Ford Tri-motor 5-AT

Ford tough

Slow down and fly tight

BY RICK DURDEN

Its massive presence announced to a previously unconvinced populace that the time had come to take air travel seriously. Compared to the wood-and-fabric box kites that preceded it, the newcomer, squatting foursquare on the ramp, looked as secure and solid as the stone bank building downtown. Most convincing to the hardened skeptic, the nameplate said *Ford*. If a company as gigantic and conservative as Ford was building airliners, it was time to buy a ticket.

The aviation boom of the 1920s was still brand-new when William Bushnell Stout found himself short of money. An inventor second only to Thomas Edison in patents held, Stout had built a promising torpedo bomber that the Navy had been inconsiderate enough to crash. The government thanked Stout for his efforts and gave him a few pennies on the dollar, leaving him with a small ball of airplane and a large debt. Persevering, Stout wrote to potential investors to raise capital. At a time when experimental aviation had its fair share of hustlers and charlatans, Stout's letter was absolutely honest, promising that if a person put up $1,000 he would never see the money again.

That 1922 letter led to Stout meeting Henry Ford and his son, Edsel. Edsel, who as a teenager in 1909 had built an airplane that flew successfully, thought that there was great potential in airplanes. One thing led to another, and eventually the Stout Metal Airplane Company became a division of Ford Motor Company. Stout found himself returning to his investors their original $1,000, plus $1,000 more.

PHOTOGRAPHY BY MIKE FIZER


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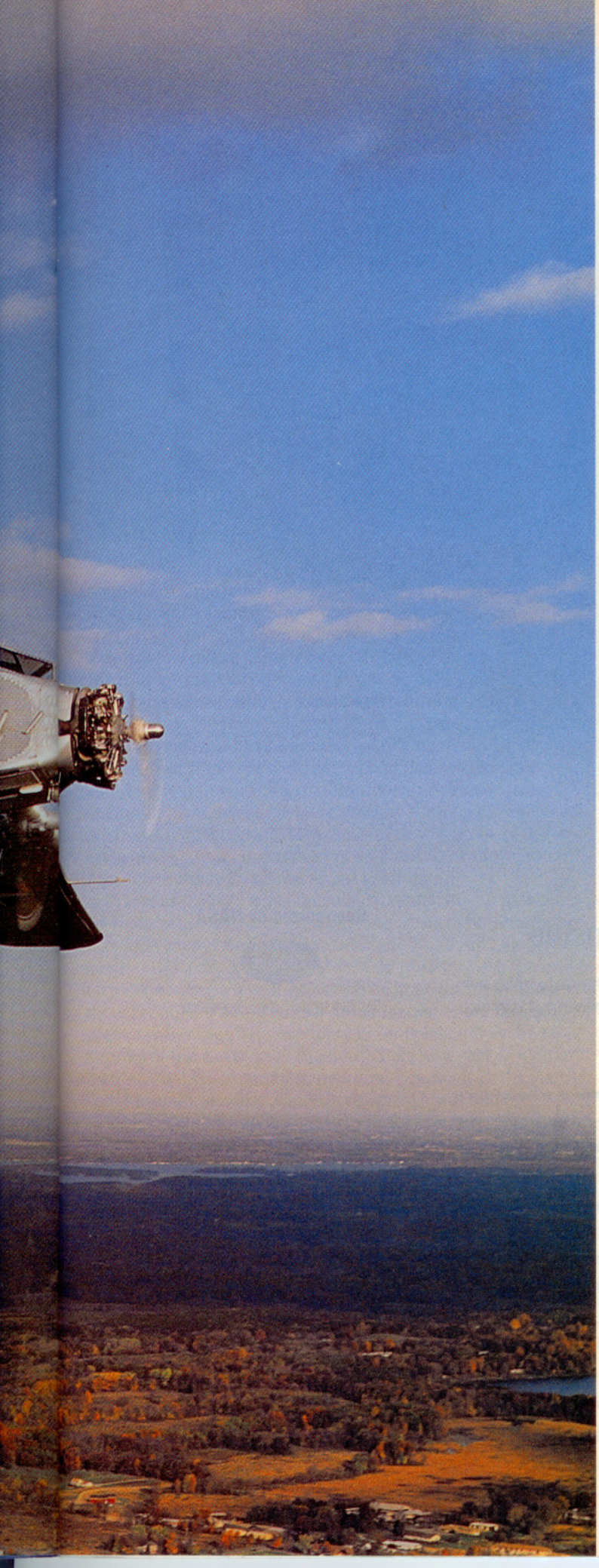


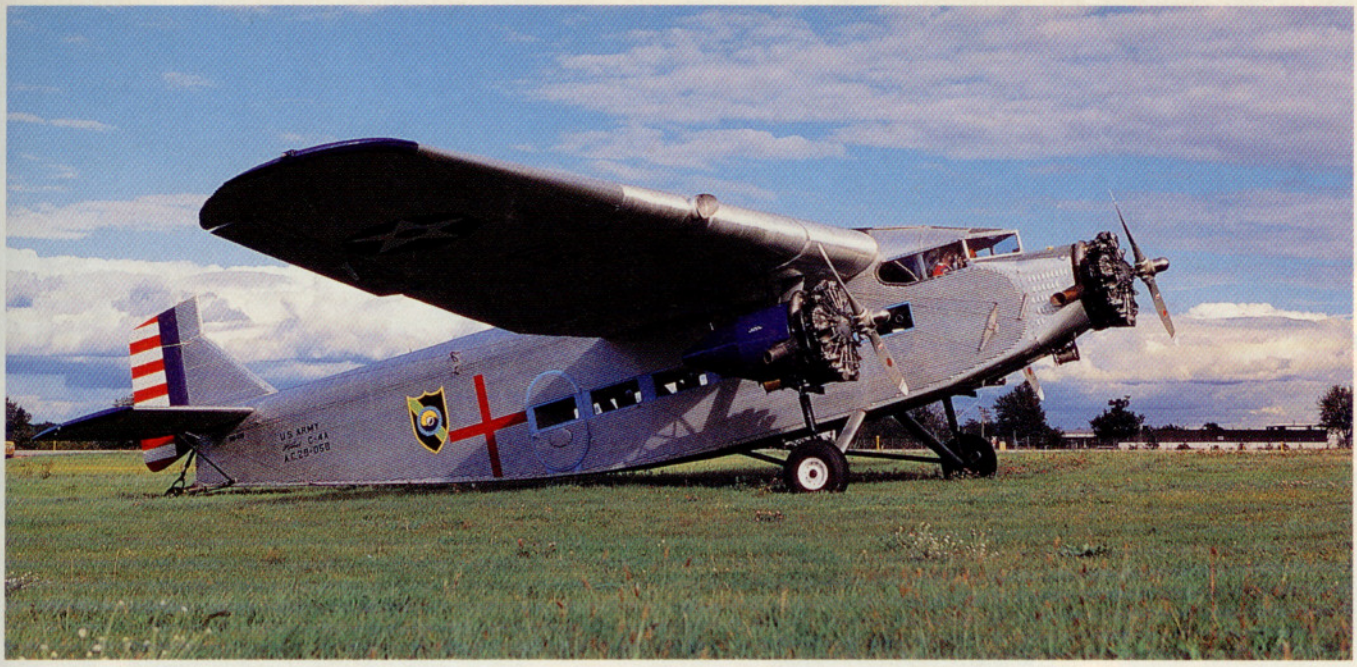
Compared to its predecessors, the Tri-motor looked solid, and the Ford name inspired public confidence.

Stout built a high-wing, all-metal monoplane powered by a 400-horsepower Liberty engine. He called it the 2–AT, because it was his second air transport airplane. He borrowed heavily from Junkers of Germany in corrugating all the skins, substantially increasing the strength of the airplane with a minimal weight penalty, even though it looked as if it had been assembled from washboards.

Henry Ford liked the first 2–AT so much he built a factory to make more and created the most advanced airport in the world, modestly referred to as Ford Airport. (The concrete runways and the factory buildings are today part of a Ford test track located immediately south of the Ford Museum and Greenfield Village in Dearborn, Michigan.) Ford then set up an airline using the stellar hauling abilities of the 2–AT to serve his factories, building airports when existing ones weren't close enough. The Ford-built hangar at the Lansing, Illinois, airport is in use to this day.

When Stout proposed a larger airplane, powered by three of the new Wright J-4, 200-hp radial engines, Ford gave the go-ahead. On Thanksgiving Day in 1925, one of the odder airplanes ever to see the light of day debuted before thousands at Ford Airport. The wings, fuselage, and tail of the model 3–AT looked to be made from a slightly enlarged 2–AT, but the front end was art deco gone bad. The three radial engines were mounted seemingly without concern for thrust lines—two on the leading edge of the wings and one on the airplane's chin. Above the center engine was a bow window, creating a dirigible gondola effect; higher yet, above the windows, was an open cockpit for the crew of two.

Unfortunately, the 3–AT flew even worse than it looked. Not one to tolerate public humiliation, Henry Ford acted. Stout was moved to Ford's airline



The Tri-motor's huge useful load made it popular with airlines, the military, and backcountry operators.

operations and his division suddenly became the Airplane Manufacturing Division of Ford. The 3–AT and its drawings were erased in a hangar fire that was made to look accidental. Ford's chief automotive engineer was given six months to build a workable airplane using a team of Massachusetts Institute of Technology grads. The team's airplane, the model 4–AT, the first of the airplanes to become known throughout the world as the Tri-motor, and colloquially as the Tin Goose, flew on June 11, 1926. It relied heavily on Stout's successful 2–AT. The landing-gear track was widened substantially so the main gear could be tied in with the structure to support the outboard engines, now mounted below the wing. Propellers were fixed pitch and nonfeathering. Like the 2–AT, it was made of the latest lightweight metal, duralumin, an aluminum alloy containing copper. Today it's known as 2024 aluminum.

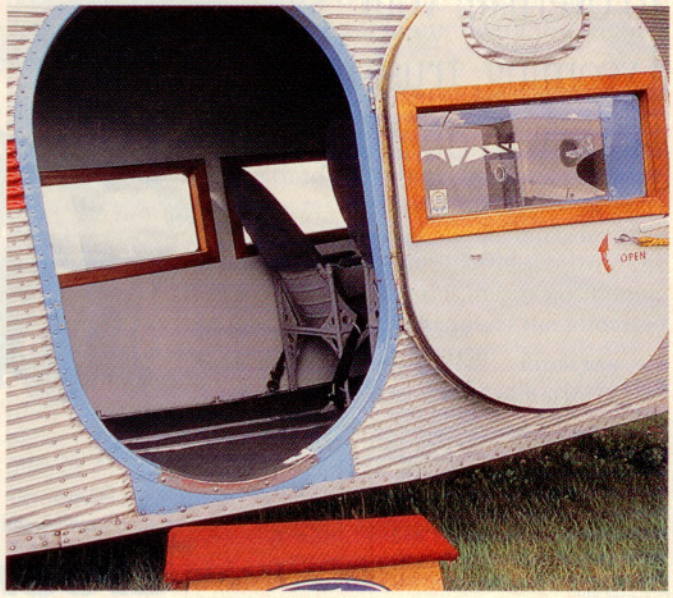
Priced at $50,000, which included full fuel, the 11-passenger Tri-motor was exactly the right airplane at the right time. Power was soon increased, first to 220 hp and finally to 300 hp per engine. The airlines snatched them up initially, with the military also buying a few; however, their huge useful load made them capable of doing almost anything that could be accomplished with wings. The legendary Bernt Balchen flew the most famous of the 4–ATs over the South Pole as a part of Richard Byrd's 1928-1929 Antarctic Expedition. It now sits in the Henry Ford Museum, less than a mile from where it was built.

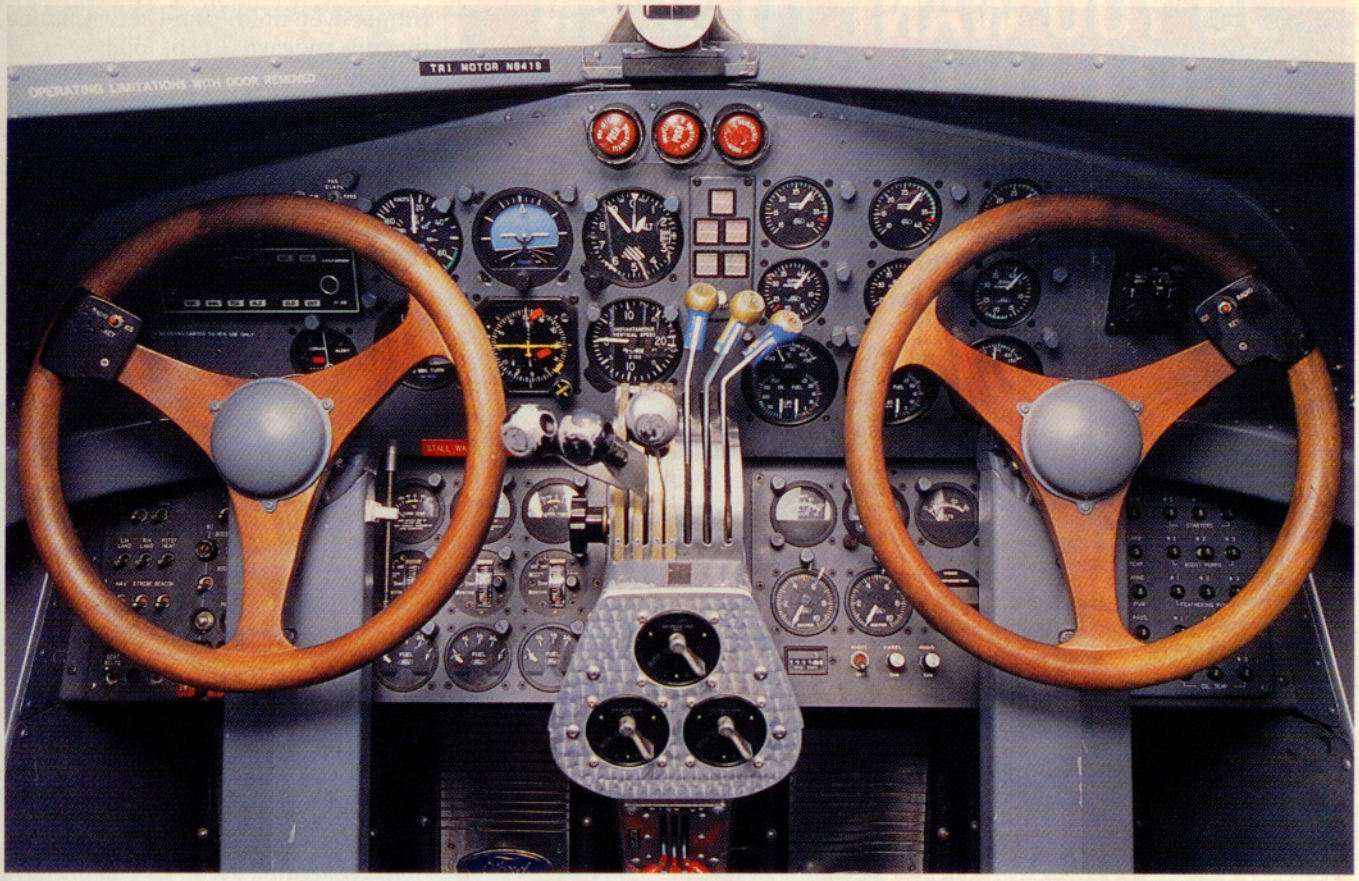
Charles Lindbergh is given credit for encouraging Henry Ford to use the new 420-hp Pratt & Whitney Wasp engines for a larger Tri-motor. The resulting 15-passenger 5–AT appeared in 1928. Its maximum gross weight was bumped to 13,500 pounds from the 10,130 pounds of the last 4–AT. Its ability to carry some 3,500 pounds in the cabin, even with full fuel, caused the 5–AT to be even more popular than the earlier model, which was soon dropped from production.

Ford's advertising promised its airplanes to be good for four years. That turned out to be about the time it took for rapidly advancing technology to relegate them to the aeronautical back pasture. As sales fell and the Depression's effects on his primary business distracted Henry Ford from building airplanes, he never allowed significant research into the next-generation airliner. Plus, he'd kicked the visionary Stout out of the design business. On top of everything, despite building some 199 Tri-motors, Henry Ford lost more than $10 million on his airplane division. Rather than create a new airplane, Ford shut down the division when the last 5–AT left the plant in June 1933.

Following their airline days, Tri-motors proved to be perfect backcountry airplanes. Throughout the world, their ability to haul very heavy loads into very short strips kept them in demand until nearly all were wrecked.

What is it like to fly something from the days before much was known about stability and control? A better-than-new 5–AT is owned by the Kalamazoo Air Zoo Museum in Michigan, where it gives rides following a restoration from wreckage in 1991. As you walk toward it, mentally roll up your sleeves and spit on your hands, because this airplane is not for the faint of heart.





The Tri-motor cockpit, with its Model T steering wheels, is built for work, not comfort.

Preflighting a Tri-motor is akin to washing an elephant—pretty basic, but there's a lot of acreage requiring attention, and you had better bring a ladder. Step back 70 years as you journey up the aisle, ducking to pass under the center section carrythrough (the wing has an incredibly strong truss assembly, with no conventional spar). Climb into the cockpit, unlock the controls, turn on the battery switch, and check fuel quantity in all three tanks, then turn off the battery.

At the forward end of the passenger cabin, above a built-in ladder, is a hatch through which you may climb and emerge on top of the airplane to visually check the fuel and fuel caps. After climbing down, securing the hatch, and going back outside, the walkaround is almost too easy. Many of the control cables are physically outside the airplane so they, and their corresponding bellcranks, can be examined. The ailerons have no aerodynamic balance at all; you will find that this is not an airplane controlled with the fingertips. The job of herding a Tri-motor across the sky is a task more akin to pulling the oars in an ancient galley than to playing with the rudder.

No matter what power a Tri-motor originally had, most of those still flying have 450-hp Pratt & Whitney R-985 radials. Use the ladder to check the engines. They can each hold 14 gallons of oil but will make do with eight. Once the fuel sumps and gasculators are drained and the brake lines and tires checked, it's time to head back inside and see if you can convince those three engines to lead you aloft.

The cockpit was designed for work. The seats and rudder pedals are not adjustable. Each control wheel is actually a Model T Ford steering wheel. It takes more than one full turn from stop to stop to operate the ailerons. The wheel is mounted on a column that is hinged at the floor to operate the elevators, thus the fore and aft throw is quite long. Each cockpit side window opens, so much warm-weather flying is performed with an elbow on the sill. The side windows on unmodified Fords need to be kept clean because the engine gauges for the wing engines are mounted on the engines themselves.

Positioning the fuel valves takes some understanding. The 345 gallons of usable fuel is carried in three tanks. The left and right fuel tanks are labeled as such; however, in keeping with the practice of the time of having a "reserve" fuel tank, the center fuel tank is the reserve and is treated differently than the others. In practice, the outboard fuel tanks feed the three engines until nearly exhausted, at which time the reserve tank is called upon. Arranging this means positioning various valves scattered behind the heads of the pilot and copilot and on the floor under the pilot's seat.

Starting a radial is an art form. Mixtures up to full rich (they move vertically), prime, turn the engine, count six propeller blades, and turn on the ignition. Reciprocation usually follows shortly thereafter, accompanied by warm puffs of oil smoke and the magnificent sound made by a radial. Warm the oil up to 40 degrees Celsius before allowing an engine to get above 1,000 rpm. The nose engine shakes the entire air-

frame, even at idle, and serves notice that this endeavor will be loud.

Taxiing is surprisingly easy. While the tailwheel is not steerable, the slipstream of the center engine makes the rudder effective even at idle power. The very wide landing gear, combined with large ailerons that create significant drag when lowered and wing engines mounted well away from the fuselage, allow most taxi tasks to be carried out without touching the brakes.

Runup is time-consuming on the Air Zoo's Tri-motor, not because the airplane is complex, but because it has been modified with feathering props and thus each engine must go through no fewer than seven separate checks to determine its willingness to conduct business. Then the flight controls are cycled to the corners—crank in full aileron in one direction; shove the column forward against the instrument panel, leaning forward in the seat to do so; wind the Model T wheel round to the other stop; heave the column back against your chest; spin the wheel again to the opposite stop; and you're done.

Elevator trim is set with a surprisingly large crank located above the door between the pilots. It turns a jackscrew that moves the horizontal stabilizer; use a full turn and a half of the trim crank for every knot of airspeed change desired.

Line up with the runway and stop, taking a moment to get a mental picture of how high you are above the ground. Hold the brakes, set 25 inches manifold pressure, and make a brief check to be sure the engines haven't reconsidered, then release the brakes and slide the power forward to 36.5 inches as noise becomes a physical presence. Trimming the throttles is left to the copilot because, for the very first time since you have been in the Tri-motor, things happen fast. The 1,350 hp barking through short stacks accelerates the Tin Goose smartly. The tail comes up of its own volition and the entire cockpit sinks a few feet toward the runway. Directional control is positive, particularly if you have thought to put in aileron toward any crosswind. The rudder is instantly effective although, as you also are discovering, astonishingly heavy.

At 65 kt the Ford floats off the runway. Seventy-two knots is best rate of climb, all engines operating, with cruise climb just three knots faster. The controls are shockingly heavy and, at first, seem to make up for it by being ineffective. More disconcerting, the huge, high lift wing rolls one way or another in response to every thermal, despite your efforts to the contrary. As a wing drops you find yourself using both hands on that Model T wheel as you force some aileron deflection only to learn that the ailerons merely function as massive adverse yaw generators. Rudder is absolutely essential when trying to use the ailerons, but the rudder feels as if it is encased in concrete. At first you find a clearly perceptible delay between control input and any effect. Your control actions initially do nothing, and then far too much, as you sort out the concept of anticipatory delay. The problem is that the heaviness of the controls means you are not physically deflecting the surfaces very far.

Stability in roll simply doesn't exist. It's not much better in pitch, but is actually satisfactory in yaw. The controls are so painfully heavy it's difficult to decide whether there is any harmony among them. Eventually you decide there isn't. The rudder is the worst offender (your leg muscles will hurt after the flight), the ailerons are marginally better, and the elevators are almost reasonable in comparison. In any turbulence you work unceasingly to return the Tri-motor to straight and level after it is deflected by the bumps or its own natural inclination to wander away from where you left it. Because the fuselage is suspended under the wing, the sense of wandering about is not nearly as noticeable in the cabin. While the passengers blissfully gawk out of the large windows and the airplane seems, to them, to carry on in stately stolidity, there is a pilot up front who is just plain busy. You think of the transcontinental airline service in Fords and realize those pilots earned every cent of their pay.

Leveling off for cruise involves reducing power to 55 to 65 percent. Anything more is just converting avgas to noise.

Realistic cruise speed for a 5-AT is about 90 kt. There are those who say the cruise speed of a Tri-motor, in mph, is equal to the cabin decibel level. They are wrong. The cruise speed never gets that high.

Fuel burn in cruise can be as high as 75 gph, meaning about 4.5 hours to dry tanks. Allowing for a 45-minute reserve, still-air range is roughly 340 nautical miles.

Shut down a wing engine and be prepared to work. Hard. Brace yourself in the seat and push with both feet on the appropriate rudder. Best-rate-of-climb speed with one engine out is 75 kt. The Tri-motor will climb with one out and, depending on density altitude and weight, should hold altitude if two engines slip their mortal coil, even if you're flying a Ford that still has fixed-pitch props.

Making the effort to maneuver a Tin Goose uncovers its secret; it is a surprisingly responsive airplane if one has the strength and willingness to truly deflect the control surfaces. It will roll into a 45-degree bank turn with vigor if you prod insistently, and once there, the airplane pivots with almost no speed decay. The Tri-motor was such a successful bush plane because, in addition to carrying a load and handling short fields, a determined, strong pilot could thread one down a canyon and shoehorn it into a narrow, short strip. Maneuvering a Ford helps one understand how that most amazing of airshow pilots of the twentieth century, Harold Johnson, did jaw-dropping, low-level aerobatic routines in a Tri-motor. Just about everything Bob Hoover has been doing in a Shrike Commander, Harold Johnson did in a Ford Tri-motor 65 years ago.

Slow flight is redundant—everything is slow flight in a Tri-motor. There is very little difference in the way the airplane handles at 85 kt or at 65. Trying to stall the airplane usually results in get-

Legacy of an air museum and its Tri-motor

One of the premier air museums in the United States is the Kalamazoo Air Zoo Museum, located on the southwest side of the Kalamazoo/Battle Creek International Airport in Kalamazoo, Michigan. Part of the inspiration for the name of the museum, beyond the comparison to the airport identifier—AZO—is its collection of Grumman military airplanes. It has, either on display or flying, most of the famous Grumman "Cat" series of piston and jet fighters. Several are airworthy and are flown for special events and airshows.

Of special value to the museum is one of the very few flying Ford tri-motor 5-ATs in the world. Bearing the same registration number given to it when it left Dearborn, Michigan, in June 1929, NC8419 traveled millions of hard miles before completing a painstaking 12-year restoration to become a fully IFR-capable work of art.

Records regarding the first owner of the Air Zoo's Tri-motor, serial number 58, are a little hazy, but it was probably delivered to National Air Transport to carry cargo and mail. In 1931 it was sold to Northwest Airways, where it flew on revenue passenger service and had the dubious distinction of dropping one of its engines into the Mississippi River. Over the years it flew the

ting the wheel all the way against your chest while watching the sink rate become extreme. However, if you do stall the airplane, there is a significant risk of a sharp wing drop, and, if mishandled, a spin. There simply wasn't a lot known about stability and control when it was designed. The design team got the wing twist just exactly backward, so the tips stall first—not a happy state of affairs.

There's not much to do to prepare for landing. There are no flaps, and the gear hasn't moved. Base and final are flown at 75 kt. Pulling the power off in the flare causes the speed to bleed off right now, so it's a good idea to leave a little power on until the mains touch. Wheel-land the airplane, because an error when doing a full-stall landing can strain that long fuselage.

Rollout is short and not difficult to control so long as you are assertive. Taxiing into the ramp you cannot help but be in awe of the independent souls who flew these airplanes in the days of rudimentary weather forecasting without radar, from fields only an optimist could call airports, all the while knowing that there was a decent chance that one of the engines would give up on the way.

After you shut down and walk away, the overwhelming feeling is respect. You realize that it was not a particularly fun airplane to fly; it was work, because that was its mission in life. Yet, despite sore legs and ringing ears, there is something about the Tri-motor that has touched you. No matter how primitive, heavy, and loud it is, you're ready to fly it again. AOPA

i Links to additional information about the Ford Tri-motor may be found on AOPA Online (www.aopa.org/pilot/links.shtml).

Rick Durden, AOPA 684126, is an aviation attorney who holds an airline transport pilot certificate and revels in flying antique and classic aircraft.

Alaska bush on wheels and skis for Wien Alaska Airlines and other operators, barnstormed the lower 48, hauled sightseers over the Grand Canyon, and carried smokejumpers for the redoubtable Johnson Flying Service in Montana. A combination of an overly demanding boss, too much tailwind, and midday thermals led to a fatal crash at a remote mountain strip in Idaho in 1965.

Fourteen years later, Kal-Aero of Kalamazoo (now Duncan Aviation) started the complex task of returning serial number 58 to airworthy condition. Along the way many modifications were made to make the very primitive bird slightly more user-friendly, including moving the instruments from the wing engines into the cockpit, installing a brake system from a Twin Beech, upgrading to feathering propellers and installing an IFR avionics suite. Because of the military orientation of the Air Zoo, the Tri-motor was painted to match the 5–ATs sold to the Army as C–4s, specifically those used by the Sixtieth Service Squadron for medical transportation.

The Air Zoo's Tri-motor regularly gives rides to museum visitors so yet another generation can discover, as did their great-grandparents, that with its modest speed and large windows, there is no finer aerial sightseeing vehicle in the world than a Ford Tri-motor. For information on the museum and rides in the Tri-motor, call 616/382-6255 or visit the Web site (www.airzoo.org). —*RD*