



Canada: Opportunities in Next Generation Aircraft Manufacturing and Research & Development

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Summary

With air traffic on the rise, the demand for aircraft is expected to reach unprecedented heights. Industry predictions are that within the next twenty years the commercial aircraft market will be valued at over \$5 trillion and require over 35,000 new aircraft. Aircraft manufacturers preparing to meet this elevated demand are doing so within a context of heightened global competition and stricter environmental standards. As a result, aerospace industries worldwide are investing in cutting-edge, next generation, environmentally and economically sustainable aircraft technologies.

Canada has the world's fifth largest aerospace industry, having generated \$23 billion in revenues in 2013. Its numerous aerospace companies and academic and private-public institutions are actively investing in research programs to develop the better performing and more sustainable next generation of aircraft. Major technologies being developed include: alternate fuel sources, cleaner and quieter engines, composite materials, new aircraft design and production methods, and aircraft navigation systems. Opportunities are arising for U.S. suppliers of next generation, green aircraft parts, products and services, and research equipment, as well as U.S. companies looking for innovation partnerships.

Next Generation Aircraft Best Prospects

Alternative Fuel Development

The International Energy Agency forecasts that biofuels may contribute 12 percent of the total liquid fuel share by 2030; the aviation sector hopes biofuels will account for 30 percent of its fuel consumption by 2050. In April 2012, a Bombardier Q400 aircraft was flown using 50% biofuel made from a combination of camelina satvia and brassica carinata oilseed crops. This was the results of a program jointly led by Bombardier Aerospace, Porter Airlines, Pratt & Whitney Canada, Targeted Growth, and GARDN (BL-NCE). In October 2012, the Canadian National Research Council flew the Falcon 20, the world's first civil flight powered completely by biofuel.

Aircraft Production / Design Methods

New aircraft configuration and designs are being developed that will reduce manufacturing costs, assembly time, and airframe noise, while taking into account best practices to integrate environmentally sustainable materials into the production process, and improve the lifecycle management of aircrafts. Other major aerospace manufacturing technologies being developed include automation, robotics, advanced materials removal, and additive manufacturing. The use of additive manufacturing in aircraft production has the potential to significantly reduce production costs, parts weight, and maintenance costs, while increasing part reliability, durability, and design flexibility.

Composite Materials

Composite materials are an integral part of developing greener, next generation aircraft. Using composite materials in lieu of aluminum and titanium offers a significant reduction in aircraft weight and fuel consumption, while making aircraft stronger, more reliable, and easier to maintain. Canada has developed unique capabilities to develop, manufacture, and repair composite materials. A great example of this expertise is Bombardier's Learjet 85, one of the few aircrafts built entirely out of composite materials. [Click here for a listing of Canadian composite materials companies.](#)

Engines

Demand is on the rise for environmentally friendly engine technologies that can reduce aircraft noise and emissions while increasing fuel performance. Pratt & Whitney Canada is the nation's largest private aerospace research and development investor; the company recently announced \$1-billion in investments over the next 4.5 years. Pratt and Whitney's PW307 engine is 33 percent more efficient than the most stringent standards set out by the International Civil Aviation Organization, and considered to be the greenest engine in the market. Rolls Royce Canada and General Electric are close followers, also investing in leading engine robotic manufacturing and extreme weather engine testing.

Navigation Systems

Next-generation navigation systems are being designed to offer enhanced graphical views of surrounding terrain, nearby aircraft, and runway approaches; better flight crew to air traffic controller communication; and the ability to traverse more direct flight routes. New technology will reduce emissions, lower operating costs, and enable pilots to see as well in low visibility flying conditions as they would with clear skies. Marshall Aerospace is currently developing avionics for Bombardier's Challenger 604 aircraft to enhance pilot to air traffic control communications, and provide customers with additional savings on time and fuel by providing access to the most efficient navigation routes.

Implications and Opportunities for U.S. Firms

U.S. suppliers of high-tech aircraft parts and components are likely to find a very receptive market in Canada amongst industry, academic and public-private research partnerships. U.S. suppliers of research, development, and testing equipment are also likely to find good business opportunities amongst Canada's growing number of aerospace research centers. Moreover, U.S. research centers engaged in aeronautical technologies would do well to consider partnering with counterparts to the North, as these are working in areas spanning the gamut of aerospace high-tech, and are often open to cross-border collaboration to better leverage and pool resources.

Major Aircraft Research & Development Programs in Canada

BioFuelNet Canada (BFN)

BFN is a Network of Centres of Excellence (NCE) hosted at McGill University in Montreal, Quebec, that support the sustainable advanced biofuels industry. Advanced biofuels are produced from materials such as Agro-forestry waste, energy crops, algae, and municipal waste. Among the Network's industrial partners are Air Canada and Airbus.

<http://www.biofuelnet.ca/>

The Coalition for Greener Aircraft (SA²GE)

SA²GE is designed to help maintain Quebec's position in the rapidly changing aeronautics market, in the context of climate change and new environmental regulations. Industrial

partners include Bell Helicopter Textron, Bombardier, Pratt & Whitney Canada, Thales, CMC Electronics, and Héroux-Devtek. Areas of focus are: aircraft composite fuselage structures, avionics for cockpit applications, landing gears, compressors, and modular avionics.
<http://www.sa2ge.org>

Composites Innovation Centre Manitoba (CIC)

The CIC is a non-profit organization in Winnipeg, Manitoba, which engages in research, development, and the application of composite materials for manufacturing industries. The CIC provides design and analysis, testing, and project management services. The CIC is working with Boeing to produce Lightweight Low-Cost Fairings & Landing Gear Doors, and has partnered with EMTEQ to create durable composite interior panels for aircraft.
<http://www.compositesinnovation.ca/>

Consortium for Aerospace Research and Innovation in Canada (CARIC)

CARIC aims to unite the best in Canadian industry, academia, and research to promote impactful aerospace research and development. Its areas of focus cover a very wide range of aerospace-related products and technologies and are project-driven.
<http://www.caric.ca/>

Consortium for Research and Innovation in Aerospace in Quebec (CRIAQ)

CRIAQ is a Montreal, Quebec-based organization created to increase aerospace education and industry competitiveness. It has signed 110 projects since conception, and its areas of focus are all encompassing of the aerospace sector.
<http://www.criAQ.aero/>

Green Aviation Research and Development Network (GARDN)

GARDN is a non-profit organization in Montreal, Quebec, whose mandate is to facilitate research projects that will reduce the environmental impact of aircrafts, engines, and systems. Industry leaders Pratt & Whitney Canada, Bombardier, and CMC Electronics head the initiative, joined by SMEs Messier-Dowty, Aercoustics, Integran and Standard Aero.
<http://gardn.org>

Canadian Environmental Test Research and Education Center (EnviroTREC)

EnviroTREC is non-profit organization in Thompson, Manitoba, partnered with the Global Aerospace Centre for Icing and Environmental Research Inc., the NRC, Western Economic Diversification Canada, the Province of Manitoba, MDS AERO Support Corporation, and MDS Aero Test. EnviroTREC was formed to stimulate the development of programs to train personnel and advance technology, to support the operation of the GLACIER facilities.
<http://www.envirotrec.ca/>

Global Aerospace Centre for Icing and Environmental Research Inc. (GLACIER)

A joint venture between Rolls-Royce Canada and Pratt & Whitney Canada, Thompson, Manitoba's GLACIER is the world's largest and most advanced cold weather testing and research facility. It is operated year-round, and specializes in new design development, engine icing certification, and the development of local expertise.
<http://www.mdsaerotest.ca/>

Natural Sciences and Engineering Research Council of Canada (NSERC)

NSERC is a Government of Canada agency created to support university-based research. GARDN has received a four-year federal investment of \$10.3 million through NSERC for projects to develop technologies and techniques to reduce aircraft noise and emissions.
<http://www.nserc-crsng.gc.ca/>

National Resource Council Canada's Institute for Aerospace Research (NRC Aerospace)

NRC Aerospace tests aircraft structures and components, develops manufacturing technologies, researches noise and vibration control, and operates gas turbine engine research facilities in Ottawa, Ontario. The NRC is currently seeking partners for aeronautical product development, air defence systems, and alternative fuel development.

<http://www.nrc-cnrc.gc.ca/eng/>

Sustainable Development Technology Canada (STDC)

SDTC funds research in alternative fuels, engine technology, and the defense sector. Its project on the environmentally efficient de-coating of aerospace structures is being led by a consortium of Cleve Technology, BRIC Engineered Systems, IMP Aerospace, and Boeing.

<http://www.sdtec.ca/>

Major Aerospace Academic Research & Development Programs

University of Alberta

The National Institute for Nanotechnology (NINT) at the University of Alberta in Edmonton, Alberta, supports interdisciplinary research in nanotechnology, with the goals of improving nanotechnology design, determining the nanoscale properties of both engineered and biological materials, and determining potential sectoral applications. NINT's 20,000 square-meter facility features some of the 'quietest' laboratories in the world, due to limiting the impact of noise from mechanical vibrations and electro-magnetic interference.

<http://www.nint-innt.ca/>

University of British Columbia (UBC)

UBC's Composites Research Network (CRN) in Vancouver, British Columbia, works to improve composites manufacturing and design, and bridge the gap between industry and academia. UBC's Manufacturing Automation Laboratory conducts research in metal-cutting, spindle design, and machining, and is responsible for developing widely-used virtual-machining algorithms used by Boeing, Airbus, Bombardier, ASCO, Pratt & Whitney Canada.

<http://crn.ubc.ca/>

<http://www.mal.mech.ubc.ca/>

British Columbia Institute of Technology (BCIT)

BCIT in Burnaby, British Columbia, is involved in many applied research projects. FP Ferric Innovations has partnered with BCIT to conduct research in biofuels. In partnership with the NRC and Boeing, research is being conducted on the use of hydrogen in a custom-designed fuel cell system, which could provide reliable auxiliary power for commercial aircraft.

<http://www.bcit.ca/transportation>

University of Calgary

The University of Calgary's Department of Mechanical & Manufacturing Engineering & CEERE in Calgary, Alberta, conducts research on fluid mechanics, thermodynamics, heat transfer and gas dynamics, to solve problems in high-speed aerodynamics, propulsion, power generation, and explosion safety. The department's partners include Space Engine Systems, Atlantis Research Labs, Lockheed Martin, and the NASA Langley Research Center (LaRC).

<http://www.ucalgary.ca/>

Carleton University's CarletonAerospace

CarletonAerospace in Ottawa, Ontario, is a large aerospace research center, and leader in rotorcraft/aeroelasticity, aerospace materials, gas turbine aerodynamics, space systems, aircraft design/systems, and health monitoring/cabin environment research.

<http://www.carletonaerospace.org/>

Concordia University's Canadian Institute of Aerospace Design and Innovation (CIADI)

CIADI in Montreal, Quebec's industry-driven aerospace research facilities include the Concordia Center for Composites; Thermodynamics of Materials Research Lab; Multi-Phase Flow Lab and Thermal Spray Laboratory; Networked Autonomous Vehicles Lab and Diagnosis, Flight Control and Simulation Laboratory; Flight Simulator Laboratory; and the Engineering Design and Manufacturing Laboratories.

<http://www.concordia.ca/encs/aerospace.html>

Dalhousie University

Dalhousie's Faculty of Engineering in Halifax, Nova Scotia, is currently studying superalloy bonding to develop stronger, lighter aircraft engine parts using less material and energy. Other research includes the Smart Materials Centre which conducts the modeling, analysis, design, fabrication, and testing of composite materials, and the Renewable Energy Storage Laboratory (RESL) which conducts research on energy storage technologies.

<http://www.dal.ca/faculty/engineering.html>

École de Technologie Supérieure (ETS)

In Montreal, Quebec, ETS' aerospace engineering team is researching aeroservoelasticity; avionics and controls; communications & circuits; mechanical & hydraulics systems; interior/exterior environment; advanced engineering materials science; design, manufacturing technologies and logistics (C-LEAN); energy; and propulsion.

<http://www.etsmtl.ca/>

École Polytechnique de Montréal (Polytechnique Montréal)

Polytechnique Montréal is a world-class engineering facility in Montreal, Quebec. It has the largest volume of industry-partnered research grants in Canada. Ongoing aerospace projects include investigating high performance robotic manipulators in aerospace structures manufacturing, and the robotic inspection of aerospace parts.

<http://www.polymtl.ca/aerospace>

University of Manitoba's Advanced Satellite Integration Facility (ASIF)

ASIF in Winnipeg, Manitoba, jointly operated by Magellan Aerospace and the University of Manitoba, announced in the spring of 2014 that it will build a 6,000-sq.ft. facility to accommodate three spacecraft, and be an innovation hub to unite industry and academia in the research, development, construction, and testing of satellite buses and components.

<http://umanitoba.ca/>

McGill University

McGill in Montreal, Quebec, hosts BioFuelNet Canada, the McGill Institute for Aerospace Engineering (MIAE), the Avian Science and Conservation Centre (ASCC), and the Centre for Intelligent Machines (CIM). The ASCC is surveying applications of unmanned vehicle systems for wildlife research; CIM is researching robotics, design, artificial intelligence, computer vision, medical imaging, haptics, systems and control and ultravideoconferencing.

<http://www.mcgill.ca/miae/mcgill-institute-aerospace-engineering>

<http://ascc.mcgill.ca/research.htm>

<http://www.cim.mcgill.ca/>

University of Sherbrooke

The University of Sherbrooke's department of mechanical engineering in Sherbrooke, Quebec, is involved in the optimization of the aerodynamics of drones, aviation acoustics and sound-absorbing materials research through the Acoustic Group of the University of

Sherbrooke (GAUS). The department works closely with CRIAQ, NSERC, and industrial partners such as Bombardier, Pratt and Whitney Canada, and Bell Helicopter Textron.
<http://www.usherbrooke.ca/gmecanique/>

University of Toronto's Institute for Aerospace Studies (UTIAS)

UTIAS in Toronto, Ontario, established the multi-million dollar Microsatellite Science and Technology Centre (MSTC) to push the forefront of space exploration research, and the Centre for Research in Sustainable Aviation (CRSA), which focuses on environmental research in aerodynamics and aeroacoustics; lightweight structures; biofuels, combustion, and atmospheric impacts; and life cycle assessment and multidisciplinary optimisation.
<http://www.utias.utoronto.ca/>

York University

York University in Toronto, Ontario, has leading space research facilities, comprised of the Centre for Vision Research, the York University Astronomical Observatory, and the Centre for Research in Earth and Space Science (CRESS). CRESS hosts research in geomatics engineering – including the design and testing of small portable sensors and transmitters on satellites, aircraft, and other vehicles, as well as space engineering and space science.
<http://www.yorku.ca/>

Looking for Canadian Aerospace Business Partners?

The following databases are great resources to locate potential clients or research partners.

Aero-Canada: <http://www.aero-canada.com>

Industry Canada: http://www.ic.gc.ca/eic/site/ad-ad.nsf/eng/h_ad03840.html

Upcoming Aerospace Trade Shows & Conferences:

Aeromart Montreal

Montreal QC, March 31-April 2, 2015

<http://www.bciaerospace.com/montreal/en>

Aero 2015 Conference

Montreal QC, April 21-23, 2015

<http://www.casi.ca/aero>

Canadian Business Aviation Convention

St-Hubert, Quebec, June 16-18 2015

<http://www.cbaaconvention.com/>

Canadian Aviation Expo

Venue TBA, Summer 2015

www.canadianaviationexpo.com

Aerospace, Defence & Security Expo

Abbotsford BC, August 6-August 7, 2015

<http://www.adse.ca>

Air Transport Association of Canada Convention & Trade Show

Montreal QC, November 2-4, 2015

<http://www.atac.ca/web/en/events/agm-and-tradeshow.html>

Canadian Aerospace Summit

Ottawa ON, Fall 2015

<http://aerospacesummit.ca/en/>

For More Information, Please Contact:

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