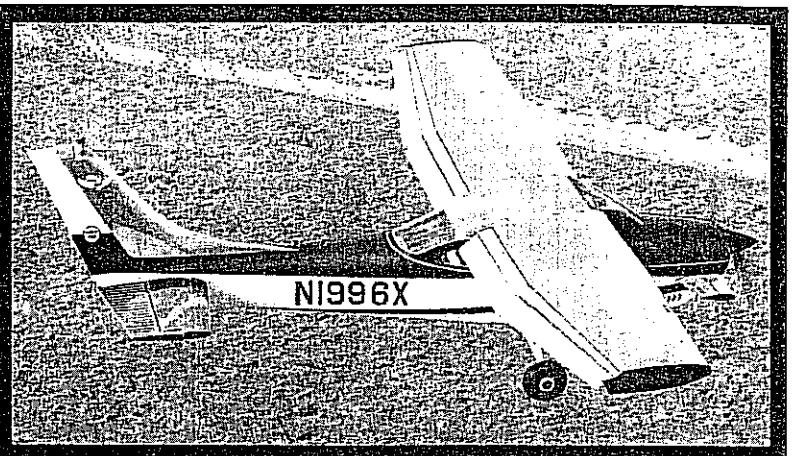
WREN 460

A CONVENTIONAL AIRPLANE WITH EXCEPTIONAL SAFE STOL AND SLOW FLIGHT ABILITY



An airplane for Very Special People . . .

The Wren is designed to be a useful tool for people who need to go places where airports are non-existent or inconveniently located. The Wren makes it possible for such people to safely land near construction sites, beside drill rigs, alongside remote villages, or in pastures to inspect or doctor cattle.

The Wren is designed for people who want usable slow-speed flight in the 40 to 60 mph range. The Wren makes it possible for such people to slowly and safely patrol power lines, forest land, fishing areas, game land, highways, or international borders.

The Wren provides increased safety with its very low landing speeds and its ability to proceed at slow speeds when visibility gets low. The Wren does all of this in *level* attitude. It is an easy airplane to fly — try the Wren for an entirely new and desirable concept in peace-of-mind flying.

Yet with all of these remarkable features, the Wren also has the get-up-and-go cruising speeds of the ordinary airplane — over 1200 miles in an eight hour day in comfort and style.

IN ALL THE WORLD . . . ONLY THE

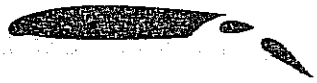
WREN 460

- ☐ CAN TAKE-OFF IN LESS THAN 300 FT.—SAFE AND LEVEL
- ☐ CAN APPROACH AT 40 TO 50 MPH IN LEVEL ATTITUDE
- ☐ CAN TOUCH DOWN AT 35 MPH AND STOP IN 200 FT.
- ☐ CAN PATROL ALL DAY AT LESS THAN 50 MPH
- ☐ AND CAN STILL CRUISE WITH 4 PEOPLE AND ALL THEIR LUGGAGE AT OVER 150 MPH

WHAT MAKES THE WREN SO SPECIAL?

The inter-related effects of the Wren's four special devices combine to provide exceptional controllability, maneuverability, and docile stall characteristics so that for the first time, safe and practical use of an airplane's low speed range is available to the average pilot. These devices are: (1) full-span, double-slotted flaps, (2) drag plates called "Wren's Teeth" mounted atop the wings, (3) an augmented wing leading edge, and (4) a nose-mounted pitch control system.

WHY USE FULL-SPAN DOUBLE-SLOTTED FLAPS?

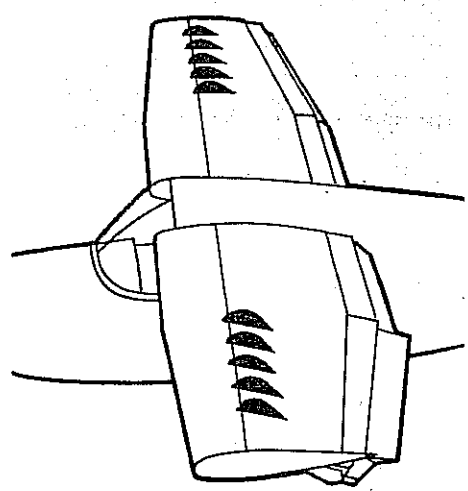


These flaps provide an 87% increase in the wing's lift coefficient when extended to their maximum position, thus providing the ability to maintain required lift at slower airspeeds. But they do much more than this, for lowering the flaps also reduces speed. With the ailerons acting both as flaps *and* ailerons ('flaperons'), the interrelated position of wing, turning vane, and flaperon with the air spaces between, direct the high energy flow of air from below the wing surface through the spaces and smoothly over the upper surfaces of the flaperons to give unusually effective aileron response even at slowest speeds. In effect, the air is being "blown" over these surfaces in much the same manner as is derived by the pumping of air over similar surfaces to produce boundary layer control as used in the latest designs of military aircraft.

Because the Wren flaps are externally hinged (instead of riding on an intricate system of rails or tracks) the center turning vane is *always* in optimum position relative to the wing and trailing flap. This results in a smooth flow of air over both the vanes and flaps at all times with the *complete* elimination of flap buffeting in any setting or condition. The Wren never encounters flap buffeting.

With flaps extended, aileron ("flaperon") power is so great that the Wren can be rocked from left wheel to right wheel while slowly taxiing down the runway.

WHAT DO THE "WREN'S TEETH" DO?

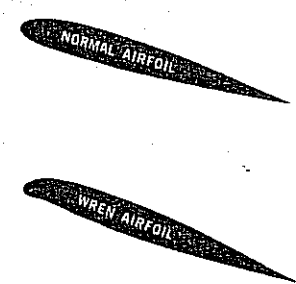


Mounted atop each wing is a series of five drag plates called "Wren's Teeth" which are normally feathered into the airstream. In slow flight (and *only* in slow flight) these Teeth turn (up to 60°) broadside to the airstream ahead of the "up" aileron *only*. The degree of turning of these Teeth is in relation to the amount of up-aileron applied and the drag thus induced offsets a like amount of drag on the opposite wing created by the use of "down" aileron that becomes almost broadside to the airstream. Without the balancing effect of the Wren's Teeth, the drag of the down aileron would create an adverse yaw making coordinated turns impossible.

The action of the Wren's Teeth augments both yaw *and* roll control with the result that coordinated turns are made using aileron only.

The ingenious rigging of the Wren ailerons, to which the Wren's Teeth are coupled, is such that the Teeth move *only* in slow-flight operation. At cruising speeds the Teeth always remain feathered into the airstream.

WHAT'S SO DIFFERENT ABOUT THE WREN WING?



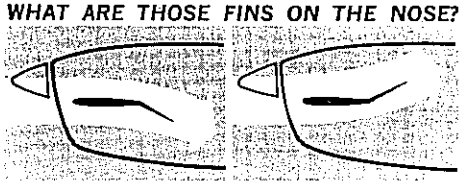
The Wren's "Safe-Stall" wing results from the combination of the full-span flaps coupled with an augmented leading edge "cuff." Most of the credit, however, goes to the leading edge cuff which prevents a stall commencing in the critical forward wing area where a separation of the smooth flow of air is difficult to re-attach. Instead, flow separation begins back near the trailing edge where it can quickly re-attach with only the slightest reduction in angle of attack. Slight release of back pressure on the

controls effects an immediate stall recovery so rapid that little or no altitude is lost in the stall.

Inadvertent stalls are next to impossible, deliberate stalls *can* be effected by the usual methods, but recovery from these intended stalls is noticeably docile and complete control around all three axes is solidly available through the stall.

Power off and flaps down, the Wren will never encounter an unintentional spin.

WHAT ARE THOSE FINS ON THE NOSE?



Mounted on the nose directly behind the propeller where they are immersed in the blast of the slipstream is a small set of horizontal stabilizers and elevators. Acting upon the strong blast of air from the propeller, these ULS controls (Patent Pending) give agile pitch response at low speeds providing added pitch power when the conventional elevators begin to be inadequate.

So powerful are these controls that the nose wheel can be lifted clear of the ground before the Wren moves even a length forward on take-off. This overcomes the only serious objection to the use of tricycle gear on airplanes operating out of sandy, muddy, or extremely rough strips.

WHY DOESN'T WREN BUILD ITS OWN AIRFRAME?

Wren uses brand new 4-5 place Cessna 182 airframes in the manufacture of the model 460, just as Cessna purchases engines, tires, brakes, radios, electrical fixtures, fittings, etc. from their suppliers.

Because Wren uses the Cessna 182, Wren owners have the advantages of economy, proven reliability and years of refinement inherent in this airframe of which more units have been built than of any airframe in commercial production today.

Further, Wren owners are assured of parts availability and trained service for the Cessna airframe throughout the free world with the world's largest aircraft service network.

WHAT EFFECT DO THE WREN DEVICES PROVIDE?

The combined effect of the Wren devices operating in "cooperation" with each other and with the dependable and rugged Cessna airframe results in maneuverability, controllability, safe and easy use of the lowest speed regime, and the ability to take-off and land in very short distances.

WHAT ABOUT THE WREN'S TAKE-OFF?

Take-off is accomplished dependably within 300 feet at sea level, standard atmosphere, from a hard surface, at gross weight and in no wind. This combination of conditions exists only in about one out of a thousand take-offs. Generally there is a light to moderate breeze, loading varies from light to heavy, the altitude is somewhat above sea level, temperatures vary as much as 50° either side of standard, and still other variables such as field conditions enter the picture. As a result, take-off distances can vary from 50 feet lightly loaded in a stiff breeze at sea level to as many as 600 feet at extreme altitudes, with heavy loads, and no wind. In any case, the Wren is off safely and easily in *less than half* the distance of the ordinary airplane under comparable conditions.

Experienced bush pilots, accustomed to getting maximum performance from ordinary airplanes can cut substantially from the quoted 300 foot rolls at sea-level, no-wind conditions. Take-off rolls of only a little more than 200 feet under these conditions are possible by the pro pilot. The 300 foot figure is based on capable handling by average pilots.

Take-off roll is a function of the time required to accelerate to flying speed. Accelerating into the take-off from a turn reduces the forward rolling distance required. When this is not possible, locking the brakes until full power is achieved is an aid. But any or all such efforts serve only to reduce the take-off roll by maybe one or two plane lengths. With flaps extended, the Wren just naturally flies off after a very short roll.

In ground effect the full-span, double-slotted flaps create a cushion of air that permits the Wren to achieve flying speed that is literally *less* than its stall speed at altitude. It is estimated at about 35 mph, perhaps a little less.

Once free of ground friction, the Wren accelerates very rapidly, thus the time in which it could be considered as "flying in ground effect and below stalling speed," is so brief that it creates no problem at all. This is difficult to express in words, but becomes clearly evident in flying the Wren.

Normal take-offs in the Wren with full flaps find the airplane airborne in a *level attitude* and climbing out *still in level attitude*. The Wren's "safe-stall" and high-lift wing is doing the flying. It is not dependent upon thrust from the propeller to contribute lift — in other words, it does not hang-on-the-prop with the nose up at a 'hairy' attitude as do most STOL airplanes.

The Wren's level attitude in take-off and climb-out is a *safe* flight attitude free of any potential stall possibility, *and* with unobstructed forward visibility for still added safety. It is a comfortable as well as a safe attitude.

Obstacles in the climb-out path can be avoided by turns which can be started as soon as the Wren is airborne. Such is the controllability and maneuverability of the remarkable Wren, that with moderate practice, climbing turns of 250 ft. radius can be accomplished beginning within 50 to 100 feet of the lift-off spot.

WHAT ABOUT WREN LANDINGS?

The same features that make take-offs short, level, comfortable and safe apply equally as well to landing approaches and landings.

Approaches at airports are made in clean configuration until about 500 feet out on final when full flaps are lowered. An immediate slow-up results and the approach continues at 65 mph to as low as 45 mph as desired, all in level to slightly nose-down attitude.

There is no single "recommended" procedure for landing approach and landing. Approaches can be made with or without power or with intermittent application of power. They can be made steep or flat or in-between. A long, shallow approach with partial power gives a better opportunity to chop power and touch down on an exactly predetermined spot. At the other extreme, a high, steep approach with power provides for the shortest touchdown distance after clearing an obstacle, and usually results in a slightly shorter landing roll.

Shortest landing rolls are accomplished by flaring with power *in ground effect* (within the last three to four feet above the surface).

The slowness of the approach with full flaps, plus the addition of power to hold the nose off, coupled with the flare (ample flare power is produced by the ULS nose control) to "roll up the ground effect cushion" results in slowest touchdowns. Immediate flap retraction places the weight on the wheels. Application of full braking will bring the Wren to a stop in about 300 feet at sea level, zero wind, gross weight, standard atmosphere, and hard surface.

Again, this combination of conditions is seldom encountered. Suffice it to say that landings are readily accomplished with ground rolls no longer than take-off runs under similar circumstances.

CAN THE WREN BE SLIPPED?

Even with flaps fully extended, it is not only possible but highly effective to slip the Wren, as a maneuver to get in shorter over an obstacle or to adjust for an approaching over-shoot. Slipping the Wren brings a rapid increase in rate of descent, but is accomplished with full controllability and instant control response. It can be likened to being "shot out of the air" while maintaining full control and recovery at will.

WHAT ABOUT A GO-AROUND IN THE WREN?

In event of an aborted landing, a go-around is simply accomplished without change of flap setting; application of additional power is all that is required. Full power is *not* required. Trim settings may be adjusted if desired, but can be easily overpowered without creating any adverse conditions.

WHAT ABOUT CROSSWIND OPERATIONS WITH THE WREN?

Crosswind landings, and/or take-offs are no more of a problem for the Wren, even with full flaps, than would be encountered in flying the basic Cessna 182 airframe *with flaps retracted*. Crosswind landings and take-offs in winds as high as 40 knots have been accomplished with no unusual difficulty. Of course, with the Wren 460, as the crosswind increases in strength, it becomes increasingly possible to arrange to land or take-off *into* the wind because rolling distance required recomes remarkably short into strong winds. A 30 knot wind, for example, will ordinarily shorten take-off or landing rolls to less than 100 feet.

WHAT ABOUT THE WREN IN TURBULENT AIR?

Turbulence is another bugaboo that is practically eliminated as a problem in the Wren 460. Because of its ability to drastically slow up while still retaining complete controllability, what would be bone-jarring turbulence in an ordinary airplane can be smoothed out absolutely phenomenally in a Wren. An entirely new and happy attitude toward turbulence is available to Wren owners. Even in summer afternoons in rugged mountain areas, the Wren's slow flight capability permits journeys to be made with only the most moderate of turbulence reaction under conditions where even experienced mountain pilots would otherwise prefer to remain grounded.

The reasons for the almost gentle re-

actions to turbulence is the slow speed with which rough air is encountered. At 60 miles per hour the effect of turbulence shock is reduced by half from the effect at 90 mph. At 120 mph the shock of turbulence is four times as great as at the Wren's 60 mph speed, and at 180 mph the shock of turbulence is nine times as rough.

The end result of slowing down the Wren is to almost completely smooth out moderate turbulence and even make severe turbulence seem only moderate.

Turbulence off the end of the landing strip on slow approaches will disturb the Wren's equilibrium (as it would with any airplane), but very gently and leaving ample time for corrective action with the Wren's nimble controllability.

WHAT ABOUT CLIMB OUTS IN THE WREN?

Climbs in the Wren with flaps fully extended are best made at 59 mph, IAS. After all obstacles are cleared and it is desired to leave the area of take-off, flaps should be retracted and a climb speed at 91 mph, IAS, established which will give a solid rate of climb of 1,080 feet per minute.

WHAT ABOUT THE WREN'S SLOW FLIGHT CRUISING?

With flaps extended, level flight *in level attitude* can be made at speeds down to 50 mph. At this speed, at sea level, power settings of 16 in. and 2,000 to 2,200 rpm are used, amounting to approximately 30% of power available. This is barely above idling power, hence no cooling or overheating problem is encountered. At this speed, fuel consumption is 7 gal. per hour and endurance is over 11 hours with long range tanks.

With flaps retracted the Wren 460 is a conventional airplane. The nose-mounted ULS control provides an additional amount of lift, but otherwise its effect is not noticeable in cruising flight except to provide a slight flattening of airplane attitude in turbulent air.

WHAT ABOUT SLOW SPEED MANEUVERING?

From the Wren's low level-flight speeds, it is possible to execute a 180° turn in 7½ seconds and 360° turns in 12 seconds without losing altitude. The turning radius in such turns is less than 200 feet. Further, because of the low speeds, "g" forces are negligible (less than 1½ g's), so slight as to be barely noticeable.

WHAT HAPPENS WITH THE WREN IN CASE OF POWER FAILURE?

Take-off is the most critical situation in any flight, even though landing accidents are by far more numerous. The critical condition in any airplane on take-off results from power failure — whether single or multi-engined.

With the Wren's level attitude during take-off and climb-out, the pilot is at all times able to execute a fully controlled forced landing—only much slower than in any ordinary airplane.

A loss of power below 20 feet altitude finds the Wren still in ground effect and flying at its slowest speed, therefore an immediate slow touchdown can be effected.

Above 20 feet, the Wren has accelerated to a speed that permits a power-off glide of 50 to 60 mph to a fully controlled forced landing with adequate flare power for a touchdown speed below 50 mph, and a landing roll of less than 400 feet. Finding a spot this size to sit down in is many times more likely than finding a cleared area twice to three times this size.

In this respect it is interesting to note the following quote concerning landing accidents from the Federal Aviation Agency's Airworthiness Manual, Part 8, Appendix B, page 92:

> "The record indicates that fatality rate increases rapidly above 55 mph."

WHAT ABOUT MAINTENANCE?

The Wren features are intentionally designed to be readily inspected, maintained or repaired *in the field* away from normal repair facilities. There are no forgings, castings, or intricately formed parts. Sheet metal and steel tubing are used exclusively for ready repairability. Yet the Wren features are those least likely to need repair or replacement. Oversized and conveniently located inspection plates permit easy access for viewing or adjusting. Unique locating holes assure quick and accurate rigging. The ULS nose control does not interfere with normal engine servicing and can be removed in 10 minutes for complete access for major engine work. Parts and service for the Cessna airframe and Continental engine are available from the world's largest aircraft and engine service networks.

WHAT DOES THE WREN GIVE UP TO GAIN ITS SPECIAL FEATURES?

Every airplane is a compromise. Period. The Wren 460 is no exception.

To gain a desirable feature in any airplane requires a sacrifice in some other feature or features. It's like a tangled mess of jackstraws . . . move one and many others are moved also.

For example, an attempt to gain more speed (as most every new model attempts to do) is invariably accompanied by a sacrifice, or a series of sacrifices, in one or more of the following: economy, ease of handling, useful load, structural limitations, cabin size, mechanical simplicity, or some other desirable feature.

The Wren had to sacrifice a little speed, useful load, and price.

HOW MUCH SPEED IS LOST?

The Wren's top speed is 160 mph. This speed is faster than eight four-place, single-engine planes on the market and slower than 15 others. It represents a loss of six miles per hour from the cruising speed of the Cessna 182 (which is utilized in the Wren's manufacture). In an eight-hour flight, this loss amounts to 48 miles.

HOW MUCH IS LOAD REDUCED?

The Wren 460's over half-ton of useful load is greater than that of 10 other four-place, single-engine models and less than that of 13. The Wren special parts add 140 lbs. to the empty weight of the airplane.

HOW ABOUT COST?

The Wren 460 is an EXTRA SPECIAL airplane, with EXTRA SPECIAL design features that are expensive to produce in the limited quantities dictated by the selective market of people with EXTRA SPECIAL desires in aircraft designed for EXTRA SPECIAL performance. As a result, the Wren 460 is the highest priced single-engine airplane with conventional airplane performance, but it is also by far the *lowest priced STOL airplane* in production.

HOW CAN THE WREN BE USED?

Obviously, to get in and out of strips too short for ordinary airplanes.

For patrol work where safe flight speeds of 50 mph to 70 mph in level attitude is required.

For pilots who desire extra safety and greater ease of flying or who may have been sweating out the use of short fields.

For mountain and canyon flying where a short turning radius can be vital.

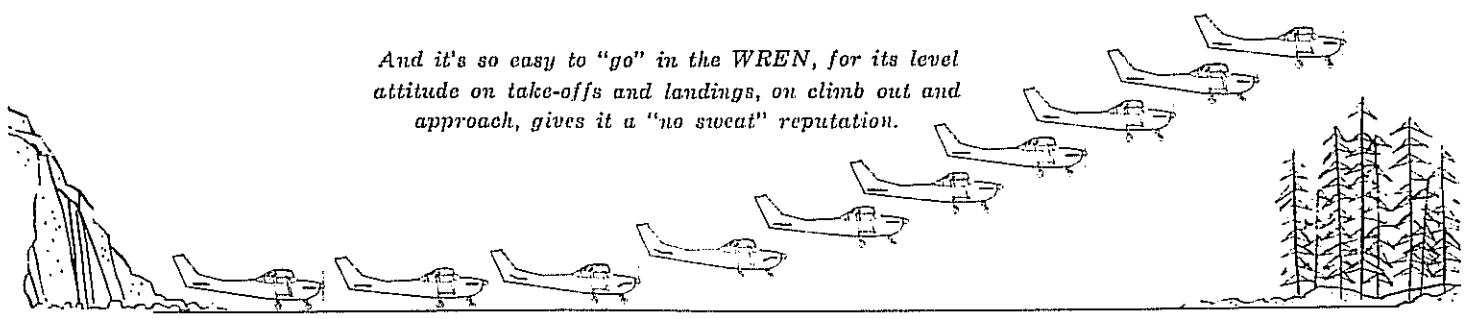
For nap-of-the-earth reconnaissance where nimble maneuvering at slow speeds is important.

For comfortable flying in turbulent air.

WHO CAN USE THE WREN?

If you drill for oil; run a ranch; build roads, bridges, dams, buildings, or pipelines; patrol power lines, forests, or highways; spot fish or game; operate in the bush or mountains; make calls at remote plant sites, farms, or wells; take aerial photographs or make geological surveys; operate an aerial ambulance service, or provide medical care (people or animals) in remote areas . . . yes, if you have any occasion to operate out of strips or pastures too short for safe operation in ordinary airplanes, and you want to do it safely and easily regardless of the number of hours in your log book . . . *you* need a Wren 460.

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

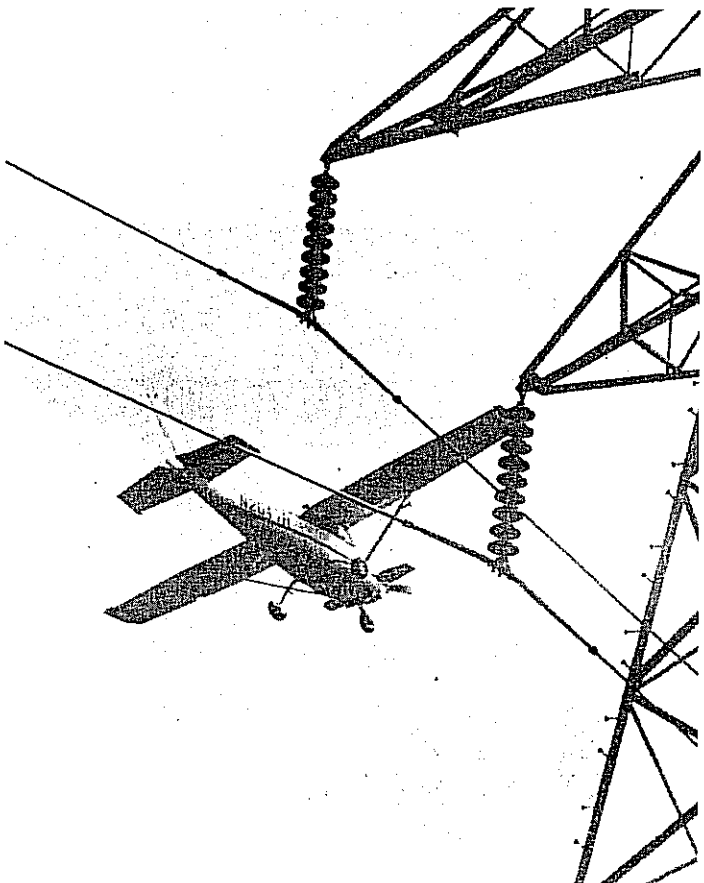


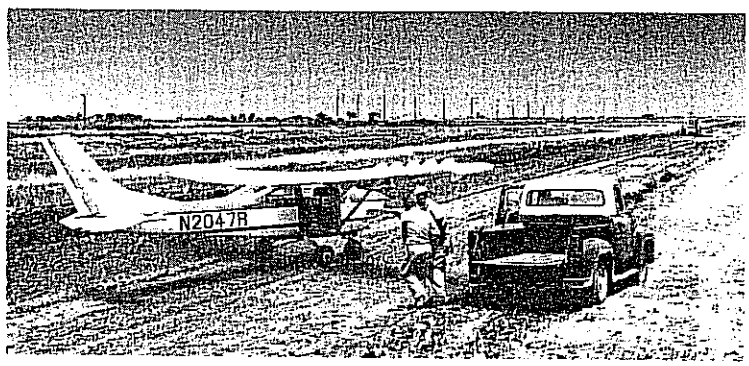
SPECIFICATIONS

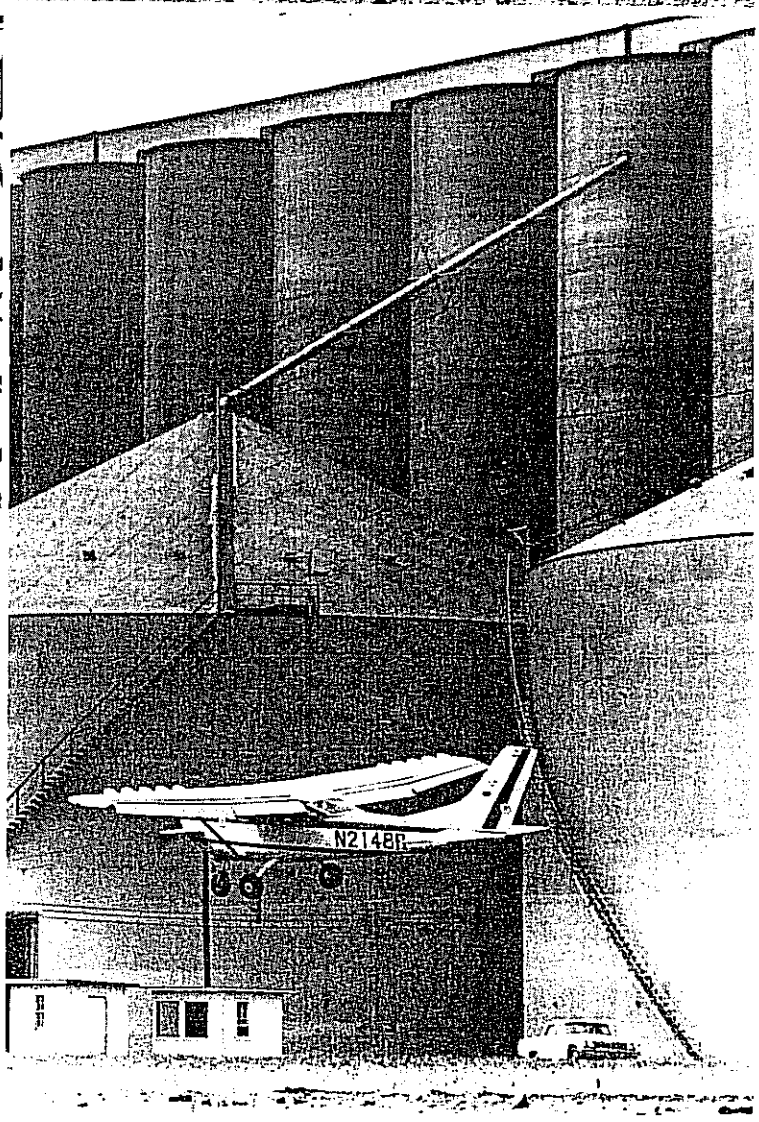
Gross Weight	2800 lbs.	Take-off (gross load, zero wind, sea level)		Range @ 10,000'—no reserve	
Empty weight (approximate)	1710 lbs.	Ground roll	300 ft.	79 gal, @ 115 mph (optimum)	1150 miles
Useful load	1090 lbs.	From stop to clear 50' obstacle	605 ft.	79 gal, @ 151 mph (normal)	872 miles
Seats	4 - 5	Landing (gross load, zero wind, sea level)		Power loading	12.2 lbs./h.p.
Speeds (gross weight)		Ground roll	300 ft.	Wing loading	16.09 lbs./sq. ft.
Top - sea level	160 mph	Clear 50' obstacle to stop	612 ft.	Power	
75% power @ 6500 ft.	151 mph	Rate of climb, sea level, flaps up	1080 ft./min.	Continental O-470-R	230 h.p.
Approach	55 mph	Service ceiling	19,200 ft.	Fuel Capacity	
Touchdown or take-off	35 mph			Standard	65 gal.
				Optional	84 gal.

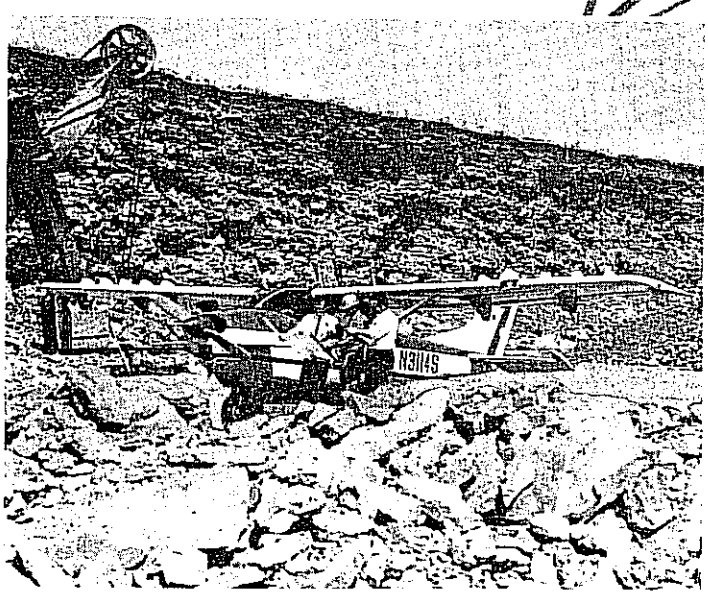
THE WREN 460 WILL TAKE YOU WHERE YOU COULDN'T GO BEFORE

Those tight little spots that are marginal or impossible in other airplanes are routine in a WREN 460 . . . we call it "THE ACRE AIRPORT AIRPLANE" . . . and that's conservative.









PRICE LIST

WREN 460 with standard equipment (listed below):..... $31,875.00

Airframe:
- New Production Cessna 182
- Wren "Safe-Stall" Wing with Wren Full-Span, Double-Slotted Hi-Lift Electric Flaps and Wren Augmented, Stall-Resistant Leading-Edge Cuffs
- Wren's Teeth Drag Plates
- ULS (Ultra Low Speed) Nose Control System

Power:
- Continental O-470-R 230 hp Carbureted Engine Driving 82" Diameter Constant Speed Propeller

Instruments:
- Airspeed Indicator
- Standard Altimeter
- Magnetic Compass
- Manifold Pressure Gauge
- Tachometer (Recording)
- Engine Unit Gauges
  - Ammeter
  - Cylinder Head Temperature
  - Oil Pressure
  - Oil Temperature
  - Electric Fuel Gauges (2)
- Flap Position Indicator
- Stall Warning Indicator

Cabin Accessories:
- Arm Rests (4)
- Ash Trays (4)
- Polycloud Seat Cushions
- Carpet
- Heating System
- Clothes Hanger Hook
- Cigarette Lighter
- Dome and Map Light (2 ea.)
- Red Instrument Panel Lights, Variable Intensity
- Map Compartment
- Radio Call Plate
- Map and Storage Pockets (4)
- Compass Card Retainer
- Rear Seats, Adjusting Backs
- Front Seats, Adjusting Fore and Aft, Reclining Backs
- Sound Proofing
- Assist Straps (2)
- Cabin Air Ventilators (Front)
- Hinged Window, Left Side
- Windshield Defroster
- Shock-Mounted Instrument Panel

Accessories:
- Battery, 12 Volt
- Gravity Type Fuel System (60 gal.)
- Alternator (52 amp. 14 volt)
- Cowl Flaps
- Carburetor Air Heating System
- Carburetor Air Filter
- Main Wheel Hub Caps
- Dual Magneto Ignition System
- Landing Light (Dual Beam)
- Navigation Lights
- Engine Exhaust Muffler (With Heat Exchangers)
- Steerable Nose Wheel
- Constant Speed Propeller
- Spring Steel Landing Gear
- Voltage Regulator (50 amp. 12 volt)
- Tie-Down Rings (Retractable)
- Engine Ignition Shielding
- Propeller Spinner
- Electric Starter
- Fuel Strainer (Cabin Quick Drain)
- Nylon Tires (With Tubes)
- Wing Strut Speed Fairing
- Elevator and Rudder Trim Systems

Controls:
- Parking Brake
- Hydraulic, Toe-Operated Brakes
- Cowl Flap Control
- Fuel Strainer Drain Control
- Mixture Control ("Braille" With Safety Lock)
- Propeller Control ("Braille"—Vernier Type)
- Throttle Control ("Braille")
- Four Position Fuel Valve
- Ignition Switch, Key Operated
- Aileron and Elevator Control Lock
- Engine Priming System
- Circuit Breakers

Other:
- Outside Baggage Compartment Door
- Baggage and Cabin Door Locks
- Cabin Steps (2)

OPTIONAL EQUIPMENT:

	Factory Installed
Axles, Heavy Duty (Exchange)	$ 55.00
Controls, Dual (Wheel, Pedals, and Toe Brakes)	140.00
Corrosion Proofing, Internal (includes Stainless Steel Cables - Exchange)	580.00
Curtains, Rear Windows	20.00
Fairings, Speed (Wheel Only) For Standard Tires	220.00
Fairings, Speed (Wheel Only) For Over-Size Tires	270.00
Fire Extinguisher, Hand Type	22.00
Gage, Carburetor Air Temperature	67.50
Ground Service Plug Receptacle	25.00
Group, Primary Includes: Sensitive Altimeter (Exchange), Clock, Outside Air Temperature Gage, Rate-Of-Climb Indicator, Turn and Bank Indicator, Sun Visors	405.00
Gyros, Horizontal and Directional - Remanufactured (Includes Suction Gage and Vacuum System)	775.00
Headrests, Front Seats (Set of Two)	ea. 20.00
Headrests, Rear Seats (Set of Two)	ea. 20.00
Heating System, Stall Warning Transmitter and Pitot	30.00
Light, Rotating Beacon	95.00
Light, Map	20.00
Lights, Courtesy (Set of Two)	15.00
Oil Cooler, Large (Exchange— Non-Congealing Type)	200.00
Oil Filter (Full Flow)	70.00
Oil Dilution System	55.00
Oxygen System	540.00
Paint Scheme, All-Over (Using Vinyl Paint)	325.00
Priming System, Engine (6 Cylinder)	60.00
Seat, Child's	125.00
Seats, Individual Front Vertical adjusting (Exchange—Specify Right, Left, or Both)	ea. 47.50
Shelf, Utility	10.00
Stabilizer, Abrasion Boots	40.00
Stretcher Installation (Completely Stowed)	140.00
Tires, Over-Size (8.00 x 6 Main and 6.00 x 6 Nose—Exchange)	115.00
Tow Bar, Aircraft	16.50

	Factory Installed
Ventilation System, Rear Seat	62.50
Windshield, Tinted (Exchange)	25.00
Wings Extended Range (Total Fuel Capacity 84 U.S. Gallons—Exchange)	375.00
Winterization Kit, Engine	25.00
Kidwell Exhaust Gas Analyzer	145.00
Communication Installation Package "A", Includes One Navigation Antenna, One Communication Antenna with Associated Cables to Instrument Panel, Cabin Speaker, Headset Jack, Microphone Jack, Radio Light Rheostat, Radio Cooling System, Radio Circuit Breaker	175.00
Electronic Equipment (Communications Package "A" Must be Purchased)	
VHF NAV/COM	
Collins 618 FIA, 360 Channel Transceiver and Navigation Receiver, Remoted	2,727.00
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WREN 460

WREN AIRCRAFT CORPORATION
MEACHAM FIELD • (817) MA 6-3739
BOX 4115 • FORT WORTH, TEXAS 76106

LET'S TALK SAFETY

WREN 460

WREN AIRCRAFT CORPORATION
MEACHAM FIELD • BOX 4115 • FORT WORTH, TEX. 76106
AC 817 MArket 6-3739

The aviation industry should stand up and brag about its safety record. But because of its early history, the subject became a sensitive one. "Safety" became a taboo subject; and it still is, although the reason has been left far behind.

Carelessness and disregard of limitations account for most aircraft accidents. The airplane, its engine, or its accessories are seldom to blame.

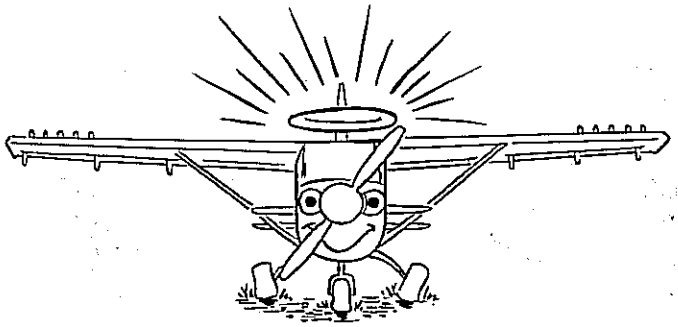
Every commercially produced airplane today is far more than reasonably safe. Some, however, demand more of the pilot than do others. Thus, a pilot must ask himself, "How much more safely can I handle airplane X, as compared to airplane Y?"

The WREN

The WREN 460 is no safer than any other airplane, except that it *is* less demanding of its pilots for average, every day flying.

How come?

For three reasons. One: the WREN can fly slowly (as slowly as 40 mph), giving its pilot more reaction time. Because it flies slowly, the WREN needs only a short takeoff run (less than 300 ft.) and approaches a landing slowly (45 to 55 mph), touching down as slowly as 35 mph. Two: the WREN is very maneuverable and responsive to the controls in the slow speed regime (it is even possible to make a 180 degree turn in 5 or 6 seconds). Three: the WREN is very stall-resistant; the stall (when it does come) is very docile; and a stall recovery is almost instantaneous, so that stalls need no longer be feared.

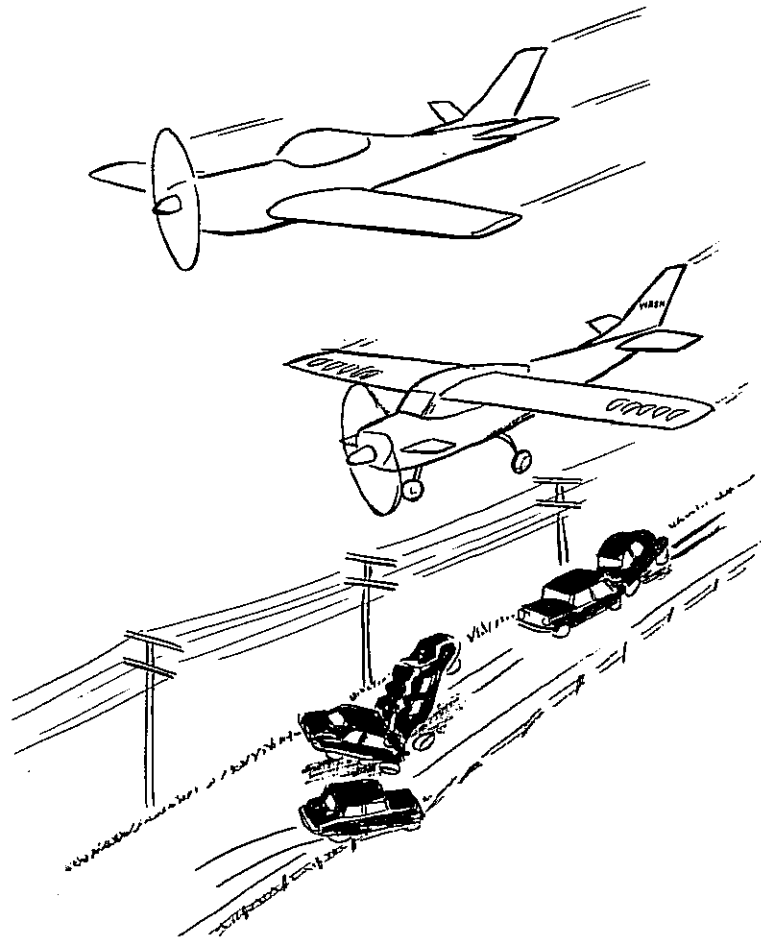


In other words, the WREN gives its pilot a better opportunity to be safe. As one WREN owner expressed it, "Flying a WREN is like owning an insurance policy on which you are your own beneficiary". And that says it pretty well.

Odds Are Good in Any Modern Airplane

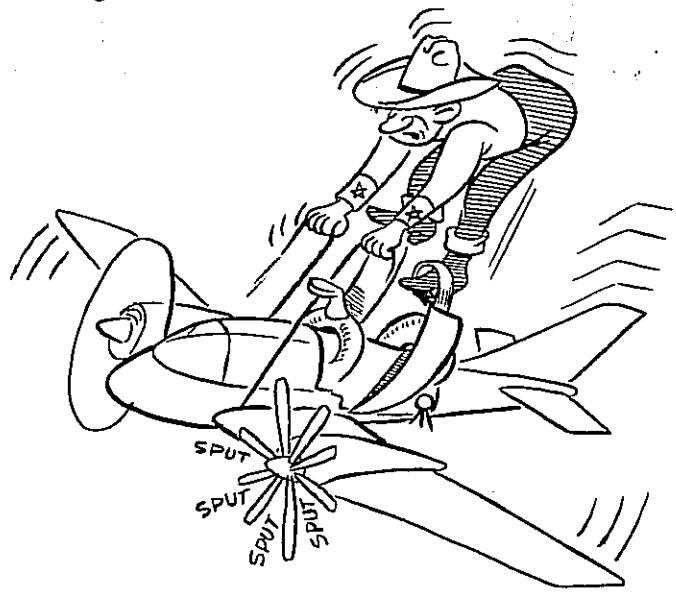
In any modern airplane, prudently flown and reasonably maintained, the odds against a hazard situation developing are something like once in many thousand *flights*.

So, what security features are inherent in the WREN as contrasted to ordinary airplanes in the cases where a hazardous situation might exist? Let's discuss them in the order of occurrence of various types of aircraft accidents in general aviation.



Are Two Engines Safer Than One?

We hear much talk about "twin-engine safety". Some twins are able to maintain a reasonable altitude at gross weight when forced to operate on only one engine, and thus *do* give the chance to continue to a suitable airport.



Basically, any twin gives a greater gliding radius on its remaining engine than is available to a single-engine plane that loses its power.

On the other hand, a twin *is* more demanding of piloting skill even when both engines are working, and *far more so* when one fan quits. Frequent practice is advised in single-engine procedures, but such advice is usually disregarded after the pilot receives his rating and check out. With lack of proficiency, a twin can pose serious hazard potentials because of its narrow controllability margin when operating on only one engine (see *Air Facts* Magazine, July 1965 issue, pages 39 and 40). Without pilot proficiency, a twin offers no more security than a single-engine plane, and possibly less so.

Types of Accidents: Approaches

First: *during approach and landing* at airports. These accidents usually result from letting the speed drop to a stall, followed by loss of control, loss of altitude, and, in combination, the beginning of a spin. In such a situation, the WREN *will not* spin, *will not* lose controllability, and a stall recovery requires only slight release of back pressure on the control wheel. When accompanied by an increase in power, no appreciable altitude will be lost.

Many pilots of ordinary airplanes are overly careful on approaches, carrying 10 to 15 miles of extra speed (20%) above the manufacturer's recommended best approach speed. If the best approach speed for their airplane is 70 mph, they come over the fence at 80 to 85. This speed must then be bled-off by a long floating glide that eats up runway — no problem on long runways, but what about on short strips? The WREN does not need an extra 20% for peace of mind, but, if carried, it would amount to only 9 mph extra, or 54 mph over the fence.

Again, in landing approach accidents, there is an appreciable number of incidents involving collision with trees, power lines, etc. in the approach pattern. Such accidents result from the pilot's concentration on something other than the flight path, which in turn allows these obstacles to come too close before evasive action is taken. The slower approach speed of the WREN allows more time to locate and identify the obstacle, more time for evasion, and the WREN's slow speed maneuverability permits successful evasive action to be taken in closer proximity to the obstacle.

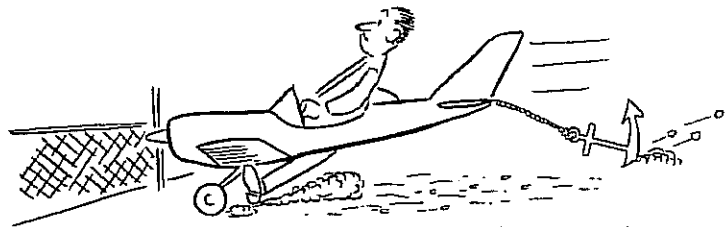
Go-Arounds

For any of several reasons it occasionally becomes necessary to abort a landing approach and "go-around" and try again. In most airplanes the average pilot secretly dreads to make the "go-around." Why? Because of the touchy moment when suddenly applied power is trying desperately to halt the sinking and overcome the drag of the flaps. Flaps must be retracted to reduce drag, but must be gently "milked" upwards so as not to spill the lift that is keeping the plane in the air until the power thrust can accelerate the plane to a safe flying speed.

Not so in the WREN. Because the WREN's flaps give maximum lift over drag, just a modest application of power brings immediate acceleration and climb. A "go-around" in the WREN at full flaps is no more demanding than the simple application of power — nothing more need be done.

Over-Runs

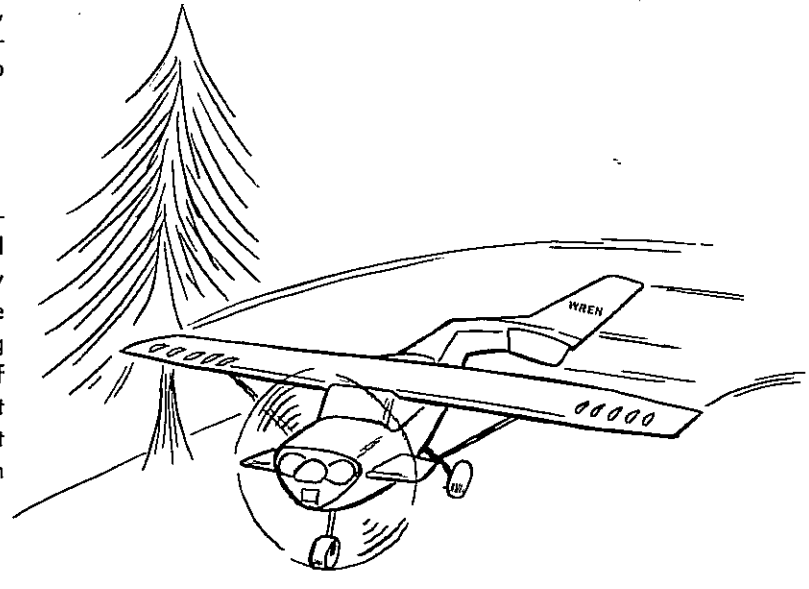
After touchdown, the greatest hazard seems to be an over-run beyond the end of the runway, resulting from too high a landing speed or from a touchdown too far down the runway. Correctly flown, the WREN touches down at 35 mph and can be stopped in less than 300 ft.



Control on the ground at such a speed is certainly no problem. But even at a 45 to 50 mph touchdown, the WREN's controllability is far more secure than at the ordinary 70 to 75, and the WREN's roll out with normal braking would still be less than 600 ft. The WREN's tricycle gear is a great help in making the transition from flying to "driving", especially in high winds, cross winds, or gusty winds. The WREN is the only STOL airplane with tricycle gear.

Takeoffs

Second: accidents *in the takeoff* phase of flight. These are of three types: a stall because of too steep a pull-up or turning too soon; failure to clear an obstacle in the climb out path; and loss of control on the ground during the takeoff roll. In each case, the WREN gives its pilots a desirable margin. The WREN's short takeoff roll of under 300 ft. helps to eliminate the need for steep climb outs. The WREN's good rate of climb of nearly 1100 ft. per minute helps to clear obstacles. The WREN's usable, steep *angle-of-climb* is an even greater aid to obstacle clearance. The WREN's level attitude in climb out gives improved forward visibility. The WREN's takeoff in less than six seconds shortens the *time* in which loss of control could



occur on the ground. The WREN's stall resistance with power (requiring a very steep angle of attack and with ample warning before the stall), coupled with the reluctance of the WREN to stay stalled, and the ease of recovery from a stalled condition by only slight release of back pressure on the control wheel, greatly reduces this hazard. And, because the WREN accelerates rapidly from its take-off speed of 35 mph up to 55 or 60 mph in four seconds, immediate turns can be made without fear of approaching a stalling condition.

Weather Hazards

Third: *weather accidents*. Principally, this type of accident involves the non-instrument-rated pilot who inadvertently (or bull-headedly) finds himself in instrument conditions with no ground or horizon reference. This is serious for this pilot in *any* airplane, but somewhat less so in a WREN for several reasons. The WREN is able to slow down with complete safety and to avoid entering the clouds in the first place by staying below them even at very low altitude (sometimes illegally, but preferably in an emergency to illegally entering the clouds). Usually, a short period of low-and-slow flight will permit locating a choice spot for a precautionary WREN landing. At 50 mph the "usable" forward visibility is effectively tripled

compared to even a 100 mph speed. Too, the nimbly maneuverable WREN at slow speeds can avoid obstacles that may suddenly loom up out of half-mile-visibility-murk.

In an extreme situation, if caught in a solid overcast, the WREN can be quickly slowed down and flaps lowered. In this configuration the WREN will not go into a spin, and, power off, can settle in level attitude at 50 mph and at a 700 to 900 ft. per minute sink rate (a bit slower than a parachute). Breaking out of even a 200 ft. ceiling in a situation gives a good chance for recovery and a controlled landing — or even for continued flight. Even when holding that rate of descent right to the ground, the odds are good for a landing without serious injury. The Federal Aviation Agency states that 55 mph at impact is the dividing line between minor injury and serious or fatal results (FAA Airworthiness Manual, Part 8, Appendix B, page 92).

A pilot with little more than a rudimentary ability to hold his plane level in instrument flight will find the WREN much simpler to control and maneuver at its slow speeds. This is an aid to completing the classical 180° turn to head back toward open sky when inadvertently entering IFR conditions.

Experienced instrument pilots, and even those only slightly familiar with instrument approach procedures, can, when the chips are down, land the WREN to a touchdown and stop under actual zero-zero conditions. Without prior practice or in severe weather conditions a zero-zero attempt might become hazardous — but far less so at 50 mph than at 80 mph or higher.

Wren has petitioned the FAA to certify the WREN (when properly equipped and when flown by a pilot who has demonstrated his ability) for landings with no minimums of ceiling or visibility at certain ILS or radar equipped airports. Wren's experience in this program indicates that the speed break between dependable performance and risky performance is at about 70 mph. As the speed reduces below this point, dependability and safety increase, above this speed they decrease rapidly. Wren considers this ability to be an emergency margin of safety, except for those who would maintain consistent practice in order to use it as an adjunct to further the utility of their WREN, when and if such operations are made legal.

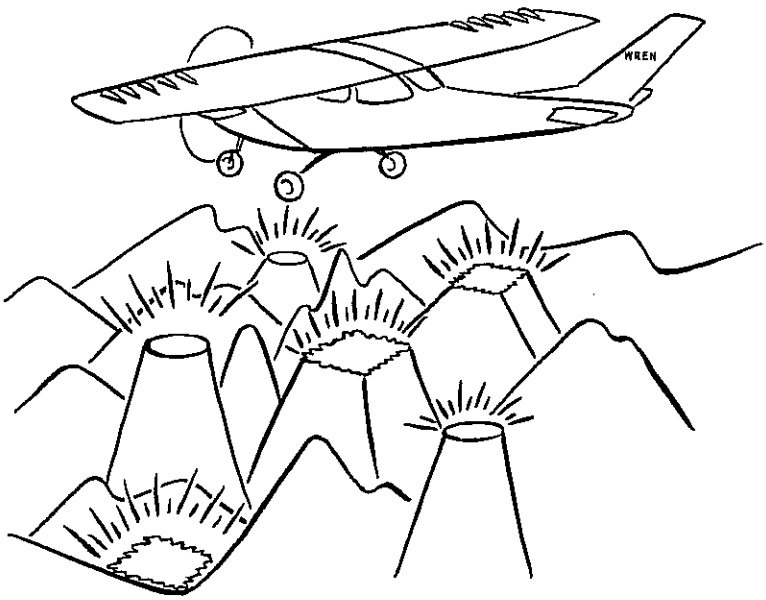
Buzzing

Fourth: *buzzing* or flat-hatting accidents. This is low flying and a form of stunting to show off before someone on the ground. The WREN would probably be no safer than any other aircraft in the hands of such a pilot. Although the WREN *is* more forgiving, *much less apt* to stall, and *much more maneuverable* under these conditions, the chances are good that this type of pilot will find a way to exceed even the WREN's safety margin. He will gain two things, though: he'll give a more spectacular show before the crack-up, and he'll have a better chance of getting out alive.

Forced Landings

Fifth: *forced landings*. Occasionally deteriorating weather or mechanical failure can bring about the necessity to land immediately. Here the WREN is like money in the bank. Small clearings 300 to 500 ft. long are far more numerous than the 1000 to 1500 ft. required by ordinary airplanes, thus the odds are conservatively at least 20 to 1 in favor of making a forced landing in a WREN without damage. Should there be no clearing, a WREN can be landed into trees, rocks, snow, plowed field or even fences. The result will be a damaged airplane but likely with only minor injury to pilot or passengers, because of the impact speed of about 40 mph or less compared to over 60 mph in a conventional airplane. Remember, the FAA says the dividing line between minor injury and serious to fatal injury is a 55 mph impact speed!

George Haddaway, publisher of *FLIGHT* Magazine, after some twelve hours of WREN flying in, over and around the Colorado Rockies, through canyons such as Colorado's Royal Gorge, and across the rugged desert country, states, "Not in any airplane, single or twin, have I had the peace of mind that the WREN gave me. Even the moments, and

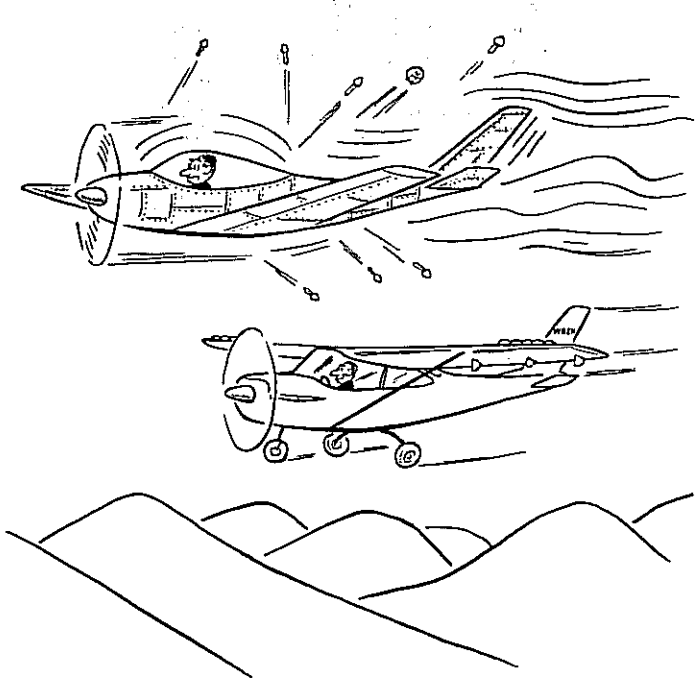


they were only moments, that a suitable landing spot was not available for the WREN, there was still no fretting, for the WREN could have been put down somewhere without much chance of injury".

Turbulence

Sixth: *turbulence* hazards. Severe turbulence can become a hazard through possible damage to the airplane, loss of controllability, incapacitation of the pilot, or disorientation in instrument flight. Moderate turbulence, while not really dangerous, can be uncomfortable to the point of nausea, and may tend toward hazard through pilot fatigue.

The WREN has the ability to drastically reduce its speed, and speed is the catalytic agent that adds most to the hazard of flight in turbulence.



The effect of turbulence rises in geometric progression with speed increase. Boring into turbulence at 200 miles per hour results in *four times* the shock effect on an aircraft and its occupants that would be encountered at 100 mph. Conversely, slowing down from 150 mph to 75 mph reduces the impact of turbulence to only one-fourth the severity.

In a WREN at slow speed, mild turbulence effectively disappears — like flying into an area of calm air — moderate turbulence becomes mild turbulence — and severe turbulence becomes moderate. Very severe turbulence should be avoided in any light aircraft.

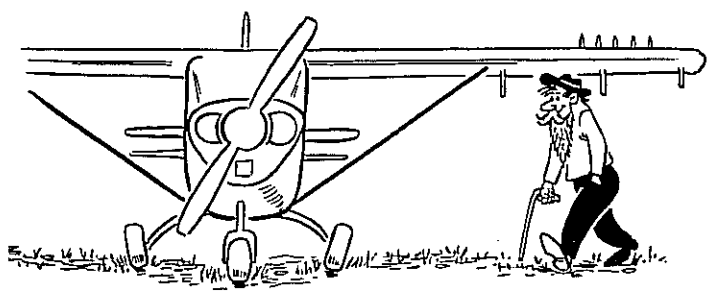
Of course it would probably be impractical to attempt an all day trip at 50 to 75 mph just for comfort in turbulence, but an all-day trip passing through occasional areas of moderate to severe turbulence can be made comfortably and safely, and may even result in completing a trip that might otherwise have been cancelled short of the intended destination by a relatively limited area of heavy turbulence.

Ground-Roll Problems

Seventh: *loss of control* on the ground. At the slow ground speeds during takeoff and landing rolls, the WREN is easily steered even in the remote possibility of a brake locking or a tire blowing out. This was amply proven during a maximum-effort landing at the highest airport in the U. S. (Leadville, Colorado's 10,000 ft. high Lake County Airport). In the thin air at that altitude and with no wind, touchdown was at nearly 50 mph ground speed. The left brake locked on application, but the WREN was controlled with no swerve, maintaining alignment with the center line of the runway. Inspection showed the tube bulging through the hole scraped in the tire. Just one more example of a WREN's operational security.

The Aging or Non-Proficient Pilot

Eighth: *proficiency problems*. Because of the WREN's slow speed, quick reaction is not demanded of the WREN pilot to anywhere near the extent required for secure operation of an ordinary airplane. Those pilots who have flown for years and are considered as veterans, who now find their reactions to be slower than in their hey-day, and who have succeeded in thoroughly scaring themselves a couple of times, and have regretfully given up flying in order to extend their years on earth (or who are considering same) — these men get a new lease on their flying life with the WREN.



And those pilots who only fly a dozen or so times a year — not enough to maintain proficiency — will appreciate the forgiving nature of the WREN.

On The Other Hand

All is not beer and skittles for WREN owners despite the very obvious additional security that the WREN offers. There is the little matter of human nature to be taken into account.

The WREN user who operates only from airports and from strips that can accommodate ordinary airplanes has hardly a problem in this flying world. But, sooner or later, he's going to start hankering for the utility that the WREN offers, and will begin operating into clearings and patches that are absolutely closed to ordinary airplanes. When this occurs, his added safety margin disappears and he's back on even terms with the ordinary airplanes that operate from larger airstrips.

Warning

In fact, the very security that the WREN offers contains its own seed of trouble. The very ease of flying the WREN invites carelessness. The degree of hazard will still be less, but trouble lurks for the pilot made over-confident by the WREN's forgiving nature. The fact still remains that aviation is not unsafe, but is terribly unforgiving of carelessness.

The Record

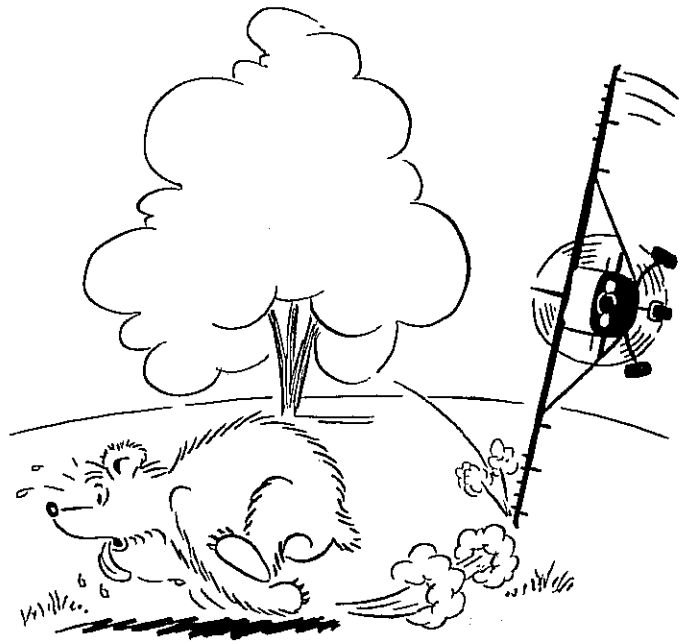
As of early 1966, five WREN's have been seriously damaged in five different types of mishaps. No fatalities have resulted and only one resulted in injury. Although four WREN's have successfully flown the North Atlantic, one WREN made a forced landing in the middle of the South Atlantic when an accessory oil filter came loose and caused a dead stick landing. 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 ft. strip atop a Kentucky mountain touced 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 granddaddy 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.

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.



Of the four accidents with people on board, all could have been fatal with ordinary airplanes. A water landing in a fixed gear airplane, at speeds of over 60 mph would have flipped over, broken up, knocked its pilot unconscious with probable drowning. Instead, at 35 mph he was not even shaken up, the plane was not damaged.

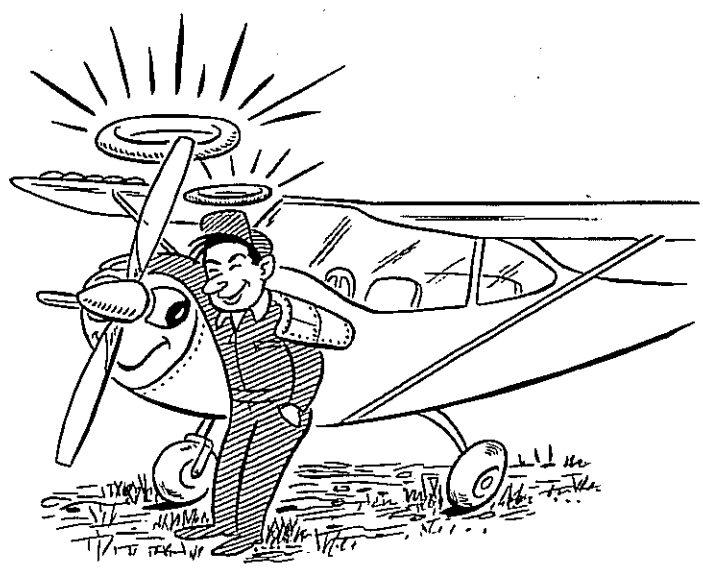
The mountain-top landing in Kentucky would not even have been attempted in an ordinary airplane.

The Mexico City "tornado" was the *fifth* such incident at that airstrip — the other four were all fatal.

As for bear chasing, not even the WREN was designed with that use in mind. If attempted in an ordinary airplane, four fatalities would have been expected.

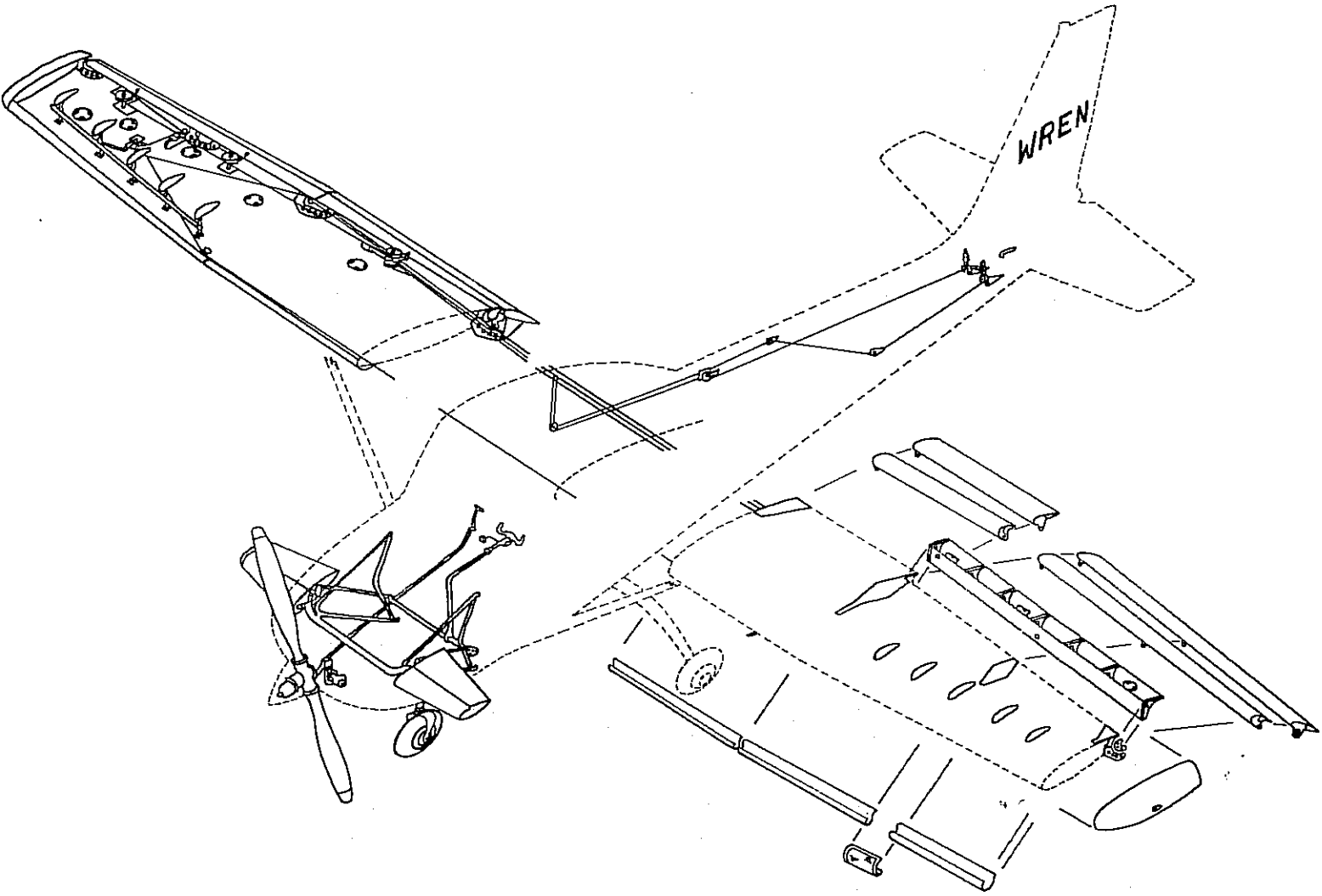
A Final Word

Safety in a WREN is assured, if you will be as careful of your WREN as your WREN is careful of you.



Drawings by W. A. Coker, Fort Worth, Texas

What makes a WREN a "WREN"..?



A Wren is a performance package of unusual design features, 1,064 Wren parts, 2,114 pieces of standard hardware, and one new Cessna 182 airframe. (Solid lines in drawing show many of the Wren parts.)

THE WREN APPROACH
to STOL
and SLOW FLIGHT PERFORMANCE

One major handicap to the sale of STOL airplanes has been their very few sales and service outlets, brought about by limited production. Hence, there is a lack of ready availability of spare parts and experienced service personnel — not only in the U. S., but, even more important, in the remote areas of the world where STOL aircraft are most needed.

Wren eliminated this handicap by adopting a world-standard airframe to Wren's STOL configuration. Wren uses only new production Cessna 182 airframes in the manufacture of the WREN 460. Such an approach is entirely new, for no aircraft manufacturer has ever previously gone into production utilizing brand new standard airframes manufactured by another company.

The advantages of this approach are obvious. Not only can Wren owners take advantage of Cessna parts and service availability throughout most of the free world for practically all routine service items, but they also gain through a lower initial cost because Wren takes advantage of Cessna's mass-production cost effectiveness. Thus Wren can offer the most effective all-around STOL on the market at the lowest price.

A WREN consists of 1064 Wren parts plus 2114 nuts, bolts, bearings, etc., and one Cessna airframe.

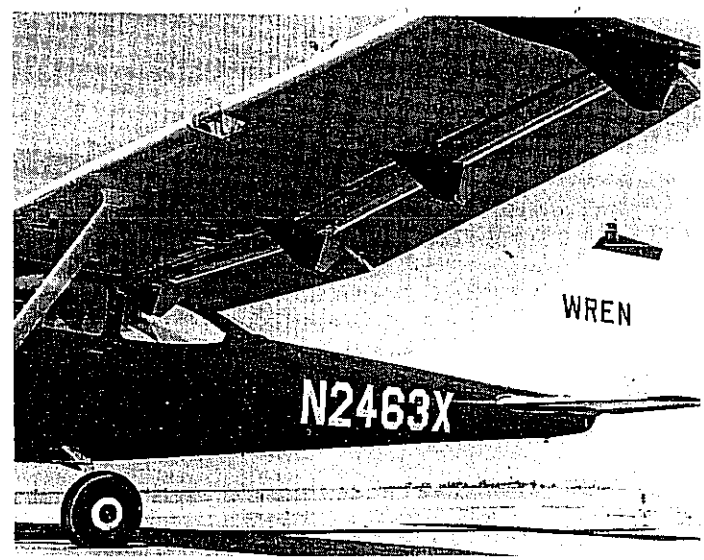
In Wren production, the mass-produced Cessna fuselage remains relatively unaltered. The wing, however, is another matter. Wren removes Cessna's ailerons, flaps and attendant mechanism, along with the outboard cove skins and wing tips. Wren adds a full-span rear spar and eight doubler plates to each wing for increased strength. Wren adds eight additional access holes to the right wing and seven to the left wing to simplify servicing and inspection. All of these holes are "oversize", easing the work of mechanic or inspector, and reducing service bills for the owner.

Cessna's bellcranks are replaced with Wren-made spools for greater reliability of control cable routing to flaps, ailerons, and the Wren's teeth atop each wing. Wren uses only stainless steel cables to control the Wren devices.

To simplify servicing, Wren adds one-eighth inch "locating holes" that are template-drilled in upper and lower skins and match a corresponding hole drilled in each of the spools to which aileron and flap control cables are attached. Lining up these "locating holes" by inserting a length of welding rod through them assures perfect rigging in a matter of minutes. Adjusting cable tension completes the rigging requirements quickly and accurately.

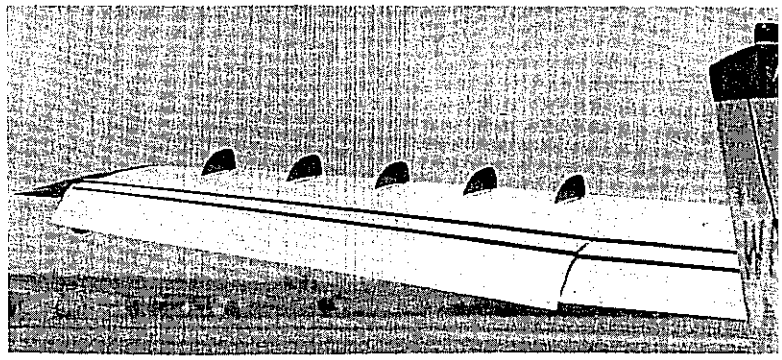
WREN FLAPS

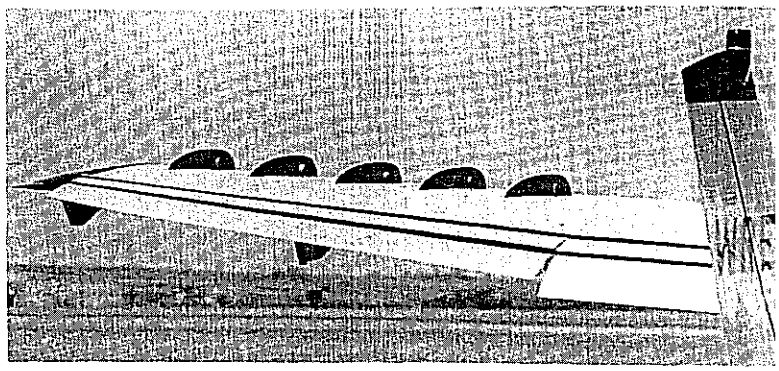
Wren designed full-span, double-slotted flaps are added to each wing. These flaps extend and lower to 30° where they add 87% to the wing's lift co-efficient, providing the lift needed for slow flight. Full 30° flaps are used both in takeoff and landing, and for slow speed patrol. Lesser amounts of flaps can be used for intermediate speeds of 55 to 90 mph. The Wren designed ailerons are part of the flap system. External hinging makes for ease of inspection and permits the intermediate turning vane to be always at optimum position in relation to wing and trailing flap, eliminating flap buffeting at any setting. With this flap system, forward and slide slips are highly effective. The Wren flap system is a high-lift system as opposed to a high-drag system, thus Wren STOL performance is achieved through aerodynamic lift as opposed to STOL designs that depend on power to hold the plane in a nose-high attitude where the resulting high drag slows down the forward speed of the plane.

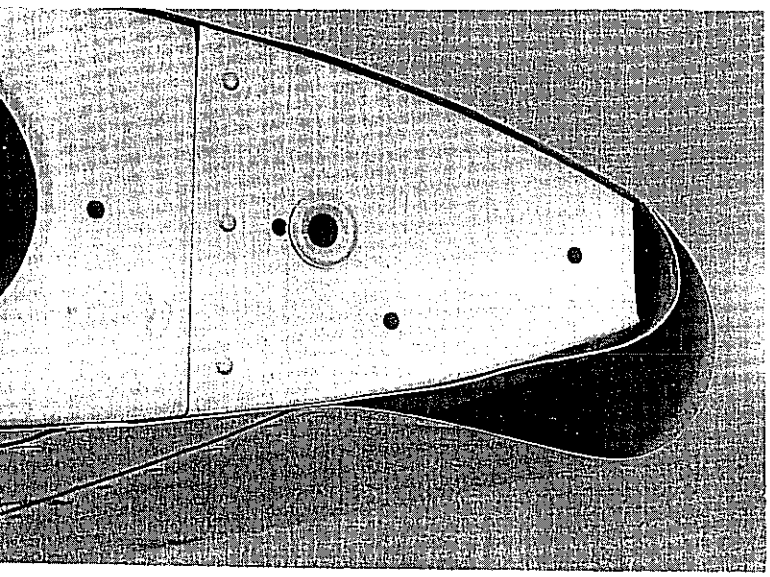


WREN'S TEETH

Mounted atop the wings immediately ahead of and permanently linked with the ailerons are a series of Wren designed drag-inducing plates called "Wren's Teeth". At normal cruising speeds and ahead of the "down" aileron in slow flight (upper picture) these teeth are at trail position, streamlined with the air stream. Ahead of the "up" aileron in slow flight, they turn as much as 60° broadside to the air stream (lower picture) to produce a balancing drag to offset the otherwise adverse yaw created by the drag of the "down" aileron of the opposite wing. These plates in broadside position (lower picture) also provide a "directional" or "rudder" effect. Thus the "teeth" provide both roll and yaw augmentation. Patent is pending on these "Wren's Teeth".





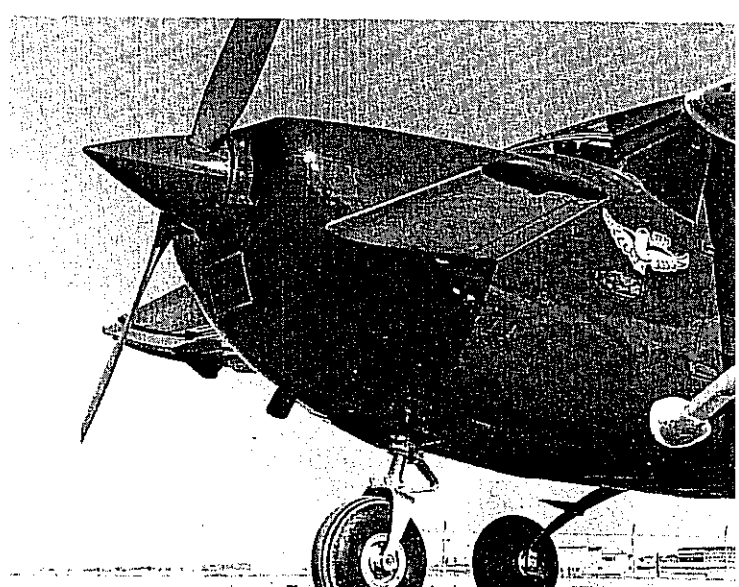


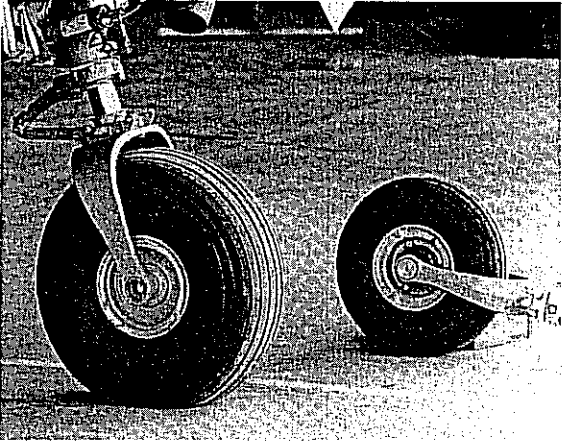
WREN SAFE-STALL WING

The leading edge of the Wren's wing is given a greater radius by the addition of a full-span "cuff" (see picture). This augmented leading edge provides much the same result as a leading edge "slot", but has no moving parts. It changes the airflow so as to move the "burble" (or stall originating point) rearward, resulting in a trailing-edge type of stall from which recovery is immediate as the air flow instantly reattaches to the wing with only the slightest reduction in angle of attack (accomplished by the pilot very slightly releasing back pressure on his control wheel). This docile stall, preceded by ample warning and with recovery almost instantaneous without loss of control or altitude provides the ability to fully utilize the low speed regime without fear of catastrophic results.

WREN NOSE-MOUNTED CONTROL

A small set of Wren-designed horizontal stabilizers and elevators mounted immediately behind the propeller disc utilizes the high energy of the propeller slipstream blast to provide additional pitch control in slow flight. Additional overall lift provided by these surfaces coupled with a reduction in the download normally resulting from deflection of the rear elevators gives the Wren increased overall lift and an additional 100 ft./min. rate of climb. So powerful is this "nose control" that the nose wheel can be lifted clear of the ground (at the start of takeoff) in less than the Wren's length. This is an important feature when operating from muddy or sandy surfaces or in slush. Wren holds a patent on the nose-mounted control surfaces.



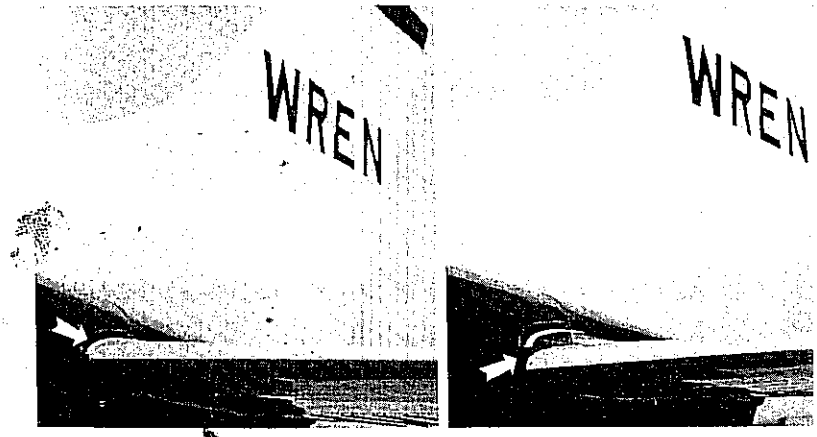


WREN HEAVY DUTY NOSE GEAR

An extra strength nosewheel installation and larger nosewheel fork is an optional Wren feature. Practically every Wren to date has been sold with oversize main (8.00 x 6) and nosewheel (6.00 x 6) tires. A still larger nosewheel fork developed and certificated by Wren permits the use of an 8.00 x 6 nosewheel tire for use on extra-rough or extra-soft landing areas. The adjacent picture shows the size of the 8.00 x 6 nosewheel tire compared with an ordinary 5.00 x 5 nosewheel tire.

WREN AUTOMATIC TRIM SYSTEM

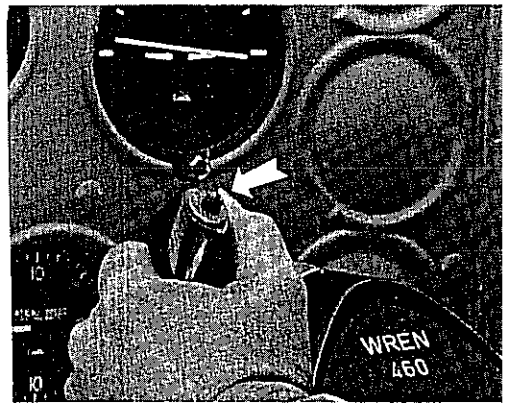
Another Wren development is a new and separate "integrated" trim system that automatically builds in the correct amount of trim to offset center of lift changes as flaps are lowered or raised. The system is actuated by the electric flap motor and lowers or raises the angle of attack of the horizontal stabilizer as the flaps are lowered or raised. (Trim tab on right elevator is still manually controlled by pilot for C.G., speed and power trim adjustments.) Pilot is relieved of need to adjust trim as flap position is changed and trim tab system remains to provide much more available flare power for power-off landings. In addition to relieving some of the work load on the pilot, this new trim system reduces takeoff ground run and landing roll by about 10%-270 ft. takeoff roll at sea level, standard atmosphere, zero wind, 2800 lb. gross weight and 250 ft. landing roll under the same conditions.



WREN REVERSE-PITCH PROP

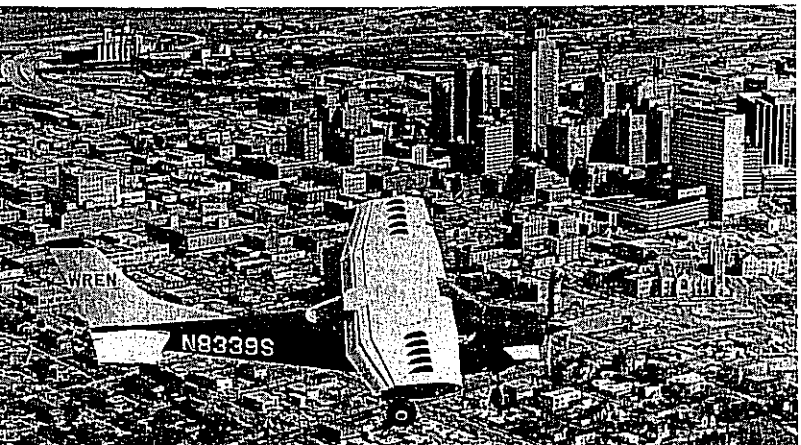
As an optional item of equipment, the Hartzell Propeller Co. has developed specifically for Wren the first reverse-pitch propeller to be used on a single-engine, reciprocating-engine, land plane. This Beta system propeller is simple to operate and highly effective for landings on slick runways, wet grass, or icy surfaces where normal braking would be ineffective, or for added safety when landing on short, one-way strips where no go-around is possible. Normal landing distance is decreased from 250 ft. to only 200 ft. when using the reverse-pitch prop.

Approach and touchdown speeds with the reverse pitch propeller can be 5 to 10 miles faster and still result in Wren-type short landings. This feature is most applicable for use in a turbulent, gusty, crosswind, or where tricky up or down drafts may be encountered at the very edge of a short strip.



WREN FLAPS-UP BUTTON

Still another Wren development is a small button on the control wheel used to retract flaps on landing. Because the Wren flaps are of the high-lift, low-drag design, their retraction at the instant of touchdown decreases lift and provides better braking action. Wren's wheel-mounted button permits the pilot to retract flaps without removing his hands from the wheel and throttle.



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