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NEWSLETTER JUNE 1999

At last the nights are drawing out and we are getting some flying time in at Calder Park although we have suffered from the vagaries of the Aberdeen weather on several occasions.

After putting up a good case to move to Hazlehead Park the council rejected our application on the grounds that it was incompatible with the current activities carried on there, I think this issue is probably dead until until there are further developments at Calder.

We had reasonable attendances for the winter programme, hopefully the attendees learned something, and this will give the committee some food for thought for next winter.

The new club winch is giving sterling service and seems to be about the right power level for club members, it is not as severe as my own winch and has a mechanical clutch rather than an electro-mechanical device. The club Rookie is in use and has given some of our novice flyers good airtime as we get about 30 minutes per tank of fuel, thanks to Bill Stark for building.

Don't forget your club membership card to put on the pegboard,

NO CARD, NO FLY, NO EXCEPTIONS

This months article is a download from the Internet and is about do it yourself vacuum bagging, I know several members of the club have gone down this route and will be of interest to other club members, all the equipment is readily available and home made. **BEWARE ON THE ELECTRICS, IF IN DOUBT GET SOMEBODY WHO KNOWS.**

Our plan is for Electra 7, this is an electric glider, several club members have built one, it looks nice and has a good glide performance, and the plan is available from Terry Stuckey.

Our slope fly-in was hit by weather, we managed to get about 1 hours flying in on Cairn 'O' Mount before the gray out, luckily not too many people turned up.

DON'T FORGET THE CLUB FLY-IN AT HAZLEHEAD ON 5TH JUNE AND THE CLUB COMP ON THE 6TH JUNE. Contact Brian Ord for details. We are trying to organise the safety awards for Saturday 5th. Names to Neil Masson please.

Well that's me off to Radioglide 99; this years target is to fly all 5 slots in 100S and Open.

t' Committee

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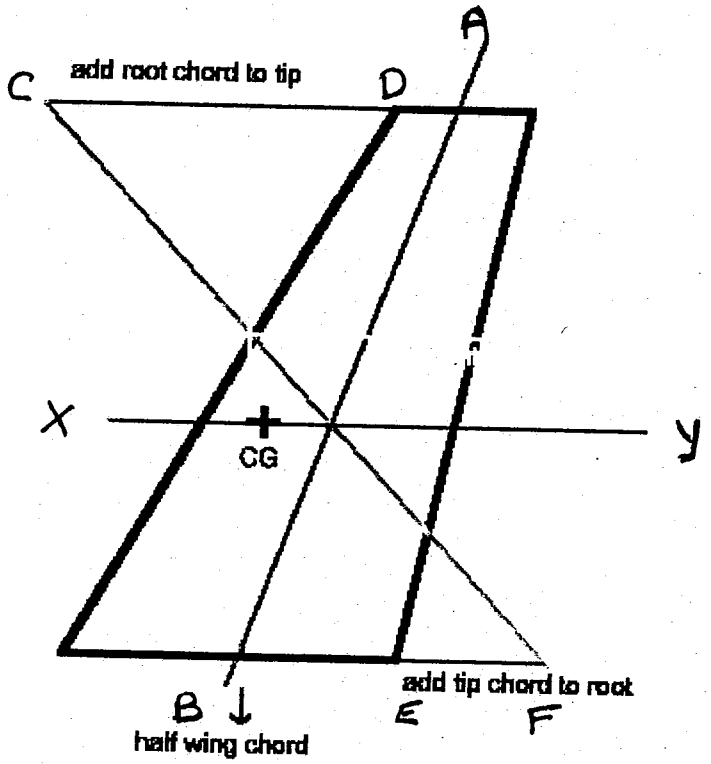
Finding the Center of gravity of a wing



Draw a line between half the tip chord and half the root chord. (A B)

Add the root chord to the tip C D

Add the tip chord to the root E F

Draw a diagonal line between these points (C F)

Where the half chord line and the diagonal line meet draw a line parallel to the chord (X Y)

About a quarter of the chord at this point is the Center of gravity for the wing. **nb:** (see note below)
(Courtesy LDMFA newsletter)

A more scientific explanation using a P51 wing as an example

Step 1 - On a scale drawing of the wing, draw a line that divides the chord of the wing in half, root to tip. Ignore the cuff at the Mustang's wing root and follow the LE all the way to the CL.

Step 2 - Measure the chord of the wing at the root (ignoring the cuff). Draw a line that length BELOW the chord of the wing at the tip, in effect adding the root chord to the tip chord.

Step 3 - Measure the chord of the wing at the tip. Draw a line that length ABOVE the chord at

the root.

Step 4 - Connect the ends of the lines drawn in steps 2 and 3 with a straight line.

Now, where the line in Step 4 crosses the line drawn in Step 1 draw a line parallel to the root or tip chord. This is the Mean Aerodynamic Chord of the wing, or MAC.

About 25% of the way back from the LE on the MAC lies the CG. Extend a line from the root through the CG point to the tip, at right angles to the CL, and the airplane can be balanced anywhere along that line.

This is the method in Martin Simon's book (and others). Seems to work and it's easy to remember.

Note: The 25% factor

You'll notice I said the CG was "about" 25% of the way back from the LE.

These C of G calculates methods focus only on the wing. What we're really doing in the diagram is finding the aerodynamic center (a/c.) of the wing which, if there was no horizontal tail and the wing tips were reflexed slightly (a flying wing), would be mighty close to the CG. However, the horizontal tail provides a stabilizing contribution to the overall stability of the airplane and moves the CG rearward slightly. For most monoplanes of normal configuration the most aft position of the CG, called the neutral point, including the contribution of the horizontal tail, is approximately 33%.

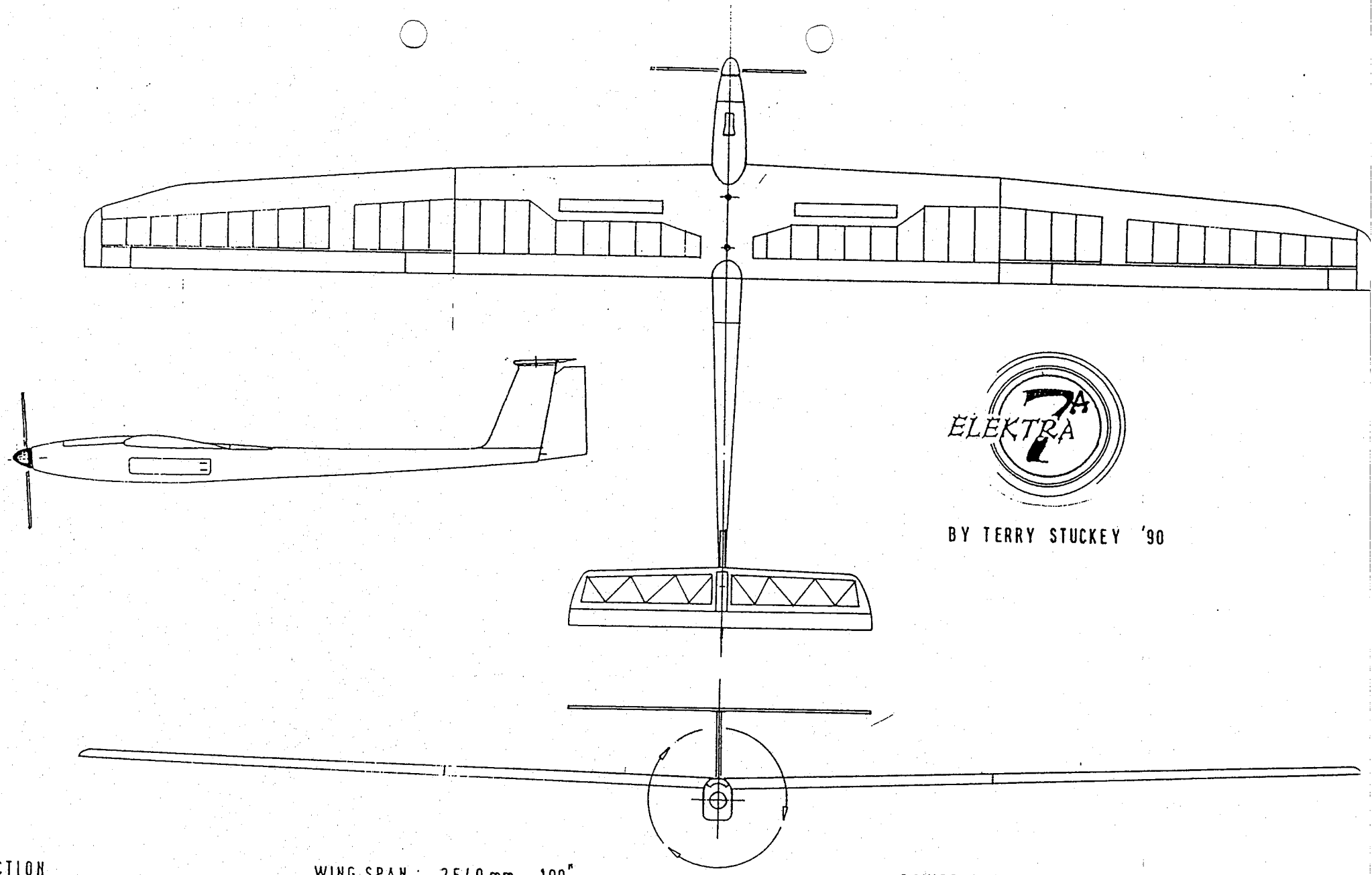
So, you might want to say that the CG of a monoplane of normal configuration lies between 25% and 33% of the MAC, measured from the LE. Chuck Cunningham, the R/C Modeler columnist, stated it just that way in one of his columns.

In the best cut and try tradition of Aeromodeling, it is suggested to put the CG at 25% for initial flights and moving the CG aft in small increments if the airplane feels sluggish in pitch, or runs out of up elevator on landing.

Courtesy *Tom McPherson*

GC of a Delta Wing

Delta wings have no horizontal stabilizer so in a way they are a flying wing with an extremely low aspect ratio... so they must follow some of the same airfoil and CG layouts of the flying wing. This means that it must be set up slightly nose heavy, and have an airfoil with a Positive pitching moment. You can use the WebPages way of finding the location if the wing has a tip chord, if it tapers all the way to the tip, just go to the point halfway between the tip and the Centerline of the fuselage. At this point draw a straight line from trailing edge to leading edge. Measure 15-20% back from the leading edge and draw a perpendicular line to the fuselage... that is where the CG will go. If it has a tip chord, use the method in the WebPages and substitute 80-85% in for the 75%... It will need to have an aerodynamic force behind the CG pushing down to counter the weight in the nose so you either need to plan on having extra up elevator throw and always flying with it trimmed up a little. You can use an airfoil with a Positive pitching moment like flying wing airfoils. You can try moving the CG farther back and using less elevator to counter it and see what happens... but start off with a little room to work with.



ELEKTRA 7A

BY TERRY STUCKEY '90

CONSTRUCTION

FUSELAGE : BALSA / LITE PLY

WING : 3 PIECE/BALSA/PLY/SPRUCE

TAIL : BALSA / PLY MOUNT

COVERING : POLYTEX

WING SPAN : 2540 mm · 100"

WING AREA : 46·45 dm^2 · 5·0 □'

WEIGHT : 1·56 kg. · 55 oz.

LOADING : 33·55 gm/dm^2 · 11·0 oz/□'

AEROFOIL : SD 6080

POWER : ASTRO COBALT 05 + GEARBOX

PROP : 11 x 6 ROBBE [FREUDENTHALER]

CELLS : 7 x 1200 SCR SANYO or 7 x 1800 SCR

CONTROLS : RUDDER. ELEVATOR. AIRBRAKES. AILERONS.
GORDON TARLING SPEED CONTROLLER

Make your own Vacuumbagging equipment

You are visitor 

Hey, how many of you have wondered about this thing called vacuum bagging and decided that it wasn't for you? Many people get scared off when they hear "High tech" and "Composite" and "Carbon fibre". I just hate the word "High tech".

You will find, like most things, once you have some experience with what you don't know about, it all becomes relatively easy. I have been lucky in that each time the necessity arose to find out about something, I had someone around that was able to demonstrate techniques to me or explain ideas. I was also just around when something was going on a lot of times. A lot of people don't have those opportunities and I would like to give a little bit of the knowledge that I have aquired, from myself and from other people to the masses.

I in no way think that I know it all. I would just like to share what I have done and found.

There seems to always be a group of people who are searching for information on how to do something. Here is my contribution on how to go about making and using your own vacuum bagging and foam cutting gear.

A word of warning.

This equipment needs a certain level of understanding about electricity and the dangers associated in working with it. If you are not competent in your wiring ability or electrical knowledge, please get someone who knows, to do the work for you.

Vacuum Bagging.

Vacuum bagging something is not "High Tech". I know people who vacuum bag their chickens before putting them in the freezer. How could you call that high technology?
All vacuum bagging does is to use atmospheric pressure to clamp something. This force follows contours exceptionally well and allows the application of HUGE amounts of force, for practically no weight. I can put the equivalent weight of parking my car on top of a wing in its cores, and then pick it up to check that everything is still aligned. How cool is that?

It also beats the hell out of having to have a bench built like a brick outhouse and piling a ton of weight on top of it, in an attempt to get the same amount of force that only 5 inches of mercury would achieve. Although each method has it's proponents, how much help does it take to figure out how to stack weights on a bench?
First thing you need is a vacuum source. I had a look at the different ways to achieve this and came to the conclusion that the easiest and most reliable way was to use an electric vacuum pump. You can of course use anything that will pull an acceptable vacuum, but nothing else will be as easy and reliable.
I had a look at what there was around and someone told me that a fridge compressor was very suitable. (I think that it was Mike Schneider) This is ideal as fridges are found around the world. People will continue to clean their freezers with sharp things. People will be needed to fix these freezers that were cleaned with sharp things, if possible. The mere fact that you are able to access the internet means that the ability to locate an old fridge compressor wont be too far away. This compressor will also (most likely) use the available voltage in the region which is a big plus.

Have a look in the yellow pages for a refridgeration mechanic and ask him if he has an old working pump that he would like to GIVE to a good home. Other than that, look around in the usual places that old fridges are found. Scrap yards and the like. Hey, you're a modeller. You must know about these things....

Anyway, have a look at my pump below. Yes it is rusty, but it runs quietly and it can even be used to pump up things, if you're willing to wait!

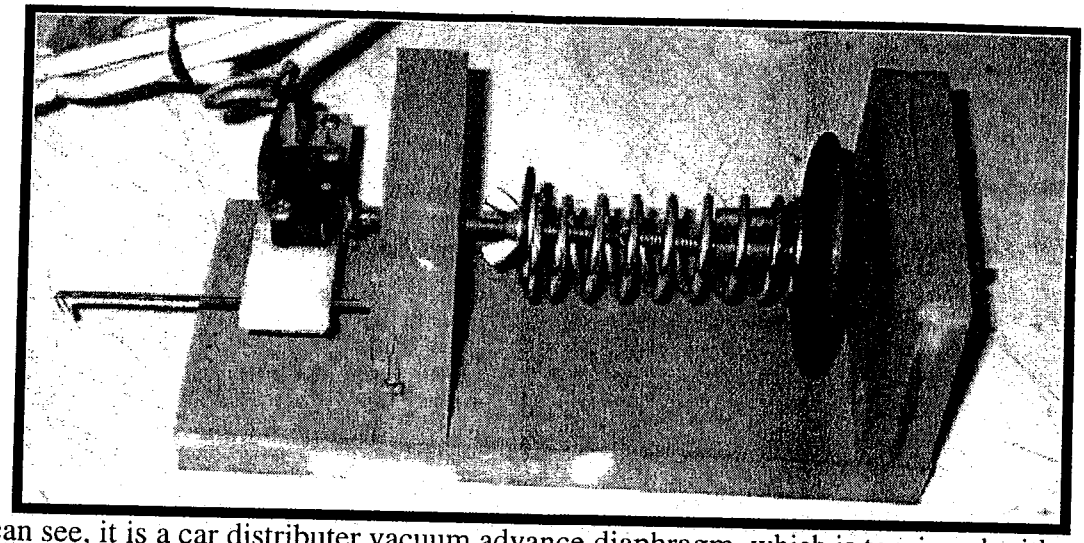
As you can see, it has two pipes , one for suck, and one for blow. With a bit of luck it will be as easily wireable as mine was. My pump will hold a vacuum. It doesn't leak when it is turned off. Some of my friends' pumps have a slight leak and you may want to make a valve up for stopping the backflow through the pump during the off phase.
How do you find out if the pump leaks? Just put the out line into some water, while you are pulling a vacuum and then turn the pump off. If your vacuum is well sealed, and the pump leaks, water will be drawn into the "out" tube.
You may want to run the tube upwards with another piece of plastic tubing and put it into a suitable plastic funnel with a marble or ball bearing dropped into it. This is a good idea even if your pump holds vacuum. The pump is surrounded by oil, which keeps it lubricated.

Don't try to tip it out! It is there to lubricate and cool the pump!

Some of the oil will blow out the "out" tube and it will seal the marble or ball bearing nicely.
Hey, don't use a ball which is too small or it will be jammed in tight and may get shot out when the pump starts. You could of course develop your own valve if you need to.

THE VACUUM SWITCH

Now you need a way of controlling the pump to limit the vacuum.
Some people are in favour of constant running pumps with a bleed screw to vary the vacuum. I have a friend who thought that this was a simple approach so he made a bleed screw which worked very well,
until one night it sucked in enough dust to jam it up and he found his white foam wing was about 3 percent thick in the morning.
He is now in favour of pressure switches....
You can buy them, but they are easy to make. Take a look at the one knocked up at the MacDonald Precision Equipment Skunk Works. This is to give you an idea about how to go about making something like this.



As you can see, it is a car distributer vacuum advance diaphragm, which is tensioned with a spring. The spring that comes out of the vacuum advance is hooked through a bolt, and this is how you pretension the diapragm, as it was never intended to have to handle the vacuum that we will put on it.

The pretension can be adjusted by screwing in the wing nut that sits on top of the washer at the end of the pretension spring. The bolt will now slide slowly into the diaphragm as the vacuum builds and the microswitch sitting on the end of the plastic following arm will follow the bolt head in.

The long piece of black wire that is going into the end of the white plastic follower arm is actually a length of threaded rod that is used to adjust the cutoff pressure by setting the limit to which the microswitch can move inwards.

When the bolt is pulled in far enough, the microswitch switches and the pump will turn off at that point. The little arm on the microswitch has been removed, and because of that, the switch cycles in a very small pressure differential. Probably about 1 psi difference. This is not a problem if you have no, or very slow leaks. It is pointless having a reservoir on this system with the pressure switch set like this, so I took it off.

If you don't want to have the switch points set so fine, just leave the arm on the micro switch and let the bolt rest against this. Then you may want a reservoir. Mine is an old extinguisher that was tossed because it was dented. Whatever you use should be reasonably strong. If it isn't, all that will happen is that it will squash when you pull a vacuum. Test it first. Don't forget to watch it because if it crushes, it can go suddenly and it looks pretty cool.

The microswitch is a standard type. You should quite easily be able to find one at a Radio Shack or just about any electronics store.

I figure that mine will eventually burn the contacts and will need replacing. This one has lasted quite a while and although I have a heavier duty switch to put on to replace it, I want to see how long it lasts. (It will probably let go in the middle of bagging my big expensive carbon fibre cross country wing) . I suppose I should replace it once a year. It only costs about 4 dollars. It is rated to 360 volts at 10 amps.

If you don't know for certain how to wire this up, please get someone you know to do it for you.

It isn't worth getting fried for this.

The follower arm is sprung with a rubber band that goes from the arm to the little screw on the side of the bolt support block. (It isn't shown in the picture) It will eventually be replaced with a pen spring on the other side. What the hell. It works with a rubber band. I just change it every six months. (hang the expense)

The whole thing is covered with a perspex case, because I had it handy and it was the right size. Remember, that unless you remote the microswitch into some sort of case, it is exposing live contacts where the wires go on, so think of safety first.
This pressure switch is connected into the system via some more tube and a T fitting somewhere in the main vacuum tube line. It doesn't matter where, but if you have any taps for running more than one bag at a time, you may want to have it near the pump.
A word about the tubing used to hook this all together. Make sure that the hottest days that you are likely to experience doesn't soften the tubing enough to make it go flat under vacuum.
This can be very bad.

The Vacuum Gauge

Here is probably the most expensive part. It is worth having. VDO make a gauge that is perfect for our needs and it costs about 28 dollars Australian.
It is also possible to use a vacuum gauge out of a car, if you have a wrecking yard handy.
Try to get the newest and biggest if you decide to go the wrecking yard variety. If you have to make a little box for it to sit in, go ahead. Gauges are fairly delicate things and you will be relying on this to stop your wing getting pressed flat.
You may have to do some conversions to get from inches of mercury to psi or whatever you decide to work in as reference. Remember that your average white foam can take around 7 psi and your average blue foam can take whatever your pump can give. Grey foam or spider foam? You're on your own.
We don't have that stuff in Australia.
(Although we wouldn't mind getting some!)

Bagging Materials.

Apparently the best stuff is Nylon. I have never used it. It's really expensive compared to the alternatives available at the supermarket and other places.
For small things, the best stuff to use is polythene shopping bags. Cheap, already sealed at one end and it conforms beautifully. Just the thing for doing tailplanes, templates, chicken and needlework. (I once bagged some cross-stitch for my wife. It looked really good as everything came out looking embossed)
For slightly larger things, Plastic Garbage bags are the next step. John Stapleton opened my eyes to this. For larger things like wings, you need to find a plastic bag manufacturer who sells the plastic tubing. Have a look at what you can buy and test with your fingers just how thin you can go before it starts to look a bit fragile. Putting tailplanes into plastic bags is one thing, but sliding a wing and everything assorted into a long thin tube of plastic is another. You don't want to go putting tears and pinholes in the plastic when you're sliding a wing in.
Get something that will resist damage, but won't be too hard to fold if you need to, or conform to whatever you're bagging.
You can seal the bag with good old masking tape, caulking, blue tack, or a commercially available bag clamp.
I have been experimenting with pvc pipe by sanding one piece into a C shape so it just fits over another. It is pretty damaging to the small polythene bags, but the bigger tubing seems to work.
I have also thought of using the little AA battery powered bag sealers to see if they will do the job.
Once again, your imagination is your best friend and it costs very little to experiment.
If you buy your bagging material in a roll, just leave the end rolled up and secured and use what you have to at the time. It makes for easy recycling and it shouldn't leak. (Check it though)

ATTACHING THE BAG TO THE PUMP

There have been several ideas for this.
At first we just used to push a piece of tube from the inside of the bag to the outside. It works well on some materials. The bag material stretches and then breaks leaving a stretched portion around the tube and you can leave it like it is, if the seal is good or put rubber bands or blue tack around it to seal it to the bag if it isn't, or just for piece of mind.
Then Andrew Goddard of Sydney showed me a little gadget that does the trick really well. Basically it is a disk with a tube that goes through it. The tube is sized to fit your vacuum hose and is sealed to the disk to make it airtight, with the tube side of the disc covered with blue tac. The tube is pushed carefully through the bag, or a small hole is made for it and the blue tac seals perfectly to the bag.
Don't make you disc too small. about 50 mm or 2 inches is good.
Remember to place the disc inside the bag on top of some loose weave material. You could glue a matching disc of some material to it (on the edges of the bottom side of the disc) to stop the bag material coming up hard against the tube and blocking the flow. Your wifes green plasticky scouring pads are perfect for this. (Make sure that they are used first. No point in wasting money/irritating the wife. Just make sure they're clean)
Hot melt glue is the perfect partner.

Breather Cloth

It pays to put something in the bag to evenly distribute the vacuum. This is where bagging with the wing saddles inside or outside the bag comes into it.
I bag with the cores inside the bag as it will push any high points down, like spars and the other layed up construction that is still green when the skin is going on.
Different people have different methods. I have seen some argument on RCSE about what is better. Eggs are only acceptable as food sunny side up too.....
I don't have any peel ply, so I don't care. I have been going to try using some rayon as peel ply but as I haven't had a use for it, I haven't bothered. Has anyone tried this?
As a medium for vacuum to travel through the bag, you can use just about anything that air will go through. Paper towels work well, but a thin fabric is a bit easier to keep arranged in the bag if it is a big one. It doesn't have to be in one piece as long as it overlaps. Just try to not let it be too thick as it may not conform around the foam as you want it.

Don't wait until you have something in the bag to try out all this. Make sure that the way you do things results in as few leaks as possible. I haven't yet achieved the airtight bag yet, but I have come damn close. I would consider 10 seconds of pump activity per hour to be extremely acceptable. This is about as good as I have got. If I am bagging templates with 5 minute epoxy, I just let the pump cycle at whatever it likes and then watch TV until I remember it later on. It hasn't got very hot yet....

Once you have all this stuff set up, it is time to check the system for leaks. Any point at which there is a connection is a potential source.
Connect your tube to the pump and pressure switch via the T joiner and block the free end securely with something that will not leak. Folding it over a few times may work quite well. We are trying to make the system airtight and don't want any false alarms.
Start your pump and set the switch with the vacuum fairly high. Make sure the pump is turning off though. We need to see how long it takes to switch on again. At this point you could attach a line to the out tube from the pump and dip it in water to see if the pump is leaking. (I hope you are using clear tubing)
Hopefully it won't suck any water when it is turned off.
One of my hardest to find leaks was at the T piece. If you intend making this connection permanent, which it should be, you have to be sure that it doesn't leak. If you do find that your pump is turning on and off pretty quickly, it is just a matter of the handy silicone sealant (rtv rubber) or hot melt glue, applied in the appropriate possible places. The longer your pump stays off the better.
With every extra fitting added to the plumbing, your cycle time should stay the same. Make sure that

you eventually test all the pieces of equipment you add to your system that you would normally use eg, reservoir, extra taps for more bags etc.
If you have eliminated the leaks from your plumbing to the bag, at least you know where the most likely leaks are coming from. You should be able to hear leaks in the bag, if they are big enough.
Nothing is more annoying than checking the bag for leaks for ages and then finding out the leak is where your vacuum gauge connects to the rest of the system. (Trust me on this one)
Time passes a lot more quickly once you are trying to fix something and you have resin going off. (Oddly enough, once it is all in the bag and finished, it can only be 24 hours that you have to wait, but it seems like a week...)
I supose there is not much more to add here. If you can think of a good idea, please don't hesitate to email me and tell me of it

Other helpful stuff...

Other things that can be helpful. If you are going to put release agent on your mylar, there are several things that you can use. Johnsons floor wax works well, Armour all and Rain-X also can be utilized.
Remember that whatever you do, try it first on a test piece so that you can be sure that your release agent doesn't react with your paint system, if you are going to use the old "Paint your mylars first " trick.
It is also possible to use no release agent with mylar. Just make sure that you clean it with acetone and don't touch it again until you paint it
Once again, test how this is going to work before committing 300 bucks worth of Carbon Skin at 45 degrees.
Just a few of the people that have knowingly and unknowingly contributed to the culmination of information on this page are (in no particular order): Andrew Goddard, Klause Mittendorf, Mike Schnieder, Mike Elsner, John Stapleton, Don Berry, Richard Tapp, Charles Smith (Australia's best Soaring Oriented ISP), and Graham Garner.

Here are some more tips given to me by Dave Jones from Melbourne...
Tips from Sprockets Shed
We use the polythene sheet (200microns) from Bunnings (a local Australian Hardware shop) cos it comes folded double and you cut it to size.
Cut in 50mm from the sides on all bar the folded side. Duct tape the ends top flap to bottom flap. This leaves the long side open (our preference, no reason why you couldn't tape one short side and one long side) to insert your job through. After job is inside bag duct tape up the final opening. Keep top surface as flat as possible until the end and where you inevitably end up with wrinkles in the corner.
When you tape the long side of a bag shut:
* if it's empty it tapes perfectly flat because there's nothing in it to deform the top sheet.
* when your job is in there, the top sheet won't tape down flat because the top sheet is deformed.
SO if you hold it out under tension while you tape it (two pairs of hands makes it easier) you only end up with wrinkles and a poor seal at the very end.

Fold across the open edge three or four times and slide on one of the poster hangers your Dad used to hang Disney posters on the wall of your room as a kid. Commonly available at all framing shops up to a metre long.
By the way, if you heat the end of the poster slide with a heat gun when you first get it and bend the two sides out to 90 degrees across the corner, you make a guide at one end which will make it much easier to slide on.
If you can't imagine what I am describing go down to Harvey Norman (a local Australian Appliance shop) and have a look at the slides that close up the bags on a few of the upright style vacuum cleaners.

We bag with the jackets inside the bag and use nothing less than 14 thou Mylar (from a transformer winding supplier) to paint and layup cloth on.

Shade cloth makes a great breather cloth out side the jackets.

Taffeta cloth is even better than peel ply, just ask Manny Reidrich (of F5B Pelican fame) at United Patterns in Mordialloc. It's all he uses.

At the local aquarium shop, they sell check valves for about $2 ea that save making one way air valves. If the tubes at each end aren't big enough, just slide on some of that clear plastic tubing from Bunnings that's a bee's dick too small, no clamp needed and slide your 1/4 inch stuff over that.

4mm sprinkler fittings make cheap fittings when enlarged in the same manner.

Your pump will cut in and out less frequently if you use a bigger reservoir. Disposable R134 gas bottles from your local refrigerator/Air Con repair joint are perfect. You can fit the hose barb however you see fit. Or use old fire extinguishers or out of date 9kg gas bottles.

Anyone else got any hints?

Other Vacuum bagging links are:-
Eddy Rademaker's Vacbagging pages
Chris Foquets Vacbagging page

Mail

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