poses of this article, we'll focus on the 690 series. These are the models 690, 690A, 690B, and 690C (better known as the Jetprop 840), produced from 1972 to 1985. Their current market values can make them a good deal for first-time turboprop buyers, and they aren't propelled by the higher powered Garrett engines used in the 900, the Jetprop 980, and the 1000. Instead, they're equipped with Garrett's TPE331-5, 717.5-shaft-horsepower engines (derated from their full, 820-shp rating)—which are less of a handful for the step-up prospect than the later model 733-, 748-, and 820-shp Garretts. The -5 (pronounced "dash five") engine has a long (3,600-hour) recommended TBO (time between overhauls), but by complying with a Garrett service bulletin (SB), the TBO can be pushed up to 5,400 hours.

We're not going to consider the early Model 680 and 681 turbine Commanders, either. Manufactured from 1966 to 1972, these airplanes have the 575-shp Garrett TPE331-43 and -43BL engines. Their TBOs were miserably short—600 hours at first, then 2,000 hours—for a turbine engine, and overhauls are about $150,000 per side. The -43s were underpowered for the heavy, 9,400-pound gross-weight airplane, too. To make matters worse, the -43s drove hydraulically powered superchargers to create cabin pressurization. Bleed air pressurization didn't come until 1970, with the Model 681 "Hawk Commander," which also had -43 engines. The best cabin pressure differential any of the -43s could provide was a rather wimpy 4.2 pounds per square inch. Maybe that's why one old turbine Commander hand claims, in jest, that "the old -43s didn't have enough power to run the engines and pressurize the cabin at the same time." Maybe that's also why you can buy a 680 for about $60,000 these days. But with $300,000 worth of overhaul staring you in the face, why bother? Anyway, of the 210 manufactured, there are only about six on the market.

Why are the 690s such a buy? First off, there's the speed. Recommended cruise power—96 percent—yields honest cruise speeds of between 275 KTAS (in the 690) and 286 KTAS (in the 690C/Jetprop 840). The 690C/840 is the fastest because of its redesigned wing profile, longer wingspan (52 feet 1 inch, versus the other 690s' 46 feet 6 inches), and Dowty-Rotol supercritical propellers.

At maximum—100-percent—cruise power, the Commander 690 true airspeeds run from 280 to 290 KTAS.

Then there are the excellent rates of climb: 3,003 feet per minute for a 690, a hair over 2,800 fpm for the rest in the series. As a rule of thumb, it'll take you just about 15 minutes to climb to the mid-20s, where the twin Commanders cruise best.

Single-engine rates of climb are in the very reassuring, 900- to 1,000-fpm, range. In their heyday, Commander twin turboprops set several time-to-climb records, some of them performed by the legendary Bob Hoover, who was a Rockwell spokesman during the 1970s.

At long-range cruise settings, Commander 690s can fly approximately 1,700 nautical miles. At maximum cruise power, ranges settle around 1,400 nm or so, except for the 840s. The 840's range is published as 1,708 at maximum cruise, thanks to its larger wing and larger, 425-gallon fuel capacity. The 690, 690A, and 690B carry 384 gallons.

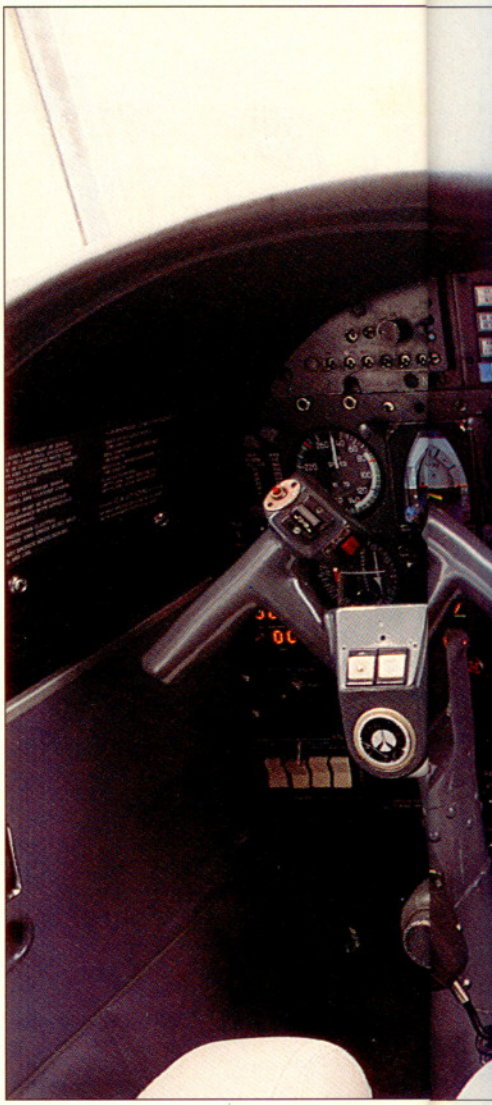
Commander 690s also shine when it comes to short-field operations. Obstacle-clearance takeoffs cover anywhere from 1,700 to 1,800 feet. Landing distances can be as low as 1,600 feet, provided you follow recommended short-field procedures and full reverse thrust.

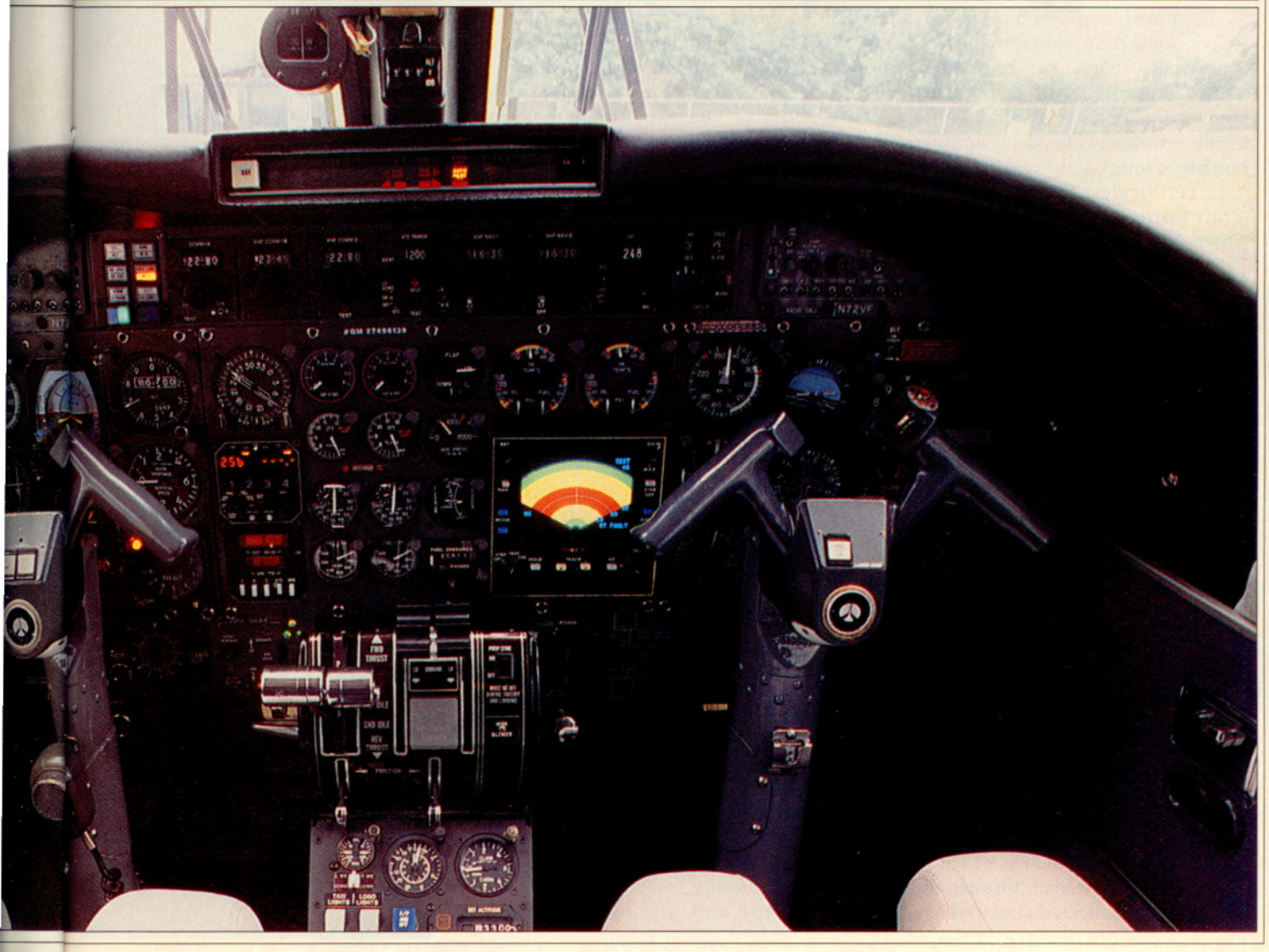
These numbers blow the prime competitors away. A Piper Cheyenne II, for example, would also make a good entry-level used turboprop. So would a 90-series Beech King Air or a Cessna Conquest I. However, they just don't perform like the 690s. Their cruise speeds are slower—by as much as 40 knots, in the case of the King Airs—their ranges are less, their runway requirements are slightly greater, and their rates of climb are lower.

In short, the twin Commanders are hot rods. They're a "pilot's airplane," in the good sense of the term. Its control response is lively, yet the airplane is rock-stable and makes a wonderful instrument platform. The cockpit is crammed with instruments; four-point harnesses are standard. There's an overhead panel for engine start, electrical, ice protection, and other switches, and a ram's horn control column. It's a macho kind of place, and being perched way out in front of the rest of the airplane reinforces the feeling of power.

You sit low to the ground, the big Garretts snarling away, then push up the power levers and shoot down the runway like you're on a rocket sled. At about 95 KIAS, you lighten the nose. Rotate and climb out at 115 to 120 KIAS, and the ground falls away. It's pretty heady stuff.

Yet for all the fun, the airplane has a practical side. You can fill the airplane with three people and their bags, top off the




N72VF

tanks, blast off, cruise at altitudes up to 31,000 feet, burn about 400 pounds per hour, fly better than halfway across the United States, then land at all but the shortest runways. As for the passengers, they're treated to a five-place cabin—six seats if you count the belted potty seat behind the cockpit. One conspicuous aspect of the Commander interior is the wide bench seat in the aft cabin. Others are the extra-large "picture windows." The bench seat is the best in the house. There, you have a great view through the windows and plenty of legroom.

The best part of all? You can have this performance at a relatively low price. According to the *Aircraft Bluebook–Price Digest*, 690-series twin Commanders now are selling for anywhere between $250,000 and $878,000, depending, of course, upon age, condition, and the time remaining before TBO. Model year for model year, twin Commanders tend to go for slightly less than Cheyennes, King Airs, and Conquests of similar vintage.

There are reasons for these lower asking prices. Some have to do with the airplane's somewhat justified reputation as a maintenance hog with out-of-sight parts prices and terrible parts availability. This problem is now being effectively addressed by the new owners of the twin Commander's type certificates, Twin Commander Aircraft Corporation (TCAC [19003 59th Drive, N.E., Arlington, Washington 98223; telephone 206/435-9797]).

Problems with the -5 engine have also dogged the 690s. One involves the stator for the third-stage power turbine wheel. The stator's central seal had a history of rubbing against the turbine wheel, causing damage to both stator and wheel. No accidents or uncontained failures of the turbine wheel ever occurred due to the bad stator, but the potential was there. AD 93-05-09 requires that these stators be replaced with one of a newer design that eliminates the problem. Garrett has a program, offered through its authorized service centers, which offers replacements for $4,975 per stator, or $9,950 for both engines; there's no labor charge.

The Bendix pneumatic-sensor fuel controllers were also a service issue. These were used up to the 1979 model year and could cause power fluctuations. The problem was traced to a combination of moisture, freezing temperatures, and polluted outside air entering the sensor and blocking its normal movements. A 1973 SB fixed this by routing bleed air through the unit, and almost all affected airplanes have had this work done by now. Garrett switched to Woodward mechanical fuel controllers in 1979, partly in response to complaints by operators who had bad experiences with the Bendix units. Woodward controllers were also offered as a retrofit to earlier 690s. Though the Bendix wrongs have been righted, the memory lingers. Woodward-equipped 690s, 690As, and 690Bs are worth about $25,000 more than those with Bendix fuel controllers, according to the *Bluebook*.

Now that the 690 series is two decades old, a great reckoning faces many twin Commander owners: They're looking at engine overhauls. At about $141,000 per engine, this can have a devastating effect on resale value or the wallet, depending on the attachment of owner to airplane.

Garrett has come to the rescue with its Century+ (Century Plus) program. Under this program, the -5's original, 3,600-hour TBO can be extended to 5,400 hours. There's a cap on the cost of the TBO extension, which is $73,550 per engine. Garrett emphasizes that this is a not-to-exceed price, which means two things. The total cost may be less than the cap, and the cost is less than what an overhaul might be. It also means that the prospective buyer of a 5,400-hour-TBO twin Commander must be prepared to pay more.

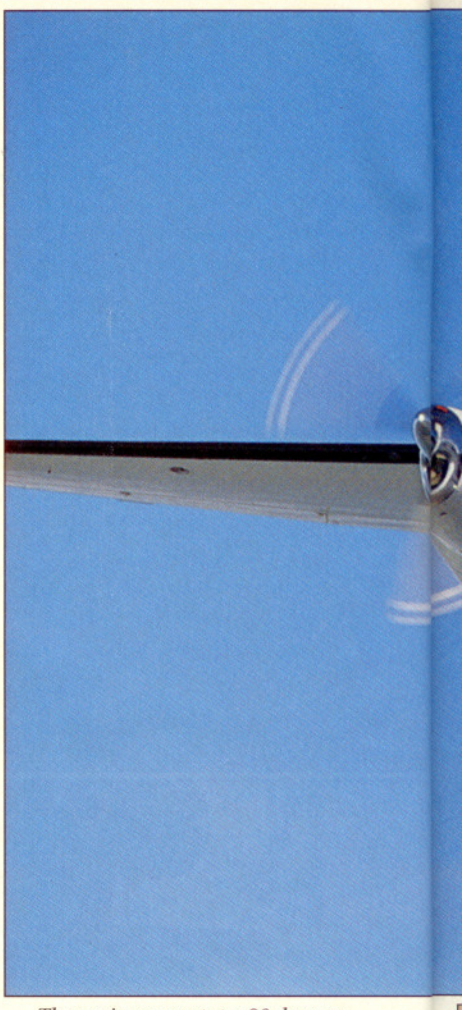
The TBO extension amounts to a big work package and incorporates many of the maintenance items mentioned earlier. Included are new first- and third-stage stator assemblies, a new compressor assembly, modifications to turbine wheel-bearing mounts, new torsion shafts, and new gears for Woodward propeller governor gears.

Another Century+ program puts a cap on the -5's 1,800-hour, scheduled hot-section inspections. That price is $45,825 and, like the TBO extension, includes parts, labor, and testing.

One more Garrett program now in the works is essentially an engine swap. This would replace the -5s' hot sections with those of Garrett's 820-shp TPE331-10-501K engines. Details aren't firm on this plan as yet. If it comes about, the 690s and 840s eligible for the upgrade would pick up about 25 knots in cruise, climb 200 to 300 fpm faster, and burn just 4 percent more fuel in return. What's more, the cost of the -10's hot-section inspection would be about half that of a -5's.

The swap would amount to a transformation of a 690-series airplane to a Commander 1000, which can cruise at just under 300 knots.

The 690 series has a strong, stout air-



The main gear rotates 90 degrees to fit into the nacelles. The cabin includes a one-step entry, a forward potty, and "picture windows."

frame, but there is a fly in the ointment. It's a big one: The main wing spars have to be inspected for corrosion.

The twin Commander spar problem first surfaced after a July 25, 1990, accident in Sweden involving a 680E model. The accident was attributed, in part, to fretting corrosion of the main lower spar cap. A stiffener at the back of an engine firewall apparently rubbed against the lower spar cap, which led to cracks, which led to a fracture of the spar cap. TCAC issued an SB requiring an inspection of the critical area and the cleanup of any corrosion. This problem affected the oldest twin Commanders, the piston-powered models built before 1960.

But it was soon learned that another type of corrosion affected other twin Commanders—more specifically, the 500, 680, 681, 685, and 690 models, up to the 690B. The corrosion in these models was also found at the lower spar cap. There are two principal reasons for the corrosion's affecting this critical area.

One was the breakdown of the zinc chromate treatment that Rockwell applied to the spar components during assembly. The other is the lower spar's design, which uses a stainless-steel strap to strengthen the spar's ability to withstand large, positive-G flight loads.

Evidence shows that as the zinc chromate breaks down, the aluminum spar cap comes in contact with the stainless-steel strap. Over the years, dissimilar-metals corrosion can set in. Notice we said *can* set in. According to a March 1993 report of 378 inspections by TCAC service centers, 59.5 percent of the airplanes showed no corrosion. Only 3.4 percent of the airplanes showed corrosion levels greater than 100 percent of allowable service limits.

To solve the problem, TCAC issued SB 208A, which set up a spar inspection schedule and guidelines for replacement of the spar cap and stainless-steel strap. If no corrosion was found or there was less than 50 percent of certain corrosion limits, 208A requires repetitive inspections at 12-month intervals. If there is more than 50 percent of the corrosion limits, replacement of the spar cap and strap is required. Of course, replacement negates the need for further inspections.

TCAC came up with a replacement spar cap kit that includes a new cap and strap. The replacement procedure involves removal of the cap and strap, cleanup of the old zinc chromate layer, and application of an epoxy resin coating to the cap. The stainless-steel strap is given an elastomeric coating, and the cap and strap are reinstalled. These new coatings will last much longer than a zinc chromate treatment, should prevent the cap and strap from ever coming in contact, and should eliminate the possibility of dissimilar-metals corrosion.

The Federal Aviation Administration liked TCAC's SB and issued AD 91-08-09, which made its provisions mandatory. A proposed AD is now in the works that would stretch the inspection intervals up to 36 months for a corrosion-free spar and 30 months for spars with less than 50 percent of allowable corrosion limits.

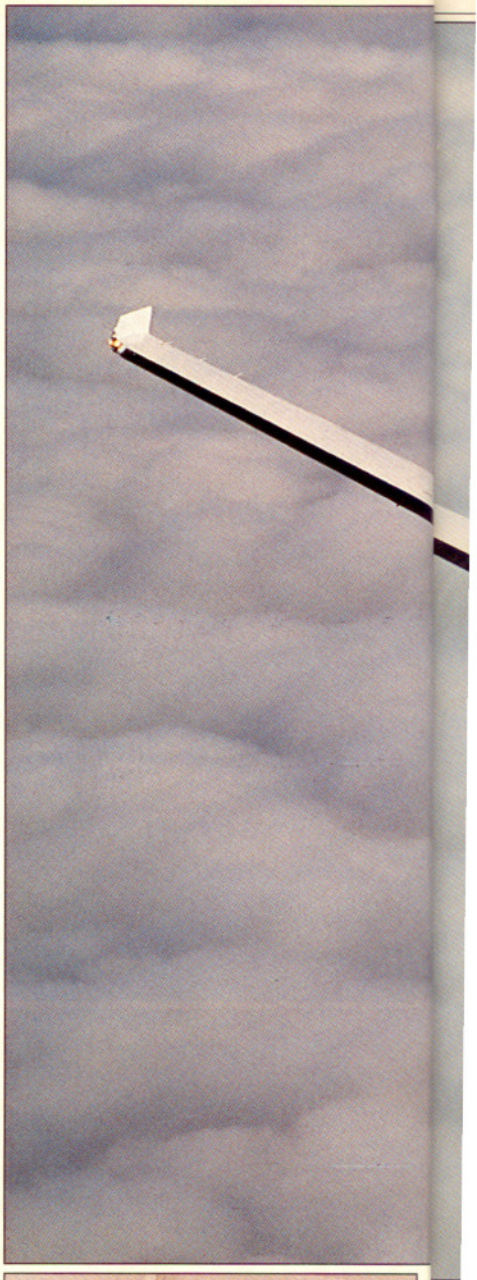
Because inspections are mandatory—and expensive—many twin Commander owners are now ending their problems by installing the new spar kit, which terminates the AD. A TCAC program offers a new cap and strap for free. There's a $70,000 labor charge for the turbine twin Commanders and a $50,000 charge for the "short-wing" piston-twin Shrikes affected by the AD.

A spar kit offered by Aviadesign of Camarillo, California, will also take care of the problem. The kit, called the "Saunders Super Spar," is available as a supplemental type certificate (STC) and employs a design quite unlike the TCAC stock replacement. According to Aviadesign's David Saunders (who designed spar straps for older King Airs), the kit uses aluminum spar caps with stronger metallurgy, fewer built-in stresses, and better temper than the stock caps. In addition, Aviadesign's kit uses an external aluminum strap attached to the spar cap but mounted on the lower wing surface. Saunders shuns the use of stainless-steel straps, calling them "the bad guys in the first place."

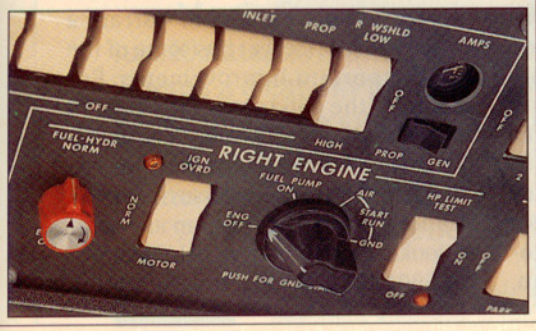
The Aviadesign kit costs $79,500 and includes parts and labor. For further information, contact Aviadesign at 375 Durley Avenue, Camarillo, California 93010; telephone 805/981-3940.

As if this weren't enough, another proposed AD would require that the spar caps of certain 690Bs be inspected for defective grain structure. TCAC has yet another SB to address this problem, and Aviadesign has an STC'd fix.

In this case, the situation has to do with a batch of bad extrusions. About 80 690Bs have the questionable spar caps, which apparently were manufactured under poor quality-control conditions. The bad caps have fine-grained aluminum with what's called an equi-axed structure, which is quite unlike the large-grain, elongated structure a spar requires. Without the correct structure, stress corrosion



Classic lines, an all-business cockpit, and more than a few quirks distinguish the turbine Commanders.



cracking can take place—as it has in a few 690Bs. If you have a bad spar cap, then replacement is necessary.

About 30 TCAC spar kits have been installed. It takes about 1,300 man-hours (around two weeks) to do the job. So far, some 14 Aviadesign kits have been completed.

So the 690 series has its share of spar problems, and any prospective buyer must be aware of them.

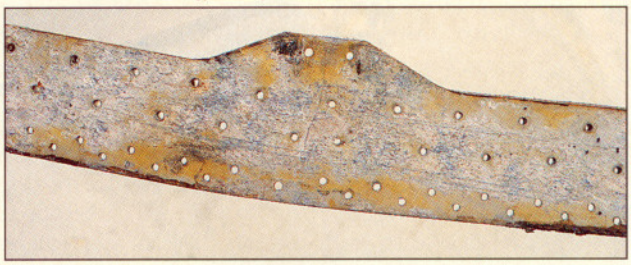
Ready for another potentially big problem? It's the fuel cells. To comply with the spar cap SBs or AD, you have to inspect the spars, right? To do this, you have to remove the 690 series' rubber fuel cells. There are 22 of them, and after 10 years or so, you can bet that some have cracked or otherwise become unusable. Sometimes the act of removing them will crack the cells. At any rate, new cells are about $3,000 apiece. Overhauled ones are somewhat less.

(The Propjet 840s have a big advantage in this department. They have wet wings, so no rubber cells.)

Actually, the 690 series' fuel system is very, very simple. All 20 wing-mounted cells feed into two fuselage-mounted cells. There's a simple on/off fuel switch (plus the usual emergency shutoff valves at the engine firewalls) and a single fuel-quantity gauge. There's no crossfeed and no transfer pumps. For pilots, the fuel system is exemplary in its user-friendliness. However, for an out-of-practice mechanic, removing and replacing those fuel cells can be a nightmare.

As we go to press, the FAA announced another notice of proposed rulemaking concerning the Commanders' wing flap cables and master pulleys. The intent is to establish an AD mandating an inspection of these components and replacement of any damaged cables, cable guides, or pulleys.

Now that we've explored all the 690s' warts, it's important to remember that TCAC supports the airplane very well through its network of authorized service centers. The Aviadesign kits can be installed at three approved facilities. Garrett has done an exemplary job in addressing the -5's problems in as economical a fashion as possible.



Replacement of defective wing spar caps involves disassembly of the wings, removal of the fuel cells, and new spar caps and straps. Strap below shows the effects of dissimilar-metals corrosion.

Pilots new to the twin Commander should, of course, receive type-specific training. The simulator-based training offered by FlightSafety International in Oklahoma City is an excellent way to become familiar with the airplane's normal, abnormal, and emergency procedures. One quirk, though—the hydraulic nosewheel steering—will take a little real-airplane practice to master. Push softly on a rudder pedal, and the hydraulic steering system turns the nosewheel. Push just a little harder, and there's plenty of braking action. The neophyte twin Commander driver is easily spotted by his lurching turns and sudden stops.

The airplane featured in the photographs accompanying this article is a 1975 690A operated by Horizon Automotive Group of Roseburg, Oregon. This is a firm that manages a network of West Coast Honda and Mazda dealerships and has interests in the lumber and wine business. The company bought its Commander from Eagle Creek Aviation Services at Indianapolis' Eagle Creek Airpark. The purchase price was $500,000.

Horizon looked at Conquest Is, C90 and E90 King Airs, and Cheyenne IIs during its airplane search. It found the Conquests and King Airs too high priced. The Cheyenne cabin was too small for Horizon's tastes, and there was also concern about the Cheyenne's longitudinal stability.

Horizon bases its Commander—N72VF—at Santa Ana's John Wayne/Orange County Airport in California. Typical mission profiles include frequent trips to Roseburg, Portland, Coos Bay, Bend, Eugene, and Astoria, Oregon. Horizon's pilot, Gordy Iler, Jr., says he usually carries two passengers and that trips to Oregon take just two hours. He usually flies between 22,000 and 28,000 feet and trues out at 270 knots.

What does he like about the airplane? "It's a good single-pilot airplane," says Iler. "And its stability makes it great for instrument flying." Iler, whose previous experience includes stints as a Learjet captain, says "It's real nice to be back in a high-performance airplane," when asked about the 690A.

What do the passengers like most about N72VF? "The speed," says Iler. "Since we can do our trips so fast that they're not standing up a lot."

Horizon's Commander has just about everything a prospective buyer should look for in today's turbine twin Commander market.

First off, the 690A itself is desirable because it's old enough to warrant a lower asking price, yet has some of the more important improvements. For example, the 690As were the first to have electrically heated glass windshields and known icing approval. The straight 690—its predecessor—uses an alcohol spray bar and has an antiquated-looking instrument panel. Secondly, the 690A has a 5.2-psi pressurization

system; the 690's is 4.8. Finally, the 690As came with more soundproofing than the 690s.

N72VF has had the spar replacement (performed by Eagle Creek, an authorized TCAC and Garrett service center), plus a new paint job and interior. It also has the 5,400-hour TBO conversion and Commander-Aero's "Aerodyne" winglets, which give the wing tips the look of a Propjet 840.

When the interior work was done, extra soundproofing was installed. The high-pitched scream of the Garrett turboprops has always been a sore spot with many operators. With the propeller arcs so close to that flat-sided fuselage, extra soundproofing is essential for achieving bearable interior noise reductions. N72VF's inside noise level was such that a passenger on the rear bench seat claimed he could hear cockpit conversations.

By the way, that rear bench seat is more or less directly beneath the airplane's center of gravity. This means that passengers seated there are subjected to a minimum of rolling and yawing in turbulence—another reason why passengers think it's the best seat in the house.

Our flights included a sampling of instrument weather, and we can attest to the airplane's excellence as an instrument platform. On our returns to the Eagle Creek airport, we flew the localizer approach with no trouble at all managing systems, power, or configuration. In spite of its rocket-ship image and high performance, it should be easy for the pilot of a piston twin to transition into a 690.

Prior to landing, the hydraulically actuated landing gear can be lowered when speed slows to 200 KIAS. Then power is reduced to 200 shp per side (there are no torquemeters; power information is provided on gauges reading in horsepower), followed shortly with the first increment of flaps.

Pattern speed works out to approximately 120 to 140 KIAS, and final should be flown no slower than blueline—115 KIAS. Over the fence, our airspeed was about 100 KIAS, followed by somewhat graceless, but acceptable, touchdowns. Veterans, however, show off by making greasers with the nose angle as high as a Skyhawk's.

No doubt about it, the airplane has fine manners. Anyone considering a 690-series Commander would soon realize he or she is getting a whole lot of airplane for the money. You may not have the interior room of a King Air or the speed of an MU-2, but you will have one of the classiest airplanes around, with record-setting performance and considerable ramp appeal. □

MEET THE NEW OWNERS

New life for a classic design

Ted Smith designed the first prototype of what was to become the twin Commander in 1946. His company, Aero Design and Engineering Corporation, certificated the design in 1952. Through the 1950s, the company cranked out several powerful, high-wing piston twins. All of them were powered by geared Lycoming engines ranging from 260 to 340 hp, and one of them, the 680E, was the world's first pressurized light twin. In 1958, the Rockwell-Standard Corporation bought Aero Design. The company name was changed to Aero Commander. Rockwell-Standard merged with North American Aviation in 1966, to form North American Rockwell. In 1981, Gulfstream American bought North American Rockwell. During this whole period, the twin—and beginning in 1976, single-engine—Commander line grew and diversified, and sales of turbine twin Commanders alone totaled 2,122 airplanes. Because of the ownership changes, twin Commanders have been known as Aero Commanders, Rockwell Commanders, and Gulfstream Commanders. But they're all the same basic airframe.

TCAC General Manager James Matheson

But in 1985, Gulfstream (Gulfstream Aerospace, by then) stopped making twin Commanders. For four years, twin Commander owners and operators languished under dwindling product support from the Gulfstream organization. Price and availability of parts, always a very sore issue with twin Commander owners and operators, worsened during this time. Many felt that a dearth of maintenance solutions to the technical problems of their aging airplanes would make it unsafe or uneconomical to fly their twin Commanders.

This all came to a happy end in December 1989, when Twin Commander Aircraft Corporation (TCAC) of Arlington, Washington, bought the type certificates for all twin Commanders from Gulfstream. TCAC, a branch of Precision Aerospace, now heads up a worldwide network of 41 TCAC-authorized twin Commander service centers (27 of which are in the United States) and a parts inventory worth more than $11 million. Most of the service centers have experience with twin Commanders dating back to the Rockwell days.

TCAC General Manager James Matheson sums up the company philosophy by saying, "We're trying to create a renaissance here." By that, he means attacking parts-availability problems, drastically lowering parts prices, and ensuring that TCAC strengthens its technical support and engineering capabilities.

One example of this is TCAC's spar cap replacement kit, mentioned in the accompanying article.

TCAC also publishes "Captain Commander's Bargain Bulletin," which lists the latest reductions in parts pricing. In one issue, reductions in the prices of some 25 different parts were announced. Heated windshields are down from $25,980 to $23,695. Boost pumps are now $1,735, down from $3,006. Starter-generators were $6,999 apiece; now they're $6,450. Even the landing-gear bungees are marked down. They were $4.25 each; now they're down to $1.20.

TCAC also sponsors an annual symposium for its authorized service centers.

"When Gulfstream let the twin Commander go," Matheson says, "there was still a great personal attachment of owners to their airplanes but also a strong feeling that the airplane had no real parent. That's what Twin Commander Aircraft is all about. We're in it for the long run." —*TAH*