BOMBARDIER

BACKGROUNDER

CSERIES

BOMBARDIER COMMERCIAL AIRCRAFT

The *CSeries* family of aircraft offers unmatched operating economics, reliability, total life cycle support, significant reduction of environmental footprint, passenger appeal and operational flexibility to meet the future demands of the 100- to 149-seat commercial market segment.

Launched on July 13, 2008, the *CSeries* aircraft is expected to enter into service in 2013. Gary Scott, President, Bombardier Commercial Aircraft is leading the development of this aircraft program.

Description

In addition to unmatched passenger comfort, the competitive 110-seat and 130-seat *CSeries* family of aircraft will benefit from the latest technological advancements, including: fourth generation aerodynamics wing; increased use of composites and advanced aluminium alloy in structures; a next-generation engine – the Pratt & Whitney PurePower® PW1000G engine; and the very latest in system technologies, such as fly-by-wire and electric brakes.

The *CSeries* models *CS100* (formerly C110) and *CS300* (formerly C130) aircraft will share a new common centerline engine and have the same crew type rating, operating and maintenance procedures. Each of the aircraft models will also have operational flexibility to permit utilization on both short-haul and transcontinental routes.

At entry into service, the *CSeries* family of aircraft will be the greenest single-aisle aircraft in its class. These game-changing aircraft will emit 20* per cent less CO_2 and 50* per cent less NO_x, fly four* times quieter, and deliver dramatic energy savings – 20* per cent fuel burn advantage as well as 15* per cent improved cash operating costs versus current in-production aircraft of similar size. The *CSeries* aircraft will set a new benchmark in the industry, consuming as little as two litres of fuel per passenger per 100 kilometers (118 miles per US gallon per passenger) in its more dense seating layouts*.

In addition to Bombardier's fourth-generation transonic composite wing design, the company is also using its Reconfigurable Engineering Flight Simulator II (REFS II) to develop customized 'fly-by-wire' control laws specific to the *CSeries* aircraft. This simulator is the first of many devices planned, as part of an extensive integrated test regime, to ensure the *CSeries* aircraft achieves consistently high levels of reliability when it enters service.

	CS100	***CS300***
Seating Capacity	Dual Class: 100 Standard Single Class: 110 High Density Single Class: 125	Dual Class: 120 Standard Single Class: 130 High Density Single Class: 145
Maximum Range 225 lb. / pax, MTOW, normal cruise	2,950 nm (5,463 km)	2,950 nm (5,463 km)
Maximum Takeoff Weight (MTOW)	121,100 lb. (54,931 kg) to 128,200 lb. (58,151 kg)	131,800 lb. (59,784 kg) to 139,600 lb. (63,322 kg)
Overall Length	114 ft. 6 in. (34.9 m)	124 ft. 10 in. (38.0 m)
Cabin Aisle Height	7 ft. 0 in. (2.13 m)	
Standard Interior Configuration	Two-by-three seating, with a comfortable 32-inch pitch separated by a 20-inch centre aisle, offering a modular forward and aft cabin. Dual class interior layouts are also available, with a four-abreast seating business class, to suit operator requirements. Overhead rotating bins, a first for single-aisle aircraft, are designed to ensure the most cabin storage in its class.	

Manufacturing

The aircraft's final assembly will take place at Bombardier's Mirabel facility; the design and manufacture of the aircraft's aft fuselage and cockpit at Bombardier's Saint-Laurent facility - both sites in the greater Montréal area; the design and manufacture of the wings will take place at Bombardier's Belfast facility.

Suppliers

All major suppliers are working with the *CSeries* team located at Bombardier Aerospace's Product Development Centre in Saint-Laurent, Québec as part of the Joint Definition Phase. Suppliers include:

- **Alenia Aeronautica** will provide the horizontal and vertical stabilizers, fully equipped with hydraulic, electrical and flight control systems, lights and antennas;

- **C&D Zodiac** will design and produce the aircraft's interior package, which includes the seats, interiors (including the linings, monuments, bins, galleys and lavatories), as well as the following systems: oxygen, lighting, insulation, waste and water;

- **CAE** of Montréal, Canada will first provide a comprehensive suite of engineering services and simulation-based technology tools to support the design, testing and certification of the *CSeries* aircraft platform as part of Bombardier's Complete Integrated Aircraft Systems Test Area (CIASTA) program. Thereafter, CAE will build prototype *CSeries* aircraft Full Flight Simulator and CAE Simfinity™ devices;

- **Esterline Control Systems-Korry** of Bellevue, Washington, USA will provide integrated cockpit control panels for the *CSeries* aircraft. The 14 Korry panels, which will use Esterline Control Systems' Opticon ^{TM} solid-state switching technology, are used to control the operation of various aircraft functions, including the hydraulic, fuel, electrical and lighting systems;

- **Goodrich Actuation Systems** will be responsible for the design and production of the flap and slat actuation systems for the *CSeries* aircraft. A critical system for take-off and landing, the flap system is installed on the wing and increases both lift and drag, while the slat system adds lift and helps maintain smoother airflow;

- **Goodrich Corporation**, headquartered in Charlotte, NC, USA has been selected to provide its next-generation SmartProbe™ air data system, ice detection system and external, cockpit and maintenance lighting systems for the *CSeries* aircraft. The next-generation SmartProbe system provides all critical air data parameters for the aircraft's flight control, pilot display and other systems. The primary ice detection system advises flight crews of ice buildup for activation of the ice protection system at the optimal time. The external, cockpit and maintenance lighting systems use HID, and LED lighting technologies to meet the lighting system requirements;

- **Fokker Elmo** will be responsible for the design and production of the entire wiring and interconnection system. Additionally Fokker Elmo will design and produce all flight test and instrumentation wiring required during the certification of the *CSeries* aircraft;

- **Hamilton Sundstrand** of Rockford, Illinois, USA will be providing the electrical system for the *CSeries* aircraft. As such, Hamilton Sundstrand will be responsible for designing and qualifying the electric power generation system, as well as the primary and secondary power distribution systems;

- **Honeywell** of Phoenix, Arizona, USA will provide the inertial reference system (IRS) and the auxiliary power unit (APU) for the *CSeries* aircraft. The IRS system provides positioning and attitude data for the aircraft's navigation system, as well as other systems. The APU provides power and pressurized air for engine start and cabin systems;

- **Kidde Aerospace & Defense**, a Hamilton Sundstrand business, located in Wilson, North Carolina, USA, will be responsible for the integrated fire protection system for the *CSeries* aircraft. The Kidde turnkey solution includes an array of fire protection equipment such as advanced technology smoke detectors, fire detectors, environmentally-friendly fire extinguishers and integrated control electronics;

- **L-3 Aviation Recorders** (L-3AR), a division of L-3 Communications, will design, develop, qualify and manufacture the state-of-the-art voice and flight data recording system for the *CSeries* aircraft. The system provides very high fidelity flight crew voice recording capability along with digital air traffic and ground control data message recording, and flight data recording at the highest data rates possible for new-design aircraft. The L-3AR CVR and FDR products and accessories ensure full compliance with all FAA and Transport Canada requirements;

- **Liebherr-Aerospace Lindenberg GmbH** of Germany will be responsible for the design and manufacture of the complete landing gears system, which includes the main and nose landing gears, the landing gear control and indication system, the alternate release system, the proximity sensing system and the steering control system;

- **Liebherr-Aerospace Toulouse SAS** will design and produce the aircraft's Air Management System, which includes the environmental control and cabin pressure control system;

- **Magnaghi & Salver**, Italy, will provide composite inboard/outboard flaps, spoilers and main landing gear doors for the *CSeries* aircraft. Magnaghi & Salver are part of the Invesco Group;

- **Meggitt Aircraft Braking Systems** (MABS) of Akron, Ohio, USA will be responsible for the design, development and manufacture of the wheels, electro-mechanically actuated carbon brakes, and the brake control system for the *CSeries* aircraft. The systems presented by MABS are designed to provide expanded capabilities when compared to a hydraulic braking system with additional features including: brake wear monitoring, enhanced system redundancy and facilitated aircraft dispatch;

- **Panasonic Avionics Corporation** of Lake Forest, CA, USA, has been selected to supply the Cabin Management and Passenger Address System (CMS). The CMS, with its highly integrated digital architecture, allows control, monitoring and diagnostics of numerous aircraft cabin functions, including temperature and lighting. The CMS also provides a complete embedded digital audio solution offering Passenger Address, Interphone and PRAM (Pre-Recorded Announcements and Music) capabilities to the *CSeries* aircraft passengers, cabin and flight crew;

- **Parker Air & Fuel Division** of Irvine, California, USA will be responsible for the design and manufacture of the fuel tank inerting system for the *CSeries* aircraft. The fuel inerting system displaces the oxygen located in the aircraft fuel tank to increase safety;

- **Parker Hannifin Corporation**, through its Aerospace Group, will design and produce the *CSeries* airliner's fully integrated fuel and hydraulics systems;

- **Rockwell Collins** will supply the aircraft's avionics system. Tailored specifically for the *CSeries* aircraft, its fully integrated flight deck capability will provide flexibility, high reliability and low life cycle costs without compromising the aircraft's performance;

- **Senior Aerospace BWT** of Manchester, UK will be responsible for the design and manufacturing of the low pressure air distribution systems for the *CSeries* aircraft cabin and cockpit environmental control systems (ECS). The low pressure ducting system brings fresh air into the aircraft for various purposes, such as conditioned air supply, cabin air re-circulation, flight deck instrumentation cooling, avionics ventilation and windshield demisting;

- **Senior Aerospace SSP** of Burbank, California, USA will be responsible for the design and manufacturing of the high pressure (HP) bleed air and ram air ducting systems for the *CSeries* aircraft. The bleed air HP ducting is conveyed from the engines and the auxiliary power unit (APU) to the environment control system (ECS), the aircraft wing anti-ice system and the fuel tank inerting system. The ram air HP ducting conveys ram air (fresh air from the outside) to the ECS and fuel tank inerting systems;

- **The Shenyang Aircraft Corporation** (SAC)**,** a subsidiary of the state-owned aviation industrial entity China Aviation Industry (AVIC) will supply the *CSeries* aircraft centre fuselage;

- **Sonaca** of Gosselies, Belgium will supply the fixed leading edges, slats and tracks for the *CSeries* aircraft wings;

- **Spirit AeroSystems** of Wichita, Kansas, USA will be responsible for the design, manufacturing and testing of the complete pylons for the *CSeries* aircraft program. The pylons are major structural components holding the engines and nacelle assembly to the wings;

- **Woodward MPC** of Skokie, Illinois, USA will be responsible for the design and production of the throttle quadrant assembly (TQA), which acts as the direct link for the control of the engine thrust and is located in the cockpit suite.

Milestones

- Starting in **2004**, Bombardier Aerospace employed a dedicated multi-disciplinary team to evaluate the feasibility and begin the development of a new-generation commercial aircraft.

- On **November 12, 2007**, Bombardier and Pratt & Whitney (P&W) reached an agreement on commercial and technical terms to provide exclusive power for the *CSeries* aircraft with P&W's Geared Turbofan™ engine, now branded the PurePower® engine.

- On **February 22, 2008**, Bombardier's Board of Directors granted Bombardier Aerospace the authority to offer (ATO) formal sales proposals of the optimized *CSeries* aircraft family to airline customers.

- At the Farnborough Air Show on **July 13, 2008**, Bombardier launched its *CSeries* family of aircraft. Lufthansa, the launch customer, signed a letter of interest (LOI) for up to 60 aircraft, including 30 options.

- On **March 11, 2009**, Bombardier Aerospace announced that Deutsche Lufthansa AG, the launch customer for the *CSeries* aircraft program, had signed a firm purchase agreement for 30 *CS100* single-aisle aircraft. These aircraft will be operated by Swiss International Air Lines Ltd. The agreement also includes options on an additional 30 *CSeries* aircraft.

- On **March 30, 2009,** Bombardier Aerospace announced that Lease Corporation International Aviation (New Buildings) Limited had signed a firm purchase agreement for three *CS100* and 17 *CS300* jetliners. The purchaser, which also took options on a further 20 *CSeries* aircraft, is a wholly owned subsidiary of Lease Corporation International Limited (LCI). LCI is a privately owned aircraft company that leases planes to major airlines.

- The first test article for the *CSeries* aircraft - a fuselage test barrel - arrived ahead of schedule at Bombardier's Saint-Laurent, Québec site from China on **August 19, 2009**. The test barrel will be used to demonstrate manufacturing and engineering structural concepts before the *CSeries* aircraft's final design phase.

- **September 15, 2009** marked a major achievement for the *CSeries* aircraft program as Bombardier Aerospace celebrated the groundbreaking of the first *CSeries* aircraft building in Québec, Canada. Located at Mirabel, 45 minutes north of Montréal, the Complete Integrated Aircraft Systems Test Area (CIASTA) is a testing and systems-proving facility that will house a virtual *CSeries* test aircraft. The CIASTA will test aircraft systems for reliability and functionality one year before the first prototype aircraft flies.

- **On November 17, 2009** Bombardier Aerospace celebrated another major milestone in the *CSeries* aircraft program as construction got under way on its new state-of-the-art aircraft wing manufacturing and assembly facility in Belfast, Northern Ireland.

- Republic Airways Holdings Inc. became the first North American customer for the *CSeries* aircraft with a firm order for 40 *CS300* airliners announced on **February 25, 2010.** The purchase agreement with the Indianapolis, Indiana-based airline also included options for an additional 40 *CS300* aircraft.

- A foundation stone-laying ceremony was held in Shenyang, China on **March 24, 2010** to mark the start of construction of the facility that will build the fuselage for the *CSeries* mainline commercial jetliner. The 21,000 square-metre (226,042 square-foot) facility will be operated by Shenyang Aircraft Corporation (SAC), a subsidiary of the state-owned aviation industrial entity, China Aviation Industry Corporation (AVIC). SAC is a key supplier in the *Bombardier CSeries* aircraft program.

- On **March 30, 2010** Bombardier announced that testing of the *CSeries* aircraft's composite demonstrator wing was under way. The testing is taking place at Bombardier's Belfast facility, which is responsible for the design, development and manufacture of the advanced composite wings for the *CSeries* aircraft. The composite wing represents an innovative leap forward in aviation design and technology.

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* The *CSeries* aircraft is in the design phase. All data and specifications are estimates, subject to change in family strategy, branding, capacity, performance during the course of the design, manufacture and certification process. Performance has been estimated based on a 500-nm North American operating environment.

Images of *CSeries* aircraft can be downloaded at www.nowisthefuture.com

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