

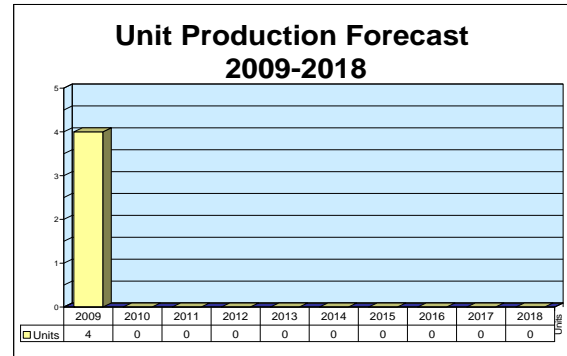
ARCHIVED REPORT

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Bombardier Q Series Multimission

Outlook

- Production of Q300 to end in mid-2009, leaving Q400 as the only new-build Q Series aircraft available for conversion for special mission role
- Offers maritime and patrol surveillance capability at lower price than purpose-built military aircraft
- Market for used airframes remains a source for aircraft conversion programs



Orientation

Description. Pressurized, 37- to 74-passenger twin-turboprop-powered regional transport aircraft.

Sponsor. Privately sponsored by Bombardier Aerospace Regional Aircraft Division. Government of Canada, Transport Canada, previously provided support.

Status. Production of Q200/300/400 variants.

Total Produced. Through January 2009, Bombardier produced 898 Q Series turboprops for both the civilian and military markets, excluding prototypes.

Military Application. Coastal and ocean surveillance, airborne electronic warfare, ASW, firefighting.

Price Range. Q300, \$17 million for green aircraft in 2008 dollars.

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Q400

Source: Bombardier

Contractors

Prime

Bombardier Aerospace, Toronto Site	http://www.bombardier.com , 123 Garratt Blvd, Downsview, M3K 1Y5 Ontario, Canada, Tel: + 1 (416) 633-7310, Fax: + 1 (416) 375-4546, Prime
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Subcontractor

Avcorp Industries Aerostructures Division	http://www.avcorp.com , 10025 River Way, Delta, V4G 1M7 British Columbia, Canada, Tel: + 1 (604) 582-1137, Fax: + 1 (604) 582-2620 (Cargo Door; Tail Plane; Vertical Stabilizer Leading Edge; Rudder)
Fleet Industries Ltd, A Magellan Aerospace Company	1011 Gimore Rd, Fort Erie, L2A 5N3 Ontario, Canada, Tel: + 1 (905) 871-2100, Fax: + 1 (905) 871-2722 (Bonded Wing & Fuselage Panel; Aileron; Inboard & Outboard Flap; Aft Engine Nacelle)
GE - Aviation Systems, Dowty Propellers	http://www.geaviationsystems.com , Anson Business Park, Cheltenham Rd E, Gloucester, GL2 9QN United Kingdom, Tel: + 44 1452 716000, Fax: + 44 1452 716001 (Propeller System)
Goodrich Corp	http://www.goodrich.com , Four Coliseum Centre, 2730 W Tyvola Rd, Charlotte, NC 28217-4578 United States, Tel: + 1 (704) 423-7000, Fax: + 1 (704) 423-7002, Email: corporate.communications@goodrich.com (Main Wheel & Brakes; Pneumatic Anti-Icing System)
Hamilton Sundstrand	http://www.hamiltonsundstrand.com , One Hamilton Rd, Windsor Locks, CT 06096-1010 United States, Tel: + 1 (860) 654-6000, Fax: + 1 (860) 654-2621, Email: hs.general@hsd.utc.com (14 SF Propeller)
L-3 Communications - Communication Systems - West	http://www.L-3Com.com/csw , 640 N 220 W, PO Box 16850, Salt Lake City, UT 84116-0850 United States, Tel: + 1 (801) 594-2000, Fax: + 1 (801) 594-3572 (Integrated Communications System (ICS))
Messier-Dowty Inc	http://www.messier-dowty.com , 574 Monarch Ave, Ajax, L1S 2G8 Ontario, Canada, Tel: + 1 (905) 683-3100, Fax: + 1 (905) 686-2914 (Steer-by-Wire; Main & Nose Landing

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	Gear; Rudder Actuator & Damper)
Rockwell Collins Inc	http://www.rockwellcollins.com, 400 Collins Rd NE, Cedar Rapids, IA 52498-0001 United States, Tel: + 1 (319) 295-1000, Fax: + 1 (319) 295-5429 (Communication & Navigation System)
Thales Aerospace	http://www.thalesgroup.com/aerospace/, 45, rue de Villiers, Neuilly Sur Seine, 92526 France, Tel: + 33 1 57 77 80 00, Fax: + 33 1 57 77 87 70 (Avionics Suite)

Comprehensive information on Contractors can be found in Forecast International's "International Contractors" series. For a detailed description, go to www.forecastinternational.com (see Products & Samples/Governments & Industries) or call + 1 (203) 426-0800. Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

(Q300/Q400)

Design Features. High-wing design, conventional T-tail, retractable tricycle landing gear. Features some of the high STOL performance of the Dash 7 but not considered a true STOL aircraft. Economic design life is 160,000 cycles.

	<u>Metric</u>	<u>U.S.</u>
Dimensions		
Length overall	25.68/25.68 m	84.25 ft
Height overall	7.62 m	25.0 ft
Wingspan	27.43/28.42 m	90.0/93.25 ft
Length	25.68/32.84 m	84.25/107.75 ft
Cabin length	12.65/18.8 m	41.5/61.77 ft
Weight		
Operating weight, empty	11,709/17,148 kg	25,814/37,804 lb
Max TOW	18,642/27,329 kg	41,100/60,250 lb
Max ZFW	16,873/25,628 kg	37,200/56,500 lb
Max payload	5,166/8,480 kg	11,386/18,696 lb
Performance		
Takeoff run, FAR 25	1,097/1,350 m	3,600/4,430 ft
Max cruise @ 4,575 m	526/648 kmph	284/350 kt
Range, typical payload (-300)	1,626 km	800 nm
Range, typical payload (-400)	2,400 km	1,296 nm

Propulsion

Q100	(2)	UTC Pratt & Whitney Canada PW120 three-shaft, centrifugal-flow, turboprop engines rated 1,432 kW (1,800 shp) each.
Q100B	(2)	PW121A turboprop engines rated 1,491 kW (2,000 shp) each.
Q200	(2)	PW123C turboprop engines derated to approximately 1,567 kW (2,100 shp) each.
Q200B	(2)	PW123D turboprops rated 1,776 kW (2,380 shp) each.
Q300/300B	(2)	PW123B turboprop engines rated 1,776 kW (2,380 shp) each.
Q400	(2)	PW150A turboprop engines rated approximately 4,477 kW (6,000 shp) each.

Variants/Upgrades

Q100. Launched in 1979, flew in 1983, certificated in 1984. Improved Q100A entered service in 1990 with new interior with fire-retardant seats, larger overhead

bins, and redesigned cabin air conditioning. Cabin has increased headroom (1.94 m/6.36 ft). Strengthened floor and moveable bulkheads can be specified for

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freight or combi operations. Subvariants Q102 and Q103 available with slight differences in cruise speed at various altitudes, and single-engine service ceiling.

Q100B. Introduced in 1992 with higher gross weight, longer range, lower cabin noise, and slightly more engine power from the PW121.

Q200. High-performance Q100 derivative announced in 1992. Cruises at 300 knots with derated PW123Cs; range of up to 940 nautical miles. Designed for operations from very high-altitude airports such as Denver, Colorado (USA) and Bogota, Colombia with little or no performance and/or payload penalty.

National Air Support Q200s are modified with Raytheon SV1022 search radars and forward-looking infrared (FLIR) systems.

U.S. Department of Homeland Security Q200s are equipped with Raytheon surveillance radar and L-3 EO/IR sensor suites.

Q200B. Higher performance variant with PW123D engines for full power at higher ambient temperatures. Initial deliveries in 1995.

Q300. Proposed in 1985 for 50 to 56 passengers, with 11.25-foot fuselage plugs, maximum gross weight of 41,100 pounds. Powered by updated PW123s. First flew in 1987, deliveries began in 1989. Variants include increased-gross-weight Q300A and Q300B with modified interior, and range/payload increases

attributable to the aircraft's PW123B engines. Q300A has maximum optional high gross weight of 43,000 pounds. Q300B with better hot/high performance and lower cabin noise, and PW123Bs, became available in 1992.

The Japanese Civil Aviation Bureau (JCAB) Q300 incorporated a UNIFIS 3000 Automatic Flight System supplied by Norwegian Special Mission.

Swedish Q300s are designed to be equipped with FLIR and IR/UV integrated sensor systems provided by L-3 and ELTA search radar.

National Air Support Q300s will incorporate Raytheon SV1022 search radar and FLIR in addition to daytime television cameras.

Q400. Incorporates 10-foot stretch to seat 65 to 70 passengers. In 1995 de Havilland selected the PW150, in the 6,000-shp class, to power the new variant.

Major changes from the Q300 are a fuselage stretch of 22.2 feet, new forward baggage door, new wing/body joint, small aft cargo door, revised flaps and ailerons, and new wing leading edges.

French Fireguard Q400s are modified with externally mounted 10,000-liter (2,640-gal) retardant tank and delivery system.

Program Review

Background. De Havilland first proposed the Dash 8 in 1979. The Dash 8 first flew in 1983, and deliveries began in 1984. Subsequently, de Havilland began development of series 200, 300, and 400 aircraft. Bombardier acquired the de Havilland product line in 1991, renaming the aircraft the Q Series.

Designed as turboprop regional airliners, the Q Series have been used as special mission aircraft by the USAF, Department of Homeland Security (DHS), French government, Japanese Coast Guard, Japanese Civil Aviation Board (JCAB), Mexican Navy, Kenyan Navy, Dutch Coast Guard, Australian Customs Service, and Swedish Coast Guard.

Military application of the Q Series began with the acquisition of two Q100s by Sierra Research for missile test range measurement by the USAF, but it is primarily used today for maritime patrol and surveillance. National Air Support of Australia, prime contractor for the Australian Customs Service, ordered the initial pair of Q Series maritime patrol aircraft (MPA), taking

delivery of two Q200s in 2000. In 2006, a follow-up order was placed for three Q300s to augment National Air Support's Surveillance Australia squadron as part of the Coastwatch contract. The Japanese and Swedish coast guards and DHS have also selected the Q Series as their MPA choice. In 2005, DHS ordered three Q200s to fulfill Immigration and Customs Enforcement multirole surveillance aircraft requirements; Japan ordered three Q300s in mid-2006; and Sweden took delivery of its final Q300s in 2007.

The Q Series has seen additional special mission use with JCAB and the French government. JCAB ordered a single Q300 in 2005 to be used as a next-generation low- and medium-altitude navigation aid and inspection aircraft. In 2004, France ordered two Q400s to convert for use as water bombers, but concerns over the suitability of the type for this role have delayed delivery of the second aircraft.

In the case of the MPA and water-bombers, modification centers have provided the upgrades

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necessary to transition Q Series into special mission aircraft. Toronto-based Field Aviation Inc has retrofitted Q200s and Q300s under contract from National Air Support. It has also served as prime contractor for the Swedish Coast Guard's entire MPA program. Norwegian Special Mission has supplied Automatic Flight Management Systems and related

systems integration for the JCAB Q300. Cascade Aerospace, meanwhile, has modified French Fireguard Q400s with externally mounted tanks and delivery systems, and Sojitz Corporation has been contracted to reconfigure the Japanese Coast Guard's Q300s. Finally, ATK Integrated Systems has provided necessary modifications to DHS' Q200 fleet.

Funding

The governments of Canada and Ontario contributed CAD490 million over five years (1991 to 1995). Bombardier invested CAD51 million for its 51 percent ownership, and Ontario took the remaining 49 percent share, for CAD49 million. DHC-8-400 development costs are estimated at \$330 million, and PW150 engine development at \$183.3 million.

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Contracts/Orders & Options

As of March 30, 2009

Operator	Designation	Quantity	Phase
Unidentified customer	DHC-8-300Q	1	On Order
Japan Coast Guard/Maritime Safety Agency	DHC-8-300Q	3	On Order

Timetable

Month	Year	Major Development
Jun	1979	Dash 8 proposal
Oct	1979	Program go-ahead announced
Feb	1980	Engine selection announced
Jun	1983	Prototype first flight
Oct	1984	Certification
Nov	1984	Initial production deliveries
Apr	1985	Q300 announced
May	1987	Q300 first flight
Late	1990	Launch of Q400 originally planned
Jan	1992	Bombardier finalizes deal to acquire controlling interest in de Havilland
Mar	1992	Q200 officially launched
Jun	1995	Q400 formally launched
Jan	2000	Certification, initial Q400 deliveries
Mid	2009	Planned end of Q200 and Q300 production

Worldwide Distribution/Inventories

As of March 30, 2009

Operator	Designation	Quantity
Canada CS	DHC-8	4
France - Securite Civile-Groupement Moyens Aeriens	DHC-8-400Q	1
Government of Quebec	DHC-8-202	1
Kenya Air Force	DHC-8	3
Mexico Navy	DHC-8-202Q	1
Norway Government	DHC-8-100	1
Sweden Coast Guard	DHC-8-300Q	3
Transport Canada - Transports Canada	DHC-8-102	2
U.S. Government/Customs Service	DHC-8-202Q	1

Market Intelligence Service Subscribers: The Airline Inventories, Orders and Options appendix provides instructions on how to access an online database of up-to-date listings. Use this database to obtain detailed, current information.

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Forecast Rationale

The civil turboprop market has been very strong in recent years, but the military market for these turboprop airliners has represented a small fraction of overall Q Series production. Demand for these aircraft from military customers has been only for the Q200 and Q300 variants of the Dash 8/Q Series product line and has involved primarily conversion into maritime patrol and surveillance aircraft.

Bombardier's early-2008 decision to end production of the Q200/300 models in 2009 will likely mark the end of construction of new Bombardier turboprops for military/parapublic customers. A market for conversions of the larger, 70-seat Q400 may emerge in the future, but, at least so far, operators do not see a need for the larger aircraft and will turn instead to competing models from ATR and EADS CASA, as well as seeking out low-time Q200s and Q300s on the used market for conversion.

Canada's Field Aviation has emerged as the prime conversion shop handling the modification of green turboprops to carry mission equipment for the maritime patrol/surveillance roles. Current operators of Q Series maritime patrol aircraft cite the extended loiter ability, low operating cost, and functional cabin space as attributes favoring use of the aircraft for the role. Turboprop power also offers maritime fleets considerable cost savings in the face of rising jet fuel costs.

Converted Q Series patrol aircraft provide military and paramilitary customers with relatively low-cost alternatives to dedicated maritime patrol/ASW aircraft such as the Lockheed P-3 Orion and the Boeing P-8 multimission aircraft, currently in development. The converted airliners are useful when the missions they are required to perform do not require the full range of capabilities those aircraft bring to the table.

The Japanese coast guard decided in January 2008 to order an additional two conversions of Q300s into maritime patrol aircraft. This order added to the four orders the agency placed for Q300 conversions. Three of these aircraft had left Bombardier's factory by the end of 2008. The remaining three will be produced in 2009. Our forecast assumes that a Q300 on order for an unidentified customer in Bombardier's backlog is also destined for conversion into a military aircraft. In total, we have forecast production of four Q300 for military/paramilitary customers in 2009.

In light of the projected end to production of the Q200 and Q300, we are not forecasting additional new production of Q Series multimission aircraft past 2009. Conversions of Q Series aircraft acquired on the used market into special mission configurations are excluded from this forecast.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program	Thru 2008	High Confidence				Good Confidence			Speculative			Total
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Bombardier Aerospace												
Q300 Multi-mission <-> PW123 B												
	12	4	0	0	0	0	0	0	0	0	0	4
Total	12	4	0	0	0	0	0	0	0	0	0	4