



Dassault Falcon 2000LX

Fuel efficiency leader in 4,000-nm class aircraft

By Fred George

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There now are more than 90 Falcon 2000LX aircraft in service and operators say the model has the best fuel efficiency of any large-cabin business jet. It also coddles passengers, operates from short runways and delivers excellent climb performance.

Dassault long has prided itself in building fuel efficient business aircraft and the twin-jet Falcon 2000LX uses the least fuel of any of its models. As such, it beats all competitive makes in its range class.

The LX has the same fuel capacity as its predecessor, the Falcon 2000EX. But the addition of Aviation Partners' winglets extends range up to 5%. Typically equipped and assuming operators have incorporated the new increased takeoff weight service bulletin, it can carry six passengers 4,000 nm at long-range cruise. Just as impressively, it can fly the same payload about 3,900 nm at 0.80 indicated Mach cruise and land with 200 nm NBAA IFR reserves.

A key to achieving such class-leading fuel efficiency numbers is having the Falcon 2000LX maintain the strict weight control of a French haute couture model. But even when bulked up with customer options, it

still has the lightest weight of any aircraft in its class. Empty weight actually is within 500 lb. of the average Challenger 300. As a result, the Falcon 2000LX needs a smaller wing, more modestly sized engines and less fuel capacity than its three main competitors. It indeed burns 17% less fuel than the Bombardier Challenger 605, 30% less than the Embraer Legacy 650 and a whopping 40% less fuel than the Gulfstream G450, operators tell *BCA*. Some operators say it burns virtually the same fuel as the Challenger 300, a claim verified by statistics in our May 2011 *Purchase Planning Handbook*.

Admittedly, the G450 has almost double the tanks-full payload of Falcon 2000LX,

Dassault Falcon Jet

along with three seating areas, higher cruise speed and 200 nm more range. But Falcon 2000LX operators say they don't need that big an aircraft for most of their missions.

In spite of its light weight, operators say Falcon 2000LX's cabin is among the quietest they've experienced. Dassault obviously didn't skimp on acoustic insulation because the aircraft has exceptionally low wind and engine noise.

Overall passenger comfort is top notch because its cabin cross-section is second only to the wide-bodied Challenger 605 in this range class. The main seating area can be as long as 22 ft., depending upon customer choice of forward galley and aft lavatory layouts. That allows it to be divided into two sections. The forward seating area almost always is configured with four club chairs. Most aircraft are configured with one of three layouts in the aft cabin. The most popular configuration features a four-seat conference grouping on the left and two facing chairs on the right side.

Some aircraft have the four-seat conference grouping plus a right side credenza that replaces the two facing chairs. Still others have a second, four-chair club section in the rear cabin that's virtually the same as the forward four-chair club section. A few aircraft have an aft, left-side, 6.6-ft. long, three-place divan that replaces the four-seat conference grouping.

Pilots say the aircraft is a joy to fly because of its fully powered flight controls, highly refined, speed proportionate artificial control feel system, crisp response and notoriously soft edged flight envelope. Few aircraft are as forgiving after an inadvertent high- or low-speed excursion. And few are as easy to land in a strong crosswind.

Many crews initially were slow to embrace Dassault's EASy cockpit design philosophy. But they've now warmed up to it, having become proficient with its point-and-click graphic user interface and exploiting the capabilities of its four large-screen displays.

Dispatch reliability, maintainability and operational practicality also are this aircraft's strong suits. Operators say the aircraft has simple systems and maintenance access is excellent. Dassault's careful attention to space utilization also allows the tow bar and other line equipment to be carried in the aft service compartment rather than taking up space in the baggage compartment. Most say they have yet to miss a mission because of a maintenance snag.



Aviation Partners' winglets add 242 lb. to the empty aircraft weight, but they boost the Falcon 2000LX's range up to 5% compared to the Falcon 2000EX.

Operator Demographics and the Purchase Decision

Most operators contacted for this report said they've been in the Falcon Jet family for several years, so there is strong brand loyalty. Many traded up from legacy Falcon 2000 or Falcon 2000EX aircraft. Their missions predominantly are transcontinental U.S. or intra-European. Intercontinental missions are much less common. The Falcon 900LX and Falcon 7X were other family members they considered when they acquired the Falcon 2000LX. But operators say they didn't need the increased range or operating expense.

Some said they wanted to stay with a transcontinental range aircraft with the EASy cockpit to simplify transition training for pilots. A few say they traded up from Gulfstream GIII and GIV aircraft for improved fuel efficiency or up from the Bombardier Challenger 300 for increased cabin comfort and range performance.

Outside the Falcon family, operators say the Gulfstream G450 was the closest competitor because of its 4,200+ nm range, Mach 0.80 cruise speed and higher tanks-full payload. Falcon 2000LX operators view the Gulfstream as an intercontinental range aircraft that can carry 12 passengers with full fuel. But for typical transcontinental U.S. missions, they say the aircraft's considerably larger size and heavier weight, accompanied by higher fuel consumption and operating costs, are detractors.

The Bombardier Challenger 605 also was a contender, but the Falcon 2000LX operators say it flies too low and too slow, needs more runway and burns more fuel. They also say they rank Dassault's product support above that of Bombardier.

Virtually no operator considered the Embraer Legacy 650 a viable competitor to the Falcon 2000LX.

Less than half of the fleet is registered in North America, but more Falcon

Falcon 2000LX 'Commercial Designation'

Falcon 2000LX isn't a model designation, according to the FAA and EASA type certificate data sheets. It's actually a Falcon 2000EX with two key modifications that were approved in April 2009. Mod M2846 reinforces the outboard wing structure and installs API winglets. Mod M3229 installs more robust slats that can handle the increased wing-bending moments associated with the aero loads imposed by the winglets.

Falcon 2000EX aircraft with s.n. 0218 and subsequent, put into service after April 2009, came factory equipped with both M2846 and M3229 modifications and were marketed as Falcon 2000LX aircraft. Some EX aircraft delivered prior to that date had structural provisions for the winglets, thereby allowing them to be fitted with both winglets and reinforced slats after delivery. A few EX aircraft delivered prior to April 2009 underwent major structural modifications for the winglets and slats, including removal of the outboard wing skins, reinforcement of the wing spars and replacement of the wing skins. All such factory-authorized retrofitted EX aircraft were reborn as Falcon 2000LX aircraft.

The M2846 and M3229 modifications should only add 242 lb. to the aircraft structure, but most LX aircraft actually weigh about 400 lb. more than EX aircraft with identical equipment.



EASy cockpit takes some learning, but most Falcon 2000LX pilots now say they love its ergonomics. However, most say EASy II, slated for certification at year-end, is a most needed upgrade.

2000LXs are registered in the U.S. than any other single country by a wide margin. Operators include large American manufacturers, real estate developers, investment firms and financial services companies, and include such names as ADM (formerly Archer Daniels Midlands), BAe Systems, Case & Associates and Childress Klein, along with Devon Energy, Duke Energy and Lewis Energy, plus Humana, Shorenstein and Steelcase. Maverick Capital, NASCAR, NextEra Energy and NPD Group, PPD Pharmaceuticals, Shuert Enterprises and Stephens Group, Travelers Indemnity, Whirlpool and Wyndham also operate Falcon 2000LX aircraft, as do many entrepreneurs and high net worth individuals. One individual in Seattle extensively uses his aircraft in support of his favorite non-profit organization, Boy Scouts of America.

Four aircraft are based in Canada. They are operated by energy, steel, metal recycling and manufacturing firms. One leased aircraft, based in Monterrey, Mexico, is operated by international air charter and management firm Execujet.

The aircraft is also popular in South America. Six are based in Brazil, operated by Odebrecht, a large civil engineering and energy company in Rio de Janeiro, Monte Cristalina a closely held Sao Paulo-based holding company, and textile giant Coteminas. Another three are flown by management and air charter companies.

Europe accounts for the second largest concentration of aircraft outside of the Americas. Air Alsie in Sonderborg, Denmark is the world's largest single operator of Falcon 2000LX aircraft, with a

fleet of eight aircraft, including six aircraft delivered new from the factory and two more EX aircraft that were converted to the LX configuration. Most of these aircraft are available for charter, but a few are operated only for their owners.

Four aircraft are registered in Italy, three of which are operated by air charter firm Sirio SpA in Milano. Another is flown by Benetton Group, a multinational clothing maker based in Veneto. Six are based in United Kingdom, five in Switzerland, two in Austria, and one each is operated by BASF in Germany, BGL Overseas Finance in Belgium, Corporate Jets XXI in Barcelona and Global Jet in



Falcon Cabin Management System, with components from Rockwell Collins, received mixed reviews because of a not-so-intuitive user interface.

Luxembourg. The only aircraft with a French registration, other than those yet to be delivered by Dassault, is operated by the French air force.

Five aircraft have found homes in Turkey with operators in Ankara, Antalya and Istanbul. One each is based in Greece, Israel and Lebanon.

Three aircraft are operated by firms in India including Bajaj Hindusthan, the nation's largest sugar and ethanol producer, infrastructure builder GMR Group and air charter operator Taj Air in Mumbai.

South African Breweries in Johannesburg operates a Falcon 2000LX and Challenger Aero Air corporation based in Manila flies one, making it the only organization in east Asia to operate a Falcon 2000LX. Apparently, the aircraft has yet to find as a loyal following in China, such as the five Falcon 7X flagships based there.

Everyday Operations

Dassault's baseline configuration for the aircraft includes a 36-in. forward galley, double club seating for eight passengers in the main cabin and an aft lavatory. With strict weight control discipline, it's possible to maintain Dassault's super lean BOW of 23,465 lb., including 830 lb. of crew and catering. At that weight, the aircraft can be topped with fuel and it will fly eight passengers 3,900 nm at 0.80 indicated Mach and land with 200 nm NBAA IFR reserves, according to Dassault's performance projections.

Even Air Alsie, an operator that has mastered weight control discipline, can't keep BOWs below 24,066 lb. on new Falcon 2000LX aircraft. Few other operators indeed have aircraft that will tip the scales at such light weights. It's not uncommon for them to bulk up their aircraft with another 500 to 1,000 lb. of options, including a 111 lb. Inmarsat SATCOM or a 41 lb. Aircell Axxess Iridium phone, a 18 lb. Aircell broadband system, a 17 lb. VHF data link radio, a 70 lb. HUD, a 36 lb. EFVS camera and a 20 lb. AC power supply system for the main cabin, along with 150 to 200 lb. of equipment in the optional, 46-in. extended galley, a second life raft at 18 lb., a 53 lb. collapsible tow bar and the 63 lb. folding third crew seat.

The ten-seat cabin option adds 153 lb. to the empty weight and it requires installation of a 13-lb. flight data recorder. Chocked full of optional equipment, some aircraft weigh in at nearly 25,000 lb.

Such heft shrinks tanks-full payload to as little as 740 lb., an unacceptable limitation for many operators. In

response, Dassault just released service bulletin FSA2000EXEasy-08-30-01-R1, a free paperwork change that increases maximum ramp and takeoff weights by 600 lb. The mod enables heavily optioned aircraft to carry six or seven passengers with full tanks. Average equipped aircraft should be able to carry eight passengers with full fuel. However, takeoff distances will be increased and OEI climb performance will decrease as a downside of operating at heavier weights.

Few operators, though, say they need to fill the tanks and fill the seats at the same time. The longest missions for most of them are 7 hr. 30 min. to 8 hr. 10 min. in duration, or about 3,340 to 3,650 nm equivalent still air distance.

Most operators believe Dassault's range and speed projections for the aircraft are accurate. They are just not comfortable arriving at destination airports with scant 1,765 lb. NBAA IFR fuel reserves. Most say they want to touch down with 2,500 to 3,000 lb. of fuel remaining.

"We can fly London to Bradley, Conn., with 20 kt. headwinds," says one flight department manager. With stronger westerly winds, most operators making trans-Atlantic trips from U.K. to the U.S. stop at Bangor, Maine, to clear customs and proceed to their final destinations.

"If you really need consistent 4,000-nm range, get yourself a Falcon 7X or G550," says one flight department manager. We heard similar comments from other veteran operators.

Most U.S. operators report average mission lengths of 1.5 to 2.0 hr. The average mission length for the whole fleet is 1.7 hr., according to Dassault Falcon Jet statistics. On such missions, they can use runways as short as 3,500 ft. On such trips, they climb directly to FL 390 to FL 410 and cruise at 0.80 indicated Mach. Some climb their aircraft in the mid-40s, even on short-range missions, to take advantage of lower fuel burns.

Denmark's Air Alsie flies much longer missions, according to CEO Henrik Therkelsen. He estimates most missions are 4 to 5 hr. He says that low fuel burn and minimum carbon footprint are two of the aircraft's most valuable assets. His fleet chief pilot, John Olesen, says he flies at 0.80 indicated Mach because "there's not much [fuel savings] to be gained by flying slower than that speed."

Notably, 0.80 indicated Mach in most current production Falcon Jets fitted with EASy cockpits actually results in Mach 0.79, equivalent to 453 KTAS in standard day conditions. Such a small instrument error, however, only adds six to seven



The most popular interior configuration features a four-seat club section up front, with a four-seat conference grouping on the left side of the aft section and two individual facing chairs on the right side.

minutes to the longest missions. It's virtually negligible on average missions.

Many operators say they take advantage of the aircraft's 39,300-lb. max landing weight to tanker fuel. One U.S. operator, for instance, said he can fly the Falcon 2000LX from Oklahoma City to Calgary and back without refueling. A Canadian operator can fly from Calgary to New Orleans to Calgary on one fuel load. Such flexibility enables operators to save up to half the cost of fuel if they have home based fuel farms or inexpensive contract fuel.

Operators say they typically climb the aircraft to FL 410 on long-range missions, even in ISA+15C conditions. First hour fuel burn averages 2,500 lb., including start, taxi, takeoff and climb out. Second

hour fuel burn drops to 1,900 pph and 1,800 pph in third hour. A step climb to FL 430 in the fourth hour helps reduce fuel burn to just over 1,700 pph. Midway through the fifth hour, the aircraft can be climbed to FL 450 where fuel flow drops to less than 1,600 pph.

The first through fourth hour fuel flow are as much as 200 pph lower on shorter missions because of lighter operating weights. At top of descent on all missions, operators log fuel flows as low as 1,300 to 1,400 pph.

Falcon 2000LX lives an easy life with many operators. They report it only flies 300 to 400 hr. per year. However, a few operators, including Air Alsie and Steelcase, fly their aircraft up to 900 hr.



The four-seat conference group may be converted into a comfortable berth. Carlsbad, Calif.-based JetBed offers one of the most comfortable, light-weight inflatable mattresses for the aircraft.

per year. Average annual utilization for the fleet is 662 hr., according to Dassault Falcon Jet. Given such utilization, high dispatch reliability is one of the aircraft's most valuable assets, operators say.

Most operators say they can fly the aircraft for \$2,100 to \$2,200 per hour while it's within the warranty period. But direct operating costs are likely to rise after the warranty expires.

Five Most and Least Liked Features

When asked to name the five things they like best about Falcon 2000LX, operators were hard pressed to limit the list to that number.

"The passengers love it, the crews love it, and it has great flying qualities, 20% lower operating costs than a Challenger 604 and slow ref speeds because of the [leading edge wing] slats," says Les Austin of Duke Energy.

Falcon 2000LX has 1,024 cu. ft. of gross cabin volume, quite clearly qualifying it as a large cabin aircraft. Departing on a 1,000 nm trip with four passengers aboard, V speeds can be as low as 103 KIAS for V₁, 114 KIAS for rotation and 117 KIAS for V₂, assuming a slats and flaps 20 deg. configuration.

"It's so stable that I can hand fly the aircraft at FL 450. I also like the climb performance, docile handling, reliability and high landing weight that allows us to tanker fuel," says Mike McShane who flies for Ranger Corp. based in Seattle.

Assuming arrival at its 39,300 lb. maximum landing weight, the aircraft can take off without refueling at 39,100 lb. and then fly as far as 3,000 nm.

Fuel miserly doesn't imply the aircraft is underpowered.

"This thing will go get it. We routinely climb to FL 410 in 19 min. With ten or fewer passengers, we can fly most Gulfstream G450 missions with \$1,500 to \$2,000 lower operating costs. I wish I had an airplane like this 20 years ago," says Al Lancaster who flies s.n. 0158.

"When flying across the North Atlantic, we always can climb above the NAT tracks," says another flight department manager.

"Cockpit automation is very, very nice. It has great ride comfort, low fuel flows making it cheap to operate, a wonderful cabin and excellent reliability," says the flight department manager of a *Fortune* 500 manufacturing company.

"Control response, climb rate, simple systems, fuel efficiency, inflight rated APU, speed, easy landing manners because of the winglets and short runway capabilities are my favorite features. Best of all, the boss loves it," says the aviation department manager of a closely held holding company.

"It's easy to work on, we've had great customer support, the parts are logically assembled, field support is excellent and the maintenance manuals are well organized," says Larry Witte, NextEra Energy's chief of maintenance.

Glenn Jones of Steelcase has been flying several Falcon jet models for more than three decades. He says that 85% of his firm's Falcon 2000LX missions involve packing all ten seats with customers. "It has great handling characteristics, low direct operating costs, cabin quiet and comfort, and reliability. For us, the ability to tanker fuel is important because we can buy fuel for less than \$4.00 per gallon at home."

Operators also like the aircraft's

aesthetics and low profile ramp presence. Its exterior dimensions are similar to those of many super-midsize aircraft even though it can seat up to ten passengers and fly up to 4,000 nm. Many Falcon 2000LX passengers want to maintain a low profile.

"When we stop on the ramp, our CEO doesn't want to see a stretch limo at the bottom of the airstair. He won't get off the airplane," says one flight department manager.

When asked about what they didn't like about Falcon 2000LX, few, if any, operators could name five areas that need improvement. But topping their lists is the late arrival of the EASy II cockpit upgrade. The software package was certified for Falcon 900LX in May 2011, but it won't be ready for Falcon 2000LX until the end of 2012 in accordance with Dassault's contract with avionics supplier Honeywell.

The second generation EASy cockpit will enable Falcon 2000LX to fly RNP AR (authorization required) 0.3 nm arrival and departure procedures, it will have an XM satellite radio weather capability, provide takeoff and go-around flight director guidance and electronic charts, along with ADS-B Out messaging and controller-to-pilot data link communications. Options will include a \$380,000 synthetic vision package, WAAS LPS approach and 0.1 RNP certification.

Second on operator's gripe lists is Dassault's inability to earn credit from FAA or EASA for using the optional enhanced flight vision system as a substitution for unaided eye vision during low visibility approaches. Dassault Falcon Jet officials say that they originally believed that the CRT HUD with EFVS would enable them to earn such an approval, but FAA and EASA tightened certification criteria resulting in disqualification of the system because of "blooming," a blurring of HUD imagery in certain lighting conditions.

Dassault believes that only second-generation LCD HUDs and newer EFVS cameras, such as the units installed on Falcon 7X aircraft, meet the latest FAA and EASA certification standards required for flying down to lower weather minimums than would be possible using unaided vision.

Bottom line? The current HUD/EFVS equipment aboard Falcon 2000LX cannot meet FAA's or EASA's revised standards for credit for flying down to lower minimums. And Dassault has no current plans for upgrading the system.

"It's a useless piece of equipment," says the flight department manager of an oil patch company. Other complaints



Green aircraft are built in Bordeaux, France, and then ferried to completion centers.

Dassault Falcon Jet

about the aircraft were few. Some pilots, for instance, love the airstair baggage compartment door because it makes it easy to hoist bags aboard the aircraft. Others hate the airstair door, saying that it gets in the way when loading bags into the compartment.

Some crews said that the cockpit seats are uncomfortable on long trips. We flew the aircraft from Bordeaux to Gander to Little Rock in one day and we experienced no such discomfort. But we've not flown the aircraft several times over a prolonged time period.

The Little Rock completion center received mixed reviews regarding quality control, both inside and outside the aircraft. While some operators said the completions were virtually flawless, others said that fit and finish fall short of what they expect in a \$33 million aircraft.

"It's no Gulfstream [completion]," one operator said. "The valences don't align, there's too much use of [hook-and-loop] fasteners and the galley pocket door won't latch," says another. "They rushed the aircraft through completion," says a Canadian flight department manager. "We had 200 squawks during the pre-delivery inspection."

Some operators said they had representatives who supervised the completion from green aircraft induction to final delivery. Their aircraft interiors were near flawless, but only because of their hands-on participation in the completion process.

The Little Rock completion center, however, has had a boatload of challenges with which to contend. While working on customer issues, it also has had to deal with much tougher FAA interpretations of aircraft completions rules. Hard line oversight policies started in mid-2008 when FAA inspectors were accused of overlooking maintenance infractions at Southwest Airlines. In the aftermath, several firms falling within the jurisdiction of FAA in the region saw enforcement procedures get much tougher.

Several folks also commented that the Falcon cabin management system, furnished by Rockwell Collins, has boot-up problems and a non-intuitive user interface. Dassault officials, though, say that the latest generation of FCMS equipment is based on Rockwell Collins Venue line and it should operate more satisfactorily. However, when we used the Venue-based system aboard Steelcase's Falcon 2000LX, we, too, found the user interface to be confusing.

Exterior paint quality and consistency also has been problematic. Some operators say the paint was applied too thickly.



The Falcon 2000LX can climb to FL 410 at MTOW, even on ISA+15C days. Operators report that it cruises one to two flight levels higher than the Falcon 2000EX, a major reason why it has the best fuel efficiency of any aircraft in the 4,000-nm range class.

Dassault says it's reevaluating its paint suppliers and refining its paint processes to produce better results. Warranty claims have cost the firm a sizable sum for refinishing some aircraft.

Dassault's customer support generated many more positive comments from U.S. operators than in previous Falcon Jet Operators Surveys. The Danish were enthusiastic. "Support from Dassault has been the best way possible. The company works with customers and takes our comments seriously," says Air Alsie's Therkelsen.

There were some negative comments from U.S. operators. A few said that Dassault is slow to respond and that there's more than a language barrier that separates the French firm from American operators. Most of the comments were related to the perceived slow pace of EASy II certification, the lack of EFVS operational credit and quality control problems at the Little Rock completions center. Operators say Dassault's support still isn't in a league with Gulfstream's.

A few operators, including Air Alsie, also said that the rejection rates for replacement parts are unacceptably high. Dassault doesn't replace failed parts under warranty with new parts. Rather it overhauls used parts to "current FAA or EASA airworthiness standards" and returns them to service with operators.

On Balance, Would They Buy Another?

Virtually all operators, including ones who griped the most about the aircraft, gave it resounding thumbs up for overall performance. "I truly cannot think of any one thing that I do not like about this aircraft," says one flight department manager whose aircraft required two major engine repairs because of violent compressor stalls.

On balance, Falcon 2000LX is well suited to transcontinental missions

because it can fly eight to ten passengers between most cities in North America, South America, Europe, Africa or Asia. With one stop, it can fly between the most popular business destinations in the world.

Its blend of low-drag aerodynamics, light airframe weight, efficient engines and Aviation Partners' winglets make it the one large-cabin business aircraft with super midsize operating costs. Operators say they can cruise one to two flight levels higher in the LX than they could with the EX, so they seldom cruise lower than FL 410. Such high-altitude cruise performance boosts fuel efficiency.

"If you're looking for low operating costs as a big driver, Falcon 2000LX is the hands down winner," says another flight department manager of a Fortune 500 financial services corporation. "This really is a 'green' aircraft," says Therkelsen.

Aside from practical considerations, long-time Falcon Jet aficionados have a palpable emotional attachment to the airplane. Few other makes of aircraft have the Falcon's soft control feel, almost ideal control harmony and forgiveness of pilot error. The LX's winglets also increase ground effect cushioning during landing, producing soft touchdowns that belie the aircraft's straight-leg main landing gear struts. It's easy to believe the LX has trailing link landing gear.

"It's just the finest flying aircraft out there. Its control harmony is so good," says Jones.

Subjective feelings notwithstanding, operating economics are this aircraft's strongest asset, say people who manage and fly it.

"For what you get for the money, it's just a great airplane," says one flight department manager. In an increasingly "green" and cost-conscious world, operators say Falcon 2000LX has no equal. **BCA**