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COZY NEWSLETTER #44
January, 1994

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COZY MARK IV OWNERS MANUALS

After finishing our flight testing, we completed the Mark IV Owners Manual and sent it off to the printers. It contains the information you will need after you finish building and before you fly, i.e. weighing and weight & balance calculations, systems checkout, pilot requirements, flight test procedures, normal operation, emergency procedures, maintenance, etc. It is available at $ 15 to cover printing and shipping.

VACATION

Now that we are pretty well caught up on our obligations (publishing the Owners Manual was our last biggie), we made some vacation plans for the winter months. We plan to go back to Minnesota for a few days over Christmas. In January we plan to take a two weeks vacation from the 14th to the 28th. Then in February we have agreed to baby-sit our grandchildren in Minnesota from the 6th to the 13th so our daughter and her husband can go on vacation. Someone will be here most of the time to answer the phone and bring in the mail. We will try to keep in touch and not get too far behind. We hope this won't inconvenience you too much!

AFT C.G. FLIGHT TESTS

In Newsletter #43, we described all of the preparations we had made for aft c.g. testing of the Mark IV. While waiting for our test pilot, Jim Patton, to schedule a trip here from Florida, we checked out the systems by determining elevator position versus speed for 4 different c.g.s so we could calculate the point of neutral stability. We didn't go below 75 knots at a c.g. of 102; we were saving that for Jim. But in the last newsletter we expressed confidence that he would not be able to stall the main wing within our design c.g. range of 97.5 to 102. Even though we increased the canard span and left off the lower winglets (as compared to the Mark IV prototype), we didn't think this would have a significant affect on flight characteristics. How wrong we were!

When Jim arrived, we did a very thorough and complete weight and balance. I had added quite a few things since the original weight and balance (wheel pants, spinner, new prop, upholstery, fire extinguisher, video carnera, weight mechanism, etc.). We did the weighing with Jim and parachute in the airplane, the exact amount of fuel we planned to carry (25 gal.) in the airplane, and the 135 lb. weight in each of the 8 different positions. We then calculated the c.g. for each of these positions. They turned out to be 96.7, 97.8, 98.9, 100, 101.OS, 102.1, 103.2, and 104.

Last April, on the way back from Sun and Fun, we stopped at Crystal River FL to meet Jim for the first time, and I took him for a ride in the Mark IV and checked him out dual. But when he came here, he had to fly it solo. On his first familiarization flight, the radio went dead just as he was readying for take off. He turned around, opened the canopy, and was preparing to taxi back when it came on again and appeared to be OK. This was just enough of a distraction for him to close, but not lock, the canopy. Shortly after take off, when he was about 3 miles out, the canopy popped up, but the safety latch caught it. I was listening in on the radio and heard him call in for a straight-in approach. On the way back he hit some bumpy air, the safety catch jiggled loose, and the canopy opened all the way. The gas spring slowed it down so that it didn't rip anything loose, but just stabilized in the fully open position. The air blast removed Jim's cap, glasses, and headset, but he didn't lose his cool. He discovered that the aircraft was fully controllable; he did not attempt to close the canopy, but instead concentrated on flying the airplane. He flew the airplane back and landed it with the canopy fully open! We couldn't believe that there was absolutely no damage and that the Mark IV could be flown and landed with the canopy fully open. This was a most important finding! We found Jim's hat, glasses and headset in the back seat. After we thoroughly inspected the canopy and hardware, determined that there was no damage, and got over the excitement and shock, Jim went back up again for an uneventful familiarization flight.

The next day we started the flight tests. We climbed up to 12,000 ft., Jim in N14CZ, and Gene Davis and I flying chase in our 3-place prototype Cozy N22CZ. Jim started out at the forward c.g. position of 96.7, closing the throttle and slowly coming back on the stick until reaching the minimum flying speed of about 55 knots. Nothing happened, even with abused controls, except the airplane would descend in a nose high attitude at about 500 fpm, fully controllable in pitch, yaw, and roll. The same procedure was repeated at each e.g. interval as the weight was moved aft.

At a c.g. of 101.05, Jim was able to get the main wing to stall. As he came back slowly on the stick, the nose would go up to about a 13 deg. angle of attack, and the airspeed would appear to stabilize at around 55 knots, and then as the main wing stalled, the airspeed would suddenly start dropping toward zero, and at the same time the airplane rolled off on one wing. Altitude loss varied depending upon how long

he held aft stick.

At a c.g. of 102.1, the aircraft behaved the same way, and at a c.g. of 103.2, when the main wing stalled, the aircraft entered a spiral turn (not a spin) and Jim lost about 3,500 ft. before he was able to effect recovery. This behavior was completely unexpected, it was scary, and obviously unacceptable. We returned to base, and tried to figure out what was happening. We decided to install wing cuffs with droop leading edges. These were found to be effective in delaying main wing stall on both the Varieze and the Velocity. Tom McNeilly hot-wire-cut a set of wing cuffs for us out of foam and we glassed them on the wings.

When we went up to flight test them, the airplane behaved even worse. At a e.g. of 100, Jim was able to get a main wing stall (airspeed suddenly dropping toward zero) and the airplane would roll off either on the left or right wing. So again we returned to base to discuss the results.

We did some serious thinking. We reasoned that the wing tips were stalling prematurely because, without lower winglets, the high pressure air under the tips was bleeding off spanwise. We decided that we had to install lower winglets. Shirley and I had committed to attending the Copper State fly-in that weekend, so installing the lower winglets had to be deferred until the following week, and in the meantime Jim had to return home. He agreed that if the lower winglets made any difference, he would come back to do more flight testing.

After the lower winglets were installed, and I took N14CZ up to test it at aft stick, it started behaving the way I expected. At forward and mid c.g.s and full aft stick, it would either give a little nose bob or a little wing rock. I could not get a main wing stall at a c.g. of 100, or at 101.05. The airplane would just sit there at about 55 knots, nose high, wings level, and develop a sink rate.

At a c.g. of 102.1 and full aft stick, I could get the main wing to stall, as evidenced by the airspeed suddenly dropping toward zero. But there was no tendency for the aircraft to roll off on a wing, and recovery was immediate with no loss of altitude. By repeated testing, I determined that the start of main wing stall was half way between 101.05 and 102.1, namely a c.g. of 101.6. I stalled the main wing at least 8 times. At no time did I continue to hold full aft stick (which isn't easy to do because stick pressure is so great) to see what would happen. I always released stick pressure before the airspeed reached zero, and recovery was always immediate with no altitude loss. We were now making real progress! We demonstrated that lower winglets perform 2 valuable functions.

1. They provide lateral stability at high angles of attack, and

2. They delay wing tip stall by containing the high pressure air under the wing tips.

The plans model Mark IV was behaving the way we intended, and was stall-proof back to and including a c.g. of 101.05. All we had to do now was to move the aft limit back one inch. We knew from experiments with the Varieze that reducing the canard span 8 inches moved the c.g. range back 1 inch. That was with the GU airfoil. We didn't have comparable data on the Roncz airfoil, so we decided to reduce the span in two steps. For the first step, we just removed 4 inches (2 inches each side). On the next test flight, after reducing the canard span only 4 inches (and with lower winglets), I could not believe the difference. The results were remarkable! The main wing would not stall. Starting at a forward c.g. of 96.7 and moving the c.g. aft in increments, at a c.g. of 101.05, the airspeed would bleed off to about 55 knots as the stick was brought all the way back, the nose would rise to about a 13 degree

angle of attack, the canard would stall, the nose would then drop and the speed would increase. If the stick was still held back, the nose would rise again and the canard would stall the second time. There was no tendency for the aircraft to fall off on one wing. The c.g. was moved as far aft as 103.2 and still no main wing stall. I had not anticipated such a dramatic improvement and believe the change was due not just to increasing the wing loading on the canard, but also to moving more of the main wing out of the downwash of the canard. I was delighted and called Jim in Florida to ask if he would come back and verify our findings.

Jim returned and resumed his flight testing at full aft stick and c.g.s of 100, 101.05, and 102.1. He agreed with our findings. Although he was not able to stall the main wing with slow and deliberate back stick pressure, and releasing pressure when the canard stalled, he was concerned that abusing the controls or continuing back stick pressure after the first canard stall might drive the nose up high enough to stall the main wing. So it was decided to lop another 2 inches off the span for additional margin of safety for builders for poor building, errors in determining c.g., poor piloting, etc.

We had the canard shortened, back on the airplane, and flying again in 24 hours. This time Jim made a number of attempts to stall the main wing at c.g.s of 102.1 and 103.2 and full aft stick, and only the canard would stall, even in a 60 degree banked turn. He concluded that setting the aft limit at 102.1 would provide a safety margin for builders, although he did not rule out the possibility that some combination of abused controls or unapproved maneuvers might cause the main wing to stall.

It is reassuring at this point to note that there is an important benefit to the canard configuration at high angles of attack. When conventional airrraft (elevators in the rear) reach a high angle of attack, the airstream exerts upward pressure on the elevators which tends to move the elevators up and increase the angle of attack. In canard aircraft, as angle of attack is increased, the same upward pressure is exerted on the elevators tends to move them up and decrease the angle of attack. The pilot feels this as an inordinate increase in stick pressure as minimum flying speed is approached. The back stick pressure required to try to stall a canard aircraft makes it very unlikely that an inattentive pilot would do this accidently.

When the c.g. range was moved farther aft by shortening the canard span, we needed to make sure that we weren't sacrificing maximum front seat weight limit. To evaluate this part of the flight envelope, we went to altitude, moved the c.g. to 96.7, established a rate of descent of 500 fpm and 80 knots, and made sure we had plenty of elevator power to flare. Then we made a couple of landings and takeoffs at this c. g. This c.g. calculates to a front seat weight of 460 lbs. in our plans model, which is well over the maxunum we have been quoting.

Shortening the canard span also moves the point of neutral stability aft (a beneficial effect). We repeated the tests of elevator position vs speed at different c.g.s we reported in Newsletter #43, and found the point of neutral stability had moved aft to 105.4.

To summarize the results of our aft c.g. testing:

1. With the original canard span and no lower winglets, the main wing stalled and the airplane rolled off on one wing at a c.g. of 101.05

2. Same as above but with wing cuffs, the stall and roll off occured at a c.g. of 100.

3. With original canard span and lower winglets, a wings- level main wing stall occured at a c.g. of 101.6.

4. With canard span reduced 4" and lower winglets, the canard would stall but not the main wing from a c.g. of 101.05 back to and including a c.g. of 103.2

5. With canard span reduced 6" and lower winglets, same as above with added safety niargin.

6. Builders will be directed to shorten their canard span by 6" and install the lower wmglets shown in the plans to have a useable c.g. range of 97.5 to 102. 1, and a point of neutral stability of 105.4

When we built our plans model Mark IV, we omitted the lower winglets because we had been told by people whose opinion we respected that the lower winglets did not perform any useful aerodynanic function. We showed them in the plans, however, because it was our intention to make tests ourselves before we recommended to our builders that they could leave them off too. We really didn't think that adding just a few inches to the canard span (as compared to our prototype) would make a measureable difference either. We fully expected that our plans model as originally built would not be capable of a main wing stall within our design c.g. range, and that the aft c.g. flight tests would amount to no more @ one or two test flights in one or two days at the most. What we encountered came as a complete surprise. We never would have dreamed these two small changes would have such a profound effect. We are glad it turned out this way, though, because it made us do a lot more flight testing than we had planned, it caused us to get a lot of experience stalling the main wing and recovering without throttle or moving the c.g., and we learned an awful lot more about this design than we would have, had things gone smoothly. We hope this serves to impress on others that even seemingly insignificant changes can have unexpected results.

We wish to acknowlege and express our appreciation for the help and assistance of Tom McNeilly in preparing the test equipment, Harry Bawcom for the loan of his parachute, and Jim Patton for his consultation, advice, and test flying.

Although we were getting pretty used to flying with all the test equipment aboard, it sure felt good to remove it, make repairs, and get N14CZ back to a more presentable appearance.

PUBLICITY

Congratulations, Alex and Norma Strong, for getting pictures of your Cozy N306AN printed in both November Sport Aviation and Kitplanes. You are the latest to be awarded a free newsletter subscription (1 yr. for each magazine).

Both Kitplanes and Sport Aviation reserve space each month for pictures and short write-ups on completed projects because they believe these are of interest to their readers and the relative number of submissions is indicative of the popularity of different designs. They (and we) encourage builders to send them a good quality color picture and short description of their completed airplanes. To encourage participation, each year Bendix-King will hold a drawing at Oshkosh and award one of the contributors to Kitplanes a brand new KX 99 Nav/com radio! A couple of years ago, Dave Martin asked us why none of our builders ever submitted a picture and write up of their completed Cozys to Kitplanes. Now,

in the November issue of Kitplanes, Peter Neville wrote a little commentary on the 50th anniversary of 'Completions", and says that the Cozy is among those most often represented. Thanks, guys and **KEEP UP THE GOOD WORK!**

CAVEAT EMPTOR

(Let the buyer beware! - Vance Atkinson)

Recently Ken Francis finished a beautiful Cosy. It was the first European Cosy (Uli Wolter's re-design of our 3-place Cozy) to fly, but not without a lot of heartache! This particular aircraft was contracted to be built by Jerry Stallings in Houston TX for Dick Smith, who lives in Pecan Plantation, just south of Ft. Worth TX.

A price around $35,000 was negotiated for building, if Dick supplied all of the parts and materials. Said job was to be completed in one year. Any of you builders who are now flying know what's coming. Yes, with less than half the aircraft built, Stallings demanded more money! So another $30,000 was handed over to finish it. Then $65,000 (plus parts and materials) later, of course it wasn't finished, and more money was demanded once again to "complete the project". At this point Dick asked Ken to drive to Houston with him, load the airplane and parts on a trailer, and bring everything back to Ken's workshop.

Now, I don't know Jerry Stallings very well, but I do know he has never built a Cozy or a Cosy. In his shop, partially completed were two other fiberglass projects. Work on these was mediocre, at best! For someone doing professional work for hire, this was terrible!

Ken agreed to help Dick Smith finish his project on an hourly basis; that is when the real work started. Ken is an inspector on the F-16 at General Dynamics in Ft. Worth. He is very meticulous when it comes to aircraft building and was amazed at the crap that he found on the Cosy. He found so many discrepancies that he started keeping a log. The tough part of this is he had to go back and and tear out the nonconforming stuff and re-do it before he could go forward with the finishing work. When Ken brought back this plane, the fuselage had no nose, but was on the gear, no canopy, the wings were glassed, no winglets, no canard, the spar was jigged and drilled to the wings (which turned out to be a major mistake) and no contouring or filling was started (thank goodness!).

Without going into the long list of screwups on this aircraft, Ken and Dick persevered and finished the project about a year later, mostly due to Ken's perseverance. Around June a good looking, albeit overweight (1200 lbs.) aircraft emerged to be test flown. Ken did the honors. It didn't fly right! At this time we found out we should have checked the wing/spar incidence. This would have been tough (but not impossible) because there were no level boards on the wings when they were brought back to Ft. Worth. As it turns out, to set the wings at the correct incidence and make the plane fly correctly, one wing ended up with a 1/2" misalignment where it joins the leading edge of the strake, and the other wing has a 1" misalignment! UNBELIEVABLE! This means Stalling never even used level boards! Your naked eyeball can sight better than this! About the only way to fix this much mismatch (other than to cut out the spar and firewall) is to cut the strakes off and re-attach them at the correct angle. Right now we've got some offset bushings between the spar and wing to take up the horrendous mismatch.

I flew some of the test hours off and would like to comment on a few things. The owner of the aircraft is older and it would be tough for him to pick up the nose, so an electric nose gear designed to pick up the plane and occupants was put in. It is fairly heavy, but I liked it. Some guys that have back problems may want to consider this. It is made by David Orr. It weighs about 20 lbs. and costs about $1200, which might be cheaper than chiropractic work! When using this device, it is kinda like riding a camel. Get in, flip the up switch, the aircraft rises to the 3-point position and you are ready to taxi. After takeoff, flip the switch and the gear retracts. What a deal! The fuselage is 2" wider (same as the Mark IV Cozy), and that makes a difference with 2 males in the front seat. The canopy is also wider which gives more head swiveling room and better visibility looking down.

The Cosy flew about the same as the Cozy, except for landing. I could never get the Cosy "in the groove" during the landing approach. It always felt to me like the c.g. was too far back (it wasn't) and wouldn't settle down. Ken had the same trouble. This aircraft weighs over 200 pounds more than mine and Ken's Cozy with similar equipment (exception being the electric retract mechanism weighing 20 lbs.). That's like flying around with an extra passenger all the time, and a heavy one at that. Some of the extra weight came from the enormous canopy (plexiglass is heavy), its layup schedule, the support for the monstrous hinges (the canopy opens forward, not sideways), and latching mechanism. We don't know where the rest of the extra weight came from since Ken used the same technique to finish his Cozy and the European Cosy.

We haven't run any speed tests side by side with our Cozys yet, but it appears to us that it is slower. Ken tried to get the time flown off by this last Oshkosh, but didn't quite make it. The owner is planning on the big O next year.

The point of this whole story is, if you are going to contract out your pride and joy for whatever reason, you better make sure the person who does the work is qualified, recognized, and has experience on your type of project. Get references and check them out! It could save you a bundle of time and money and heartache. We figure the Cosy had over $100,000 invested in it before it flew. Lotta money for a fixed gear, fixed prop, overweight airplane with crooked wings! If you need to talk to Ken about this project, his phone is (817) 737-4659.

Editor.- We feel very badly, because we had personal knowledge of Stallings bad reputation, and could have averted this tragedy, had we been consulted. By way of reference, our plans model Mark IV, with a larger fuselage, larger and heavier engine, heavier and stronger landing gear, and 2 ft. more wingspan weighed in at 1029 lbs.

FIRST FLIGHTS

We would like to hear about first flights of our builders.

1. We don't think we reported that Andre Soria flew his Cozy F-PRSC the first time on 11/6/92. His empty weight is 1000 lbs with an 0-320 Lyc. He now has accumulated 70 flying hours. His is #3 of 5 Cozys now flying in the Montpellier area of France.

2. Bernard Missol flew his Cozy F-PFB7 for the first time on 5/l/93 in La Montague, France. His empty weight is 935 lbs with an 0-320 Lyc. His is a very unusual and pretty Cozy. He

recontoured the fuselage along the lines of a sail plane. Then he made a plug, then a mold, and then prefabricated the fuselage halves. It appears to be just a little wider in the back than the stock 3-place, to accommodate 2 small children.

3. Gilles Degruelles, from Paris, flew his newly finished Cozy F-PRZZ, after many delays, on 10/26/93. His empty weight is 1034 lbs. with a 160 hp 0-320. Gilles visited us and has promised us a first flight report. This makes 12 Cozys flying in Europe, that we know of.

4. Carl Denk first flew his European Cosy on 11/27/93. All we know about it so far is that his empty weight is 1180 lbs.

5. **Ken Brimmer**, who first flew his Cozy N249KJ on 2/28/93 writes this from Saudi Arabia:

   Dear Nat,

   I am sorry for not having written this letter sooner, but to tell you the truth, between my work and flying the Cozy (I can't stop flying it), I could not sit down and give you a report on my plane and its first flight. My job has taken me back to Saudi, so I finally have enforced inactivity and time to write.

   I first flew on 2/28/93. Dewy Davis had given me a check ride in his beautiful Cozy the day before. I was not keeping my arm on the armrest and was overcontrolling, but Dewey did not give up on me and made me keep at it until I got it right. With a plane as beautiful as his, it took a brave soul. The day I flew was a cold clear day with snow on the ground but not on the runway. The air was so thick I think the plane would have flown with square leading edges. I left for the field with the idea of just starting the high speed taxi testing. My sons decided that they would come along out of curiosity and to video tape this first part of the testing phase. My home field is Easton MD which has a 5700 ft. runway crossed by a 4000 ft. runway at 75' ASL The wind was dead calm. Caint git no better than that. I did a number of succeedingly faster runs down the runway and everything was working perfectly. My boys put the camera away as it all seemed repetitious. Nose off the ground was easy, but I kept increasing speed until all three wheels were just off the runway. Due to the crown in the runway, the boys did not see all wheels leave the runway, so (you can see this coming, can't you?) I went just a little faster on the next taxi and the plane leaped into the air. Even with all that runway, I realized I might not be able to get it down and stopped in time so it was anchors away! The plane was slightly right wing heavy, which trimmed out easily. I developed the first sense of Cozyitus, which is a feeling that you never want to land. But I only circled the field at 110 mph, crossed the fence at 90, and flew in and touched down like a feather. My sons were on the ground trying to get the camera out of the case and back together so they could get the landing, which they did.

   I set myself a program of pulling the cowling after the first 30 min. flight, then the first hour, then after 2 hrs. From these inspections I was then able to discover any vibration wear, looseness, etc., and correct it before it became a problem. I use an electric screwdriver to reduce my reluctance to do the tedious cowling work. The only real problem I had was my OAT probe and one of my EGTs did not work properly. Vision Micro Systems replaced them with no charge.

   I am sure that what the current builders want to know is how does it fly? Well, it flies just as advertised, or maybe better. At 8000' and full throttle I get a little over 170 mph true turning

2740 rpm. This is with an 0-235 and no wheel pants. I seem to have the best cruise of the two Longs and one Varieze at our airport. This may be due to my Warnke propellor and/or Hal Hunts carb box. I never have a need to touch the rudders in flight, only during landing will I depress both rudders to increase my angle of descent without gaining too much speed. Due to my complete engine monitoring system and all the wire that entails, my plane is about 25 lbs. heavier than it would be otherwise. It has a full panel and a vacuum system. Empty weight is 950 lbs. Before leaving the states, we covered the entire east coast from Florida to Canada, and long trips are a pleasure. Marc Pichot flew in from France and I gave him a check ride. He flew and landed from both the right seat and the left. He has been doing a lot of flying in preparation for his first flight and I swear his landings were better than mine. For some reason, I am not able to fly the plane very well from the right seat, but Marc had no trouble, so it must be me. Man, do I miss flying it!

Again I would like to thank you for all the support. It is really a great plane and all the other pilots to whom I give rides think it is also.

Regards,
Ken Brimmer

COME ON GUYS! LET'S HAVE THOSE FIRST FLIGHT REPORTS!

HEXCEL'S NEW EPOXY

In our last newsletter we reported that Hexcel has finalized their replacement for Safe T Poxy. They eliminated the two com- pounds MDA and styrene, which OSHA objected to, and used only compounds which were on OSHA's approved list. The replacement is named Epolite 2427 and uses exactly the same mix ratio as Safe T Poxy. It essentially matches the properties of Safe T Poxy, and is actually stronger in impact resistance. Its properties are superior to the RAE system (2410) in tensile strength, compressive strength, flexural strength and temperature resistance.

Right after the last newsletter was mailed, we obtained a gallon of the new Epolite 2427 and have used it on a number of layups. It has a viscosity of 1000 cps, which is much lower than the recently approved PTM&W PR2032, and is much faster in wetting out and easier to work with. It is now #1 on our recommended list. Some of our builders, who have already switched, have been very impressed. We hope it will prove to be less allergenic. If you have already built part of your airplane with Safe T Poxy, RAE, of PTM&W, there is no need to worry because all of these epoxies have acceptable properties and adhere to each other if the surface has been properly prepared.

BUILDER HINTS

1. Several Mark IV builders have advised us that their canards are slightly longer in cross section (chord) then shown on M-11, and when the lift tabs are in contact with the forward face of F-22, the trailing edge of the canard is 1/8 to 1/4" aft of the forward face of F-28, and that the

alignment tabs cannot be built as shown. Should this also be the case with your canard, you may lay up additional plies of BID locally on the forward face of F-22 up to 1/8" thick, or remove up to 1/8" of the trailing edge of the canard locally at the tabs, or a combination of both.

2. It is important for appearance that the strakes are straight (no bumps), and properly aligned with the wing. The wing should be installed on the centersection spar when the strake is built, and a straight edge should be used to make sure that the leading edges of the ribs are aligned vrith the leading edge of the wing, and that all points on the rib airfoils align with the wing airfoil. Of course, you will need to make allowance (using spacers) for the 3/8" foam and several layers of glass skin which will be subsequently be laid over the ribs.

3. Mark IV builder Chuck Larson writes, "I've discovered a tip that works great for wet sanding the Sterling primer. I use a grouting trowel which is used for grouting ceramic tile. I bought mine years ago at Color Tile. It is 9" x 4". It has a wooden handle attached to an aluminum plate which has dense rubber foam bonded to it. Wet or dry sandpaper will adhere to the foam rubber well enough to allow the sanding. It keeps the surface flat, and it is easy to remove and wash out the sandpaper".

4. Will Sladaritz writes, "The canopy is somewhat awkward to handle when it is off the fuselage during finishing. Enclosed are a few pictures showing an EZ way of manipulating it by installing scrap hinge sections along the edge of the workbench, and hinging the canopy to the edge of the workbench".

CAUTION

1. Jack Grandman modified his 2 into 1 Sport Flight exhaust pipes to a 4-pipe system by welding stainless partitions up the middle of the 2-1/2' collector pipes, as we had done. He advised that after several years of service, the partitions failed where the exhaust gasses impinged, and went through his prop. It wrecked his prop and spoiled his day. We reconnnend installing a true 4-pipe system from Custom Aircraft.

2. John Ashe reported that NG-61, the torque tube which retracts and extends the nose gear, failed at the lower end where it bolts into the universal joint. This caused a nosegear-up landing, with some esthetic damage to the underside of the nose as it slid down the runway. He will replace this thin-wall aluminum torque tube with one of 4130 steel.

MARK IV CHANGES/CORRECTIONS

MANDATORY MARK IV DESIGN CHANGE

NOSE GEAR RATCHET

Cozy builder **Dr. Curtis Smith** invented a little gem of a ratchet which locks the nose gear up or down. It is still available for $38, which includes postage and packaging. No need to call, just send check or money order. This little device should be considered a "must" by all 3 and 4-place Cozy builder/flyers. Once you have flown with it you will wonder how you ever did without it. Allow several months lead time. Contact:

Dr. Curtis Smith
1846 Sextant Dr.
Worden, IL 62097
(618) 656-5120

FOR SALE

1. Fuel sight gages, $35.00 per set including postage. Vance Atkinson, 3604 Willomet Ct., Bedford, TX 76021-2431 (817) 354-8064.

2. Electric speed brake actuator. Compact. All parts needed for installation, with instructions. $250. Contact: **Wayne Lanza**, 9425 Honeysuckle Dr., Sebastian, FL 32976. (407) 664-9239.

3. Rebuilt aircraft instruments, much less expensive than new, guaranteed. Contact: Howard Francis, 5631 S. Crows Nest Rd., Tempe, AZ 85283 (602) 820-0405.

4. Cozy builder, **Bill Walsh**, who arranged the very successful Cozy banquet at '93 Sun & Fun, has arranged a source of tee shirts (sweatshirts available on request). They have a detailed picture of the Cozy or Cozy Mk IV on either a white, blue or dark colored shirt. The Cozy name is printed above. Bill is also working on other Cozy items, such as caps, pins, and cups. The shirts are available at $9.75 plus $1.50 shipping and handling. Make checks out to Linda Walsh, PO Box 160884, Altamonte Springs FL 32716. (407) 695-3543.

5. Roncz canard for Mark IV, brand new, 1/4" thick lift tabs, ready to trim to length. Includes torque tubes and elevators. $1490.00. Contact Dennis Oelmann (319) 232-0018.

6. Set of four Mark IV rudder pedals, never used. Jim Cullen (702) 254-8815

7. Cozy Mark IV counted cross stitch (needle point) kits to make caps ($5.99), tee-shirts ($7.99), or framed pictures ($8.99). Chart also available ($4.00). Send $2.50 S/H with order or SASE for more info to: Carolyn Cullen, 9456 Mast Drive, Las Vegas NV 89117.

8. With much saddness I am forced to offer my Cozy 369CZ for sale. The FAA has stated that my cardiac problems are not acceptable and has pulled my medical. Please spread the word that it is for sale. 3-place Cozy, IFR, many extras. 0-290 Lyc., Sterba prop, King avionics. Bill Teeters, 2731 Timber Trail, Rockford, IL 61107- 2850 Ph (815) 399-0390. Call anytime, I'll respond.

LETTERS FROM BUILDERS

11/22/93
Dear Nat,

Please find enclosed a check for the newsletter. I can hardly believe that a year has gone by. Things were really hectic this year, and I haven't gotten much done on the Mark IV. I have just finished Chap. 4 and ordered materials for Chap. 5. I am really impressed on how easy the construction is and the plans are self-explanatory as you build. So far I have enjoyed the experience. I am using the RAE system and getting along just fine.

I was planning to go to Oshkosh this summer, but the week before the sun came out and I had to stay home and catch up on my work after all that rain. Was quite disappointed about that! I was hoping to meet you and your wife and to see the end result of my project.

How are the c.g. tests progressing? I can really believe that it was hard to cut up the seat backs to install the mechanism. After all the work of building the plane, to start cutting holes in it would be difficult to say the least!!

Before I close I would like to thank you for the great set of plans and wish you the best. Will keep you informed on my program.

John Williams
Heaton, ND

10/01/93
Dear Nat,

It is with extreme regret that I am writing you to advise you that due to headaches caused by the epoxy, I am forced to discontinue the Cozy project. I started with the PTM&W epoxy, (which I really reacted to), then switched to the Safe T Poxy II, which I also have a reaction to. I discontinued working on the project three weeks ago and after 2 doctor visits and several prescriptions, I am still dealing with a sinus headache. This is in spite of using a respirator, gloves, eye protection, and an elaborate exhaust ventilation system.

I have contacted Hexcel and talked with their lab chemist. He said that their new epoxy will not have MDA and styrene in it, but I probably will be sensitive to it the same way I was to PTM&W.

If possible I would like to recoup some of my investment in the project. I have completed the bulkheads, except for the firewall, and would be willing to give them to anyone along with my other supplies plus the plans (which have been updated with the newsletter corrections), for a nominal amount. Also, for any builders in southern California, I would like to see the work table I made (4' x 11') with adjustable legs and built-in fume exhaust go to good use, and would make a very good deal to anyone that could use it.

Again, I would like to compliment you on the plans. I have spent many hours looking over them and found them to be very precise and clear and the project was very enjoyable. I am very disappointed that I must discontinue it.

Best regards,
Ken Whitaker
13043 Espinheira Dr
Cerritos, CA 90701
(310) 924-5306

10/31/93
Dear Nat and Shirley,

Carol and I are very excited about starting our Mark IV. I have been building and flying radio controlled models for 25 years, and many times have considered building a full-scale airplane. Once we decided to go ahead, selecting an airplane turned out to be somewhat difficult. I wanted to work with composites for a variety of reasons. Also, we wanted the airplane to be a family thing, so 4 seats became a requirement.

A coworker suggested the Cozy last winter, and we began collecting information about the airplane, including your info pack. The Cozy fits our mission - an IFR cross-country family airplane, derived from Rutan designs of which I have long been a fan.

Thanks very much,
Michael Brady
Redmond WA

10/31/93
Dear Nat,

Just wanted to keep you informed on progress of Mark IV #175. I know I've pestered you enough on the phone so at least you can read this at your leisure. First, I'd like to thank you for your phone support. I know I've made a number of calls along with a couple harried ones while in the middle of a lay-up, and you just always seem to be around. My only suggestion for improvement would be to put in an 800 number (just kidding). My first anniversary of construction is fast approaching and it's immensely pleasurable to look back and see how much I've learned and grown. There is a pride and a joy that comes from building that is difficult to put into words. With some of the first lay-ups came difficulties with cloth placement and fiber direction, but now I can pull up a wet sheet and reorient the fibers if I wanted to. Sometimes, you look at the plans and say "I'm never going to be able to do that", but you dig in and work carefully and it all comes together.

Last weekend I finished up the installation of the main gear. The fit between the bulkheads was perfect. There is no movement of the gear between the bulkheads whatsoever. When I checked the fuselage station of the leading edge of the main gear, it was right on as well. I'll tell you Nat, it's a real confidence builder! I've had to be very sequential in my building as I'm working in my neighbors shop and I have to leave him some room to work as well. I wonder if he realized how big this is going to get? I have hot-wired the cores for the canard and am preparing for the shear web lay-ups.

If I've become an expert at anything, it is probably building epoxy scales. In my one year I've gone from the RAE system to Safe T Poxy, to PTM&W, and now back to Safe T Poxy. Maybe it's a good reason not to buy a pump until you get into your own "groove". I would like to throw my two cents worth in on PTM&W.

I've used about 3 gallons of the PTM&W and I can't find much good to say about it. The biggest problem I notice is its viscosity. I'm not well versed in talking Centipoise, but suffice to say that at 80 degrees it has a viscosity similar to molasses. I pour the epoxy into a 2 liter pop bottle to help in controlled pouring and I keep everything in a wamiing box at 80 deg. When my light bulb burned out in my warming box I tried using a little at 60 degrees, and it almost wouldn't pour out of the bottle. The high viscosity causes other problems. While pot life may be the same as some of the other systems, it takes you much longer to wet out the cloth. Another problem is air entrainment. When stippling, you drive a lot of epoxy up into your brush. This epoxy in your brush is all foam. The surface tension of the epoxy is high enough that none of the bubbles release. It just got to the point that when I stipple, any residual on the brushes was scraped off into a scrap cup. Believe me, that can be a fair amount of epoxy. The PTM&W system is clear. While it is great because you can't hide anything from a discerning eye, it is very difficult to make sure that the cloth is completely wetted. The color hues of the other systems help a lot in this regard. Finally, there is something in the hardener that migrates to the surface when it cures. When cured, the piece has a tacky feeling. The first lay-up I made with this concerned me because after two days, it still felt wet. I called the folks at PTM&W and they told me that this was normal in areas of high humidity. Well, with Lake Michigan on my right and Huron on my left, I guess that's me. They said that isopropyl alcohol would remove this film, as would sanding. However, they mentioned that because of this tacky glaze, areas coming into contact with secondary lay-ups must be sanded. I would think that this even includes areas that have been peel plyed because that glaze is still there.

Lastly, I'd like to put in a plug for the Central States Assoc. newsletter. Terry Schubert does a great job of pulling together a quarterly publication of builder hints, concerns, and stories. You've quoted from them a couple times but some of the more isolated builders may not know about them. Central States is for canard aircraft only. Their January issue has a list of members, projects, and addresses. On my last business trip to Ohio, I took the directory with me. Instead of twiddling my thumbs at the hotel, I called a couple of builders in the area and got to see a couple neat projects (both Cozys). It's really great to go almost anywhere in the country and not be too far from a canard builder and friend. If you'd like to subscribe, send $15 to Terry Schubert, 9283 Lindbergh Blvd., Olmsted Falls, OH 44138.

Good luck on your aft c. g. tests!!

Sincerely,
Ken Grakauskas
Sanford, MI

Editor.- We agree with Ken about the PTM&W epoxy. If Hexcel had been just a little quicker in developing their replacement for Safe T Poxy, Epolite 2427, we wouldn't have approved PTM&W.

9/28/93
Dear Nat,

Central States Assoc., a group of over 500 builders and flyers of Rutan type aircraft, is planning a National gathering for next summer and would appreciate it very much if you would invite your builders:

June 17, 18, & 19, 1994 at Johnson Co. Industrial Airport (KDCD), Olathe, KS. Fourth National Gathering for Canard Type Airplanes. Social events, seminars, prizes. Contact: Terry Yake, 8904 West 116th Terrace, Overland, KS 66210-1963 (913) 451-8904.

Your assistance in promoting this event is most appreciated. Last year the gathering brought together nearly 70 EZ types from the four corners of our nation.

Sincerely,
Terry Schubert

11/11/93
Dear Nat,

Enclosed is a check for the newsletter. One of these days I expect to see N24DL published in Sport Aviation and Kitplanes. I submitted photos a while ago.

June and I have enjoyed the airplane tremendously in this first year that it has been flying. We traveled to Oshkosh, Lakeland, Rough River and the Bahamas, as well as dozens of other short trips. I've got 180 hours flying in the first 12 months. This year we plan to see Nova Scotia and to make a trip from coast to coast also.

The airplane has been performing great. Recently I added a Performance 3-bladed prop and an LSE electronic ignition. I'm very happy with the prop; it certainly runs smoother and the top speed is as good or better than my old prop, though take off acceleration seems slightly lower. The electronic ignition has given mixed results. It does start the engine much easier and it idles smoother, and it probably burns less fuel at altitude. But it didn't add any horsepower at the top end and the cylinder head temperatures are up about 25 deg now (though EGT is reduced at least 50 deg., which I like a lot; gotta protect those exhaust valves!)

One of my winter projects is to design and build a high- accuracy engine monitor. Most of the commercial instruments for measuring CHT, EGT, etc. are either very inaccurate or very expensive (or both). I think I can make a digital unit, with internal thermocouple temperature compensation, that will be accurate to + 2 deg. regardless of cabin temp or OAT. Then I'll know what is really going on in the engine compartment. I'll let you know how it works out.

Regards,
Dewey Davis
Warrenton, VA

11/30/93
Dear Nat,

Enclosed is a check for the newsletter. I spent two years in an Aeroquip approved hose shop, and I agree

that 666 Teflon hose is superior to 601, 303, and 701 for fuel. These rubber hoses are perfectly fine for oil, however. The rubber compounds (601 type) are broken down over time by hydrocarbon fuels and will begin to "seep" through the cover. If the assembly leaks behind the "socket" (or fitting) the hose was assembled incorrectly. The only procedure approved by Aeroquip, Deutch, and Stratoflex is hydralic testing at 2 times max operating pressure of the hose. These should be done every five years, and rubber hose replaced at fifteen years. These are general rules of thumb and cannot take into account all the variables that affect the life of a hose assembly. It is important to remember a hose is considered an "accessory" and should be treated as such. KEEP EM FLYING!

Sincerely,
Todd Carrico
Plano, TX

10/01/93
Dear Nat and Shirley,

Enjoyed the nuts and bolts article on locating the neutral stability point in the last newsletters Looking forward to the reports on flight tests with the weights in the aft c.g. region.

Best wishes,
Samuel Walker
Coronado, CA

10/02/93
Dear Nat,

Enclosed is $16 for two years of newsletters. Thank you for the two year option.

I wrote to you about a year ago last June concenung an article in Sport Aviation on the effect of fuel on plastics, glass-epoxy in particular. The article suggested that individuals could easily do their own fuel compatibility tests if they so desired. I remember writing to you about my intent to do such a test at the time. If you would be interested, I can send you the results I have obtained to date.

You were doubtful of the advisability or value of such a test at the time I wrote and you were mostly correct in your opinion that there were ample data already published and that I would not be surprised. I have had one very nasty even shocking surprise. This was the affect of methanol gasohol on the samples exposed to it. They fell apart in 6 months! A bland statement that this fuel is incompatible with glass-epoxy is not nearly forceful enough! Rest assured that I never had any intention of putting this stuff in my Cozy. I tested it out of a desire for completeness and a desire to see how bad was "bad".

Sincerely,
Daniel Schaffer
Englewood, OH

10/08/93
Dear Nat and Shirley,

Just a few lines to let you know how it is going on Mark IV #0225. My partner Harry (Wilbur) and I, Jim (Orville) purchased Mark IV plans in April, 1993. Since then we have leased a hangar with an option to buy and are in the process of setting up shop and winterizing it. We have managed to work thru Chap. 3 and part of Chap. 4, in between working on Cozy Corner (hangar), so far we have found the plans to be excellent in every way. The newsletters are also a big big help, we enjoy reading about all the things you and other Cozy builders are doing and dreaming about.

Now about the Orville and Wilbur stuff above. Those are our nicknames given to us by our fellow workers, of course they think we have fallen down and bumped our collective heads for wanting to build our own airplane, but we take it all in fun, besides I can't think of a better pair of aviators that I would rather be compared to than the Wright brothers.

I would like to extend an open invitation to fellow Cozy builders to stop in and see us, if you are ever in the Marysville MI area. We are stationed at St. Clair Co. International Airport, hangar #3. I'll be sending our names and addresses to the Pershings to go on the builder list. Also if there are any builders in our area that would like to give us a trip around the patch, we would sure appreciate it; we can't wait to see how a Cozy handles in the air.

I made my first trip to Oshkosh in 1992. 1 was overwhelmed to say the least, but I came away remembering there was another promise I made myself a long time ago, that was to build my own airplane, the first was to get my pilot's license. I returned to Oshkosh this year, but with a whole new perspective. I came this year looking for the plans built Mark IV. WOW! What a plane! I hope Wilbur and mine turns out half that good. I don't know if I could have cut it for the c.g. testing.

In closing, I would like to just say thanks for a good inexspensive airplane design, and your dedication to aviation!

Sincerely,
James Arnold
Chesterfield MI

9/21/93
Dear Nat,

It is hard to believe, but it has been a year since I first began the Mark IV project. Progress has not been as rapid as I would have liked it to be, but despite business pressures, I have managed to build a fuselage with landing gear. While I certainly am looking forward to flying this beauty, I am enjoying the construction phase very much. Experienced builders have urged me not to get anxious about completing the plane within some artificially derived timetable. They suggest that for many, the building hours are as pleasurable as time spent flying Perhaps ..... but I still look longingly skyward and dream about some COZY flying.

Thanks again for your contribution to aviation. You have to be one of the busiest "retired" people alive. We builders appreciate it! Hope to see you at Sun and Fun, 1994.

Sincerely,
Michael G Link
Nashville, TN

10/5/93
Dear Nat and Shirley,

My fuselage outside has been contoured and glassed and I've enjoyed the milestone of logging some "cross-country" time around the basement (photo enclosed). Shoulder brace is now installed and headrests assembled, though I will defer installing them until after I'm out of the basement and have sufficient clearance. I have the benefit of some excellent help from a long time Long EZ owner who also gives me frequent stick time doing cross-country and pattern work so I'm getting building advice, flying experience and motivational training at the same time. I'm looking forward to transitioning to the front seat of a Cozy!

I have obtained an 0-320 with 35 hours SMOH. I was able to get it at a very good price from a chapter member who has a Long EZ and was intending to use the 0-320 on a Defiant he is building. He has opted for an auto engine conversion using Rovers instead. I have all logs and the engine was thoroughly inspected and signed off after being removed from a wind- damaged Cherokee. It has a good history of use, so I think I got lucky. I declined to purchase the starter and alternator since I want something lighter back there. I have reviewed all newsletters regarding 0-320 installations (moving it farther forward, heavier extrusions, more plies of UND, etc.) and would appreciate any further suggestions.

On the subject of allergies, I have found that if I don't wear my cartridge respirator, I develop an epoxy reaction even though I am wearing butyl gloves! The symptoms disappeared in about 10 days and were not nearly as severe as the reaction I had last September, which lasted almost 3 months, but I reacted nonetheless. I have never had a problem wearing gloves AND respirator. I believe the airborne component may be more responsible for reactions than many may think.

We were not able to make Oshkosh '93 due to a heavy schedule at work, but we should be able to make '94. Thanks again for quality plans. During a recent chapter visit to my shop, several members commented on the quality of the Cozy plans vs what they had to work from. Sometimes it is hard to appreciate the effort put into them until you see what others are forced to work with! I just received Newsletter #43 and am pleased that the new Safe T Poxy has been formulated.

Regards,
Dave Barthelmes
Nashua, NH

11/22/93
Dear Nat,

I saw the Cozy Mark IV at Sun and Fun, and it was a beauty! I recently read how you've gotten up to 220 mph with new wheel pants. I have some questions about them ..... I would like to get them for my Defiant project.

Thanks for your help and time. Congratulations on developing an outstanding fast, 4-seat design, one a person can pay for a little at a time as he builds. I think your design is the best value for a homebuilt, cross-country aircraft.

Best regards,

Fred L. Mahan
Long EZ N86LE

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