

Volume 125

January/February 2007

THE OFFICIAL VOICE OF DRAGONFLY BUILDERS AND FLYERS ALL  
OVER THE WORLD

# *Dragonfly Builders and Flyers Newsletter*



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# Exhaust System Supports

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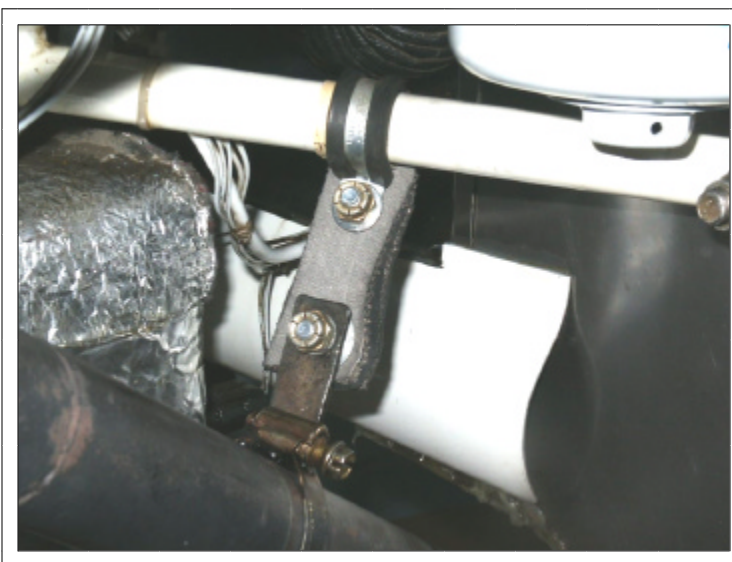
*by Justin Mace*

A few months back I started noticing there was a pronounced “seat of the pants” vibration in the aircraft. I could see the instrument panel shake a little when the vibration would start. I scratched my head for some time over this funny vibration. It would start at 2,500 RPM and continue up to WOT at about 2,900 RPM. As soon as I reduced the throttle to 2,400 RPM the engine would smooth out. The difference was amazing between 2,400 & 2,500 RPM. I have a computer controlled multi point fuel injection with dual electronic ignition and at first I thought that it was either fuel or spark causing the vibration. It felt similar to a spark plug that had gone bad. No amount of enriching or leaning the mixture would cause a difference in the vibration. It would vibrate the same with either ignition system shut down. I noticed that when the vibration would start it also caused the RPM to drop slightly. It took a while but I finally got it figured out.

I have a 4 into 1 exhaust system constructed from 321 SS. The right side cylinders exhaust forward then cross in front of the engine then turn back and pickup the two left side exhausts then drop back about 24” to exhaust under the canard. The exhaust pipe hangs well behind the firewall under the canard/front wing. Years ago I made a home made exhaust pipe hanger (is there any other kind?). The hanger is mounted with an Adel clamp to the motor mount lower tube and is constructed of rubber. The lower end of the rubber isolator is bolted to a fabricated 90 degree piece of steel. It is attached to the 1.5” exhaust pipe with a stainless steel hose clamp. The rubber isolator is made from two pieces of an old tire that I had changed. I glued two pieces together with Shoe Goo, drilled two holes and hung the pipe.

Over the years the holes in the rubber isolator have enlarged and allowed some movement of the pipe. I could not feel the movement nor could I see it. When I removed the hanger I could then see the elongated holes. I decided to make a new hanger just in case this might be the problem. After making and installing a new hanger I added a large spring to ensure that the resonant frequency was not the same as it had been. I just had to fly to see if this was the cause of the vibration. The new hanger dampened the vibration totally and the engine is now as smooth at 2,500 to 2,900 as it is at 2,400 RPM. It is very interesting that the engine shakes enough at 2,500 RPM that the exhaust pipe hits a resonance frequency and will shake the whole plane.

I know this can be a problem because after I built the exhaust system for Allen’s Dragonfly I told him to be sure and hang the exhaust pipes ends. He has a two into two exhaust system. Well in the excitement of getting the plane ready for flight the exhaust pipe hangers were overlooked. A few hours into his test flight program he told me the plane was making a funny noise and he found a piece of one of the pipes had broken off and the pipes were cracked at the last weld. After repairs to the pipes, he constructed and installed hangers and has had no further problems.



It is interesting that after constructing the Dragonfly and flying it for well over 1,000 hours, I still learn something new about the plane every few flights.

*Justin*

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*In the top picture on this page Justin demonstrates how to fit two Dragonfly's in a standard T-hangar. Either Dragonfly can be moved without moving the other aircraft. Those Tucson guys have it all figured out!! These two beautiful Dragonfly's both powered by Continental engines.*

*The photo on the cover is of Justin's MK-II. The cover photo and the bottom photo on this page were both taken by Jerry Clark from his C-182 with his autopilot on. Justin referred to the photo below as a Dragonfly sandwich.*

*Jeff*



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# Subaru Power and Flight Testing

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by Reg Clarke

The following presents a series of related thoughts on the topic of flying similarities and/or differences on the Q2 and Dragonfly aircraft. I have no formal or informal training or background as an engineer, but I enjoy experimenting and testing, flying, and recording the performance characteristics of my home built aircraft. I have helped people build, modify, and repair their homebuilt aircraft and have done a variety of work on the Dragonfly and Q2 including some design work on the airframes and firewall forward with the Subaru engines and related systems.

I am not a trained or professional test pilot although I have test flown a few different homebuilder airplanes for friends and acquaintances. I work at a flight school as an instructor and specialize in tail wheel training in my Taylorcraft. This is not written so as to persuade, but merely to record my thoughts and test flight results. None of these ideas are new and I don't necessarily expect you to agree with them. This is a group with a lot of experience and expertise, my intent is not to argue or persuade, just to report what I found to be of interest to me.

I flew my Dragonfly (Xpresso) about 900 hours with several different engines and did a lot of experimenting along the way. The last engine I installed in my Dragonfly was a 150 HP direct drive turbocharged inter-cooled Subaru EJ 2.5. I did some flight testing to get an idea on power, speeds, airframe glide, and economy cruise ETC.



At Oshkosh in 1995 I met an older gentleman named John Cheek. John built his Q2 in the late 1980's with the LS1 canard and Revmaster VW. When I met John, he was looking for a different engine for his Q2 and noticed the EA81 Subaru (100 HP) engine in Xpresso. The following year at Oshkosh he ordered an EA81 Subaru engine from me. The February 1996 issue of Sport Aviation contained an article about Xpresso.



John had the Subaru installed and was taxing it but, had several problems to solve, mostly related to the

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cooling systems. He called me on the telephone and asked me to come to Nashville to help him work out some problems. I went down a total of five times, and on the last trip I flew his Q2 in the pattern a few times at Smyrna (KMQY) airport just outside Nashville.

Our plan was to fly his Q2 and my Dragonfly to Sun'N Fun and Oshkosh as a flight of two. A few days after I get home from my last trip to Nashville, his wife called to tell me his cancer was back and

that he wanted me to fly his Q2 to Oshkosh for him. Unfortunately, John passed away just 10 days later. Bud and I ended up trailering the Q2 back home to Canada and after that I sold my Dragonfly.



### ***Refurbishing the Q2***

I totally stripped and cleaned Q2 airframe and committed two years to learning about Quickies and making modifications and changes that I thought made sense.

- made new cooling scoop and cooling system
- changed to individual brakes & master cylinders
- balanced ailerons
- new tail spring
- new tail wheel to rudder linkage
- new wheel alignment according to David Gall
- new firewall forward & cowling (EJ 2.5)
- new (glass) panel
- new fuel filler caps
- electric roll trim
- new canopy hinge & latching system
- removed speed brake

The empty weight of my Q2 is 800 pounds, compared to 960 pounds for my Dragonfly.



### ***First Flying Impressions***

The Q2 and Dragonfly basically feel and fly like the same airplane. The Q2 is lighter & quicker on roll and pitch, but the Dragonfly has more rudder control. During taxi the airplanes are typical tail wheel airplanes, very well mannered and steer well with feet.

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### ***Take-Off***

Dragonfly: brakes on - manifold pressure 30'', rolling manifold pressure 35'', keep straight with rudder authority that is almost immediately available (I LOVE THAT LARGE RUDDER), control stick 3/4 ahead, tail up, rotate at 65 knots, climb at 120 knots. The Dragonfly can handle a lot more crosswind than typical tail wheel airplane.

Q2: brakes on - manifold pressure 30'', rolling manifold pressure 35'', keep straight with rudder, control stick 3/4 back, tail down, rotate at 65 knots, climb at 120 knots. I am still experimenting with crosswinds.

### ***Climb***

Both aircraft are pretty much same and visibility is about the same.

### ***Cruise***

Both aircraft are pretty much same. The Q2 is faster and I like the good control harmony and response of Q2.

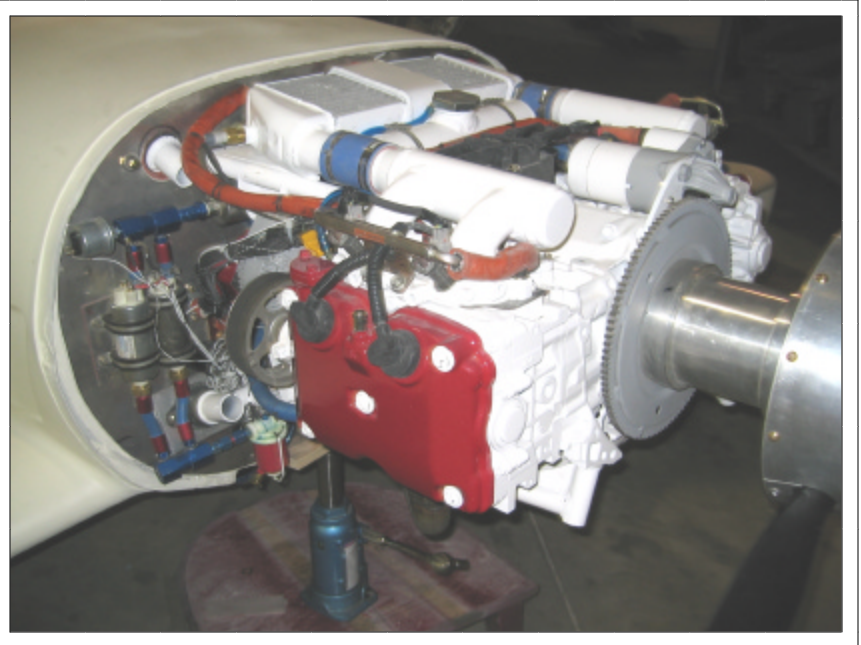
### ***Turning***

Both aircraft have good yaw control and stay in the banked attitude. I would give the nod to the Dragonfly.

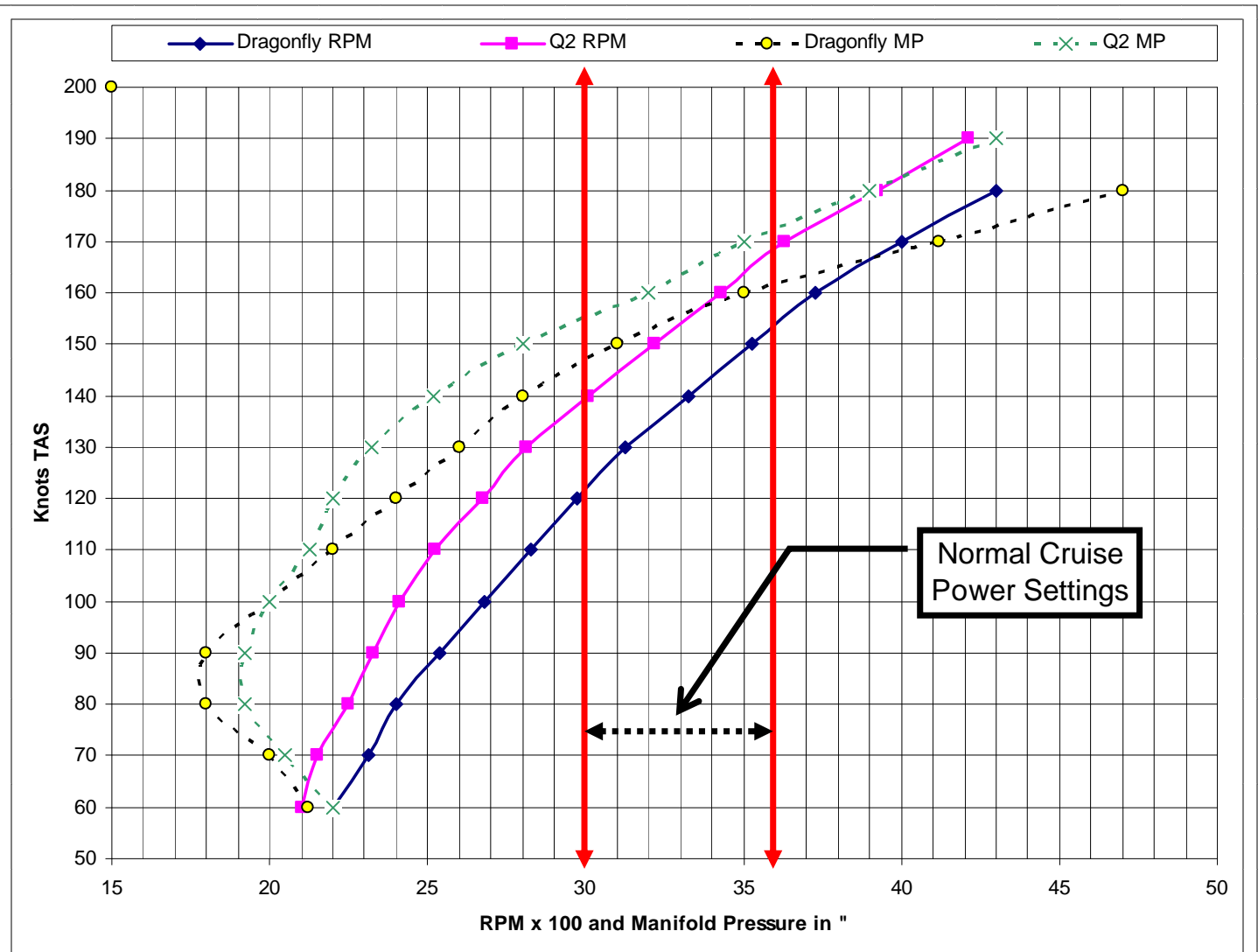
### ***Higher Altitudes***

SEA LEVEL HP > HIGHER ALTITUDES > HIGHER TAS > THINNER AIR > HIGHER RPM > PULLING POWER BACK = NEED COCKPIT AJUSTABLE PROPELLOR.

I usually cruise at 10,000' to 12,500', if I had oxygen I would go up much higher because these airplanes fly very well up high and usually want to climb higher. What this airplane really needs is a cockpit adjustable propeller because the speeds spread is so large and the power with the turbocharger means sea level power is available at all times.



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**NOTES ON CHART:** 54" three blade Warp Drive ground adjustable propeller with custom airfoils set at 21 degrees. Dragonfly testing conducted in October 2000 with smooth air, 4,000' PA, and 30°F. Q2 testing conducted in November 2006 with smooth air, 4,000' PA, and 20 °F. Some of these figures are rounded off and are general settings for the guys content with a homemade graph (EXPERIMENTAL).

-RPM SETTINGS along bottom X 100. RPM is basically controlled with blade pitch angle, 21 degrees times three equals 63". RPM will vary with forward speed, density altitude, and power setting. Field elevation at Lethbridge is 3000' MSL. I find at lower altitudes it is hard to get enough RPM and at higher altitudes the RPM goes up (faster) as you go up (higher). Remember the engine maintains sea level power up to altitude.

-MANIFOLD PRESSURE along bottom is in inches. It takes two inches of manifold pressure to equal one PSI in the intake manifold. One atmosphere at sea level is 15 PSI of pressure or 30" MP.

-You can see both aircraft start at same power. The Dragonfly needs less power in slow flight up to about 100 knots and then more power for speeds above 100 knots. The Q2 needs more power un to 100 knots and then less power for the same speeds above 100 knots.

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### ***Descents/Approaches/Landings***

Dragonfly: you choose 85 knots 65 knots fly down to runway wheel landing or three point (side slips are great)

Q2: you choose 85 knots 65 knots fly down to runway, wheel landing or three point (side slips are good)

### ***Stalls***

Both airplanes stall the same and ailerons are always working for turns.

-one person: mushes at 900'' FPM descent at 60 knots

-two people: mushes and bobs 1000'' FPM descent at 65 knots

### ***Flight Testing***

The other day I picked up 1/8'' of rime ice while flying VFR. There were no difference in flying qualities that I could detect right down to stall and landing. I was amazed how quickly it accumulated on leading edge wings, this could be very dangerous. I wasn't experimenting on purpose and this is the first time I've picked up ice on an airplane wing.

Both airplanes have the same engine configuration and propeller: Subaru EJ 2.5 direct drive, turbocharged, and intercooled with a three blade ground adjustable Warp Drive set at 21 degrees pitch with modified airfoils. I will be changing blade pitch (ground adjustable) angle as part of my testing.

### ***Summary***

I need to fly the Q2 more to get more experience. I have 900 hours in the Dragonfly compared to 45 hours in the Q2. I shared this with the intent of reporting my own personal conclusions on this topic and not to anger somebody with these words, I recognize that this is my opinion. I have flown the Dragonfly much more than the Q2. I love both airplanes and am looking forward to flying the Q2 to Oshkosh. I am planning on entering it in the AIR VENTURE CUP RACE this July. Sam Hoskins gave me some good advice to fly my airplane at least 100 hours first. I respect this advice from a veteran. It is January 2007 and I will know by spring if me and the airplane are ready for racing. I still have more testing to do on both the engine and airframe.

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## TW'ers Gone West

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I am writing today with a very heavy heart. Over the last couple months we have lost three tandem wing enthusiasts. On December 3rd Peter Flueckiger from Hohenrain, Switzerland was killed in an aircraft accident in his One Design DR107. The aircraft was destroyed when it impacted terrain following engine problems while departing Langenthal Airfield, Switzerland. Peter was probably within a year of finishing his Dragonfly, he was incorporating several very interesting modifications and was going to power the aircraft with a Rotax 912. Peter loved flying aerobatics in his beautiful DR107. I was looking forward to meeting Peter during a business trip to the US...I am sorry that I missed the opportunity.



On March 5th Robert Justin from St. Louis died in an off-field landing in his Tri-Q2. Mr. Justin served in the US Air Force for 23 years and took up flying after his retirement. According to a preliminary report on the accident, the aircraft experienced engine problems and was forced to land in a farm field near Edwardsville, IL.

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On March 12th Dave Richardson from Stow, OH died in his sleep of an apparent heart attack. Dave was the Q-Talk newsletter editor for many years and was an incredible supporter of the tandem wing effort. Dave flew his Tri-Q for the first time in 2005 and he and Suzie flew the airplane to the 2006 Field of Dreams Fly-In. Dave helped me many times the last few years and I considered him a close personal friend. I will really miss Dave.

Peter, Robert, and Dave will be sorely missed



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## International Dragonfly Week

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The Dragonfly is a very neat airplane; a very safe design that is economical to build and operate...but with only a few hundred spread around the globe it can be difficult to find another one to look at or get an orientation flight in one. If you were building an RV, there might be 2 or 3 on your home field, but you might have to drive 2 or 3 states to see another Dragonfly. I enjoy having something that is a little different than the guy in the next hangar has. Don't get me wrong, the RV family of aircraft is FANTASTIC, but it is neat having something different.

Unless you live in Tucson, AZ you probably do not have ready access to a Dragonfly builder and flyer support group. Your Dragonfly lifeline is probably this newsletter and the email list if you have a computer and internet access. Without readily available support (and motivation), it can be easy to loose focus and take some time off from the building process.

It starts off innocently enough...I am tired tonight, I think I will just sit down and watch some TV. Then the next night there is something else that comes up. Pretty soon a week has gone by and you have not worked on or even looked at your Dragonfly project. Then that week turns into a month and then a year...pretty soon you can not even remember where your project is located, except your spouse is probably nagging about not being able to park their car in the garage.

I am hereby proclaiming the week of April 1st, 2007 as International Dragonfly Week. At least once during the first week of April I want you to go out and work on or fly your Dragonfly. It might be something as simple as organizing your plans or you might go on the first cross-country flight of the year. I expect each and every Dragonfly builder and flyer to take a couple pictures and send them to me along with a paragraph or two about what you are up to. Please include the date and time the photos were taken. My email and snail mail addresses can be found on the back page of this newsletter. I am really looking forward to hearing what you are up to!!!

Jeff

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# TW Spring Fly-In Schedule

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**April 27-29, 2007—Jean, Nevada.** The 4th Annual Alternative Engine Round-Up and Experimental Aircraft Fly-In (formally the Mountain States TW Fly-In) See <http://www.contactmagazine.com/Roundup.html> for more information.

**May 18-20 - Iowa City, Iowa.** Last fall there was a lot of talk about moving the Field of Dreams. With much discussion, it was decided to leave that in Spud's hands and look to the spring event. Greg Zimmerman, Paul Fisher, Terry Crouch, Jeff LeTempt, and myself got together and looked at having this years event in Iowa City, IA. It has come about!

The airport has an old hanger that United Airlines used to own, that is ours for the using. Greg has informed me there will be an area for camping and he is looking into having a new casino pick us up and take us to their buffet, and return us.

Also there is an aviation theme motel basically on the airport, the Alexis Park Inn and Suites. The owners are our kind of people. We toured the motel last fall and were very impressed. It took us half an hour to walk down the hall looking at all the aviation pictures. The motel's phone number is (319) 337-8665 and their web site is [www.alexisparkinn.com](http://www.alexisparkinn.com). I am not sure of the room rates, but they did say they would give the group a discount and allow cancellations, due to weather or maintenance, until the last minute. Jay Honeck, the owner of the Alexis Park Inn, has a new big screen super computer flight simulator he would like us to try out also.

The event will be laid back and easy going, hopefully we will be doing a lot of flying. I am sure there will be questions and we will have more info as we firm up some details. For all of you new to the group, those looking to see a Q or Dragonfly for the first time, those looking for a first ride, those getting close to flying and looking to get some stick time. THIS is your chance. Don't miss out.

Kevin Boddicker  
Tri Q 200 N7868B 46.5 hours  
Luana, IA

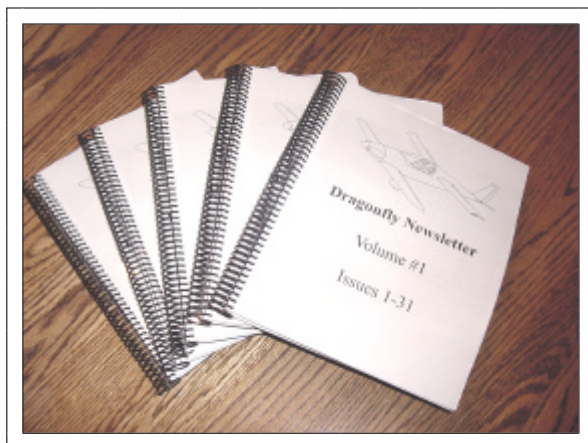
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## Hard Copy DBFN Archive

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The hard copy archive looks great!!! The archive consists of 6 volumes and includes newsletter #1 through #124 (NOV-DEC 2006 issue). The price is \$135 plus shipping for all 6 volumes. Please email or call me with your address I will calculate a total delivered price for you. My email address is [jef-frey.letempt@us.army.mil](mailto:jef-frey.letempt@us.army.mil) or call me at work (573) 596-0165 or at home (573) 364-2545 (*before 2030 central time please*). Personal checks and money orders are ok. I can not accept credit cards, but I can gladly accept PayPal payments.

Jeff



# Classifieds

**For Sale:** Dragonfly MK-III. Engine: Modified HAPI/VW with pulley driven alternator, Airflow performance fuel injection, etc. Engine and airframe 170 hrs. The aircraft is located in Norway, always



hanged and in good condition. For more information, pictures etc. contact Torvid Lensebakken via email [lensebakken@telefonica.net](mailto:lensebakken@telefonica.net)

**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 email [OneSkyDog@aol.com](mailto:OneSkyDog@aol.com)

**For Sale:** Composite spinners for the Dragonfly \$180.00. Call Tim at 310-386-8354 or email [dflypilot@yahoo.com](mailto:dflypilot@yahoo.com)

**For Sale:** Dragonfly Fuselage For Sale -- \$600 Firm -- This includes fiber glassed sides, bottom, front and rear turtle decks, fuel tank/seat, engine cowl, motor mount and bulkheads. This would be a good start for someone. Just start putting it together. Located at the South Lakeland Airport (X49) in Florida. Pictures available via email request. (863) 646-2612 or email [cgentry12@msn.com](mailto:cgentry12@msn.com)

**For Sale:** Dragonfly MK-I 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. Nearly complete. Asking \$10,000. Call 815-397-1533 or email [stiegginding@aol.com](mailto:stiegginding@aol.com)



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Dragonfly Builders & Flyers Newsletter (DBFN) is currently published Bi-monthly at a rate of \$22.00 per year in the US, \$24.50 per year in Canada, Alaska and Mexico, and \$29.50 per year (US funds) per year for foreign subscribers. An electronic version is available for \$16.00 per year regardless of where you live. Send remittance to and make payment payable to:

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For hard copy back issues send \$4.00 for each issue to Jeffrey A. LeTempt at the above address.

Issues #89 through #106 are available electronically from Pat Panzera for \$4.00 each.

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