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Learjet 60XR

Bring it on

Blending luxury and performance

BY THOMAS A. HORNE

The Learjet 60XR is the latest in a long line of storied, sleek business jets with reputations for speed, aggressive good looks, and—let's face it—machismo. But where the early Lear Jets (the Lear Jet name was split until 1969, when founder William P.Lear was bought out by the Gates Rubber Company and the airplane was renamed the Gates Learjet) were definitely "pilots' airplanes," the 60XR underscores a new emphasis on the cabin and its creature comforts. Long gone are the ear-splitting, straight-pipe, "blowtorch" General Electric turbojet engines of the 1960s Lears. The 60XR has much more civilized, much quieter Pratt & Whitney PW305A high-bypass turbofans. And a cabin with a galley, seating for eight, and a lavatory.

Based on the Learjet 60, which was in production from 1993 to 2005, the 60XR has the biggest cabin yet in a Learjet. It's more than 17 feet long and six feet wide, has a five-foot, eight-inch height, and plenty of aisle and legroom. You can select from several floor plans, but the most popular is the one with a forward galley, a three-place side-facing divan opposite the entry door, club seating aft, and an aft lavatory. The seats are berthable for

The 60XR's Pro Line 21 suite has electronic charts and can portray flight plan routes in 3-D (second screen from right). Autopilot controls are on the glareshield panel, with warning annunciators immediately above them. Subpanel switches and controls are cleanly grouped by function, and well-organized.

SPECSHEET

Learjet 60XR
Average equipped price: $13.65 million

Specifications

Powerplants	Two Pratt & Whitney PW305A, 4,600 lbst ea
Recommended TBO	6,000 hr
Length	58 ft 8 in
Height	14 ft 6 in
Wingspan	43 ft 9 in
Wing area	264.5 sq ft
Wing loading	88.8 lb/sq ft
Power loading	2.55 lb/lb
Seats	2 + up to 8
Cabin length	17 ft 7 in
Cabin width	5 ft 11 in
Cabin height	5 ft 8 in
Basic operating weight	15,180 lb
Max ramp weight	23,750 lb
Max takeoff weight	23,500 lb
Max zero fuel weight	17,000 lb
Payload w/full fuel	660 lb
Max landing weight	19,500 lb
Fuel capacity	7,910 lb/1,185 gal

Performance

Takeoff distance	5,450 ft
Climb to FL410	18.5 min
High speed cruise	466 KTAS/Mach 0.81
Typical cruise speed	453 KTAS/Mach 0.79
Long range speed	426 KTAS/Mach 0.74
Max range	2,451 nm
Max operating altitude	51,000 ft
Single-engine service ceiling	24,300 ft
Sea-level cabin to	25,700 ft
Landing distance	3,420 ft

For more information, contact Bombardier Aerospace, 400 Cote-Vertu Road West, Dorval, Quebec, Canada H4S 1Y9; telephone 800-268-0030; www.businessaircraft.bombardier.com.

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted.

sleeping, and there's a cabin entertainment system that comes with individual three-inch LCD touchscreens at each seat. The touchscreens let you control cabin lighting, temperature, and audio/video volume and source.

Still a pilot's airplane

The 60XR treats its passengers well, but its performance can still set its pilots' hearts aflutter. With a max takeoff weight of 23,500 pounds and engines that put out a total of 9,200 lbst, that works out to 0.391 pounds of thrust for each pound of weight. (The original Lear Jet 23 had a 1:2.2 thrust-to-weight ratio; Concorde had a 0.373 thrust-to-weight ratio.) This kind of thrust is what gives all Learjets their breathtaking acceleration and climb performance, which we'll see shortly.

Like so many other new business aircraft, the 60XR uses the Rockwell Collins Pro Line 21 avionics suite. That's saying a lot. This comprises, in part: four 8-by-10-inch LCD screens, dual FMS-5000 flight management systems, an integrated flight control system, dual AHRS units, RVSM certification, plus Jeppesen electronic charts, engine indicating systems, and an Integrated Standby Indicator System (ISIS)—an emergency display showing airspeed, altitude, heading, and navigation guidance.

A few of the 60XR's other systems are worth a mention, too. The engines are FADEC-controlled, for more precise power settings and lower pilot workload. An automatic power reserve

(APR) feature kicks in should an engine fail on takeoff; this boosts the operating engine's power and permits single-engine climb rates in the 2,000-plus-fpm range. The pressurization system has a whopping 9.4-psi maximum pressure differential, which means an 8,000-foot cabin at 51,000 feet. If you forget to set the pressurization system, automatic bleed air switches close to pressurize the cabin as you pass through 13,000 feet. Using the single-point refueling port, you can top off the 60XR's 1,180-gallon fuel tanks in 40 minutes. The airplane has two methods for emergency landing gear extension: blow-down bottles and/or free-fall.

The keys, please

Strap into the Lear 60XR and you're faced with wall-to-wall Pro Line glass and well-organized subpanel switch groupings. My mentor on my 1.1-hour flight, Bombardier Learjet's Christian Barnard, programmed the FMS for our flight out of Wichita's Mid-Continent Airport, where Bombardier has its flight test center. Engine starts were a matter of flipping two toggle switches,

> For pilots and passengers alike, this latest Learjet has the right combination of performance and ergonomics.

and after the pre-taxi checks we made our way to the runway. Surface winds, always rowdy at Wichita, were acting up in grand fashion. Sustained winds were in the 30-knot range, with gusts reaching 45 knots. Big crosswind components? You bet.

There's no tiller, so the steer-by-wire nosewheel steering is via rudder pedals. Below 90 knots, you have steering authority within a 60-degree arc. Above 90, that arc narrows to a mere one degree. This helps prevent overcorrecting and swerving.

Our weight was 18,600 pounds—of which 2,900 was fuel—and our takeoff V speeds worked out to a V_1 of 115 KIAS, a rotation speed of 127 KIAS, and a V_2 of 134 KIAS. Our takeoff distance was calculated at 3,700 feet.

Shove the thrust levers forward to the "TO" clickstop, and you'll sense a slight lag from the engine spool-up. Then it's hang on, because soon comes a terrific acceleration. It's what Learjets are famous for, and even with step-climbs it took us just 13 minutes and 100 gallons to reach FL430. On the way up, climb rates were phenomenal: 6,200 fpm climbing at 250 KIAS right after takeoff; and 4,900 fpm climbing from FL370 to FL430. Deep into the flight levels, the 60XR still has plenty of excess thrust.

Normal cruise speed is Mach 0.77 to Mach 0.78, which at FL430 worked out to 437 KTAS. This, under ISA minus-7-degree conditions, and burning a total of 1,040 pph (155 gph). At long-range power settings, the numbers were Mach 0.74, 411 KTAS, and 840 pph (125 gph).

Barnard says that there's still a bit of "Lear fear" out there, the legacy of the early Lear Jets' reputation for

Sure, Learjets are known for speed, but the 60XR's cabin is nothing like the Lears of yore. With the Learjet 60, more attention was paid to expanding cabin dimensions and amenities. The 60XR took that concept a step further. This is a true mid-size cabin, with a galley, side-facing divan, and a flushing aft lavatory.

wicked stall behavior. The Learjet 60 and 60XR have a new wing design that's more docile at critical angles of attack. There are vortex generators, stall fences, and a new leading edge—all designed to energize the boundary layer over the wing.

To see how the wing behaved in the thin air at altitude under an aerodynamic load, I rolled the airplane into a 45-degree bank at FL430 doing Mach 0.75 and felt only the hint of a stall buffet.

As for the landing, we added some extra speed to compensate for the gusts. We tooled down final at 140 KIAS, planted the gear, and went into reverse. Ground spoilers automatically deployed when the airplane's weight-on-wheels system activated.

For a rookie Lear driver, my arrival on terra firma was a challenge in all that wind. But not that difficult, really. For pilots and passengers alike, this latest Learjet has the right combination of performance and ergonomics.

The 60XR may be a transcontinental mid-size luxury jet, but it still retains plenty of leftover testosterone from the blowtorch days. However, the 60XR will be the last of the breed. Next up is the all-composite Learjet 85—a mid-size jet with a total of 12,200 pounds of thrust. It'll have the biggest cabin of any Learjet, Bombardier says. And with all that thrust I think we're safe in assuming it'll do a good job of preserving Learjet's tradition of performance. Stay tuned. AOPA

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TURBINETALK

Swept-wing jet no-nos

What not to do with that high-performance jet

By Peter A. Bedell

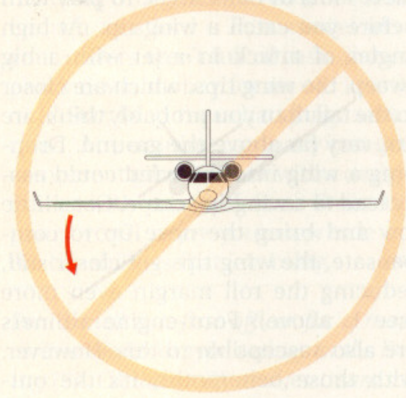
So you've got your mitts on a jet. Now you'll enjoy blistering speed, all-weather capability, and power to spare. But when you climb the ranks into jet aircraft, it's time to put to rest some habits you may have formed when flying light, straight-wing airplanes. Swept-wing jets, especially models with older wing designs, can behave quite differently from the airplanes you've flown up to this point. The following is a list of no-no's in swept-wing jets. Some of these apply to straight-wing turbine aircraft as well.

1. Don't get behind the power curve. Unlike light airplanes, swept-wing jets are less tolerant of getting "behind the power curve." In a high, nose-up attitude, a swept-wing jet creates an astonishing amount of drag. And despite lots of available power on tap, a jet may not have the reserve to power out of an extreme nose-up attitude. Powered approaches are the norm in swept-wing jets and many of them need quite a bit of power to drag all those flaps and high-lift devices through the air. Descending the glideslope with flaps full, don't be surprised to see 70-percent power or more to maintain your target speed descending on the glideslope. Compounding the problem on the backside of the power curve is the slow spool-time of jet engines. With piston engines and some turboprops, there's a lot of power available as fast as you can advance it. It can take a jet several seconds to spool up to its full power, slowing recovery efforts.

2. Don't be "unstabilized" on final below 500 feet agl. Because of the above-mentioned characteristics, it is important to have a jet stabilized on speed, on power, and on the VNAV path (glideslope, VASI or PAPI), if applicable. Unlike lighter aircraft that can fly myriad approach configurations based on obstacles, conditions, and unique weather patterns, swept-wing jets are not nearly as flexible. Don't try to salvage the approach below 500 feet agl. It's been proven foolish many times with bent metal—very poignantly when a Boeing 737 landed in Burbank, California, in March 2000. The airplane touched down at 182 knots. Target speed for the approach was calculated at 138 knots. Of course, there were many factors that affected the event, but the bottom line was that the airplane was never established on the approach and the crew tried to salvage it all the way to the gas station off the far end of the runway. This is a good time to mention that many jets don't go down and slow down very well at the same time.

3. Avoid high-speed aborts for anything but the most critical malfunctions. It may seem odd, but if an engine catches fire 10 knots before V_1 (takeoff decision speed), the safest choice may be to keep going. Most jets are capable of extinguishing a fire in flight. The energy level of a jet during the takeoff roll is extremely high since takeoff weight can vastly exceed the landing weight. Bringing all that mass to a safe stop is a serious hazard, especially if the runway is short. Small jet on a long runway? Sure, a high-speed abort is probably doable. Otherwise, keep going. There's a good chance that a high-speed abort could lead to a runway overrun, a brake fire, or blown tires. At my airline, we don't abort for anything but a power loss or anything that renders the airplane uncontrollable above 100 knots. After that speed, we're dealing with the problem in the air.

4. No steep banks at high altitudes and high indicated airspeed. This mostly applies to older jets with less forgiving wing designs. At high altitudes, there may be a very narrow airspeed band between maximum Mach speed and the stall speed, also known as Coffin Corner.

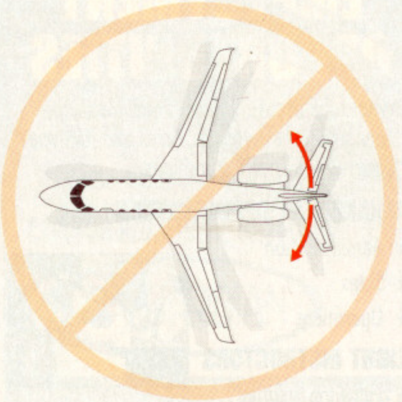


STEVE KARP

These "legacy" jets may also experience Mach buffet at speeds approaching the max Mach (M_{MO}). Even if you're below M_{MO}, there's a good chance of getting a buffet in a steep bank because of the added load factor (G load) on the wing. It's best to limit your banks to 15 degrees up high.

5. No flight above the max altitude for your weight. Today, everybody wants to save some fuel and flying high is usually the best way to do it. Unfortunately, if you're flying at a heavy weight, there simply isn't enough wing to support the weight at that altitude. Pilots who fly right up to the max allowable altitude in an attempt to save fuel or top weather and/or turbulence are putting themselves at risk and possibly burning more fuel than flying at the airplane's optimum altitude for the current weight. Your stall margin is minimal at the max altitude and if you get some spirited turbulence while flying up there, you may end up "falling out" to a lower altitude.

6. Don't overcontrol the rudder. Manhandling a Cessna Skyhawk in howling crosswinds can be done and it's quite

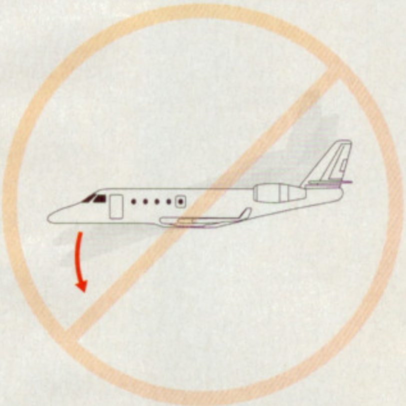


satisfying when you and your machine overcome Mother Nature for another successful landing. However, Dutch roll tendencies are higher in swept-wing jets making crosswind landings a little different and trickier for the uninitiated. Step on a rudder and the airplane will authoritatively roll the same direction thanks to the geometry of swept wings and how they hit the oncoming air. Remember that Internet video of a Lufthansa A320 scraping its wing during a landing in a strong crosswind? The jury's still out, but it appears that when the pilot jabbed in a huge dose of left rudder to line the airplane up with the runway, the right wing lifted up in return, causing the left wing to scrape the runway. That crew was lucky to go around with only a scraped wingtip. The crew of an American Airlines Airbus was not so lucky after an encounter with wake turbulence led to another incident of overcontrolling the rudder. In that November 2001 accident, the NTSB determined that the vertical stabilizer and rudder of the Airbus A300 departed the airplane following full or nearly full application of rudder in both directions that exceeded the load limits. Conventional wisdom traditionally stated that, at low speeds, pilots couldn't exceed an airplane's load limits. This accident proved us wrong. It's best to let an airplane ride through turbulence with a minimum of input, especially with a hydraulically boosted rudder, rather than heroically trying to fight the bumps. It's a smoother ride, too.

Dutch roll tendencies are higher in swept-wing jets making crosswind landings a little different and trickier.

7. Consider your wing tips when landing in crosswinds in airplanes with highly swept wings like the Bombardier Global Express and the Cessna Citation X. In a Cessna or Piper trainer, there's lots of bank angle to play with before you catch a wing tip. At high angles of attack in a jet with a big sweep, the wing tips, which are closer to the tail than you probably think, are not very far above the ground. Dropping a wing into the wind could easily lead to a wingtip scrape. Get a little low and bring the nose up to compensate, the wing tips get closer still, reducing the roll margin even more (see 1. above). Four-engine airliners are also susceptible to this. However, with those behemoths, it's the outboard engines that get scraped. In airplanes susceptible to scrapes, it's not unusual to land in a slight crab. Once both mains are on the ground and the ground spoilers lock them down, it's quite easy to get things straightened out on the centerline.

8. Avoid Mach tuck. In high-speed flight when an airplane approaches the speed of sound, a shock wave forms and moves farther aft on the wing as speed increases. This causes the center of lift to move rearward causing the nose to pitch down. That's the opposite of what you'd expect in a high-speed descent in light airplanes where a higher speed causes the nose to pitch up. Back in the jet, if the Mach tuck is not corrected with Up trim (using a Mach trim system), the problem gets worse. The faster the airplane goes, the more the nose points down and the faster the airplane goes. This can reach a point where there's not enough up elevator available to counter the Mach tuck and a high-speed dive into terrain ensues. Respect M_{MO} and Mach tuck won't be an issue. Bust the redline, and you're in test-pilot territory.



Thankfully, modern wing design has eliminated many of the high-altitude handling problems for those fortunate enough to afford a later-model jet. If your coffers aren't full of cash and you plunk down money for an old Lear Jet or JetStar, keep these handling traits in mind. Any training company can get a competent pilot on track with a design's quirks with minimal fuss. From that point, you'll enjoy your new ride and the capabilities that jets bring. AOPA

STEVE KARP

Pete Bedell is a first officer for a major airline. He holds type ratings in the Boeing 737, Canadair RJ, and Jetstream 41.