Pilot Report: Lear Jet 24

Second generation Lear Jet retains the high performance, adds payload and the mystique of transport category certification.

By Barry Tully/Associate Editor

Transport category certification, like the Bill of Rights, is something that most corporate pilots stand ready to defend with lives, liberty and sacred honor, but few can explain in detail.

This blind devotion to a code, abhorrent to political and aeronautical freethinkers, we explain away with the reasoning: These documents offer basic guarantees, which we accept in principle, but choose not to explore in detail. In the marketing of the Lear Jet Model 23, however, this doctrinaire intransigence (toward the T-category, not the Bill of Rights) presented a distinct, very practical problem.

The Lear Jet Model 23 was certificated under CAR Part 3 (under 12,500 lb), in line with the company philosophy to produce a high speed, low cost corporate transport. This approach required less extensive certification testing, and resulted in foreshortened development and a low, low ($600,000) price. The success of this philosophy is evident in the 100 Model 23s delivered, but, despite strong salesmanship, many pilots (and many companies) would not consider the aircraft simply because "it doesn't meet 4b." Whether the pilot knew what it was in the transport category that he required, or whether he didn't, the result was the same-almost insurmountable sales resistance.

Model 23 operators had another compelling reason for transport category certification-growth potential. Transport category jets can grow in terms of weight (empty, fuel and gross) by meeting structural and performance criteria. But any weight added to the Model 23 had to be lopped off the payload by the procrustean 12,500 lb gross (and resultant 9,000 lb zero fuel) weight.

Hence, a transport category version of the Lear Jet became a necessity and at the 1965 NBAA convention at Los Angeles the company heralded the new Model 24 with "not Part 3, not 4b, but FAR 25." This last reference was to the transport category in the revised edition, under which the Model 24 (somewhat modified from the original specifications) was duly certificated on March 17, 1966.

By May, the transport category Lear Jet was in production and available to business aviation at a price of $649,000, some $50,000 more than its Part 3 predecessor. On May 26, the new model achieved renown when it completed an around-the-world flight from Wichita in a total elapsed time of 65 hr, 40 min.

From a recognition standpoint, the Model 24 is virtually indistinguishable from the original Lear Jet. Now gross weight is 13,000 lb (13,300 lb ramp weight) and the plane has such standard T-category accouterments as engine fire extinguishers, birdproof windshield, cabin seatbelt lights and visible locking pins in the entrance door. Some minor aerodynamic modifications have been made in the vortex generator pattern on the upper wing surface and a "stick puller" (to apply back pressure to the elevators) has been added to slow the craft in the event Vmo, (305 kt) or Mmo (Mach 0.81) is, exceeded.

On a trip to Lear Jet to sample the flying qualities of the new Lear Jet, we found none in an up status. Rather than wait in Wichita, we arranged to fly to Chicago O'Hare Airport to meet N425NJ, one of the early Model 24s. Piloting the plane was Ed McCready of Northern Air Service, Grand Rapids, Mich. McCready had just become a Lear Jet dealer and had recently made the transition to the plane.

A light rain limited our preflight to the essentials and we readily concurred when McCready suggested making the takeoff and IFR climbout with his copilot. This gave us an opportunity to inspect the cabin and to check our notes made with Lear project engineers while McCready coped with O'Hare departure control.

From the piloting standpoint, a big improvement in the Model 24 is fuel control with the new jet pump fuel system. A battery start was made; fuel pressure supplied by a DC pump until lightoff. Thence, engine-driven pumps supply high-pressure "motive flow" fuel to the jet pumps, which are the prime source of fuel from the wing tanks to the engines. The fuel control panel is straightforward: toggle switches control left and right jet pumps, electric standby pumps fuselage tank transfer and crossflow. Normally each "side" supplies fuel to its respective engines; however, a crossflow permits imbalance to be equalized and makes all fuel available to either engine. A single gage shows capacity of any tank as well as total fuel. A fuel counter is optional.

Our gross weight was about 11,000 lb with four on board and less than full fuel. Balanced field length from O'Hare at 70°F was about 4,000 ft. Takeoff performance is quite similar to the older aircraft; more important to the pilot is that the 500 lb gross weight increase affords more leeway in load scheduling.

Our radar-vectored climb with holds at 5,000 and 12,000 ft was typical of instrument departures from busy terminal areas. Best climb in the plane is 300 kt indicated to 31,000 and Mach 0.7 on up to cruise.

Blue skies appeared at 28,000 ft and we slid up into the front. The cockpit panel is changed for the better with "T" configuration flight instruments built around a Lear attitude gyro and Collins PN-101 nav display. The Collins FD-108 flight director is a popular option.

Normal flight operation is conducted with the Lear automatic flight control system, but we turned this off to sample the control feel of the 24. Normal cruise in the plane is 0.77 Mach at 41,000 ft (441 kt under standard conditions). High speed can be maintained at Mach 0.80 (458 kt, ISA) with some range sacrifices.

Most pilots flight plan the Lear Jet for 41,000 ft unless short range (our destination was Detroit, 196 nm distant) or severe headwinds dictate otherwise. This flight level offers best economy and is the operational ceiling of the aircraft. Full fuel with our passenger load of two, and 60 lb of baggage would be 5,350 lb in the Model 24. This would be sufficient for a VFR flight (with 45 min reserve on landing) of 1,600 nm. Add two more passengers and bags, and fuel load decreases to 4950 lb and the range to 1,450 nm. A full house (eight total) cuts takeoff fuel allowance to 4,550 lb, sufficient for a VFR flight to 1,300 nm. These theoretical flight profiles assume standard conditions, 41,000 ft cruise, no wind, direct climb and descent with 45 min fuel left on landing. No provision is made for missed approach or cruise to alternate.

Detroit, our destination, was VFR with scattered clouds so we descended below 24,000 ft and canceled. Descents normally are made at 250 KIAS to stay well below the Mmo/Vmo We let the speed build to this value to sample the effect of the stick puller. The back pressure imposed by the puller upon reaching limit speed is light, but firm. Actuation of this stick force unit is rarely encountered during normal speedbrake descents, although, according to Lear test pilot Bob Fisher, it (the stick puller is set at 305 kt) is sometimes encountered on production test flights when pilots make high-speed letdowns.

The 305 kt Vno is some 50 kt below that for the 23 and, paradoxically, is the result of the stronger, birdproof windshield. But, this is the speed at which the windshield was tested. Hence, this becomes Vno. The windshield itself is heavy Plexiglass and our's created some distortion on the curves.

The control feel, as far as we could tell, was indistinguishable from that of the Model 23.

However because of the aerodynamic modifications some pilots claim they can detect more stability in the newer model. But, most experienced Lear Jet pilots we queried said that the two planes were virtually identical from the standpoint of control "feel." One pilot said that there was more "difference" between an early and late Model 23, than between a late 23 and the Model 24.

The Lear Jet we flew handled smoothly. With unboosted flight controls and electric trim, the plane was easy to control. Like any jet, altitude control, sans autopilot, is a strictly instrument procedure and elevator trim is relied upon to maintain attitude control during banked turns.

The electrical system of the Model 24 consists of dual 400-amp DC starter-generators, either one of which can supply the full electrical load. AC powered equipment operates from two 400-KVA inverters. Loss of the main inverter renders the weather radar inoperative.

An Emergency Powerpack

New with the Model 24 is an emergency power pack fitted under the copilot's seat in the high density Lear Jet (the autopilot is under the pilot seat). The emergency power pack is completely independent of the aircraft electrical system except for a continuous trickle charge on the 28-volt Sonotone nickel cadmium battery. This keeps the unit in constant readiness to supply one hour of power to the copilot's attitude and directional gyros in the event of a complete electrical failure. Thus basic flight instruments would continue to function along with sufficient navigation and communication gear for a safe landing in IFR conditions. Specifically, the battery power pack energizes a Bayside 990 VHF transceiver, Bendix ADF, copilots audio panel, stabilizer and aileron trim, nose wheel shimmy dampener and turn coordinator along with the copilots flight instruments.

Hydraulic system functions when in the emergency mode — gear, flaps and spoilers — are operated in the normal manner while holding a momentary power switch. In essence, the separate power pack supplies the basic DC power normally received from the aircraft battery. (Lear Jets have a single nickel cadmium 28-volt battery in the electrical system.) This saves the complexity of designing an emergency bus system as well as adding a larger battery.

An electric hydraulic pump supplies system pressure on a standby basis, however either of the two engine-driven pumps can deliver full 1,500 psi system pressure, and, for gear extension and braking, a pneumatic blowdown provides the backup in the event fluid loss or multiple failures render the normal system inoperative.

Single engine flight in the new Lear Jet 24, like that in the former model, is routine in cruising flight. The high thrust-to-weight ratio, for practical purposes, remains unchanged. Most noticeable effect of pulling an engine back is the "pressure bump" as the pressurization system struggles to catch up (i.e., supply full cabin pressure from one engine).

Unrestricted descent from altitude in the Model 24 can be conducted at 250 KIAS and 250 fpm. This no-wind flight profile for this descent calls for beginning descent at 90 nm (16 min) out from 40,000 ft. In practice, however, most descents are at the pleasure of air traffic control.

Increased maximum pressure differential on the new model Lear Jet (8.78 psi) will maintain a 7,000-ft cabin altitude at flight level 410.

The Model 23 maintained an 8.0 psi difference. Pressurization is derived from bleed air with either engine able to maintain full cabin pressure.

Landing the 24

Landing weight of the new Lear Jet is 11,880 lb, and it handles just like the older model. Reference speed for final approach can be computed mentally with the following rule of thumb: At 10,000 lb landing weight, approach speed (full flaps) is 112 kt and add or subtract 5 kt for each 1,000 lb over or under 10,000.

Pilots flying planes equipped with a fuel counter can merely subtract fuel burnoff from ramp weight on leaving the chocks to find landing gross. This mental computation will come close enough to charted performance figures for any practical landing situation.

Most pilots tend to bring the plane around on the fast side, which will result in some float. However, this can be partly offset by reducing height over the threshold to prevent excessive landing distance.

Stall speed in the aircraft (at gross weight) with gear and landing flaps is 100 kt. Thus even at landing weight, one should remain well above this figure until power is induced for touchdown. Most pilots experience more trouble getting slowed sufficiently, however on transitioning flights.

We had some 7,000 ft available on Detroit Metro's Runway 21L, hence, stopping the aircraft was not a problem.

Taxiing back at Metro we decided that the T-category Lear Jet offers few, if any, difference in flight characteristics over its successful predecessor. The instrument panel is a decided improvement and from a systems standpoint, the new fuel control offers greater simplicity and the emergency battery pack, greater back up reliability.

From a loading standpoint, the Model 24 with some 300-lb more payload will be welcomed by the corporate pilot, but this is hardly enough to warrant the interest of a charter/air taxi operator. These owners will no doubt continue to fly the Model 23 until the 10-place Model 25 becomes available. This aircraft, with its 33 percent greater passenger seating capacity, offers considerably more potential as a profit maker.

But for the chief pilot who won't consider a Lear Jet until it "meets 4b," the Model 24 has arrived. B/CA

Lear Jet Model 24 Performance

Takeoff distance	
(BFL, sea level, ISA)	4,800 ft
Max climb	
(sea level, gross)	
All engines	6,300 fpm
Engine out	1,700 fpm
Max operating speeds	
Mmo (above 31,100 ft)	0.81 Mach
Vmo (to 31,100 ft)	300 kt
Cruise speeds	
Normal cruise	441 kt
High speed cruise	458 kt
Cruise ranges	
Normal cruise	1,220 nm
High speed	1,340 nm
Stall speeds (wings level)	
Gear, flaps up	120 kt

Gear, flaps down	100 kt
Minimum control speed	93 kt
Landing distance (anti-skid) (landing weight, sea level, ISA, over 50 ft. obstacle)	3307 ft

Specifications

Span	35.6 ft
Length	43.3 ft
Height	12.6 ft
Gross takeoff weight	13,000 lb
Taxi weight	13,300 lb
Landing weight	11,800 lb
Load factors	
Positive maneuvering load	4.4 g
Negative maneuvering load	-1.76 g
Cabin pressure differential	8.78 psi