B/CA Analysis: Cessna 425 Corsair

Cessna has designed an excellent "step-up" turboprop for operators of the company's popular 400 series. Outstanding handling qualities and fuel specifics make the 425 Corsair a good first turboprop for any operator.

By Richard N. Aarons

It's a pretty safe bet that no one will ever come up with the "perfect" airplane-the airplane that is all things to all people.

However, every once in a great while, a manufacturer seems to get just the right combination of airframe, engine and systems to produce an airplane that becomes a "standard within class;" an airplane that pilots, passengers, and accountants can love.

It will be years before the final verdict is in on Cessna's newest turboprop executive transport, but our guess is that this machine, the Model 425 Corsair, will become just such a standard in the light turboprop class.

At first glance, the 425 Corsair is simply a 421 Golden Eagle reengined with Pratt & Whitney PT6A-112 powerplants. As you know, however, nothing is simple in a major redesign and new certification.

To be sure, the Corsair's "wide-oval" cabin geometry is based on the 421 and so is the basic shape of its airfoil, its trailing-link landing gear concept and many of its non-powerplant-related systems. But the transition from recip engines to turboprop power required structural redesign in the fuselage, wing and empennage.

The goals of the 425 design team were pretty straightforward:

➤Produce a relatively small-cabin (six- to eight-place) turboprop executive transport that had especially good fuel specifics at altitude.

➤Produce an aircraft with handling characteristics and systems that facilitate quick and safe transition by piston-twin pilots.

➤Produce a logical "step-up" airplane for the 400-series Cessna owners who until now had to go out of brand to get onto the first rung of the turboprop ladder.

In our opinion, Cessna's design concepts are good and their execution is even better.

The heart of the Corsair, of course, is its powerplant. The Pratt & Whitney PT6A-112 is flat-rated to 450 shp each in the Model 425. Basically the -112 is the same engine that powers Piper's Cheyenne I (the PT6A-11), but in the Piper installation it produces 500 shp.

The rather dramatic flat rating in the Cessna installation increases the altitude at which full power can be drawn. For example, in the 425 installation the engines can produce rated takeoff thrust to 17,700 feet or, looking at it another way, at sea-level ambient temperatures up to 53°C.

Operationally, this approach provides some interesting improvements. For instance, most light turboprops realize their fastest cruise speeds at relatively low altitudes, usually between 10,000 and 14,000 feet, where fuel specifics are relatively poor. The Corsair's maximum cruise speed of 264 KTAS occurs at 17,700 feet. (You can see the results of this difference in the Comparison Profile high-speed cruise parameters.) To take advantage of the -112's high-altitude performance, Cessna engineers went to a relatively high-aspect ratio wing. This improved both climb rates and cruise specifics at higher altitudes.

Thus the powerplants and wing design work together to optimize the airplane for high-altitude missions.

Some comparative figures may put this into perspective. At 12,000 feet, the Corsair's maxi-

mum-power cruise speed is only about a knot or two faster than Beech's E-90 and Piper's Cheyenne 1. All three of these airplanes are about 20 knots faster than the Beech C-90 King Air. However, at this altitude the Cheyenne II beats the Corsair by some 30 knots and the King Air F-90 beats the Corsair by about 18 knots.

The picture changes significantly at 18,000 feet where only the Cheyenne II is faster than the Corsair and even at that, its lead has been whittled down to some nine knots. At 25,000 feet, where the Corsair's cabin altitude is 10,000 feet, the Cessna airplane takes the lead and becomes the fastest (and most fuel-efficient) of the group.

Of course, all of this makes operational sense only if the Corsair can get to altitude rapidly to take advantage of these features. It can - and we'll talk more about that a little later.

Fine Workship

Our introduction to the Corsair came at Cessna's Air Transportation Department facilities in Wichita. The machine we evaluated was the fourth production aircraft and had just completed the nationwide circuit of dealer demonstrations.

Frankly, the first thing we looked at was the detail work. It's no secret that Cessna's Wallace Division has been working to cure quality control problems since the beginning of 1980. If the craftsmanship on the 425 is an example of what's happening in the rest of the Wallace Division, it's obvious they've got their act together.

The workmanship on this airplane, inside and out, is better than any we've seen on a new offering from Cessna. During the walkaround the attention to detail is evident in panel mating, filling, rivet polishing, sealing, bonding and painting. A similar fine attention to — detail is demonstrated in the interior appointments.

External walkaround is pretty standard. Engine fluid levels can be reached without a ladder, as can the avionics bay. The metal-to-metal bonded wet wings are (as the Cessna brochures point out) smooth as glass. The wings forward of the rear spar and outboard of the nacelles are wet. A "collector" tank at each wing root houses boost pumps and collects fuel from the wing and (standard) nacelle tanks. Total capacity is 2,452 pounds.

All fueling is accomplished via the nacelle tank fillers. (There are no fillers for the wing tanks.) We suspect this arrangement could create some problems when impatient line personnel fail to allow proper drain-down time during a top-off. At the very least, fueling will require crew vigilance to be sure the required fuel is, in fact, delivered. But on the plus side, there is no way with this arrangement that you can open a filler cap below the fuel head and create a major fuel spill, as can happen with some turboprops.

Our guess is that many folks new to the Corsair will spend a bit of preflight time looking at the empennage. The vertical tail has a 421-look about it. However, the horizontal tail has the same dramatic dihedral — in this case, 12 degrees — seen on the Citations I and II and the Conquest. Cessna engineers say the dihedral improves Dutch roll qualities and moves a major portion of the tail out of the prop wash, thus providing a smoother ride.

Dual pitch-trim actuators are standard. Internal construction is different from that which created problems for early model Cessna's larger turboprop, the 441 Conquest.

It's difficult to avoid too much subjectivity about things like cockpit comfort, instrument and control human factors and handling qualities. And that statement is the only attempt we'll make to mitigate our enthusiasm for what has been done for the pilot of this airplane.

The cockpit itself is roomy. Even those pilots doomed to buying their sports jackets at the "big 'n tall" department will find the 425 pretty accommodating. The optional fully articulating seats (complete with pneumatic lumbar support) are firm enough for the longest missions, yet have no

uncomfortable bumps. The seat belts and inertial-reel shoulder harnesses are the automotive type. We'd like to see something more substantial in the cockpit; however, complete restraint systems are not on the Corsair options list.

The instrument panel is more Citation than 421. Instruments and indicators are intelligently positioned, and the panel itself is absolutely uncluttered. (Copilot flight instruments are standard equipment.)

Warning lights are grouped together in a single caution panel located on the instrument panel to the right of center. We believe this arrangement is far superior to the glareshield strip provided in some turboprops.

Although Collins's remote-mounted avionics are available as an option, Cessna believes most 425's will be equipped with panel-mounted equipment. The aircraft we flew had Cessna's 1000-series integrated flight control system.

(Some folks still turn down Cessna avionics summarily because of real or imagined problems with earlier ARC products. If you haven't flown Cessna's top-line avionics recently, you may want to take a second look before turning thumbs down. We were especially impressed with the IFCS. It performs with all the finesse and agility of the most expensive systems. The displays are nicely designed and presented. Aircraft control is positive; heading and altitude intercepts are soft and on the dime. We cannot comment on maintainability and support only because we did not have time during this visit to pursue the matter. However, performance seems to be first rate.)

Electrical system controls as well as lighting switches, deice system controls and engine starting switches are mounted on a panel on the captain's side wall. Circuit breakers are on left and right side panels. All switches are easily reached from either seat.

The electrical system has two 250-amp starter-generators, each powering its own bus. Bus ties and breakers are used for circuit and component isolation. Either generator can handle a full IFR load.

Starter-Generator Protection

Cessna has taken a lot of the hassle out of starting the PT6A-112s by controlling the starter and generator functions of the starter-generator with separate switches, appropriately protecting the system from inadvertent action. Starts are pretty much automatic. A "starter/ignition" switch is turned to the "on" position and the gas generator is monitored for 12 percent. At 12 percent, a condition lever is moved out of a "stop" detent to a "run" detent to open the fuel cocks. Temperature and spool-up are monitored on the instruments. As soon as idle rpm is reached, the starter is turned off and the separate generator switch is turned on. The generator of the first engine started is routinely used to assist in starting the second engine, and it is left in the "on" position throughout the start.

We made several back-to-back starts that were cool and quick.

As soon as the Corsair moved out of the chocks we noticed the remarkable ride of the wide-track, trailing-link gear. Cessna pilots recommend taxiing with one engine feathered to save wear and tear on the brakes. We used the technique and liked it. The airplane can be moved from a standing position with just one engine without too much nosewheel/brake pumping.

Ground handling may be best in class. That's a subjective opinion, but one in which we have a lot of confidence. Perhaps the best way to put it is that we doubt any pilot will have problems taxiing the 425 or controlling it during takeoff or rollout-even in gusty winds.

On takeoff, brakes are held momentarily until the props get on the governors. Acceleration to "rotation" speed between 90 and 100 knots is brisk. We put "rotation" in quotes because really no rotation is required. The airplane flies off at takeoff speed and arrives at cruise-climb attitude

(130 knots or so) in complete trim.

An autofeather system is standard equipment on the Corsair-a nice feature to have standing by. If the system senses a loss of power on either powerplant, it will feather the offending engine and lock the other out of feather. The pilot's only action is to arm the system for takeoff and landing and check its function on the first preflight of the day.

Best-rate-of-climb speed is 115 knots; the flight manual advertises 2,027 fpm at max gross takeoff weight. Although we departed at less than gross, our guess is that you'll get all of that (and perhaps more). At about 800 pounds under maximum gross we got better than 2,500 fpm. The only problem with the 115-knot maximum-rate climb speed is that forward visibility is restricted by the long nose. A cruise-climb speed of 135 knots gave us plenty of visibility ahead and still produced 2,000 fpm.

Earlier we pointed out that Cessna believes the Corsair is best thought of as a high-altitude airplane-even for relatively short missions. Well-it works both on paper and in the air. The airplane can go from sea level to 25,000 feet in 16 minutes, according to the AFM. Starting at 1,500 feet at 7,400 pounds, we made it to FL 250 in 11 minutes, 37 seconds. That climb rate makes FL 250 practical for any trip much over 200 nm.

Pilots, in our opinion, will like the way this airplane handles. High or low speed, high or low altitude, one or two engines, the Corsair is in every way a pleasure to fly. Stalls are docile and grandly announced by much rumbling and buffeting. Pitch excursions are damped positively and comfortably. Even accelerated Stalls produce no untoward snaps and are captured easily.

Engine-out maneuvering is positive and has no mushiness. The ailerons have plenty of power — even at approach speeds — to pick up the dead engine rapidly. (Single engine climb rate at 13,000 feet at 7,000 pounds was about 500 fpm.)

We should note that one of the real advantages of the large flat-rating margin is extraordinary single engine performance at altitude. The Corsair's single engine service ceiling is 18,500 feet at max gross takeoff weight.

The PT6A-112s can provide up to 100 psi of bleed air pressure at max power; 17 psi at idle. We detected no pressurization bumps during engine-out work and a simulated emergency descent with both engines at flight idle.

Low Workload, Fatigue

These fine handling attributes increase safety, we think, in that they reduce cockpit workload and fatigue. And it's in the approach and landing maneuvers that all of this is shown off best.

If you'll permit us just one more subjective superlative, the Corsair is, in our opinion, close to the best (if not *the* best) handling airplane of this class in the approach and landing modes. Deck angles are at all times comfortable and visibility unobstructed. The split-type, electromechanical flaps create no illogical pitch trim changes, and lowering of the gear creates no pitch trim changes at all.

Pattern speeds are modest 150 to 130 knots on downwind, 120 base-to-final, and 100 over the fence. Touchdown on the trailing-link gear makes you look good from your first landing.

The propeller plane is well ahead of the cockpit and, therefore, several feet ahead of the first passenger seat. Thus, both the cockpit and the cabin of the Corsair are relatively quiet. In fact, we suspect the cabin noise levels are among the lowest in its class. Interior furnishings are sturdy and well crafted - the best we've seen from Cessna's interior shops in a long time. Seats are comfortable and the cabin itself has a very low vibration level.

Cessna believes that most 425s will be delivered with hard fore and aft dividers and a club seating arrangement with refreshment center and potty. However, seventh and eighth seats can be

installed for a high-density version. Our demonstration aircraft had no hard dividers, its outfitters opting instead for club seats and a belted potty. The potty would be comfortable for only the shortest trips.

The 1981 base price of the 425 Corsair is $825,000. However, options such as full deicing equipment, RNAV and an executive interior will bring the typically equipped price tag to the $903,000 to $906,000 range.

(The major manufacturers were just setting 1981 prices as we went to press. Therefore, the prices for the comparison profile — including the Corsair's — are 1980 prices. Although the absolute prices will change with the new year, the relative positions of those prices are expected to remain essentially the same. Thus the comparison "price line" should be valid for 1981.)

Obviously, these costs will vary with the price of fuel, labor rates and overhaul experience. However, they do suggest a starting point for your own calculations on this airplane.

Although Cessna plans to market the Corsair against Piper's Cheyenne I and II and all three 90-series King Airs, we used only the Cheyenne I and King Air C90 for this profile.

The 425 Corsair comes in at the number two position in most of the passenger comfort and convenience items, and in useful load and payload. The cabin accommodation battle can be decided only by the end user.

Cessna has always given up aisle height in favor of width on the theory that a passenger spends most of his inflight time seated. However, if the boss is particularly tall, he may need the extra height offered by the competition.

Significant differences exist among the three airplanes in payload handling capability-more between the Corsair and C90 than between the Corsair and Cheyenne 1. All three airplanes can handle five passengers and baggage without problems. The Corsair's nose baggage compartment also can handle skis and golf clubs-a real plus for some operators.

Perhaps the comparison shows most clearly the Corsair's very efficient specifics at altitude. But remember, this lead exists only at altitude. The comparison profile ranges are based on an altitude at which each airplane has an 8,000-foot cabin. (We've used a 10,000-foot cabin for our specifications table and performance graphs.) B/CA