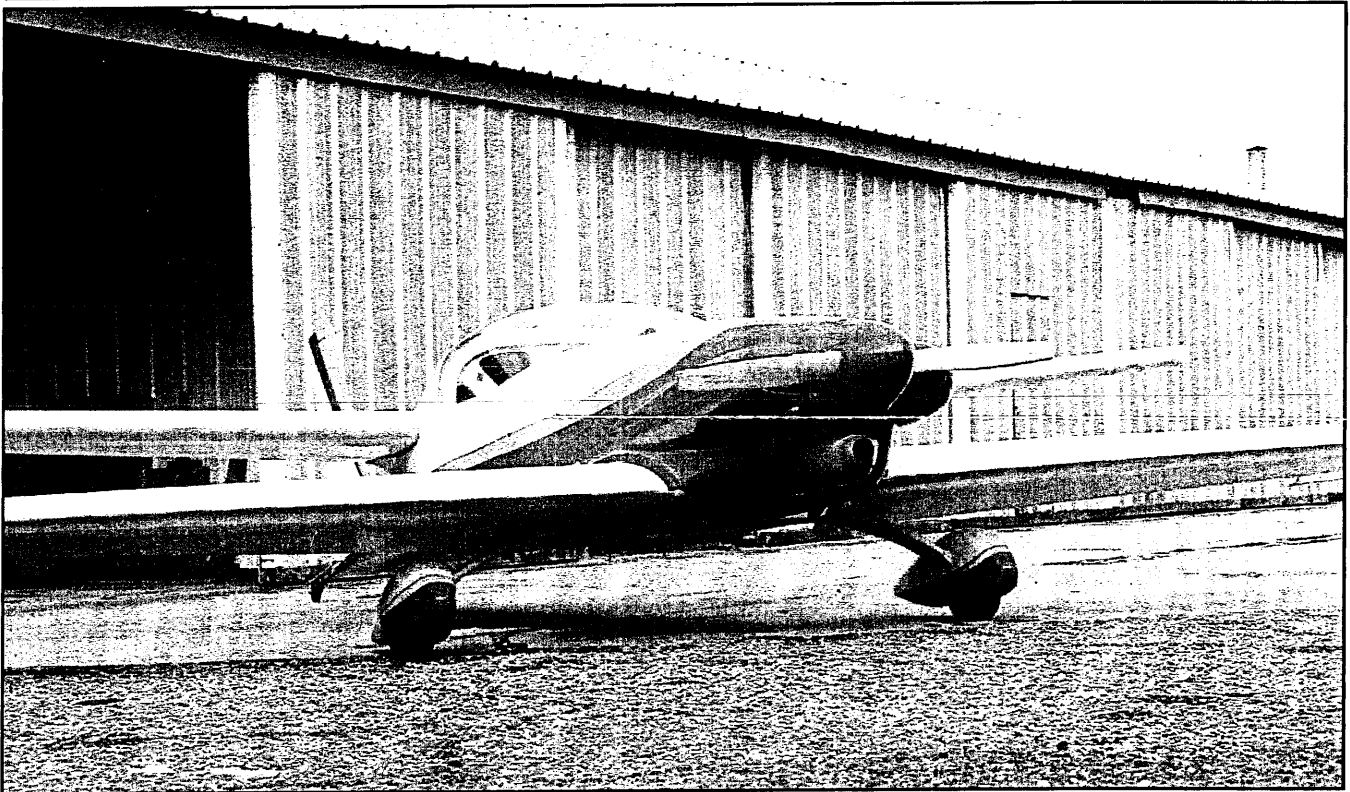


# DRAGONFLY BUILDERS AND FLYERS NEWSLETTER

THE OFFICIAL VOICE OF DRAGONFLYERS ALL OVER THE WORLD

VOLUME 83

JANUARY - FEBRUARY 2000



## ***Aubrey Wanzor's Mark II Dragonfly makes its first flight!***

Hello everyone,

We've seen a lot of first flights over the years but this seems special. Aubrey was one of the very first subscribers to DBFN way back on 9-1-1990! He has supplied us with progress reports over the years and has shown us what "stick to it" really means.

Aubrey has shown us that you can

build a solid-simple airplane but that you can still do it with style. Please look closely at the photos. Especially his instrument panel, what a refreshing look! It is truly a gorgeous airplane! - Spud

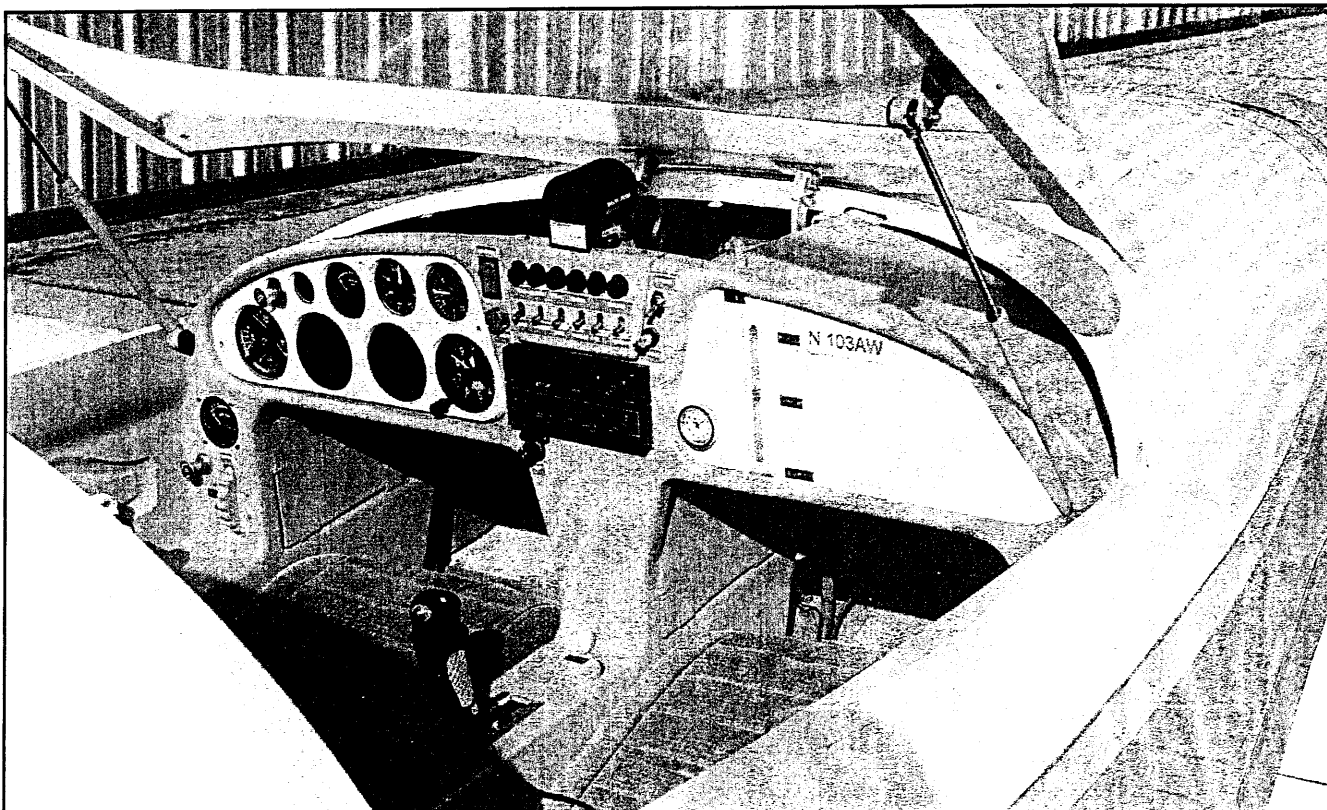
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Hi Spud:

Glad to see you are back as "Pilot In Command" of DBFN.

I guess we all agree with Mike Puhl's assessment of the Dragonfly. Compare all the performance stat's of the Dragonfly with any other aircraft and few or any are as impressive.

The building of my Dragonfly has taken far too long. However, it did finally get completed and successfully flown.



The first flight for Dragonfly N103AW was made in the fall by test pilot Charlie Terry.

The first thrill for me was to see the airplane lift off and climb out. The second thrill was to see the smile on Charlie's face after he landed and stated "No bad habits".

Work remains to be done but nothing major.

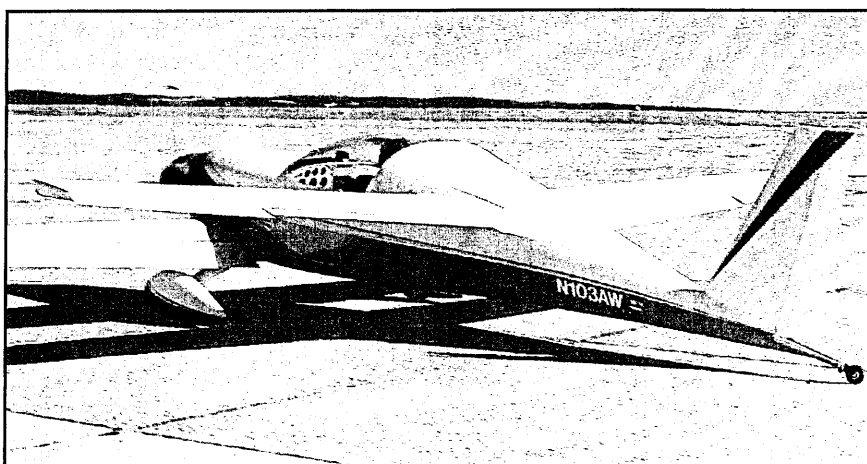
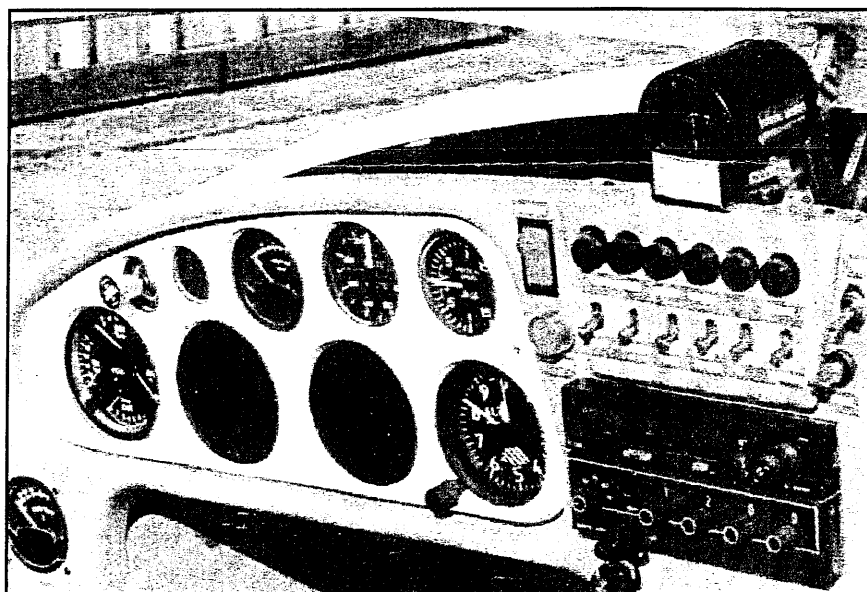
Illness and winter has prevented further progress up to this point. I am looking forward to spring and flying off the 40 hours.

Hope you like the photos.

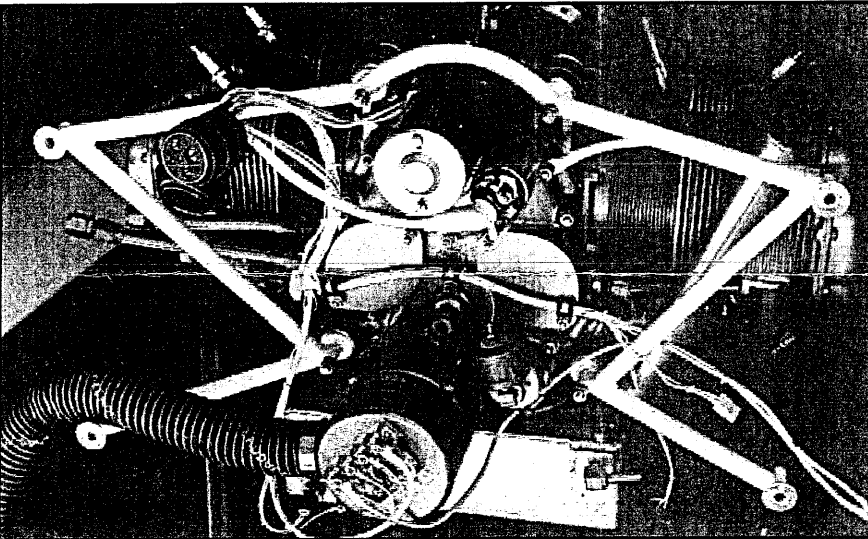
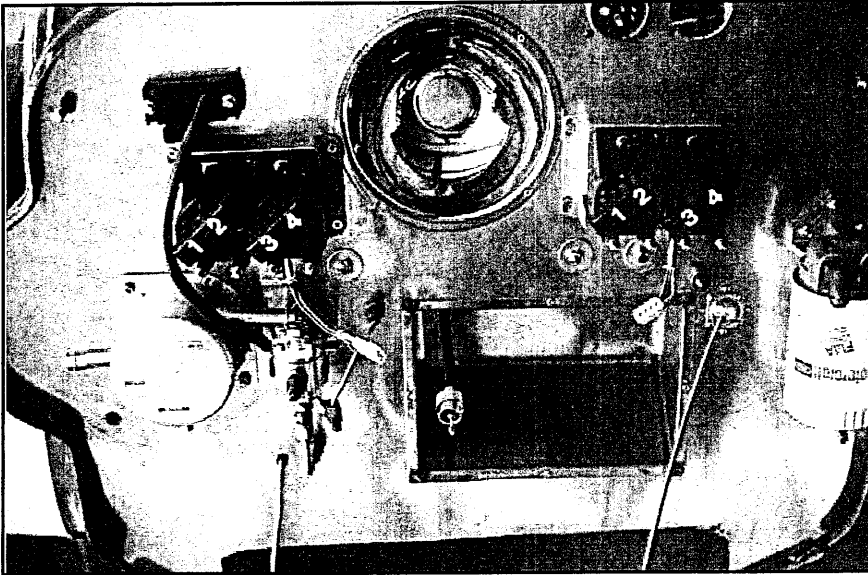
Keep up the good work. Maybe I will be able to introduce you and the DF gang my Dragonfly in the next year.

Keep the shiney side up

**Aubrey Wanzor**  
**Southold, New York**



# Multicom



## • From the Justin Mace Shunkworks

Hello Spud and fellow DF builders,

My project is still going along but very slowly. I am still working on the cowl & baffling. I am attempting to make the cowl fit the O-200 without looking like its over an O-200. I will be doing a large lay-up this weekend, suppose to be about 80 degrees. I am looking forward to seeing you and the gang in October I do plan on coming to Ottawa this year.

Here are a couple of photos of my Continental motor mount and fire-

wall. I robbed the kitchen for the S/S salad bowl for the starter indent. I had to make the large one for the alternator. Dual coils for the SDS ignition. All engine electric's are thru the firewall using two Cannon type plugs. The 54 pin includes the computer electric's and the 4 cyl CHT & EGT. Starter power and alt are thru the other plug. It only takes 30 to remove the engine. This setup is SO much simpler than the Legacy.

I will keep everyone posted as things progress.

Justin Mace  
Tucson, Arizona

## • Trial and Error on Improving VW Engine Cooling

Dragonfly Mark I 1835 VW HAPI  
60-2DM Great Plains Heads

This engine and baffle installation are done per Dragonfly plans and works fairly well but I thought there was need for improvement.

These are the things I tried:

**Step 1:** Relieved bottom lower cowl - didn't help

**Step 2:** Make low pressure lip on bottom lower cowl - didn't help

**Step 3:** Made deflectors on cowl-ing inlets to deflect more air up. Helps on long climbs to keep head temperature down.

**Step 4:** Lowered bottom of cowl 1 1/2 " and installed low pressure lip - didn't help.

**Step 5:** Closed up large hole in front of cowling behind spinner leaving a 3" hole for crank shaft. This was the biggest improvement, the head temperature came down 35-50 degrees and the oil temp was almost to cool. I blocked off part of oil cooler to bring oil temp back up.

I know that other VW DF drivers have been experiencing the same cooling problems. I hope this helps them get closer to solving their cooling problems. I challenge other DF Builders and flyers to share the successes and failures with the entire group.

Regards,

Wayne Ulvestad  
Volga, South Dakota

# Thinning West System Epoxy

This article appeared in the Fall 1999 issue of *Epoxyworks*, published by *Gougeon Brothers*, manufacturers of the *West System Epoxies*. This topic has been bounced around the composite and the wood/ experimental aircraft camps. Its solid information that we all can use. Our thanks to *Gougeon* for permission to publish this in the Dragonfly Builder and Flyers Newsletter . - Spud

A question frequently posed to our technical staff is "can I thin West System epoxy so it will flow or penetrate a better?" The answer to that question is "yes, but not without consequences." Many of the advantages of thinning epoxy are offset by disadvantages in other areas of epoxy performance.

Thinning epoxy means lowering its viscosity. Low viscosity epoxy flows better, is easier to roll or brush, saturates fiberglass fabric quickly, and penetrates more deeply and more easily into porous surfaces like partially rotted wood. There are two methods of temporarily thinning epoxy. One is to heat the mixture and the other is to add solvent to the mix. The goal of both methods is to reduce the epoxy's viscosity. This article explains what happens to West System epoxy when it is thinned either by heating the components or adding solvent to the mixture.

Through knowledge gained from our comprehensive test programs and from 30 years of practical experience, we have learned that epoxy formulation is a balancing act. When one characteristic is altered-e.g.. changing handling attributes by adding a volatile solvent—other characteristics like moisture resistance and strength are also changed. Our chemists formulate a well balanced, versatile epoxy that provides excellent structural strength

and moisture resistance. If you elect to modify it, you become an epoxy formulator and need to understand the effects of your changes.

Armed with the information in this article, you can decide if thinning epoxy is worth the tradeoff in performance.

## Is thinning necessary?

There is a perception that epoxy needs to penetrate deeply into wood to be effective. Sometimes this is true, but most of the time it is not. Some common misconceptions are that deep penetration of epoxy 1) makes rotted wood as strong as new, 2) it creases adhesion, and 3) makes wood more waterproof. The following is a brief discussion of these points.

1 ) Rotted wood impregnated with epoxy does not make the damaged wood as good as new. Deep penetration of epoxy into rotted wood will make the wood hard but it will not restore its original strength. This is not important if the rotted material is non load bearing. A rotted door threshold does not need to be strong, just hard. How' ever, when the wood fiber is damaged, wood loses its ability to carry loads and unless the fiber is replaced, it will not regain its full strength. A rotted deck beam or sailboat mast needs more than epoxy consolidation to return the wood to its original load carrying capacity.

2) Adhesion in all but the highest density wood is not enhanced by deep penetration of the glue into the wood. Research performed at the Forest Products Laboratory showed that

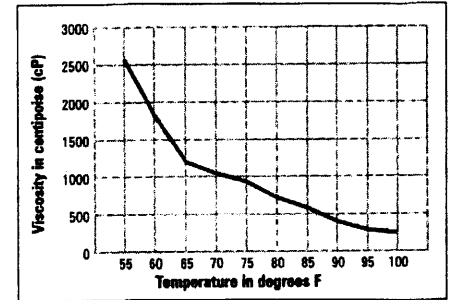


Figure #2. Viscosity of 105 resin vs temperature. Resin viscosity is reduced as the temperature is raised.

adhesion to birch was in' creased slightly by using thinned epoxy. In lower density wood species like Sitka spruce or Douglas fir, the weak link is the cross grain strength of the wood. It does not matter if the epoxy penetrates 1/4" into the wood or 0.005". The strength of the wood, the amount of surface area and the adhesive ability of the glue determine the strength of a glue joint. Most types of wood glue do not penetrate deeply, yet, if used properly, they can exceed the grain strength. Epoxy is no exception.

3 ) Water resistance of a piece of wood is not enhanced by deep penetration. Wrapping wood in plastic makes a pretty good waterproof seal without any penetration at all. Likewise, an epoxy coating on the surface is more water-resistant than a thinned epoxy coating that has penetrated deeply into the wood because, in most instances, the epoxy thinned with solvent is porous.

The USDA Forest Products Laboratory developed the Moisture Exclusion Effectiveness (MEE) test. It is a measure of how much moisture is absorbed by wood when it is continuously exposed to 100% humidity. Higher numbers mean the wood has absorbed more moisture while lower numbers indicate less moisture is absorbed. You can see that epoxy with solvent added is not nearly as moisture resistant as un- epoxy (Figure 1). However, if you need an epoxy coated surface that is less of a vapor barrier, thinning West System epoxy with solvent is a valid way to achieve this.

## Thinning epoxy with heat

Heating the resin/hardener components and then mixing them together results in a thinned epoxy mixture that, when cured, retains all the characteristics of epoxy cure at room temperature. The viscosity of epoxy is very sensitive to changes in tempera' sure, and warming the

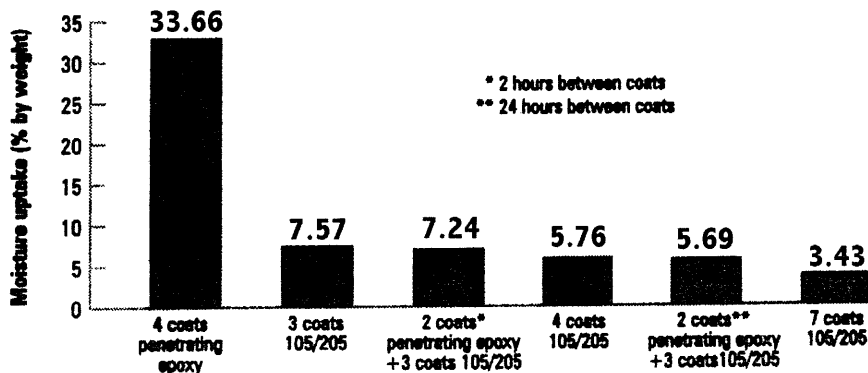


Figure #1. MEE of various combination of thinned and unthinned epoxy at six weeks exposure to 100% humidity.

components (resin and hardener) and/or the substrate substantially lowers its viscosity (Figure 2).

With wood, the best method of thinning epoxy with heat is to warm the wood and have the resin and hardener at room temperature. Mix the components and apply the mixture to the warm wood surface. Remove the heat source just before the epoxy is applied. When the epoxy mixture comes in contact with the warm wood, it gets warm and its viscosity becomes lower. As the temperature of the wood falls, the thin epoxy is drawn in deeply before it begins to gel. By heating the substrate instead of the components, you get the best of both worlds- low viscosity epoxy on the work surface and longer working time in the mixing pot.

### Potential Problems

Thinning epoxy with heat can create problems, however. Warm epoxy cures much more quickly than you may be accustomed to. Have things organized before you mix the resin and hardener and move quickly. Use one of the slower hardeners-206, 207, or 209-to increase the working time.

How warm is warm? should be able to comfortably touch the substrate or the component containers when they are appropriately warmed-about 115°F maximum. Excessive heat will cause the epoxy to harden too fast, especially in thick applications. Very rapid cure will overheat the epoxy. If smoke rises from the curing epoxy, it is likely the epoxy is damaged and should be replaced.

### Thinning epoxy with solvent

Adding solvent is a quick, simple method of thinning epoxy, but unlike using heat to thin it, the strength and moisture resistance of the cured epoxy are drastically affected. Below are some of the effects adding solvent has on West System epoxy. While there are a large number of chemicals available to thin epoxy, we selected acetone, lacquer thinner and denatured alcohol for this discussion because they are commonly available and do a good job of reducing viscosity. Additionally, these solvents evaporate quickly and are less likely to be trapped in the cured epoxy-an important characteristic. For a variety of reasons, fast evaporating lacquer thinner appears to be more appropriate for thinning purposes than acetone or alcohol. Adding a small amount of one of these solvents has a significant effect on the viscosity of the epoxy. For example, adding 5% lacquer thinner makes about a 60% reduction in viscosity (Figure 3).

Adding 5% lacquer thinner to epoxy reduces the epoxy's compressive strength by 35%—a big hit in the mechanical properties of West System epoxy (Figure 4). The addition of more than 5% solvent results in an excessively flexible cured-material. Thinning epoxy with solvent causes enough loss of strength that we (and most other reputable epoxy formulators) cannot recommend using it as a structural adhesive.

Adding a volatile solvent extends the pot life and cure time of epoxy and jeopardizes the reliability and predictability of cure. Additionally, with slow rate of cure, it takes longer before work can be sanded.

Adding volatile solvent may cause shrinkage of the cured epoxy. Applying thinned epoxy in large, confined areas (like consolidating a large pocket of rotted wood) is likely to trap some of the solvent. In thick applications, the epoxy cures very quickly and not all of the solvent has time to evaporate before the epoxy hardens. Over time, the solvent works its way out and as this happens, the cured epoxy shrinks and in many instances cracks.

Shrinkage also causes print-through. You may have a surface sanded smooth only to have the resin shrink. This shrinkage often reveals the texture of the substrate. Shrinkage can continue to be a problem until all the trapped solvent works its way out of the cured epoxy.

Adding solvents, especially acetone, alters the color of the cured epoxy. While the effects are not immediate, adding acetone to epoxy causes the color to change from slightly amber to very dark amber.

Adding solvent results in a temporary reduction in viscosity. Volatile solvents

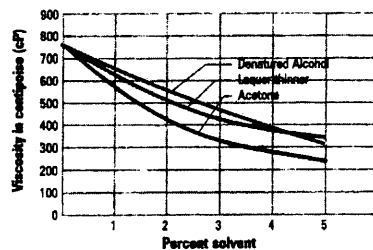


Figure 3. Viscosity of 105 / 206 epoxy vs percent of solvent added.

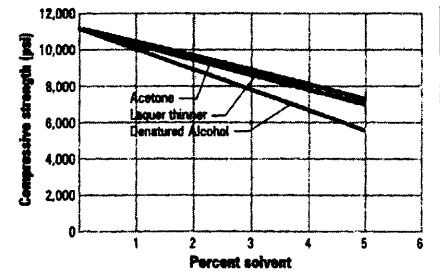


Figure 4. Compressive strength of 105/205 epoxy vs percent of solvent added.

evaporate quickly as they are agitated during brushing or rolling, causing the viscosity to continually change as time passes.

Adding solvent to epoxy may damage the substrate. Many materials (Styrofoam for example) are not attacked by epoxy but may be attacked by the solvent used to thin the epoxy. Be certain to test the substrate with the solvent before using it to thin the epoxy.

Adding volatile solvent to West System epoxy has some adverse health and safety effects. West System epoxy components are nonflammable but the chance of fire or explosion goes up in proportion to the amount of solvent you add. Also, the vapors of many volatile solvents are hazardous to your health and proper ventilation is mandatory to prevent inhaling harmful quantities of them.

Adding volatile solvent to epoxy which is then applied as a coating may cause problems with various regulatory agencies. If your business is inspected for air quality, adding volatile solvents to West System epoxy may make your business noncompliant.

Adding solvent to epoxy to enhance fiberglass wet-out will result in more "drain out" of the resin on a vertical surface. The fabric will wet-out quickly but it may become resin starved when too much epoxy runs out of the fabric.

Does thinning epoxy make sense? In some situations, thinning is appropriate. In others, it is not. We feel that in most circumstances using heat to thin epoxy is preferred to using solvents. As long as the epoxy does not overheat during cure, the full physical characteristics of the cured epoxy remain. Adding solvent is a quick, simple method of thinning epoxy, but the strength and moisture resistance of the cured epoxy are significantly reduced.

We will continue to research this subject and publish our findings in *Epoxyworks*. - by Brian Knight

# Mike's Corner



Dear Readers:

I received a couple of inquiries this past month from Dragonfly builders, as to whether SlipStream was able to supply the same pre-fabricated composite parts, canopies and control systems pieces that Viking Aircraft had offered. The answer is a definite yes...and then some.

I mentioned in last month's DBFN, that we own the Dragonfly molds, which are in the possession of a subcontractor in California. In the past, all pre-fabricated component orders were subcontracted out, resulting in lead times of a minimum of 30 to 60 days. We have recently instructed the manufacturer to crate the molds for return to Wisconsin, where we will assume the manufacture of all of these parts in our own glass shop. We expect to receive the molds, as well as one complete set of parts that we ordered to cover the needs of our customers, before the end of March.

The control systems parts that were formerly subcontracted out for manufacture, are already being produced in our facility in Wautoma, so long lead times in this regard are a thing of the past. In fact, the only parts we envision subcontracting

out, are the canopies for which we have neither the experience nor sales volume to produce efficiently.

Anyone, who wishes to receive a current list of available dragonfly parts, can request a price list by calling us toll-free at 1-800-464-3664. You can also email your request to us at [www.slipstream@vbe.com](mailto:www.slipstream@vbe.com)

During the past fourteen months we have inked numerous OEM contracts with aircraft parts suppliers, which allow us to offer a litany of products for the homebuilder at competitive prices. At present we can supply just about any product you could envision including in your aircraft. The following is a partial list of the suppliers we represent, and we continue to expand the list every week:

Westberg Manufacturing  
Engine Instrumentation  
Randolph Products Finishes  
Azusa Wheels, Tires and Tubes  
Matco Hydraulic Brakes & Parts  
Aircraft Specialties Hyd Brakes  
Ameri-King ELT's and Encoders  
R.A. Miller Antennas  
Rotax Engines  
Tennessee Propeller  
Wood Propellers  
Powerfin Composite Props  
Lowrance Avionics  
Airmap GPS Products  
MicroAir Electronics COM/Trncvrs  
Jensen Elec. Fuel Flow Mtrs  
Menzimer Aircraft Components  
Electric Trim Systems  
Aeroflash Signal  
Nav/Strobe/Position Lights  
Kuntzleman Elect. Strobe Lights  
Axis Products Paint Respirators  
BRS Emergency Chutes  
Lynx AVI Noise Canceling Hdsts

This is only a partial listing of the better known manufacturers that we represent. We also carry a full

complement of flight instruments such as Airspeed Indicators, Altimeters, Vertical Speed Indicators, Vacuum Gyros, Vertical Compass Cards, etc. at competitive prices.

Please feel free to call us toll-free at 1-800-464-3664 for prices and availability of any of your building needs. We welcome your stocking suggestions.

**Mike Puhl**



## 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:** 2276cc HAPI engine just completely freshened, New GPAS "Force One" prop hub, dual electronic ignition, gear reduction starter, Hapi alternator, HAPI/Scat split cylinder heads. Call for more details. \$2000.00 Paul Fischer - Kansas (913) 829-2536 after 6:00 PM CST or e-mail at: [patfischer@msn.com](mailto:patfischer@msn.com)



## **"Classifieds" continued**

**For Sale:** Dragonfly Mark II project - 100 TT. Aircraft was purchased approx. tw years ago, less FWF. One gear box and steel gear leg damaged. Project includes an EA 81 Subaru Turbo. O time on engine and turbo. All appropriate engine parts balanced, also includes the fuel injection and related components. Engine mount, custom radiator, starter, ring gear and alternator mounted. Cleveland wheels and brakes, instruments. First \$5,900.00 takes it. Contact Robert Bircher, PO Box 71, Hinckley, MN 55037-0071 (320) 384-7566 E-mail robertc@pinenet.com

**For Sale:** "Snap" Dragonfly MKIIH hoop gear project for sale. 75% complete. Fuselage built. All bulkheads in place. Fuel tank in place. Wing, canard, aileron, and elevators completed, ready for primer and alignment to the fuselage completed. Most everthing to compete the project: tutle decks, canopy, hoop gear, verticle fin/rudder, tail wheel assembly, tubing, bellcranks, VW engine mount, etc.. No engine or instruments. \$5800.00 OBO. Located in Omaha NE. Ask for Doug "Hawkeye" Humble Call weekdays 402-558-1211. See photo's at ..... <http://hometown.aol.com/hawki-doug/myhomepage/sale.html>

**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:** 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

**For Sale:** Dragonfly Firewal forward package. 1835 HAPI 60 2DM with Great Plains heads, Extra set of heads, mount, matched prop & spinner, exhaust, Super carb, Baffling, Hapi alternator & regulator. Call for more details \$3,000.00 of best offer. Contact Wayne Ulvestad - Volga, SD (605) 627-9291 days or (605)627-5365 evenings & weekends.

**Wanted:** New or gently used Dragonfly canopy and/or frame. Please contact Mark Jones at (414) 542-9561 (after 6 pm central time) or 2710 Meadowbrook Rd. Waukesha, WI 53188

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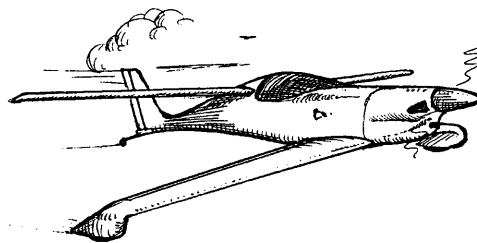
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**Bill "Spud" Spornitz**  
**(913) 764-5118**  
**E-mail [dbfnspud@aol.com](mailto:dbfnspud@aol.com)**



**Subject: The Student Pilot, the First Month.**

**Week 1: Monday:** Rain, **Tuesday:** Rain. **Wednesday:** No rain; no visibility either. **Thursday:** Take instructor to lunch. Discover I don't know enough to take instructor to lunch. **Friday:** FLY! Do first stall and second stall during same maneuver, cover instructor with lunch.

**Week 2: Monday:** Learned not to scrape frost off plexiglass with ice-scraper. Used big scratches on windshield as marker to set pitch. **Tuesday:** Instructor wants me to stop calling throttle, "THAT BIG KNOB THING." Also, hates it when I call instruments 'GADGETS'. **Wednesday:** Radios won't pick up radio stations, so I turn them off. Instructor seems to think I missed something during the introductory flight, **Thursday:** Learned 10 degree bank is not a steep turn. Did stall again today. Lost 2000 feet. Instructor said that was some kind of record. My first compliment, **Friday:** Did steep turn. Instructor said I was not ready for inverted flight yet.

**Week 3: Monday:** Instructor called in sick. New instructor told me to stop calling her "BABE" Did steep turns. She said I have to have permission for inverted flight. **Tuesday:** Instructor back. He told me to stop calling him "BABE", too. He got mad when I pulled power back on takeoff because the engine was too loud. **Wednesday:** Instructor said after the first 20 hours, most students have established a learning curve. He said it seemed there was only a slight bend in mine. Ah-ha!...progress! **Thursday:** Did stalls. Clean recovery. Instructor said I did a good job. Also did turns around a point. Instructor warned me never to pick ex-fiancee's house as point again. **Friday:** Did pattern work. Instructor said that if downwind, base, and final formed a triangle, I would be perfect. More praise!

**Week 4: Monday:** First landing at controlled field. Did fine until I told the captain in the 747 ahead of us on taxiway to move his bird. Instructor says we'll have ground school all this week on radio procedures. **Tuesday:** Asked instructor if everyone in his family had turned gray at such an early age. He smiled. We did takeoff stalls. He says I did just fine but to wait until we reach altitude next time. C-150 will be out of shop in three days when the new nose-strut and tire arrive. Instructor says his back bothers him only a little. **Wednesday:** Flew through clouds. I thought those radio towers were a lot lower. I'm sure my instructor is going gray. **Thursday:** Left flaps down for entire flight. Instructor asked why. I told him I wanted the extra lift as a safety margin. More ground school. **Friday:** Asked instructor when I could solo. He laughed till he cried. What was so funny?

**Remember: I don't write these words of wisdom,  
I just pass them on down the line**

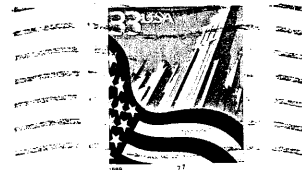
Respectfully submitted by Chuck Kaplan, Walpole, MA



*The Official Voice of Dragonflyers All Over the World*

**Spud Spornitz - Editor/Publisher**

**1112 East Layton Drive - Olathe, Kansas 66061**



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