USED TURBINE REVIEW

CHEYENNES: THE I, IA, II, AND IIXL

Step-up turboprops that offer capability but demand respect

BY THOMAS A. HORNE

Those in the market for a used, entry-level turboprop twin have a lot of choices these days. The trick, as always, is to find the airplane that offers the most features for the money, fits typical mission requirements, and hits a prospective owner's emotional hot buttons. Of course, high on the list of importance is speed. But good looks, affordability, and ease of maintenance are just as important. For a large number of buyers, the early models of Piper's Cheyenne series fulfill these requirements. By "early models," we mean the original Cheyenne (later renamed the Cheyenne II), the Cheyenne

IA, and the stretched Cheyenne IIXL. The other three Cheyenne models, the III, IIIA, and 400LS, don't really fit into the entry-level category.

Design work on the Cheyenne began in 1965 as a turboprop-powered version of Piper's Pressurized Navajo. The Navajo airframe was fitted out with 620-shaft-horsepower Pratt & Whitney PT6A-28 engines, given a pair of 30-gallon wing-tip fuel tanks, and certified in May 1972. This model, designated the PA–31T-620, was manufactured from 1974 to 1977. Some 178 of these Cheyennes were built, and they were very popular in their day. Then as now, they offered a low-cost way of flying faster than their principal competitors, the Beech King Airs C90 and E90. New, the average equipped price of a Cheyenne was about $536,700; C90s and E90s went for $535,000 and $618,600, respectively. However, the Cheyenne offered slightly lower fuel burns at normal cruise power settings than the King Airs and boasted lower operating costs.

In both twin- and single-engine climb rate (2,800 and 660 feet per minute, respectively), the Cheyenne bests the King Airs; the C90 claims 2,000 and 555 fpm and the E90, 1,870 and 470 fpm.

The Cheyenne is no slouch in the cruise department, either. Its maximum speed at optimum altitude is advertised as 283 KTAS (the C90 and E90 topped out at 254 and 288 KTAS, respectively) and it has range-versus-payload numbers very comparable to the King Airs. True, the King Airs have more sumptuous cabins. But for owner-pilots drawn to the Cheyenne's hot-rod image, its tighter cabin was of secondary concern. The seat that counted was the front left.

The Cheyenne's other competition at the time, the Gulfstream (nee Rockwell) Turbo Commander 690s and the Mitsubishi MU–2, were really out of the question for most entry-level turboprop candidates. Their engines—Garrett TPE331s—are far more powerful (665 shp for the MU–2, 717 shp for the Turbo Commander) than the Cheyenne's PT6s; they cost up to $200,000 more and, in the case of the MU–2, had unconventional flight controls and handling characteristics.

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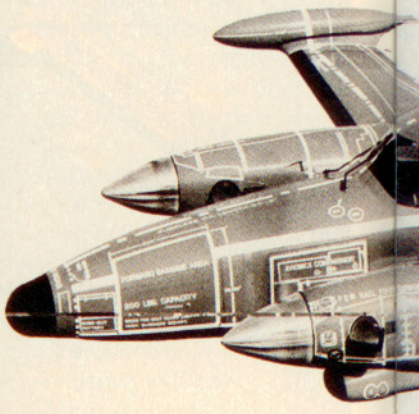
But the Cheyenne's flight behavior has a serious quirk of its own, and it's important to take the time to explain it. Why? Because it's a principal reason for the Cheyenne's low price in today's used market.

The Cheyenne's airframe was designed for the Navajo's geared, 425-hp Lycoming TIGO-541-E1A engines. Swapping them with the more powerful—and 500-pound lighter—PT6s upset the airplane's longitudinal stability, so Piper engineers came up with a stability augmentation system, or SAS, to deal with these destabilizing effects. In this application, the SAS is just a fancy term for an elevator downspring actuated by an angle-of-attack vane.

Of and by themselves, elevator downsprings are no big deal. Many, many airplanes use them, or a combination of downsprings and bobweights, to help augment an airplane's natural stability characteristics so that pilots have the proper pitch forces throughout the entire center of gravity, speed, and flight maneuver envelopes. But the Cheyenne was more dependent on its SAS than your average airplane.



In pre-certification flights, test pilots found that the Cheyenne didn't have the proper stick forces throughout the airplane's CG range—especially with a CG near the aft limit at high power settings and low airspeeds.

A pitch-stable airplane will return—after a few oscillations—to its trim airspeed if displaced. Pull back on the

control column to fly slower than trim speed, release the controls, and an airplane is supposed to nose over and return to trim speed. Push forward and release, and an airplane's nose is supposed to rise until trim speed is regained.

The pre-certification Cheyenne did neither. Rather, the airplane didn't seek a trim speed at all in this critical condition. Instead, it was at what aerodynamicists call the stick-free neutral point, which is a dangerous place to be at any time, let alone at high angles of attack, such as during takeoff or go-arounds. Control forces were very light, meaning that if the pilot pulled back and let go, the Cheyenne stayed at the new airspeed without giving the pilot the feeling that he was pulling—or pushing—away from the trim airspeed. Pitch control was still effective, but the control feel didn't meet the regulatory requirements.

Enter the SAS. When this system detects low airspeed and high angle of attack, it activates a variable-pressure elevator downspring to provide the proper control feel. Piper designed the SAS so that when the Cheyenne's airspeed drops below 125 KIAS, the downspring begins applying forward pressure on the control column. At 100 KIAS, the downspring exerts maximum nose-down force. To back up the SAS in case of a failure, an emergency system is provided. To activate it, the pilot pulls on a lanyard beneath his subpanel, which fires a CO_2 bottle that applies full downspring (forward stick) pressure. By the way, an inoperative SAS is a no-go item.

This method of producing artificial control feel allowed the Cheyenne to meet regulatory requirements, but the story doesn't end there.

On November 12, 1976, a Swiss-registered Cheyenne crashed after taking off into low ceilings and fog at Shannon airport in Ireland. All five aboard were killed. Irish accident investigators named the pilot's failure to maintain a positive rate of climb as the probable cause of the crash but mentioned the Cheyenne's "undesirable flying qualities" as a contributing factor. On February 24, 1979, another Cheyenne crashed after taking off in IFR conditions from Harrisburg, Pennsylvania's Capital City Airport, killing all eight aboard, plus one person on the ground.

Allegations soon flew, and suddenly the Cheyenne was at the center of controversy. British Civil Aviation Authority test pilots said that the Cheyenne had poor longitudinal stability in spite of the SAS. A fired Piper test pilot claimed that the SAS could cause wildly divergent pitch oscillations because of sharp nose-down inputs. A spate of newspaper and magazine articles came out, all critical of the Cheyenne's stability. In 1984, Piper paid $12 million to settle two lawsuits that arose from the Shannon and Harrisburg accidents. These alleged that the Cheyenne was an unsafe design, that Piper knew it before bringing it to market, and that the company lied under oath and destroyed evidence.

Though the National Transportation Safety Board named incorrect loading (i.e., aft of the approved CG range) as the probable cause of the Harrisburg crash and found no unsafe conditions in the design, certification, or manufacture of the Cheyenne, the damage was done. Properly loaded and flown by properly trained pilots, the Cheyenne is a safe airplane. But the SAS and pitch-stability controversies still haunt the airplane. For some, the Cheyenne's snappy control responses are something to be feared. For others, they evoke a fighter-like controllability that complements the airplane's aura of high performance.

In 1978, Piper came out with another version of the Cheyenne, the Cheyenne I. In acknowledgment of the original Cheyenne's faults, the I was given less powerful, 500-shp PT6A-11 engines, and its aft CG limit was brought 2 inches forward. Because of the reduced power, initial climb rate dropped by almost 1,000 fpm compared to the original Cheyenne, and maximum cruise speed fell by 40 knots. However, the Cheyenne I's changes allowed the airplane to be certified *without* an SAS. To sweeten the deal, the Cheyenne I average equipped price was about $621,500—some $100,000 less than a 620-shp Cheyenne. A standard Cheyenne I came without wing-tip fuel tanks, but they were available as an $8,600 option, and almost everyone anted up.

At the same time, the original Cheyenne was renamed the Cheyenne II. Nothing much changed but the name, though many still think the Cheyenne and the Cheyenne II are two different airplanes. They aren't. The cabin interior was widened by 3 inches (by recessing the sidewalls and armrests), the glareshield was lowered to give better visibility, and other minor changes were implemented over the Cheyenne/Cheyenne II's lifetime. But the SAS, the engines, and the CG envelope remained the same. For the 1980 model, a bobweight was

When the Cheyenne was brand-new, Piper sent a "blueprinted" version on a road show. Succeeding models (left, top to bottom) included Cheyennes I, IA, and IIXL. A 1982 Cheyenne II is featured on the title page.

added to the elevator control linkage, which improved pitch control feel and allowed Piper engineers to reduce elevator area and the size of the SAS's downspring. In 1981, auto-ignition was first offered as an option.

Operationally, two revealing changes were made to the Cheyenne II's pilot's operating handbook: a climb power limitation of 500 shp and a minimum climb speed of 120 KIAS. The 500-shp rating is the maximum power of the SAS-less Cheyenne I; 120 KIAS marks the entry—should the SAS fail—into the dangerous stick-free neutral zone of the flight envelope.

Cheyennes I and II were manufactured from 1978 to 1983. The Cheyenne I, with 189 sales, formed a solid niche but was no match for the II's impressive sales record of 343 airplanes. Apparently, the doomsayers had little effect on the II's popularity.

For an aging airplane, the Cheyennes have remarkably few major maintenance problems or airworthiness directives.

The Cheyenne IIXL, manufactured from 1981 to 1984, is basically a Cheyenne II with a 2-foot stretch—all of it forward of the main spar. This forward movement of the airplane's empty-weight CG, along with a climb power limitation of 500 shp, allowed the IIXL to be certified without the SAS. The IIXL is also the most versatile load-hauler of all the early Cheyennes. It's possible to fill up all eight of the IIXL's seats (with 170-pounders, that is), put 200 pounds each in the nose and aft baggage areas, still be within the loading envelope, and be just 20 gallons shy of full fuel. In this condition, you could take off, climb to 29,000 feet, cruise at 250 KTAS or so, and have an IFR range of about 1,170 nautical miles and an endurance of 4 hours 30 minutes. A total of 81 IIXLs were sold.

The Cheyenne IA, a slightly modified version of the Cheyenne I, came along in 1984. Wing-tip fuel tanks were standard with this airplane, and so were redesigned engine air intakes and elongated exhaust stacks. Compared to the I, these engine improvements gave the IA up to 12 more knots at the IA's service ceiling of 29,000 feet and about 6 more knots at maximum

cruise power and 12,000 feet. As with the Cheyenne I, there is no SAS.

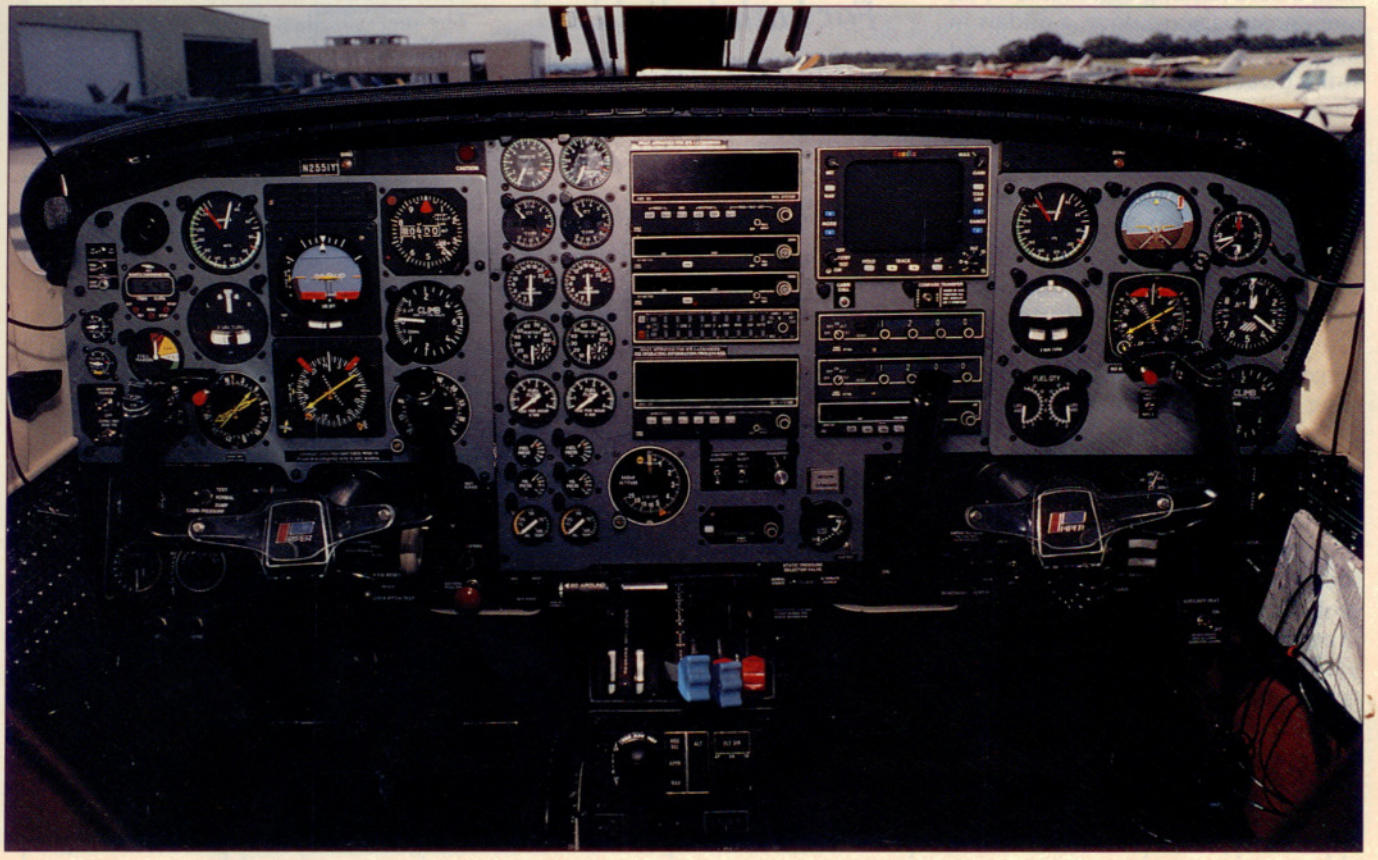
The IA's intakes were tailored for better recovery of ram air and, therefore, greater propeller efficiency. Part of the redesign involved reshaping the intakes for better air velocity; another change gave the oil cooler its own airscoop. In the I, intake air from a single scoop is shared by both the engine and oil cooler, which deprives the engines of the full benefit of the incoming ram air.

With just 20 sales, the IA is the rarest Cheyenne. Production was halted after just one year of production.

Thanks in large part to the SAS controversy, today's price for an early Cheyenne is approximately half the new price, making it affordable to more shoppers and even more competitive with the C90-series King Airs of the same age. The C90s of 1974 to 1985 now sell, on average, for about $100,000 more than the Cheyennes of that era. The 450-shp, PT6-powered Model 425 Cessna Conquests (built from 1981 to 1986) sell for about the same as a Cheyenne of comparable age but cruise up to 20 knots slower. The 635-shp, Garrett-powered Model 441 Conquest (built from 1978 to 1986) can go for up to $500,000 more than a Cheyenne.

The Commanders—with the exception of the Model 1000—are also comparable in price to the Cheyennes. The 1000 still fetches about $1.2 million, but with its 820-shp engines, it's really not in the same league as the early Cheyennes. MU–2s, on the other hand, go for anywhere from $100,000 to $200,000 less. That's because safety has been an issue with these airplanes, too—but that's another story.

Take a high-performance turboprop twin at a bargain-basement price, add a macho pilot with limited experience and training, then toss in an engine failure, IFR weather, or any kind of distraction. That's a recipe for a bad accident rate and a scenario that closely matches the accident history of the Cheyenne—the MU–2 as well, for that matter. The record shows that, when it comes to safely stepping up to turboprops, there is simply no substitute for a regimen of structured recurrent training. The courses offered by outfits such as FlightSafety International and SimCom, which include



extensive classroom and simulator time, are excellent for obtaining and maintaining Cheyenne proficiency.

A look at the AOPA Air Safety Foundation's general aviation accident database for the years 1982 through 1990 shows a total of 27 Cheyenne accidents. Eleven of them involved fatalities, and all but one (a Cheyenne I that had a midair collision) of these crashes were of Cheyenne/Cheyenne IIs. Six of the 11 fatal crashes occurred during instrument approaches, all of them associated with a loss of control or a failure to follow published procedures; two happened during or after missed approaches. Engine failures preceded two of the loss-of-control accidents. In one case, a pilot shut down the good engine prior to crashing. Two fatal accidents were of the classic stall/spin variety during turns from base to final. Another was a night VFR-into-IFR situation where the pilot flew into a fog bank on short final. The remainder of the Cheyenne fatals were controlled descents into terrain, also at night.

Among the remaining 16, nonfatal Cheyenne accidents, there were three gear-up landings, a landing-gear collapse, a landing short of the runway, a decompression caused by a failed window, a ditching due to fuel starvation, a hard landing aggravated by an open nose baggage door, a midair in which there were no injuries, and some directional control problems during takeoff or landing.

For an aging airplane, the Cheyennes have remarkably few major maintenance problems or airworthiness directives. According to Jim Salentano, chief of maintenance at Columbia Air Services in Groton, Connecticut (a Piper distributor and Cheyenne service center), "The biggest maintenance problem for the older Cheyennes is *no* maintenance.

"A lot of owners take their airplanes to shops unfamiliar with the Cheyenne, so many items on the recommended maintenance schedule get neglected," Salentano said. "Then, by the time a Cheyenne service center sees it, the airplane needs a whole lot of corrective work."

Citing one common example, Salentano mentions the Piper-recommended special inspection procedure for the fuel bladders. Every two years or 2,000 hours, the bladders are supposed to be opened and cleaned, but apparently, it's a procedure that's rarely done. "I've seen everything in those fuel cells," Salentano says. "Jelly-like masses of microbial gunk 4 inches deep, packs of cigarettes, ball point pens, even a newspaper."

Other recommended procedures include starter-generator overhauls every 1,000 hours and replacement of the SAS downspring pivot points every 2,000 hours. Other SAS maintenance is also very common. The angle-of-attack vane's potentiometer often fails. ("I replace about one a week, on average," says Salentano.) Periodic adjustments of the elevator downspring pressure are also required.

The SAS's angle-of-attack vane.

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A repetitive AD on the Cheyenne's Janitrol heater can be a real headache. To check for cracks in the burner cans, the heaters must undergo a leakdown test every 100 hours. After being pressurized, the cans can't leak more than 1 psi per minute. If they fail this pressure decay test, the heater must be replaced, at about $2,000 a pop.

Contamination of the air conditioning system can be yet another problem. Over the years, contaminants enter the system, causing corrosion and damage to components.

Structurally, the Cheyennes have weathered well over the years. Corrosion of the airframe has been rare, thanks to Piper's use of extensive anticorrosion treatments and epoxy primers. There are reports of wear at the elevator hinge points, which require affected elevators to be removed and their hinge bearings be replaced. Cracks in the landing-gear doors are also common. So are failed inertial separator transmission jackscrews in the PT6 engine's air intake system.

The most serious service bulletin concerning the airframe asks that Cheyenne elevator butt ribs (those at the inboard end of the elevator) be inspected for cracks every 500 hours, unless four external reinforcement patches are installed.

Parts availability for older Cheyennes hasn't been a problem. Piper still stocks a large number of parts, but if a Cheyenne part is unavailable, Piper will still make you one. However, you'll wait two to four weeks to receive it. A healthy salvage network can provide customers with all manner of non-life-limited parts.

So when looking for an early Cheyenne, look for one that's been maintained by one of the 21 Piper distributors (in the Cheyenne's salad days, there were more than 200 Piper-approved service centers), and one that has the paperwork to prove that the maintenance was thorough.

The search shouldn't be too difficult, and now is a good time to buy. The recession has driven prices down, and availability is generally very good. From November 1992 through March 1993, some 55 Cheyenne/Cheyenne IIs were up for sale; 26 went for an average price of $425,000. There were 21 Cheyenne I/IAs on the market; 15 sold at an average of $440,000. At the same time, there were 10 IIXLs for sale, and three went for an average of $700,000. Those are average prices. For a beat-up Cheyenne with run-out engines, prices will naturally be lower—as low as $270,000 for a 1974 Cheyenne and about $585,000 for a IIXL, according to the latest *Aircraft Bluebook–Price Digest.*

For both individual and corporate owners, the early Cheyennes make sense as step-up purchases, as long as the combination of low price, low maintenance, and high performance remains in vogue. If you train for and respect the airplane's high performance, understand the II's loading limitations, and look beyond the SAS brouhaha, the Cheyenne will reward you with pleasant handling, great capability, and classy ramp presence. □