Flying the Dassault Falcon 2000

This CFE738-powered twin can carry 2 pilots + 8 pax 3000 nm at M.8 and with Flight Dynamics HGS can handle Cat IIIa approaches.

By Clay Lacy
ATP/CFII/Helo/Sea.
Gulfstream II/III/IV, Learjet series, HS125, Boeing 727/747 and 25 misc type ratings

One Wednesday afternoon not long ago a Dassault Falcon 2000 pulled up on the ramp at Clay Lacy Aviation VNY (Van Nuys CA). This was the aircraft I was to flightcheck the following morning and I had some time to admire its lines in anticipation of the next day's flights. Marcel Dassault always used to say that if an airplane looks great it will fly great. I'm sure he was right and I was looking forward to flying this popular widebody Falcon Jet.

Early the next morning I met up with Dassault Falcon Jet Chief Pilot Ops Dave DeAngelis, Capt Bill Magnus, Regional Sales Manager Dwight Reimer and my good friend Dassault Falcon Jet

Director of Communications John House. House had brought with him an extensive collection of material on the Falcon 2000 program—everything you could want to know about the airplane and its competitive positioning. DeAngelis, who I would be flying with, had worked with Pan Am's Falcon Jet business aircraft division back in the early 70s. He joined Dassault Falcon Jet when it acquired the program in 1974, and he probably knows as much about flying Falcons as anyone in the world.

Dassault started thinking about what was referred to as the Falcon X in the late 1980s. At the Paris Air Show of 1989 the Falcon 2000 was announced. First flight was in early 1993 and FAA certification was achieved in early 1995. Since then over 150 aircraft have been sold and the 100th Falcon 2000 was delivered late last year.

The 2000 has achieved a number of firsts. It was the first bizjet to be JAA certified from scratch and in 1996 the Falcon 2000 won the distinction of being the largest business jet approved to operate in and out of LCY (London City, England) which requires a 5.5 glideslope. Last year the 2000 became the first business jet to be involved in fractional ownership programs in 3 continents—US, Europe and the Middle East. It's been extremely successful in fractional ownership applications. Falcon 2000 fractional orders now total 60, with 35 of these in the US NetJets program, 13 in NetJets Europe and 12 in National Air Services Middle East program which is operated by NetJets.

Transcon optimized

House explained that the 2000 was created mainly around the North American transcontinental mission. With 3100 nm range at Mach .75 longrange cruise, and 3000 nm at Mach .80, it's an honest transcontinental aircraft. It will take 8 pax from Miami FL to Vancouver, or Portland ME to San Diego CA, against 99%

Flightcheck Author Clay Lacy departs Rwy 16 at VNY (Van Nuys CA) for FL410.

Photos by Jack Sykes

(L) Lacy and Dassault Falcon Jet Chief Pilot Dave DeAngelis engage in preflight discussion. (Middle) DeAngelis points out the carbon-fiber construction of a wheel well cover. (R) Lacy and DeAngelis inspect the Falcon 2000's aft service bay.

probability winds in a large comfortable cabin.

The 2000 is an offshoot of the Falcon 900, which is itself an offshoot of the Falcon 50. In conceiving the Falcon 2000, Dassault was aiming for a long-range, widebody replacement for the Falcon 20—an aircraft that would fly higher, faster and farther with a really large cabin. It discovered that by putting the Falcon 50's wings on the wider fuselage it would increase span and aspect ratio by exactly the right amount to meet these goals. The end result is an airplane with essentially the same wing as the Falcon 50 and the same cross section as the 900EX. While the 26 ft 2 in cabin of the 2000 is 6 ft shorter than the 900EX it's 92 in wide, which is 8 in greater than a Gulfstream V and only 6 in narrower than a Bombardier Challenger CL-604.

The airplane we were to fly, msn 87, was a well-equipped demonstrator with all the extras including dual TCAS II, Airshow and a Flight Dynamics heads-up-guidance system (HGS). A standard configuration Falcon 2000 comes very nicely equipped at a $21.27 million pricetag, or about $23 million for a fully loaded airplane. I found it interestingly that almost half of non-fractional ownership buyers are specing out their aircraft with Flight Dynamics HGS. This $483,200 option gives operators Cat III capability as well as benefits throughout all phases of flight.

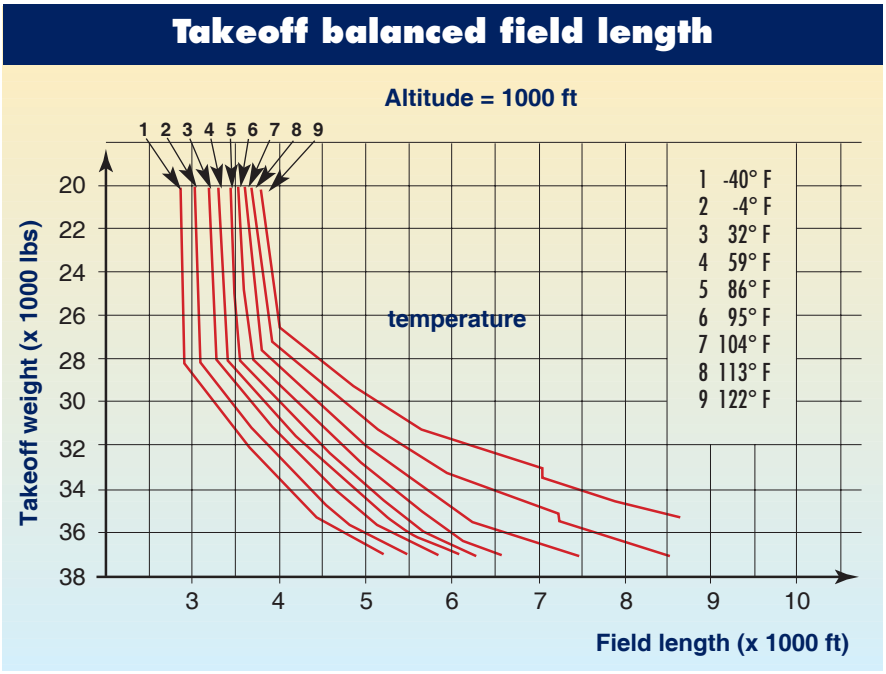
Preflight

DeAngelis and I headed out to the ramp for a walkaround. Typical of all Falcons, you can't help noticing the fine workmanship on the skin surfaces and riveting. DeAngelis pointed out Dassault's fairly extensive use of Kevlar and composites in various panels and non-structural applications, which helps keep the weight of the airplane down. Landing gear is the same as the 900EX except that the 2000 has 2 independent hydraulic antiskid brake systems which work in unison.

The 5918 lb thrust AlliedSignal/General Electric CFE738-1-1B turbofans are positioned close to the centerline as a result of aggressive area ruling techniques which Dassault achieved using CATIA design processes. The thrust reversers, built by Alenia, are a Dee Howard target-type design. An AlliedSignal APU, which is required for pneumatic engine start, is up in the aft tailcone and easily accessible for servicing.

I was impressed with the external baggage capacity on this airplane. The main baggage compartment, which is pressurized and accessible from the cabin, is 134 cu ft and 1600 lbs capable. The aft service bay is clean and well organized making it easy to check accumulator and air bottle pressures. A nice feature here is that you can stow skis, golf clubs and engine covers in this spacious, 150 lbs capable, service bay. Both of these compartments have built-in integral steps, which is a great feature.

The air stairs are nice and comfortable, the entry door is adequate and leads you into an expanse of fine cabinetry work in the forward galley. With 18 well-positioned windows the passenger cabin is flooded with light. Our demonstra-



Out of shorter runways the Falcon 2000 excels.

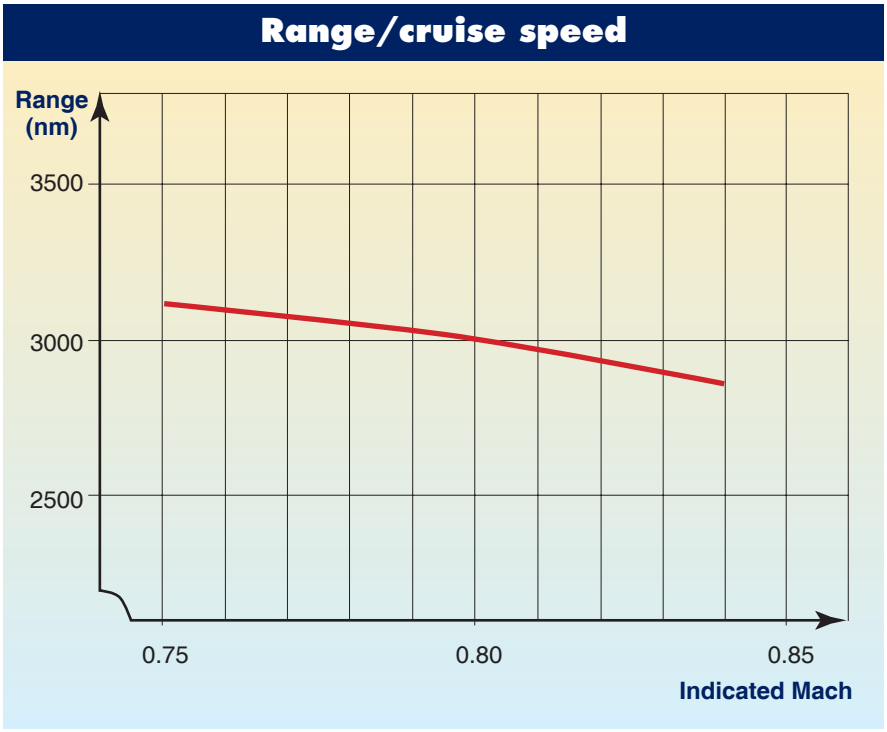
Lacy found the Flight Dynamics HGS easy to adapt to. He used it on approach and landing at MHV (Mojave CA) and VNY (Van Nuys CA).

tor aircraft had a low-density 8-seat configuration with a settee facing the dining/conference table. The galley was large, the lav was roomy and the interior was done in a high-quality Gaboon veneer, from Carl F Booth & Company, with a 4-way grain match. Dassault does an excellent job in producing squawk-free interior completions out of its Little Rock AR facility.

Dassault prefers to control the completion process internally and has made large investments at Little Rock over recent years. House explained that from 650 employees and 285,000 sq ft of facility in 1993 the operation has now grown to 1700 people and 495,000 sq ft. Last year Dassault completed a record 70 Falcon Jets, 60 out of Little Rock and the remaining 10 under subcontract with Jet Aviation Basel and Dassault Falcon Service at LBG (Le Bourget/Paris France). All interiors, whether done out of Little Rock or a subcontract facility, are warranteed by Dassault Aviation.

I found the flightdeck of the Falcon 2000 to be very comfortable, well laid out and very similar to the 900EX. Flightdeck windows are a nice design, very smooth and quiet in flight, and I like the direct-vision opening window which is a feature of all Falcons. Flight displays and FMSs are all Collins, and our aircraft was fitted with a Flight Dynamics HGS with a controller panel at the base of the pedestal.

Engine start was easy and automated. The Falcon 2000 has dual full authority digital engine controls (FADEC), 1 active and 1 standby, and this is a great power management tool. Steering is excellent—however, the 2000 does not have rudder pedal steering. The brakes on the 2000 require considerable pressure but I like them, and they're very effective. As we taxied for takeoff on runway 16 at VNY our weight was 29,600 lbs (about 83% of the 35,800 lbs MTOW), with 5800 lbs of fuel and 2 passengers, giving us a V1 of 113 kts and a V2 of 116 kts.



Built to fly fast, the Falcon 2000's max range at Mach .80 is only slightly less than at Mach .75.

Flying the 2000

Our climb profile to FL410 was 250 kts to 10,000 ft then 260 kts to Mach .75. We had leveloffs at 6000, 17,000 and 34,000 ft and, at our relatively light weight, we were still climbing at better than 1000 fpm as we approached FL410. Leveling off at FL410, we went to Mach .80 to confirm fuel burn. One nice feature on the 2000, which I've never seen before on an aircraft, is a Mach hold button. If you punch it at Mach .80 the FADEC will vary power levels to hold you at the selected speed. This feature worked very well. As we stabilized at Mach .80 total fuel burn was 1500 lbs, slightly better than the book figure of 1540 lbs at our 27,000 lb weight.

DeAngelis suggested that I try some steep turns. I started out with a 50 bank to the right at Mach .80, then rolled the other way, adding power as speed had dropped to Mach .75 indicated. We were up to as much as a 60 bank for a period of time with no buffet.

We then made a modified emergency descent to FL240 at flight idle with airbrakes out. With speeds up to Mach .90, and a pronounced nose-down attitude, we were descending in excess of 13,000 fpm. The airplane is stable and controllable and the spoilers caused very little buffet. DeAngelis told me that in an emergency situation the 2000 will get down from FL450 to FL200 in about 2.5 min.

Leveling at 17,000 ft, we canceled IFR and headed toward MHV (Mojave CA) to do a few touch-and-gos on Rwy 08 before coming around for a full stop. The 2000 lands very nicely but you've got to be on the numbers or you'll float. The thrust reversers are beefy, well engineered and they work great. Although you can deploy reverser buckets on landing you can't advance power past idle until the nosewheel is on the ground.

On our second takeoff from MHV DeAngelis pulled power on the left engine. While I had to push right rudder all the way in it was easy to maintain directional control and we were climbing single-engine at 1500 fpm. Departing Rwy 08 we turned right to VNY and climbed to 12,500 ft. I flew a low pass over

(Top) The 2000 offers a Collins Pro Line 4 panel. (Left) A Flight Dynamics HGS is a popular option at $483,200. (Right) A spacious 8-pax configuration was featured on this aircraft. (Insert) There was plenty of headroom even for Lacy.

VNY for photo purposes followed by a full stop landing. Again, I noticed that this airplane really lands smoothly and slowly with lots of ground effect. For most landings, it would be easy to turn off at the 2000 ft point.

We landed at VNY with 1600 lbs of fuel after our 1 hr 40 min flight, **giving us a total fuel burn of just 4200 lbs. Not bad considering we were below FL180 for all but 20 min of the flight and we made 4 landings and circuits. The Falcon 2000 is truly a miser on fuel!**

I used the Flight Dynamics HGS quite a bit in the air and I really liked it. This same Flight Dynamics system has been proven by years of operation on Alaska Airlines, it's standard equipment on the BBJ and it's a really great feature. With HGS you can hand fly Cat III approaches down to 600 ft RVR and a 50 ft decision height.

I felt the overall handling characteristics of the Falcon 2000 were excellent. The airplane has very responsive controls which are balanced nicely. Controls are somewhat more sensitive compared to most corporate jets and you don't want to manhandle this airplane. This is an airplane you need to fly with your fingertips and not with a heavy grip. With its full-

(L) The airstair and entry door of the 2000 are very comfortable. A pair of CFE 738-1-1Bs feature dual FADEC control. (Bottom) Ample baggage storage is available in the 2 aft compartments, each with built-in steps.

Dassault Falcon 2000 Specifications

Price	
Basic equipped ($MIL US)	$22.0
Powerplant (2)	CFE738-1-1B
Max thrust @ SL/30°C	5,918 lbs
Dimensions	
Wingspan (ft)	63.5
Length	66.4
Height	23.2
Cabin length	26.3
Width	7.7
Height	6.2
Baggage (cu ft)	134.0
Normal seating crew/pax	2/8
Weights and loading	
Wing loading (lb/sq ft)	67.9
MTOW (lb)	36,000
Zero fuel weight	28,660
Basic operating weight	21,450
Max payload	2,360
Max fuel (lb)	12,154
Performance	
T/O SL/ISA @MTOW (BFL in ft)	5,440
Max rate climb (fpm)	
all engines MTOW	3,000
one engine out MTOW	600
Cruise ceiling@MTOW (ft)	47,000
Pressurization Delta P	9.4
Typical cruise (KTAS)	459
@ altitude	410
Range (nm) NBAA IFR	3,120
Fuel flow (total pph)	1,295
Mmo	.87
Vsl (KIAS)	93
Vmo	370

Figures supplied by Dassault

time yaw damper the only time I had to use rudder was on the simulated engine out.

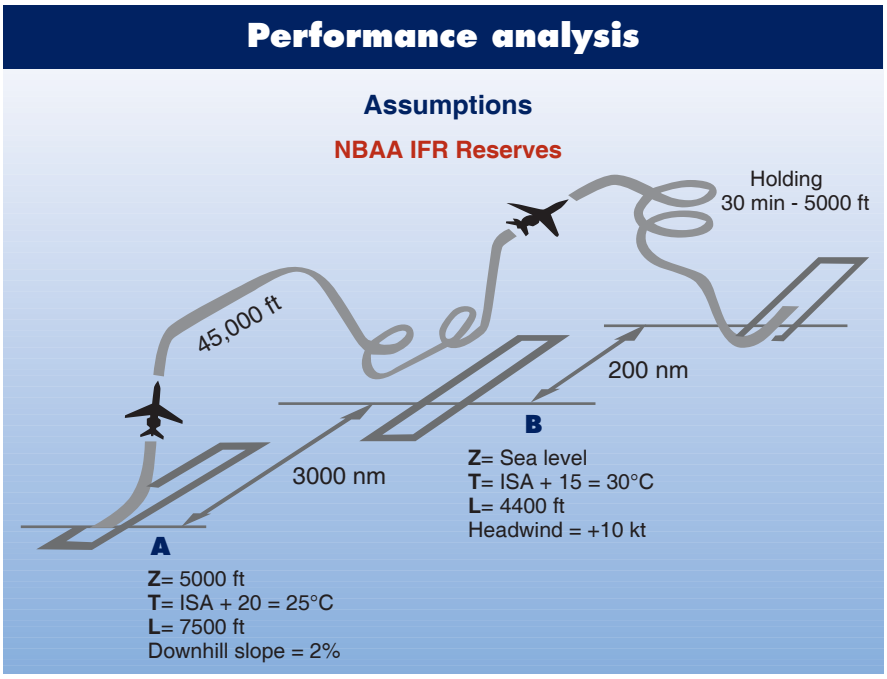
Systems

One of the secrets behind the Falcon 2000, and every one of the 1300 Falcons built to date, is Dassault's great experience in designing high-performance military aircraft. The Falcon 2000 wing is a doubleswept supercritical design for low-drag and high-Mach configuration with 29 of sweep inboard and 24 outboard. The thrust reversers have been carefully engineered to add virtually no drag in cruise. A Collins Pro Line 4 integrated avionics suite, featuring dual FMS and 4 large-screen LCD displays, is standard. This digital system is certified for Cat II landings. When equipped with the optional Flight Dynamics HGS, the 2000 can land in Cat IIIa conditions.

The CFE738 turbofans power the Falcon 2000 with plenty of reserves. Each engine is controlled by 2 FADECs and, in the flightdeck, 3 engine instrument electronic displays (EIEDs) permit continuous monitoring of all engine and system parameters.

The flight control system of the Falcon 2000 is remarkable in its simplicity and its high degree of

Photos by Jack Sykes



Multistop missions without refueling are a specialty of the Falcon 2000. The widebody Dassault product has a surprisingly low fuel burn.

precision. Primary flight controls are hydraulically assisted with artificial feel unit (AFU) servo-controls designed to return to neutral and to provide feedback to the pilot. The airplane has 2 leading edge slats and 4 trailing edge double-slotted Fowler flaps plus 6 airbrake panels.

The Falcon 2000 operates with 2 main independent and simultaneous hydraulic systems. An auxiliary hydraulic power supply is also provided, consisting of an electrical stand-by pump which can be operated automatically as soon as a pressure drop is detected in hydraulic system nbr 2.

A 28-volt DC power system is powered by 2 rectifier-alternators driven by the engines and a starter generator driven by the APU. Emergency batteries are provided for operation of the stand-by horizon and inertial reference system (IRS).

The fuel system consists of tanks in each wing and in a center wing box. Total useable fuel is 12,154 lbs and each engine draws from its respective tank. A crossfeed interconnect is available and fuel tanks are pressurized with engine bleed air. Normal refueling is through a pressure system with an over-the-wing system also. Air conditioning is obtained from air bled from 1 low pressure port on each engine or from the APU. Three modes are available on the cabin pressurization system—automatic, manual or rapid depressurization. A programmed pressurization schedule ensures a max cabin altitude of 8000 ft at FL470 with a 9 psi differential. The cabin can be rapidly depressurized, at up to 2500 ft/min, by pressing the dump push button.

The Falcon 2000 is equipped with 2 anti-icing systems. Hot bleed air protects the wing leading edges, engine air intake and ventilation duct air intake. An electrical system protects the flightdeck windshields as well as various probes and sensors.

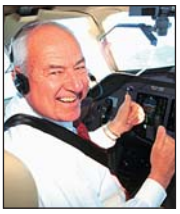
Dassault provides training for 2 pilots and 1 mechanic, and the initial pilot course at FlightSafety runs 3.5 weeks. For any pilot who's previously flown a Falcon this should be an easy transition as the flightdeck layout, flight controls and overhead panels are similar on all Falcons. The 5 years or 5000 flight-hr Falcon 2000 warranty covers structure, avionics and standard equipment. The primary airframe structure is prorated through years 6–10 and the CFE engines carry a 5 year or 2000 flight hour warranty. Typical of all Falcons, this airplane does not have any life limited airframe parts. Availability of Falcon Jet parts is good these days with supplies out of France, Teterboro and Little Rock. With 33 authorized service centers around the world, and a spares depot in Singapore, operators can get parts much faster than they could in the old days.

Dassault offers an optimized continuous inspection program (OCIP) on all currently production models. This allows you to split up inspection tasks and it's helpful for the operator with only 1 or 2 mechanics on staff. A CFE engine-by-the-hour maintenance program is available and this seems to be popular with Falcon operators.

Summary

Dassault has come up with a unique and attractive combination of cabin size, range and speed with the Falcon 2000. In many ways it's today's cultural equivalent of the Falcon 20. With its widebody comfort and improved performance, it's a wonderful airplane for operators whose missions are primarily within North America. It will do the vast majority of what's required within the continent with a fuel burn at Mach .80 that's only about 8% greater than the much smaller Falcon 10. If you want to fly farther, this airplane has the range capability and the cabin to take you anywhere in the world.

More and more business jet buyers these days are looking for comfortable walk-around cabins and this part of the market has really taken off in recent years. A lot of wealth has been generated recently by start-up companies and high-tech ventures, particularly out west. These guys have the money to afford a corporate airplane, and many are looking for a fast transport with a comfortable cabin for primary operations within North America or Europe. House explained that the center of gravity for his market has been shifting westward. There's alot of new wealth out here and many buyers are stepping right into a



Falcon 2000 or Falcon 900EX class of airplane. I expect to see more Falcon 2000s and 900EXs based here at VNY in coming years.

Falcons are such great flying aircraft that I feel most pilots would enjoy flying a Falcon for their entire

career without worrying about moving up to a new aircraft. With its superb control system, nice quiet modern flightdeck and high quality engineering throughout, the Falcon 2000 is as nice an aircraft as any pilot could want to fly.

Clay Lacy has more than 48,000 hrs as a pilot flying everything from DC3s to 747-400s and nearly every corporate jet. His VNY-based Clay Lacy Aviation is home for Lacy's popular charter fleet, which consists of Learjet 24s, 25s, 35s, 55s, Challengers, Gulfstreams IISPs, IIIs, IVs and a B727.