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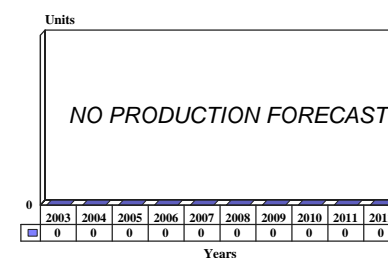
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BAE/Avro International 146/RJX - Archived 5/2004

Outlook

- Program terminated, final deliveries at end-2001

10 Year Unit Production Forecast
2003 - 2012



Orientation

Description. A family of four-engine, short-range, narrowbody commercial transport aircraft.

Sponsor. The BAe 146 was privately sponsored by British Aerospace. Since 1993, the 146/RJ has been sponsored by Avro International Aerospace Ltd.

Contractors. Avro International Aerospace Ltd (division of British Aerospace Regional Aircraft), Woodford, Cheshire, England, UK.

Status. RJ/RJX programs terminated November 2001. Final four RJ85/100s completed, delivered at end-2001.

Total Produced. Through 2002, BAE built 218 146 models, 85 RJ85s, 70 RJ100s, and 12 RJ70 models.

Application. Short-haul regional/commuter passenger transportation and all cargo/freight services.

Price Range. RJ85, \$24 million; RJ100, \$27 million; RJX85, \$26 million; RJX100, \$28.5 million (all in 2001 US dollars).

Technical Data

(RJ70/RJ85/RJ100)

Design Features. Pressurized fuselage; high-wing, swept back 15° at quarter-chord. Single-section fowler flaps over 78 percent of each wing's trailing edge, mechanically actuated balanced ailerons. Swept-back

T-tail with fixed incidence tailplane. Hydraulically retractable tricycle-type landing gear of Dowty Rotol design. Main units retract into fairings on fuselage, steerable nose wheel retracts forward.

	<u>Metric</u>	<u>US</u>
Dimensions		
Length overall	26.2/28.6/30.99 m	85.9/93.8/104.75 ft
Height	8.61/8.59 m	28.25/28.15 ft
Wingspan ^(a)	26.21 m	86.0 ft
Cabin internal width	3.42 m	11.21 ft

	<u>Metric</u>	<u>US</u>
Weight		
Operating weight, empty	23,781/24,377/25,362 kg	52,430/53,743/55,915 lb
Max take-off weight	38,102/42,184/44,225 kg	84,000/93,000/97,500 lb
Max landing weight	37,875/38,555/40,143 kg	83,500/85,000/88,500 lb

Performance

Take-off run to 10.67 m (35 ft)	1,469/1,564/1,692 m	4,820/5,130/5,550 ft
Range (std fuel)	3,619/3,302/3,098 km	1,952/1,782/1,671 nm
Cruise speed	555 km/h	300 kt

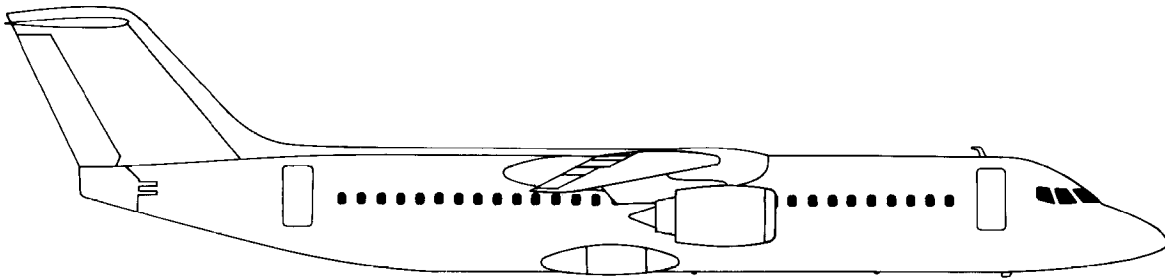
Propulsion

RJ85/100/115	(4)	Textron Lycoming LF-507 turbofans, each rated at 31.14 kN (7,000 lbst) in underwing pods. No reverse thrust.
RJ70	(4)	LF 507s, derated to 27.27 kN (6,130 lbst) each.
RJX	(4)	AlliedSignal AS977-1A advanced turbofan, 33.8 kN (7,000 lbst) each. LF 507s, derated to 27.27 kN (6,130 lbst) each.

Seating

RJ70, 70-94; RJ85, up to 112; RJ100, 100-128 passengers.

^(a) For -100, -200 only.



B Ae 146

Source: Forecast International

Variants/Upgrades

B Ae 146-100. Original 71-93-seater, operated in and out of 1,219 meters (4,000 ft) airfields. On unpaved fields, max TOW of 33,498 kilograms (73,850 lb); 38,102 kilograms (84,000 lb) on paved runways. Standard 88-seat high-density layout with six-abreast widebody seats.

B Ae 146-200. Stretched four fuselage frames (2.225 m) to seat 82-109, max TOW was 42,184 kilograms (93,000 lb). More underfloor cargo volume compared to the -100.

B Ae 146-300 Retained airfoil, -5 engines of the -200, stretched 8 feet to seat 100-112 passengers. Certification, initial deliveries in late 1988.

B Ae 146-QT. Quiet Trader freighter version of the -200, converted for all-cargo role by Pemco Aeroplex of Dothan, Alabama. Entered service in 1987.

B Ae 146-200/300 QC. Quick changes from passenger to freighter version. Freight volume on -200 QC is 1,860 cubic feet (52.67 cu m) with 20,055 pounds (9,097 kg), or 21,253 pounds (9,639 kg) on the -300 QC. Aircraft seats 85-96 passengers. Conversion takes less than 30 minutes.

RJ70/85/100. Lightweight versions of the Dash 100, 200, and 300, respectively, for regional airline networks. RJ70 launched in December 1991, with first deliveries in 1993. First RJ85 and RJ100 orders placed in 1992.

RJ115. Same fuselage dimensions as RJ100 but fitted with mid-cabin exits, and having a higher design weight and increased fuel capacity. Seats 116.

Avro RJX. Proposed in 1998 as upgraded RJ85 and RJ100 models. Featured 2,000-pound weight reduction,

new AlliedSignal AS977-1A engines in the 7,000 lbst power class. Program terminated late 2001.

Program Review

Background. BAE Systems acquired the former Hawker Siddeley HS.146 STOL transport program in its merger with the latter company in the late 1970s. The four-engined aircraft dominated a relatively small market niche: short-haul segments where runway length, unimproved runways, or environmentally sensitive airports are the rule, not the exception. The 146 also carved a niche as one of the most successful small freighters, especially in developing regions of Asia, Africa, Eastern Europe, and Latin America.

To counter the new generation of regional jets designed by Bombardier and Embraer, BAE launched low-cost, lightweight derivatives of the 146. Designated RJ70, RJ85, and RJ100, these were configured for 70, 85, and 100 seats, respectively, used Textron Lycoming LF507 turbfans, and incorporated lightweight interiors. BAE

delivered about 165, then closed the line at the end of 2001.

Re-engined, Upgraded Avro RJX. Proposed in 1998 as an upgraded RJ85 and RJ100, with 2,000 pound weight reduction and powered by new AlliedSignal AS977-1A engines in the 7,000 lbst power class.

Program, RJ Division Terminated. In November 2001, BAE said it was closing its Regional Aircraft Ltd division and terminating the RJ/RJX programs. The decision was made primarily in response to the events of September 11. Demand had softened for the RJ series, and BAE had lined up only 14 firm RJX orders at that time. BAE completed two RJ85s and two RJ100s that were on the line at Woodford, and subsequently the unfilled RJX orders were canceled.

Funding

The amount of funding devoted to development of the 146 has not been made available, although estimates vary from \$150 million to \$400 million for all three derivatives. The RJ derivatives will cost little to develop, while the RJX has been estimated to cost between \$1 billion and \$2.5 billion to design, develop and certify.

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
May	1972	Preliminary market/design studies completed
Aug	1973	British government grants financial support to program
Oct	1974	Program canceled
Jul	1978	British government relaunches program
Jun	1980	Initial sales recorded
Feb	1983	CAA certification obtained
Jun	1983	FAA certification, initial deliveries
Oct	1988	-300 certification, initial deliveries
Dec	1989	QC Convertible version initial delivery
	1990	RJ Series unveiled; RJX proposed
Dec	1991	Business Express orders RJ70
Spring	1993	Initial RJ70 deliveries
	1998	RJX announced/proposed
Nov	2001	RJ/RJX programs, RJ Division closed

Worldwide Distribution

See the "World Airline Inventories, Orders and Options" appendix for current order book, now available on line. Refer to the Appendix Lead Sheet for instructions.

Forecast Rationale

BAE Systems continues to support 146 and RJ-series aircraft in the field, but production was completed in 2001.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

Aircraft	(Engine)	thru 02	High Confidence Level			Good Confidence Level			Speculative			Total 03-12	
			03	04	05	06	07	08	09	10	11		12
AVRO INTERNATIONAL AEROSPACE													
146/RJ100	LF500 SERIES	70	0	0	0	0	0	0	0	0	0	0	0
146/RJ70	LF500 SERIES	12	0	0	0	0	0	0	0	0	0	0	0
146/RJ85	LF500 SERIES	85	0	0	0	0	0	0	0	0	0	0	0
RJX100	AS977-1A	1	0	0	0	0	0	0	0	0	0	0	0
RJX85	AS977-1A	1	0	0	0	0	0	0	0	0	0	0	0
Subtotal - AVRO INTERNATIONAL AEROSPACE		169	0	0	0	0	0	0	0	0	0	0	0
BRITISH AEROSPACE A/C GROUP													
146 QC	ALF502R-5/5A	4	0	0	0	0	0	0	0	0	0	0	0
146 QC	LF500 SERIES	1	0	0	0	0	0	0	0	0	0	0	0
146 QT	ALF502R-5/5A	23	0	0	0	0	0	0	0	0	0	0	0
146-100	ALF502R-5	32	0	0	0	0	0	0	0	0	0	0	0
146-200	ALF502R-5/5A	94	0	0	0	0	0	0	0	0	0	0	0
146-200	LF500 SERIES	5	0	0	0	0	0	0	0	0	0	0	0
146-300	ALF502R-5/5A	48	0	0	0	0	0	0	0	0	0	0	0
146-300	LF500 SERIES	11	0	0	0	0	0	0	0	0	0	0	0
Subtotal - BRITISH AEROSPACE A/C GROUP		218	0	0	0	0	0	0	0	0	0	0	0
Total Production		387	0	0	0	0	0	0	0	0	0	0	0