Cessna Corsair

THE PURSUIT OF BUSINESS

BY EDWARD G. TRIPP

Cessna is a company with the reputation of developing an aircraft to fill every conceivable chink in the marketplace. This befits the image of an organization noted more for its marketing than for design or engineering.

Quite a few years back, the company decided to pass turboprops by and went directly to jets: the Citation. Then it backtracked and developed the Model 441 Conquest.

Almost since the introduction of the Conquest in 1977, there has been talk of a smaller turboprop. Usually referred to as the turbine 421, it was introduced publicly at Cessna's sales meeting in 1979, and many commented on how much it looked like the 421.

A few months ago, Cessna invited a group of journalists and financial analysts to Wichita for presentations on the status of the certification of the Citation III and a candid discussion of the steps being taken to deal with manufacturing, scheduling, quality control and design concerns that have plagued the company for the past three years.

Four aircraft were featured during the tour that followed: the Citation III, the Conquest, the Crusader (the Model 303, which started as a light-light twin originally dubbed the Clipper) and the Model 425 Corsair.

The tour of the reorganized Wallace Division plant, where the jets and twin piston aircraft are made, was led by Cessna Chairman Russell W. Meyer Jr. As we approached the Corsair, it did look like a 421 with turbine engines. But as we walked around it, it was obvious that any resemblance ended just aft of the air-stair door.

There is a lot more structure from the rear pressure bulkhead aft that can be traced by the hundreds of rivets. The tail looks like a refugee from the corrected Conquest: big span and lots of dihedral. There is a single trim tab on the starboard elevator. It's beefy, and the double actuating rods are, too.

PHOTOGRAPHY BY THOMAS A. HORNE

Simplicity costs a million bucks.

After a number of empennage problems, particularly structural failures in the 441 and the 414 and the yet-to-be solved defect in the 335/340 series, Cessna has tried to do it right the first time on the Corsair.

The tail—and, of course, the Pratt and Whitney PT6A-112 turbine engines—are not the only differences between the 421 and the 425. The latter has a wingspan three feet longer and a wing area just under 10 feet larger. The composite airfoils are the same: NACA 23018 modified at the root, 23015 modified at the nacelle and 23009 modified at the tip. The 425's weights average nearly 800 pounds heavier throughout the range except for the zero fuel weights, which are 6,740 pounds for the Corsair and 6,733 for the 421.

Fuel capacity of the 425 is 366 usable gallons (2,452 pounds) of turbine fuel, as opposed to the 421's 206 usable gallons (1,236 pounds) of 100 octane.

Both aircraft are products of the updated 400 series. One of the biggest elements in the update is the change to the bonded, wet wing, which has improved handling characteristics, enabled a simplified fuel system and reduced drag. Both share the trailing-link main gear that was introduced on the 441. It requires less maintenance and, most importantly for the crew, makes most landings sweet arrivals.

Another key element is that the 400 series aircraft have cockpit arrangements and systems derived from the Citation program that reduce pilot workload; they are well-organized, simple yet sophisticated and better designed than previous Cessna systems.

Appearances cannot substitute for operational experience; but our first impression of the Corsair is that it is obviously the product of the practical application of a great deal of experience, analysis and planning to both the concept and the detail design and structure of the airplane.

In this respect, Cessna has come a long way with the top end of the company's product line—and I hope the process and the product improvement will be passed on down to the light single-engine aircraft.

After what can only be termed a pitiful record of quality control on even the most expensive products in the line, Cessna has been making intensive efforts to improve performance at the Wallace Division.

One outward and visible sign of the commitment to quality control is that Charles B. Husick, the Cessna senior vice president who was given the task of straightening out the plant's problems, personally is performing acceptance test flights on each Corsair that rolls off the line during the first few months of production.

There are quite a few design details that are evidence of careful attention to operational and maintenance considerations. For instance, most turboprops have long soot lines, along the nacelles and even the fuselage, from the exhaust. The Corsair has exhaust-deflecting louvers in the nacelles, just aft of the exhaust stacks, to keep the dirty by-product of combustion in the airstream and off the airplane.

There is an optional rudder gust lock mounted on the tail: a lever that engages a pin. Should a pilot forget to disengage it during preflight, it will disengage automatically when the elevator is moved up beyond six degrees.

The fuel system is simple—on, off, crossfeed. Electric pumps are used only for starting and during crossfeed operations; otherwise, the fuel-flow system is automatic. The main pumps employ a principle called motive flow: There are no moving parts and no electrical power. Filling each side is done through a single point at the nacelle that is low enough so that no ladder is required. The only shortcoming is that because of the slow rate, gravity feed from the nacelle bladder to the collector bladder and the wet main fuel cells has to be monitored carefully.

The 28-volt electrical system is powered by a 24-volt, 39-ampere-hour nickel cadmium battery for starting and emergency operations and two 250-amp engine-driven starter generators. Each of the generators powers its own bus; if one fails, the other will pick up the load. The separate avionics bus is split, also. The battery is reached easily (not always the case) through a bay on the starboard side of the nose.

The engine cowling is easy to remove for inspection, and access to fuel pumps and plumbing is good. The inboard leading edge of the wing is removable for access to the bleed-air system, which provides pressurization and heating and drives the pressure gyros, pneumatic leading-edge deicing boots and the pressure regulating valve.

The pressurization system is set for a five-pound per square inch differential, which provides a 10,000-foot cabin altitude at 26,500 feet and just under 12,000 feet at 30,000 feet. Either engine set at Flight Idle will provide sufficient bleed air to maintain pressurization, so loss of pressure is not a concern during

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Most pilots who step up from piston twins to the Corsair will find it easier to operate and fly.

maximum rate descents. The balance of the systems and the airframe appear to reflect the same attention to simplicity, accessibility and maintainability.

The powerplants seem to be a good choice for the airframe. They are fairly far out on the wings, and the slow-turning propellers (1,900-rpm maximum) have nearly two feet of clearance between the tips and the fuselage.

The PT6A is a proven design—and is offered in quite a range of power. Recommended time between overhaul is 3,500 hours.

The engine in the Corsair installation is flat-rated to 450 hp, which it can maintain to 17,700 feet or at 130° F at sea level. The installation is clean; Cessna claims that it is the most drag-free and provides the highest inlet-pressure percentage of any, which means there is less performance loss.

The PT6 is a free-turbine design. There are two independent turbines. One drives a compressor and the other the propeller through a reduction gear box. The compressor and the power turbines can be inspected, serviced and overhauled separately.

The free-turbine has some characteristics of more direct interest to pilots. In the event of an engine failure, there is less propeller drag than on a direct-drive engine. Also, feathered or windmilling starts can be done in flight.

On the other hand, a propeller can be feathered without shutting down the engine. This is an advantage during simulated engine failures. It is also an advantage during ground operations. Although idle speed is only 600 rpm, the residual thrust can result in higher than desired taxi speed. Feathering the propeller of one engine helps keep the speed down—and saves wear and tear on the brakes.

Three-bladed propellers are standard, as are synchrophasers, electric deice and reverse (beta) mode.

Anti-icing and ingestion are quite simply handled on the installation. The air inlets are heated constantly by exhaust gas; there is no need to engage a system. Engine moisture and foreign-object ingestion are prevented by an inertial air-separation system, which, when engaged, moves vanes into the intake duct to separate air from heavier particles. The air passes on into the engine-air inlet; the foreign matter is diverted through a by-pass duct.

Other standard equipment includes air conditioning, copilot flight instruments, heated dual pitot-static systems, engine-bay fire detection and warning (fire extinguishing systems are optional), corrosion proofing and emergency oxygen system (11 cubic feet; a larger capacity system is optional).

There are a lot of options left to buy for the Corsair. Operational ones include a known-icing package ($18,855) and additional avionics.

A basic package of ARC 400 series avionics—dual nav/com, dual glideslope, automatic direction finder, distance measuring equipment, marker beacon receiver, transponder, encoding altimeter, 1000 series autopilot with slaved HSI (horizontal situation indicator) and yaw damper—is standard. Two alternate packages are offered. One is an ARC 1000 series, which includes a radio magnetic indicator (RMI) for $16,630. The other is a Collins system, including a WXR 200A radar system, for $69,350.

Two *Pilot* staff members flew the fourth production Corsair, N98817. Its list price is $928,815 (the current base price is $825,000). More than $62,000 of the difference is for additional avionics. It probably is representative of the way the average 425 will be equipped.

There are enough avionics, equip-


N98817

continued

ment and interior options to keep someone planning, checking weight and the bank balance for weeks. Some add weight but increase performance; others trade weight and space for comfort, convenience and privacy for the folks who ride in the cabin.

The standard seating arrangement is for six with a club design in the back. There are two seven-place and two eight-place options, plus a multitude of dividers, tables, toilets, refreshment provisions, storage drawers, adjustable seats and entertainment features.

The Corsair is being presented as an airplane that makes the transition from piston twins to turboprops easier. This is not really true, since the transition to practically any turboprop from a medium piston twin is easy. Yes, there is more power; yes, things happen faster. But power management and, usually, fuel management are simpler; and, generally, cockpits are more intelligently organized and systems are both better and simpler. The truth is that most competent pilots who step into a 425 from, for instance a 310, a 340, a 414 or a 421 will find it much easier to operate and fly. It is also smoother and quieter, so the insidious fatigue they cause is much reduced.

The 425 is very well mannered and pilot workload is comparatively low, which lets the crew concentrate on the important things. That is, so long as the pilot(s) is trained properly, fully current, very meticulous in flight planning, preflight and all operations; so long as maintenance is good. . .and so long as everything is working properly.

One of the best pieces of standard equipment that comes with the Corsair (and, today, most other turboprops) is training for two crewmembers at FlightSafety International. It encompasses system training, simulator training and actual flight in the customer's aircraft. This should be followed up with a regular recurrent training schedule.

Our flights in the Corsair were really just introductory, although we did sample some of the emergency procedures, some operational variations, instrument meteorological conditions and approaches and missed approaches. Once again, however, if first impressions are to be trusted, the combination of intelligent design and good systems means that a pilot has a lot of things working for him when things go wrong.

A well-appointed cabin allows passengers to ride in comfort and in style.

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For instance, in an engine failure immediately after takeoff, with the combination of autofeather and basic good flight characteristics, the Corsair is easier to handle in single pilot operation than most piston twins.

A pilot with no turbine experience has quite a lot of new terms, concepts and other things to learn—Mmo (maximum operating speed expressed in percentage of Mach number); temperature compressibility effects; ITT (interturbine temperature); Ng and Np (gas generator rpm and propeller rpm); flameout; torque. And then there are those things in the cockpit that look like throttle, mixture and prop, but are called power, condition and fuel levers.

They function basically the same way (except the fuel control is left

alone in normal operations from the time the engine is running properly to the time it is shut down. Look, mom—no leaning. It has only two positions: Off and Run); they just require a lot less fiddling with in flight.

Preflight is straightforward, although a bit more involved. The pre-takeoff check list uses up 18 pages of the operating manual, for instance, and the emergency procedures use 48 pages.

Cessna has a good method of describing emergency procedures in its operating manuals, by the way. Steps that must be committed to memory are boxed. Useful information, cautions and warnings—actions that, if taken, can really ruin the day—are further flagged. The process makes it easier for pilots to determine what they must do before they have the leisure time to reach for the check list.

There is an annunciator panel under the glareshield with 33 items to call the pilot's attention to emergencies (red), hazard (amber) and safe or normal conditions (green or white).

Now we get to the good part: flying. Once all the preliminaries have been completed and the passengers have been seated and briefed and the airstair door secured, the fun begins.

The before-start check list is uncomplicated, as is the normal start. In fact, most starts—even in cold weather—will be easier than with a piston engine. Before taxiing and before takeoff, there are a lot of systems and settings to check, but, again, it is just that there is more, not more difficulty.

Ground handling is good. The main-gear track is wide, and the action of the trailing-link gear smooths out most rough spots. Nosewheel steering is fairly light. It is preferable to get the engines "on the bit"—the propellers developing 1,900 rpm—before brake release to avoid differential thrust, which makes directional control look a bit sloppy and bothers the passengers.

Torque is the governing condition on takeoff (1,244 foot-pounds maximum) for the Corsair (with some powerplants, temperature is the limiting factor), and care must be taken to avoid passing through the value, since it will increase as speed increases. Lever movement must be measured and smooth.

Gross weight Vmc (minimum control speed with critical engine inoperative) is 90 knots indicated airspeed; the Corsair will accelerate through quite quickly, and a bit of back pressure through 98 knots will provide lift-off at 102 KIAS, which is Vsse (minimum intentional one-engine inoperative speed). Tap the brakes, and retract the gear. It will be buttoned up in less than five seconds (the book says 4.5, 7.5 with one engine out). Speed and altitude increase quite rapidly, and the critical configuration and the time of exposure for engine failure are passed very quickly. The best-rate-of-climb speed, 115 KIAS, fills the windshield with the nose. A comfortable cruise climb speed is 150 KIAS.

Turbine engines are noted for their high fuel consumption at lower altitudes. The climb performance of the Corsair is good, so there is no reason to stay low even for relatively short trips.

We tried a time-to-climb on one flight. With three aboard and 1,400 pounds of fuel, the aircraft was 740 pounds below maximum takeoff weight. The time to climb from brake release at Wichita Mid-Continent, 1,332 feet, to 26,000 feet was just under twelve and a half minutes using an initial climb speed of 120 KIAS. The initial rate of climb was more than 2,200 fpm (sea level rate of climb at maximum weight and 115 KIAS is listed as 2,027 fpm). Fuel flow averaged 434 pounds per hour (pph).

Leveling at cruise and establishing

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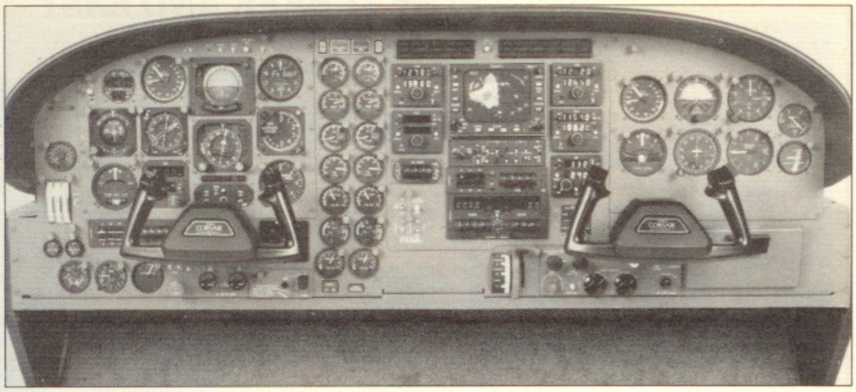
The trailing-beam gear is easy to care for and makes landing an event worth looking forward to.



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The Corsair's panel is simple, yet sophisticated. Pilot work load is low, thanks to cockpit arrangement and systems derived from the Citation program.

CESSNA CORSAIR MODEL 425

Basic price $825,000 (1981)

Price as tested $928,815

Specifications

Engine	Pratt & Whitney PT6A-112, 450 shp, 1,900 rpm,
Recommended TBO	3,500 hr
Propeller	Hartzell, 3-blade, constant speed, full feather and reversible, 93.4 in dia.
Wingspan	44 ft 1 in
Length	35 ft 10 in
Height	12 ft 7 in
Wing area	225 sq ft
Wing loading	36.44 lb/sq ft
Power loading	9.11 lb/hp
Seats	6 (7 & 8 opt)
Cabin length	15 ft 10 in
Cabin width	4 ft 8 in
Cabin height	4 ft 3 in
Empty weight (basic aircraft)	4,870 lb
Empty weight (as tested)	5,186 lb
Useful load (basic aircraft)	3,405 lb
Useful load (as tested)	3,089 lb
Payload w/full fuel (basic aircraft)	952.8 lb
Payload w/full fuel (as tested)	636.8 lb
Ramp weight	8,275 lb
Gross weight (takeoff)	8,200 lb
Gross weight (landing)	8,000 lb
Max zero fuel weight	6,740 lb
Fuel capacity	2,499 lb (2,452 usable)
Fuel flow	434 pph
Oil capacity	9 qt (ea engine)
Baggage capacity	1,100 lb

Performance

Takeoff distance (ground roll)	2,047 ft
Takeoff over 50 ft	2,341 ft
Rate of climb (sea level)	2,027 fpm
Single-engine ROC (sea level)	434 fpm
Maximum level speed (17,700 ft)	264 kt
Cruise speed (1,900 rpm, 8,200 lb)	
20,000 ft	259 kt
26,000 ft	251 kt
30,000 ft	240 kt
Cruise speed (1,800 rpm, 8,200 lb)	
20,000 ft	257 kt
26,000 ft	249 kt
30,000 ft	238 kt
Cruise speed (1,700 rpm, 8,200 lb)	
20,000 ft	254 kt
26,000 ft	245 kt
30,000 ft	233 kt
Range @ 30,000 ft, 8,200 lb takeoff, 1,900 rpm	
250 kt	1,406 nm
210 kt	1,640 nm
Range @ 25,000 ft, 8,200 lb takeoff, 1,900 rpm	
258 kt	1,210 nm
206 kt	1,530 nm
Range @ 20,000 ft, 8,200 lb takeoff, 1,900 rpm	
263 kt	1,020 nm
205 kt	1,370 nm
Service ceiling	34,700 ft
Single-engine service ceiling	18,500 ft
Landing distance (ground roll)	952 ft
Landing over 50 ft	2,145 ft

Limiting and Recommended Airspeeds

Indicated airspeeds, not calibrated

Va (Maneuvering)	154 kt
Vfe (Maximum flap extended)	
15°	175 kt
45°	145 kt
Vlo (Maximum gear operating)	175 kt
Vle (Maximum gear extended)	175 kt
Vne (Never exceed)	230 kt
Vsi (Stall clean)	90 kt
Vso (Stall in landing configuration)	84 kt
Vsse (Minimum intentional one-engine inoperative)	102 kt
Vmc (Minimum control with critical engine inoperative)	90 kt
Vx (Best angle-of-climb)	107 kt
Vy (Best rate-of-climb)	115 kt

Based on manufacturer's figures

maximum cruise power of 1,900 rpm, torque at 933 and fuel flow at 380 pph, the indicated airspeed was 169 knots, true airspeed 252 knots. The noise level was quite low. Using 1,700 rpm and higher torque lowered the noise level and resulted in practically the same speed, but higher fuel burn.

Range at maximum cruise power at that altitude with full fuel is 1,265 miles at 257 knots. At 30,000, it increases to 1,406 miles at 250 knots. The Corsair does like altitude.

The day was quite choppy, and the airplane handled it well, both at altitude during cruise and at low altitude and low airspeed. The controls are well harmonized at all speeds with, of course, higher effort at the upper end of the speed range.

We tried a maximum performance descent from cruise altitude. With power at Flight Idle and speed at 210 knots, the initial rate of descent was 5,000 feet per minute.

We tried both coupled and uncoupled approaches with some balked landings thrown in. We also tried single-engine situations and stalls. There isn't much to say about it all. The Corsair is very well behaved and shows no tendency to get away from the pilot.

Both gear and the (first 15 degrees of) flaps can be extended at 175 KIAS, which will do a lot to help operations in high density areas or to descend in choppy air. Maneuvering speed is a relatively high 154 KIAS, too, although towards the end of the flight it must be reduced (for instance, to 131 KIAS at 5,500 pounds).

Normal approach speeds are well below comfortable speeds for quite a few piston twins. The recommended approach speed is 102 KIAS.

And the landings. Ah, yes. That gear does make up for more than its share of poor technique and misjudgment.

It would be nice to fly such an airplane regularly. It also would be wonderful to be able to enjoy some of the systems and human engineering developments in smaller, less expensive aircraft. Those of us who spend the majority of our time grinding around in the muck at lower altitudes could certainly use the help and the security.

It is a shame that simplicity costs a million bucks. Perhaps Cessna, which has made obvious strides in the pilot's favor at the high end of the line, will put the same kind of effort into its single-engine aircraft. □