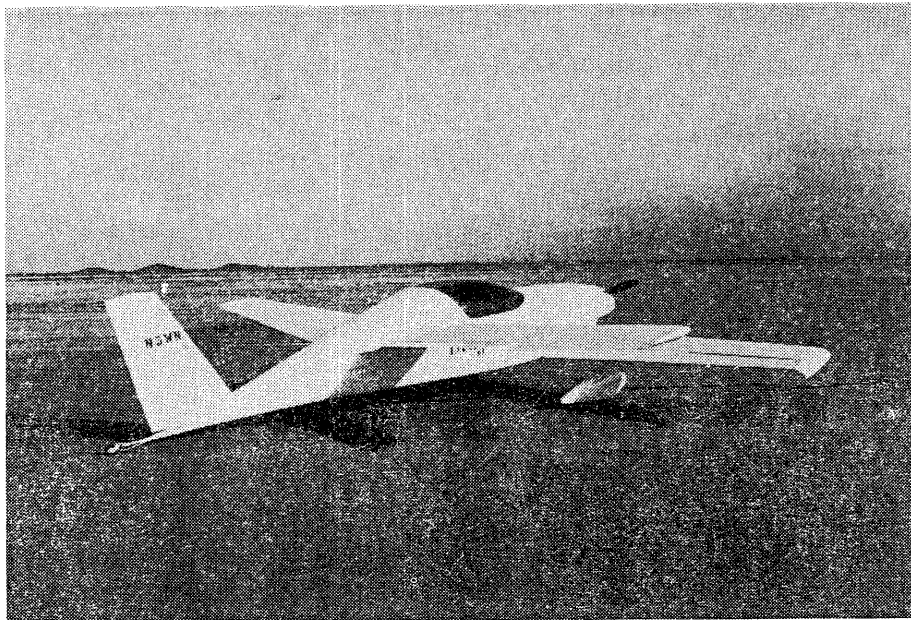


Dragonfly



DRAGONFLY NEWSLETTER # 18 SPRING ISSUE '85

SUBSCRIPTION PRICE \$10.00 \$15.00 OVERSEAS

SUN 'N' FUN

The first major flyin of the year was well attended by DRAGONFLY pilots with Bob Verriest who hails from up around Flint, Michigan and Gary Konrad of Royal Oaks, Michigan, forming a flight of two from the north country. David Bethard of Orange, Texas also attended, accompanied by his wife.

Gary Konrad was awarded the outstanding workmanship award for his DRAGONFLY pictured at the top of this newsletter.

I'm very proud of the level of workmanship that seems to be average on the DRAGONFLYS. The average DRAGONFLY is above average when compared to other home builds on the field. You guys are doing nice jobs out there. Keep up the good work.

Last year we had eight DRAGONFLYS at Oshkosh during the week. Unfortunately not all of them were there at the same time. We hope to see considerably more airplanes at Oshkosh this year as many of them are from that area in the northeast, so the turnout at Oshkosh should be good. We're going to have a real nice trophy at Oshkosh this year for the best DRAGONFLY. Also for the DRAGONFLY traveling the greatest distance to get to Oshkosh. Prototype excepted of course.

We have scheduled a meeting for all of the DRAGONFLY builders on the opening saturday evening 10/3/85 at 8:00 P.M. until who knows how late it will last. This will be just an informal get together for all the DRAGONFLY builders to get acquainted and talk about whatever they want to talk about. By being on that first Saturday it should be well attended. Please try to be there.

The DRAGONFLY forum will be held on Sunday, July 28, 1985 at 10:45 to 11:30.

MORE FOREIGN FLYERS

I received a nice letter from Len Dyson of Melbourn, Australia describing his "first flight" in the first Australian built DRAGONFLY to fly. Len said the flight went well except for a minor incident on landing that resulted in a scuffed wheel pant and broken propeller.

Len had the outer end of the axle that plugs into the wooden insert and the outer side of the wheel pant came loose which resulted in a ground loop and tipping up on the nose. This problem hasn't shown up on any other airplane except Len's and may be an isolated incident but Len did come up with a simple fix that will preclude the possibility of this happening in the future. He has simply drilled and tapped the outer end of the axle so that another bolt can be put in from the outer side, locking both ends of the axle firmly in place. To avoid the possibility of an incident similar to Len's, we are advising that you do this. Changes can be made as per sketched in this newsletter.

Len is flying his Dragonfly at the old gross weight of 1,075 pounds, that was established when the aircraft was powered by the 1600 cc volkswagon conversion that Bob started with. We have raised the allowable gross weight of the airplane to 1150 pounds and many of our builders have reported flight at gross weights higher than that. Len is very desirous at raising the gross weight on his airplane, but in Australia, before a change can be made, documentation must be submitted to the D.O.A. with 500 flight hours, in five different airplanes (100 hours each) that have been operated at the 1150 pounds.

Len needs five of these forms filled out. Of course one can be the prototype, and we'll still need four more. It would be a great help to Len if four of you guys would volunteer to fill out these forms. I'll send them to you if you request them. When submitted over there he can get his gross weight up to make the airplane really useful. Your help will be greatly appreciated by Len.

We have another new DRAGONFLY flying in Puerto Rico, built and flown by Art Stanwood. I don't know if Puerto Rico is considered a foreign country or not. It's a U.S. possession, but it is another point on the Globe that has a DRAGONFLY flying.

DRAGONFLY SWARMING

The third annual Dragonfly Swarming will be held here at Eloy this year on the 18th, 19th, and 20th of October. I hope every DRAGONFLY builder in the United States will plan to attend this year. We have a good program planned with much more emphasis on how to do it and more going on than we had last year. With the Building School being fully operational now, we will be able to demonstrate the construction of a fuselage and we will have a wing and canard under construction so that people can step right up and get hands on experience if they want during the three days that our builders will be here. My son Patrick is running the Fun Flight Center out there and has supervised the building of two more DRAGONFLYS every two weeks for some months now, so I don't think you can find a better qualified builder/instructor than he is. We've worked on a lot of shortcuts in the building process and I'll guarantee you we'll blow your mind at how easy we can put this airplane together without cutting any corners on quality.

Our prefab builders are now checking into the building center and going to work on Monday morning, working five days a week under supervision and on Saturday unsupervised, then on Friday of the next following week they have their wing and canard all layed up, fuselage halves are joined together, the bulk heads are in and the last Friday is taken up with alignment. We mate the wing and canard to the fuselage, drilling the bolt holes and getting everything perfectly aligned so that the aircraft can be disassembled and taken home to be finished. That's a lot of work to get done in two weeks, but it is happening.

AIRCRAFT SPRUCE NOW APPROVED DRAGONFLY MATERIAL SOURCE

We recently sat down with Jim Irwin, Owner/Manager of Aircraft Spruce and in Fullerton, California and worked out the details of his becoming a Viking approved source for the materials on Dragonfly. Aircraft Spruce is one of the big material suppliers for all home builds. Many of you have bought your Dragonfly materials from Aircraft Spruce. Wick's Aircraft Supply in Highland Park, Illinois has long been an approved source for Dragonfly materiel and has given our builders excellent service. Geographically speaking Aircraft Spruce is a better choice for the builders in the southern California area, so it makes sense to work out a situation where they can get their materials from Aircraft Spruce. We hope that this will be a convenience to our builders and should your first choice materials vender not be able to supply you with some item he may be out of stock on, perhaps the other one can.

We strongly recommend that you use Wicks or Aircraft Spruce in supplying your material needs. Both of these companies have been in the business for many years and have

outstanding reputations for supplying the right materials as specified by the designer. Many of you will remember the problems we've had in the past with non-approved vendors, choosing to substitute materials that are not designer approved and not suitable to be used in Dragonfly construction. The big attraction is that they offer "discount" prices. There has been a great leveling off in prices among the suppliers for materials for home builds. I think if you check now you'll find that Aircraft Spruce and Wick's prices are very much in line with the so called "discounters" and you get the right stuff the first time. If you get the wrong stuff, it's not cheap even if they give it to you. Before buying anything because it's cheap check out the approved vendors, you might find that they're not any higher than the guys that are supposedly selling at a discount.

CANOPY TINTS AND EFFECT

When choosing a canopy for your DRAGONFLY several things should be considered in order to match the canopy to your needs. The very dark smoke canopy that is on the prototype is not at all suitable for night time flying. The dark tint blocks out so much light that the effect when flying at dawn or dusk is one of flying in full dark even though the clear canopy would give you plenty of outside light, to continue flying on. Several times I have landed at dusk and have to feel for the ground, I simply cannot see the runway. It's just a black void between the rows of runway lights. Don't figure on this super dark canopy if you ever have any intentions whatsoever of flying after dark.

Canopies are available with a light gray or a light green tint which are suitable for night time use and both have a pleasing appearance. Canopies are also available in clear. Aircraft Windshield has advised us that the light gray tint and the dark gray will have to be sold at a slightly higher cost in the future than the light green and the clear because the manufacturer is charging a premium for those two colors, something to do with the cost of manufacture.

Both Wicks and Hapi are carrying windshields in stock at all times and they are available from Aircraft Windshield in Los Alamitos, CA. Since a canopy is an unwieldy thing to package, if at all possible pick up your canopy from one of the three sources. If not, you'll have to pay for crating and shipping. They do have a good deal on shipping out of Aircraft Windshield. They recently dropped shipped from Aircraft Windshields to a fellow in Florida and he was able to get his canopy two days after ordering it. Seems that Flying Tigers Airlines has a super special airfreight deal and they were able to deliver the canopy from their door to the customers door for about \$70.00. That's cheaper than they could have gotten it there by truck.

TAIL DRAGGER FLIGHT TRAINING

Viking has a new neighbor next door to us, Golden Aviation, owned and operated by Frank Stezler. Frank is a very well qualified flight instructor and has both a Cessna 150 and a 115 hp Citarbia available for instruction.

In the past couple years I have given over 30 Dragonfly pilot familiarization rides here at absolutely no charge to anyone. With the majority of the pilots I've checked out, this has involved about an hour of take offs and landings before we felt that they could probably go home and fly their Dragonfly without any problems. I have flown with some very very good pilots and I have flown with a couple that needed considerable training before attempting to fly their Dragonfly. Now I'm not

a flight instructor and the familiarization rides that we have are not designed to teach a pilot how to fly. In several cases I've found that the person I was checking out had little or no tail dragger time to draw upon so instead of familiarization I was involved with teaching him basics, which I don't have the time to do and I'm not licensed to do.

Since Frank has opened his business here I've worked out a situation with Frank so that a potential Dragonfly pilot can come here without any tail dragger experience and have Frank transition him into tail draggers, flying the Citarbria exactly the same way he should be flying a Dragonfly. After Frank has soloed you in his Citarbria then I'll be glad to give you a half an hour in the Dragonfly to transition you into the Dragonfly.

I'm going to have to insist that all the pilots in the future coming here for checkout, go through Frank and get a little checkout from him. It may only involve a half an hour in his aircraft before he feels that you can solo it, but it would help me greatly if I knew all the pilots had proficiency in a Tail Dragger before getting into the prototype Dragonfly so I can simply teach them the idiosyncrasies of Dragonflying.

Frank's checkout will also include endorsing your logbook with a bi-annual flight review and if you're a pilot who's never had any tail dragger time, probably you're looking at 2 or 3 hours before you're checked out and soloing his Airplane. It won't be terribly expensive ordeal. Frank gets \$40.00 an hour for dual in a Citarbria. Since we don't have a control tower or anything that will make you stay on the ground and waste time here, an hours flying is an hours flying.

Those of you who are coming here to the building school and building your airplanes here, even if you're a non-pilot at the moment, you could very well build your airplanes and schedule a little flight time each day so that you could go home soloed out in a Tail Dragger with your airplane ready to finish at home. A copy of Frank's business card is included in the newsletter here. Those of you who would like to talk with him about such as that, contact him directly.

They're also several Dragonfly builders around the country who are flying now, who have checked out new Dragonfly pilots. Tom Wolfe recently checked out David Bethard. David is now flying. Mark Mazzoni of Ohio has checked out people. Mark is also a flight instructor and there are several others who are doing this. It shouldn't be difficult to get a familiarization ride in a Dragonfly before you fly and it's very decidedly to your advantage to have a familiarization ride with somebody before you even think about flying.

NEWSLETTER SUBSCRIPTIONS

We have had problems in the last six months with some of you builders complaining that you've missed your newsletter. They do lose approximately 10% of the newsletters in the mail. The biggest percentage of them being the the overseas mail. All the newsletters are mailed first class mail and airmail overseas, but the loss rate is still high. We have just completely reviewed our mailing list in the computer. We believe that it's up to date, accurate and that everybody who is entitled to a newsletter is going to have one mailed to him.

If you don't receive your newsletter, please do contact us and we'll send you another one. Obviously if you don't get this one, you're not going to get this message until you do. If you have a fellow builder who says he's not receiving his newsletter, have him contact us and we'll see if we can see what the problem is. I had a secretary about eight months ago who handled the newsletter subscriptions and such, who

apparently wasn't doing as good a job as we thought she was. Please work with us, if you don't get your newsletter and you're entitled to it, we want you to have it as much as you want to get it.

The next newsletter will be mailed in July just previous to leaving to Oshkosh. If any of you have something of interest to contribute to that newsletter, Viking would welcome it and I'm sure the builders would enjoy reading somebodies words rather than mine.

CHECK YOUR POSA

Ever since Hapi Engines bought Posa Carburetors three years ago this past January they have been issuing safety bulletins and maintenance procedures in all of the major sport aviation magazines. These items have appeared in this newsletter, Sport Aviation and Homebuilt Aircraft Magazines, and several foreign magazines.

We still hear of a guy occasionally who has a problem with his Posa, like the needle turning in flight, and apparently has never read any of the safety bulletins, so lets do it one more time.

If you have an engine equipped with a Posa that has not had the additional positive needle lock set screw installed, you may experience fuel starvation in flight caused by the needle rotating. The positive lock screw has been standard on all new Posas built in the last couple of years and it can be retrofitted to the earlier carburetors. You can even do it yourself. Hapi will supply you with a little drawing and the necessary set screws for \$5.00 so you can do it yourself. The kit also includes a new needle friction retainer bushing, which should be replaced on all Posa Carburetors once a year at annual time, or once every hundred hours whichever occurs first.

It would appear that some of the builders expect the parts in a Posa to last forever and for nothing to ever go wrong with the carburetor. If you were flying a certified carburetor, you would expect to overhaul it periodically and replace the parts that vibration and simple aging does render unairworthy periodically. A Posa Carburetor is no different. It must be maintained on a periodic basis, if you're to expect good airworthy service out of it.

All builders would be well advised to read the "Hotline" section in Sport Aviation Magazine and also to watch the news sections of the other homebuilder periodicals for safety bulletins that different manufacturers issue on their products from time to time. It's virtually impossible for a manufacturer to know who has his products, because many of them change hands several times. By keeping current on your reading, you may become aware of some problem will directly affect your safety.

JERRY WILSON VISITS VIKING

Jerry Wilson of Grand Junction, Colorado stopped by Viking on his way to Disneyland. He and his wife put up with some miserable weather to get here. The wind was blowing pretty hard the day they arrived. I had an interesting talk with Jerry concerning airfoils. Jerry and brother Art are partners in this particular Dragonfly. They originally had a Mark I canard on it which was broken at about 35 flight hours, when he ran off the runway and into the rough stuff. Jerry and Art built another canard and put the wheels out on about a 10' center line in wheel pants similar to what it originally had on the tips and flew that for some time. They had some kind of

engine problems, (no it was not a Hapi Engine) and had to land the airplane in a dry riverbed, breaking the second canard. They are now flying on the third canard which is the same as the second except the wheels are moved in to an 8' gear tread.

Jerry and I were talking about the affect of bugs and rain on the canard. He said that the first canard affected the trim stall speed about ten miles an hour with bugs and rain and exhibited a pronounced pitch down in rain. The airplane stayed controlable but was a big nuisance. The second canard built by the same two guys through the same set of airfoil templates, showed virtually no change when bugged up or flown in the rain. The third canard, still built with the same templates is somewhere between the first and second canard in its reaction to rain and bugs. I just talked with David Bethard from Grange, TX who just finished his trip to Sun 'N' Fun and back. He got a lot of rain flying. He said that he eroded his prop pretty badly and typically his Dragonfly pitches the nose down a little bit when he hits the rain, but does not produce any control problems or anything. Rain will reduce your airspeed about ten miles an hour if you're cruising along pretty good.

In the past we've heard an awful lot about the affect of rain on canards. Particularly the way it affected the Quickie. The big difference between Dragonfly and Quickie is that Dragonfly carries over half again as much wing area as the Quickie. Consequently we can afford to give up a little bit of our efficiency and still have plenty left to fly on without it becoming a big uncontrollable problem.

Jerry Wilson's experience does point out quite graphically though, the fact that no two of these airfoils are ever alike. I have spent several years of my life working as a model maker, on both low and high speed wind tunnel models, where we did an awful lot of work on airfoil sections. I don't pretend to be an aerodynamicacist, but I do know that a couple of a thousandths of an inch of change in an airfoil produces major changes in the way the airfoil reacts in the wind tunnel. I don't believe that there's ever been two Dragonflies that are exactly alike or two of any other all composite airplanes that were exactly alike.

As we sand and smooth and contour, we work for a good smooth surface finish. Averaging everything out probably all of us are pretty close to the airfoils as originally drawn, but I doubt that any of us are right on. I have seen some Dragonflies where the spar-cap projected from the top of the airfoil, a considerable distance. One of them almost a quarter of an inch, yet the builder simply put a lot of micro ahead and behind the spar and smoothed it all out and it came out a pretty nice looking wing, but definitely not the airfoil that Bob designed up there or not even close to it. What kind of affect are these kind of airfoil changes going to have on their performance? Nobody knows until we get out and fly the airplanes and test them. Each one you is going to come up with an individual airplane that has individual characteristics. I personally have flown six Dragonflies now and they all flew pretty much the same but down at the fine line of stall speed, bug and rain tolerance, is where they appear to show the greatest differences.

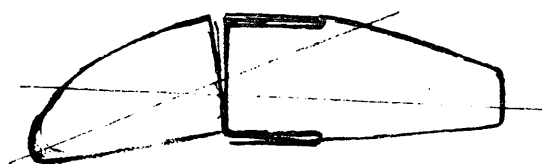
The new Mark II canard on Dragonfly now flies differently in the rain than the original Mark I did. The original Mark I took more back pressure on the elevator when flying in the rain and showed a greater loss in top speed and about a ten mile an hour increase in stall speed. The present Mark II canard totally bugged up shows about the same ten mile an hour increase in stall speed, doesn't lose as much on the high speed

and does not require as much back pressure on the elevator to maintain level flight in the rain. I don't know if this is due to the increased wing area on the canard, the increased elevator area on the canard or as several have suggested the fact that the new canard does not have the highly polished high gloss finish that the original had. In our haste to get things ready for Oshkosh last year, we sprayed the new canard and never rubbed it out. Some people think that the laminar flow sticks better on a slightly rough surface than on a real smooth surface. The sailplane guys get out and sand their wings before a competitive event with 400 grit sandpaper to create a slightly rough surface. The bottom line is that rain will be a nuisance to you, but if your airfoil is pretty close to what the original has, rain will not produce a safety problem. At worst, you'll simply have a tired arm from holding the up elevator until you fly out of the rain.

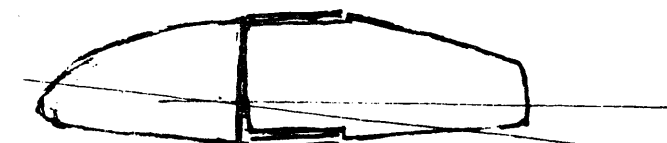
WING AND CANARD BUILDING TIPS

There are several common causes that we have noticed in looking at a lot of different builders airplanes, that result in gross distortion of the airfoil, consequently an airfoil that is unpredictable in flight qualities. The crude sketches below show some of the distortions that are common, and the following sketches describe how we avoid these problems in the Flight Center.

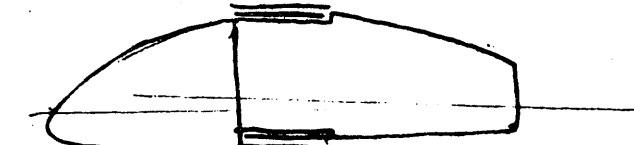
Building as many airplanes as we have in the past few months, we've gained a great deal of experience in a short span of time. With each new set of builders we improve our tooling and methods and are discovering more and better ways to get the airplane built quickly and accurately. Some of the builders come here with no experience, but they have background experiences in life, and when you get a bunch of people



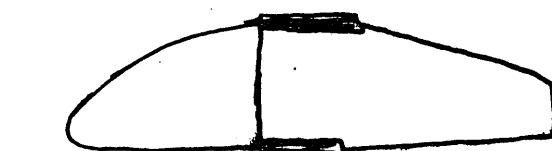
NOSE CORE TIPPED DOWN



NOSE CORE TIPPED UP



CORES MISALIGNED



SPAR PROJECTS FROM CORES

together thinking about the same problem, some good results occur.

Full size cradle templates are provided in the plans for jiggging the wing and canard in the proper position on the table so that you can do the layups holding the wing in proper alignment. Using the airfoil templates that are also provided full size in the plans, we have extended the ends of the support cradles so that they reach around the leading edge of the airfoil.

Using the support cradles with the extended ends in the manner described in the sketch here, we are able to hold the airfoil to exact contour and avoid the problems described in the previous sketch. One of the big problems you run into is holding the cores in the right position while the micro sets up. In order to do this, we cut old innertubes into big rubber bands and hook them over nails in the bottom of the table in such a manner as to gently hold the cores down and keep the pressure on everything. You can adjust the tension to either increase it or decrease it on one side of the canard or the other and cause the leading edge to pull one direction or the other. By using the nails in the foam core to position it on the shear web, we've found that we've now got a very adequate degree of control and we can put the cores exactly where we want them. We use the templates at all the buttlines to position everything and eyeball everything from the outer end to make sure all the lines going towards the center of the flight surface are exactly straight. Once everything is in position we can walk away from it and we know it will stay in position while the micro dries. Most importantly, we know that we've got the airfoil contour accurately jigged so that the end result airfoil is going to be very very close to what Bob designed. The use of the templates also assures us of enough room on the top and bottom of the shear web to embed the main spar below the surface of the foam so that it doesn't project from the top. The template shows you the amount of gaps that you're going to have that will later be filled with the carbon spar at the time you are positioning the foam blocks. It works

great and best of all you can get old used innertubes for the asking at just about any tire place to cut into rubber bands. You will need a pad on the leading edge to keep the tension bands from pressing into the foam, causing local damage. We simply fold a pad of used newspapers to spread out the load. Tooling can't get much easier or cheaper than that.

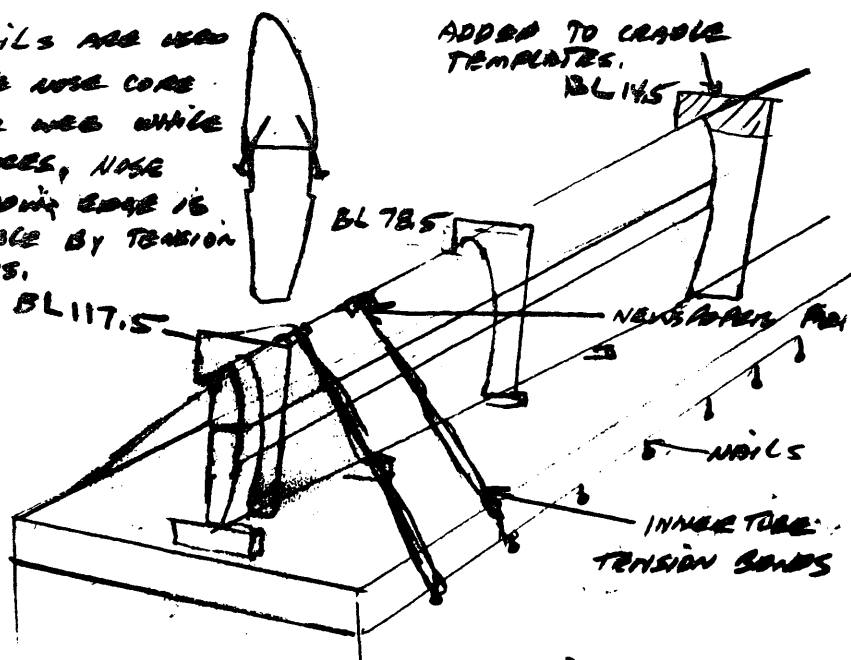
Sorry that the quality of the sketches is a little bit crude, but then if I could make the kind of living that a good draftsman does in an eight hour day, I wouldn't have to work fourteen hours a day, 6 days a week, trying to make a living peddling airplanes, would I?

SHEAR WEB THICKNESS

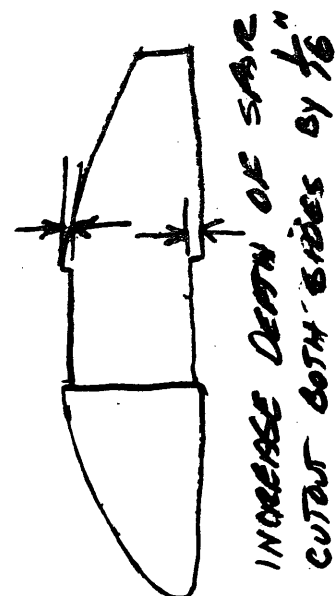
We have noticed with the pre-cut foam wing cores from Task, that the burn down that Bob allowed for with the original templates, is not as great as he anticipated. The result of this is that the carbon spar cap doesn't get embedded as deeply in the airfoil as it should be sometimes, and causes it to project from the top of the airfoil, requiring a blending with micro that changes the shape of the airfoil.

To avoid this, if you're cutting your own cores from your own templates, add 1/16th to the depth of the spar cutout by altering your templates just slightly. If you already have your cores cut or if you purchased cores from Task or Wick's, simply take a sanding block and sand another 1/16th off the top and bottom of the core at the shear web. This will allow more room for the carbon spar to bed in and will avoid the spar sticking out of the top of the airfoil. If after layup, you do wind with an area over the spar that's a little bit low, that's easy to fill with micro and you'll wind up with the proper airfoil. Note-TASK has been notified of this problem and are modifying the templates so that all cores cut after APR.1,85 will not need any further modification.

NOTE- NAILS ARE USED TO LOCATE WING CORE ON SHEAR WEB WHILE MICRO CURES, NOSE CORE LEADING EDGE IS ADJUSTABLE BY TENSION ON BANDS.



ADDED TO CRADLE TEMPLATES.



TEMPLATES AT KEY BUTTLINES ASSURE AIRFOIL CONTOUR ACCURACY 5

NEW CLOTH

All of you who have been through the ordeal of laying up the wing and canard know what a time consuming job the layup process is. It became imperative in the building school to find a way around this major expenditure of time that was being consumed in layups. We got pretty good at it but it still took four people four hours to do one side of either a canard or a wing, from the time we walked up to it until the time we walked away from it. We've found a new cloth that has allowed us to reduce the time involved to one hour forty five minutes total time for two men. This includes squeegeeing the micro on the canard, laying the carbon spars, laying the nine inch wide piece of Uni and then laying the one layer of cloth that replaces the three layers of uni that we formally had to use. This is a specially woven cloth, a three ply, it has two layers of unidirectional on the bottom, each one oriented at 45 degrees to the top layer and a top layer of unidirectional running parallel with the spar. The three layers are woven together and the cloth comes off the roll in one long piece 21' long, 35" wide. You simply lay it on and soak it down and squeegee it out. It's almost as easy as it sounds. We've also saved all of the time that we've normally spent on the cutting table, cutting all those seemingly endless pieces and getting them ready to do the layup. Three days ago five guys in the shop layed up two wings and two canards, simultaneously in a total time of just over three hours. Each person was doing his own wing or canard and one guy was floating around the shop helping out wherever he was needed. This new cloth has made this such difference.

How does it compare in strength for 7715? We layed up three test samples, a small airfoil. (See the picture) Postcured all three samples at the same temperature for the same period of time, then devised a fixture for testing them. First test was for flexure and we found that the tri-ply was virtually identical to the standard three layers of 7715. The other sample we had built using one layer of 7715 on top and a two layer of fabric on the bottom was considerably deficient in flexural strength and didn't exhibit the amount of the resistances to bending of the other two samples.

The next test was to check torsional strength. We clamped one end of the little airfoil sections into a fixture, rested the other end on a pivot point, put a long arm on and weighed the end of the arm, then measured the amount of deflection. (See the sketch) Again we have found the tri-ply to be virtually identical to the 7715 and the two ply plus one layer of 7715 to be deficient.

Hapi Engine is now stocking this material and it is more expensive than the 7715. What you get for the extra expense is greatly reduced building time and a material that's a whole lot easier to use.

We want to emphasize that this DOES NOT obsolete the 7715. You can still build your airplane out of that if you choose to. This is simply an alternative that you may choose to use or not, depending on whether you want to spend the extra money. Hexcell 7715 Cloth was and still is approved for use on the DRAGONFLY. It's available from both Wicks and Aircraft Spruce. The Burlington style #7715 is NOT APPROVED for use on the DRAGONFLY. If you're interested in just a small sample of the tri-ply cloth to see what it looks like, send a stamped, self-addressed envelope to Hapi and we'll send you a little piece of scrap to look at.

We have been using the Safe-T-Poxy II exclusively in the Fun Flight Center and are very happy with the way it works, compared to the Safe-T-Poxy I, the original Safe-T-Poxy. Safe-T-Poxy II seems to be thinner, it wets out better, it goes just a little bit farther and has we believe better workability. We use it with Michael's resin pumps and are very happy with results we're getting.

WARNING

When using a resin pump such as the Michaels Pump, don't assume that every batch is going to be perfectly mixed. We have found that occasionally the resin pump will start acting up and give you an inaccurate mix ratio. You should have a couple of small containers properly marked to check the mix ratios being dispensed by the resin pump. Periodically and particularly before doing any critical layups such as the spar sections or other highly stressed areas in the aircraft, you should pump resin into your checking cups to assure yourself that your pump is dispensing the proper ratios. If not disassemble that sucker and find out why not and make sure it does dispense the proper ratio before you go ahead. We have found that the Michaels pumps we are using do give good service for the most part, but occasionally one will act up and require some attention to continue to mix properly. Follow the manufacturers instructions on assembly and disassembly.

SPINNER PROBLEMS

Spinner cracking problems, whether in the bulk head or in the spinner itself, are something that's common in airplanes, even in production airplanes, something you should inspect for before every flight, but most of these problems can be prevented by fitting and installing the spinner properly.

We have had two builders who have had problems have problems with the back plate cracking around the propeller hub on the spinner. The first builder had run his spinner without a front alignment plate installed, allowing it to stress the back plate as the engine operated, which resulted in the cracks. When a new spinner was installed with the front plate, he's having no more problems. The second builder did have the front plate installed, but not secured with screws and he had similar problem with cracking around the back plate.

It is absolutely essential that the front plate be installed in these spinners and installed snugly. A spinner is designed with the back plates the right distance apart to fit both the Great American and Props, Inc. Propellers, which have a hub thickness of 2 3/8". If you use a prop that's any thinner than that, you're going to have to shim the front plate out until it makes firm contact with the spinner. If you use the thicker prop than that, the front bulk head on the spinner is simply not going to work for you and you'll have to fabricate a new one.

All the parts that are sold for DRAGONFLY are made to match the other parts that are sold. The propeller matches the spinner and visa versa. When you change something, usually you create a domino effect that creates problems.

Two newsletters ago I offered a thousand dollars to any prop maker who could provide me with a wooden propeller that would get me a five mile an hour increase in speed, or a good increase in rate of climb performance. Something that will get me more performance out of Dragonfly. So far no prop maker has

ven attempted to claim that thousand dollars. Bottom line is simply this. We've tested probably twenty different propellers on Dragonfly. None of them have out performed the Great American 52"D.-42"P. or the Props, Inc. 52"D.-42"P. and I don't care who your prop maker is or what he tells you about increased performance, I don't think you're going to get more performance that easily. I'd very much like to have a propeller that would give us a performance increase. If you think of your propeller on your aircraft as being very similar to the transmission-differential combination on a car, the propeller is what harnesses the power of the engine, translates it into thrust, rate of climb and cruise speed. If your propeller is engineered to give you all the right ratios, you get good performance. If you pick the wrong propeller, your airplane is going to be a dog. We recommend the Prop, Inc. or the Great American Propellers for one simple reason. They get the very best performance it's possible to get out of Dragonfly. Now we'll keep recommending them until somebody comes along with something better and then we'll recommend that one.

We've experienced builders who buy some other prop, the airplane doesn't perform, they're all unhappy, then they finally change and put on what we recommended in the first place and the airplane performs as advertised. If you want the airplane to perform like the prototype, build a duplicate of the prototype and use the same parts we used on the prototype.

Tony Ringelis has written an excellent book called Firewall Forward. The topic is engine installation methods which has a chapter in it on "installing spinners." There's more to installing a spinner than just simply sticking it on the front of the airplane. Tony tells you how to make accurate templates so you can make the cuts in the spinner right the first time, how to drill it so it matches the prop and everything will run concentric, how to determine the front bulk head fit and how to adjust it if it doesn't fit and so on. I highly recommend Tony's book. As we've said before, you guys that are first time builders need to acquire a good reference library of books such as Tony's, that you may refer to when you come upon something that you haven't experienced before or don't understand.

There's a lot to building an airplane. There's a lot of different skills required and even several different methods sometimes for doing the same job. A reference library would help you a great deal in surmounting a lot of the obstacles you have to overcome before you have get bird in the air.

A BARGAIN ENGINE

We recently removed the Hapi 60-2DM engine from the prototype Dragonfly to install a new engine in the bird. The new engine was installed for flight testing. It is equipped with hydraulic valve lifters and very soon we'll be flying the new heads in a 75 horse version. We tend to develop these things one step at a time, rather than putting them all on one engine at the same time, which might confuse the results that we are getting out of each individual modification.

In the near future, all the Hapi engines will come with hydraulic valve lifters as standard equipment. They're going to cost a little more money, but we feel that the added expense is well justified by the fact that you never have to adjust the valves anymore. The hydraulic lifters automatically compensate for all the expansion and contraction that occurs in the engine when it runs and maintains the proper clearance on the valves at all times.

The original Dragonfly engine has almost 900 flight hours on it and is in the shop for a total re-build. This engine was still a strong runner even after all of the abuse it's been subjected to in the past 3 years. We will totally disassemble it to determine the extent of wear that has occurred during it's service life. It will be put back together and be considered a re-manufactured engine with all new bearings, new pistons, cylinders, valves, guides, springs, everything that wears will be replaced it it. If one of you builders wants this engine, at a considerable savings compared to a new engine price, contact me at Hapi, I'll be glad to discuss it with you. In performance and anticipated engine life, it will be equal to a brand new engine.

75 HORSEPOWER HEADS

Hapi has had several obstacles to overcome to get the 75 horse heads into production. The first of these involved a new 60 station tool change, automatic computer controlled milling machine, the second one built in Japan and the first one in the United States, that had a bad glitch in it. It would run along for a few days perfectly and then go berserk, start destroying itself and tooling, of course the operator would shut it off instantly, then they couldn't find the problem. It did this a total of three times and finally the repair crew out of Japan had to come to the States and get it on line. It is working now, but it cost almost three months time to get it going. In the mean time we have elected to change the head casting a little bit, adding considerably more fin area to it and changing the rocker box castings to reduce the overall width dimension of the engine by about two inches. This is involving time, but the decision was made to do it at this point because it's much cheaper to do now, before much of the permanent tooling is locked in and the computer programs finalized. We expect to start shipping the new heads in the month of June.

The new heads will retrofit on all the Hapi engines out in the field or in fact on any Volkswagen engine conversion that's based on a 1600cc case. The parts that will change are the cylinder heads from the top of the cylinders outward, the intake manifold, the carburation, push rods and push rod tubes.

The new heads feature much bigger valves and very clean intake and exhaust passages that allow us to flow a lot more fuel and air through the heads. Each head is an individual head, rather than being connected as the Volkswagen heads are, and that eliminates a lot of the problems that can come about from unequal expansion. All of the hold down studs are of equal lengths, so again we get equal expansion and solve some of the sealing problems. These heads have been designed to be aircraft heads from the paper up and are not "converted" from anything. They are capable of producing more horsepower than the Volkswagen heads, simply because you can flow more fuel and air through them, allowing you to burn more fuel and by virtue of that, produce more horsepower.

Our computer program tells us that 75 horsepower should give us about six mile an hour increase in top speed and a hundred and sixty feet per minute in rate of climb. I personally don't feel that the Dragonfly needs any increase in power. It does very well with what it has.

A FEW WORDS ABOUT HORSEPOWER The term horsepower can be very misleading and I think sometimes that the home builder is deliberately misled by some people peddling engines who like to quote high horsepower. To say that an engine develops so much horsepower and not qualify that horsepower, by giving the RPM at which the engine develops the

horsepower is to give you only half of the information. We have rated Hapi engines at 3200 RPM, because that's where they operate at. Three thousand to 3200 RPM is a good cruising RPM and the amount of horsepower you can develop in the range where you can use it, is what is important.

Many engine manufacturers choose to put a flywheel on an engine on a dyno and wind it up to 3800 RPM to read the horsepower up there and quote you that horsepower. Whatever amount of horsepower the engine will develop at 3800 RPM is absolutely useless to you because you can't get a prop that will run at that speed on a Dragonfly. If you were to prop the airplane so that it could turn that kind of RPM, the disk area would be so small on the prop, that it would be useless on the aircraft.

Perhaps even more important than horsepower figures, which really don't mean anything, is performance figures, documented in fact, not advertising B...S... on a piece of paper. Approximately half of the builders who are now flying their own Dragonfly's are reaching advertised speeds and rate of climb on the airplane. These are the builders that have followed the plans pretty closely, built their airplanes at about the same way as the prototype, about the same finish as the prototype and the pilots have learned how to fly the airplane well and get the most performance out of it. All of the guys that have written say they are getting as advertised performance ~~and~~ running 1835 VW's. Some of them Hapi's, some of them they've built up themselves.

The two airplanes that I know of that are flying on 2100's are both slow airplanes according to the builder pilots. So apparently that powerful 2100 is not cranking out any more real life power. We notice one thing here a Viking and at Hapi that I really would like you builders to take note of also. We are the only plan sellers, kit sellers and engine manufacturers who have ever openly offered to let you builders fly in the prototype and decide for yourself whether or not it performs as advertised. A few hundred of you have done that. We have put Dragonfly in competition against other manufacturers airplanes and engines who are advertised to produce a lot more power and the airplanes are supposed to really out perform Dragonfly, yet Dragonfly pointed out in competition way ahead of their airplanes.

We've told you the truth about performance from day one, (both Bob Walters and ourselves) and we've told you the truth about horsepower at a specific RPM. If you want a lot of horsepower at a high RPM, all we have to do is wind our engines up to those RPM'S and they produce the horsepower that the others are claiming, but what good is it if you can't use it? The only horsepower that's any good to you is the horsepower at the operating RPM's that the prop can use. Limbach is claiming a lot of horsepower, but look at the RPM. That's the deciding factor. Revmaster's claiming a lot of horsepower, look at the RPM. If all they talk about is horsepower, you're only getting half the story. It's always seemed a bit strange to me, that these horrendously powerful engines and super speedy aircraft seem to be a whole lot slower and less powerful in reality than they are in the advertisements. It also seems a bit strange to me that you builders are not able to get rides in these superplanes. Also seems odd that what few magazine writers get to fly them, can't get advertised performance. Wonder why?

DRAGONFLY HARDWARE

Hapi Engines now has in stock, all of the Dragonfly hardware that was formerly offered by Ken Brock Manufacturing. Hapi has purchased Ken's complete inventory in their continuing effort to stock everything for Dragonfly under one roof.

Ken Brock had raised the prices 10% on all Dragonfly hardware recently, but as an introductory special Hapi will sell the Dragonfly hardware at the 1984 prices, if you buy a complete set, which amounts to a 10% discount on everything.

Several builders have found it frustrating to buy the stamped metal hardware and the welded hardware from Ken Brock for items such as control surface hinges. Then have to get the bronze bushing inserts from another source and the bolts from another source. Hapi is going to be changing some of this in the future and offering more of this stuff as a kit.

SAVE FREIGHT ON ENGINES

Hapi takes three engines to Oshkosh each year to be used as display engines in the booth there. These engines can help the builders coming to Oshkosh to realize a good savings if they buy engines now and take delivery on the engines the last day of the show at Oshkosh. In this manner a builder can save all of the freight charges and all the crating charges. These engines will be sold on a first come first serve basis, so if you are interested in that give Hapi a call.

Mark II DISC BRAKES

Many of the builders have elected to change over from the Mark I configuration to the Mark II with the inboard gear.

This changeover has created some confusion with respect to the hydraulic brakes. The hydraulic brakes that we used on the Mark I, (the internal expanding drum type brakes) will not fit the Mark II. The Mark II was designed around a disc brake and an entirely different axle. There are no common parts in the two brake systems. The drum brakes as used on the Mark I are fitted around the 5/8 diameter axle that is supported from both ends and have ball bearings.

The disc type brakes as used on the Mark II have a 3/4" diameter axle supported from only one end (see the sketch) and tapered roller bearings. There are no common parts in the two systems. A few of the builders have already bought their hydraulic brakes for the Mark I and now want to change over to the Mark II. Unfortunately the brakes they have will not fit the Mark II, so they are faced with the problem of having money invested in one set of brakes and needing another set.

The DRAGONFLY design is undergoing a constant evolution and will continue to do so. The by-product of this evolution is that some parts will become obsolete. This is not the intent of new development but simply a by-product. If we could of used the drum type brakes on the Mark II, we would of used them. The gear leg design made it imperative that we support the axle from only one end, so consequently a different brake setup had to be used. We were looking for a brake setup that would give us a very narrow wheel profile where all the brakes were essentially tucked inside the wheel and a disc brake set up does that. It's unfortunate that the design requirements precluded the use of the drum type brakes and the wheels on the Mark II.

MARK II CANARD TIPS

We have had several request for premolded tips for the Mark II canard. These are pretty much the reverse of the tips that Bob originally designed and showed on the plans for the

wing on the Mark I. We had planned to take some molds off the Mark II tips and offer them premolded.

Just recently I received a letter from a gentleman named Bill Sargeant, who holds the patent rights apparently on wing tips turned down similar to what we're using on the Mark II. I had turned the tips down on the Mark II because I liked the looks of them. I haven't given any thought to patent rights, but Mr. Sargeant says that if we produced them we would be infringing on his patent rights. So I guess we won't produce them. It is not illegal, however, nor an infringement on a persons patent rights, if you builders choose to build your own and turn them down. According to U.S. Patent Law, any person is allowed to build something for his own use, not for sale. This is not viewed to be an infringement on someone elses patent rights. So if you like the turndown tips, go ahead and build them that way, just don't sell them to anybody.

INSTALLING MARK II INBOARD GEAR LEGS IN AN EXISTING MARK I CANARD

Several builders have contacted us who have already completed their MARK I canards and asked if the MARK II mods can be retro-fitted into that canard. The answer is yes. The MARK II gear leg mounts can be put in the MARK I canard. It's a little more difficult than building it in the original structure, but not terribly difficult. It's best to be able to do it before the fairing between the drag spar and the elevator is installed, but can be retro-fitted even on an airplane that is already flying.

The fiberglass spring gear leg on the MARK II is retained in a gear leg socket that is fabricated from 2 - 1/4" aircraft plywood ribs backed on both sides with 3 layers of glass cloth. Between these two ribs, two "U" shaped aluminum extrusions are bolted and a resulting box structure forms the rectangular socket that the gear leg fits in. When building a MARK II canard, this structure is pre-assembled and inserted right in the core and the shear web is layed up over it. Then when the top and bottom glass skins are put on the canard, the gear box structure winds up being firmly bonded to all the wing skins and captured within the front spar, plus being butted into the rear spar.

To re-trofit, we do things a little differently. We turn the canard upsidedown, and cut through the drag spar and the bottom side of the canard up to the rear most edge of the spar. Then we carefully make a cavity, hollowing out all the way to the shear web that the gear box, which has already been assembled, can be fitted into. Once we're satisfied with the fit and the gear box is nicely fitted to the inside of the shear web and the top skin on the canard, the gear box is bonded firmly in place with lots of flox.

The next step is to fill up any voids with pour-in-place foam to get back to a solid structure again. Then we feather out the edges on the drag spar to a point of about 6 inches on either side of where we've cut through. We re-laminate the same amount of layers we have cut through, plus an extra two layers on top as shown in the MARK II plans that helps to distribute the load over a bigger area. On the top side of the canard, all the paint and such in an area 15" on either side of the gear box that might be there, has to be removed so that two more layers of glass can be added, to spread the load on the top side also. Beyond that everything is as described in the DRAGONFLY plans as far as finishing and painting are concerned. The brake lines for the MARK II brakes are routed through the C section between the drag spar and the leading edge of the

elevator, and on an existing canard that could be accomplished by routing a 1/4" wide groove in the bottom side of the canard and laying the brake line in it, then re-glassing there.

The MARK II does have some increased wing area on the canard and also an increase in elevator area, but that's not necessary to do to retrofit the gear into a MARK I. The airplane will fly equally as well with the MARK II gear as it did with the MARK I gear.

I've been asked many times, how much speed we've lost with the MARK II gear. We didn't lose any speed at all on the top end, and by the virtue of adding a little more elevator area and a little more wing area on the canard, we've reduced the stall speed by about three miles an hour. The MARK II gear on a MARK I canard should not show up any performance degradation and will certainly improve the ground handling qualities. With the inboard gear and individually toe operated disc brakes, the MARK II is a pussycat on the ground, and any tail-dragger pilot who's even remotely able to fly a tail-dragger should have absolutely no problems with it. The solid fiberglass gear legs are capable of absorbing considerable abuse on landing but they don't store energy and rebound with a long stroke as the MARK I does, consequently if you do drive it into the ground, it doesn't get into the porpoise situation as the MARK I canard is prone to.

There has not been as yet any formal plans drawn to retrofit the MARK II gear into the MARK I, but I believe that any builder armed with the MARK II gear kit and the above instructions will have no difficulty in installing the gear on a MARK I.

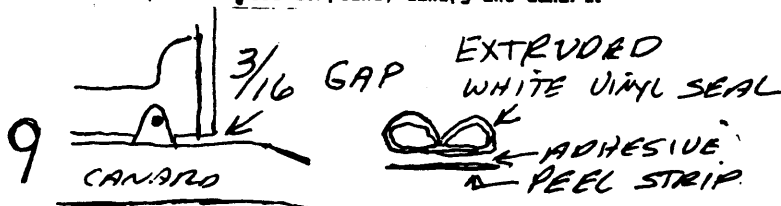
MARK I CANARD BREAKAGE

We have noted in looking at pictures of several MARK I canard breakages that have occurred after hard landing incidents, that in three of them the break occurred right at the fuselage/canard juncture.

There is good reason to believe that fitting the fuselage very closely to the canard in this area, introduces severe localized stress on the upper spar cap when the canard is subjected to extreme flexing under heavy loads, as it is when you fly the airplane into the ground. When such a load is imposed on the canard it is transferred into the fuselage, using the canard lift fittings as pivot points.

Because of the above we are advising that you create a 3/16" gap between the upper surface of the canard and the fuselage to allow for flexure. By doing this you'll preclude any possibility of localizing the stress on the spar cap of the canard and in effect breaking it over the sharp corner of the fuselage edge.

Of course nobody wants to fly around in an airplane with a 3/16" air gap up there, so a flexible seal for that becomes the next order of business. We have found a flexible vinyl seal made with a real sticky adhesive on the flat side, (cross-section as per sketch,) that will fill up that gap and keep the air and rain out, while allowing the canard to flex at the same time. This vinyl seal also makes a real good seal between the canopy and the fuselage, providing you allow enough room for it when you fit the canopy. The seal strip is available from HAPI and sells for .07 per foot and you'll need less than \$2.00 worth to do the whole airplane, canopy and canard.



RANDOM THOUGHTS PAGE

HOW MANY DRAGONFLYS FLYING?

As near as we can count, there appear to be between 65 and 70 Dragonflies flying at this point and time. We really would like to have an accurate count of how many of you guys are flying and be able to locate you on the map. We have a lot of Dragonfly builders who call and ask, "well, where's the closest one to me that's flying?" Sometimes we can tell him, sometimes we can't.

We'd also like to have pilot reports from you guys that are flying with pictures of your airplane. In this particular newsletter I had intended to use a picture of Gary Konrad's airplane, which he was going to send me, but it didn't show up in time to make the newsletter. I'd like to use pictures of builders projects if you'll just send them in. Please do put your name and address on the back of a picture when you send it in, so that we can identify it and give you credit for it.

AWAY FROM HOME

I have been invited to speak to the EAA Chapter in Placerville, California on the night of May 15th and expect to be there with DRAGONFLY, weather permitting. Any of you fellows that are in that area, contact the Placerville Chapter and come and set in on it.

There are two of the prefab airplanes in the Placerville area. Both of these guys have been down here and been cycled through the Fun Flight Center with their airplanes. We also plan to attend the Watsonville Flyin this year.

WANT TO FLY LONG RANGE?

In flying Dragonfly I have been playing around in a very much reduced fuel flow. The prototype Dragonfly is equipped with a CompuFlight onboard computer that gives considerable information, like outside air temperature for pressure altitude calculations. It measures the fuel flow and gives me a direct digital read out. Also, can be programmed to record the amount of fuel burned, calculate the amount left in the tank, translate that into either time remaining to fly or number of miles you can fly on the remaining fuel load at the present burn.

Many of the builders are concerned about adding bigger fuel tanks to Dragonfly, because they want to fly long distances.

I've been running some fuel flow tests versus airspeed and I find that at 100 miles an hour and 2100 RPM at gross load, the airplane can be leaned out to burn 1.2 gallons an hour.

This would give you an 1100 mile range with a half hour reserve, if you want to set there for eleven hours. Of course that's totally ridiculous. If you want to slow the airplane down to 130 miles an hour, you can still get a range of over 800 miles, if you set there for about six hours. Range is a function of airspeed and fuel burn and a Dragonfly can give you a lot of airframe efficiency, with minimum fuel burn if you want to stretch that range out. I think simply slowing it down a little bit and stretching the range out is a far better alternative than trying to hang big tanks in it, which may cause CG problems and will cause some structural headaches I'm sure.

TRICYCLE GEAR DEVELOPMENT

We're still working on the tricycle gear configuration on a Dragonfly. The first tricycle gear arrangement as put together over at Task, turned out to be quite heavy and has some manufacturing drawbacks that simply weren't suitable.

As with just about any development project, once it's been

done you can look back and see how it could have been done a whole lot better and a whole lot easier. That's where we're at now. We're building a new prefab airplane around tricycle gear, using round spring steel gear legs, ala Steve Whittman and we believe that the end result will be a gear that's a whole lot easier to put in the airplane. The main gear mount is a welded tubular structure with the sockets in it, that goes in behind the seat back bulkhead and incorporates the sockets that the upper end of the gear legs fit into. The socket for the nose gear is built into the canard. We think the end result is going to be considerably lighter and less expensive than the first iteration was. The tricycle gear is going to produce a more expensive airplane and it's going to slow down. You simply can't hang three wheels out in the breeze without losing something off the top of the cruise speed, probably between ten and fifteen miles an hour. To put tricycle gear into Dragonfly is going to require many hours of extra work and a few hundred dollars more money out of your pocket. I'm not a fan of the tricycle gear, I've got to admit that. I've got a few thousand hours in the air on tricycle gear, but to me, learning to fly with nothing but tricycle gear is like learning to drive a car with an automatic transmission. If you learn on a stick shift you can drive anything. If you learn to fly in a conventional gear you can fly any kind of an airplane. I would suggest to you guys, that if you look at it from the performance side, the conventional gear makes a lot more sense and the money you would spend for two or three hours dual, with a competent instructor and a tail dragger before he solos you, is a whole lot less money than it's going to cost to build the airplane into a tricycle geared airplane. You simply take the instruction and you don't have to spend those extra building hours on the airplane. It's something to think about, I fully realize that there are some people that are going to insist on having the tricycle landing gear and that's reason we're building a tricycle landing geared airplane.

EXTRA PAGES THIS ISSUE

You will notice that this newsletter is twelve pages rather than the usual eight. We've said a little more about Hapi than we usually do and I suppose we will probably get a couple of letters as we usually do, chastising us for being a little too commercial. The plain fact is, we do have to make a living out of Viking Aircraft and out of Hapi Engines and telling you about the stuff that we sell is part of the way of making that living. We've added four pages to the newsletter this month in order to compensate for the extra space taking up, telling you about the products. I think that's a fair exchange and I hope that you'll feel that way too.

MOTEL RESERVATIONS FOR THE SWARMING

Those of you who are planning to attend the DRAGONFLY SWARMING and need motel reservations, we suggest the Albertan Motel. (682-836-8376). It has nice rooms, colored TV, convenient restaurants. Ground transportation will be provided, or you can stay at the Golden 6 if you want to, it has about the same rates and services as the Albertan and have dirty movies on their TV. (682-466-7374)

ONE MORE THING

Patrick and Robin became parents of a new boy, March 31st, their second child and our tenth grandchild. We're eagerly anticipating getting him down here at the shop so we can put the third generation to work. Both mother and baby are doing fine.

HAPI NOW STOCKS

All the Task built pre-fab parts

All of the Ken Brock hardware

Motor mounts

Pre-cut lift tabs and canard inserts

Propellers

Engine installation kits include finder strainers, valves, fuel line, AN fittings, gascolator, firesleeve and clamps.

Spinners-drilled or undrilled.

Two or three lever throttle quadrants.

Teflon lined Bowden control cable

FLIGHT INSTRUMENTS

Altimeters

Air Speed indicator. Properly range marked for Dragonfly.

Rate of climb

Turn co-ordinators (electric)

Compass

Radios - Terra radios at super low prices

ENGINE INSTRUMENTS

Tachometer

Oil pressure

Cylinder head temperature

Oil temperature

Exhaust gas temperature

Voltmeters

ELECTRICAL SWITCHES

MARK "I" MECHANICAL BRAKES

An internal expanding drum type brake, considerably improved over the Azusa's originally specified. Feature 5" wheels that will use either 1100 X 4X5 lamb tires or 500X5 aircraft tires. Brakes and wheels include custom axles, bearings and hardware.

MARK "II" DISC BRAKES

This complete braking system includes the wheels, axles, disc brake packs, hydraulic fittings and brake line, two master cylinders and cast toe brake pedals to slip over your existing rudder pedals. Use lamb tires or 500X5 aircraft tires.

MARK "I" DISC BRAKES

Same as above except fitted with different axles and supplied with one master cylinder suitable for hand operation.

DRAGONFLY AIRFRAME CONSTRUCTION MATERIALS

Complete nuts and bolts kits

Epoxy hand cleaner

Canopys (all tints)

Michaels resin pumps

3-ply layup cloth

Dragonfly cowlings

Safety Poxxy II

Tires & tubes

COMPLETE LINE OF ENGINES

10 different models, 50 to 75 horsepower

Build it yourself engine kits

Complete line of engine parts and accessories



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