Encore! Encore!

Cessna keeps pushing the top end of the 'light jet' envelope

BY THOMAS A. HORNE

Cessna's latest Citation—the Encore—brings more improvements to the company's growing business jet offerings. Its predecessor designs, the Citation V (in production from 1989 to 1994) and Citation V Ultra (built from 1994 to 2000), were popular enough to garner a total of 537 sales. But with the advent of ever more sophisticated avionics

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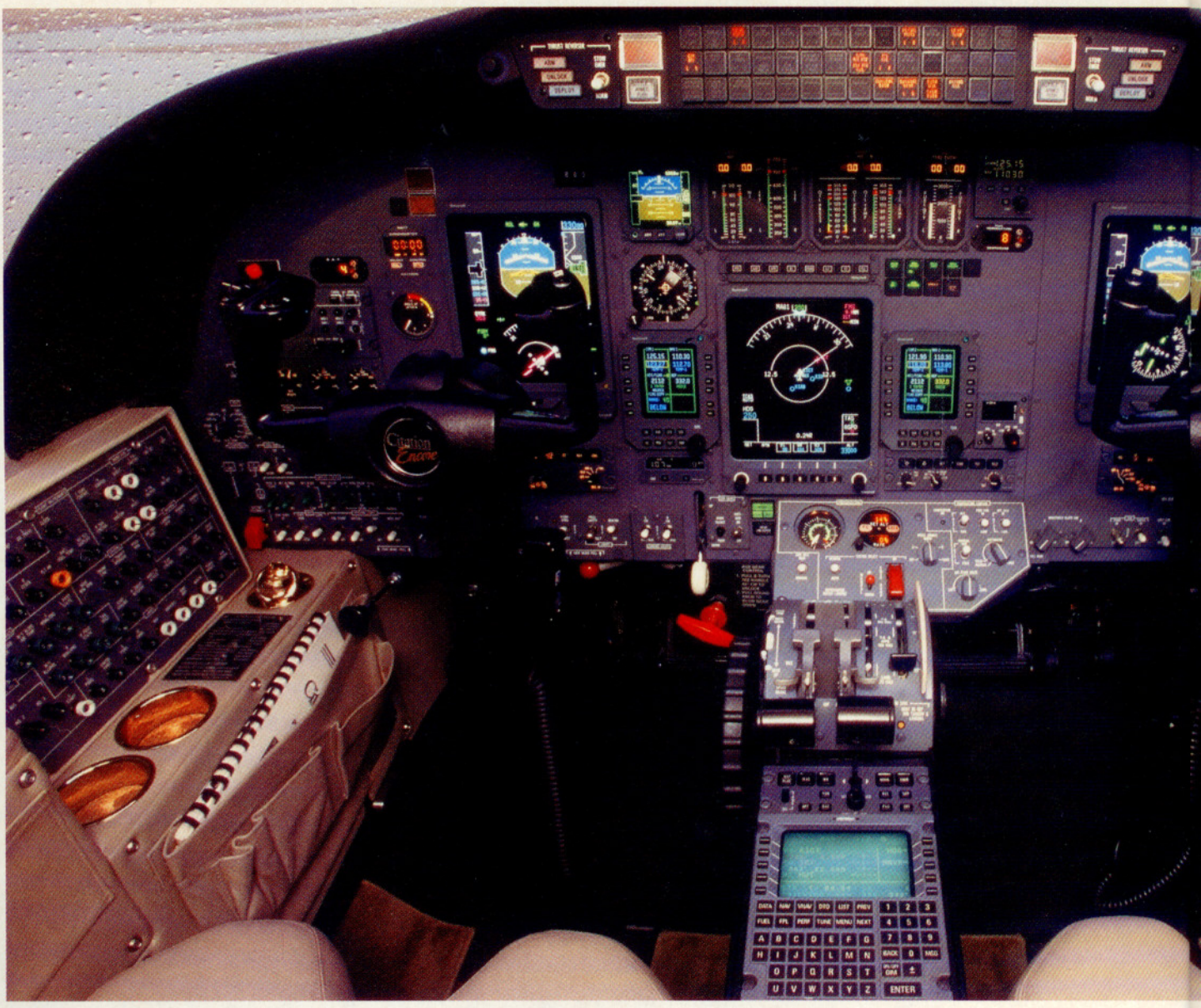

More powerful PW535 turbofans, a longer wingspan, full-span bleed-air anti-ice panels, and trailing-link landing gear distinguish the new Citation Encore. The standard, three-tube Honeywell Primus 1000 avionics suite—with a standby Meggitt combination attitude indicator/HSI color LCD—gives the Encore an additional edge over its predecessors.

avionics and more fuel-efficient and quieter engines, the decisions to incrementally improve the "old" Citation V line were inevitable. But such high-tech upgrades weren't the only issues forcing redesigns. No, siree. It seems that the V and V Ultra had earned reputations as difficult to land and taxi smoothly. For its pilots and passengers, this gripe was at the top of the list. And in a $5 million-plus, 420-knot-plus, 16,000-lb-plus, up-to-13-seat business jet, shortcomings like that can assume large proportions.

No more bump and jolt

Citation V and V Ultra pilots tried, but no matter how carefully they flared, the touchdown was more apt to be a firm bump than a roll-on squeaker. And as for taxiing, these airplanes gave a firm ride, one that seemed to transmit the jolt of passing every seam, crack, or uneveness in a runway or taxiway.

To remedy this problem, Cessna gave the Encore trailing-link main landing gear. Not exactly a manifestation of cutting-edge landing gear geometry (the Ercoupe of the 1940s had trailing-link landing gear), but certainly effective enough to consistently provide face-saving landings and docile taxis. The trailing link absorbs shocks much better than the stiff single-strut gear used in the earlier Vs and V Ultras. Now all seven Citations currently in production have trailing-link main gear.

Other airframe improvements include a 28-inch-wider wingspan, bleed-air anti-ice panels for wing leading-edge ice protection (as opposed to the earlier designs, which used a combination of bleed-air anti-ice panels on the inboard wing sections and inflatable deice boots on the remainder of the leading edges), one inch more seated headroom in the cabin, and an angle-of-attack sensor assembly that's serviceable from the outside of the airplane.

More power on less fuel

Together with the new Pratt & Whitney Canada PW535A turbofans of 3,400-pounds static thrust apiece, the extra wingspan punches the Encore 4,500 fpm. This gives the Encore a slight edge in the time-to-climb department. Where the V Ultra can climb to Flight Level 450 in 34 minutes, the Encore can get there six minutes quicker. Encore cruise speeds are faster, too. Under standard conditions, at midweight (say, 14,000 lb) and optimum altitude (FL310), the Encore can turn in a 433-kt true airspeed; that's eight knots faster than a V Ultra. At FL410, however, where the Encore can cruise at 419 kt, its speed advantage drops to a mere five knots.

Eight-knot and five-knot speed spreads may not seem like much in view of the fact that the PW535s put out a total of up to 1,000 more pounds of thrust than the older 2,900- and 3,045-lbst Pratt & Whitney JT15Ds used in the previous models. But that's not the whole story. The new engines are 15 to 16 percent more fuel efficient than the JT15Ds, Cessna says, and this lets the Encore fly farther on less fuel than the Vs or V Ultras can.

And that's a good thing, because the landing gear and hot wings take up

valuable wing volume—volume that would ordinarily be available to hold fuel. The Encore's maximum fuel capacity is 806 gallons; the V Ultra can carry 55 gallons more than that.

Finally, the PW535s, at a takeoff rating of 58 dBA, are much quieter than the V Ultra's JT15Ds, which turn in a 67.1 dBA score.

A hike in payload together with a largish—for a light jet—cabin make the Encore an airplane of choice for Executive Jets' NetJet fractional ownership fleet.

One more passenger

The stouter gear, longer wings, and more powerful engines permit yet another benefit: increased payload. Cessna says that a standard-issue Encore has a full-fuel payload of 953 lb, which is approximately 193 lb more than the V Ultra. The actual maximum payload of any individual airplane depends, of course, on its own individual empty weight and fuel loading.

In the tradeoff between range and payload, the Encore's flight planning guide states that the airplane can carry 10 passengers and two pilots as far as 1,200 nm. In more normal loading situations—say, two pilots and two passengers—the range extends to its maximum advertised value of 1,970 nm. This assumes a basic 45-minute IFR fuel reserve and a high-speed cruise at FL450 with zero wind and standard conditions. Maximum IFR range drops to approximately 1,700 nm if the planned alternate airport is 100 nm away from the destination.

Together with its largish (for a jet that pushes the very top end of the "small" jet niche) cabin, airstair entry door, refreshment center, and aft lavatory, this loading flexibility makes the Encore desirable as a high-use people-mover. Which probably explains why Executive Jet Aviation's NetJets fractional ownership program has 24 Encores on order. Since first delivery in October 2000, eight Encores have gone out the factory door.

Panel power

Some pilots are under the impression that the more sophisticated the airplane, the more complex and confusing its panels must necessarily be. Not necessarily. The Encore's Honeywell Primus 1000 avionics suite presents most of its information on three eight-by-seven-inch displays, and it's all arranged in a readable style. Each pilot has his own primary flight display (PFD), which makes use of vertical tapes for airspeed and altitude information, together with more traditional depictions of attitude indicators and horizontal situation indicators (HSIs). The centrally located multifunction display (MFD) lets you view your flight-planned legs, TCAS I or II information ($77,150 and $145,150 options, respectively), enhanced ground proximity warning system (EGPWS—a $73,550 option), weather radar returns, or any combination of the above. The MFD can also be used to plug in target V-speeds for takeoff and landing, which then appear as airspeed bugs on the PFDs' vertical tapes. Should any of the three tubes fail, reversionary modes allow you to shuttle imagery to a functioning display screen.

Another neat feature comes via the flight management system—that pedestal-mounted brain-box that uses a mixture of GPS, VOR, and DME inputs to help compute everything from navigation data to running accounts of your weight status, and your reserve fuel at the destination. The FMS also calculates and sends real-time winds aloft data to the lower left of the PFD, where the direction and speed of any head-, cross-, or tailwinds are depicted. The standard FMS is a Honeywell/AlliedSignal GNS-XL, but most choose the Universal UNS-1Csp—a $3,800 option.

Another display worth mentioning is the standby instrumentation. This consists of a Meggitt standby attitude indicator that uses a small liquid crystal display screen to show airspeed, altitude, ILS, localizer, and back-course information. An additional, mechanical HSI is provided for additional heading and VHF navigation redundancy. There's also a backup com radio.

Up on the glareshield you'll find the annunciators for emergency, cautionary, and status indications for all of the Encore's systems, along with the engine thrust reverser and fire extinguishing controls. On either side of the MFD are the Honeywell Primus II integrated radio system units; these can be used to tune in and activate VHF communications and navigation frequencies, NDBs, and transponder codes—although frequencies can also be tuned through one of the FMS's many modes of operation. A second ADF and high-frequency (HF) radios are optional.

As for the switches and other gauges, they're all strategically grouped: the ignition and electrical switches over on the left, with white switch covers; ice-protection switches near them, in green switch covers; pressurization and air conditioning controls to the front and right of the thrust levers; and the engine gauges front and center, just above the MFD. One more critically important gauge—the angle-of-attack indicator—gets prime real estate just to the left of the captain's PFD.

For a two-pilot airplane with such a full complement of standard equipment, the panel doesn't seem crowded or confusing. After an hour or so of familiarization, there's no futile searching for the information or control you're after. Now the FMS, that's another matter. Those who've never worked one before can expect to spend much of the two-week pilot initial training course (provided by FlightSafety International and included in the Encore's typically equipped, $7.5 million price) coming to terms with the GNS or UNS. Flying the airplane is easy; flying "the box" is something else.

ICT to S07

Your author's familiarization flight in the Encore went from Cessna's factory at the Wichita Mid-Continent Airport to Bend, Oregon, with some extra time spent doing practice instrument approaches to Roberts Field at nearby Redmond, Oregon. It was a trip that took three hours and 47 minutes, covered approximately 1,300 nm, and burned 4,414 pounds (about 658 gallons) of our original 5,400-lb (806 gallons) fuel load.

At a takeoff weight of 16,000 pounds, we launched out of Wichita at a rotation speed of 102 knots, then settled into a 250-kt, 1,750-fpm climb on our way to FL370 and the Hays, Kansas, VOR—the first leg of the trip. Subsequently cleared to FL390, we settled into a 426-KTAS/Mach 0.743 cruise with an unfortunate 73-kt headwind.

After the second hour, a scan through the UNS's pages showed that it

SPECSHEET

Cessna Citation Encore (C–560)

Typically equipped price: $7.5 million

Specifications

Powerplants	2 Pratt & Whitney Canada PW535A turbofans
Recommended TBO	5,000 hr
Recommended hot section interval	2,500 hr
Length	48 ft 11 in
Height	15 ft 2 in
Wingspan	54 ft 1 in
Wing area	322.3 sq ft
Maximum wing loading	51.6 lb/sq ft
Power loading @ MTOW	2.44 lb/lbst
Passenger seats	7 to 9
Cabin length	22 ft 5 in
Cabin width	4 ft 11 in
Cabin height	4 ft 8.5 in
Basic operating weight	10,477 lb
Maximum ramp weight	16,830 lb
Maximum payload	2,123 lb
Maximum payload w/full fuel	953 lb
Maximum takeoff weight	16,630 lb
Maximum landing weight	15,200 lb
Maximum zero fuel weight	12,400 lb
Fuel capacity, std	806 gal 5,400 lb
Total baggage capacity	1,410 lb, 69 cu ft

Performance

Takeoff distance (MTOW, ISA, SL)	3,560 ft
Maximum rate of climb, 2 engines	4,640 fpm
Maximum rate of climb, 1 engine	1,440 fpm
High-speed cruise, range, endurance, fuel burn (@ FL450, ISA, and zero wind, with IFR reserves)	414 KTAS; 1,800 nm; 4.6 hours; 4,400 lb
Maximum operating altitude	45,000 ft
Landing distance (MLW, ISA, SL)	2,865 ft

Limiting and Recommended Airspeeds

V_{MCA} (min control w/one engine inoperative, air)	86 KIAS
V_{MCG} (min control w/one engine inoperative, ground) flaps 7	96 KIAS
V_1 (takeoff decision speed)	98 KIAS
V_R (rotation speed)	105 KIAS
V_2 (takeoff safety speed/best single-engine rate-of-climb speed)	115 KIAS
V_2 +10 (2-engine best rate of climb)	125 KIAS
V_T (2-engine enroute climb speed)	160 KIAS
V_{YSE} (one engine inoperative best rate of climb)	180 KIAS
V_A (design maneuvering, @ 25,000 ft)	236 KIAS
V_{FE} (max flap extended) 35-degree extension	175 KIAS
15-degree extension	200 KIAS
V_{LE} (max gear extended)	292 KIAS
V_{LO} (max gear operating) Extend	250 KIAS
Retract	200 KIAS
V_{MO} (max operating) SL to 8,000 ft	261 KIAS
8,000 to 28,900 ft	292 KIAS
M_{MO} (max Mach number), 28,900 ft and above	Mach 0.755
V_{S1} (stall, clean)	97 KIAS
V_{SO} (stall, in landing configuration)	86 KIAS

For more information, contact Cessna Marketing, Cessna Aircraft Company, One Cessna Boulevard, Wichita, Kansas 67215; telephone 316/517-6449; fax 316/517-6640; or visit the Web site (www.Encore.Cessna.com).

had been keeping track of our flight with an eagle eye. Our distance flown was 861 nm; we'd used 2,745 lb of fuel; there were 1,136 lb remaining; our landing weight would be 12,378 lb; overhead Bend, we'd have enough fuel left to fly another one hour, 21 minutes, and cover 553 more miles.

It's on approach that you learn the angle-of-attack gauge's utility. There's a notch in the gauge's white arc, indicating 0.6 units of AOA (angle of attack). That's the value you're looking for on a stabilized final approach course. As a general rule, once you're set up in the landing configuration, you can use the thrust levers to set the engine fan speeds (N_1) at 60 percent. The result should yield somewhere around 0.6 units AOA. And so it was at Redmond and Bend. This, in turn, produced approach air-speeds within a few knots of the 100-kt mark. At heavier weights, expect V_{REF} speeds of 108 kt; when landing light, the magic number is as low as 91 knots.

The landings were fine, but after approaches and landings at Redmond's 7,000-foot-long, 100- and 150-foot-wide runways, Bend's 5,000-foot-long, 75-foot-wide runway looked tiny by comparison. On approach, I had a slight excess of energy. A glance at the AOA: 0.5. A glance at the airspeed: 110 kt. Speed brakes on final and gobs of reverse thrust after touchdown kept our speed down and got us stopped on the runway in style.

Like all the Citations before it, the Encore delivers a lot of performance and capability without demanding too much of its pilots. This is one of the secrets to the Citation line's string of successful designs. Some others include simplicity of design, a wide-ranging and well-marketed network of service centers, cockpit and systems standardization, competitive pricing, a wide product range, and a program of consistent upgrades.

The Encore may be the latest in the new Citation line, but it won't be the last. Next up is the Sovereign, a super-midsize business jet with a first-flight date set for early 2002 and certification scheduled by the end of 2003. Though the airplane has yet to see the light of day, it's already a success: NetJets has ordered 100 Sovereigns. We'll keep you posted as this next installment in the Citation saga makes its way to a ramp near you. AOPA

E-mail the author at tom.horne@aopa.org