

Building your own Baggage Pods - Primitive Supplement to plans by Featherlite.

I got a set of Baggage Pods from the successor to Featherlite, AeroComposites at the early 2020 price: \$674 plus \$80 Shipping for a total of: \$754. It came in 8 pieces in a box that fit from door to door behind my front seats of my Mazda6. I was told the price is going up because of the materials costs AeroComposites is encountering in the marketplace.

I built my own Long EZ in 1982-87 and I've done repairs to various other canards since, but I have never made Baggage pods. I like having them - even have some hearsay that pods helped preserve two Variezes that have left the runway and gone cross country - the pods self-destructing as the plane cruised on the pods. The fuselages sustained less damage. Even the pods were reconstructed from the pieces and used again. Meanwhile my friend Dave Ronneberg calls them Wing Breakers - he must have seen different accident results I've not heard of.

I have had 8 Flying canards and so far have added pods to 4 of them. I don't remember building up a pair 30+ years ago on my homebuilt Long EZ, but I must have, there weren't any fully built ones back then - I think I got them from Bruce Tifft in 8 pieces - his molds went to Featherlite, I understand.

But later, rather than building them, I preferred to snap them up when they come for sale, and I've found myself outbid by faster buyers for the most part, but found my already built 4th set and mounted them on a Long EZ that is now in Las Vegas. (Transporting baggage pods, even with the tail cones off, is not an easy long distance thing - but the Berkut has a big back seat... For the second set for the Dave Lind Long EZ, I had the help of a Latino friend who has since been deported. Then I got mostly complete carbon fiber pods as the first customer of Pat Yoshikane, very light and very nice and again I think my Latino friend put them on my Berkut. I flew with them in black and boy did they get hot, so I got them painted when I got the Berkut itself painted. Interesting side note - I flew with just one of his pods the other day and the drag of one pod was shocking - I found myself holding a rudder out for the short trip to drop off the pod at Chino, just 15 minutes away. Sounds odd I would experiment with that, but in the old days I've flown a Long EZ with only one wheel pant, I've flown with a pair of jumper cables wrapped around the gear leg another time and I flew my first Long EZ with only one baggage pod all with almost no yaw imparted - so I think this third pair must be "toed in" (I guess I could check) -

when both of them are on, the plane has a slightly different yaw performance - changing from climb to cruise a slight bit of electric yaw trim. And the top speed with both pods seems to be within 3 knots of the top speed without pods - a wag as I am not much on testing. So I have a Cozy IV that might need baggage and another Berkut that may need them too. I'm not seeing pods come up for sale any more - although I had my eye on a set of Baggage Pod molds for years in Phoenix and went and got them recently. They don't have the built in recesses for the joining of the pods of the "professionally built" pods - but they are available to my cheaper friends. I've never bought the oversized Cozy IV pods from Gary Hunter - now being sold by Dale Martin and I'm really interested in the much further along set Gary sold and now Dale took over and sells.

So here's my take on building up a set of pods, starting with Featherlite's assembly and mounting instructions:

INSTRUCTIONS FOR ASSEMBLING AND MOUNTING BAGGAGE PODS FOR THE VARIEZE, LONG-EZ, & COZY

ASSEMBLING THE PODS

1. The two tail cones marked 1 and 2 go together.

I looked for the numbers and found they were marked in Roman Numeral I and II, why is that important - well, the tail cone, is you put it on its open end, actually stands with the tip off center - kind of tail down in flight, the bottom line of the pods continues out to the rear in a slow upward curve but the upper side of the pod actually descends to the rear tip more. They are divided from top to bottom (two sides tail cone and pod, not upper/lower parts). I found the two parts were not exactly the same length when the tips were stuck together, one seemed to be the same length on the short side and on the other side they were the same. I'll trim it even after it is assembled.

2. Sand the finish dull in the recessed seam area on the outside of each half of the pods and the tail cones. Also, sand 2" in from the edge on the inside of each half of the pods and the tail cones, and on the pylons 2" from the front and rear edges, both inside and outside. You must cut bid on a 45 for outside pylon T-edge.

The instructions say sand 2" in from the edge inside and out. Rather I sanded $\frac{3}{4}$ " - the width of the recessed part - together they come to 1.5" where the tape will go. If you have peel ply and intend to use it, you should sand out to 2" total or perhaps 2.5" total, not 4" as in the plans. I started this step on the cones with some 80 grit sand paper and got really bored very fast, I got out 40 grit and finished one cone and bored again went on to assemble that one cone first. Perhaps with a vibrating sander I'd have been better off - I don't know where it has gone...

3. Cut the edges of the tail cones to the trim line for length after they're together.

I don't understand this instruction - I think it means cut the two long edges of the tail cones to the trim lines so they match so you can make them fit together. First problem is that there wasn't any trim line visible - I suspect AeroComposites trimmed them for me - the line isn't perfectly straight but a good approximation. When I lined them up, they certainly could be forced to touch about 4 times for a few inches in each length. I didn't see a cut line on what will be the mouth of the tail cones - just the Roman Numerals mentioned before. A bigger problem is that the instructions seem to indicate you do the tail cones first - you can't fit them to the pods properly if you glue them together first - but I was able to expand one pod that was too tight a fit...see step 11.

4. When putting the halves of the pods and tail cones together, duct tape the outside and bondo to hold the halves together while doing the layup on the inside. Hot glue also works very well.

These are four dumb edges to be held in space, duct tape may work on the outside but the edges seem to overlap while you are working with adjacent edges, Bondo is a quick filler but you need more hands to apply it unless you have a mold to hold the pieces together for you. I remembered the tricks we learned at Santa Monica and tried to find "Zap-A-Gap" which dries in about 40 seconds with an accelerator spray that you spray on the glue. (I set out to shop at the hobby/model stores I've used in the last 10 years - both were gone. I went to the big chains, Hobby Lobby and Michaels etc. The first had a roller knife but had never heard of Zap-A-Gap. The second had a different brand's accelerator but not the fast epoxy that went with it. I googled a place nearby, called NitroHouse, which had model kits and small bottle kits of Zap-A-Gap, so I snapped up 2 little Glue bottles and one accelerator spray. He sub-leases a workshop behind a different business and directed me to a small door on the alley to find him. He does almost all his sales on the internet. I wish I had a larger epoxy bottle...)

So I had to make good - touching edges with the epoxy and then zapping the accelerator seemed to work on 1" of joint at a time so I put the two parts on the soon to be "open" end and they didn't line up exactly right. I used package tape to keep one joint approximately connected and then addressed the other side. I found that the Zap-A-Gap could be used where the two edges touch - about 70% of the edge is just far enough off parallel that the gap there is nearly 1/8" no matter how you work it. I thought of running rough sand paper between the two edges to take down the high spots, but I didn't have an extra pair of hands to hold the two pieces edge to edge. Had they left a true trim line I might have cut wide of the cut line and then sanded the excess down to the cut line, and frankly that would be a lot of work. I could get the Zap-A-Gap to sort of hold with about 4 separate inches over the length of the edges to be mated. (Realize that the depression on the outside of the part edges is for BID to fill, you don't put the one edge inside the other as you do when you mount the tail cone to the main part of the baggage pod itself. So I mixed up some 5 Minute Epoxy and ran that to try to fill the gaps - it sort of worked, but left so much glue in the parts I'd just sanded that I was upset with that result and with about 3 hours work, gave the day up. I went out for about 20 minutes and used Zap-A-Gap on the second tail cone, gave up on the 5 Minute Epoxy idea. I went to get my angle grinder the third day - could not find my hand sander - the angle grinder made quite a rough mess, brought a few more things too, a work board as I don't have a work table at home, tin foil, Olfa Roller knife with a new cutter disk, brushes, stir sticks, hardware for mounting the tail cone - nut plates and a screw, drills, blind rivets, a measuring stick, a few yards of BID, and stood outside Aircraft Spruce to get a kit of Gougeon Brothers West System 105 Epoxy and slow hardener - a Quart kit that costs nearly as much as a gallon kit in the ancient past



Most boating stores charge even more for it - wood working stores seem cheaper. (I remember getting a 5 gallon kit delivered by Gougeon Brothers directly to my home...I drift...) I'd bet I need no more than a pint for this exercise. I didn't think of hot glue - but sanding hot glue is not fun.

Day 4, I pulled out the angle grinder and "sanded" $\frac{3}{4}$ " back on both sides of virtually every edge except the top of the future pylons, the future opening of the pods and tail sections. My arm got tired, but it sure went faster, with a few slips that cut into the edges and a certain amount of nervousness as I juggled big fiberglass parts and a whirling wheel:



I then tried to figure out where to connect up the two parts of the pod itself, I had half a mold and found the parts didn't extend out of the mold so I had to raise the pod up a bit and then planning to use Zap-A-Gap I had to put a plastic sheet (plastic trash bag) under the parts to keep the glue from hardening on the mold itself. The plastic stuck to the parts more firmly than I expected. Anyway, the complex shape doesn't exactly match up because it warps as you are handling it - here the tail cone end:



I thought I'd start with the leading bullet end of the pod and work along the bottom - nah - when I got to the pylon I realized it was well out of alignment. Getting the pylon parts to line up first resulted in the nose separating, not badly:



then the bottom separated again, despite 5 little glue points...so I found that if I started Zap-A-Gapping the pylon, soon realized that the trailing edge of the pylon has depressions on that edge but the pieces go flat against each other - how do you join them temporarily and yet join them permanently later, split it open again and fill with "real" epoxy or flox? - Bid doesn't go around square corners like that so easily, maybe I can sand it round. I then proceeded to the nose of the pod, which was somewhat off, but not too badly for filling. The bottom of the leading edge of the pylon was also off a bit, but again, not so badly... Lastly I Zap-A-Gapped the bottom edge, using stir sticks over 5" segments, and that proved to be a much better way to hold the two halves together:



I actually ran the Zap-A-Gap around the edges of the stir stick and sprayed it with accelerator and pushed it onto the two edges - bringing them into alignment for the length of the stir stick. Note the edges don't always touch...

The trailing edge of the pylon can be separated, the zap-a-gap sanded away and you can flox the trailing edge, use flat plywood pieces with a couple clamps each or you can flox and place a few strategic pop rivets through the trailing edge. Then BID around the trailing edge.



5. Assemble the tail cones first, and with the pods duct taped together, trail fit the tail cones to the pods.

I initially skipped the end of this "simple step" (trial is misspelled) but the pods are hard enough to try to assemble without trying to stick the tail cones on too, not 4 hands, now I need 6 hands. Maybe I'll pay for this later. But I did make "tapes" and start assembling the tail cones. Now, someone at Featherlite must have long arms or very long brushes, or was it Bruce Tiffit - I don't remember him having long arms when I flew in his "Beez". I want to put 2 ply of bid on the inside of the cone but my arm is only good for about 26" of application - this photo is with the ruler stuck into my armpit:



The tail cone is 36" long and the pod itself 42" long - Bruce designed these to carry his B&T props to customers at the various Flyins after all. I certainly can't get my shoulders inside the pod or cone - but I'll work on that after the pods are assembled, maybe... Anyway, I laid out tapes for my 26" by 1.5", the tin foil I laid out easily accommodated 8 lengths - turns out I could only use 7 lengths - the epoxy started kicking off. A new guy might try using 4 per epoxy mix. I mixed up epoxy about 2 pump squirts per mix - but the tapes had most of 4 pump's worth slowly curing as I worked on applying the tapes. Before I gloved up and started mixing epoxy, I cut glass - and for you, who have not built these, see instruction 2 above, on the 45 - meaning you don't let the threads of the glass run lengthwise and widthwise - it is not as strong as running it across the gaps at 45 degrees, something we practiced in the building of these wonderful birds. Here is the glass laid out for the first piece before cutting it out:



You can see the black lines on the tin foil under the glass. I cut the first layer out of the entire cloth, and then used the triangular remnants for the second layer (which goes against the parts) - the

first layer on the tin foil is the final, visual, tape layer and looks a lot better uninterrupted, you can waste a lot of glass making the second layer one piece, so that's where you put the remnants. Here's the second layer:



Just a note - the second photo is after the trial fit of the triangular remnants, after the West System epoxy is mixed, the tin foil is wet out, the first layer is carefully rolled out and wet out with a brush - I don't spend too much time squeegeeing out the excess during the layup of tapes - I'm not a purist on weight savings, particularly on baggage pods that I might use for family trips - they sit on a stand in my hangar when not on a trip with my wife. Some people leave them on all the time...spend more time saving weight if you intend to do that. (If the glass has distorted, work at the ends of the 45 degree threads, and try to pull the threads straight and where you need them, it takes time and you might have to work the other direction too.)

6. Lay up 2-ply BID cloth inside and 3 plys outside of each seam of the pods, tail cones and pylons (use peel ply).



As I did all my attaching on the outside I simply applied the BID tapes inside all 4 parts - keeping the aluminum foil attached until the tape was where I wanted it. I didn't run them all the way to the closed end as I couldn't easily reach it. I don't usually use Peel ply, preferring to sand down rough edges of things, but the inside layups would have been better with peel ply, if you have it. Adding this step, you might have to rush with 4 pieces of BID tape...using peel ply you might sand out to a 2" wide swath. I didn't so here's the tap applied:



However, the aluminum leaves a pretty nice surface if you firmly push down the edges:



If you pull it back the aluminum strip on itself and use a wet brush to tamp anything that has come up back down the final picture looks pretty good - but you will need to sand edges. Again, if you have stretched the tape out with the aluminum off in this process - making it narrower, you can pull the threads straight and adjust its width again.



Having an extra tape left after 2 tapes in each cone and one tape in the pod floor, I added a tape to the leading edge of the pylons, down onto the top of the pod, leaving the other attachment places alone. I discovered the 7th tape was kind of taking it's own set - which means the epoxy was "cooking off" too far along to use the 8th. As thin as they are, they don't really heat up like a pot full of mixed epoxy. I ended up sanding back through the 7th tape on one pylon - so even as fast as I go, 7 tapes were too many.

The 5th day I created 6 tapes 36"x1.5" and ran 4 on the outside of the tail cones, pulled the aluminum and that went very fast. I ran the remaining 2 tapes on the bottom of the pods - after removing the wooden sticks:



The front of one pylon was sketchy, so I sanded it back to run a new tape there - I added up the inches of un-covered baggage pods - and ended up with tin foil and about 45 inches of 3 ply of BID and a bit of 1 ply to cover the pylon leading edge I sanded previously.

7. "C" clamp two pieces of thin plywood to hold the pylons in shape when they are filled with foam.

I found some cheap clamps at Harbor Freight and got myself some thin plywood, cut myself some strips, but it doesn't stay put as you go through the succeeding steps. You'll find in the mounting section a suggestion you should construct a cradle to hold the pod level, pylon straight up. I didn't have the material for that so I took the shipping box, marked out a number of cut lines to use to hold the pod for these stages:



I supported the nose of the pod up front:

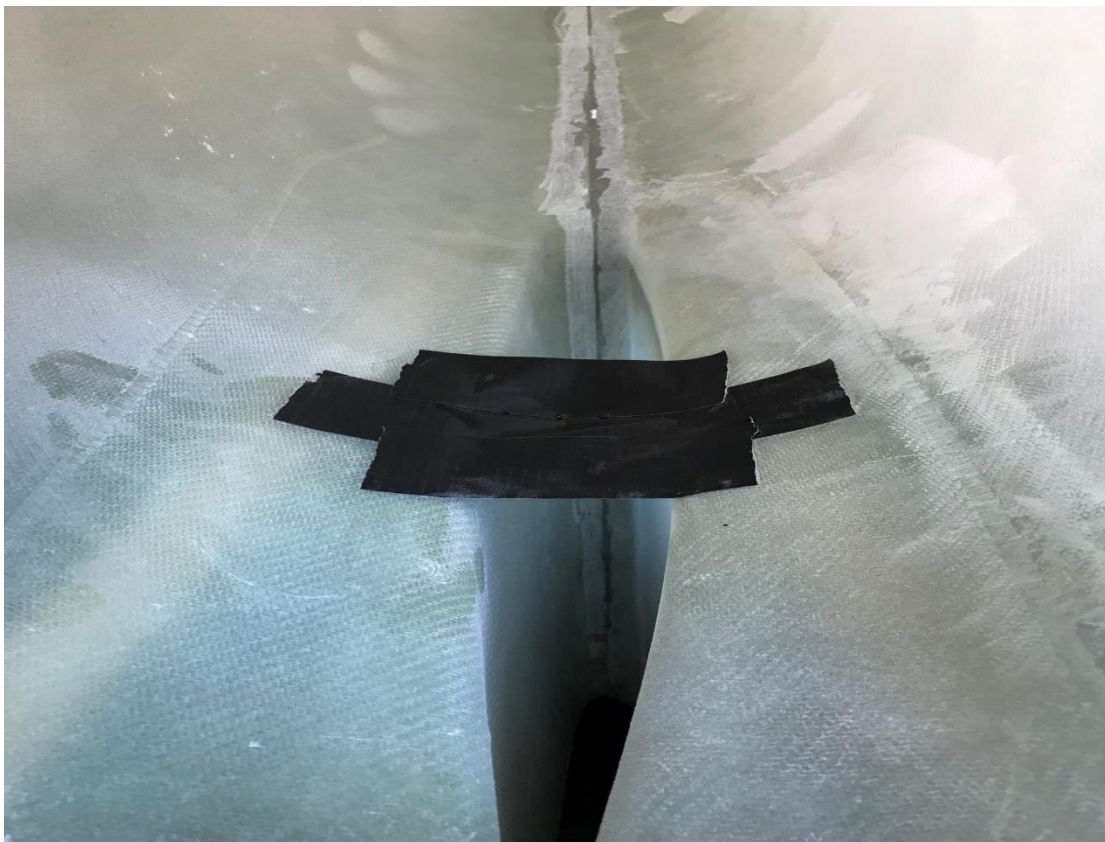


And you can support the pylon straight up:



8. Duct tape a piece of poster board over the opening of the pylon inside of the pod.

I actually installed the pod upside down in a big old trash can and used Gorilla tape to cover the bottom of the pylon. The tape kind of sagged through this method, so perhaps the poster board might work - frankly, I think the board might have been pushed into the pod considerably - so I just used gorilla tape across the pod:



Of course, you cover the whole pylon hole with tape...

9. Mix approximately 1/2 cup (?) each of A and B portions of 40X foam and pour into the pylons. Hold the poster board on top while the foam cures.

I'm assuming the cup referred to is a cooking cup size - but frankly, you can waste a lot of foam if you don't realize how large the expanded foam will become. I'll overkill that lesson, I took photos at 10 minutes and 30 minutes, etc. and if you haven't used it before you will be surprised how it keeps on expanding. Secondly, I don't know what 40X foam might be - I don't see it at Aircraft Spruce - the foam we always used from Aircraft Spruce is called X-30 Urethane two part foam mixed 50/50. Soon as you have used the stuff, the caps glue themselves closed, so it is good to have a wrench ready too:



I'd guess it lasts about 10 years in the can if you use the wrench to close the cap each time - if you don't, you will leave gaps and the foam will dry out. Anyway, I decided that a pair of two full sized

cups would yield a lot of foam. So I instead got little kids drinking cups - the ones that are just about 1" across and just over 1" tall. You don't have to be exact in your pour out:



In this case I simply poured out all the dark part and left a little light brown liquid in the other - I used the same cups measuring out less the second set, about half the third set, and less than half of these cups the fourth mix. I did the other pylon in 3 fills. The next step is to mix them - doing it in these small cups is difficult and actually ends up quite funny even if you don't let it overflow. However, the plastic cups I had were over a quart sized, so I simply used a Dremmel wheel to cut each cup down to about 1.5" height. Here's what pouring the two together does:



And then you pick it up and in less than 30 seconds you have a very active tan color:



If you wait until the stuff starts expanding - you may run out of time, in my case I poured the first load in a long thin line from the leading edge to the trailing edge of the bottom of the pylon - ah, but it is hard to get into the leading corner. This is 5 minutes later - looking down in the pylon:



Because the sun was shining - I was able to show you the profile too:



After 5 minutes the first mixing cup is still expanding:



Well, the leading edge being so hard to fill, I put the nose down in the support box, installed the plywood strips and clamps - and mixed up a ½ cup x2 of the X-30.



Here's the profile of the foam highlighted by the sun:



the first cup continued to expand, the second mixing cup was starting up and the first fill was pushing through the bottom tape a little:



A little surprise to me - the tape actually sucked up into the pylon. However, the second load was still expanding too:



So I mixed up a 1/4 cup part A&B and mixed that up and poured it into the top - but it came up short, so I mixed up another 1/4 cup and found the foam topping out the pylon so I used the mixing cup to scoop up some of the unnecessary foam and slide it to other parts of the pylon top.



30 minutes later the foam was still working up:



10. After the foam has hardened, remove the poster board from inside and top of the pylons, sand the foam flush with the inside of the pods, sand the glass dull around the foam,

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don't like the idea of putting poster board or even tape on the top of the pylon - if you could install it carefully while the foam is expanding. Rather than trying to limit or trim expanding foam it makes more sense to let it flow up and cut off the extra material - a lighter result. If you crush the foam in - you are removing the bubbles and leaving the urethane weight.

You'll see that the bottom pylon tape was sucked into the pylon - leaving a valley. So I turned the pod upside down in my support box and mixed up about 1/6th of a cup and poured it into the little valley - I could have used less...



That's 5 minutes - but at 30 minutes the pylon bottom was overflowing a lot more:

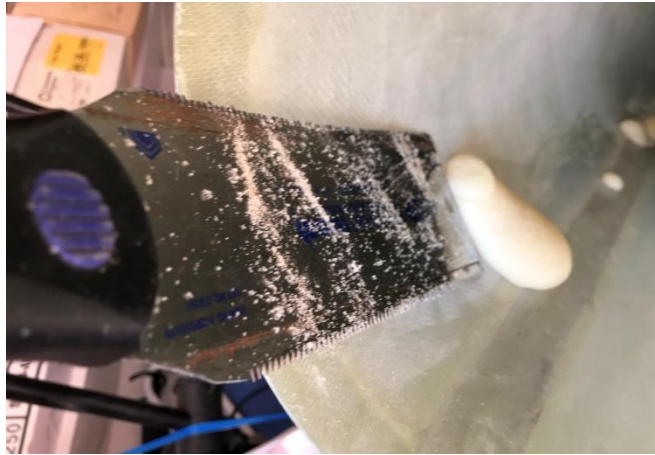


The foam under the other tape had continued expanding too - I'm sure card stock would not have stopped it:



I particularly like a Japanese draw saw for foam, and even fiberglass (although the saw will loose teeth on fiberglass).

You can use the end of the saw to knock away errant foam drops:



To bring down the foam top and bottom you intend to sand smooth :



And a simple 17" 40 grit sand paper bar can finish the effect:



And you can sand the interior concave too:



And finish off hand sanding the edges - the urethane, where thing will be thicker and stickier.



micro the foam and lay up 2 plys BID lapping over 1" onto the pod's glass. Peel ply the lay-up.

I used flox but micro makes more sense there. My final result came out lumpy - the micro would have been smoother.

11. Fit the tail cones to the pods lining up the top and bottom seams. Be sure the tail cone is mounted properly to maintain the airfoil. Drill three 3/16" holes in the 2, 6 and 10 o'clock positions for mounting camloc fasteners. Use a #4 camloc in the 2 and the 10 o'clock positions, and a #7 camloc in the 6 o'clock position.

You need to be sure that the tail cones are oriented the right way - there is a long seam on top and a slightly shorter seam on the bottom. The trailing edge of the pylon extend right to the pod opening - so you either have to shorten the trailing edge for the tail cone to slide in under it, or cut a notch in the tail cone for the trailing edge to slide into. I chose the latter because I've found with pods that lining up the holes can take some time in the rain. The trailing edge notch makes that simple.

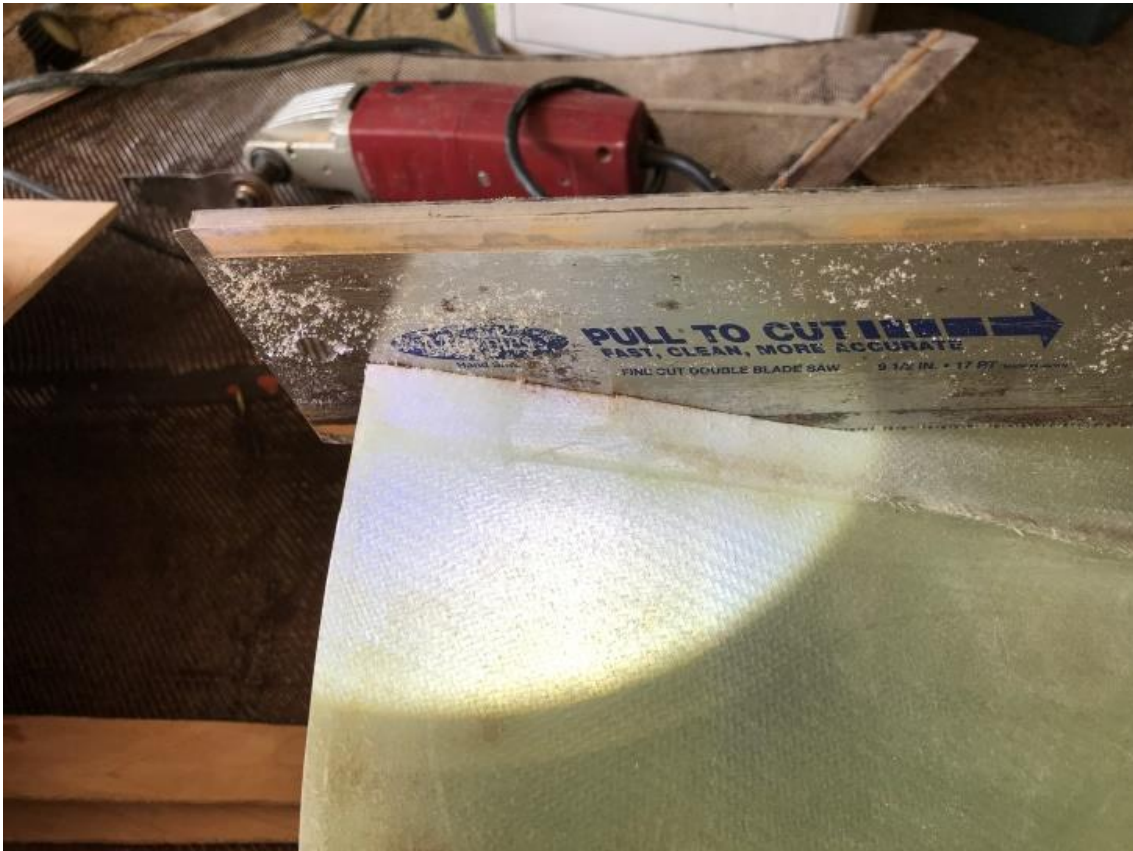
You couldn't pre-construct the pods before building the tail cones, so this is really the first time you can trial fit the cone over the rear lip of the pods. I found one was too tight. First I discovered a kind of flash on the pod trailing edge - it is hard to see in this photo:



The other cone slid up to about $\frac{3}{16}$ " from the available overlap. But the tight one only made it about $\frac{1}{2}$ of the way on and I had to expand the built cone - I picked the bottom seam of the cone and installed a bright light in the tail cone so I could separate the parts on the seam:

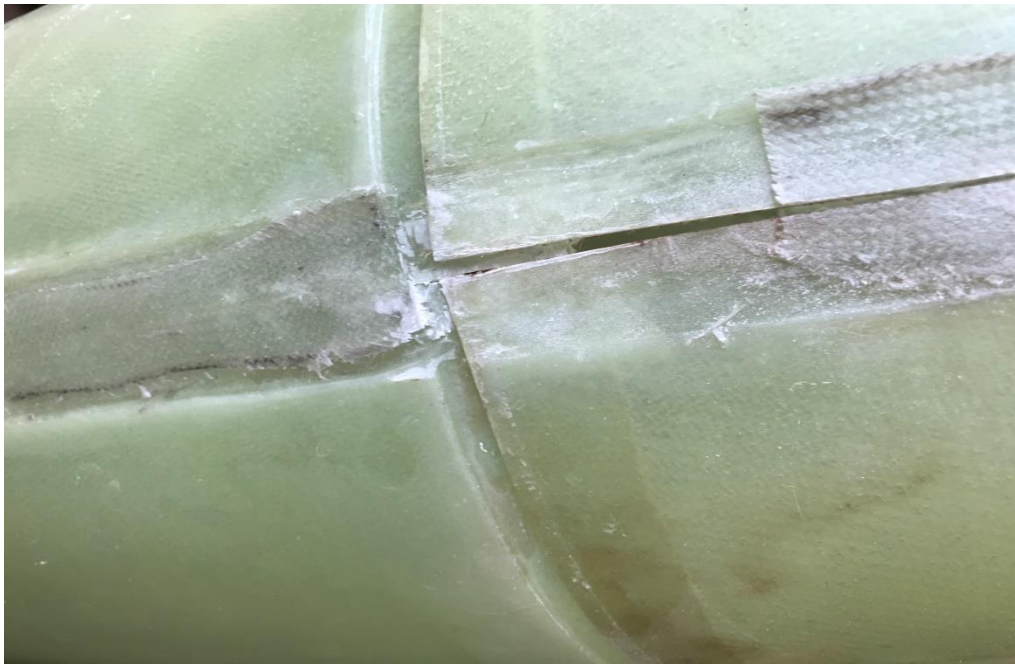


You can see the notch I made in the tail cone under the light. So using my Japanese draw saw along that part line allowed me to widen the cone to fit over the Pods.



And I slid it on to the same distance as the unmodified tail cone slid on. I don't like using cam locks on the pods, they cannot be retained in the pod like they are in the cowls, you have to remove them and keep track of them. If you lose one in the grass, you had better have another one that is the right size to replace it. I use #10 bolts and nut plates. What is more, I've worked with pods for years and found the bottom attachment is the hardest to do - so instead of using 6 o'clock, I rotate it about 20 degrees, put the first and then 1/3 of the way around the pod you place the next and then the third. . That works out to be 1 o'clock (which I put on the outside where it is easiest to do, then 5 o'clock and then 9 o'clock - on the inside where you are more cramped to be using your little screwdriver or portable drill. The tail cones have never been interchangeable in my experience - so why make the mounting identical? Put the mounting points where you can get to them easier.

Here's the result of the splitting of the bottom seam when trial mounted:



So you need to add some Bid to freeze it as expanded - yes you are making the cone slightly concave on the bottom as you do this. When you have let that Bid cure you can take the pod off and lay up Bid aft of the area where the pod is overlapped - you don't want to reduce the inside edge of the tail cone.

Now, I forgot to make photos of the adding of nut plates with rivets and bolts to hold the tail cone on the pod - to their credit, the pods have a wonderful step down edge to which you can push the tail cone on and it remains very much straight from nose to tail; that step down is actually a cork shape - it expands as you slide the tail cone on the pod. While I'm at it, I found that there was some "flash" on the very trailing edge of the pod itself that needed to be sanded away. I was not trying to lengthen the pod, but I only slid the tail cone as far as you can see in the photo above, matching it both pods - and it is easy to be sure the cone/pod gap is the same all the way around; there is plenty of meat for a good connection with 3 bolts and nut plates - it was easy to do and in putting in the nut plates and bolts I disregarded the Featherlite (maybe the Tifft) plan to put in a loose cam lock - I love cam locks on the cowls, but Dave Ronneberg points out that they don't hold the cowl firmly in one position. He insists on screws and lock nuts on the leading edge and trailing edges of the cowls - Camlocks only allowed on the side because he's seen too many marching cowls that have about failed with Camlocks on leading edge - I've heard of several who have lost their Camlock because they must, every time, insert a loose Camlock body through the strake edge into the cam lock bowl fixed into the cowl lip. Camlock bodies can do wonderful prop damage if they go through

the prop. Now, on the sides, you can fix the Camlock bowls on the underlying wing and fix the body in the cowl itself with a split washer that retains it as long as the hole for the body is the correct size, even if you fail to use a screwdriver and lock the Camlock just one time. So I was reluctant to do the same with the Camlocks - you'd have to remove the Camlock body, keep track of them and get them back in with the correct depth for each (Plans suggest longer Camlock body on the bottom - if you screw that up, maybe even mix up the correct receptacles you can lose the pod contents and the tail cone for the rest of the trip - if you lose a #10-32 screw during the loading process, you can find one elsewhere on the plane - I carry lots of them for cross-country. (Bill Oertel saw his tail cone off the resort in Mexico, we made the mistake of finishing lunch instead of asking a fisherman to go out and pick it up - where it was floating dip down, and the plane flies fine - he had to tape the contents in with tape strapped against the prevailing wind for the trip home...) By the way, I've flown with one wheel pant on and the other off - I thought I'd proved it was the same with one Baggage pod before. But recently I put only one pod on and had a terrible time with rudder trim, which makes me wonder if it was improperly mounted, I found it certainly was. I've been studying that as I build up the pods.

Moving on to the mounting. The first thing you do is lay up the strap that attaches to your wing. I had a pair of these straps that had been painted and had to dig a while to find the straps in my cluttered hangar and bring it to my Berkut. You see, I want to make the pods I have ambidextrous for my 3 planes. I ordered up a set of pod anchors for my next set of wings. Mr. Yoshikane sold them to me for nothing this time. I thought they were kind of expensive but there are 12 of these specially created parts. I have an older memo on putting the anchors in virgin wings. (19SIII9) So, I have no photos to show the first stage. I had to accept the orientation and distance from centerline of the straps and they are clearly off angle. So the lineup of the pods had to delay until the pylon to the strap stage.

Here are the official instructions:

3. Underneath each wing, measure out 50" for the VARIEZE and 61" for the LONG-EZ and COZY, 74" for the COZY Mark IV from the nose/prop hub plumb line and draw a line that extends beyond the leading and trailing edges of each wing.

I don't know the measurement for the Berkut - probably easy enough to calculate if you know the length of the spar - which is a "C" spar

instead of the Long EZ spar which is a full box - with the longest measurement on the missing front of the spar in the Berkut.

4. Run plumb lines from the leading and trailing edges of each wing to line up with the lines on the floor that are 50" or 61" out from the nose/prop hub line.

Lining up the nose/prop hub line is not all that easy because your nose wheel will be in the way - if you raise the nose off the ground - you have to hope the nose will be in the same position when you go back to the pitch level that you expect to find in cruise flight. This was the nose gear retracted method - didn't work:

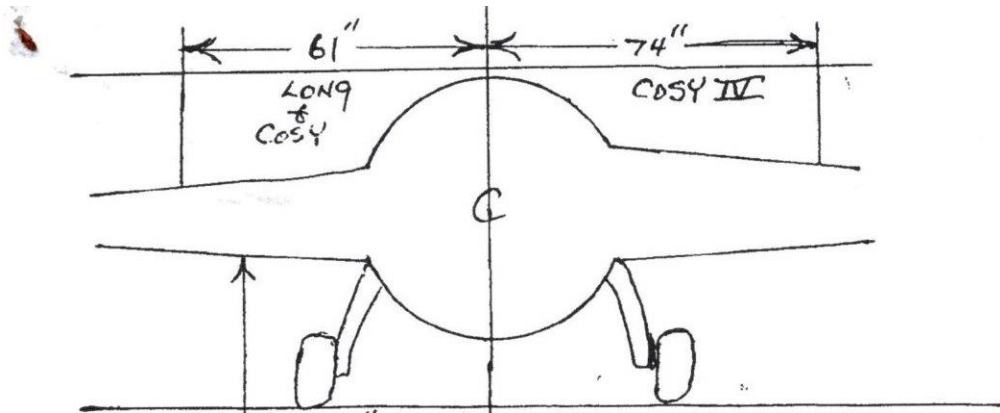


Then I tried cocking the nose wheel so I could run a chalk line from directly below the pitot to the prop centerline (in my case a little pointy spinner).



The white line behind the tire is the hangar's painted centerline - I found that I had trouble getting the plane exactly over that centerline - but when I started measuring various pairs of points on the wing and canard above the floor I started realizing how uneven this apparently smooth floor was - I gave up on being sure the plane was absolutely level in roll and decided to use local wing to floor distance using my cradle to set the elevation of the pod in the local area. I found that I could raise the right wing to match the distance between wing and floor on the left side without adjustments - I did my measurement at the strap.

Now the plans have a simple way of installing the strap that I couldn't use because I had anchor holes already - my original strap was cocked toe out and I had to make my strap fit the anchor holes this time too. But here are the instructions for the Bruce Tifft approach:



5. Put duct tape 8" to 10" each side on the bottom of the wings (and ailerons EZ only) and lap the tape up over the wing leading edges 6".
6. Draw a line on the duct tape from the front to the rear plumb lines.
7. Lay up 7 plys BID 7" wide, long enough to extend from 1/2" on the front of the aileron (EZ only) up and over the leading edge by 3" to form the mounting strip. Wet the 7 plys of BID and roll it up. Unroll the wet BID starting at the leading edge. After about 6" of the BID has been unrolled, use duct tape to hold the 7 plys in place and continue to unroll the BID to the back, centering the BID over the plumb line on the duct tape. As the BID comes up over the leading edge, it will have a tendency to follow the flow of the wing and should be pulled to line up with the plumb line on the top of the wing. On the LONG-EZ, you can put in two more inserts per pod and shorten the 7 ply BID strap to 5" behind the back of the pylon. About 29" long lay up.



10. Using a Sears degree finder attached to a fuselage longeron, determine how many degrees up the nose of your plane is in level flight. On the ground, raise the nose of the plane to match the flight degrees. Most are 1-1/2 degrees.

With the Berkut, the longeron came up level with the nose gear full extended electrically - this offset of the nose wheel may cause a slight difference in roll...

For the Long EZ, that is a couple of degrees nose high, for the Berkut it was level - easy enough to determine with a level:



8. Construct a cradle to hold one pod up to the wing on the plumb line. Hang plumb lines down from leading and trailing edges of pod.
11. Locate the water line on the pods running a line from the tip of the tail cone to the nose of the pod. You must hold a string out from the pod and look from the side to do this. Bondo a small block of wood on the water line and sit the degree finder on the wood block. Position the pod in the cradle so that the nose is 1/2 degree nose high.

This actually seems pretty wrong - you raise the nose of the plane to the in flight cruise level - you don't want the pods to go up hill with you too, I don't think - they might look better, so your choice. Better, as 90% of your time is in cruise, to have your pods directly into the apparent wind - I'd keep them level. My Berkut issue was a non-issue - didn't have to do any of this. The cradle needed to be constructed to have the pod's nose and tip at the same elevation above the floor - I had a little table that was a little tall, so I constructed the cradle and later took off the wheels and slide it along on the metal pieces that remained - I've had people suggest the pod could be as close as 4" to the wing but with all that pylon, why not leave it near full, it can and has provided some fuselage

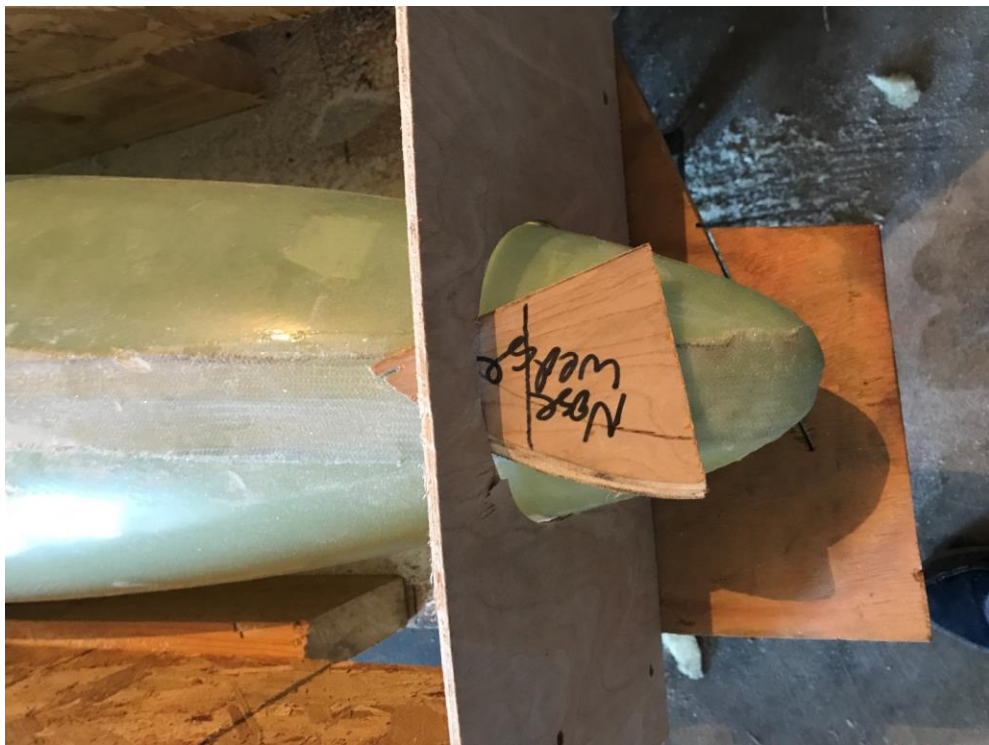
relief in off-airport landings this way - I used cardboard on the front of the cradle to decide where to put a hole for the nose of the pod:



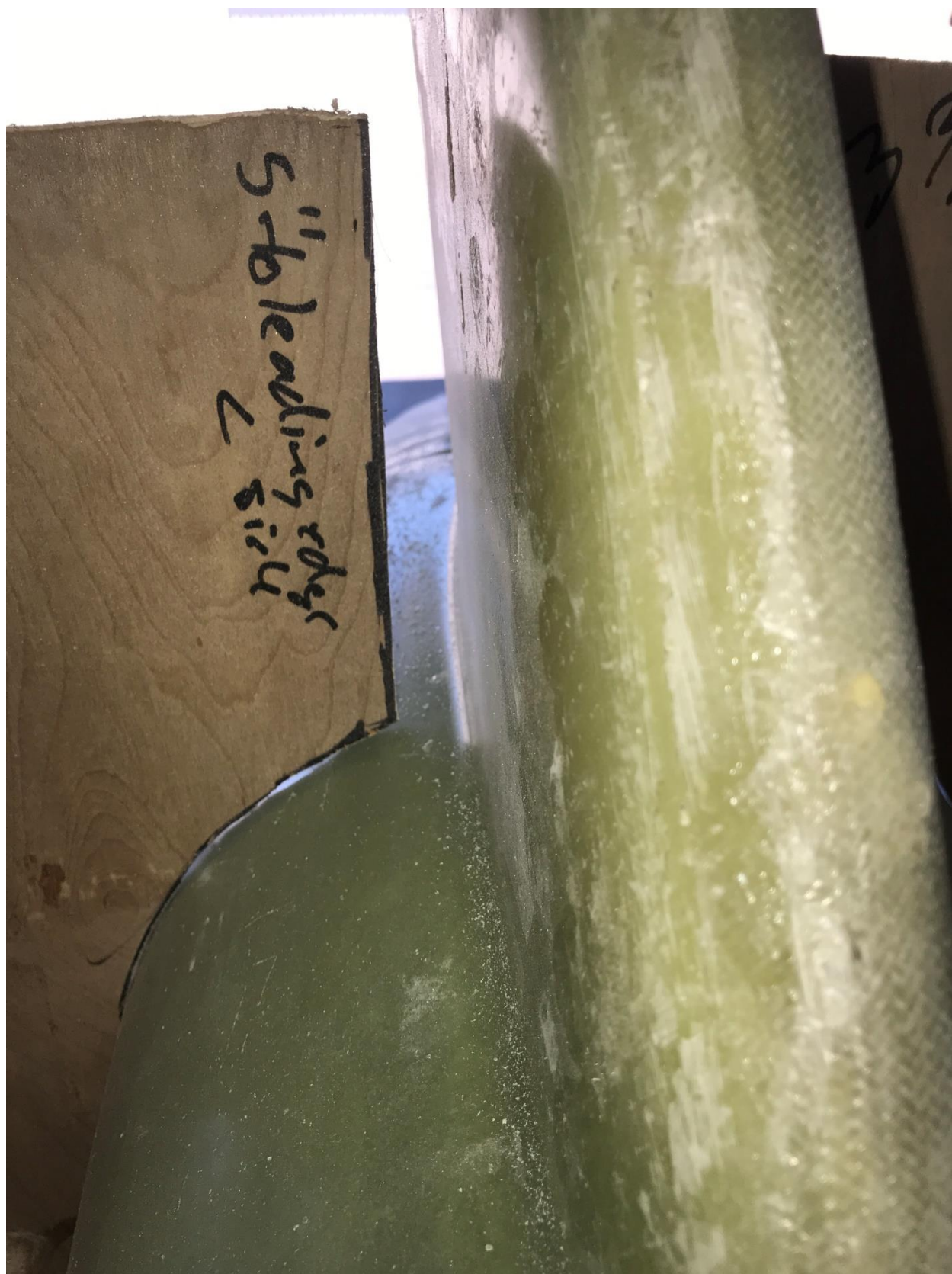
I recreated a plywood nose holder and then wedged the back of the pod so it was level...and created the two side supports for the rest of the pod.



I screwed down the adjuster (above) to level the rear of the pod and used a little rear height "adjuster" to be sure the pod was level:



and used a feature of the cradle to be sure the pylon was vertical:



9. Mount the leading edge of the pylons at the leading edges of the wings.

Easier said than done - if you had a wonderful curve creator that would do this in three dimensions, you'd be set. I decided to approach it conservatively and move the pod aft into the wing - trimming away about $\frac{1}{2}$ " at the front and $\frac{1}{8}$ " at the rear each time. Each time I moved the pod aft - I checked the distance to the centerline was the same at nose and tail of the pod. Because I didn't have a measurement setting the centerline of the strap already on the plane I had to keep adjusting and measuring the distance to the aircraft centerline - and yes I was moving both the nose and the tail - and yes your eye can be this far off over about 6' of curving pod - I crossed out the prior marks front and back - this is the nose of the left pod:



This is the matching set of marks for the rear tip:



If you had already put down a pod centerline on the floor you won't have to do this, and with my strap decided location I came up with 61.25" on both sides - my measurements actually came to (note the use of a tool to be sure I was measuring 90 degrees:



The center blue chalk line disappears in this photo - it was there.
 The Hangar centerline remains right of Aircraft centerline at the
 back of the airplane too.

12. With a marking pencil and a block of wood the thickness of the gap between the front top edge of the pylon and the 7" mounting strip, mark a line on each side of the pylons from the front to the back. This will mark the curve that needs to be cut in the top of the pylon to fit the mounting strip. Trial fit the pylon to make sure the pod's pitch is correct. Then cut 1/2" more off the first pylon. This will give you a little leeway on the next one.

My

cradle gives me a fixed "approach" so I ignored instruction 12.

But the pods have to be lined up correctly and trimmed to the profile of the swept wing - so I started by cutting back the pylon when level in the cradle: - and it turned out that I had to slowly move the pylon back about an 1/2" with each cut back, and you can double the cut by simply drawing an estimated line and move the pod back an inch each time:



This was the first "by eye" trim. Then I slid the cradle toward the wing and started trimming:



I used a stir stick to mark each side of the pylon...and eventually cut that back to a brush handle under the horizontal part of the wing and the stir stick on the curving leading edge. I followed this approach about 12 times. Eventually I got in the habit of making my marks and then sketched another $\frac{1}{2}$ " of leading edge cut out. I used an angle grinder to carefully cut through the skin (biased upward in the foam) and then used a flat sanding bar to bring the foam down to the level.



Eventually I had the leading edge of the pylon to the leading edge of the wing:



Obviously the cut out follows the right wing's sweep. Big step, sand the top 1" of the pylon before going on - and sand the soon to be exposed part of the strap too. In my case because I had to attach my strap by bolts, I removed them and replaced them as I sanded - and I put some clay (red) in the bolt to keep it clear of epoxy later - with a brand new glassed strap that you apply, you don't have to do the bolts and anchors until after mounting the pylon to the strap:



13. Bondo all around the pylon to the mounting strip with a small radius and sand, then lay up three plys BID, lapping 2" onto the pylon and onto the mounting strip. Sand the pylon and the mounting strip dull where the BID overlaps and peel ply.

I don't like using Bondo for this, it does provide a quick fit... So for my next step, I microed the pylon to the strap - I found I had to remove the ladder under the wing to get the parts close together. For those who haven't made micro- I used Gougeon Brother's West System (you can get it at about any boat or wood working store - I actually used exactly one quart kit for the entire process from assembling the pods to mounting the pods on the straps (but not the whole straps - I earlier had to redo the leading edge of the two pre-built straps I had - they were likely more properly lined up with some prior aircraft's centerline and I was trying to utilize the anchor positions already in the wings for them.

So the micro consistency is set by how much micro you add to the epoxy in the cup. It stands up and loses it's shine. I made up two squirts of epoxy and found it worked for one pylon/strap attachment.



I'm sorry the hangar's door track can confuse this photo...

Of course you have to check your pod centerline and how vertical the pylon is - as you did as you were cutting down the pylon to fit the

wing. I scraped off flush the extra micro as I wanted to make a stronger pylon to install a Flox corner:



Then the flox corner using again, a single squirt of epoxy, but before you put cotton flocks in the mixture you use a brush to pre-wet the two surfaces you will be applying BID tapes to then you mix in the cotton flocks which mixture is then called flox. Here's the consistency I like:



The rounded end of the stir stick can make really nice flox corners:



Again, you need to cut the tapes on the 45 - it will not go around tight spaces if cut at 90 degrees and will not be as strong as all the fibers going around the corner from the vertical pylon to the horizontal of the tape above.



I build the BID tapes in advance, but it is not vital if you keep building - and here I also build them on marked Aluminum foil and then fold them about 90 degrees down the length of the tape so that it is ready to be applied.



So with the tape up against both surfaces you use your gloved fingers to apply the tape firmly by pushing through the tin foil. When the tin covered BID tape is very much in place, you peel the tin foil back on itself - so it doesn't "suck" the BID tape of the surfaces and flox corner.



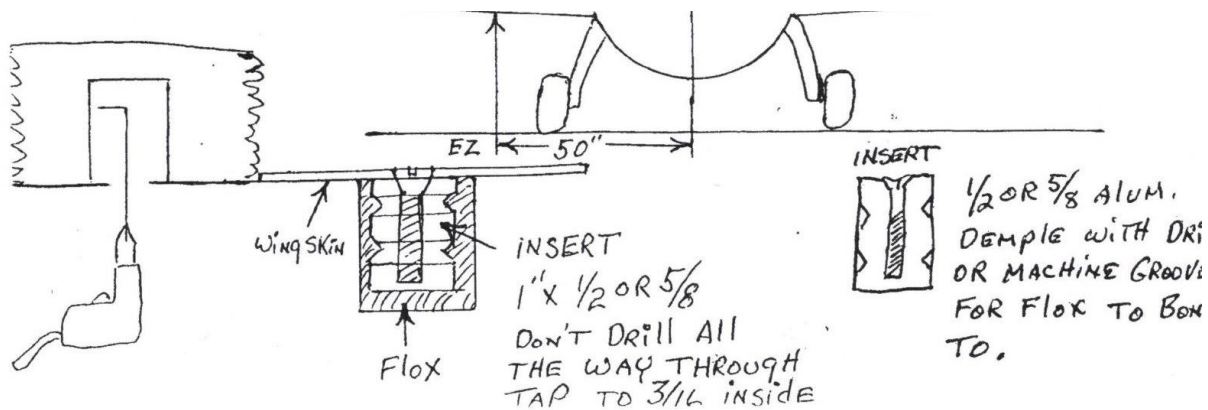
Then use the wet brush again to poke the BID tape against the surface, you really can't squeegee any epoxy out of these joints. You leave the cradle and pod in place to dry - you cannot use heat to cure the tapes - you can so easily melt the blue foam in the wing - not a good idea - particularly here.

Leave the first pod to cure overnight.

14. After mounting the first pod, run a piece of 1/4" clear plastic tubing from its nose to the nose of the second pod. Fill the tube with water and adjust the second pod until the water is level. Repeat the process on the tail cones. The wings must be level when mounting second pod.

This could be done a number of ways. Theoretically if the cockpit longerons are level the wings are level - but I found my plane had a kind of left bank on the tires - I suppose I could have let the air out of one to level it - but I didn't have a water tube.

I had already removed the ladder, but I checked the left wing was the same distance off the floor locally and used my cradle to set the height of the left pod.



This stage had already been done on this plane - so I refer you to the library item I created putting pods on a Long EZ previously.

16. Remove the pod from the wing, using paint stir sticks so that the paint job is not ruined. Trim the 7 ply mounting strip to a 6" width and feather the edges smooth.
17. Fabricate 8 aluminum inserts for EZ and 12 for LONG-EZ and COZY for 3/16" screws. DO NOT drill the hole all the way through the insert. (Shown below)

I bought 12 anchor aluminum inserts from Yoshikane for the Long EZ - something like \$80, but you might check with him. I haven't looked for other sources: Pat Yoshikane
Huntington Beach, CA 714-271-6509 patyoshikane@gmail.com

18. Drill the two holes on the top of the wing and the four holes two in front and two behind the spar-cap up to 3/8. Use a spot facer 1/2 or 5/8 with a 3/8 pilot and go 1-1/8 deep into the wing. Take a wire shown below and clean out foam inside each hole. Put a piece of duct tape over the hold and cut out the tape over the hole. Put a piece of tape on a larger washer and mount to insert. Put slow flox into the hole (be careful not to put too much flox into the hole or it will push out the insert - air will do this also). Weight or tape the inserts in place and let cure. When the flox has cured, remove the tape and washer.

On my Berkut, the service I used to install my original Berkut pods not only got the straps toe out but drilled right into the channel for the strobe light wiring – and floxed all the wires in place – in a subsequent wiring exercise I had to pull the wire and the flox glob out of the 1" foam channel and move the anchor points away from the spar and the strobe light wiring channel – I'd mark up your tape with those locations very carefully from plans and studying the location of those structures before drilling any holes.

19. The pod can now be mounted permanently. If the pods are removed, the screws can be inserted into the inserts and the heads will show or the screws can be left out and the 3/16" holes will show.

The Anchor aluminum Yoshikane sells has a beveled recess and the heads of round Phillips head stainless #10 bolts will actually bury a bit inside the anchors with the pods removed. While I've seen two Variezes get less damage when the gear is knocked off – because of pods, and I've seen a plane that spun onto the threshold of a runway after hitting a fence and the pods were knocked off the aircraft without damage, I will quote Berkut Designer Dave Ronneberg who calls pods "wing breakers" and yet I don't think he knows of a wing damaged by pod impacts. Nevertheless the plane flies a little faster and looks better to me without pods so I remove the pods most of the time and carry extra bolts as stainless will gall... I like #10 bolts for virtually everything so I can salvage parts off the rest of the plane when away from home and needing a critical bolt. I find that a small table (the base of the cradle) will hold the pods with a few wood screws through the mounting holes – I save all the mounting hardware between the pods on that small table in a plastic bucket with lid that I also screw to the table. If the table has wheels, it will be even easier to store in the hanger. I've seen pods secured to overhead beams and they are big items...