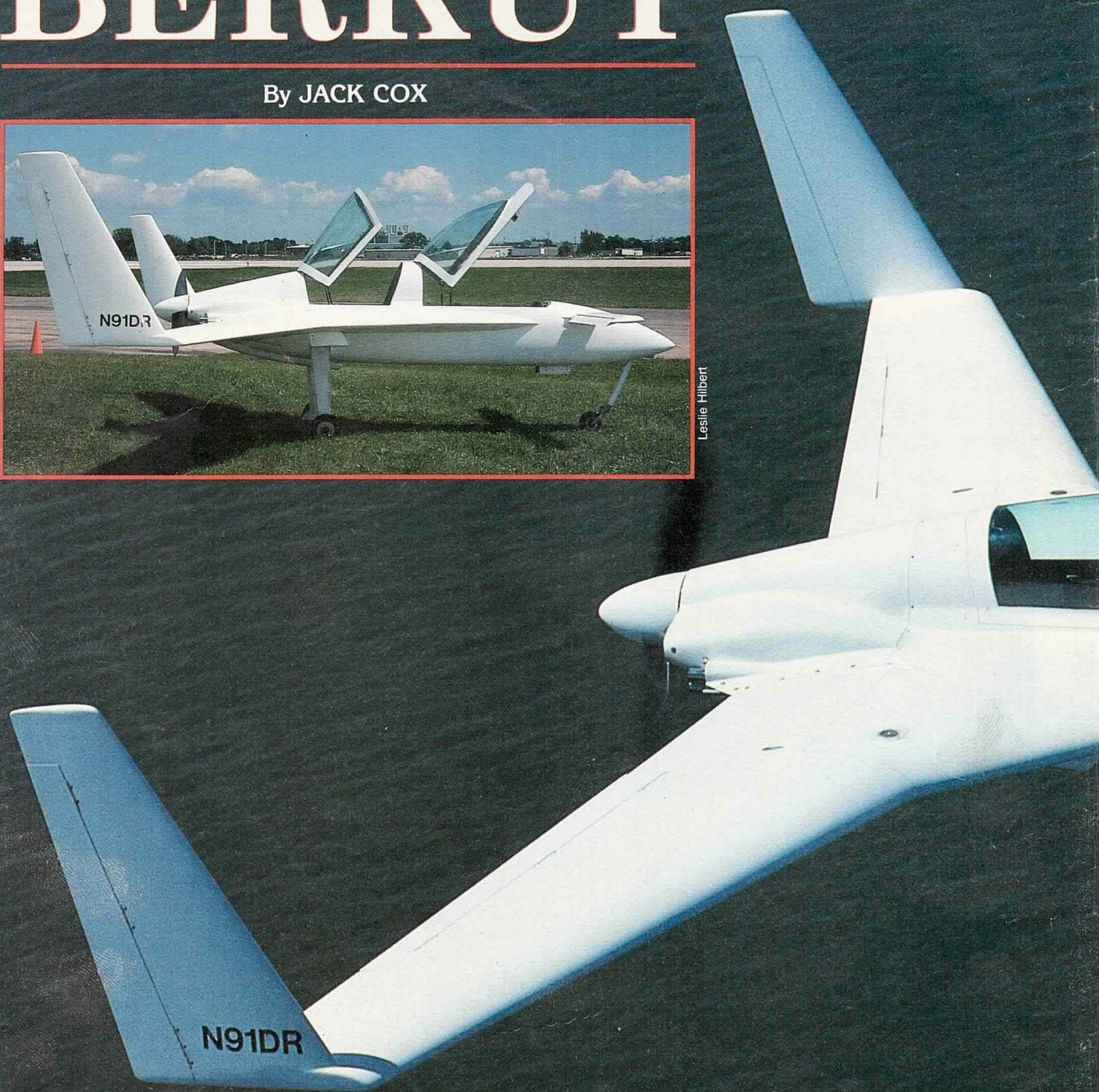


BERKUT

By JACK COX



Leslie Hilbert



At one of his forums at Oshkosh '91 someone asked Burt Rutan what he considered to be his most successful design. His answer was: "From the standpoint of the number built and how well the airplane carried out its intended mission, I guess I would have to say the Long-EZ."

Introduced in 1979, the Long-EZ has become one of the most popular home-built designs of all times . . . and is also proving to be one of the most durable. Although the plans were withdrawn from the market in 1985, examples are still being built today and they still show up in greater numbers than any other

design at Oshkosh each summer. Yet, in spite of the continuing popularity and success of the design, there are many who believe that Burt got out of the homebuilding business before fully exploiting the possibilities inherent in the basic Long-EZ design. As a result, others have come along to create the

spin-offs builders have asked for ... others like Nat Puffer who, with his Cozy, has fulfilled the wishes of those who prefer side-by-side to tandem seating. And more recently, both Nat with his Cozy Mk. IV and and Danny Maher with his Velocity have answered the call for 4-seat canards at least initially inspired by the Long-EZ.

When Burt Rutan designed the VariEze in the early 1970s, one of his goals was to create a new method of building an airframe ... a quicker, easier, less expensive method. His "moldless composite" building system was revolutionary in 1975 and is still preferred by many today, but it did involve a lot of laborious finish work. When the Glasair opened the decade of the '80s with a completely molded airframe ... and the promise of even faster building times ... EAAers began to ask Burt for a molded version of the Long-EZ. He was already moving into other areas of aeronautical endeavor, however, and would withdraw from the homebuilt

around for a closer look. What they saw were features like a retractable main gear, an obviously wider fuselage and taller canopy ... and a very unusual propeller.

"What is it?"

"A Berkut."

"A Ber ... what?"

That little scenario went on all week at Oshkosh '91, so in case you did not see the item on the airplane in last month's issue, the name is pronounced "Ber-koot" and has been assigned to a species of eagle native to the Soviet republic of Kirghizia. A powerful bird, they are trained by natives of the area to seek out and attack predatory wolves.

The person climbing out of the airplane and admitting to being responsible for its design and construction was Dave Ronneberg of Santa Monica, California ... who was immediately hemmed in between the canard and the wing strake by the shoulder-to-shoulder crowd and subjected to a barrage of questions. Before he was finally re-



Dave Ronneberg

Carl Schuppel Photos



market before any serious consideration of the requests could be made. His Solitaire powered sailplane of the early 1980s had a molded fuselage, so a molded, advanced version of the Long-EZ *might* have been a future development. In reality, however, such an airplane would exist only as a wistful might-have-been in the minds and hearts of the Rutan faithful ... until now.

Although it has been no secret while in development, particularly in the Los Angeles area and within the VariEze/Long-Ez community, most EAAers were caught unaware at Oshkosh '91 when what they thought was a Long-EZ came taxiing into the homebuilt parking area. However, when two separate canopies opened after the engine was shut down, most realized they were seeing something new ... and crowded

leased ... temporarily ... by his captors, they had extracted the following basic information:

- "Yes, the fuselage is molded, with a core of end grain balsa. There are two outer plies of unidirectional glass and one interior ply of bias cloth on a 45 degree orientation. There are three bulkheads between the nose and the firewall ... and the basic fuselage weighs 58 pounds.

- "The fuselage is 3.75 inches wider than a Long-EZ at the crew's shoulders, the cockpit is a foot longer and the canopy is 4-1/2 inches taller ... and, yes, there's plenty of room for your headset ... even a helmet.

- "The wing is essentially solid foam core Long-EZ construction, but it has carbon spar caps and an 8 ply shear

web rather than the 6 on the Long. The skins are carbon and the cloth weighs just 4-1/2 ounces ... compared to the 6 ounce glass cloth used in Long-EZs. The bottom skin is 3-ply instead of 2. The winglets are glass because there are antennas in them.

- "The canard has carbon spar caps, but otherwise is identical to a Roncz Long-EZ canard.

- "The engine is a Dick Demars' modified Lycoming IO-360 B1A ... with one mag and Klaus Savier's Light Speed Engineering electronic ignition in place of the other one. According to Demars, it produces 205 hp at 2,700 rpm. It has a 9.7 to 1 compression ratio, is balanced and has a beautifully painted case - just a jewel in appearance. What else? Well, a B&C starter and regulator,

airspeed is 54 knots indicated with the gear down, and 52 knots indicated clean. With Klaus' prop, we're averaging 2,000 fpm initially from sea level. The service ceiling is 32,000 feet. At reduced power, 65%, endurance is 5.5 hours, with reserves. The power loading is 9.75 pounds per horsepower.

• "The basic dimensions are: span - 26 ft. 8 in.; length - 18 ft. 6 in.; and the height to the top of the winglets is 7 ft. 6 in."

Luckily, we were able to spirit Dave away from his public one afternoon during Oshkosh '91 and sit down in a quiet place to discuss the Berkut in more depth. Some of my first questions were about Dave, himself. He is, I learned, one of those rare human beings actually born in Los Angeles . . . Santa Monica, to be specific . . . but who reversed the usual immigration process there by moving away and growing up in other parts of the country. His father was employed by an oil company and was constantly being moved to where the action was in that business. Dave lived in Tyler, TX until he was five, Roswell, NM until he was in the ninth grade in school, then after a brief sojourn back in LA, in New Jersey until he was 20. At that point he moved back to California . . . and in his words, ". . . spent five wonderful years as a ski bum during winter and a beach bum during the summer." This pleasant

but aimless existence came to a jarring halt in 1976, however, with the death of his older brother. The shock of coming to grips at so young an age with the fragility of life caused him to re-evaluate his own course. To his credit, he came to realize that there were no easy answers, no half a loaf alternatives. Nothing less than a 180 degree turn was required . . . and he had to have the courage and persistence to see it through.

The new course Dave set for himself was so unique to the Los Angeles area that it requires some explanation for residents of the rest of the world. The next time you fly into LA, look carefully down at the cityscape below . . . at the endless pattern of industrial parks and what appear from the air to be countless little strip malls. What, you'll wonder, goes on in all those places . . . and the answer is what makes the LA basin like no other place on the planet. The answer is . . . everything! Despite all the negatives one can dredge up to slander LA, it is, nevertheless, an entrepreneur's paradise. If there is any form of manufacturing or service activity that cannot be found somewhere in the basin, one simply has to conclude it is not needed by modern society. And if society needs something new . . . whether it realizes it or not . . . it very likely will have its start in one of those

reinforced concrete tilt-up buildings that spring up daily like mushrooms all over the area.

What all this means . . . and how it applied in Dave's case . . . is that a kind of informal but highly effective apprentice system is at work for those who care to avail themselves of it. If you're single, free to move about and willing to put up with low wages for a time, as Dave was, you can learn how to do almost anything by simply shifting from job to job in these endless little shops and offices.

Dave knew he had to set a goal for himself that was so difficult it would take all his brain power, concentration and all his effort to achieve it . . . and that, he eventually decided, was the design and building of his own airplane. He had always been interested in flying, but for a variety of reasons had never pursued it. Now he would learn to fly, learn what he had to about aircraft design and construction . . . by whatever means he could. He concedes today that, in the beginning, he was not certain he could pull it all off, but he knew he had to try.

To finance his flying and building, he began working at whatever a high school graduate with little in the way of previous job experience could get . . . driving a truck, working as a plumber's assistant, and as an apprentice carpenter. He progressed rapidly as a car-



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penter and soon was doing custom work in the booming construction industry LA was experiencing at the time - which put him into an unusual situation. He now had the money for flying lessons, but not the daylight hours since it was during the winter months. His solution was to learn to fly almost exclusively at night. With his instructor, Claude Bennett, he flew his first 30 hours or so from the Hawthorne, CA Airport after work . . . and after dark.

During this period, Dave met and went to work for Tom Aberle at the Compton, CA airport, initially on a one-shot project in which he would build a set of Starduster wings in exchange for Tom's welding up an engine mount for him. This worked into full-time employment with Tom, who operated his own custom building and maintenance shop . . . as well as doing some air racing in biplanes at Reno. Tom would later become the national Biplane champion in his highly modified Mong. This work experience on a variety of airplanes and all types of construction would prove to be invaluable to Dave in the years ahead.

After about a year and a half, Tom

moved his operation south to the Fallbrook, CA airport and Dave, who wanted to remain in the LA area, was out of work. Not too long afterwards, however, he came across a man who was building his own dream car, and after looking it over, decided to make the owner a bold proposition. The fellow was attempting to make a plug for his car body out of plaster . . . and not doing a very accurate job of it, in Dave's opinion . . . so he offered to build the aft end of the car in foam and glass for free, on the condition that if the owner liked his work, he would hire him at 10 dollars an hour to complete it. The car builder took him up on the deal on the spot . . . did like Dave's work and did hire him to complete the tooling. The work took about a year, after which Dave went back to carpentry to stay solvent.

All the while he had been working in fits and spurts on his own original design airplane, which was to be built of foam and glass. Burt Rutan's VariEze had come onto the market place by this time, and Dave was using a set of Eze building instructions to do what he terms some "reverse engineering" on the number of laminates for certain

areas, teaching himself to do hot wiring of foam cores, etc. Then one day a neighbor spotted his fuselage in his garage and strolled in to inquire if Dave knew anything about VariEzes. The long and short of this chance encounter was that it started Dave off on a new career as a custom aircraft builder . . . but with a difference. From the beginning, he believed that the 51% rule was a good one in that without doing at least that much work, the owner would never really have a feel for and an understanding of his airplane. His participation in the projects he would take on in the years ahead would be as a teacher as much as a builder, because he insisted that the owner do his agreed upon share of the work.

Dave's own project, his original design, was shelved and he began working on his own VariEze. Early on, however, the Long-EZ came on the market and with one of the early sets of building instructions he obtained by rushing to Mojave and standing in line for them, his Eze underwent a transformation and emerged as a modified Long-EZ. He flew it for the first time in April of 1983 . . . and became a full-fledged member

of the Santa Monica Rutan air force that was developing there.

During the decade of the '80s, Dave would participate in the building of 8 Long-EZs, many of which incorporated a number of non-aerodynamic modifications. During this period he also took 7 months off to go to work for Dick Rutan and Jeana Yeager on the Voyager . . . and was flying co-pilot with Jeana when she made her forced landing on a busy highway after experiencing a prop failure during a CAFE 400 race. Dave still recalls with awe the day the Voyager's carbon wing spars were hauled home to Mojave: "They looked like train rails . . . and when you tapped them, they sounded like rails! They were amazing structures!"

Returning to Santa Monica about the time Burt was departing the homebuilt market and beginning his association with Beech Aircraft, Dave once more delved into Long-EZ building activity . . . and began formalizing the idea that would eventually result in the Berkut. It did not come in a blinding flash of inspiration . . . rather, it was an evolutionary process stretched out over the decade of the '80s. Over the years, Dave had been mentally adding to a wish list all the things his customers and other EZ builders had indicated they would like to see changed and/or included on their airplanes . . . so that by 1985 he had a pretty clear picture in his mind of what would eventually show up at Oshkosh as the Berkut.

The Berkut-to-be actually had a false start in 1985. Dave had been working with a friend and fellow builder, Sam Kriedel, who was the head of Space Shuttle design at North American at the time, and both were interested in a taller, wider canopy for the Long-EZ. Sam was lofting a new fuselage for his airplane that involved a 4 inch stretch and a bigger canopy, and eventually came up with computer produced cross sections every ten inches down the entire length of the fuselage. The canopy that resulted was the one Dave would also utilize on the Berkut . . . cut into two parts so that a sturdy roll-over structure could be built between them. During this period, Dave also made the acquaintance of Don Murphy, who wanted assistance in producing an original design he had in mind. However, after seeing the Berkut-to-be, he agreed to become involved in that venture instead . . . providing financing for the production of a fuselage plug. The plug was built in Mojave by Andy Green, who had been involved with the construction of Scale Composite's proof of concept version of the Starship. As events would transpire, however, the plug would lie dormant in Dave's shop until 1989, when work on the project finally began in earnest. It would take a year and nine

months to build the prototype. A tremendous amount of effort was expended to create molds that would result in parts that fit easily and accurately. 17 tools were developed to make parts that fit one way and one way only, so that no expensive mistakes will be made by builders.

Dave flew the Berkut for the first time on July 11, 1991 at the Camarillo, CA airport, and was joined by Bram Arnold in flying off the 40 hour test time assigned by the FAA . . . with the big time pressure of getting it to Oshkosh staring them in the face. An airline pilot and a Navy Reserve Lt. Commander who flies F/A-18s on weekends, Bram thoroughly wrung out the airplane, taking it to all the corners of the envelope. There were 40.6 hours on the clock and a sign-off in the logs when the airplane was finally returned to its Santa Monica Airport base and immediately taken apart for an inspection and working off the gigs that been noted during the flight test period. There was no time to paint the airframe or install custom upholstery, but Dave and his partner, Don Murphy, flew the Berkut to Oshkosh '91. They encountered an area of thunderstorms in Colorado, landed and spent the night in Montrose, but easily made it into Oshkosh the following day. The total flight time was about 7.5 hours. At Montrose, the spinner was removed and the safety wire was cut off the prop bolts so they could be retorqued . . . just to be sure all was going well.

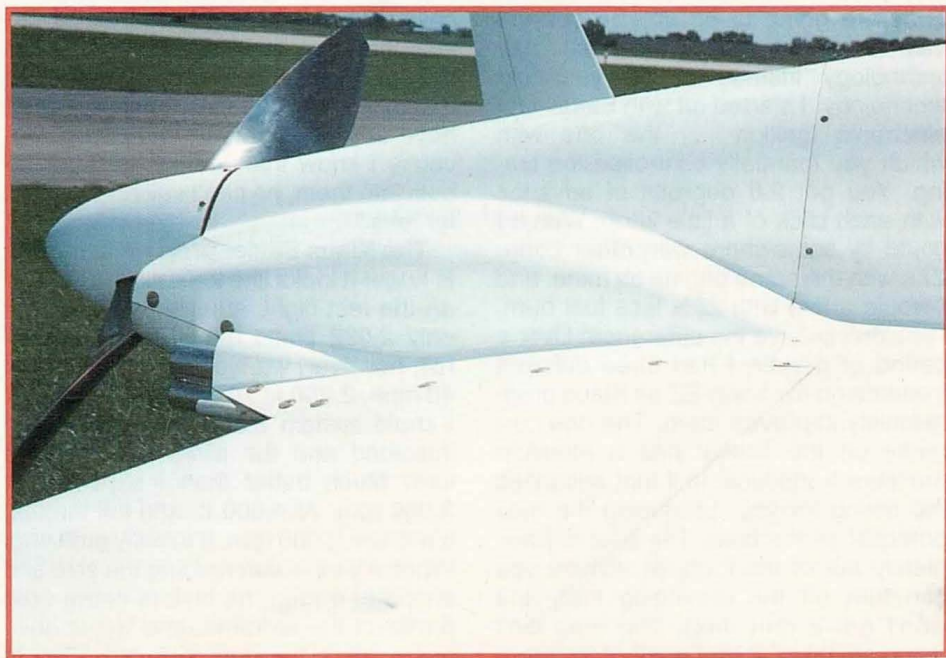
At Oshkosh, Dave, Don and their crew talked to EAAers until they were hoarse . . . and flew the Berkut at every opportunity. When they headed home the following week, they left behind them the impression that theirs was an unusually well sorted out airplane for a first timer at Oshkosh.

After covering the history of the

airplane's development and its physical makeup, the rest of our conversation settled on several specific areas of interest . . . such as:

The EZ relationship - Dave is very emphatic in acknowledging the Long-EZ heritage in the Berkut. "We've made a lot of modifications, the canopy, the landing gear, the wiring, the engine installation, but the essential airplane that Burt Rutan designed has not been altered in the Berkut. There are no changes in the flying surfaces and the control surfaces. I did not change the things that dictate how the airplane flies. I still think the Long-EZ is one of the finest airplanes I've ever flown or worked on. I'm not a professional engineer . . . I consider myself to be an extrapolator. I stick close to things I know and leave alone the things I don't know. I'm not in the same universe with Burt as a designer, builder and engineer . . . it has taken me ten years to learn enough to come up with a design like this, even with the Long-EZ as the starting point. I think the Berkut is a good extrapolation of the Long-EZ, however, and I'm proud of it."

Klaus Xavier's electronic ignition - I had Klaus' electronic ignition on my Long-EZ, replacing one of the mags. I flew it for about 400 hours and it worked flawlessly. During that period, however, I had three failures of the remaining mag . . . two of them mechanical and one electrical. As a result of that experience, I never intended to build the Berkut with anything but Klaus' system. People say its too expensive . . . but in a year or two they will be saving the amount of money they are afraid of spending . . . on fuel alone. They won't be spending it rebuilding mags, they're going to be hearing lower exhaust noises and they are going to be able to



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lean their engine **on the ground** like they have never been able to do before. They are going to be able to operate their engines utilizing present day technology instead of 50 year old technology. I started off with Klaus' first electronic ignition . . . the one with which you manually controlled the timing. You got 2.8 degrees of advance with each click of a little knob. With it I could fly somewhere with other Long-EZs with the same engine as mine, and I would arrive with 25% less fuel burn. I couldn't believe the difference! Over a period of a year, I had three different systems on my Long-EZ as Klaus progressively improved them. The one currently on the Berkut has a manifold pressure transducer in it that advances the timing for you, producing the max potential all the time. The pilot is completely out of the loop. At altitude you can turn off the remaining mag and won't get a rpm drop. The mag isn't doing anything at that point. If it's burn-

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ing anything, I'd be surprised . . . and the higher you go, the more this is the case. Klaus is the most methodical researcher I've ever seen. He'll go up over and over and over again gathering data. He is absolutely relentless. I don't have any problem with his prices, because I know that with all the work he puts into them, he can't sell his systems for less."

The Klaus Xavier prop - "Klaus' prop is huge! It looks like too much prop, and on the test flight, sure enough, we got only 2,022 static rpm. On the takeoff roll, however, we were seeing 2,150 at 40 mph, 2,250 at 70 and 2,300 at lift-off. I could sustain 2,300 at 110-115 mph indicated and the climb was really a kick! Much better than I expected at 2,300 rpm. At 4,000 ft. and full throttle, it will turn 2,900 rpm. It's really amazing. When Klaus is determining the size and shape of a prop, he factors in the drag profile of the airframe, and we've obviously got a low drag airframe. One of

the factors that allows the prop to perform as it does is the fact that it is so stiff. You can grab an aluminum prop at its tip and bend it and twist it, but you can't do either to this one. It is stiff! Over three times stiffer than any prop Klaus has ever made, he tells me. A friend of mine had a piece of a carbon cowl go through his Klaus Xavier prop on takeoff, and although the cowl was chopped to pieces, there wasn't a nick on the prop!"

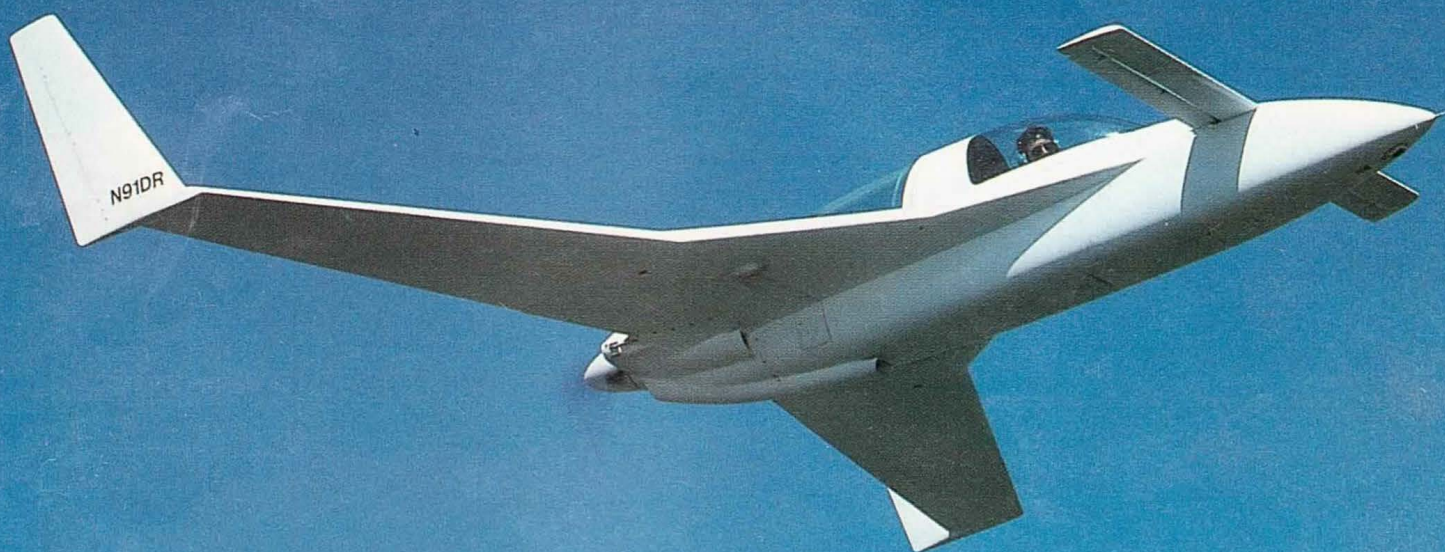
Cooling inlets - "I wanted to be absolutely certain Berkut's expensive engine cooled properly right from the beginning, so I decided to forego the flush NACA inlet and use ram air scoops. There's one on the bottom of the cowl for the intake system and the oil cooler, and a couple under the wings to direct ram air to the cylinders. The shape was sort of eyeballed, but has worked great from the beginning. The highest CHT I have seen is 370 degrees . . . and that was during the break-in period. There's only about a 40 degree spread between cylinders. The hottest cylinder is the forward right cylinder. 205 degrees on a 95 degree day was the highest I've seen for oil temperature. I'm quite happy with the cooling, and I don't think we're paying too high a drag penalty with our scoops."

Landing brake - "I don't know if our belly mounted air brake is absolutely necessary, because the gear is so draggy when it comes down . . . but the brake works well as a rock guard for the prop. I leave it down to keep gravel thrown up by the nose wheel out of the prop."

The Berkut kit - "I will write a building instruction book and we will have drawings for every part . . . all in an effort to answer as many of the builder's questions as we possibly can. The molded parts, as previously mentioned, will fit as accurately as we can make them fit, and will go together in just one way. Not all parts will be molded, however. There are some things, small components mostly, that simply do not lend themselves to molding. If you do, they come out weighing much more than a simple solid foam core structure. And, in turn, that additional weight of, say, a control surface means you have to use additional counterbalance weight. It's just bad every way you look at it.

"We will provide some of the weldments that are exclusive to the Berkut . . . the engine mount, machined parts in the main landing gear, etc., but the Long-EZ metal parts we call out can be bought from Ken Brock Manufacturing. I'm not going to manufacture anything I don't have to.

"Builders will have two wing options. The standard wing kit will be much like that in the Long-EZ program: a mate-



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rials kit and building instructions. The other option will be to have a factory designated company build the portion of the wing that involves critical alignment, holes, etc. This will involve considerable extra cost, but some builders prefer having this work done for them. In any case, the work remaining for the builder will fall well within the 51% rule."

Acknowledgements - "A lot of people helped make the Berkut possible and I'd like everyone to know who they are. First, my partner, Don Murphy, made the financial commitment that allowed everything else to fall in place. Otherwise, there would be no Berkut at this point. Others who have helped in a variety of ways are Diane Moser, John Hodson, Paul Barnes, Vern Simon, Chris Williams and Guy DallaRiva. I'm grateful

for all their support and assistance."

In mid-November, just before closing out this issue, a call was made to Dave to get an update on what has been happening with the Berkut program since Oshkosh. Incredibly, the airplane had been flown over 170 hours ... 120 or so since departing the Convention in early August ... so obviously there have been few problems with the engine, airframe and its systems. It has been painted ... white, of course ... and the trim scheme is still to be selected. The Berkut was displayed at the NBAA convention in Houston in late October and was well received by the business flyers ... but some of the most enthusiastic builders-to-be are military and ex-military fighter pilots. They see a lot of the appearance and

handling qualities in the Berkut they have enjoyed in jet fighters ... in a form they can afford as individuals. A number of them will be giving demo rides in the airplane for Experimental Aviation.

With all the flying that has been done since Oshkosh '91, Dave has been pleasantly surprised to find that the prototype Berkut has been exceeding many of the performance figures found in the brochure available at Oshkosh.

In mid-November, Dave told SPORT AVIATION that Experimental Aviation's goal was to begin shipment of Berkut kits in March. The price of the kit was still being worked out at that time. For further information, contact: Experimental Aviation, 3021 Airport Avenue, Suite 109, Santa Monica, CA 90405, phone 213/391-1943.