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1965 "Wren" (182 Conversion)
C.O.O. Member Michael Shyne, Alamogordo, AZ

182 Conversions:
The Wren and
Todd Petersen's *260SE/STOL*

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Don't You Dare Call a Wren a "182!"

by Kevin Garrison
and
David Sakrison

General Aviation pilots are dreamers. When we aren't dreaming of perfect weather and flawless landings, we are cloudy-eyed with dreams of perfect airplanes.

It isn't hard to imagine such a plane. It would be able to carry at least four people in relatively stable comfort — at least as comfortable as a four-door car. It would have to be extremely easy to fly, and would be very forgiving if you got yourself into a bind.

A cruise speed of around 150 knots would be nice. That's fast enough to get you where you want to go in reasonable time, slow enough to be no huge mental challenge in keeping up with it. At the low end of the speed range wouldn't it be nice to be able to keep flying at, say, 45 knots? Just think of the small turning radius you could get at 45 knots...

While we're dreaming, why not make the aircraft capable of flying out of your back yard? How much room should it take for this bird to get airborne? Let's settle on a conservative takeoff roll of 270 feet, and a distance of 560 feet to clear an obstacle 50 feet high.

Landing? You say your dream plane would have to land in your back yard, too? No problemo... Remember we're dreaming and in a dream anything is possible. How about a landing roll of 205 feet? If you have to land past that fifty foot obstacle, we'll have to extend your back-forty runway to 454 feet. You'll touch down at 35 knots.

Suddenly, with a dream plane like that, all sorts of other dreams become a possibility. For example, take crashing (please).

According to studies by FAA crash gurus, if you impact your aircraft upon the ground at speeds exceeding 50 knots, chances are you will seriously hurt yourself and anybody else aviating with you that day. What would happen if our Dream Plane could touch down in the trees or rocks at 35 knots? Your chances of surviving the impact with very little injury would be pretty good.

That assumes you lose the engine and can't find a clearing of three to four hundred feet to set your dream bird down on. Your "prefect plane" would have roughly twenty times more clearings to choose from than you had in your run-of-the-mill general aviation "spam-can."

One of the major draw-backs to flying on instruments in a single engine aircraft has been the vexing question: "What do you do when you are flying through 200 and 1/2 weather and the engine quits?" Basically, in most general aviation aircraft, you are seriously in the "hurt locker" and the best option you have would be to slow to an approach speed of seventy or eighty knots and await a very painful impact. For that reason, many pilots only fly twin engine aircraft when the weather gets very low. The trouble with that, of course, is that they don't stay very proficient in these twins. It's impossible to be real sharp in a twin if you only fly it a few hours a month during spells of poor weather. So when these guys lose an engine they are already way behind the power curve skill-wise, just when they need their skills the most. Another thing these instrument pilots forget is that many light twins won't climb on one engine, especially the older used ones!

Our single engine dream plane would make instrument flying a safe snap in the lowest of weather. First of all, it's ability to slow to very low airspeeds could soften the blow of the most nasty turbulence. Zero-Zero ILS approaches would be possible in such an aircraft because you could slow to such a low speed that, even if you got a little off the centerline, you could stop before hurting yourself or the plane. Heck, you could probably land such a plane SIDEWAYS on most instrument runways in this country and still stop safely.

Of course, you know that such an aircraft already exists. It has been around since the mid 1960s and it is still being produced today, after a 15-year hiatus.

The Wren was originally hatched by the late James D.L. Robinson, who is perhaps best known as the aerodynamic wizard who invented the "Robinson" STOL modifications. After getting his

1967 Wren 460 Beta

Base Price	$33,650
Gross Wt	2,800 lbs
Empty Wt	1,697 lbs
Useful Load	1,103 lbs
Cargo Cap'y	790 lbs
Power Loading	12.2 lbs\hp
Wing Loading	16.09 lbs\sq ft
Propeller	82" Hartzell/Wren Beta-Control System reversible
Fuel (standard)	60 gals
Engine	Cont. O-470-R, 230 hp, normally aspirated
Top Speed	160 mph
Cruise Speed (75%)	153 mph @ 6,500 ft
Cruise Speed (65%)	143 mph @ 6,500 ft
Fuel Burn @ 75%	14 gph
@ 65%	12 gph
Range @ 75%	601 miles
@ 65 %	655 miles
Service Ceiling	19,200
Rate of Climb	1,080 fpm at Sea Level
Takeoff Run	270 ft
Takeoff / 50-ft Obstacle	560
Landing Roll	205 ft (270 w/o Beta)
Landing / 50-ft Obstacle	454 (555 w/o Beta)
Stall Speed, Flaps Down	26 mph
Takeoff Speed	35 mph
Best Rate of Climb	1,080

degree in aerodynamics at Iowa State College and a business degree from Harvard, Robinson worked for the Helio Aircraft Corporation as a design engineer. The Helio *Courier* is one of the most phenomenal STOL performers ever built. Its leading-edge slats, spoilers, and 75-percent span ailerons allow the *Courier* to take off in 340 feet and land in 275 feet. Its full-flap stall speed is a mere 26 knots. The Courier was designed by MIT's Otto C. Koppen, and Robinson worked on the Courier project during his brief stint at Helio.

He must have learned a thing or two; in 1962 he hatched his own prototype STOL aircraft. He called it the "Skyshark," and it did have a rather predatory look about it. It was a large single-engine airframe (5,000 lbs gross takeoff weight) with huge double-slatted Fowler flaps and full-span leading-edge extensions called "shrouds." Like the later Wren, it had a canard, but the Skyshark's canard also sported rudders. This strange-looking aircraft was hauled around by a 420-hp engine, and according to Jane's All the World's Aircraft, its performance was as unusual as its appearance: Full-flap stall speed, 17 knots; takeoff roll, 85 ft; landing roll, 35 feet.

The Skyshark probably offered more STOL performance than anyone could be expected to want or need. At least that is what Robinson concluded. His proof-of-concept plane was the only one ever built. The projected cost of manufacturing the airplane and doubts about the demand for such extreme STOL performance kept the Skyshark from ever going to market.

From an engineering perspective, however, the Skyshark was a triumph and Robinson used what he had learned to develop the Wren. He also turned to A.E. "Doc" Morris, an aeronautical engineer and veteran bush-pilot, for help. In 1964, they formed a new company, the Wren Aircraft Corporation, and the Wren was certificated by the FAA.

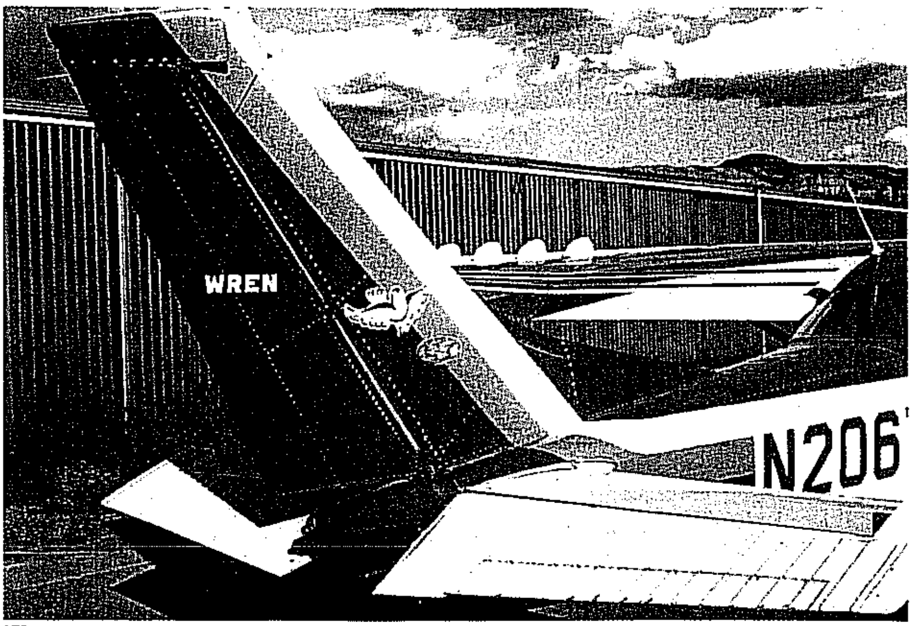
The Wren was popular almost from Day One and sales increased steadily from 1964 through 1967, the company's best year and, ironically, its last.

In all, the Wren Aircraft Corp. built more than 200 Wrens in that period. Some 60 or 70 of them went overseas and nearly 75 percent of the total production is still believed to be in service.

The Wrens built during this period were very similar to Todd Petersen's 260 SE/STOL in many respects. One major difference was the earlier Wren's reversible-pitch prop. Designed to improve short-field operations, that prop was probably too complicated and too maintenance-intensive for bush flying. It was also smaller than a normal prop, which meant less "oomph" on takeoff.

In 1968, with the Vietnam War in full swing, the Air Force took an interest in the Wren's STOL talents and the Wren Aircraft Corp. began working on a STOL version of the Cessna O-2, intended for night reconnaissance. The O-2 (a beefed-up Cessna 337 in military gray) was doing Forward Artillery Control duty and looking for other roles. The company was also quietly working for the Air Force on a prototype military version of the Wren.

Military R&D was costly and when the Air Force rejected both of the proto-



Here, on C.O.O. member Michael Shyne's Wren, you can see "Wren teeth" on the left wing. These teeth improve slow flight aileron effectiveness and adverse yaw. (Photo by Ron Guerin)

types, Wren Aircraft Corp. was in trouble. That same year, an engine fire and subsequent crash in a prototype Wren took the life of Doc Morris. Losing military funding and the head of R&D was too much; in early 1969, the company filed for Bankruptcy.

Robertson was already long gone. Way back in 1964, for reasons that aren't clear, the Board of Directors had voted him out of his position as head of the company not long after the Wren was certificated. Robertson went to work for Boeing and, in 1966, started his own company again. The Robertson Aircraft Corp. was a success with its founder's line of STOL modifications, some of which incorporate lessons learned on the Wren, including the distinctive drooped ailerons and leading edge cuffs.

The Supplemental Type Certificates belonging to the bankrupt Wren Aircraft Corp. were sold to a Wichita aeronautical engineer named Galen Means, who did nothing much with them. In 1977, he sold them to Todd Peterson, a Nebraska airshow pilot and aircraft repair shop operator. Peterson refined the tooling for the Wren but didn't have room to build it in Thedford, Nebraska. In Buckeye, Arizona, he found the room, the flying weather, and lack of interruptions he wanted and began building his version of the Wren. In the mid-1980s, Peterson moved the operation to its current home in Ashland, Kansas, west of Wichita.

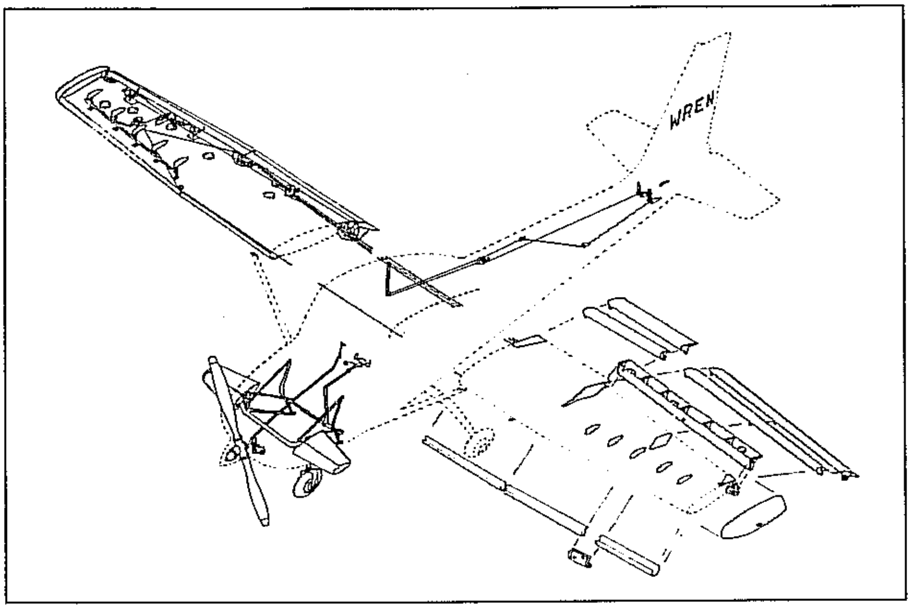
The Wren Aircraft Corp. took a stock aircraft, the Cessna 182, and turned it into a totally new bird. This result fulfilled just about every dream of the general aviation pilot. If you could only add afterburners, an ejection seat, and some guns, every G.A. pilot in the country would be in love with it!

DON'T YOU DARE CALL A WREN "A 182"!

Wren owners (at least those owners of Wrens built between 1964 and 1967) are quite uncomfortable about calling a Wren a "modified 182" and they are right. Calling a Wren a modified 182 is like calling the space shuttle a "modified Jenny." The Wren factory took a stock Cessna 182 and added over 1,064 Wren parts and over 2,114 pieces of standard hardware to convert it into a dream plane.

The most striking difference between a Wren and a Skylane are the canards on the nose. These two "mini wings" are

The Wren Aircraft Corporation took one stock 182, added 2,114 pieces of standard hardware and 1,064 pieces that no one had ever seen before, and called it a "Wren." Its owners call it "amazing."



placed on the cowling just aft of the propeller to add to the stability of the bird at very slow speeds. Their location just behind the prop allows the canards to use prop wash for lift. One of the major problems with using a nose wheel aircraft for STOL work is the beating the nosewheel takes on the takeoff roll. Using the canard, the nosewheel on the Wren leaves terra-firma at ten knots. According to the Wren stats, these little mini-stabilizers add over 100 fpm to the total rate of climb. The canards also help keep the pitch attitude at a reasonable angle during slow flight operations. The "nose stabilizer" is controlled through a mechanical interconnect.

Just in front of the more noticeable canards is an optional fully reversible prop. This Hartzell prop was the first reverse-pitch propeller to be used on a single-engine reciprocating-engine aircraft. Beta range (when the prop has zero pitch, positive or negative) is enough to stop the aircraft on landing at 200 feet. With the full reverse option the prop makes it possible for you to back your bird up after landing. If you use the full reverse feature in the air, be ready for some helicopter like performance in the descent.

Heavy duty landing gear and tires were an option and were recommended for serious bush flying.

THE WING IS THE THING....

Obviously the most important feature of any STOL craft is the wing used to do all that fancy stuff. The Wren wing is a quantum leap above your average General Aviation Airfoil. Let's start our wing tour at the leading edge.

The front part of this wing is adorned with leading edge "cuffs" which add a little bit of leading edge camber like a leading edge "slot" does on airliners, but unlike the jet's slots, it has no moving parts to break or malfunction. The cuff moves the burble of a stall further back over the trailing edge of the wing, making stall speeds lower and stall recoveries a little easier on the pilot.

Moving back from the leading edge to the top of the wing you notice "Wren teeth." These look a little like the boundary layer control strakes found on some jets, but these teeth are installed on the Wren to improve slow flight aileron effectiveness as well as adverse yaw. The teeth are mechanically linked to the ailerons. At normal cruising speeds the teeth are streamlined to the airflow. When an aileron rises the teeth turn broadside into the slipstream to produce a balancing drag to offset the drag of the down aileron on the opposite wing. This little function not only directs airflow over the up aileron but almost eliminates adverse yaw.

Full-span double-slotted flaps adorn the trailing edge of a Wren's wing. They can lower to 30 degrees and are designed to add 87% to the wing's lift coefficient. While most STOL aircraft depend on very powerful engines dragging aircraft with huge dragging flaps and spoilers to get their STOL job accomplished, the Wren uses full-span flaps to add lift (and not much drag) to the equation.

When you have such large configuration changes, keeping up with the trimming requirements can be a real chore in most aircraft. Even "Heavies" like the MD-88 and 727 require huge pitch trim changes to keep up with flap and slat extensions.

The Wren has an automatic pitch trim system. It is controlled by the flap motor and raises or lowers the entire horizontal stabilizer of the tail in order to offset trim needed during configuration changes. The pilot still has the traditional trim tab on the elevator to help with power changes and other trim needs. This automatic trim system translates into 10% less landing distances.

Another feature that helps flap control is a flaps-up button on the control wheel. After landing you can push this button and dump all the flaps, putting all the weight on the wheels for braking. Use this button with care. On approach at 45 knots dumping all your flaps could lead you into a very bad day...

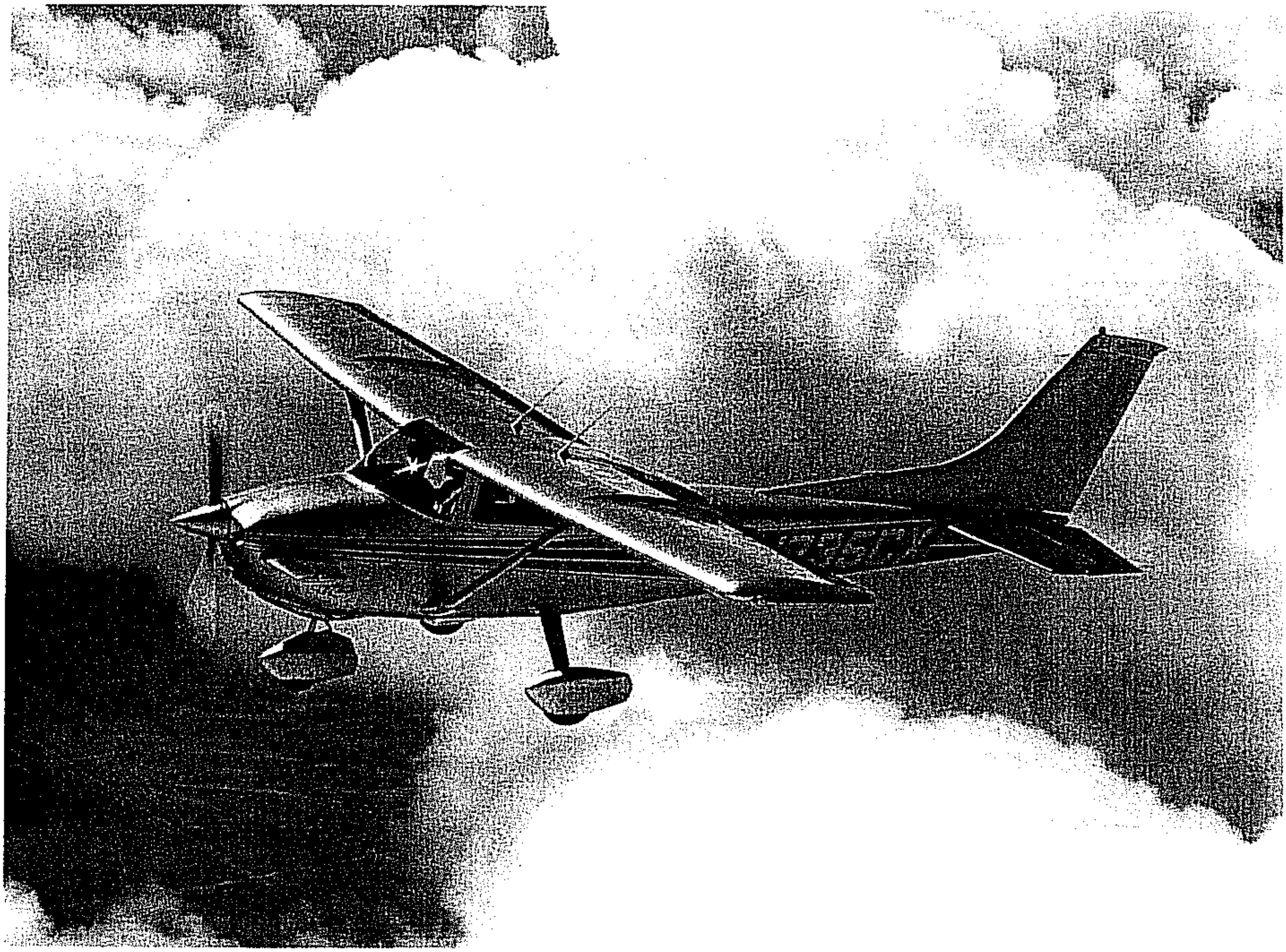
All these goodies make it possible to do STOL operations without all the high pitch attitudes you are used to seeing such aircraft use.

All the Wren mods were designed with field maintenance in mind and even the engine cowl, encumbered with the canards, can reportedly be removed in ten minutes.

What you get after all this re-design and monkey-motion is a dream airplane. Using sound engineering and common sense the Wren and its newer versions answer the needs of most general aviation pilots. All this sounds great, you say, but what about cost? How much is this dream bird going to cost me?

Like most dreams, the Wren doesn't come cheap, although I think it's less expensive than you might imagine. Just about every variation of the 1992 version of the Wren translates out to a price of around 97 grand. This price is for a completely remanufactured "new" condition bird with a full warranty. In other words, for just about the price of a new 172 (if they were still making new 172s) you can get a new STOL dream bird.

The 1967 Wren 460 had a base price of $33,650, or $31,875 without the reversible "Beta" prop. Finding current prices on the original Wrens is not easy; finding an owner who wants to part with one is nigh onto impossible. Michael Shyne, whose 1965 Wren 460 appears on this month's cover, said he searched "for a long time" and with great difficulty to find a Wren that was for sale. But he also told us that the rewards of owning such a magnificent bird are well worth the trouble. ☆



One Wonderful *Wren!*

In the 1960's, "Wrenaissance" men James D.L. Robinson and Doc Morris blended principles of STOL aircraft with a Cessna 182 and invented the *Wren.* Now, in the 1990's, Todd Peterson has revived the manufacture of the 260 SE/STOL conversion. The result, called the *Wren 460*, is an amazing aircraft!

by Jim Cavanagh

I just got introduced to a remarkable airplane! I had expected a nice airplane, one which was faster than normal and handled better than normal, but expectations are optimistic at best and vague at worst, and nothing approaches life like experience. What I experienced was far more impressive than I had imagined, and as mods go, this airplane, this Super Skylane that J. Todd Peterson flew into my airport, has to be the best conceived, best built attempt to optimize an airplane that I have yet encountered, and I have encountered a bunch of modified airplanes!

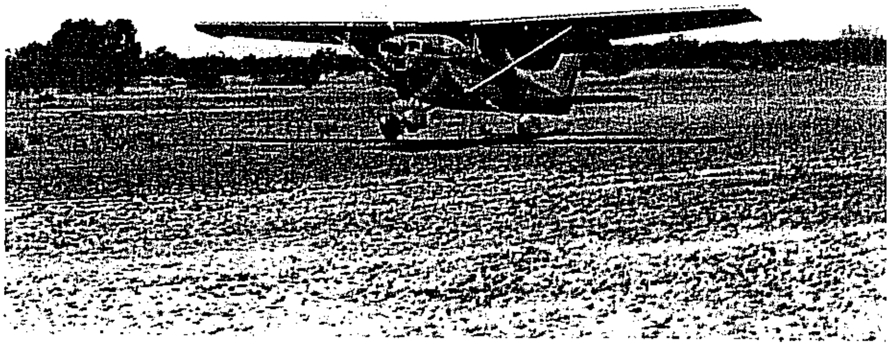
It all started when Todd Peterson called and told me that he was delivering one of his airplanes to Philadelphia, and if I was interested, he could stop and let me try the airplane. Scheduling worked out and the next day at noon, he landed at my home airport. Mutual friends, Ann Marie and John Morrissey, joined us for lunch. They knew Todd from the Aerobatic/Airshow circuit. Todd and his wife Jo, perform at airshows in a *Chipmonk* and *Great Lakes*, respectively. John Morrissey is the U.S. Aerobatic Team Coach and demonstrates *Pitts* for Aviat at the Paris Airshow. Indeed, no lightweights here. By the way, Ann Marie is a CFII who instructs in a gorgeous Luscombe.

Over lunch we talked about the history and development of the 260 SE/STOL conversion, and I learned how the airplane was initially geared to pure STOL flight. It was radically modified with numerous moveable fences mounted on the top of the wing, and full span, double slotted flaps. To get these latter to fit, his shop removed ten inches of the aft portion of the wing, installed a massive secondary spar, and with the help of two thousand fabricated pieces and another two thousand pieces of hardware (I hope this included the rivets) these impressive airline-style flaps enabled a Skylane to fly at around 25 kts! Todd called the airplane a WREN 460.

Todd was living south of Phoenix, AZ, when he undertook this program. A well produced video shows a WREN operating out of impossible topography, with billowing clouds of dust and sand, cacti, and bumps and dips which a Jeep might have trouble with. The military was impressed by the tape, and ordered a few of the modified airplanes. Todd tells of owners operating out of three hundred foot strips behind their houses.

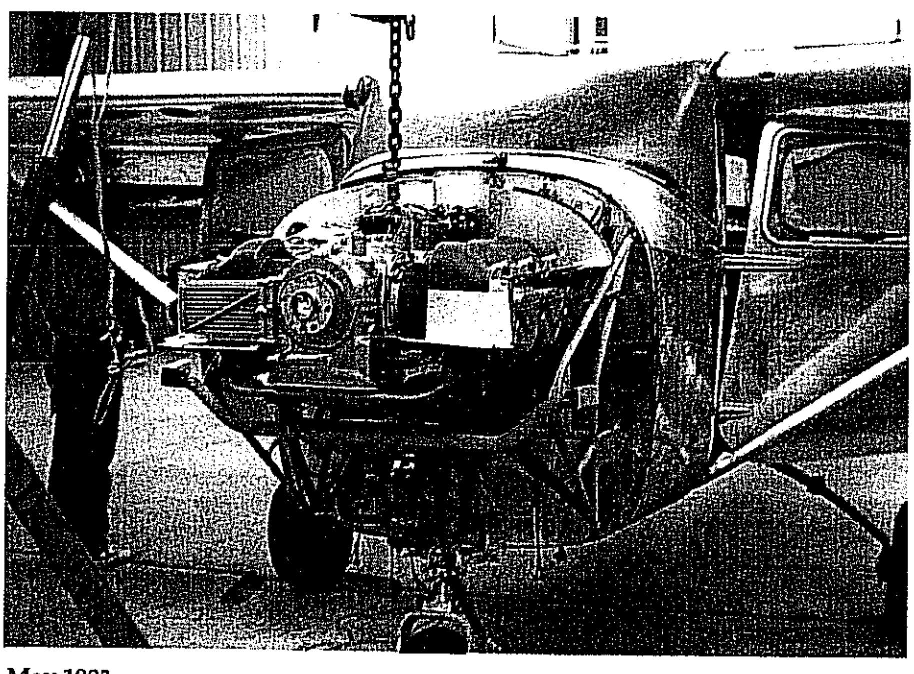
As remarkable as the WREN was, Todd wasn't satisfied. He studied the design closely and realized that not all of his mods were contributing to the performance or abilities of the aircraft. The WREN was also pretty slow, considering the weight, heavy duty landing gear and all of the flap system. Todd went back to the drawing board, looking for a compromise, and developed a series of mods which allowed the airplane to keep most of the STOL performance while increasing the top end of the speed envelope far above that of a standard Skylane.

Skylanes, by the way, are one of the most popular airplanes ever built. Cessna introduced the design in 1956, and built 21,716 worldwide during the production run. There were obviously many changes to the airplane, going from the straight tail and high turtledeck to the slanted tail with Omni Vision, then retracting the gear, then adding a Turbo. But all of the straight legged airplanes cruised at around 155 mph and traditionally could carry more than they were supposed to into places they weren't supposed to go. They were the tri-geared workhorse of the fleet, and were just as able to be luxurious and comfortable for the family. It was almost an "everything" airplane.



According to Todd Peterson, during takeoff (above) the Wren 460's nose will lift off at around five to seven mph. For landing, only about 350 to 400 feet of asphalt runway and a slight headwind are needed.

The highly modified Wren is powered by a fuel injected, Continental IO-470-F (below), boasting 260 horses. This engine not only costs less than a 300 hp engine, but the fuel savings alone nearly pay for the conversion over the span of the TBO.



When Todd decided to go after both ends of the envelope, he knew that he needed STOL devices which weren't too draggy, and speed devices which weren't too heavy. You can't get something for nothing, so whatever he did was going to add weight to the airplane. You can't do much to balance out this weight gain aerodynamically. The more devices you add, the heavier the airplane gets. The only thing which will negate a weight gain is power, and for this Todd installed a fuel injected, Continental IO-470-F, boasting 260 hp.

There are those who wonder why he didn't go to the 300 hp. engine which is used on the 210, and the answer is fairly simple. Besides costing much less initially, the fuel savings alone would nearly pay for the conversion over the span of the TBO. The -F is a dependable, fuel efficient engine and adds only around 25 lbs to the airplane empty weight.

For the slow speed end, Todd developed a canard for the front end. Canards were trendy for a while, particularly in the homebuilt area. If aviation hadn't begun to die when it did, we would probably see a lot more canard designs. His design isn't a particular airfoil design, per se, but features movable surfaces which are tied in with the elevator controls. The entire assembly is mounted on a steel tube frame bolted to the firewall at the engine mount points. A continuous torque tube with a bellcrank activates the movable surfaces, which deflect a scant two degrees up and seven degrees down. As the elevator moves upwards, the control sufaces up front move downwards. The tail download, a major drag component, is drastically reduced. The weight of the engine is partially supported by the canard, which means that the extra twenty five pounds probably doesn't do much to the actual wing loading of the airplane.

For top end, Todd used pure aerodynamic clean-up, starting with flap gap seals, then adding very nice, very tight wheelpants and gear leg fairings and a slick nosewheel fairing which covers the strut and shimmy damper. If Todd could do something about the antennae farm up on the roof, he might add three or four knots, but considering the high tech panel in N5144N, the dependability of good reception is a fair tradeoff.

The airplane Todd and I flew belongs to Larry Putterman, the owner of a manufacturing facility in Williamsport, PA. He is typical of Todd's customers, who seem to be fifty-ish, successful, established, and competent pilots who are coming out of retractable, high performance singles or twins and are looking for a safe, reasonably fast and comfortable airplane which may be the last one they ever buy. That is, they are not the macho, flying cowhand or sportsman types who relish the great outdoors and impossible landing strips. Furthermore, Peterson's clientele rarely consists of Cessna 180 pilots and, in fact, many of his sales are to people who have never owned a Cessna. Instead, nearly seventy percent of his sales are to customers who want him to find a good Skylane, install the mods, and deliver it ready to fly.

According to flight tests, the plane's optimum cruise altitude is 8,000 feet with a top speed of about 180 mph.

Below, Todd Peterson poses next to one of the planes he has recently finished for a customer. Todd's operation is located in Ashland, Kansas.

Regarding sales, Todd reports that he does between thirty-five and forty airplanes a year. This included the airplane we flew and other models which use different combinations of the STC's he has developed. He will add a canard and speed kit to an existing stock Skylane, add just the 260 hp. engine with no airframe changes, and convert a Skylane to a *Bushmaster*, a back-country-dedicated, heavy duty airplane. Any of these modifications can be applied at his shop in Ashland, Kansas, west of Wichita on the Oklahoma border, or sold as kits to be installed by the owner's favorite mechanic.

These kits are a rather new turn, by the way. Originally, Todd only converted airplanes which he found, bought, and basically remanufactured. After moving to Ashland, and deciding to cut down on the family's grueling airshow work, he began offering kits, simply because he has a two man shop and couldn't fill the orders he was getting. He is always concerned that outside shops will not do the quality work he is used to, but to date, there have been no problems.

Strapping into the airplane, I noted the awesome panel. Dual Mark 12 D's, GPS, an Argus 5000 moving map, the works. It was obvious that Larry Putterman was serious about his flying.

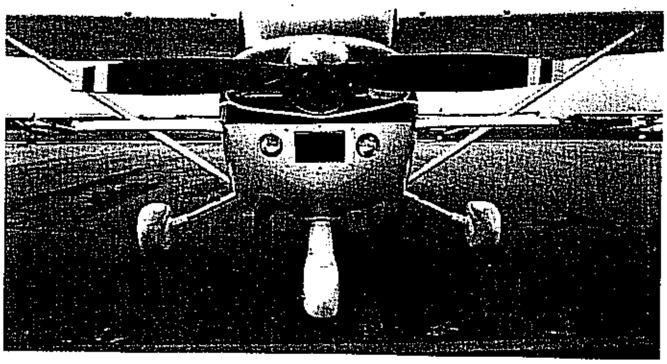
The engine started with a couple of flips of the prop, and was remarkably quiet. We taxied out to *One-Eight* in 35 degree Missouri air and after a thorough run up, pulled onto the active.

The canard was shaking quite a bit at idle, but Todd assured me that nothing would fall off. As power was applied, it became rock solid. Holding the brakes and giving her the gas, Todd told me that the nose would lift off at around 5 to 7 mph. He let go the brakes, and WHOA! the runway disappeared. He lowered the nose for a more normal roll, and at 40 kts. we levitated off the ground, immediately accelerated to 70 KIAS, and climbed out at this speed with the VSI bumping 1500 fpm at an impressive deck angle.

It had been a few years since I had flown a Skylane, and I found myself remembering the heavy controls, impressive acceleration and the huge, view-restricting panel and glareshield. It was nice to refamiliarize myself with the roomy cockpit, comfortable seats and relative quiet. Even stock, this is a great airplane. Modified as it was, it was becoming apparent that the airplane was outstanding.

A few miles east of the airport we slowed the airplane to 45 kts. At about 1500 ft. AGL, Todd demonstrated hands-off, forty-five degree banked turns. We could turn a full circle in an estimated three hundred feet. Actually, we didn't have to do anything. Trimmed, the airplane felt as if it could do this until the tanks ran dry. I guess it would start climbing at some point, wouldn't it?

Something the canard does is allow the airplane to fly at a relatively level attitude at 45 kts. There is no steep angle of attack, only a marked quiet. Most



airplanes in this configuration, including the models we normally consider STOL airplanes, are on the back of the power curve in such a maneuver. If an engine is lost, particularly at low altitude, ain't nuthin' but bad news! Totally crossed controls produced a waggle Madonna would be proud of, but stall-wise, nothing happened. Of course, at 45 kts., we were still 10 kts above the full gross stall speed.

Stalls in this critter are surprising. Even with the engine at idle, the angle is imposing. It was the closest I had come to flying the Space Shuttle. The impression was that the stall would be an uncontrollable explosion of twisting, spinning aluminum, but it was more like puffing the fuzz off a dandelion. You actually have to use a bit of power to get the stall, and this was nothing more than a brief dip of the nose and a slight falling sensation. Todd didn't have to spin test the airplane for certification, but has spun it for the Army. He reports that it is impossible to hold it in a spin of more than one revolution. So, Stalls? Ho Hum.

Having shown me the slow stuff, Todd wanted to show the fast stuff. Punching it, he pulled the nose up and we literally rocketed up to 4500 ft. Trimming to level, the airspeed needle crept up to 143 kts indicated. The optimum cruise altitude is 8000 ft., so we were well below top speed. Flight testing has shown that the airplane will true out to around 175 mph loaded and bumps over 180 mph light. The canard slows the airplane a couple of mph, but is a good tradeoff for the low end. Basically, what the mods do is make the old top speeds the new cruise speeds and give you a new set of top numbers to brag about at the airport.

Heading back to the airport, we set up for a couple of landings. Normal landings find the airplane rigged for 65 kts. Lowering anywhere from 20-40 degrees of flap, you fly a base of 55 kts, slow to 45 kts over the threshold and do a standard Skylane landing, only in slow motion. A max performance landing with a bit of headwind on asphalt is about 350-400 feet. Realistically, short landings will be made on grass strips with a roll-out of closer to 200 feet. That's Santa Claus distance.

The package I flew runs $36,400,

The canard features movable surfaces which are tied in with the elevator controls. The entire assembly is mounted on a steel tube frame bolted to the firewall at the engine mount points, and the weight of the engine is partially supported by the Canard.

which includes the engine, canard and speed mods, all installed at Ashland. Another kit offers the canard and speed kit, but no new engine, installed at the shop for $13,000. This combination is called the *230SE/STOL*, and by keeping the 230 hp., provides a 150 kt. cruise and a takeoff distance of 475 feet. The *Super Skylane* model is simply the replacement of the 230 hp. mill with the 260 hp. version. No airframe modifications are made except for some firewall and engine mount rework to accomodate the engine.

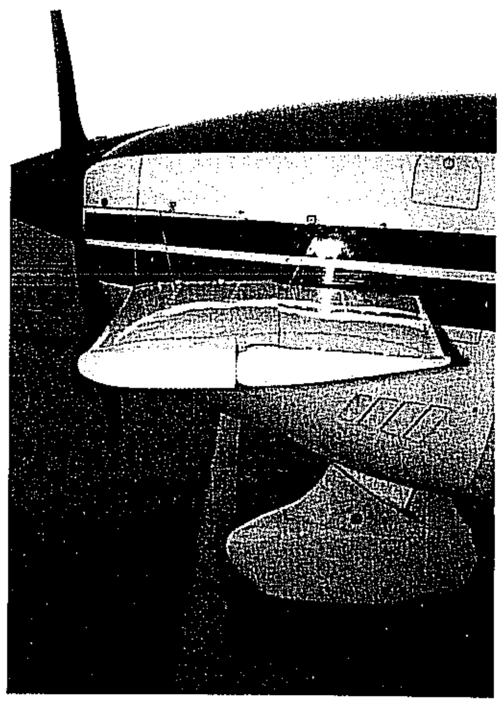
The *Bushmaster* is the final model, which features oversize tires, heavy landing gear all round, HD brakes and the leaf spring, Wittman-style landing gear, 260 hp. engine and canard. No speed mods on this baby. The rocks and trees would probably break them off.

By the way, if you don't want the aerodymanic speed kit on the other airplanes, deduct $3500 and around 20 mph. I doubt if many will do this. After all, what's the point of doing the rest if you aren't going for the whole shooting match?

This coming April 1 will be going to Ashland to visit the shop. The trip will be in conjunction with a seven to ten day Aerobatic clinic which Todd and Mary Jo will host this year. Ashland's runways are long, smooth grass strips, geared to taildraggers and fun flying, and some of the best aerobaticists in the country show up for the practice, coaching, critiquing by their peers and just plane fun.

It is exciting that people like Todd Peterson are taking proven aircraft and optimizing their performance. The factories which built the GA fleet over the years were notorious for offering airplanes which obviously had more performance potential than was used. I guess the big difference is that for the last twenty years of active aircraft production, the designs were determined by the marketing department, rather than pilots. They evidently struck the balance they thought was saleable. At least the airplanes they produced were strong, well engineered and safe. You can't ask more than that...or can you?

Interested in the Peterson family of airplanes? You can call him for mere pennies at 1-316-635-45055. He has a decent info packet and a very entertaining video. If you have a Skylane, you really owe it to yourself check out Peterson's bag of tricks. ☆



Reprint From
PLANE & PILOT MAGAZINE
MAY 1967

INFLIGHT TEST--

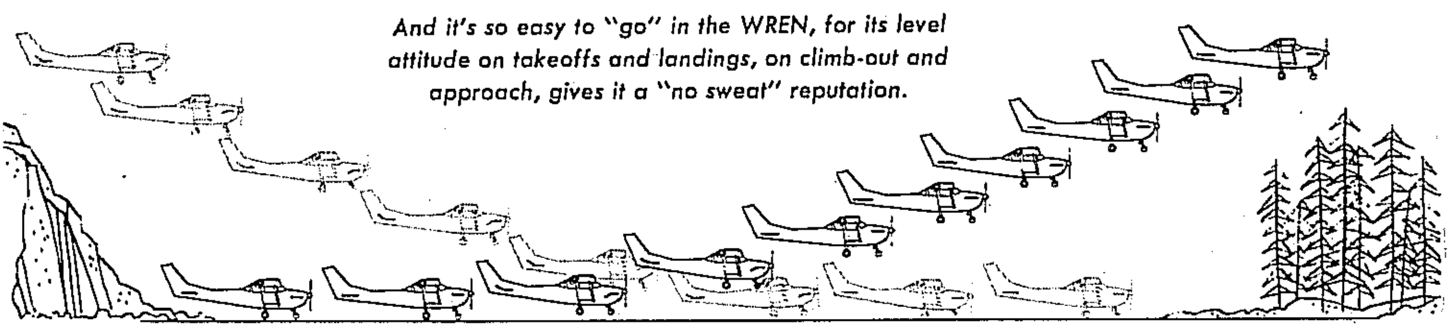
STOL WREN

A synthesis of revolutionary but practical performance characteristics has been built into the fast-flying, slow-flying, high-flying, low-flying Wren

By MARVIN PATCHEN

PLANE & PILOT MAGAZINE INFLIGHT TEST REPORT
Flying Time 8.5 Hours

TEST PLANE	Wren
BASE PRICE	$33,650 ($31,875 without Beta prop)
YEAR AND MODEL	1967 460 Beta
DESIGN TYPE	High-wing, single-engine STOL
PILOT & PASSENGER CAPACITY	Four (six option)
GROSS WEIGHT	2,800 pounds
EMPTY WEIGHT	1,697 pounds (1,680 without Beta)
USEFUL LOAD	1,103 pounds (1,120 without Beta)
CARGO CAPACITY	790 pounds
NUMBER OF DOORS	Two
POWER LOADING (LBS/HP)	12.2
WING LOADING (LBS/SQ. FT)	16.09
LANDING GEAR TYPE	Tricycle, fixed gear
WINGSPAN	35.8 feet
WING AREA (SQ. FT)	175.4
OVERALL LENGTH	27.3 feet
OVERALL HEIGHT	9.0 feet
PROPELLER SIZE	82 inches
PROPELLER TYPE	Hartzell/Wren Beta-control system reversible (or Hartzell or McCauley constant-speed)
FUEL CAPACITY STANDARD	60 gallons
NUMBER OF ENGINES	One
MAKE OF ENGINE	Continental 0-470-R
PISTON OR TURBINE	Piston
NUMBER OF CYLINDERS	Six
SUPERCHARGED	No
HORSEPOWER RATING	230
CARBURETOR OR INJECTION	Carburetor
TOP SPEED	160 mph
CRUISING SPEED 75% POWER	153 mph (149 with large tires) @ 6,500 feet
CRUISING SPEED 65% POWER	143 mph (139 with large tires) @ 6,500 feet
GALLONS PER HOUR 75% POWER	14
GALLONS PER HOUR 65% POWER	12
RANGE STANDARD TANKS 75% POWER	601 miles
RANGE STANDARD TANKS 65% POWER	655 miles
SERVICE CEILING	19,200 feet
RATE OF CLIMB	1,080 fpm @ sea level
TAKEOFF RUN	270 feet
TAKEOFF DISTANCE TO CLEAR 50 FEET	560 feet
LANDING ROLL	205 feet (270 without Beta)
LANDING ROLL CLEARING 50-FOOT BARRIER	454 feet (555 without Beta)
STALL SPEED — FLAPS DOWN	26 mph
TAKEOFF SPEED	35 mph
BEST RATE OF CLIMB FEET PER MINUTE	1,080



And it's so easy to "go" in the WREN, for its level attitude on takeoffs and landings, on climb-out and approach, gives it a "no sweat" reputation.

No other plane has the "teeth" atc the wing, hinges below it, and the ULS fins on the nose cowling.

INFLIGHT TEST--

STOL WREN

By MARVIN PATCHEN

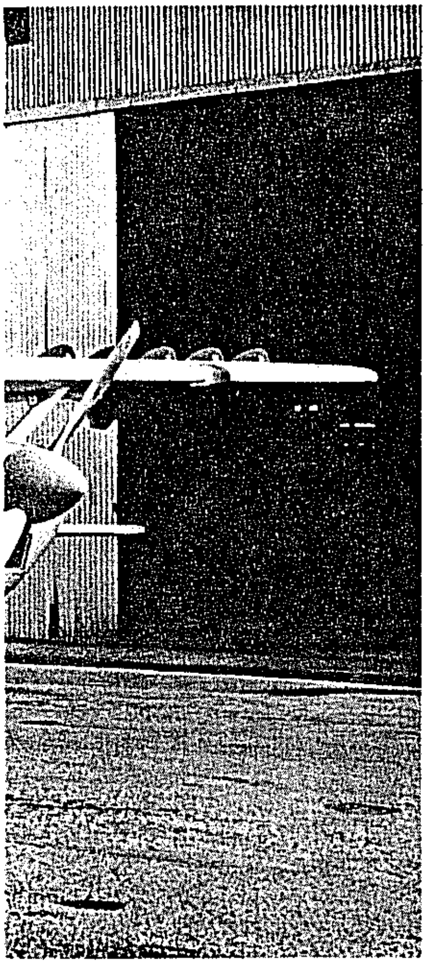
In piloting the Wren for several event-filled hours, it seemed that I almost had to unlearn the safe flying maneuvers that had been drilled into my reflexes after hundreds of hours of flying. I made flat, low-altitude, low-speed turns. I came in high on final on short strips. I intentionally skidded and slipped in turns, all at speeds between 40 and 50 mph.

But the purpose of the Wren is not to rewrite the book on how to fly; rather, it is designed to do certain jobs efficiently, safely, and economically.

The Wren came into being when Mr. E. H. Pickering and Doc Morris, a veteran bush pilot, blended the principles of STOL aircraft, developed by Jim Robertson, into a Cessna 182 airframe.

Doc Morris, after leading an extensive bush operation in Paraguay, was convinced that a successful STOL plane must be a combination of good performance, easy maintenance, and accessibility of parts. The Cessna's world-wide distribution and comparative abundance of parts convinced Doc that the 182 was the airframe to begin with. The 230-hp Continental 470-R engine, running low octane, provided ample power with economy.

Selecting a tricycle gear rather than the conventional gear found on most STOL planes was done with the reasoning that the three large-diameter



wheels give far more flotation in soft sand and mud. Also, bush strips with the usual single runway are many times subject to difficult crosswind conditions that are eased with a tricycle configuration. Further, the Wren is designed to do its landings and takeoffs at a level attitude. This adds immensely to safe visibility, especially when landing. Those who fear a nosewheel, thinking it might be subject to abuse, forget that the Wren lands at a super-low airspeed and that most of their planes are equipped with extra heavy-duty nosewheels and forks.

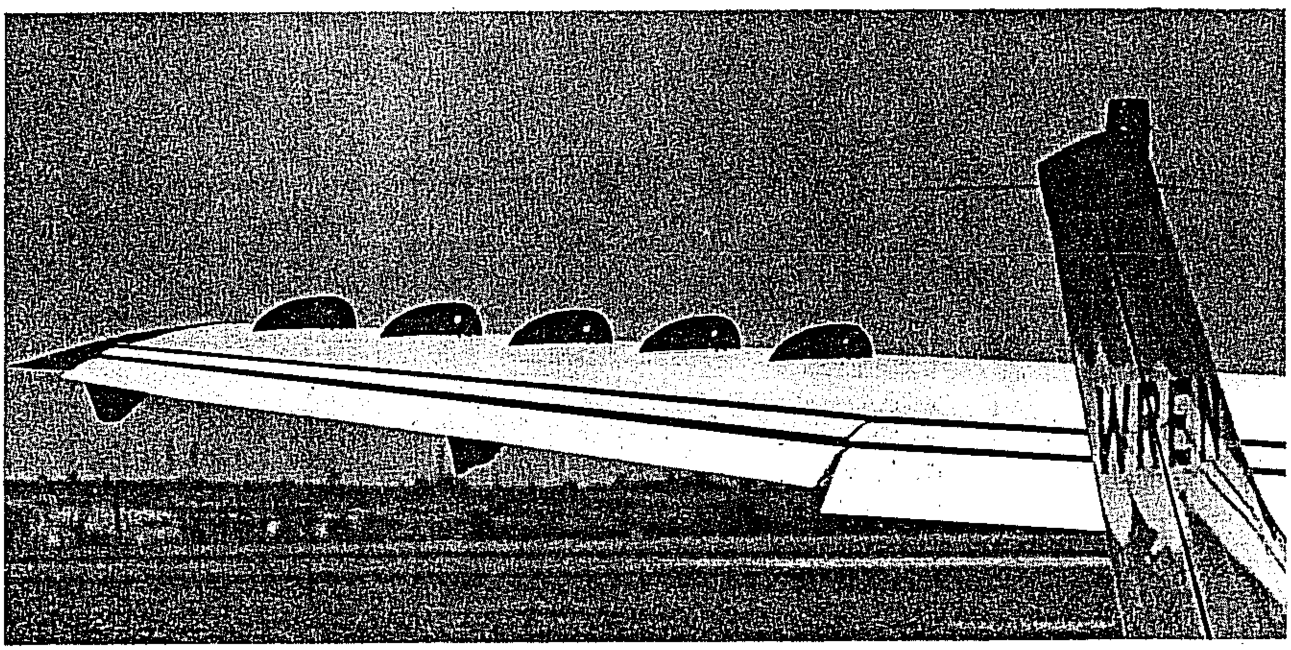
What is it like to fly a Wren? On takeoff, it's quite similar to a Cub or a Champ with a stiff breeze blowing on its nose. With an almost flat attitude, you seem just to go up and up and up like an elevator, the nose just a few degrees above the horizon. Full flaps are used for takeoff, and 35 mph is the rotating speed. At full gross and zero wind, you should get off in less than 300 feet.

The flaps travel 30 degrees, as compared with the standard 40 degrees on 182's. The special Wren full-span flaps are "lift" as opposed to "drag" flaps and provide an 87 per cent increase in the lift coefficient of the wing. The outboard flap sections (tagged with the name "flaperons") act as both ailerons and flaps. At low speeds, their effectiveness is enhanced by a vane which directs airflow from the lower wing surface through the double slots, smoothing the flow over the upper flap and aileron surfaces, adding extra low-speed control, and doing away with the buffeting during ultraslow flight. With the flaps down, the ailerons are so effective that you can rock the aircraft from side to side during a slow taxi.

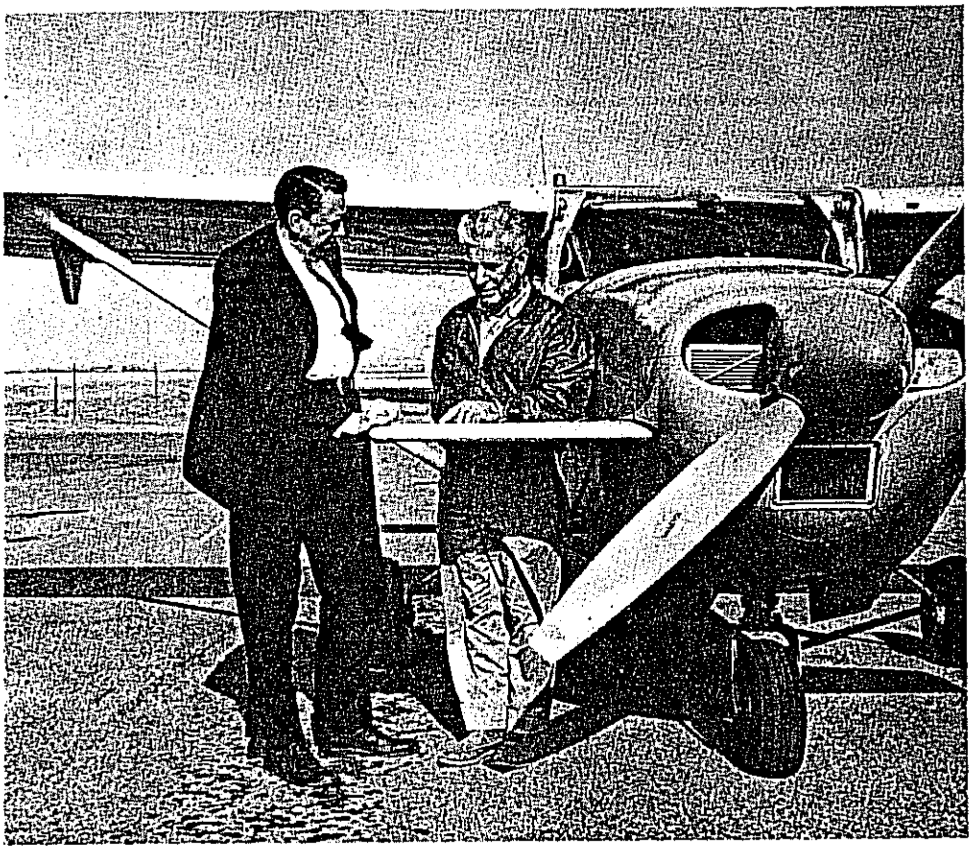
Full flaps on takeoff in effect scoop air forward and down, creating a ground cushion. This allows you to lift off under stall speed. After you break ground, acceleration is so quick that the plane rapidly attains speeds above stall as it flies away from the ground effect.

Another Wren feature is the integrated trim system, which automatically offers the right amount of trim, compensating for any change in the flap position. In other words, you set the trim in the normal manner, and, if you suddenly dump the flaps, you do not frantically have to readjust the trim.

Our takeoff point was Meacham Field in Forth Worth, Texas, where we made intersection takeoffs on the last quarter of the runway. With any help from the wind, we could have



Although the aileron (flaperon) seems to be slightly down, it is in the up position. The "teeth" are turned toward the aileron, thus counteracting the yaw created by the down aileron during low-speed turns.



E. H. Pickering (left) and Doc Morris discuss the ULS system that gives the Wren super-efficient elevator control at low speeds.

taken off crosswise on the runway; however, I am sure the tower would have frowned on such a demonstration.

Away from the city, Doc Morris and I swept low and slow over Texas. I made 180-degree turns in under eight seconds. Doc's record is just over four seconds. At such low speeds, you can turn 180 degrees within a 200-foot circle.

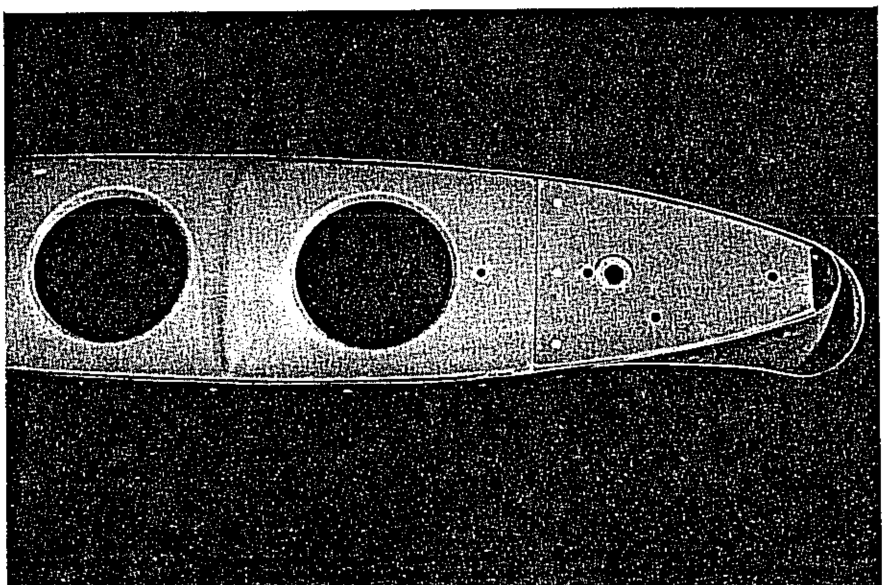
Paralleling the highway, we spooked a truck driver with our shadow. Normally, anyone driving on the ground expects to see the shadow of an aircraft going in the same direction pass by him, but, in our case, truck and Wren were both at about 55 mph. The truck tried to slow down, expecting the shadow to move ahead. We slowed too, with the results that the truck almost came to a halt trying to lose us. If the various state highway patrols get wind of the Wren's ability, certain drivers could be in a whole lot of trouble for any more illegal road antics.

It's natural for one to compare the Wren to a helicopter. To be sure, it doesn't have the vertical ascent and descent capabilities, but that is about all it gives up. Television station KONO, of San Antonio, Texas, was using a helicopter for traffic reporting but switched to a Wren and enjoyed a 65 per cent saving in operating costs. The Wren could maneuver almost twice as fast, maintenance was far simpler, and it became a far more effective tool.

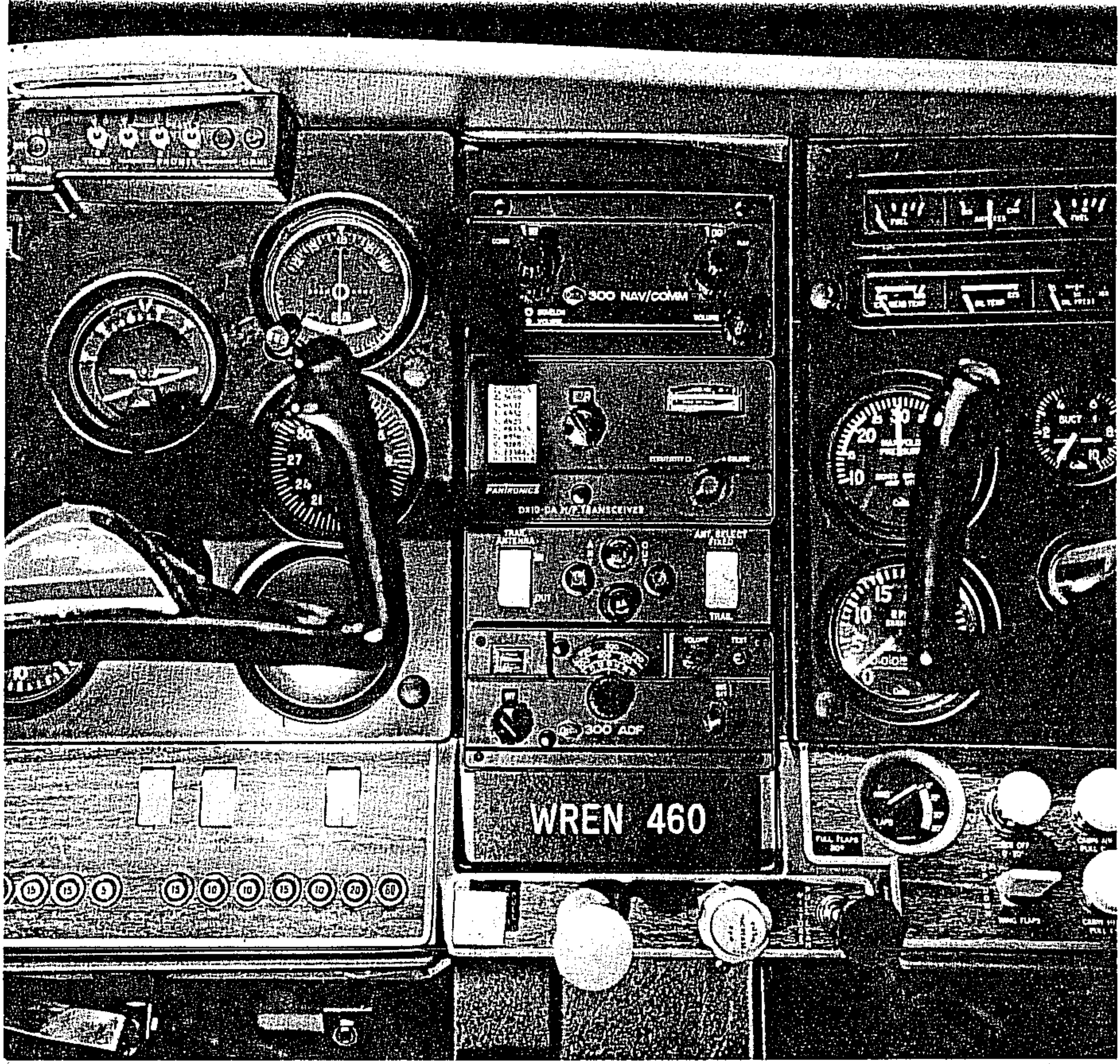
Later, I tried a few stalls. "Tried" is the correct word, because you really have to work at it to stop flying. The leading edge of the Wren's wing is redesigned simply by attaching a new shape over the existing wing. This increases its radius, adds lift, and also smooths the airflow over the leading edge — causing the stall to begin at the trailing edge of the wing where the airflow can be reattached by a slight reduction in the angle of the attack.

Another device which enhances roll and yaw control during slow speeds is the series of vertical Wren "teeth" on each outer half of the upper wing surfaces. They are connected to the ailerons so that during level flight they are feathered into the wind. As the ailerons are used during slow flight, the teeth deflect broadside to the airstream ahead of the *up* aileron. The more the aileron is deflected, the more the teeth turn toward their maximum of 60 degrees. These teeth introduce a drag which offsets the adverse yaw created by the *down* aileron during low-speed turns.

Still another special device is the ULS, which stands for Ultra-Low-Speed. This looks like a small elevator, except that it is located on the nose cowling. Because it is right in the propeller's slip stream, it is super-effective even during power-off glides and flare-outs. The ULS is directly connected to the elevators on the tail



A wing cutaway clearly shows how Wren changes the original 182 leading edge simply by attaching a new shape over the existing airfoil.



The Wren panel, here minus the Wren-Beta reversible prop control, is standard Cessna. However, this aircraft has a special high-frequency radio used in many foreign countries.

(however, they work in opposite directions), giving the Wren powerful pitch control and the ability during soft field operations to lift its nosewheel in less than its own length.

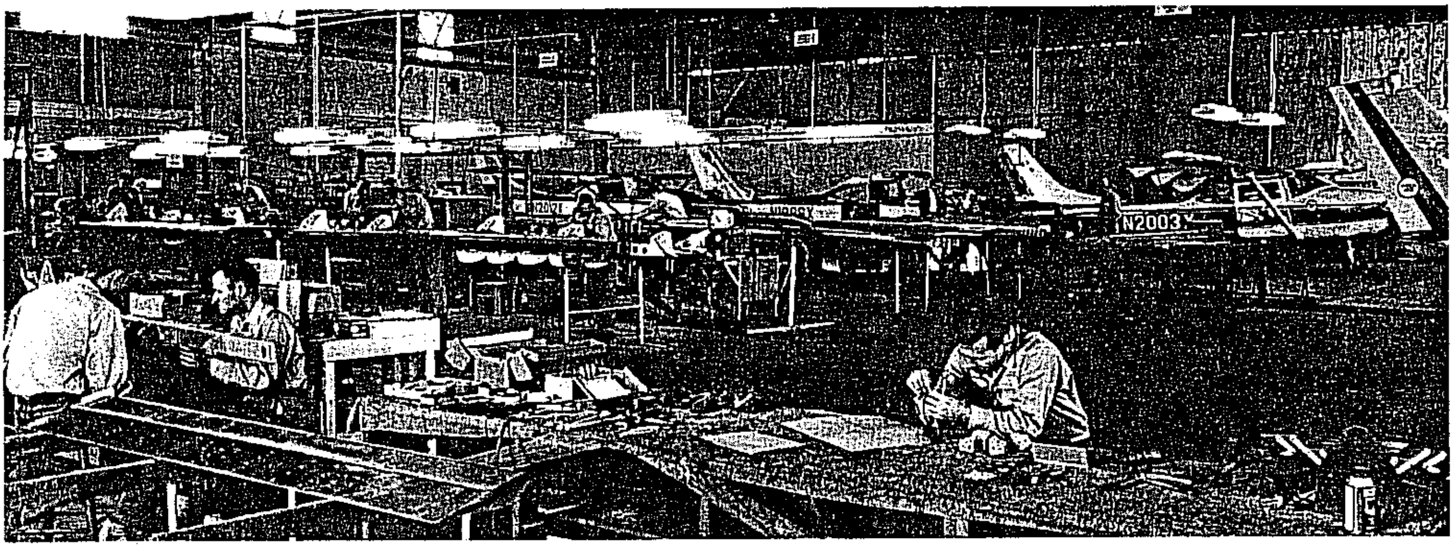
I tried slow-flying. It took about 16 inches and 2100 rpm to hold 60 mph with the nose on the horizon. Turns at this speed felt solid and safe. Backing off the power even further, I made a series of turns at 50 mph, and still I felt comfortable and safe. At low power settings you have 11 hours of cruise, which is, of course, far above the average man's physical capacity to go without a "rest" stop.

After the series of unconventional, low-to-the-ground, low-speed turns, I tried out the other end of the Wren's speed range. Having once owned a 182, I can say with authority that during normal cruise settings the aircraft feels, sounds, and flies like any other 182 except that its true speed is about six mph slower. The Wren brochures point out that its speed is faster than eight other four-place, single-engine planes on the market and slower than 15 others. In eight hours of flight, the distance difference between a 182 and a Wren would be only 48 miles.

The only other thing the Wren gives up is about 130 pounds of useful load. Of course, the 182 is known for its weight-carrying ability, so you still end up with 1,103 pounds of load capacity. Aside from the small losses in speed and load, the Wren gives you far more in return. It is virtually spin-proof and stall-proof and does its maneuvering at level attitudes where visibility is the greatest. It takes off quickly, lands short, and has extra rugged gear — plus, it's backed by Cessna's world-wide parts service.

Another Wren feature is that its wings are made up so that field inspection and maintenance are easily performed. Oversized inspection plates permit exceptional access for viewing or adjusting. Also, the parts made by Wren are so designed that they can be repaired in the field with simple hand tools. There are no forgings or castings parts to hold up a repair job or take a plane out of service. In three years, Wren has sold only two replacement parts.

The Wren enjoys a large advantage in turbulent air. When most aircraft would wisely remain on the ground, the Wren's slow-flight ability smooths out turbulence that would be tooth-shattering for most other aircraft. It is calculated that at 60 mph the turbu-



All Wrens start out as brand new Cessna 182's and are then modified for STOL performance in this factory at Fort Worth, Texas.

lence shock is only one-half of that experienced at 90 mph. At 120 mph, shock is four times as great as at 60 mph, and at 180 mph turbulence shock is nine times rougher.

Still another plus mark for the Wren is the safety aspect during a forced landing. A plane that can touch down below 50 mph for a short landing roll has a much greater chance for injury-free forced landings than other aircraft. Also, according to the FAA, when accidents occur above 55 mph impact speed, the fatality rate rapidly increases.

If you find yourself making the mistake of flying into poor visibility and low ceilings, at least if you are in the Wren you can fly slowly enough to avoid many of the consequences. Also, the Wren has been certified for 0/0 landings (zero ceilings, zero visibility). Making an instrument approach at safe slow speeds and level attitude, the Wren needs no attitude change at touchdown. Coupling this with the tricycle landing gear used during the transition from flying to driving eliminates the nose-over problem and makes the Wren the safest blind landing plane available. In other words, you keep a slow, shallow descent rate at 50-60 mph following the glidescope and localizer, keep on flying until the wheels touch the ground, and then pull off your power. With such a slow speed you shouldn't float or bounce after touching down. Even the helicopter is not allowed to make approaches under zero-zero conditions.

The Wren-Beta system is a modified Hartzell prop that is controlled by a handle on the panel which is coupled to the prop pitch controls and the throttle. By pulling down on the handle, you can change the pitch range anywhere from 14 degrees positive to 14 degrees negative. By controlling the amount of positive or negative pitch during a descent, it is possible to bring the Wren in from ridiculously high altitudes at steep angles of descent (but with the airplane in a fairly level attitude) without picking up airspeed. Once the plane touches down, the prop control is brought to its full reversing position, cutting the landing roll on a dry, paved surface from 25 to 45 per cent. I calculated that you could come in over a 500-foot obstacle (yes, 500 feet), land, and stop within 1,000 feet! Using the reversing prop, you also have the ability to back

This Wren is equipped with a reversible prop, which is controlled by a handle on the panel. Using this device, the pilot can descend at 2,500 fpm with low airspeeds and a stabilizing gyroscopic propeller action.

up while taxiing. The Beta prop also has an unusual gyroscopic effect which makes landing approaches in turbulent air a steady, wing-level affair.

All my landings were of the ultra-high approach variety. Most of them used up about 150 feet of runway. Once, I goofed and rolled about 200 feet. Not having had the opportunity to fly a Wren with a standard prop, I did some research and found that the proper technique is to bring the aircraft in below 59 mph and above 50, using a slight amount of power. When you are ready to flare out, you give a very short burst of power, which raises the nose, then close the throttle. This gives an ultra-slow, main-wheels-first landing. Actually, conventional landings can be made with less than a 30-degree flap setting. But, for the real gee-whizzers with or without the reversible prop, the Wren has the ability to get in mighty short for a full-size aircraft.

A bonus point with the reversible prop is its capability on ice and snow. It can shorten a landing run by 80 per cent on icy runways. This prop is available for all Continental engines in the 470 or 540 series.

If you have a 600-foot-square patch, you can land and take off in any direction and still have a safety margin. Wren-Ports could be located in communities where helicopter air taxi services are too costly or slow.

The base price of the Wren is $31,875, which is a little over $15,000 more than a 182. What you get for your money is 1,064 Wren parts and 2,114 nuts, bolts, and bearings, all assembled to make your airplane a star in the traditional "fun and profit" category. One item that can't be measured in dollars, units, and weight is security. Take, for example, the Wren's high-altitude capabilities. The Lake County Airport in Leadville, Colorado has a field elevation of 9,952 feet. With a calm wind and density altitude of 10,500 feet, at full gross weight, a Wren took off with a 761-foot run and touched down in 422 feet without the aid of a reversible prop. Performance like this is super-security. With the Wren, there is no need to wait around for the wind to come up or the temperature to cool down, in order to lift off safely from mountain airports. A high-temperature, high-altitude strip is just another airport to the Wren.

One way a Wren can save its owner money is through the convenience of building a strip next to his farm or ranch, warehouse, office, home, etc. A Wren needs only a fifth of the amount of land for runway length that is required for an ordinary aircraft. If you shape the land correctly, even half an acre can do. With a Wren-Port adjacent to your work or home, you can beat the portal-to-portal time of a 300-mile jet trip and an ordinary 200-mph aircraft's 600-mile trip. Many cases would favor the Wren even more, depending on the distance you would have to drive to an ordinary airport.

Compared to other STOL planes, the Wren's operating costs are quite modest. It uses twelve gph of low-octane fuel at 55 per cent power. At its super-economy cruise of 115 mph, the Wren will burn a little under eight

The Wren is at home in any part of the world. Here, a missionary stops for a visit at a refugee village deep in Laos.

gph, and, for low-speed patrolling using 20 per cent power, it uses only 5.3 gph.

I brought the Wren in for my last landing using the approach angle of a ski jump. As soon as the wheels touched down, I hit the button on the control wheel which automatically dumps the flaps for improved braking. This standard Wren feature is one that I would like to see on other Cessnas.

I purposefully selected a parking spot so that I had to back up, using the reversible prop.

Turning off the mags and master switch, I thought about those who would enjoy a Wren and profit from owning one. Ranchers, contractors, pipeline patrollers, high-altitude forest workers, highway patrollers, fish and game spotters, resort owners, photographers, and geologists will all find the Wren a profitable business tool.

There could be an even bigger Wren market for people like you and me – people who like to explore in Mexico or Canada, or use high mountain strips and fly slow and low over the beautiful sections of our country. People like you and me who make lots of cross-country flights can almost wipe the possibility of an unsafe forced landing from our minds, knowing that the Wren doubles the chance for a successful emergency landing. In the Wren, you have an airplane that does not sacrifice too much speed for its STOL feature. With my experience in fast airplanes like the Aero Commander 200, Comanche, Bonanza, Bellanca, and Centurion, I am happy if I have an airport-to-airport groundspeed of 170 mph. On a 325-mile trip, this speed generates a flight time of 1 hour and 54 minutes. The same trip would take you only 25 minutes longer in a Wren.

When you are planning a flight, Weems, Jeppeson, and the other computer manufacturers all have one factor missing from their dials – peace of mind. That is what you pay for and get when you own a Wren.

For more information about the WREN, contact:

WREN AIRCRAFT CORPORATION
Meacham Field
Fort Worth, Texas 76106
Area Code 817 MArket 6-3739

An unwise maneuver in most other aircraft, canyon flying can be practical for an experienced pilot who understands the superb low-speed handling and small turning radius of his Wren.

I WAS NO. 9 ZERO-ZERO

Even Grandmother can land the gentle, slow-flying Wren 460 under the hood, simulating zero-zero conditions

By RUTH TAKSEL

THERE are definite and distinct advantages to being a midde-aged grandmother type of pilot, uncoordinated and not a bit mechanically inclined. For one thing, when it comes time to prove how easy things are to do — or to fly — you are often called upon. Sometimes it turns out to be interesting and fun, too.

This was one of the reasons I found myself in Fort Worth recently, driving a brand-new Wren 460 down the glidepath all the way to the ground and to a stop, mind you—completely under the hood in simulated zero-zero weather conditions. I believe that practically anyone can land the gentle, slow-flying Wren in zero-zero weather.

The Wren is presently approved for IFR landings with ceilings of 100 feet and one-fourth mile visibility, and the FAA will review the situation after six month's experimenting with the present minimums. The company has petitioned the FAA to lower the minimums to zero visibility and zero ceilings, which is the first time such approval has been sought for any U.S. aircraft. Wren's reasons for believing it can do what other planes cannot include (1) A safe, slow approach (50 to 60 mph) without worrying about a stall, and which permits a shallow rate of descent without "eating up" runway; (2) level attitude of the Wren in slow flight so no change is needed at touchdown; (3) no tendency to float on a bounce after original touchdown; (4) tricycle gear to allow transition from flying to "driving" without risk of nose-over, and (5) slow landing speed for stopping in a short distance. No other plane combines all these features; other general aviation STOL (short take-off and landing) aircraft lack tricycle gear and level attitudes. Ordinary planes do not have ultra-slow-speed approach or touchdown capabilities, and have a tendency to float.

While present Wren minimums (100 and ¼) are the same as set forth in FAA's Category II program, the Wren is actually granted more liberal authority as it is not limited to those few airports that have the intricate ground electronic equipment for Category II operations. It does not need the complex airborne equipment required for Category II. IFR equipment and an ILS-equipped airport are all that's necessary in the Wren. To be approved for zero-zero landings, a pilot would have to be instrument rated and specifically tested for this type of approach. I understand that even helicopters cannot safely make instrument approaches to lower than 50 feet.)

As part of Wren's documentary to prove their plane is safe for zero-zero landings, the company has invited pilots with a variety of experience to make IFR approaches to simulated zero-zero landings. I was the ninth pilot to do so — the first woman, and one of the first non-instrument rated pilots. It was quite a thrill and not too difficult at all. When it was over I was presented with a silver zero-zero pin. One of the nine members of the Zero-Zero Club wears a gold pin — he made an actual IFR approach in zero-zero conditions when the weather closed down unexpectedly at both his destination and alternate. In my case, I felt the guy who deserved the medal was Doc Morris, Wren vice president, who calmly and courageously rode the approach with me.

Here's the Authoress with Doc Morris beside the Wren's supplementary nose control surfaces. No other STOL aircraft can match its level attitude at speeds below 50 mph.

Since it was an exceedingly rough day for my particular flight, I managed to answer my own question regarding the entire procedure: "While a zero-zero landing may be possible in smooth air, what happens when it's turbulent?" I found it no big problem at all, even with my limited experience.

To say that it was comfortable coming down the glideslope in the turbulent air would be less than truthful. But I can say that it was entirely manageable. The extremely slow approach speed minimizes the roughness and, as the Wren folks point out, the air can be calm in actual zero-zero conditions (fog). In weather conditions where there is rough air and gusty winds, they tell me you usually have a little ceiling and visibility. In my three practice approaches with Doc, I found that it was quite a simple matter to land if I shed the hood 30 ft. above the runway. The times when you have less than a 30-ft. ceiling are very rare indeed.

In practice, the zero-zero landing is basically simple. My biggest hurdle was using the glideslope, which I'd never done except for a couple of Link Trainer practice approaches. But in spite of that and the fact that I'd had no actual left-seat time in the Wren previously, it took only three practice approaches before I was able to make a successful approach all the way to the runway and to a stop. It's not hard to keep everything centered at those slow speeds — things don't happen too fast. At about 30 feet above the ground and ¼ down the runway, you ease off the rate of descent to about 200 fpm. At the prescribed 45 to 50-mph. touchdown speed, your bounce is a light one. You float just about one airplane length and simply continue to land the airplane in a normal way. After a time or two you find you can actually "feel" the ground effect. When the wheels touch a second time you raise the flaps and apply the brakes. If it's actually zero-zero weather, the hardest part is still ahead — taxiing in to the ramp. Better, we feel, to sit tight, and wait for a truck to come tow you in. Driving around on the ground in conditions like that could be *dangerous!*

September 1983

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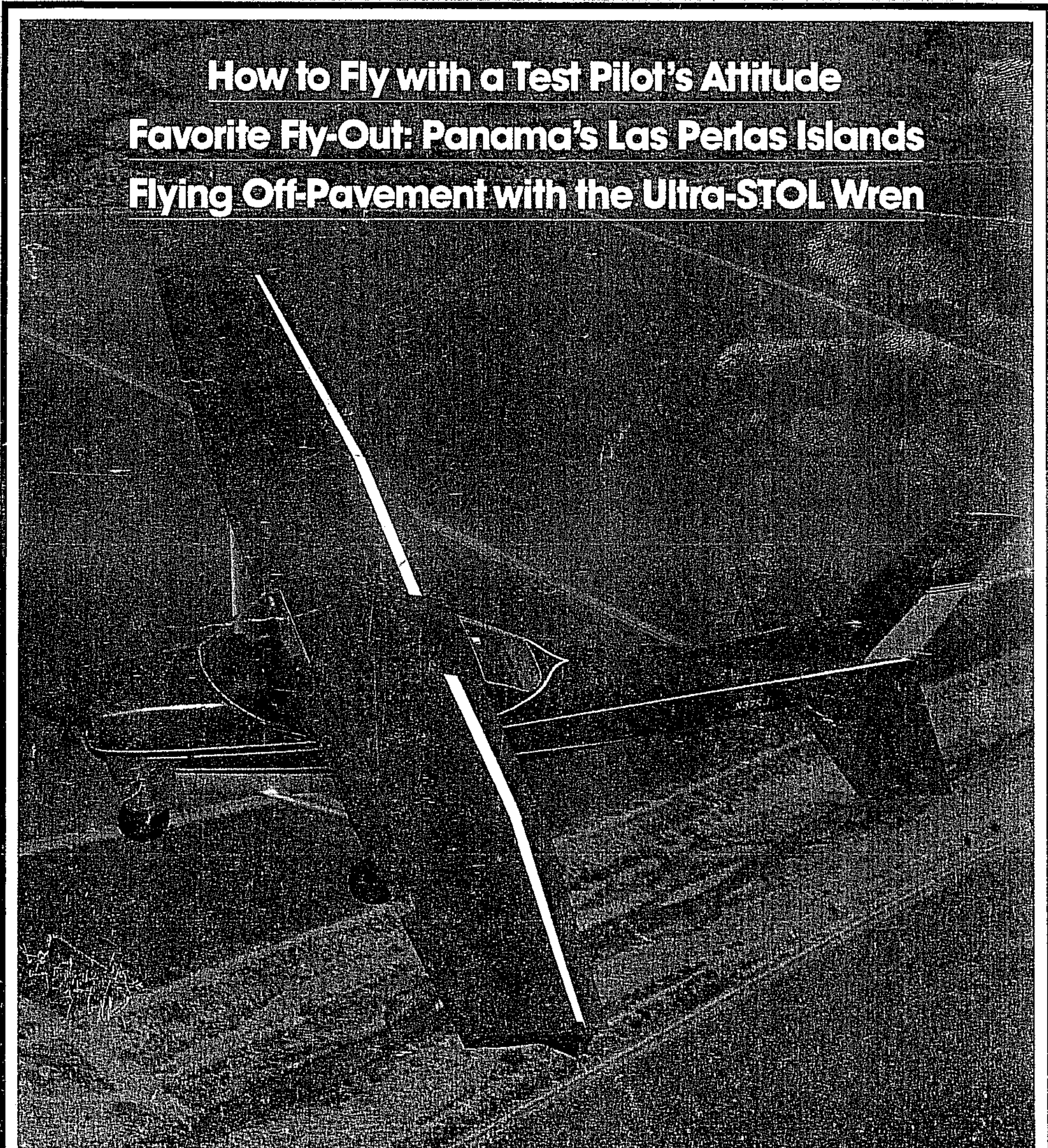
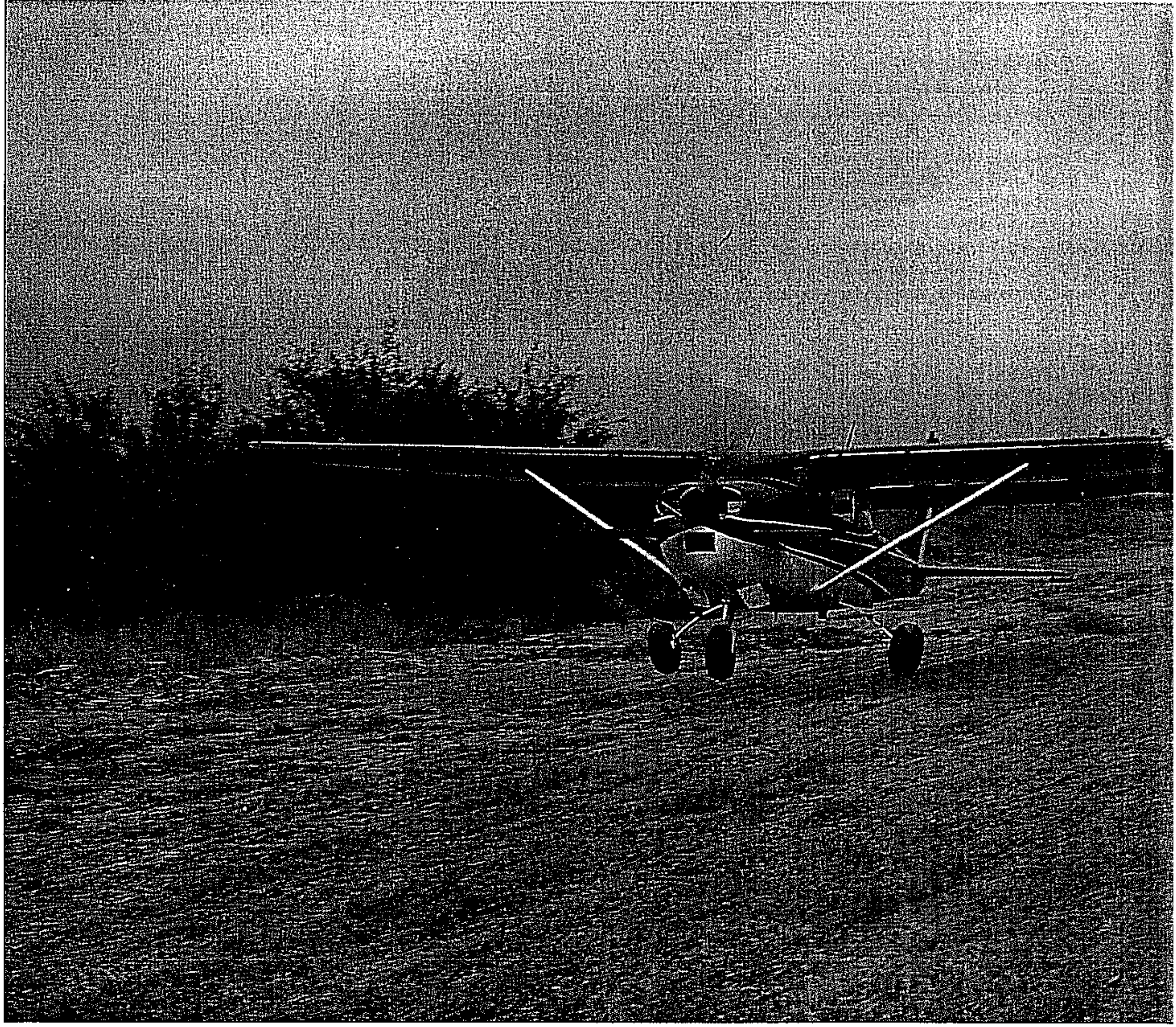
AERO

THE AIRCRAFT OWNER'S MAGAZINE





Reborn Wren Revives Interest in the Old/New Airplane of the Sixties

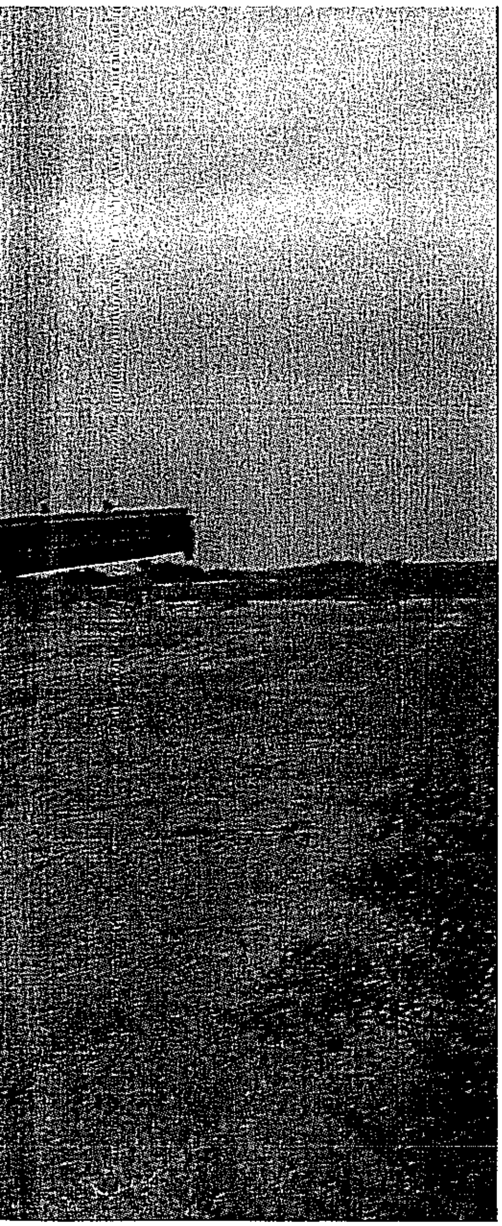
by Don Downie

ARIZONA'S STATE BIRD is the cactus wren, which is fitting because the Grand Canyon state is the home of the Wren 460. The Wren is a STOL modification of the ubiquitous Cessna 182. Some 200 Wren modifications were built in Texas between 1962 and 1967 when production was halted. An estimated 60–70 of these units were sold overseas. Nearly 150 of the total aircraft produced are believed to be still in service.

After 16 years, the Wren is back in production, thanks to the single-handed efforts of mini-entrepreneur Todd (Pete) Peterson. Todd, only 31, has been getting his hands greasy around airplanes ever since he graduated from an A&P program at the Cannon Aero Center, Cheyenne, Wyoming. He worked for several FBOs before starting his own major repair shop with an I. A. (Inspection Authorization) in Thedford, Nebraska. Todd said Thedford was the county seat and boasted a population of 300; "nice country, terrible weather." He opened his shop in 1972 and remained for 10 years.

How the Wren was reborn in the sandy deserts of Buckeye, Arizona, is a story in itself. Todd saw a small advertisement in *Trade-A-Plane* more than six years ago stating that the Wren project was for sale. Todd quickly purchased, "at a very reasonable price," the STC, drawings dating back to 1962 and minimal tooling. In his youthful enthusiasm, Todd fully expected to be building a few airplanes within a year. However, general aviation progress is not all that swift, and he has just recently delivered his sixth unit. Nevertheless, he is backordered until March, 1984, on his present two–three per month schedule. He has firm deposits on 18 units.

The Wren project is completely owned by Todd Peterson and his wife Jo. They reinvested the profits from their Nebraska repair shop, updated the Wren drawings and combined them into one master set. The tooling was refined for closer tolerances and Todd began looking for a place in which to build his bird because his Nebraska hangar was too small. The town of Great Falls, Montana, quoted an excellent price on a hangar lease, but Todd and Jo had fairly well had it with midwest winter weather. They decided to investigate the Arizona sunbelt not only because of the cli-



Julia Downie

Don Downie

The reborn Wren, which is back in production in Arizona, is a STOL modification of a Cessna 182.

All STOL takeoffs and landings are made with full 30° flaps, which remain down after takeoff so there is no unnecessary work during an aborted takeoff.

mate and flying weather, but also because many established aviation contractors and a trained labor force are close by.

The Petersons wanted something permanent with a long-term lease available. Falcon Field in Mesa, Arizona, had a beautiful hangar, but the price was 36 cents per square foot. While flying in the Mesa area, Todd stopped at Buckeye, Arizona, some 35 miles west of Phoenix, and saw the wide-open, seldom-used city airport. Upon questioning city officials, Todd discovered the city owned half of the existing hangar. Within three weeks, the city had bought out the other owner and leased the unpretentious but completely adequate facility to Todd at 8 cents per square foot. He has been in Buckeye now for 1½ years.

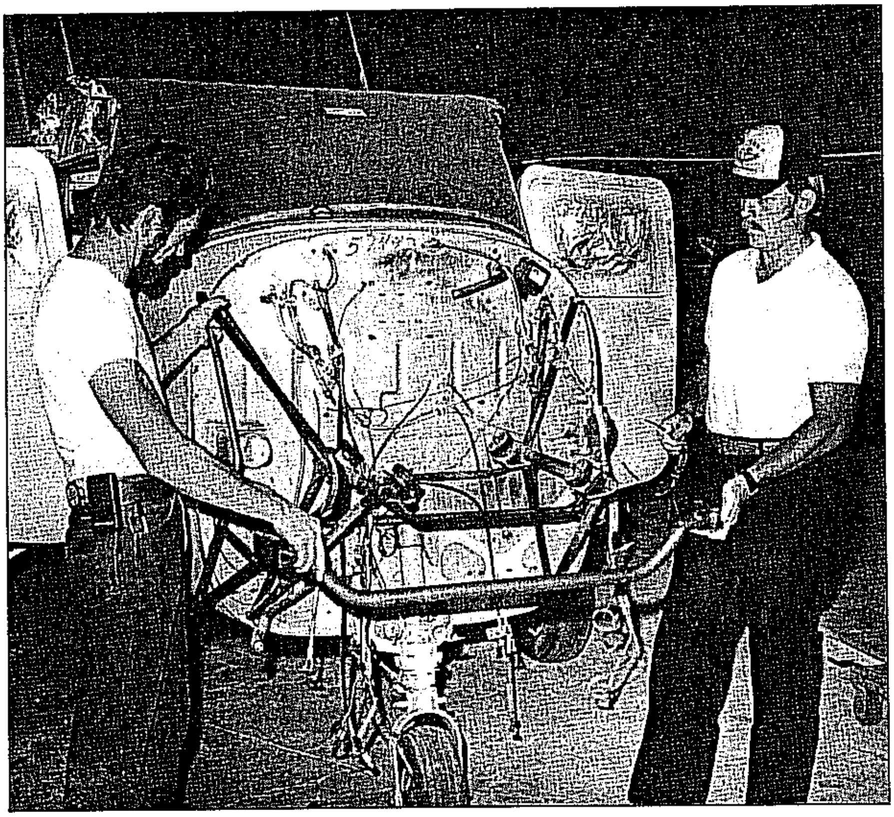
Todd said his isolated locale has certain advantages: "One, nobody bothers me. Two, when visitors do stop by, they are truly interested in buying. It's amazing how much time can be lost in a day talking to well-intentioned 'tire-kickers' who happen to wander in. Three, the wide open spaces dotted with sagebrush and Siguarro cactus are ideal for demonstrating a STOL like the Wren. Nobody yells and the city loves it." (After flying for a part of two days with Todd in his Wren, I can assure you that the combination would have been thrown off any conventional airport in the first week.) "Four, the Wren hatchery is now the second largest business in Buckeye with 24 employees. It's about as close to having a private airport as you can be," he smiled.

Todd is no stranger to the world of STOL aircraft. He has owned a Cessna 182 with a Robertson STOL and a Maule, and he also has flown extensively in the Helio Courier. However, many of his 4000 hours (private ticket with instrument rating) were obtained flying air shows in the Nebraska area in an Acroduster II. "When I invested in the Wren project, the Acroduster was the first thing to be sold because it sat in the back of the hangar for eight months a year and didn't make a dime. However, when I can afford it, an aerobatic showplane will be the first thing I'll buy. I love aerobatics!"

Todd is enthusiastic about the Wren's capabilities. He beams when he talks about his ship. "Everybody loves it," he said. "We get bush pilots from all over the world stopping in 'way out here. The airplane's safe, you're never behind the power curve and there's none of this extreme high angle of attack where you're hanging on the prop. Just wait until we get into the air and I'll show you. You'll love it." He was right.

The Wren is built around the popular and proven Cessna Skylane, vintage 1966–1969. Todd eventually plans to modify the 1970–1971 models as well, but he says he will never rebuild a newer-than-that airframe because of the change by Cessna in 1965 that put the broad 206 elevator and stabilizer on the 182. Then in 1972, Cessna widened the wheel tread, added a tubular gear and moved the landing gear aft with a resultant greater load on the nose gear. However, there are almost 5000 1966–1969 airframes available and, Todd said "even if we upped production to four per month, it would take us 10 years to modify 500 out of that 5000. So, we're not about to build ourselves out of 182 airframes." The Cessna 180H can be adapted to the Wren modification also, and Todd is studying that possibility. At the moment though, he's busy cranking his production up to four per month. "We'll make a taildragger model if we can get six orders in advance."

Todd's method of building and selling is unique. Each order is custom built, with avionics (if any) added at the customer's request and the paint job suited to the individual as well. Substantial deposits secure a delivery slot. The Wren sells for two prices, depending on whether the customer fur-



photos: Don Downie

Todd Peterson examines one of the thousands of new parts that go into the Wren STOL modification he recently brought back into production in Buckeye, Arizona.

Doug Burke, left, and Todd Peterson examine the torque tube that fits between the canards that are installed on the Wren modification.

WREN/*continued*

nishes the 182 or Todd buys one to modify. Customer-furnished aircraft are currently modified for $29,000 with six weeks down time.

Remanufactured "new" Wrens involve returning a 182J-182M airframe to a zero-time status. Everything from the firewall forward is new with a zero-time, factory-remanufactured engine complete with warranty. Price for the "new" Wren is $65,000. Todd said he can find good, clean airframes with run-out engines for from $14,000–$20,000. "We won't modify a 'dog.' Each airframe is on a case-by-case basis. We put in a new interior; new instrument panel that we make here, and all new gyros; we replace the windshield; add long-range tanks, if they are not installed already; replace all cables and stressed parts and corrosion-proof the airframe. Strobes are standard equipment with the Wrens, as are articulating seats, dual brakes and an external power receptacle.

Just what is the Wren concept and where did it come from? It was a product of the late Jim Robertson (Robertson Aircraft) and A. E. "Doc" Morris, and grew out of a 420-hp Lycoming-powered Robertson Sky Shark design concept. Aside from beefing-up the area around the landing gear, the rear spar and some other structures, four basic modifications are required to convert a stock 182 into a Wren. Full-span, double-slotted flaps and drag plates, called Wren's teeth, are added to the wing. These five vertical vanes atop the wings on each side are interconnected with the ailerons so they deflect outward only when "down" aileron is applied. This action helps spoil the lift on the descending wing and also supplies drag on the inside of the turn, combating the usual problem of differential aileron yaw. Item three is a modified leading edge cuff, similar in concept to the Robertson system and now used on the latest production Cessnas. However, the most unusual addition is a small canard just aft of the propeller with a movable trailing edge that is connected to the conventional elevator on the tail.

A small number of Wrens have been flown without this canard, and an STC from another company is available for a "canardless" modification. However, the canard has a number of advantages including the capability to lift the nosegear off the ground before starting the takeoff roll, creating an instant taildragger with added performance on soft, muddy or snowy runways.

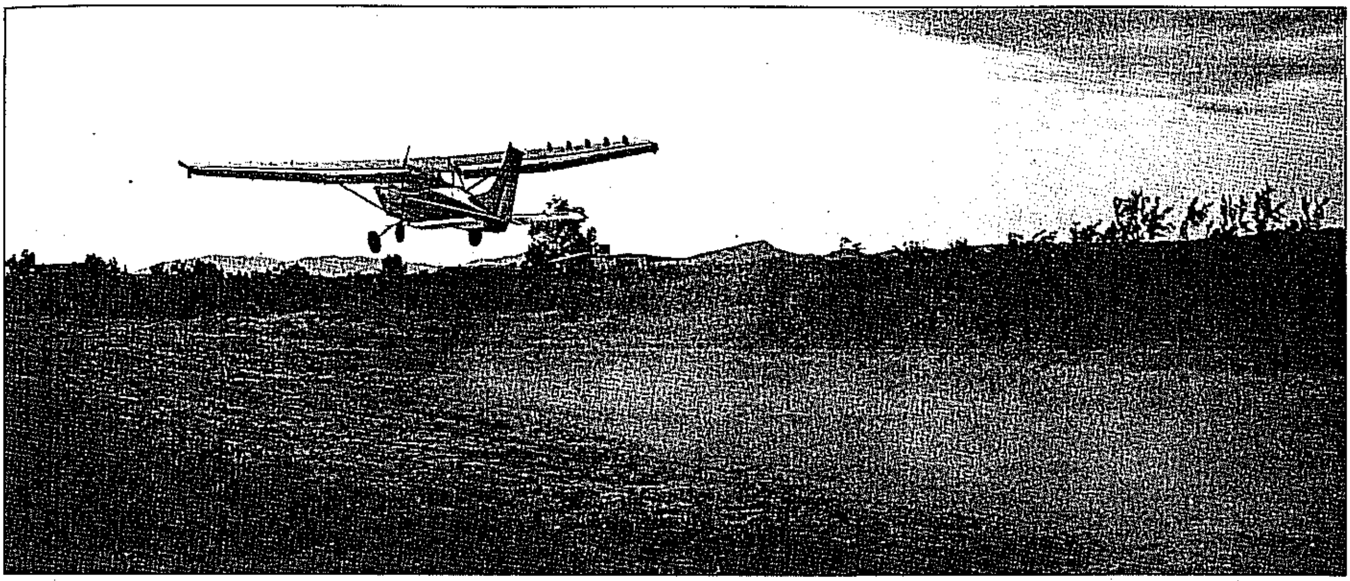
A stabilizer modification is included that allows the leading edge of the tailplane to move two or three inches down as the flaps extend. This is connected to the flap extension system to take care of the more extreme trim changes as the full-span, double-slotted flaps are actuated. Peterson was experimenting with eliminating this stabilizer movement at the time I flew with him. He believed, however, that both takeoff and landing rolls were adversely affected, albeit slightly, and he was returning to the original movable surface with its added cost.

John Kendro, one of the engineers on the original project for four or five years, acts as a consultant to Todd and helps unify the drawings. The entire package, including all drawings, filled the back of a Cessna 182 with the seat removed for two complete trips. Now Todd has a fully FAA-approved PMA shop for the Wren.

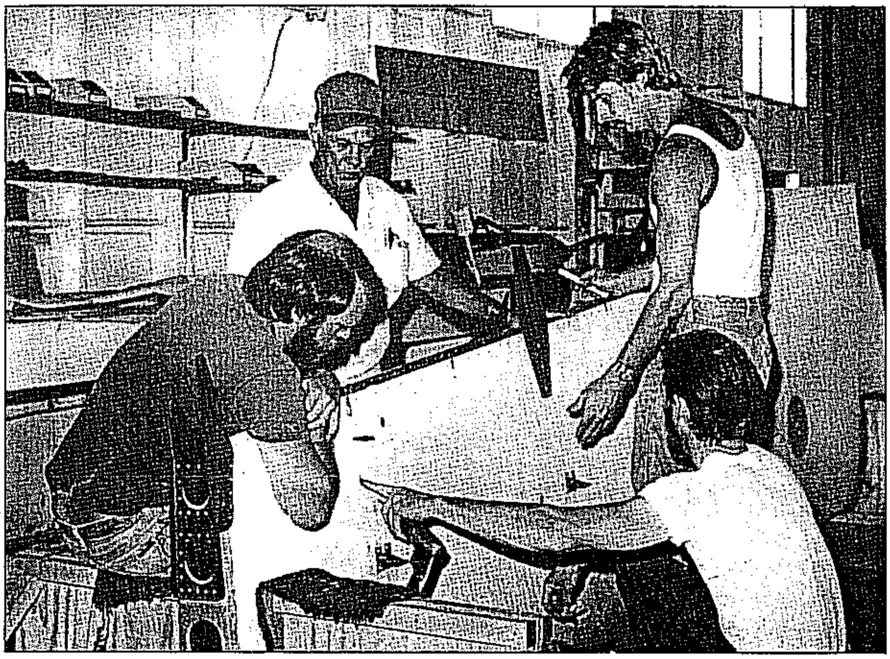
Todd has found a ready backlog of skilled craftsmen in the Phoenix area because of layoffs at Lear, Varga and Lockheed. He is thus able to be extremely selective in hiring and is building what he considers a topflight team of precision fabricators. "A number of our regular employees would be supervisors in a larger organization," he said. "Six months ago I had four fellows in the shop, now I have 19 and we're in the process of hiring three or four more."

Todd originally planned to handle all sales from Buckeye, but he found the distance too great for some customers. He has established seven dealerships, each with a large enough territory to support a demonstrator. Locations include Florida, Minnesota, Oregon, California, Illinois and Peru, with the New York dealer handling European contacts. The factory handles Arizona and nearby New Mexico and Texas. Originally, Todd had dealer applications from 34 companies, but, he said, "I took a lot of lessons from Cessna who, I feel, oversaturated their territories with dealers. We don't require our dealers to stock an inventory and we have no quotas. All sales leads go to our dealers."

Wren buyers normally pick up their airplanes at Buckeye, where they receive a free flight checkout, usually from Doug Burke, a CFI with a great deal of STOL time. Each pilot receives a maintenance briefing, essentially showing all the systems, how they are connected and how they work along with a review of areas where maintenance may be required. Since about half of the Wren buyers are bush pilots operating far from normal maintenance facilities, this briefing is considered essential. Todd said



Julia Downie



The Wren has the ability to land and takeoff amidst the sagebrush in the Arizona desert.

From left, Randy Allen, shop supervisor Art Hernandez, Jim Schiessa and Doug Burke discuss a wing assembly before it is mounted on the Wren.

an annual Wren inspection should not take more than one hour longer than it does on a standard 182.

An interesting legal overload is permitted on the Wren. Gross weight may be raised from the normal 2800 pounds to 3650 pounds in a limited category just as long as the flap-extension speed is dropped from 90 mph to 80 mph and the rate of descent at touchdown is less than 500 fpm.

Many under-the-skin changes are present in Todd's aircraft. For example, the front canard mounts have been modified so it is unnecessary to remove all the engine bolts to remove the canard; the canard stays with the aircraft when the cowling is removed for maintenance.

The Wren modification is designed for easy field repair. The new rear spar is made of .050 aluminum without lightening holes. The teeth on top of each wing are actuated by a push rod with sealed bearings. The flap hangers are made from 3/8-inch aluminum plate. Neither forgings nor castings are found in the design.

For off-airport flying, the Wren comes with 8.00 x 6 main tires that can handle wheel fairings and a 6.00 x 6 nose tire. An optional change ($350 or more) provides a modified nose-wheel fork to handle 8.00 x 6 front tires and 8.50 x 6 on the mains. These large tires will not take wheel fairings.

The Continental 0-470-R front runs well on auto gas, although Todd hastens to point out that this may not yet be legal.

In going over the old paperwork from the original Wren, Todd found that the Texas-based company stopped production in late 1967 in favor of two unsolicited military projects (on which you don't get paid unless the project is accepted) for a quiet reconnaissance airplane for Vietnam and a canard version of the Cessna push-pull Skymaster. A Congressional objection to the pricing on the projects apparently caught the company in a financial crunch. However, the final blow that knocked the Wren out of the air was the crash of a much-modified aircraft with a flush-bottom wing surface that was designed to eliminate wind noise. It appeared that no flutter analysis had been completed and flutter combined with an in-flight fire killed both Doc Morris and another company pilot.

Todd said the original Wrens saw service both in Laos and Vietnam. In fact, he had a pilot working for a government agency stop in recently and give a first-hand account of this super STOL in several unique combat zone applications.

Todd pointed out with pride that his Wren will go anywhere an ultralight goes—and many places they won't. (He has flown the Cobra and Hummingbird ultralights.)

Whenever Todd leaves his isolated home base at Buckeye and lands at another airport, he parks the Wren with the flaps extended. The unconventional appearance of the Wren always draws a crowd and it isn't long until some onlooker wants to see what happens with the flaps extended.

Todd said the ability of the Wren to stay in the air at very slow speeds is based directly on the lift from the double-slotted flaps. A button on the pilot's control wheel retracts the flaps precisely at touchdown so that adequate braking can be applied immediately without skidding the tires. Flap retraction uses the original Cessna system, taking between four and five seconds from 30° full flaps to zero.

The Arizona builder said half of his buyers have been bush pilots or "earth movers," and half of the units sold to such pilots have replaced helicopters. The other half of the purchasers have been mature, private pilots who want the advantage of STOL safety while retaining the cross-country performance of the Skylane.

"When the flaps are up, the Wren flies exactly like any other Skylane," said Todd. "All the STOL efficiencies appear when the big flaps go down."

While the leading edge cuff is being installed, the pitot head is relocated and its angle changed. Todd believes that stock 182s will indicate 40 mph while actually traveling at 60. On the Wren, he said, 40 mph indicated is an actual 42 mph. All Wren performance figures are in miles—not knots.

Unlike some Cessnas, particularly the 170B, the Wren can be slipped with full flaps and still retain full control. One of the more interesting demonstrations that Todd made in flight was to completely cross the controls—full left aileron, full right rudder and heavy back wheel. The Wren will not spin. While rolling with crossed controls from one side to the other, that usual "sickening slip-and-slide, pit-of-the stomach" reaction was not apparent because the Wren's teeth take care of differential aileron yaw.

For the statistically minded, the Wren modification adds 115 pounds to the weight. There are 1064 extra parts that are components of the Wren system plus 2100 new nuts and bolts. Todd said a full 30% of the aircraft is new after the modification.

Todd said he has more than $100,000 of his own money plus a great deal of personal time and effort wrapped up in his Wren. "This aircraft is me!" he states with pride. Todd has been told by FAA officials that it would take almost $2 million three years to develop a similar project today. He said he has turned down several offers to sell the package outright at a profit.

The Wren is strictly a Peterson family project. Todd's wife Jo handles the complex paperwork with subcontractors. Todd proudly said she's a good riveter, particularly once between 3 a.m.–5 a.m. when there was a rough, rush job to get out of his A&P shop. She also has a student pilot's permit.

Todd's present demonstrator, N37RJ, has a colorful history. It is an original Wren that has been updated. The plane was flown by the Texas Department of Wildlife for 6500 hours and survived an engine failure over the Rockies with a full load of passengers. The pilot put down in a snowfield 300–400 feet long and commented later that if he had not been flying this STOL modification, he doubted that everyone would have walked away.

Even though Todd's demonstrator has extensive bush flying hours in its logs, six people are lined up to buy it just as soon as Todd gets his own "new" Wren.

When it came time to go flying, Todd and I climbed aboard the well-used demonstrator on a sweltering summer day. Nearby Phoenix was the hottest city in the nation the next day. Inside, the Wren was strictly stock with the single exception of the flap retract button on the pilot's wheel. Todd had just reupholstered his aircraft with a plush blue velour that would be more at home in a bedroom than in a bush plane. The interior decoration didn't interfere with the flying characteristics though.

A double shoulder harness was rigged up for each of the front seats.

After a number of years of both making demonstration flights and observing them, I've found it best to sit back and let the factory pilot go through his routine, then attempt to duplicate as much of it as you feel like trying.

So we taxied out in the overpowering heat, a factor that greatly reduces any aircraft's performance, and Todd showed what the Wren will do. First, he applied full power on the hard-surfaced ramp, hauled back on the wheel that actuated both canard and elevator, and the nose wheel promptly came off the ground without any forward movement. We were not loaded aft C.G. This capability is a unique feature of the Wren and a substantial benefit on any soft field.

All STOL takeoffs and landings are made with full 30° flaps. The flaps remain down after takeoff or during a go-around so that there is no unnecessary cockpit workload during an aborted landing.

Much of the Wren's claim to fame is that it performs its STOL profile without using a ridiculously high angle of attack that can put the pilot behind the power curve and greatly reduce forward visibility. Thus the max-performance takeoffs that Todd demonstrated were made with a deck angle comparable to a stock airplane during a normal takeoff.

Wren specifications call for a takeoff in 300 feet at sea level with no wind and a hard-surface runway at full gross weight. Our altitude was 1024 feet; the outside air temperature was 109°F, and we were about 250 pounds under gross weight. Todd taxied slowly toward the south end of the runway. When we were perhaps 400 feet from the end, he opened the throttle and we headed toward the sagebrush. As the airspeed came up off the peg, he came back on the wheel and the Wren climbed solidly into the air. With that sort of temperature, I wouldn't call it a leap, but the rate of climb was 800–900 fpm and the angle of climb was flat.

We circled the old WW II triangular training pad and Todd picked out a 300-foot square area that had been cleared for model airplane use. He let the flaps remain full down and established a 50-mph power-on approach. As we crossed the sagebrush barrier, he cut the power, rotated and dumped the flaps as we touched. The timing was deceptively simple, but Todd has had ample opportunity to practice and he is very sharp at getting the most out of his airplane.

We shot a series of across-the-runway takeoffs and landings and then headed for a farmer's dirt strip some 20 miles to the north. During all our circuits and bumps at Buckeye, we were seldom over 300 feet in altitude, but in this wide-open part of the desert nobody cares.

The next morning, it was finally my turn to fly the Wren. First I tried lifting the nose gear off without moving. Then came a take-off roll from that position. There was more than enough rudder to counteract torque, and we remained well within the boundary of the airport. We climbed out to about 1000 feet AGL and experimented with the circling radius of the STOL craft. At 50–55 mph, about 17 inches and full flaps, naturally we were able to make full 360° turns well within a 300-foot radius in complete comfort. At this slow speed, very little G-force is applied.

A previous owner had installed a vernier control on the throttle that, to me, caused a minor complication in achieving instant power changes. Personally, I'd leave the vernier control on the prop and mixture, but go to a conventional push-pull rod for the power.

In slow flight, turns, cross-controlled maneuvers and approaches, the control touch is smooth and comfortable. With the horizontal stabilizer non-movable at the time I flew the Wren, it took a considerable manual nose-up trim on final approach to keep the wheel forces within a comfortable range. In case of a go-around, there would be a marked tendency to pitch up as power was applied. This, plus a slightly longer take-off and landing roll in this configuration has convinced Todd to stay with the original design, as mentioned earlier, even though it is more expensive and weight consuming.

A 50-mph indicated final approach speed seemed quite comfortable. Over-the-nose visibility was good; the controls felt solid, not mushy, and enough speed was available for a proper flare. Even as a stranger to the Wren, I had no problem in touching down within 100 feet of the threshold by dragging the ship in with a little power and coming off the throttle and back on the remaining travel on the wheel as we passed the threshold. We were on the runway and stopped with moderate braking inside the 350-foot mark. I could have shortened the roll slightly with heavier brake application, but I've never enjoyed abusing an airplane, even if it is a demonstrator.

We shot a representative number of takeoffs and landings in complete comfort—except for the heat that was beginning to build up again. After exhausting my curiosity, Todd showed me some more tricks. He demonstrated the Wren's superb maneuverability by making a turning approach into a short strip. We chose the 300-foot model airplane pad for a target and Todd came in at 90° to the field, making a shallow turn on low final approach. His experience as an airshow performer helped since our low wingtip was playing footsies with the sagebrush for the last couple of hundred feet before a smooth, fast rollout and flare. We came sliding to a stop within the confines of the 300-foot square. It was most impressive, but a maneuver that I didn't feel compelled to try to duplicate.

The air was beginning to warm up and become bumpy. On our next touchdown with Todd at the controls, we hit short and hard. Nothing bent, but we dropped the final 15 or 20 feet and Todd described it as "we hit a little 'downer' out there just before touchdown." The Wren is a tough bird.

Yes, it is possible to bend a Wren or any other airplane if you try hard enough. The original Texas factory kept a record of the first five models to be wrecked. All these accidents were back in 1966, but they typify what goes on with a busy bush plane.

"After four successful deliveries across the North Atlantic, one Wren made a forced landing in the middle of the South Atlantic when an accessory oil filter came loose and caused a dead stick landing," reported the original Wren builders. "The Wren was undamaged and remained afloat for 30 hours. The pilot/owner wired his order for a replacement Wren the same day he was rescued, wet and tired but uninjured.

"One Wren parked on the apron of a Southeast Asia airport was blown over by a transport plane running up its engines. No occupants—no injuries.

"One Wren negotiating a landing on an 800-foot strip atop a Kentucky mountain touched down too far down the strip, eased over the end and down a mountainside into trees and rocks. No injuries, and the plane is back in the air.

"A fourth Wren was barely airborne from a small airstrip near Mexico City when it was picked up by a 'tornado,' spun around, turned upside down, and none too gently deposited on its back. None of the four occupants received a bruise or a scratch. The pressure in the center of the 'tornado' (sort of a cross between a Kansas cyclone and a grandaddy Texas dust devil) was so low that the tops of four cans of oil in the back of the Wren were blown off as cleanly as though sliced with a machete. This was the fifth such incident at this airport. The other four were fatal.

"In Alaska, a Wren was chasing a bear. Apparently the bear turned and the Wren caught a wingtip on the ground in trying to turn as short as the bear. Of four occupants on board—no fatalities, two injuries."

So reported the original builders of the Texas Wren.

The Wren is a solid, comfortable STOL airplane that excels with its relatively level deck angle at slow speeds. This is a combination that any low-time Skylane pilot could learn to master in short order. With the present enthusiasm of Todd Peterson and his crew of quality-minded assemblers, it is going to be interesting to watch the progress of this old, new, almost forgotten STOL package that has suddenly found a market in an aviation scene that has shown little enthusiasm in recent years.

It's so nice to walk into a general aviation production facility and see people busily assembling newly modified aircraft and wheeling them out the door to waiting customers. Yes, the Buckeye cactus Wren is a refreshing wilderness bird. □

Wren 460: STOL with Safety

Converted C-182 takes off in 270 feet, lands in 205, may be most remarkable STOL plane on market.

by Gary Glassmeyer

THE WREN 460 is the kind of airplane you visualize when you are dreaming that you are flying. You are tucked under the covers warm and cozy and your mind begins to drift. You're no longer aware of the real world around you. Somehow you have obtained the abilities of a bird. There is no fear of stalling or spinning. You can approach, land and take off on incredibly small patches of land.

Your dream goes on. You find yourself landing on back roads, in fields and pastures. On an approach to a 400-foot clearing you find yourself high and fast; you can't make it, but it's no problem—a small amount of power and you are climbing skyward with the flaps fully extended. After a go-around in a very small pattern you give the approach more careful thought. This time everything is perfect, and with a little breeze on your nose, you set down in about 150 feet.

Now your mind creates a scene that casts you as a mighty eagle in search of prey. A very choice mouse is spotted at the tip of the shadow cast by a huge grain silo. You maneuver into a position that puts the sun to your back and into the victim's eyes. Then you approach the silo with about one-half wingspan of clearance and minimum airspeed. Upon crossing the top of the silo you spot your target and aim straight for it (full flaps and propeller in reverse thrust). With your nose up slightly above the horizon and with only a bit of forward thrust you sink your talons into the victim and fly away.

This kind of flying is not a dream. It is real! If that silo were a 500-foot obstacle (yes, *500*-foot), you could clear it and roll to a complete stop within 1000 feet of its base. Some 1800 hours of flying a Wren 460 on a daily basis have given me some of the privileges of a bird and the load-carrying capability of a pickup truck. What is even better is that the Wren is wrought from one of the world's most reliable and popular airframes—the Cessna 182.

There are no changes to the engine, but the wing is extensively modified to make a Wren. There are 1064 parts added to the Wren 460, which boost the empty weight by about 100 pounds. None of these extra parts requires high technology to fabricate and they could be repaired or duplicated by a competent mechanic in the field. These parts are "over-designed" for strength and are very rugged. I have read that only three replacement parts have been sold for the Wren in the last 15 years.

Flying the Wren 460 is much like flying two different popular airplanes. With the full-span, double-slotted flaps fully extended, it's like being in a Piper Cub. The main difference is that the stall of the Wren 460 is more gentle and controllable. With the flaps up in cruise, it is like an everyday, load-hauling Cessna 182.

The most outstanding feature of the Wren 460 is its pair of full-span, double-slotted flaps. Fully extended, they increase lift by 87%—that's about like having a 60-foot wing. Imagine the performance of a 230-hp, four-passenger powered sailplane!

Tied into the flap extension system is an elevator trim system. Jack screws are used to move what normally is the fixed horizontal stabilizer. This feature nearly eliminates the need for the fast trim

Key to super-STOL performance is Wren's full-span, double-slotted flap. This early Wren omitted the canard.

Photos: Gary Glassmeyer

nificantly when a wind is blowing. From this saga of conflicting "buts" and "ifs," you would be justified in asking, "Are there any simple rules?" Thankfully, there are. I have divided them into phases of flight:

1) *Takeoff*—Never rely on uninformed advice or assume that 10° of flap will improve the takeoff run or steepen the climb path. When flaps do have an effect, 25° may be required on some types of aircraft. Consult the flight manual, and if no improvements are claimed through use of flaps, forget the idea.

There are proper techniques for short- or soft-field takeoffs. Use the recommended flap settings and rotation speeds for best results.

Forget about way-out techniques like starting the roll and putting down flaps when speed is near the point of no return. You should be concentrating on keeping the airplane straight. In any case, if the situation is that desperate, you have no business attempting the takeoff.

When use of flap has proved of benefit to takeoff performance or the subsequent climbout, the manual will say so. Otherwise, setting your idea of what should be ideal flaps for takeoff can be a waste of time at best, and counter-productive, at worst.

2) *Approach and Landing*—It is convenient to lower the flaps in stages, a little on the downwind leg for fast aircraft, about 20° on base leg and the rest on final. When full flaps should be lowered depends on wind conditions but, crosswinds excepted, get them down and damn the expense. Usually, those last few degrees make all the difference.

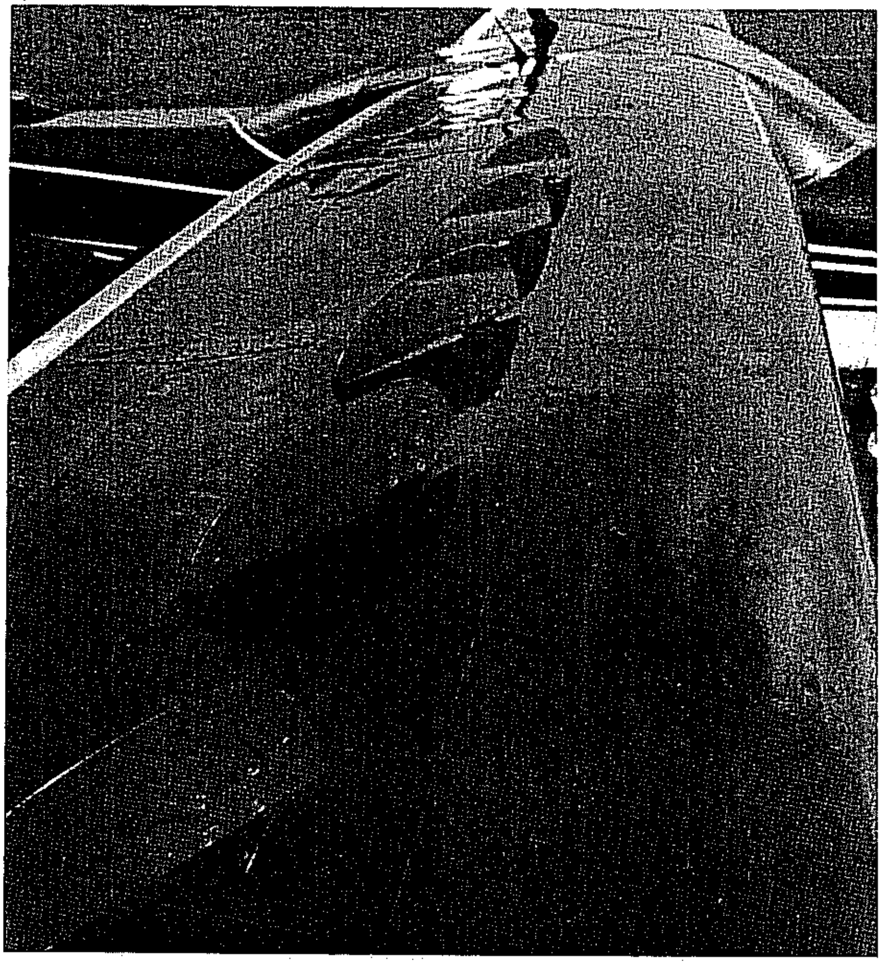
After the final turn, trim the aircraft at a speed some 10 knots below that for the best glide. By going slightly on the back of the drag curve, it is easier to control the descent path by using power and elevators.

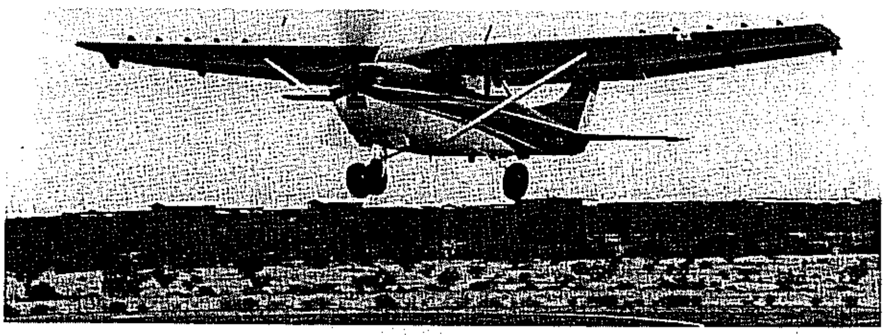
Control the aircraft with pitch/power so that the runway threshold remains fixed in relation to the windshield.

According to wind strength, apply full flaps when time comes to slow down for the "over the threshold" target speed. For information on using flaps in a crosswind, consult the flight manual.

After landing, leave the flaps alone until you have cleared the runway. Raising them to improve braking is of dubious value in a light aircraft and is potentially dangerous in a retractable if you pull the wrong gadget. I kid you not: there have been many arrivals that have terminated with the cabin several feet nearer the ground than intended, simply because "the brakes are supposed to work better with flaps up." Pilots have done it on 6000-foot runways, too!

"To flap or not to flap: that is the question." So might Captain Bill Shakespeare have pondered. But, he was enough of a professional that the great man no doubt consulted his flight manual for the answer!





changes that otherwise would be required when changing from fast cruise with the flaps up to slowflight with the whole shooting match trailing in the breeze. There is nothing complicated about this automatic trim feature. In fact, it uses parts from a Cessna 180 trim system. Consequently replacement parts are available the world over.

In order to get rid of the huge amount of lift that still is being generated at touchdown speeds, Wren provides a button on the control wheel that retracts the flaps. Pushing this button immediately before the maingear touches allows the weight of the airplane to settle on the wheels for maximum braking effectiveness. Tires on a Wren can last more than 1000 hours, providing you don't forget to get rid of all of the flaps before standing hard on the brakes. Stalling speed is so slow that you might try applying the brakes while the wing still is carrying the load. This results in grinding rubber off the tires, if you are landing on a paved runway.

The Wren retains full roll control and even can climb with the inboard part of the wing fully stalled!

Many manufacturers have added a relatively low-cost leading edge cuff to their aircraft to improve slow-speed performance. The leading edge modification contributes the most with the least cost and effort. The Wren 460 has a leading edge cuff that is tapered; it is more pronounced as you go down the wing toward the tip. This causes the stall to begin at the inboard end of the wing and move slowly toward the tip as the angle of attack is increased. The Wren retains full roll control and even can climb with the inboard part of the wing fully stalled! To transition from a touchdown configuration to a go-around configuration requires only a partial opening of the throttle.

About this far along in the description of a Wren 460 to a group of pilots, some foolhardy taildragger pilot usually will step in and say that he knows of a certain

"Wren's teeth" eliminate adverse yaw during slow-speed turns by accelerating airflow over low wing's aileron, improving roll control and adding drag.

Wren lands at nearly a level attitude. Touching down at minimum flying speed of 26 mph reduces ground roll to 205 feet!

With a Wren, extreme crosswinds require only a slightly different takeoff and landing technique. Runway 25, anyone?

C-182 30 days

WREN 460
continued

conventional-gear airplane that can do almost as well. All it takes to shut him up is to ask him to show you how that tail-dragger will perform in a 30-knot crosswind or while taking off and landing in six inches of sticky mud, or better yet, making a landing in zero-zero conditions. Wren designers put an extra-rugged nosegear on the airplane. It is one of the few aircraft that is capable of landing safely with no visibility and no ceiling.

The very large tires make pretty good floats when operating out of thick mud. One day, when the rain had been driving down hard for hours, I headed out to my clay runway. The mud reached about a third of the way up the 18-inch-diameter tires. Water was over the axles and the propeller was sucking up muddy water and covering the windshield. I could not see out the front. These circumstances would ground most airplanes, but in fact proved to be of little consequence to the Wren. Because the takeoff distance is so short, eyeing the directional gyro on takeoff was all that was necessary to keep lined up with the runway. For fun, I decided to leave it on the ground awhile to see what terminal velocity through the mud would be. 37 mph was all she could do, but 30 mph was all she needed! A pull on the yoke shot the Wren into the

Wren 460 STOL

SPECIFICATIONS AND PERFORMANCE

Price: 1960–69 AIRFRAME

New, 1983	$69,000

Geronimo 29K

External Dimensions:

Wingspan	35 ft., 10 in.
Wing area	176 sq. ft.
Length overall	27 ft., 4 in.
Height overall	9 ft.

Weights and Loadings:

Maximum gross weight	2800 lb.
Empty weight, standard airplane	1680 lb.
Useful load, standard airplane	1120 lb.
Fuel capacity	80 gal.
Seats	4

Power Unit:
Continental O-470-R, six-cylinder, opposed, air-cooled, carburetor-equipped 230 rated hp.

Propeller:
McCauley constant-speed, two-blade. Optional propellers include Hartzell reversible-pitch and McCauley constant-speed, two-blade, 88-inch diameter.

Performance:

Cruise speed, 75% power	130-135 kt. (150-155 mph)
Stall speed, flaps down	25 kt. (29 mph)
Range, 75% power	782 n.m. (900 s.m.)
Range, maximum	1043 n.m. (1200 s.m.)
Maximum endurance	15 hours
Rate of climb, sea level	1080 fpm
Service ceiling	19,200 ft.
Turning radius, 50 mph, minimum	250 ft.
Minimum sink rate, 48 kt. (55 mph)	350 fpm
Takeoff ground roll	270 ft.
Takeoff over 50-ft. obstacle	560 ft.
with reversible-pitch propeller	600 ft.
Landing over 50-ft. obstacle	555 ft.
with reversible-pitch propeller	454 ft.
Landing ground roll	270 ft.
with reversible-pitch propeller	205 ft.

Manufacturer:
Wren Aircraft, Inc. — TOP PEDERSON
Route 2, Box 351
Buckeye, AZ 85326
(602) 386-6204 Call day A HEAD

air and, almost immediately, the driving rain washed the muddy windshield clear. A feeling of wonder filled my chest, as it still does today when I think about the capabilities of this amazing bird.

Unlike other STOL planes, no special techniques are needed to get the Wren to perform. You simply shove in the throttle and when the airspeed reads 30 mph you rotate abruptly and hold it in a climb. The secret to the Wren's design is its set of high-lift, full-span, double-slotted flaps; you don't have to hang it on the prop like other STOL ships. Climbout and approach are done in nearly a level attitude. That way, if your plugs foul or a little water or ice get in your carburetor, you don't wind up in a tail slide.

This level climb, cruise and approach attitude is a very important safety consideration. Visibility in many airplanes is poor on climbout. Because full flaps are used during takeoff, the nose of the Wren is pitched down to give excellent visibility. Cooling is a serious problem with many STOL designs because of high angles of attack needed to maintain slowflight. Many Wrens have been used for years of continuous slow-speed patrolling with no problems.

I recall one day as I was flying to work. The Goodyear blimp was making one of its many passes through our area. I was about a half-hour early that day and it was one of those beautiful mornings that makes you glad to be alive. The temptation to do something had been with me for a couple of years—the time finally had come. I slowed down and dropped full flaps. At an airspeed of about 40 mph I assumed a position on the right side of the huge blimp. I came up slowly from behind and slightly below the pilot's cabin. As I passed the tail of the ship I could see that the rudder was painted in red, white and blue. The identification number was N4A—I believe she was named *Columbia*. This was terribly

Two barrels of water, fuel, supplies and pilot brought this Wren to 300 pounds over gross. It needed 400 feet to get into the air.

WREN 460

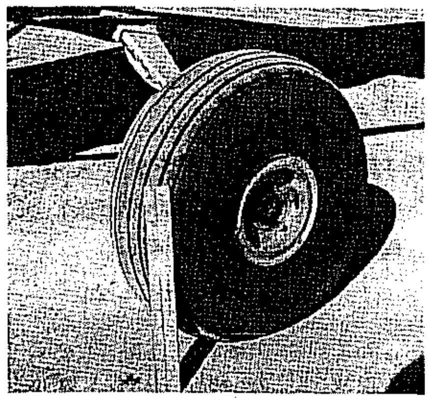
continued

exciting! As I approached the cabin of the blimp I slowed down to about 35 mph to take a good look. I could see the captain rubber-necking to take a second and third look at the unidentified flying object that invaded his airspace. To make my adventure complete I sped the Wren up, dropped about 300 feet and flew a circle under the belly of this magnificent flying whale. The turning radius of the Wren is only 250 feet, so you can imagine the spectacular view. From a position behind and underneath N4A I built up to maximum cruise speed and after safely passing the nose of that craft, I did a sharp pull-up at about 2000 fpm initial rate of climb.

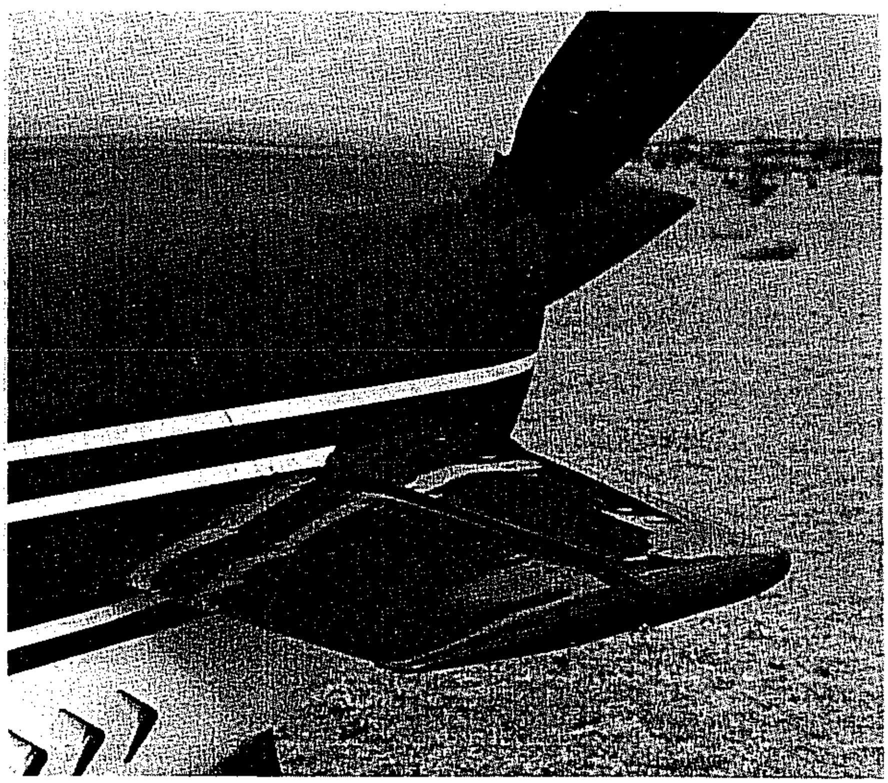
Most airplanes have one, two or sometimes three rudders. The Wren has 11 rudders! Only one is where you might expect to find it, pivoting on the trailing edge of the vertical stabilizer. There are five more on the top of the left wing forward of the aileron and another five on the right wing. These rudders were named "Wren's teeth" by some character who must have thought they were as rare as hen's teeth. They are connected to the ailerons and during level flight are feathered into the wind. When the ailerons are used during slowflight, the teeth deflect broadside to the airstream ahead of the up aileron. The more the aileron is deflected, the more the teeth turn toward their maximum deflection of 60°. These teeth introduce a drag which offsets the adverse yaw created by the down aileron on the opposite wing during slow speed turns. The teeth on the down aileron side remain streamlined. The teeth move only in slowflight operation; at cruising speeds, they remain feathered into the airstream.

A canard elevator and stabilizer are mounted immediately behind the propeller, and utilize the high energy of the propeller blast to provide additional pitch control in slowflight. Additional lift provided by this canard gives the Wren another 100 fpm rate of climb. This canard is so effective that the nosewheel can be lifted off of the ground in less than 30 feet during the takeoff roll. This can be useful in some applications, but because most of the maintenance of this

Big, 18-inch-diameter bush tires provide good flotation on muddy, unimproved airstrips.



Canard added to engine cowling allows Wren's nosewheel to be horsed off runway within first 30 feet of takeoff roll.



aircraft centers around the engine, the canard is somewhat of a nuisance. Many of these control surfaces have been removed by operators who decided they were not needed.

One of my more memorable experiences in the Wren occurred in Vacaville, California, at the Nut Tree Airport. There often are very strong crosswinds there, and such was the case on this occasion. Not only was there a direct crosswind as I approached the runway, but it was gusty and turbulent, too.

I aborted the first approach. On the second attempt, I had a good chance of getting down in one piece but had to go around again to make room for a brand-new Mooney just ahead of me. As I looked down on him I saw his left wing drop abruptly, dig into the runway and throw him into a ditch on the left side. "What a terrible shame," I thought. "I hope no one is hurt; I'm really going to have to work at this landing." My own landing was uneventful. The Mooney pilot had a severe case of broken pride and considerable frustration, but was unhurt otherwise. The wind perpendicular to the runway was measured at 45–55 knots! I decided to tie down for the night and visit a friend.

The next day, the wind was even greater, at 50–60 knots. I loaded the baggage and, while preflighting, kept wondering how I was going to get the airplane safely into the sky. The Sunday morning airport bums were starting to assemble around my airplane as I climbed inside. About eight of them were holding on to the wingtips as if to help me taxi out to the runway. I still was very confused as to what to do in this situation.

The secret of the Wren's design is its set of high-lift, full-span, double-slotted flaps; you don't have to hang it on the prop, like other STOL ships.

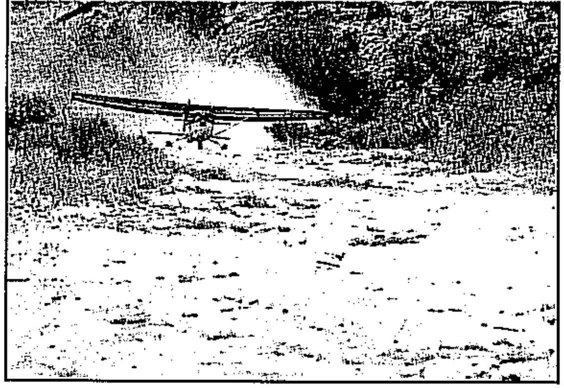
The Wren was faced directly into the wind at its tiedown spot, and as I started to turn out, a gust blasted the rudder and turned me straight into the wind again. A glance at the airspeed indicator started me thinking. I lowered the flaps to their maximum 30° position and motioned to those holding onto the wings to let go. I moved the throttle forward, eased back on the elevator and looked straight down as my helpers disappeared directly *below* me! The Wren was rising straight up at 1000 fpm! I never will forget the sight of all those wide-open mouths and the craned necks of those fellows looking up in disbelief. Moments later, someone came through on 122.8 MHz saying, "Nut Tree traffic, this is Cessna (so and so), turning crosswind. I have . . . uh . . . uh, what appears to be an airplane going straight up in sight."

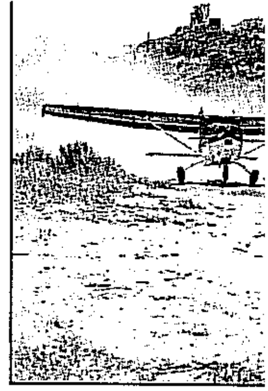
Although I have found no direct substitute for my instrument rating, I certainly was able to get along without it for an extended period of time because of the Wren's outstanding scud-running capability. Sneaking under overcasts and making tight turns to get out of traps is quite easy with the Wren. The pounding turbulence that often is encountered during such escapades is softened considerably as a result of the slow airspeed obtainable with this bird.

As a test, I overloaded the Wren by 300 pounds. It took off in 400 feet rather than the usual 270.

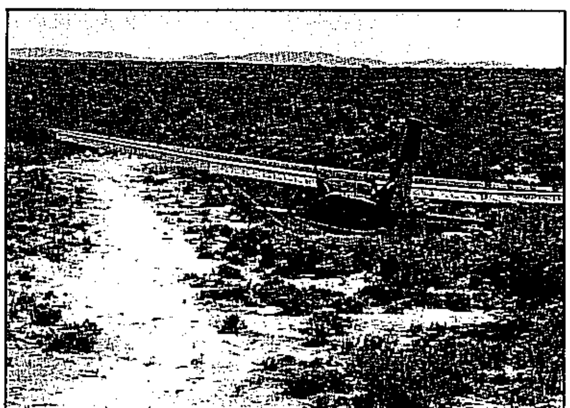
Compared to other STOL planes, the Wren's operating costs are quite modest. It uses 12 gph of 80-octane fuel at 55% power. At an economy cruise speed of 115 mph, it burns 8 gph, and for slow-speed patrolling using 20% power it uses only 5.3 gph.

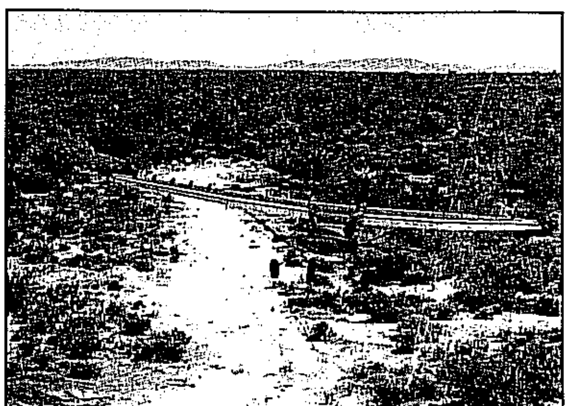
There is one more thing that I can say about the Wren. Although it is difficult to express (you have to fly one awhile to appreciate it), it has to do with the incredible peace of mind, the confidence and the constant sensation of amazement that this machine gives you. Fly one if you ever get the chance!

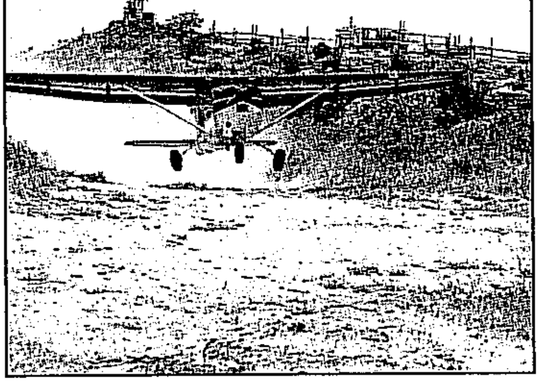
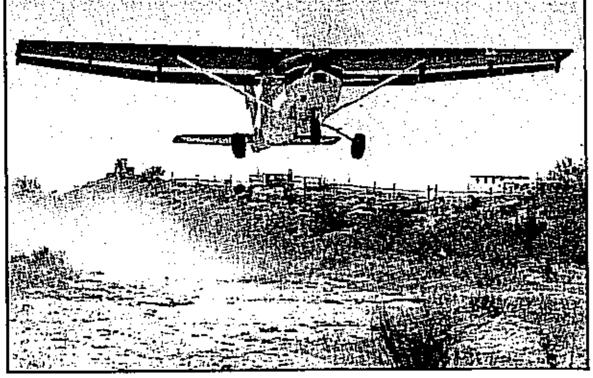




SHORT & SWEET





STOL without pain, courtesy of the Wren 460P.

BY J. JEFFERSON MILLER

When a prospective customer arrives at Wren Aircraft in Buckeye, Arizona, he is treated to a demonstration flight in the Wren 460P at the Buckeye Municipal Airport. Company president J. Todd Peterson will perform takeoffs and landings from a 300-foot pad, demonstrate slow flight at 30 knots and execute a simulated power-off landing after ascending to 50 feet at the best angle of climb and suddenly closing the throttle.

But when an aviation journalist comes to call, Peterson believes a more compelling demonstration of the Wren's abilities is in order. For such special demonstrations, he has constructed a bush strip near a small gold mine in the Arizona desert.

The miners' construction equipment was used to pull shrubs and cacti from an overgrown jeep trail. Only a minimal effort was made at filling in the resulting divots. The strip's rough surface and its 300-foot length, however, are not what make it such a challenge for a STOL airplane. It is The Obstacle—a 100-foot-high hill that peaks a scant 100 yards past the west end of the strip. You cannot climb over it; you have to fly around it. But that is easy in a Wren. The hard part is landing to the east, over The Obstacle.

On the second day of my visit to Wren Aircraft, Peterson and I flew out to the gold mine. Circling overhead, I had trouble spotting the landing area. The strip, when I found it, did not look like much of a strip at all. It seemed to be just a small clearing among the cacti. We lined up on final with full-span Fowler flaps down; approach speed was pegged on 43 knots. We passed over the hill by at least a few feet. To touch down at the end of the strip required a 1,400-fpm rate of descent. From my vantage point it seemed that we were dropping almost straight down in a nose-level mush. A sudden shot of power slowed our descent so that we hit with a tolerable crunch. The Wren skittered to a halt with about 50 feet to spare.

Peterson gave a no-sweat grin and said, "You really can beat the soup out of the old girl."

Beat the soup out of her we did. Between Peterson's crunchers at the mine and my own hard landings during short-field practice back at Buckeye Municipal, I was surprised we did not leave a trail of aluminum wherever we flew. Whether the wings fell off the airplane the day after I left Buckeye, I do not know. But I doubt it.

Peterson's own Wren, 37RJ, is meticulously maintained, yet it is hardly a typical factory demonstrator. The airframe has accumulated 6,000 hours, most of them bouncing in and out of short strips. Parts of the tail are pitted and scarred from pebbles thrown back by prop blast. The propeller tips are nicked all over. (Buckeye's gravel runways seem to eat up props.)

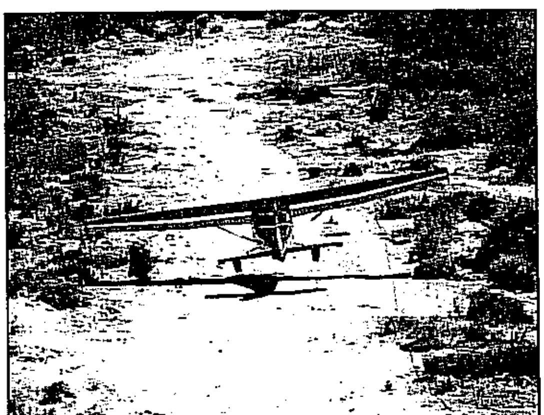
Even with its new red, white and blue paint job, 37RJ hardly could be described as a pretty airplane. A canard protruding from either side of the cowling gives the Wren, from certain angles, an appearance similar to that of a catfish. Massive flap hinges hang below the wing. On top are mounted 10 drag plates used for directional control at low airspeeds.

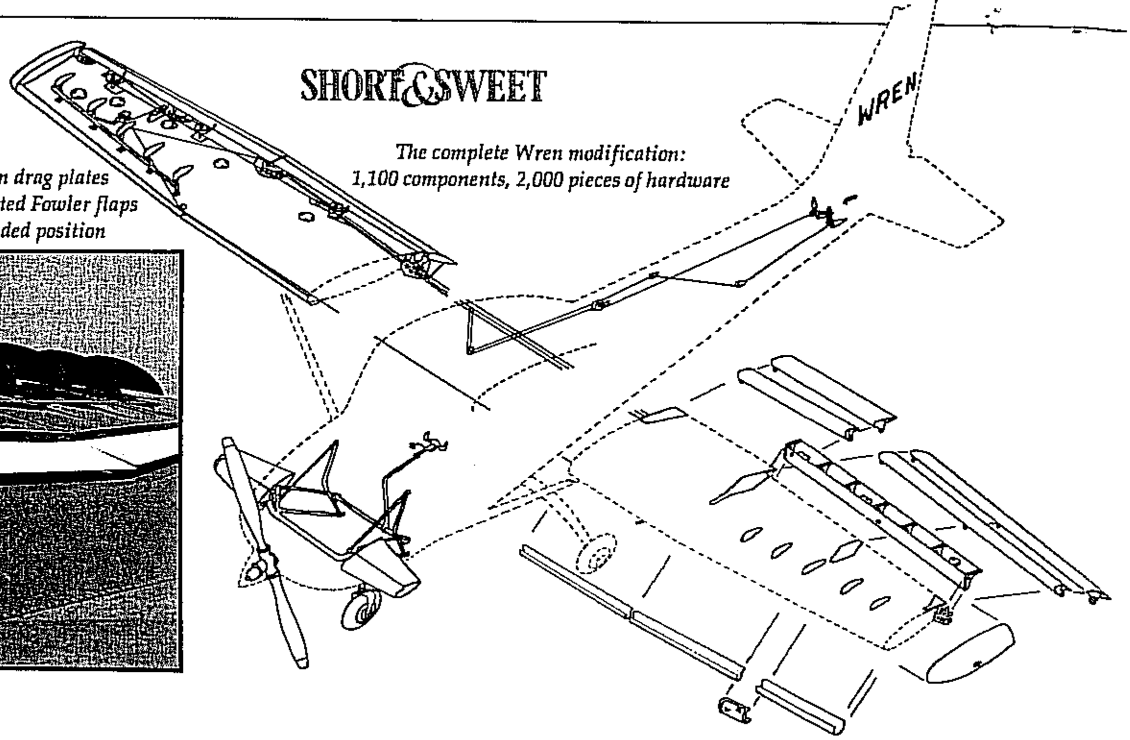
But the Wren never will go seeking compliments on its appearance. The beauty of this airplane is all in what it does, not in how it looks.

Loaded to gross weight, the Wren will take off and land within 270 feet. At 43 knots it can complete a 180-degree turn within a radius of 300 feet. It will cruise for 13 hours at 47 knots with no danger of overheating. And it can carry a useful load of up to 1,970 pounds when operated in the Limited category, which restricts the pilot to a 500-fpm rate of descent on landing and lowers the maximum flap-extension speed from 78 knots to 69 knots.

The Wren is the only piston single-engine aircraft certified for Category II operations (100-foot decision height, one-quarter mile visibility). The FAA considers the Wren's approach speeds slow enough to allow a sufficient margin of safety when using the lower minimums.

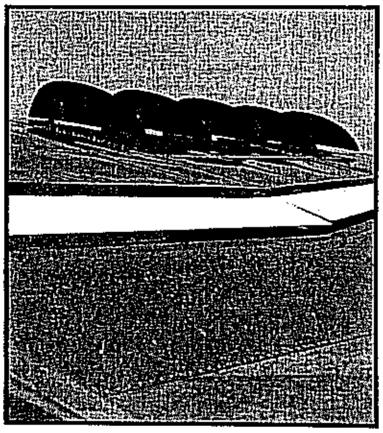
What impressed me most about the Wren, however, was the relative ease with which I learned to land the air-

The complete Wren modification: 1,100 components, 2,000 pieces of hardware

Below: Wren drag plates and double-slotted Fowler flaps in the extended position



plane in its minimum distance. Though I rarely land an airplane on runways less than half-a-mile long, after a few hours practice I was consistently landing the Wren within 300 feet.

To modify an airplane into a 460P (460 is twice the horsepower of the engine; the P stands for Peterson) you have to start with a stock Cessna 182, which is no slug when it comes to short-field performance. At 68°F at sea level, a 182 weighing 2,800 pounds can take off in 660 feet. It can land in 600 feet. To halve those figures requires the addition of 1,100 Wren Aircraft-manufactured components, 2,000 pieces of hardware (nuts, bolts and so forth) and between 800 and 1,000 man-hours of labor.

Wren Aircraft buys 182s manufactured between 1966 and 1969 (the last year designated under the Wren STCs). The Continental 230-hp O-470-R engine is exchanged for a factory remanufactured one. The propeller is replaced. A new interior, new fuel cells and a new windshield are installed. All cables, pulleys and stressed bolts are replaced. The airframe is inspected and any damage is repaired. The hydraulic and electrical systems are inspected, and parts are replaced as necessary. The airplane is repainted.

Skylane owners can have their aircraft modified by Wren Aircraft without having a complete rebuild, but Peterson says he will not perform the modification if he considers the aircraft only marginally airworthy.

The bulk of the Wren modifications involve the 182 wing. Everything after the rear spar is cut away. The rear spar is removed and replaced with a new one that is five times heavier than the original. The heavier and stronger structure is needed to handle the greater loads placed on the rear spar by the addition of the Wren's larger flap system. The new spar allows the aircraft's maximum gross weight to be raised.

Full-span, double-slotted Fowler flaps are added. The ailerons and flaps droop to 30 degrees when fully extended. In this configuration, the wing produces 87 percent more lift than with the flaps retracted. When making a short-field landing, it is very important to retract the flaps quickly after touching down in order to eliminate the extra lift they generate. A button has been added to the yoke that will retract the flaps in four seconds.

A variable-radius leading-edge cuff has been riveted over the old leading edge. The Wren's leading edge is much more rounded than the Skylane's and must add considerable drag, but it also allows the air to flow smoothly over the wing at extremely slow speeds and high angles of attack. Because the cuff radius narrows and the droop lessens toward the tip, there is very little progression of the stall out from the wing root. Complete roll control is provided throughout the stall.

The drag plates, or "Wren's teeth" as they are called by the company, are both spoilers and rudders. During a turn with flaps down, the plates ahead of the aileron on the downside wing will turn up to 60 degrees diagonally to create drag to counteract the adverse yaw produced by the aileron on the upside and to direct air over the aileron for greater effectiveness. Each tooth is mounted on a steel shaft. The five plates on each side are interconnected and activated by a push rod.

The Wren's canard consists of a stabilizer and elevator sprouting from each side of the cowling. The canard is attached to the control column by a push rod and acts opposite the elevator: When the tail elevator is down, the canard elevator is up. The canard enables the Wren to maintain a flat pitch attitude during short-field takeoffs and landings. It is very effective in the prop blast. Because of the canard, the nosewheel can be lifted off the ground within the first 15 feet of a takeoff run. Without the canard, takeoff and landing distances increase by 40 percent.

The Wren's stabilizer is linked to the flap actuation system: When the flaps are extended, the stabilizer's leading edge tilts down to minimize pitch changes and relieve some of the trim load from the elevator.

The main landing-gear springs are standard Skylane issue, capable of handling a 750-fpm drop onto the surface at gross weight. The wheels are heavy-duty: 8.00 X 6s on the mains; 6.00 X 6s for the nose gear. Wheel fairings are available. As an option you can order extra extra large wheels: 8.50

SHORT WORK

Even with an airplane such as the Wren, it is not easy to land in 300 feet. It requires pilot technique, concentration and, above all, practice.

All pilots learn to make short-field landings in preparation for their private pilot checkride. They are taught to set up a steep approach at a slower-than-normal speed. This allows the pilot to clear obstacles and minimizes the forward travel of the aircraft once it reaches the runway.

Rarely are pilots faced with a situation that requires them to extract maximum landing performance from their aircraft. Since many usually land at airports with runways longer than 2,500 feet, they tend to come in for a landing with excess speed and float a long distance down the runway. This is fine when sufficient runway is available. But a pilot who does not practice landing on a desired spot soon loses the ability (if he ever had it).

Being such a pilot, I had much to relearn when I began my short-field training with J. Todd Peterson, president of Wren Aircraft. First I had to come to terms with the 300-foot patch on which I would be landing. I would have to have the airplane on the ground at one end of the runway and stopped at the other. The airplane could not float so much as 50 feet. I was doubtful I could make such a landing.

At the start, Peterson had me practice takeoffs and landings in order to get a feel for the airplane. He would ask me to taxi almost to the end of a runway and then, instead of pointing the airplane down the length of the runway, he would ask me to take off using the remaining 200 feet. To land, I would concentrate on touching down as near a taxiway as possible. At first I flew my approaches at 47 to 52 knots, which is faster than necessary in the Wren.

Having begun consistently to land near the taxiway, we moved our landing site to one of the corners formed by the airport's triangular runways. This area provided about 500 feet for landing. I would fly a pattern about 400 feet above the ground and reduce power at a point I thought would provide the correct glide angle down to the edge of the landing area. As my rate of sink increased and I dropped below my imaginary glideslope, I would increase power to bring myself back up toward it but inevitably would overshoot. Though my corrections were minimal, they caused the airplane to approach the runway in a series of steps. As I neared the threshold, I would find myself either slightly high or slightly low. If I was low, I would drag it in with power, but the Wren develops so much lift that I would end up floating 100 feet past my touchdown point. If I was too high, I would chop the power and begin to sink in earnest, then try to arrest the sink with a last second shot of power. But I usually would apply the power too late, hit with a bone-jarring thud and then bounce back up a few feet, only to come crashing down a second time. I also had the bad habit of slightly relaxing back pressure on the yoke after touching down.

Peterson had me slow my approach speed to 43 knots. He began talking about a "stabilized approach." In other words, he wanted me to set up a steady rate of descent after turning final, minimizing pitch and power changes, so that I would descend in a straight line to my touchdown point. I lengthened my final approach leg to give myself more time to stabilize the aircraft. Though my approach angle was straighter, I found I still was having problems reaching my touchdown point at the right speed.

Peterson, fortunately, had determined my problem (I was chasing the airspeed needle) and told me to stop watching the airspeed indicator after I had established 43 knots on the descent. With some reluctance I followed this advice. On our next approach, Peterson sat beside me urging me in the style of Obi Wan Kenobi to reach out with my senses and "feel the lift." Lo and behold, the technique worked. I set the Wren down on my touchdown point and had it stopped in 300 feet. End of the day's lesson.

The next morning we began our practice by making diagonal approaches to one of the wide runways at Buckeye Municipal Airport, Buckeye, Arizona (the home of Wren Aircraft). At first I used a diagonal length of about 500 feet and gradually worked my way down to a diagonal length of about 400 feet. Peterson told me to choose a landing point ahead of the runway threshold, because even at the slowest approach speed, I would float perhaps 30 feet before touching down.

Now I was ready for the acid test—the 300-foot pad. I set up my stabilized approach, ignored the airspeed indicator, flared 30 feet ahead of the pad, hit right on the edge, held the stick all the way back, pushed the flaps-up button and applied brakes. The Wren was stopped in about 270 feet, as per book figure. I landed on the 300-foot pad several more times, until it really did not seem to be such a short distance.

Finally, I decided that Peterson perhaps was exaggerating the pad's short length. So I climbed out of the airplane and paced it off—100 strides, exactly.

When I returned to Frederick Airport in Maryland, I thought I would try some short-field approaches in a Skylane. With two onboard and full fuel, we were carrying about as much weight as in the Wren, but the density altitude in Frederick was much lower. Following my Wren procedures, I set up a stabilized approach at the short-field landing speed indicated in the *Skylane Information Manual*, 61 knots.

I wanted to make the first turnoff located 750 feet down the runway. But I flared over the threshold and floated, floated, floated, missing the turn. On the second pass I slowed to 55 knots and still missed the turn. On the third pass I slowed to 50 knots indicated, which actually is 57 knots calibrated and safely above the 49-knot stall. The airplane was wallowing a bit and sinking fast, but the approach was stabilized and I thought we would make it. A shot of power over the threshold saved us from a hard landing. I quickly retracted the flaps and applied brakes. This time I made the turn.

Once off the runway, I looked back and saw another Skylane pilot trying to duplicate my approach. But he was not slow enough. He landed long and missed the turn. It was then that I realized I had learned something in the Wren that I could take with me to any airplane. —*JJM*

X 6 mains and an 8.00 X 6 nosewheel. But you cannot order fairings for these. Peterson says, "You almost can walk on water with the optional tires, but they slow you up, too."

The Wren's pitot tube is moved outboard four inches and dropped four degrees to give more accurate speed indications at slow speeds. The Skylane airspeed indicator will indicate 40 knots when the airplane is flying at a calibrated airspeed of 52 knots. The Wren will indicate 35 knots when flying at 36 knots.

The Wren is fitted with a standard Cessna Skylane variable pitch 82-inch McCauley prop and can be ordered with an optional 88-inch McCauley propeller for greater acceleration on takeoff. With the larger propeller you also receive a longer nose strut.

Wren Aircraft cuts a new, standard T-formation instrument panel, adds new gyros, will install new King or Bendix radios and a Century II autopilot.

The first production Wren to be built in Peterson's Buckeye facility was scheduled to roll out in mid-July. According to Peterson, subsequent Wrens will be produced at the rate of two-and-a-half a month, which will be increased to a maximum of four a month.

There have been no airworthiness directives on the Wren modifications. The cost of a new Wren is $69,000; the cost of modifying a Skylane is $29,000.

Even with all of the Wren's high-lift devices working for you, it takes practice consistently to land the airplane in 300 feet. Buckeye Municipal Airport, an ex-military, auxiliary landing site near Luke Air Force Base, Arizona, is a

WRENAISSANCE

The Wren is the brainchild of the late James D.L. Robertson, who is best known for developing a series of STOL modification kits for many single- and light twin-engine aircraft. Robertson studied aerodynamics at Iowa State College, business administration at Harvard University and served a brief stint as a design engineer for the Helio Aircraft Corporation working on the Helio Courier STOL airplane. The Courier, designed by Dr. Otto C. Koppen of the Massachusetts Institute of Technology, has leading-edge slats, 75-percent span flaps, a combination of spoilers and ailerons for roll control and truly impressive STOL performance: takeoff run, 335 feet; landing distance, 270 feet; flaps-down stall speed, 26 knots.

In 1962, Robertson developed his own prototype STOL airplane, the Skyshark. It was a big single with a 420-hp engine. Massive double-slotted Fowler flaps (42 percent of the wing chord) hung from the wings and extended down to 80 degrees. The flaps extended simultaneously with a full-span leading-edge extension known as a shroud. Not only did the Skyshark have a canard, but a canard with rudders. It was a weird-looking craft that, in appearance, lived up to its sharkish name.

If *Jane's All the World's Aircraft* for 1962 to 1963 can be believed, the Skyshark could take off in 85 feet, land in 35 feet and fly as slowly as 17 knots—rather impressive performance for an aircraft with a maximum takeoff weight of 5,000 pounds. As a proof-of-concept airplane, it was a technical triumph, showing the level of STOL performance that could be obtained from an aircraft. As a marketing venture, however, it was a flop.

The Skyshark never was offered to the public. It would have been an extremely expensive airplane to manufacture and probably offered more STOL performance than anyone needed. But many of the lessons learned from the Skyshark were incorporated into the Wren, which Robertson designed with the assistance of A.E. (Doc) Morris, an aeronautical engineer with extensive bush-flying experience in Paraguay. The Wren was certificated in 1964 and produced by Robertson's newly formed company, the Wren Aircraft Corporation of Fort Worth, Texas. That same year, according to company president J. Todd Peterson, who retains the company's records, the board of directors voted Robertson out of his position as director of the company. It is not clear from the records what led to Robertson's ouster.

In 1965 Robertson went to work for Boeing. The next year he started the Robertson Aircraft Corporation in Bellevue, Washington, and introduced his very lucrative line of STOL modification packages. Certain elements of the Wren's design (a leading-edge cuff and drooped ailerons) were incorporated into the modifications. Robertson died in 1968.

Wren Aircraft sales increased each year between 1964 and 1967. These Wrens came with a reversible-pitch propeller that is not offered on the currently produced aircraft. Peterson believes the reversible prop is too complicated for bush operations and requires too much maintenance. The reversible prop also had to be smaller than the standard propeller and therefore provided less thrust on takeoff.

In 1968, the company began developing a prototype STOL modification for the O-2, the military version of the Cessna 337. The airplane was configured for night reconnaissance in Vietnam. Wren Aircraft also was working on a quiet version of the Wren for the Air Force. That year Doc Morris, who was serving as vice president and head of research and development, died when an engine fire in a Wren designed for quiet flight led to a crash.

Morris's death, the cash drain caused by the military research and development work and the rejection by the Air Force of both the O-2 and Wren designs precipitated Wren Aircraft's bankruptcy in 1969.

Galen Means, an aeronautical engineer from Wichita, bought the Wren supplemental type certificates from the bankrupt company. Means sold them to Peterson in 1977. At the time, Peterson was operating an aircraft repair station in Thedford, Nebraska, and flying the air-show circuit in an Akro Duster II. He moved his operation to Buckeye, Arizona, in February 1982. Like the Air Force, he was attracted to the area by the preponderance of VFR-flying days and also by the extremely low rent he pays for hangar space at the Buckeye airport.

Peterson says that the Wren was an aircraft ahead of its time. Judging from his eight month backlog in orders, the time is now right to be making Wrens. —*JJM*

good location for such practice. The little-used airport has three runways set in a triangle that allow a pilot to land into the wind almost always. But the Wren rarely lines up directly with a runway. Wren landings usually are conducted on the diagonal, or across one of the tips of the triangle. Peterson has had asphalt laid over a 300-foot diagonal patch of one of the runways. This is the main practice area for STOL takeoffs and departures.

On the first day of my three-and-a-half day visit to Wren Aircraft, Peterson took me up to familiarize me with the Wren. A hot wind was whipping across the desert at about 30 knots, sweeping stinging sand into the air. Peterson performed a runup on the roll to minimize the chance for propeller nicks on the gravel surface. Flaps were extended to their full 30-degree down position and checked visually. Mixture and prop were set full forward. We were ready for takeoff.

Peterson pushed in the throttle and we rumbled across the runway. The airspeed needle crept up to 30 knots. As we neared the edge, Peterson pulled back slightly on the yoke and we were airborne. Later, when I tried it for myself, I learned how easy short-field takeoffs are in the Wren.

Once off the ground, proper technique calls for easing off the back pressure to establish the Wren in an almost nose-level attitude. The airplane then will quickly accelerate to 52 knots, best-angle-of-climb speed, and, according to the manual, begin ascending at 950 fpm at sea level and standard temperature at maximum gross weight in the Normal category. We were flying at a few hundred pounds below max gross weight and at a density altitude of about 4,000 feet. Our initial rate of climb was between 800 and 1,000 fpm.

The Wren differs from other STOL airplanes in its ability to climb in an almost flat attitude rather than clawing for altitude, nose 20 degrees to the horizon. An Air Force test pilot who flew the Wren wrote in his report on the aircraft, "The near-level attitude of the fuselage indicated that the wings were producing the lift required for the STOL performance. This was a gratifying feeling of safety to the pilot who has flown other aircraft that gain STOL performance from engine power and thus give the 'hanging-on-the-prop' feeling of insecurity."

Wren takeoffs provide two safety advantages. First, the nose-level climb provides excellent forward visibility. Second, a lower level of skill and technique is required to safely land after an engine failure. Peterson demonstrated this by having me take off straight down the runway rather than diagonal to it as is the standard procedure. At 50 feet he chopped the power. Slight forward pressure nosed the Wren over into a gentle, 43 knot glide down to the runway. We stopped about 1,500 feet from where our takeoff roll began.

Another advantage of the Wren takeoff is that it allows you easily to maneuver around objects over which you would not be able to fly. With flaps down and 43 to 52 knots, the Wren is extremely nimble. Steep turns immediately after takeoff are no problem as long as you provide sufficient altitude to avoid catching a wing tip. Peterson will take off, lower the nose until he has 52 knots and rack the Wren into a 60-degree bank no more than 20 feet above the surface. One of his favorite maneuvers is to take off, bank into a steep turn, complete a three-sixty and land in the same spot still banked with the wheel on the banked side touching first. The entire turn is completed in a 300-foot radius.

With power off and the yoke held all the way back, the Wren will just descend in a flat attitude at about 500 to 600 fpm. Ailerons and drag plates still are effective, and the Wren actually can be mushed all the way down to a landing, albeit a hard one. Releasing the back pressure is all that is necessary for stall recovery. A pilot can recover from a power-on stall without losing any altitude if the back pressure is released promptly.

At 30 to 35 knots, it is possible to violently cross the controls without stalling or spinning. Peterson eagerly demonstrated this by kicking this way and that on the rudder pedals while working the ailerons in the opposite direction. The airplane gyrated back and forth around its axes, making me feel as if I was inside a washing machine. But it did not stall or spin.

At 47 knots, the Wren will cruise at 30 percent power, using just 6.5 gph. It can fly this way almost all day with no danger of overheating. Other airplanes, comparable in weight and power, might be able to patrol at this speed, but would require higher power settings and probably would not be able to achieve sufficient cooling over the engine to stay at it for very long. For 15 minutes or so, Peterson and I followed U.S. Route 10 through the desert watching the cars and trucks pass us by as they exceeded the 55-mph speed limit.

Executing a short-field landing should not be an overly demanding task for a competent, low-time Skylane pilot, but it does require a practiced hand. Basically, the trick is to set up a steep approach at a constant speed of about 43 knots, aiming for a point about 30 to 50 feet in front of the touchdown point. At the last second, the yoke is pulled back and a shot of power is applied to arrest the sink. As soon as the wheels touch, the flaps are retracted and the brakes applied.

The Wren's approach, like its departure, is made in a flat attitude; there is no need to drag it in nose high with a lot of power. As with the takeoff, the flat attitude gives a margin of safety some other aircraft do not provide.

A balked landing in a Wren presents little hazard. On one of our approaches to the mine strip, Peterson misjudged his approach angle, flared about 75 feet down the runway, floated another 50 feet, touched down, decided he was not going to be able to stop and fed in the power. A classic scenario for go-around disaster. But not in the Wren. Up we soared, quickly accelerating to 52 knots. That go-around demonstrated to me one of the Wren's greatest attributes: It allows you to change your mind at the last second.

Still, most pilots do not need the kind of performance the Wren provides. Someday in the future, however, pilots' needs may change. As the number of airports open to the public continues to shrink, tiedown rent rises and major urban airports become more congested, an airplane such as the Wren is likely to look more attractive to a pilot with a few unused acres in back of the house. One might imagine that in an age of computerized communications, professional people who have moved far away from the cities would use a Wren or similar airplane as their means of transportation to the midtown STOL port.

Of course, that day may be a long way off or may never come. Even if it does, the Wren may not be the everyman's airplane. At the current planned production rate, only 30 aircraft a year will be built. And that will not increase greatly, according to Peterson. "The Wren," he says, "will always be a limited production airplane." □

Wren 460P

Base price $69,000/
modification alone—$29,000
AOPA Pilot Operations/Equipment Category*:
Cross-country $72,500
IFR $79,000

Specifications

Powerplant	Continental O-470-R, 230 hp @ 2,400 rpm
Recommended TBO	1,500 hr
Propeller	McCauley 2 blade, constant speed, 82-inch dia
Recommended TBO	1,500 hr
Length	27 ft 4 in
Height	9 ft
Wingspan	35 ft 10 in
Wing area	175.4 sq ft
Wing loading	16.09 lb/sq ft
Power loading	12.2 lb/hp
Seats	4
Cabin length	8 ft
Cabin width	3 ft 2 in
Cabin height	4 ft
Empty weight	1,680 lb
Empty weight, as tested	1,705 lb
Max ramp weight	3,650 lb
Gross weight	2,800 lb (3,650 Limited category)
Useful load	1,120 lb (1,970 Limited category)
Useful load, as tested	1,095 lb (1,945 Limited category)
Payload w/full fuel	640 lb (1,490 Limited category)
Payload w/full fuel, as tested	615 lb (1,465 Limited category)
Max takeoff weight	3,650 lb
Max landing weight	3,650 lb
Zero fuel weight	1,644 lb
Fuel capacity, std	480 lb (456 lb usable) 80 gal (76 gal usable)
Oil capacity, ea engine	12 qt
Baggage capacity	120 lb

Performance

Takeoff distance, ground roll	270 ft
Takeoff distance over 50-ft obst	550 ft
Accelerate/stop distance	450 ft
Max demonstrated crosswind component	25 kt
Rate of climb, sea level	1,080 fpm flaps up/ 950 fpm flaps down
Max level speed, sea level	130 kt
Max level speed, 8,000 ft	138 kt
Cruise speed/Range w/45-min rsv, std fuel (fuel consumption, ea engine)	
@ 75% power, best economy 5,000 ft	130 kt/813 nm (75 pph/12.5 gph)
@ 55% power, best economy 5,000 ft	109 kt/934 nm (54 pph/9 gph)
@ 30% power, best economy 5,000 ft	47 kt/620 nm (36 pph/6 gph) endurance—13 hrs
Service ceiling	19,200 ft
Landing distance over 50-ft obst	555 ft
Landing distance, ground roll	270 ft

Limiting and Recommended Airspeeds

Vx (Best angle of climb) full flaps	52 KIAS – 64 MPH
Vy (Best rate of climb) no flaps	78 KIAS – 90 MPH
Va (Design maneuvering)	flaps up 98 KIAS, flaps down 37 KIAS
Vfe (Max flap extended)	78 KIAS
Vno (Max structural cruising)	151 KIAS
Vne (Never exceed)	182 KIAS
Vr (Rotation)	30 KIAS
Vs1 (Stall clean)	50 KIAS
Vso (Stall in landing configuration)	25 KIAS

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, at sea level and gross weight, unless otherwise noted.
**Operations/Equipment Categories are defined in June 1983 Pilot, p. 96. The prices reflect the costs for equipment recommended to operate in the listed categories.*

Paul Hoffman

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not the only possibilities — just the right ones for me. I add to this list regularly.

1) When in doubt, sit it out.

2) Whenever possible, my alternate will be an en route airport. There is no advantage in continuing to fly into deteriorating conditions. Regular weather updates, obtained en route, provide more options, and will save a lot of trouble later on.

3) My personal minimum-fuel situation is one hour left in the tanks. At that time, I will be on the ground, at my destination or alternate, re-fueling. This is not the time to be trying to decide where to go for more gas.

4) Except for brief penetrations on departure or at my destination, continuous actual Instrument Meteorological Conditions (IMC) require two pilots. Bumpy clouds and an aircraft with no autopilot aren't the place to be fumbling with charts, trying to figure out a new or revised ATC clearance.

5) Cockpit Resource Management is not just an FAA buzzword. With two pilots, even if one is not IFR-rated, one can fly the aircraft and the second can handle communications and navigation equipment.

6) If there is any question or doubt when doing the flight plan, figure in a significant fear factor of 25 to 50 percent. Always plan for an adverse wind, a lower ceiling, or a longer route. If these factors require a change to the flight plan, so much the better.

8) Err on the side of caution.

9) When all else fails, see rule No. 1.

Larry Paquette holds a private-pilot ASEL license with an instrument rating. He has been flying for approximately five years, with nearly 600 hours. He flies Cessna 172 and 206 models. Paquette also holds a mission pilot standard rating in the California Wing of the Civil Air Patrol, where he participates in high-altitude mountain flying. He also trains for search operations, including aircraft performance, wave, winds, weather and terrain, plus factors affecting pilot performance.