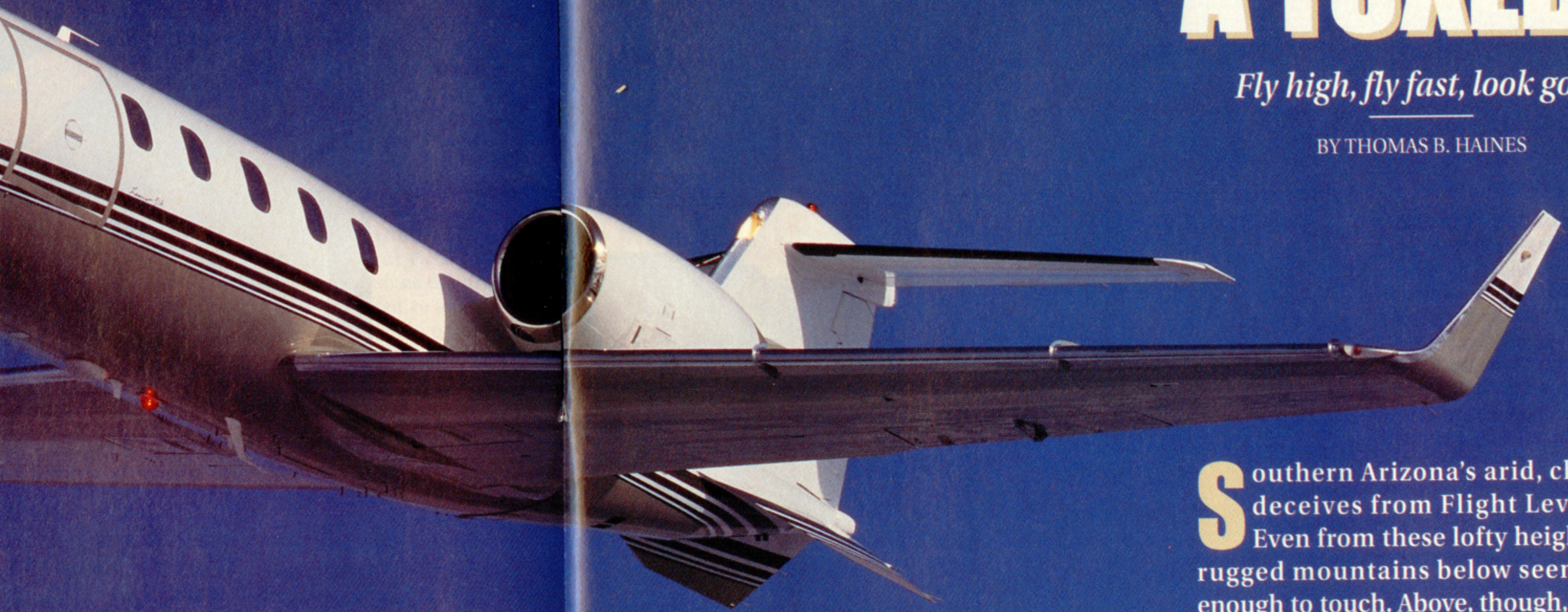
HOT ROD IN A TUXEDO

Fly high, fly fast, look good

BY THOMAS B. HAINES



Southern Arizona's arid, clear air deceives from Flight Level 510. Even from these lofty heights, the rugged mountains below seem close enough to touch. Above, though, the sky becomes a deep azure, the telltale sign of high-altitude flight. It's a bit brisk out there, too—minus 58 degrees Celsius. Far below us, cactus grows in a balmy 85 degrees Fahrenheit on the desert floor. ■ Though the environment up here is hostile to humans, the Learjet 31A seems in its element, tooling along at Mach .71 or 404 knots true airspeed; the groundspeed is 442 knots, an unusually strong wind up this high. High-altitude winds typically peak between 30,000 and 40,000 feet and are much calmer in the upper flight levels. Total fuel burn

PHOTOGRAPHY BY MIKE FIZER

through the two Garrett turbofans is down to 790 pounds per hour.

The Learjet demo pilot likes to point out that while there are a number of other airplanes certified to fly at FL510, few except the Lears actually do so on a regular basis. Indeed, even the hot rod 31A struggled to altitude on this March day. We're heavy, and the temperature, though right at the official "standard" temperature, is slightly warmer than typical at this altitude.

I hand-fly right up through 50,000 feet, but it soon becomes obvious that in the thin air, the autopilot can fly a better profile than this ham-fisted human. Still, with the autopilot off, the 31A handles well up here. It seems a little ponderous, though, compared to the crisp control responses at lower altitudes—a bit like slow flight in a Cessna Skyhawk.

The high-altitude capabilities of the 31A mean learning a whole new method of flight planning. No longer is the climb just some phase you endure until you can level and "begin" the trip. Instead, climbing at Mach .70 or better is part *of* the journey. The fact that the climb rate drops to just a couple of hundred feet per minute at extreme altitudes is irrelevant. In fact, a third of the trip may be spent climbing, but all the while, the true airspeed is increasing while fuel burn is decreasing, bringing ever-greater efficiencies. An added benefit is the quiet of the cabin because the engines are producing so little power up here. With a couple of ATC-

induced delays, our trip up to the deep blue required about 48 minutes. A typical flight might spend another 1.5 hours cruising and then 20 minutes in the descent.

At a more routine cruising altitude of FL450, the 31A turned in a sprightly Mach .75 indicated and 436 KTAS on 864 pph. High-speed cruise is at FL410, where the 31A shows 463 knots but at an invest-in-your-own-refinery fuel burn of 1,200 pounds per hour.

Touch and goes in a jet, particularly a Learjet, are almost sinfully fun. There is nothing quite like thrust to give a pilot a head rush, and the 31A comes with a maximum of 3,500 pounds of thrust per side. Touch down, shove the thrust levers forward to the takeoff setting (about 95 percent N_1 this day), wait a nanosecond, and feel yourself squashed back in the seat as the power kicks in. By then, the V_1 of 109 knots or so is behind you. Rotate at a typical V_R of about 114 knots, call for gear and flaps up, yaw damper on, and *oh,* you just busted the 200-knot speed limit in the airport traffic area. Yank that power back right now or you'll break 250 knots well below 10,000 feet—though at an initial climb rate of 5,000 feet per minute or so, it won't take long to make you legal again above 10,000.

The first time around, I blew through Tucson's 4,000-foot pattern altitude and was then remonstrated by the controller for straying outside the interstate highway that parallels the airport. Those F-16s from Davis Monthan Air Force Base will eat you alive, he warned.

On downwind, just more than 50 percent thrust still gives 200 knots, equal to the gear operating speed (V_{LO}). Eight degrees of flap will help in slowing down. Bring in 20 degrees on base and 40 degrees on short final—shooting for a V_{REF} of about 110 knots. Leave some power in across the fence and fly it right onto the ground, reducing thrust just before the mains touch down. Toggle the spoilers up, yank up on the paddle-shaped handles ahead of the thrust levers to deploy the thrust reversers, and climb on the brakes for all they're worth. The 31A's anti-skid system does the rest, promising a straight stop in less than 3,000 feet.

Learjet's concerted efforts to refine all of its products over the years have not changed the perception that these are pilots' airplanes. Of course, these days, with plush and elegant cabins in the back, they're also passengers' airplanes. And, with a $500,000 price reduction last fall, the 31A in particular may even warm the hearts of the company accountants.

Learjet marketing officials like to call the price reduction a "repositioning" of the 31A in the market. In layman's terms, it just wasn't selling well at the higher price. Only 14 were sold in 1994. However, the company is building 22 this year, and all but two are already sold, according to Learjet President and CEO Brian Barents. With the price reduction, a standard airplane sells for about $4.9 million. In this case, "standard" equates to well-equipped. There are few options on the airplane, with thrust reversers probably the most likely nice-to-have item.

The new price means that the typical 31A will come in about $1 million less than a new Learjet 45 when deliveries begin in early 1997. The Lear 45 is the company's first entirely new design in decades. While it will maintain the Lear's characteristic good looks, the 45 is all new from the wing airfoil and engines to the construction methods. The 45 is being built in partnership with several other companies—an arrangement common with Lear's parent company, Bombardier Aerospace. Bombardier also manufactures the Canadair Challenger and RJ jets; de Havilland turboprop airliners; and a host of other products, including the Rotax engines now popular in some kit airplanes, such as the Aero Designs Pulsar (see "Parenting a Pulsar: Graduation Day," p. 62).

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The company was able to reduce the 31A's price not by removing value from the airplane, but by decreasing the labor content through manufacturing efficiencies and new processes, cooperation from suppliers, and by Learjet itself simply taking smaller margins. The goal was to make the 31A a contender in a light-jet market crowded with such worthy competitors as the Beechjet 400A and the 500-series Cessna Citations.

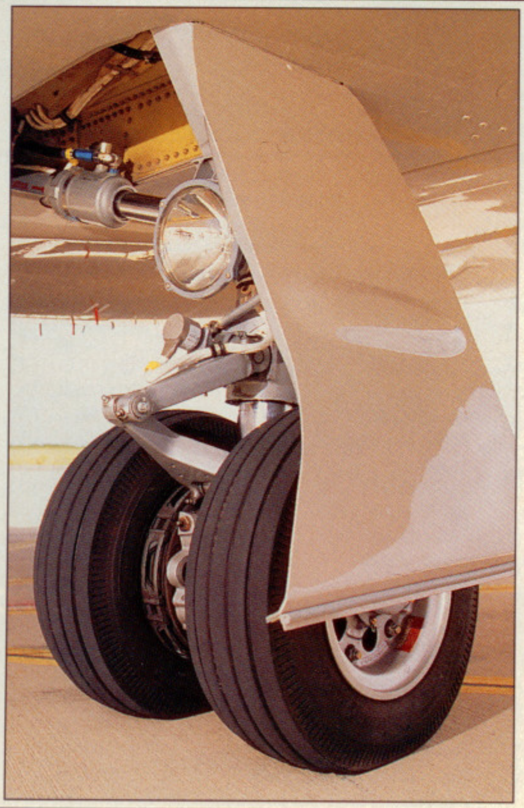
The 31A compares favorably with the Citation V, for example, in runway performance, but beats the Cessna by almost 35 knots in max cruise. The Beechjet nearly matches the Learjet in max cruise (though needing about 600 pph more fuel to do it), but the Beech requires an extra 1,000 feet of runway in a balanced-field situation. Of course, speed and runway performance are only a couple of the factors a customer takes into account in such a purchase. Price, cabin size, reliability, and support are other key considerations.

Learjet's efforts to reduce costs are transparent to the customer, though. When stepping through the 31A's wide cabin door—big enough to allow a medevac litter or cargo containers to slip in easily—it becomes obvious that

this is no stripped-down airplane. To the right is the newly redesigned cabin interior with seating for seven to eight, depending upon configuration. One of the new options is an aft lavatory, though the airplane we photographed was equipped with a lav opposite the cabin door.

As part of the changes to the manufacturing processes, Lear reengineered the plumbing on the airplane and gained two inches of headroom as a result. All of the cabin fixtures and chairs also were reworked to give the 31A a modern look.

Previously, the 31A had shared pretty much the same interior that debuted in the Lear 35 series in the mid-1970s, according to Barents. In fact, the 31A shares much with the 35, which is no longer produced except on special order—usually for special missions. The 31A is basically a 35 fuselage sitting on a Lear 55 wing, which is pretty much the same wing as that which was used



on the 29-series Lears, but with the addition of winglets. The 31A's vertical and horizontal stabilizer are directly from the 28/29 airplanes.

The 31A comes with aerodynamic devices called delta fins that debuted on the 55C. The fins, which hang down at an angle on either side of the tail, serve to make the airplane more docile in the stall. Aerodynamically, the fins serve the same purpose as the third feather on an arrow. Indeed, the delta-fin-equipped airplanes viewed from the rear look remarkably like arrows. In flight and operationally, the fins make a significant difference. Because of the stabilizing effect of the fins, the 31A could have been certified without a yaw damper, whereas the earlier Lears without the fins require a yaw damper; in fact, the 35-series airplanes have two yaw dampers, and both must be operational before dispatch.

Perhaps more than anything else,

the improved high-speed, high-altitude handling and stall recovery benefits of the fins have helped eliminate the Learjet's reputation as a Fearjet. Only Learjet test pilots would even think of doing any extreme maneuvers in an older model at FL510.

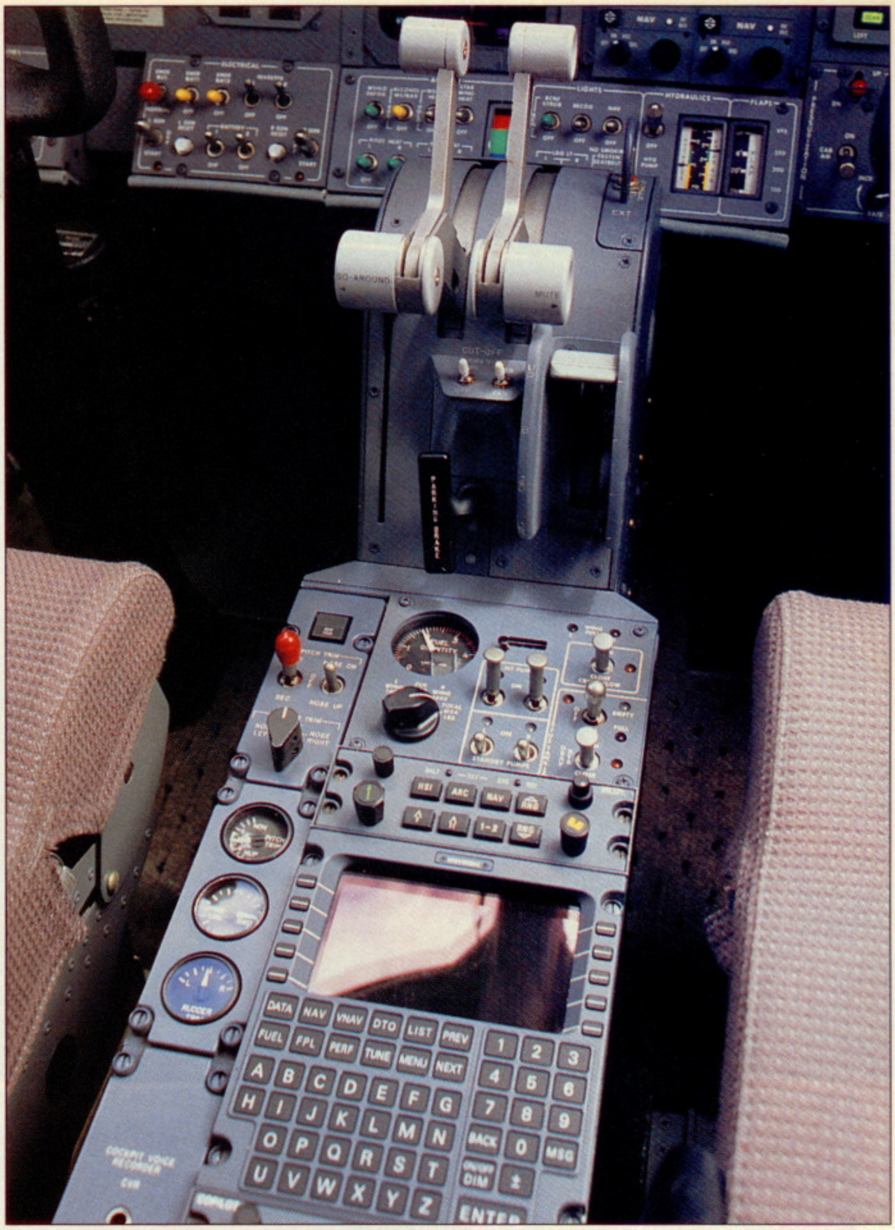
Externally, a number of minor changes differentiate the 31A from earlier models. For example, three extra inches of flap chord over the 35 and 55 airplanes give the 31A better short-field performance.

Up front, it's the glass cockpit that sets the 31A apart from the original 31. The 31 used electromechanical instrumentation, a JET autopilot/flight director, and Collins Proline II avionics. The 31A, which debuted in the early 1990s, carries a five-tube AlliedSignal EFIS. The Bendix/King KFC 3100 flight control system is truly remarkable in its capabilities. And with dual everything, the variations on what can be displayed on any one tube when another one goes down is almost beyond description.

Yet despite the system's complexities and capabilities, Editor at Large Tom Horne and I felt quite at home in the 31A after spending three half-days in the FlightSafety International Learjet 31A simulator in Tucson (see "Two in the Sweatbox," p. T-16). In fact, the simulator is so exact in both appearance and handling that moving from it to the real thing, you can't help asking, "Is it live or is it Memorex?" If anything, the simulator is slightly more difficult to fly than the real airplane. For example, the airplane's electric nosegear steering system is sensitive, for sure, but it's not nearly as challenging on the initial takeoff roll as it is in the simulator.

After our brief FSI experience, we felt as though we were off to a good start in learning to fly the airplane, but it's obvious that the full two-week initial course is necessary to become truly comfortable in the cockpit. In fact, dozens of hours of experience would be necessary to take full advantage of the flight control system alone.

But when it comes to flying an airplane as capable as the Learjet 31A, the last thing a pilot wants to do is spend time head-down in the cockpit. Instead, the time should be spent up high, enjoying the view of the world streaking by the Learjet's signature wrap-around windshield. □



Learjet 31A
Price: $4.9 million

Specifications

Powerplants	2 Garrett TFE731-2-3B turbofans, 3,500 lbst ea
Length	48 ft 8 in
Height	12 ft 3 in
Wingspan	43 ft 10 in
Wing area	264.41 sq ft
Wing loading	62.40 lb/sq ft
Power loading	2.36 lb/lbst
Seats	10 max
Cabin length	20 ft 7 in
Cabin width	4 ft 11 in
Cabin height	4 ft 6 in
Empty weight	10,698 lb
Max ramp weight	16,750 lb
Max takeoff weight	16,500 lb
Useful load	6,052 lb
Zero fuel weight	13,000 lb
Fuel capacity	4,653 lb

Performance

Balanced field length	3,280 ft
Rate of climb, engine out	1,530 fpm
Rate of climb, two engines	5,100 fpm
Cruise speed, max	481 kt
Max certified altitude	51,000 ft
Landing distance	2,767 ft

Limiting and Recommended Airspeeds

V_1	111 kt
V_R	118 kt
V_2	122 kt
V_{LO} (extend and retract)	200 kt
V_{LE}	260 kt
V_{FE} (8 degrees)	250 kt
V_{FE} (20 degrees)	200 kt
V_{FE} (40 degrees)	150 kt
V_{MO} (SL to 27,500 ft)	325 kt
M_{MO} (27,500 ft to 43,000 ft)	M 0.81
M_{MO} (43,000 to 47,000 ft)	M 0.81-0.79
M_{MO} (above 47,000 ft)	M 0.79

For more information, contact Learjet Incorporated, One Learjet Way, Wichita, Kansas 67277-7707; telephone 316/946-3085, fax 316/946-2220.

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