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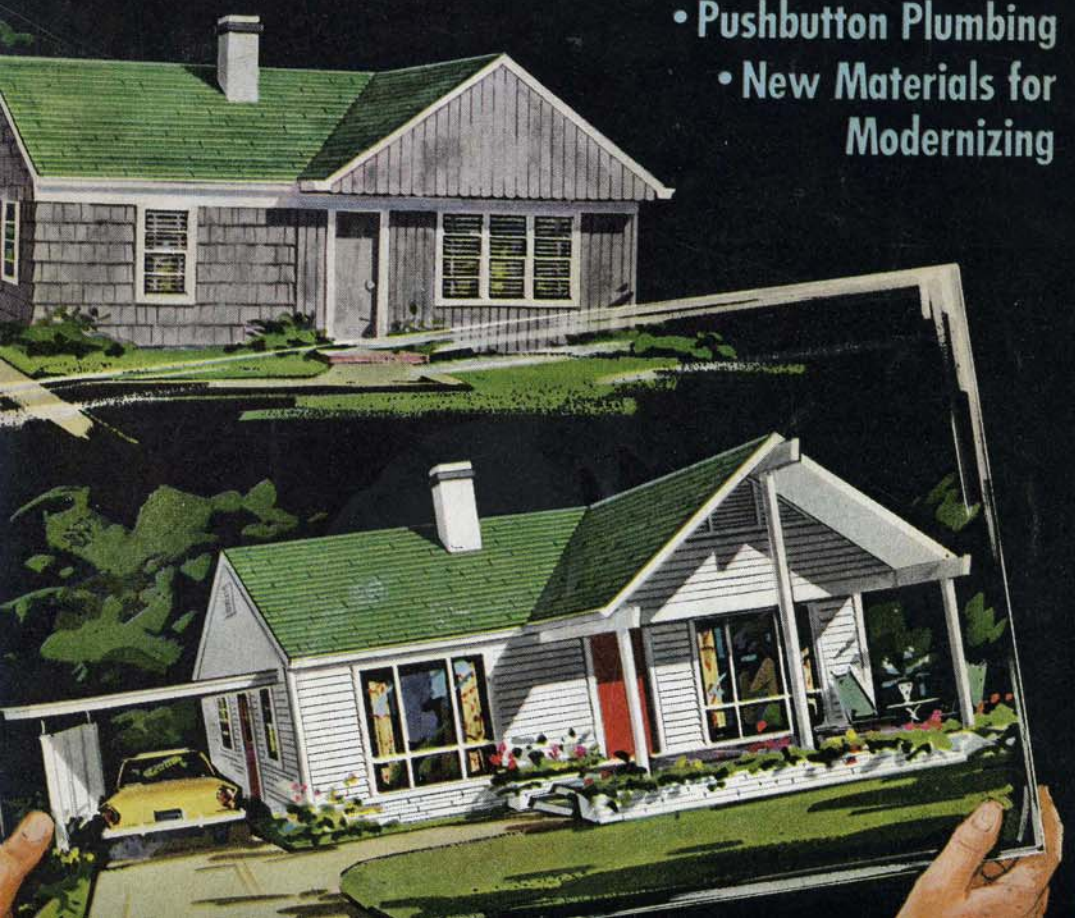

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Takeoff At 30

Wren cruises—hands off—at 26 m.p.h., turns at 30 without losing altitude and finally "lands on a silver dollar"

By Kevin Brown

THE EASIEST THING to report about the remarkable Wren is that everything they say about it is true. Its specifications sound like a press agent's puff, but, in a flight lasting more than an hour, *PM* found that none are exaggerated.

The Wren takes off at 30 miles per hour, sometimes with less than 150 feet of roll.

It climbs at 50 m.p.h. or less and is 1000 feet up before it reaches the end of the runway.

It flies straight and level—hands off—anywhere from 26 m.p.h. to 160 m.p.h.—a ratio of 6-to-1.

NEW WREN, a made-over Cessna 182, includes forward canard for pitch control, "teeth" on upper wing for control in low-speed turns, huge double flaps and a drooped leading edge on the high wing

TAKEOFF AT 30 M.P.H. can be done consistently in Wren by using full 40-degree flaps. The flaps, double slotted, have eight panels and run full span

HANDS-OFF flying at close to 30 m.p.h. Try that in your own light plane! Speed gauge, added to normal cockpit instruments, works from an anemometer

WREN LANDS just about where you want it. At Meacham field in Fort Worth, it touched down at edge of runway, braked to stop, turned into first taxi strip

It can cruise for extended periods—without engine overheating—at speeds as low as 50 m.p.h.

It can make completely controlled turns at 30 m.p.h. without losing altitude.

It's hard to stall but easy to recover.

It makes its final approach at close to 30 m.p.h. and lands, if not on a dime, at least on a silver dollar, and it rolls to a stop from 100 to 200 feet further on, depending on wind and the pilot.

It is, all in all, a highly unusual airplane.

Its makers, the newly formed Wren Aircraft Corp. of Fort Worth, Tex., call it HTOL, for "helicopter takeoff or landing." They claim it can operate from any area large enough to accommodate a helicopter. Others will probably put it in the STOL category, for "short takeoff or landing."

Its ability to get in and out of small areas, however, is only part of its story. Other aircraft, including STOLs and helicopters, can do this. Its unique feature is its ability to maneuver and maintain level, controlled flight at remarkably low speeds—as low as 30 m.p.h., the speed limit on most city streets—without sacrificing much of its maximum speed.

It's this ability that should suit it for a wide variety of utility operations, especially patrolling, surveillance and bush operations where landing away from an airport is necessary.

The Wren is actually a mongrel, made from a standard Cessna 180 or 182 with four major modifications: The addition of a forward canard, and a made-over wing that includes an augmented leading edge up front, vortex generators on top and double flaps in the rear. And there are no special controls for any of it. From inside the cockpit, the Wren operates like any other airplane.

The canard, or nose control, is called the ULS (for ultra-low speed) control system. It gives the Wren the appearance of wearing a bristly mustache. It operates in conjunction with the elevator in the tail assembly—in fact, it is directly connected by a push-rod linkage. As the elevator pitches the tail up or down, the ULS pitches the nose down or up. Its chief effectiveness is at low speeds when the large flaps block out the elevator, and the prop blast gives it sufficient air stream to react against.

The augmented leading edge, which is no more than a cuff of metal wrapped around the original wing edge, blunts and droops the edge, increasing its stall resistance over the original Cessna wing from a 16 to a 28-degree angle of attack. The blunt edge makes it easier for the air to break around the edge at low speeds

JAMES ROBERTSON, Wren's designer, explains nose control to *PM*'s aviation editor. At low speeds, prop blast enables it to control pitch of airplane

and the droop, in effect, drops the edge to meet the airstream head-on at high angles of attack.

The vortex generators or spoilers, called "Wren's teeth" by the makers, counteract yaw tendencies in low-speed banks. Only one set of "teeth" operate at a time, and only at low speeds, without any extra control from the cockpit. Geared to the ailerons, the teeth turn into the airstream only on the low-wing side to keep the nose from yawing toward the high-wing side. They operate only at low speeds—and remain feathered at high speeds—because it is only at low speeds that the ailerons are deflected enough to bring them into play. In slow turns, the aileron on the high-wing side is deflected downward, creating a drag and tending to pull the nose toward it. Meanwhile, when the aileron on the down-wing side is deflected upward, it brings its spoilers into play, creating a balancing drag and allowing the nose to fly straight through the turn. The teeth on the high-wing side stay feathered throughout the turn.

The double flaps, while not new, are perhaps more effective on the Wren. Other STOLs have them, but controlling the plane at low speeds is sometimes a problem. The ULS control and the Wren's teeth help overcome this. While these two modifications are essentially for control at low speeds, the flaps are definitely what brings the Wren down to these slow speeds. They consist of four panels on each wing, mounted in pairs and running the full span of the wing. The second panel of each outside pair acts as an aileron. Or, to put it another way, each aileron doubles as a flap. The whole set can be locked at 10, 20 and 40-degree angles, and the makers claim that, at any position, low-speed buffeting is impossible.

This combination of modifications is the work of James Robertson, an aeronautical engineer who admits to 37 and looks younger. He came by his aviation background honestly. His father was Major Bill Robertson, who operated an airline out of St. Louis after World War I and included on his roster a young pilot named Charles Lindbergh. James, after college and Navy flight training, almost immediately became involved in vertical and short-takeoff-or-landing aircraft, working with other companies before forming his own. The Wren is his fourth design, and is essentially a simplified version of his Skyshark (*PM*, August, 1962) which could fly at 20 m.p.h. and proved out the nose control. Robertson has full patents pending on the ULS system and partial patents on the Wren's teeth.

He was our host during *PM*'s test of the

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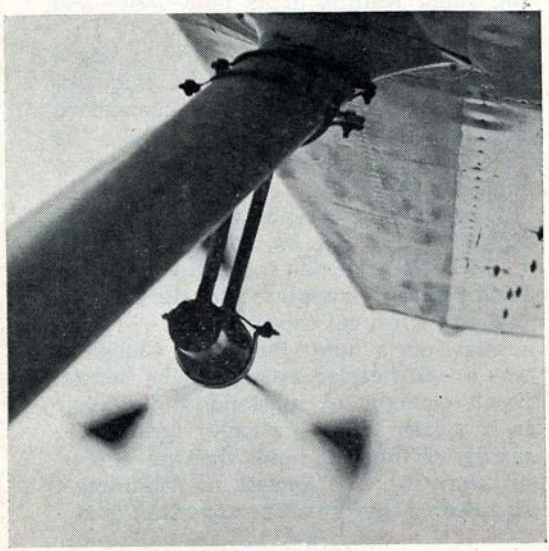
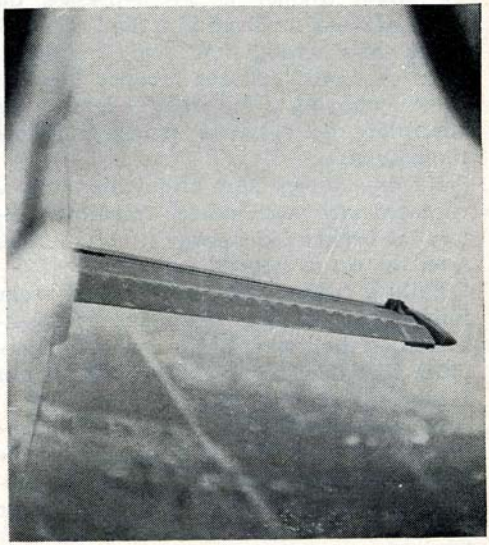
THREE-CUP ANEMOMETER spins freely from underside of right wing, sending true air-speed reading to instrument in cockpit. It's most useful at low speeds



NOSE CONTROL, like anemometer at left, was photographed by leaning out window with camera while flying along, straight and level, at about 30 m.p.h.



Takeoff at 30

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Wren in the wide-open spaces of Texas.

We flew from Love Field at Dallas to Meacham Field at Fort Worth, practicing the takeoffs and landings there and the aerial maneuvers in between. Apart from the amazing performance of the Wren itself, the most surprising thing was the reaction of the tower personnel and the pilots of other planes.

Before one takeoff, Robertson asked the tower if we could make a 360-degree turn and come back in and land—just like that, all in one motion. When the tower okayed it, we asked if they knew the plane that well. He chuckled.

"They didn't at first," he said, "but they do now."

Full Circle on Approach

Coming in for one landing, another plane was on the runway, so the tower told us to make a 360-degree turn right there—on final approach. Any other plane would be ordered to go around and reenter the traffic pattern.

On almost all the landings, we would plop down at the edge of the runway, roll 100 feet or so, then turn and taxi over alongside the planes waiting for takeoff. Some of the pilots in the waiting planes, especially transient airliners, were wide-eyed with incredulity at such goings on. Most planes roll halfway down the runway before turning off. It's like landing on the taxi strip—sideways.

Our tests began with a series of takeoffs and landings. As mentioned, the Wren has standard controls, and its cockpit, too, is standard with only two additions, an angle-of-attack indicator and a special air-speed indicator.

The angle-of-attack indicator, we found, was of no significant value. It operates from a vane attached beneath the left wing. The same kind of vane is found on Air Force jets. The cockpit gauge has an indicator which shows the angle of attack, at any angle, expanding the function of the stall-warning light found in most light planes. It is primarily to warn of stalls, but veteran pilots, we're sure, will ignore it, claiming if you can't feel a stall coming on, the indicator will help you only while you're learning. After that, it's useless.

The extra air-speed indicator, however, is a worthwhile addition, and could easily be recommended for low-speed flying in any light plane. It works directly off an anemometer, the same kind used by weather stations to measure wind velocity. Mounted beneath the right wing, its three cups catch the wind and translate it into air speed on the cockpit dial. The dial reads from zero to 200 m.p.h., but is most useful at the low-speed readings when the normal air-speed indicator becomes inaccurate. The anemometer, which gives direct readings without any atmospheric or altitude corrections, is accurate to within 1½ m.p.h., the Wren people claim.

For takeoffs, we usually started at the back edge of the runway, mostly so we'd have a standard starting point for measurements. The Wren will make a normal takeoff roll, with flaps up, using as much of the runway as necessary, but for test purposes we made only short takeoffs.

Flaps were placed in the full-down position, or 40 degrees. They work hard, requiring a goodly amount of muscle power. And small wonder. The standard floor stick, which would ordinarily lower only two flaps, is now required to lower eight of them. Each notch up means the flaps are going down 10, 20 or 40 degrees, and it gets harder with each notch. The Wren may need a flap booster of some kind in later models.

When lined up in takeoff position, we held the brakes, revved the engine until the brakes began slipping, then let go. All of the takeoff rolls were over and under 150 feet, with none over 200 feet. The air speed picks up immediately, and when the indicator hits 30 m.p.h. the nose is rolled up and the plane flies off the ground in a steady climb with no dip back toward the runway. Air speed picks up to 50 m.p.h. and, on at least one straight-ahead takeoff, we were above 1000 feet before reaching the end of the runway.

Takeoff Never Exceeds 300 Feet

The takeoffs, of course, were impressive, but they were made under ideal conditions from a paved runway. The plane's makers claim, however, that the takeoff roll will not exceed 300 feet under any conditions, and that it can clear a 50-foot obstacle in 500 feet. We had no chance to check rough-field operations, so it remains to be seen whether these figures would stand up under an unlimited number of conditions. We would hesitate, for instance, to land or take off the Wren from heliports located on tops of tall buildings. However, for a standard airplane, it's the best we've seen at short-field operation.

In the air, at normal speeds, the Wren behaves like an ordinary airplane. Its powerful, 230-hp. engine gives you positive acceleration and indicated speeds close to 160 m.p.h. Robertson claims that with the extra equipment on the Wren it loses only 6 m.p.h. The Cessna 182, for instance, has a rated maximum of 167

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Takeoff at 30

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miles per hour with the same engine.

But the high-speed test only shows that the Wren flies like any other airplane. It's at low speeds that it flies like no other airplane. So we slowed it down, dropped flaps all the way (and in the air the flaps really work hard) and flew at speeds we had never flown before.

It's like breaking the sound barrier backwards.

No plane we had ever been in got much below 50 or 60 m.p.h. except in stalls or on final approach and landing. We flew the Wren, and maneuvered it between 30 and 35 m.p.h. It's weird!

Having nothing else to compare the experience to, we are forced into some subjective reactions. The Wren does fly and handle at these speeds, but the controls become mushy and we were inclined to overcontrol it. Now, is this our own inexperience at this kind of flying, or will all flying at these ultra-low speeds be mushy? Or has the Wren really perfected low-speed control yet? In an hour's flight, no definite conclusion can be reached, but we were left with the distinct impression that the Wren, if it isn't perfect just yet, is on the right track.

No Fear of Stalling

There was no concern at any time that it would stall out of any of the maneuvers, and there was a constant feeling that if we had more time with it we could overcome the tendency to over-control. Robertson, certainly, had no problem.

In fact, while we climbed into the back seat to get a picture of it, he slowed it down close to 30 m.p.h., trimmed it up, then took his hands off the controls altogether. And it went right on flying, straight and level. No sweat.

For more pictures, he suggested we open a window. And, for the uninitiated, may we point out that you just don't open windows of cabin aircraft while flying. Well, we did, stuck the camera and our head out into the 30-m.p.h. breeze, focused and shot pictures of both the nose control and the anemometer.

Back at the controls again, we tried some power-on stalls. They're quite gentle, with plenty of warning. To recover, we just let go of the wheel, and it flew its own way out. With power off, the plane doesn't stall technically, but it sinks pretty fast, and there's no future in that. However, below its minimum speed—something like 24 m.p.h.—the Wren again proves its maker's claim, that it's a docile airplane with

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Takeoff at 30

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no dangerous tricks. It wants to fly.

The turns are probably the hardest things to get used to, next to the landings. We tried some around 30 m.p.h. and it's like standing it on one wing and pivoting right there. The high-wing Cessna already gives excellent visibility, but turning on a dime—almost hovering—should make it ideal for patrol, search and surveillance.

Lands Like Carrier Plane

The landings, always the most critical part of flight for any pilot, are all but unbelievable in the Wren. Flying at altitude at 30 m.p.h. can't give you the same sensation as approaching the ground at these speeds. The tendency is to give it more throttle or nose it down to pick up speed, but after a few tries we forced ourselves to do it. The touch down, let's face it, is quite hard, about the way Navy planes plop down on the deck of a carrier—with about as much roll. The trick is to bring it in with power—it won't stall without power—flare out, let it plop down then dump the flaps immediately after touchdown, because the plane is still floating and won't become "heavy" with flaps down. Since you're using power, it's fairly easy to pick your touchdown spot. The brakes can go on almost immediately, too, because the plane is now down around 20 m.p.h. Our landing rolls were all close to 100 feet, and all less than the takeoff rolls.

All in all, a remarkable performance.

The Wren, when it goes into production, will retail at $29,950—a pretty sizable boost over the original list of about $16,000 for the Cessnas. Among those who might consider it worthwhile, however, are highway, forest and pipeline patrols, construction companies, bush pilots, missionaries, oil-well operators, ranchers, aerial sprayers, aerial photographers and cartographers, some business executives and even the military services.

Popular Mechanics' opinion is that we'll probably be seeing more of the plane with the teeth in its wing and the mustache in its nose. ★★★

Organic Detergent

A new household cleaning product, an organic detergent, won't cause detergent pollution of the water supply and is said to be completely "digestible" in septic tanks and sewage disposal systems. Called L.O.C. (Liquid Organic Compound), it's nonpoisonous, can be used on floors, dishes and for general household cleaning. L.O.C. is made by Amway Sales Corp., Ada, Mich.