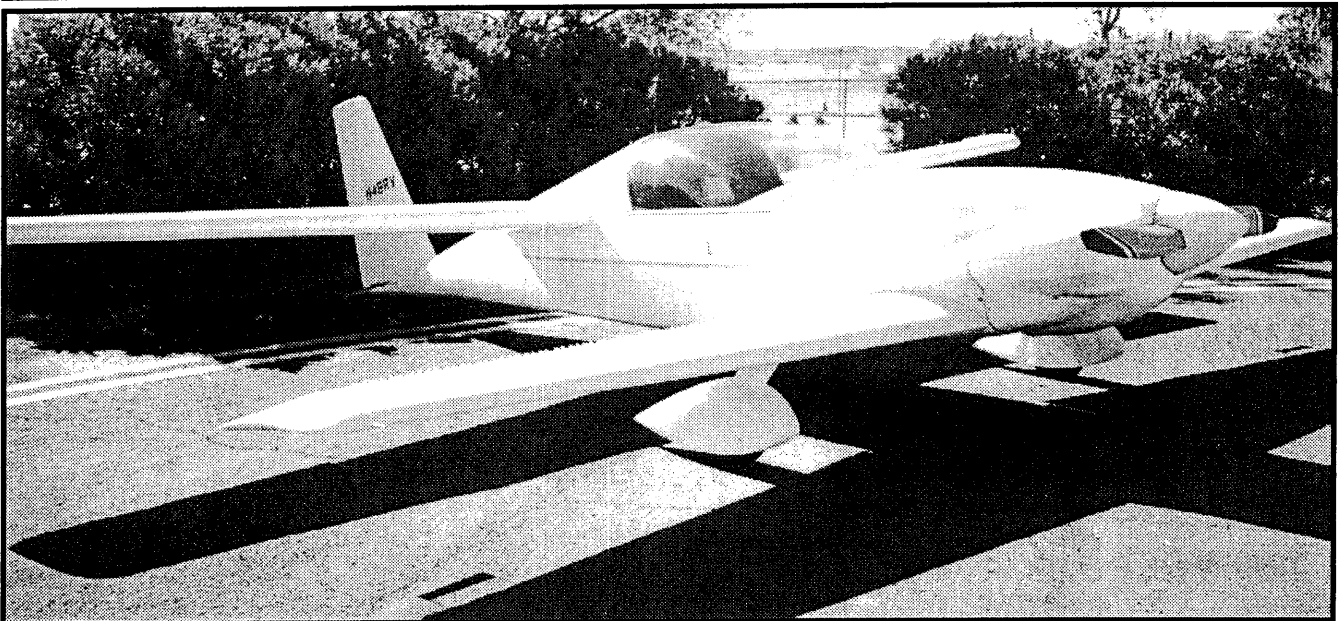


# DRAGONFLY BUILDERS AND FLYERS NEWSLETTER

THE OFFICIAL VOICE OF DRAGONFLYERS ALL OVER THE WORLD

VOLUME 76

MARCH - APRIL 1998



## MARK SNOW'S CONTINENTAL POWERED DRAGONFLY

Hey Gang! Get ready for one of the finest articles to come along for a long time for the DBFN readers. Mark...my hats off to you for this superb overview on your Continental engine installation. I know you put a lot of work into it. Thanks!!  
Spring - 1998

Spud:

Here is the long overdue article that I promised you regarding the installation of the Continental engine and accessories in 48RV. On Labor Day weekend 1995, I made the last

flight in my Dragonfly under Volkswagen power. I pulled the engine, removed the wings, and hauled the fuselage to my shop for the Continental engine installation. I initially thought the conversion would take three months, but it wound up taking approximately seven months.

I bought a C-85 engine from a fellow Dragonflyer, Gene Arthur, and overhauled it. The interesting thing about this engine was that it used Continental ground power unit (GPU) cylinders, which I liked because I felt an over-the-engine

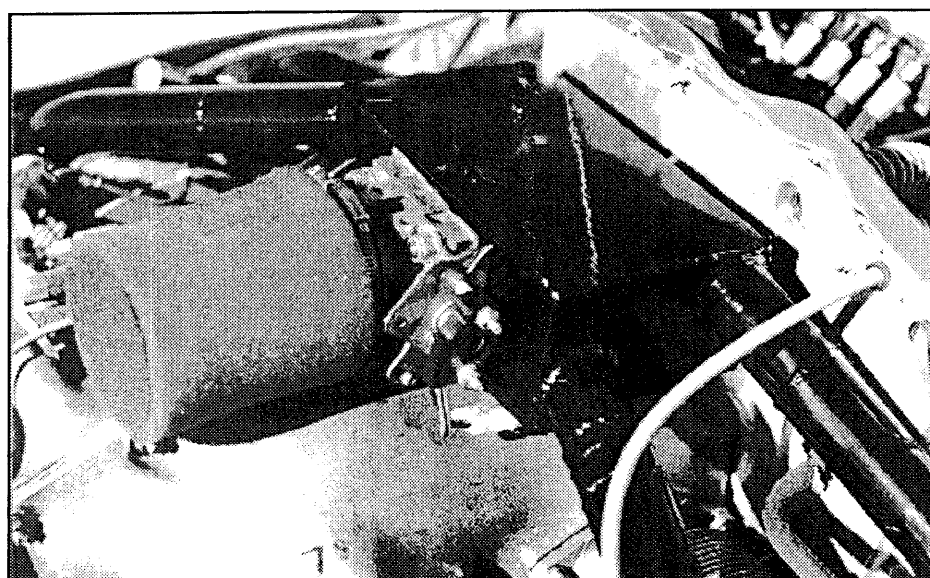
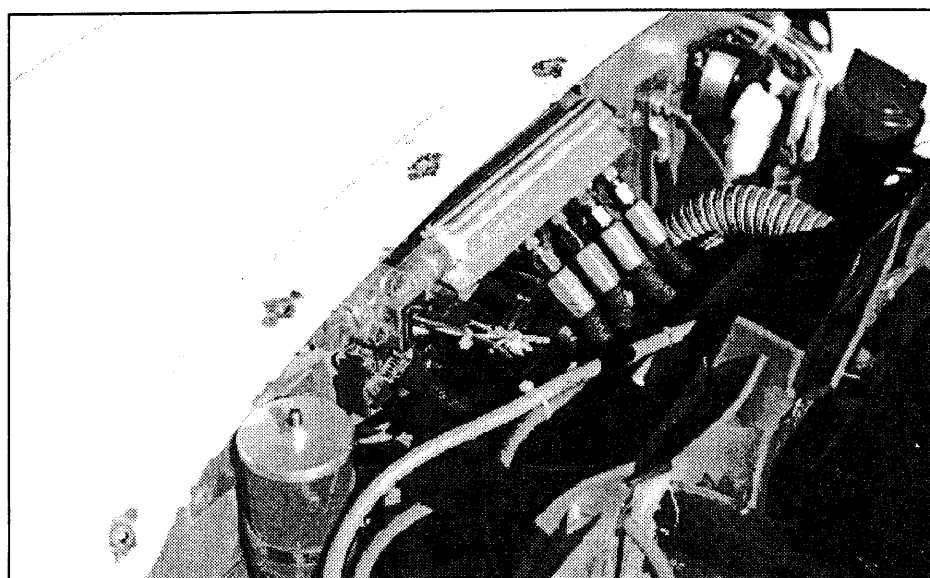
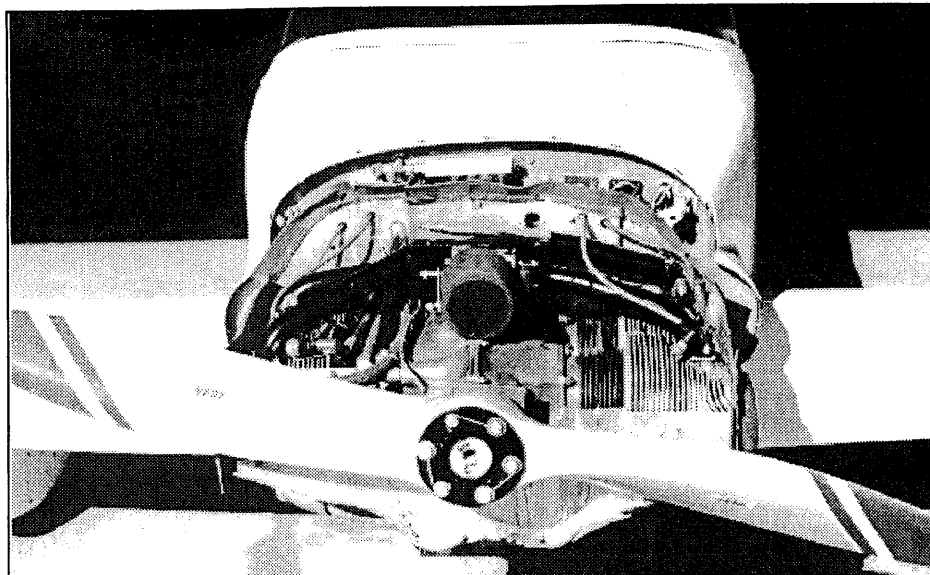
intake manifold would be more efficient than an under-the-engine manifold. Also there is a lot of room between the top of the engine and upper cowl that I wanted to take advantage of. While overhauling the engine, I decided to run C-85 pistons that raised the compression ratio from 7 to 1 to 8.3 to 1. I had the crankshaft, rods, and pistons balanced. Total seal gap-less rings were also used. I ended up with a C-85 case, GPU crankshaft (same as O-200 except one offset drive lug), O-200 cam, O-200 rods, and as I said, the GPU cylinders. The weight difference between the

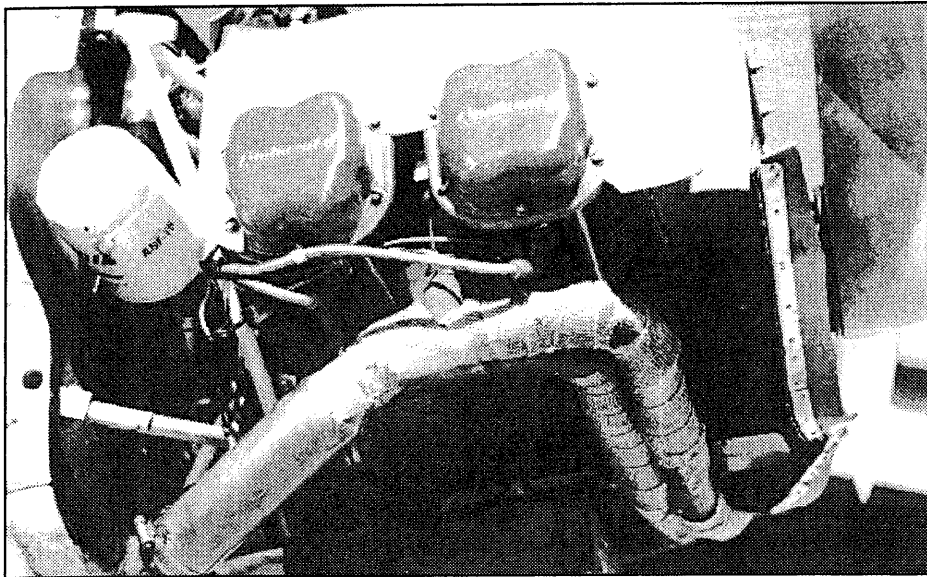
Volkswagen and the continental including prop, exhaust system and oil was 33 lbs. Due to pilot size moving the battery or adding ballast was not necessary.

I had decided I would make every effort to make the Continental fit into the old cowl with as little modification as possible. To keep the prop flange in the same position that the Volkswagen was in would require that the starter and alternator be recessed into the firewall. This was not a problem. I went on a stainless steel bowl hunt in the kitchen when the wife wasn't home, thinking that I had plenty of time to come up with a good story for why I took them, before she needed them. You guessed it! She needed them that evening. After giving my word that I would never again borrow things used for cooking to build airplanes, and ten "Hail Betty Crocker's," I was allowed to resume work on the Dragonfly. The upper cowling required very little modification. The lower cowling required considerable enlargement, but I was able to retain the basic shape of the original cowling.

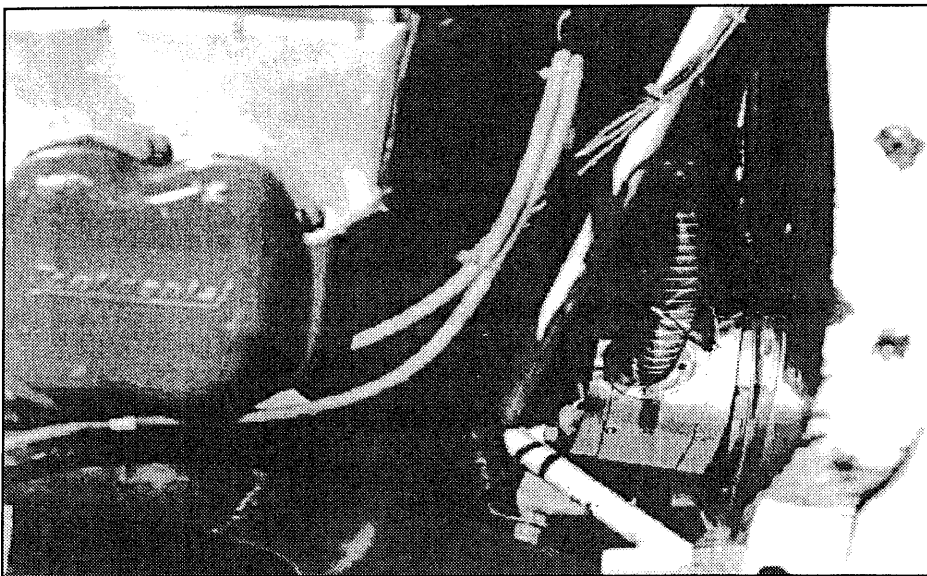
The motor mount was the next area of concern. The angle of the mount arms was going to be a lot shallower than they were for the Volkswagen. I made myself feel better about this by deciding to go with 5/8" x .056" wall tube. When the engine and prop were on the fuselage, I noticed that the motor mount would flex as the tip of the prop was aggressively pushed and pulled on. I didn't like that one bit. No one in the local EAA Chapter liked it either. Ponder, ponder. I finally decided to pay a structural engineer specializing in aviation to do an analysis on it. After I made his recommended changes to it, the engineer pronounced the mount good for 4.4 G's. I was satisfied.

Early on I decided that I would try electronic fuel injection. I have always felt that fuel injection has

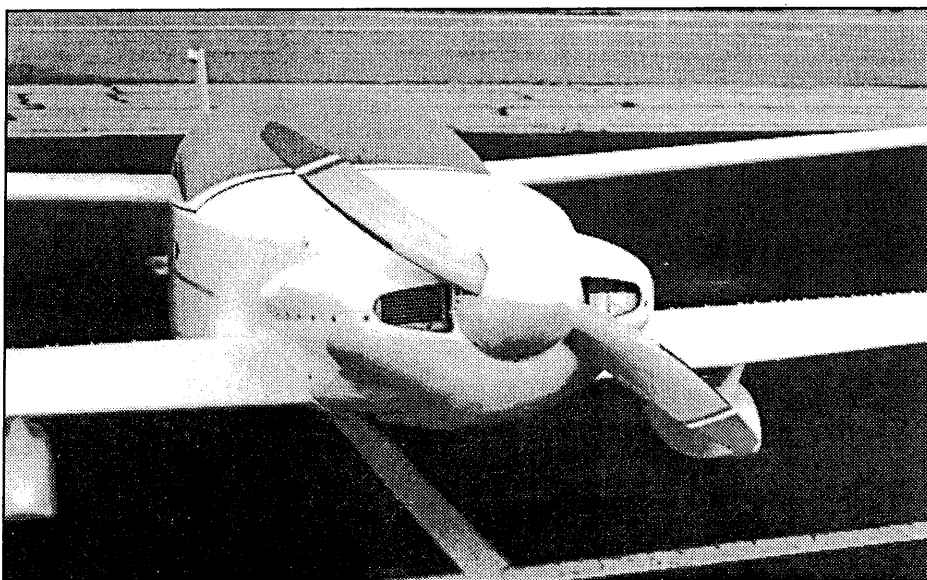




many benefits over a carburetor and very few drawbacks. I ordered a fuel injection computer from Swag Aero out of Tucson and installed it on the engine. I did everything I could to make this system work; it would idle, but would not take throttle. After many phone calls to the manufacturer with no results, I was becoming discouraged. One day I was sitting in my shop trying to decide what was the best course of action. Should I continue to pursue the fuel injection or just give in and go back to the carburetor? I thought about this for over a week, and then a *Sport Aviation* magazine came in the mail with an article in the new product section about a new fuel injection system. I ordered the literature and talked with the people that had developed this system. The more I learned about it, the better I liked it.



I ordered the system from Racetech Engineering. I installed it on the Continental, and was even able to use the injectors from the other system. The sensor roster for this system includes manifold air pressure (MAP), throttle position (TPS), coolant temperature sensor (CTS), air temperature sensor (ATS), and oxygen (O<sub>2</sub>) sensor. The coolant temperature sensor in this case is actually oil temperature. The fuel injectors are late model GM disc style injectors; however, the system is compatible with all late model style injectors. The injector mounting hardware came from MSD. They have a fuel management catalog, which would be helpful to anyone adapting EFI to an engine. The fuel rail on the firewall came from blower drive service (BDS). Fuel delivery from the rail to the injectors is via Gates 303 hose. The fuel regulator is mounted inside the fuselage and excess fuel is returned to the header tank. Fuel pressure is 45 PSI. I have an electronic mixture meter that operates off of the O<sub>2</sub> sensor that gives a very precise indication of mixture. I use it instead of the EGT. To achieve the inherent accuracy of the O<sub>2</sub> sensor



and mixture-meter combination requires that unleaded fuel be used.

The fuel injection system uses a variable resistor for rough trim of fuel delivery, which is necessary during the initial programming process. I kept this variable resistor, mounted it on the instrument panel and it acts as a mixture control. While a mixture control is not needed with EFI, I have grown to like it, especially at altitude, where I lean to the lean side of peak.

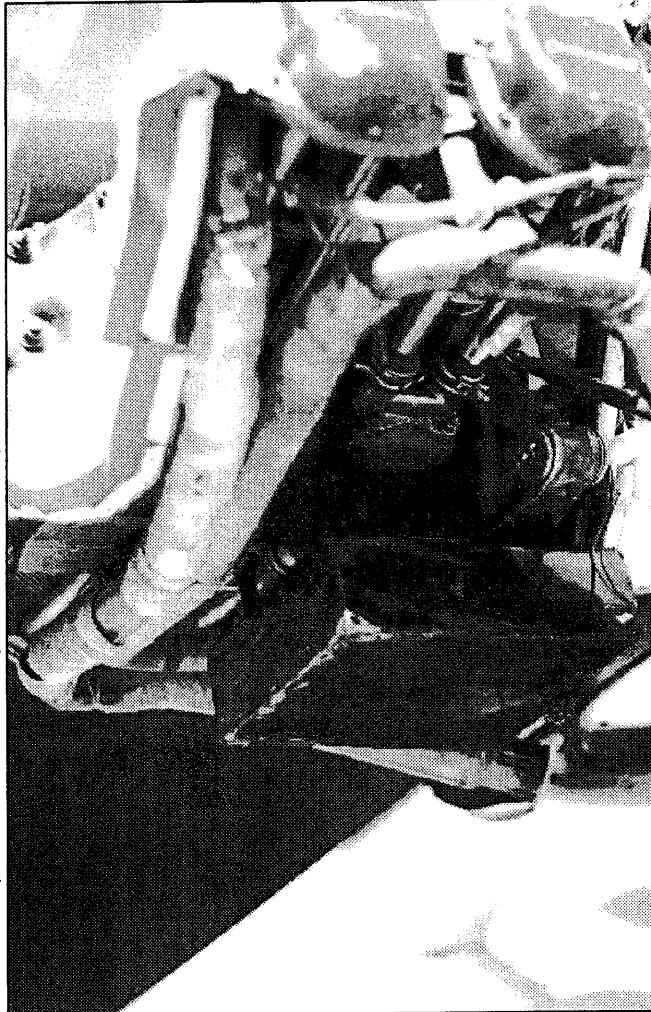
The programmer allows you to operate in either closed loop or open loop mode. Due to the slightly leaner operating characteristics of closed loop, I decided to run mine in the open loop mode, programming in a little extra fuel during wide open throttle (WOT) operations such as climbs. Another reason for running in open loop is because I run a mixture of 100 LL and unleaded fuel. Any lead tends to deteriorate the O<sub>2</sub> sensor.

I was satisfied with the cold start performance of the EFI until the OAT got down to the mid 20's. It seemed that it had to crank longer that I liked before it started. I built up a free running oscillator, which tricks the computer into thinking the engine is running at about 800 RPM, thus delivering fuel out of the injectors. I ran the signal through a panel-mounted switch, so now I have an electronic primer, and it starts on the second or third blade, no matter how cold.

One of the nice features of this system is the remote programmer, which I mounted on my instrument panel. This programmer displays all of the fuel delivery parameters, injector duty cycle, and manifold pressure (displayed in inches).

Programming is possible on the fly (literally).

I retained the electronic ignition system from the Volkswagen engine and built up and installed a second system just like it for my #2 ignition. I ran the two tach signals from the ignition systems through an or gate so that the fuel injection computer would get a tach pulse even though one ignition system was turned off. This feature allows the engine run up to be conducted in the same



manner as for a mag-equipped engine. The #1 ignition system is triggered from a magnet embedded in one of the prop bolts. The #2 system uses the tach drive which has been modified with a rotating magnet assembly to trigger the hall-effect sensors. This was the only other place that could be used to trigger the #2 system and give full redundancy. It has worked well for 320 hours.

Many things had to be fabricated including the motor mount, the intake manifold, the oil sump, and the exhaust system. There was nothing too difficult about any of these except the stainless steel exhaust, which, for me, was difficult to weld.

I thought it would be nice to try and tame the bark of the mighty Continental and decided to use the shorty-style Harley mufflers with the replaceable packing. They did quiet it down, but it lost some power. Since there's no substitute for power, I left the packing out and let her bark.

I wanted to run a full flow oil filter, but didn't like the prices of the kits I saw in *Trade A Plane*, so a friend of mine, who is a machinist, machined one for me out of billet aluminum. It has worked fine since day one, for about one-third of the cost.

I modified a Chevy Luv alternator and mounted it on the accessory case where the stock alternator went. The advantage of the Luv alternator is its smaller size, lighter weight, and external regulator. It is good for about 35 amps. I designed an over and under voltage circuit which lights a bright red LED mounted on the instrument panel. The trigger points are 12.5 volts for low and 15.5 volts for high. I plan to install an alternator field circuit crowbar, which will disable the alternator in the event of a failed regulator.

Battery redundancy is another planned future project. If there is a down side to the EFI and electronic ignition system, it has to be the total dependence of these systems on electrical power. I would encourage anyone who is planning an all electric airplane to purchase the book, *Aero Electric Connection*, and to

heed the recommendations of the author.

I have always felt that the Continental and Lycoming are good engines; however, their fuel delivery and ignition systems have become dated with time. If these systems could be updated to modern systems, we would have a better engine. Leaving only the combustion chambers as old designs, which would be really tough to improve upon. However, I don't take making these changes lightly. After all, the old systems gave decades of good service. Care must be taken in adapting these systems to our older engines, giving thought to even the smallest details, consider that one bad electrical connection in the wrong place can put you in the glider mode. But for me, I have found that the ideal engine for the Dragonfly = small Continental + EFI + electronic ignition.

A two-way GPS run yielded these numbers:

- Empty wt 765 lbs.
- 1. Ground speed – 154 MPH
- Hegy prop 56 x 65
- 2. Fuel burn – 4.5 GPH
- Max rpm 3300
- 3. Manifold pressure – 21.6
- Max recorded speed (2-way GPS run) 183 mph
- 4. RPM – 2940
- Average cruise 155-160 mph
- 5. OAT – 50° F
- 6. 5000' MSL
- 7. MPG – 34.22

HAPPY FLYING!!!  
Mark D. Snow

### List of Sources

Blower Drive Service Co. Inc.  
12140 Washington Blvd.  
Whittier, CA 90606  
(310)693-4302  
Fuel delivery parts

Mark Snow  
704 N. Third St.  
Carlsbad, NM 88220  
(505)885-9105  
Custom electronic ignition  
Systems using MSD components

Ducarra Aviation  
1505 N. Front St.  
Niles, MI 49120  
(616)684-4440  
Continental GPU parts

Autronic Controls Corp.  
1490 Henry Brennan Dr.  
El Paso, TX 79936  
(915)857-5200  
MSD Ignition Systems,  
Fuel delivery parts,  
Accessories

Racetech Engineering  
Bay G 1007 55<sup>th</sup> Ave. NE  
Calgary, Alberta, Canada T2E  
6W1(403)274-0154  
EFI Systems

Total Seal  
2225 W. Mountain View, Suite 6  
Phoenix, AZ 85021  
1-800-874-2753  
Gapless rings

The Aeroelectric Connection  
6936 Bainbridge Road  
Wichita, KS 67226-1008  
(316)685-8617  
Useful technical information

## **“SLIM PICKENS”**

This is the *lightest* newsletter that I have produced since I started doing the newsletter back in fall of 1990. We still have way over 300 subscribers in 19 different countries. I must remind everyone that this is **our** newsletter and I can't do and don't know everything (*THAT LAST PARTS FOR SURE!*) We all have a responsibility to make this a good information forum. Hopefully its just the time of year? Can we count on you in the near future for some type of contribution?? Regards, Spud

## **1998 FLY-IN**

For the last 7 years we have had our Tandem Wing Fly-in in Ottawa, Kansas for the Dragonfly and the Quickie bunch. This has turned out to be an excellent fly-in. I have learned that a lot of other groups (particularly the small groups such as the DF & Quickie groups) don't have any real annual fly-in of their own or at least at the magnitude of our event. I feel we have plenty of room for expansion of our event to include these other groups. I hope everyone becomes excited about hosting an expanded event as I am.

First off... We are changing things around this year. We are changing the name of the Fly-in to: **“The 1998 Field of Dreams Invitational Fly-in”**. This fly-in will be by invitation **ONLY!** Who's invited? This fly-in is for Homebuilts only with a current designer's gross weight of **1400 lbs. OR LESS**. We are designing this fly-in for the little guy in mind, I guess we could even call it sorta of a “Little Guys Nationals”.

The groups out there that really don't have any type of annual fly-in supported by their designer and/or the group itself. My hope is that these groups will adopt this fly-in for their annual get together.

The dates for the fly-in will remain on Labor Day weekend like in years past, but we are making Friday a full day where it was only a half day in the past. Those dates are full day Friday – September 4<sup>th</sup>. Full day on Saturday – September 5<sup>th</sup> and the traditional day (morning) on Sunday – September 6<sup>th</sup>.

You'll receive pre-registration forms for the fly-in in your May/June and July /August issues of DBFN.

A couple of groups that have made tentative plans to attend: The Sonerai group, The Hummel Bird Group, The VP-1 and VP-2 gang!

Note: Group leaders (other than the Dragonfly or Quickie)and/or designers please contact me to start scheduling forum times.

## THE CLASSIFIEDS

**Great Plains Aircraft Supply**  
**Quality Aircraft Parts, Excellent Service & Support at Reasonable Prices Since 1982** - We have a full line of assembled and tested VW based aircraft engines, short or long block component packages - assembled or in kit form. We have individual components, quite a few replacement parts for HAPI and Revmaster engines, props and many accessories. The 64 page catalog and technical manual still only \$4.00!! Send for yours today. Our business hours are Monday through Friday 8:00 AM to 6:00 PM and Saturdays 8:00 AM till NOON Great Plains Aircraft Supply P.O. Box 545 Boys Town, NE 68010 Phone (402) 493-6507 Fax (402)333-7750

**For sale:** Balanced 2180 VW engine package—Not yet removed from aircraft. May be flight tested prior to May 15th. All systems go with the package—intake, Ellison throttle body, alternate air box, cabin heat muff, exhaust system, baffling, 40 amp alternator, geared starter, oil cooler, spin on oil filter, Bendix mag, electronic ignition., aluminum fined barrels, extra heavy heads, force one prop hub, Dragonfly task cowling, engine mount, hydraulic lifters, and a chrome spinner and Great American prop. This is a bolt on and fly program...E-mail Phone—209-626-4991 Price—\$ 4500.00 Reason for sale is—I am installing a very special Cont. C-85 engine (more power and speed).

**Wanted:** Any info and/or plans for a "Headwind" aircraft. Please contact Chuck Mack, 24013 Highland Drive, Manhattan, IL. 60442

**For Sale:** HAPI 60DM (firewall Forward)Engine Mount included. This engine was new when purchased and I had Great Planes Aircraft tear it down and check it out in 1995. He replaced the crank and gave it his OK. I would like \$3,500.00 for it and it has less than

1 hour on it (taxi tests, etc) E-Mail address is [alfitz@computer-concepts.com](mailto:alfitz@computer-concepts.com) My phone is 308 389-3569

**Wanted:** I'm looking for a new or used "new style" engine mount for the HAPI accessory case. Patrick Panzera. Phone number is: (209) 584-3306

**For Sale:** 2180 VW "O" time (X-great Plains) Complete w/ Ellison carb \$6000.00 Contact Dave Bastion (810) 659-7228 (Michigan)

**For Sale:** HEALTH FORCES SALE - Dragonfly MK II project with HAPI 1835, 1 mag & 1 electronic ignition, prop spinner, all instruments, hand held nav/com headset, GPS, custom dolly for fuselage, custom built trailer for highway transportation. All for \$8,500 Phone for more details (509) 935-8461 Rex Barrans, Box 348, Chewlah, WA 99109-0348

**For Sale:** HAPI 1835 cc W/new float bowl carb (60 HP @3200 RPM), complete with motor mount & 56X28 wood prop w/flange 67 hrs recorded on engine log. Make an offer to Ron in Virginia 804 693 5186 or E-Mail [phantom11@juno.com](mailto:phantom11@juno.com)

**For Sale:** Builder deceased - Dragonfly project 75% complete, wing and canard are glassed HAPI 1835cc engine, Hydraulic disc brake kit, swept tip prop, New style hoop gear and wheel pants, a few instruments, construction videos, project available for inspection. Make reasonable offer - no tire kickers - serious inquires only please - Contact Aileen Rawson at (941) 763-3315 - 8333 NW 189th Ave., Okeechobee, FL 34972-9687

**For Sale:** Prefab Dragonfly Kit - \$5,500.00. Fuselage assembled with tail fin, rudder, fire wall, motor mount angles, upper-lower seat back, intercostal-tail bulkheads,

fuel tank & consoles installed. Pre-cut canard and wing cores, fiberglass cloth, some carbon fiber, engine cowling, Mark I wheel pants, some hardware. Wayne Ulvestad, Volga, SD work (605) 627-9291 home (606) 627-5365

**For Sale:** Dragonfly Mark II, 128 TTSN, 20 STOH, 1835 HAPI engine, dual ignition, new carburetor, new tires, new brake and fuel lines, new automotive battery, micrometer throttle control, basic instruments plus portable nav/Com, no damage history, always Hangared. Rated a 9 in and out, \$12,500, (864) 458-1887 or (864) 942-0025 after 5:30 p.m. EST.

**N4422K is still for sale!** This well constructed bird has been flown about 69 hours, and needs only fairly minor work to get back in the air. Asking \$8,900 but must sell soon, so all serious offers will be considered. For more information, you can call John at (415) 604 - 5384 or send e-mail to [jbunnell@mail.arc.nasa.gov](mailto:jbunnell@mail.arc.nasa.gov)

**For Sale:** Dragonfly MK II, 90% complete. Everything to finish airframe included. Hoop gear mod completed with Cleveland's and VFR instruments. \$6500.00 Must sell 616-343-6990

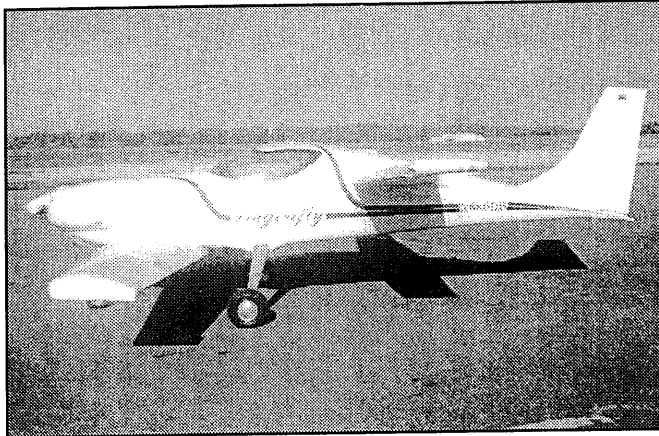
**For Sale:** 1991 Dragonfly Mark II, N64TM, VW 2165, 471 HRS TTAf, 014 HRS STOH, 3 blade Warp drive prop, Terra Com, Mode C, '94 Best Overall Dragonfly. Bill Masons' original DF \$16,500 OBO (or best offer) (512)-749-4230

**For Sale:** New fully assembled Dragonfly -MK I with Com & Loran. 2 hrs. flying time, Recently A & P inspected. Engine 7 hours, new brakes, carbon fiber spar. (770) 886-7707 \$13,500.00 (73)

**Inboard Mark II "Hoop Style" Gear Plans** - Full size hoop gear

template drawings for making the mold and instructions on how to mount to the fuselage. \$14.00 (\$18.00 outside of U.S.) Mail your checks to: Bill Spornitz, 1112 East Layton Drive, Olathe, Kansas 66061-2936

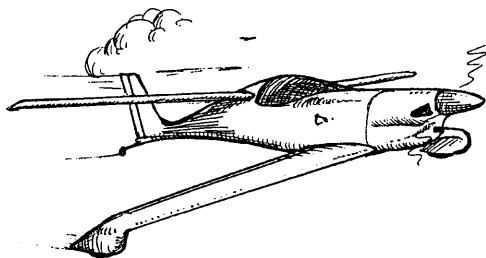
**Wanted:** I'm looking for a pair of "un-used" Mark I wheel fairing halves from a Task Pre-fab kit. Also looking for a canard bottom fairing piece. Must be reasonably priced. Ask for Mark Carroll at (502) 759-3135 work or (502) 759-4740 home



**For Sale:** Tri-gear Dragonfly (Photo above) 90 hrs T.T., Terra radio, transponder with mode C, Loran, New Tires, many extra's (no engine) \$8600.00 Contact Dave Bastion (810) 659-7228(Michigan)

**Wanted:** Your extra materials, looking for canopies, 5" carbon fiber (for spar caps), bi or uni cloth, blue foam, Instruments, etc. Spud (913) 764-5118

**For Sale:** Dragonfly Mark 1 kit w/HAPI 1835cc dual electronic ignition. Many extras. Very close to completion. At least 85% More details available on-line at the Dragonfly web page. Call after 5:00 PM EST 207-324-6072 \$9,500.00



## Subscribers Information

Dragonfly Builders & Flyers Newsletter (DBFN) is currently published Bimonthly at a rate of \$3.50 per issue/\$21.00 a year in U.S. \$3.84 per issue/\$23.00 a yr. in Canada, Alaska & Mexico. \$5.00 per issue/\$30.00 a yr. (U.S. funds) per 6 issues to foreign subscribers. Send remittance to: DBFN, 1112 E. Layton Drive, Olathe, Kansas 66061. PLEASE MAKE CHECKS PAYABLE TO: BILL SPORNITZ

Ideas and opinions expressed in DBFN are solely those of the individual submitter. This information is for educational purposes only! Application of these ideas and/or suggestions contained in DBFN is the sole responsibility of the experimental aircraft builder at their own risk, which could result in builder/pilot personal injury or death. DBFN does not imply or suggest in any way their usage.

Letters, Pictures and computer supplied data submitted to DBFN are subject to final screening by DBFN / Bill "Spud" Spornitz and may be restricted, deleted or revised. Material returned by request only.

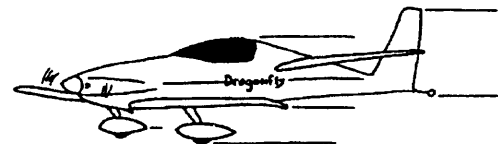
Classified advertising; (non-commercial) for current subscribers may place an ad of 50 words or less for \$6.00 per issue, with one photo a additional \$12.00. Back issues of "DragonFlyer", "Dragonfiles" & "DBFN" are available at \$3.00 each.

The use of "VW" or Subaru by DBFN is for the sole purpose of application and description only and is not intended to infer or imply a direct connection between DBFN and Volkswagen or Subaru.

**24 hour Phone & Fax**

**1-913-397-0518**

**E-mail DBFNSPUD@AOL.COM**



TOP TEN AMISH SPRING BREAK ACTIVITIES

- Number #10. Drink molasses 'til you heave.
- Number #9. Stuff as many guys as you can into a buggy.
- Number #8. Churn butter naked.
- Number #7 Blow past Dairy Queen on a really bitchin' Clydesdale.
- Number #6. Get a tattoo: "Born To Raise Barns"
- Number #5. Cruise the streets shouting insults at people with zippers.
- Number #4. Sleep in 'til 6:00 a.m.
- Number #3. Drive over to Allensville and kick some Mennonite butt.
- Number #2. Two words: Buttermilk Kegger
- And the number one Amish Spring Break Activity:
- Number #1. Wet bonnet contest!

**DRAGONFLY  
BUILDERS AND FLYERS  
NEWSLETTER**

*The Official Voice of Dragonflyer All Over The World*

*Bill "Spud" Spornitz - Editor/Publisher*

1112 East Layton Drive - Olathe, Kansas 66061-2936  
24 Hour Phone and Fax (913) 397-0518

**FIRST CLASS MAIL**

