Safety first

Win-A-Twin training, and the reasons why

BY THOMAS A. HORNE

Up to now, we've been covering the restoration aspects of AOPA's Win-A-Twin Comanche project. It's been a sometimes frustrating, sometimes funny, always educational saga, as anyone who has followed the updates in *AOPA Pilot* or on AOPA's Web site can confirm.

But now it's time to talk about the Piper Twin Comanche's alleged darker side, and the safety issues that have followed this airplane around for four decades. We're not talking about the merely bothersome idiosyncrasies that attach to any airplane—things such as funny landing traits and other odd behaviors (although we'll certainly address these in a future article)—we're talking about dangerous traits.

Before we go too far, though, remember this: The issues that affect the Twin Comanche also affect many other light twins. Deadly rollover crashes because of loss of control in low-airspeed, asymmetric-thrust conditions are not the province of Twin Comanches alone. They've happened to Beechcraft Barons and Travel Airs, Cessna 310s and 320s, and Piper Apaches and Aztecs, too—to name just a few airplanes.

Marketing perspectives

The Twin Comanche came along in 1963, and faced competition from the Beechcraft Travel Air. But Piper sold Twin Comanches for an average of $41,190. Travel Airs went for $66,800. That price differential coupled with the two airplanes' nearly equal performance (Piper advertised a 169-knot cruise; Beechcraft said the Travel Air would do 174 knots) and unequal fuel burns (the Twin Comanche's 14-gph total versus the Travel Air's 180-horsepower engines burning 20 gph) clinched the deal for many.

The same strategies were used in selling single-engine Comanches against the prestigious Beechcraft Bonanza. And so it was that the Comanche quickly became known as the "poor man's Bonanza," and the Twin Comanche the "poor man's Travel Air." In any event, their economic advantages landed many Twin Comanches in multiengine training fleets.

Training in the 1960s

In the early 1960s, there was little in the way of practical test standards for designated examiners giving the multiengine rating checkride. Multiengine instructors felt free to concoct

PHOTOGRAPH BY MIKE FIZER

their own methods and procedures for training multiengine students. Many instructors merely passed on the dangerous training maneuvers they'd been exposed to. Sometimes this meant subjecting students to engine cuts right after takeoff, single-engine stalls, steep turns at slow airspeeds with a windmilling or feathered engine, single-engine go-arounds with a feathered engine, and other hair-raising stunts that aren't tolerated today.

Pulling an engine right after takeoff was a favorite teaching drill. It was also the most dangerous. During the initial climb, airspeed is relatively low, and so is altitude. Often, an engine's power was reduced to idle when the airplane was well below 500 feet agl.

Down low, engines develop their greatest power—and the most asymmetric thrust should one of those engines experience a power loss. If airspeed is allowed to drop below V_{MC} (the minimum airspeed at which directional control can be maintained with the critical engine inoperative and the other engine at full power) the Twin Comanche—and any other light twin with two conventional, clockwise-rotating engines—it can produce uncontrollable yawing and rolling forces. The result: a rollover to the inverted. With so little altitude, there's little room for recovery and little margin for error should recovery efforts be delayed, botched, or ignored.

So, while low-altitude engine cuts could be convincing demonstrations of low-airspeed, engine-out aerodynamics, they could also prove too realistic.

Soon after its introduction, fatal stall/spin accidents involving Twin Comanches began to occur. Many appeared to be the result of V_{MC} demonstrations gone horribly wrong. Some were at low altitude, some involved aft-center-of-gravity loadings, and some involved low-time instructors.

By 1967, 13 Twin Comanche training accidents had killed 30 people. By 1971, 73 had lost their lives in 40 Twin Comanche training accidents.

The question was asked: Was the Twin Comanche an unforgiving airplane, even for the proficient? In short, was it safe?

Inquiries

After the NTSB and the FAA conducted special inquiries of the airplane's engine-out and spin characteristics, several measures were taken.

What's V_{MC}?

Pilots unfamiliar with multiengine flying may wonder why there's so much fuss about V_{MC}. While a full discussion is outside the scope of this article, in the context of the accompanying article a brief explanation is in order.

All pilots know that control effectiveness deteriorates at slow airspeeds. Ailerons require more deflection to effect changes in bank, and the rudder and elevator also call for a heavier hand. In a fully developed stall, the controls essentially stop working altogether. The airplane is out of control—until you recover from the stall.

V_{MC} is a sort of multiengine equivalent. With the critical engine out, if you fly below V_{MC} (which is marked on the airspeed indicator with a red radial line) you may not have enough rudder effectiveness to counter the yawing produced by asymmetric thrust. And this can lead to an out-of-control situation as the airplane rolls into the dead engine.

What's a critical engine? It's the engine whose loss most adversely affects an airplane's performance and handling. In PA-30s like the Win-A-Twin, that's the left engine. Why? To be brutally brief, at low airspeeds and higher angles of attack the descending blades of the right engine's propeller produce far more torque and p-factor than the left engine's—because they're farther out on the wing, and have stronger moment-arm forces. The right wing's center of lift also exerts a stronger force than the left wing's, for the same reason.

So, lose the left engine and all those forces on the right side make for greater asymmetric thrust and roll than if the right engine conked out. The left engine's descending propeller blades exert all their forces closer to the airplane's fuselage and center of gravity.

Late-model light twins (including the PA-39 Twin Comanche) do away with the critical engine by designing the right propeller to rotate counterclockwise. Under this setup, neither engine is critical from an aerodynamic standpoint. Or, put another way, each engine is equally critical. ***—TAH***

The NTSB was concerned about the number of airplanes that crashed in flat attitudes. A letter from the NTSB to the FAA noted that Piper test flights showed no tendency for Twin Comanches to enter flat spins; it also noted that there were no attempts to deliberately provoke them.

In September 1967, after NASA conducted wind-tunnel tests, Piper changed its Twin Comanche pilot's operating handbooks (POHs) to prohibit intentional spins. At the same time, it began publishing spin recovery procedures in Twin Comanche POHs.

More steps concerning the Twin Comanche—and all other light twins—came with Advisory Circular (AC) 61-40, also published in September 1967. This AC was designed to enhance safety in multiengine training. The AC:

- Banned the demonstration of single-engine stalls on multiengine flight tests.
- Banned V_{MC} demonstrations when it is known that the density altitude is such that V_{MC} is close to stall speed.
- Banned low-altitude stall demonstrations. Now they have to be performed at a "high enough altitude to permit recovery from an inadvertent spin, and in no case below 1,500 feet above ground level."

NASA's July 1971 final report reached three conclusions about the PA-30 Twin Comanche:

- At the stall, large rolling and yawing moments occurred as a result of asymmetric wing stall. The left wing stalled, NASA said, at an angle of attack about 2 degrees lower than the right wing.
- These rolling and yawing moments are larger than the corrective moments produced by aileron and rudder controls.
- The airplane exhibits a flat spin under certain conditions involving the use of asymmetric power.

ADs and fixes

Still other moves were made to make the Twin Comanche safer. An airworthiness directive—AD 69-24-04—required the Twin Comanche's V_{MC} to be upped from 80 mph/69 knots to a more conservative 90 mph/78 knots. This provides a greater margin from the stall, and better control effectiveness against rolling and yawing moments.

Piper came out with some fixes of its own. In May 1970 a new right engine, with a counterrotating propeller, was made available as a retrofit kit via Service Letter 552. This eliminates the

Twin Comanche's critical (left) engine, but involves a massive work package. This was never mandated as an AD.

In July 1970, Piper provided—free of charge via Service Letter 558—an airflow modification kit. This included wing leading edge stall strips, a rudder seal strip, an aileron/rudder interconnect system, and a re-rigging of the rudder and stabilator. All of this was intended to provide better aerodynamic stall warning and controllability at low airspeeds and high angles of attack.

Flown with proper respect and discipline, PA–30s like our Win-A-Twin are safe airplanes.

Of course, the ultimate fix came in 1970, when Piper discontinued the straight PA–30 and replaced it with the PA–39 C/R. The C/R stands for *counter-rotating* propellers, which mark the last of the Twin Comanches. Counterrotating propellers eliminate that left, critical engine of the PA–30s.

Bottom line: thorough training

Flown with proper respect and discipline, PA–30s like our Win-A-Twin are safe airplanes. Of course, familiarity with the airplane is vital, and AOPA has taken steps to make sure the Win-A-Twin's winner will make a smooth, safe transition to the left seat.

If the winner doesn't have a multiengine rating, American Flyers will provide multiengine training in preparation for the checkride.

The International Comanche Society's (ICS) Comanche Flyer Foundation (CFF) will provide type-specific training in N204WT as the final step. The ICS' Larry Larkin, who specializes in Comanche and Twin Comanche training, will tailor the transition course based on the winner's flying background.

If the winner has a multiengine rating but no Twin Comanche experience, a two-day ground school comes first, followed by three hours of dual instruction.

If the winner has some Twin Comanche time, then the dual will be tailored to the pilot's experience level. In any case, dual instruction will cover the following as a bare minimum:

- Stalls (no, no single-engine stalls), slow flight, and steep turns.
- Emergency procedures, including engine failure procedures, feathering and restarting procedures, and V_{MC} demonstrations.
- Instrument training, including partial-panel work and unusual attitude recoveries.
- Takeoffs and landings.

Insurance requirements will also vary according to the winner's background. This will be dealt with on a case-by-case basis, and may require as many as 25 additional hours of supervised solo with a qualified, experienced Twin Comanche instructor-pilot riding shotgun until the winner's insurance experience requirements are fulfilled.

Be not afraid!

Did we scare you? I hope not. Our goal is to make you, the winner, a safe pilot in your new Twin Comanche. Yes, there have been some dark chapters in Twin Comanche—and multiengine training—history, and you deserve to know about them. But today we benefit from the shortcomings and mistakes of the past, and know a lot more about single-engine aerodynamics and sound training practices than we did 40 years ago.

> **i** Links to additional information about the Win-A-Twin Comanche may be found on AOPA Online (www.aopa.org/pilot/links.shtml). Keyword search: Win-A-Twin.

Get proficient, stay proficient, always keep a safe margin of airspeed above V_{MC}, and your totally reworked and upgraded Win-A-Twin will give you better-than-book performance and modern conveniences undreamt of in the days of its youth.

Stay tuned for next month's report on the Win-A-Twin. I'll have even more hours under my belt, and share some—OK, a lot of—stories from the lighter side of Twin Comanche flying. AOPA

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