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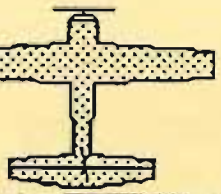


NEWS OF NORTHWEST CONTROL-LINE MODEL AVIATION

1073 Windemere Dr. NW, Salem, OR 97304 Editor: **Mike Hazel**

DECEMBER 1996

ISSUE #136

IN THIS VERY END OF THE YEAR ISSUE..... FRED CRONENWETT ON SCALE, ORIN HUMPRHIES ON STRUCTURES (THIS ISSUE GET TWO HUMPHRIES FOR THE PRICE OF ONE!), JOHN THOMPSON'S ROUND & ROUND, PLUS RECORD REVIEW FOR CLASS I MOUSE RACE!

Is it still 1996? Well it is when this thing is being put together, but I predict (I'm pretty good about these things) that you won't have this ish in your hot little hands until 1997. Is it the usual editorial excuses this time? Or, something else. Yes, something else.....yer editor has been sick, so have been laying low (and slow) about the modeling chores and duties.

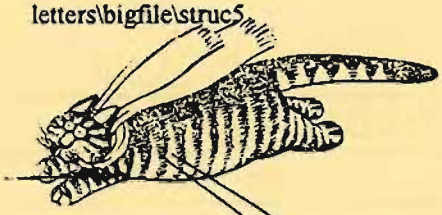
Speaking of sick, is anyone else just about sick of this winter yet? On the coast side of the mountains, we have had enough rain for two seasons. Let's see, heavy rains, winds, ice storms, I'm ready for warm weather fare, say like drought and locusts. Oh well, try to keep perspective and get yer winter building projects done. The sun will again shine someday.

No contests for awhile yet, but the NW does have its annual "oasis" in the form of the NW Model Expo in Puyallup, Washington. (flyer in this issue). This event is usually just the ticket to beat the winter blahs. Come look at displays of models, tour the commercial booths (some deals can be found), or enter the WWF Swap Meet Ring, and prepare to do battle with hordes of hobbiests, all crazed and bent on beating you to the deal-of-the-century somewhere hiding in the maze of tables. Of course the best part of this Expo is just hooking up with fellow modelers, and sharing ideas about the coming season.

Around the New Year is when we are supposed to make resolutions for the coming period of time. This editor has one which will make things nicer for your eyes. Yes, Flying Lines is ready for an upgrade of graphics and layout. I have been kind of lazy in regards to even learning how to use our family computer, so the result has been kind of a crazy quilt of hand cut and paste technique not unlike from long ago. Watch for the improvements, but please be patient!

Product Notes: I have noted the last several months since the Estes company took over Cox, that there have many varying reports regarding the Cox engine line. Does anyone have the last word? From a couple of small ads, I see that K&B is changing their epoxy paint line. Nothing wrong with the old stuff, so hope the new stuff is good. All for now, have a great 1997!

letters\bigfile\struc5



SPECIAL TOPICS

Born to fly

I-BEAMS PART 3
by Orin Humphries
STRUCTURES PART 5

What do we know so far? A structure is strong only so long as it holds its shape. A structural member that will see compressive loads must have three times the cross sectional area it would need if it saw the same load as a tension or it will buckle. Stiffness of an I-beam increases with the square of the square of the change in web height. A look, now, at "the neutral axis" will let us get at some more goodies.

Say we have an I-beam held securely (fixed) at one end and the free end is loaded vertically. Of course it is bent with a tension load in the cap on the outer radius of the bend curve and a compression load in the cap on the inner surface of the curve. The caps are a tension-compression pair as mentioned in the first Part of I-Beams. This leads us to a question.

If the outer cap is in tension and the inner cap is in compression, what happens to the load in between them? Please look at Fig. A.

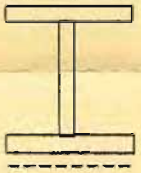


Fig. A

The "+" signs indicate this cap is in tension and the "-" mean the other is in compression. What is the situation with the loads in the web, between the caps?

Lets consider first a symmetric I-beam, i.e., one that has equal areas and shapes for both caps. please look at Fig. B.

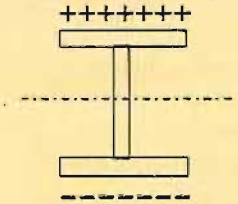


Fig. B

If the load is to change sign from tension to compression, logically, it must decrease to zero as we go along the web from the upper cap to the line of symmetry. Then, it must change to compression and get bigger in that sense as we go to the lower cap.

For this I-beam the line of symmetry also happens to be a line where the longitudinal load in the beam is zero, or neutral. Tension loads are found to one side of it and compression on the other. This is called the "neutral axis". In general, the line where this is the case doesn't have to lie on a symmetry line as many are simply not symmetrical. If you make one cap have more area than the other, the neutral axis will lie closer to it.

If you make one cap out of balsa and the other out of spruce, the neutral axis will lie closer to the stronger member.

Think of the neutral axis as sort of a teeter totter. The compression loads in the one cap are trying to push the beam back into a straight shape. The tension loads in the other cap are trying to pull the beam into that straight shape. They are working together to resist the applied load which bent the beam. Thus, they are a partnership, and I called this a tension-compression, t-c, pair. In a beam with one cap stronger, well, that's like a heavy kid on one end of the teeter totter and a lighter one on the other. It will balance closer to the heavier kid. In I-beams, however, the distance from a cap to the neutral axis is not a simple, linear relationship depending upon their areas or strengths[weights]. The actual relationship is a second power (square) of the distance to the center of the cap. Please see Fig. C.

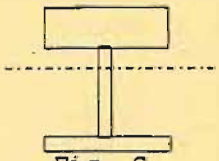


Fig. C

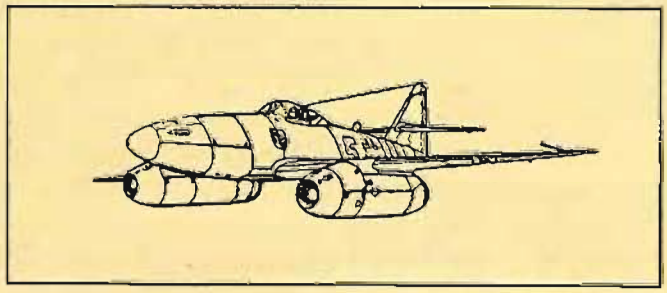
The neutral axis, here, lies much closer to the bigger or stronger cap.

An immediate fallout from this is you may reduce the cross sectional area of any other secondary stiffeners, stringers, you may want to put along the wing/skin surface next to the smaller cap at the bottom of the figure. Since they are farther from the neutral axis than would be stringers up next to the large cap, the lower ones are much more effective. Their effectiveness varies with the square of the distance from the stringer to the neutral axis.

SPECIAL TOPICS

by Orin Humphries

STRONG AND LIGHT 2
BUCKLING



In the first article I said things are strong so long as they hold their shape. Let's look at what happens when they don't.

Take a 1/4" sq. stick off of your stock shelf, in fact pick a straight one and a bent one. Apply a tension load to each by pulling on the ends. Don't bend the ends; just pull on them. The bent one will straighten and the straight one, well, no surprise there. Structural members under tension loads need no supporting structure to hold their shapes.

The same is not true, however, for a member undergoing compressive loads. Place one end of the straight stick on the floor, place the palm of your hand on the top, and push down on it. Don't try to bend it, just push straight down. What do you find? (This will be better if you go try these things as we go along rather than reading ahead.)

So, what happened? Most find the stick seems to resist the load for a bit as you increase it. Soon, the stick buckles and the load drops off quickly. After the stick is no longer straight it takes very little load to bend it further. It took a lot to get it buckled and then almost nothing after that point. Try this again with the already bent stick you pulled out. I'll wait here while you do that... .... You no doubt found there was no initial high load, just right off you were into the low loads that bend the stick further. Once a member gets out of a straight shape, its days as a load bearer are over. You may be starting that next project, as well.

Many tests in the engineering world have shown that a compression member in a structure has to have about three times the cross sectional area as it would need were it under tension, instead, for the same applied force. This is solely to keep it from buckling. I will give you a nifty tip on that at the end of this, but first we need to talk a bit more about buckling.

There is no rigorous formula for the load at which a member will buckle. There is only a range that goes through a factor of four when estimating the load. It all depends on how the ends of the member are "fixed". Rigidly fixed means the ends cannot rotate at all as the load is applied. Free ends means they can rotate easily. Fixed ends resist much higher loads before the member buckles, hence, the factor of four in the buckling load estimation.

It is easy to see this all around you in structures. Just drive to the nearest steel bridge on the freeway or look at a railroad bridge. The thin members are under tension and the thick ones are under compression.

In your Ringmaster wing you have a top spar and a bottom spar. If the plane is pulling and inside loop, the wing is being bent up by the load. You can see right off that the top spar and the bottom one carry opposite loads. One is being compressed and the other is being stretched. When you pull an outside loop the wing will be bent down. Which spar is being compressed, now?

This realization is the key to efficient structure design (and pop can rule #2). Before that, though, we will talk briefly about strengths of woods in the next piece. The tip I promised you earlier is this. If you know a member will have to resist a significant compressive load, you need three times the cross sectional area to survive that, so use spruce of the same cross section area as a balsa member under tension would have. Boy, that was a mouthful. Let me say that again. Your lower spar in this other plane will be under tension. Chose a balsa stick with enough area to support that. The upper spar will be under compression. (No outside loops). If you have the space (upper spar) for a balsa stick with three times the area of the lower one, use balsa. If, however, space is at a premium, substitute spruce (same area as the lower spar) for the upper one. Spruce is three times as strong as balsa for the same dimension and its weight is just three times higher. The two sticks (the fat balsa and the thin spruce) will weigh the same. You'd have, say, a 1/4" square balsa lower and a 1/4" square spruce upper.

I know you hate to be left hanging for things as I seem to do. There is a lot of ground to cover. You will get, for your patience, the sweetest, simplest, bestest spar design I have ever found, at the end of the series. I want you to know why it is so good, first.

The C/L Scale model - From an RC kit

By: Fred Cronenwett

I know what you are thinking, the nasty word "Radio Control" has come into the picture. But if it wasn't for Radio Control models we wouldn't have the large array of hinges, motors, and other hardware the we use everyday on our CL models. But why stop with the hardware and motors. Very few kits if any are advertised as a Control Line scale model. In fact Sig advertises the Fazer kit as a RC model but we all know it can be converted over to CL Stunt very easily. The outside of the box doesn't tell you that inside is the instructions for the conversion.

While Control line speed, combat, racing and Precision Aerobatic models are specially designed for CL, if you want to fly for fun, Scale or Carrier there is a large array of RC kits available that can be converted over to CL. The RC scale model kit has many parts that will be used for the conversion over to CL. The builder needs to add a few additional features and the result is a scale model that can be flown for fun or scale. Don't limit your imagination and consider all types of kits, fiberglass, and even large scale models. Remember that Sport scale rules allow for a 20 lbs (max weight) and 1.35 maximum cubic inches of engine.

One of the largest CL scale models being flown today is Grant Hiestand's 1/3 scale Spacewalker built from the Sig kit. With an wingspan of 108" the plane is powered by an Astro 90 geared electric motor. Keep on thing in mind when you build this large, transportation to and from the flying field can be a problem. I built and flew the 1/4 scale Morrisey Bravo (Sig kit) and this plane was BIG. The Saito 91 four stroke easily fit inside the cowl and the fuselage was 6 feet long. This plane could be only transported by a 8 foot long trailer. Based on our experience the best size model to flying in CL scale has a wingspan from 60" to 70", powered with an .60 sized engine.

Once you decide on what plane you want to build, get your documentation and pile up all of the required hardware. Open up the kit and follow the instructions in the kit as if you going to build for RC with the following exceptions. Lets start the tail and take a good look at the elevator. The incidence on the elevator must be set at zero degrees to the fuselage centerline. We learned this the hard way when one of our club members built a Grumman Wildcat with the scale positive incidence built into the elevator. This model would not trim out properly regardless of where we put the CG. Once the elevator was set at Zero degrees the model flew great and all of it's prior nasty habits disappeared. So look at the plans and build that elevator at zero degrees!

The rudder -- you don't need it to keep your line tension, and you just may as well set it at the neutral position and forget it. In fact I flew a scratch built model with a OS-60FP for power without a rudder and it flew great. If you want you can make the rudder adjustable on the ground with a simple clevis and pushrod, this is as far as you should go. Keep it simple. Remember to lock the tail wheel so the plane will roll in a straight line or slightly to the left. The larger models will drag the tailwheel without an problems. Some models may require more precise adjustment of the tail wheel due to the size or configuration. The Piper Cub is one of the models that needs to have the tailwheel carefully adjusted to maintain the proper taxi.

Installation of the bellcrank can be located in the fuselage or wing, your choice. Use your experience with your CL models to help you position it. But in general we had good luck putting a 3 1/2" bellcrank with the center bolt 1" behind the CG. The CG should be between the front leadout and the center bolt. Be sure you install an adjustable leadout guide. This will be very useful to reduce the amount of line tension for the larger models. Start with 2 or 3 degrees of line rake and reduce the line rake as you test fly the model. Hang the model from the leadouts and be sure the starboard wing hangs below the port wing before the model is test flown.

When it comes to ailerons, make them separate to make the plane look scale, and make them "FIXED, BUT ADJUSTABLE". This means that you attach the control horn with a pushrod and clevis and make adjustments on the ground. On Grant's Spacewalker the ailerons were VERY effective and were not really required to maintain line tension. Flaps are a wonderful addition to a scale model. These will allow you to land much slower and earn one more scale option in the scale flight pattern. This option is hard to screw up. If this is your first sport scale model consider a plane that will have flaps and throttle. This combination gives you six options with a single engine plane using the Sport scale rules. Remember to add the wingtip weight to the starboard wing.

The throttle is installed per the RC instructions since we will be using the electronics. I like using a micro servo with a Du-Bro flexible pushrod. Put a non-adjustable clevis at the servo and an adjustable clevis at the engine. Once you get the electronics hooked up, make minor adjustments with the adjustable clevis at the engine to get an reliable idle. Converting the large array of RC kits over for CL scale or fun flying opens up a whole new world. The RC market has many kits and other accessories that really lift the CL scale model of today into the 21st century. Remember the only difference between a RC model and a CL model is that we fly in a circle and control the elevator with a bellcrank. Good luck and look twice at the RC equipment that you see at the Hobby shop next time your go shopping.

Fred Cronenwett
Canoga Park, CA
818-719-0167

For additional photographs and 3-views call Scale model research
The Group NASA supports all forms of Scale modeling including free flight, CL and RC

Scale Model Research
Bob Banka
3114 Yukon Ave
Costa Mesa, CA 92626
(714) 979-8058

National Association of Scale Aeromodelers
Attn: Bert Dugan (call for membership info)
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Clio, MI 48420
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RECORD REVIEW

This month's report is on Paul Gibeault's Class I Mouse Race equipment, which was effectively used at the last Raider Roundup in September 96.

Paul is known for campaigning the "Streaker" design, which was used for the performance. Construction is almost all basswood, the exception being plywood for the engine firewall mount. Two ounce fiberglass cloth with Safe-T-Poxy was used to surfaceand reinforce the model. With this construction, an all-up weight of 6-3/4 ounces resulted, which according to Paul is nearly ideal.

(continued on next page)

The Flying Flea Market

Classified advertisements — FREE for FL subscribers

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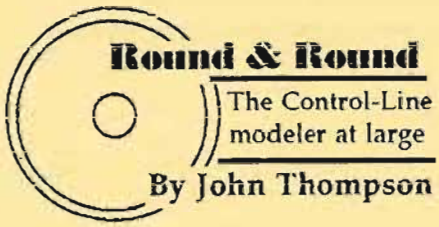
The engine used was a stock Cox Venom .049, but with the plastic tank back replaced with a metal unit from a Golden Bee engine. The Cox #1702 high compression glow head was used. Prop is a Tornado nylon 5 x 4, which is trimmed to 4-3/4 inch diameter, and balanced. Fuel used was Sig brand 35% nitro blend. Paul exclaims wonderment that his special high nitro blend that he has used elsewhere is slower than the Sig fuel when used locally.

Other equipment notes include usage of a Kustom Kraftsmanship bellcrank with monoline style button connectors. The glow plug connector was a Cox clip with a guitar pick soldered to it. During the record runs, Paul did his own piloting, and was ably pitted by John Thompson. The times turned were: 2:31 for 50 lap heat, and 5:03 for the 100 lap feature (now superseded)



Modeling thought for the month:

"Matter will be damaged in direct proportion to its value."

— Murphy's Constant

Details, details!

Does anyone remember building a model airplane without a Dremel tool? It's just one of those many things that's a standard in our workshops now that we couldn't live without.

Every now and then we come across a new tool and don't know how we ever built a plane without it.

The "good news" of the demise of *Model Builder* is that I've once again begun paying period visits to my workshop and discovering the old tools and even one or two new ones. Yup, that two-year-old All American project is back on track. A couple of Flying Clowns (one for the Nitroholics to race and one for my wife to practice her flying on) are in planning. All of last year's combat planes are repaired. And so it goes.

All this building has given me a chance to try out a new tool that I bought some months ago and has been hanging on the hook waiting for me to give it a real workout. How did I ever live without this tool?

It's a Craftsman Detail Sander. Craftsman is the Sears brand but there are other brands of exactly the same tool.

It's kind of big and clunky looking compared with the Dremel but definitely comes in handy. It is a power handle with a triangular pad of sandpaper that vibrates.

In the real world it's designed for getting into corners of cabinets and other hard-to-sand areas. In our toy airplane universe it's good for that, but also it's good for flattening out those stubborn glue joints, smoothing one part into another, etc. — sanding of the type that used to take hours of rubbing with a sanding block.

I've found it useful in the All American project and even in some of the combat plane repairs. Because it's a flat sanding pad, it allows much more accuracy in tight spaces than you could get with the spinning Dremel sanding wheel, no gouging, etc. And it allows a much softer touch that the belt sander — a little slip won't ruin the piece.

Check it out.

Speaking of checking things out: You've noticed that the *Model Aviation* contest calendar doesn't list all the contests, because the deadline for magazine publication is so far in advance that the sanctions haven't been processed by deadline.

But the calendar exists in a much more up-to-date form on the AMA's World Wide Web page. There's also lots of other nifty AMA-related stuff on the Web site. The address is: http://www.modelaircraft.org.

While you're online, there are some other good Web sites to check out. The National Control Line Racing Association's site is a good and developing resource, and it has links to other Web sites updated periodically: http//members.aol.com/DMcD143/index.htm. Old NCLRA members note that this is a new address for the association's web site.

PAMPA and other stunt related news is maintained by *Stunt News* editor Larry Cunningham at http://www.zianet.com/pampaeditor/.

MACA News editor Iskandar Taib maintains a CL model page and links to others at http://bigwig.geology.indiana.edu/iskandar/models.html.

For an international perspective, try Goran Olsson's page in Sweden at http://www.plasma.kth.se/~olsson/index/html or Peter Nyffeler's CL page at http://www.chem.ethz.ch/~peny/CL/CL.html.

A new engine supplier on the European scene is Paul Landels, who handles European engines and spare parts, including Modela, MVVS, SuperTigre, Moki, etc. Send him an e-mail at justengines@enterprise.net and he'll e-mail you a catalog.

Finally, those with e-mail and an interest in international affairs may want to subscribe to Goran Olsson's Internet Control-Line News, a periodic report on worldwide CL competition transmitted via e-mail.

Contact Goran at olsson@plasma.kth.se to subscribe.

Send comments, questions, and topics for discussion to John Thompson, 2456 Quince St., Eugene, OR 97404...e-mail JohnT4051@aol.com.

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