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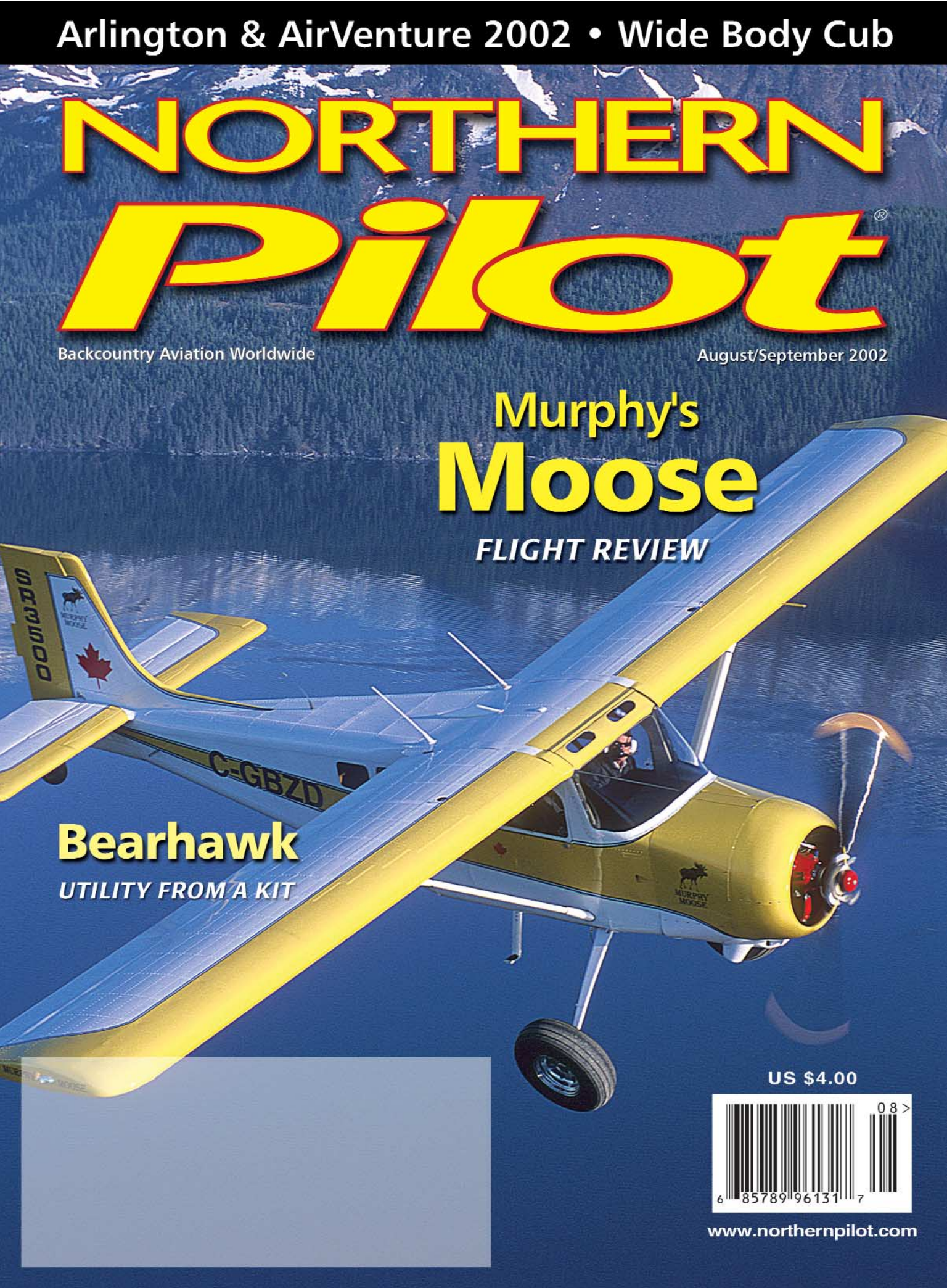
FLIGHT REVIEW



Bearhawk

UTILITY FROM A KIT

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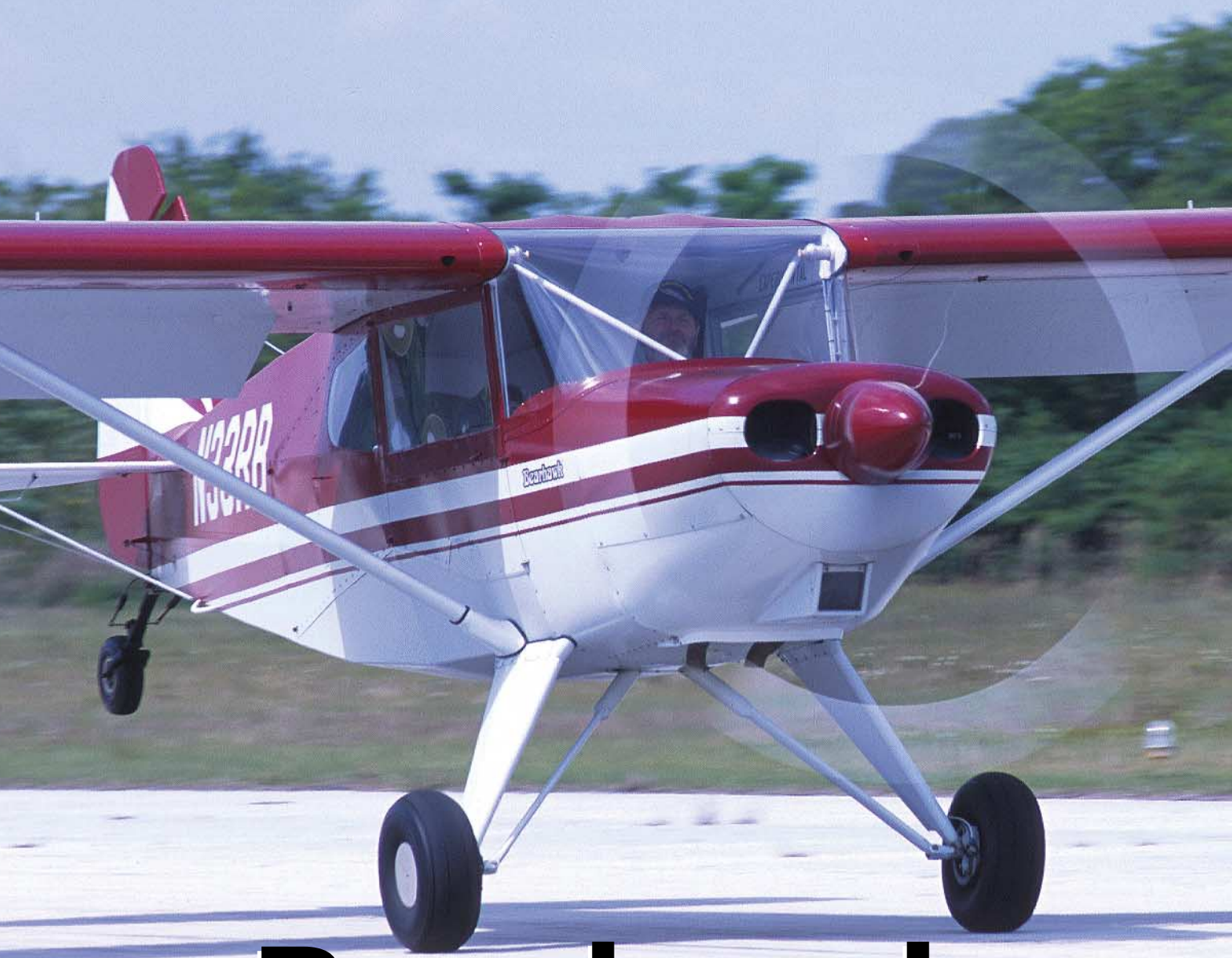


Bearhawk

COMBINING UTILITY WITH AIRPLANE

Story and photography by David Kujawa

The Bearhawk puts the concepts of utility and airplane back into the same sentence. A no-nonsense, homebuilt airplane with four seats, 1,100 to 1,300-pound useful load, good cruise speed and awesome short field performance, the Bearhawk can be built from scratch or kit.

Like many other amateur-built aircraft, the Bearhawk was designed to fulfill a need not being met by certificated airplanes. Bob Barrows, owner of an engine building business catering to homebuilders, had been using a Cessna 170 to haul engine parts and deliver completed engines to customers, oftentimes into and out of short fields. He became dissatisfied with the performance of the C-170, so as a long-time professional engineer with two successful airplane designs behind him, Barrows rolled up his sleeves and designed a true utility airplane to meet the performance perimeters he required. Little did he know at the time, that over 500 other pilots were looking for the same thing.

Bearhawk by the plans

In late 1994, after the completion of his first Bearhawk, people began asking Barrows for plans, eventually he determined that he could sell 50 sets of plans — enough to make it worth his while. Relying on his experience as a mechanical engineer Barrows produced drawings that more than satisfied builders — selling over 540 sets to date.

Building an airplane is a major project for anyone; if you're not into large projects you don't want to do a homebuilt. In relation to many other homebuilts, however, the Bearhawk can be built with a minimum of tools and without a lot of special equipment. There are no complex parts or major machining operations. First-time and experienced builders alike are constructing Bearhawks.

The plane utilizes proven design techniques and standard aircraft building materials — no high technology here. Barrows wanted something durable and inexpensive.

IT'S RUDIMENTARY, UNCOMPLICATED, HAS NO TRICKS AND DOES WHAT IT'S DESIGNED TO DO.

The fuselage and tail feathers are 4130 steel tubing with fabric covering. The wing is all aluminum and single-strut braced. Barrows selected the high-lift 4412 airfoil for its combination of good short field performance and acceptable cruise speed characteristics.

The flaps and ailerons are framed in aluminum and covered with fabric. The main landing gear is a Maule-type oil-spring shock and is probably the most complex item a builder has to make. Barrows chose this style of landing gear over spring steel because it spreads the landing loads out over the fuselage. If you land on an uneven surface there isn't a big moment arm trying to bend back the gear and rip it out of a gearbox. The spring-hydraulic system also limits the amount of rebound on hard landings. The tailwheel assembly (Barrows' design, plans available) is made from steel and, based on the fork size, can accommodate a variety of tire sizes up to 500 x 5. Information for float attachment points is included in the drawings; the use of heavier wall tubing in a few fuselage points is required for floats.

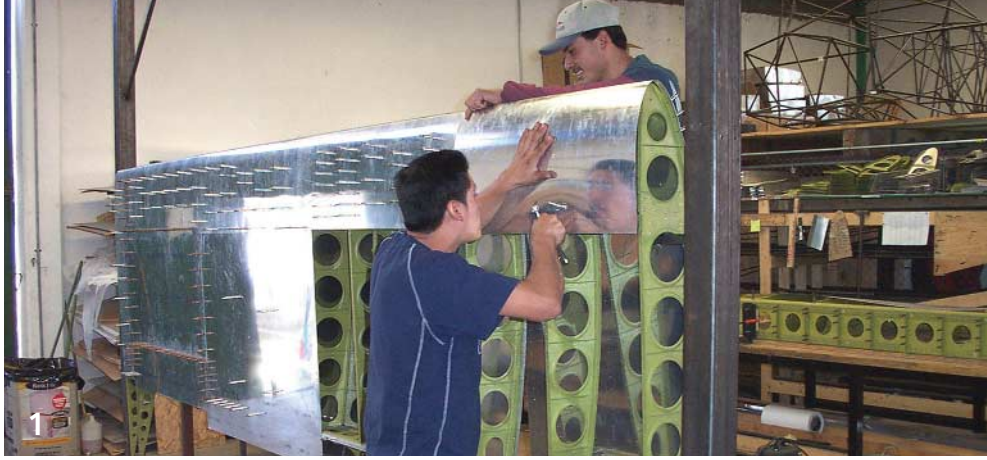
The front doors on both sides are two-piece. The bottom half is hinged forward and the top half — a large window — folds up. Front and rear seat room is slightly larger than a Cessna 172. The rear seat is accessed by a rear door on the right side of the fuselage. The optional cargo door is located behind the rear seat door — a combined opening of six feet — resulting in a huge cargo space when the rear seat is removed. Cessna-type wing root air inlets provide fresh air into the cabin. A muffler shroud captures hot air that is routed to the cockpit providing cabin heat.

A stick connects your hand to the ailerons and elevator. Cables and pulleys actuate all flight controls with a bellcrank attached to a short push rod for the ailerons. Toe brakes atop the rudder pedals activate the brakes. The elevator trim wheel is located overhead. Huge, wide chord flaps (simple hinged-type, five-position with extension to 50 degrees) go up and down manually via a Johnson bar-type handle positioned on the floor between the front seats. The panel contains adequate space for avionics.

Barrows is a fan of the 180 hp Lycoming so he felt 150 to 180 hp would be the standard powerplant for the Bearhawk, but he also made sure there was enough strength in the design to handle the weight, thrust and forces encountered with a 250 or 260 hp engine. This design latitude allows builders to use automotive engines of all different configurations in addition to various aircraft engines.

Barrows made a concerted effort to keep his second Bearhawk, powered by a 260 hp Lycoming, as light as possible (a little over 1,100 pounds empty weight). The airplane was built according to plans, but the use of aircraft fabric and cloth in the interior along with a floor made of 0.032-inch aluminum instead of 1/4-inch plywood helped keep the pounds off. There's not much of an electrical system, but there is a starter and battery for the big six-cylinder Lycoming. Barrows uses handheld radios, saving a little more weight. A few pounds here and there will add up, or in this case subtract, from the empty weight. In true homebuilder fashion, Barrows even built his own three-blade, composite propeller based on a Hoffman hub.

The designer of a true utility airplane — Bob Barrows with his Bearhawk.



Bearhawk kit construction at the AviPro factory. 1. Vertical jigs are used for final wing skinning. All internal wing components are primed prior to assembly. 2. All major components are gas welded with the critical areas stressed relieved. 3. The fuselage jig is in the upper left corner and one of two vertical wing jigs is on the right.

He flew his first Bearhawk, powered by a 180 hp Lycoming, to Alaska. On the way, he had no trouble crossing mountain ranges such as the Tetons saying, "It's like they weren't even there. You just push the throttle in and go right over them. Mountain height doesn't really matter. If you've got any chance of breathing up there the engine will breathe better than you do and the airplane will fly better than you will."

Building time for a basic, plans-built Bearhawk is in the 2,500 to 3,000 hour range for someone with average skills. This is time spent building the airplane, not including time for jig or fixture building or educational time.

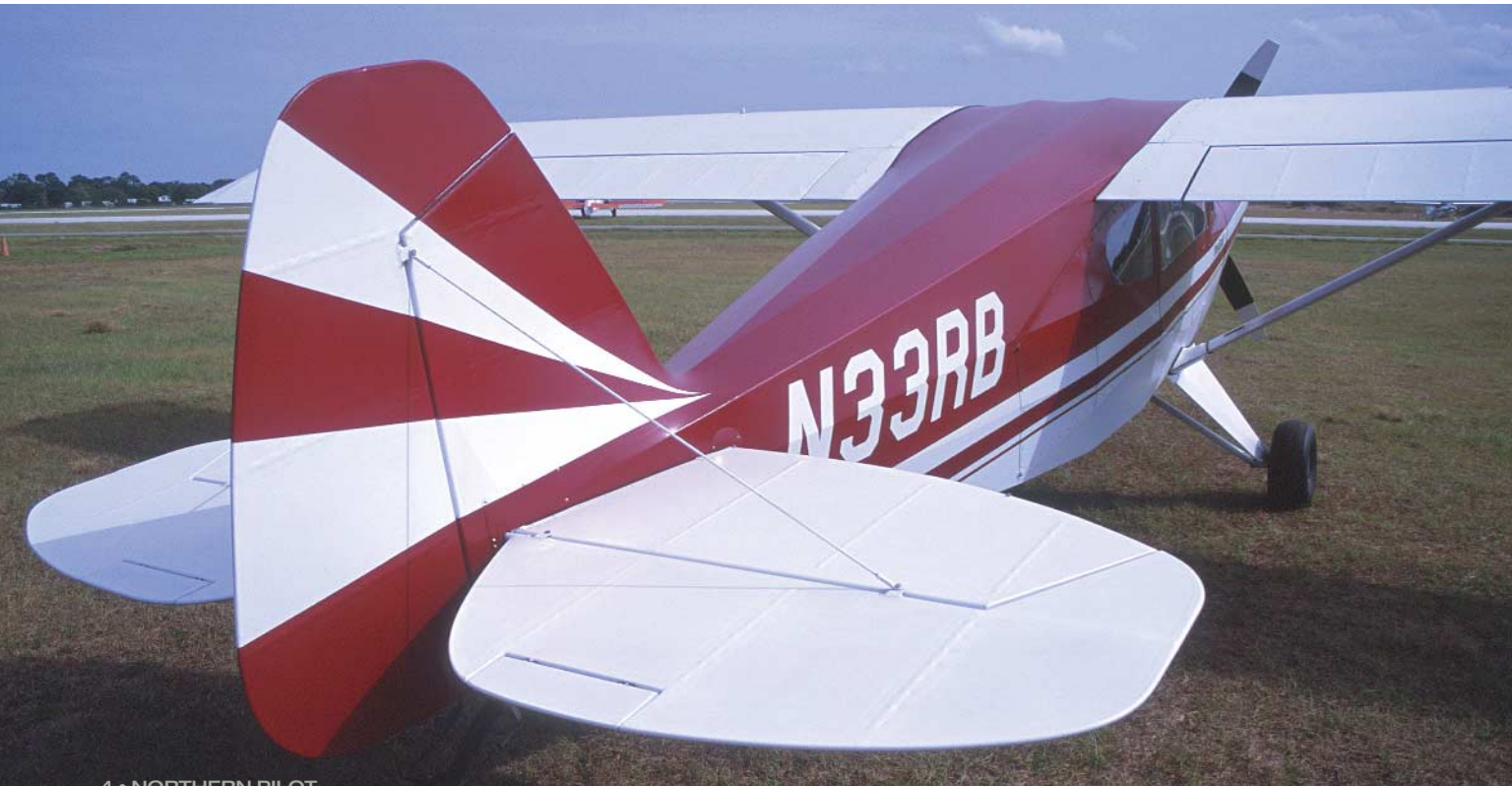
Bearhawk by the Kit

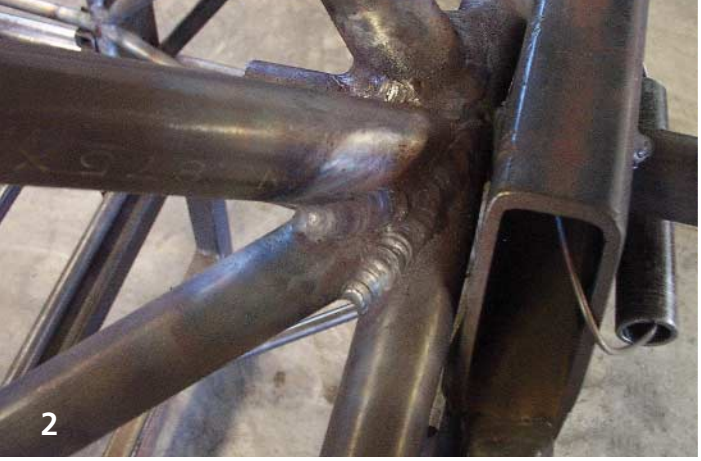
Not interested in spending 2,500-plus hours building your Bearhawk? Enter Budd Davisson and AviPro Aircraft Ltd., manufacturer of the kit Bearhawk. Saying those magic words "send me a quickbuild kit" will put you about 1,700 hours closer to a flying Bearhawk.

Davisson, an aeronautical engineer in addition to his career as an aviation writer, first encountered Barrows' 180 hp Bearhawk at Oshkosh in 1995. What he saw and flew was a straightforward, utility airplane that could have been built by any one of the general aviation aircraft manufacturers. He says it's "a ball-peen hammer" airplane. It's rudimentary, uncomplicated, has no tricks and does what it's designed to do. What truly impressed Davisson were the Bearhawk's flying qualities. Many homebuilt airplanes have some trait in their handling character that needs to be compensated for. Not so with the Bearhawk; its harmonized control forces and middle of the road stability profile are uncompromised.

Davisson felt so strongly about the abilities of the Bearhawk that he thought it would be an ideal candidate

IT'S EASY TO FLY A TIGHT-IN APPROACH WITH THE BEARHAWK. WITH ALL THOSE FLAPS, ALL THAT HORSEPOWER AND FLIGHT CONTROL AUTHORITY IT'S ALMOST TAUNTING YOU TO PICK A SPECIFIC SPOT TO LAND ON.

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for a kit. The Bearhawk was becoming popular in scratch-built form, but many potential builders don't have the time to build an airplane piece by piece. With Barrows's blessing, Davisson started contract negotiations with a manufacturing company in Romania with which he was familiar and began promoting the availability of the kit.

He was close to signing contracts with the Romanians when one of the early quickbuild buyers offered to provide funding for the operation and to provide manufacturing contacts in Mexico. Davisson traveled to Atlixco, reviewed the opportunity and the Bearhawk kit found a home. Tooling up and training began soon thereafter.

Major tooling (jigs and fixtures) was built in the U.S. with Barrows' approval and inspection. All of the aluminum and steel used in kit construction, tooling and other required equipment was shipped from the States to the Atlixco plant. Barrows makes periodic visits to the plant to ensure quality control. To order a kit the builder must first purchase the plans — another way Barrows keeps a watchful eye on the process.

All major components are gas welded with the critical areas stress relieved. AviPro uses gas welding because they feel the thermal shock to the 4130 chromoly is less and easier to control than TIG or MIG welding. A long cool-down cycle for each weld is part of their welding procedure. Smaller components like the tail surfaces are TIG welded and stress relieved.

To control distortion and obtain maximum accuracy, fuselages are welded as completely as possible in a massive master jig. Five-point motor mount bushings are welded in place to accommodate various four- and six-cylinder engine installations. Secondary jigs are used to weld the fittings, tabs and bushings necessary to attach various systems to the fuselage. All AviPro fuselages come with the cargo door and float fittings installed. The height of the instrument panel has been increased by one inch in the kit version to allow more room for radios.

A horizontal jig table is used for initial wing construction. All individual wing parts are primed prior to assembly. The ribs, spars and all internal parts are trued and riveted together. Vertical jigs are used to skin the wings.

All sub-assemblies, such as the landing gear and rudder pedals, are welded-in hard fixtures, making each part interchangeable with the next, resulting in extremely accurate assembly for the kit builder.

AviPro Quickbuilds

The AviPro quickbuild kits include all of the parts specific to the Bearhawk. All prices listed here are FOB Austin, Texas. The rest of the materials (bolts, pulleys, cable, etc.) can be ordered direct from Wicks Aircraft Supply (800-221-9425 or www.wicksaircraft.com). Just tell them you're building a Bearhawk kit and they'll send you all the hardware parts needed to complete the airplane.

The quickbuild kit features a completely welded fuselage, painted and ready for stringers, cover and systems installation. Landing gear and tail feathers are finished and ready for installation and cover. The control system is fabricated and ready to install. The wings are finished with only the top skin, which is already riveted at the spar, drilled and dimpled, to be final riveted. Control surfaces are assembled and ready for cover. Wing struts are finished and drilled. Fuel tanks are ready to install and the motor mount is ready to install (choices include Lycoming 0-320/360, 0-540 and Continental 0-470). The firewall and boot cowl are marked, drilled and ready for assembly. Price is $25,500.

Quickbuild completion time is in the 1,000 to 1,300 hour range. The quickbuild kit conforms to the FAA 51 percent rule. Paperwork has been filed and the Bearhawk should be on the 51 percent "approved list" by the time you read this.

Other Kit Options

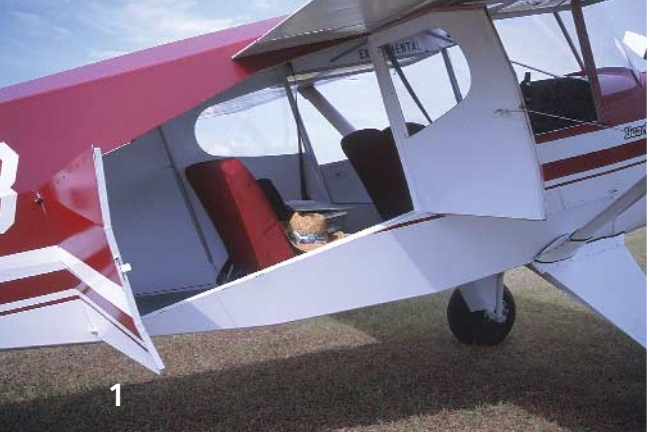
For those builders who want the convenience of a kit plus budget flexibility, there are options to the all-at-once quickbuild. A fuselage/tail/landing gear kit is $10,500 and includes the complete fuselage with the tail feathers and landing gear ready for cover and installation. A bare, welded fuselage kit with wing, landing gear and horizontal tail fittings attached is $5,650.

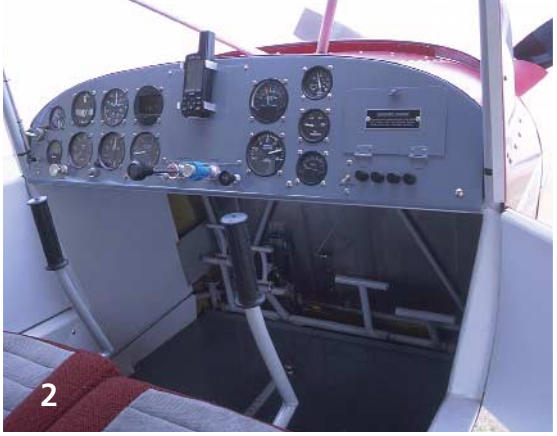
The ultra wing kit is $9,700 for the complete wing (skinned with top skin partially attached) with control surfaces finished and ready for cover and installation. Fuel tanks, struts and wingtips are optional. The standard wing kit contains formed ribs, completely finished spars, skins trimmed and drilled and all internal parts and hinges finished for $6,900. Fuel tanks, struts and wingtips are optional. The wing component kit containing ribs and spars only is $3,795.

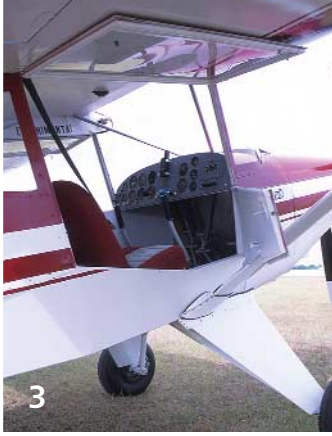
AviPro is in the process of building two demonstration aircraft. One will be located in Kissimmee, Fla., and will be available for demo rides only. The other will be located in Phoenix, Ariz., and will be incorporated into Davisson's specialized flight school (he gives Pitts Special landing checkouts) and available for demo rides and training/checkouts.

Flying It

I had the rare opportunity for a brief flight in the Bearhawk at Sun 'n Fun 2002. I say rare because there are only five Bearhawks (with engines from 160 hp to 260 hp) currently flying. This one







happened to be none other than Bob Barrows' personal airplane with an O-540.

The first thing I noticed was the Bearhawk's nice proportions. Either an airplane looks good or it doesn't and the Bearhawk just looks right. The next thing I noticed was its three-point stance. The Bearhawk has impressive prop clearance, just the sort of thing you'd want for flying out of unimproved fields. Walking around the Bearhawk I noted the generous size of all the flight control surfaces, including the flaps. I like airplanes that have a muscular attitude and the Bearhawk's robust design makes it the kind of airplane that says to me, "Take me out and let's play hard."

I couldn't wait to saddle up this lightweight, 260 hp monster. I had no trouble climbing into the front seat in spite of the lack of a foot peg or step. (The kit aircraft all have a foot peg.) Remember, Barrows' building mantra is "keep it light" and this extends to numerous details. Earplugs would be advisable, as there were no radios and consequently no headsets. After getting the seat adjusted I checked to find quite a space between the headliner and the top of my head. There was plenty of room for my 5-foot 11-inch frame. Even without a skylight, the interior was very brightly lit, thanks to the generous amount of plexi surrounding the cabin and the above-the-eye line mounting of the wings.

The stick, throttle and flap handle were all within easy reach. The engine was already hot from Barrows' flight over from Lakeland so the O-540 popped right off. Taxiing is a breeze. Visibility over the nose, even with the Bearhawk's nose-high, three-point stance, is good because the top corners of the instrument panel curve down near the sides of the windshield. If I had been sitting on a one-inch cushion, I could have seen completely over the nose. Run-up is standard airplane stuff and we were soon positioned on the runway for takeoff with two notches (20 degrees) of flaps hanging out.

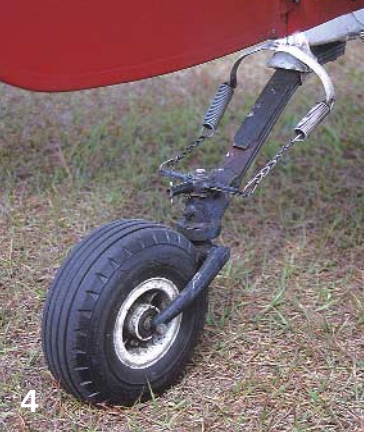
THE BEARHAWK HAS A LOT OF FLIGHT CONTROL AUTHORITY IN BOTH CRUISE AND AT SLOW SPEED. IN SLOW FLIGHT THE AIRPLANE DID EXACTLY WHAT I TOLD IT TO DO WITHOUT ANY MUSHINESS IN THE CONTROLS, ESPECIALLY THE AILERONS.

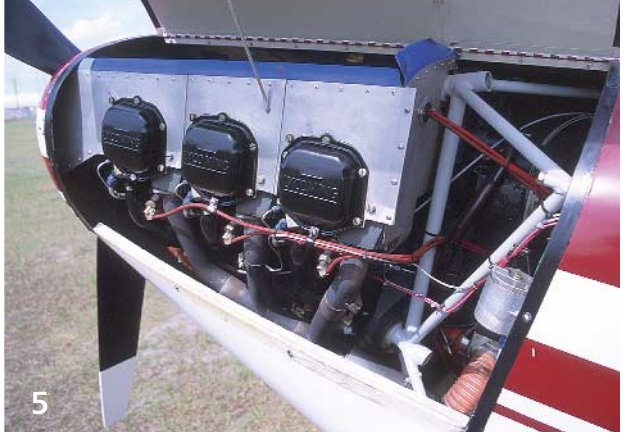
I must have blinked, because one moment we were sitting there and the next moment I was pushing the nose over to keep from exploding through traffic pattern altitude with half of the runway still in front of us. It was that fast. The airplane blasted off the ground before the throttle was in all the way and long before I caught up with it. I'd like to describe its directional stability during the takeoff roll, but I can't because it happened entirely too quickly for me to do anything but hang on. I didn't even have time to raise the tail. The throttle went in, the engine got really loud and we were climbing. That was it.

The takeoff roll couldn't have been more than 200 feet and we only had a slight breeze on the nose. Granted, it was just Barrows and I in the airplane with close to full fuel, so we were nowhere near gross weight. The rate of climb had to be in excess of 2,000 feet per minute, but without a VSI that's just a guess. Besides, my mind was still sitting back on the runway. I'm glad my hands and feet knew what to do. This thing would be amazing with even the most rudimentary short field techniques applied. I'll bet a rolling takeoff wouldn't take 100 feet.

Pulling the power and the prop back to more reasonable numbers helped lower the nose from our ridiculous climb angle. Barrows never runs his engines hard, so I set up his recommended cruise configuration of 20 squared. With the O-540 loafing along the airspeed indicated a little over 120 mph indicated, for about 127 mph true at our temperature and altitude. I wondered what this thing would do balls-to-the-wall, but since it wasn't my airplane I had to use my imagination. Davisson says his tests on the same airplane gave an honest 158 mph true at 23 inches of manifold and 2,300 rpm. On the other hand, at Barrows' low power settings he's only burning 7.5 gallons per hour, which with the standard 55-gallon tanks (two 10 gallon aux tanks in the wings are optional), gives the airplane a lot more endurance than most of our bladders have.

The Bearhawk has a lot of flight control authority in both cruise and at slow speed. In slow flight the airplane did exactly what I told it to do without any mushiness in the controls, especially the ailerons. Not that I couldn't tell when the airplane was approaching a stall, which happens somewhere around 40 mph indicated, but rather I still had excellent aileron control authority. It was easy to fly with two fingers on the stick while in cruise, a nice trait for crosscountry flying. The ailerons have a distinctly Beechcraft feel to them because the pressures are fairly light and the response is immediate. They are much nicer than any Cessna and remain that way right down to stall. In fact, at 45 mph, with





1. Rear seat door and cargo door provide a six-foot opening to the cargo area. Back seat is removable for increased storage. **2.** Spartan interior keeps Barrows' Bearhawk light. **3.** Lower half of front door swings out and large side window folds up. **4.** Barrows' designed tailwheel can accommodate up to a 500 x 5 tire. **5.** A builders dream — room for horsepower. 260 hp Lycoming installation shown.

just a little power, you can fly the airplane around with as much confidence as you can at cruise. It's really solid. The Bearhawk is lightly wing loaded and the ride is reminiscent of a Super Cub. No doubt a couple hundred pounds of gear in the back would settle things down.

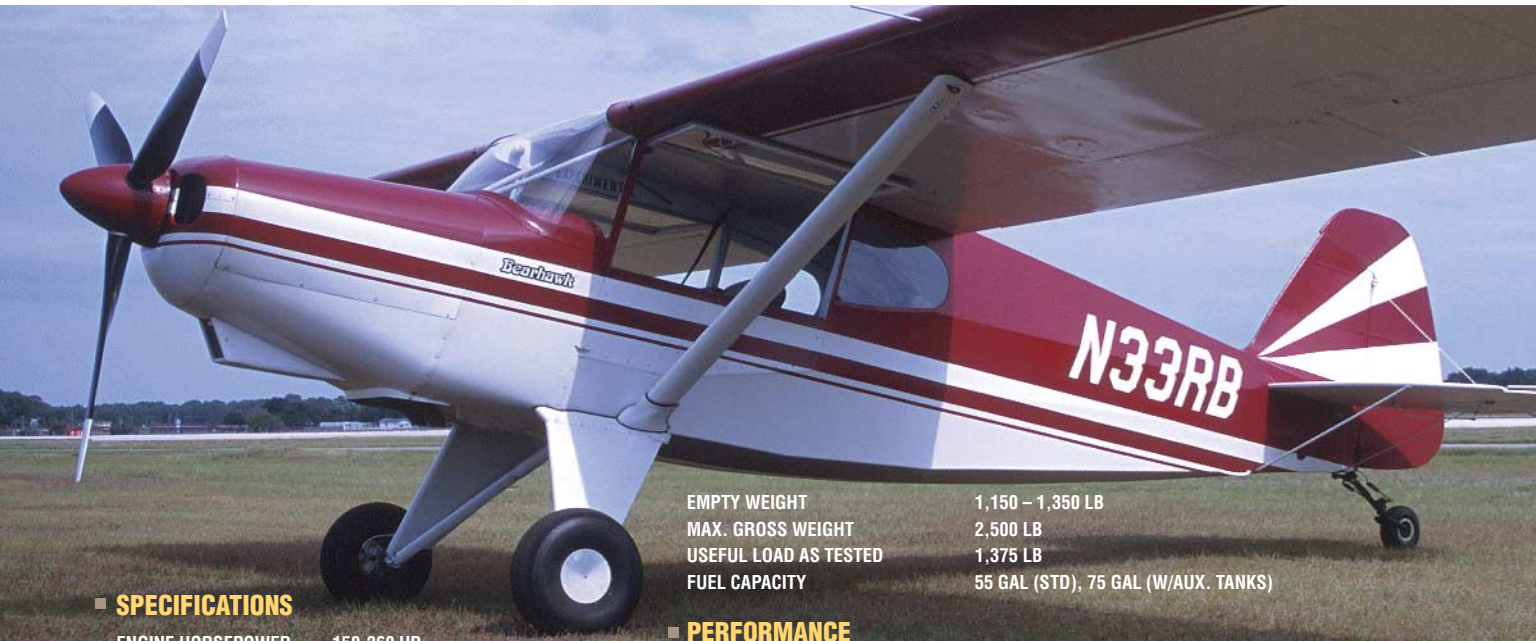
All too soon it was time to head back to the airport. Power back abeam the numbers we put out one notch of flaps at 80 mph and grabbed a second notch on base at around 65 mph. It's easy to fly a tight-in approach with the Bearhawk. With all those flaps, all that horsepower and flight control authority it's almost taunting you to pick a specific spot to land on. If you can't hit it it's your fault because the airplane is giving you more than enough tools to do it with. Down the pipe at 60 mph and set it on (Barrows recommends 45 mph on final for short fields). No brain surgery here. And no bad habits on the ground either. In fact, the airplane touches down and rolls out very much like a Citabria, but the gear feels much more solid. It's about as well behaved as a taildragger can be. Davisson has flown the airplane in some really nasty crosswinds and says its control authority lets you three-point it with ease even with a big gust spread.

Probably the biggest compliment I can give the airplane is that I totally forgot I was flying a homebuilt airplane. Everything about it felt like a factory-built machine that was designed specifically for the same role as the much-vaunted Cessna 180, but at a much lower price and using more easily repairable material (rag and tube). With its bigger engine and lighter weight, the Bearhawk's performance is much higher and the utility is still there. This thing is a backcountry pickup truck with wings that is also capable of taking you into town at a pretty good clip. I can hardly wait to play with this airplane when it's mounted on a set of 29-inch tundra tires!

Folks, I think we've just been introduced to a new standard in practical, four-place, homebuilt airplanes. The Bearhawk's roominess, load hauling capability, speed and agility combine to put utility back into airplane.

For plans contact Bob Barrows, 2079 Breckinridge Mill Rd., Fincastle, VA 24090, 540-473-3661.

For kits contact: AviPro Aircraft, Ltd, 3536 E. Shangri-La Rd., Phoenix, AZ, 85028 602-971-3768, www.bearhawkaircraft.com ■



SPECIFICATIONS

ENGINE HORSEPOWER	150-260 HP
LENGTH	23 FT 6 IN
WING SPAN	33 FT
WING AREA	180 SQ FT
WING LOADING	13.89 LB/SQ FT
POWER LOADING	13.89 – 9.61 LB/HP
SEATS	4
CABIN WIDTH	42 IN
CABIN LENGTH	9 FT 8 IN (FIREWALL AFT)
EMPTY WEIGHT	1,150 – 1,350 LB
MAX. GROSS WEIGHT	2,500 LB
USEFUL LOAD AS TESTED	1,375 LB
FUEL CAPACITY	55 GAL (STD), 75 GAL (W/AUX. TANKS)

PERFORMANCE

TAKEOFF ROLL	200-500 FT, DEMONSTRATED (depends on engine)
RATE OF CLIMB @ GROSS	1,700 FPM
CRUISE SPEED @ 60% (260 HP)	155-160 MPH (TAS)
CRUISE SPEED @ 60% (180 HP)	140 MPH (TAS)
RANGE @ 65% (ESTIMATED)	650 MI
RANGE @ 50% (ESTIMATED)	900 MI
V_{NE}	175 MPH (IAS)
LANDING SPEED	40 MPH (IAS)