

PUSHER CHECKOUT

The best kind of history lesson

BY PETER M. BOWERS

The current interest in ultralights has resulted, inevitably, in comparisons with pre-World War I aircraft. Though separated in history by more than a half-century, these aircraft share certain attributes. The simpler ultralights are comparable to the earliest powered aircraft in terms of speed and range. And, as in some of the early airplanes, the pilots of some ultralights sit in the open, exposed to the elements, controlling their aircraft by shifting their weight. So ultralight pilots should have some idea of what it was like to fly primitive airplanes.

But the only way to appreciate fully the pleasures and perils of flying the earliest airplanes is to fly one. Of course, this kind of experience is not easy to come by. Today, there are only a very few flyable specimens of pre-World War I aircraft. There also are a small number of reproductions of pioneer-era designs. I own one of these—a full-scale reproduction of a 1912 Curtiss Pusher. Until it was put out of commission in an accident (it is now being restored), I flew the Pusher more than 200 hours over a period of 12 years and became intimately acquainted with its quirks, as well as its unique capabilities.

The Pusher was designed and built in 1946 by Walter Bullock, a Northwest Airlines pilot. Bullock had owned a Curtiss Pusher in 1916 and thought it would be fun to have one again. With no originals available, he had to create his own. Working mostly from memory and old photographs, he sketched out the basic structure. He could find nothing in old books about the airfoil, so he copied its shape from a side-view photograph.

Structurally and aerodynamically, the flying surfaces closely resembled the original design, even to the use of

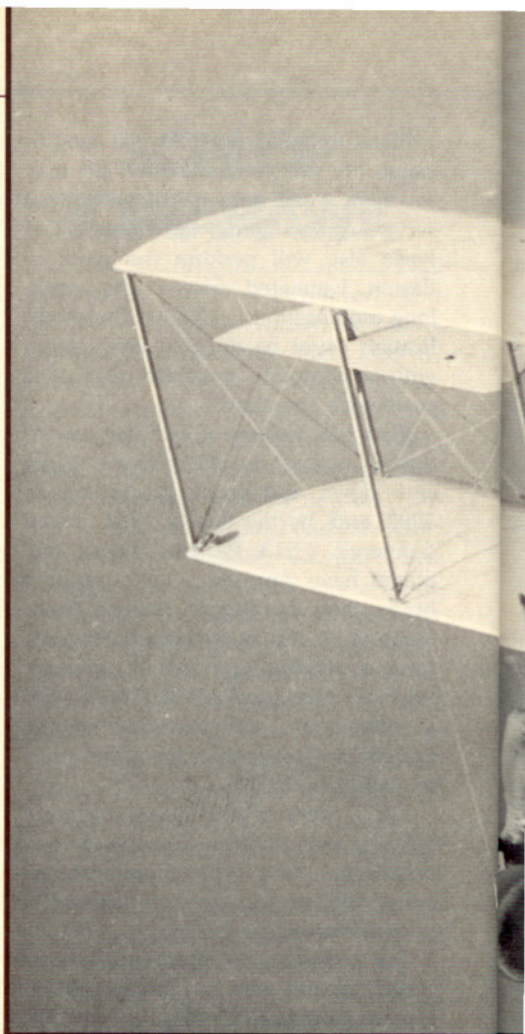
between-the-wing ailerons. The rest of the airplane, however, was highly modernized—adulterated, to the purists. The tail booms are steel tubing instead of bamboo, and the frames of the tail surfaces also are made of steel tubing rather than wood. To counterbalance the replica's heavier tail and boom construction, lead blocks weighing a total of 75 pounds were fitted into the forward boom structure alongside the nosewheel.

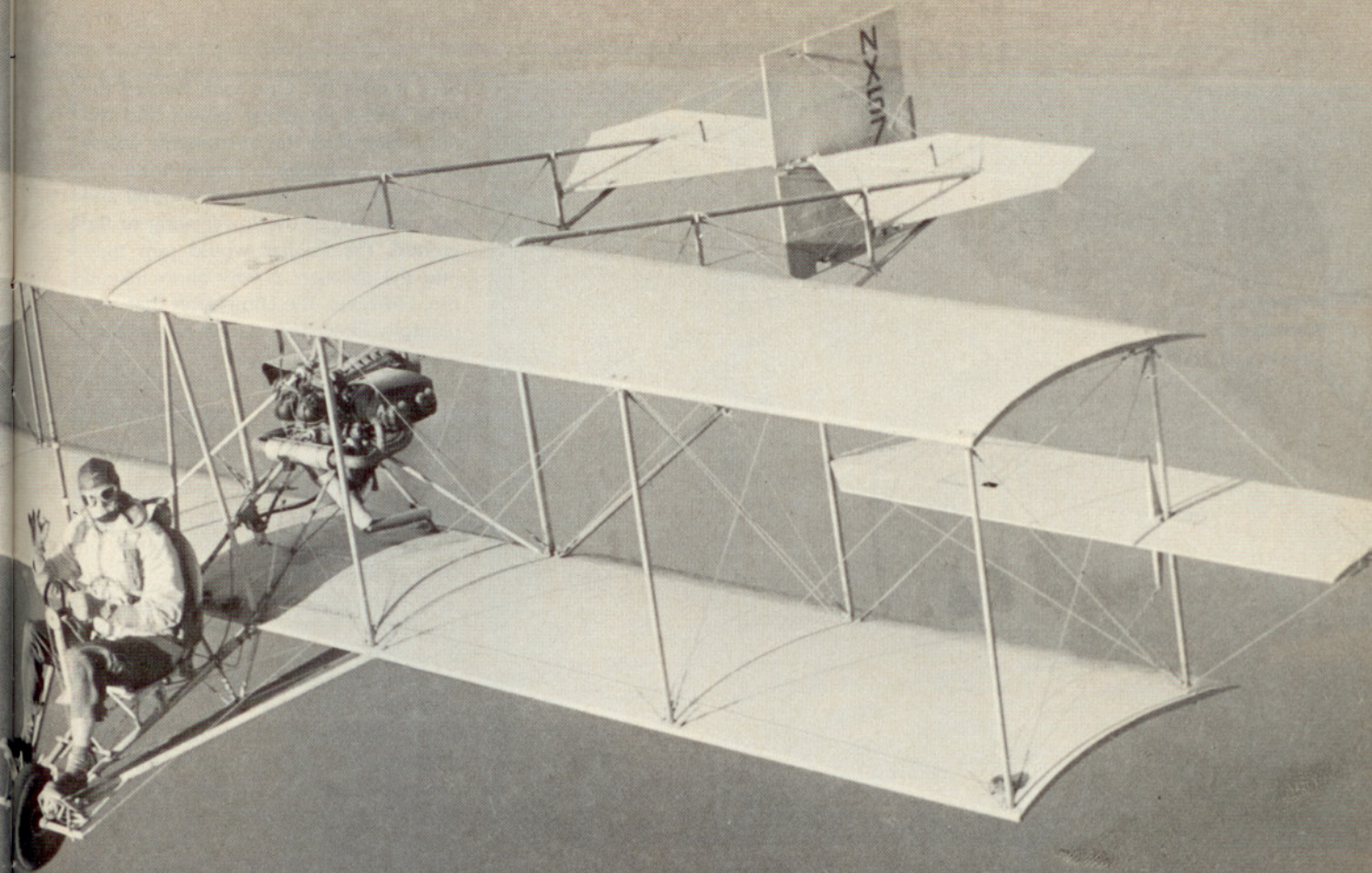
Bullock used a 75-hp Continental A-75 for the replica. The original had a Curtiss-designed and -built engine. Modern wheels and brakes from a Piper J-3 Cub also were used, and an instrument panel (with engine gauges, airspeed indicator and altimeter) was mounted alongside the pilot.

The controls were changed substantially from those on the original design. The old Curtiss used body English for roll control. The pilot was fitted with a shoulder yoke that worked the ailerons: to turn left, he leaned left (this action was natural for designer Glenn Curtiss, a former motorcycle racer). Rudders were linked to the control wheel. Fore and aft motion of the control column worked the elevators. One foot worked the throttle, as on an automobile. Either foot could be pressed against the nosewheel to act as a brake (some Pushers were equipped with a slightly more sophisticated system—a board that could be pressed down against the nosewheel).

The Bullock-Curtiss replica, to use its registered name, used the wheel to work the ailerons and rudder pedals to work the rudder. Hydraulic wheel brakes, also from a J-3, were inboard of the rudder pedals.

Bullock kept the Pusher at his private strip, where he could fly it at leisure with no traffic problems. After a





Author Peter M. Bowers, dressed for the wind chill, in his 1912 Curtiss Pusher reconstruction. Finding an assistant to hand prop the Continental engine was a luxury.

few years, during which he made frequent appearances in the Pusher at local airshows, he sold it to aviation historian E. D. (Hud) Weeks and Howard V. Gregory, AOPA 4238, both of Des Moines, Iowa, from whom I bought the airplane in 1955.

The Bullock-Curtiss replica was not an easy airplane to fly. Because the main wheels were set too far aft relative to the center of gravity, an unusual and somewhat dangerous takeoff technique had to be used. To rotate the airplane, it was necessary to apply full "up" elevator. As soon as the wheels were off the ground, the column had to be put back to neutral immediately. If one was too slow in doing so, the Pusher's nose pointed toward the sky; too fast, and the nosewheel would bang onto the ground.

The ailerons of the Bullock-Curtiss were badly overbalanced aerodynamically and had a severe case of "snatch": Turn the wheel slightly and the force of the air on the aileron's

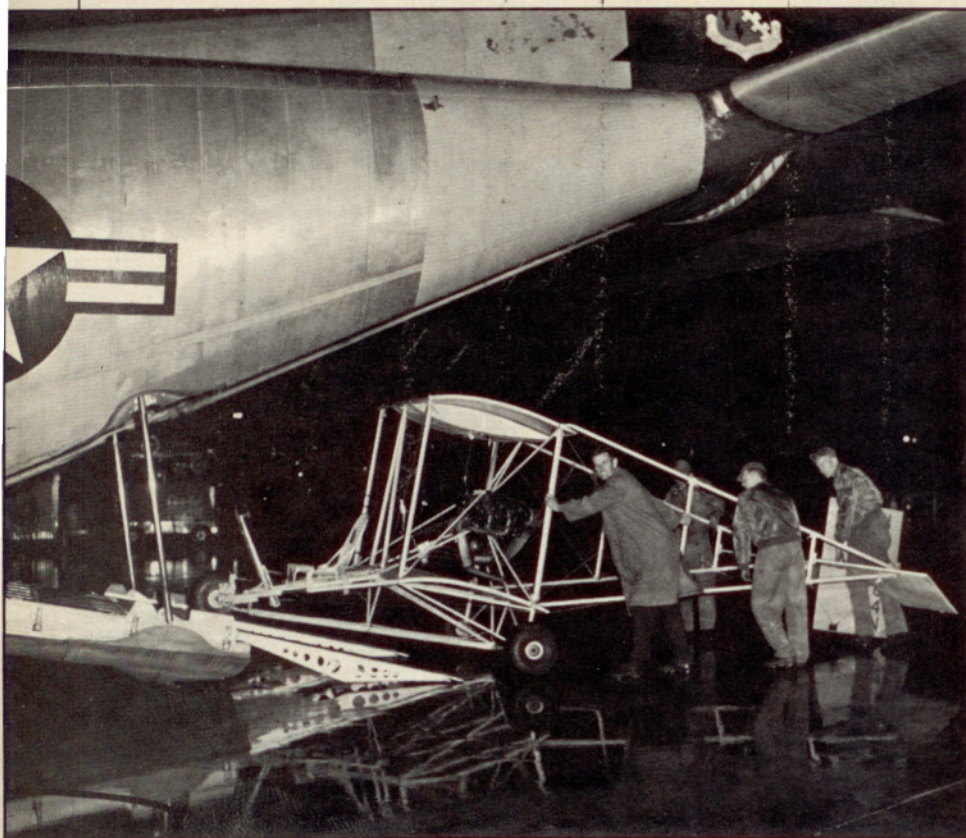
leading edge tried to pull the aileron all the way to the stop. Opposite aileron force had to be applied to counteract this tendency. The overbalance problem, it turns out, was not a characteristic of the 1912 original—too much balance area forward of the aileron hinge line had been built into the Pusher replica's ailerons.

The Pusher had absolutely no rudder "feel." Due to the lack of forward reference, it was possible to fly in a crabbed attitude with the rudder displaced and never know it. To assure a straight rudder, the pilot either had to look at the rudder pedals to see if they were even or look over his shoulder at the rudder to see if it was straight.

Another major flight problem was the airplane's lack of a reference point between the pilot and the horizon ahead. The pilot compensated by using the wings for attitude reference. If the struts along the leading edge of the wings were perpendicular to the horizon, the airplane was level. If they tilted back, the airplane was nose high; if they tilted forward, nose down. If the tape where the wires cross was below the horizon, that wing was low.

It was full throttle for takeoff, then

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The Pusher traveled aboard larger aircraft to airshows around the country. Here it is being pushed aboard an Air Force C-130 cargo airplane.

PUSHER CHECKOUT

back it off a bit. One soon learned the right sound for cruise power and did not bother with the instruments unless there was a change in engine noise.

Thanks to the deep-curve airfoil and the closeness of the lower wing to the ground, the Pusher would pop right into the air after a very short takeoff run. However, the climb after that was painfully slow due mainly to the high drag of the structure.

Rate of climb was influenced greatly by temperature and humidity. On occasion, I figured that the Pusher's service ceiling—that altitude at which the rate of climb is 100 fpm—was sea level. Sometimes it would not do quite that, and I would sweat out the row of trees a mile upwind on takeoff.

In flight, with all the wind on that unprotected front seat, one did not use a map. When I went cross country, I memorized, before takeoff, the route over the next relatively short hop. Navigation was by landmark. I would pick something prominent in the distance and head for it. Cruising altitude was selected once airborne. On some cross-countries, I went as high as 5,000 feet, but only to avoid rough air. Now, short flights in shirtsleeves were fun in good weather, but even on hot days, a flight of any length called for heavy



As a stunt, the author entered the 1966 Powder Puff Derby as "Contestant Number 0," but did not compete.

*Low pass over the U.S.S. Bonne
Homme Richard. The navy would not
allow a civil aircraft to land.*



Wind-in-the-wings flying evokes the early days of flight.

clothing. Think about it—if all that air going by could cool a 75-hp engine, what would it do to a 180-pound pilot?

Turbulence was a major problem in the Pusher. A little too much and the airplane started going downhill with each bump. Fighting the ailerons in turbulence quickly became a fatiguing chore. Some days simply were not "Pusher days," much to the disappointment of people who were expecting to see it fly that day. One time, I flew it at a local air show. The wind had come up, and there was a lot of rolling turbulence in the lee of a nearby hill. Between the downdraft and the turbulence, I couldn't even turn after takeoff; I could only go straight ahead. Fortunately, there was a football field with a clear approach just beyond the airfield, so I landed on it and, with a little help at the wing tips, was able to taxi down streets and back to the airport.

Since the drag of the Pusher was very high, with a lift-to-drag ratio of approximately 4:1, the airplane came down steeply without power. Normal

procedure was to fly it right down to the ground at close to the Pusher's cruising speed of 45 mph.

One of the airplane's special capabilities, thanks to its terrific forward/downward visibility and its ability to fly so slowly (it could sustain flight at 30 mph), was non-instrument flight in virtually zero/zero conditions. However, performing this feat required cooperative airport management and tower operators. When the Pusher was based at the Renton, Washington, airport, I used to take it out when the field was closed because of fog. I would line up on the center stripe, then take off and fly the length of the runway at two or three feet. When the numbers loomed up ahead, it was time to chop the power, put the wheels on the ground and hit the brakes. Then I would turn the airplane around and repeat the process in the opposite direction as long as I cared to or the conditions prevailed.

As on the 1912 original, my Pusher had tricycle landing gear with a fixed nosewheel. To make a turn, it was nec-

essary to come to a full stop, put one's feet on the ground, lift the nosewheel and turn the whole machine to the desired heading. People often asked why I didn't install a steerable nosewheel. I answered that it would be more trouble than it was worth; I did not consider the problem that serious.

The Pusher's engine had to be started by the old technique of hand-propping. If I was alone, I had to do it myself, with the ship tied down or the wheels chocked. This called for some running back and forth: Turn on the gas and work the primer up front; go between the booms to pull the prop through; back up front to crack the throttle and turn the switch on; then back between the booms to prop it. This was no job for a prop-shy person. You could not back away after the engine was started—the boom cross wires were right behind you.

Over the twelve years I flew the Pusher, the airplane performed well, but not flawlessly. One incident in particular comes to mind: a forced landing from fuel starvation when the tank was

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one-quarter full. I was making a straight-in approach to the uncontrolled airport at Olympia, Washington, and had throttled back for a steep glide to the runway. At about 500 feet and well short of the runway, the engine quit. It was then that I found that the Pusher could be sideslipped. I put it down in a 600-foot-square field across the road from the airport.

Why the engine stoppage? Because of the steep nose-down attitude, the fuel ran to the front of the very shallow tank, uncovering the outlet that was in the center. The crowd that gathered in the field helped me move the airplane onto the airport by taking down a wooden fence, lifting it across a ditch and then lifting it again to take it sideways through the back gate of the airport.

The Pusher was always in demand for exhibit and flight demonstration at local air shows. The seat was practically worn out from children (and a considerable number of pilots) sitting on it to have their pictures taken.

It also traveled to air shows around the country in the cargo holds of modern transport aircraft. It was transported in this manner to the state of New York so that it could reenact the 1910 Glenn Curtiss flight from Albany to New York City (Curtiss made the flight in one of his earlier Pusher designs). My flight along that route, in 1959, was part of the "150 Years of New York History" celebration.

After a lot of close calls, the Pusher's marginal performance finally did it in. On a 100°F day, the Pusher, with another pilot at the controls, barely was able to climb out of ground effect and crashed into telephone lines. Fortunately, the pilot was not hurt, but the Pusher very nearly was totalled.

It is being rebuilt slowly, with a few improvements. The nose is longer, which places the pilot farther forward and corrects the balance problem without all the extra lead. A Continental C-85 (85 hp) engine has replaced the A-75. New ailerons with less overbalance have been built. Wire wheels have been added for a more authentic 1912 look. And the new gas tank has outlets at both ends instead of in the middle.

Still no nosewheel steering, though. □

Intrigued by airplanes long before his first ride in a Travel Air at age 10, Peter Bowers, AOPA 54408, has since logged more than 4,200 hours.