BEAST OF BURDEN

In the face of adversity, Christen Industries sees only opportunity.

BY MARK R. TWOMBLY

Christen Industries, Incorporated, the diminutive Afton, Wyoming, manufacturer of factory-built Pitts Special and kit-built Christen Eagle sport biplanes, has veered into the utility airplane market with an unabashed copy of one of the world's most successful workaday airplanes. The Christen A-1 Husky is remarkably similar to the Piper PA-18 Super Cub in general appearance, but in fact there are few interchangeable parts. The major differences are the Husky's 180-horsepower engine and constant-speed propeller, larger slotted flaps, pitch-trim system and 55-gallon fuel capacity. There is one other vital distinction: The Husky is in production; the Super Cub is not.

Piper got its start and achieved prosperity with the J-3 Cub, but by 1947 the 65-hp two-seater that made William T. Piper the Henry Ford of aviation had exhausted its potential as a trainer and personal airplane. Piper correctly perceived a large market for a rugged and simple utility airplane and transformed the J-3 into the PA-11 Cub Special and eventually the PA-18 Super Cub by upgrading to more powerful engines, greater fuel capacity, roomier interior and stronger structure. The Super Cub became the airplane of choice for low and slow observation work, bush flying, glider towing and a host of other chores.

During a 34-year production run, Piper built nearly 8,500 Super Cubs. The last batch of 50 were delivered in 1983 to WTA, Incorporated, of Lubbock, Texas, which had exclusive worldwide distribution rights to the Super Cub and PA-36 Brave, a Piper agricultural applications airplane. WTA also had first refusal rights to purchase the PA-18 type certificates and tooling. Despite its belief in a worldwide annual market for 100 Super Cubs, WTA exercised its thumbs down option when Piper insisted on $100-million worth of liability insurance to cover all Super Cubs manufactured since 1950.

The Super Cub was Piper's successful solution to the problem of market saturation of its seminal design. Christen Industries is following Piper's example. About four years ago, Christen owner Frank L. Christensen, AOPA 152306, and president and general manager Herb Andersen realized that their traditional annual production rate of 40 to 50 Pitts Specials and a handful of Eagle kits could not be sustained. The company had to produce 38 to 40 aircraft a year to survive, yet they projected a declining market for their aerobatic designs, perhaps leveling at 15 to 25 new aircraft a year. The solution was to expand the product line.

A utility airplane seemed the wise choice considering the prognosis for sport aircraft. Given its modest financial resources, the company sought to avoid expensive development, certification and tooling costs by buying an existing design compatible with the tube and fabric construction employed on the Pitts and Eagle. The logical candidate was the Super Cub, but when Christen approached Piper the same lofty wall of liability insurance premiums that stopped WTA was erected. Christen then bid for the Champion line but lost out to Tetelestai, Incorporated, an Austin, Texas, holding company that buys defunct companies for resale.

The only alternative was to design something new. Conventional wisdom holds that new general aviation airplanes are far too expensive to develop and certificate in today's anemic market. Christen subscribed to that view until putting it to the test. The company took advantage of a cost-saving provision in FAA certification standards that waives the requirement for fatigue analysis provided the airfoil and wing structure are similar to an existing certificated design.


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Most of the high-wing fabric airplanes designed in the 1930s—the Cub, Taylorcraft, Champ, Porterfield and Interstate—have virtually identical wings, according to Andersen: Clark Y or USA 35-series airfoils with a 63-inch chord, 35- to 36-foot span and 6.66:1 aspect ratio. What are the vital statistics for the Husky wing? Modified Clark Y-USA 35B airfoil, 63-inch chord, 35.5-foot span, 6.66:1 aspect ratio.

Furthermore, since the spars, struts and wing fittings are identical to other designs, production parts are available off the shelf from Univair Aircraft Corporation in Aurora, Colorado. Univair has FAA approval to manufacture replacement parts for several out-of-production aircraft.

Finally, Christen elected to certificate the Husky under Normal category airworthiness standards of Federal Aviation Regulation Part 23. To have sought Utility category certification would have meant a far more extensive, and expensive, spin-testing program, according to Andersen. "The market is just not great enough to justify the costs," he explained. The Husky is placarded against intentional spins. Andersen claims it is difficult to induce a spin in the Husky with flaps retracted and virtually impossible with flaps extended.

The A-1 received FAA type certification in May 1987. Christen found that it cost less to build a new aircraft than to adopt an existing design. By the end of 1987, 32 had been delivered to dealers and customers. Christen now reports a backlog through August and plans to step up production to one airplane a week in July.

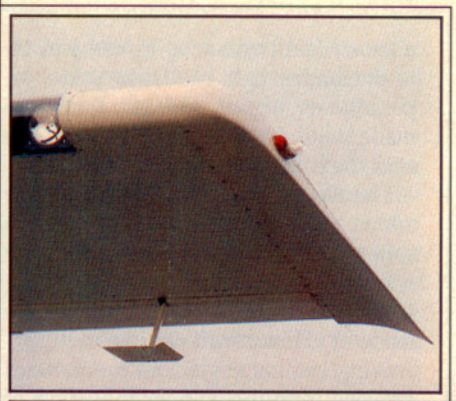
A big spinner, wide cowling and thicker profile give a 'huskier' look than the Super Cub's puppy-dog snout.

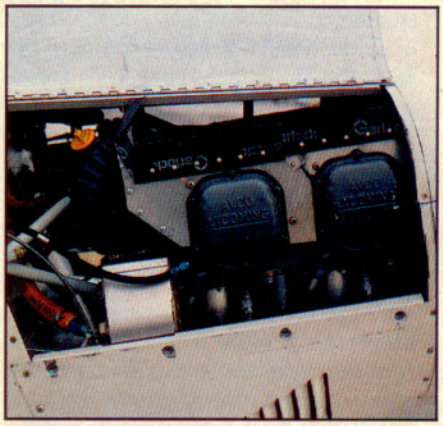
Who is buying? Half of Christen's sales have been to foreigners, thanks to a weak dollar. In this country, customers include government agencies such as the United States Border Patrol, which has ordered 12, ranchers, bush pilots, grass-strip romantics—the same people who bought Super Cubs. Jack B. Poage, AOPA 019874, is typical. Poage and his wife, June, own and operate Westair, Incorporated, an FBO at Carroll County Airport west of Baltimore, Maryland. For several years Poage used a modified 180-hp Super Cub for aerial photography and banner towing, but 2,600 hours of hard labor took its toll with a mounting stack of maintenance bills. When Christen announced it was developing the Husky, Poage, who had owned a Pitts Special, placed his order. He took delivery of Husky serial number eight in July 1987, in Afton.

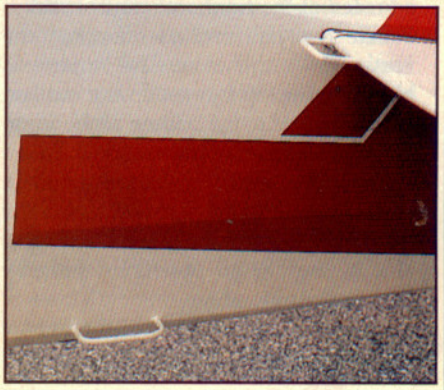
The airplane earns its keep the same way the Super Cub did, towing banners and serving as an aerial photography platform. Poage installed a banner tow hook and designed and built a combination radio rack/camera lens holder that is mounted on the floor ahead of the front seat. Like the Super Cub, the Husky is an ideal banner tug and air-to-ground photo platform because of its slow-speed capability, tandem seating arrangement and fold-open-and-latch door and window. Christen plans to certificate and offer optional IFR avionics, snow skis and floats.

The Husky is in all respects an evolutionary design. It retains the best characteristics of the Super Cub, such as short takeoff runs, low landing and stall speeds and no-frills simplicity, and improves on many of its shortcomings. The distinctions are evident on a walkaround, beginning with the nose.

A big spinner, wide cowling and thicker profile give the Husky a, yes, huskier look than the puppy-dog snout







of the Super Cub. Each side of the hinged cowling opens to reveal most of the Lycoming O-360-C1G engine and accessories. Christen had hoped to match the 180-hp engine with a fixed-pitch propeller but in testing the same engine-prop combination on a Pitts, found that the high rpm required to achieve desired cruise speeds resulted in excessive propeller noise, based on FAA limitations. The extra weight and maintenance requirements of a propeller governor and hub are drawbacks when operating in the bush, but the trade-off is better all-around climb and cruise performance.

Empty weight of the Husky is 1,190 pounds, 260 pounds more than the Super Cub's. The 1,800-pound gross weight is 50 pounds more than the Super Cub's, but useful load is 210 pounds less. With full fuel, the payload is 310 pounds, so most two-person flights must begin with a partial fuel load.

Like the rest of the Husky's tubular airframe, the engine mount is coated with a very light gray-colored epoxy paint for corrosion protection. Christen saves about 10 pounds by using a lightweight B&C Specialty Products starter originally designed for homebuilt aircraft, according to Andersen. Exhaust pipes are made of stainless steel for longer life. Ram air in the engine plenum is routed through a flexible hose to the oil cooler located behind the right bank of cylinders. Cooling air exhausts through louvers on the lower cowl.

The fat, flat-bottomed wing was designed for low-speed lift, gentle stall traits and good top-end speed. It is virtually the same airfoil used on the Callair, an agricultural applications airplane once built in the factory now occupied by Christen. The leading edge of the wing has a larger radius than the standard Clark Y airfoil, a modification developed for the Callair to achieve better low-speed lift for improved takeoff performance in the high density altitudes of the tropics. The wing incorporates one degree of dihedral and about one degree of washout.

Christen elected to sacrifice aileron area for larger flaps to achieve better takeoff and slow-flight performance. The Husky has 50 percent more flap area than the Super Cub. The single-slotted flaps move down and away from the trailing edge of the wing, locking at 15 and 30 degrees. The effect of flap extension is to generate more lift than drag. Christen recommends 30 degrees of flaps for maximum performance takeoffs and normal and short-field landings, except in crosswinds.

The leading edge of each aileron has a slightly greater radius than the thickness of the wing immediately in front of it for better low-speed aileron effectiveness. To compensate for reduced aileron area, Christen borrowed an aerodynamic device used on the Pitts: a flat aluminum spade attached to and hanging below each aileron. The spades act as control boosts to reduce stick force. Even so, the

ailerons feel ponderous in comparison to the feather-light rudder pressure, especially at higher speeds. Turns are made with gross movements of the stick, light touches with the feet.

The Husky's drooped wing tips were added more as an aesthetic touch to soften the sharp lines of the rectangular wing than as an aerodynamic device, according to Andersen. Spars and ribs are made of aluminum.

Wing leading edges and the forward fuselage from the spinner to just aft of the door are skinned in aluminum and painted with enamel. The rest of the airframe is covered in 2.7-ounce Dacron fabric protected with layers of nitrate and butyrate dope. Order any color you like as long as it is white with red trim. The fabric should last indefinitely if the airplane is hangared, but the airplane will need recovering eventually if stored outdoors, according to Christen. Pop rivets secure the fabric to wing ribs.

Each wing contains a 26-gallon gravity-feed fuel tank, 25 gallons of which is usable. Landing, taxi, navigation and strobe lights are standard equipment.

Strolling under the Husky wing can be hazardous to one's health, what with aileron spades and flap actuators hanging down to snare an unprotected noggin. Flap actuators are capped in rubber pads to soften impacts, and the inside actuator is striped in red and white paint for visibility. Just keep those sharp aluminum spades in mind.

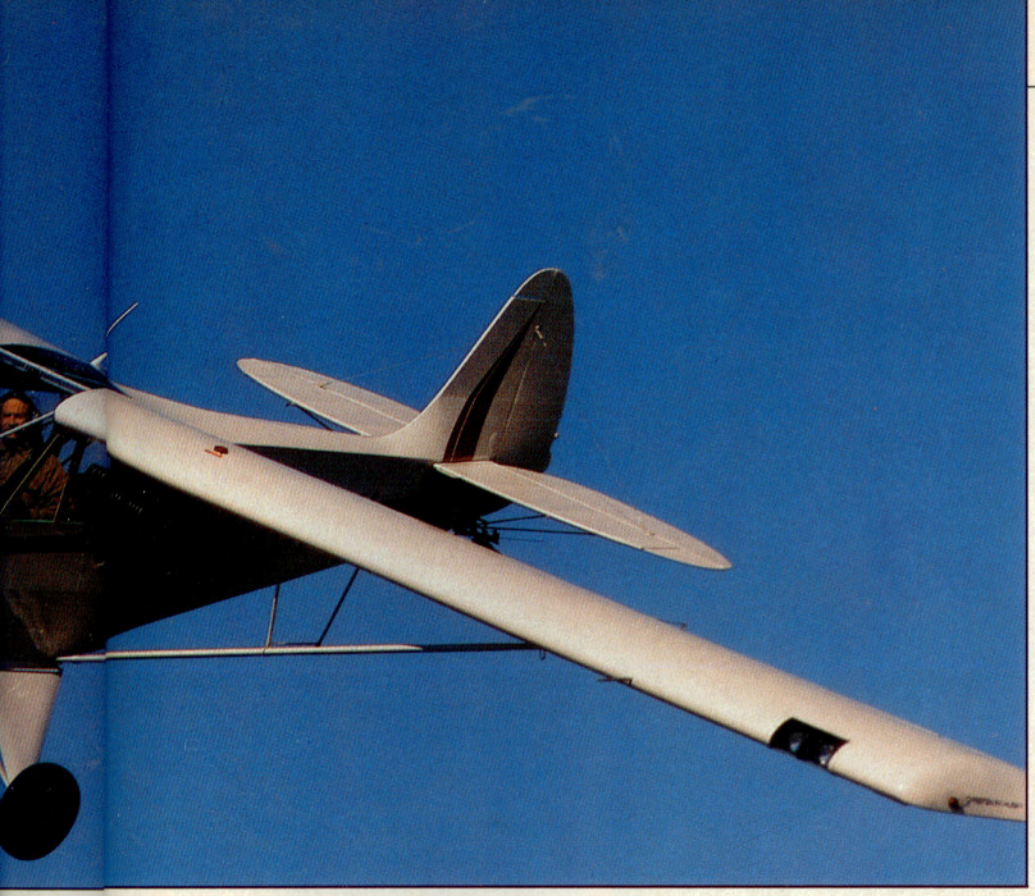
Other details distinguish the Husky from the Super Cub. Longerons extend along the top of the fuselage, in contrast to a birdcage structure that forms the top of the Super Cub fuselage. Wire rods and tubular struts provide more rigidity for the horizontal stabilizer, and strap hinges that link control surfaces to the airframe can be machined and shimmed when worn. Main landing gear shock absorber cords are located underneath the front seat, protected from weather and wear, and control surface rigging is adjusted at the front seat control stick.

Like the Cub and its offspring, the Husky has a split door. The window is hinged at the top to open up and out and can be latched to the bottom of the wing. The bottom half is hinged to fold down. With both door and window open in flight, the pilot and rear-seat passenger are presented with a view out the right side of the aircraft obstructed only by the wing struts.

Climbing into and out of the Husky calls for the same gymnastics as in a Super Cub: Right foot on step, right hand gripping tubular brace over panel, swing left leg over seat and control stick, settle into seat. Exit by hoisting yourself out of the seat so you can sit on the door frame and swing both legs out of the cabin.

The cockpit is a bit more capacious than the Super Cub's, especially in legroom, thanks to its non-tapering lower fuselage cross section, slightly reclined seats and angled fire wall. The 10-cubic-foot baggage bay behind the rear seat will hold 50 pounds.

Husky's 180-hp engine, constant-speed propeller, larger slotted flaps, pitch-trim system and 55-gallon fuel capacity are main differences from the Super Cub.



The Husky is flown solo from the front seat. The back-seater has a throttle, stick, rudder pedals and brakes but no instruments, flap handle or propeller, mixture or carburetor heat controls. As in most aircraft controlled with a stick, power controls are manipulated with the left hand.

Clear plastic tubes on each wing root serve as fuel gauges, and a simple On-Off handle on the side wall controls fuel flow to the engine. Headset jacks (installed by Poage) and a toggle switch and rheostat for cockpit lights also are located in the wing roots. All other electrical system switches are on the panel. Basic flight and engine instruments plus a cylinder head temperature gauge are standard on the Husky. Poage installed a vacuum pump and air-driven attitude and direction indicators on his own.

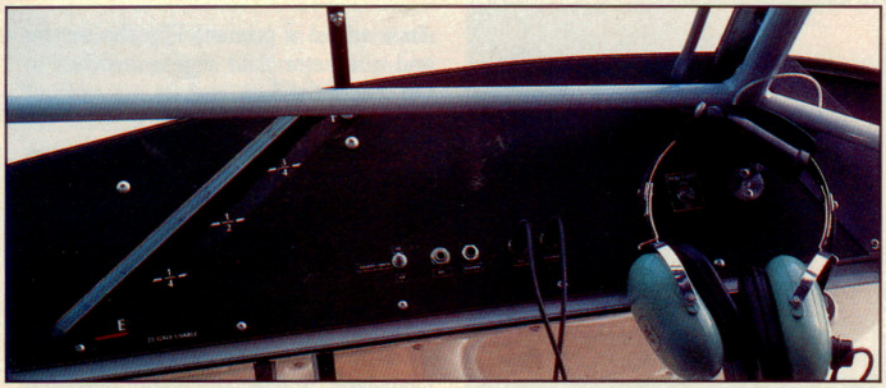
The thermometer hovered around freezing when Poage and I climbed in his Husky for a check-out. Cold weather starts call for several pumps of the throttle to prime the engine. (Christen has since added a primer.) Flip the master and alternator field toggle switches to On, twist the key and in a couple of turns the Lycoming clatters to life.

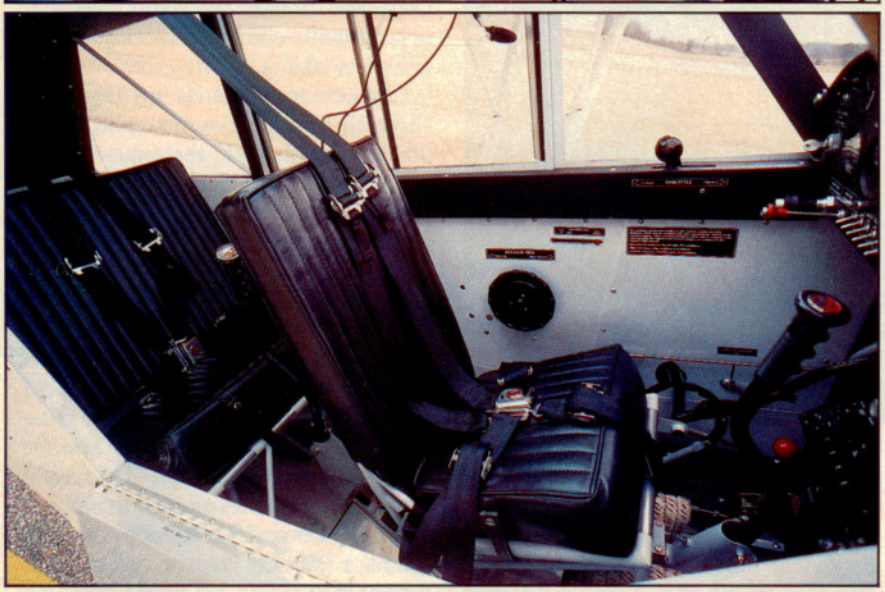
Ground handling is a cinch, both with and without power. Grab handles on the fuselage and horizontal stabilizer make it easy to lift the tail and point the nose in the right direction. The front seat is high enough to enable a pilot of average height to see over the nose. The Husky's steerable Scott tailwheel, toe-activated Cleveland brakes and good over-the-nose visibility eliminate the vexations of tailwheel taxiing.

Christen recommends no flaps and slight aft trim for a normal takeoff and 30 degrees of flaps, three-quarters aft trim and full throttle before brake release for a maximum performance departure. Flaps are deployed by pulling on a metal bar on the left side of the cabin floor. The Husky accelerates briskly, and any tendency to veer left of the centerline from torque is easily corrected. The stick is held back to keep the tail on the runway throughout the takeoff roll. At about 45 mph (39 knots; the airspeed indicator is calibrated in mph) the airplane levitates off the runway and climbs in a near-level attitude. Christen claims a 200-foot takeoff roll at gross weight in standard conditions.

The Husky climbed at about 1,000 fpm with tanks three-quarters full, flaps stowed, power reduced to 25 inches manifold pressure and 2,500 rpm and airspeed indicating about 80 mph (56 knots). Best rate of climb speed is 73 mph (63 knots), which yields a very steep nose attitude and, according to Christen, a 1,500-fpm ascent. At 2,000 feet agl with the power set at 23 inches and 2,300 rpm, indicated airspeed settled on 135 mph (117 knots) in level flight for a true airspeed of 137 mph (119 knots), well into the caution range. Book specifications claim a 75-percent power cruise true airspeed of 140 mph (122 knots).

Most Husky owners probably have a need to go slow rather than fast. With 30 degrees of flaps extended and the power pulled back, Poage's Husky maintained level flight at 35 mph IAS (30 knots) with full roll control. Pulling back on the stick forced an immediate but gentle stall. Holding full aft stick caused the nose to bob up and down as the wings alternately stalled and regained lift. Eventually one wing began to fall through, but a small dose of power and relaxed pressure on the stick quickly re-



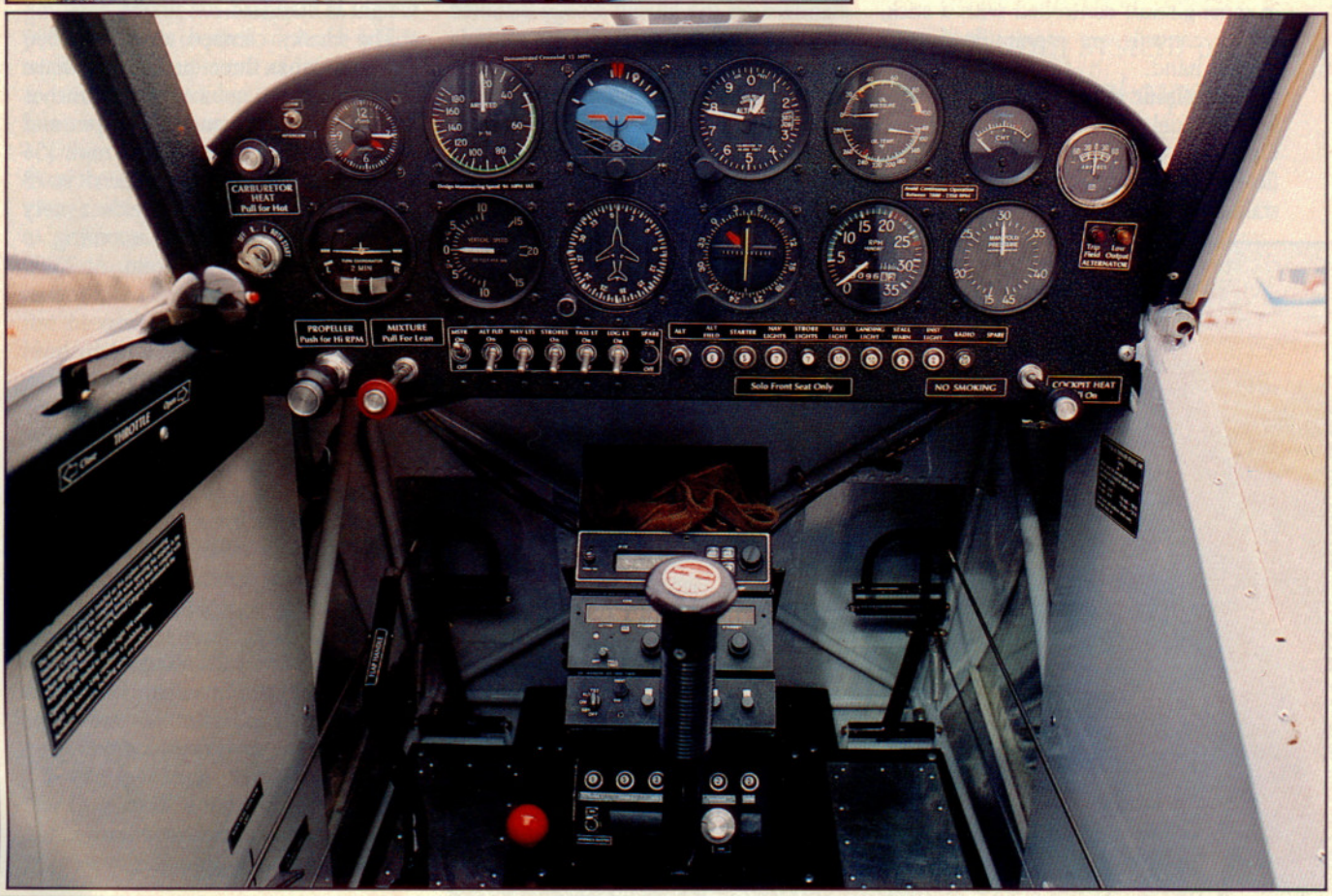


stored lift. Poage reports that he conducts aerial photo missions at 45 mph (39 knots) with complete confidence.

Poor visibility in turns is the price paid in high-wing airplanes for being able to look straight down, but the Husky's clear greenhouse cabin roof compensates. As for cabin comfort, let's just say the heater should keep your right foot toasty, and don't forget the headsets. Creature features aside, the sensation of maneuvering an airplane while sitting on the longitudinal axis beats side-by-side flying hands down. Call it stick and rudder nostalgia, but it feels right.

To trim for pitch, the pilot turns a large plastic wheel on the left side wall to tension a set of springs connected to the elevator control cables. There is no adjustable elevator trim tab. Spinning the trim wheel simply alters the neutral position of the stick. The Super Cub is trimmed by turning a crank that operates a jackscrew on the horizontal stabilizer, which moves the leading edge of the stabilizer up or down, depending on the desired trim setting. One advantage to the Husky's system is the speed with which pitch trim can be adjusted. It also is maintenance-free, unlike the jackscrew arrangement.

Full forward trim is required to main-



tain hands-off level flight at cruise, and full aft trim is a must on landing. Try as I might, I could not pull off a successful three-point landing during my initial outing in the Husky. The tail simply would not get low enough before the wings stalled and the mains plopped onto the runway. The reason, I discovered, was that I had failed to visually check the trim indicator on short final to ensure that I had dialed in full nose-up trim. As I flared, control force was so heavy I mistakenly thought I had reached full aft stick travel.

Sink rate is easily controlled with power, provided airspeed is kept to about 60 mph (52 knots) or less. Otherwise, the Husky will hang in the air, especially with full flaps. Recommended short-field final approach speed is 50 to 55 mph (43 to 48 knots) for a landing roll of 350 feet.

Like its Eskimo dog namesake, the Husky is bred for a life of work. Frank Christensen freely admits the airplane is not revolutionary in design or construction. It is simply a new and improved version of the Super Cub, an airplane with a reputation for getting the job done. The only reason the Husky exists is that new Super Cubs and other blue-collar airplanes, with the exception of the Maule, are no longer available to replace an aging utility fleet.

If there is a secret to Christen's relatively quick, painless and inexpensive journey to a new aircraft, it is in carefully plotting market strategy, selecting proven and simple design concepts and refusing to succumb to the pessimism pervading the general aviation manufacturing industry. On the latter point Christensen is downright evangelical.

"It seems that in American industry today there is a distinct lack of courage in the face of adversity," he said. "Industries seem to be seeking easy solutions to their problems, and they think too much about the bottom line for the next quarter than about long-term opportunities and commitments. Instead of making long-term plans and attacking problems creatively and with confidence, many industries are allowing valuable capabilities and productive resources to wither away while time is wasted complaining about problems and looking for scapegoats. We think this tendency of many general aviation manufacturers to remain inactive and complain rather than to take positive action is one of the reasons that the industry is in serious decline."

And how about Christen Industries? "We still have the old-fashioned view that the long-term is what is really important and that in adversity there is always opportunity," Christensen said. "We are convinced that if we can survive the current adverse economic climate in general aviation by taking prudent action we will prosper in the future and that other light aircraft manufacturers can do the same."

The Husky is a testament to Christensen's belief in fundamentals as a path through tough times. "The desire to fly is an intrinsic human passion, and the economic and utilitarian value of light aircraft has long been proven," he explained. "The current economic adversity in general aviation will not change these facts, and the desire and need for light aircraft will not go away. Those who remain courageous, committed and active can ensure a future for general aviation. We think the Husky story is a good example." □

Christen A-1 Husky
Base price: $55,000

Specifications

Powerplant	Lycoming O-360-C1G 180 hp @ 2,700 rpm
Recommended TBO	2,000 hr
Propeller	Hartzell HC-C2YK-1BF-F7666A 76-inch diameter; constant speed
Length	22 ft 7 in
Height	6 ft 7 in
Wingspan	35 ft 6 in
Wing area	183 sq ft
Wing loading	9.8 lb/sq ft
Power loading	10 lb/hp
Seats	2 (tandem)
Empty weight	1,190 lb
Gross weight	1,800 lb
Useful load	610 lb
Payload w/full fuel	310 lb
Fuel capacity, std	52 gal (50 gal usable) 312 lb (300 lb usable)
Oil capacity	8 qt
Baggage capacity	50 lb, 10 cu ft

Performance

Takeoff distance, ground roll	200 ft
Takeoff distance over 50-ft obst	520 ft
Max demonstrated crosswind component	15 mph/13 kt
Rate of climb, sea level	1,500 fpm
Max level speed, sea level	145 mph/126 kt
Cruise speed-range w/45-min rsv, std fuel (fuel consumption) @ 55% power, best economy 7,500 ft	130 mph/112 KTAS/600 nm (46 pph/7.7 gph)
Service ceiling	20,000 ft
Landing distance over 50-ft obst	1,400 ft
Landing distance, ground roll	350 ft

Limiting and Recommended Airspeeds

Vx (best angle of climb)	58 mph/50 KIAS
Vy (best rate of climb)	73 mph/63 KIAS
Va (design maneuvering)	94 mph/82 KIAS
Vfe (max flap extended)	73 mph/63 KIAS
Vno (max structural cruising)	119 mph/103 KIAS
Vne (never exceed)	152 mph/132 KIAS
Vs1 (stall clean)	51 mph/44 KIAS
Vso (stall in landing configuration)	45 mph/39 KIAS

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted.