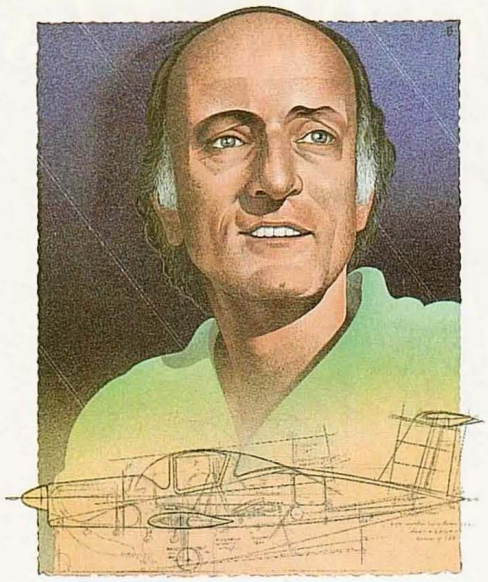

BY PETER GARRISON

TECHNICALITIES

BERKUT IS A LARGER LONG-EZ

Airplane designers don't love having their work tampered with. It isn't just a matter of ego: Endless careful reflection goes into designing an airplane, and a thoughtless modifier can do a lot of harm. So I was surprised when I asked Burt Rutan what he thought about the Berkut and he didn't start to vituperate. (Don't reach for your dictionary—it isn't there. A berkut is an eagle used by Kirghiz nomads for hunting.) Rutan was careful not to endorse the airplane, or any other airplane, conveyance or device of any type as suitable for any purpose whatever, because, he explained, he didn't want to be called as a witness; but he didn't *vituperate*.

What was remarkable about this complacency is that Rutan always used to be implacably resistant to modifications to his designs, and the Berkut is a frank—and unauthorized—makeover of Rutan's Long-EZ by Dave Ronneberg, who had worked on Voyager and then, as a professional hired-gun craftsman, had previously built seven Long-EZs for other people.

Rutan himself quit the homebuilt business years ago, but he left a legacy of canard designs—VariEze, Quickie, Long-EZ and Defiant—that still fascinate pilots, and that have been built and modified, and continue to be built and modified, in large numbers. The most popular of these is the Long-EZ, a two-seat tandem canard originally designed for the Lycoming O-235 and O-320 engines. The "Long," as its familiars call it, has a fixed main landing gear and retractable nose gear. Rutan was aiming for simplicity, and he made the nosewheel retractable not in order to reduce drag (though this was certainly a dividend) but in order to be able to park the airplane. Rear-engined tandem canard airplanes balance the engine with the pilot. When he climbs out, the airplane may tip over backward at the slightest impulse. Making virtue of necessity, Rutan provided the Long with the trademark "kneeling camel" parking position that in fact turns out to be a great convenience, making it unnecessary to chock or tie the airplane most of the time.

People often complained about the Long's fixed main gear; it was ugly and bowlegged and it certainly robbed a fast airplane of a few knots—nobody was ever sure how many, though Rutan always said it was not so many as you would suppose. As usual, people also wanted bigger engines, constant-speed props—you name it. They wanted more room for their feet, shoulders, hips, luggage and babies, they wanted to sit side by side, they wanted four seats instead of two, they wanted the rather lumpy fuselage to be sleeker . . .

Some Long-EZ variants have been entirely new designs, but the Berkut is essentially a new fuselage mated to the Long's flying surfaces. The kit, which combines prefabricated fuselage components with raw materials for the foam-core flying surfaces, is offered by Ronneberg's Santa Monica, California, company, Experimental Aviation Inc., for $26,890. The kit doesn't include engine, wiring, avionics or painting supplies.

At a glance you might take the Berkut for a Long-EZ, especially in flight; the wing and canard planforms and the shapes of the wingtip vertical fins are the same. A closer look reveals a number of differences. The most obvious is the electrohydraulic retractable landing gear. The stalky-looking main legs are mounted in the fuselage and swing outward into the wings. Hence the tiny Lamb tires: Nothing bigger would fit.

Almost equally striking is the canopy design. The Long-EZ's side-hinged one-piece canopy has been replaced by a two-piece arrangement like that of many two-place jets; the segments of the canopy are hinged at the rear top and open up and aft.

A subtler clue is the shape of the fuselage. Computer-lofted and built in molds, it's more graceful than that of the Long-EZ, and, incidentally, longer and wider inside. The added length is there not only to ease the torments of leggy rear-seat passengers, but also to balance a larger powerplant: a Lycoming IO-360 modified to yield 205 hp and driving a graphite two-blade propeller of 91-inch pitch.

It's customary to operate homebuilts at higher-than-normal rpm and altitude; between the two, you pick up quite a few knots. EAI advertises a maximum cruising speed of 208 knots at 2,840 rpm at 8,000 feet, and a top speed of 216 knots at 6,000 feet and 2,940 rpm. I noted 196 knots at 2,800 rpm at 8,500 feet with an OAT 20° C.

NOT ENTIRELY NEW, THE BERKUT IS ESSENTIALLY A NEW FUSELAGE MATED TO THE LONG-EZ'S FLYING SURFACES.

above standard, but I'm inclined to trust Ronneberg's figures, both because I believe him to be candid and because the airplane's performance in races has been in line with its published stats.

None too surprisingly, the Berkut flies a lot like a Long-EZ. Its control forces are light and well-balanced. Its lateral stability is about neutral, and it won't fly straight-and-level for long un-

less the air is perfectly smooth. As you would expect, a normal stall consists of mild "pitch bucking"—the nose rising and falling rhythmically as the canard stalls and unstalls.

Like the Long-EZ's, the Berkut's rudders deflect outward only; after the rudder pedal has traveled a few inches it begins to apply brake on that side. Ground steering is by differential braking, and is very precise and responsive. The system has the minor disadvantage that you can't rest your feet on the rudder pedals, because even light pressure begins to deflect the rudders. Normally, rudder pedals are interconnected in such a way that if you press on both at once, nothing happens. In this airplane, if you press on both at once, both rudders move outward. The builder can, of course, install his rudder pedals in such a way that his feet are comfortable, or place his feet between the pedals while flying. The Berkut is without adverse yaw, and it's generally unnecessary to use the rudders.

The combination of kneeling-camel parking and retractable gear obliged Ronneberg to find a way to isolate the nose gear from the system and retract it alone. I don't like the solution in the prototype, which requires that you first isolate the mains with a valve in the nose, then stand behind the canard and, while supporting the nose, reach into the cockpit for the normal gear switch. What's needed is a system operated by a single lever in the nose, and I'm sure that Ronneberg or one of his builders will soon come up with it.

Canards generally take off and land at higher speeds than conventional airplanes of similar wing loadings; and so they tend to use more runway. You don't land them in a full stall, because the stall in a canard airplane consists not of a general sinking but rather of the nose dropping; instead, you fly them on, as you would a jet. You also don't drag them off soft-field-fashion by holding aft stick through the takeoff roll; instead, you accelerate to flying speed with a neutral stick, pull back to lift the nose, and then arrest the rotation by relaxing back pressure.

In the Berkut the advantage of a low power loading (9.75 pounds per horsepower) is largely canceled by the steeply pitched cruise prop; takeoff performance is average, with a reported 1,000-foot ground roll. Landing, likewise, is neither long nor short; EAI cites a ground roll of 1,500 feet. Once airborne, the Berkut climbs 2,000 fpm at 120 KIAS.

A large belly-mounted air brake adds drag for descent and landing, and there's no limit-gear-lowering speed; so it's not hard to get down from altitude. The belly-board, manually actuated in the prototype, will be electrically actuated in later airplanes; in the prototype, you can't force it down above about 120 KIAS. The prototype has no warning for takeoff power combined with air brake open, as I found out when I inadvertently took off with the brake extended. My first clue (I somehow overlooked the buffetting) was that the rate of climb wasn't what it should have been; the airplane had no trouble getting off.

THE BERKUT IS STILL AT HEART A LONG-EZ, AND IT PRESERVES SOME OF THE LONG'S SHORTCOMINGS.

In spite of the changes, the Berkut is still at heart a Long-EZ, and it preserves some of the Long's shortcomings. The back seat provides limited downward visibility, and the passenger's foot position, while it's improved, is still not optimal. There is no luggage compartment; instead, the wing roots are hollowed out, requiring fitted or highly flexible valises. Of course, when you build a plane like this and can sail right past a Baron in it, tricky luggage doesn't seem too high a price to pay.

Getting aboard requires a kind of twisting leap, comical when performed by a beginner and becoming merely inconvenient with experience. It may be transformed into an edifying athletic display by a skilled practitioner; the rest of us will need the boarding step that's part of the kit, but not installed on the prototype.

The standard fuel-gauging system consists of standpipes in the wing roots; the pilot has to look over a shoulder to see them. This is tolerable for day VFR flying, but I think that for night and IFR, the risk of spatial disorientation from head-turning should be avoided, and builders should install senders in the tank roots and gauges on the panel.

Of course, the Long was designed as a fast, simple VFR airplane with an 800-pound empty weight: a sport plane. It has a high roll rate, does some aerobatics nicely (but no stalled maneuvers, such as snaps or spins), and is a great pleasure just to swoop around in. Naturally, however, people are tempted by the speed, economy, and the impression upon *hoi polloi* produced by swept wings, and the airplane gains a couple of hundred pounds and finds itself punching through embedded cu at night into Washington National. It's inevitable that an airplane this fast tends to evolve from special- to general-purpose use.

At speeds of 200 knots there may not be a lot of time to think about where you're going, and the small cockpit, in which the pilot sits in a semireclined position, makes handling charts rather inconvenient. You have to plan cross-country flights carefully, anticipate eventualities, and perhaps even cut your charts into strips. The Jepp case will stay at home. In an airplane this fast and light on the controls, incidentally, a wing-leveler should be considered a requirement for all but the most incidental IFR flying.

Since I had first flown the Long's precursor, the VariEze prototype, back in the late 1970s when it didn't even have ailerons (Rutan's hope then had been to use the canard flaps for roll as well as pitch control), I found it interesting to see how far the design has come since then. The original engine was a VW and everyone was impressed that the airplane could do 150 knots. The biggest engine that's been used in a Long so far (to my knowledge) is the 180-hp Lycoming O-360; thus powered, it can do about 200 knots flat out.

The Berkut's additional speed (credit for which you may divvy up any way you like between drag reduction and power increase), the aesthetic effect of retractable gear, the time saving of a largely prefabricated fuselage, and the high quality of Experimental Aviation's composite components will make this aircraft a tempting alternative to a Long-EZ. □