



# JET EZE

## Turning a dream into reality, part 1.

BY LANCE HOOLEY



**It started in 1974** with my first flying lessons. I was 14. Delivering newspapers, riding 17 miles a day on my bicycle before school, landed me enough money to take a one-hour lesson a month, or sometimes every other month at 12 bucks an hour *with* the instructor in a Cessna 150. Soloed on my 16th birthday after riding my bike to the airport...it was only 12 miles. I had to ride my bike; I did not have my driver's license. The state trooper who gave me the driving test a few days later had a good laugh with it—yep, can fly an airplane but could not drive to the airport.

In '77 I enlisted in the Air Force and ended up at Fairchild AFB, Spokane, Washington. This is where I built my Rutan VariEze. Pusher, canard, looks futuristic...sign me up. In '86, during my crop dusting days, I decided to build a Rutan Quickie. Single place, pretty inexpensive, cheap to operate, and took me six months to complete.

In '95 I built a DR-107 One Design. I was getting heavy into aerobatics. The 107 took me two years to build. What a

crotch rocket! One of the easiest taildraggers to land I have ever flown. It had an O-360 in it with a fixed-pitch prop. Just a blast to fly. During my time with the 107, I was doing fabric work for Ray Williams in Tennessee. This gave me experience rebuilding airplanes—mostly Pitts, but also a Stinson 108, Skybolts, and an Eagle or two.

Some of this rebuild stuff was insurance work...translation, it be broke. Cracked spars, ribs, wing tip bows. This started me down the path of how do I do this?

While flying for a commuter airline in Orlando, Florida, in 1999, I worked at Jim Kimball Enterprises doing their fabric work. This was top-end stuff. You only do the best with them. Their award list shows it, too. In 2000 I moved to Tennessee again and was out of building airplanes. But not for too long.

### Back to Building

In 2001 the bug to build bit me again. Just kinda in my nature to create. This is when the Long-EZ kept coming back to the

top of my “wanna build” list. Fiberglass work was no stranger to me, so this did not slow me down...well sorta. The finish work is labor intensive. The biggest expense is time. Lots of time to build a moldless composite airplane.

There were also a lot of unknowns. Could I build another airplane? Yeah, I’ve already built two other Rutan-type airplanes. Where would I do it? Hopefully at home. The build goes faster when you can work on it anytime you can. How long would this one take? Longest it had taken me in the past was two years. Could I afford it? Pay as I go; this will defer the costs over a period of time. It will cost blood, sweat, and a few tears. It’s not a hobby if it doesn’t involve blood.

Have you noticed the question of *could* I build it did not come up? In no way did I think I had all the knowledge to build it. However, I do not believe in can’t. Learning is enjoyable to me. So finding out all I needed to know to build an airplane was part of the journey. So why build? Learning. Building a cool airplane almost exactly as I wanted it was cool itself.

The Long-EZ has always had an appeal to me. Man, is it an older design though, like 1977 or so. But even to this day, it looks futuristic. Along came an article in *Sport Aviation* about Robert Harris and the EZ Hangar in Covington, Tennessee. I was living in Nashville at the time and called them. Robert was more than willing to talk to me about



Canard tip. On a lot of the parts for the original Long-EZ, Burt Rutan says, “Sand to a pleasing shape.” Works for me...This is made out of carbon.

building a Long. So my soon-to-be wife and I did a day trip over to see him. My concern about the older design was put to rest when Robert suggested I build it with current knowledge of fiberglass structure and materials.

The visit started a friendship between Robert and myself, which we continue today. Robert ended up being my mentor with airplanes. He mentored me in the building process, building for ease of maintaining and flying homebuilts. How did this happen? Easy. Robert gets a *lot* of tire kickers. People talk a lot and then do nothing. It gets frustrating since Robert does not charge for this...consultation. It blows his time though. Then I disappeared for a while, so naturally he thought I was a pipsqueak tire kicker, too. I called Robert one day to say I had the center section spar built in Florida.

Robert told me some time later it was then he realized I was serious about this and being a builder.

### Why Not a Jet?

So now it gets interesting. As if building an airplane was not interesting enough already. From here on, it’s not a Long-EZ. I wanted a big engine in it...more power. The only time you have too much power is right before impact. I wanted to put an IO-360 in it with dual electronic ignition. Robert said fine, but we needed to change the structure since a Long has a 190-knot  $V_{NE}$  and was never intended to have this much power.

First up was the canard. The airfoil is the stock GU canard...the internal structure is a bit different. Next came the wings and winglets. They come from another design, modified for



The inside of most of the nose is a box structure; this is the beginning of the nose.



Robert doing a layup on the bottom of the Jet Eze's carbon fiber cowling.



The second tub, with all the mods for strength, out of the garage for the first time. No wheels yet.



The center section spar ready for fiberglass layups. The black lines are for fiberglass weave orientation reference.

higher speeds and weights. The winglet construction was pretty much stock at this point.

I had the fuselage to the tub stage, with mods for the higher horsepower engine, when I called Robert about the center section spar mods needed because of larger engine mount attachments. Robert suggested making the fuselage man size—four inches wider right down the middle and six inches longer in the back seat, along with moving the front seat bulkhead top forward one inch and moving the main gear aft one inch, so it would stand on its own and not have to be parked nose down. He also mentioned adding a ply of Kevlar to the bottom for off-airport puncture resistance. Crap. It would be easier and quicker for me to build another fuselage than modify the current one.

I gave the tub away...don't know if the guy who took it ever did anything with it. But I built another tub with all the mods. I didn't know how to make these mods when I started tub 2, but I figured it out as I went. All the measurements in the Long-EZ plans had to be changed—spar cut-outs, bulkhead locations, etc. Change one thing and change six more...do the math.

Here is where we took a large jump toward unique. Robert suggested putting a GE T-58 jet engine on it, like he did with the CozyJet he built. Whaaat? Robert put a feather in my cap and said he thought I could handle the building and, more importantly, the flying of it. Up to me, but it would be different. I saw a challenge. Boy, did I underestimate this. Yep, we would only have to bolt it on and build a different engine mount. How hard could it be?

## Full-On Building

Robert came to Kissimmee, Florida, to pick up my fuselage and take it back to his shop for us to have a concentrated effort to get some critical components built under his supervision. Robert and his wife, along with my wife and me, got the nose on it, along with the gear under it, and the canopy on it, mounted in carbon fiber. The nose gear is mounted a little lower than expected, as the main gear is modified for much higher weights and is longer than a Long-EZ gear. Mine is more like a Rutan Defiant. So for the airplane to sit at the correct attitude on the ground, we had to mount the nose gear lower. It has an F-4 style bump on the bottom...you did notice this, right? Most people don't. We did all this in 10 days. This also exposed me to Robert's advanced building techniques. Really



Robert (on the left) and I cutting the canard cover and canopy off to glass the inside of each.



Canopy prior to being cut off. Yep, it's bedded in carbon fiber. Most of the airplane is constructed with E-Z Poxi.

advanced. How else were we to do all this in just 10 days? Oh yeah, we also cut out all the access holes these parts needed and glassed them in this time. We also completed minor stuff like cutting the canopy off the tub, mounting all three gear, cutting the canard access cover, and cutting the nose off for the batteries to be kept in the nose.

The canopy is *much* larger than a Long-EZ. As you can see from the picture on page 6, there is a lot of room between my helmet and the canopy. The canopy is also twice as thick as a Long-EZ canopy. Airplane Plastics in Tipp City, Ohio, blew the canopy plastic for us. I sent in a full-size drawing from the side and top, and they sent a clear test canopy. We marked the test canopy with a grease pencil, indicating things like move this down, make this shorter, etc., and sent it back. A short time later, the actual canopy arrived, tinted like I wanted, and it fit great. Really nice job at what I thought was a very reasonable price.

With the airplane back in Kissimmee, I built four sets of pods...yep, four. All four are modified FeatherLite pods. They are mounted permanently. Usually the pods are removable. Mine are not. The inner two are fuel tanks, and the outer pods are for baggage. Remember the change rule? How do you make mostly hollow structures (the pods) load bearing? They were meant to carry 15 pounds each. Twenty-five gallons



This is how the “pleasing shape” starts out...with foam blocks hot glued together, then you sand off what doesn’t look right.

of fuel per pod times 6.75 pounds per gallon is...a lot of weight. Back to learning. How to translate the weight to the strakes? I figured it out, along with the plumbing required to get the fuel from the pods into the strakes where fuel is usually kept.

Next came building the strakes themselves. They are bigger than a normal Long. Plus I wanted the strakes to carry the load of all four pods. There is additional structure inside the strakes for this. OK, I got carried away and overbuilt the strakes and pods. The pods have bruised, tweaked, cut, and poked all of us. They do not move—at all. I think they sometimes reach out and grab you because you’re too close.

## More Math

I wanted to know how much the strakes would hold, based on the size I made them. Robert wrote the formula upside down on the forward face of the left center section spar. It’s still there. Here was more math I had to learn. There is only one straight line in the strakes: the aft edge. Everything else is a curved edge. We did quick measurements and figured 107 gallons total. Based on this, I did not need the pods. I mean, we have over three hours of fuel in the strakes alone, and I have a two-hour bladder. The pods stayed on just for the cool factor alone. They kinda grow on you. We were wrong about the quantity of the strakes.



(Left) Looking forward inside one of the fuel pods prior to installing the back half. I put several baffles in to keep fuel slosh to a minimum. (Right) Near the end of primer coats. Notice the unevenness on the pods—not quite finished yet.



Internal structure of the left strake. I built two sub spars to carry the load of the fuel and baggage pods.



Robert standing behind the finished carbon fiber cowling—all 5 feet of it.

Turned out to be 105.5 gallons. Well, they were quick measurements!

More math again: This engine will suck an Olympic-size swimming pool of air in one minute. What size do you make the intakes? Too small and you starve the engine, too large and it creates an air dam and drag, along with tunnel rumble and other problems. There's a formula for that, too. Four of us used the formula and came up with the same square inches for an answer needed to size the intakes. Now build them! Aaargh. More aerodynamics involved here. By the way, the intakes work really well. We ended up with the airframe on a trailer, pulled it through several thunderstorms, and the water left a lot of

streaks inside the intakes. They were all straight lines—perfect attachment front to rear. It was cool to see.

Aft of the intakes on the firewall is where the plenum has to bend the air around to the engine. There is a fair amount of voodoo involved with this. You don't want to choke the air or cause it to separate and hit the first stage turbine at an angle. There are something like 45 cure cycles in the plenum alone. Yeah, it's complicated. If you want to know how to build them, talk to Robert. He'll probably laugh at you and say, "It's complicated."

The cowling is one-piece carbon fiber...well it is now. What you do is this: Put the engine on, cover it in

foam, carve to a pleasing shape, glass the bottom (yeah, the airplane has to be upside down), turn the airplane over, then glass the top. Next, pull the cowling with the foam off in one piece, get rid of the foam, add rigidity to the inside, add the attachment points to put it back on the airplane, and you're done! Yeah, right. Down the road I put a rather large hole in it where it had to be modified to accept the alternator, it needed intake scoops on the bottom to allow ventilation air, and I also added drain holes. Had to build a bump for the alternator hole, too. More aerodynamics here.

## Blended Winglets

I thought it would be cool to have blended winglets. There's no drag advantage in having them unless you can do better than about 150 knots in cruise, but it sure looks good. Talk about adding problems. The rudders on this airplane, Longs, and VariEzes are on the winglets. However, the inside surfaces of the winglets create lift. So the rudder only goes outboard. This makes the rudder act like a flap on a wing and increases the lift on the inside surface, which pulls the nose around. Works just like a normal rudder, only different. Also when you want brakes, you push on the rudder pedals, just like a normal airplane. When the rudders reach full deflection, you start to get brakes. So yes, you can push on both



Robert (on the left) and I sanding the blend for the blended winglets. We were both *much* heavier back then.



The front half of the winglet in the foreground has been cut off to allow the wing spar to be extended into the winglet.



Both winglets ready for the fiberglass layups. Notice the cutouts for overlap onto the main wing spar at the end of the wing.

rudders at the same time in flight...mini speed brakes. So...the blend is curved... and it needs a cable going through the wing to actuate the rudder. This got into arms, radiuses, and deflections. Great, more math. Remember the change rule. So I figured it out. Move the rudder out sometime when you see the airplane, and you can see how I did it.

Then there is the problem of structurally integrating the winglet to the wing and the shape of the blend. This is a biggie. The Long-EZ is able to take a side load on its winglets of 170 knots at 90 degrees. Now, I would not want to try it, but it's strong. Robert came down to Florida for a visit, and we went after it. Basically—very basically—we extended the wing spar through to the tip of the winglet. Then we put the winglets on, shaped the foam for the blend, and

glassed them on in three days. Day two was kinda long, but we got it done.

This is where the pipsqueak thought he was the master. When we glassed the outer skin of the winglets, I wanted to use peel ply at the end. Peel ply is used to wick up the excess epoxy, smooth the layup, make the layup appear thinner, and pre-prep the surface for more layups later. Robert had only seen peel ply in 2-inch wide rolls...this would take forever. I came out with a roll that was 5 feet wide. Slapped it on, and we were done in 10 minutes. Robert uses this technique to this day.

Before I wanted blended winglets, I thought I was going to use the stock winglets and had already built a pair to mount on the wings, complete with antennas in them. We did not use them because structurally, they were not

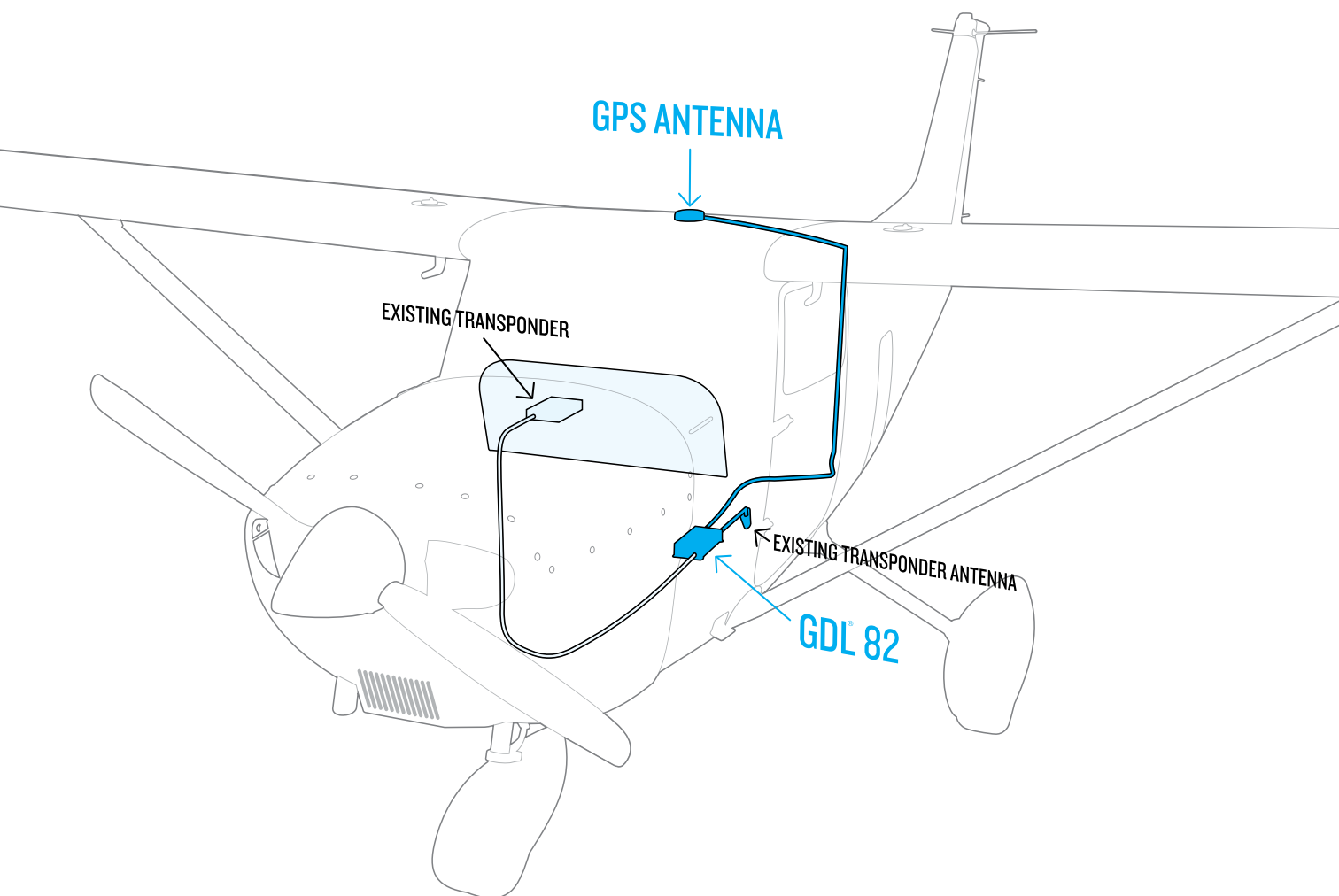
strong enough to use blended. There is a lot of this when you build a one-of-a-kind airplane. Many parts I have built two or three times. Two sets of winglets, two fuselage tubs. What happens is this: I would be trying to overcome a problem, build the solution, and then see a better way—sometimes safer, sometimes lighter, sometimes a cooler way of doing it. I found it easier at times to think on it until I was happy with the plan, then jump in. Yep, you're gonna make mistakes, yep you're going to make more than one of the same part. But you know, in the end you're learning, solving problems, and making it happen. And that's what the Jet Eze project was all about.

There's still a lot more work to do before it flies, but we're out of space, so I'll tell you the rest of the story in part 2. ✚

Clear blue sky at Oshkosh 2017... oh, yeah, the jet is pretty nice, too!



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# JET EZE

## Turning a dream into reality, part 2.

BY LANCE HOOLEY

**With the airframe** coming together nicely (see part 1), I started installing systems. The control tubes for the ailerons ended up being rather complicated due to the fuselage changes. They're all mounted in ball bearings. The ailerons also have an idler doubler on the firewall to ensure the ability to achieve full aileron deflection. Works well.

### Discovering Electricity

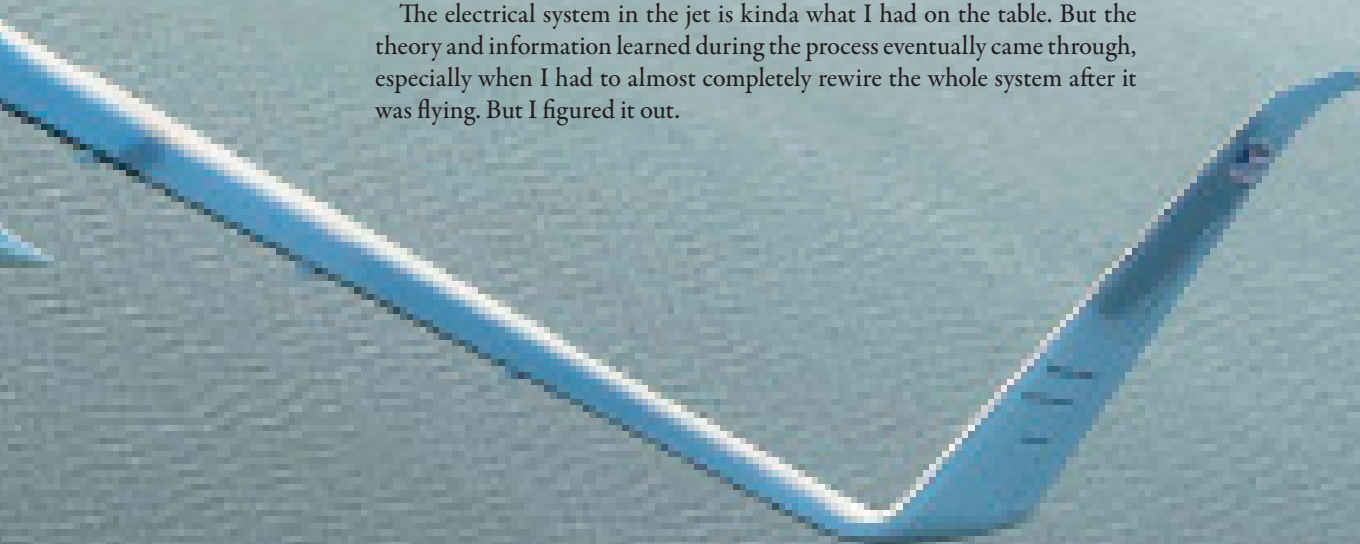
Electrons get my attention, especially when they are charged. I'm one of those guys who can accidentally arc weld with two 12-volt batteries. It's cool...after you can see because of the flash that you weren't expecting happens, the smoke clears from the battery post disappearing, you can hear again because of the loud pop, and you quit shaking like a dog trying to pass a Georgia peach seed. Yeah, I won't do that again! I may be electronic stupid, but I'm smart enough to know I be stupid.

So, my arm is in a cast from surgery, and I want some snarky stuff for the electrical system. I know what I want the system to do, but I don't know how to make it happen. Part of my premise was to make the jet simple, at least from the pilots seat.

I queried five engineers in aircraft electronics. Ya know, even though I was going to pay them, not one came through. Can't work, can't really work on the jet...grrr...whatever.

Did you know Digi-Key has an outstanding education section on their website? Once again, learn the information, solve the problem. I called Digi-Key, too. Then I built a complete electrical system on my bench to test the theory.

The electrical system in the jet is kinda what I had on the table. But the theory and information learned during the process eventually came through, especially when I had to almost completely rewire the whole system after it was flying. But I figured it out.



## Gluing Metal Parts

Throughout the airframe I needed special parts—one of a kind stuff. I needed to glue metal parts together. It's called welding. Everybody knows how to weld, right? Mike Yancey and Robert Harris got tired of me asking them to weld this, and this, so they took it upon themselves to teach me to weld—not using batteries, but an actual welder. Whenever a welding project came up on non-important stuff in the shop, I got instruction. Yep, I created some junk, which ended up in the trash, but I did some pretty good stuff in the end. Since then, I have bought my own welder and yes, I glue metal parts together regularly. Well, what do you know, I learned a new skill. As Robert says, “Just something manly about welding.” He's right.

## Finish Work

Doing the finish work on this animal... well...it's fiberglass. You can get as carried away with the finish as you desire. There is a point, though, where if you do more fill and sand, you are not gaining any performance, just appearance. I admit, I put way too much time into the finish. It cost me time. Probably could have shaved a year off the project by not going so overboard with the finish. But it's what I wanted. I had the airframe upside down in my garage and the finish work complete on the bottom, what we call the dead bug stage. You know,



“Is that an RC?” “Is it really a jet?” “No way you built it in the garage!” Those are the types of comments you get from people driving by when they see a jet in your driveway.

the gear is sticking up, and it looks like a dead bug.

Robert showed up to help me flip it over, not an easy task considering there were four pods on it. I came up with a rollover structure, which balanced the airframe nicely, and it ended up being an easy, but nerve-racking experience. While it was in the driveway, we decided to put the canopy back on, and the wings and canard on. While I was in the back seat putting bolts in the canopy, a guy pulled up and yelled out through his window, “How much is that thing?” Robert responded, “Bout 200 grand, most of it in chrome though.” There's no chrome on it.

The next car asked if it was an RC airplane. Robert responded, “Yep, it's half

scale though,” and I'm still sitting in the back seat!

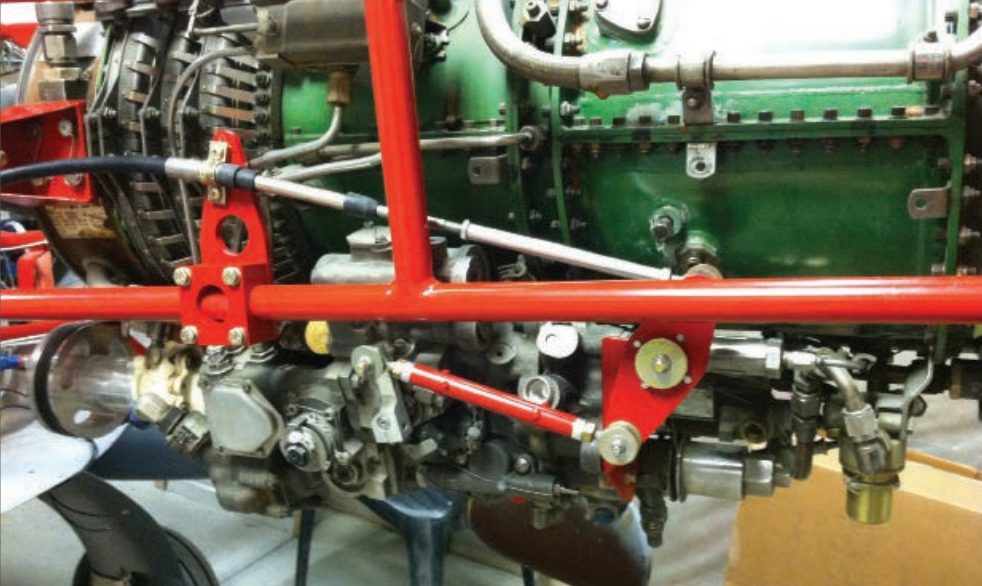
Next one asked if it's a jet. Robert said, “Yep, it's OK though; Lance's wife use to be a Playboy Bunny flight attendant on their DC-9. She still has the tail!” That one got around the neighborhood. That's my neighbors y'all.

## Airbrushing

People think the jet is painted camo grey, like some Navy stuff. Nope. Originally I wanted the winglets to appear as though they had flown through an American flag and were pulling it along. So I went to three different airbrush artists in Orlando to get quotes on how much to do this. Learning how to airbrush was not on my agenda, since with my artistic ability, I



This rollover structure was used to flip the Jet Eze over, not an easy task considering there were four pods on it. The center is offset on the half wheel, making it balance really well.



GE T58 and custom engine mount. It produces about 860 pounds of thrust, which is in the ballpark of 800 hp.

can't draw stick men. After talking with these guys and seeing them, I figured how hard can this be? The \$23,000 price tag just to do the winglets kinda pushed me also. More learning in my future.

Did you know you can go to airbrushing classes in Orlando? I went for six days and learned the basics. At first, I wondered if I could fade primer onto itself. Yep. Then, if the primer is high build, I wondered if I could make it feel smoother making letters. Yep. Run you hand across the letters on the pods; you can't feel 'em. It was my intention to paint the jet later after all the bugs and tweaking were completed. Now, darn near everybody says leave it. So, on to the next thing...

Do you know how to sand and buff clear coat? I airbrushed some license plates for EZ Jets using water-based and

acrylic paints, then clear coated them with House of Kolor Show Klear, just so I could learn sanding and buffing clear coat. Man, it's easy. All of it. Still can't draw stick men though. This winter, I'll break the jet down and clear coat it, as is. So the color is actually tintable PPG K36 primer. The oil tank is made of aluminum so I used a 1.5-inch Scotch-Brite sanding disk and swirl patterned it. Then I used KK11 red candy transparent paint and clear coated it...nice effect...thanks to airbrushing.

### Keep It Simple

The engine hook up is really simple. It's a GE T58-8F, a helicopter engine modified to pure jet. Call it 860 pounds of thrust or somewhere around 800 hp. A separate oil tank is required. The oil

## JET EZE

|                                    |                              |
|------------------------------------|------------------------------|
| Price .....                        | 3 times what was expected    |
| Estimated build time .....         | 13 years                     |
| Number flying (at press time)..... | 1                            |
| Powerplant .....                   | GE-T58-8F, 840 lbs of thrust |
| Powerplant options.....            | 200-hp Lycoming to turbine   |

### AIRFRAME

|                           |                                    |
|---------------------------|------------------------------------|
| Wingspan .....            | 28 ft 5 in                         |
| Wing loading .....        | .35 lb/sq ft                       |
| Fuel capacity.....        | 150 gal                            |
| Maximum gross weight..... | 3500 lb                            |
| Typical empty weight..... | 1435 lb                            |
| Typical useful load ..... | 2065 lb                            |
| Full-fuel payload .....   | 1053 lb*                           |
| Seating capacity .....    | 2                                  |
| Cabin width.....          | 28 in. at shoulder, opens up lower |
| Baggage capacity .....    | 150 lb                             |

### PERFORMANCE

|                                           |                              |
|-------------------------------------------|------------------------------|
| Cruise speed .....                        | 300 kt (average)             |
| Maximum rate of climb ....                | 7000 fpm (it hurts the ears) |
| Normal climb .....                        | 4500 fpm @ 200 kt            |
| Stall speed (landing configuration) ..... | 68 kt                        |
| Stall speed (clean).....                  | 68 kt                        |
| Takeoff distance.....                     | 1000 ft                      |
| Landing distance.....                     | 1200 ft                      |

*\*Full fuel is enough to stay in the air 4 hours at cruise. Lance has a 2-hour bladder, so it's rare for him to have more than 80 gallons on board.*

system only holds about seven quarts, but the engine will cycle six gallons a *minute*. One wire for ignition to get it started, starter cable, fuel control cables times 2, and a fuel line. Done. No mags, spark plug wires, cylinder baffles, spinny thing on the back. It does have a snarky



tail cone for the exhaust. The shape, length, size, and internal construction are critical. Yeah, it's expensive; it's made out of Hastelloy or some weird metal. By the way, it gets hot. Ask me how I know.

Like I said, from the front seat it's a simple jet. Blue Mountain EFIS, Garmin SL30, SL40, GTX 327, and an audio panel. No autopilot. I fly for a living, and the bus I fly is on autopilot most of the time. I built this for me to hand fly. The winglets are canted out a little—I won't give out the degrees—it's kinda critical. Go too far and the airplane would be uncontrollable. Where they are makes the airplane very stable. Yeah, you can yank and bank and have ridiculous climb rates at hair-on-fire speeds, or just putt around at 150 knots. You have pod pumps, main engine fuel pump, lights...standard stuff.

But a couple of things are not standard. I wanted fire detection and extinguishing ability. Because of weight and balance, I put a 10-pound halon bottle in the nose and ran the lines for the engine. How, you ask? I went to Fire Fight Products ([www.firefightproducts.com](http://www.firefightproducts.com)) and they custom built a system for me...no, not expensive. It's a bottle and outlet made for where it sits in the nose. Detection is just low-temp melting insulation wire wrapped with rudder cable wire. The rudder cable is grounded, and the low-temp wire is connected to 24 volts. The insulation melting completes the circuit and turns on red lights on



The large red tank on the firewall is the oil tank. The plenum extends from the intake scoops and bends to get air into the engine.

the panel. I'll put one in every airplane I build from here on—maybe not 10 pounds' worth, but it will be there.

### Engine Start-Up

We had problems starting the engine. In the past, this same problem was solved by changing the fuel flow divider. I didn't know anything about being a jet engine guy, and changing the flow divider is scary stuff. It took me 3 hours to do it, but same problem: It wouldn't start. However, I can change one now in 15 minutes.

OK, change the fuel controller. Wait, do what? It weighs 35 pounds and is two feet long, but you need to pull the

oil pump first. Wait, what? To take this stuff off and put it back on takes 8 hours for one person.

We finally got the engine running, and I was doing taxi tests. We had covered some bleed air holes not being used, and this was a catastrophic mistake. While taxing—bang, unspool, followed by screeching!

Those holes being covered caused the back-pressure air to find a way out. It went out by the number 2 bearing, which blew the oil off the bearing. Know how to tear down a jet engine? Nope... gonna learn. So it happened. Robert, Mike, and I rebuilt that sucker—figured it out and learned how to do it.



(Left) The panel includes a Blue Mountain EFIS, Garmin SL30 and SL40 radios, GTX 327 transponder, but no autopilot. (Right) Mounted in the forward cockpit in front of the rudder pedals, the fire bottle holds 10 pounds of halon for the engine compartment and is segregated into two sections. The power board includes 12- and 24-volt circuit breakers.



Kevlar oxygen bottle is located behind the front seat. It's good for two people for 7 hours.



The strakes provide additional storage and a bit more elbow room in the forward cockpit.

Since it's a jet, higher is better for fuel burn and speed. It's also why I have an F-16 O<sub>2</sub> system in it, front and rear seat, diluter demand and all. It's one reason why I wear a helmet; another is for bird protection, should one try to join me in the cockpit through the canopy. The system has a Kevlar bottle behind the front seat good for two people sucking on it for 8 hours. I did not know diddly about O<sub>2</sub> system installation when I started, especially using a real mask and not the canola type. Fluid Power, Inc. ([www.fluidpowerohio.com](http://www.fluidpowerohio.com)) educated me and set me up with all the required components such as the flow blinker (lets you know O<sub>2</sub> is actually moving),

diluter demand unit (mixes ambient or draws straight O<sub>2</sub>, connectors for the helmet, and the hose from high pressure to mask. I got all the little plumbing for the fill and supply lines from Mountain High ([www.mboxygen.com](http://www.mboxygen.com)). Great people to work with.

### First Flight

Are you up to the first flight of the airplane you built? Really? I'm fortunate to own a Long-EZ and be current in it. Plus I fly for a living, big stuff, but they all work the same. Most people who are building are not flying...I understand.

Flight test is very different than just going flying. Stuff *will* happen. Plus I'm

kinda out there. My design airplane, canted blended winglets, pods, jet engine, new trim system, huge canopy, four pods; a lot can go wrong—usually quickly. This was not my first...or second...or third first flight, so I knew.

I'm not very smart...poor time to admit this. But I'm smart enough to know I'm not very smart. Fortunately for me, we were doing the test flights in Covington, Tennessee, under the supervision of some really smart people. Since Robert has a repair shop there, he has done a lot of test flying. But first flights are a little different. I had an inner circle of guys who we all agreed had the authority to say "Stop! I don't like this." Since I was the pilot, I agreed we would stop until *everybody* was happy.

Robert Harris, Mike Yancey, and Terry Sweat were in charge of ground operations...read rescue if it went bad. Ryszard Zadow and I were flight. Ryszard did me the honor of flying chase. Ryszard was a Top Gun pilot, is the boss of the Rutan Aircraft Flying Experience, and is a race pilot. His frank input was appreciated. A word of advise: Don't let him get near you if he has guns on his airplane; no matter what I did in flight, he was all over me.

We had a first flight test card we *all* agreed on—takeoff, level off, turn left and right, breathe, and land. I'm not kidding. Exciting? Not for me. I was



The inboard pods are for fuel, and the outboards are for baggage. Each one is 5 feet long and 1 foot in diameter. The intake scoop provides air to the engine.



(Left) Like many Rutan canards, the main gear is fixed, but the nose wheel is retractable. (Right) Rear cockpit includes a side stick so the guy (or gal) in back can share the fun.

busy—really busy. It was a little out of trim, nothing bad, just out. It did not help that I hit some turbulence at 100 feet while I was sorting out trim. Mike and Robert were chasing me in Robert's truck; it must have been scary from the ground. Mike was videoing the takeoff, and all they could hear as I climbed away was the blinkers in the truck; nobody said a word. You can see the YouTube video under JetGuys. There was a lot at stake on this flight. We weren't paranoid, and there was no melodrama. We were prepared and just being realistic about it.

Up until the 10th flight we followed the same program. Steve Bailey, our jet engine guy, joined the group beginning with the second flight. We all would sit and discuss what we were going to do, agree, and then go fly the program. I put the wheel pants on for the third flight and tape on the wing joints, standard for EZs. Wow! I gained 27 knots at the same power setting. OK, they're big tires, 15-6.00x6, with Grove heavy-duty double-puck brakes. But still, we were not expecting this large a gain. It really made the third landing...sporty.

Here's an interesting side note: I put two Nflight cams, one facing forward and one out to the left wing, plus a GoPro facing aft on the cowl. Robert was not for this...waste of time and money. I was after a poor man's cockpit voice recorder. The Nflight cams were on the audio system, and the GoPro was on its own. Wow, have they been invaluable for flight analysis. We use the heck out of them, and yes, Robert is the first to admit we are better off with them. We'll probably use them on all test flights.

By the way, notice the tips on the canard and winglets? *Everybody* told me I would have buzz from them. The guys in Covington actually had a bet pool on how long it would be until I took a Sawzall to them. They are still there and no buzz. I win. Pay up guys!

Know why I put them on? Because I can. No, really, there's no other reason. They do nothing—but I think they look cool. Cool factor counts.

## How Fast?

People often ask, "What is the Jet Eze's cruise speed?" The answer really depends on altitude. It will cruise at 310 knots true at 17,000 feet burning about 31 gallons an hour. But keep in mind, outside air temperature and altitude greatly affect fuel burn. With turbine engines the lower you go, the higher the fuel burn. If I'm down low, about 8000 feet, I'm typically putting around at 200 knots burning 45 gallons an hour. At idle sitting in front of the hangar, it burns 22 gallons an hour.

During takeoff the Jet Eze burns 100 gph at 100% thrust. It's cool to watch the fuel flow decrease as I climb...and yeah, it climbs in a hurry. Most days at 200 knots *indicated* (so true airspeed is increasing as you climb holding a constant indicated), it'll climb at 4500 feet per minute, so the fuel burn drops rapidly. Keep in mind that 4 minutes into the climb, you are just below flight levels doing 300 knots true when you level off.

It'll come off the ground at 80 knots when it's heavy, and I shoot for an approach speed of 90 on base and 80 on final. Idle power over the fence yields a 70-knot touchdown. It's very docile handling in most respects; you just have to fly it differently than a piston engine. It's not harder, just different.

Another question I'm often asked is, "If the Jet Eze was powered by a piston engine, how much horsepower would it need to achieve the same performance as the jet?" There's no firm answer to this that everybody agrees on, but knowing that the jet produces 840 pounds of thrust, it would take about 800 hp to push the Jet Eze at the speeds we see with the GE T58 jet engine.

—L.H.



Look carefully at the N-number and you'll see the word NOISEY!



## What's It Like to Fly?

The Jet Eze has been out there on speed. Way out there. You can cover five miles a minute. The faster we go, the more stuff we see that we want to change...but you know, we'll figure it out. We always have.

For the most part it flies like a Long-EZ—very stable. When heavy, it comes off the ground in 1500 feet at about 75 knots. By the time you get to the end of a 5000-foot runway, you are doing 135 knots and climbing at 2500 feet a minute. Accelerate out to 180 knots, and the climb rate goes to 3000 feet per minute; it's easier to see over the nose, too.

Landing is a little different. On final approach, the goal is to be at 80 knots with a 700 fpm rate of descent with at least 78% rpm. Why? Good question. Jet engines produce 85% of their thrust in the last 15% of rpm. So the closer you are to 85% rpm, the less lag to real power. Conversely, if you are at idle and

slam in full power, it will be 4–6 seconds before you get any appreciable power. It's a drawback to turbojet engines and the only bugaboo in flying the Jet Eze. But you learn to plan for it. When I come in with greater than 78% power, there is almost no lag, yet I can easily get it stopped in 2000 feet down the runway, after touching in the touchdown zone.

## It's Not Easy

Have you seen the trend? I build for the challenge. If anybody could do it, everybody would. I personally think the reason they can't is because they don't try. I did not have near all the knowledge, answers, or skills on how to build my jet when I started. But I was willing to ask questions, research, and go find answers.

Was it a long road to build it? Extremely. There were days I worked for 10 hours straight, stepped away from it, and couldn't see a thing I did. The light

at the end of the tunnel was a candle—or maybe a train. I kept listening, just to make sure. But put one foot in front of the other and keep walking. So many people get lost in the walk and just stop. I see it all the time. Try to remember, you may think you're alone in the build process, but you're not. It may take a village to raise a child; let me tell you, having built several planes, it take a village to build an airplane.

OK, how long have I been working on this one? Thirteen years. Now I admit I had life happen and did not touch it for two of those years. So call it 11 years of active building. Would I do it again? I already have a Long-EZ in the garage that I'm modifying to full dual controls. It will be used to train new EZ drivers. Would I build another jet? Yep. Only better.

A friend of mine said, "More people have climbed Mt. Everest than have built their own jet." Humbling. ✚



Note the markings on the throttle: Fuel Cut Off, Ludicrous, and Lightspeed. Yes, the DAR approved it.



These guys were *all* instrumental in the first flight ever happening. From left: Robert Harris, Ryzard Zadow, Terry Sweat, Mike Yancey, and me.