

Dave's Corvair Experience

by Dave Morris

As I write this, 2 people have already beat me to the punch of flying a Corvair powered Dragonfly. And I count at least 6 other guys who are converting Corvairs to power their Dragonfly aircraft. So I'm not the first, but here's my story:

When I started building my Dragonfly in 1992, I fully intended to hang a 2180 VW engine on the firewall. After all, I read all the dire warnings that came from Rex Taylor in the early DBFN newsletters. I knew that the VW engine was "it" for the Dragonfly. I grew up in the land of the Volkswagen (Germany) through my formative years and missed out on the thrill that many American teenagers experience of tearing engines apart and hot rodding cars. I wasn't interested in cars much - I was busy building kilowatt RF power amplifiers and 30 foot antennas and talking to monks in Nepal in Morse code.

So here I was finishing up the major airframe parts of my Dragonfly and needed to start thinking about an engine. I knew nothing about engines, so I got hold of Steve Bennett's catalog from Great Plains Aircraft Supply and started drooling over the Type 4 engines I saw. I'm a big guy. Big enough that I've only been able to wrangle one ride in a Dragonfly in the 13 years I've been building one. Why just put a 2180cc engine out front if I could have a 2.4 or even a 2.6 liter engine and get a bunch more horsepower and a more bulletproof engine? When I had started building my Dragonfly in December of 1992, Spud had cautioned me to wait until the airframe was nearly complete before even thinking about an engine. That was great advice. A lot more powerplant options were appearing as time wore on.

In October 1998, I started hearing about the Corvair engine. I think Pat Panzera brought it up first. I asked the members of the Dragonflylist whether anybody had any information about the Corvair in aircraft. The late Gene Arthur, a Dragonfly builder whom I greatly respected, and who was then flying an O-200 equivalent (GPU), tried to dissuade me many times by saying things like "When you get through with all the work and headaches you will have spent as much

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money for an unknown engine.” Or “Lycoming and Continental build airplane engines – Chevrolet builds automobile engines. You’re comparing apples and oranges.” I looked at the O-200 as a good possibility, but choked on the price tag every time I looked at prices for even a very worn out O-200.

I joined the Virtual Vairs discussion group and quickly made the acquaintance of another guy I respect, Rad Davis. He said, I could expect “better MTBF than for an equivalent type 1-3 VW based engine, to be sure. No valve adjustments after run-in. In stock trim, 100LL fuel would easily give 120 HP @ 4400 RPM and 160 lb-ft of torque at 2800 RPM at sea level on a nominal 110 HP engine, assuming airplane-type intake and exhaust plumbing.”

A year after Pat and I began intense discussions about the Corvair engine, talking to people who had driven Corvairs, put them into airplanes, turbocharged them, and trashed them, Terry Bailey showed up in my driveway with a Corvair engine. We unloaded it and I took a full roll of photos. I had no idea what I was looking at, or which end was the power end, or whether I was looking at an intake manifold or an exhaust manifold. I’m a software guy. I took lots of pictures. I also found William Wynne, bought his book, talked to him on the phone, studied his web site (and offered to build him a new one), and kept on “drinking the KoolAid”. The prospect of having an engine with the same weight and horsepower as an O-200 was very attractive, since we already had a couple of examples of O-200s in Dragonfly aircraft. (By the way, we are now discovering through William’s dynamometer that the Corvair may actually produce more horsepower than an O-200!)

At one of the tandem wing Field of Dreams fly-ins, we had the good fortune of having both Steve Bennett and William Wynne present to discuss the VW and the Corvair conversions. William made a statement to the effect that “if you want a proven, bolt-on engine that is already matched to the Dragonfly with engine mounts and other things available off-the-shelf, buy one of Steve’s engines. If you are willing and able to do some experimenting, and you want a much more powerful engine that is more reliable, check into the Corvair.” Pat kept trying to convince me that there were several other Dragonfly builders who would also be doing Corvair conversions, and that together we could pull this off. I didn’t even know how to spell “gearhead”, knew nothing of grade 8 bolts and helicoils and how to turn a torque wrench, but the idea that there would be a few of us to support each other advancing the state of the art in Dragonfly powerplants made me take the bait.

In April 2002, Jeff LeTempt found 3 engine cores and graciously offered to sell me the best of the 3, with the intention of making an engine for himself out of the other 2. Mine sat on the floor in the garage for a while until I got motivated nearly a year later to start cleaning it up. I first took it to a do-it-yourself car wash and tried to steam clean it, but didn’t get very far because it was extremely greasy. Then I started calling transmission repair shops in the Yellow Pages and found one that would run the whole engine through their washer. I was able to start disassembling the engine and got the heads off, but was stumped by some nuts that would not budge. Not having any experience with this sort of work, I took the engine core with me to San Antonio to a “Corvair College” that William Wynne conducted in January 2003, hoping to get some advice and assistance. I joined Mark Langford’s e-mail discussion list which was filling up with other people building Corvair engines for a variety of different aircraft. I bought books. I watched videos.

The Corvair College was exactly what I needed. There were a bunch of guys who had varying degrees of knowledge about engines, and between all of them, and William’s occasional instruction, we managed to remove the pistons and other hardware and split the case to remove the crank and cam. I learned a lot of things. For instance, I learned that I had probably messed up my click-type torque wrench by using it as a breaker bar to remove obstinate bolts. We discovered that one of the 6 pistons was completely different than the rest. And

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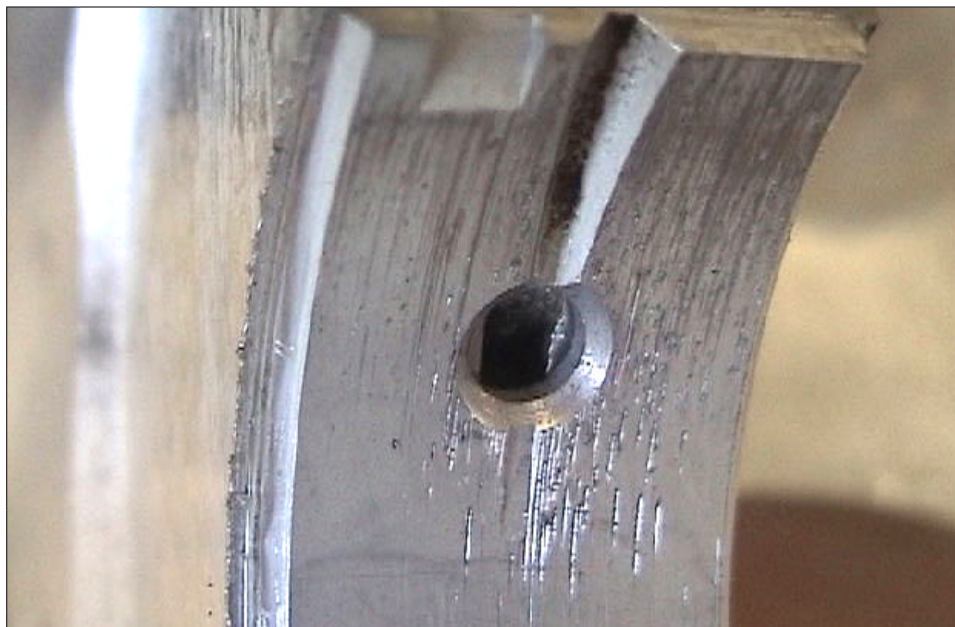
the car had obviously run for some time, because of the carbon deposits on the replaced piston. The reason the engine failed was not because of the unequal pistons, but because a small piece of debris had gotten into the crankcase and had wedged itself between the crank gear and the cam gear. This was my first introduction to the robustness of the Corvair engine. I later heard a lot of anecdotal evidence on the Virtual Vairs discussion board that this engine is indeed very difficult to kill, even when it is run hard without oil and with flames shooting out of it!



Crank and cam sitting in the half case, spinning easily

William took my crank home with him to have it reground and to have the nose drilled and tapped for his safety shaft. I went home and started ordering bearings and a cam and lifters and other things required to start assembling the bottom end. I learned how to use Plastigage to measure bearing clearances. I bought a new beam torque wrench and learned the tedious process of tightening the case bolts. The crank and cam fit smoothly together and every time I would go into the hangar to work on the plane, I would give them a spin, and it felt great. I sent my cylinders off to Larry's Corvair and ordered new TRW pistons and rods with ARP rod bolts and to have the cylinders honed and matched up with the pistons.

A few months later learned how important it is to clean everything in the block and crank. I apparently didn't get all the dirty oil out of some of the galleries somewhere, and after a few months, I turned the crank one day and it no longer rotated smoothly. It made a sort of hissing sound. I wanted to know what was going on, so I opened up the case again and pulled the cam and crank out. Disaster. The bearings and journals were scratched. I started over from scratch cleaning the block and crank again. I bought a rifle cleaning kit and made sure every single gallery was completely free of any contaminants.



Scratches on bearings as a result of not cleaning every oil passage

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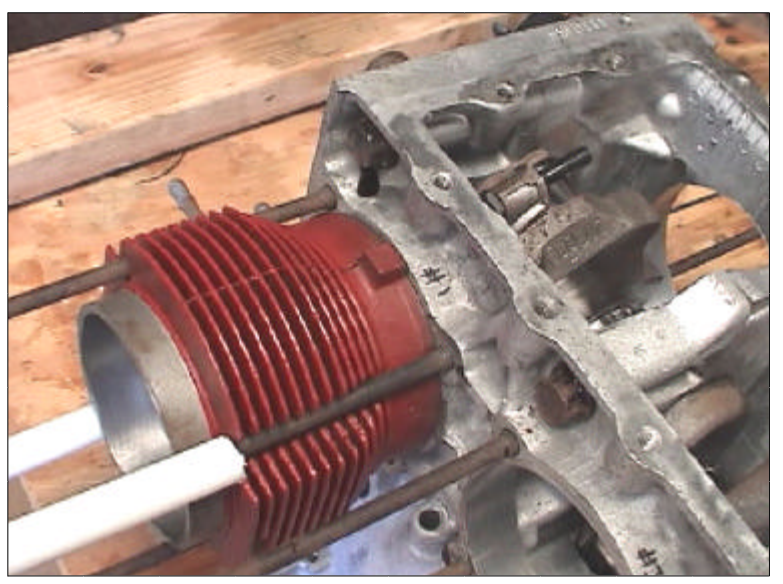
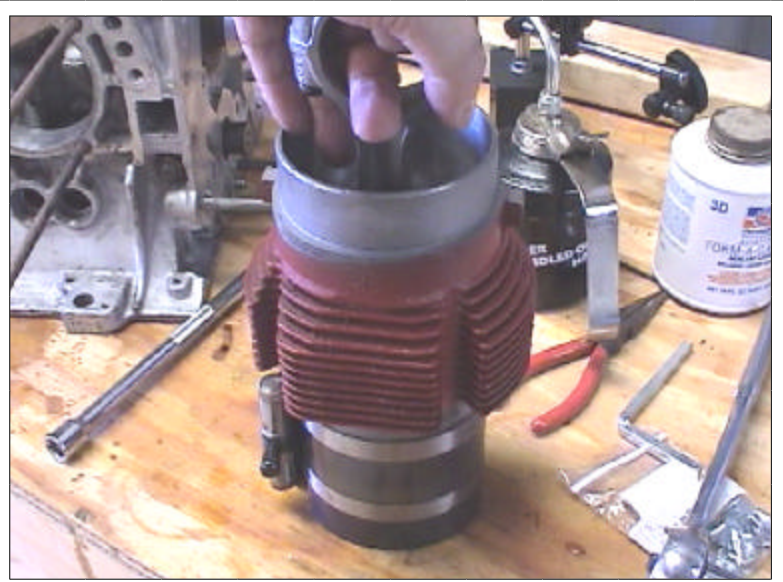
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Then I took the crank to a machine shop and had them polish the journals again to make sure there were no raised scratch marks that would cause problems. By the time I had reassembled the case, my pistons and cylinders had returned. I found that one of the cylinders had bounced around in shipping and dinged a spot on one of the pistons. I sent the piston back and got a replacement, covered by the shipping insurance. (Pay the extra money for insurance when you're dealing with delicate parts like this!)

When I ordered the pistons and cylinder work, I also had them rebuild and balance the rods, install the ARP rod bolts, and assemble the rods on the pistons. That saved me a lot of time and experimentation with a blowtorch and a bucket of ice, and didn't really cost all that much extra. I let the shop do it with their rod heaters and special tools.

Next it was time to attach the piston rings and insert the pistons into the jugs. William has a special wooden jig he uses, but I found I was able to sit on a stool and hold the piston and cylinder just the right way and put it all together without the jig. With the pistons assembled to the cylinders, it was now time to slide the cylinders onto the studs and carefully place the big ends of the rods over the crank journals and add the rod caps. I had been dreading this because it looked like it would be nearly impossible to get a torque wrench into the case to tighten the nuts on the rod bolts, but it actually went quite easily, even for a guy with big hands and fingers like me.

I had sent out the heads for about \$1000 of work that included new valves, springs, guides, seats, and "cc'ing" which makes all combustion chambers the same size. The before-and-after photos are pretty impressive. Assembling the heads onto the rest of the engine went pretty much without a hitch, except that I once again didn't believe William when he said to use washers under the head nuts. Instead, I bought the special "head nuts with shoulders" from



Can you tell the rocker arms are "wrong"? Note the washers under the head nuts. All lessons learned.

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Clark's that are supposed to be "better". Well, what happened was that when I torqued them up to about 25 ft-lbs, they would not go any higher because the shoulders were digging into the soft aluminum of the case. I started over and used washers as William suggested, and everything torqued up perfectly.

Meanwhile, a Dragonfly builder who wishes to remain anonymous, but who is a phenomenally great welder, built an engine mount that matches the Corvair and the HAPI mount locations on the Dragonfly. I was ready to get this engine finished and test-run, so I could install it and get the show on the road. But I was uncomfortable with the thought of test running the engine all by myself, without the supervision of someone who knows what the engine is supposed to sound like.

So, almost exactly 3 years after Jeff dropped off the core engine in my garage, I pulled up in front of William's hangar near Daytona Beach, Florida one afternoon in April, and we unloaded my nearly finished engine. I had managed to convince my boss that on one of my business trips to Florida, I should drive my SUV instead of flying. When the business part of the trip was over, I took a few days of vacation and drove to William's place. After spending a few hours meeting everybody and discussing how we wanted to proceed, William shooed me off to my hotel and told me to come back at 9am the next day. When I got back the next morning, it turned out he and Kevin had stayed up until late at night and had pulled the heads off to check everything.

Over the next few days we worked on my engine during the day, and the "Keebler Elves" seemed to always do even more work at night while I was asleep! They put Timeserts in my spark plug holes so I would have no reason not to check and change the plugs often, checked the torque on the rod bolts, added the "oil slinger" disc on the crank that I had overlooked, and corrected a few other minor things. Kevin is so good with these engines, he took one look at my rocker arms and said "they're wrong". It seems that when the machine shop replaced the valve seats, it changed the geometry of the pushrods ever so slightly. William happened to have a set of aftermarket rocker arms that were a slightly different size, and they fit perfectly and cleaned up the geometry.

After about 2 ½ days of work by William, Kevin, Gus, Bill Clapp, and Dave Vargesko, which also included adding a curved dual-points distributor, a remote oil filter adapter, an oil pan, welding breather tubes to a valve cover, building a custom oil filler tube, and many other little details, we were ready to fire up the engine for the first time. We mounted it on William's dynamometer and hooked it up to his MA-3SPA carb, fuel tank and ignition system, and while I scrambled to get my camcorder running, William started it cranking. In a couple of seconds it sprang to life and ran smoothly. He used one of those remote thermometer guns to check for cylinder head temps and oil temps and we watched the oil pressure on a mechanical gauge. It was such an awesome feeling to hear the engine running so smoothly after all that work and worry.

I wasn't able to breathe again until I got my new engine all the way back to Dallas, another 1200 mile drive, and mounted it on the firewall again. Now I've got to get the rest of the firewall forward installed, plumbed, and wired. I hope to be able to start driving around the airport under Corvair power by the end of this year! Not bad for a software guy. As we say in Dallas, Yeeehaaaa!

Thanks Dave—Hope to see you flying your Dragonfly real soon!!!

Dave has a web site with an incredible amount of information about his Dragonfly and Corvair engine located at: <http://www.davemorris.com/Dave/DFly.html>

More information about William Wynne "The Corvair Authority" go to: <http://www.flycorvair.com/>

Jeff



Getting that engine running for the first time is an awesome feeling for a guy who has never done anything like this before!

Field of Dreams Fly-In

by Jeffrey A. LeTempt

The 15th Annual Tandem Wing Field of Dreams Fly-In is right around the corner. Everything is coming together here in Missouri and I am very much looking forward to seeing you at Sullivan from 23-25 September 2005. The event will once again be held at Sullivan Regional Airport (UUV). Sullivan was the perfect place for the fly-in the last two years and I am hopeful that it will even be better (if that is possible) this year.

Pretty much going to keep the same format for the fly-in again this year. I feel that we learn the most about these great little airplanes by talking with the builders and going over the planes with a fine tooth comb. The forums are useful, but sometimes they are almost a distraction. My theme again this year is going to be “less is more”.

The last two years on Friday at the fly-in we had a hands-on composite construction class. The demand for this class a few months before the fly-in last year was almost non-existent, but a few weeks prior to the fly-in the demand actually exceeded our maximum class capacity of 20. If there is enough demand for a similar hands on composite construction class, I will gladly set it all up again. I just need to hear from you very soon if you are interested. There will be a \$20 fee per composite class participant to pay for the materials used in the training.

We will once again have the truck stop dinner on Friday evening. They have a pretty good sea food buffet or you can order from the menu. I just need to know if you plan on attending the dinner so I can let the restaurant manager know how many people to expect. No prepayment is required, just pay the restaurant at the dinner.

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I need a few volunteers to help me out at the fly-in. The three of us who took care of the performance run timing last year should all have flying planes participating in the run this year, so I will need two people to handle the timing of the run. I also need a few guys who would be willing to serve as airplane judges. In a perfect world I would like to have 3 Q guys judge the Dragonfly's and 3 Dragonfly guys judge the Q's. Please contact me if you would like to help out.

Food and drinks will be available at the airport on Saturday. A local organization will run the concession stand as a fund raiser. In 2003 the proceeds were used to buy equipment for rescue dogs. The menu usually include hot dogs, hamburgers, brats, chips, and drinks.

23 September	
1200	Event Officially Open
1200-1700	Hands-On Composite Construction Class (\$20 fee per participant—limited to 20 participants—sign up early!!)
1800	Dinner at the Truck Stop
24 September	
0830	Performance Run Briefing (mandatory for performance run participants)
0900-1030	Performance Run
1030-1230	Q Forum
1300-1500	Dragonfly Forum
1500-1600	Group Photo
1600-1730	Fun Fly
1800	Awards Banquet (we have the building until 2230)
25 September	
0900-1200	Fun Fly
1200	Event Officially Closed

Now a few words about the cost of the event.....you all know how inflation works – right? In 2003 the event registration fee was \$7.50 and the dinner on Saturday evening was \$12.50. In 2004 the event registration fee was \$5.00 and the dinner on Saturday evening was \$12.00. With the continued generosity of the Airport Manager at Sullivan and a little penny pinching on my part, the costs to attend this year's event will be reduced again. Event registration fees will be \$3.00 per person and the awards dinner on Saturday will be \$12.00 per person. Maybe I need to take Economics 101 again?

If you fly your Dragonfly or Q bird to the fly-in, you will be treated like a King!!! No registration fees and no hangar/tie-down fees. All you have to do is pay for your meal at the awards banquet!!! Thanks for flying your tandem wing aircraft to the event!!!! The last two years we were able to park all the tandem wing planes inside a hangar for overnight storage (20 TW planes in 2004). I can not promise we will be able to get all the TW planes in a hangar this year, but I bet that we can.

I have a fly-in web site at: <http://www.fidnet.com/~letempt/index.htm> Listed on the site are detailed driving directions, information about lodging in the local area (5 hotels within about 1 mile), and a wide variety of other useful bits of information. If you do not have internet access, go over to a friend's house or the library and spend 30 minutes on the computer....it will be time well spent.

I welcome you to join the Tandem Wing Fly-In email list on Yahoo Groups if you would like to provide input about the event. The group is located at: http://groups.yahoo.com/group/TandemWingFly_In/

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Now you just need to sit down and fill out the registration card.....and get it back to me. You can fill out the registration card contained in the newsletter and mail it back to me with your payment or if you prefer you can email me the information and pay with PayPal.

In 2003 we had 19 tandem wing planes (20 if you include the Long Eze) and about 10 conventional airplanes that flew in for the event. In 2004 we had 14 tandem wing planes and several conventional airplanes that flew in for the event. I think we could see 25 tandem wing planes show up this year if the weather cooperates. If you have any questions about the event you can email me at: jeffrey.letempt@us.army.mil or call me at (573) 364-2545 before 9 pm CST.

The major EAA fly-ins are GREAT, but this type specific fly-in is the place to be if you want to see and learn about Dragonfly's and Q's. I hope to see you at the fly-in!!!

Builder Profile—Fred Worrell

Meet Fred Worrell from Decatur, IL. Fred has been building on his Dragonfly for several years and just keeps plugging away at it. Fred is building a MK-II with steel gear legs that will be powered by a Subaru EA81 direct drive turbocharged (DDT) engine.

Fred stays active with the building process by working on different parts of his airplane rather than just working on one part until it is complete. One day he may work on the landing gear, the next day he may work on the instrument panel, and the next he may work on his engine. By doing this is never gets bored working on the same project.

The Subaru EA81 DDT that Fred is building is a very compact engine that should produce close to 100 HP, although he told me he would be very happy with 90 HP. Like me, Fred is more interested in economy than high speed cross-country cruising. The increased power should be great for take-off and climb performance, but economy cruising is available by pulling the power back a little.

Cooling the engine will be accomplished by a radiator that is attached to the bottom of the fuselage under the wing. The radiator is a custom built unit from an automotive speed shop. This combination is well proven on several Canadian Dragonfly's who are very happy with their airplanes.



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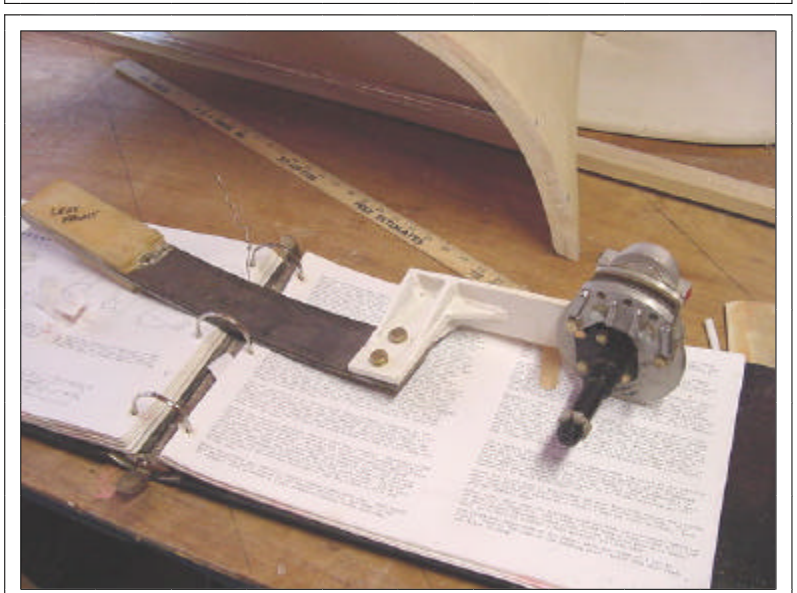
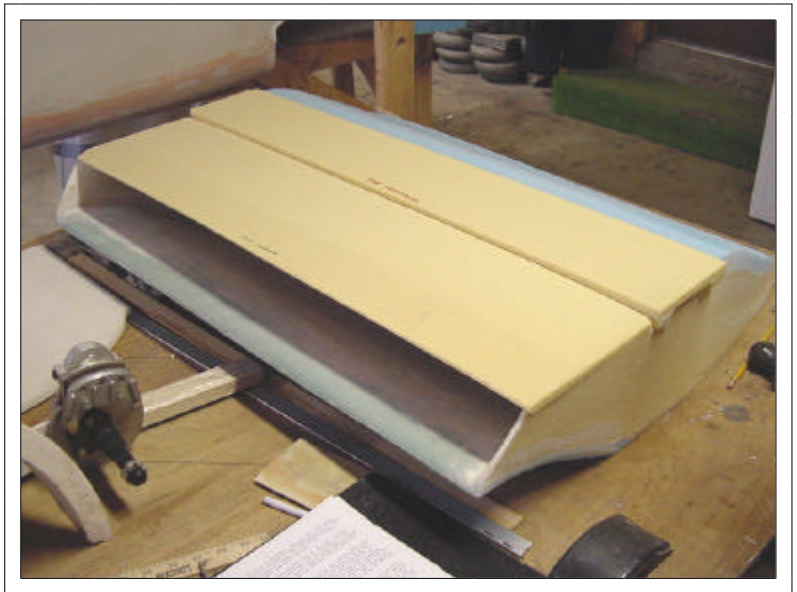
Fred strayed from the flock a little by selecting a Garrett T3 turbo rather than going with the usual Subaru EA82 turbo. This has proven to be slightly troublesome in that he has been having a hard time finding the correct fitting for the coolant and lubrication lines going into the turbo. He got a great deal on a new turbo and just could not pass it up. I am sure he will get it all figured out, but he did tell me if he had it to do over again he would use the standard EA82 turbo.

For ignition the engine will use a pair of magnetic pickups inside the stock distributor. The system will include a pair of coils and a MSD coil switcher with the stock one spark plug per cylinder arrangement. This does not provide 100% redundancy, but there is redundancy for all the parts that are most likely to fail (and it is not likely that they will fail). This ignition system has been used for 1,000's of hours in various engine/airframe combinations (including several Dragonfly's).

Fred has not yet decided on his fuel delivery system, but it will be a carburetor for simplicity. His ignition will require electricity to operate, so Fred has designed a very robust electrical system that is fault tolerant with dual busses. The engine is amazingly compact and the engine cowl cheeks could easily be shaved off, but Fred likes the lines of the stock cowl so it will be used pretty much as-is.

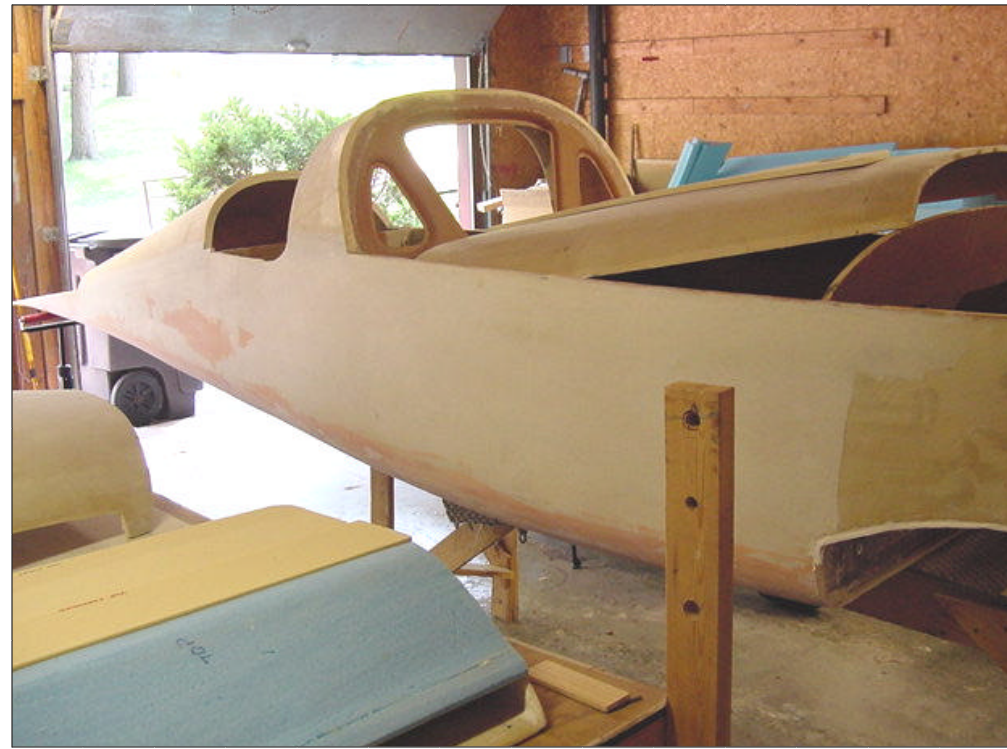
The landing gear is per Steve Laribee as detailed in the DBFN several years ago. Fred has extended the main fuel tank aft so the back of the tank goes all the way to the seat bulkhead, this should give the plane a couple extra gallons of fuel. Most of the major work has been completed on his Dragonfly, the wing and canard have both been glassed, as has the fuselage. Fred has been doing some very nice work, his plans built fuselage is as nice as any I have ever seen.

Fred developed a few special tools to help with the construction process. On his firewall he has mounted a pipe flange and then attached a length



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of pipe. With the pipe and tail supported this allows Fred to rotate the fuselage upside down to easily work on the underside of the fuselage. Fred also bought an old surgical table that he can crank up and down to different heights. This has been very helpful accomplishing many tasks.

Like I said, Fred keeps plugging away at his Dragonfly, but he knows that it will be a few years until the project will be completed. Once completed, I am sure this will be one nice Dragonfly. Keep at it Fred, you will certainly be rewarded by your efforts once the plane is flying!!!

Editor Ramblings

I am happy to report that Dart Industries is currently building their first Dragonfly. They have orders coming in and expect to keep busy building airplanes!!! Dart has purchased Bud Clarke's Subaru powered MK-II Dragonfly and it is currently on a boat heading to South Africa. I have asked Dart Industries to write an article for the next newsletter to keep us up-to-date on their progress.

As I write this article I am having a hard time controlling my emotions. I just returned from

AirVenture 2005 a couple of days ago and I had a great time. It was the first time I had ever flown to OSH and my Dragonfly MK-IIIH performed flawlessly. I was asked to fly my Dragonfly in the homebuilt showcase fly-by on 7/29 – what a thrill!!!



Bud Clarke's Dragonfly is Heading to SA

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At the briefing on the morning of 7/29 I met Phil Lankford from San Marcos, CA. Phil flew his beautiful Q200 to AirVenture and was also asked to participate in the fly-by. He was #13 and I was #14 for the fly-by. It all went off without a hitch and was probably the highlight of my Dragonfly flying experience. What a thrill to represent the Dragonfly community at the premier aviation event in the world.



Phil Lankford in his Q200 at Oshkosh

I was saddened to hear that Phil and his wife Cherie were both injured after an emergency landing in their Q200 at Delano, CA. Apparently the propeller (reported to be a Amar Demuth) experienced a catastrophic failure. The failure happened at about 9,500' and Phil was forced to shut the engine down. He set-up for a glide about 11 miles from the airport and ended up about 30' short of the runway when he contacted the ground. The plane took out about 160' of chain link fence then went inverted after contacting the ground. The canard separated the aircraft and the canopy busted loose as they were sliding upside down. After the accident about 1/4 of the diameter of the propeller was gone.

I just received an email from Jim Patillo saying that he just got off the phone with Phil at the hospital. He wanted to let us know that Phil and Cherie are OK but badly banged up, sore and scratched and that Phil has a busted sternum. They are both at Kern County Medical Center near Bakersfield, CA. The good news is they are both going to be ok.

As with most things in life, the larger the potential reward...the larger the risk. I can think of few things that are more rewarding than building and flying your own plane and we all know that our airplanes are generally not very forgiving when something goes wrong. We build the planes the best that we can, but mechanical failures can and do happen. Please be very careful and always error on the side of safety.

Jeff
Dragonfly MK-IIH
N41GK



My Dragonfly MK-IIH at AirVenture 2005

Classifieds

For Sale: 1836cc engine complete from prop spinner to firewall for a Dragonfly. All new engine with four hours run time. Dual ignition (one slick magneto and one electronic). Exhaust system complete with heat muff and carburetor heat box, Hapi ultra carburetor, Spin on oil filter, hydraulic lifters. The engine cowling also goes with this, so you will have a complete firewall forward for a Dragonfly. A&P built. \$3000.00 OBO. Call Joe Anthony at (636) 398-6211 or email hjoe@acer-access.com for pictures or additional information.

For Sale: Continental PE-90 engine (a rebuilt GPU engine) 0-315. This engine has been started to be converted to aircraft use, dual plugs, oil tank and intake started but not finished welding. One magneto, all continental accessories will fit this engine. \$1500.00 Call Joe Anthony at (636) 398-6211 or email hjoe@acer-access.com for pictures or additional information.

For Sale: NACA Flush Inlets designed for 1/2" sandwich structures. These make a good looking functional inlet to replace the hand carved per plans ones. Inlets are \$40 per pair, plus \$4.00 shipping. Note: Spinners no longer available. Contact Charlie Johnson, 2228 East 7875 South, Ogden UT 84405 (801)-479-7446 or e-mail: OneSkyDog@aol.com

For Sale: Dragonfly Type 1 converted to hoop gear. Porsche 1800 engine (big VW) converted to 2400 with parts from Great Plains. Airframe complete & wings & control surface mounts are finished. Cleveland wheels & brakes. Ed Sterba prop. Very nearly complete. Asking \$10,000. Call 815-397-1533 or email stiegrinding@aol.com



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