Cessna entered the turboprop market in 1977 with the CE-441, well after Beech and Rockwell Commander had established themselves in that market segment. Originally trade-named “Conquest,” Cessna’s AlliedSignal TPE331-8 powered airplane was renamed “Conquest II” in 1983. The 441 was designed for performance and actually outperformed some early Citations in selected parameters. Indeed, some companies offering aftermarket performance mods for today’s Conquest fleet say an updated CE-441 can still run head-to-head with the Citation II.

The 441’s cabin is large. It can accommodate 11 passenger seats in commuter configuration, and, more typically, six or seven seats in executive configuration. The airplane’s long nose has two separate baggage bays, with the avionics rack in the forward bay and the batteries stowed under the rear bay floor. There also is a large baggage area in the aft cabin. The cabin has a large two-part airstair door, and a wide, three-part door option was available.

The cockpit is laid out in typical Cessna 400 series fashion, reflecting the lessons learned in developing the much-praised Citation cockpit. Pilot seats are comfortable and large and there is good visibility out of the cockpit windows.

Standard avionics, which included an RMI, transponder with encoder, weather radar and a flight control system, was (except for the radar) from Cessna’s electronics subsidiary, Aircraft Radio Corp. (ARC). An optional Collins package, which many customers preferred, was available. However, the FCS 1000 flight director was the only FCS available until the very end of production. Ultimately some 15 airplanes went out the door with the Sperry (Honeywell) SPZ-500.

Many turboprops of the day were poor performers between 17,000 and 25,000 feet because of powerplant and environmental system limitations. But, the Conquest II can roll right up to and above FL 300 except in very high temperatures. Early 441’s can reach FL 330 in about 25 minutes using a recommended cruise climb of 160 KIAS (130 above FL 250) in ISA standard day conditions after a takeoff at a MTOW of 9,850 pounds.

Cruise speed tops out at 276 KTAS. Maximum effort, zero-wind, VFR range is just under 2,000 nm. (See the accompanying specifications.)

The performance of the Conquest extends beyond all-out speed or seats-empty range. It offers flexibility, comfortably handling the more typical (shorter) distances of most business trips and hauling a lot of payload, while still providing near-jet performance to handle longer legs.

Development

A total of 362 CE-441’s were manufactured. According to Aviation Data Ser-
The CE-441 horizontal stabilizer (below) was designed with pronounced dihedral to minimize the effects of propeller whirl mode vibration, but failures required significant redesign. Right: The long nose provides generous baggage space and easy access.


The CE-441 was grounded twice during its first two years in service. Failure of the trim tab actuator jack screws and subsequent elevator flutter led to in-flight airframe failure of the sixth production airplane.

The final fix was a complete redesign of the horizontal tailplane, including thicker skins, a redesigned leading edge and elevators, additional ribs and a second spar in the horizontal stabilizer. The fix included a new aft fairing and dual trim tab actuators. The AD (79-19-13) detailing the modification also required inspection and modification or replacement of the tailcone shelf assembly. The model was re-certificated in 1979. The first 109 production aircraft were 1978 and 1979 models. The AD applied to Serial Numbers 001 to 0106 and to Serial Number 0109.

Cessna worked vigorously to support its customers during the lengthy tail-fix down time, including supplying them with replacement piston twins while the 441 fix was developed. In a big step forward in customer service, Cessna also developed fixes for other shortcomings and frequently picked up much of the cost, too.

During its short manufacturing span, list price of a factory-equipped airplane nearly doubled from $925,000 to $1,795,000.

For the 1981 model year, maximum operating altitude was increased to FL 350, beginning with Serial Number 0173. Cessna offered a high-altitude kit (SK 441-36) to owners of earlier aircraft. At the same time, the single battery switch was changed to individual switches for each of the two nickel cadmium batteries, and a service retrofit kit was made available for this change, as well (SK 441-37).

Operating experience turned up a number of other problems that were addressed during the production run. The engine fuel nozzles, for example, proved troublesome in service, and the combustor chamber was prone to carbon buildup, which not only reduced performance but also could create hot spots that could lead to combustor damage.

Starter/generators and batteries provided less than optimum service in the field. The windows developed a number of problems early on, including delamination, and improved units were developed. Many operators converted to glass windshields.

Cessna made many of the product improvement service bulletins and kits available at no charge to operators.

Among several changes introduced at Serial Number 0260 (during the 1982 model year) was the addition of windshield defoog blowers to help handle condensation in the cockpit (SK 441-72). The last major change was the introduction of an engine power management system (PMS) with Serial Number 0340. Service kit SK 441-79 was made available for retrofit.

The End of the Line

There is some question about whether any 441’s were actually built in 1986 or whether they were actually inventory built in 1984 or 1985 and carried forward. More important is that Cessna had reached the end of the line for all turbo-prop products except for the single P&W PT6 powered Caravan. In 1986, Cessna evaluated a follow-on, economy version of the 441, powered by PT6s. It was not a go then, nor did it pass muster with the dealer organization in the early 1990s when planners again proposed the program. Dealers thought the P&W-powered version would be a step backwards because, in the words of one, “it couldn’t climb, go as fast or as high as the Conquest II.”

Despite fairly extensive service problems with the AlliedSignal TPE331-8 engines, there have been only five ADs issued to date. Three—92-02-19, 93-02-19, which superseded the previous AD, and 93-02-01—addressed fuel manifold problems. They all had very short compliance periods. The most recent, 95-1608, required an extensive review of records and mandatory engine disassembly if any major work had been done by Fliteline Maintenance of Wharton, Texas and two specifically named mechanics, or if any life-limited parts had been supplied by them.

The most recent ADs are blanket ones, affecting many aircraft. AD 97-25-04, requires changes to the AFM to prohibit positioning the power levers below the flight idle stop in flight. Another directive affects operation in icing conditions (See Intelligence, April 1998, page 20.)

According to one Conquest specialist, John Bertiz, business development manager at Executive Wings, Inc. of Lake-land, Fla., “AD searches on Conquests are fairly easy. We do a number of pre-buy inspections, and ADs and service bulletins are not big issues. The main questions are whether the customer is getting a good airplane for the price.”

Propulsion System

The TPE331-8, rated at 636 shp, and developed for the CE-441, provided excellent performance for the price.
However, reliability issues quickly arose. Fuel nozzle problems and maintenance requirements, carbon buildup in the combustor and performance deterioration in relatively few operating hours due to turbine blade erosion were among operator complaints. (See “Operator Survey,” November 1984, page 42). The -8 has short major service intervals—hot section inspections at 1,500-hour intervals and a 3,000-hour TBO. Operators have not liked the high cost of major maintenance, either.

Executive Wings claims to be the pioneer in upgrading the -8 for maintainability and reliability, obtaining two STCs in March 1991. The improvements developed involve exchanging the -8 combustor and turbine with components developed for the TPE331-10 series.

This change addresses another issue, since the -10 includes duplex, two-headed fuel nozzles. At first, the company called its mods the “Super 8 Engine Conversion.” It is now trademarked as the “Executive Five Eleven” conversion. HSI is extended to 2,500 hours; TBO is stretched to 5,000 hours. Among other advantages Executive Wings claims are reduction of HSI costs of from 30 to 50 percent, fuel nozzle maintenance costs cut by as much as 75 percent—from an average of $8 per hour to $2—and reduced turbine blade carbon erosion. The -10 first stage turbine wheels are air-cooled. They also are segmented and have replaceable blades. The modification can reduce 441 operating costs up to $155 per hour compared to a standard 441, according to Executive Wings.

Berizzi says the initial objective of the conversion was to cut maintenance costs and improve reliability. The substantial performance improvement, including the ability to carry full power to FL 260, up from FL 220 in standard conditions, and an increase in cruise speed of from 25 KTAS to 30 KTAS, were bonuses, he
Operations

AlliedSignal in 1992 and obtained an Colo. approached the -8 in a different engines. license covers -1 through -11 series overhaul facility. The repair station Wings was FAA approved as a TPE331-10N engines on the Conquest II. Customer engines are removed at West Star and shipped to AlliedSignal’s Phoenix facility for modification and then returned to Grand Junction for installation and final rigging.

West Star’s conversion is trademarked as the Dash 10 and offers comparable benefits. Russ Williams, West Star’s vice president of business development, says time-to-climb to cruise altitude improves by eight to 10 percent, cruise speed increases an average of 25 knots and hourly total cost, including reserves, can be reduced by as much as 11 percent. Williams estimates DOCs range from $300 to $350 per hour depending on stage lengths, power settings and average fuel costs.

The higher power output at altitude claims. In September 1997, Executive Wings was FAA approved as a TPE331 overhaul facility. The repair station license covers -1 through -11 series engines.

West Star Aviation of Grand Junction, Colo. approached the -8 in a different way. The company teamed with AlliedSignal in 1992 and obtained an STC to install factory-modified TPE331-10N engines on the Conquest II. Customer engines are removed at West Star and shipped to AlliedSignal’s Phoenix facility for modification and then returned to Grand Junction for installation and final rigging.

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The higher power output at altitude

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### Mods, Support, Training and ADs

➤ Propellers—Hartzell initially supplied the original equipment propellers. According to West Star’s Williams, Cessna installed McCauley three-blade propellers with Serial Number 0196. Both are 90 inches in diameter.

The Conquest’s long nose is an effective transmitter of noise and vibration generated by the props. Depending upon power selection, the noise can be more pronounced in the cabin than in the cockpit.

Blade-tip ground clearance is 10.2 inches. Blade erosion from dust, debris and water is a concern, and so is the possibility of prop strikes when taxiing over uneven ground.

Berizzi of Executive Wings says his company worked with Hartzell to develop four-blade propellers to replace the OEM three-blade units. Tip clearance is increased by 2 1/4 inches. Executive Wings claims an eight- to 10-dB noise reduction in the cabin, decreased takeoff roll (primarily because of faster acceleration from more propeller efficiency), a 400- to 500-fpm rate of climb improvement and a three- to five-knot cruise speed increase. The replacement propellers have a five-year or 3,000-hour TBO.

McCauley has STCed a BlackMac four-blade conversion for the 441. As with the Hartzell replacement props, they can be installed on aircraft powered by either an original -8 engine or the -10 conversion. They offer similar performance and sound reduction improvements. Diameter is 88.0 inches, and McCauley notes that the four-blade conversion reduces flyover noise as well as cabin sound levels. Recommended TBO is the earlier of 4,000 hours or 72 calendar months.

Either conversion is available from both Executive Wings and West Star Aviation. Executive is pricing the Hartzell propeller switch at $33,900 for aircraft with original McCauley propellers and $37,250 for aircraft with Hartzell props. Its conversion price for the McCauley BlackMac is $37,500. West Star’s price for either is $37,500.

➤ Batteries—Original equipment batteries are two, 25.5 volt, 22 ampere-hour nickel cadmium units. Marathon Battery Products was the source until Cessna changed to SAFT America with Serial Number 0340. The batteries, called “half-height” by some also provide about half the cranking power of full-size nickel cadmium batteries. Marathon has developed a modification that drops the battery box base to permit installation of full-size nickel cadmium units.

There are lead acid battery conversions. Premier Air Center of East Alton, Ill., offers one that costs $5,000, or about the cost of a nickel cadmium battery, according to Rick Micacek of Premier. It provides more cranking power and simplifies maintenance. This is important at an airport with marginal service. Premier recommends that operators replace lead acid batteries every two years. They cost approximately $800 each.

Premier also offers stainless steel exhaust fairings to replace the original equipment overwing exhaust duct. Exhaust heat embrittles the surrounding fiberglass, which then begins to deteriorate, leaving no support or attachment for the exhaust duct. The replacement ducts provide a metal-to-metal structure.

➤ Other Operational Mods—Both Executive Wings and West Star Aviation offer a number of other modifications. Executive has a reduced-drag wing tip mod ($5,900) that provides a slight cruise speed increase. The greatest advantage, according to Berizzi, is improved stability at altitude. It also reduces autopilot workload.

West Star Aviation offers a Rockwell Collins APS-65 retrofit, a digital flight control system and three-axis autopilot that adds a number of features to reduce pilot workload and increase passenger comfort. Features include improved altitude preselect and hold, indicated airspeed and vertical speed hold, and half-bank and soft ride modes. It is certificated to Category II approach standards.

West Star charges $124,500 to remove the ARC 1000 and install the APS-65. For an operator who is planning to keep a 441, it can pay off economically and operationally.

➤ Increase Weight Kit—Boundary Layer Research of Everett, Wash. has received an STC to add vortex generators to flying surfaces. The kit permits an increase of ramp weight from 9,925 to 10,240 pounds; max takeoff from 9,850 to 10,165 pounds; and zero fuel weight from 8,500 to 8,815 pounds. Max landing weight remains at 9,360 pounds. Stall speeds increase by one knot at the higher weight: Vs goes from 89 to 90 KIAS and Vso from 74 to 75 KIAS. YMCA remains at 91 KIAS. Kit price is $5,995 excluding shipping and handling. BLR estimated installation time is three hours. According to Robert de Roche of BLR, the company is evaluating development of a modification to further increase operating weights.

➤ Noise Control—Cabin noise levels remain a major passenger gripe, while temperature control runs a close second. Both Executive Wings and West Star have developed mods that involve relining the interior of the cabin to deaden sound. Executive Wings says its $7,200 retrofit reduces cabin noise levels by four to six dB. West Star says its mod costs $7,500 and involves the removal and replacement of original insulation with sound-deadening materials and new insulation. Both firms add inner cabin window
comes at the expense of a seven to 10 per-
cent increase in fuel burned. Both West
Star and Executive Wings say reduced
block times compensate for the fuel
burned, and customer comments support
the claims.

Each company offers two conversion
options. The first is a continued-time
conversion, which could be done if
engines were approaching an HSI inter-
val or needed maintenance. West Star's
Dash 10 continued-time conversion
includes an HSI, a gear box inspection, a
functional check of accessories (but no
accessory overhaul), new hoses and
engine mounts, tests and documentation.
West Star charges approximately
$302,000. Executive Wings charges
$267,500 for its continued-time conver-
sion. A fully overhauled, zero-time con-
version costs approximately $430,000 at
Executive Wings and $454,000 at West
Star.

Executive Wings has completed 65
conversions; West Star Aviation had done
150 as of press time. Thus, 68 percent of
the fleet has undergone the engine
upgrade. The two firms are fierce com-
petitors. Conquest operators interested in
upgrading their airplanes are advised to
talk to both companies to determine the
relative merits.

THE MARKET

Aftermarket suppliers stress the increase
in resale value some modifications add,
particularly performance and reliability
improvements such as the -10 engine
conversion. Resale prices would seem to
bear out their claims. Williams of West
Star stressed to B/CA that the Aircraft
Blue Book Price Digest reports an
increase of $18,000 to $19,000 in the last
quarter, with estimated market values of
even the oldest aircraft of more than $1
million, and that these are for TPE331-8-
powered aircraft. Williams claims that
-10 Conquests are worth from $250,000
to $300,000 more than unmodified air-
planes.

Conquest specialists think a number of
operators are making investments that
represent 25 percent or more of the cur-
rent value of their aircraft because they
plan to keep operating them well into the
future.

According to numbers offered by
Williams, average total time of the 441
fleet ranges from just under 3,700 hours
for late model aircraft to nearly 6,200
hours for early serial numbers. With an
annual hourly utilization of 308 hours,
there is a lot of useful time left for the
fleet. The only life-limited airframe ele-
ment at this point are the aileron hinges,
which have a 10,000 hour life. If averages
are any guide, it will be more than 12
years before the average high-time air-
plane approaches 10,000 hours.

The bad news is that the returning
appeal and the improvements available
for the Conquest II have driven up prices
and constrained the availability of aircraft
at the same time.

Popularity comes and goes with air-
planes just as it does with entertainers.
Yesterday's dog is tomorrow's darling, and
vice versa. In the current situation, the
441 appears more in the desirable col-
umn. As an example, a 1981 model that
had depreciated to, or had reached a
residual value of—in market demand
terms—roughly 64 percent of its original
price in 1987 has now climbed back up to
82 percent. B/CA
stabilizer forward attach bulkhead for cracks. The structure must be replaced if cracks are found before further flight. Installation of SK 441-103A is terminating action for the repeat inspections.

95-25-10—Replace outflow/safety valve. (Requires the replacement of cabin pressure outflow valves to prevent cracking and depressurization).