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# COZY NEWSLETTER #73

## April, 2001

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### OTHER PARTS WE RECOMMEND:

We can recommend the following items:

1. Improved Rudder pedals for lay-down brake cylinders, adjustable both sides. Dennis Oelmann (319) 234-6109.
2. Improved MKNG-6 and NG-6 Pivots with tapered roller bearings. Jack Wilhelmson (843) 884-5061.
3. Electric speed brake actuator kit. Wayne Lanza (561) 664-9239.
4. Switching and breaker panel. Wayne Lanza (561) 664-9239.
5. Fuel sight gages. Vance Atkinson (817) 354-8064.
6. Electric nose-lift. Steve Wright (615) 373-8764.

7. Electric pitch trim. Alex Strong (760) 254-3692.
  8. Voice annunciated warning system. Richard Lewis (423) 376-1450.
  9. Rebuilt flight instruments. Howard Francis (not a Cozy builder) (480) 820-0405.
  10. T-shirts, etc. Bill Walsh, nogofsu@sprintmail.com. (407) 696-0942.
  11. Antennas. RST Jim Weir (530) 272-2203.
  12. Teflon & Stainless Hinge Pins Replacement. Gary Hall (954) 979-9494.
  13. Nosegear crank ratchets. Bill Theeringer (805) 964-5453.
  14. Embroidered clothing. With pictures of a Cozy, name, N number, etc. in any color. Trish Vermeylen (609) 693-4819.
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## **PLANS CORRECTIONS/CLARIFICATION**

There are no new corrections in this newsletter. However, we are including a summary by chapter of all known corrections to the Mark IV 2nd edition at the end of this newsletter. Please make sure your plans have been updated.

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## **WHAT WE HAVE BEEN DOING**

In January, Shirley's artist friend, Shirley Lewis-Smith, came down from British Columbia to stay in our home while we went on vacation, and then to go on painting trips with Shirley after our return. It works out well for all of us. Shirley L-S really can't give building advice or answer our e-mail, so we hope you all weren't too inconvenienced by our absence.

We lost our pet Lahasa Apso, Shu Shu, before we left for vacation. She has been a household companion for 16 years, and it made us very sad, so it was good that we could go away on vacation. We went down to the Carribbean, as usual. While there, we celebrated my 75th birthday. I reminisced a little, that it has been 56 years now since I first learned to fly and 28 years now that I have been involved in building airplanes and helping others. Life continues to be very interesting, and we have been bountifully blessed.

We have had a number of visitors this quarter, some that I took for rides. David Domeier and his lovely wife paid us a visit. Also builders Michael Skorjia, Wayne Hicks, and Clark Canedy. I always enjoy complements on the Mark IV. They all said that having a ride renewed their energy and determination. It's nice to have an airplane that is always ready, with an engine recently rebuilt, and nothing to worry about. I told each of them that mine was a plain, vanilla airplane, nothing fancy, and everything works.

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## BUILDER HINTS

1. For coupling a wing leveler to a GPS, Jim Ham sells a "Smart Coupler". You can reach him at (650) 326-2669 or jimham@porcine.com.
  2. Do not use "hard shelling". It reduces the strength of your airplane.
  3. John Epplin suggests that when you attach the wings many times in the shop, don't use the AN365 nuts over and over again, but instead get some fine thread nuts at the hardware store which are much easier to install and you don't have to worry about them wearing out.
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## FOR SALE

1. Sensenich 2-blade propellor 70 diameter x 85 pitch, for 180 hp or 200hp Cozy Mark IV. (480) 981-6401.
  2. Cozy Mark IV project: Partially completed fuselage, partially completed centersection spar, and canard and elevators sanded and filled by Dennis Oelmann, and plans, all for less than cost. Mile Mueller (440) 967-2373.
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## FIRST FLIGHTS

We have learned about 3 first flights, two in France and one in the U.S.

1. Alain Raposo in September 2000
2. Yves Pranal in January 2001
3. Gary Juergens on 2/12/02

Dear Nat,

Cozy Mark IV N2187J (plans #412) first flew on 2/10/01 at 4:00 p.m. on a cold, calm day. It was inspected 11/01/00 by St. Louis FSDO, who were a pleasure to do business with. The builder then walked away from the building process and took a break for 2 months. After renewing my bi-annual and a few hours practice, I felt I was ready to fly it. As soon as I made the decision to fly, friends and relatives came out of the woodwork to watch. I could have done without the extra pressure!! I made 1 more high speed run down the runway, and taxied back for take off. I went through my check list one more time and tried to clear the lump in my throat, and had nothing left to do but go. I rolled onto the active runway and applied full throttle. In just a couple of seconds I was approaching rotation speed and started applying aft stick. The nose lifted and the plane flew off just like in a training film. I kept the canard on the horizon and everything was going good until I looked at my air speed indicator-I was passing through 160 mph! No one told me I might have to reduce power climbing out, but that's exactly what I did. I flew around for about 20 minutes getting the feel. At 1500 rpm I was indicating 140 kts, not a Cessna 150!!! I entered my downwind leg with 1000 rpm and around 100 kts. I extended the

downwind leg and cut power to idle on base maintaining 90 kts. Picked up VASI lights on final and maintained 80 kts (more or less). Over the threshold I began the flare and tried to maintain 70 kts. The landing was picture perfect and the whole flight was beyond expectations. What a rush! It took till the next day to finally calm down. The plane flies great! I may have to add a stronger spring to the pitch trim for slow flight. My wife bought me the plans for my birthday 6 years ago, so I just had to make the first flight on my birthday this year. Starting to have fun flying. Thanks for the plans. February 10,2001 was my day!

Gary W Juergens  
Sullivan, MO

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## AWARDS

Both Sport Aviation and Kitplanes are requesting all designers to have their builders send in pictures of their completed projects, with short write-ups, because that is one of the most interesting features for their readers. Kitplanes even offers the incentive of entering the builders in a drawing for a free hand-held GPS. We have found that these pictures and write ups are more impressive with prospective builders than an equivalent sized picture ad. That is why we reward each builder \$100 for their entry in either or both magazines, or an Alex Strong pitch trim, which would otherwise sell for \$175. The only new entry we found this last quarter was: Ed Richards in December 2000 Sport Aviation. Our copy arrived too late to get this in the last newsletter. We are sending Ed \$100, which he can turn in to Alex for an electric pitch trim. In the meantime, Send your pictures in!!!!

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## EMPTY WEIGHT

A prospective builder, Eric Mecham, recently asked why some builders ended up with empty weights around 1300 lbs when the published empty weight of our plans model was 1050 lbs. I explained that the answer was very simple. Our airplane was built exactly according to plans, but many builders add things that increase the empty weight. I gave examples, like larger engines, original equipment alternators, starters, and carburetors, constant speed props, electric nose lifts, nose wheel doors, larger main wheels, leather upholstery, extra instrumentation like remote fuel gages, fuel flow meters, too much finishing materials, bondo (heaven forbid!), too much paint, and the list goes on and on. He answered: "Thanks for the reply, Nat. That's about what I figured. I was wondering if perhaps some people built very heavy layups, and was wondering how in the world they could add 100 pounds of epoxy to the airframe. The extra features, however, make it quite plausible.

I am a computer guy by training. In computers, you have a phenomenon called 'the second system effect.' It refers to the tendency to get the first computer system (the software part of the system) out the door as soon as possible, with a minimum of features. Then the second time around, they add so many new things to it, the project gets gargantuan in a hurry. It seems to be the same effect. Someone has/flyies

a plane they are used to, but wants all the extra goodies. So when they decide to build one, they want to build in everything they can get their fingers around!

It will be a while (several months) before I can get myself in a position to do something about starting my own airplane. Funny story though. I was discussing homebuilts with my girlfriend whom I found was not only interested in flying but thought building a plane yourself would be fun. She never knew it was possible until I started showing her various planes. When I told her about the Long EZ, she immediately rejected it saying (and without ever being in it or seeing one, just a picture) that from the back seat, you wouldn't be able to see. That is when I started looking and found the Cozy. So, hopefully in the near future, I'll be contacting you again."

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## **NOSE GEAR - MECHANICAL**

The mechanical operator for the nose gear on the Cozy Mark IV is similar to that used on the Long EZ. Like all retractable gear, it was designed to be extended or retracted in the air. The weight of the strut, fork, wheel and tire is offset by the wind resistance so that there is very little load on the spur and worm gears, so it takes very little effort to extend or retract it in the air. It is designed so that when it is extended, the mechanism goes over center to a stop. When over center, there is no longer any load on the spur and worm gears at that point, and the nose gear can then support a huge load, such as from a bad landing. If you wish to retract or extend the gear on the ground, for example to park nose down, it is necessary to support the weight of the nose by holding under either the canard or the instrument panel while cranking the strut either up or down. When empty, a plans built Mark IV will not have any weight on the nose wheel whatsoever when the fuselage is level, so you actually have to hold the canard down while either extending or retracting the gear.

The nose gear should not be retracted or extended mechanically with any weight on it. What usually happens if someone tries this is that the teeth will break off the spur gear, both due to the weight and also the shock of suddenly collapsing. Since the teeth are broken off for only 180 degrees, you can rotate the gear 180 degrees and actually break the teeth off twice before you have to buy a new gear. You should realize, however, that the damage you will do to your Mark IV is much less than you would do to a factory built, if you accidentally retracted the gear on the ground.

It is possible, if you taxi over a bump or too fast over a dip, that you can unload the nose gear and the mechanism can jiggle back over center and collapse and break half the teeth off the spur gear. If you bounce the nose and see the nose wheel crank jiggling, you should grab ahold to prevent it from unwinding. It is good insurance for you to have some way of preventing the crank from backing up unintentionally, like installing a lock, or a ratchet that allows rotation in only one direction.

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## **NOSE GEAR - ELECTRICAL**

The electric nose gear employs a ball-screw actuator which is very powerful. It is rated at 3,000 lbs. When the nose gear is retracted, if the wheel is not aligned with the wheel well, the actuator is probably strong enough to make a new wheel well in the bottom of your fuselage, it is that strong.

The electric nose gear was invented after the Long EZ and the Cozy were designed. Jack Wilhelmson has calculated that in a Mark IV built per plans with an electric nose lift, with 400 lbs. in the front seat, the bending load on the nosewheel fork assembly will be approximately 500 lbs, and the bending load on the strut, and also NG-6 will be approximately 3,000 lbs, about what the actuator is capable of delivering. The nosewheel fork assembly, the nose gear strut, the NG-6 pivot, and the nose structure were not designed to handle loads of that magnitude. The claim has been made that the electric nose lift can lift the nose of a Mark IV fully loaded with 4 people, luggage, and a full load of fuel. This may be true for the actuator, but not necessarily true for all the nose gear components and nose structure. We haven't heard of any failures of the nose gear components or the nose structure so far, but it could happen. Our recommendation would be that you never try to lift (or lower) the nose with more than one person in the front seat, and if that person weighs more than 150 lbs., lift the nose half way before that person gets in, or only lower it half way before that person gets out. In that way, you should have an ample safety factor against bending your airplane.

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## ENGINES

The Renault Diesel:

Cozy builder Brian Deford saw this in the AOPA online newsletter: "FRENCH COMPANY TO PRODUCE DIESEL ENGINE. A French company has received Design Organization Approval in Europe for its SR 305 230-hp diesel engine that offers improved performance, longer TBO, and the ability to run on jet fuel. SMA, Societe de Motorisation Aeronautiques, created four years ago by Aerospatiale and Renault for the development and sales of a range of piston aircraft engines, plans to go into production soon. All of the testing has been completed. Following an administrative process, the company expects to have certification under the Joint Aviation Authorities (JAA) by the end of the month, said a company official. Through a reciprocal agreement, SMA also plans to receive FAA certification in the United States Later this year. A price has not been announced. For more, see the Web site [www.smaengines.com](http://www.smaengines.com)."

The Delta Hawk Diesel:

Nick Ugolini writes:

"I have confirmation number 176 for a Delta Hawk engine. They recommend larger vent lines and larger fuel filler openings to accommodate the larger nozzle size used on Jet-A fuel trucks. There is basically no problem with Jet-A fuel in a composite tank. As a petroleum environmental engineer, most of the underground fuel tanks I deal with are now built of composite materials of a lower quality than the high quality epoxy we are using in our planes. They hold all sorts of fuels quite well. Auto gas is just about the worst liquid you can put in your tanks, but I have been using it for almost 1000 hours with no problems at all. My Long EZ (low compression engine) loves auto fuel."

The Continental GAP Diesel:

Todd Parker writes:



"After several phone calls, over several days, I finally was able to talk "engineer to engineer" to the right person, the engineer responsible for engine development, on 1/15/01. He said the program is behind schedule, but proceeding well. He expects the engine to be ready for production in 2 to 3 years. They are currently in "prop" test phase and will be testing it on a Cessna 337. They are currently working on engine cooling and changing the casting to improve it. They are working with Hartzel on developing the prop for the engine. A major concern for them appears to be overspeeding the prop, and for this reason will probably recommend a constant speed. This will help to take advantage of the lower rpm rating for the engine (2200rpm). It will burn Jet-A or regular diesel fuel. Their target is 200 hp with the same installed weight as the 0-360 Lyc. Specific fuel consumption will be about .365 lb fuel/hr/hp as compared with .48 to .50 for conventional engines He estimates 9 gal per hour at best power. He confirmed no electrical ignition. He hinted that the engine is performing a little better than anticipated and actual hp may be a little better than 200hp."

The Twin Suzukis:

Carlos V Leon writes:

"Best of regards from Ruben and myself. Still wishing you and Shirley all the luck in the world with Cozys. From our part we have 370 hours on our Cozy now and are enjoying it ever so much. We are always improving little design details in the engines (none of any real consequence) but the airframe has performed perfectly. "

The Subaru:

Al Wick started taxi testing in January and has been posting results of his ground tests to the internet group. As of this writing, he has not reported any flight tests.

O-320 Lycoming engines:

Don Rothrock writes:

"I have the Lyc IO-320 160 hp with a Sensenich 67x85 prop. At 1870 lbs. we indicate 156 kts at 2640 rpm (full power). TAS was 173kts (200 mph). With a little less pitch I might see a little more speed. VSI on departure was 1200+ fpm. Not too shabby for 160 hp!"

Richard Riley writes:

"If you use the 9:1 pistons from the 0-320-H2AD (Lyc part 35357) it's good for 170 hp, and you still have a 2000 hr TBO and you save about 20 lbs. off the 180 hp. 0-360. According to Lycoming, the 9:1 will be fine with the new avgas at 92 octane. The 10:1 that Dick Rutan has might be a problem, and the 13:1 that Sean Tucker is using won't be a good thing at all."

Paul Kraska writes:

"I know of one Long EZ in FL which is running a 0-320 narrow deck with high compression pistons, a helicopter cam, an Ellison throttle body and an electronic ignition. The owner claims he is getting in excess of 180 hp. He used his calculated hp to size his prop, and still had to add pitch to bring the rpm down. The engine really lops at idle, and roars at full throttle. I am not recommending this, it is just for information."

Nat Puffer posted:

"I called Bobby's Planes and Parts (940) 682-4220 to ask about the price difference and availability of the 160 vs 180 hp. He said that an 0-360 core now brings about \$7,500, whereas the 0-320s start at about \$3,500 and are a lot more plentiful."

## ENGINE MOUNT CORROSION PROTECTION

Howard Rogers writes:

"Buy some boiled linseed oil at your hardware or paint store. Get a hypodermic (the type we use for squirting glue is just fine) and shoot a small quantity of the oil into each hole. Tape over the holes, temporarily, and rotate the mount into several positions, allowing it to rest for a while in each position. The idea is to coat the inside of the steel tubing everywhere, with the oil. Linseed oil has a natural tendency to crawl everywhere, with sufficient time, so don't get in a hurry. The next day, drain as much of the oil out as you can, and permanently plug the holes with drive screws. These are available from Wicks, ACS, etc. Buy them to match with the hole diameters you have. They simply drive into the hole with a hammer. Voila! You are done, and the interior of your welded steel structure is protected from corrosion. Purchase the FAA publication AC 4313-2A for extensive info on building airplanes."

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## CRANKCASE BREATHER

Peter Lert, writer for aviation magazines and a long time friend, called me to comment on the writeup we had in the last newsletter about crankcase breathers freezing up in cold weather. He said pilots in Alaska have long known that breathers can freeze up and cause the crankshaft seal to blow out with the loss of all the engine oil. He said what they all do is to make a 2" long slit with a razor blade in the top of the rubber breather line where it leaves the accessory case. As long as the breather line is open, the slit stays shut, but if the breather line freezes shut, the crankcase fumes will vent through the slit without blowing out the crankshaft seal and resulting in an engine failure.

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## BACKFIRES

When an engine is running with either magnetos or electronic ignition, the spark is advanced to 25 or more degrees before the piston reaches top dead center. This is not a problem because it takes a finite time after the mixture is ignited before a pressure peak occurs, and by that time, the piston has passed top dead center and is on its way down. When starting, however, it is a different matter, so with either magnetos or electronic ignition, the spark is retarded to after top dead center, so the engine won't backfire, or kickback when starting.

Some electronic ignition systems, such as the Jeff Rose, use the waste spark firing method. As I understand it, one spark is sent to the cylinder on the power stroke, and the "waste" spark is sent to a different cylinder which is either ending the exhaust stroke or beginning the intake stroke. This isn't a problem when the engine is running, because fuel is present only for the power stroke. However, if all



of the cylinders are primed for starting, and there is fuel in all cylinders, and two different cylinders get a spark, the wrong one could fire and cause a kick back. Apparently, there are several ways to avoid this. One way is to over prime, so the mixture is too rich and the engine does not fire until it has turned enough to add air to the mixture. Another way is to keep one mag (the impulse mag) and start on the impulse mag only. Still another way is to delay turning on the electronic ignition until the engine is turning over smartly. I hope this is an accurate summary of the discussion which occurred on the Cozy builders news group.

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## BATTERIES

Here are some battery considerations:

1. Lead-acid batteries are not a good idea for airplanes, because they are prone to leak. You would have to have a battery box with a drain to the outside. Fiberglass layups are fairly resistant to sulfuric acid, but it is messy.
  2. Sealed batteries are much better. Gel-cell batteries are sealed, but they have some bad characteristics.
  3. Bill Bainbridges gas-recombinant batteries are sealed, and are far superior to anything else. They are compact and light. I have been using them for about 10 years now. The 25 amp-hour size is quite adequate. The best feature is that they have low internal resistance, so when you draw a heavy load, like starting, there is very little voltage drop, which really spins the engine and helps it to start quickly. The first one I had lasted me about 8 years, even though it had been drained flat at least 3 times. The only thing that was affected was its capacity; it still put out the same voltage. By comparison, where we live, an auto battery lasts about 3 years, even if you keep the level up. The only problem with gas-recombinant batteries is that they are more expensive. The last one cost me \$140. But for airplane use, the good characteristics are worth spending extra money for.
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## ANTENNAS

Here are the dimensions (each arm) Jim Weir has published for the following di-pole antennas:

- Marker Beacon - 34.3 in.
- FM Music Radio - 26.2 in.
- VOR/LOC - 22.8 in.
- VHF/COM - 20.3 in.
- Amateur 2m - 17.7 in.
- Glideslope - 7.5 in.

The COM is the only one that needs to be vertically oriented. All the rest should be horizontal. The

VOR should be a V shape. Some say the marker beacon should be along the airplane centerline. I installed mine in the wing and it worked just fine. You should keep the tips of di-pole antennas away from metal, and away from each other, particularly transmitting antennas. I have used Jim's measurements and they work well-better than most factory antennas. My GPS antenna is mounted in the nose, just under the inspection cover (pointed upward toward the satellites) and works well there. I like this location because the co-ax is very short. My transponder antenna is in the bottom of the nose, with the probe just sticking through the skin (pointed down toward the ground stations). You can make your own transponder antenna. It should be 2.65 inches long from the tip of the probe to the ground plane, and insulated from the ground plane. The ground plane can be made from .062 aluminum. It is about 8 inches in diameter (I lost my drawing). I have made my own from one of Jim's kits, and also from scratch, and they work well. You attach the center conductor to the radiating rod, and the co-ax ground to the ground plane. You get a lot of satisfaction when you make your own antennas, they are all hidden, and they work better than the ones that cost mucho bucks!

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## STICK GRIPS

We have always used rather slim sidestick grips, like ski pole grips in which we mounted a push-to-talk switch, or computer game sticks which already had a switch mounted on the end. Companies have sent us samples of nice fat sticks with all kinds of switches, but we would have to have put a blister on both sides of the fuselage to allow room for full aileron travel with one's hand around the stick. The time when you are most likely to need full aileron travel is at slow speed when rolling out of a turn to final, or on takeoff if you get caught in the backwash of another plane. For safety sake, you should make sure that stick size and travel does not limit aileron travel. One builder suggested a bicycle handlebar grip which comes with a chrome end plug, which can be drilled for a push to talk switch. There is only one switch which is really a convenience to have mounted on the stick, and that is the push-to-talk. All other switches can just as easily go on the panel.

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## COVERS

Eric Westland writes:

"Yep, that was me. Lynn Cunningham's business ([www.cunninghamcovers.com](http://www.cunninghamcovers.com)) is located at my field and I have seen plenty of his covers (which are well done), so I had him make me one. When we couldn't get to OSH, he asked if he could take mine along as an example and I agreed. I also put up some pictures on the net to let you folks know. I figured if someone was in the market at OSH and could try it to see if it fit, it would better equip them to make a decision.

After work today I went to the airport to see what was up for Kevin. His cover was completed weeks ago and was sitting on the table; Lynn was waiting to get a couple of strap measurements off of mine before sending it Kevin's way. Lynn has plenty of work to keep him busy, when I dropped by today, he had 3 other people sewing for him. He's a skilled, honest person that keeps plenty busy. Of course, if

you can find someone local to sew a cover for your plane, you know it's going to fit."

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## **BRAKE CHATTER (revisited)**

David Domeier writes:

"The BRAKE CHATTER write up in Newsletter #72 needs clarifying. There was, in my opinion, more than one cause of the problem; wheel alignment, tire balance, right brake binding due to restricted plastic line, and finally disk run out. As I corrected each item, the chatter lessened somewhat, but never did go away completely until the last and most expensive fix - installing new stainless disks. When that was done, I still had the AN303 hoses in the system and hoped that going back to the original plastic would not reintroduce the problem. It did not. Plastic is OK as long as the line is not tie wrapped to the strut. The original disks (part 164-08500) have about 350 landings and were worn somewhat with a run out of .004 to .008. Without any doubt in my mind, that much run out is too much. But brake chatter, which is relatively common in these airplanes, can be caused by other factors. Do not go out and buy new disks until the wheels are properly aligned, balanced, and the anchor bolt is checked for free movement in the torque plate."

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## **PROP BOLT TORQUE**

It has been discussed many times that it is important to check the prop bolts for wooden props frequently.

David Domeir writes:

"I've had 3 Performance proplors and every one has a maintenance sheet with the following numbers for bolt torque values:

3/8" - 30 to 35 ft lbs

7/16" - 35 to 40 ft lbs

1/2" - 40 to 50 ft lbs

I agree that 40 to 45 seems high and I use the low side of 40. But these are the numbers specified by the manufacturer who has been making these things for many years.

There is some variance from one prop manufacturer to another. The Performance numbers are higher. Felix props specify 30 to 32 for 1/2" bolts. That could be because Performance has many more laminations than Felix. Felix has less glue, and it weighs less. I use 40 to 45 ft lbs on Performance propellors as bible."

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## PAINT STRIPPING

Vance Atkinson writes on 1/17/01:

Ok.....you guys who want to know about removing paint from EZ type planes using a razor blade, it works! My wife and I stripped our Cozy of the topcoat paint (leaving the primer underneath) using single edged razors and a 75 cent hardware store holder.

We went through about 100 blades doing the entire airplane. You cannot do sharper curves with the blades, like leading edges, landing gear, and most of the entire upper and lower cowls, which were sanded. But we did an entire wing and winglet in about 4 hours.

The paint we stripped off was enamel. I don't know how this would work with some of the tougher urethane paints. Our paint was also coming off in the air anyway. As some of our flights flew through moderate to heavy rain. One winglet eventually had 30% of its paint gone after one particular encounter, and that's when we decided to repaint.

If you have ever used a wood shaving plane, you will know a particular angle of the blade held in the hand will produce a nice long curly cue of wood. That angle is about 45 degrees. If the angle is too steep, the forward motion of your hand will produce a "dig in", whereby you will instantly stop. If the angle is too shallow, the blade will skip across the surface doing not much of anything. The secret is to get the right angle.....and it's not thard with a little experimenting. We would start on one side of the wing root and make a continuous pass down to the winglet. If I kept the andle correct and the pressure correct, I made that pass in one single stroke! You can also go from leading edge to trailing edge.

Yes, you will get some "digs" every once in a while. These are very small and are easily repaired after all the aircraft is stripped. The tight rounded corners can be stripped in this manner, but are more tedious to do, and a much smaller area is stripped per stroke.

The above method works well if you have a straight plane and no waves in the surface. If you craft is wavy, you might as well block sand the finish because you will need to fill in the low areas anyway, so you might as well use the old paint to do that.

## SPRAY BOOTHS

There was a protracted discussion on the internet about building special paint booths to paint your airplane. I related my experience. The 3M Company, where I worked for 30 years, did quite a bit of research on finishing materials for automobiles, and had a very nice spray booth. I knew the head of that research laboratory and asked him if I could use the 3M spray booth on a weekend to paint my airplane. He told me it wasn't necessary. He said I should just paint it outside, on a calm day in the morning when there weren't any bugs. I should use PPG's acrylic urethane paint, put on plenty of paint, and then when it was cured, wet sand it to remove the orange peel and overspray. Go from 600 to 1000 to 1500 and then to 2000 grit (which 3M makes), and then buff it with 3M's Finesse-it II. This has worked well for

me. I paint everything dissembled-elevators, ailerons, rudders, canopy, canard, fuselage, cowlings, spinners, wheel pants, and wings. I can't brag about my paint jobs, because I am always in a hurry and don't do as much wet sanding as I should, but Gene Davis followed the same procedure and if he flies his Mark IV to Oshkosh, will probably win an award, because his paint job is gorgeous!

When I posted this on the internet, it created some controversy, even among professional painters. Some said not to paint airplanes this way, and some said it was good advice. You be the judge!

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## **CABIN HEATERS - OIL**

Some builders install an oil heat exchanger in the nose to provide cabin heat, but Jack Wilhelmson came up with a different solution. He writes:

I just installed a heat exchanger in my Cozy III. It is a standard 7 row cooler in series with the main 9 row cooler. It has a 105 cu ft per min blower. My setup is simple in that the exchanger is mounted in an aluminum box that ducts the air from the blower through the exchanger into two 2" ducts. The whole thing is housed in a foam and fiberglass box with some airspace around the metal box (for insulation in the summertime) and mounted on the floor behind the pilots seat. One 2" duct is attached to the standard heat duct system and the other one is attached to the map pocket cavity with an aluminum sliding gate valve attached to the inside of the map pocket. This gives control of the hot air to the upper cabin between the pilots, and/or to the lower cabin in the front floor area. The cabin heat exchanger is plumbed with standard 303 hose and fittings through PVC grommets in the firewall. The only control is blower on or off. In the summer the heat from the exchanger will be trapped in the insulated box and the oil will be cooled by the regular cooler. I expect oil temperature to stay below 180 deg F. This setup is simple and requires minimum alteration to the airplane. The system sets in the backseat floor space and still leaves plenty of passenger leg room. It adds one hose fitting and about ten feet of hose. It requires one extra quart of oil.

I flew my airplane with it's new heater system. The temperature outside on the ground was 50 F, and at 4000 ft, was 38 F, so it wasn't a good test. The oil temperature reached 170 F after about 5 min. The air from the heater was very warm After about 10 minutes I had to turn the fan off, even though I was dressed in light clothing.

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## **CABIN HEATERS - ELECTRIC**

Bill Theeringer markets a small electric cabin heater. Bill takes a suitable electric hair dryer and using only the case and fan motor, rewinds it to run on 13.8 volts, drawing 175, 350 or 525 watts (40 amps). The 3 settings are panel selectable. Low heat is 80F at 15CFM. High heat is 155F at 30CFM. Cost is \$300, including solid state controller and installation materials. Contact him at (805) 964-5453 for more information.

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## INSURABILITY

Someone commented that they could no longer get insurance through AOPA. The EAA works closely with Avemco, which is where we have our insurance. We have been told that the Cozy record is twice as good as Cessna's, and we haven't had any problem with Avemco. As we reported in the last newsletter, Velocity, Lancair, and Glasair all have had problems, which required their builders to have special inspections and training as a prerequisite for getting insurance.

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## LETTERS FROM BUILDERS (some from the net)

12/22/00

Hi Nat,

Merry Christmas to you and Shirley and may you both have a healthy and happy New Year. I hope you like the T-shirts. My wife Trish just started an embroidery business and made them for you. Sincerely,

John Vermeylen  
Lanoka Harbor NJ

*(Editor: John sent us two T-shirts, each with an embroidered picture of a Mark IV, and one with my name and one with Shirley's name. I called Trish to thank her. She bought a very expensive computerized embroidery machine which can use any combination of colors, and she does T-shirts, denim shirts, jackets, caps, towels, and almost anything. Over and above the cost of the clothing, the Cozy emblem costs \$14, and first and last names \$3. Great Presents! (609) 693-4819 )*

1/12/01

Dear Nat,

Wow! What a great Christmas present. Do I have a wonderful wife or what? She provided the plans. That must mean it's okay to start building. Thanks.

Marv Royster

1/15/01

Dear Nat,

As you already know, I recently received the Mark IV plans for Christmas. What a great gift! After considering the many options to get my butt into a plane of my own, I settled on your design. I would like to thank you for all of your contributions to the aviation community and cannot wait to start the



build. My proposed start date is May 12, 2001, my birthday, but I still have many things to work out. I should be finished with my ticket by then. I am planning to equip my Cozy full IFR with a 0-360 Lycoming and electric lift. No other alterations to the plans will take place.

Jack Fairchaid  
Bear, DE

1/20/01  
Dear Nat,

I thought I would send you a note so that you can get an understanding of your newest builder. My fiancée, April, ordered the plans as a Christmas gift for me. I have been longing for them for quite a while. I have already read all of the newsletters available online and with other research, I feel like I have made the best choice like the 924 people before me. I won't be the fastest builder, since we just graduated from Embry-Riddle Aeronautical U - Daytona Beach campus, and money is tight with loans, but I will be one that actually completes the project.

For the last year, I have had a job building 13 Lancair IVs, both pressurized and not, along with two Glass Gooses. I feel confident that what I have learned at work will help me produce one of the best airplanes. I hope to add to the list of Cozy Grand Champions.

Finally, April would like to thank you for helping her on the phone. She told me that she became very nervous when you picked up the phone. She has a ton of respect for you since you designed such a great plane. Secretly, I think she may be more excited about building as I am, as hard as that may be to believe.

April and I will be married on Jan. 28,2001 and she will be using my last name.

Tim & April Hedstrom  
Daytona Bch FL

1/28/01  
Dear Nat,

I'm 39 years old and just now got my first computer! I finally have joined the rest of the world. I have a degree in computer science, so I guess I never thought I would need one. The first thing I did was to check out your website. It's a great site, but I do have to say that what most impressed me was Shirley's artwork! What a talent! Now, can she paint over fiberglass filled with micro?

My Cozy has been in the air 3 years now. Great airplane! While it (N171BH) is in annual, I want to upgrade my aileron torque tube bearings from the original phenolic type to the triangle type to remove excess aileron slop. Is the nylon bearing the proper one to put in my wing roots, next to the engine compartment (ans: yes)? I can't believe these bearings are so cheap! Take care.

Brian Heinitz  
Gold River, CA

2/07/01

Builders,

I recently had the opportunity to strip and repaint a Long EZ that has been in service since 1982 and has over 1600 flight hours on it. The owner flew it in to the Waterloo Airport in October, last year. I'd like to share a few notes and maybe help somebody save some time, money, and weight.

The owner flew the airplane in to the airport where I live to clarify that it was in flying condition and was in good working order, but the owner said he always parked in the back row at flyins because he was ashamed by the way it looked. I put on new wheel pants by Claus, baggage pods, new interior paint, and sight gages just to name a few add ons. The paint had been lifting and cracking in many places. I could hardly wait to find out why?

I disassembled the plane and took it to my shop about 2 miles from the airport. I started with the wings. Using a DA sander and 36 grit, I carefully sanded the paint off. The builder (not the owner) had painted with Imron and I could tell by how hard the paint was. As I would sand through the paint and get to the fill, I found out why the paint was peeling off in spots, especially bad in high stress areas like under the canard next to the fuselage. The culprit was lacquer base glazing compound and body putty. It seems that the red glazing compound, sometimes blue in color, absorbs moisture. It was also used to spot fill areas up to 6 in in size, thus causing blisters and lifting over time. As I sanded and all the paint fell to the floor and on everything else I own and I got down to the structure, I was impressed!!

After 18 years the structural integrity of the plane was as good as the day it was built. Hurray for RAE epoxy!!! Hurray for good basic building techniques!! One might want to consider this when thinking of hard shelling and vacuum bagging, which I think is a waste of time unless you are using molds. Anyway, lesson one: Don't use anything on your airplane if it doesn't have a hardner in it. I like Evercoat to fill pin holes and small scratches if the builder of this plane had used that instead, the paint wouldn't have peeled off. After all the paint was removed, we started the recontouring. I used the West System cause I know it won't come off. I applied the micro using an underlayment trowel as I have described previously.

After the West system was on and the plane all reshaped, I squeegeed a coat of West over all the surfaces. I call this sloppy slurry mixed like Elmers glue. It fills all the pin holes and scratches left from the 36 grit and 80 grit I used in the West System contouring. This puts a shell on the surfaces. I like to make the surface wet with the West micro mixture and then squeegee as much off as I can. Wiping the squeegee each time with a paper towel also prevents ridges. Sometimes it takes more than one coat. When that's cured, usually two days, I sand off any ridges with 80 grit and start priming.

I think PPG K-38 high build primer is a great choice. Two wet coats at 45 to 50 psi at the gun and block by hand with 180 or 220 in the DA. I blow off all the dust (or better yet wash with water) and go over the surface with a good light and look for imperfections. You won't have to look far. I circle them with a pencil. Evercoat is an ultra smooth primer/filler you can paint right over. Mix up small batches on pieces of cardboard and with a small spreader, press it hard into those scratches and pits you missed. Block with 180. Another 2 wet coats of primer and block with 320 and you are read for the finish coat, well, almost.

PPG makes a little brother to the K 38 high build primer. Its called K 36. This is a sealer primer mixed 2 parts primer with 2 parts color and 2 parts reducer and 1 part hardner. It goes on wet and you paint over

it wet. You have 15 to 45 minutes to get the top coat on after you shoot the K 36. What's great about it is that you mix the color with the primer sealer. This gives better coverage and less chance for primer bleed through, cause your bird is now the color its ging to be on the outside. This primer really flows and fills sanding scratches that you missed and it's the color of the finish coat so you don't have to put so much paint on to hide anything. I believe you'll use less paint to cover and thus have a lighter plane. I mentioned before I don't believe in vacuum bagging. If you use a blow drier to do layups and take out excess epoxy, that's good enough. The real weight gainers in this filling process is the primer. This stuff is heavy, and that's why it fills so much. One or two extra passes with the primer gun and you lost all you gained with so much effort and cost with vacuum bagging. So, after the K 36 primer/sealer you have 15 to 45 minutes to put on the top coat. I used Concept 2000 acrylic urethane paint color 91045 white. I was a little bit worried I would have a hard time seeing where I had painted, since it was still wet, but the top coat is really shiny and it was EZ to see where I had been. I use a Sharpy siphon gun, just make sure it is clean. Most paint stores will soak and overhaul a paint gun for around 35 bucks and it might be a good idea after you are done priming, if you plan to use the same gun for painting. I would recommend a large air compressor, 5 hp minimum with 80 gallon tank. Use a water trap in line and a regulator at the gun to control pressure. I use fish eye eliminator in all the top coats I put on just as a precaution (1 oz per sprayable quart). Do not spray anything in your shop with an aerosol can 3 days prior to painting, such as cleaners or, heaven forbid, WD40 or Armourall or ANYTHING with silicone in it. Fisheyes are a bodyman's nightmare. Hope this saves you some grief. Painting is really fun, it's the sanding that makes it work, but it is worth it.

Dennis Oelmann  
Cedar Falls IA

2/07/01

Dennis,

I agree with your recommendations on painting with one exception. Unless I am wrong, Evercoat is a polyester resin based product. All polyester based products will eventually cause lifting (it may take several years) of the urethane top layers. Having learned this lesson the hard way over 15 years, I feel obligated to pass it on. There are many catalytic curing urethane based products that can be used in place of the Evercoat. One that I have had good results with is Dupont URO sanding primer.

Jack Wilhelmson  
Charleston SC

1/19/01

Dear Nat and Shirley,

I heard about a horror story of a Long EZ builder who asked a body shop to contour and finish his airplane. He didn't like to work with micro balloons and epoxy, so he used auto body filler (bondo). It was way overweight, and had to be ballasted, even with a 205 lb. pilot, to bring it up to the aft c.g. limit, so I decided to test the weight of filling materials.

I took a container and filled it with 10 oz of water for reference. Using the same kind of container, I mixed micro balloons and epoxy to putty consistency and filled it. I then filled a container with bondo. Here is the weight comparison:  
Water 10.00 ounces

Auto body filler (bondo) 12.37 ounces  
Safety-Poxy & micro balloons 4.23 ounces  
EZ-10 epoxy & micro balloons 4.08 ounces  
Superfil 5.36 ounces  
Aeropoxy light filler 3.28 ounces

Aeropoxy light weight filler hardens in 30 minutes and can be sanded or carved sooner than the others. I hope this information will be of interest to you and other builders. I will testify in court in April about the Long EZ.

Jaquest Genest  
Chambly, QU

3/1/01  
Dear Nat,

I am including a book of pictures of my bird. The registration is F-PGJL. It means Le Fier Petit Goeland Jonathan Livingston (the proud little Seagull) story of Richard Bach. When I am asked why I love flying, I tell the asker to read that book. The answer is written a lot better than I could express my feelings.

So I decided to have the decoration of my bird on this idea. My son did the design. He wanted it quite simple with feathers at the end of the flying surfaces, and a few seagulls painted on the plane (pictures in next newsletter).

We are quite active near Paris, because in the last year there are 3 new Cozys flying. Mine first flew 5/5/00 and now has more that 50 hours on it with no problems. Alain Raposo Flew in September 2000 and he also has 50 or more hours with no problems. The last one is Yves Pranal, who flew his in January 2001, and it looks like he has no problems as well. All of us are very happy. When do you come to see us?

Benoit Lecoq  
Paris, France

2/20/01  
Howdy Nat and Shirley,

The Cozy was my first aircraft construction project and I can truly say that after six years of construction, Cozy III N296MH is flying with me as the pilot. Although the maiden flight took place in June 1999, it wasn't until January 2000 that I was able to get into the plane unassisted and actually take off and land. Since then I have spent over 175 hours in the air making several cross-country trips. N296MH is powered by a 1955 0-320 engine with a Jeff Rose dual electronic ignition and Airflow fuel injection. I'm slow but sure. In July 2000, I completed the wheel pants and then flew to Oshkosh. In October 2000, my son, Tom, and I made it to Copperstate and to your barbecue. Thank you and Shirley for your hospitality, it was a great time at your house. In November 2000, I finished an oil-cooled heater and placed it in the nose.

I would like to take this opportunity to thank Steve Willhoite for test piloting N296MH and then flying

beside me in the plane for seven months as I adapted the controls for one-handed flight. Thanks to Gene Davis for sharing his tremendous knowledge of airplane construction with me as well as flying to Santa Fe to help me with the weight and balance. And, last but not least, thank you for making yourself available at a moment's notice to provide support and guidance and answers to the hundreds of questions I asked. I cruise at 155 knots at 2500 rpm and the plane is truly hands-off flying. Great design!

Malcolm Hart  
Santa Fe NM

*(Editor: Malcolm is severely handicapped with only one arm. He is truly an amazing person.)*

01/09/01  
Cozy builders,

I have modified the original nose gear ratchet (of Curt Smith) per Mike Melvill's suggestion using a Sears Box ratchet. This has a bunch of advantages. The shaft and crank assembly can be easily removed by disconnecting the shaft at the U joint and then pulling it out through the front panel. It is available in kit form for \$50 delivered. The parts cost about \$16 and it takes about 2 hours of machine time. I have sold about 10 so far and everyone seems to be completely satisfied.

Bill Theeringer

01/12/01  
Dear Nat,

I would like to inform you that we bought Mark IV drawings 0296 from Paul Lacroix in Gatineau, Canada. His plans and airframe now belong to me and Daniel Desjardins as partners in the Mark IV construction. Personally, I was not convinced or a true believer in composite aircraft, but Daniel managed to convince me while he was helping me on my Super Cub. I was a true aluminum guy and I was not ready to face the "harsh comments and jokes" about my plastic airplane. But Daniel did a tremendous job in convincing me that composite is the future. I have heard very nice comments about you!

Marc Metivier  
Blainville, Quebec

02/12/01  
Dear Nat,

I would be willing to give a presentation at Oshkosh. I could talk about building speed. Basically, if I can fly this plane on June 3rd, that would be 19 months of construction time. Now, I still have a lot of finishing to do, but it is moving along. I think that the basics of building speed are the same for any project that you are working on, and would be applicable to plane projects in particular. You need good plans, the budget to support the process, dedicate some time every day (maybe only 2 to 3 hours, but try to hit every day), don't change things, find some experts you trust, practice ahead of time, etc.

I still have plenty to do to finish this plane up, but I know I could build faster the next time. First, I built

all my own metal parts with the exception of the nose wheel/fork assembly, canopy safety catch, NG4, and the nose lift assembly. Next time, I would have these parts made before I started, or I would just buy them from Brock. Once you get to the point where you are buying engine parts or avionics, it doesn't look like such a big deal to buy the parts from Brock. I think it would be an effective speech if I have the plane sitting there.

Norm Muzzy  
Cedar Falls IA

01/29/01  
Dear Nat,

Here in Venezuela I had the opportunity to fly as co-pilot with Carlos Leon in Cozy YV-22X. It flies fantastic and stable.

Rafi Kalustian  
Caracas Venezuela

02/06/01  
Dear Nat,

Thanx for taking us up for a ride this past Saturday. The plane flies like I would have imagined, and I'm now anxious more than ever to finish mine. Hope to see you and Shirley at Sun N Fun, but with this job and the traveling I'm doing, I never know!

Wayne Hicks  
Carrolton, VA

On 01/08/01 John Slade forwarded me a message which Ron Castle posted on another mail list:

"I have a lot of experience with canards and the owners of plans. The reason to build a Cozy over the others is that the level of support is superior. Compared to the Eracer, Long EZ, SQ2000, Velocity, only the Cozy from Puffer gives the support needed to finish an aircraft. All the others are there only sometime. And not on all types of installations such as auto conversions. This is very important to you. I think Cozy plans are the best also. My plans for the Eracer either didn't have the dimensions or they didn't add up to the balanced assembly. I had to recalculate every part twice."

Ron Castle  
KR2 & Eracer builder

01/01/01  
Hi Nat,

I wanted to thank you for the quick shipping of the plans for my Cozy so quickly. I wanted to let you know that I appreciate your consideration and concern for your builders. I would like to meet with other builders in the Las Vegas area.



I am an A&P as well as a retired airline captain. I chose you to do business with due to your excellent reputation and the excellent performance numbers for your aircraft. I look forward to building the Cozy and continuing relation with you and yours.

Marty Druckman  
Las Vegas, NV

01/01/01  
Hello Nat,

I hope you and Shirley had a great holliday. I just wanted to let you know how much I and my friend Baine enjoyed seeing you and your airplane. Thank you so much for taking the time to meet with us. It was a thrill for me to have you take me up in your Cozy. I loved the way it flew. It was an inspiration for me to continue working on my plane.

Phillip Sill  
Cuncan, SC

12.20/00  
Nat,

I noticed in Newsletter #72 that my Cozy is still listed for sale. I sold it to Ivano Luini of Long Island. He stays in touch and seems to be enjoying the Cozy and the attention he gets with it. He had an A&P go through the airplane recently. He called and let me talk to his mechanic to make sure that the logs are up to date. His closing comments were that the Cozy is well designed and he approved of my workmanship. It's great to hear that from a guy who works on certified airplanes everyday. Ken Miller also checked the airplane for him before purchase and gave his approval. Ken has a pristine Long EZ, 160 hp. My intention is to stay in touch with the Cozy group. We started construction on a new home a couple of months ago. Of course I also get a new workshop to build my next Cozy in. See you at Sun n Fun.

Mike Davis  
Rincon GA

01/29/01  
Dear Nat,

I have been asked to give a presentation on the Cozy at our next Chapter 35 meeting. Using the plans, newsletters and Don and Julia Downie's "Complete Guide to Rutan Aircraft" I have enough information.

The weather here has been a bit cold for layups, so 3 of us recently got together and hot wired the foam for wings and winglets. Brad Doppelt and Terry Winnett cut out their canards also. I have my canard done and have been following the sequence in the plans. My shop is only 150 sq. ft. (10 x 15). I built the smallest table you recommended. At present I am allowed half of our two car garage. Yesterday, I did the layup on the bottom of the right wing, unassisted except for my wife who helped pull the UNI fibers straight. Outside temp was 60 F but I was able to get the inside up to 78 F using a small electric heater and three 250 W heat lamps over my work table.

If you are passing thru the area, please give a call (210)496-4751. Chapter 35 is one of the best in the U. S. and we have 170 members. We have a 2000 sq ft building on a private fly-in community airport with 4,600 ft of runway. We must have 30 people either restoring or building. You and Shirley are welcome to visit, and we can show you our great city.

Lowell Robinson  
San Antonio, TX

03/05/01  
Builders,

After 7 years and 9 months, I finally heard the roar of the engine in my Cozy on Saturday. What a feeling! My boost pump failed to work (now corrected), I forgot to turn the fuel valve on for the first try (nervous and not using a checklist to start) and I flooded the injector, but after that, she finally started up. Tightening a few hoses and all the leaks were take care of.

It ran rough on the mag, but very smooth on the Lightspeed ignition. I am going to re-time the mag to see if that helps. I still have to adjust the idle mixture as well. Temps all within tolerances (EGTs - 550 C, Oil - 50 C, and CHTs - 180 C) with the cowling off. FAA inspection scheduled for Thursday. I may just make it yet. To all still building, keep at it - it will be worth it.

Paul Stowitts,

San Dimas, CA

2/10/01  
Dear Nat and Shirley,

My Mark IV #400 is slowly progressing. Airframe construction is nearly complete and flying surfaces are filled but not primed. Instruments and switches are mostly in and I am currently doing electrical and trying to build up the bank account for the engine mount, cowling, etc for the next step. I came across a good deal (I hope) on an IO360A1A engine. Came with a BD4 that my brother wants to put an auto engine in so he got the airframe and I got the engine. Do you have anything available for the installation differences? I've gotten some information from Eric Westland, but would appreciate any other help. Thank you for your support in the Newsletters, internet and in person. Building has been fun but I am looking forward to flying.

Dennis Rose  
Aromas, CA

3/4/01  
Dear Nat and Shirley

Our plane is in the finishing process. I need to put in instrumentation and electrical. First flight will be some time this year. We hope to make Oshkosh with our Cozy. Thanks for your willing support over the years.

Don & Lisa Ponciroli  
Ledyard CT

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