

THE COZY NEWSLETTER #22 July, 1988

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BUILDER SUPPORT

Subscription to the Cozy newsletter (\$7.50!yr.) is mandatory for all builders, because the newsletter is the most effective and efficient way of communicating information to all builders. We answer individual questions by letter (please enclose a SASE) and by telephone. Our office is in our home, so you can call us anytime, except during sleeping hours (We are on Pacific time in summer). Sometimes our phone is unattended, if we are on a trip, or at the airport, or in church, but we have an answering machine and will return. your calls as soon as we are able. If you leave a message, mention the subject of your call, your telephone number, and when to return the call.

Our newsletter is sent directly to subscribers in the US and Canada. Builders in other countries will receive our newsletter and also that of Co-Z Europe directly from Uli and Linda. Their address is: Co-Z Europe, Ahornstrasse 10, D-8901 Ried, West Germany

We still have a supply of A-drawings, Owners Manuals, Info Kits, and Cozy decals (specify whether black, brown, blue, green, or red). Prices are:

A-drawings ..\$15.00

Info kits. ...9.00

Owners Manuals. 15.00

Decals (specify color) 5.00

If you have purchased plans from someone else, we cannot execute a license agreement with you, but we will answer your questions as a matter of courtesy.

OUR ACTIVITIES

For the last 3 months, we have been working as hard as we could to finish up the Mark IV (we even gave up flying for awhile) If we have been tardy in answering your questions, or not spent as much time with visitors as they may have liked, we apologize. It did payoff, however, because we did finish, moved the Mark IV to the airport on June 18th, with the help of several friends, and it was inspected (and approved) by the FAA on June 21, 1988. The FAA now issues all of the paperwork at the time of the one inspection, and all you do is note in your log book and notify them when the 40 hours are flown off.

The Mark IV is larger than the Cozy, and has a more powerful and heavier engine. The design objective, with starter and fully IFR, was 1050 lbs. But when some similarly equipped 3-place Cozys reported empty weights around 1020 lbs., we began to wonder whether 1050 was realistic, and we were hoping that at least we wouldn't exceed 1100 lbs. Needless to say, we were very pleased that the Mark IV weighed in empty at 1070 lbs. After doing the weight and balance, we determined that the optimum battery location was in the rear, rather than in the nose, where we had put it, so after the first few flights, we moved it aft. We could have saved a lot of work, had we known this sooner, but this is one of the reasons the first airplane of any design is considered to be a prototype.

For those of you who might be interested, a brief description of the Mark IV is as follows: It is a 4-place version of the Cozy, which it very much resembles. It was built of the same materials and in the same manner as the Cozy, following the Cozy plans, as much as possible. The rear cockpit was widened about 14 inches to accommodate 2 adults in the rear seat, and the canopy and turtleback height was increased 1 inch to provide more headroom in the rear. The main wing span was increased 2 ft. by going to an 11 ft. (rather than 9) center section spar. Spar cap thickness in the center section and wings was increased 25%, and shear webs were also strengthened. Wing roots were extended inboard 4 inches each side to widen attach points, make it easier to reach the bolts from inside the fuselage, and to keep the cowlings from getting too large. The main gear was made 14 inches (new tooling) wider, the chord lengthened 1 inch and thickness increased ¼ inch. Defiant hardware and mounting method was used to attach the gear to the fuselage. The firewall was moved forward 2-½ inches to provide more engine clearance at the firewall, and a conventional bolt-on engine mount was used. the firewall was beefed up locally to accept the engine mount. The engine is a Lycoming O-360 of 180 hp., and the propeller is a Great American 66 x 74. A Roncz (MS 1145) airfoil was used for the canard.

Systems check out was somewhat more frustrating than expected. There were a few glitches in our pre-wired avionics harness which had to be traced down and corrected before the radios would work. The intercom was picking up the DME signal, even though we had used shielded external wiring and we had to shield the chassis as well to cut out the interference. When we started the engine, we discovered that the oil cooler leaked like a sieve, and it had to be replaced. We planned to use all stainless flexible fuel and oil lines that were advertised as being so flexible you could tie them in a knot, but they were so stiff I was concerned they would cause the fittings on the firewall to fatigue, so I replaced them with Aeroquip 7Q1 hoses. The tachometer malfunctioned because of a mechanical defect in the 3 inch extension required to clear the vacuum pump, and that was corrected. The electronic temperature scanner blew a chip and stopped working because of a voltage spike caused by starter. It was under warrantee, and was replaced, but we changed the wiring and put it on the avionics master circuit, rather than engine instruments, so that wouldn't happen again.

All of these nuisance problems were corrected, but they were a pain, and we began to wonder what was going to go wrong next. In the meantime, they closed the main runway at Falcon Field for resurfacing, leaving only the short runway available for taxi tests, and then the heat wave hit in full force with daytime temperatures of 115°F.

I did a few high speed taxi tests, but the short runway didn't allow me to do even nose wheel lift-offs, and still leave room enough to stop. I slept on the situation overnight, and decided the only reasonable option was to give it full throttle and go. So I got up real early on the 24th while it was still a cool 90°F, and went for it. The Roncz (MS 1145) canard didn't lift the nose wheel off early, like the GU I was accustomed to, but at about 83 mph the nosewheel came unstuck, and the Mark IV jumped into the air, and it was flying.

During my several taxi runs, the oil temp went to 240° before I shut it down, so I was anxious to see where it would stabilize in the air. I climbed to 9,000 ft., and the oil temp stabilized at 240° F. I decided that was too hot for my new engine with chrome cylinders, so I throttled back, descended, and landed. On landing, the Roncz canard played out sooner than the GU, and the nosewheel went ker-plunk on the runway, rather than easing down the way I am accustomed to.

On the first flight, the Mark IV handled beautifully over the entire speed range. It was smooth, quiet, solid, etc. In slow flight at 60 mph (c.g. at 100.5) it was very smooth and solid. At aft stick, there was no bobbing or tendency for Dutch roll. The airplane flew just great, so I decided to concentrate on getting the oil temperature down, and the CHTs balanced. Over the next several days, I tried different things. Most effective on the oil temperature was to put a 1 in. high "boat windshield" 1 in. ahead of the oil cooler outlet, and to run a 3 in. aeroduct duct directly from the scoop to the cooler. Oil temperature now peaks at 200° at full throttle, and I still have a couple of more things to try. I also discovered that by building baffles in my bottom cowlings, it is possible to direct the air to different cylinders. In general, cylinders 3 & 4, closest to the firewall, run hotter, because the air has a tendency to pile up at the back of the cowlings. Also, cylinders 1 and 3 are at a disadvantage because the hot exhaust pipes block the fins. So it is a matter of directing more to the hotter cylinders. You really should have CHT probes on all 4 cylinders--I recommend it.

I am really pleased with my prop! It turns up 2450 rpm static and 2850 full throttle cruise at 195 mph

without wheel pants and spinner. After those are added, it will probably turn up a little higher. The heavy duty brakes, cylinders in the nose on the same side really work great.

I am evaluating an Ellison throttle body (carburetor), which I mounted sideways (slide going from side to side, rather than fore and aft). I guessed that would eliminate the strange phenomena some builders experience of a drop in rpm at full, throttle because the mixture goes lean. I have a theory about why this happens, and it appears my theory is correct. I am pleased with the fiberglass leaf-spring pitch trim Tom McNeilly invented, and will cover it in a later newsletter. You really shouldn't recommend things until you try them and make sure they work.

During the first phase of flight testing, I have settled on a c.g. of 101, and have been concentrating on getting the engine temperatures level between cylinders and oil temperature down. When I am happy with these, I will explore the c.g. range and higher gross weights--although I may wait until they open the main runway and it cools off a bit.

All in all, I am very pleased with the Mark IV. It looks like a Cozy, and it flies great.

YET ANOTHER COZY FLIES!

Bill Spreuer wrote to us on June 7th to report that his Cozy N84CZ is now flying and in the flight test program.. Empty weight is 912 lbs. with an O-320 engine, full panel, but no starter. Bill is in the process of adjusting his engine temperatures as well. Congratulations, Bill, on a pretty

Cozy with a light weight!

There must be a lot of builders out there almost ready to fly. Please let us know when you are flying.

THE RONCZ MS 1145 CANARD

Vance Atkinson has conducted a very complete flight test program on his MS 1145 canard with dihedral, and sent us all of his test data. He has fully explored the c.g. range from 96.9 to 102.5 and was not able to get a main wing stall or divergence from controlled flight, even at aft c.g., full aft stick, and cross controls at all power settings. This is very encouraging, but we don't have any data as yet on a straight canard. Uli has built a straight canard, but has not yet supplied us with data. We have a straight canard on the Mark IV, but have not yet tested it over the full c.g. range, and the data won't be directly applicable to the 3-place.

Vance is delighted that he has no trim change now in rain (he is a heavy IFR pilot), and has not commented unfavorably (as have I) about take-off and landing characteristics. He does believe that he has picked up a few knots of speed on the top end, because of the shorter span, and he made a very impressive showing at Sun and Fun in the race. He was timed at an average speed of 211 mph from a standing still start on the ground, but was penalized 6 mph because he cut a pylon. He passed 8 aircraft which were thought to be faster, and therefore started ahead of him. He finished 11th overall (after penalty) out of 30 entries including Glasair IIIs, Lancairs, Cassutts, Long EZs. Variezes, etc.. Only one Long EZ was faster, but not by much. He also received many compliments on the

appearance of his Cozy. Vance certainly is a credit to the program!

FUELING FIRES

When flammable liquids are transferred from one container to another, an electrical potential is developed. If an electrical path is not provided for this potential to equalize, it will build up until it becomes high enough to jump across an air gap. If fumes are present, they will ignite. For this reason, safe practice is to ground both containers, and then to be doubly certain, to bond them together electrically. When FBOs refuel airplanes, then assume the airplane is grounded, and they bond to either a bonding lug on the tank, or the engine exhaust pipe. In a composite airplane, bonding to the exhaust pipe accomplishes nothing.

There have now been 2 reported cases of fueling fires in Long EZs. Both were extinguished by fast action with a fire extinguisher. As a result, RAF has now recommended installing a bonding or grounding lug through the filler ring. with a cable attached which extends down into the lowest portion of the tank. The fueler would bond to this lug before removing the cap.

We are using an alternate method on the Mark IV which doesn't require cutting into the tank:

We carry with us a 24 in. cable with alligator clamps on both ends. and clamp one end to the cap before removing it (or just after) and the other end to the fuel nozzle. The fuel nozzle is then inserted through the filler neck, and when fueling is completed. withdrawn; the cap is then replaced before the bonding cable is disconnected. We like this system better than the one recommended by RAF and believe it to be just as safe. You should use the system you prefer.

ACCIDENTS

A factory built aircraft crashed into a residential area of Phoenix a few weeks ago enroute to Falcon Field, Mesa, after a stop off at Sky Harbor, Phoenix. to discharge passengers. The pilot was killed, as were 3 on the ground, and one house was demolished. The pilot had 800 hrs of flight time, an aeronautical engineering degree, and was involved with the 99s pinch hitter course my wife took. The aircraft was observed on radar moving erratically prior to the crash.

The NTSB found that the door of the aircraft was open at the time of the crash. and the pilots safety belt and harness were unfastened.

The preliminary conclusion was that the passenger door was not secured after discharging passengers at Sky Harbor, and came open during take-off. The pilot unbuckled to reach the open door on the passenger side, and lost control of the aircraft while trying to close the door. The liability insurance on the aircraft had lapsed. so the heirs of the victims are suing the manufacturer of the aircraft.

The purpose of mentioning this accident is to remind all of you that in an in-flight emergency, the foremost pilot responsibility is to FLY THE AIRCRAFT. People have been killed trying to close doors and canopies, even though the aircraft could be safely flown with them open. In and emergency, remember: FLY THE AIRCRAFT!

ENGINE MOUNT INTERFERENCE PROBLEMS

1) Some builders using the short mount for the 0-320 engine have reported an interference with the rudder cable bell crank DS-15. There are a number of acceptable solutions, but perhaps the neatest is to replace the bell cranks with pulleys. This solution requires that the brake cylinders be mounted in the nose, which is recommended anyway. It has the advantage that you can run a continuous cable all the way from the rudder pedals to the wing disconnect, and eliminate a whole bunch of nicopress thimbles and sleeves. If you use pulleys, remember to contain the cable. same as with CS 72 pulley assembly. so it can't jump off the pulley.

2) Some builders have experienced an interference between the mechanical fuel pump and the engine mount. We didn't understand how this could happen until we learned that the fuel pump AC 1140295 (stamped on the mounting flange) used by Lycoming on all 0-235 and 0-320 engines was taken out of production in 1978, and when Lycoming ran out of their inventory, they had to switch to the larger AC 1141271, which is 7/16 in. deeper. We have requested Brock to modify their tooling to accommodate the deeper fuel pump. In the meantime if you find an interference, you will not have to modify your engine mount if you can locate one of the smaller pumps.

BUILDER HINTS

1) Tom McNeilly called to my attention that facing the fuel vents forward pressurizes fuel tanks appreciably at high speeds and could place undue strain on the bond between baffles and skins. I calculated that 200 mph velocity is equivalent to a head pressure of 0.75 psig. This may not seem like much, but if your tank area is roughly 25" x 30", it equals a force of 650 lbs. trying to burst your tanks every time you fly. Facing them aft would generate an equal force trying to crush them. After thinking about this, I went out and rebent my vents to just slightly forward of vertical, and I suggest you do the same.

2) You can (and should) verify the c.g. of your fuel tanks. The initial weighing is usually done with the tanks empty. To avoid reweighing with the tanks full, consider this. Fill your tanks. Multiply the number of gallons by 6 to get the weight in pounds. Level the airplane, and see how much the weight on the nose wheel has changed. Subtract the increase in nose wheel weight from the weight of fuel added, to get the weight increase on the main gear. Since you know the fuselage station of the nose wheel and main gear (you measure these during your initial weight and balance) and you know how much of the fuel weight each is carrying, you can calculate where the fuel c.g. is.

3) In contouring, as soon as you discover a low spot, fill it before sanding surrounding areas down to contour. Otherwise your low spots may turn into high spots.

4) Sterling really sticks--to skin, fingernails, finished paint, tools, and, I presume, equally well to fiberglass.

5) You will be grateful later on if you fill and finish paint the inside of your cowlings.

6) A few builders have expressed concern about permanently bonding on the top of the fuselage forward of the instrument panel, which would preclude doing any major maintenance or making any major changes later on. I appreciated their concern even more after I had to pull my avionics stack of trays out several times to trouble-shoot glitches in the harness and trays. My solution was to install hidden piano hinges along the longerons from F-78 to the instrument panel with hinge pins that can be pulled out through the instrument panel inside the cockpit to remove the cover. I also built a flange on the forward end of the cover, that mates with the aft face of F-28, and bolted the flange to F-28 with six 10-32 flat head screws into nut plates fastened to the flange. The only evidence that the cover is removable is two hairline seams, one on either side. I don't believe I sacrificed any fuselage integrity.

7) A ½" I.D. tube (I used plastic) is sufficient to operate two gyro instruments, mounting the vacuum regulator behind the instrument panel, and running the tube along the fuselage side to the vacuum pump.

8) Electric wiring is greatly simplified if you run ¾" I.D. conduits down either side of the fuselage, in the arm rests, and under the pockets. Pull the wires through with a string, so they don't get tangled, and leave the string in permanently for future use.

9) To avoid electrical noise, use shielded wire for the alternator power supply, magneto p-leads, tach signal generators, and the plus wire to the strobe power pack. It is not good practice to run these wires in the same conduit with co-ax cables and thermocouple leads.

10) I am told that it is possible for an alternator to short and if it is connected directly to the battery, the battery would discharge through the alternator, causing an electrical fire. The recommended solution is to install a 35 to 50 amp circuit breaker in the power line from the alternator, and connect this to the power bus down stream from the master switch. Then, if the alternator shorts, you can still operate on battery power.

11) The J. P. Instruments temperature scanner is an excellent choice. Mine is set up to scan 10 temperatures; 4 CHTs, 4 EGTs, 1 oil temp, and 1 cowling air temp.

12) Want a simple nose tie down? Install either a 1/8" or ¼" pipe plug in the nose for the pitot tube, and use either a AN 840-4D or AN 840-6D hose nipple for a removable pitot (as suggested in the plans). Then when you park nose down and remove your pitot tube so bugs and dirt don't get in, rather than replacing the pitot tube with a plain pipe plug, drill and tap the pipe plug for an eye-bolt, and use it for a nose tie-down. When you untie your airplane, you will be reminded to reinstall the pitot tube.

13) I saw a partially built Varieze fuselage that had been stored unprotected from sun. The nylon brake lines could be snapped like potato chips, but only where exposed to sun light. Be sure you protect your tubing from sunlight--before and after installation. Wrap them with aluminum tape where they come out of the gear legs and attach to the brake calipers.

14) The simplest way to fill brake lines is to attach tubing to the bleeder valve on the bottom of the

calipers and a funnel to the other end. Pour brake fluid into the funnel until the brake cylinders are full. If the cylinders are in the nose, you may not get all the air out in the first filling. If not, pump some fluid back by operating the brake pedals, and then refill the cylinders. Repeat until all air is purged. Best to have someone help. If you spill fluid, it is a mess:

15) Bruce Ibbotson reports that most silicones give off corrosive fumes, but that Dow Corning Silastic RTV 738 is a non-corrosive sealant, and recommends using it to secure the cover plates over the wing attach bolts.

16) Using wing jig templates #2 & #4, you can build saw horses which fit the bottom wing contour and hold the wings at just the correct height for bolting on the airplane. Sure makes installing and removal a lot easier, and is well worth the effort.

17) If you use a combination starter-mag key switch, you cannot use a mag driven tachometer. Carr no longer manufactures their signal generator operated tachometers, but Westburg Mfg. does. You will have to have at least a 3" extension on the tach drive on the Lyc accessory case for the signal generator to clear the vacuum pump.

FOR SALE

New Brock throttle quadrant, never used, 25% off new price. Call Ron (602) 883-8679.

OSHKOSH 88

We expect to be there with the Mark IV, and hope to see as many of you there as possible. We have scheduled a Cozy Builders Forum at 11:30 AM, Sunday, July 31, Tent #8. Better check the schedule, however, because it has been changed several times, but we hope this is final. We expect to park the Mark IV in the same place as the Cozys have parked for the last several years--just SE of the tower. But they have made some changes in the display area this year, so you may have to hunt for the Cozys. As before, we expect to be camped in Paul's Woods.

DESIGN CHANGES

1) **Chap. 22, p. 1, and Owners Manual p.9:** Delete alternator connected to battery side of master switch. Show alternator connected to main bus through a 35 to 50 amp circuit breaker.

2) **Chap. 21, p. 1, Fig. 1, & p.2, Fig. 7:** Do not face vents forward as shown. Instead, install them 10° forward of vertical.

3) **Chap. 21, p.5, Fig. 17:** Make provision for electrically bonding cap, filler neck, and fuel inside tank to fuel nozzle before transferring fuel, according to suggestions elsewhere in this newsletter.

4) **Owners Manual, p.10, Normal Operations. Add:** CAUTION. When fueling aircraft, have fire extinguisher handy, and electrically bond fuel in tank, filler neck and cap to fuel nozzle before transferring fuel.

GALLERY