On the other hand, there is also a consensus among respondents that as a free-market economy, the State cannot be the primary supplier of goods and services. Yet, interviewees agree that in terms of **infrastructure**, public services, public security, and welfare, the Canadian government is more present than that of the United States. Canada has a good network of public services and they are perceived as part of the Canadian life. When compared to Canada, Brazil is geographically isolated from the rest of the global industry, a factor that can translate in higher costs for foreign manufacturers – especially when the available infrastructure is inadequate. By contrast, as more than one Canadian interviewee said it, one of the reasons that the Canadian supply chain is so strong is that it is close enough to the American market and the **infrastructure** that is available to the industry to export its product is adequate.

Factor	Current Situation
Infrastructure (hostile or supportive of investments to improve infrastructures, promote the development of regional aerospace clusters and to promote the creation of SMEs)	The Canadian governments (at the federal and provincial levels) have been supportive of the private sector in terms of infrastructure. The country's good infrastructure was crucial to the establishment of the Montreal aerospace cluster. The main challenge the Canadian government has to face concerning infrastructure is the costs to maintain and repair the aging infrastructures of the country. As for SMEs & regional support to the industry: the OSME and Canada Economic Development for Quebec Regions are federal agencies aiming at the support and development of SMEs in aerospace, assisting them in governmental procurement processes. However, SMEs complain that obtaining federal assistance is a lengthy, bureaucratic process, and they are discouraged by all the required paperwork. Besides strong support from Quebec, aerospace also receives some support from other provincial governments.

As for issues related to **financing mechanisms and export credits** available to the industry (including the **support to SMEs**), the macroeconomic policies of the Canadian government are a factor of little concern to the industry, according to the interviewees. As the Bank of Canada is the ultimate decision-maker on changes in the interest and exchange rates, private firms know that there is little room to negotiate with other federal agencies involved with the sector. As the United States is the main economic partner of Canada, Canadian firms have learned long ago how the exchange and interest rates affect their businesses, including in their decisions to renew their machinery and capital goods. But even in this case, according to the representative from MDEIE, the government is aware that companies need to have favorable financial conditions to invest in new capital goods, otherwise the country risks to compromise its productivity. On a different note, according to a representative from an industry association, the government should improve its mechanisms to offer financial support for SMEs to renew their capital goods in programmed intervals. Finally, as the respondent from Bombardier put it, the private sector has developed some mechanisms to edge the risks associated with fluctuations in the exchange rate. Other than that, as far as economic policies are concerned, FDI is considered

to be an integral part of Canadian industries (and the private sector), as the country's economy is deeply intertwined with the United States.

The SMEs within the industry know that they play an important role in the local supply chain, but they feel that the official financial support at the base of the producer's pyramid is still scarce. As an example, the respondent from an industry association cited that applying for the SADI program grants is virtually impossible for SMEs, given the complexity of the paperwork associated with the program. In addition, the government should improve existing and/or implement new policies to attract more SMEs to reinforce the supply chain within the industry. The industry is also concerned about the participation of SMEs in the sales of defence equipment to the government.

Factor	Current Situation
Financing and Export Credits (hostile or supportive mechanisms to internal and external sales of the industry; erratic or predictable tax system; hostile or supportive foreign trade legislation)	Interviewees agree that the Federal Government is supportive of the industry: EDC plays a similar role of BNDES in the export and financing of Canadian aircraft. However, Canadian taxpayers are more vigilant about government spending than Brazilian ones, a fact that can limit the amount of public money supporting the industry. Regarding taxation, Canada has a predictable tax system and the State is strong in its mandate of collecting taxes. Even though the tax system is not a major concern for the Canadian aerospace firms, the private sector advocates for tax reforms that would address issues such as cuts on capital taxes and corporate income tax; and smoothing corporate tax rate increases for SMEs. At the regional level, Quebec has a good tax system for new investments, when compared to other provinces of Canada. In terms of foreign trade legislation, Canada has supportive foreign trade legislation: besides NAFTA, Canada has free trade agreements with several countries. In addition, Canada advocates for freer trade through the WTO Doha Development Round.

Regarding **regulation and legal framework**, respondents share a similar view of the regulatory system of Canada: it is predictable and stable. In addition, the country has good law enforcement mechanisms, which is a key factor to determine the state as strong in

terms of its legal framework. Interviewees also agree that the Canadian judicial system is perceived as strong, independent, and fully functional. The industry has no specific needs from the judicial branch; and while judicial costs can be high, especially for SMEs, the system is in general affordable. In addition, conflict resolution chambers are an alternative to costly judicial disputes. There is no doubt of the strength of Canada's democracy, respect for human rights and private property, which are, in fact, so strong and stable that the private sector does not even worry about institutional changes in these areas. It is a common opinion among respondents that changes in the institutional framework are discussed at large before they come into action, so everyone affected by such changes is well aware of new rules and regulations, while tools such as the Access to Information Act is a powerful mean to control the support of the government to the industry.

At the provincial level, the provincial judicial system is strong and independent and the legal framework of Quebec offers favourable conditions for private businesses, according to a representative from the provincial government. There have been only a few **labour** disputes in the past 30 years, which is a sign of a **stable labour environment**. Even though Quebec (and as a consequence, Canada) has a high labour cost for the industry, the respondent from Bombardier says that this is part of the game: the private firms established in Quebec do consider that labour costs are high, but they are aware that the industry employs high skilled workers, who will always demand high salaries. As a result, the sector knows that it is impossible to avoid high labour costs.

There is also a common opinion among the Canadian interviewees about the labour regulation: Canada has good regulatory mechanisms of the labour force and the private sector is not concerned about labour legislation. Even the workers of the sector seem to be satisfied with the current labour regulations, as the private sector has no history of conflict with unions or worker's associations. According to the representative from the Quebec government, one of the reasons, in his perception, of the success of the Montreal aerospace cluster is that Quebec labour laws are more favourable to business than in the rest of

Canada or in the U.S., a factor that contributes to the decision of companies to establish their businesses in the province.

Crime and corruption are not tolerated and the government is constantly fighting both. As a result, politicians are well aware of the risks of engaging in corrupt acts. As a matter of fact, as one to representatives from AIAC put it, the tolerance for corruption is so low that it occasionally interferes in the activities of legitimate groups such as AIAC and AQA, in the sense that they need to register as lobby organizations and have to be careful in their dealings with government officials. As a consequence, the associations are required to keep records of their interactions with the government and are subject to the regulations that apply to all lobby organizations.

Factor	Current Situation
Regulation and Legal Framework (erratic or predictable laws and rules; weak or strong law enforcement mechanisms)	Regulations are predictable and the government has strong mechanisms to enforce the law. Transport Canada is the federal agency responsible for civil aviation regulation and it works in cooperation with the FAA and other international regulatory bodies. The industry has a good relationship with TC and there is good communication on the establishment of new rules and regulations concerning aerospace. Regarding labour legislation: just like in Brazil, there is no specific labour legislation for the aerospace industry in Canada. Quebec, where most of the Canadian industry is located, ranks in fourth place when its labour costs are compared to other provinces (considering the minimum wage and labour taxes); and labour legislation (orientation of labour laws, influence and leverage of certain unions; and level of bureaucracy/paperwork associated with regular employment or job openings).

Regarding the private companies within the sector, Bombardier is such an emblematic and important firm to the Canadian aerospace industry because it has emerged as the most successful business from the Canadian effort to build a competitive aerospace industry. The local aerospace industry is the result of an industrial policy aimed at creating

a Canadian industrial capability and increasing the country's ability to encompass externalities within national borders. Bombardier is also emblematic in its role as the leading force of the Montreal aerospace cluster, which is also considered to be a broader success of the country's public policy for the aerospace industry. Of course the government has extremely high expectations for the sector, after all the money that was invested over the years in the development of national aerospace powerhouses. Bombardier is among the 50 largest exporting companies of Canada, which is a relatively small group of firms for the bulk of the country's exports. The pressure is even higher because many of these exporting firms do not enjoy commanding positions in high-technology sectors. As the respondent from Bombardier says, apart from small adjustments in specific points of the policies supporting the local aerospace industry, the private sector seems to enjoy a positive relationship with the Canadian government. Other interviewees suggested that there is a high degree of mutual trust and openness between the public and private sectors, which translates into a supportive environment for business and into positive economic dividends for Canada and its citizens.

Despite their commercial disputes and overall competition, Bombardier and Embraer have indeed much in common. Within the industry, both firms are perceived as well-run companies with strong and consistent strategies for the regional aviation market. Both companies benefited from strong, imaginative leadership, which contributed to produce excellent relations with each country's policy decision-makers: the governments of Brazil and Canada consider the two companies as indispensable parts of their national economies, generating thousands of jobs and bringing millions of dollars to each country every year. Both firms are connected as they both identified the potentials of the regional jet market ahead of their rivals. As a consequence of their status, in spite of their low employment contribution, these firms have considerable political weight.

A difference that is symptomatic of an institutional environment less developed in Brazil than in Canada is the perception among private businesses that the best way the government can support them is by staying out of their way, as one Brazilian respondent

put it. If Brazil really wants to move forward and have a more prominent role in the world economy, the government needs to start addressing these structural deficiencies immediately. Finally, both Brazil and Canada have a tradition of government intervention in the economy, combined with nervousness about the influence of the United States over both their domestic economies and the international trading system. In their efforts to support their local aerospace industries, both governments absorbed debt and provided other means of financial support to their aerospace champions. The willingness of Canada and Brazil to defend Bombardier and Embraer is a clear sign that the two governments, while embracing liberalisation, are not willing to disregard the nationality of internationalised firms. It is clear that both Canada and Brazil consider the aerospace industry to be a cornerstone of their technology policies and neither is willing to abandon the field or give some space to their competitors.

In the course of our research and during the interviews with representatives from governmental agencies from both countries and members of the aerospace industry, we concluded that the governments of both Brazil and Canada are facilitative of their aerospace industries. Both governments are supportive of independent organizations within the aerospace sector and both governments have fairly predictable policies, laws and regulations, despite the big gap between their institutional environments.

As we have shown in this report, the quality of the institutional environment has a direct impact in the business environment of a country. In our example, it is clear that Canada has a stronger government, more solid institutions, and efficient mechanisms to guarantee the enforcement of its laws and regulations. Brazil, on the other hand, is perceived as a somewhat strong State, with relatively strong and stable institutions, a vibrant economy and social indicators that have been consistently improving in the past 30 years. However, the country still has some pressing issues to address in terms of law enforcement, fairness and reliability of the justice system, fighting corruption, and diminishing the staggering gaps in wealth distribution, to name just a few of the problems that are still preventing the country to be a fully developed world economy.

As a reflex of its more advanced and organized institutional environment , the Canadian government support to its aerospace industry is more consistent and embracing and better coordinated than that of the Brazilian government. As figures 11 through 15 show, while the Canadian Federal Government has at least 15 agencies involved in the development of its aerospace industry, the Brazilian government has only 8 federal agencies directly involved with the sector. To make matters even worse, the coordination between the Brazilian agencies is weak and somehow disconnected from the real needs of the industry. Right now, one of the top priorities of the Brazilian government for the sector is the expansion of the local supply chain, even though it is clear that the industry is not mature enough to have a second major OEM operating in the country. The fact that some of the Brazilian government officials interviewed are confident that the local supply chain has the potential to grow to the point that even turbines could be made in Brazil may be a bit too much optimistic. The country's technological environment may never be advanced enough to attract major players within the global industry for such high and risky investments.

For Canada, while the institutional environment does not pose a threat to the private sector, the obvious challenge is to diversify its economic partners and not depend so much on the health of the U.S. economy. As shown in this report, the other crucial issue to be addressed in the country is the demographic changes that will occur with the retirement of baby-boomers and the ability of companies to replace them and train the new generation of workers. Bombardier has a solid support system in the Montreal aerospace cluster, especially in terms of investments (both private and public) in R&D and professional training, and the company mostly likely will continue to be stable, profitable, and innovative for many years to come. The Canadian aerospace sector as a whole will mostly likely to continue to profit from its proximity to the U.S. and the highly integration between the supply chains of both countries.

One major difference that reflects level of development of the industry in both countries is the investments in education and R&D. Brazil lacks a serious, long-term

educational policy and the federal universities have a long history of lack of investments in both infrastructure and personnel. The little interaction between universities and the private sector also compromises the quality of the higher education system, as there is a gap between the skills and qualifications in demand by private firms and the curricula of the universities and other training centers. As there is no question that highly qualified personnel will always be in demand by the aerospace industry, both in Canada and Brazil, the differences in the quality of the education they receive in each country plays a central role in the amount of innovation, higher productivity, and the ability to adapt to changes to economic adversities that differentiates these two great nations.

As a Brazilian citizen, it is easy to understand the pride Brazil takes in Embraer and the importance of the company as a flagship model of the industrial capacity of the country. The company is a constant reminder that Brazil can offer more to the world than just commodities and good music. Unfortunately, until the institutional improvements that the country needs so badly are in place, there are slim chances that the success of Embraer can be applied to other Brazilian manufacturers or industrial sectors. Until such institutional adjustments take place, the most likely scenario for Embraer is to continue on its proven path to success: as little dependence from the government as possible (with the exception of the export credit lines), private funding of R&D initiatives, and a strong focus on external sales.

The aerospace industry has an enormous capacity to expand in Brazil, given the recent increases in the numbers of passengers flying for the first time and willing to become frequent users of civil aviation services in Brazil. Who knows if Embraer would be able to supply all the aircraft needed if other regional hubs were to be developed in Brazil? There is no question of the size of unexplored markets and the growth potential, they are beyond promising – but the real challenge lays in the following question: what are the basic requirements in terms of knowledge and capacity to adapt necessary to survive in an institutional environment that is anything but obvious? Would it be possible for Canadian

SMEs within the industry to increase their presence in Brazil and avoid the current risks and threats associated with the current institutional environment?

It is our hope that this report could open the door to a collaborative approach between Brazil and Canada in the aerospace industry. In order to answer the questions above, it is necessary to further investigate the growth potential for Embraer and Bombardier in Brazil; and the viability of a collaborative approach between Brazil and Canada to further develop their aerospace industries – including joint investments in R&D, expansion of educational exchanges and training programs, and a combined strategy to address the imminent competition of China and Russia in the regional aviation market.

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## **Appendix B**

### Questionnaire of the Structured Interviews with the Participants of the Research (English Version Only)

The problem to be investigated:

“What aspects of the institutional environment and which public policies of Brazil and Canada have the greatest impact in the development of independent economic organizations of the aerospace industry of both countries?”

Objectives of the research:

1. To identify the aspects of the institutional environment of Brazil and Canada which qualify their governments as facilitative or nonfacilitative of the economic independent organizations in the aerospace industry.
2. To identify how the independent economic organizations of the aerospace industry in Brazil and Canada relate to the institutional environment of each country in order to enhance their positions in terms of business performance, profitability, market share, and other indicators of business development.
3. To identify the perception of government representatives, aerospace industry associations, regulatory agencies, and private businesses about the effects of public policies in the development of independent economic organizations in the aerospace industry of Brazil and Canada.
4. To compare and describe the similarities and differences between Brazil and Canada concerning the institutional environment, the relationships between business and government organizations resulting from this environment, and the influences of public policies in the development of aerospace industry of both countries.

Initial introduction and greetings to the interviewees.

I'm a student of the Master Program in International Public Administration at École nationale d'administration publique – ENAP Montreal. My research project is a comparative study based on the aerospace industries of Brazil and Canada that seeks to identify which aspects of the institutional environment of both countries will qualify their governments as facilitative or nonfacilitative of the independent economic organizations. You were selected to collaborate with this project because (explain the reasons why the person was selected) and for that reason, I would like to interview you. I would like to request your permission to record this interview, so that I can take the most advantage of our conversation. This research project is being conducted for academic purposes only and it is one of the requirements to obtain my degree at the ENAP Masters program.

If you agree to collaborate with this research project, I would like to stress the following points: 1) you can, at any time, refuse to answer any of the questions that may embarrass you in any way; 2) you may refuse to take part in this research project and you do not need to justify your reasons; 3) you may have access to the results of this study, if you wish; and the access to the results is unconditional to your participation in this project.

I would like to stress that there will not be any type of identification of the interviewees that may cause you an embarrassment or uncomfortable situation. There is no right or wrong answers. What matters the most to this project is your own perception about the questions that I will ask you. The questions are organized in a pre-determined order that may be changed in response to the answers of all interviewees taking part in this study.

After this brief presentation, I would like to start our interview, which has an estimated time of 35 minutes.

1. How do you perceive the Canadian institutional framework in terms of its legal stability (e.g. sudden changes in the legislation, respect of contracts, and independence of the judicial system) and what is the impact of this stability/instability in the economic development of the country?
2. Would you please make some comments on the relevance of the Canadian government investments in infrastructure, including energy, education, telecommunications, R&D, and transportation (roads, railroads, ports, and airports), etc., and the impact of the current Canadian infrastructure in the development of the aerospace industry?
3. In your opinion, to what extent does the government of Canada can influence the Canadian aerospace industry? In answering this question, please bear in mind the ability of the State in the decision making process of private businesses in terms of investment, business expansion, employment, internal and external sales, pricing policies, mergers and acquisitions; and salaries.
4. What is the impact of the current economic policies of the Canadian government (in terms of the interest rates, exchange rate, inflation, etc.) in the development of the aerospace industry of Canada?
5. Would you please make some comments about the Canadian legislation related to the following fields: intellectual property, private investment (including foreign direct investment - FDI), monopolies, taxation, and work regulation; and its impact on the aerospace industry?

6. Considering the taxation structure of Canada, would you please make some comments on the impact of the current level of taxation applied for the aerospace industry in Canada? What are the positive and negative aspects of the taxes applied to the Canadian aerospace industry?
7. Would you please make some comments about the Canadian Judicial Branch, based on the following criteria: fairness/impartiality, honesty, agility (time), costs (affordable), and consistency/reliability?
8. In your opinion, how capable is the Canadian government in terms of law enforcement and punishments to those who break the law? How this ability/inability of the Canadian government affects the industrial/economic development of the country?
9. How do you evaluate the presence of the government in terms of respect to private property, public safety, fight against organized crime and corruption, supply of quality public services, etc?
10. How do you perceive the performance of the Canadian government as a regulator (through several regulating agencies) of the private economic activity in Canada?
11. Based on your general knowledge, would you please make a comparison between the Canadian and the Brazilian aerospace industries and the role that the government of each country has as a promoter of economic and industrial development?
12. This is the end of our interview. Please feel free to make any additional comments or statements about the role of the Canadian government and the private organizations of the aerospace industry.

## **Appendix C**

### Summarized Transcripts of the Interviews

## **Interviewee 1 – Ministry of Development, Industry and Foreign Trade – Brasilia**

**Question 1:** The Brazilian institutional framework is considered to be stable – members of the Brazilian Association of Aerospace Industries do not consider the institutional framework as a threat to their businesses.

**Question 2:** Brazil has a good airport infrastructure, even though it's not expanding at the same rate of the rest of the economy - this problem could be solved in part by developing regional hubs in smaller cities.

**Question 3:** There are no specific policies for the government acquisitions for defence (nor minimum percentage of parts made in Brazil). The government should promote more joint-ventures and cooperative projects with foreign manufacturers. The government should support more R&D initiatives.

**Question 4:** The government is more focused on how to further develop the local supply chain than on issues related to the exchange rate. As the Ministry sees it, the exchange rate is not a major concern of the industry. There is room for improvement in FDI, taxation and logistics & infrastructures.

**Question 5:** Brazil has high labour costs, especially compared to those of Mexico and other Asian countries - there are no specific labour laws for the industry and this is unlikely to change. There are good laws on IP, but there is no culture among companies of patent depositing. There are no policies covering technological cooperation. The industry could benefit from a policy to enhance the abilities of SMEs, which plays a crucial role in the industry but lacks some expertise and the capacity to innovate.

**Question 6:** The taxation system that is in place tends to favour companies on the Tier 1 of the production chain and it penalizes the final purchaser of the aircraft (who pays most taxes). Most Tier 1 companies are from foreign countries and they usually benefit from financial support from their home governments. The RETAERO program aims to correct this distortion and it was a government response to a request from the industry. However,

the government understands that fiscal benefits alone cannot improve the performance of the industry, it is also important to improve our competitiveness.

**Question 7:** The Judicial Branch is not a major concern among the members of the aerospace industry in Brazil.

**Question 8:** Law enforcement does not play a major role in the aerospace industry in Brazil.

**Question 9:** IP protection, public safety, organized crime, corruption fighting and the offer of public services do not play a major role in the aerospace industry in Brazil.

**Question 10:** ANAC is the agency responsible for ticket pricing, airport fees, and signing bilateral agreements with foreign countries or companies operating in Brazil. There are no specific policies for foreign companies flying to Brazil or Brazilian companies flying abroad. There should be further integration with the Latin American markets. The government should improve the regulatory framework concerning defence purchases aiming at the further development of the supply chain in Brazil.

**Question 11:** Canada is better equipped to invest in innovation. Besides Bombardier and Bell Helicopter, Canada has several OEMs that play a major role in the world industry. Quebec has a strong aerospace cluster and Canada has a better support system for R&D, funded by both provincial and the Federal Governments. BNDES is studying the Canadian R&D financial support programs and may replicate them in Brazil. Embraer still depends excessively on foreign parts. The Brazilian supply chain can only further develop (to level with the Canadian counterpart) with massive investments in R&D.

## **Interviewee 2 – Ministry of Development, Industry and Foreign Trade – Brasilia**

**Question 1:** Ever since the creation of Embraer and its privatization in 1994, the Brazilian government is committed to the aerospace industry - so the institutional framework

connected to the sector is as stable as possible. The priority right now is to further develop the supply chain (Helibrás). The Brazilian government is constantly comparing the institutional framework of other major players in the industry in order to offer a similar reality in Brazil. Although the institutional framework is stable, this is an industry that is very susceptible to the economic environment, at both local and international scales.

**Question 2:** The main infrastructure connected to the industry is that of airports - other infrastructure aspects have an impact on the overall costs of operating in Brazil. One of the reasons the government offers financial support to the industry is to compensate the lack of a strong supply chain in the country. For example, Brazil has little to none suppliers of aerospace steel and for that reason, the industry depends on the prices set by foreign suppliers. If a second Tier 1 integrator (Helibrás) comes into the industry, it would be easier to justify the establishment of a supplier of aerospace steel in the country.

**Question 3:** There is no direct interference on issues related to compensation. The industry traditionally needs government support to finance the development and selling of aircraft. Defence purchases can play a major role in the industry. BNDES has a major role in the relationship of the government and private business - through its credit lines, the bank can boost the sales of local companies.

**Question 4:** The main variable regarding economic policies is the exchange rate, since the Brazilian industry still depends extensively on imported parts. Devaluating the Brazilian currency would have a very negative impact on the industry.

**Question 5:** The legislation concerning IP is fairly good, even though Brazil has no tradition in investing in innovation, patent registration and R&D. However, this problem is not exclusive of the aerospace industry - all industries in Brazil have a weak performance in terms of innovation and R&D.

**Question 6:** The taxation system is heavy and harmful to the industry. Taxes are collected over all stages of production, which will impact on the final price of products. It's hard for

the government to have a taxation policy exclusive to the aerospace industry; any benefits given to one specific industry should apply to all others. Taxes also have a negative impact on the industrial policies created by the Brazilian government.

**Question 7:** The Brazilian judicial system is heavy, expensive and the access to it is difficult. The flaws of the system have negative impacts in all industries in Brazil. One main impact is on the price of goods and services: companies tend charge more to compensate their judicial costs. The frail legal framework also has an impact on financial support to the industry: private banks generally do not offer credit lines to the aerospace sector.

**Question 8:** As a reflection of the problems in the judicial system, the law enforcement in Brazil is somewhat weak. The two main challenges for private businesses in Brazil are the judicial and the taxation systems. As mentioned before, this has an impact on the prices of goods and services, as companies transfer those extra costs to its consumers.

**Question 9:** IP protection, public safety, organized crime, corruption fighting and the offer of public services do not play a major role in the aerospace industry in Brazil. As Brazil is a federative republic, each state has its own policies concerning public safety, education, health care, etc. However, it is well known in Brazil that there is room for improvements at both the quality of public services and the percentage of the population that have access to them.

**Question 10:** Ideally, the Brazilian government would work only as a regulator of the private sector in the country, as opposed to the role of a supplier of goods and services. There is now a counter-movement to the 1980-1990s privatization waves and the government is reinforcing its presence in economic activities. However, this movement is not being observed in the aerospace industry.

**Question 11:** The Canadian government (at provincial and federal levels) gives a more significant financial support to its aerospace industry. The Canadian supply chain benefits from its proximity to the USA market.

**Question 12:** The Brazilian government has an industrial policy aiming at 32 different sectors of the industry. Aerospace should not be considered as a simple industry, as it also has a significant impact on defence and national security policies - There should not be a distinction between civil and military aviation, in terms of industrial support to aerospace. The main focus of the Brazilian government is on the strength and further development of the supply chain. Considering the aerospace industry, the Brazilian government is supportive of the independent organization, predictable and strong.

### **Interviewee 3 – Brazilian Agency for Industrial Development - Brasilia**

**Question 1:** The Brazilian government is supportive of the aerospace industry. Embraer was created as an extension of the research investment started with ITA and CTA. The government showed its support through the bilateral agreements signed between Brazil and Italy (AMX) and Argentina (CBA 123). The HTA consortium and the financial support to external sales (BNDES) also show the commitment of the government to the sector. The current policies for the industry are considered to be stable (mature) and the government seeks to have an open channel of communication with the industry. The government compares the support given to the industry by other major players and tries to implement similar initiatives in Brazil.

**Question 2:** The Brazilian aerospace industry is concentrated in São José dos Campos, an area that has good infrastructure in comparison to the rest of the country. There is easy access to airports, training centers and universities, etc. There is a constant flow of investment in the region (main industrial hub in Brazil). Some modern labs and research centers are available, but there is need to invest more in the modernization of the existing

infrastructure. Even with the infrastructural disadvantages, Embraer performance is equal to that of other major players in the industry.

**Question 3:** There is little to none interference on how private organizations conduct their businesses in the sector. The main areas of influence are HR training, R&D, adjustments in the taxation system and financial support to exports. BNDES is focusing on some R&D programs to strengthen SMEs. There are also programs aiming at the enhancement of the productivity and technological development of the sector. Other than that, the Brazilian government has a golden share at Embraer, with veto power over defence-related issues.

**Question 4:** Economic policies have a relevant impact on the industry. BNDES has offered some financial support to the export of Embraer aircraft, after the 2007/2008 economic crisis. The Brazilian government is trying to reduce the interest rates in order to improve the business environment in the country - and it still needs to be further reduced. As most of the production of the industry is exported, the government seeks to improve economic conditions that have a positive impact on foreign trade. Exchange rate is one of the reasons for the OMC disputes between Brazil and Canada.

**Question 5:** There is good legislation on IP, but there is no tradition or a culture of patent registration in Brazil. ANAC (civil aviation) usually follows the recommendations of the FAA and JAA. Local manufacturers working with foreign partners may actually lose IP on products developed locally resulting from local adaptation to an imported part or machinery. ABDI and INPI are trying to improve the IP legislation and awareness in the industry. There is a lack of resources in the Brazilian agencies responsible for IP in the country. BNDES is seeking to perfect the lending mechanism for foreign buyers of Brazilian aircraft. There is rigid labour legislation in place, with high indirect labour costs. Hiring foreign professionals (specialists) should be an easier process.

**Question 6:** Brazil is working closely with the OECD and WTO to correct fiscal discrepancies in the sector and equalize it with other major players in the industry. The Brazilian government created the RETAERO program in order to extend fiscal benefits to

SMEs working in the industry, in order to strengthen its supply chain; part of these fiscal incentives is meant to correct productivity disadvantages of local manufacturers resulting from a lack of HR training. Tax breaks for R&D actions is seen as a positive long-term investment in the further development of the industry.

**Question 7:** ABDI never had any negative feedback from the industry concerning the judicial branch. There is a governmental effort to modernize the judicial branch, with investments in the digitization of processes and massive acquisition of IT equipment. There has been a constant improvement in the Brazilian courts in the last decade. The WTO disputes with Canada served to educate the industry on how to seek legal assistance on international forums: both the government and the businesses are now better prepared for future disputes. The industry is now more aware of international law and seeks constant assistance from the government in helping members of the industry settling commercial disputes.

**Question 8:** The Brazilian government has good capacity to enforce the law - the problem is that there are several ways to appeal from a decision and it can take years before a final verdict is ruled. Brazil is growing at high rates and fast speed, so the government sometimes lack the capacity to invest in the judicial system at the same pace. The Ministry of Justice has a special agency (CADE) that rules over industrial disputes. Brazil still needs to improve its image overseas (e.g. international credibility over issues such as the Gol accident in 2006).

**Question 9:** Brazil has recently invested in the modernization of its police force at both federal and state levels. There is more awareness concerning the fight against corruption. There is freedom of press and people are more informed today than ever. There is room for improvement in controlling the borders with neighbouring countries and customs services.

**Question 10:** ANAC is directly responsible for certifying new aircraft. There are also the Civil Aviation Secretariat (MD) and Infraero (airports). ANAC works closely with the FAA in order to determine the safety standards for the industry.

**Question 11:** The Brazilian government has prepared a benchmark study to compare its industry to that of Canada, aiming at the further development of the Brazilian supply chain. SMEs in Canada can receive more fiscal benefits than companies in the 1st tier (as a result of the WTO disputes). Canada has better support mechanisms for SMEs than Brazil, including R&D facilities financed by the government. The Brazilian legislation currently prevents the government from implementing similar initiatives in the country. The Ministry of Industry is currently studying ways to create R&D centers in Brazil to further support PMEs in the aerospace sector.

**Question 12:** The Brazilian government is committed to support independent economic organizations through ABDI. Brazil is trying to consolidate its institutional framework and its repercussions on private organizations and business transactions. A sign of the latest advancements is the specific ABDI policies for the aerospace industry. The government is also seeking to consolidate and narrow down its relationship with the industry. Right now, the industry is still recovering from the 2007/08 economic crisis, but its overall situation is satisfactory.

#### **Interviewee 4 - Brazilian Development Bank – Rio de Janeiro**

**Question 1:** Brazil has improved the stability of its institutional framework since the return of democratic governments. Changes in the tax legislation have the most impact on the aerospace industry. Contracts are respected and the economic stability is a reflection of the stable institutional environment. Brazil understands that a stable institutional framework is requirement for economic development.

**Question 2:** Brazil is experiencing a major investment cycle in infrastructure, especially hydroelectricity, roads, and ports. The government is establishing PPPs to co-finance these works. Aerospace is not so dependent on the physical current infrastructure - what is more

crucial is the R&D infrastructure, which is still weak in Brazil. Embraer is the main sponsor of R&D programs in the industry, but it is still not enough.

**Question 3:** Considering the performance of Embraer, government has an important role in the industry, but it is not the main element of Embraer's success. The government has a major inducing role in all economic activities - and in the case of aerospace, it wants to strengthen the supply chain and enhance the aggregate value of the parts and aircraft made in Brazil. BNDES is committed to support the export of Brazilian products/aircraft. The government does not interfere on pricing policies. Regarding monopolies and acquisitions/mergers: the government knows that a stronger supply chain and higher gains of scale will only be possible with bigger players.

**Question 4:** The current policy on inflation targets is harmful to all industries. Brazilian high interest rates, combined with an exchange rate that is permanently high reduce the competitiveness of the industry in terms of relative prices.

**Question 5:** Brazil has good legislation on IP, but there is no tradition in the industry concerning patents. FDI: Brazil has adequate legislation to attract foreign investment, but in the end, each company will choose foreign partners to establish joint-ventures. CADE is the agency responsible for regulating monopolies and unfair practices. Taxes: this is a problematic issue, with taxes being collected in all stages of production - RETAERO is aiming at fixing the distortions in the industry. Labour laws could be modernized to facilitate hiring/dismissing employees in the industry.

**Question 6:** It is possible that Embraer may pay more taxes on a part that is made locally than on one that is imported, given some current tax incentives. There is a work group that is pushing the regulation of RETAERO in order to correct these flaws. In general, the tax legislation has negative impacts on the industry.

**Question 7:** In general terms, the Brazilian judicial branch is fair and honest, but it is not fast. There are endless possibilities to appeal from a sentence and as a result, the system is slow.

**Question 8:** The government is capable of enforcing the law. However, in certain occasions, society does not adhere to a specific law, as people don't see it as a fair/reasonable rule. Because the justice system is so slow, individuals who break the law tend not to worry about possible punishments - and even if they are punished, they can appeal from the sentence.

**Question 9:** There are different levels of responsibility - the federal and state governments are each responsible for some items. The Federal Government is improving the quality of the services that it provides nationwide. Brazil still needs to improve its ability to fight organized crime, and it is doing so as a consequence of its economic growth. The Ministry of Defence is conducting studies to purchase new, modern equipment to fight crime in Brazil.

**Question 10:** After the privatization processes started in the 1990s, Brazil established several regulatory agencies - they are still "young" institutions and they are still establishing their field of action. At this time, the agencies are investing in attracting and training talent in order to improve their work. Over time, the agencies will play an important role in the economic development of Brazil.

**Question 11:** The Canadian supply chain is stronger than the Brazilian, including the Canadian ability to manufacture engines, for example. Canadian competences are more complex and more developed. Both governments play a decisive role in the success of their industries - Canada gives more support to R&D than Brazil. EDC is also an important element of the Canadian industry and even though BNDES gives financial support to the export of Brazilian aircraft, it is not as strong and constant as that offered by EDC to foreign buyers of Canadian parts and aircraft (Brazil currently observes the WTO & OECD treaties and regulations concerning financial support to the aerospace industry).

**Interviewees 5 & 6 - National Agency of Civil Aviation – Brasilia & Montreal  
(Delegate of the Agency at ICAO)**

**Question 1:** ANAC symbolizes the Brazilian government message to the aerospace industry (civil aviation) that it has a stable institutional environment. The government wants to be transparent and have a stable regulatory environment. All changes in the framework are supposed to be discussed in a broad level - the agencies try to be an open communication channel between government and industries. In Brazil, institutional changes are a complex and long process. Contracts are by large respected in Brazil. Better environment today than 10 years ago. Brazil is getting ready to have a stronger voice in international forums.

**Question 2:** Economic stability after 1995 translated into new investments in infrastructure. 15 years later, one can say that it's still not enough time to rebuilt or modernize it. How to finance new infrastructure? Through PPPs. Some investments are not attractive to private sector, so the government has to finance them. Airport infrastructure is still weak, but it's improving, but Brazil still has a long way ahead. There have been recent investments in air-traffic control. Financial resources (Infraero) need to be better managed. Aerospace is not so dependent on physical infrastructure and improvements on infrastructure to the sector are less cost consuming than in other industries. Investments in HR training and R&D still very low, but it's improving (ITA & Co.). Ideally, Brazil should duplicate its current infrastructure every 2 years to keep up its economic growth.

**Question 3:** Governments play an important role in aerospace. All four main global players depend on government financing. BNDES is the main financer of Embraer exports. WTO disputes are a consequence of government support to the industry. Embraer has an advantage over SMEs in receiving government funds. Government acquisitions (defence) play a major role in the performance of aerospace companies. Brazil should have legislation inspired on the Buy American Act to propel national industry. CADE works in a

transparent way and Brazil has good mechanisms to control mergers and acquisitions. Regarding pricing strategies, the government does not interfere in this matter.

**Question 4:** Inflation is under control. The foreign debt has been paid. BNDES has a straightforward and daring policy for the sector. Inflation-targets policy is not harmful to the sector. Exchange rate is harmful to the sector and the government is slow in managing it. In general, government makes good choices, but it is just too slow to react at the moment businesses need a change. Interest rates works as a discouragement to any industrial activity in Brazil. Brazil has one of the highest interest rates of the world and the government does not have a plausible explanation to that.

**Question 5:** Labour legislation is obsolete and it is almost impossible to change it.

**Question 6:** Brazil needs to reform its fiscal legislation - it doesn't make sense to have heavy taxes on labour in a country that needs more jobs. Brazil has good tax legislation for the aerospace industry. Taxes are also at a satisfactory level for civil aviation. In comparison to other sectors of the economy, aerospace has a lower taxation level over it. Certain segments of the sector still pay high taxes.

**Question 7:** The judicial branch is independent, and even though it has some problems, it is functional, but not effective. The main problem of the judicial branch is that it's very slow. A dispute in a Brazilian court can take 10 years or more to be ruled. Corruption is another factor of concern. Because the system is so slow, people sometimes don't even bother to seek legal assistance to solve a problem. The legal bureaucracy associated with opening and closing a business in Brazil hurts the economic activity.

**Question 8:** Law enforcement is still weak in Brazil. It's imperative that Brazil fights corruption and promotes a major reform in the judicial system if it wants to be seen as a developed country. Judges need to pass on the message that the system works and that people can rely on the justice to settle their legal problems.

**Question 9:** The state is present in matters of protection of private property. Police apparatus has much improved in the past 10-20 years. Fight against organized crime and corruption has also improved. Corruption is not anymore acceptable in police forces. There are even some excessive actions in the Federal Police investigations. Again, the system needs to be more agile.

**Question 10:** ANAC, in conjunction with FAA sets security standards for the industry. Security standards are now more rigid than those of ICAO's. Brazil is still developing a regulatory agency culture; the government still needs to evolve its capacity as a regulator. ANAC works in a satisfactory way and in general, companies follow its resolutions. A good regulatory agency has two basic responsibilities: observe (control) the market and regulate it. There are some distortions in the Brazilian model: some agencies collect more money than their "parent" ministries. ANAC has a good legislation behind it; it is on the right track to train its personnel; it has a reasonable system to select and replace (over time) its board of directors; and it is fairly (self) funded.

**Question 11:** Canada has a higher level of financial support to its aerospace industry. Canada benefits from its proximity to the U.S. and its participation on NATO (the defence segment of the industry). Canada also has a more advanced space program, which benefits all segments of the aerospace industry. Brazil should invest more on defence and the acquisition of fighter jets.

**Question 12:** HR training, reinforcement of the educational system, and more investments in R&D are paramount to the future success of Brazilian industrial activities. In comparison to Canada, Brazil lacks huge investments on HR training.

#### **Interviewee 7 – University of Brasilia - Brasilia**

**Question 1:** The industrial policies for the aerospace sector are very weak - ABDI has limited resources, limited personnel and limited freedom to manage industrial policies. It

basically prepares reports that are most important to politicians, with few practical results for private businesses. Most of their studies are filled with positive suggestions to further develop all industrial activity in Brazil, but they are out of synch with the market. The industrial policy designed by the MDIC is not feasible: you can't have 30+ different sectors of the economy targeted as "priority."

**Question 2:** Investments in R&D are concentrated in the São José dos Campos area, but Embraer is the main investor in R&D - government funding is still very scarce.

**Question 3:** Strong dependence on governmental support: R&D, financing, acquisitions for defence purposes. The industry cannot survive without government support.

**Question 4:** Embraer depends on the BNDES credit lines to export its planes = it's the same business model of the Eximbank, EDC, and the EU, but the issue is still controversial (WTO disputes)

**Question 6:** The Brazilian tax system is harmful to all industrial activities and for that reason, the government put in place the tax incentive programs (RETAERO) and other mechanisms (BNDES) to support the industry. If we compare the amount of taxes over aircraft made by Bombardier and Embraer, Bombardier will pay fewer taxes than Embraer.

**Question 9:** To the industry, the best approach is "if you can't help us, you should at least do not disturb us."

**Question 10:** Brazilian regional aviation has a great potential to expand and reinforce the industry. The government should support the establishment of transportation hubs in smaller cities.

**Question 11:** Embraer has always had its focus on the external markets - the government support was essential for the success of its external sales. The main source of income of Embraer is the external markets, not the government. The government has been present ever since = P&D before the privatization, BNDES support to foreign sales after

privatization. International partnerships (AMX) were crucial to the learning process of Embraer (risk partnerships). Embraer doesn't need government money anymore to design new aircraft. The focus of Embraer is turning to defence. Canada supply chain benefits from its proximity to the U.S. market. Canadian support is stronger because the industry is stronger in Canada - better supply chain, for instance.

**Question 12:** The further development of the Brazilian supply chain is unlikely to happen: there is no other major OEM in the area to justify the investment. The percentage of parts made in Brazil that is sold to foreign OEM is negligible. TAM and Gol would not buy Embraer aircraft even if the government offered financial support to buy them: they prefer to keep maintenance costs down with a few models from EADS/Airbus & Boeing. Initiatives such as GE buying a plant to manufacture turbines in Brazil were seen as a positive sign of a stronger supply chain, but in fact, nothing happened so far.

**Interviewee 8 – Ministry of Economic Development, Innovation and Export Trade – Montreal**

**Question 1:** Canada and Quebec have very stable institutional frameworks. The judicial framework is a favourable environment for private businesses. Few labour disputes in the past 30 years, so it's safe to say that the labour environment is stable. Contracts can be withdrawn in times of government transitions; it has been in the past and it is not unusual to happen in such times.

**Question 2:** Canada's investment in infrastructure is equivalent to other OECD countries. Aerospace has no specific needs in terms of physical infrastructure. Quebec is committed to renew aging infrastructures. Quebec has a great power matrix and it's a point of advantage to the industry. Costs of building new hydro plants are increasing, but aerospace is not energy intensive. Telecommunications is not an issue for this sector. Education and R&D are advantage factors in Quebec and the challenge is to keep up the trend and train enough

people each year. Demographic changes (retirement) is a concern. Investments in R&D must be constant and it's a long-term investment, so governmental support is not unusual.

**Question 3:** Defence acquisitions play an important role in the performance of the industry. Canadian government has been buying substantial quantities of defence equipment. Government support for R&D activities is justifiable because aerospace is source of high incomes and developing aircraft is expensive, but in the long term, the investment pays itself. Government has little power to interfere on business decisions, but it has been a long time supporter of the sector. No employment policies for sector. EDC plays a major role in the export of aircraft, but the support follows the WTO directives. There are no pricing policies or other interferences from the government. The Competition Bureau oversees mergers and acquisitions, but aerospace is not a concern. The Federal Government has mechanisms to control FDI.

**Question 4:** Economic policies are conducted by the Federal Government (Bank of Canada) and no industry benefits from special economic policies. Interest rate is higher than in the U.S. Companies are adapted to a strong CAD dollar. Some companies waited too long to renew their equipment, profiting from a favourable exchange rate, which may also have influenced in the lower Canadian productivity. The trend of parity or quasi-parity will persist.

**Question 5:** Quebec labour laws are more favourable to business than the rest of Canada and the U.S. Contracts are respected and they are not a source of problems to the industry. IP is regulated by the Federal Government and it is not a factor of concern. FDI is regulated by the Federal Government and the policies can change according to the party in power, but it is not a factor of concern. The Canadian economy is deeply intertwined with the U.S., so foreign direct investment is an integral part of the Canadian industry.

**Question 6:** Both the provincial and the federal tax system is favourable to the industry. There are fewer taxes over profits in Canada than in the U.S. Taxation is not a factor of concern for the members of AIAC/AQA. Tax breaks for R&D play an important role in the

industry and are becoming more and more common in countries with major players in the industry (U.S., EU)

**Question 7:** The judicial branch is strong, independent, and fully functional. Aerospace has no specific needs from the judicial branch. Judicial costs can be high, especially for SMEs, but in general, the system is affordable. Conflict resolution chambers are an alternative to costly judicial disputes.

**Question 8:** Canada has a strong law enforcement capacity and the government is strong. However, democracy is strong and Canada is far from being an oppressive regime. Private property is well recognized and respected in Canada.

**Question 9:** There is a free-market economy in Canada; the state is not the primary supplier of goods and services. In terms of infrastructure, public services, public security, and welfare, Canadian government is more present than the U.S. There is a good network of public services and they are part of the Canadian life. Crime and corruption are not tolerated and the government is constantly fighting both. Politicians are well aware of the risks of engaging in corrupt acts.

**Question 10:** Recent changes in the market suggest that foreign airlines will be allowed to serve domestic routes in North America and Europe. Regulatory agencies are mostly a federal responsibility. Mergers and acquisitions are usually approved. Quebec has more labour regulations than the rest of Canada, but there haven't been any significant disputes in the past two decades.

**Question 11:** The most visible aspects of the competition between Brazil and Canada are the WTO disputes. Brazil is growing in importance in the aerospace sector and it has the potential to be a major player in the world industry. The Canadian industry is older and more developed than the Brazilian. Embraer benefited from the military government in its early developments. MDEIE follows the strategies of Embraer closely. Quebec is aware of the investments to diversify the Brazilian supply chain. Canada is aware that the Brazilian

government will invest more in defence in the future. Canada is not a major buyer of military equipment and most of its acquisitions are imported. Government support in the defence sector is crucial because most civil aircraft is an adaptation of military equipment.

Question 12: CRIAQ is a concise way to explain the support of the Quebec government to the industry, as it's a forum to facilitate the communication between government, universities, and industry members. CAMAQ is a very effective forum that deals with HR and training issues. AQA and AIAC are important parts of the dialogue between government and industry, together with AéroMontréal. MEDIE has a small staff dedicated to the aerospace sector, but it's very active and very effective. MDEIE's offices overseas are also committed to support the export of parts and planes made in Quebec.

### **Interviewee 9 & 10 – Industry Canada - Ottawa**

**Question 1:** Canada has a strong institutional framework, which is not a concern of the private sector. Canada has strong institutions.

**Question 2:** There is a good infrastructure network that is part of the Canadian quality of life. In terms of maintenance of the infrastructure, there is a shared responsibility between federal and provincial governments. The recent Economic Action Plan is part of a federal initiative to improve the general infrastructure of the country. No industry is favoured in terms of investments in infrastructure.

**Question 3:** Limited influence: focus mainly on the business environment (innovation, productivity, R&D). IC focuses on the legal aspects of the market, such as Competition Act, Investment Canada Act, etc. Other agencies involved in the industry are: DFAIT, Business Development Bank of Canada, National Defence, Transport Canada, EDC (federal), and MDEIE (Quebec) and Department of Industry (Ontario). Also NRC collaborates with universities and provincial governments on training issues

**Question 4:** Interest & exchange rates, together with inflation targets are all set by the Bank of Canada, which is independent of the PM's Office. As most of the transactions in the aerospace industry are conducted in U.S. \$, the exchange rate is the most important aspect of the economic policies. Higher exchange rates meant that companies had to invest more in innovation, productivity, and continued investment

**Question 5:** The legal framework is strong. Competition Act is a strong piece of legislation. Investment Canada Act reviews the mandate of FDI in the country. Patent Act deals with IP. None of these issues is a major source of concern in the aerospace industry. IP is not a factor of concern among the members of the industry - the IP legislation is effective. IP protection is primarily provided by the Patent Act - it sets out what can and cannot be patented in Canada, the process for obtaining a Canadian patent, and enforcement provisions for the protection of patent rights in Canada.

**Question 6:** There is no specific tax regime for the aerospace sector. Canada has one of the lowest new investment tax rates in the G7. Canada has export sales financing mechanisms - through EDC, which is governed by the Aircraft Sector Understanding (OECD). The level of taxation is not an issue with the companies applying for the SADI program.

**Question 7:** Canada has a strong, independent and fully functional judicial branch. The legal framework of Canada is not a source of concern in the aerospace industry.

**Question 8:** Canada has strong mechanisms to enforce the law. Law enforcement is not a concern in the industry.

**Question 9:** Institutions such as the RCMP, DFAIT, and CIDA are collaborating with the governments of Afghanistan, Haiti and other countries, in an effort to improve their institutional framework.

**Question 10:** Transport Canada is the agency responsible for regulating civil aviation. It works closely with FAA and EASA and it maintains high security standards.

**Question 11:** Industry Canada has limited knowledge of the Brazilian aerospace sector. Bombardier and Embraer compete in the same regional aircraft market and Embraer has a strong reputation in the world market. IC seeks to collaborate with its Brazilian counterparts in the industry, especially in ways to minimize the threat of new entrants (China, Russia) in the market. The strength of the supply chain in both countries is also a topic for further collaboration.

**Question 12:** IC is aware of a possible HR shortage in the near future and it's been devising policies to address the future needs of the industry - but education is mainly in the hands of provincial governments. The FMP Initiative is an example of collaboration between the government and the industry, together with AIAC.

#### **Interviewee 11 – Industry Canada - Ottawa**

**Question 2:** Investments in infrastructure are shared between the federal and provincial governments. Federally regulated areas (airports, ports, railways) are funded by the Federal Government. Education, health care, local transit, energy and highways and roads are funded by the provinces. Economic Action Plan is an example of a federal program to finance new infra. No specific infrastructure programs for aerospace sector.

**Question 3:** Industry Canada and its SADI program are an important source of R&D financing, especially for SMEs. The government doesn't make any distinction between grants given for military or civil aviation programs. There is very limited direct influence over private firms. All companies are privately owned. The Competition Act is one example of legislation governing marketplace practices, it prevents anti-competitive practices.

**Question 4:** The exchange rate has a major impact on all manufacturing in Canada. A high valued dollar can make things difficult for the manufacturing sector as it makes products less competitive internationally. It also creates pressure for innovation and improvement

and this helps manufacturing in the longer-term. Since the Canadian aerospace industry is highly export oriented, the nature of economic policies abroad has a major impact on the sector.

**Question 5:** The Competition Act is the government tool that deals with conspiracies against competition, bid-rigging, abuse of dominant position, exclusive dealing, market restrictions, refusal to deal, and price maintenance. The Investment Canada Act requires a review of significant FDI in Canada. It applies to new investments in Canada and the acquisition of control of existing Canadian business. There have been no major concerns raised by the aerospace industry about patent protection in Canada. There have been no major competition issues in the Canadian aerospace industry.

**Question 10:** The main regulatory authority for the aerospace industry in Canada is Transport Canada. It has responsibility for aircraft certification and ongoing airworthiness of aircraft.

**Question 11:** Brazil and Canada have "sister" aerospace industries: both depend heavily on exports. Embraer has more domestic recognition than Bombardier. Canada should increase domestic awareness of its aerospace industry. The supply chain is more integrated in Canada.

### **Interviewee 12 – Bombardier – Montreal**

**Question 1:** The government shows great support to the industry. It's a relationship of mutual trust. Canada has a stable legal framework. Government policies for the industry are consistent, stable and comply with international regulations. A good institutional framework gives credibility to both the government and the industry. Access to Information Act is a powerful tool to control the support of the government to the industry.

**Question 2:** The support offered by the Canadian government to R&D projects is of crucial importance to the development of the industry. The government is always keen on promoting the ideals that make the country move forward. Government is doing a great job expanding and maintaining the existing infrastructure.

**Question 3:** The government of Canada, through IC, has been supporting the industry for some time, as the industry generates high revenues and creates high profile jobs in Canada. Government does support the industry, but it's the companies that make the final decisions. Government supports the exports of Canadian products and should continue to do it. Bombardier keeps the government informed of its projects, as it is considered to be a partner of the company.

**Question 4:** The exchange rate is a factor of concern, but Bombardier has some mechanism to edge the risks associated with it. When the company is developing a new project, they always make multiple projections based on different economic realities to mitigate the risks associated with that project.

**Question 5:** As a company, Bombardier follows the rules and laws of Canada, because it's the country that they've selected to do business in. Regarding IP, Canada should have stronger mechanisms to protect its IP rights - maybe Canada should follow U.S. IP laws more closely. There should be more dialogue between government and business in regards of better IP legislation. Even if the legislation is not strong enough, the government is still supportive of IP disputes involving Canadian firms.

**Question 6:** Taxes associated with labour costs are high, but considering the high level of the professionals working in the industry, it is justifiable. High skilled workers will always have high costs associated with them.

**Question 10:** Transport Canada has a high standard regulatory framework and Bombardier sees it as a reinforcing message of the safety associated with the industry. FAA has also an important role in the regulatory framework. It's important to comply with safety

requirements, even if it means complying with bureaucratic steps. Sometimes the safety regulations aren't reviewed as dynamically as they should, but in general, the government does a fair job within the regulatory agencies.

**Question 11:** Both countries have top quality aerospace industries. Brazilian government support to the industry is stronger than that of Canada. Canadian government support to the industry has a higher level of transparency, although Brazil claims to comply with international regulations on government support to the industry. In comparison to other emerging countries in the industry, Canada is never being accused to breach international agreements on official support to the industry. EDC and BNDES have similar roles in their support to the industry.

**Question 12:** Bombardier regards both the federal and the provincial governments as partners and is happy to supply them with all the information they need to improve their policies to the industry. The (possible) lack of qualified personnel is a worrisome factor, but Canada is not alone in this matter. Bombardier is keeping an eye on the future of the industry and on Embraer's strategies - also Russia and China are being observed. Canada and Brazil should combine forces to better understand the advances of new competitors in the industry.

### **Interviewee 13 – Association Québécoise de l'aérospatiale - Montreal**

**Question 1:** Canada has a strong, stable institutional framework and this environment is very favourable to businesses.

**Question 2:** Physical infrastructure is not a factor of concern in the industry. There should be official programs to assist SMEs in renewing their machinery more often - similar to the German program.

**Question 3:** NRC-IRAP is an important program to support R&D programs in SMEs, but the support should be expanded. Access to Federal Government funding programs is complicated, especially for SMEs: requirements to apply for them should be simplified.

**Question 4:** Companies are mostly satisfied with econ policies. There should be more access to credit, especially to SMEs. Economic conditions are fundamental in Canada's response to foreign competition: government should prevent companies from moving plants to "low cost" countries.

**Question 5:** There is a certain degree of flexibility regarding mergers and acquisitions. There should be more programs to attract SMEs to reinforce the supply chain. Legislation governing military purchases should be further discussed in order to support local SMEs. AQA members would like to see a formal federal policy for the industry. Federal programs to support the industry should be more coordinated. OEMs are still the main target of government support.

**Question 6:** Good taxation system in place, but there is room for improvement. Tax contributions are welcome, but they should consider the long ROI times of the industry. The EU has better tax credits mechanisms to support its industry.

**Questions 7 through 9:** In general, Canada has a strong government. The law enforcement is strong in terms of IP. There is a high level of compliance with the WTO regulations, so this is not a problem to the industry. Corruption and other issues mentioned in the questions are not a concern either.

**Question 10:** AQA members are satisfied with the domestic regulatory framework. The only sources of concern are international agreements with foreign agencies (e.g. FAA) and the impact they have on exports of Canadian aircraft and parts. Transport Canada is fairly independent on matters of regulating the industry.

**Question 11:** Brazil has one large company – Embraer, and then a very small number of companies in the supply chain. So obviously, in Brazil there is not a significant “in-house”

participation in the supply chain and for that reason one can argue that the industry is not fully operational. This is not the case in Canada and this is a major difference.

**Question 12:** AQA counts on government support to help SMEs expand in other markets. The major challenge of AQA is to attract SMEs into R&D. SMEs would like to enhance their transactions with OEMs and for that, they expect some government support. Government should work closely with the industry to prepare for possible HR shortages in the industry. Training programs and education should be a constant priority.

#### **Interviewee 14: Université du Québec à Montréal – Montreal**

**Question 1:** Government is stable and supportive of the private sector. There is a moderate level of public support to the sector. The arrival of China, Russia and others will change the dynamics of the industry. The establishment of the Montreal cluster was a smart move from the Canadian government.

**Question 2:** The level of public investment in infrastructure is considered to be adequate, though it can be considered moderate. Besides the investment being made in infrastructure, the government is also investing in attracting qualified immigrants to work in the aerospace industry.

**Question 3:** The subsidies offered to the industry (mainly from the Federal Government) gives the government some power to negotiate business decisions, especially in terms of keeping production lines (and jobs) in Canada, instead of relocating them to developing countries.

**Question 4:** Both Brazil and Canada depend largely on the price of commodities (natural resources) and for that reason, exchange rate is always a factor of concern. Right now, the Canadian dollar is very strong and this can be bad for the industry. Interest rates, on the other hand, are very low.

**Question 5:** Canada does not have a specific legislation for the aerospace industry – the government lets it to the industry to determine their IP strategies. It's really each company that will decide how deal with their IP issues (investment, patent registration, innovation, etc). There is no policy in this area.

**Question 6:** The tax credit programs (both provincial and federal) are an excellent way to finance R&D programs. Quebec invests more in R&D (through tax credits) than some countries. There are no specific programs for the aerospace industry.

**Questions 7 through 9:** There are no major problems in the system. Canada has a very stable institutional framework. Crime rates are very low, corruption is not a relevant issue (take note of the Transparency International Index).

**Question 10:** The Conservative party traditionally doesn't have a strong regulatory role in private businesses. The Conservatives have a "laissez-faire" understanding of the market.

**Question 11:** Brazil and Canada were very successful in supporting their aerospace industries. Brazil has a very strong in the world economy and its importance is growing remarkably. The PDP (MDIC) is very ambitious and hardly feasible. Canada is more selective and more focused on a few industries, which facilitates the government support. Apart from aerospace, Brazil has no remarkable industrial success story. Bombardier needs to succeed in the C-Series, otherwise it can be in serious financial problems.

**Question 12:** New entrants will define the strategies of Brazil and Canada in aerospace. Aerospace will always need government support. Most of the support in Canada comes from the Federal Government. Quebec is supportive, but in terms of financial resources, most of it comes from Ottawa. Bombardier benefited from government support given to Canadian companies after the WWII to be in its current position.

## **Interviewees 15 & 16 - Aerospace Industries Association of Canada – Ottawa**

**Question 1:** Canada is a very stable country, especially the legal framework, and this reflects on good businesses in the industry. Changes in the institutional framework are discussed at large before coming into action.

**Question 2:** The industry is not so dependent on physical infrastructure. There are governmental programs to support the development of R&D infrastructure that are extremely beneficial to the industry.

**Question 3:** Government can influence through free trade agreements that can benefit the industry. As a large exporter, Canada could always benefit from free trade agreements - and that is one of the main concerns of AIAB members. The Quebec government is considered to be quite supportive of the industry.

**Question 4:** Inflation is not a problem. The strong Canadian dollar is a factor of concern, as it makes Canadian exports less competitive. To compensate the losses, companies invest in the improvement of their competitiveness. Aerospace is a long-term investment (with returns and profits lasting 30-40 years, as the life of a particular model), so investors need to have some degree of certainty.

**Question 5:** Monopolies don't pose a threat in the industry. IP legislation is not totally clear. Some companies don't know how to protect their IP interests. The emergence of China in the industry poses questions about IP rights. Major players in the industry should address this question collectively.

**Question 6:** Taxation levels (just like the exchange rate) are considered to be high among AIAC members (especially when compared to the U.S.). AIAC has expressed its concerns to the government, but they haven't been addressed yet. The industry understands that the tax system will not change in the near future. DFAIT is committed to improve its support system to industry in this regard.

**Question 7:** Canada has a strong government, and the judicial branch is independent. Excessive legal requirements (as in the case of lobby organizations) can be costly and add bureaucracy to industry associations.

**Question 8:** Corruption is not tolerated - and it's fought even to an obsessive level: the regulation on lobbying is considered to be very tight.

**Question 9:** The state is present and strong and companies don't consider government agencies as a threat to businesses.

**Question 10:** Transport Canada is the main regulator of the industry, and companies established in Canada do pretty much what TC determines in terms of safety regulations. The industry has a good relationship with TC, which works closely with FAA and EASA in matters of security regulations. AIAC has a good collaborative relationship with TC, FAA, and EASA. The "green airplane" is a factor of concern, as it can add high costs to the industry (as a result of environmental regulations).

**Question 11:** The Canadian industry has both national companies and subsidiaries of foreign manufacturers. The supply chain in Canada is more developed than that of Brazil. AIAC has a good relationship with AIAB (under the ICCAIA). Brazil has a reputation of good civil aviation services. Canada benefits from its proximity to the U.S. and it has a stronger supply chain. Embraer is a "de-facto" monopoly, while Canada has several companies in all tiers of the industry. The Canadian industry is more advanced and it invests more in innovation.

**Question 12:** A future need of trained personnel is a concern, but there are several programs to address the issue (e.g. CCAA). On the other hand, the retirement of baby-boomers will pose a great challenge to all Canada. Outsourcing is another major concern of the industry, especially to Latin America and Asia - Brazil should pay attention to this trend, as it can be equally lucrative and dangerous to the industry. AIAC members would like to have less government involvement (esp. regulations) in the industry.