

THE COZY NEWSLETTER #21 April, 1988

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BUILDER SUPPORT

We continue to support Cozy builders by newsletter, replies to personal letters, and telephone calls. We mail our newsletter directly to subscribers in the U.S. and Canada. Builders in other countries receive our newsletter and that of Co-Z Europe directly from Uli and Linda.

---Co-Z Europe has hit the ground running and is actively promoting the Cozy in all countries. including Canada, but not in the U.S. They will continue to sell information kits, plans and Owners Manuals. and perhaps some items of flight clothing if they are successful in making the arrangements.

Their address is:

Co-Z Europe

Ahornstrasse 10

D-8901 Ried. W. Germany

We still have a supply of A Drawings available, and Owners Manuals. and have procured a new supply of Cozy decals in brown, black, red., blue and green. These are available at the following prices:

A drawings \$15.00

Owners Manuals \$15.00

Decals (specify color) \$5.00

Info Kits \$9.00

We continue to receive inquiries about plans. but have to advise that they are no longer available from us. In a few cases. we have assisted people who missed out on the deadline to locate a previous plans purchaser who is not building. In these situations. we cannot execute a license

agreement. because the plans were not purchased from us. We occasionally hear of people building a Cozy who did not purchase plans from us. so apparently some plans are changing hands.

OUR ACTIVITIES

Winter is the popular time for vacationing in Arizona, and we have had our share of relatives and friends as house guests. Builders vacation here too, and a number of them stop in to say hello, so we have not lacked for visitors during this period. Since January, I have been working more less steadily on the Mark IV. It is essentially a one-man. part-time operation. so progress is slower than desired. I am about 20 months into the project to date. The Mark IV is all painted now, except for the inside and top of the fuselage. We turned it upside down for finishing and painting the bottom, which is the only way. With the aid of an engine hoist and a few friends, turning it over was a breeze. I am just starting now on instruments, wiring, and engine. We still hope to make Oshkosh 88.

AEROMET

The end of February, Ken Winter flew the Aeromet 4-place in from Tulsa OK to Falcon Field, Mesa, to visit us and show it off. It was still in gray primer, but looked very nice. It attracted a small crowd of local builders. Ken is delighted with the flying qualities, and claimed some very impressive performance numbers. It is equipped with an on-board computer, servos, and sophisticated nav equipment for remote, drone operation. The turtleback is completely removable for the installation of electronic weather monitoring equipment. They are anxious to get it out to Kwajalein, where they are under contract to monitor weather in the missile range. According

to Ken, they are ready to start building one or more additional aircraft.

Ken stayed with us overnight, and then performed a number of fly-bys the next morning before departing for Tulsa. His glowing report makes us anxious to get ours finished and flying.

ACCIDENTS

To paraphrase a familiar quotation. aviation is not inherently dangerous, it is just less forgiving of carelessness and mistakes.

We don't have any Cozy accidents to report, but a friend and Cozy builder relayed to us 3rd or 4th hand the following: A builder was flight testing a Velocity at 4,000 ft. and at what he calculated to be the aft c.g. limit. In slow flight with full aft stick, he experienced a main wing stall. The aircraft began to fall with wings level in a very nose-high attitude. There was no response to any combination of control and power input. The pilot unbuckled and leaned forward to the instrument panel. Still there was no response. Nothing he could do would get the nose down. The aircraft hit the water in a nose high attitude and the pilot was seriously injured.

It was reported that the builder-pilot had made two design changes: 1) He had moved the front seat back 3 in., and 2) he had enlarged the fuel tanks to hold in excess of 80 gal. It is not known whether he had made any other changes.

Normally the designer sets the aft c.g. limit a little forward of the point of neutral stability, so there will always be a nose-down tendency. On a canard, he also selects the airfoils and incidences so that the canard will reach its maximum lift, or stall, before the main wing, provided the c.g. is within the recommended limits. Assuming that this is true of the Velocity, what could have gone wrong? I can think of several possibilities :

- 1) When the builder moved the front seat back 3 in., did he revise the formula for calculating c.g. accordingly?
- 2) When the builder revised the fuel tanks, did he calculate a new c.g. for the fuel tank, prove it by weighing, and correct the formula for calculating c.g. accordingly?
- 3) With the larger fuel tanks, was there more room for the fuel to flow aft when in a nose-high attitude, so that there was a greater c.g. shift than expected in flight?

Any of the above would have caused the actual c.g. to be farther aft than calculated, and could explain the departure from controlled flight.

If you contemplate a design change, bounce it off us. We may not agree, but we will at least explain our concerns, which may be of some help to you during your test stage. We have already cautioned a couple of builders about enlarging the fuel tanks outboard because of the adverse affect on c.g. We don't want to spoil your fun; we are just trying to help you build safe airplanes.

CANARDS

The R1145MS (Roncz) canard airfoil was developed by the Rutan Aircraft Factory as an option for the Long EZ for those pilots who frequently flew in rain and objected to the pitch trim change characteristic of the GU airfoil. It had a significantly higher coefficient of lift, which necessitated reducing the canard span, and increasing its angle of incidence. Even so, it could raise the nose higher than the GU, so vortilons were made mandatory, to provide an additional margin of safety against main wing stall. Side benefits were a slightly higher top speed, because of the

reduced span, and a slightly lower minimum speed because of the higher angles of attack. Disadvantages were that the new canard was more difficult to build, it had a different stick

feel, and it might be more dangerous at aft c.g.s. The R1145MS elevators have less trailing edge up travel, and more trailing edge down travel than the GU, which gives it more nose up authority, and less nose down authority than the GU, and hence the concern about aft c.g.

The Cozy does not require as much canard airfoil as the Long EZ, because of its wider fuselage, which helps the canard in lifting. Fuselage lift is destabilizing, however, which is the reason we increased the incidence on the canard 0.5° more than on the Long EZ, and moved the aft c.g. limit from 103 on the Long to 102 for the Cozy. We believed (and RAF concurred) that adapting the R1145MS airfoil to the Cozy would require further restricting the c.g. range, which would be highly undesirable in a side-by-side configuration with variable loads in the front seat. So we took the position of not recommending the R1145MS for the Cozy.

It was inevitable, however, that the 'lure of no trim change in rain would be too much for heavy IFR pilots to resist. There are several R1145MS canards under construction, and one is already flying. So far, they are all different. Some have dihedral, others not. Some have fancy tips, others not. Spans vary. All have increased incidence. The builder already flying is still in the initial test stage, but is very pleased with the results so far. He has been very cautious in testing at aft c.g.s, but has not found any tendency for main wing stall. He has observed at aft c.g. and full power cruise he must hold 6 to 7° of nose down (trailing edge up) elevator to maintain level flight. This is much more than desired, but at a condition he would not normally fly. He has sent us his test data so far, and hopefully we will have more to report in our next newsletter.

COMPLETED PROJECTS

Wm. Spreuer has sent us an invitation to his "coming out" party, prior to taxi testing. We regret we

cannot attend. Aren't there more of you almost ready to fly?

BUILDER HINTS

1) Tim Freeze advises that McMaster-Carr (312) 833-0300 has 94818A033 locking clips available to hold wing attach nuts in place inside the center spar. Sounds like a good idea:

2) Mike McCallum suggests wrapping used epoxy brushes in plastic and popping them in the freezer to prevent curing and to save until next needed (They can also be washed out with soap and hot water).

3) Bill Thomas suggests sanding gear legs outside, wearing a mask, long sleeves, and gloves, to minimize discomfort from broken glass fibers.

4) He suggests holding the 18 layers of glass for the gear attach brackets in place with pins around the edges so they do not slide around when weighted down for cure.

5) He suggests cutting the UND for wrapping the gear oversize to ease placement.

6) He suggests taping a piece of foam in place between the gear attach tabs and then guiding the spot facing tool through the foam for a perfect fit of foam under the steel tube.

7) He suggests using a large hypodermic syringe to lay down a bead of micro in inside corners. He then cleans it with acetone or MEK for reuse later.

8) He points out that wiring is easier to install if you locate a conduit under the armrests before installing them. He suggests 1" CAT. We used 1" thin-wall PVC sprinkler tubing. Wrapping with aluminum tape provides electrical shielding.

FINISHING AND PAINTING

Finishing and painting is sort of a mixed blessing. On the one hand, after staring at nothing but fiberglass for 2 or more years, it is real satisfaction to start covering it with something of a different color. On the other hand, finishing is a lot of work (a lot of sanding and filling), and some builders approach this stage with considerable trepidation.

Forget about turning the project over to an auto paint shop. Most of these shops would not know how to prepare a composite airplane for painting, and even if they did, an airplane has so much more surface than an automobile, the cost would be astronomical.

I do not consider myself to be an expert on finishing and painting. My total experience in the last 10 years is finishing and painting 3 airplanes. I consider my work to be less than "Best of Show" quality, but rather between acceptable and good. Having cautioned you, I can now pass on some of the things I have learned.

The challenge is to bring your airplane up to perfect contour and surface finish using the least amount of the lightest possible materials. This starts with properly shaping the foam, and anticipating where you will have overlaps in the glass, and recessing the foam accordingly to avoid bumps in your lay-ups.

Over the glass, the best filling material is micro, mixed as dry as possible, but still spreadable. Micro does not spread or trowel well, so expect to make repeated applications with sanding in between. The "West System" (Gougeon Bros.) is recommended, rather than the epoxy used for lay-ups, because it cures faster and is easier sanding. Applied Plastics (Hexcel) makes a similar epoxy, but I have not used it. Sanding straight surfaces (airfoils) or flat surfaces (strakes) should be with a spline at least 16 in. long. This could be either a straight board, but I prefer the "Hand File Boards" sold at auto paint stores. Sandpaper is available both in rolls and strips, either with or without adhesive coating. 36 grit is used for rough contouring, and 60 grit later for a smoother surface. Check surfaces with a straight edge. If you can see light under it, mark with a pencil and fill with more micro. The better the job you do with micro, the less work and filling you will have to do later. Take your choice. Bring everything up to final contour and fill as many defects as you can with micro, before proceeding to the next step.

The next step is "surfacing", in between contouring and priming. You will need a "high build" material to fill the defects in your contouring, and most of this should be sanded off again. Do not use FeatherFill. It does not have good adhesion to glass. Sterling polyurethane has been recommended by RAF, because it cures in about 20 minutes. That makes it difficult to apply by either brush or gun, however, and it is prone to pin-holing. You should mix in as many micro spheres as possible, to reduce weight and add bulk. If you spray, be sure to filter the mixture first.

For paint, I prefer Ditzler Deltron, which is an acrylic urethane which cross-links when it cures. I haven't tried DuPont Imron, but I think Deltron is easier to use. A "slow" solvent allows more time for the paint to flow out, and reduces the problem of overspray. But because it

dries more slowly, there is greater exposure to air borne debris and bugs.

Plan to use at least 2, and better 3 wet coats. The first coat must be light, to prevent running. Wait 15 or 20 minutes for it to flash dry, and then follow with the second coat. It can go on a little heavier because the coat underneath soaks up some of the solvent. The 2nd coat should be sprayed in a different direction than the 1st to prevent heavy and light areas from corresponding.

I have never tried to paint an entire airplane all at once. I think it would be a disaster. I turned the Mark IV upside down to paint the bottom of the fuselage and strakes. Likewise, I painted the bottoms of the wings and canard first, then, after cure, turned them over to paint the top.

Trim colors are best applied first, without masking, using a fast dry lacquer. Then mask off the trim, lightly sand the areas where the trim color over sprayed the primer, and you are ready for the white. 3M makes a narrow, green, polypropylene masking tape which can be curved and is ideal for making a clean edge between colors. Make sure you iron the edge down well to prevent wicking of paint underneath the edge. Masking tape should always be removed as soon as the paint is tack-free, and before it hardens. Tape should never be pulled away at a 90° angle to the surface, because it can lift

any paint that is not well adhered, and won't give you a clean line. Rather, it should be pulled back against itself at a 180° angle, so it cuts through the paint where it overlaps the tape.

You should prepare thoroughly ahead of time for painting. You should have a professional gun which is clean. Check that the air and paint nozzles are not plugged, and that the valves work smoothly, and that the canister vent is not plugged, and the canister gasket seals tightly so paint will not drip. You will need at least a 2 hp compressor with an adjustable pressure regulator and a water trap. You will need enough hose to get around all sides of

your work.

Make sure you have enough paint and solvent. Use a standard automotive color whose formula is on file at all paint stores, so you can match it if you need more. I use Chrysler "Spinnaker White". After mixing paint, catalyst and solvent, filter before putting in canister. Filters are usually supplied free with the paint, otherwise use a silk stocking (nylon). Everything possible should be

vacuumed. Pay particular attention to any sanding debris close to where you are painting, which could become airborne when spray hits it (like inside wing attach cavities). The floor should be wet down, and the surface to be painted wiped down with a damp solvent cloth, and then a tack cloth. You will need a charcoal mask. If you wear glasses, wear an old pair. Use ply 9 on you hands, so you can wash the paint off with water.

When all is ready, check your spray pattern on a piece of plywood and adjust air or paint as necessary. Wear a short sleeve shirt and tuck the tail in you pants so you

don't drag a sleeve or a tail through the fresh paint. When reaching out, drape the hose over your shoulder so you don't drag it through the paint. Start the gun away from your work so the initial blast doesn't make a heavy spot. Hold the gun a constant distance from the work (about 8"), and make sure you keep it moving at a constant speed. If there is any air movement, spray in the direction of the movement to keep overspray off the fresh paint. Add a little extra solvent for the 3rd coat to improve flow out and reduce orange peel.

What I prefer for surfacing is an epoxy surfacing primer, which I buy from the Viking Paint Co. in Minneapolis. It is available in yellow and gray. I use the yellow, loaded with microspheres, for surfacing. It dries in about an hour, but has a 48 hr cure, so I wait 2 days before sanding. It adheres and sands well, and after cure is solvent proof. If the sanding of the surfacer shows up large low areas, I either fill with micro or spray on more surfacer. I use "Bondo" very sparingly. The surfacer is also spline sanded starting with 120 and going up to 220. In Each step you must look for pin holes and fill them. Use a trouble light close to the surface so the pin-holes show up with shadows. Spot putty can be used to fill pin-holes, but use it sparingly, because it can be redissolved with solvent. Micro or Bondo can also be used. Sand away the surfacer until you start breaking through to the layer underneath.

After surfacing, I use the gray epoxy primer with no microspheres. In spite of your best efforts up to this point, you will still find pin-holes and defects which require filling. Depending on the magnitude,

you may have to prime again. Spline sand the primer in steps up to 400, until you just start to break through in some areas. Wet sanding is faster and cleaner than dry. Wet paper is available from 220 grit up.

Avoid using any primer (such as "lacquer primers") which does not use a catalyst to cross-link it. If you ever have to repaint, you will regret having anything underneath the finish paint which is not solvent proof.

The primed surface must be perfect. That means no dips or ripples, no pin-holes, and no scratches deeper than 400 grit, because the final coat will hide nothing. The primer coat should be shiny like a mirror.

I have never had the benefit of a spray booth for the final coat. When I asked to use the spray booth at 3M, I was advised that it wasn't necessary. Two options were suggested: 1) Accept overspray and air-borne debris in the final coat, and after cure, sand with 400 grit. Then spray a light coat of clear for a deep, wet-look. 2) Sand the final coat with 1000, 1200, and 1500, then rub it out with compound and buff with a glazing compound or wax. This produces a very smooth and shiny surface.

At various times I have sprayed in my garage with the doors shut (you need a good mask for sure), in the garage with the doors open, in my driveway, and outside at the airport. Outside is best for light and ventilation, but don't attempt it if it is windy, or there is air-borne

debris, or bugs. Bugs are scarcest in the morning, and most abundant in afternoon and evening. Up north, the best place was at the airport, where there weren't any trees, in the early morning when it was calm and the dew was still on the grass.

Clean the gun thoroughly after use, and spray clear solvent to clean internal parts. Don't spray lacquer at high humidities, because it could blush.

Do a little rehearsing ahead of time, to make sure you can reach everything you want to paint, and decide what stroke sequence you will follow. Have a set of tweezers in your pocket to remove anything which falls on the paint in between coats. After the final coat, don't try to remove anything until after the paint has dried. If there are some areas hard to reach with the gun, and not very visible, try hitting those first with a brush.

If you do all of these things well, you should have at least an acceptable paint job. For those professional painters out there, we welcome your advice on how to get a perfect show quality job.

DESIGN CHANGES/CORRECTIONS

NL #20, p.3, rudder drawing: Change 39" to 40"(approx.). Thank you, Mike McCallum

Chap.9, p.7, last para: Change Chap. 16 to Chap. 17

Chap.17, p.1: Material list shows LB-11 bracket and LB-12 springs, but text does not give

instructions for installing. Installation is shown on A-23. LB-11 is riveted in place as well as floxed. LB-12 springs are same as hardware store sells for screen doors.

FOR SALE

1) COZY project ser. #85. Complete through Chapter 20. Remaining unfinished, strakes, fairings, electrical, engine and finishing. (Kids need college tuition) \$8,500 (sounds like a bargain) Bob Bolander, 10203 Aspen St., Austin, TX 78758. (512) 836-3578.

2) Hard to locate heavy extrusions for heavy engine installation. 1-1/4 x 1-1/4 x 1/4 2024-T3 aluminum. Enough for one airplane at my cost of \$25. Mike McCallum, Box 507, Turnpike Rd., Ashby, Mass 01431 (617) 386-7766.

LETTERS

Dear Nat, 12-21-87

Just a note to wish you a happy holiday season and a check to keep my newsletter coming for 2 more years. My Cozy was coming along very nicely until last June when I injured my back in an accident. I haven't been able to do very much at all on my project except for gathering parts, and reading plans, but I do feel lucky that I can at least walk and stand for awhile again. Hopefully by this spring I'll be able to get moving again and get my poor neglected airplane on its gear. Thanks for a great set of plans, Nat. I've seen a lot of plans other builders are using that are generally

pretty bad to say the least. These guys are amazed when they see how good my Cozy plans are compared to theirs.

Happy Holidays

Ed Jasper

Dear Nat, 2-3-88

Have a suggestion for mounting axles to gear leg. Lay up 3 plys BID as per plans. Peel ply and allow to cure. Then apply a generous layer of wet flox to both the outboard and inboard sides where the axle and back plate mount. After cure use a belt sander or wood rasp and file the outboard surface to 1/4° toe in, and in-board surface parallel to it. When surfaces are perfect, flox axles and plates into position, clamp, and cure; then drill holes. This results in perfect axle alignment with no hassles.

Sincerely,

Dave Petrosino

Dear Nat, 1-27-88

Enclosed is a check to renew my newsletter. Also, I want to tell you how much fun I'm having building your airplane. So far since I started 3-29-87 I've worked on the project 1438 hrs, not counting reading time. That averages about 36 hrs per week. I love it: My wife (very understanding) calls it my obsession. The 36 hrs along with the 40 hr week on the job, which isn't related at all to building airplanes. I'm a journeyman meat cutter for a large grocery chain here in the Midwest. I'm 30 years old and have been flying since 1978. I am also a CFI with instr instructor rating and a multi-engine commercial instr. Between work, building, and students, my schedule is full. Here are some weights: Center spar, 28.75 lbs.; wings with end cavity glassed, right 42.0, left 41.75; elevators, right 3.14, left 3.17. Pictures to follow.

Regards,

Dennis Oelmann

Dear Nat, 1-23-88

Thought I would let you know where I am at on Cozy #300. I am just finishing up the fuel strakes. I am going to finish the entire airframe up to the primer coat before installing the engine. I will send you photos before the next newsletter. My Cozy is "per plans", no exceptions. I don't see any reason to mess with a perfect design. I am looking for an engine. If you know of one, please let me know. With a little luck I should have it in the air next fall--maybe summer.

Thanks,

Dave Mendenhall

Dear Nat and Shirley, 2-1-88

Time does fly when you are having fun. Enclosed please find a check to renew my newsletter.

Presently, I am installing the instruments and radios in the panel. The exterior has been painted and is ready for final assembly. There are several small details that will require considerable time. But my goal is to fly to Oshkosh this summer. My completion date is only one year behind. I am sure others have the same problem, my job keeps interfering with my working on the Cozy. It has been a great help having 3 Cozys being constructed locally. One was started last March and now is being fitted with a canopy. Last year we had several opportunities to demonstrate construction techniques of composite airplanes to the local EAA chapter. We hope to see you in July.

Sincerely,

Rex W Pershing

GALLERY