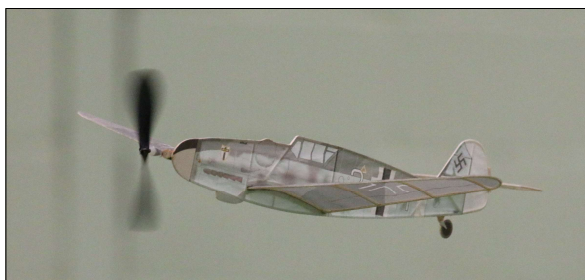


I poked my head out of the door the other day and my word, it was cold – far too cold to be outside freezing my n*ts off. Winter is the time for building things, writing a green-ink letter to the Editor complaining about some heinous infraction, or going to the gym; the best bit is when you walk out to the right place on the floor with a model (often a peanut, for me) and release it for take-off. As you watch it circle and climb towards the ceiling, you grin – because you can't help it. It really is an outstandingly rewarding thing to do.

I really like indoor free-flight in its various forms, particularly anything scale-ish. The latest “thing” for me is No-Cals – profile scale models of real aircraft; they fly slowly, for quite a long time, and have a certain charm.

Your editor eventually found out about my No-Cal obsession and has successfully twisted my arm to write “something about No-Cals for the snoozeletter, aimed at RC flyers”... I hope that you find the following at least moderately informative, and I also hope that some of you might consider having a go over the winter. Or at least coming over to Berinsfield to see what the fuss is about.

What's a No-Cal?



No-Cal Messerschmitt Bf109G

No-Cals are built to rules written by the Flying Aces Club in the U.S. The basic rules describe profile models with a maximum wing span of 16", and they must be “recognizable” as the aircraft being modelled. All the struts and fixed landing gear must be on the model, but retractable landing gear can be portrayed in the “up” position.

Indoor Flying

I'll admit that there's a small barrier to getting started with indoor flying because you're there for the day and you'll need some equipment; as an absolute bare minimum, apart from the model and tools you'll need:

- A small winder ([Derek Knight](#) does a very suitable product),
- Some rubber cut to the right width (I'd start with 0.070" and 0.060" – see [Free Flight Supplies](#)), or have a word with one of your indoor flying mates – I've certainly got more than I need,
- Rubber lube – either [VMC](#) or [Deluxe materials](#) have silicone-based lube,
- A colleague to hold the propeller and support the model whilst you stretch-wind the rubber motor.

Of course, skilled exponents of the art have fold-up-tables, chairs, coffee, sandwiches, a box for the models, an indoor stooge to hold the model, etc. But none of these are *strictly* necessary if you just want to stick your toe in the water.

The closest Indoor venue is probably the Abbey Sports Centre in Berinsfield, events are usually held on the first Sunday of the month during Winter and are traditionally attended by various OMFC members. The next events are 2nd January, 6th February and 6th March, flying is from 9:00 am till 3:00 pm and costs a tenner if you're planning on flying anything. I think Spectators are free.

Tools and Materials

In addition to the usual drills, saws, CA, etc. you will need to think about the following;

Tools

You may have some old R/C Modeller's pins left over from the last RC model that you built but you're much better off getting some smaller, purpose-made pins – John Lewis do some nice glass-headed dressmaking pins that are clearly of far more use in a modelling context than for sewing. I would never suggest, of course, that you purloin pins belonging to your other half...

(Ed. - [The Balsa Cabin](#) have my favourites – the excellent Czech Republic "[needle](#)" pins in various colours!)

Your modelling knife is probably (relatively speaking) enormous, you really need a smaller and thinner blade such as the smaller X-ACTO knife or a scalpel. Buy a new set of blades and change them as soon as there's any suggestion that the wood is being crushed rather than cut.

Finally, I suggest that a pair of tweezers is very useful for handling pieces of 1/16" square.

Glues

You may well have been used to applying **cyano** (CA) to a large R/C model structure and lifting it off the board almost as soon as the top is back on the glue bottle, but CA isn't a great choice for small models; the problems are that the glue blobs are (relatively) quite large and of course none of it will evaporate so it's quite heavy, and it gets everywhere.

Balsa cement has its place, but not for the main structure of indoor models, in view – it's not very strong and it shrinks as it dries (it *will* warp these very lightweight structures).

The best glue to use is probably a specialist woodworking glue such as *Titebond* I or II (red or blue label) that will set to a hard surface so it's easier to sand, applied in sparing amounts with a toothpick or spare bit of 1/16" square.

Other PVA glues such as *Deluxe Materials Speed Bond* can be pressed into service if that's what you've got. *Deluxe Materials Aliphatic Resin* seems to take a long time to dry, in my opinion, but it's useable. Stay away from *Titebond III* (green label) because it's prone to creep, and its shear strength degrades as the temperature increases.

Wood Selection

Wood for small indoor models is generally lighter than for outdoor models, so when the plan says "hard balsa" it often means about 8-10 lb/cu ft (or the normal medium outdoor grade) rather than the 14-16 lb/cu ft stuff you'll be used to using on RC models.

If you go into a model shop with the kitchen scales, a sheet of light (6 lb/cu ft) 1/16" balsa 4" wide should weigh about 14g – I normally go to Mantua Models in Windsor (if they haven't got any good stuff left it's probably because I got there before you did). Use the lightest wood you can get for the sheet parts and non-critical structure, and harder stuff (about 8-9 lb, or a lightish-medium grade weighing about 20-21g) for the longerons and leading/trailing edges.

Construction

Construction of a No-Cal is quite conventional if you've built any of the old *Keil Kraft* kits in your youth (if you haven't, find a video), but do remember to use some clear plastic sheet between the plan and the glued parts because otherwise there may be Bad Language when you try and take the glued structure off the plan.

If you have a balsa stripper, it's often better to strip your own because leftover kit strip-wood is often quite heavy. Also, check the stiffness of the wood by twirling it between your fingers – strips from the same sheet which should have the same weight can often vary a lot in strength and stiffness.

One area that's different for No-Cals is the use of sliced ribs; basically, you pin down and glue

the leading edges, trailing edges and tips and whilst that's drying, make a cutting template for the ribs (thin ply is best). Then you slice a set of full-sized ribs to the same thickness as the LE and TE (1/16", usually) and carefully cut each rib to shape by cutting/sanding the trailing edge until it fits. These ribs can be a bit fragile before they're covered, when you break one the best glue is balsa cement because it has quite good grab, and most of the weight evaporates as it dries. (Or make a few extra whilst you're cutting them out! Ed)

Plans and Resources

The Internet is awash with plans, the best site for beginners is [Paul and Ralph Bradley's website](#), there are loads of No-Cal plans that use conventional wood sizes (i.e. nothing smaller than 1/16"). Any of the single-engine designs will be reliable performers, choose one that you like.

Techniques and Short-Cuts

Motor Stick

All the Bradley plans (and most No-Cal plans, in fact) show a motor stick made from rolled 1/32" sheet because this is easily the best solution – it's light, and very rigid. [There's a trick](#) that will enable even a Klutz like me to make a passable 1/4" diameter motor tube.

If you don't fancy trying that then you can use either a) two laminations of 3/32" square hard balsa, or b) two pieces of medium-hard 1/4" x 1/16" glued together to form an L-section, as shown in the detail pictures below. Both of these will work as long as your model isn't over powered.



Bending and Shaping 1/16" Square

All the structural wood on the Bradley plans is 1/16", it's really easy to bend 1/16" square in the steam from a kettle but as a reminder it's also easy to put a slight bend in it by pulling it through your fingers whilst compressing the inside with a fingernail. For sharp bends you can nick the inside of the longeron and pin in place, drop a little thinned PVA onto the inside of the bend to fix tight bends in place.

It's also possible to bend all the curved parts using wet wood and a soldering iron (!). Unlikely as it sounds, this does work really well and takes very little time (see below). The [technique is detailed on the Bradley Models website](#) and there's a convincing video somewhere of the technique in action.

Making the Thrust Button Holder

The traditional nose arrangement on No-Cals is to use a Peck Polymers 1/32" nose button (or similar) held in a piece of bent 1/32" aluminium sheet. The trick here is to drill the hole and get it to the right size *first* (drill to 3mm, then finish carefully with a needle file until the nose button is a snug fit) and only then cut and file the aluminium sheet to the correct outer shape.

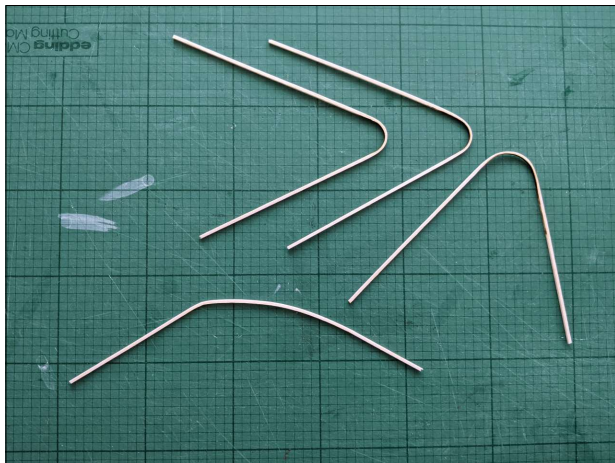


Propellers

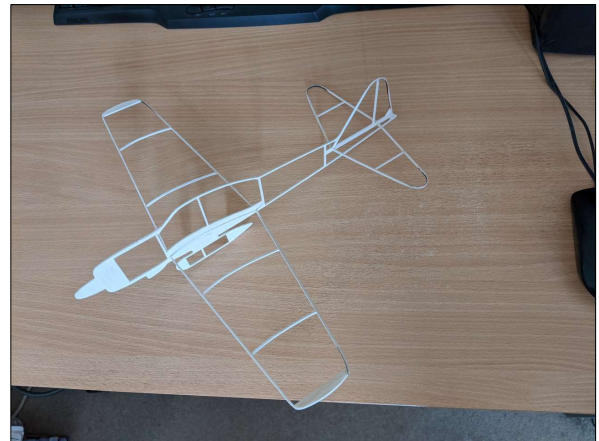
The vast majority of No-Cal plans show a balsa propeller, you can use one if you want to get more performance and if you have to time to build one, details are [available on the Bradley Models website](#) but you'll get a fairly reasonable level of performance with a plastic propeller, which is what's specified in the Trinity Indoor No-Cal rules. The favoured props are the lightest – Peck 4" and 4.75", North Pacific 5.5" (all available from VMC). Do balance the propeller, though.

Mitsubishi A6M3 Zero

I recently built a No-Cal Zero from a Paul Bradley plan, partly because I like Zeros (particularly the clipped-wing A6M3), but also because I wanted to see how long it would take to build.



Curved outlines are formed from wet 1/16" square around a hot soldering iron. I confess to a certain amount of trepidation before starting, but the whole lot only took me about 20 minutes! You do have to pin them down until they dry out, though.



The structure is extremely sparse and was only worked on in the morning and evening for about an hour or so, but it was done inside a week, so total construction time was about 9-10 hours.

Decoration and Covering

Jap tissue was taped to a frame and pre-shrunk (important if you want to avoid warps later), then it was taped down over a copy of the plan and decorated with 4B pencils (for the panel lines) and fibre-tip pens; this took about an hour or so and was remarkably therapeutic – a bit like those colouring books you buy from W H Smiths.

Michael Morrow's Aero Aces website has some really good detailed advice on [decorating No-Cals](#).

If you haven't got any Jap tissue, ordinary domestic tissue can be used but it often has no wet strength so check with the coloured pens that you're using first to make sure that it doesn't fall apart. (Ed – [Free Flight Supplies](#) has Esaki Lite Flite and Asuka Japanese tissue)

The best way of attaching the tissue is using Spray Mount on the structure; place the pieces on some newspaper to protect the carpet and give it a quick spray, then leave it for 2 minutes to allow the adhesive to be repositionable (not sure that's a real word, but you get the idea).

I hadn't got any newspapers to protect the carpet so I used a UHU glue stick (carefully); the structure bends alarmingly when first applied, but goes back straight when it dries out. So don't worry about it.

The covering process was:

- For the fuselage and tail, tape the tissue (coloured face down) onto a flat surface (e.g. cutting mat); don't stretch the tissue, though.
- Practise positioning the structure over the tissue a few times, add pencil registration marks on the tissue until you can place it in the right position first time.
- If necessary, apply adhesive to the structure and then carefully apply the structure to the tissue on the previously-added registration marks. Make sure that the tissue is slack to allow for changing atmospheric conditions; if it looks tight, lift it and re-position.

Covering wings is similar except that the tissue is positioned on the cutting mat, coloured face down, but is only held in place with a ruler or pencils to stop it moving around. The trailing edge of the wing is stuck down first onto the tissue, and the wing structure rolled forwards (carefully!) on the ribs towards the leading edge.

The Aero Aces website details a [more refined \(and probably better\) technique](#) for covering No-Cals.



A6M3 Zero was covered and assembled in a few hours over the weekend



Peanut-sized messerschmitt bf109G was coloured with Letraset/Windsor & Newton artist's fibre tip pens. panel lines were added using a sharpie.

Trimming

No-Cals are a bit odd in that they usually don't want to turn without some fairly significant persuasion; a lot of sidethrust in the direction of turn (I fly my models to the left under low ceilings) is usually required, and is quite normal.

After the tail weight was finalised by pinning the prop in position and doing some test-glides, it only took a couple of flights to get the Zero's trim about right (by bending the 1/32" aluminium sheet nose bush holder with two small pairs of pliers), it currently has about 5 degrees left thrust and about 6 degrees downthrust. I think the current motor is about an 18" loop of 0.063" (1/16") turning a Peck 4.75" prop.

Summary

The Zero was dead easy and quite quick to make, I imagine that most of the other Bradley designs will be similar. You don't *really* need to roll a motor tube for smaller indoor models, an L-shaped girder or 3/16" x 3/32" hard balsa stick will work as long as you don't over-power it. Use a Peck/VMC 4 3/4" prop and a loop of 0.065" or 0.070" rubber and you're good to go.