QUÉBEC'S AEROSPACE SECTOR

A true symbol of national pride

ALL ABOARD!

Surprisingly, many Quebecers are unaware that our aerospace industry puts Québec on the world map and is a source of national pride.

We are pleased to present this special supplement, which we hope will demonstrate the importance of our sector of activities.

Our industry creates wealth and has greatly contributed to the development of a modern Québec. It has made our province a world-wide aerospace hub.

Our industry stands out through its capacity for innovation and is a symbol of the future. The highly skilled men and women who work in this industry represent Québec's excellence.

For all these reasons, this industry is for Québec and Quebecers a source of national pride. Players in the sector, be they companies, research centres, educational institutions, associations or unions, are a true inspiration. They are the key drivers of a Québec industrial jewel.

Let us tell you all about it!

Marc Parent
Chairman of the Board of Aéro Montréal and Executive Vice President and Chief Operating Officer, CAE Inc.

École Polytechnique de Montréal graduate in mechanical engineering

Québec's aerospace sector, which includes companies working in the design, manufacture and maintenance of aircraft, modelling and simulation equipment (aircraft, helicopters, simulators) and aircraft components, as well as educational and aerospace training institutions and research centres, is a powerful economic engine that contributes to our quality of life.

Our aerospace sector generates substantial economic activity and provides tens of thousands of high quality jobs for Quebecers. It is a demonstrated leader in research and development and includes Canada's most prestigious aerospace technical institutions, schools and universities.

With 98% of Québec aerospace activity concentrated in the Greater Montréal area, it is one of the most important aerospace regions in the world along with Seattle in the United States and Toulouse in France. Moreover, the Montréal region is one of the rare places in the world where you can buy almost all the components for an aircraft within a 30 km radius.

The Greater Montréal area is one of the most important aerospace regions in the world.

Montréal is also home to the head offices of international organizations such as the International Air Transport Association (IATA), the International Business Aviation Council (IBAC) and the International Civil Aviation Organization (ICAO), testifying to the leadership of Montréal and Québec in the sector.

Welcome to the wonderful world of Québec's aerospace industry.

Enjoy the ride!

This document has been prepared by

AÉRO MONTRÉAL
www.aeromontreal.ca

Aéro Montréal is a think tank that brings together all the major decision makers in the region's aerospace sector, including companies, educational and research institutions, associations and unions.

Aéro Montréal's mission is to rally industry players around common goals and focused actions to increase coherence and foster an environment of increased productivity and growth that will lead to even greater wealth creation for the Montréal region, Québec and Canada.

A BRIEF HISTORY

Québec has played a historic role in the conquest of air and space. A mainstay of Canada's aerospace industry since the 1920s and 1930s, Québec can claim to be the birthplace of bush and commercial aviation in Canada. Here are some key milestones in the history of Québec's aerospace industry.

Laurence J. Lesh, a 14-year-old Montrealer, achieves the first glider flights in Canada. Lesh's gliders were pulled by a galloping horse, an automobile and even a motorboat over the Saint Lawrence River.

1907

An aviation week is held in Pointe-Claire during the summer. A first in Canada, the event was a huge success, drawing 20,000 visitors a day.

1910

The first airplane developed in Québec, in a garage on Ste. Catherine Street, flies to Cartierville. The plane was a prototype made by Percival Reid, considered to be one of the pioneers of aerospace manufacturing in Québec.

1911

Stuart Graham, his wife Madge and mechanic "Bill" Kahre make the first bush flight in Canada on an HS-2L seaplane called "Vigilance". The aircraft lands on Lac-à-la-Tortue in Québec after flying from Dartmouth (Nova Scotia) in June.

1919

The Noorduyn Norseman is designed and manufactured in Montréal. More than 900 of the legendary bush planes, as powerful on pontoons as on wheels, were built, making the Norseman the first best-seller in Montréal's aerospace industry.

1935

Joseph Thibault, a priest, founds the Compagnie d'aviation Charlevoix-Saguenay, with a primarily humanitarian vocation. At the start, the company operated with a single Travel Air type airplane, piloted by Rodolphe Pagé.

1937

The first Canadian transcontinental airline is created under the name Trans-Canada Air Lines, today Air Canada. In its early days it flew between Vancouver and Seattle.

1- Photo of Laurence Lesh's glider (1907): Scientific American 1907.

2- Photo of Rodolphe Pagé and his airplane, Émerillon: "Rodolphe Pagé – Québec Aviation Pioneer" by Raoul Lapointe. Publication of the Saguenay Historical Society, No. 26, 1972.

3- CSA astronaut Marc Garneau in 1996, before his second space shuttle mission (STS-77).

At the end of the Second World War, major cities in America become connected by air. Trans-Canada Airlines develops regular flights between Québec City, Montréal, Trois-Rivières, Saguenay – Lac Saint-Jean and Abitibi.

1950

Quebecair is launched in Rimouski.

1953

THE CONQUEST OF SPACE...

Following the lead of Russia and the United States, Canada becomes the third country to launch into space by placing the Alouette 1 satellite in orbit on September 29, 1962. Canada has since launched 17 satellites.

1962

1984

Did you know that...

...Our aerospace industrial base includes 236 companies that generate annual sales of $12.3 billion, 80% of which is from exports, and employ more than 42,000 workers.

...While one in 180 Quebecers works in the aerospace industry in 2007, in the Greater Montréal area one in 90 has a job related to the aerospace sector.

...Salaries of aerospace workers are 30% above the manufacturing sector average in Quebec.

...More than 3,600 graduates join the aerospace workforce pool every year from technical and trade schools or universities.

...Our aerospace sector is the 5th largest in the world in terms of sales behind the United States, United Kingdom, France and Germany.

...Québec's aerospace industry accounts for:

- About 60% of Canada's total aerospace production (2007 data);
- More than 50% of Canadian employment in the sector (2007 data);
- Nearly 70% of total Canadian aerospace research and development expenditures;
- Ranks 1st in R&D for Québec's manufacturing sector and was 1st among Québec manufacturing exports in 2007;
- More than 11,500 engineers and scientists work in this sector.

The Québec aerosp

Active on five continents, the industry includes four prime contractors – Bell Helicopter Textron Canada, Bombardier Aerospace, CAE and Pratt & Whitney Canada – as well as about 15 world-class equipment integrators supported by a large network of subcontractors and suppliers of specialized products.

"Working at CAE means being in a rich environment where aviation meets high technology, where the company culture is deeply rooted in innovation with customers on five continents, and where the career opportunities are numerous. My colleagues and I share tremendous pride but also a responsibility for contributing directly to air safety by training pilots since each one of them has to train in a flight simulator before flying an aircraft. Could there be a more stimulating environment for an engineer?"

François Dubé, P. eng., MBA
Manager-Deployment,
Simulation Products,
CAE

Degree in mechanical engineering, with concentration in aerospace engineering from the University of Sherbrooke and an MBA from UQAM/Paris-Dauphine

# of aviation in Québec

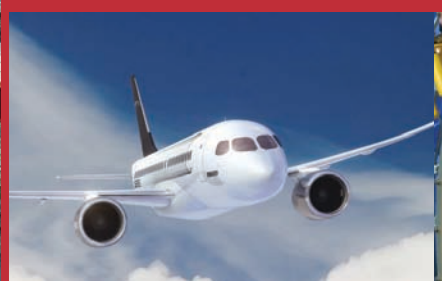
1922

Laurentide Air Service is launched to patrol forest fires. In 1924, Laurentide Air Service inaugurates the first regular air service in Québec, linking Angliers with Rouyn in Abitibi-Témiscamingue. The one-way fare is $40 and roundtrip $75. The first stowaway in history is discovered during one of these flights!

1924

The Vedette, the first seaplane with a cabin, is developed in Montréal by Wilfrid T. Reid and built by the aerospace division of Canadian Vickers, at the time the only aerospace builder in Canada. The Vedette became the most built aircraft between the two world wars (61 units).

1928



The Montréal region has been an industrial world leader since the 1920s and 1930s. Canadair, established in the '40s, is sold by the federal government in 1986 to Bombardier, a pillar of our sector.

In 1928, Pratt & Whitney Canada is born, followed by Héroux-Devtek in 1942 and CAE in 1947.

1939

The outbreak of a new world war stimulates Canadian aviation. Military airbases are built in Bagotville, Mont-Joli, Mingan and Fort Chimo [Kuujjuaq]. Military schools are established in Québec City, Saint-Jean, Cartierville, Bagotville, Cap-de-la-Madeleine, Saint-Hubert and Mont-Joli. They trained pilots from several allied countries and American President Roosevelt describes Canada as the "airport of democracy."

More than 230,000 men and 17,000 women served in the Royal Canadian Air Force. A squad mainly composed of French Canadian aviators is formed in England: the Alouettes Squadron. After the war, civil aviation draws heavily on this pool of qualified manpower.

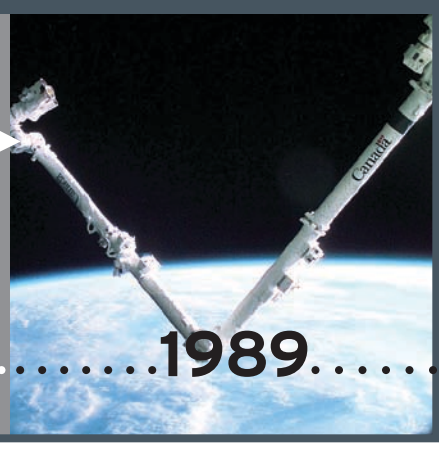
1947

After the war, several major players joined Québec's aerospace industrial sector: Rolls-Royce Canada, Bell Helicopter Textron Canada, Messier-Dowty, to name just a few.

1989

In 1984, Quebecer Marc Garneau became the first Canadian astronaut to go into space aboard the Challenger Shuttle.

The Canadian Space Agency is founded and establishes its head office in Saint-Hubert. The official inauguration takes place on October 2, 1996. Technology developed in Canada has since equipped numerous space missions throughout the world. The best known is the Canadarm Shuttle Remote Manipulator System on the American space shuttles.



2000

Finally, since 2000, new companies, including several from abroad, have set up in Québec to take advantage of its industrial expertise, quality manpower and the aerospace sector's capacity to innovate.

EVOLUTION OF THE INDUSTRIAL SECTOR...

ace industrial network

ORIGINAL EQUIPMENT MANUFACTURERS (OEMS)

EMPLOYEES: 24,110 (57%)

SALES: $8.7 billion (70 %)

Commercial helicopters: **Bell Helicopter Textron Canada**

Business, regional and amphibious aircraft and related services: **Bombardier Aerospace**

Simulator and modelling technologies and integrated training for civilian and military aviation: **CAE**

Engines for business, general and regional aircraft and helicopters: **Pratt & Whitney Canada**

EQUIPMENT MANUFACTURERS AND INTEGRATORS

EMPLOYEES: 7,930 (19%)

SALES: $2.3 billion (19%)

Maintenance, repair and overhaul: **Aveos, L-3 Communications MAS (Canada), Rolls-Royce Canada, Turbomeca Canada, SAFRAN Group**

Landing gear: **Héroux-Devtek, Messier-Dowty, SAFRAN Group**

Engine components and accessories: **General Electric, Goodrich**

Electric and electronic systems: **Esterline CMC Electronics, Lockheed Martin, MDA Space, Rheinmetall Canada, Thales Canada, Aerospace Division**

Wing panels: **Sonaca NMF Canada**

SUBCONTRACTORS, SUPPLIERS OF PRODUCTS AND SPECIALIZED SERVICES

EMPLOYMENT: 10,330 (24%)

SALES: $1.3 billion (11%)

Fields of expertise: Aircraft interior completion; test benches and waterjet cutting equipment; boilermakers/soldering; engine components and accessories; design/calculation/certification; containers; satellite equipment; support equipment; hydraulic and pneumatic equipment; tests/controls; digital control milling; foundry; shot peening; information/software; maintenance/repair; scale models and mock-ups; tooling/tools; plastics; rapid prototyping and sub-assembly; plasma and ionic nitruration coating; laser and ultrasound inspection systems; electric/electronic systems; surface treatment; thermal treatment; machining and fastening.

The Québec Aerospace Association (AQA) represents Québec aerospace SMEs. It seeks to strengthen relations among SMEs and aerospace prime contractors, enhance networking and partnerships, promote innovation and competitiveness, and increase the penetration of Québec SMEs in global markets.

TOTAL: 236 COMPANIES; 42,370 EMPLOYEES; $12.3 BILLION SALES

Founding dates of some of our aerospace companies

Esterline CMC Electronics (Marconi Canada – 1903)

Pratt & Whitney Canada – 1928

Aveos (Air Canada Technical Services – 1937)

Héroux-Devtek – 1942

Bombardier Aerospace (Canadair – 1944)

CAE – 1947

Rolls-Royce Canada – 1947

Goodrich (Lucas – 1949)

MDA Space (Spar Aerospace – 1968)

General Electric – 1981

Lockheed Martin – 1982

Bell Helicopter Textron Canada – 1986

Rheinmetall Canada (Oerlikon – 1986)

Messier-Dowty, SAFRAN Group – 1991

Sonaca NMF Canada (NMF Canada – 1992)

Thales Canada, Aerospace Division (Sextant – 1996)

Turbomeca Canada, SAFRAN Group – 2002

Mecachrome International – 2002

L-3 Communications MAS (Canada) – 2003

Martin Busque
Fitter-Assembler, Bombardier Aerospace

Aerospace sheet metal mechanic graduate

"As an aircraft fitter-assembler, I assemble aircraft components according to a manufacturing plan. I have to meticulously follow the design instructions given to me to ensure that the component I have helped to assemble respects the highest standards of quality for which Bombardier aircraft are famous.

My job gives me the opportunity to innovate in terms of new ways of working in order to minimize assembly errors. And since the construction of an airplane is a team effort, I work side-by-side with colleagues who have the same passion for precision work and share my sense of pride in Bombardier aircraft."

The Québec aerospace industry's **research capacity**

The Québec aerospace sector also has an extraordinary innovation capacity that makes our industry a model of excellence with an international reputation.

The industry is home to most of the corporate centres of excellence in Canada, as well as the **Consortium for Research and Innovation in Aerospace in Québec (CRIAQ)**, seven universities active in aerospace research and more than 10 well-known public and parapublic research centres.

These research centres include:

CRIAQ, a unique innovation network fostering partnership between industry, universities, and research centers through collaborative research, finances and structures many projects on all fields of aerospace (materials, environnement, life cycle, acoustics, manufacturing, avionics, health monitoring).Several international projects have also been initiated.

The **Aerospace Manufacturing Technology Centre (AMTC)**, one of the five laboratories of the National Research Council of Canada's Institute for Aerospace Research (IAR), aims to develop a competency centre and advance modern manufacturing methods in aerospace.

The **Industrial Materials Institute (IMI)** focuses on R&D projects for the development of materials, their formulation, production and control of their processes. Metals, polymers, ceramics, including their composites and alloys, are also part of this work.

The **Centre technologique en aérospatiale (CTA)**, the technology transfer centre of the École nationale d'aérotechnique (ÉNA), helps companies integrate new manufacturing technologies such as high performance machining and composite materials, while making available to them a technology incubator centre.

The **Composites Development Centre of Québec (CDCQ)** is a technology transfer centre and integral part of the Cégep de Saint-Jérôme. It carries out R&D activities and technology transfers for companies in Québec's composites sector. It has offered a diploma in composite material processing since 1986.

Manpower development in Québec's aerospace sector

Recognized schools and training institutions

In Québec, aerospace training is provided by various institutions, schools and universities that train tradespeople, technicians and engineers. Many options are open for the next generation of workers wishing to update or enhance their skills.

The **École des métiers de l'aérospatiale de Montréal (EMAM)**, a vocational training institution with a 9,755 m² plant and a machinery inventory worth $30 million, offers specialized programs such as: assembly of cables and circuits; tooling methods; aerospace structure and mechanical assembly, etc. Whether it be for a professional diploma, specialized professional certificate or varied specific training, it offers facilities and equipment for hands-on training that is aligned with market realties.

The **École nationale d'aérotechnique (ÉNA)**, the largest in North America, operates cutting-edge equipment and aircraft (a fleet of 27 planes) worth over $50 million. It offers specialized technical collegial programs in aeronautical manufacturing, aircraft maintenance and avionics. Theoretical training is coupled with practical training and students can enrol in the Alternance work-study program allowing them to participate in paid internships with companies. It also offers a large number of programs in leading-edge sectors through continuing education (methods agent, numerical control, structures, gas turbines, landing gear, etc.).

École Polytechnique de Montréal, École de technologie supérieure (ÉTS), McGill, Concordia, Laval and **Sherbrooke** universities work jointly with the industry to offer a master's degree in aerospace engineering. École Polytechnique de Montréal will also offer a bachelor's program in aerospace engineering starting in September 2009.

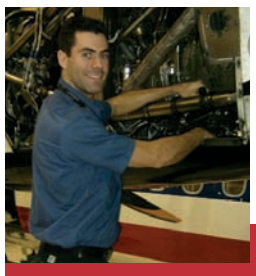
The **Montreal Aerospace Institute** is an umbrella organization for the Concordia Institute of Aerospace Design and Innovation (CIADI), the Institut d'Innovation et de Conception en Aérospatial de Polytechnique (IICAP) and École de Technologie Supérieure's Institut de Conception et d'Innovation en aérospatiale (ICIA) that, in partnership with industry, provide engineering students a research environment and access to cutting-edge know how, through projects and short-courses, that complements their basic learning at the bachelor's or master's levels.

The **Institut de formation aérospatiale (IFA)**, created by the École des métiers de l'aérospatiale de Montréal (EMAM), the École nationale d'aérotechnique (ÉNA) and the École de technologie supérieure (ETS), in collaboration with the Comité sectoriel de main-d'oeuvre en aérospatiale au Québec (CAMAQ), offers companies programs allowing them to meet their training and manpower development requirements by providing services in a single location.

For its part, the **Comité sectoriel de main-d'œuvre en aérospatiale au Québec (CAMAQ)**, works to foster better collaboration among employers, workers, the heads of educational institutions and government agencies involved in the area of manpower planning and training for the aerospace and airline industries.

Qualified graduates prized by employers

For nearly 25 years, the Québec aerospace industry has enjoyed annual growth of 9.2%. This represents thousands of new jobs every year. Career options in the sector are stimulating, numerous and varied and are ripe for the picking.



Jean-René Bureau
Certified Mechanic (ACA) at Exeltech Aerospace

Diploma (DEC) in Aircraft Maintenance, École Nationale d'Aérotechnique, Saint-Hubert

"As an inspector on the overhaul line, I have to ensure the aircraft complies with applicable airworthiness standards.

I have to be attentive since it's my responsibility to identify and resolve the tiniest defect during inspections. During the inspection stage, I carry out engine tests, avionics adjustments, parts replacements and various aircraft systems tests.

I enjoy working at Exeltech Aerospace since I can suggest ways to improve productivity. The overhaul process is a team effort and I work every day with colleagues from many other departments. Aircraft do not all have the same requirements so every day is different!"

Jean-François Thériault
Aircraft Structural Assembler at Bell Helicopter Textron Canada

Aircraft structural assembly graduate, École des métiers de l'aérospatiale de Montréal

"I have been fascinated by aeronautics since childhood. That's why I decided to enrol in the École des métiers de l'aérospatiale de Montréal and obtain a degree in structural assembly.

After graduation I was hired by Bell Helicopter Textron Canada in Mirabel. I love my job, which requires attention to detail and good manual dexterity. I can proudly say that the parts I manufacture are flawless!"

Sources: Fondation Aérovision Québec inc. (www.aerovision.org), November 2008; Thiffault, Pierre, *Au temps des premières ailes : petite histoire aérienne du Québec*, éditions Tifographe, Laval, 2004; Canadian Encyclopedia, The Historica Foundation of Canada, 2008; Québec Ministry of Economic Development, Innovation and Export Trade, November 2008.

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