

# ARCHIVED REPORT

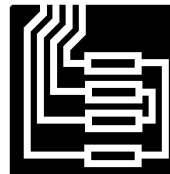
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## Dassault Falcon 20 - Archived 10/2000

### Outlook

- More than 100 Falcon 20s re-engined with 731-5s, program well received
- Anticipated FAA ruling will result in EGPWS retrofits of aircraft in commercial service

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



### Orientation

**Description.** Twin-turbofan, medium-capacity executive transport aircraft; normal seating for eight to 10 passengers plus crew of two. Maximum seating for 14 with cabin tables removed.

**Developer/Primary Manufacturer.** Dassault Aviation; Vaucresson, France.

**Current Status.** Production of the Falcon 20/200 series ended in 1988.

**Total Produced.** Approximately 510 Falcon 20/200s were produced.

**Application.** Short-medium range business/executive transportation.

**Price Range.** Used prices (good condition) range from \$2-\$2.5 million. Falcon 731 upgrade (re-engining, new interior, new avionics) costs \$8-\$9 million.

### Technical Data

(FALCON 20F)

	<u>Metric</u>	<u>US</u>
<b>Dimensions</b>		
Length overall	17.15 m	56.25 ft
Height overall	5.32 m	17.45 ft
Wingspan	16.30 m	53.48 ft
Wing area, gross	41 sq m	440 sq ft
<b>Weight</b>		
Empty, equipped	7,530 kg	16,600 lb
Max payload	1,180 kg	2,600 lb
Max T-O weight	13,000 kg	28,660 lb

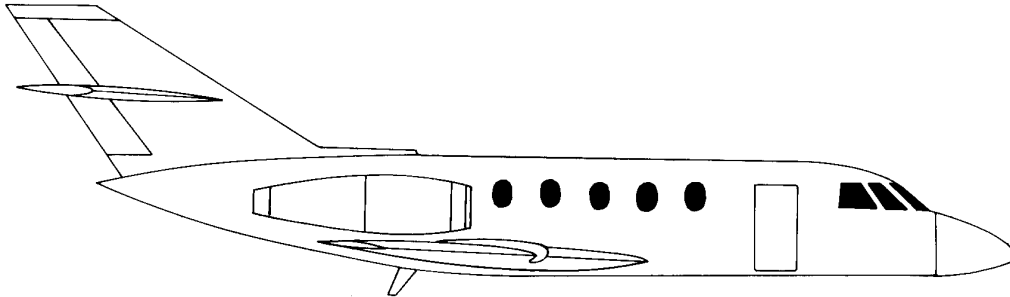
**Performance**

Max cruising speed	862 km/h	465 knots
Range <sup>(a)</sup>	3,300 km	1,780 nm

**Propulsion**

Two General Electric CF700-2D-2 turbofans		
Thrust (each)	20 kN	4,496 lbst

<sup>(a)</sup>With eight passengers and 45-minute cruise reserves



DASSAULT FALCON 20

Source: Forecast International

## Program Review

**Background.** The Falcon 20 was produced jointly by French aircraft manufacturers Dassault-Breguet and Sud-Aviation. The two companies began construction of the prototype in January 1962. Later, Sud-Aviation was merged into the French aerospace company, Aerospatiale. Sud built the wings and tail unit for the

original Mystere-Falcon 20 prototype, while Dassault constructed the fuselage. On production models, Aerospatiale produced the fuselages and tail units while Dassault built the wings. The aircraft was marketed in the US as the Falcon 20, and in other countries as the Mystere 20.

## Variants

**Standard Falcon.** First-generation, medium-capacity business aircraft introduced in mid-1960s as the Fan Jet Falcon. Powered by General Electric CF700-2C turbofans, rated at 18.35 kN (4,125 lbst) each.

**Falcon 20C.** Similar to Standard Falcon, but with increased fuel capacity and optional Saphir I APU; equipped with GE700-2C engines.

**Falcon 20D.** Another derivative of the Standard Falcon, but equipped with more powerful GE CF700-2D engines rated at 18.9 kN (4,250 lbst) each. Fuel capacity increased to 5,090 liters (1,344 US gallons).

**Falcon 20E.** Comparable to Falcon 20F, but with fuel tankage and wing controls of series D, and optional Saphir II APU.

**Falcon 20F.** First publicly displayed in June 1969, this version features new high-lift devices, including a leading edge flap inboard of each wing fence and a

slotted leading edge flap outboard of each wing fence. Thrust increased by two GE CF700-2D-2 engines.

**Falcon 20G/HU-25A.** In 1976, Dassault announced the Falcon 20G, powered by two Garrett ATF3-6-2C turbofan engines rated at 24.2 kN (5,441 lbst) each. The Falcon 20G featured a range increase to 4,170 kilometers (2,250 nm), assuming a crew of six and reserves of 5 percent total fuel plus 30 minutes at sea level. No civil examples were produced. The only 20G examples produced were the HU-25A Gardians for the US Coast Guard.

The Falcon 20G was selected to fill the US Coast Guard's medium-range surveillance aircraft requirement, and Falcon Jet Corp of Teterboro, New Jersey, was awarded the USCG contract for 41 aircraft (designated HU-25A). For this role, the aircraft is fitted with a drop hatch and two fuselage search windows, plus four underwing and four underfuselage hardpoints. HU-25A deliveries were completed in December 1983.

**HU-25B.** Later designation for HU-25As used for location of sea pollution and identification of the vessels responsible. Equipment includes a Motorola APS-131 SLAR pod, a Texas Instruments RS-18C linescan unit, and a laser-illuminated TV.

**HU-25C.** Designation of eight Gardians converted to identify and track airborne and seaborne drug smugglers. Equipment includes a Westinghouse APG-66 radar, a turret-mounted Texas Instruments WF-360 FLIR, and HF/UHF/VHF-FM radio communications.

**Falcon 200.** Introduced as the Falcon 20H, the Falcon 200 is powered by Garrett ATF3-6A turbofan engines. Certified in June 1981. Only some 35 Falcon 200s were produced.

**Gardian.** Based on experience obtained from the HU-25A Gardian program, the Gardian is a specialized

maritime surveillance aircraft adapted from the Falcon 200. France ordered five Gardians, to replace Lockheed P-2H Neptunes, for use in the Pacific region. The Gardian is fitted with an FCS-80, two VHF systems, two VOR/ILS systems, an ADF, two DME and ATC transponders, a VHF-FM system, a UHF system, an HF system, a VLF/Omega navigation system, a navigation table, a high-performance Varan radar, a handheld camera linked to the navigation system for automatic data annotation, and four underwing attachments.

**Gardian 2.** Simplified version of Gardian; features a Varan radar, a Sextant Avionique Omega navigation system, and four hardpoints.

**Falcon ST.** Dassault also produced a special Falcon ST systems trainer variant, small quantities of which were bought by the French and Libyan air forces for training purposes.

## Milestones

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Jan	1962	Prototype construction begun
May	1963	Prototype flown with P&W JT12A-8 engines
Jul	1964	Prototype flown with GE CF700 engines
Jan	1965	First production aircraft flies
Jun	1981	Falcon 200 receives French certification
Dec	1983	HU-25A deliveries completed
May	1987	Program announced by Garrett to retrofit Falcon 20s with TFE731 engines
Mar	1989	Falcon 20 certificated with TFE731-5AR powerplants
	1989	Volpar announces effort to re-engine Falcon 20 with PW305s
Feb	1991	Volpar's re-engined Falcon 20 makes first flight
Early	1995	Greenwich Aircraft announces PW305 re-engining project

## Worldwide Distribution

### Military/Government Operators

<u>Region</u>	<u>Country</u>	<u>Total A/C</u>	<u>Type</u>	<u>Average Age (Yrs)<sup>(a)</sup></u>
<u>Africa</u>	Liberia			
	Liberia Gov't	1	Falcon 20E	28
	Libya			
	Libya Gov't	1	Falcon 20C	28
	Morocco			
	Morocco AF	2	Falcon 20DC	24
<u>Asia</u>	Sudan			
	Sudan Gov't	1	Falcon 20F	20
	Indonesia			
	Indonesia Gov't	1	Falcon 20F	20
	Pakistan			
Pakistan AF	1	Falcon 20E	29	

<u>Region</u>	<u>Country</u>	<u>Total A/C</u>	<u>Type</u>	<u>Average Age (Yrs)<sup>(a)</sup></u>	
<u>Europe</u>	Belgium				
	Belgium AF	2	Falcon 20E	27	
	France				
	France AF	4	Falcon 20C	27	
			2	Falcon 20E	26
			3	Falcon 20F	17
	France Gov't	5	Falcon 20C	27	
			3	Falcon 20E	24
			1	Falcon 20F	16
	Norway				
	Norway AF	2	Falcon 20C	29	
	Portugal				
	Portugal AF	1	Falcon 20DC	18	
Spain					
Spain AF	1	Falcon 20E	26		
		1	Falcon 20F	17	
<u>Latin America/ Caribbean</u>	Peru				
	Peru AF	1	Falcon 20F	15	
	Venezuela				
	Venezuela AF	1	Falcon 20C	21	
			2	Falcon 20DC	19
		1	Falcon 20F	16	
<u>Middle East</u>	Egypt				
	Egypt Gov't	1	Falcon 20E	26	
			2	Falcon 20F	22
	Iran				
	Iran AF	4	Falcon 20F	21	
			2	Falcon 20E	26
	Iran Navy	4	Falcon 20E	28	
Syria					
Syria AF	2	Falcon 20F	21		
<u>North America</u>	United States				
	US Coast Guard	18	HU-25	15; 23 in storage	

Commercial Operators

Falcon 20 operators are found worldwide, and a complete listing of them is unavailable. The overwhelming majority of Falcon 20 operators are located in the United States and Western Europe.

<sup>(a)</sup>Some ages are estimated.

## Opportunities

More than 100 Falcon 20s have been refitted with the AlliedSignal TFE731-5 powerplants, while to date efforts to offer a PW305 retrofit have failed to reach fruition.

In the area of electronics/avionics retrofits, the US Coast Guard plans to retrofit its 18 active HU-25

Falcons with NAVSTAR GPS receivers by the beginning of the next decade, and a portion of the worldwide civil Falcon 20 fleet will almost certainly also receive this equipment during the coming years.

Assuming that the US FAA mandates its planned enhanced ground proximity warning system (EGPWS)

retrofit, Falcon 20s used in commercial service are expected to have to comply by the end of the year 2003.

#### AIRFRAME

Cargo Modification. In the spring of 1995, Avcon Industries of Newton, Kansas, announced the receipt of a \$1.1 million contract from an unidentified customer to convert three Falcon 20s to an all-cargo configuration. Specific details of the actual conversion were not released.

Previously, Avtec Inc of Sauget, Illinois, had carried out ten Falcon 20 cargo conversions, including five aircraft for Michigan-based Grand Aire Express. The Avtec conversion included installation of a 76.5-inch by 54-inch fuselage door and required two to three months to complete.

No further cargo mods have been announced.

#### PROPULSION

TFE731 Engine Retrofit. AlliedSignal Aerospace Co offers a Falcon 20 engine retrofit using its TFE731-5BR turbofan engine. The TFE731-5BR is rated at 4,750 lbst, and re-engined aircraft are redesignated Falcon 20B. Equipped with these engines, the aircraft has its range increased to 2,450 nautical miles, cruising at Mach 0.82 and carrying eight passengers and NBAA IFR reserves.

The TFE731 retrofit consists of the new powerplants (\$4.1 million including thrust reversers), new Collins ProLine avionics (\$1.5-\$1.6 million), and a complete interior refurbishment (about \$750,000). Several locations are available across the US and Europe for installation of the upgrade kit as well as optional avionics and interior upgrades. These installation locations include AlliedSignal Aviation Services facilities in Los Angeles, California, and Springfield, Illinois Other locations include Falcon Jet Service Center, Little Rock, Arkansas; Europe Dassault Service, Le Bourget Airport, France; and Transairco, Geneva, Switzerland.

Optional equipment on offer includes the AlliedSignal GTCP36-150 auxiliary power unit, and Dee Howard is offering its TR5020 thrust reversers. Inclusion of the TR5020s adds \$275,000 to the AlliedSignal package price. AlliedSignal delivered the 100th Falcon 731 upgrade in July 1998.

PW305 Engine Retrofit. Volpar Aircraft of Van Nuys, California, and Flight Services Group (FSG) of Fairfield, Connecticut, had each offered a re-engining program featuring the Pratt & Whitney Canada PW305, rated at 23.2 kW (5,225 lbst). Neither program reached fruition, however, and Volpar has ceased operations altogether.

In early 1995, Greenwich Aircraft Corp of Sausalito, California, announced a PW305 re-engining program costing about \$4 million per aircraft and yielding an 82 percent range increase, improved hot/high runway performance, Stage 3 compliance, and reduced direct operating costs. Original plans called for certification in spring 1997, but very little has been heard of this program in recent years. It must be noted that P&WC has essentially withdrawn its support of Falcon 20/PW305 conversions and, as the engine manufacturer has yet to publicly reverse this position, we are not forecasting such an upgrade/re-engining project.

Tail-Mounted APU. Columbia (Maryland)-based PATS Inc received a Supplemental Type Certificate (STC) for its Falcon 20 tail-mounted installation of a Sundstrand T-40C29 APU. The unit is certificated for strats up to 25,000 feet and for operation up to 35,000 feet. Total installed weight of the package is 102 pounds and the kit is priced at about \$260,000. Installation requires an estimated 800 hours, according to PATS. No customers have been announced as yet.

#### ELECTRONICS

Avionics Packages. A number of avionics manufacturers have offered upgrade packages for the Falcon 20 aircraft. AlliedSignal Aerospace has tailored a digital avionics package for the 731 Falcon 20. This package includes a five-tube electronic flight instrumentation system (EFIS), dual KNS-660 navigation management systems, a quadra-color weather radar, and a TCAS II traffic alert/collision avoidance system.

Rockwell Collins offers a comprehensive upgrade package; customers may select the Collins EFIS-85 Electronic Flight Instrument System featuring 5 inch displays, or the EFIS-86 with 6 inch displays. Either system is part of a retrofit package which includes the APS-85 digital autopilot, ADS-82 air data system, AHS-85 attitude heading reference system, TWR-850 Doppler turbulence detection weather radar, and Pro-Line II comm/nav/pulse.

Honeywell also offers a Falcon 20 avionics upgrade. The package includes Honeywell's five-tube EFIS, FZ-500 flight directors, AZ-800 digital air data computers, SPZ-500 autopilot, Global GNS-X, PRIMUS II communications/navigation system, and associated flight instrumentation. According to Million Air, Dallas, Texas, which has performed the installation, work takes approximately 12-16 weeks at a cost of \$1 million.

NAVSTAR GPS. We expect many civil and commercial aircraft to be fitted with NAVSTAR Global Positioning System (GPS) airborne receivers.

In December 1994, the US FAA approved the NAVSTAR GPS for en route operations over oceanic and remote areas with some restrictions. This satellite-based system continues to evolve – the ultimate use of differential GPS (DGPS) will correct current limitations in judging aircraft altitude. If this integration is a success, GPS is expected to be used for CAT 2 and 3 operations.

In mid-1996, the UK CAA noted its plans to approve GPS as a primary means of navigation on North Atlantic routes. This announcement came close on the heels of European Joint Aviation Authorities (JAA) clearance for national aviation authorities to establish their own GPS policies.

During 1997-98, concerns about over-reliance on the GPS as the sole means of navigation surfaced in the United States, with the threat of signal-jamming receiving increased attention. Whether from natural phenomena such as solar activity or from hostile electronic jamming such as from terrorists, the danger of signal interruption has prompted renewed debate.

In the second half of 1998, the FAA surprised many by announcing that it would not approve the GPS for sole use navigation, but would require a backup system. It now appears that the FAA will extend and update the existing Loran-C system as an economical backup to GPS, at least until 2008.

EGPWS. In 1998 the FAA announced plans to issue a notice of proposed rulemaking (NPRM) for compulsory installation of an enhanced ground proximity warning system aboard turbine-powered business aircraft with six or more passenger seats. The agency had hoped to come up with a final ruling in early 1999 but thus far this process has suffered several delays. Implementation would be mandatory by year's end.

Existing rules require the EGPWS aboard aircraft seating 10 or more, but only if the aircraft operates on commercial services. According to AlliedSignal, an EGPWS for regional and business aircraft would cost about \$35,000, not including installation.

## FI's Opportunity Outlook

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Program	99	20	01	02	03	04	05	06	07	08	09	10	11	12	13
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### AIRFRAME

#### **Cargo Modification**

Available <=====> 10-15 Falcon 20 (Int'l)

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Program	99	20	01	02	03	04	05	06	07	08	09	10	11	12	13
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### PROPULSION

#### **TFE731 Engine Retrofit**

In Progress/

Planned +====> 8-10 Falcon 20 (US/Int'l)

Anticipated <=====> 25 Falcon 20 (Int'l)

#### **Tail-Mounted APU**

Available <=====> 50-100 Falcon 20 (US/Int'l)

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Program	99	20	01	02	03	04	05	06	07	08	09	10	11	12	13
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### ELECTRONICS

#### **Avionics Packages**

In Progress/

Anticipated +=====> 15-20 Falcon 20 (Int'l)

Speculative <=====> 30-50 Falcon 20 (Int'l)

#### **NAVSTAR GPS**

Planned <=====> 23 HU-25 (USCG)

<=====> 75 Falcon 20 (Int'l)

#### **EGPWS**

Anticipated <=====> 75-100 Falcon 20 (US)

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Program	99	20	01	02	03	04	05	06	07	08	09	10	11	12	13
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