

# ARCHIVED REPORT

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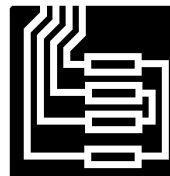
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## Fokker F.28/100 – Archived 9/2006

### Outlook

- Fokker Services remarketing a cheaper, shorter range alternative to Boeing BBJ and Airbus ACJ
- Ex-American Airlines, US Airways Fokkers typically have 50,000 cycles/hours of remaining service life
- Avionics upgrades likely for Fokker 100EJ/CS conversions

Note: Icons indicate area(s) of current and potential retrofit/modernization activity



### Orientation

**Description.** Twin-turbofan, narrow body, short-range commercial jet transport.

**Developer/Primary Manufacturer.** NV Koninklijke Nederlandse Vliegtuigfabriek Fokker, Amsterdam, the Netherlands.

**Current Status.** F.28 production ended in 1986; Fokker 100 production ended in 1997.

**Total Produced.** F.28 production totaled 241; Fokker 100 production totaled 278 units.

**Application.** Short-range scheduled passenger transportation, including high-density regional/commuter operations.

**Price Range.** Estimated cost of used F.28-1000, \$1.25 million; F.28-2000, \$1.5 million; F.28-3000, \$2.5 million; F.28-4000, \$3.0 million; Fokker 100, \$9.5 million. Estimated cost of Fokker 100EJ/CS, \$12-\$15 million in 2005 dollars.

### Technical Data

(F.28-4000/Fokker 100)

	<u>Metric</u>	<u>U.S.</u>
<b>Dimensions</b>		
Length	26.76/35.53 m	87.8/116.57 ft
Height	8.47/8.5 m	27.8/27.89 ft
Wingspan	25.07/28.08 m	82.25/92.13 ft
<b>Weight</b>		
Operating weight, empty	17,645/24,512 kg	38,900/54,039 lb
Max TOW	33,110/45,810 kg	73,000/100,993 lb
Max payload	10,478/12,228 kg	23,100/26,958 lb

### Seating

F.28-4000 seats maximum of 85 passengers at 29-inch pitch.

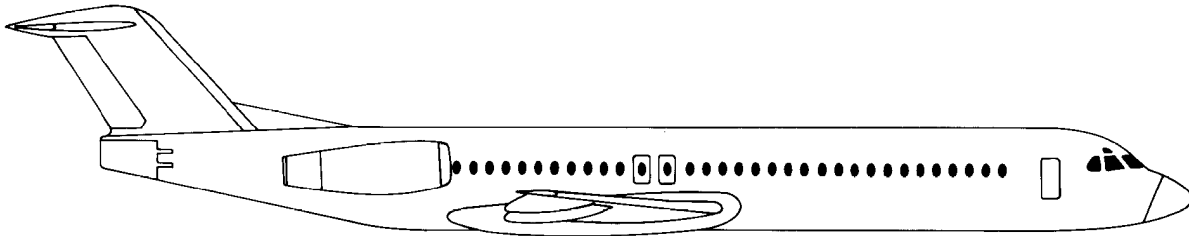
Fokker 100 seats 107 at 32-inch pitch in two-class layout, or 119 in single-class layout.

**Performance**

Max cruise speed	455 kt	455 kt
Max cruise altitude	10,668 m	35,000 ft
Max range, full passenger complement	2,085/3,167 km	1,125/1,710 nm

**Propulsion**

F.28-4000	Two Rolls-Royce RB183-2 Mk 555-15P Spey turbofans, 44 kN 9 (9,900 lbst) each.
Fokker 100	Two Rolls-Royce Tay Mk 620 turbofans, 61.6 kN (13,850 lbst) each, or two Tay Mk 650 turbofans, 67.16 kN (15,100 lbst) each.

FOKKER 100

Source: Forecast International

**Program Review**

**Background.** The F.28 is a short-range jet transport designed for economic operations from unpaved airfields of 4,500 feet or less. The aircraft was configured, in several variants, for seating capacities of 55 to 85 passengers. Fokker began development of the F.28 in 1961 with private funding but obtained Dutch government financing shortly thereafter. A prototype flew in 1967 and the aircraft obtained Dutch, German, and FAA certification in 1969.

The final production variant, as well as the best selling model, was the 85-passenger F.28-4000 which entered production in 1976. Fokker produced 241 F.28s of all variants through 1986.

Fokker 100. The follow-on to the F.28, this model was launched in 1983. The Fokker 100 features a

lengthened fuselage, uprated engines and greater use of composite materials compared with its predecessor. Swissair was the launch customer, placing orders and options for 16 aircraft in 1984. The following year the Fokker 100 logged its first major North American sale when USAir ordered 20 aircraft. Initial Fokker 100 deliveries took place in February 1988 and, through the end of 1995, the Dutch firm had sold 290 units and delivered 274. Fokker declared bankruptcy in March 1996.

During 2001-03 there were several reported attempts to revive the Fokker 70/100 program both in the Netherlands and in China, but to date this has not occurred and appears increasingly unlikely.

Fokker 100EJ. See **Variants**, below.

**Variants**

F.28-1000. The initial production model, seating 65 passengers, it was also offered in a mixed passenger/cargo layout. Fokker produced 97 units.

F.28-2000. Introduced in 1971, the stretched Mk 2000 seated up to 79 passengers; only 10 were sold.

F.28-3000. Entered production in 1976 and seated 65 passengers; 22 were produced.

F.28-4000. The line's best seller, the Mk 4000 entered production concurrently with the Mk 3000, above. It combined the stretched fuselage of the Mk 2000 with

the uprated engines of the Mk 3000 and seated up to 85 passengers. Fokker sold 112 Mk 4000s.

Fokker 100. Launched in December 1983, this 90 to 107 seater is based largely on the F.28 but incorporates significant equipment and design improvements. The prototype flew in 1986 and first deliveries took place in early 1988.

Fokker 70. Based on the Fokker 100 but with a fuselage shortened to the approximate length of the F.28s. This 64- to 82-seat variant entered service in 1996, powered by Tay Mk 620 turbofans and offering a simplified avionics suite as standard equipment.

Fokker 100EJ. In early 2004, Fokker Services acquired a number of Fokker 100s retired by American and U.S. Airlines, among others, intending to refurbish and remarket them as the Fokker 100EJ. This is a lower cost, shorter range (1,150-3,200 nautical miles depending on payload) alternative to the corporate-configured Boeing 737 BBJ.

The company notes that the American and US Airways Fokkers have typically logged 20,000-30,000 cycles/hours, nowhere near their 90,000 cycles/hours of certificated lives. With 10 passengers the Fokker 100EJ will be capable of serving London-Riyadh, New York-Shannon, Moscow-Yakutsk, or Paris-Libreville city pairs.

## Milestones

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1961	F.28 development initiated
	1967	F.28 prototype first flight
	1969	F.28 obtains Dutch, German, FAA certification
	1983	Fokker 100 launched
	1986	F.28 production ends
Feb	1988	Initial Fokker 100 deliveries
Sep	1988	Stretched Fokker 130 variant announced
	1995	Initial Fokker 70 deliveries
Mar	1996	Fokker declares bankruptcy
Early	2004	Fokker 100EJ upgrade announced

## Worldwide Distribution

(As of June 1, 2005)

<u>Region</u>	<u>Country</u>	<u>Total</u>	<u>Variant</u>	<u>Avg. Age (Yr)</u>	
<u>Africa</u>	Burkina Faso				
	Air Burkina	1	F.28-4000	19	
			1	F.28-2000	29
	Gabon				
	Air Gabon	1	Fokker 100	13	
	Ghana				
	Air Force	1	F.28-3000	27	
	Govt.	1	F.28-3000	28	
	Ivory Coast				
	Air Ivoire	3	F.28-4000	19	
	Libya				
	Libyan Arab Airlines	5	F.28-4000	23	
	Mauritania				
	Air Mauritanie	1	F.28-6000	23	
		1	F.28-4000	30	
	Nigeria				
	IRS Airlines	3	F.28-4000	19	
		2	Fokker 100	13	
	South Africa				
	Airquarius Aviation	2	F.28-4000	19	
	1	F.28-3000	26		
Tanzania					
Air Tanzania	1	F.28-4000	19		
Govt.	1	F.28-3000	27		
Togo					
Air Force	2	F.28-2000	30		

<u>Region</u>	<u>Country</u>	<u>Total</u>	<u>Variant</u>	<u>Avg. Age (Yr)</u>	
<u>Asia</u>	Bangladesh				
	Biman Bangladesh	2	F.28-4000	28	
	Indonesia	Air Force	1	F.28-1000	34
			2	F.28-3000	27
			2	F.28-2000	29
	Batavia Air		1	F.28-4000	23
		Garuda	1	F.28-3000	27
	Merpati		12	F.28-4000	19
			2	Fokker 100	12
		Pelita Air Service	1	F.28-4000	21
		5	Fokker 100	12	
	Malaysia	Air Force	2	F.28-1000	29
		Myanmar			
	Myanma Airways	3	F.28-4000	20	
	Nepal	Cosmic Air	4	Fokker 100	13
		Papua New Guinea			
	Air Niugini	1	F.28-1000	33	
		4	F.28-4000	21	
		2	Fokker 100	15	
	Taiwan	Mandarin Airlines	6	Fokker 100	13
Vietnam					
Vietnam Airlines	2	Fokker 70	10		
<u>Australia/</u>					
<u>New Zealand</u>	Australia				
	Alliance Airlines	6	Fokker 100	14	
	Skywest	3	Fokker 100	11	
<u>Europe</u>	Austria				
	Austrian Airlines	4	Fokker 70	9	
	Austrian Arrows		6	Fokker 70	10
			8	Fokker 100	11
		France			
	Brit Air	10	Fokker 100	11	
	Regional Airlines		4	Fokker 70	10
			7	Fokker 100	14
		TAT	1	Fokker 100	13
		1	F.28-1000	34	
	Germany	Air Berlin	1	Fokker 100	15
		Luftahrgesellschaft	16	Fokker 100	13
	Hungary	Malev	4	Fokker 70	9
		Ireland			
	EU Jet	4	Fokker 100	14	
	Italy	Alpi Eagles	8	Fokker 100	17
		Netherlands			
KLM Cityhopper	19	Fokker 70	9		
	15	Fokker 100	16		

<u>Region</u>	<u>Country</u>	<u>Total</u>	<u>Variant</u>	<u>Avg. Age (Yr)</u>
<u>Europe</u> (continued)	Portugal			
	Portugalia	6	Fokker 100	15
	Serbia & Montenegro			
	Montenegro Airlines	3	Fokker 100	14
	Switzerland			
	Helvetic Airways	7	Fokker 100	11
	Turkey			
	Inter Airlines	2	Fokker 100	13
<u>Middle East</u>	Iran			
	Iran Asseman	4	F.28-4000	27
		2	F.28-1000	29
		10	Fokker 100	13
	Iran Air	9	Fokker 100	12
<u>North America</u>	Canada			
	Air Canada Jazz	8	F.28-1000	32
	Canadian North	1	F.28-1000	31
	Mexico			
	Mexicana	10	Fokker 100	13
	United States			
	American	3	Fokker 100	12
Ford Motor Co	1	Fokker 70	14	
<u>South America</u>	Argentina			
	Air Force	6	F.28-1000C	27
	Navy	3	F.28-3000	23
	Brazil			
	TAM	24	Fokker 100	11
	Colombia			
	Air Force	1	F.28-1000	34
		1	F.28-3000	32
	Satena	1	F.28-3000	25
	Ecuador			
	TAME	2	F.28-4000	25
	Icaro Express	5	F.28-4000	20
	Peru			
	Air Force	1	F.28-1000	27
	Uruguay			
U Air	2	Fokker 100	13	

## Opportunities

Fokker Services and Rolls-Royce launched the FUTURE100 program, which is the re-marketing of Fokker 100s coming available for sale or lease, in early 2003. Key vendors such as Honeywell, Rockwell Collins, and Messier-Dowty are involved in the program to ensure a competitive customized support package is available for new operators of the type.

Fokker Services stated it had handled about 150 FUTURE100 transactions by the end of 2004, in addition to 21 FUTURE50 remarketed Fokker 50 twin-turboprops. Austrian Airlines, as an example, is

replacing its MD-80s with nine FUTURE100 transports, and also holds six options.

More recently Fokker Services launched the Fokker 100EJ (executive jet) and CS (corporate shuttle) projects, which refurbish ex-airline aircraft with customized executive interiors. These aircraft are priced at about \$12-\$15 million and offered as a lower cost but shorter range alternative to Boeing's 737-based BBJ and the Airbus ACJ.

**AIRFRAME**

Fokker 100EJ/CS. In the spring of 2004, Fokker Services launched the EJ modification of Fokker 100s withdrawn from airline service. The company will refurbish the airframe (no details provided) and replace the cabin interior with an executive layout per customer specifications. Optional configurations would include seating for 19-31 passenger seats or shower-equipped master suites. Depending on the selected configuration, the EJ aircraft will sell for \$12-\$15 million.

The EJ will offer a max-payload range of 1,150 nautical miles but, depending on fuel, gross weight and payload, will be capable of 3,200-nautical-mile ranges. The company has estimated potential demand for 20-30 such conversions.

Fokker Services also offers a corporate shuttle (CS) conversion typically seating 30-50 persons which, with installation of an auxiliary fuel k system, would have a range of about 2,350 nautical miles.

Fokker Services notes that the ex-American Airlines and US Airways Fokkers have typically logged 20,000-30,000 cycles/hours, nowhere near their 90,000 cycles/hours of certificated lives. The company adds that the aircraft's Tay 650 engines already meet the planned Stage 4 noise standards.

**PROPULSION**

Hushkits. There have been several attempts to come up with hushkits for the F.28's Rolls-Royce Spey engines in the past 10 years from outfits such as Nordam, Quiet Nacelle Corp (QNC), and Stage III Technologies, but none of these projects has reached fruition. Very little has been heard of such efforts in the past few years, and current interest is clearly favoring Fokker 100 upgrades, such as the FUTURE100 and Fokker 100EJ programs.

We are no longer including propulsion upgrades in our **Opportunity Outlook.**

**ELECTRONICS**

Avionics Upgrades. Airlines and corporate customers acquiring used/refurbished Fokker 100s may elect to retrofit new avionics to achieve fleet commonality, while existing operators may wish to refit their aircraft with updated and more efficient systems. Weather radar and state-of-the-art nav systems would appear to be likely systems for retrofit, and several operators have already performed such upgrades.

The recently launched FUTURE100 and Fokker 100EJ programs almost certainly will result in additional avionics upgrades.

**FI's Opportunity Outlook**

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Program	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
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**AIRFRAME**

**Fokker 100EJ/CS**

Anticipated <-----> 25-50 Fokker 100 (Int'l)

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Program	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
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**ELECTRONICS**

**Avionics Upgrades**

Available <-----> 50+ Fokker 100 (Int'l)

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Program	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
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