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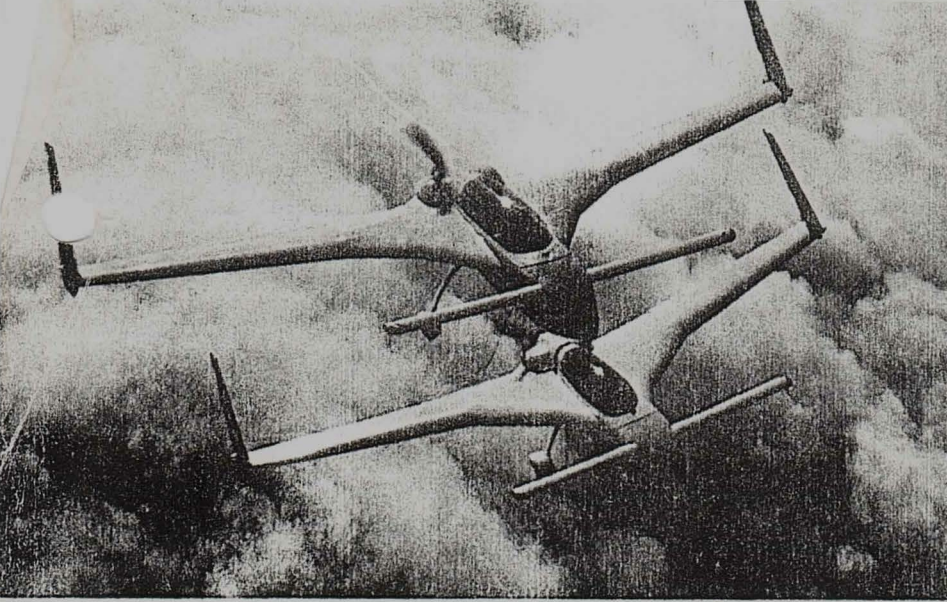
History

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Although VariEze pilots loved the efficiency and the eye-catching look of the airplane, it had a number of problems. Baggage room was nil. Landing and takeoff distances were high. And the VariEze had some very odd handling characteristics. Also, most builders were unable to match the light weight of the factory prototype, and many added things like starters and generators that Rutan hadn't counted on. As a result, useful load and center-of-gravity envelopes were very limited in some VariEzes. And then, in 1977, Continental halted production of the Continental O-200, the prime VariEze engine. Prices for used O-200's shot up, as hundreds of VariEze builders started bidding against each other.

To correct these problems, Rutan began working on a bigger version of the airplane designed to use the Lycoming O-235 with full electrical system. Called the Long-EZ, it made its debut in 1980. Essentially, the VariEze was obsolete the day the Long-EZ plans went up for sale. Virtually all plans sales since have been Long-EZs.

The Aviation Consumer
January 15, 1985



Used Aircraft Guide

Rutan VariEze and Long-EZ

The Rutan VariEze and Long-EZ are neat-looking, fast, efficient and dirt-cheap to fly. But because they are homebuilt kit planes, they have remained fond dreams for the majority of pilots, who can't muster up the skill and dogged determination it takes to build an airplane in the basement. As the number of Rutan canard pushers climbs past the 800 mark, however, a reasonable number of already built Ezes and EZs has come onto the used-plane market. It's now possible to own and fly one of these Star Wars sportplanes without having to build it.

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The VariEze, when it first appeared in 1975, turned the homebuilt industry on its ear. Before it, the typical homebuilt plane was an antediluvian wood or steel-tube design whose construction (usually from bare-bones plans) required the skills of a carpenter, welder, aircraft mechanic and scrounger. In most cases, these old-generation homebuilts, the result of thousands of hours of painstaking labor, performed no better than comparable production aircraft. Homebuilders were dedicated expert hobbyists who typically got more fun from the building than the flying.

The New Generation

But the VariEze was refreshingly different: a futuristic design with a canard foreplane, swept wings and wingtip rudders, made of foam and fiberglass. It succeeded where the BD-5 before it had failed: it offered performance superior to production planes, and construction was easy enough to bring it within reach of the merely persistent rather than the totally fanatical. The VariEze spawned a whole new generation of slick-looking com-

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Range of the VariEze is good. With 25 gallons, five hours of moderate cruising is available at 150-160 mph, for a range of around 750 miles at nearly 40 miles per gallon.

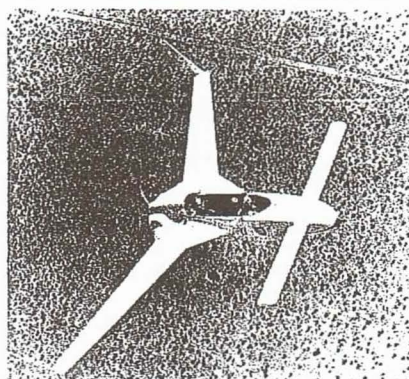
The bigger, more powerful Long-EZ is a better cruising machine, but payload/range is still a bit limited. Gross weight is 1,325 pounds, and empty weights average around 850 pounds, for a useful load of 475 pounds. With two standard people and 50 pounds of baggage, there's room for about 12 gallons of gas, enough for a couple of hundred miles and a decent reserve. Using the long-smooth-runway takeoff weight of 1,425 pounds authorized by Rutan, allowable fuel increases to about 28 gallons, good for about 800 miles.

With reduced cabin loads, the Long-EZ's 52-gallon fuel tank makes it a mile-eater *par excellence*. With full fuel, a Long-EZ can fly nearly 2,000 miles at about 40 percent power (140 mph or so). Dick Rutan, brother of designer Burt Rutan, has set a closed-course distance record of 4,800 miles in a special Long-Eze with 130-gallon fuel tanks.

Flying Qualities

In this respect, the VariEze and Long-EZ are worlds apart. The Vari is a hot, quirky handling little plane, while the Long is, by all reports, a delight to fly.

The first VariEzes had very poor roll control. Rutan, in his quest for lightness and simplicity, originally designed the plane without ailerons. Roll control was to come from differential movement of the canard elevators. It didn't work; roll control was virtually nil below 100 mph and actually reversed at very low speeds. The original VariEze had to be banked almost



Original prototype VariEze weighed under 400 pounds empty with a 65-hp Volkswagen engine.

entirely with the rudders. To solve this problem, spoilers were added on the top of the inboard wing strakes. That didn't help much. Finally, ailerons were added, but even they have rather limited authority. The key to banking a VariEze is to help out with the rudder.

On the other hand, the VariEze's pitch control is hair-trigger. A delicate touch is needed on the small side-stick controller to avoid porpoising on takeoff. This trait is more pronounced if the aircraft is tail-heavy, as many Ezes are.

Before tackling a VariEze, the average pilot should get some dual instruction in a plane with sensitive pitch controls, such as an AA-1 Yankee or Trainer.

The Long-EZ, on the other hand, is well-harmonized. Roll authority is much better, and pitch is not quite so sensitive. By all reports, the average pilot can handle a Long-EZ pretty well, once he gets used to the tight cockpit, sidestick controller and semi-reclining seat position.

Both airplanes are virtually stall-proof if built precisely according to

the plans. The canard is designed to stall before the main wing, dropping the nose slightly before the main wing can reach the stall angle of attack. With the stick held full back, both planes merely bob their noses gently, descending or climbing according to power.

However, things like center of gravity, canard incidence and wing shape can change stall behavior. A couple of VariEze accidents have looked suspiciously like stall/spins, and a few builders report real stalls. Moral: test-fly any Eze considered for purchase to make sure the individual airplane is stall-proof, and check the factors mentioned above to ensure the airplane conforms to the plans.

Both aircraft are quite stable, particularly in the roll axis. Owners report that the Long-EZ will fly level hands-off almost indefinitely, even righting itself in turbulence. This makes it one of the few homebuilts that might be suitable for some limited IFR flying.

Long Runways

But watch the runways. The major flaw of both VariEze and Long-EZ is the inordinate amount of real estate required for takeoff and landing. This stems from a number of traits. First, takeoff and landing speeds are fairly high for a light two-seater. "The VariEze is a hot little airplane," says Rutan's Mike Melville. "The rear wing doesn't work as well as it does in the Long-EZ." Owners report landing speeds in the 75-80 mph range, which requires approach speeds of at least 85 mph. (The Long-EZ, with its lower wing loading, has a slightly lower approach speed.)

The dark side of the Ezes' aerodynamic efficiency is a very flat glide angle, which makes it

Cost/Performance/Specifications

Model	Year	Number Built	Average Retail Price	Cruise Speed (mph)	Rate of Climb (fpm)	Useful Load (lbs)	Fuel Std/Opt (gals)	Engine	TBO (hrs)	Overhaul Cost
VariEze	1977-84	600	\$12,000-16,000	170	1,500	400	25	100-hp Cont. O-200	1,800	\$5,000
				160	1,100	375	25	85-hp Cont. C-85	1,800	\$4,000
Long-EZ	1981-84	200	\$25,000-40,000	180	1,200	475	52	115-hp Lyc. O-235	2,000	\$5,000

Rutan VariEze, Long-EZ

tougher to land the airplane on a spot. Bring it in a bit too fast, and it'll float forever, much like a Mooney. Some Ezes have speed brakes, which help a bit, but still don't solve the problem.

On takeoff, there's not enough elevator power to lift the nose below about 65 mph. This is partly due to the tail-in-front, engine-in-back layout, which means there's no prop blast to help the elevator do its job. Secondly, the elevator itself is, by design, limited in authority to make the plane stall-proof.

Rutan sets the minimum runway at 2,500 feet unless the pilot is very skilled and confident. (One pilot of an 85-hp Eze reports his takeoff rolls average 2,000 feet.) Some VariEze pilots use 1,500-foot strips if they have to, but others make 3,000 feet their minimum runway, and we would agree. For a low-time VariEze jockey, a 5,000-foot runway is a good idea. (Incidentally, grass runways severely degrade takeoff performance. Because the plane can't rotate early to take some of the load off the wheels, drag on the small, high-pressure tires is significant. Rutan recommends the airplanes for hard surfaces only, or on turf runways where the grass is no longer than two inches.)

Creature Comforts

For the pilot accustomed to Skylanes and Bonanzas, the Eze cockpit takes some getting used to. It is very tight. The pilot sits in a semi-reclining position, with the canopy an inch or two above his head, and his legs encased in two small tunnels that lead eventually to the rudder pedals. Once the pilot adjusts psychologically to being virtually wrapped in the airplane, however, the pilot's seat is very comfortable indeed. Owners report making four- or five-hour flights without fatigue or discomfort. The back-seater doesn't get as much legroom, but comfort there is still not too bad.

The Ezes are noisy, however, particularly for the passenger, who sits with his or her ears only a foot

or so from the engine. Cabin heat can also be a problem, although on sunny days the fuselage and canopy act like a big solar collector to keep things reasonably warm, except for the pilot's toes.

Poor Baggage Space

A glaring drawback of the VariEze is the total lack of baggage space. (Rutan occasionally lets his mania for light weight and aerodynamic efficiency overwhelm human factors.) Basically, you can carry in a VariEze whatever you can get on your lap or under your knees. The Long-EZ is better in this respect; it has small baggage areas, accessible from the rear seat, in the wing-root strakes. But still, don't plan on any golf bags.

Visibility is superb, with one major exception. During landing approach and on takeoff, in the VariEze particularly, the canard surface greatly impairs the pilot's view of the runway. The Long-EZ is somewhat better in this respect.

Maintenance and Operating Costs

By the standards of most other high-performance airplanes, the cost of running a VariEze or Long-EZ is startlingly low. Fuel consumption is about that of a small trainer, averaging four to five gallons per hour. Since they are homebuilts, auto gas can be used, and by all reports works just fine. So total fuel costs should run around \$5 to \$6 per hour.

Maintenance is virtually nil, since in most cases the owner can do it himself. The planes are disarmingly simple to inspect, since there is virtually no internal structure that can be inspected. The wing, for example, is simply a piece of solid foam sheathed in fiberglass and epoxy. What's to check?

Owners report that tires and brakes wear out very quickly because of the high landing and takeoff speeds. Wheel alignment is critical. Others report problems with nosewheel shimmy and advise careful adjustment of the shimmy damper. One VariEze

owner calls the entire nosewheel assembly "relatively weak," and says he's had to replace the fork, spring strut rod ends pivot bearings and wheel assembly. Other than that, the engine is about the only thing that will eat up maintenance dollars.

Buying A Homebuilt

Checking out a homebuilt airplane can be a mystifying exercise. The big sign in the cockpit that says "Experimental" is no joke—you are truly buying somebody's experiment. If the experimenter was diligent and competent, you'll have a fine airplane—probably better built than a Wichita product—but no FAA man looked over the builder's shoulder to make sure that he followed the plans precisely, that he did all his fiberglass layups properly, or that the weight-and-balance calculations are correct.

Unfortunately, the Ezes' construction method traps the used-plane buyer in a pincer of uncertainty. First of all, seemingly minor errors in construction (a layer of fiberglass with the fibers running the wrong way, for example) can seriously weaken the airplane. Secondly, the internal structure can't really be inspected. "It's very hard to analyze," comments Mike Melville. "There's no way to verify that the structure is good."

Fortunately, Rutan took these uncertainties into account during the design of the plane, and a properly built plane has huge structural margins—up to 12 Gs in some areas. Even if a builder screws it up and the plane is only half as strong as it's supposed to be, the result is just as strong as a production airplane. There has been only one accident caused by a structural failure in an Eze. A winglet separated during a high-speed pass. It turns out that the builder had completely left out several key layers of fiberglass in the winglet attach structure, in gross violation of the plans and common sense. Nevertheless, there would have been no way to discover this serious flaw beforehand.



Long-EZ with long, slender wings, is more efficient than its distant ancestor, the pioneering delta Vari-Viggen.

Buyer's Checklist

Here's a list of things to look for when buying a VariEze or Long-EZ. While they can't absolutely guarantee a properly built airplane, they can make the odds very good:

- Check the weight. Construction technique plays a big role in the empty weight of the finished product. A slapdash builder tends to slop on the epoxy to save time, and he'll cover up imperfections with filler. Both add weight. A properly built VariEze should weigh between 620 and 650 pounds (with an O-200 engine, equipped for day VFR), according to Rutan's Mike Melville. "If it weighs 700 pounds, the guy was sloppy with the epoxy. He may have been sloppy on the other stuff, too." A Long-Eze should weigh in at about 820 to 860 pounds. If it's much heavier than that, be suspicious.

- Check the plans and the construction logbook. Did the builder keep meticulous records? That's a good sign. Are the plans complete? Are all the plans changes up to date? (A builder is supposed to have all copies of the Rutan newsletter, which contains these changes.) Are the maintenance logbooks up to date and complete? In general, you are looking for signs of a meticulous, methodical, conscientious attitude on the part of the guy who built the plane.

- Check general detail work. As one VariEze owner put it, "Look at the details, fillets, hinges, general surface smoothness and trueness of contour, fit of cowl and canard

... If it looks good, the owner probably followed the construction instructions faithfully."

- Check the paint for cracks or peeling. Oddly, paint can play a role in the structural integrity of the Ezes. The epoxy used in construction begins to break down under heat, so all airplanes must be painted white to reflect sunlight. If the paint has come off, you may have a weak spot. If the paint is cracked, sand it off to see whether the crack extends into the epoxy and fiberglass itself. If it does, there might be a problem. (One cheery note: if you do find a structural problem, it's usually very easy to repair.)

- Check the integrity of the fiberglass in critical areas by tapping the surface with a quarter. A dull "thud" instead of the usual sharp tap may signal a delamination.

- Check the attach points of the wing and canard for cracks. Structural integrity here is vital.

- Check the landing gear legs and attach points. These were notorious weak spots in the VariEze; the bolt holes tend to elongate, and the bolts get loose. Many Varis have been retrofitted with Long-EZ gear.

- Check the quality of the engine baffling. Cooling efficiency apparently varies dramatically from airplane to airplane, and a flight test on a hot day is a good idea. Give the engine compartment a thorough once-over. "There's some awful-looking work out there," comments Melville.

- Finally, make sure you test-fly the plane, or hire someone to do it for you. One reader who bought a used VariEze reports he found one for sale with badly misrigged wing cuffs. As a result, it tended to roll strongly to the left in cruise, and stalled with a sharp wing drop.

Modifications

Rutan has come up with several major improvements over the years, some of them labeled "mandatory." But it's a fact of Experimental life that Rutan's "Airworthiness Directives" have no legal force, and a builder may choose not to adopt them. We would not advise buying an Eze lacking a Rutan-mandated mod. Among the mods to look for:

- VariEze wing leading-edge cuffs. These improve stall behavior and are considered mandatory. As this is written, Rutan has just approved so-called "vortilons," a sort of protruding stall fence, to replace the cuffs for better climb performance.

- Revised canopy latch and warning system. This is another "must-have" item; there have been several accidents caused by in-flight canopy openings, which render the plane virtually uncontrollable.

- High-performance rudders on the Long-EZ give better ground handling in a crosswind. With the original rudders, one owner comments, "Crosswind takeoffs are a disaster."

- Long-EZ landing gear retrofit for the VariEze.

- Improved nose gear. Mods include an easier crank-up system and a redesign for improved crashworthiness.

- Cleveland brakes instead of the originally specified Rosehans models.

- Belly-mounted speed brake. This steepens the glide angle and makes spot landings easier.

- Flush cowl scoop reportedly improves engine cooling.

- Improved canard. This major modification is still under development, but it promises to lower the high rotation speed, reduce or eliminate the nose-down effect in rain, and perhaps improve performance in the bargain. Look for the new canard to be available this spring.

Safety

The safety record of homebuilts is not particularly good. The Ezes were designed with safety in mind, but they don't seem to have lived up to their promise in this regard. There have been 11 fatal VariEze accidents and three Long-EZ fatalities.

Because there are no good estimates of hours flown for homebuilts, it's hard to figure per-hour accident rates. But assuming an average of 400 airplanes in the air over the last eight years, each flying an average of 100 hours per year, we arrive at a rough guesstimate of about 320,000 flight hours.

The total of 14 fatal accidents works out to about four fatal accidents per 100,000 flight hours, a moderately high figure compared to the typical single-engine production airplane. The Cessna 150, for example, has a fatal accident rate of about 1.3, while the Piper Cherokee scores a 2.0. The worst of the modern single-engine planes is the hot, sporty little Grumman/American AA-1 series, which rates a 4.8.

If our guesstimate is correct, The Ezes' fatal accident rate is roughly comparable to those of older two-seat taildragger sportplanes like the Cub, Swift, Luscombe and Er-

coupe, which all have rates in the four-to-five range. For all the Ezes' advanced aerodynamics, they seem to represent little safety improvement over the two-seat sportplanes of four decades ago.

However, we must compliment RAF for its frank, safety-minded attitude. Safety is constantly emphasized in the plans and newsletters, and the company is quick to make safety-related changes. RAF sends an investigator to inspect most fatal Eze accidents, and writes them up in detail in the newsletter. Few homebuilt plans sellers—not to mention the Wichita manufacturers of "real" airplanes—take this much trouble in safety matters.

"Factory" Support

Rutan Aircraft, by all reports, does an excellent job of supporting its airplanes. Unlike some other kit sellers, Rutan always answers the phone and patiently answers questions. Rutan Aircraft Factory, Building 13, Mojave Airport, Mojave, Calif. 93501; 805-824-2645.

Primary sources of parts and materials (Rutan dispenses only plans and advice) are Aircraft Spruce and Specialty, Box 424, Fullerton, Calif. 92632, 714-870-7551; Ken Brock Aircraft, 11852 Western Ave., Stanton, Ca. 90680, 714-898-4366; Wicks Aircraft Supply, 410 Pine St., Highland, Ill. 62249, 618-654-7447; and Task Research, 848 E. Santa Maria, Santa Paula, Ca. 93060; 805-528-4445.

Owner Comments

I have a VariEze powered by a Lycoming O-235-C. The airplane is relatively light in weight at 650 pounds (it doesn't have lights, starter, gyros or any extras), so performance is very good with this engine. Cruise at 75 percent is 200 mph, but I usually fly at reduced power at about 175 mph on 4.3 to 4.5 gph.

It's a hot little aircraft and not for everyone. The controls are very

sensitive, but easy to get accustomed to. The high runway speeds—80 mph for liftoff and touchdown—wear out the little tires in a hurry, so they last only about 200 landings. The airplane has been trouble-free with almost no maintenance required. My major costs are hangar and insurance. With everything included, flying about 150 hours per year, my cost is \$20 per hour.

I would rank the Eze above all other planes I've flown except for baggage space.

W. Butters
Florissant, Mo.

I do the annual inspections on my VariEze myself. It takes about six hours. It's a low-maintenance airplane, except for tires and brakes. The small tires and high landing speeds (80 mph) result in high tire wear. AI steering is done by brakes, which results in high brake wear.

The VariEze is very responsive, the closest thing to a jet fighter most people will ever fly. The side stick is very nice. The small amount of stick travel takes some getting used to. To land, the plane is flown onto the runway at 75-80 mph, not flared and held off in the usual manner. Once these points are understood, flying the plane is EZ. Noise levels are similar to other small planes, but an intercom is a must due to the tandem seating arrangement. My cruise speed is 175 mph, 185 with wheel pants, burning five gph. Useful load is 400 pounds, or 500 pounds at the maximum takeoff weight.

Will Thorn
Canton, Mass.

I purchased a used VariEze in January 1984. I based my selection on visual appearance and workmanship, consultation with the FAA men who inspected the airplanes during construction, review of airframe mods and updates, and flight characteristics of each airplane.

I selected six airplanes as candidates for evaluation. Four wer

located from *Sport Aviation*, one from *Trade-A-Plane* and one was for sale in my local EAA chapter. Two were eliminated for price and logistical reasons (too far away), and I looked at four airplanes. Time on the planes ranged from 400 to 600 hours. All had the Continental O-200, and all cruised 150-170 mph at 3,000 feet. My strategy for evaluating airframe integrity came down to looking at the details, fillets, hinges, general surface smoothness and trueness of contours, and the fit of the cowlings and canard. Since there is no true way to determine structural integrity, the best you can do is assume that if it looks good, the builder probably followed the construction instructions faithfully.

The airplane I bought rotates at 60 mph indicated, lifts off at 80, climbs at 90 at 1800 fpm solo, 700 fpm dual. Full throttle (2550 rpm, I can't seem to get more) is 160 mph at 3,000 feet. Final approach is 80-90 mph, touchdown at 80. Stall (mine does in fact stall, dropping the left wing smartly, due to an improperly built wing) is at 62 mph power-on and 64 mph power-off.

I love the bird for all its quirks, and wouldn't trade it for anything but a Christen Eagle or a Long-EZ.

Dan Morris
Dana Point, Calif.

I built a Long-EZ in 1981-82, with a new Lycoming O-235-L2C. It has 150 hours on it. It is full IFR with all pre-fabricated parts. I expect it would sell for about \$45,000.

My advice to Long-EZ buyers: remember that each one is built by an individual, and there is no way of inspecting the internal structure of the craft. One must beware of poor workmanship. The canard and wings should not show any fiberglass weave and have straight leading and trailing edges. Tapping with a quarter will reveal any delaminations with a dull thud instead of a sharp tap.

Check the dimensions with the owner's manual; the weight-and-balance should not show a c.g. too

far from the center of the envelope. Basic empty weight of an IFR-equipped EZ with upholstery, generator and starter should not exceed 925-950 pounds. If so, suspect excess epoxy (not a structural defect) or lots of filler to cover bumpy layups.

The engine should be well-baffled in a professional way. All the metal parts for the Long-EZ are available ready-made, and unless the builder is a professional metalworker, I wouldn't touch a plane without the pre-made metal parts. The plans call for a canopy safety catch and a gear-up canopy-unlocked warning system that should be installed during construction.

The flying qualities are superb—it is fast, responsive and a joy to the pilot. It is sensitive in pitch, and the rudders are not coupled to the ailerons, so it may take some getting used to, perhaps an hour or two.

Speed and fuel consumption are right up to Rutan's book figures. However, it is not really a two-seat airplane—more like one-and-a-half. The tandem seating can be unpleasant at times, especially if the rear-seat person gets weary in turbulence.

Ground handling, with the differential-brake steering, is not the best feature of the plane. I am on my third set of brake linings. One learns to use more runway on landing to save the brakes. I did lose a nosewheel to a very rough runway in Albuquerque (Alameda). It shimmied off in seconds, even though I had just checked the damper. Now I have it adjusted even tighter.

Backup from Rutan has always been super. The owner's manual is better and more candid than that of most production aircraft. A quarterly newsletter is mandatory for updates and "ADs."

Robert Forest
Santa Barbara, Calif.

I built a Long-EZ and have been flying it for a year and a half. In that time I've put 162 hours on it, with 263 landings. Performance is with-



High-aspect-ratio wing plays a big role in the EZ's excellent climb and cruise performance.

in one or two knots of the RAF predictions.

Handling on the ground is very maneuverable and nimble. In flight, it is very stable, but the controls are quite sensitive. It must be flown with a light touch. Does not stall. There is a slight pitch-down in rain, but I have made many wet takeoffs, and they are no problem.

Maintenance: I've replaced one set of brake pads. The Lycoming O-235-L2C does not foul plugs like it does in the Tomahawk and 152. No lead-fouling detected to date.

Parts availability from Brock, Aviation Spruce and Wicks is very good. Props are a bit slow coming through, but my B&T is of excellent quality. RAF support is outstanding; Mike and Sally Melville do a very good job.

Cost of operation is low; it's the cheapest way to fly. Overall fuel burn is about 5.6 gph, which yields 140 knots. Liability insurance is \$450 per year. Annual cost is the \$50 hangar rent while I do the inspection myself. Overall, the Long-EZ is a very addictive flying machine. I cannot go to the airport without flying it.

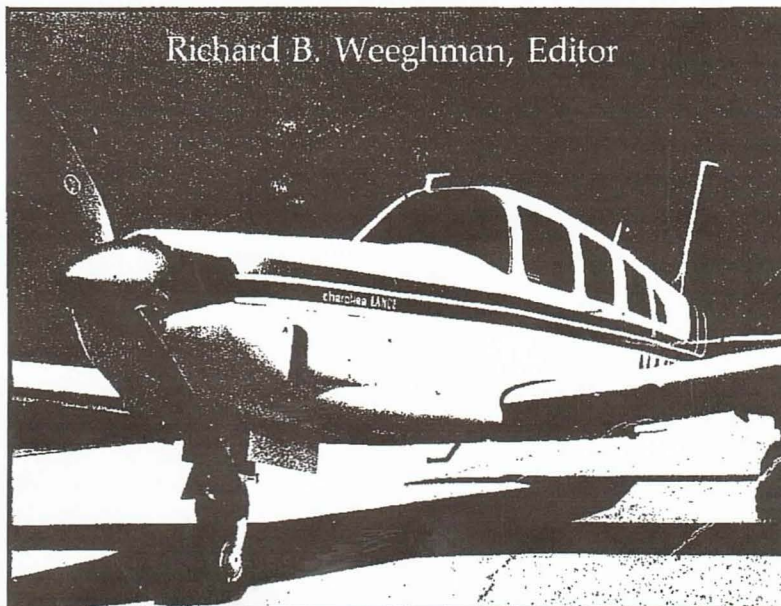
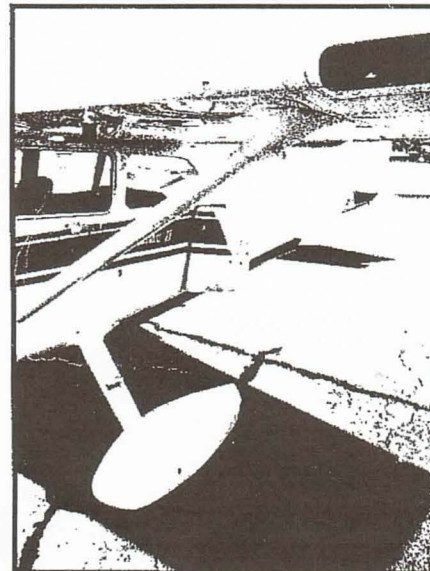
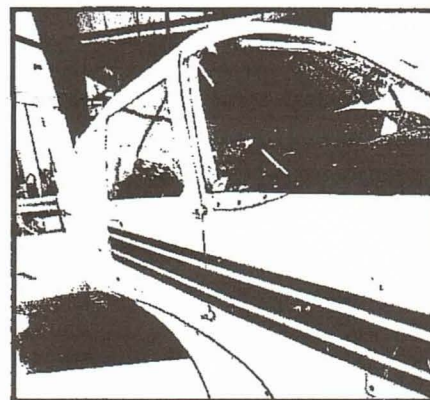
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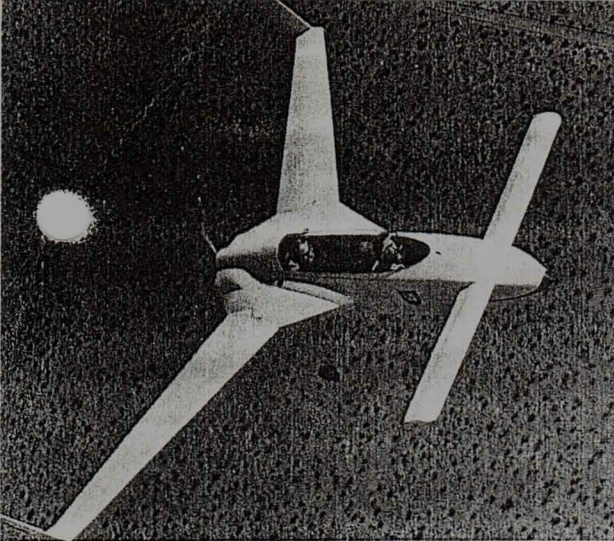
The Aviation
Consumer



USED AIRCRAFT GUIDE



Richard B. Weeghman, Editor



Original prototype VariEze weighed under 400 pounds empty with a 65-hp Volkswagen engine.

But because of the long lead time between plans sale and first flight, freshly built VariEzes are still taking to the air at the rate of a couple a month.

Used-Plane Market

You won't find a VariEze on the ramp out at the local used-plane dealer's. Best sources are *Trade-A-Plane*, the EAA magazine *Sport Aviation* and the Rutan Aircraft Factory newsletter.

The used-plane marketplace has clearly decided in favor of the Long-EZ. While good VariEzes can be bought for sums in the \$12,000-to-\$16,000 range, a flyable Long-EZ goes for at least \$25,000 in most cases. A creampuff Long, built with fanatical devotion to detail and IFR-equipped, will command as much as \$40,000. One fellow claims he turned down \$60,000 cash for his immaculate Long-EZ.

Performance

The Rutan canards are known for excellent performance and efficiency. By comparison, they put factory-built aircraft with the same engines to shame. This fact is usually credited to the canard design, which is said to cut drag by eliminating the download of a conventional tail. More likely, the Ezes are faster than production airplanes of the same power because they are much smaller (less frontal area) and have high aspect ratio wings. The smooth fiberglass skin and the careful attention to detail of some builders is

also a factor. The Ezes seem to be no more efficient than other small smooth-skinned homebuilts of conventional design, such as the Glasair.

Cruise efficiency of the VariEze is better than that of the Long-EZ, since it has less frontal area, less wing area and less weight. Owners report typical cruising speeds for both aircraft in the 150-170 mph range. (The Long-EZ does it on about five gph, the VariEze on four gph.) Speeds vary significantly according to the skills of the builder, of course. Probably the most efficient Rutan canard in the air is an 80-hp VariEze that can fly 156 mph on 3.2 gph and can achieve a max cruise speed of 186 mph. More typical is the 155 mph on five gph reported by the owner of a 100-hp VariEze.

Realistic Cruise Speeds

A word about max cruise speeds in Ezes: almost nobody ever revs them up that fast. Rutan's "book" cruise figure for the Long-EZ is 185 mph, but because of the fixed-pitch prop, the only way to achieve such high cruise speeds is to rev the engine well beyond Lycoming's 2700-rpm red-line. Rutan claims this is okay because the low-inertia prop puts less strain on the crankshaft. But in any case, revving an O-235 to 3100 rpm is very noisy, and it certainly does nothing to help engine reliability. Virtually every Eze owner who wrote us listed a typical cruise speed well below the maximum available.

(This is a common problem among small, fast homebuilts, and there's probably a fortune awaiting the fellow who comes up with a light, cheap, reliable two-position variable-pitch propeller that can be controlled from the cockpit. A pilot could take off and climb—with vastly improved efficiency—in low pitch, and then "shift gears" to high pitch for cruise, where full throttle would be available without exceeding redline.)

The Ezes' rate of climb, because of the high-aspect-ratio wings, is excellent, about double that of O-235-powered production trainers. Book climb for the Long-EZ is 1,200 fpm at gross weight; owners report climb rates as high as 2,000 fpm for a Long-EZ at very light weight to 400 fpm for an 85-hp VariEze at 5,000 feet.

Payload/Range

The VariEze is not bad in this respect if the plane is built light, but many planes have payload problems. Rutan has set gross weight at 1,050 lbs for the O-200-powered VariEze (less for the 65-85-hp models), and average empty weight is about 650. That leaves about 400 pounds for people and gas. Fill the 25-gallon tanks, and there's only 250 pounds left. An overweight, sloppily built plane with extra equipment might top 700 pounds empty; consider such a plane a single-seater.

It's tempting to bust gross weight limitations in homebuilts, simply because they are arbitrary and have no legal force. (Theoretically, the individual builder sets the gross weight at any number he likes.) But the Rutan-recommended figures should be taken as Gospel, since the structure of the plane was designed to those numbers. For payload-hungry VariEze pilots, Rutan does allow a takeoff weight up to 1,110 pounds (on long, smooth runways only), but you'll have to burn off 10 gallons of fuel—that's more than two hours of flying—before you can land. Moral: carefully check the empty weight, as equipped, of any Eze considered for purchase.

Range of the VariEze is good. With 25 gallons, five hours of moderate cruising is available at 150-160 mph, for a range of around 750 miles at nearly 40 miles per gallon.

The bigger, more powerful Long-EZ is a better cruising machine, but payload/range is still a bit limited. Gross weight is 1,325 pounds, and empty weights average around 850 pounds, for a useful load of 475 pounds. With two standard people

and 50 pounds of baggage, there's room for about 12 gallons of gas, enough for a couple of hundred miles and a decent reserve. Using the long-smooth-runway takeoff weight of 1,425 pounds authorized by Rutan, allowable fuel increases to about 28 gallons, good for about 800 miles.

With reduced cabin loads, the Long-EZ's 52-gallon fuel tank makes it a mile-eater *par excellence*. With full fuel, a Long-EZ can fly nearly 2,000 miles at about 40 percent power (140 mph or so). Dick Rutan, brother of designer Burt Rutan, has set a closed-course distance record of 4,800 miles in a special Long-Eze with 143-gallon fuel tanks.

Flying Qualities

In this respect, the VariEze and Long-EZ are worlds apart. The Vari is a hot, quirky-handling little plane, while the Long is, according to builders, a delight to fly.

The first VariEzes had very poor roll control. Rutan, in his quest for lightness and simplicity, originally designed the plane without ailerons. Roll control was to come from differential movement of the canard elevators. It didn't work; roll control was virtually nil below 100 mph and actually reversed at very low speeds. The original VariEze had to be banked almost entirely with the rudders. To solve this problem, spoilers were added on the top of the inboard wing strakes. That didn't help much. Finally, ailerons were added, but even they have rather limited authority. The key to banking a VariEze is to help out with the rudder.

On the other hand, the VariEze's pitch control is hair-trigger. A delicate touch is needed on the small side-stick controller to avoid porpoising on takeoff. This trait is more pronounced if the aircraft is tail-heavy, as many Ezes are.

Vari-Eze is the world's most popular homebuilt aircraft. An Oshkosh gaggle demonstrates the plane's odd kneeling parking posture.

Before tackling a VariEze, the average pilot should get some dual instruction in a plane with sensitive pitch controls, such as an AA-1 Yankee or Trainer.

The Long-EZ, on the other hand, is well-harmonized. Roll authority is much better, and pitch is not quite so sensitive. By all reports, the average pilot can handle a Long-EZ pretty well, once he gets used to the tight cockpit, sidestick controller and semi-reclining seat position.

Both airplanes are virtually stall-proof if built precisely according to the plans. The canard is designed to stall before the main wing, dropping the nose slightly before the main wing can reach the stall angle of attack. With the stick held full back, both planes merely bob their noses gently, descending or climbing according to power.

However, things like center of gravity, canard incidence and wing shape can change stall behavior. A couple of VariEze accidents have looked suspiciously like stall/spins, and a few builders report real stalls. Moral: test-fly any Eze considered for purchase to make sure the individual airplane is stall-proof, and check the factors mentioned above to ensure the airplane conforms to the plans.

Both aircraft are quite stable, particularly in the roll axis. Owners report that the Long-EZ will fly

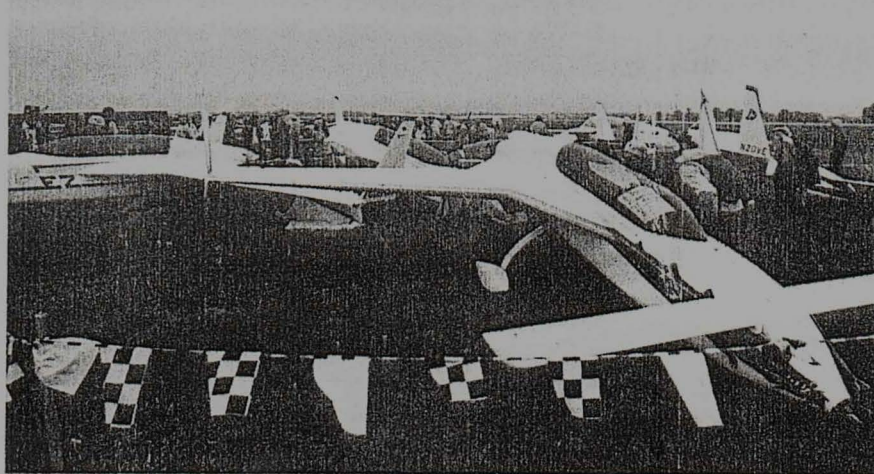
level hands-off almost indefinitely, even righting itself in turbulence. This makes it one of the few homebuilts that might be suitable for some limited IFR flying.

Long Runways

But watch the runways. The major flaw of both VariEze and Long-EZ is the inordinate amount of real estate required for takeoff and landing. This stems from a number of traits. First, takeoff and landing speeds are fairly high for a light two-seater. "The VariEze is a hot little airplane," says Rutan's Mike Melville. "The rear wing doesn't work as well as it does in the Long-EZ." Owners report landing speeds in the 75-80 mph range, which requires approach speeds of at least 85 mph. (The Long-EZ, with its lower wing loading, has a slightly lower approach speed.)

The dark side of the Ezes' aerodynamic efficiency is a very flat glide angle, which makes it tougher to land the airplane on a spot. Bring it in a bit too fast, and it'll float forever, much like a Mooney. Some Ezes have speed brakes, which help a bit, but still don't solve the problem.

On takeoff, there's not enough elevator power to lift the nose below about 65 mph. This is partly due to the tail-in-front, engine-in-back layout, which means there's no prop blast to help the elevator do its job. Secondly, the elevator



itself is, by design, limited in authority to make the plane stall-proof.

Rutan sets the minimum runway at 2,500 feet unless the pilot is very skilled and confident. (One pilot of an 85-hp Eze reports his takeoff rolls average 2,000 feet.) Some VariEze pilots use 1,500-foot strips if they have to, but others make 3,000 feet their minimum runway, and we would agree. For a low-time VariEze jockey, a 5,000-foot runway is a good idea. (Incidentally, grass runways severely degrade takeoff performance. Because the plane can't rotate early to take some of the load off the wheels, drag on the small, high-pressure tires is significant. Rutan recommends the airplanes for hard surfaces only, or on turf runways where the grass is no longer than two inches.)

Creature Comforts

For the pilot accustomed to Skylanes and Bonanzas, the Eze cockpit takes some getting used to. It is very tight. The pilot sits in a semi-reclining position, with the canopy an inch or two above his head, and his legs encased in two small tunnels that lead eventually to the rudder pedals. Once the pilot adjusts psychologically to being virtually wrapped in the airplane, however, the pilot's seat is very comfortable indeed. Owners report making four- or five-hour flights without fatigue or discomfort. The back-seater doesn't get as much legroom, but comfort there is still not too bad.

The Ezes are noisy, however, particularly for the passenger, who sits with his or her ears only a foot or so from the engine. Cabin heat can also be a problem, although on

sunny days the fuselage and canopy act like a big solar collector to keep things reasonably warm, except for the pilot's toes.

Poor Baggage Space

A glaring drawback of the VariEze is the total lack of baggage space.

Maintenance is virtually nil, since in most cases the owner can do it himself.

(Rutan occasionally lets his mania for light weight and aerodynamic efficiency overwhelm human factors.) Basically, you can carry in a VariEze whatever you can get on your lap or under your knees. The Long-EZ is better in this respect; it has small baggage areas, accessible from the rear seat, in the wing-root strakes. But still, don't plan on any golf bags.

Visibility is superb, with one major exception. During landing approach and on takeoff, in the VariEze particularly, the canard surface greatly impairs the pilot's view of the runway. The Long-EZ is somewhat better in this respect.

Maintenance and Operating Costs

By the standards of most other high-performance airplanes, the cost of running a VariEze or Long-EZ is startlingly low. Fuel consumption is about that of a small trainer, averaging four to five gallons per hour. Since they are homebuilts, auto gas can be used,

and by all reports works just fine. So total fuel costs should run around \$5 to \$6 per hour.

Maintenance is virtually nil, since in most cases the owner can do it himself. The planes are disarmingly simple to inspect, since there is virtually no internal structure that can be inspected. The wing, for example, is simply a piece of solid foam sheathed in fiberglass and epoxy. What's to check?

Owners report that tires and brakes wear out very quickly because of the high landing and takeoff speeds. Wheel alignment is critical. Others report problems with nosewheel shimmy and advise careful adjustment of the shimmy damper. One VariEze owner calls the entire nosewheel assembly "relatively weak," and says he's had to replace the fork, spring strut rod ends, pivot bearings and wheel assembly. Other than that, the engine is about the only thing that will eat up maintenance dollars.

Buying A Homebuilt

Checking out a homebuilt airplane can be a mystifying exercise. The big sign in the cockpit that says "Experimental" is no joke—you are truly buying somebody's experiment. If the experimenter was diligent and competent, you'll have a fine airplane—probably better built than a Wichita product—but no FAA man looked over the builder's shoulder to make sure that he followed the plans precisely, that he did all his fiberglass layups properly, or that the weight-and-balance calculations are correct.

Unfortunately, the Ezes' construction method traps the used-plane

Cost/Performance/Specifications

Model	Year	Number Built	Average Retail Price	Cruise Speed (mph)	Rate of Climb (fpm)	Useful Load (lbs)	Fuel Std/Opt (gals)	Engine	TBO (hrs)	Overhaul Cost
VariEze	1977-1984	600	\$12,000-16,000	170	1,500	400	25	100-hp Cont. O-200	1,800	\$5,000
				160	1,100	375	25	85-hp Cont. C-85	1,800	\$4,000
Long-EZ	1981-1984	200	\$25,000-40,000	180	1,200	475	52	115-hp Lyc. O-235	2,000	\$5,000

High-aspect-ratio wing plays a big role in the EZ's excellent climb and cruise performance.

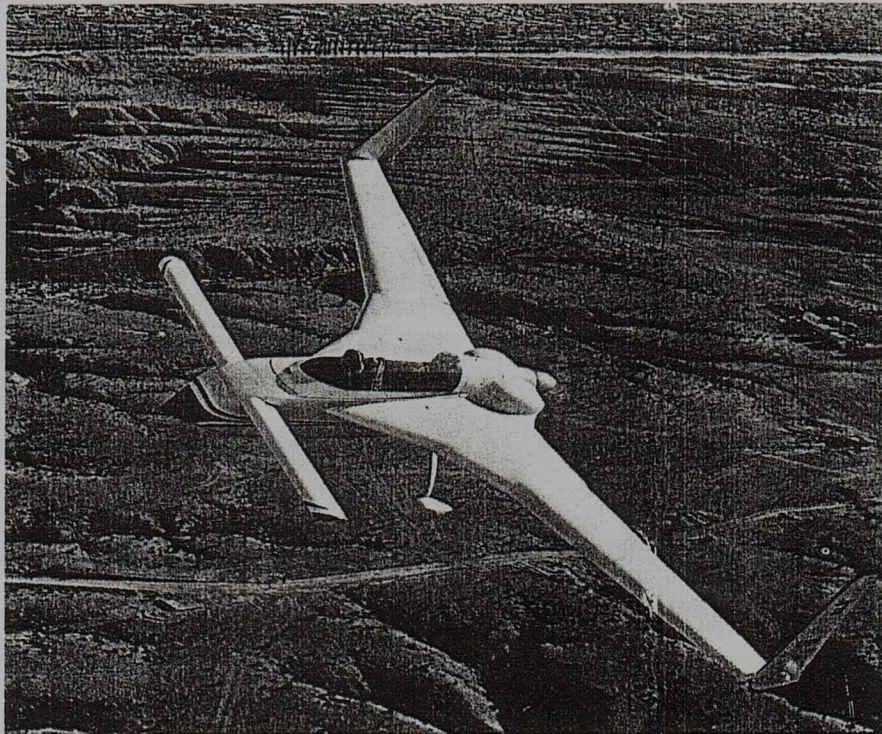
buyer in a pincer of uncertainty. First of all, seemingly minor errors in construction (a layer of fiberglass with the fibers running the wrong way, for example) can seriously weaken the airplane. Secondly, the internal structure can't really be inspected. "It's very hard to analyze," comments Mike Melville. "There's no way to verify that the structure is good."

Fortunately, Rutan took these uncertainties into account during the design of the plane, and a properly built plane has huge structural margins—up to 12 Gs in some areas. Even if a builder screws it up and the plane is only half as strong as it's supposed to be, the result is just as strong as a production airplane. There has been only one accident caused by a structural failure in an Eze. A winglet separated during a high-speed pass. It turns out that the builder had completely left out several key layers of fiberglass in the winglet attach structure, in gross violation of the plans and common sense. Nevertheless, there would have been no way to discover this serious flaw beforehand.

Buyer's Checklist

Here's a list of things to look for when buying a VariEze or Long-EZ. While they can't absolutely guarantee a properly built airplane, they can make the odds very good:

- Check the weight. Construction technique plays a big role in the empty weight of the finished product. A slapdash builder tends to slop on the epoxy to save time, and he'll cover up imperfections with filler. Both add weight. A properly built VariEze should weigh between 620 and 650 pounds (with an O-200 engine, equipped for day VFR), according to Rutan's Mike Melville. "If it weighs 700 pounds, the guy was sloppy with the epoxy. He may have been sloppy on the other stuff, too." A Long-Eze should weigh in at about 820 to 860



pounds. If it's much heavier than that, be suspicious.

- Check the plans and the construction logbook. Did the builder keep meticulous records? That's a good sign. Are the plans complete? Are all the plans changes up to date? (A builder is supposed to have all copies of the Rutan newsletter, which contains these changes.) Are the maintenance logbooks up to date and complete? In general, you are looking for signs of a meticulous, methodical, conscientious attitude on the part of the guy who built the plane.

- Check general detail work. As one VariEze owner put it, "Look at the details, fillets, hinges, general surface smoothness and trueness of contour, fit of cowling and canard...If it looks good, the owner probably followed the construction instructions faithfully."

- Check the paint for cracks or peeling. Oddly, paint can play a role in the structural integrity of the Ezes. The epoxy used in construction begins to break down under heat, so all airplanes must be painted white to reflect sunlight. If the paint has come off, you may have a weak spot. If the paint is cracked, sand it off to see whether the crack

extends into the epoxy and fiberglass itself. If it does, there might be a problem. (One cheery note: if you do find a structural problem, it's usually very easy to repair.)

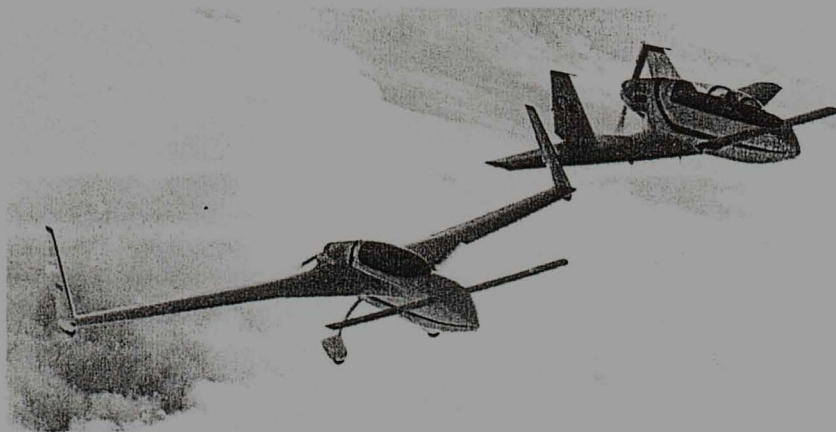
- Check the integrity of the fiberglass in critical areas by tapping the surface with a quarter. A dull "thud" instead of the usual sharp tap may signal a delamination.

- Check the attach points of the wing and canard for cracks. Structural integrity here is vital.

- Check the landing gear legs and attach points. These were notorious weak spots in the VariEze; the bolt holes tend to elongate, and the bolts get loose. Many Varis have been retrofitted with Long-EZ gear.

- Check the quality of the engine baffling. Cooling efficiency apparently varies dramatically from airplane to airplane, and a flight test on a hot day is a good idea. Give the engine compartment a thorough once-over. "There's some awful-looking work out there," comments Melville.

- Finally, make sure you test-fly the plane, or hire someone to do it for



you. One reader who bought a used VariEze reports he found one for sale with badly misrigged wing cuffs. As a result, it tended to roll strongly to the left in cruise, and stalled with a sharp wing drop.

Modifications

Rutan has come up with several major improvements over the years, some of them labeled "mandatory." But it's a fact of Experimental life that Rutan's "Airworthiness Directives" have no legal force, and a builder may choose not to adopt them. We would not advise buying an Eze lacking a Rutan-mandated mod. Among the mods to look for:

- VariEze wing leading-edge cuffs. These improve stall behavior and are considered mandatory. As this is written, Rutan has just approved so-called "vortilons," a sort of protruding stall fence, to replace the cuffs. Climb performance improvements are claimed for the vortilons.

- Revised canopy latch and warning system. This is another "must-have" item; there have been several accidents caused by in-flight canopy openings, which render the plane virtually uncontrollable.

- High-performance rudders on the Long-EZ give better ground handling in a crosswind. With the original rudders, one owner comments, "Crosswind takeoffs are a disaster."

- Long-EZ landing gear retrofit for the VariEze.

Long-EZ with long, slender wings, is more efficient than its distant ancestor, the pioneering delta Vari-Viggen.

- Improved nose gear. Mods include an easier crank-up system and a redesign for improved crashworthiness.

- Cleveland brakes instead of the originally specified Rosehans models.

- Belly-mounted speed brake. This steepens the glide angle and makes spot landings easier.

- Flush cowl scoop reportedly improves engine cooling.

- Improved canard. This major modification is still under development, but it promises to lower the high rotation speed, reduce or eliminate the nose-down effect in rain, and perhaps improve performance in the bargain. Look for the new canard to be available this spring.

Safety

The safety record of homebuilts is not particularly good. The Ezes were designed with safety in mind, but they don't seem to have lived up to their promise in this regard. There have been 23 fatal VariEze accidents and three Long-EZ fatalities.

Because there are no good estimates of hours flown for homebuilts, it's hard to figure per-hour accident rates. But assuming an average of 400 airplanes in the air over the last eight years, each

flying an average of 100 hours per year, we arrive at a rough guesstimate of about 320,000 flight hours.

The total of 26 fatal accidents works out to about eight accidents per 100,000 flight hours, a very high figure compared to the typical single-engine production airplane. The Cessna 150, for example, has a fatal accident rate of about 1.3, while the Piper Cherokee scores a 2.0. The worst of the modern single-engine planes is the hot, sporty little Grumman/American AA-1 series, which rates a 4.8.

If our guesstimate is correct, the Ezes' fatal accident rate is considerably worse than those of older two-seat taildragger sportplanes like the Cub, Swift, Luscombe and Ercoupe, which all have rates in the four-to-five range. For all the Ezes' advanced aerodynamics, they seem to represent no safety improvement over the two-seat sportplanes of four decades ago:

However, we must compliment RAF for its frank, safety-minded attitude. Safety is constantly emphasized in the plans and newsletters, and the company is quick to make safety-related changes. RAF sends an investigator to inspect most fatal Eze accidents, and writes them up in detail in the newsletter. Few homebuilt plans sellers—not to mention the Wichita manufacturers of "real" airplanes—take this much trouble in safety matters.

"Factory" Support

Rutan Aircraft, by all reports, does an excellent job of supporting its airplanes. Unlike some other kit sellers, Rutan always answers the phone and patiently answers questions. Rutan Aircraft Factory, Building 13, Mojave Airport, Mojave, Calif. 93501; (805) 824-2645.

Primary sources of parts and materials (Rutan dispenses only plans and advice) are Aircraft Spruce and Specialty, Box 424, Fullerton, Calif. 92632, (714) 870-7551; Ken Brock Aircraft, 11852 Western Ave., Stanton, Ca. 90680,

(714) 898-4366; Wicks Aircraft Supply, 410 Pine St., Highland, Ill. 62249, (618) 654-7447; and Task Research, 848 E. Santa Maria, Santa Paula, Ca. 93060; (805) 528-4445.

Owner Comments

I have a VariEze powered by a Lycoming O-235-C. The airplane is relatively light in weight at 650 pounds (it doesn't have lights, starter, gyros or any extras), so performance is very good with this engine. Cruise at 75 percent is 200 mph, but I usually fly at reduced power at about 175 mph on 4.3 to 4.5 gph.

It's a hot little aircraft and not for everyone. The controls are very sensitive, but easy to get accustomed to. The high runway speeds—80 mph for liftoff and touch-down—wear out the little tires in a hurry, so they last only about 200 landings. The airplane has been trouble-free with almost no maintenance required. My major costs are hangar and insurance. With everything included, flying about 150 hours per year, my cost is \$20 per hour.

I would rank the Eze above all other planes I've flown except for baggage space.

W. Butters
Florissant, Mo.

I do the annual inspections on my VariEze myself. It takes about six hours. It's a low-maintenance airplane, except for tires and brakes. The small tires and high landing speeds (80 mph) result in high tire wear. All steering is done by brakes, which results in high brake wear.

The VariEze is very responsive, the closest thing to a jet fighter most people will ever fly. The side stick is very nice. The small amount of stick travel takes some getting used to. To land, the plane is flown onto

the runway at 75-80 mph, not flared and held off in the usual manner. Once these points are understood, flying the plane is EZ. Noise levels are similar to other small planes, but an intercom is a must due to the tandem seating arrangement. My cruise speed is 175 mph, 185 with wheel pants, burning five gph. Useful load is 400 pounds, or 500 pounds at the maximum takeoff weight.

Will Thorn
Canton, Mass.

I purchased a used VariEze in January 1984. I based my selection on visual appearance and workmanship, consultation with the FAA men who inspected the airplanes during construction, review of airframe mods and updates; and flight characteristics of each airplane.

I selected six airplanes as candidates for evaluation. Four were located from *Sport Aviation*, one from *Trade-A-Plane* and one was for sale in my local EAA chapter. Two were eliminated for price and logistical reasons (too far away), and I looked at four airplanes. Time on the planes ranged from 40 to 600 hours. All had the Continental O-200, and all cruised 150-170 mph at 3,000 feet. My strategy for evaluating airframe integrity came down to looking at the details, fillets, hinges, general surface smoothness and trueness of contours, and the fit of the cowlings and canard. Since there is no true way to determine structural integrity, the best you can do is assume that if it looks good, the builder probably followed the construction instructions faithfully.

The airplane I bought rotates at 60 mph indicated, lifts off at 80, climbs at 90 at 1800 fpm solo, 700 fpm dual. Full throttle (2550 rpm, I can't seem to get more) is 160 mph at 3,000 feet. Final approach is 80-90 mph, touchdown at 80. Stall (mine does in fact stall, dropping the left wing smartly, due to an improperly built wing) is at 62 mph power-on and 64 mph power-off.

I love the bird for all its quirks, and

wouldn't trade it for anything but a Christen Eagle or a Long-EZ.

Dan Morris
Dana Point, Calif.

I built a Long-EZ and have been flying it for a year and a half. In that time I've put 162 hours on it, with 263 landings. Performance is within one or two knots of the RAF 11 predictions.

Handling on the ground is very maneuverable and nimble. In flight, it is very stable, but the controls are quite sensitive. It must be flown with a light touch. Does not stall. There is a slight pitch-down in rain, but I have made many wet takeoffs, and they are no problem.

Maintenance: I've replaced one set of brake pads. The Lycoming O-235-L2C does not foul plugs like it does in the Tomahawk and 152. No lead-fouling detected to date.

Parts availability from Brock, Aviation Spruce and Wicks is very good. Props are a bit slow coming through, but my B&T is of excellent quality. RAF support is outstanding; Mike and Sally Melville do a very good job.

Cost of operation is low; it's the cheapest way to fly. Overall fuel burn is about 5.6 gph, which yields 140 knots. Liability insurance is \$450 per year. Annual cost is the \$50 hangar rent while I do the inspection myself. Overall, the Long-EZ is a very addictive flying machine. I cannot go to the airport without flying it.

David Domeier
Fall Village, Ct.

I built a Long-EZ in 1981-82, with a new Lycoming O-235-L2C. It has 150 hours on it. It is full IFR with all pre-fabricated parts. I expect it would sell for about \$45,000.

My advice to Long-EZ buyers: remember that each one is built by an individual, and there is no way of inspecting the internal structure of the craft. One must beware of

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Dan Morris
Dana Point, Calif.

I built a Long-EZ and have been flying it for a year and a half. In that time I've put 162 hours on it, with 263 landings. Performance is within one or two knots of the RAF 11 predictions.

Handling on the ground is very maneuverable and nimble. In flight, it is very stable, but the controls are quite sensitive. It must be flown with a light touch. Does not stall. There is a slight pitch-down in rain, but I have made many wet takeoffs, and they are no problem.

Maintenance: I've replaced one set of brake pads. The Lycoming O-235-L2C does not foul plugs like it does in the Tomahawk and 152. No lead-fouling detected to date.

Parts availability from Brock, Aviation Spruce and Wicks is very good. Props are a bit slow coming through, but my B&T is of excellent quality. RAF support is outstanding; Mike and Sally Melville do a very good job.

Cost of operation is low; it's the cheapest way to fly. Overall fuel burn is about 5.6 gph, which yields 140 knots. Liability insurance is \$450 per year. Annual cost is the \$50 hangar rent while I do the inspection myself. Overall, the Long-EZ is a very addictive flying machine. I cannot go to the airport without flying it.

David Domeier
Fall Village, Ct.

I built a Long-EZ in 1981-82, with a new Lycoming O-235-L2C. It has 150 hours on it. It is full IFR with all pre-fabricated parts. I expect it would sell for about \$45,000.

My advice to Long-EZ buyers: remember that each one is built by an individual, and there is no way of inspecting the internal structure of the craft. One must beware of

poor workmanship. The canard and wings should not show any fiberglass weave and have straight leading and trailing edges. Tapping with a quarter will reveal any delaminations with a dull thud instead of a sharp tap.

- 12 Check the dimensions with the owner's manual; the weight-and-balance should not show a c.g. too far from the center of the envelope. Basic empty weight of an IFR-equipped EZ with upholstery, generator and starter should not exceed 925-950 pounds. If so, suspect excess epoxy (not a structural defect) or lots of filler to cover bumpy layouts.

The engine should be well-baffled in a professional way. All the metal parts for the Long-EZ are available ready-made, and unless the builder is a professional metalworker, I wouldn't touch a plane without the pre-made metal parts. The plans call for a canopy safety catch and a gear-up canopy-unlocked warning system that should be installed during construction.

The flying qualities are superb—it is fast, responsive and a joy to the pilot. It is sensitive in pitch, and the rudders are not coupled to the ailerons, so it may take some getting used to, perhaps an hour or two.

Speed and fuel consumption are right up to Rutan's book figures. However, it is not really a two-seat airplane—more like one-and-a-half. The tandem seating can be unpleasant at times, especially if the rear-seat person gets weary in turbulence.

Ground handling, with the differential-brake steering, is not the best feature of the plane. I am on my third set of brake linings. One learns to use more runway on landing to save the brakes. I did lose a nosewheel to a very rough runway in Albuquerque (Alameda). It shimmied off in seconds, even though I had just checked the damper. Now I have it adjusted even tighter. I wore out a set of tires very quickly because of improper

toe-in, but after corrective shims were put in place, the problem was solved.

Backup from Rutan has always been super. The owner's manual is better and more candid than that of most production aircraft. A quarterly newsletter is mandatory for updates and "ADs."

Robert Forest
Santa Barbara, Calif.

We finished our Long-EZ in the summer of 1982. We've since flown it on several trips across the U.S., and it has about 300 hours total time. It has a 118-hp Lycoming O-235-L2C engine, King digital nav, glideslope, comm, DME, transponder, encoding altimeter.

My previous flying experience was about 700 hours in a Cessna 182 and 210. The Long-EZ is more fun to fly. It is very stable, lighter on the controls and reacts faster. It is not nearly as tiring to fly on a long trip. The sidestick controller is much more comfortable and precise than a conventional wheel or stick. From the front seat, visibility is great, both up and down, from the rear seat, not so good.

For the horsepower, it will climb higher (I've had it to 21,000 feet) cruise faster (we get 160 mph at five gph) and fly much farther than a conventional plane (10 hours if you care to sit there that long).

Factory support is excellent. They pass on all new ideas and discuss problem areas. (How long before the lawyers fix this?) I've had almost no trouble with the airplane in 300 hours—much less than with the two Cessnas that I bought new.

The Long-EZ does have some disadvantages compared to conventional airplanes, however. It is no quieter than a conventional plane, and may be a little noisier. You need a headset.

It must be parked on with the nosewheel retracted or else it'll fall over on its wing

the winglets and/or prop. The nose is rather heavy to lift when the gas tanks are near full. Our Long-EZ pitches nosedown in rain, which requires a trim change. Annoying. It is not a short-field or rough-field airplane. It's easy to damage the prop from stones kicked up by the front tire. Insurance is higher than for a conventional plane. I pay \$600 a year for only \$100,000 per seat, with no hull coverage.

Here are some sample performance figures for my aircraft, based on rather careful testing under many conditions. At 5,500 feet (density altitude 7,800 feet), max cruise is 190 mph (24", 3050 rpm). At 23x2950, speed is 180; at 21x2800 it's 172 mph; at 19x2500 it's 145 mph.

At 8,500 ft (10,500 density), max cruise is 185 mph (21x3050). Other speeds are 175 mph (20x2900), 166 mph (19x2750) and 145 mph (18x2550). Rate of climb is 845 fpm at 7200 feet density altitude, and 500 fpm at 12,500 feet.

John Sheffels
Great Falls, Mont.

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