

# TWIN COMMANDER'S TURNAROUND

*Rebuilding a classic turbine twin  
from the ground up*

BY THOMAS A. HORNE

**IT'S** been two years since *Turbine Pilot* covered the goings-on with the Twin Commander series of turboprop twins ("Used Turbine Review: The Commander 690 Series," September 1993 *Pilot*). ■ Since then, a lot of new developments have taken place. The Twin Commander Aircraft Corporation (TCAC), the new holder of the type certificates for all piston- and turbine-powered Twin Commanders, has steadily implemented a number of significant maintenance and product improvement initiatives. "We're trying to create a renaissance here," TCAC General Manager Jim Matheson said during our last visit. ■ He's followed through on the effort, as demonstrated initially by

PHOTOGRAPHY BY MIKE FIZER



TCAC's proactive stance with regard to concerns about the 690-series Twin Commander airframe. It was TCAC that first issued service bulletins calling for inspections of certain Twin Commander wing spar components. Several Twin Commanders showed evidence of corrosion along the lower wing spar cap. On its own initiative, TCAC issued service bulletins that offered guidance for fixing the problem, then came up with a spar kit to do the job. Though the FAA later issued airworthiness directives ordering that the spar caps be fixed, its phrasing mimicked TCAC's instructions. Now, most of the affected airplanes have had the TCAC fix performed (cost: approximately \$75,000), and the AD is no longer the big issue it used to be.

TCAC also dealt with three other big service issues. One involved the Twin Commander's flap cables and pulleys. Some were wearing and binding, so TCAC put out another service bulletin and provided another fix. This one costs \$3,600. Once again, the FAA followed this lead and required the repair by issuing an AD.

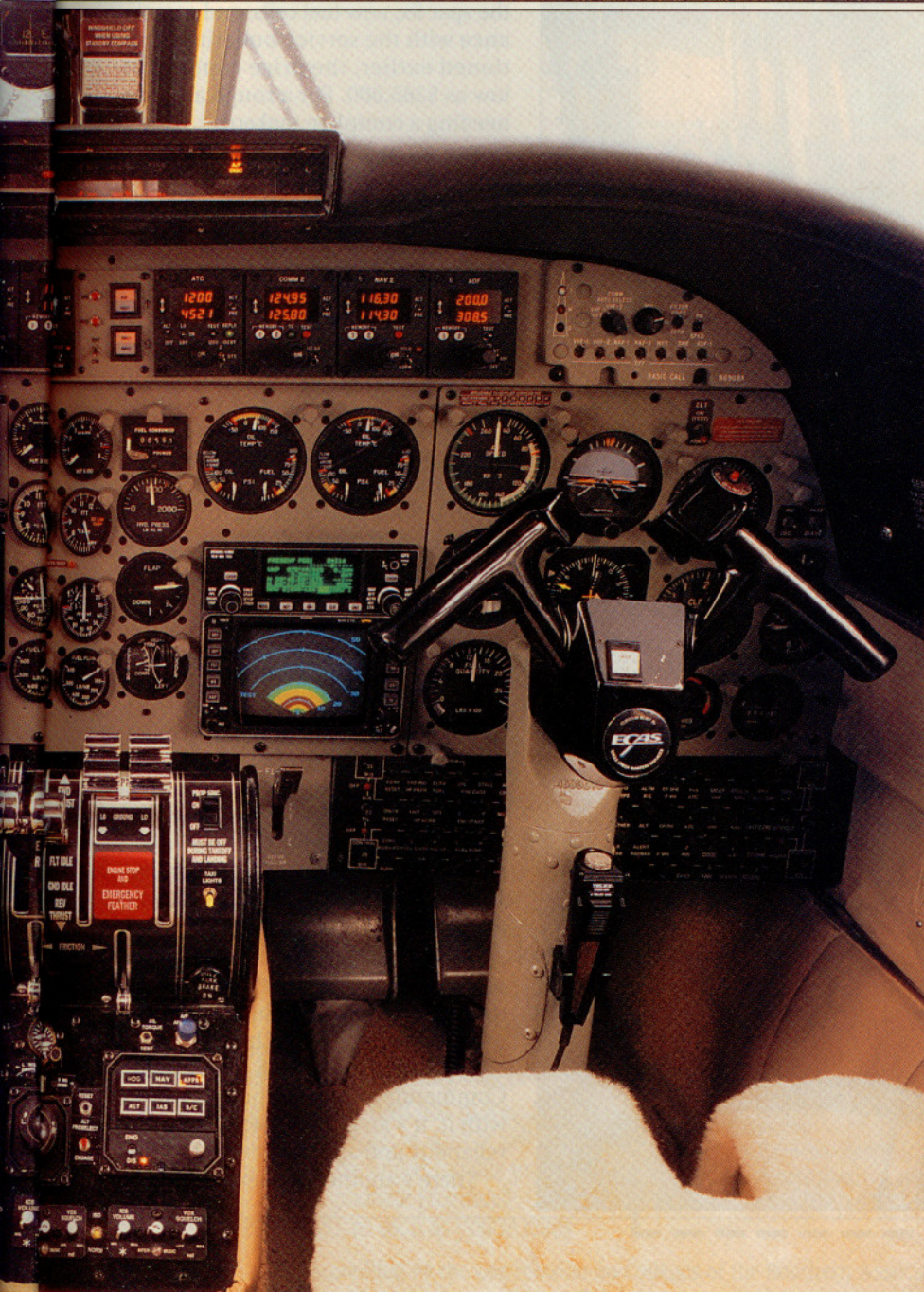
Another TCAC service bulletin recommends beefing up certain Twin Commander vertical stabilizers with stringers and doublers, and providing an access panel on the vertical tail so that areas exhibiting stress can be more easily inspected. This fix runs \$6,250.

Still another program lets owners of 690A, -B, and -C model Twin Commanders replace their aging fuel cells at drastically reduced prices. Two years ago, a set of new rubber fuel cells (there are 22 of them) for these airplanes cost \$67,500. TCAC jawboned its suppliers' prices down and now offers the cells for about \$33,250.

Prices of other replacement parts have also been reduced. Nose gear doors that cost \$2,000 in 1993, for example, now go for \$600. A full set of high-pressure Teflon hoses for fuel and hydraulic lines once sold for \$5,800. Now TCAC sells them for \$3,200.

Last summer, a controversial National Transportation Safety Board recommendation called for a review of the Twin Commander's ailerons. This was brought about by a pilot's report that his airplane experienced an uncommanded roll. Based on an interview with the pilot, the NTSB felt that the airplane may have experienced a phenomenon known as





aileron snatch. This is a condition in which there is a sudden, uncommanded, violent aileron deflection. Because Twin Commanders employ Frise-type ailerons, the NTSB felt that they might have been at the root of this pilot's problem. Frise ailerons are designed to provide balanced aileron control forces and reduced adverse yaw by having the leading edges of an upraised aileron extend into the relative wind. Perhaps, the NTSB believed, those leading edges can descend too far into the relative wind and cause enough drag to produce wild rolling moments.

TCAC, with FAA involvement and the participation of engineers from Lockheed and Boeing, came up with an exhaustive flight test program to

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explore the possibility of aileron snatch. A Twin Commander was deliberately misrigged so that the ailerons would move far beyond their specified travel limits. Then the aileron trim tab was misrigged—with twice the allowable free play.

In this condition, test pilots flew the misrigged Twin Commander at high altitude and low, and at speeds up to redline. The airplane was even taken beyond the maximum operational Mach speed at high altitude. At each point in the flight test envelope, pilots introduced rapid aileron inputs. There was no evidence of unusual aileron activity, the test report was accepted by the FAA, and the NTSB subsequently dropped the issue.

It took a while, but programs like these helped turn around the image of Twin Commanders as AD magnets and service nightmares. These days, Twin Commanders have one of the best service and support networks of any turboprop twin, let alone one that's 20-plus years old.

At the National Business Aircraft Association convention in October 1994, TCAC took its campaign to preserve the fleet a level higher. That was when Matheson announced the



"Renaissance Commander" program, a service package that will restore 690A, -B, -C (also known as Jetprop 840), or -D (Jetprop 900) model airframes to like-new condition.

"... We feel two-thirds of this classic airframe's life is still ahead of it," Matheson said at the time. "When an owner completes this program, he will have one of the safest, most cost-effective airplanes on the market."

A listing of all the procedures bound up in a Renaissance refurbishment would take more than space permits. Let's just say that every part of a

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Renaissance Commander that moves or wears will be removed and replaced with new components. This takes in every system on the airplane: control system, fuel system, hydraulic system,

electrical system, you name it.

Compliance with all service bulletins and ADs is included in this huge work package, as is a thorough inspection for corrosion and replacement of any defective parts. As Indianapolis-based Eagle Creek Aviation Services, one of the 27 TCAC-authorized U.S. service centers, likes to say, this is a "radome to tailcone" job. Not a single part of the airframe goes unscrutinized.

A new interior and JetGlo paint job are part of the deal, and so are repainting and relettering of all instrument panels. The thrust and rpm levers are even rechromed.

How much, you say? It all depends. If you've already had some of the necessary work performed, such as, say, the spar fix, new fuel cells, and compliance with the service bulletins mentioned earlier, the price could be as low as \$265,000. For a rough airplane needing a complete makeover, expect to pay up to \$365,000. Those figures include parts and labor. A new interior with leather seats and relaminated cabinets will run you another \$25,000 or so, and the paint job is another \$14,000. Topping off the deal is a one-year warranty on parts and workmanship. An optional two-year extended warranty will probably be offered in the near future, but TCAC says it hasn't yet decided on its price structure.

Having a beat-up old Twin Commander morphed into a Renaissance version isn't as simple as rolling the airplane up to a maintenance hangar and handing over a wad of cash. Certain baseline standards must be met as preconditions. First the airplane must go through a maintenance audit. A complete maintenance history is a must, so that inspections, parts, and repairs can be traced. There can be no corrosion so advanced that it cannot be restored to near-new condition. There can't be any damage-related repairs unless they've been made according to factory specifications. Finally, the candidate airplane must have a clear title.

"When customers go with a Renaissance deal, they're not buying into a used 690A, for example, that's been worked over," Matheson says. "They're buying a 1995 Renaissance Commander. By the time we're done with it, it's an airplane with near-new reliability and appearance."

There's another big new TCAC pro-



*Before: Interiors are ripped out, the entire airframe is inspected, and any problems are corrected.  
After: This new interior with leather seats and all the trimmings was done by Byerly Aviation of Peoria, Illinois.*

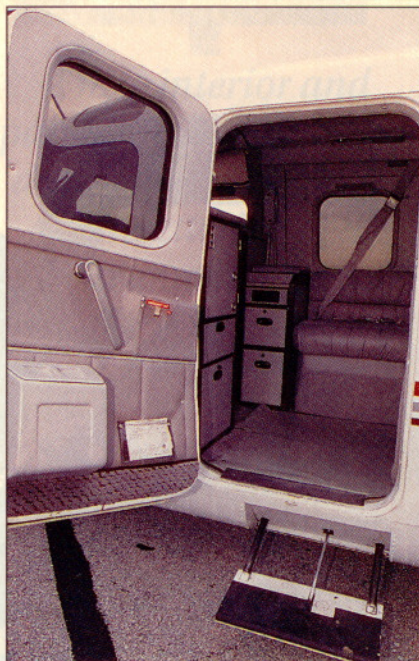




gram that will jack up both the value and the performance of an old 690A, -B, -C, or -D. This is an engine upgrade—actually a hot section replacement and upgrade—that lets owners switch from those airplanes' standard Garrett TPE-331-5 engines to TPE-331-10 powerplants. The -10 conversion gives pilots more power to higher altitudes, faster times to climb, and greater fuel economy than the factory-equipped engines. In fact, the -10 engine is the same used in the latest Twin Commanders, the models 980 and 1000. The -10 hot sections are the same as those used in the British Aerospace Jetstream and Fairchild Metroliner series of turboprop commuters, which have 3,000-hour hot section inspection (HSI) intervals.

Where the stock -5 engines have a thermodynamic horsepower rating of 840 shaft horsepower and a flat rating to 717.5 shp, the -10 weighs in with a 1,000-shp thermodynamic rating and an identical flat rating. This lets these engines loaf at altitude, because they're not working so close to their ultimate potential power and temperature limits.

Cruising at FL290, a Twin Commander with -10 engines will do 296 KTAS while burning about 476 pph, or 71 gph, according to TCAC. The best a -5-powered Twin Commander can do is



**When customers go with a Renaissance deal, they're buying a 1995 Renaissance Commander.**

approximately 282 KTAS at FL180, burning 588 pph or 88 gph.

At altitudes more favorable to high

cruise speeds, like FL240, the -10 can make a Twin Commander tool along at 300 to 315 KTAS, depending on weight, while burning 520 pph. In short, the -10s can give up to 33 more knots in cruise—with seven percent less fuel flow than would be the case with the standard-issue -5s, according to TCAC.

At mid-weights (say, 8,700 pounds), TCAC says -10-converted airplanes will take just 12 minutes or so to climb to FL290 and will produce full takeoff horsepower up to 15,000 feet. At FL180, the -10s can still make 700 shp per side. At FL240, power is still up at the 600-shp mark for each engine.

The -5s begin to lose steam at 6,000 feet. At FL240, they can turn in only 265 shp per side, or less than half the horsepower the -10s can make.

The conversion can be made in one of two ways. Let's say your old -5s are reaching their 5,400-hour TBOs. You can have the conversion done in place of the regular overhaul, at a price of approximately \$425,000 for both engines. While this is some \$180,000 more expensive than doing a straight -5 overhaul, the advantage is that the next HSI comes at 2,500 hours—not the 1,800 hours called for by the standard -5 engines.

Under the terms of the conversion, cost of that next HSI is capped at \$25,550 per engine. This means that





operators need reserve only a total of \$22 per hour for the HSIs.

Moreover, the second HSI and gearbox inspection, which must be performed at 3,600 hours on -5s, can be waived. The disadvantage here is that, under this scheme, TBO is cut back to 5,000 hours.

The other way a -10 conversion can be made is at engine midlife. Owners facing that second HSI and gearbox inspection at 3,600 hours can have their engines converted to -10s instead. This work package should run from \$285,000 (690As and Bs) to \$295,000 (690Cs and Ds). TBO stays at 5,400 hours.

While this option is about \$180,000 more expensive than a typical HSI and gearbox inspection, TCAC has found that many owners can't wait to get the extra performance of the -10s and like the idea of still having 1,800 hours to go until TBO.

The conversion replaces the three original turbine wheels, turbine shaft, plenum, combustor, and associated parts. The new hot section components have better metallurgy, better cooling, individually replaceable blades, a larger plenum, and a new combustor design that produces less carbon.

Also included in the -10 conversion are duplex fuel nozzles—a paired system with primary and secondary nozzles. The placement of these nozzles improves fuel efficiency via a better spray pattern and cuts way back on carbon erosion of blade parts, a problem that many -5 engines have experienced.

Externally, the most obvious signs of a -10 conversion are the huge, chromed exhaust stacks—identical to the those of a Twin Commander model 1000. Oil cooler doors are also installed on the engine nacelles. In the cockpit, the original ITT gauges are replaced with EGT indicators. TCAC says the very sensitive ITT gauges used in the original Twin Commanders are not really needed in these conversions because engine temperatures run cooler. Besides, EGT gauges and components require far less maintenance than ITT equipment.

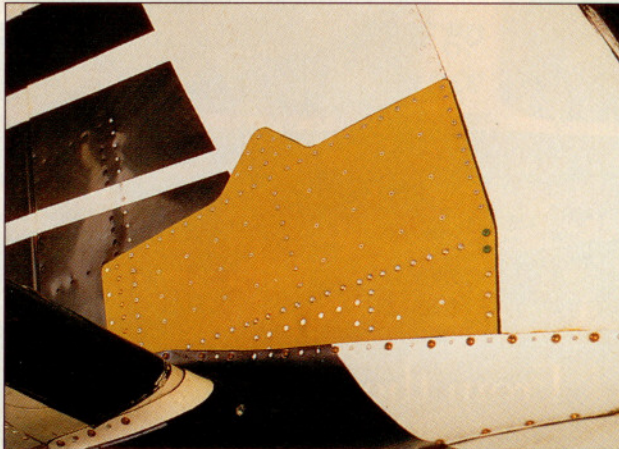
It takes about five weeks for a

TCAC service center to perform the -10 conversion.

Lucky me. I had a chance to visit Eagle Creek Aviation twice in the past six months and flew both a -10 conversion and a 690A restored to Renaissance specs.

I flew a 1973 690A with the -10 conversion from Indianapolis' Eagle Creek airport to last year's AOPA Expo in Palm Springs, California. Enroute at

■  
*It's important to  
remember that they're  
not making new  
Twin Commanders  
any more.*



*The Renaissance Commander work package includes compliance with service bulletin number 218, which calls for a vertical stabilizer beefup and an access panel for future inspections.*

FL240 and minus 22 degrees Celsius (slightly warmer than standard), I recorded a true airspeed of 311 knots while producing 620 shp per side. Fuel burn was 260 pph per side, and EGTs were at 550 degrees—10 degrees below redline. There was enough power left for a sprightly climb to higher altitudes.

If that airplane had had -5 engines, the speed would have been 276 KTAS, each engine would have been putting out 440 shp, and the fuel burn would have been 245 pph per side. Climbing any higher would have been a time-consuming effort.

There was a punishing 80-knot headwind on the first leg to Pueblo, Colorado, but groundspeeds still

hovered near 235 knots—not bad for westbound at FL240. By the end of the second leg, near Needles, California, our GPS finally registered a 300-knot groundspeed. Later, I was told that the same airplane made the return trip non-stop.

More recently, I watched physician William G. James' 1974 690A roll out of Eagle Creek's maintenance hangar. James pulled out all the stops, and now his is truly a gorgeous airplane. He had the full Renaissance/-10 conversion package done, which gave him an airplane that TCAC calls the "Supreme Commander." Photographs of the airplane accompany this article.

It's hard to believe that this airplane is 21 years old. The cockpit treatment is particularly nice, including the Gables digital control heads and displays on the ship's Collins Pro Line VHF nav and comm radios.

TCAC has other irons in the fire, and EFIS is one of them. The company is now designing a two-tube EFIS upgrade for the Twin Commander, along with an all-new panel design. Early estimates are that a Collins EFIS package will cost around \$130,000 and take 200 hours to install.

Another plan in the works would extend eligibility in the Renaissance program to straight 690 airplanes and the piston-twin Shrike model 500S.

While these programs aren't cheap, it's important to remember that they're not making new Twin Commanders any more. The TCAC Renaissance package is currently the only way to go if owners want to turn back the clock on their airframes and dial up the resale values. As for the -10s, they're the real icing on the cake.

For a closer look at all these mods, plan a visit to the Twin Commander Flight Group's first Fly-In and Convention at Oklahoma City's Downtown Airpark June 15 through 18. Steve McKinley (816/224-0346), TCFG's director, can provide additional information on the event.

For more information on the modifications, contact Twin Commander Aircraft Corporation, 19010 59th Drive, N.E., Arlington, Washington 98223; 360/435-9797; fax 360/435-1112. □