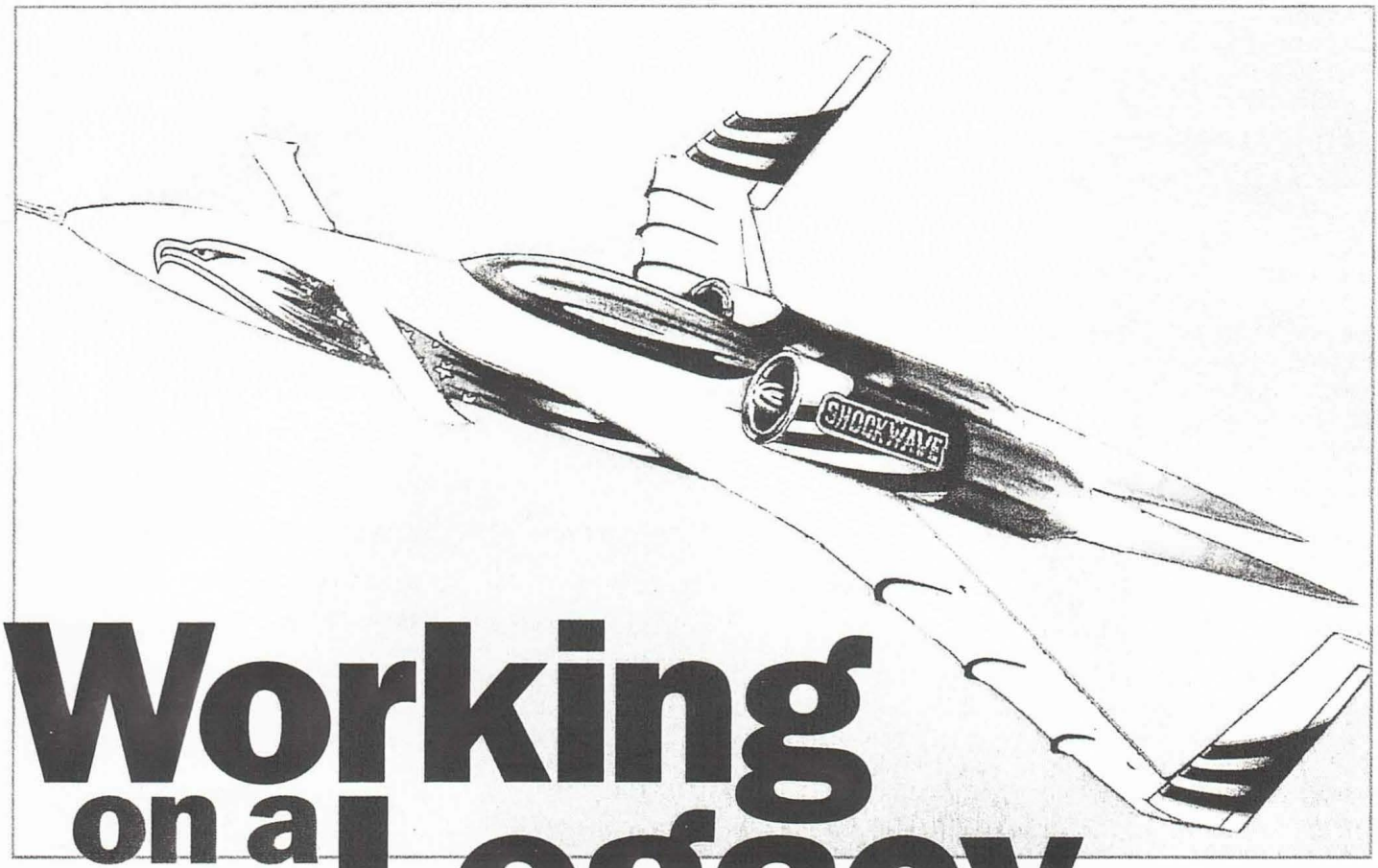


Working on a Legacy

The EZ Hangar

BY ANN MCMAHON

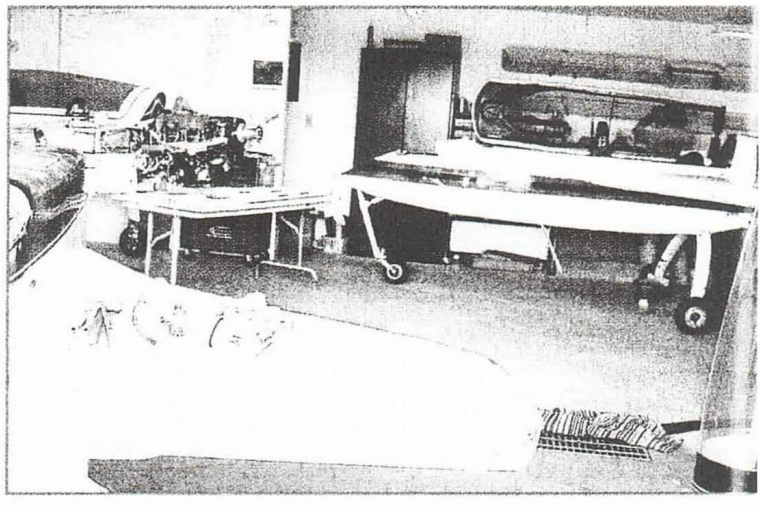
IN THE WORLD of custom planes there are two realities: the way a plane builds and the way a plane flies. Builders are intimately acquainted with their plane as it goes together from the kit or the plans, while a good pilot learns the details of the behavior of the aircraft in flight. Some knowledge of building can transfer to flying and vice versa. However, each reality has its own domain.

In the 1970s and into the 1980s, the usual progression was one of moving from the reality of building to the reality of flying what you had built. Like their manufactured brethren, custom planes had their own eccentricities from one model to the next, and they could also have unique flight qualities from one plane to the next of the same model. Therefore, prudent builders obtained a pilot experienced in the aircraft they had just built to help them learn to fly their completed project.

In the 1990s this began to change. Plentiful custom planes, like the Long-EZ and VariEze, with their fast, economical flight, attracted buyers who were never builders. Some of them wanted EZs because they could afford to maintain and fly them, as opposed to an expensive manufactured plane. Some just liked the slick, fighter-like controls, responsiveness and speed, while others were attracted by all these qualities.

With the change to pilots of custom planes who weren't the plane's builder, came a different reality. Some nonbuilder owners viewed their new purchases as something of a toy, not to be treated the same as a manufactured plane. As a result, they didn't obtain an experienced pilot for flight training in type, as had the prudent builders before them. And many of them paid a high price, as the investigation into John Denver's death in a Long-EZ indicates.[1]

However, the buyer/nonbuilder phenomenon hasn't slowed. In fact, it's growing as we progress toward our second century of flight. A sample of 1197 FAA registration records for Long-EZs, VariEzes, Defiants and VariViggens



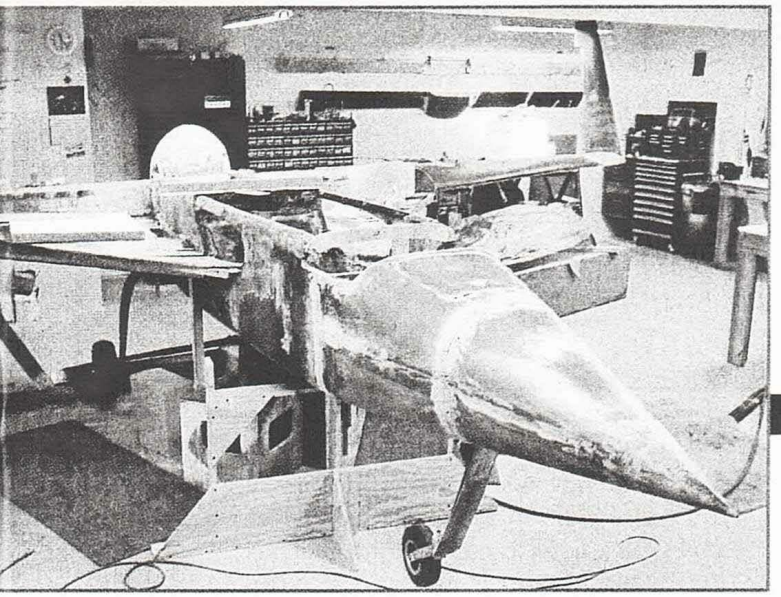
Hangar bay B contains other aircraft repairs in progress.

shows 42% of the airworthiness certificates held by someone other than the builder.[2] This is a significant shift to the reality of the nonbuilder pilot.

According to the Rutan Aircraft Factory, which stopped selling plans in 1985, there were approximately 4000 VariEze plans sold from 1976 to 1980 and approximately 4400 Long-EZ plans sold from 1980 to 1985. Exactly how many of these plans turned into flyable aircraft and exactly how many of them are flying today is difficult to determine because the FAA enforces no standard for registration of the model name.

However, more than 1200 are flying and aging as they go. As a result, a small industry has grown to support these nonbuilders and, ironically, builders as well. The EZ Hangar is such a venture.[3]

Started in 1992 by Robert and Valerie Harris as a business to rebuild and rehab wrecked EZs, the EZ Hangar has provided a foundation for these two A&P mechanics to provide a variety of services, including major repair, expert advice, routine maintenance and design. Nonbuilders come to Valerie and Robert to get their EZs fixed and to learn about maintaining their aircraft. Builders also come to them to get major repairs. In addition to both being A&Ps, Valerie is an aircraft inspector (IA) and Robert, who has worked as a line mechanic for Northwest Airlines for 16 years, is a designated airworthiness representative (DAR). Valerie should have her DAR rating as of press time.



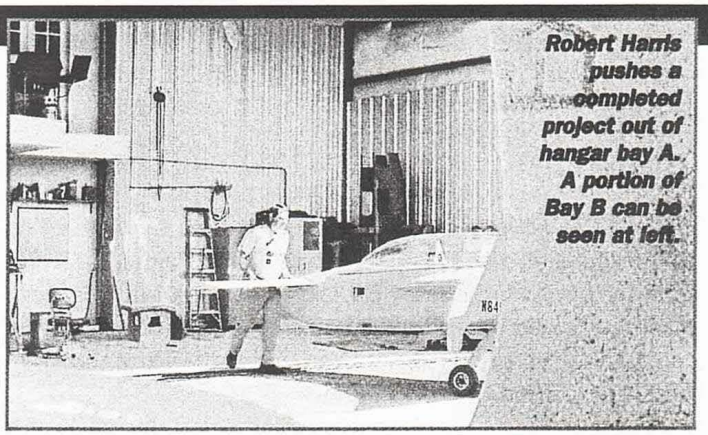
The wrecked VariEze, shown on page 30, has been restored to an almost complete aircraft once again.

As it turns out, putting a mangled piece of wreckage back together to fly safely again requires a different set of skills than building from a kit or plans. As the accompanying pictures show, the EZ Hangar gets the really tough jobs. Robert brings 24 years and Valerie brings 10 years of working on EZs and their professional training to bear on each repair and design project.

In chatting with them, you can gain insight into the EZ that was unknown in the '70s and '80s. "The aircraft are aging quite well," said Valerie. "The years have proved there were very few inherent problems with EZ construction. The largest problems are that you need two people to do the large lay-ups, such as the wings, spar caps, canard and the center-section spar. They really do need two people to handle all the cloth and laying out of material." She adds, "Most people find themselves laying this much cloth only if they purchase an incomplete project or decide to rebuild portions of a project."

Much more in demand is maintenance knowledge for an aging fleet of EZs now flying. Regarding important maintenance, Valerie cites four items. "It is very important to set and then periodically check nosewheel friction, as well as the tightness of the bushings at the top of the nosestrut. For the VariEze, it is crucial that the maingear attachments remain tight. The O-rings on the fuel caps on both EZs need to be kept in good condition," she said.

Robert, who has considerable experience painting composites, indicates numerous older EZs are approaching a time when they'll have to be repainted mainly because the primers that were used with the paints didn't adhere well enough, especially in the high heat area of the engine cowls. "While painting a newly constructed EZ is a large job," says Robert, "repainting will require tremendous work from the owner because paint shops can't afford to sand off the old paint, and chemically stripping paint off the fiberglass composite construction of an EZ is not recommended. Also, the primers and paints that do well on fiberglass are now known to be extremely toxic, so anyone who elects to paint their own plane—and they may because a lot of paint shops know how difficult the job can be and refuse to do it for any money—must invest in proper respirators and have a forced-air paint booth and paint system," he adds.



Robert Harris pushes a completed project out of hangar bay A. A portion of Bay B can be seen at left.

While fading paint jobs are lurking, some other problems are far less imposing though repetitively present. Valerie and Robert say they see builders not properly balancing flight controls, owners who don't keep their weight and balance in order and builders who lack the ability to properly wire their aircraft.

Valerie says, "We suggest that if you're still using Tygon tubing in your VariEze fuel system, change it every two years." Robert adds, "When the tubing gets hard, you are well past time to change it."

On the topic of routine EZ maintenance, the EZ Hangar couple suggests following the checklists contained in the flight manual for each aircraft, as well as AC 43.13. AC 43.13 is the advisory circular that is *Acceptable Methods, Techniques, and Practices - Aircraft Inspection and*

Whine of the Valkyrie

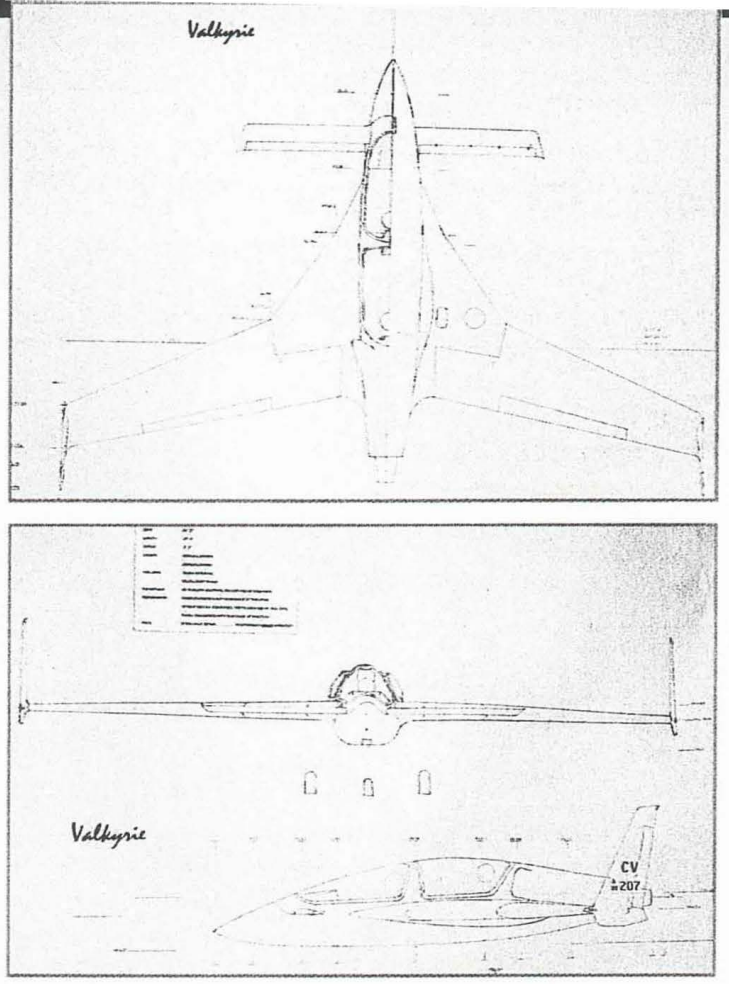
IMAGINE YOURSELF TAXIING from your T-hangar—not with the roar of pistons and prop, but with the whine of a jet engine. You no longer have to worry about oil changes, sticking valves, breaking crankshafts, pistons and pushrods. Gone are the days of rotating sparks plugs and junky magnetos. Instead, you have a simple turbine, running on diesel fuel, which will operate for years with virtually no maintenance.

Now imagine yourself near the end of the runway with your jet. If you have over a thousand flight hours, that's exactly where you'll be with no other requirements needed. Imagine going down a very different checklist than the one you presently use.

It's time to take off. The throttle goes forward, and the response—unlike the big jets—is instantaneous. You feel a push in the small of your back, and in 1500 feet you're airborne in the Valkyrie. You retract the gear and see yourself climbing easily at 6000 fpm and 110 KIAS. You're burning 30 gph of fuel on the ground and in the climb.

Then you arrive at altitude. Throttle back to a cruise at 95% power. You're now burning 45 gph, and you're moving at 250 knots. You'll arrive at your destination in half the time it took in your piston-engine EZ.

While there's nothing to show for the significant tax dollars spent on the development of a small jet engine for general aviation, Robert and Valerie Harris are making it happen right now using an available GE T-58 engine. The wings, center-section spars and fuel tanks designed for the Valkyrie have been completed. They're being attached to a fuselage at the EZ Hangar for the Twin Jet airshow plane. The Twin Jet is set to debut in 2002, and its performances will test the basics of the Valkyrie structure with loads up to 8 G. Keep your eye in the sky.

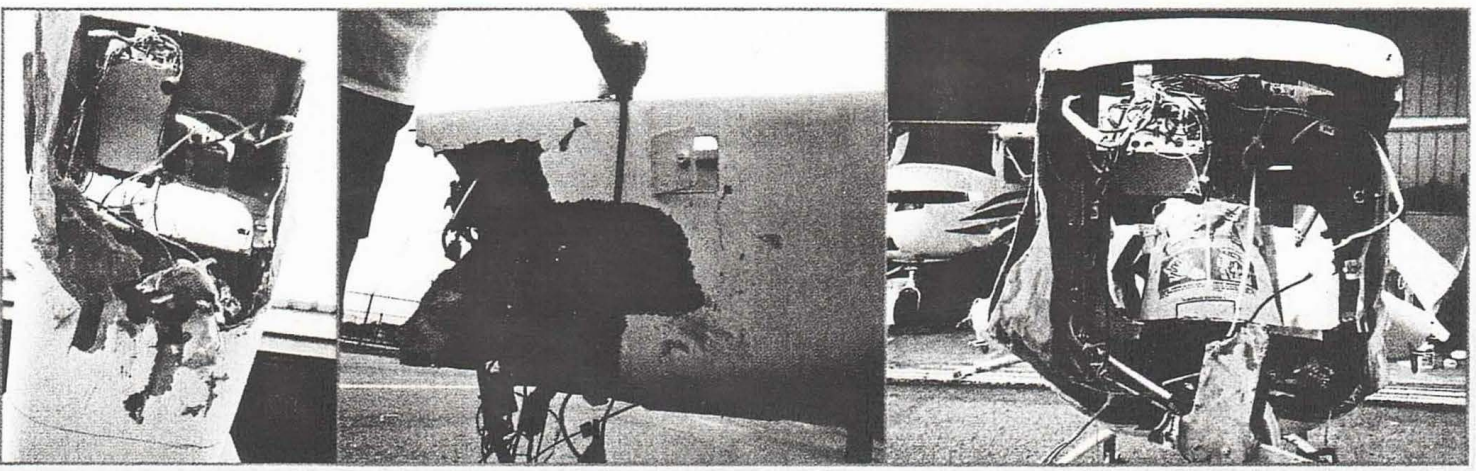


These are artist's concept drawings of the proposed Valkyrie jet,

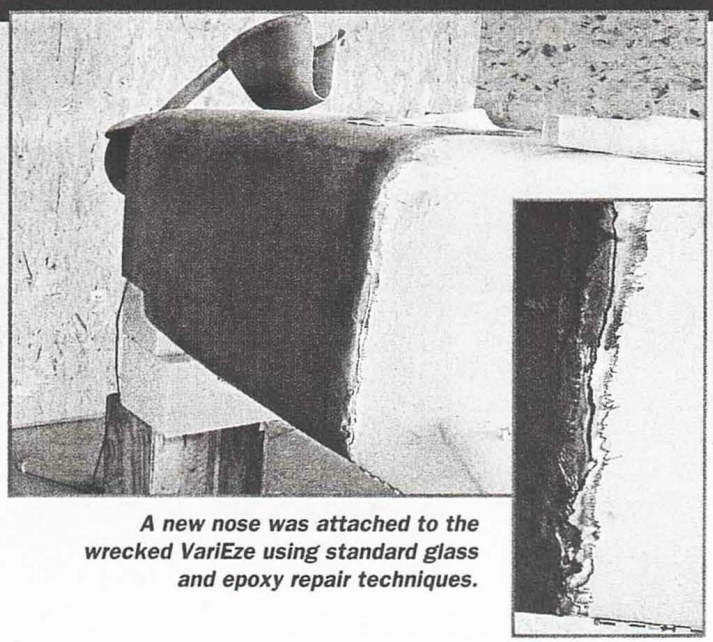
Repair. The purposes of AC43.13, according to the FAA, is to promulgate methods, techniques and practices acceptable to the Administrator for the inspection and repair of nonpressurized areas of civil aircraft, when there are no manufacturer repair or maintenance instructions (i.e., plans- or kit-built aircraft).

The data in this circular generally pertains to minor repairs, but there are also specific major repairs identified in the circular that can be used as a guide for FAA approval of those major repairs. Valerie says, "Owners of homebuilt aircraft, who have certified engines on their aircraft, need to hire someone qualified to check over the certified engine and to do required maintenance."

When asked about modifications, outside the original plans, to these aircraft, they respond that most modifications have worked well over the years and have enhanced safety, as well as landing and flight characteristics, of the EZs. Good examples are the large rudders and the large brakes modified to work on the Long-EZ. The larger rudders have given the Long-EZ a true 30-knot crosswind control capability, while the larger brakes stop the plane after a high-speed landing without fading from the heat generated by the stop. Additionally, both the Long-EZ and the VariEze have been modified to use larger engines than called for in



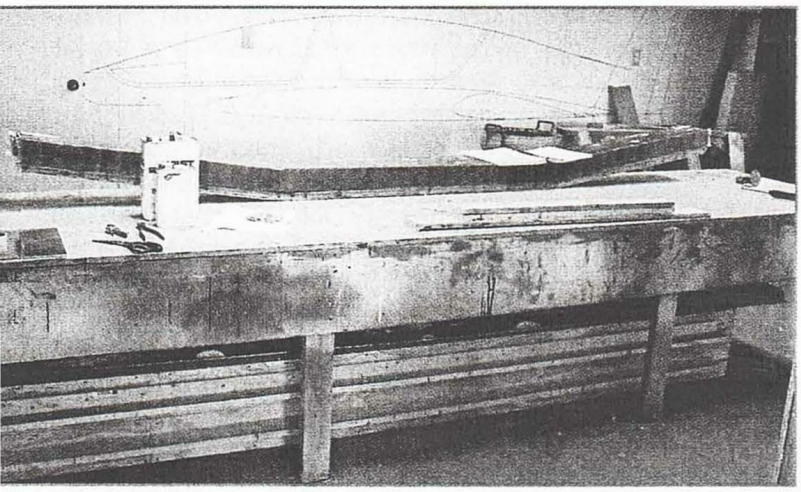
This VariEze project had its entire front end ripped out in a crash. Technicians at the EZ Hangar rebuilt it.



A new nose was attached to the wrecked VariEze using standard glass and epoxy repair techniques.

the original planes. The more powerful engines have made takeoff safer on hot days, as well as provide additional power for flying over mountainous terrain, handling turbulence and powering through high winds and crosswinds.

Related to modifications, Robert has designed and created a highbred, jet EZ. Called the Valkyrie (see sidebar), this canard jet will feature a wider body than the traditional EZ. The passenger will sit behind the pilot, but at a high enough level to see above the pilot's head, while experiencing a standard 6000-fpm climb and 250-knot cruise speed. If you think the fiberglass composite construction of



The new Valkyrie jet pusher's center section spar now awaits its new hardware attachments, which are to be completed.

an EZ can't handle the G forces involved in jet flight, think again. A rocket-powered Long-EZ has flown twice successfully last year at Mojave Airport in California.[4]

As you can see from the accompanying pictures, the basic structure of the Valkyrie is being built into the Twin Jet EZ, scheduled to debut in 2002 with Jimmy Franklin at the controls. Franklin is an aerobatic, airshow pilot with years of experience. The Twin Jet EZ is Les Shockley's project. If you don't remember Shockley, you'll remember his jet-powered semi rig called *Shock Wave* that has thrilled airshow fans for years.

Notes

1. The final report on the NTSB investigation of the Long-EZ crash can be found at the following URL: http://www.ntsb.gov/ntsb/brief.asp?ev_id=20001209045&key=1.

2. The sample was obtained from the FAA Civil Aviation Registry, Interactive Database and running a comparison of the manufacturer's name against the registered owner's name.

3. The EZ Hangar is located in Covington, Tennessee, at the Covington Airport (0M4). Call the hangar at 901/475-3686.

4. See http://www.xcor.com/ezrocket02.html for a picture of the modified, homebuilt Long-EZ powered by twin 400-pound-thrust, regenerately cooled rocket engines and fueled by isopropyl alcohol and liquid oxygen.

5. In 1963, the current joint designation system for all U.S. military missiles, rockets, drones and probes was devised. This system became formally effective on June 27, 1963. In 1990, the system was extended to include boosters and satellites. The system is defined in Air Force Joint Instruction (AFJI) 16-401 and in DOD Publication 4120.15-L [3]. The latter document also contains a listing of current designations. Aeromet AURA (Aeromet Unmanned Reconnaissance Aircraft) unmanned version of Rutan Long-EZ evaluated as reconnaissance UAV; should have been designated GQM-n). See http://www.designation-systems.net/usmilav/missiles.html#_Listings for more information.

6. See http://www.noaa.inel.gov/Capabilities/longEZ/ for pictures and an explanation of the research being done with Long-EZ N3R.

The Twin Jet will have one jet engine mounted on each side of the fuselage above the strake area, while the Valkyrie will have a single, in-line jet engine. In the Twin Jet there's room at the back for a drag 'chute to stop the high-speed aircraft after landing, and the Twin Jet will carry a BRS or ballistic recovery 'chute as well. Built into the Twin Jet's wings is enough strength to support additional fuel, as well as the weight of the engines. The Valkyrie will benefit from all this strength with less load because it will have only one jet engine.

Yes, the EZs are aging quite well. Their revolutionary design continues to inspire, proving time and again its basic soundness, while exhibiting a futuristic look with a technology that's decades old. The Long-EZ shares the distinction of being one of the few civilian-built aircraft with a military designation.[5] Some of their owners and builders are respectful of the EZs heritage and passionate about their future, working on modifications that have put the VariEze at a cruise speed of more than 200 mph and as a competitor in the Reno Air Races.

Other advancements include electronic ignitions, EZs with twin engines, rotary-engine EZs, wide bodies, asymmetrical bodies, downdraft cooling and cowls, luggage and fuel pods, avionics and the list goes on. There is even a Long-EZ (N3R) used for weather instrument research by NOAA.[6] EZs have spurred evolutions of themselves in the Cozy, the Berkut and the Velocity—all sharing a rich past and an even richer future to come with jet power.