This magnificent picture was taken on 2021–06–11 by Alexandre Mittaz after a mid-afternoon, one hour long thermal flight in the Val d'Hérens / Valais / Switzerland. The aircraft is a Drops388 from DropsFactory in Germany. Its wingspan is 388cm, weighs in at 5.8kg unballasted and is constructed with hardshell carbon fiber wings. To provide a sense of scale, Alexandre's wife can be seen at the extreme left of the photo (you'll have to look really, really closely).

In The Air

Is great flying right on your doorstep?

Terence C. Gannon Follow
Jun 12 · 6 min read

One of the occupational hazards of this job is that I have a steadily growing list of 'must see' places to visit on this gorgeous Big Blue Marble of ours. I am truly fortunate to get to see (in some cases before it's seen anywhere else) some truly breathtaking photos of what clearly are the best places to fly in the world. If I can ever gather the courage to get on a plane again — and I win the *MaxMillions* to pay for it — I could easily stay busy travelling the world for the rest of my life and not even scratch the surface of great flying

sites. Take, for example, Alexandre Mittaz's photo which headlines this month's *In The Air*. If there is a scene which is more idyllic, I can't imagine what it is or where it is. I've even suggested to my wife that we simply sell our house, pack our bags and move to Switzerland permanently. Until, of course, I discovered there's a reason why there aren't many Swiss listings on the *@YourCheapDreamHome* Instagram feed.

I moved to Calgary, Alberta over 30 years ago, and for quite a few years after I arrived here, I lamented the fact 'there was no where to slope fly'. That condition went on for quite some time until, for reasons I am not readily able to explain, I began to look at the urbanized, prairie landscape through different eyes. I realized the reason I couldn't find a good place to fly is that **they are everywhere**. It was one of those classic cases of not being able to see the forest except for all of those pesky trees that kept getting in the way. I started keeping track of potential sites and while the vast majority I have not yet had an opportunity to try — *yet* — there are something like 25 sites which have real potential.

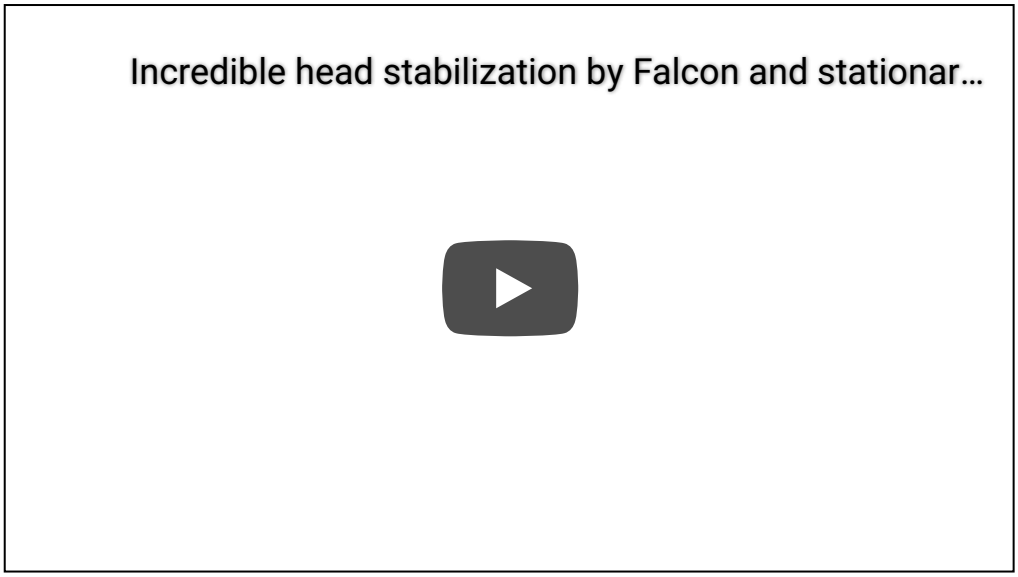
In retrospect, what likely changed the way I looked at my home town's offerings with respect to flying sites was the advent of small, lightweight, efficient and highly maneuverable designs like Mike Richter's *Alula*, for just one of many examples. Aircraft which, happily, fit under the 250g threshold where many of the new array of civil aviation regulations kick in as I described in last month's *In The Air*. Yet another great reason to be thinking about the *250g Grand Challenge* which I mentioned in that column as well.

For the sites I have tried and have had success there are three specific techniques which I use to assess the lift potential before I commit an aircraft (that is 'money') to a new slope:

The first is simple geometry: if there is a clean run up to a slope of even a modest inclination and the prevailing wind is blowing within anything close to 30 degrees of the fall line, there are precious few ways for the wind to go but up. It's not a perfect science, by far, but I'm still surprised at the reliability of this method to determine that the lift 'must be there'. And then have it turn out that it actually is. I'm not always good enough to exploit it, of course, but that's on me, not the quality of the opportunity.

Second, a bottle of kids' blowing bubbles is always close at hand in the car and my wife, Michelle, has waited patiently many a time as I walk around a potential site and start

blowing soap bubbles and studying their flight path intently. The kind soul she is, she has even explained to passersby that I am not actually a lunatic as I wander around, seemingly aimlessly, in the long grass, stopping occasionally to produce another cloud of 'tiny bubbles' (with apologies to the great Don Ho). Bubbles not only are the single most accurate method of determining wind direction (see previous paragraph) but if they go up there is a pretty good chance you will, too.



Thing you're as good as this little guy? No offense, but you're not. None of us are. (video: YouTube)

Finally, there is a trick that was taught to me by an old flying buddy of mine back in the late 1970s — George Cotten of Victoria, BC —who studied birds on potential slopes and made this very sage observation: for gulls and raptors who are already up there looking down on you — and undoubtedly laughing their asses off — study their tails, not just their wings. If the wings and tail are both steady, there's a good chance you'll be keeping company with them shortly. If the wings are steady but the tail is twisting, you'll do just as well to move on. There are times we have to face the fact our feathered friends are just way better at this thing that we do than we are.

So until such time that those lottery numbers come in and you can afford that big RV and launch out on the endless road trip exploring all the great flying sites you have seen and read about, first look around your home town. There may be places to fly which are

walking distance from where you already live. Oh, an important note: be really smart in the use of these sites for this purpose. Always obey prevailing city and other ordinances and by-laws, of course. If you're a good citizen who is being careful and considerate, nobody will be in a position to complain about this green, clean and interesting recreational use of the site. You may even be able to create a couple of converts!

And what about you? Do you have a tip or technique for exploring a brand new, potentially unflown slope? Or perhaps a method of picking out potential candidates? Let us know or better yet, contribute an article and share your wisdom with the RCSD readership. We would all love to hear from you!

In This Issue

I have said it before but it bears repeating every month: I am humbled and gratified by those great contributors who are making RCSD one of their online homes. We have another great issue with probably too many highlights to list them all. But I'll try:

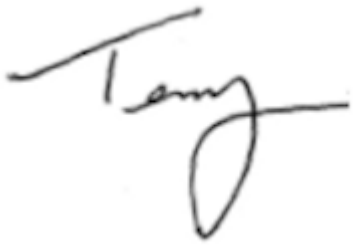
Way back in the first issue of the NEW RCSD, Phil Cooke reported on the Power Scale Soaring Association (PSSA)'s September event at the Great Orme in Wales. I'm thrilled to welcome Phil back as he reports on their first post-pandemic event from just last month. As always, it's hard to say which Phil does better, pictures or storytelling, because he does both so well. James Hammond returns with his fourth and final instalment in his *Designing for…* master class. This time 'round, James covers aircraft which would be suitable for that beautiful Swiss landscape above. Fear not, though, turns out that James is going to be back next month after all — see his latest for a hint as to why. Pierre Rondel adds to his previous and very well-received article on the STGmodel *Orden*. It's gone electro! In particular, check out the video in that article…it's fabulous. Bob Dodgson also returns with the second of his three part autobiography along with that signature, modern twist we have added. Last but certainly not least, Michael 'RC Soaring Diaries' Berends provides in-depth coverage of his new *Windburner* and *RPM* from Australia's Kevie Built RC Planes.

But wait, there's more! We also have more event coverage from the *2021 New England Scale Soaring Aerotow* by Steve Pasierb. Peter Scott writes another one of his inimitable reviews, this time for the FrSky Electronic Speed Controller. Broeski is back with yet another smart tip which will have you face-palming yourself punch drunk. Finally, Norimichi Kawakami provides the next part of his *1/3rd Scale Mita Type 3 Production*

Notes in both Japanese and English. And in the 'really pleasant surprises' department, Norimichi has provided a really neat bonus article. For that, you will just have to dig through the June issue to find that gem.

So, with a bit of luck, something for everybody. Thank you so much for reading and I really hope you enjoy what we have managed to cobble together for you this month.

Fair winds and blue skies!



This month's stunning cover photo is from Stéphane Ruelle, and was taken on 2021–06–06 at the site of the US GPS Triangle Nationals at the Siskiyou County Airport in Montague, California. Stéphane will have a full report on his attendance at the event in the July issue of RCSD. Now, without further ado, here's the ***first article*** *in this issue or go to the* ***table of contents*** *for all that other good stuff. Downloadable PDFS: just this article or this entire issue.*

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Chris Collis' North American Rockwell OV-10 Bronco cuts an unusual shape into the skies above Llandudno.

An Energetic Return to the Slopes!

Phil Cooke and Al Gorham report from the first slope event of the year hosted by the UK's Power Scale Soaring Association — 21st/22nd May 2021

Phil Cooke Follow
Jun 14 · 12 min read

It is very clear the spirit of the PSSA community has not been eroded one bit by the COVID lockdown. The lengthy enforced grounding we all had to endure due to travel restrictions in the UK meant this was an eagerly awaited meet, and despite a mixed weather forecast it played out to be a well-attended opener at the start of our delayed 2021 flying season.

Day 1 — Saturday

30+ pilots gathered at the top of the Great Orme, Llandudno, North Wales on Saturday morning for the event brief at 10am — covering not only the handful of rules we employ to enable safe, continuous operation of PSS models at a public site, but also the ongoing Covid governance details as well as the newly required CAA registration checks and Article 16 compliance requirements. Although social distancing is easy to self-manage in such a big, open space we agreed to apply further mitigation with limits in the pits of two models being rigged by each pilot at any one time and similarly we limited the number of pilots in the active flying box to six.

Saturday provided good strength (15–25mph) northwest winds which saw us flying from the lower 'Café slope' ledge — a great lifting cliff face with a steep drop to the Irish Sea but one with limitations due to the shape and size of the landing zone — not best suited for maiden flights or approaches with the bigger or less manoeuvrable PSS models. Flying commenced immediately after the brief and continued impressively right up until sundown on the Saturday, pilots wanting to extract every last minute of opportunity in the ideal conditions, knowing that Sundays weather was forecast to be quite different!

One 'silver lining' evident with the enforced break from flying activity was the number of newly completed models on show and in action throughout the weekend. New models of all types across a wide range of scales — the levels of ingenuity and fidelity in the quest for scale realism is always inspiring and something which this group of modellers clearly continues to thrive upon!

Models on Show

I'll start with the North American F-86 Sabre, the model type and short-kit selected back in 2019 as the subject of the PSSA's 2020 Mass Build, an event still not run (delayed due to COVID) and currently deferred until September 2021. More and more models are now reaching the point of completion, and there were at least half a dozen examples of the type brought to this event — although only Martin Gay and Peter Garsden were seen flying their Sabres on the Saturday. I'd not seen Peter's model fly before, it's modified from the all built up plan with the utilisation of a lost foam fibreglass fuselage which saw Pete complete and test fly his model much sooner than the rest of the group building the lite-ply and balsa planked fuselage.

Photo 2: Bob Jennings provides the launch for Peter Garsden's new F-86 Sabre built from the G&M models kit.

Pete's F-86 is finished in the flamboyant scheme from the 4th Aerobrigata Italian Airforce aerobatic team 'Cavallino Rampante' circa 1956 who flew five Sabres in close formation. With an AUW of 4.5lbs it flew brilliantly early in the day showing great pace and agility cruising up and down the slope. Later in the afternoon Martin flew his now well proven, all silver prototype airframe to equally good effect, before a group of Sabres were gathered as one for the camera with builders swapping notes and learnings from this latest group pursuit.

Photo 3: A taste of things to come — PSSA Mass Build F-86 Sabres begin to dominate the slope!

As well as the wide range of schemes already clearly evident, I was particularly taken by the modified two-seater TF-86 prototype (built by Martin and Gordon Studley) with it's longer nose and huge double canopy! A very rare machine indeed! We eagerly await the Mass Build event in September where we hope to amass many more Sabres together upon the Great Orme.

Andy Meade had completed his new Gloster Meteor Mk3 just in time for the event which was sat rigged in the pits and looking superb bathed in the Welsh sunlight. This is an impressive airframe — at 1/7th scale, conventionally built up from Andy's own drawings it spans 69" and has an AUW just over 10lb. I was very keen to photograph the model in the good light during the Saturday morning session.

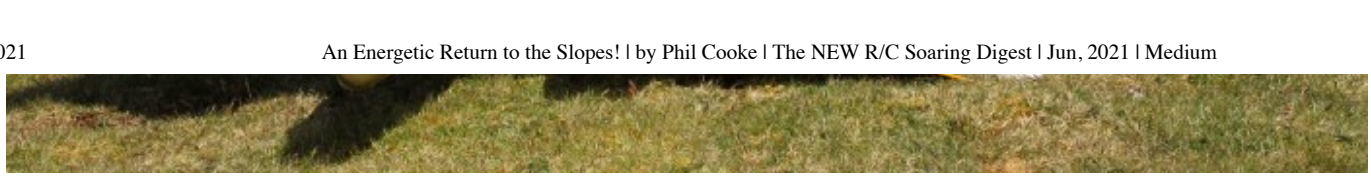

Photo 4: PSSA member Andy Meade lends some scale to his fantastic new Gloster Meteor.

It's fitted with working flaps and a complex rudder, split either side of the mid-mounted tailplane just like the fullsize. This stunning new model was wisely not test flown on the unforgiving NW Café slope we were operating from — Andy awaiting the opportunity to fly from the South West slope later in the weekend! The model is finished in 25g/m2 glass cloth and resin and painted with acrylics with decals from Callie Graphics. Andy explained that the plans will soon be available for purchase through the PSSA website (see *Resources* section at the end of this article).

Chris Collis was flying with us once again and like last time we met at the Lleyn in 2020, he'd brought with him his pair of huge Avro Lancasters — each spanning 134" and with an AUW of 25lb. These would both be aired later in the day but prior to that Chris also campaigned a brand new O/D model in the characteristic shape of the North American Rockwell OV-10 Bronco.

Photo 5: The OV-10 Bronco on finals into land at the end of its successul maiden flight

Fully built up and with a span of 60” this rugged shaped model enjoyed a successful maiden flight and looked great in the sun with its USMC three-tone desert camouflage.

PSS encompasses all types of aircraft, some more naturally suited to slope use than others, so considering their clean, sleek lines I’ve always thought it odd we don’t see more business aviation jets flown from the slope. Dave Gilder has improved that situation with his latest build in the shape of the Cessna Citation Bravo. This large-scale model has been converted to PSS from the Hero Eagle EDF power kit and Dave has repainted the model to represent the aircraft flown in Switzerland by the TCS Air Ambulance Service.

Photo 6: Cessna Citation Bravo built and converted to PSS by Dave Gilder

It spans an impressive 71” and has an AUW of 8.75lbs, the large fuselage and engine pods are all formed in fibreglass and it has a fully built up wing and tailplanes. As yet unflown, Dave did rig the model at the event for the camera and I think it holds huge potential as a great, rugged performer from the slope!

Formation Flights

Although there are no formal timed display slots at our 'Fly for Fun' PSS meetings it's quite common for similar aircraft types to be flown together when the opportunity arises and this meeting was no exception with two separate performances being worthy of note.

Photo 7: Tim Mackey's Airbus A380 gets away as the second of three flown together

Prior to lunch, Tim Mackey and Steve Kemp both flew their Airbus A380 models built for PSS from the Windrider EDF kit. These 72" span, all foam models are well proven from the slope and have been flown together before to great effect, their size and stability lending themselves really well to a series of gentle formation passes. Tim's model is finished in the legacy Airbus Industrie house colours and Steve has finished his model in a recent Emirates livery. Building upon this spectacle, Dave Gilder also launched his Airbus A380 built for PSS from the slightly smaller Hobbyking EDF kit and recently refurbished in the latest QANTAS livery.

Photo 8: Airbus formation flight (left to right) Tim Mackey, Steve Kemp & David Gilder.

These three similar models went on to hold the spectators attention for 20 minutes or so with a series of formation and tail chase passes which looked superb against the clear skies we were blessed with. The end of this impressive flight was signalled with a series of three controlled circuits and descents into the tight landing zone, characterised by the underslung engine pods 'knocking off' by design as each of the aircraft slid to a stop in the short grass!

Later in the afternoon Chris Collis enlisted the help of Andy Meade and myself to fly his large Avro Lancasters together as a pair. Andy and I familiarised ourselves with the models transmitter set up before helping see both airframes moved over from the car park to the launch area. Prior to the flight we agreed a plan to fly from the current site but to land these large, heavy models higher up on the upper South West slope which has a much more generous landing zone — however to get there we would have to walk and climb to the upper shelf whilst the models were kept safely in flight out over the North West slope. With that part of the flight plan agreed we committed to launch.

Photo 9: Final checks before the second large Lancaster is launched out to sea.

At 25lb AUW each model required its own paired launch crew but once safely away the two models were quickly trimmed out and united in safe formation cruising up and down the slope and looking very realistic indeed! Out to the left hand side of each circuit the late afternoon sun was playing beautifully against the aircrafts' satin finish and the models looked superb making that slow right hand turn back towards us out over the sea.

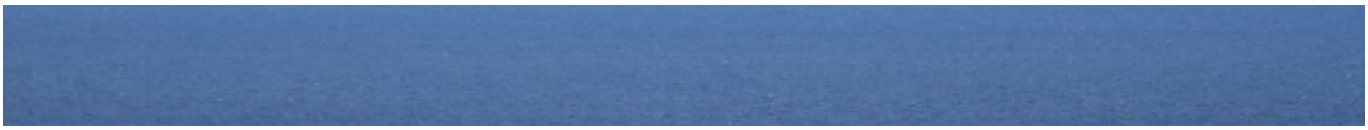

Photo 10: Lancaster duo, Chris Collis owned models flown here by Andy Meade and Phil Cooke.

Andy and I enjoyed a 20 minute flight consisting of a number of gentle formation passes very characteristic of the full size Lancaster. Both models proved nicely controllable particularly with a few degrees of flap added to regulate the speed and with coordinated aileron and rudder turns — I think we both thoroughly enjoyed the opportunity to fly these impressive models together for Chris and all who were stood watching. Although we were still revelling flying up and down the Café slope close in to the cliff face the time had come to enact our landing plan and both models were allowed to push out and climb to height a little before we set off on our hike to the chosen landing zone.

Photo 11: Low level bombing run.

With a small party of guides (including Chris) we made our way safely across the Great Orme's perimeter road and then steadily up the steep face of the main NW slope behind us, all the time keeping the two identical looking Lancasters flying out over the North West slope. After a 10 minute climb we found ourselves back on top of the South West slope with the vast open area now exclusively available to us — into which we could circuit and bring the Lancasters safely in to rest. I must admit I was very relieved to be able to keep the model I was flying above the changing horizon as we climbed to the higher landing zone, and once we'd regained our breath from the climb Andy and I readied ourselves for the consecutive landings. Both models were brought home safely, one of the models touching down in some of the longer heather which resulted in a little damage to the tail but all in all a great success!! Chris was clearly over the moon with the spectacle we'd just realised for him seeing both of his large models operated together as a pair!

Flying continued at pace all afternoon in good conditions, but as early evening arrived we saw a swing in wind direction from North West to our most favoured South West slope — and those who were still in attendance enjoyed some superb conditions back up on the main tank-track site from where we flew until sunset.

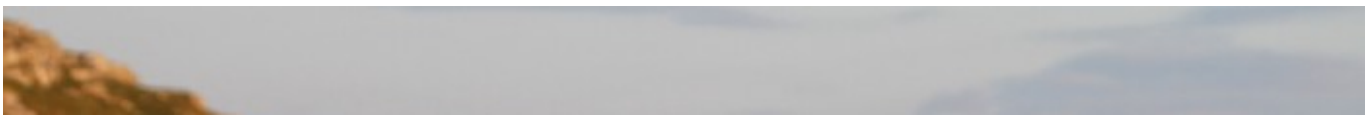

Photo 12: Tim Mackey launches Bob Jennings Fouga Magister during ‘golden hour’ — sublime.

In particular the final hour of light generated some sublime photographic conditions and some very memorable moments with Bob Jennings flying his ‘Tiger Stripe’ Fouga Magister against a superb sunset horizon as well as a clear moonlit sky! Jet Provosts and Mustangs were also in action revelling in the great conditions. As a small group we flew on until very last light, some forced to derig and load their cars by moonlight! What a superb days flying we’d all just enjoyed!

Photo 13: Phil Cooke's small scale Jet Provost darting about in the final rays of daylight.

Day 2 — Sunday

Sunday dawned with a weather system which looked frustratingly accurate to the forecast. Winds were from the southeast (the only wind direction which isn't ably supported on the Orme for flying models of our type) with accompanying heavy rain showers which looked aligned to be with us until early evening. Conditions were forecast to improve around 6pm, with the skies due to clear and the wind due to swing back round to the ideal southwest direction — but there were many hours of poor weather to endure before that. As a result, only a handful of modellers ventured up the hill on the Sunday morning, and a few of those departed at lunchtime (myself included!) But those who stayed on were richly awarded with another 'golden hour' evening session — fair play to all that stuck it out!

The following wording is kindly provided by PSSA member Al Gorham:

Those that were able to stay on (and who weren't dispirited by the ceaseless rain) were rewarded with a brightening sky from the Holyhead direction. I had a quick proving flight in light drizzle with my Hawker Tempest at 5.15 and found the wind was bang onto the slope and generating superb lift. By 6pm, the rain had stopped, replaced with golden sunlight and models were eagerly being readied and brought to the slope.

Steve McLaren aired his A-4 Skyhawk, Jet Provost and especially his Folland Gnat. The silver and fluorescent orange RAF trainer scheme showed up extremely well with the Gnat performing brilliantly as always. Harry Twist enjoyed his maiden flight with a Shorts Tucano which has had 'several' previous owners. She went away smoothly into a long and successful flight, the first of many under the control of her latest owner I'm sure!

Bob Jennings brought a Heinkel 162 Salamander built from a Neil McHardy plan, Bob having made some modifications to the engine pod shape to improve scale appearance. The model did look a natural glider though and it was so good to see her leave my hand

steadily from launch without a click of trim needed. The Salamander looked superb zipping around and it certainly had a unique silhouette! Sadly, a slight mishap occurred on landing, but Bob knows the model is such a lovely flyer I'm sure he will have her repaired and back flying ASAP.

Andy Meade warmed his thumbs up by performing his own maiden with the large P-51D (ex Matt Jones conversion from the Blackhorse power kit). Again, the evening light showed this model off so well with it's natural metal type finish.

Photo 14: Andy Meade concentrates late in the day at the start of another maiden flight. (image: Shona Meade)

Andy then produced the highlight of the weekend for me, as, aided by a launch from Bob Jennings, he got air under the wings of his O/D Gloster Meteor F3. I'm sure the accompanying pictures will tell the story perfectly, but this model has real presence and proved to be a very smooth flyer needed very little trim or adjustments during or after the first flight.

Photo 15: Andy Meade's Gloster Meteor F3 flies smartly through the LZ. (image: Shona Meade)

Indeed, the only thing missing was the distinctive Meteor 'blue-note' sound — which I am sure the other pilots watching on were hearing in their imaginations! Well done Andy — a very satisfying conclusion to your latest homebrew project, no doubt.

Another late finish on the slope then, but some truly memorable flying to round off another great weekend with the Power Scale Soaring Association.

More photos from this Great Orme PSSA event can be found on Flickr (see *Resources*, below)

There's a break now until the PSSA's next event planned at the Lleyn Peninsula 10th/11th July from which time the Association will run a series of events around the UK until mid October.

For more information on anything related to Power Scale Soaring or the PSSA please see our website or drop us a line on email using the links listed in *Resources* below.

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Resources

- Additional photos (Flickr)

- Power Scale Soaring Association (PSSA) (website)
- Power Scale Soaring Association (PSSA) (email)

*All photos by author unless otherwise noted. Read the **next article** in this issue, return to the **previous article** in this issue or go to the **table of contents**. Downloadable PDFS: just this article or this entire issue.*

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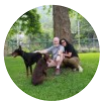
Alpina getting the old heave ho. (image: Gerard Risbourg)

Designing for an Alpine Soarer

The hills are alive...with sailplanes designed for for the rigours of mountain soaring.



James Hammond Follow
Jun 9 · 16 min read

This is the last in my series of four articles on design, but fear not, there is more coming. In an article in the near future, I'll be highlighting the Aeroic Sine Wave Spar (ASWS) — a feature now used to great effect in all my models. For this article I'm going to go through the design processes used in this case for my Alpenbrise (Alpine breeze) alpine soaring model. I don't really know how others do their designs, but what I can do is to let you in on how I do it; so, I do hope that this article will help to give you an insight into the thought progressions behind the model's development. Hopefully it won't be too boring. — JH

Alpine: Related to High Mountains

Photo 1: Can you imagine? The lift is all around you... (image: Hahnnenmoos Burger Hotel)

Well Then, What's an Alpine Soarer?

I'll answer my own question: they are designed to fly in the mountains and valleys; typically, an airframe that's larger than we have been dealing with so far. An alpine soarer is a model that's designed to have the ability to fly higher and further than any of my previous design studies, by utilizing the different kinds of lift that mountain sites provide.

Alpine Flying?

Before doing anything else, we have to try to understand the potential flying conditions that we are dealing with, as this will have a very direct effect on how we set out our model design. We have to realize that there can be real differences in alpine soaring when compared to slope flying. A mountain flying site can be a really diverse flying environment to let's say a hillside, or maybe an ocean-facing slope. One thing that remains the same is that our models are flying on updrafts of air. The sources of the updrafts can however, be quite unlike those associated with 'normal' slope flying.

Lift

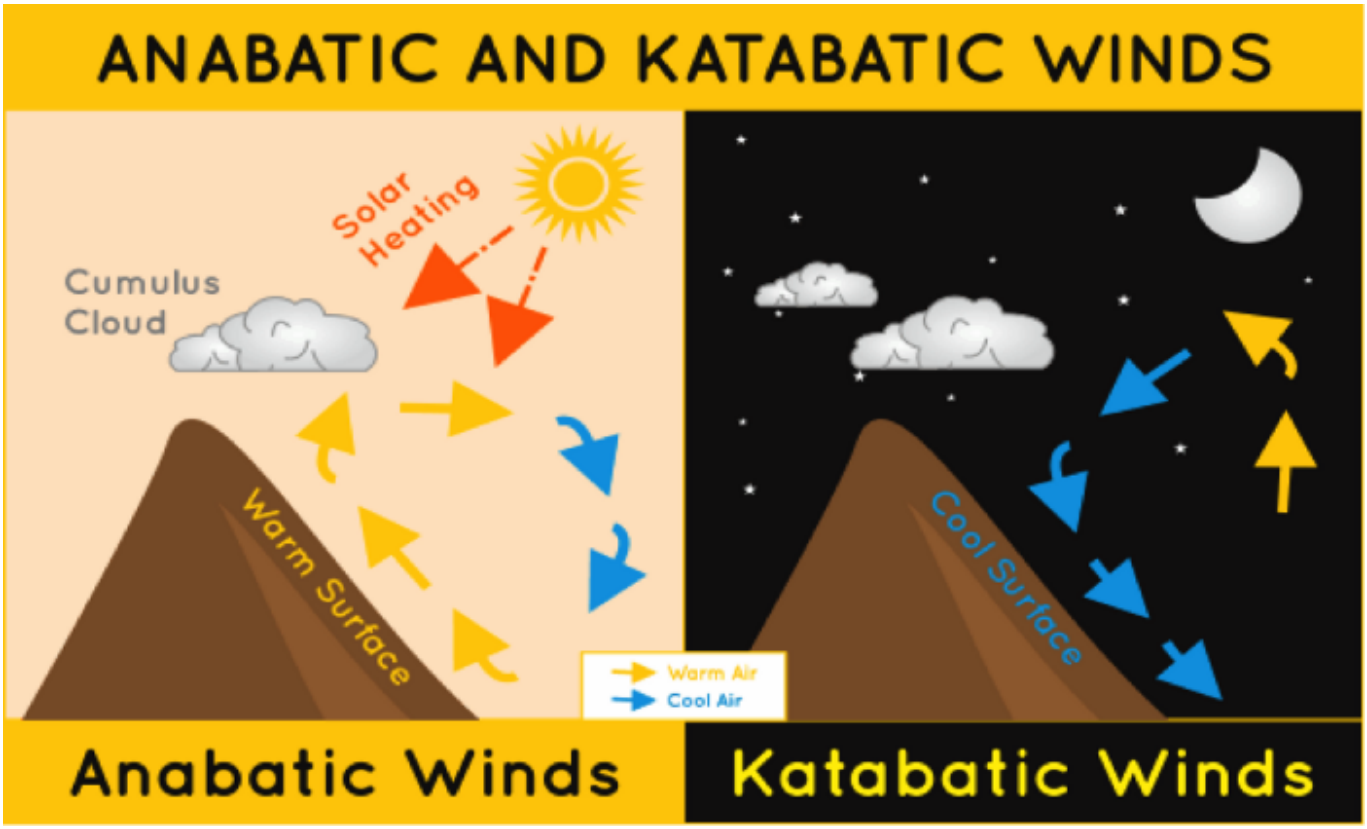
On a hillside or an ocean slope, most of the lift is coming from wind directed upwards by running into an angular obstacle, with the occasional thermal thrown in if we are lucky. However, on a mountainside, though we still find thermals — sometimes huge ones, typically the air is naturally flowing upwards as a result of thermal difference — hot air rises. Since the valleys are typically flat, may have roads, may be cultivated, and may have towns or villages; the temperatures at the lower elevations will normally be higher than those at higher elevations. Added to that, the surface of the mountainside over which we want to fly is probably being heated by the sun too.

Photo 3: The Famous Hahnnenmoos pass — would you like to fly against that backdrop? (image: Modellfluggruppe Wohlen)

Night and Day

Many alpine (mountainous) flying sites, especially those in Europe where alpine flying originated, have air constantly flowing up the mountainsides as heat rises. A good example in the USA is the Mammoth Mountain area where depending on the

temperature differences, the daytime rising air flow can be sluggish or really quite fierce, but unless there are some really adverse wind conditions, the lift is almost always there. This is explained by simple thermal activity in the form of anabatic airflow (daytime) versus katabatic airflow (night time)



Drawing 4: (image: Pinterest)

Get the Feel

I have often stood on mountainsides in central Taiwan marvelling at how small clouds or skeins of mist seem to be rushing up the mountainsides all around me, or maybe on a distantly visible mountainside, but always quite fast — yet I can feel little or no actual wind. This is alpine lift. Sometimes you can't see it, most of the time you can't even feel it — but it's there. Now we know what we are dealing with, what do we need to make a model that will fully utilize this 'ghostly' lift?

Size Matters

The first thing to realize is that alpine lift can be very variable — even on the same day, in seemingly the same conditions, and it can be hard to gauge. So, to get the most out of it we need a model that's probably larger than the average slope model. A good example

of a model that was specifically designed to fly in alpine lift conditions is the now classic Multiplex *Alpina* — as its name suggests. The *Alpina* flew incredibly well, it would hang in low lift, shriek through the air in good lift and was really very aerobatic — in short everything we would want, so it's a really good model to study if we want to make our own alpine soarer.

Grunt in the Front

Last but not least of the flying performance design considerations is the provision to easily fit an electric motor drive. This not only makes the model more adaptable, it also makes it suitable for the smaller GPS Triangle racing classes — though a propeller on the front does not please all of the purists! It's an easy provision actually as it only needs the front couple of inches of fuselage being perfectly round to be able to accommodate a spinner.

If we study a bit, we find that in fact, the actual differences between a small GPS class soarer and an alpine model are almost zero. Both fly higher and further than we would typically venture on a slope, and both are relying for the most part on non-slope type lift, so although I'm calling this an alpine soarer it could easily be classed as an alpine/GPS model. In addition, having a motor in the front and a larger battery to drive it; to many people represents 'payload' which is far, far, better than adding lead slugs in the front.

> Takeaway: Alpine flying is not the same as slope flying, though some aspects can be similar.
>
> Takeaway: Models fly higher and further, so they are better designed larger.
>
> Takeaway: Design your model with provision for an electric motor up front — you never know.

Multiplex Alpina: Possibly the First Alpine Soarer?

Photo 5: Alpina — the beautiful lines of a classic in every way. (image: Gerard Risbourg)

Wings

Four meters span (158”) which would be large for a non-scale slope model, but it has a nice scale look. The aspect ratio is over 20:1 which again is pretty high, and more in keeping with scale or full-sized sailplanes.

Aerofoil

The aerofoil is a Ritz 3–30–12 which is a 12% semi symmetrical non-undercambered section with a slightly blunt leading-edge — which to our modern-day eyes may look a little strange or maybe dated on a glider. Nor is this a section I would have chosen, but the key point is, it works.

Fuselage

More like a slimmed down ASW or other scale model type rather than the broomsticks we use on our fast slope models. Lots of room for a motor if needed, retracting undercarriages, servos and radio gear, tow releases and the like. The general feeling is of an attractive scale type arrangement.

Horizontal and Vertical Stabilizers

Large and nicely proportioned vertical stab with a huge rudder. Horizontal stab oddly is of the all-moving (AMT) type. Again, this is not something which I would have done — but as usual it works well enough.

Performance

In short, a model that really did exactly what it was designed to do. With its long high aspect ratio wings its rarely caught out by light lift, with the thicker 12% section it will do spectacular big air manoeuvres with great energy retention, and on those low, fast, fly-bys, it sings a lovely song.

Overall Impression

This, to me at least, is very important. The original *Alpina*, as designed is a true classic and although there have been many attempts to improve on it with various 2001, 3001, 4001, versions, and now I see we have a 5001 version, I'll stick my neck out as usual and say that to me all of the 'improvements' have failed to retain the most important aspect that I am looking for which is the wonderful looks of the original — especially in flight. If the machine works…

Photo 6: Perfect proportions and outstanding flying characteristics…if it looks good… (image: Gerard Risbourg)

> Takeaway: For good start off information on what is good, take a look at the successful past and present designs.

> Takeaway: Learn from the models available, look at the specs, make use of the valuable lessons that can be found in them.

Now Let's Look at Our Own Alpine Soarer Design

Now that we have more understanding of what we need, and what has already been done, let's look at our own design.

Concept to Model

As many of you will now understand,what I tend to do before designing any model is to try to figure out what I want to achieve, and then to make a list of design points that I hope will achieve those goals. When that list, let's call it a 'design envelope' is completed — and assuming that all the things that I want are actually compatible with each other, I start sketching. The key point here to get all the technical stuff onboard first, and *then* tweak the boxes to make it look beautiful. You can have the most beautiful model in the world but if it won't fly well in the conditions it's supposed to, then its pretty useless. By the same token, a bunch of boxes just strung together is like a box of spare parts and unlikely to give much satisfaction.

Flying Environment Requirements

For alpine flying, let's imagine a flying place that has suddenly been 'de-restricted' and by that, I mean that most, if not all of the slope restrictions have gone. No more need to fly in the compression band, no need to fly so close to the edge, no need to avoid rotors or no lift zones, and as long as the model can be seen then it's mostly possible to fly further and wider than would be possible to fly on a simple slope. All that against a backdrop of snow topped mountains? I'm in!

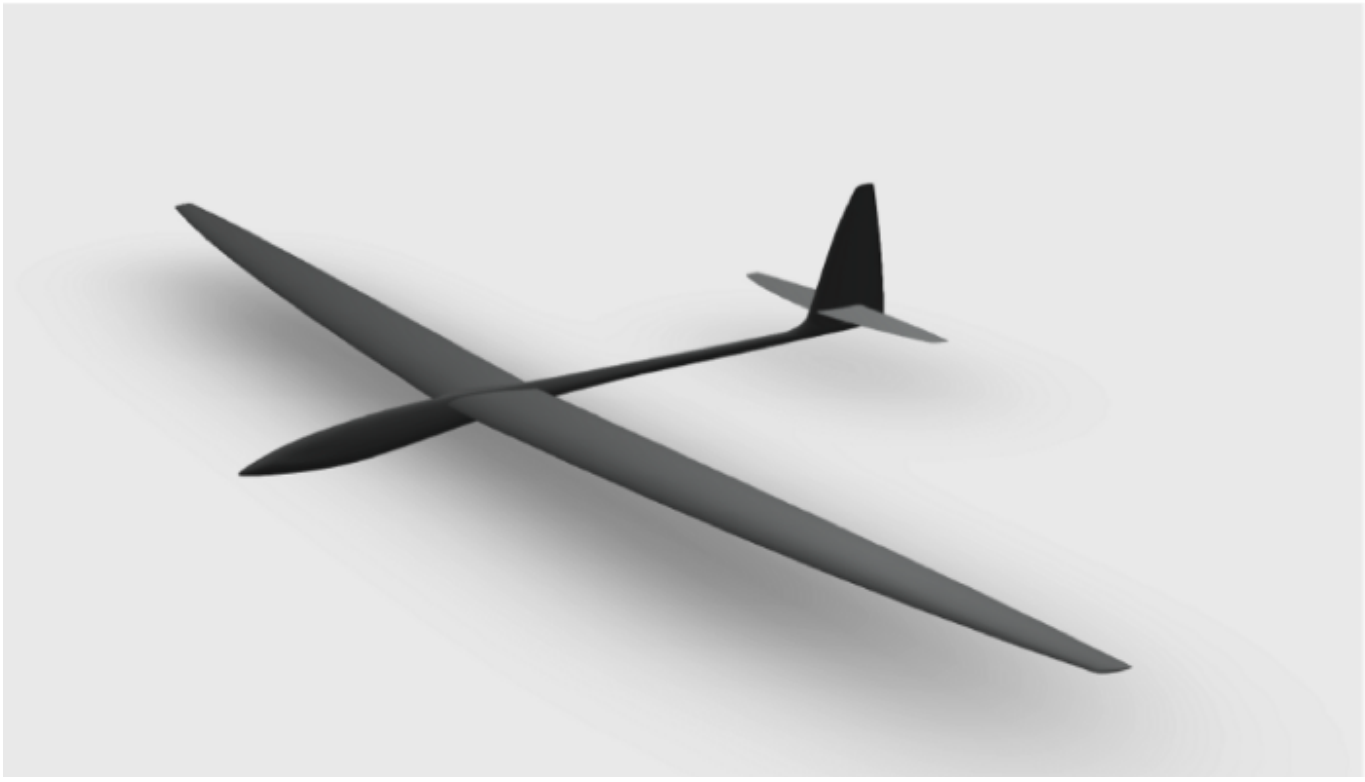
Make Your Mark

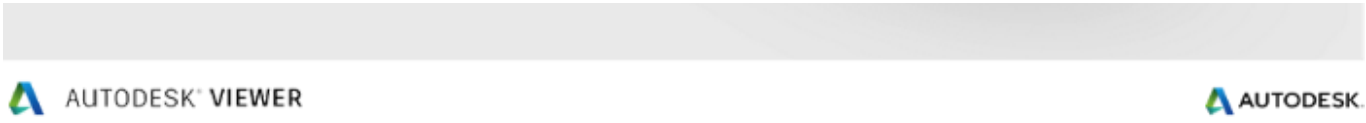
One point here, when designing a model for yourself, it's not always a good idea to try to do better than any existing design — unless of course you are a hardened competition flyer who will demand the sharpest of cutting-edge performance. Sometimes it's better to take the lessons learned from what's available and then use the parts that you like in your design, but please don't forget that you have a golden opportunity to put your own unique stamp on the resulting model.

> Takeaway: Take time to jot down the requirements personal and practical for your model before putting pen to paper.

> Takeaway: Only AFTER deciding your technical design envelope is it time to bend and curve to make your model beautiful.

Alpenbrise-2nd_Draft.stl





Drawing 7: Alpenbrise initial CAD rendering. (image: Dr. James Hammond)

The Decision Tree Is Planted

What Is Different From What We Have Done Before?

We'll be flying further, probably higher, maybe even faster at times than we would with a racing slope model. Bigger models are better we know, but bigger is also potentially faster and definitely more efficient, plus much easier to see at distance too.

Scale Effect

The bigger the model gets, the thinner, or relatively less viscous the air becomes, relative to it. That's why if a full-sized aircraft prototype is to be wind tunnel tested, then to give meaningful results the test model needs to be at least 33% of the full size. This is the area that we begin to enter with these larger alpine models, and so the aerofoil considerations change when compared to a fast slope plane.

> Takeaway: Try to study what you need and make decisions on each important part of the model design before drawing it up.

Wing Span

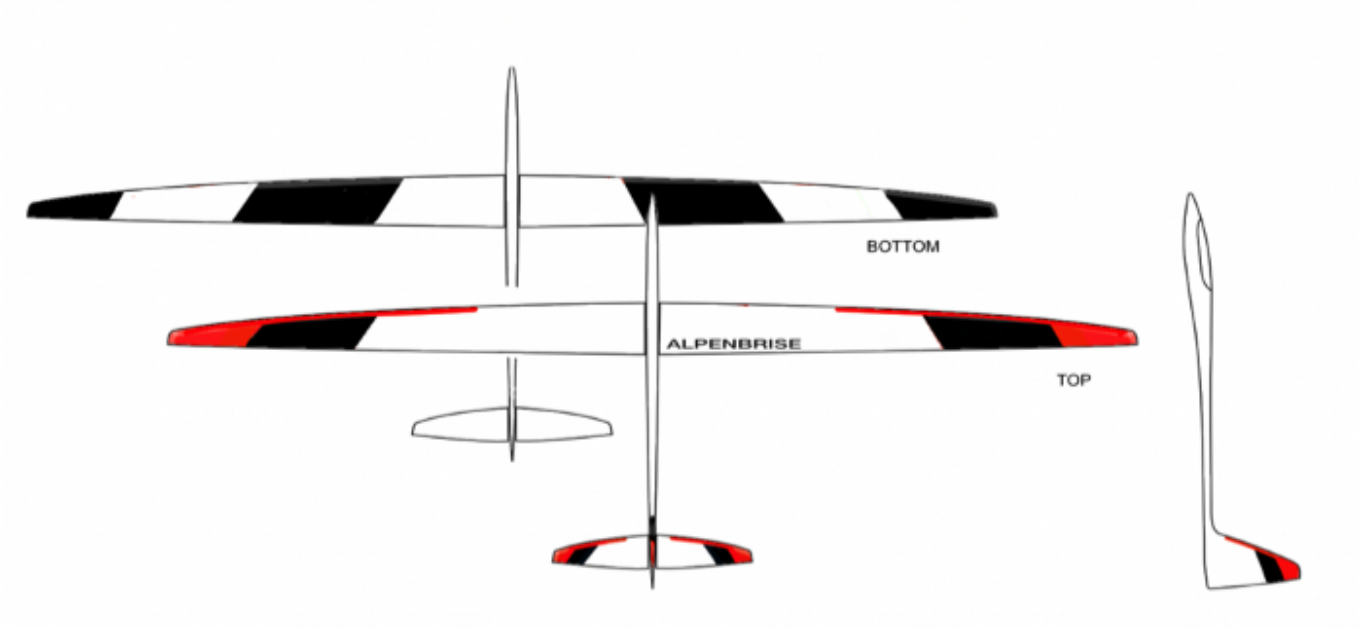
As usual the first decision on which everything else follows is how big are we going to make our new model. As this will be a specialist model, designed for its job, we need for it to be big enough to perform really well, yet not so large as to cause severe transport difficulties, so let's limit ourselves to four metres (150" to 160") right now.

Although bigger is better — *always* — any larger than this and for many, except possibly the super-scale enthusiasts, the problems with transport and storage, plus spouse/partner pacification could become a serious problem. Added to that the aerobatic performance, especially in roll and stall turns, tends to suffer if the aspect ratio

is too great in favour of span. Last but not least on wingspan, let's face it, if we wanted a six- or seven-meter monster, then there are now so many ¼, or even ½ scale models out there — if you have the craving and the disposable budget.

Wing Planform Design

As any of you who have read any of my other articles in this series will understand, for any high-performance model that I design, I am a firm proponent of putting the wing area, which is to say lift, where it's needed and only where it's needed. There really is no point in having oar-like wings with loads of area out near the tips. It's just not needed there and can cause a wide variety of unwelcome problems.



Drawing 8 (image: Dr. James Hammond)

Aspect Ratio

Since fast turns are no longer critical on our alpine soarer, we can shift our attention a little to think about a wing that will be somewhere in the middle of the requirements for out and out speed, but also provide agile turning ability. I have designed my *Alpenbrise* to be in that ballpark at a little over 22:1 — so it's not up there in the scale zone of 25:1 or even higher, nor yet down in the three-meter performance area of 19:1. In this way with good chord — think 'lift' — distribution we will be in a good position for both speed and turning and at four meters the wing area will give a low wing loading that will be adequate for very light air operation if needed.

Chord Distribution

Many people have been concerned at first when they see the shape of my wings with small tips, but actually alarm has turned to happiness after they fly them.

Setting the lift in the right positions, in the amounts we need and no more makes a very fast yet well behaved wing, which will not only accelerate like a racing snake, but at the other end of the flight will also slow down well with no problems. I always plan the chord distribution on my wings to end up with a tip chord that is half the mean chord. There is no real formula for this but it works very well. As usual I design an elliptical curve with the leading edge sweep back roughly twice that of the trailing edge. As we have learned before, this slightly separates the MAC and the CG positions to give a nice stable yet responsive wing.

Aerofoil

This is a very important part of any design but as I have mentioned in previous articles, it is not the be-all and and-all, not yet does it have the greatest influence on the overall performance as that honour belongs to the wing planform design.

This is a larger model than we have been talking about before, and it will operate in a different environment, so logically it might need a somewhat different set of performance goals — similar to say a racing model but not exactly the same.

JH35.dxf

Drawing 9: JH35 High lift/high response aerofoil. (image: Dr. James Hammond)

Thickness and Camber

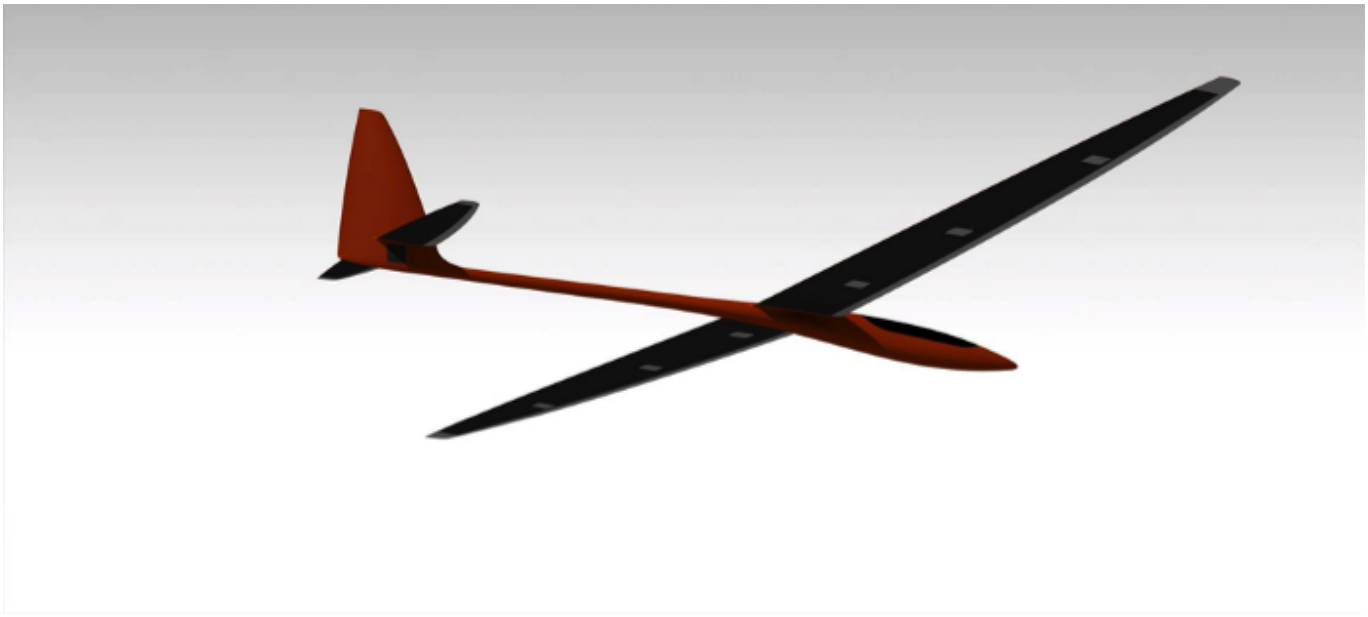
Where we wanted to get a nice balance of lift versus drag on our fast slope racer, the chord length on the alpine model has increased and this gives us more scope. As the alpine airframe gets bigger, and the drag influences on the model become less of a consideration, we can now begin to consider aerofoils with more thickness and more camber. This also helps with the construction as a thicker aerofoil gives a thicker spar and internal construction can be made stronger but without much weight penalty.

Which Section?

For the new *Alpenbrise* model I'm using a new section: JH35–9 which was a result of some recent research that was not actually aimed at models, but seemed to have all the parameters I'm looking for to use for an alpine soarer.

Photo 10: Beautiful lines even 40 years ago. (image: Gerard Risbourg)

In fact, there are suitable sections such as the HQW series by Dr. Quabeck, the RG 15 by Mr. Girsberger, and many others and the selection becomes easier as we enter the larger airframe performance envelope. Low drag, good lift, no drag bucket, around 9% thickness or even thicker with the right aerofoil. As a hint, I think if I were starting out, what I might be tempted to look at would be the GPS model sections as the performance requirements are very similar to that of an alpine soarer. The original *Alpina* used a Ritz 3 section.



Drawing 11: My 'Alpenbrise' Alpine/GPS soarer — hopefully a tribute to the great Alpina. (image: Dr. James Hammond)

Takeaway: With a larger alpine soarer, we are beginning to get into the realm of full-sized sailplanes.

Takeaway: Typically, thicker sections can be used on larger models than those we need for their smaller brethren.

The Back End

Horizontal Stabiliser

Here we need to consider the stabilizer aerofoil to be used, the tailplane area and whether to go for an all moving tail (AMT) or a conventional elevator setup.

Stabilizer aerofoil choice is not too hard and there are many sections to choose from: A symmetrical aerofoil of between 7 to 10% is required. As usual I use my JHSYM-9 at a controversial 9% thickness — probably more thickness than most people would go for, but as mentioned in my other articles, there is method in my madness. Through testing the aerofoils WITH elevator movements, I quickly found that the thicker aerofoils actually have less drag and more control response than the thinner ones. This is likely due to the way the air flows around and separates on the thicker section when the elevator is deployed compared to a thinner section where it can have an entirely different separation path.

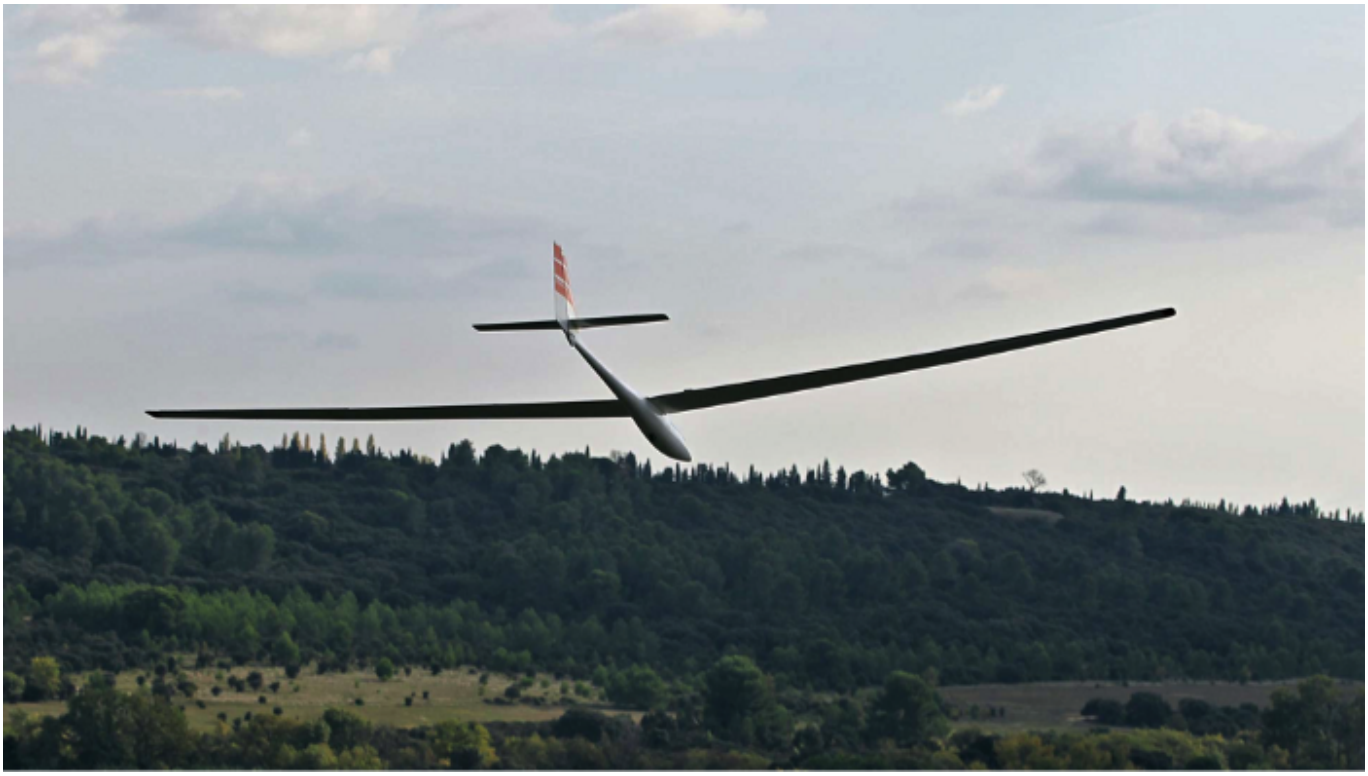


Photo 12: Off we go… (image. Gerard Risbourg)

Stabilizer Area

If you go for 10% to 15% of the wing area, you'll be on safe ground. In this range, the stabilizer will be big enough to be effective, but not needlessly over large.

To AMT or not to AMT?

For control effectiveness I can tell you — through many long hours of wind-tunnel and practical flight testing — that the elevator setup is more effective in every way than the all-moving tailplane (AMT). On the other hand, the elevator type can be a bit trickier to make with its hinges, and to actuate — but I'm assuming that if you do actually get to making a model then this is well within your capability. The AMT works well enough for most people, and is a lot less work. Your choice, but for me it's always the elevator type. The elevator chord should be suitable for the aerofoil section but normally 25% is good.

Stabilizer Shape?

As usual, follow the wing shape that you have used as much as possible — this is not only for looks, but also effectiveness as the things that we have discussed for the wing shape are all valid for the stab too.

Cross-Tail, V-Tail or T-Tail?

It's entirely up to you. There may be some control advantages to the cross- and t-tails while there might be a very narrow drag advantage to the v-tail configuration. Personally, I like the cross-tail as it's a bit more robust than the t-tail and works better than the v-tail. But practically, on this size of model, there is no significant advantage to differentiate one from the other so it really comes down to the designer's preference. Have to say though…t-tails look really cool!

> Takeaway: Thinner horizontal stabilizer aerofoils do not necessarily have less drag, and may actually lessen control response.

> Takeaway: A tail volume of between 10 to 15% of the wing area will work well.

Takeaway: Elevator setups work better than AMT type.

Takeaway: Elevator or AMT, make the stabilizer shape similar to the wing shape — the same rules apply.

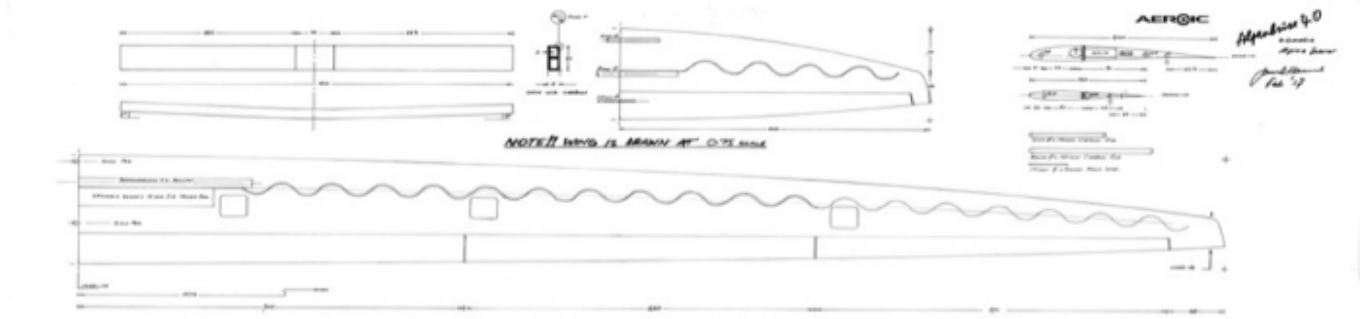
Takeaway: There is no practical difference between cross-tail, t-tail and v-tail.

Building the Flying Surfaces

Wings/Tails

The most important part for success, construction of the wings and tailplane(s) should follow conventional practice with a cored glass laminated structure, carbon reinforcements where needed, and a decently designed, possibly box type spar with good UD carbon spar caps. Carbon used for the wings should be of the highest modulus available.

And Now for Something Completely Different



Drawing 13: Get a wiggle on…the ASWS in the Alpenbrise wing. (image: Dr. James Hammond)

The Aeroic Sine Wave Spar (ASWS)

Here is where I depart from the norm yet again with a unique and I think vastly improved spar design. From about three years ago, all of my designs have featured a Sine Wave Spar. No, it's not my original idea, and in fact versions can be found in different forms on several military airframes. Then why 'Aeroic Sine Wave Spar'? I hear you query. Well, one, I am the first one to use this idea for commercially available model sailplanes, and two, my design is similar in principle, but completely different in practice when compared to full-sized applications.



Photos 14, 15 and 16: The ASWS under construction and installed in the completed airframe. (images: Dr. James Hammond)

The Future

The Sine Wave Spar and in particular the Aeroic Sine Wave Spar (ASWS) will be featured in its own separate article in an upcoming issue of RCSD. Watch this space!

Food for Thought: Other Commercial Alpine Soarers

Photo 17: Mistral 4.3M. (image: Paritech GMBH)

Above is the Mistral 4.3M from manufacturer Paritech, in Germany — another purpose designed alpine soarer, that as you can see from the nose has had an electric motor installed, thus increasing its versatility. This model also comes in a 4.6M version.

Photo 18: Condor (image: Paritech GMBH)

Above, at the other end of the purpose-designed scale, this is the impressive *Condor*, also from Paritech in Germany — at nearly 7 metres, 275 Inches — or almost 23 feet, it's a biggie! Wow!

Photo 19: Ikura 4M (image: Aer-O-Tec)

Another, purpose designed alpine flyer, this time from Aer-O-Tec in Germany. The *Ikura 4M* a beautifully set out model which uses a lot of advanced design techniques on the wings. This aircraft has a real 'presence' when in flight.

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RTGmodel adds an electric option to their new F3F design.The Electro Orden doing a fly by at the slope.

The Orden Goes Electro!

RTGmodel adds an electric option to their new F3F design.

Pierre RONDEL Follow
Jun 8 · 6 min read

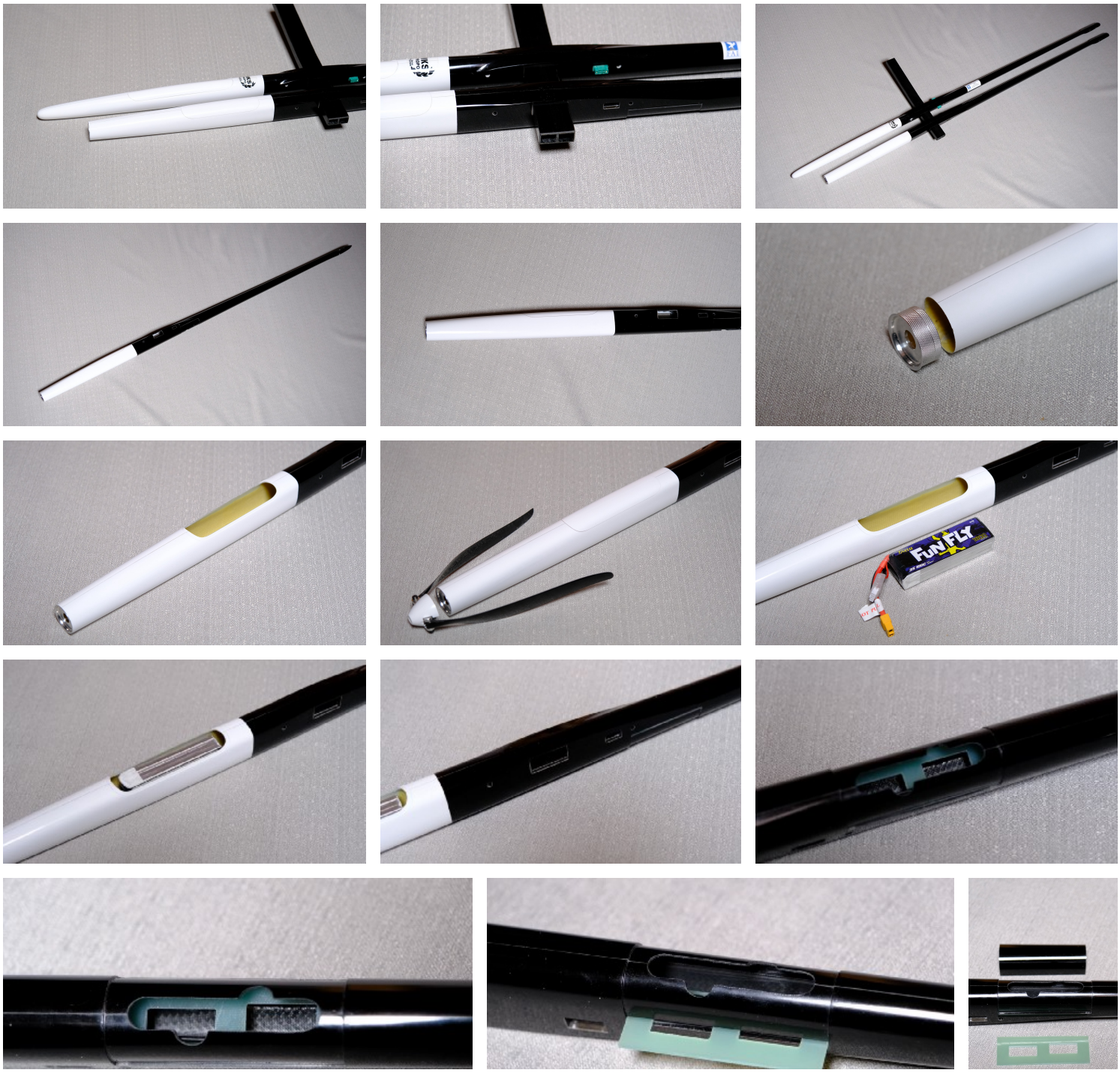
With the new F3G category coming up, every model which offers an electro fuselage is now raising the interest of pilots. Not only for competition, but for sport flying, such electro F3F/B gliders can save you the afternoon, and in some situations save your plane.

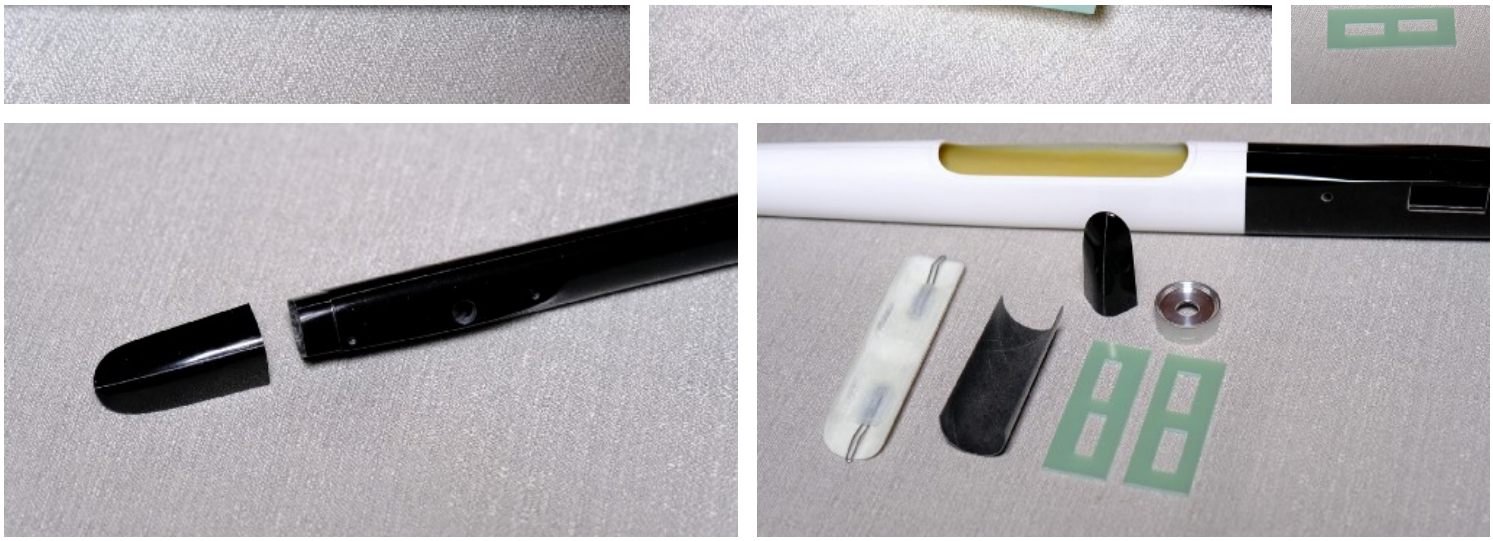
RTGmodel recently introduced an electro fuselage for its flagship model, the *Orden*, that I reviewed two months ago in RCSD (see *Resources* at the end of this article for the link).

Consider this new article as an add-on as I will not come back on the rest of the model assembly, and will focus only on this e-fuselage.

So let's have a look to this new fuselage which brings a smart innovation in the radio installation.

Molding quality is, as with the glider version, top notch. The front part, 2.4 Ghz friendly, is more square to easily host the battery. Spinner diameter is 30mm, with a nice aluminium part that fits perfectly.





Photos 2 to 18: Details of the fuselage and comparison side by side with the glider fuselage.

The fuselage features a very smart elevator servo tray that you insert by the side. Two epoxy trays are provided, one for 10mm servos (e.g. MKS MKS HV6100) while the other one is made for another brand and model of servos.

This layout frees lots of space on the front side for the battery (I guess that a 4S battery made of 2 x 2S battery is possible.) On my side, it will be a 3S 1800mAh battery.

In fact, I have decided to use the same combo than for my e-Quantum, that is to say:

- Motor TS 1520–12T + microEdition 5:1 from Reisenauer
- ESC SunRiseModel 60A BEC 7.4V (Reisenauer)
- Propeller GM Competition 16x10

Photo 19: GM competition line 16×10 folding prop at the bottom, compared to the standard GM propeller of the same size.

- Accus Tattu 3S 75C 1800 mAh or Tattu Funfly 3S 100C 1800 mAh

Photo 20: My setup ready for assembly.

I took the opportunity of a rainy holiday week to stay in my workshop and complete the assembly of the electro fuselage.

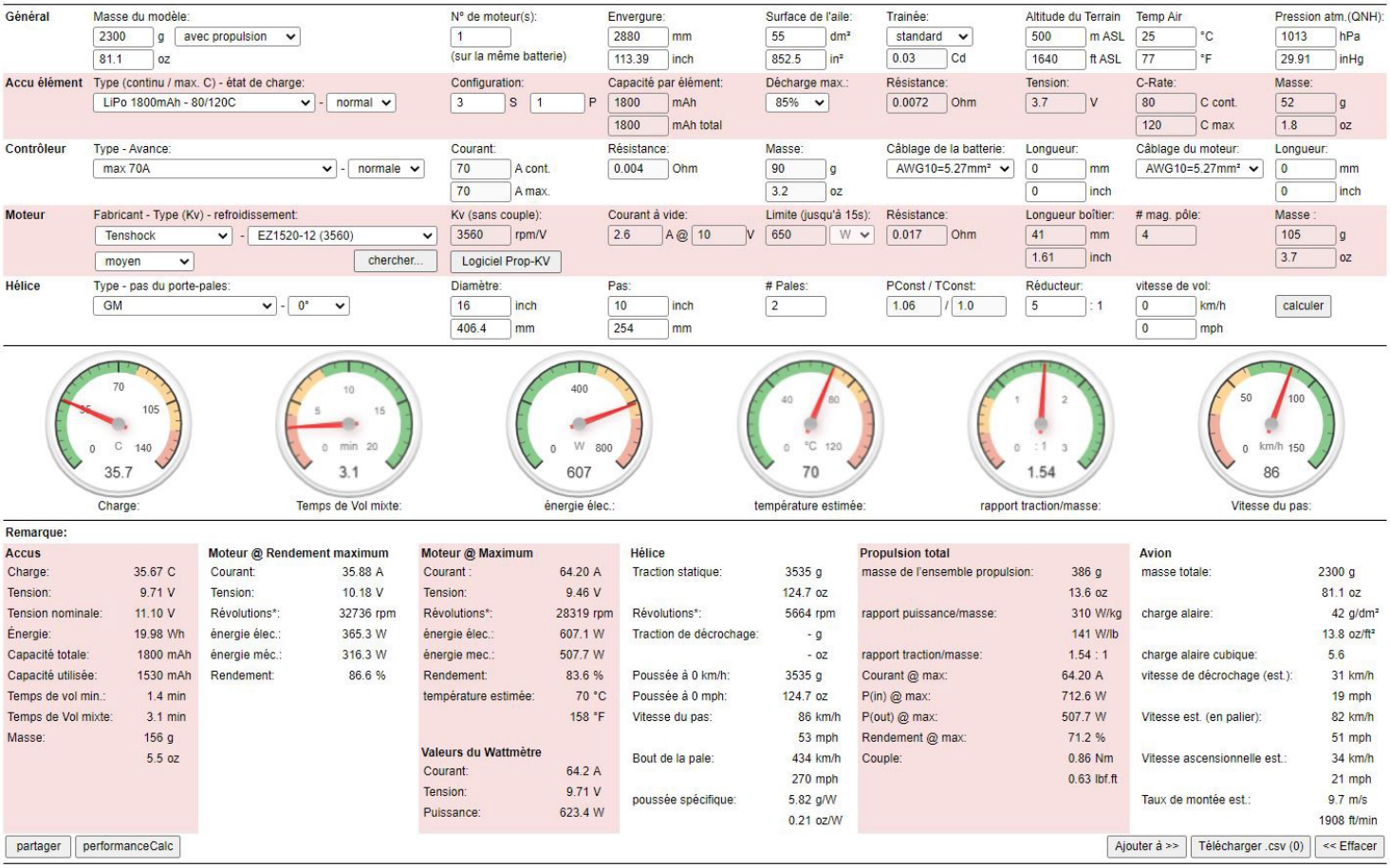


Photo 21: Simulation of the power train on ecalc (image: Ecalc.ch)

The assembly went well but the installation of the elevator servos needs particular care and attention as it is very, *very* tight. I had to grind the opening in order to insert the servos in place once the tray glued with rapid epoxy (R&G 30 minutes). Below are some pictures of the elevator servo installation:



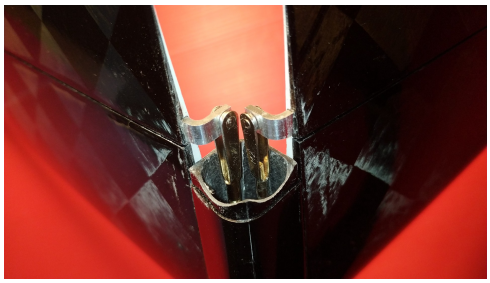
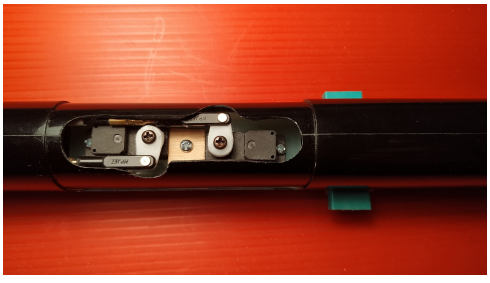
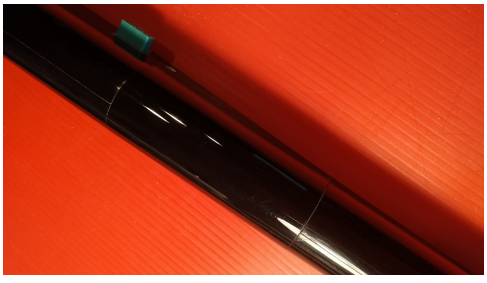





Photo 22 to 30: Some pictures of the assembly.

I installed the antennas on each side of the fuselage at 90° to each other. I think this should work even if the battery is located between the antenna. On the front or rear side, antennas are not masked. On the side the battery envelope is acting as a reflector to the antenna so reception should be fine. Testing will tell if it works. If you have any doubt you can always exit the antennas, but on my side I'm always afraid to damage them, that is why I prefer to keep them inside the fuselage.

Photo 23: The installation layout, and the position of the antennas.

On the scale, I'm reaching 2.3kg flying weight with the standard wing (double carbon C80 wings). This is 150gr heavier compared to the glider version. I needed to add 30grs in the nose to obtain the 99mm CG. This means eventually you can use a 20 to 30gr heavier and more powerful motor (i.e EZ1530 instead of my EZ1520).

Photo 24: the Electro Orden ready for maiden.

I had no surprises with the maiden flight of the *Electro-Orden*: With the same CG and same settings, it just behaves exactly the same. The *e-Orden* is particularly silent when the propeller is folded, thanks to the GM competition folding prop.

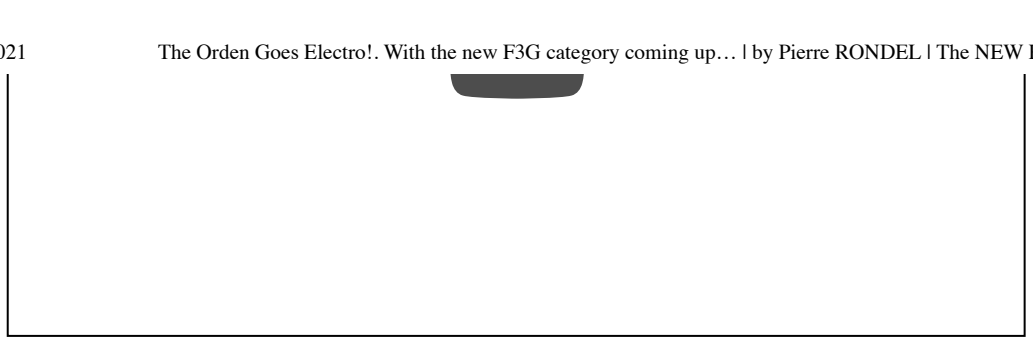
I just needed one battery 1800mAh for the whole afternoon. Good climbing rate, as it was on the e-Quantum (exactly the same setup).

Photos 25 to 38: The Electro Orden in flight.

More pictures are available on Google Photos (see *Resources* section at the end of this article.)

To complement the pictures in flight, here is a video. Many thanks to my club mate Didier for providing all the video footage using his Mavic drone and Osmo Pocket that afternoon.

Flying the Electro Orden of RTGModel



Video 39: A short video showing the Electro Orden in action.

The Final Word

The electro fuselage is the ideal complement of the *Orden*, and will allow you to fly the *Orden* in any situations, and conditions with no risk. More generally, I warmly recommend you, if you own already a F3x plane, to buy an electro fuselage it if exist.

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Resources

- Orden by RTGmodel, Fly Different! by Pierre Rondel.
- RTGmodel (*Orden* manufacturer's website)
- Additional photos on Google Photos.

*All images by Joël Marin & Pierre Rondel unless otherwise noted. Video courtesy of Didier Trouilloud. Read the **next article** in this issue, return to the **previous article** in this issue or go to the **table of contents**. Downloadable PDFS: just this article or this entire issue.*

Electro Rtgmodel Slope Soaring F3g F3f

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The pitot-static tube as well as the pilot's-eye-view camera installed in the ⅕ ASK-18 configured for Auto Soaring.

Auto Soaring

An introduction to this cutting edge technology in the world of RC soaring.

Norimichi Kawakami Follow
Jun 12 · 7 min read

Introduction

In the RCSD May issue, Mr. Peter Scott introduced some very attractive applications of the Arduino microcomputer technology to RC airplanes. Here is another application of the microcomputer and sensor technology to RC airplanes wherein you can fly your RC glider in many styles including Auto Soaring.

I admit that the true fun of RC soaring is to predict where the thermal is, fly your glider into it and control the aircraft to stay within the thermal considering the best bank angle

and other factors. But I believe that to experience and work with new technology is another interesting aspect of our RC hobby. After I completed the 1/3rd Mita construction (which some of you may have been reading about here in RCSD) I took on the challenge of using this new technology. Let me explain how you might experience this new technology as well.

Do I Need Computer Knowledge?

No special knowledge is required. What is required is to get a flight controller (FC), a GPS/compass sensor and, if necessary, a power module.

The FC is a module on which a microcomputer, memory, sensors — such as 3-axis gyro, 3-axis accelerometer, compass and barometer — are packed. The microcomputer calculates and sends commands to servos by executing the program stored in the memory and using data from the sensors. The gyro determines the attitude of the plane, the compass its heading, the accelerometer measures X,Y and Z directional accelerations and the barometer measures the aircraft's barometric altitude. Taking GPS data, the FC knows where the aircraft is and its velocity vectors in relation to the earth.

There are many kinds of FCs available, many of which are listed in the *ArduPilot Hardware Options* listed in the the *Resources* section at the end of this article.

What Kinds of Flight Are Possible?

You can fly your airplane in many regimes of flight. These are referred to as flight modes. The flight modes are grouped in two categories: assisted flight and autonomous flight.

In the assisted flight modes, the FC assists you by increasing aircraft stability or maintaining its attitude so you can fly it much more easily than fully manual flight. Straight and level flight is a typical mode of this assisted group. You can fly your aircraft straight and level even in a harsh wind. There is also acro mode, circle mode and others from which to choose.

In the autonomous flight modes the aircraft flies autonomously, which is to say with your hands entirely off your RC transmitter's controls. The FC assumes all responsibility for controlling the aircraft according to the specified mission. It can even automatically

take off or land and fly through specified waypoints on a map. The autonomous flight mode in which we're interested, of course, is Auto Soaring.

What Program Is Used?

The program used in conjunction with the FC is *ArduPilot* which is free, open source software. If the FC you purchase does not have *ArduPilot* installed, you are free to download it and load it into your FC.

The Ground Control Station

One more element is required, which is the Ground Control Station (GCS). This is a normal PC with special software such as *Mission Planner* or *QGroundControl* installed (see *Resources* section, below). Both of these packages are also free and open source and you can download either one and install it. The GCS is used to download the *ArduPilot* program, calibrate sensors, calibrate the RC transmitter's sticks throw ranges and assign flight modes to the RC transmitter's switches, for example. If you want to fly your aircraft through predefined waypoints, you can use the GCS to specify these waypoints using Google Maps along with altitudes and flight speeds. These mission data are uploaded on the FC using a USB cable before flight and stored in the memory.

If you connect telemetry devices on both PC and aircraft, you can communicate with the aircraft while it is flying. You can monitor its flight path on a map, check its flight speed, altitude, attitude, heading. You can even change control parameters mid-flight.

The FC has a micro SD card and stores various flight data such as position, speed, altitude, attitude, RC inputs, servo outputs, battery voltage and current for the motor. You can download these log data with the GCS and analyze these data after flight.

Auto Soaring Flight Parameters

There is a parameter SOAR_ENABLE in the *ArduPilot*. When you set this parameter to 1, the glider will Auto Soar. With this parameter, you must specify additional parameters which define the Auto Soar profile:

SOAR_ALT_MAX and SOAR_ALT_MIN define the thermal hunting maximum and minimum altitude. Flight is limited to within these altitudes. SOAR_ALT_CUTOFF is the altitude where the motor is cut off and the glider begins gliding. If the glider can't find any thermals and its altitude reaches the SOAR_ALT_MIN, the motor automatically

turns on and the glider begins to climb again. During gliding, when the aircraft determines by the data from accelerometer and barometer that it gains vertical speed more than SOAR_VSPEED, it starts auto thermal centering with bank angle SOAR_THML_BANK and soars with the thermal. The parameters SOAR_POLAR_B and SOAR_POLAR_CD0 are the polar curve coefficients of the glider.

How To Get Started

Here is a high level overview of the steps required to setup Auto Soaring:

1. Acquire the hardware (FC, GPS/compass, power module, telemetry devices).
2. Install this hardware and connect them with your RC receiver and servos.
3. Download the GCS and install on your PC.
4. Download the *ArduPilot* software and install on your FC.
5. Setup your hardware (sensor calibration, RC stick calibration for example).
6. Flight test in various flight modes.
7. Set soaring parameters and you can fly Auto Soar.

You can find a detailed explanation of each step at the following site in the *User Manual* documentation found in the *Resources* section at the end of this article.

An Example

Let me show you my case study as an example:

The Glider

This is the glider I used to test the Auto Soaring. It is a 1/5th scale of the ASK-18 which has 3.2m wingspan and around 2Kg gross weight.

Photo 2: ⅕ scale ASK-18 by which I tested the ArduPilot Auto Soaring function.

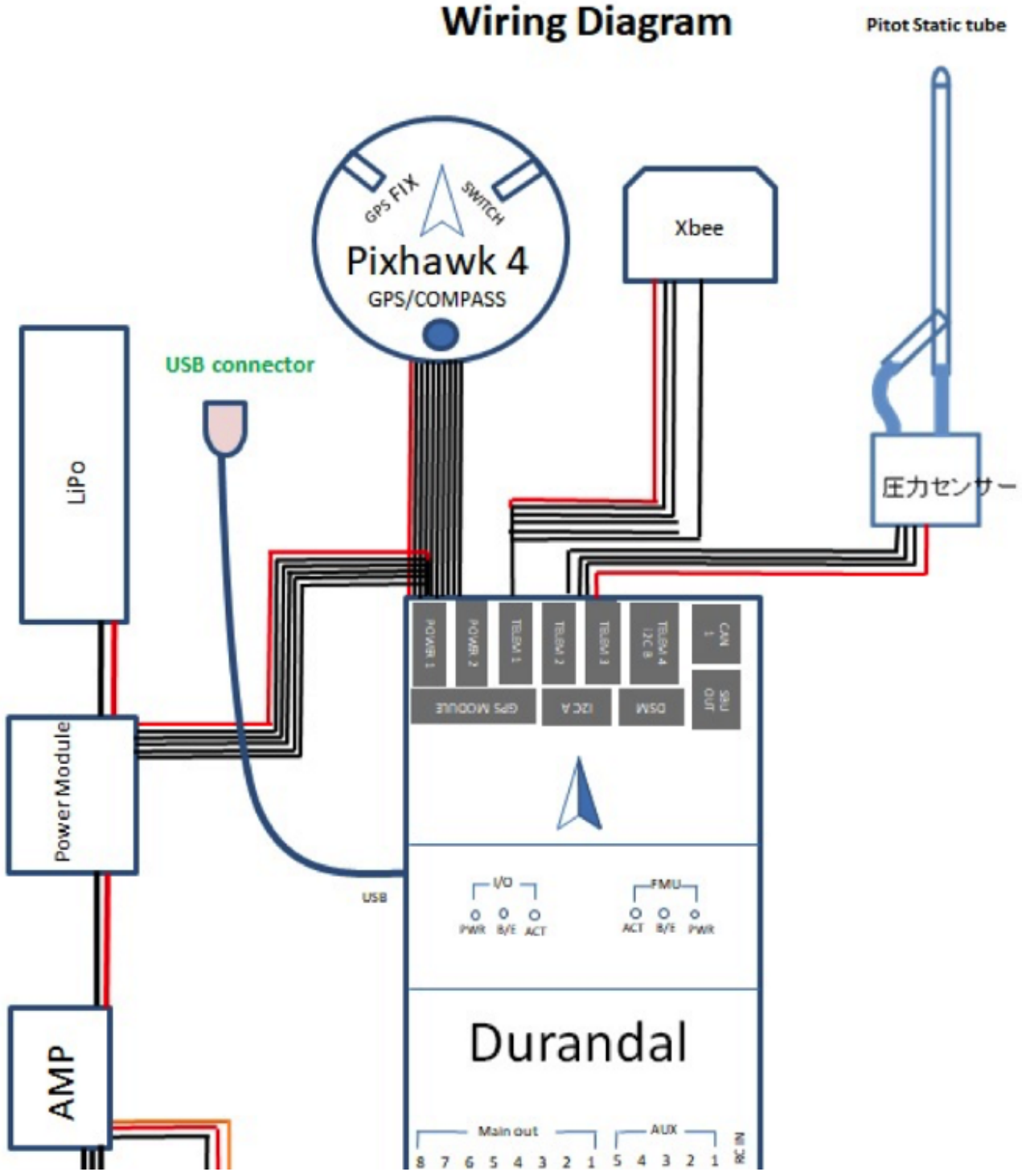
The Hardware

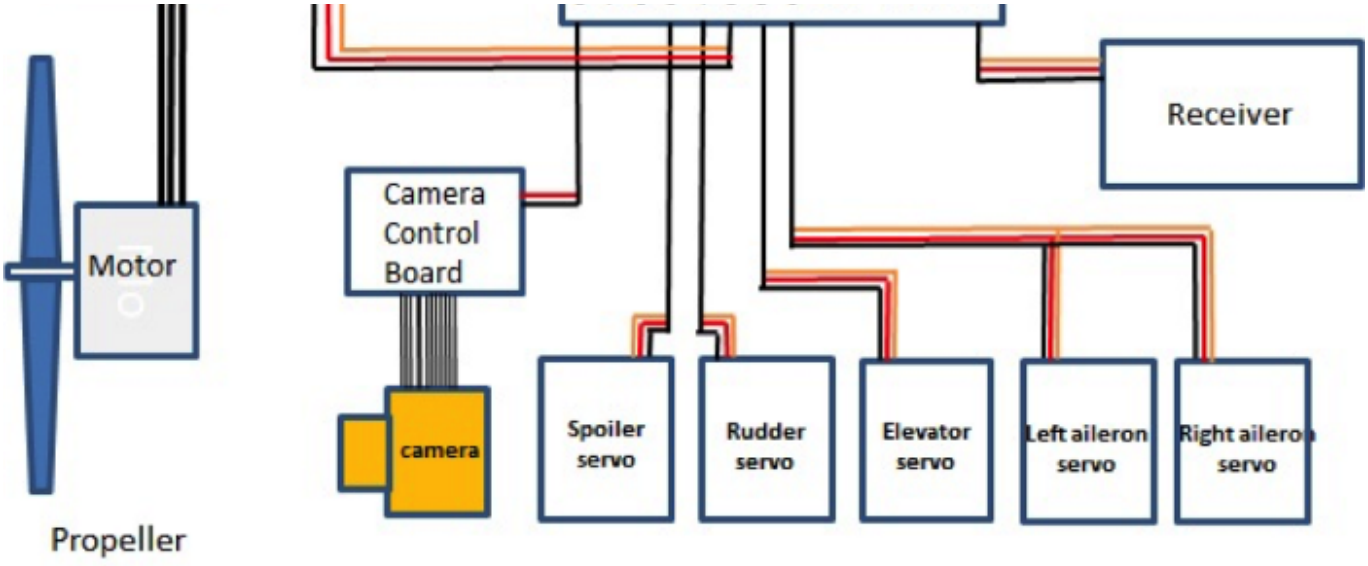
I purchased a Durandal FC, its power module and a Pixhawk 4 GPS/Compass module from Holybro. Photo below shows these this along with its connecting wires. Links can be found in the *Resources* section at the end of this article.

Photo 3: The hardware I purchased.

Wiring Diagram

The above hardware was installed on the ⅕ scale ASK-18 glider and was connected following the wiring diagram below. In addition to the above hardware I installed a pitot-static sensor for airspeed measurement, an Xbee telemetry device and a mini camera to take flight video.





Drawing 4: Wiring diagram for the ⅕ scale ASK-18. (image: Durandal)

Installation

This picture shows the FC, camera and pitot-static sensor installation.

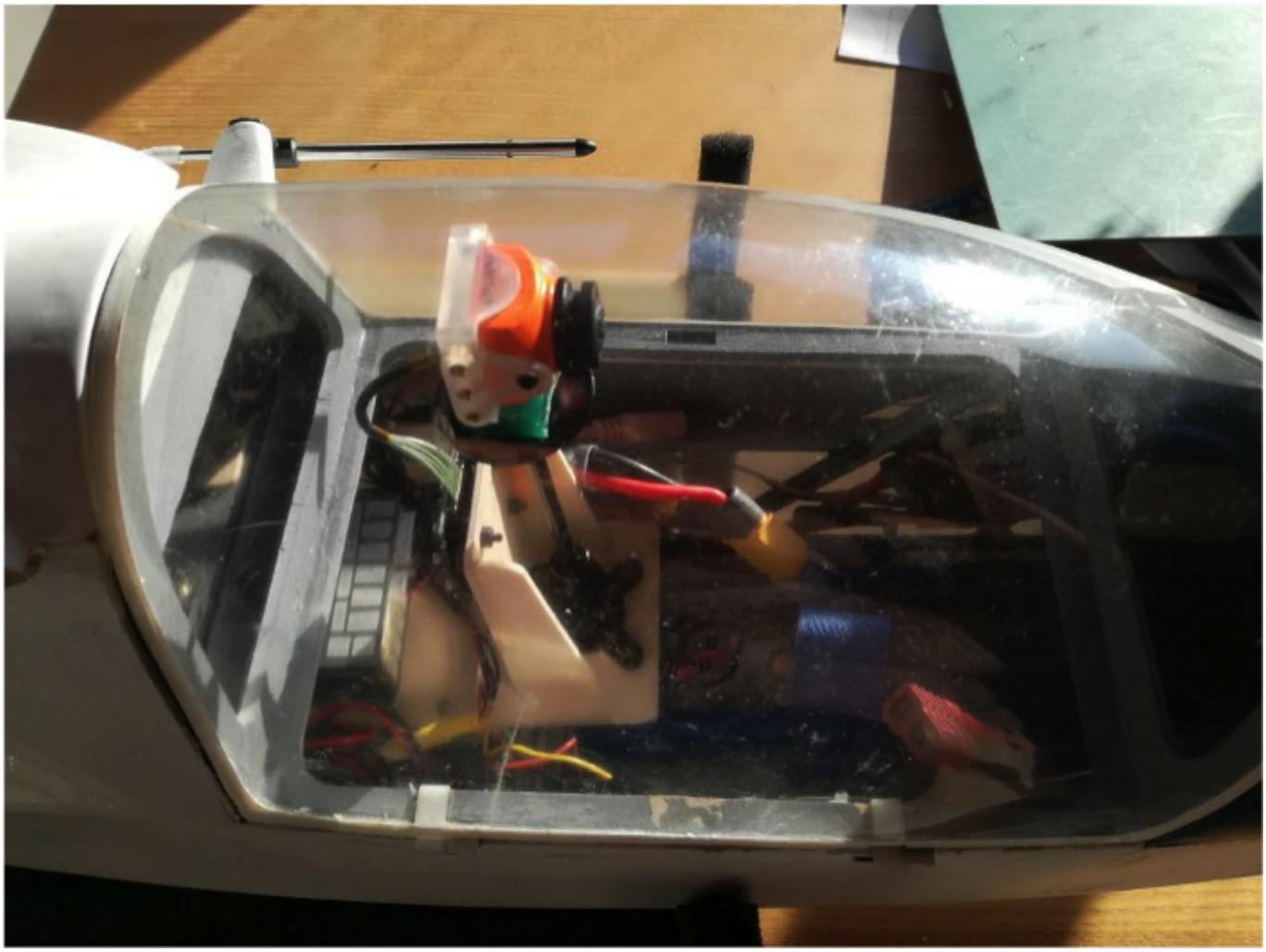


Photo 5: FC, camera and pitot-static tube installation.

Flight Test

With the above configuration, I conducted a series of *ArduPilot* Auto Soaring function tests.

Below is a case where the test was successful. This is the flight path the ASK-18 flew which was stored in the SD card of the FC.

Figure 6: Auto Soaring flight path.

The white dotted square lines are lines connecting the waypoints. The ASK-18 glided along these lines. The yellow flight path is the area where the glider soared automatically (Loiter mode).

There are three Loiter groups, and the top one is the most successful case, where the glider caught a medium strength thermal and climbed 45 meters during eight turns in about two minutes and 15 seconds..

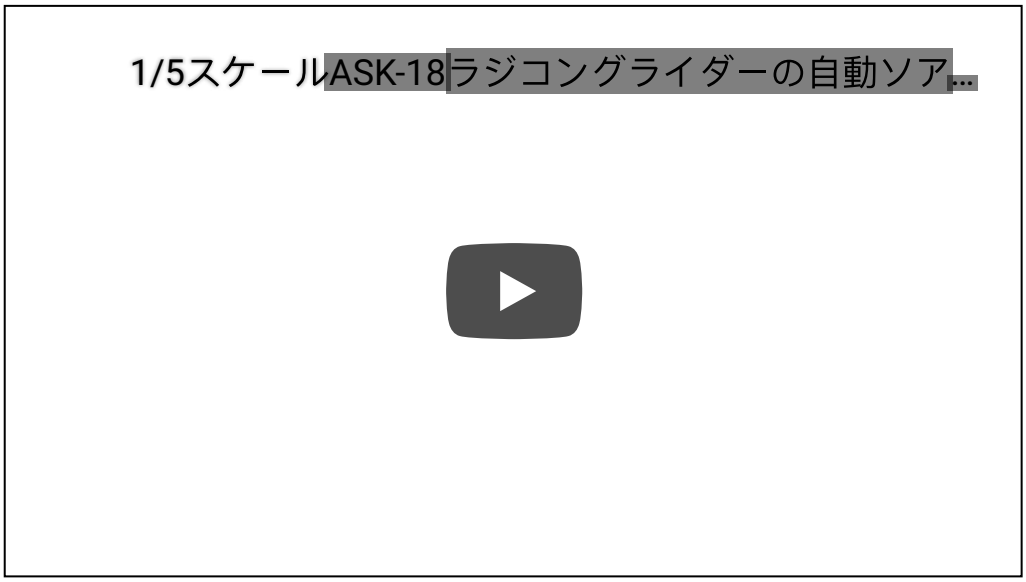
In the middle altitude part, because it was not a strong thermal, it went up for the first 10 seconds or so, but after that, it slowly flowed to the north (left side of the screen) while decreasing the altitude at the descent rate of about 0.1m per second.

Below is the airspeed logged during this flight correlated with the flight mode.

Figure 7: Airspeed log.

In Figure 7, the vertical axis represents both the aircraft's airspeed (m/sec) — that's the orange line — and the numeric value of the flight mode, which is the green line. A flight mode of 5 is manual control, 10 is gliding flight, and 12 soaring flight. It is clear that both gliding and soaring are flying at the specified 10 m/sec.

There are many peripherals and free software in the *ArduPilot* ecosystem that provide many kinds of data analysis. Below is the flight replay animation using one of such peripheral software and flight log data.



Video 8: Flight replay animation.

What I have provided in this article is a high level overview which does not provide cover many of the details you will require. However, I hope this article has at least sparked your interest in this technology and that you take this next challenging step.

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Resources

- AutoPilot Hardware Options
- User Manual Introduction
- Mission Planner GCS
- QGroundControl
- Durandal Flight Controller

- Pixhawk GPS Module
- Mita 3 Project

*All images and video are by the author unless otherwise specified. Read the **next article** in this issue, return to the **previous article** or go to the **table of contents**. Downloadable PDFS: just this article or this entire issue.*

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“12 Dodgson Designs planes flew in the 1988 Western States Soaring Championship in Modesto, CA and 6 of those shown here trophied. Left-to-Right: Steve Callup, Brad Clasen, Shawn Lenci, Bob Dodgson, Steve Clasen and Dave Banks who won 2nd place.” (image: Bob Dodgson)

The Implementation of a Dream

“In 1970, Sandy and I quit our jobs, rented out our houseboat on Lake Union in Seattle…”

Bob Dodgson Follow
Jun 13 · 10 min read

This is the second part of a three part series. To get the whole story, you’ll want to read the first part (if you haven’t already) and then this article. Once again, we’re featuring author and reader photos of Dodgson Designs aircraft and we thank all of them for the opportunity to present them here. — Ed.

In 1970, Sandy and I quit our jobs, rented out our houseboat on Lake Union in Seattle, piled our six-month-old daughter Heather (Todi) into our VW camper, and headed out for a six-month tour of the United States, on a very limited budget. I had sold my first four-channel plane to Larry Nuss before I left, and I had designed a new glider to take with me. The new glider had the same control system but two sets of wings. The long set had a span of about 120 inches and an NACA 4412 airfoil. The short set of wings (100 inches) had a semi-symmetrical airfoil. They were interchangeable on the fuselage as it had no fillet and was flat at the point the wing root contacted the fuselage sides, as on the later Todi and Maestro gliders. The flaps and ailerons were mixed with the forerunner of the Dodgson Coupler, which was devised, in part, by an innovative Seattle flyer and mechanical engineer Sandy McAusland from my own sliding bell crank platform. The Dodgson Coupler was to become the first two control mixer available to the model airplane industry.

“Walt Volhard launching Dodgson Saber at 60 Acres Park, 1991” (image: Waid Reynolds)

Our trip was plagued by radio problems. However, I did get some good flying at Torrey Pines, California, where I met some notables like Fritz Bien and Kelly Pike. After six months of being cooped up in our camper with a young child, Sandy and I were hardly speaking to each other on our return to Seattle. Needless to say, I had no desire to resume work as an architectural draftsman, so I put in for unemployment compensation while I cogitated on the alternatives. I discovered that while my planes were as good in light slope lift as any before my trip, that upon my return the Monterey had been introduced and it was superb as a light-life slope machine. I also discovered that Larry Nuss, who was now flying my original four-channel glider with the Eppler 387 airfoil, was out-flying my new gliders and he was getting performance from the ship that had eluded me. His secret, come to find out, was that he lost the lead nose ballast I had in it and was inadvertently flying with a much further aft CG.

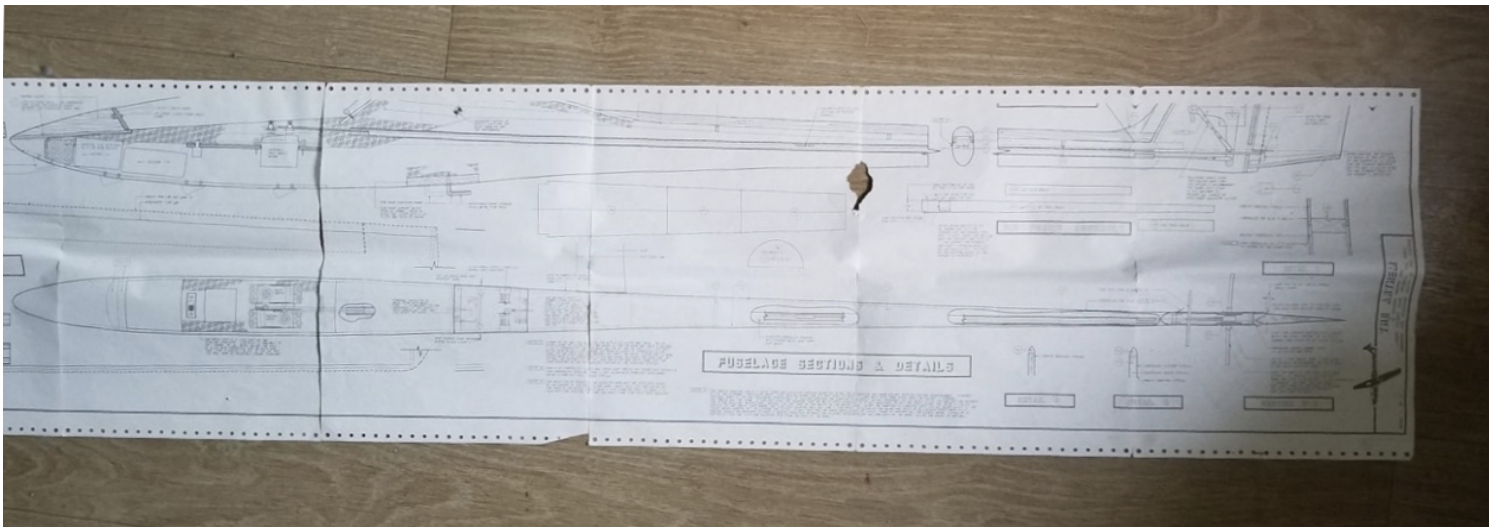
“Megan Dodgson with the First Windsong ever built that I flew to second place at the 1983 Nationals.” (image: Bob Dodgson)

Don Burt, who had been brought to the United States from Scotland by Boeing as an aerodynamics engineer, played a prominent part in my life at this time. He also had designed several gliders with multi-channel control. The Boss T had polyhedral wings, but it had flaps and it had ailerons that were coupled to the flaps so that they moved about half as far as the flaps moved. Don Burt’s T2 had two-channel control and polyhedral, but it had flaps coupled to elevator and ailerons coupled to rudder, so it got a lot of mileage out of those two channels.

Don had all the design books by Horner, etc., and had been a well-known Free Flight competitor in Scotland. We spent many hours discussing the merits of different design concepts, wing tips, control systems, etc. In the end, we had several basic differences of opinion as to the configuration of the best high-performance glider.

“My yellow Windsong.” (image: Craig Christensen)

Don decided that he would kit his T2 and Boss T in a small kit run. The idea seemed totally outlandish to me, but I started thinking that if Don Burt could do it, why couldn’t I? My latest design after the six-month sojourn was a winner. It could hold with the Montereys in light slope lift and yet it could move out, was fully aerobatic, and had two sets of wings with flaperons. It was to become the Todi. The original fuselage was of shaped balsa, covered with Monokote. (I still have it.) I had no fiberglass experience but wanted to make the pod of fiberglass. I wanted to make the tail boom of balsa but couldn’t figure out a good way to do so. Ralph White, who now owned Flight Glass Models, generously and kindly instructed me on how to make molds and fiberglass fuselage shells. Don Burt gave me the basic idea of rolling the balsa tail boom, but it took many frustrating experiences before I developed the hardware to do the job.



Dodgson Anthem plans apparently printed on a dot matrix printer. (image: Tim Egersheim)

It took several weeks of work, but I finally got my first Todi kit together, plans and all. I placed a tiny 1/12-page ad in Radio Control Modeler (RCM) magazine, for about $50 and started getting catalog requests. Soon, orders started to trickle in. From early 1972 to the end of 1972, we made our kits where we lived — on a 400-square-foot houseboat on Lake Union. The fiber glassing and the sawing were done on the covered portion of the deck while the materials were stored inside. All parts and the kit assembly were done inside the tiny houseboat. The first Todi had been ordered by John Davis, one of my slope-flying friends. He constructed it and when the great day for the test-flight arrived, he called me and we went to the slope.

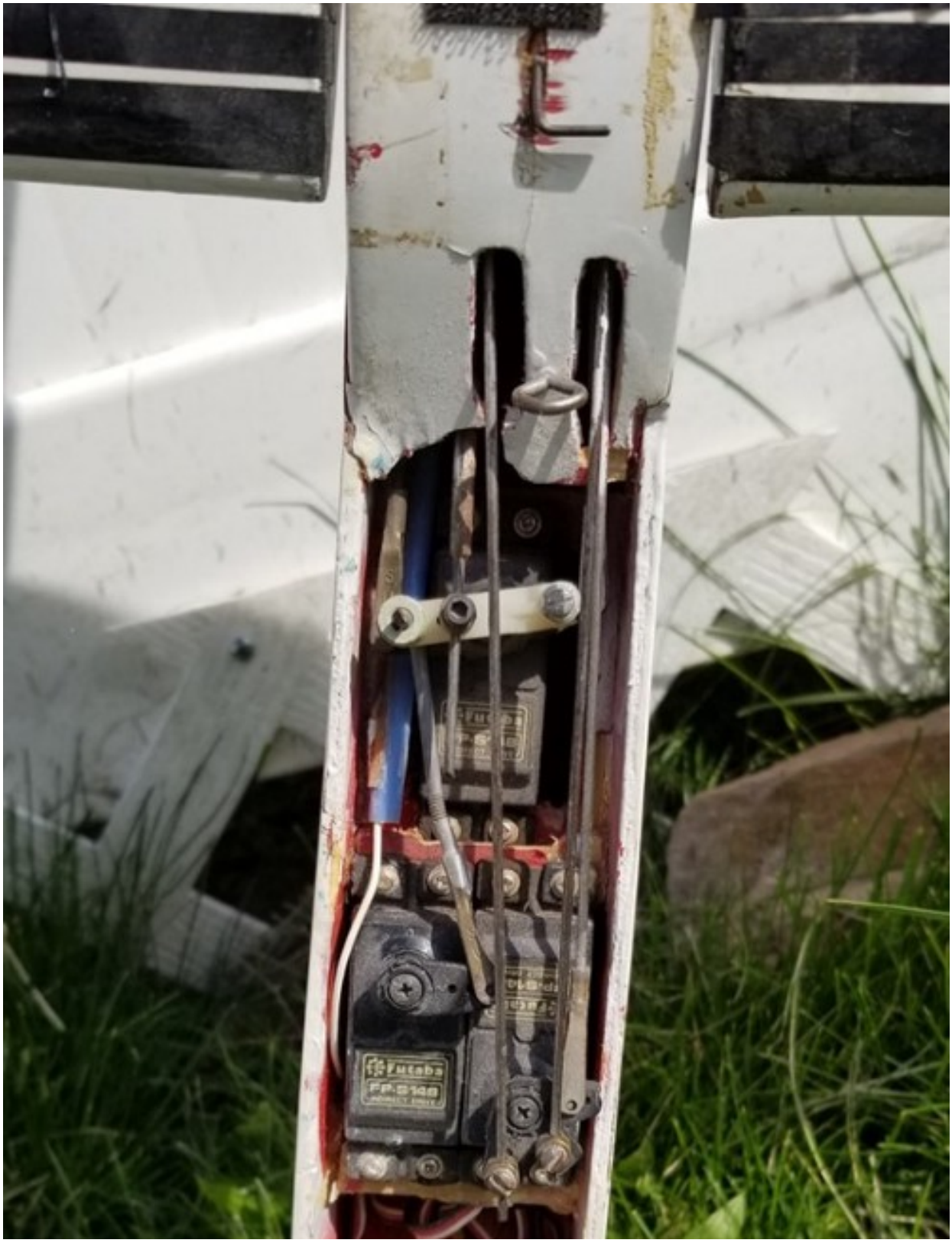
“From top-to-bottom: Todi, Maestro, Lovesong, Saber, Camano, Camano-shell, V-gilante, Pivot.” (image: Kristopher Harig)

This was the moment for which my ego had been waiting — the day when I would see my creation, built and flown by someone else, soar to glory! John threw it out over the slope with a steady hand. It was a success. But wait. Suddenly the glider went into a series of gyrations and crashed. John said it was the squirliest glider he’d ever seen. After several similar attempts, John gave the glider to me in disgust. I was totally crestfallen. This was 1972. I took John’s Todi home, put my radio in it and flew the glider. It flew great. I told John, and he didn’t believe it. I had to conjure up several witnesses. Finally, John took the Todi back and somehow discovered that his antenna wire in his transmitter had broken. The problem resolved John’s Todi flew fine. In fact, at the 1983 model show in Puyallup, Washington, I heard from John Davis that he was still flying the №1 Todi kit from 1972.

“This picture was taken at the 1983 National Soaring Society ‘Soar In’. Me holding the white WIndsong won 1st place.” (image: Mike Hansow)

The Todi was born on the slope but it had all the necessary ingredients to be a thermal champion. I now wanted to put the Todi to the test in serious thermal competition, but I had had little experience with winch tows and no contest experience. My early winch

tow memories still give me nightmares! The concept of the turn-a-round had not yet been born, so the winch box was placed at the far end of the field with a highly trusted person left there to operate it. You hooked your plane on the line, waved to the winch operator, watched the line tighten and then off the plane would go full bore to the top of the line, if you were lucky.

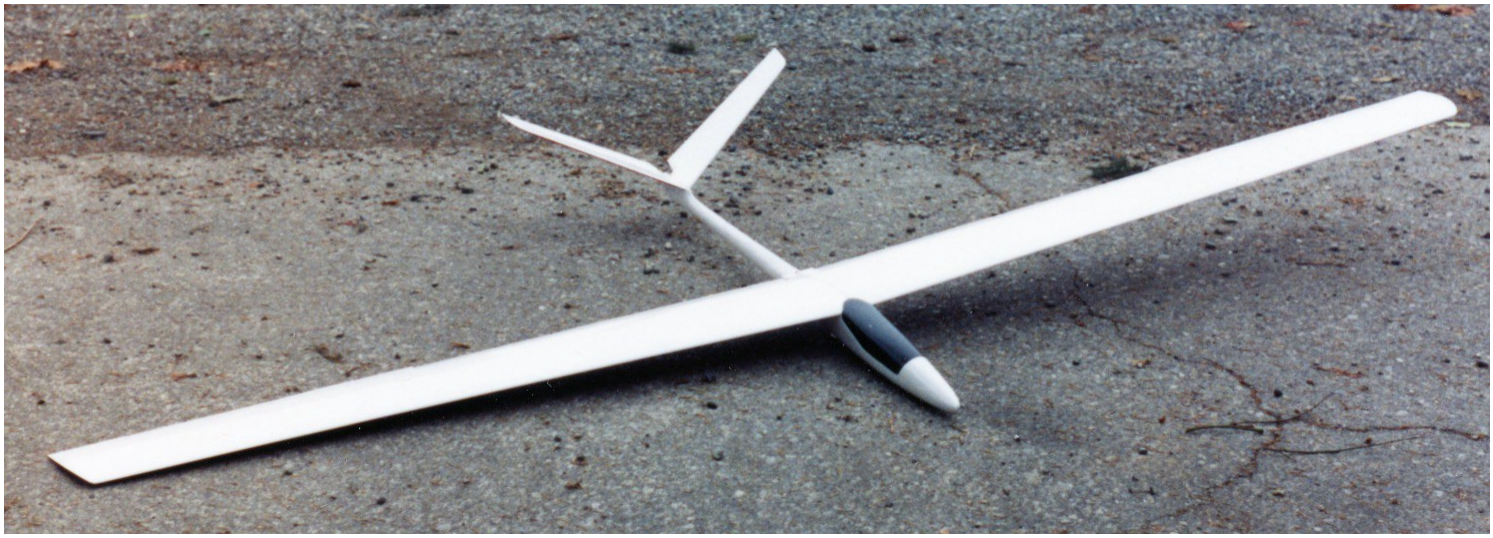


“What is this wizardry?” (image: Tim Egersheim)

Steve and Larry Nuss were the first boys in the Seattle area with one of these marvelous winches. It was only their constant enthusiasm that enticed me out, Todi in hand, to observe winch launching first hand. Larry had a Dandy two-meter glider with which he was going to show me how easy and safe this launching technique really was. Steve was running the winch. Finally, the moment came when Larry signaled the winch man that he was ready. With a surge of power, the Dandy sprung to life. It catapulted about 20 feet into the air and then did a snap roll on tow. Unshaken, Larry calmly continued on up the line to get a reasonable tow. “There, see how easy it is!” said Larry looking over at a quivering mass of humanity, holding a Todi that immediately went, unflown, back into my car.

At the annual slope flying bash, the second for me, on Badger Mountain (near Wenatchee), I heard that there was to be a thermal contest in Spokane as a part of the Spokane Internationals, a well-known power contest at that time. This, I thought, would be the golden opportunity to showcase my new Todi. I would simply breeze in with my wonderful multi-channel bird, win a decisive victory, impress the heck out of everyone

and get great material for my advertising. Sandy, my supportive wife and I, drove for six hours and got to Spokane only to find that no one knew anything about the contest. Finally, we found out that we were two weeks too early. As luck would have it, the Spokane Barons were holding a glider contest that weekend anyway to sharpen their flying skills in preparation for the big contest.



“This is my 100” V-gilante.” (image: Bob Dodgson)

We decided to stay and fly in this local contest, since we were already there and had nothing else going at the time. At the field, on the morning of the contest, I was chuckling to myself upon seeing the sorry assortment of gliders represented. Some flyers were even entering converted power planes, with the engines removed. There were a few Cirruses around though and they were good planes. Also, the first Airtronics kits were represented. They were the original Olympic 88 and 99. Harley Michaelis was there with one of his beautiful, published designs.

Among many other sterling performances through the years, Tom Neilson not only won the 1987 Nats, flying his Windsong in open class, he won the Hi-Johnson trophy for the highest score and he won the Dan Pruss trophy for being on the winning team.

Dave Johnson and Tom Brightbill completed the winning team and all were flying Dodgson Designs gliders! Oh yes, the Craig Robinson Built Windsong Tom Neilson was flying won in 3 categories in the static judging, too --including best sailplane!

Interestingly, Ed Berton and his Windsong placed 2nd at the 1987 Nats --so Windsongs were 1st and 2nd! Ed also won the big 1988 Tangerine meet!

“Tom Neilson and his Windsong won the Nationals in 1987.” (image: Bob Dodgson)

The first flight was a three-minute precision, which I figured would be a snap. I got a terrible launch and it was readily apparent that I was having a radio range problem, which demanded that I not stray very far away. Even so, I had no trouble getting the three minutes. In fact, I did so well that I got about four minutes and couldn’t understand why I got zero flight points for this heroic effort. Finally, it sunk in what a precision flight was all about. My first flight was probably my best of the contest. I came off tow a few times, the winches were down at the other end of the field operated as described earlier, and I was having every problem known to a green contest flyer.

To compound my problems, most of the early Spokane Contests required that the launch be Rise- off-the-Ground (ROG) rather than throwing the plane from the hand. This type of launch was fostered by the LSF nationally and was used in their big annual California contests. Many articles were written in the magazines telling how much safer this ROG launch was than the hand-held launch. My own observations were that you were lucky to get three successful launches out of four with the ROG system. It was scary, you couldn’t get as high and anything could happen in the first few feet while the plane was getting up to flying speed. Eventually both Spokane and LSF abandoned the ROG launch, much to my relief.

“Dave Banks carries his ‘song through a fleet of Dodgson gliders as another ‘song is launched. Doug Buchanan behind him. circa early 90s” (image: Waid Reynolds)

At the end of the contest, I had finished 15th out of 16 entrants. Even the converted power planes had beaten me. Either Harley Michaelis or Randy Holzapple won the contest as I recall. I went home a broken man. No one was impressed with either my amazing glider or me. I knew that my design could outperform the other planes at the contest, but no one else could have seen the potential from my dismal showing. Alas this was to be my fate on many more occasions over the next 15 years.

“Our daughter Megan holding the Orbiter-2 that won Handlaunch at the Nationals in 1995 flown and slightly modified by Steve Cameron. The original Orbiter was designed by Eric Jackson and kitted by Dodgson Designs. With the Orbiter-2 shown below we incorporated the fiberglass tail boom like the one with which Steve Cameron won the 1995 Nationals.” (image: Bob Dodgson)

I knew that I had to go back and fly in the Spokane Internationals to redeem myself, so two weeks later we returned. There were about 40 entered in the glider portion of the contest. Several flyers were there from the Portland area, and five flyers of note from California.

This contest was a different story. I wasn’t having any radio trouble at this field and I knew what a precision flight was. I had also been practicing landings. At the end of the first day, I was in the lead. My glider was a hit; even George Steiner and Greg Allen from California were going to buy kits. By the end of the contest, however, I had managed to drop to third place, the first two places going to the Allen boys from California. So ends the saga of Dodgson Designs . . . the beginning.

©1983, 2002 Bob Dodgson

The third and final part of this series is coming up in the July issue of RCSD. This article was originally published in the April 1983 Northwest Soaring Society Newsletter edited by Dean Rea. Bob updated and submitted it to the AMA History Project in 2002. RCSD would like to thank both Bob and the AMA History Project for permitting the use of the AMAHP document as a source for this series of articles in RCSD. In particular, we would like to thank Jackie Shalberg, Archivist and Historian for the National Model Aviation Museum, for the assistance in making these arrangements. — Ed.

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The Windburner right before it's first flight. (image: Michael Berends)

RC Soaring Diaries

Some speed from Down Under: The Windburner and RPM from Kevie Built RC Planes.

Michael Berends Follow
Jun 15 · 11 min read

After being involved in RC soaring for 40 years, I've had a chance to do pretty much every type of discipline the hobby has to offer. Although I thoroughly enjoy the grace and romance of gently guiding a glider from thermal to thermal under a sky of puffy cumulus clouds. The wild child in me has the 'need for speed' and dynamic soaring (DS) is something that I can't get enough of!

The first time I ever heard about dynamic soaring was roughly 20+ years ago. There was talk about Joe Wurts reaching amazing speeds flying on the back of the slope. The place

where we were always told to stay far away from as it took your glider and slammed it into the ground due to all the turbulent rotor that was on the backside of the hill. There was descriptions of how this was accomplished in magazines, such as this, but none of it really made sense to most of us. I just couldn't wrap my head around crossing between different energy zones in an elliptical path to obtain insane speeds. Even with the drawings and diagrams provided I was just left scratching my head and doubting everything I read.

That all changed one day when I was at a friend's house after a slope soaring session and he turned on the TV, popped in a VHS tape and I got to see what DS flying looked like for the very first time! There was Joe Wurts flying at speeds so fast it appeared as if the video was on fast forward with the glider emitting roaring sounds as it ferociously tore apart the air at these insane speeds!

This was a life changing moment that started my dynamic soaring pursuits. Although the beginnings and learning process were difficult and frustrating at times, the rewards in the end have been absolutely amazing!

After flying a number of different types of gliders on the 'dark side', including EPP (expanded polypropylene) DS planes and a variety of composite ships. I have never owned a composite glider that was designed specifically for dynamic soaring. So for this season I decided to invest in a few fast ships to help me hit some higher speeds and reach some new goals.

The first ship that came to mind was the *Windburner*, produced by Kevin Bennet of Kevie Built RC Planes in Australia. I had followed this sleek flying wing for quite a number of years. Here's what Kevin had to say about it:

> *"I wanted a fast plank which was easy to build and just as fun and easy to fly for dynamic soaring. It started off as a 40" plane with a lost foam fuselage. From the very first* Windburner *I realised I had something special. So I made a plug for a fuse and increased the wing size to 48". The wing was made from a plastic laminate material which is a skinny laminate of 0.5 mm. It flew so well that it broke the 48" tailless world record. So then I decided to make a hollow moulded wing version. From then on, the* Windburner *has gone from strength to strength. I've refined it to make it faster and faster over time and so far it*

> *has broken not only the 48" world record but holds the outright world record for a tailless aircraft."*

After 10 years of watching this little marvel break 200 mph, then 300mph and eventually smashing it all with the current 48" world record speed of 341mph for a 48" wingspan glider. I knew that I finally needed one.

So, I reached out to Kevin, who is a super nice guy, and put in an order for one. He told me that he had to finish up a few *RPM* gliders first which is the new plane he is producing. This had me wanting to dive in and know more about the *RPM* and really liked what I saw, so I was quickly swayed into putting in an order for an *RPM* too!

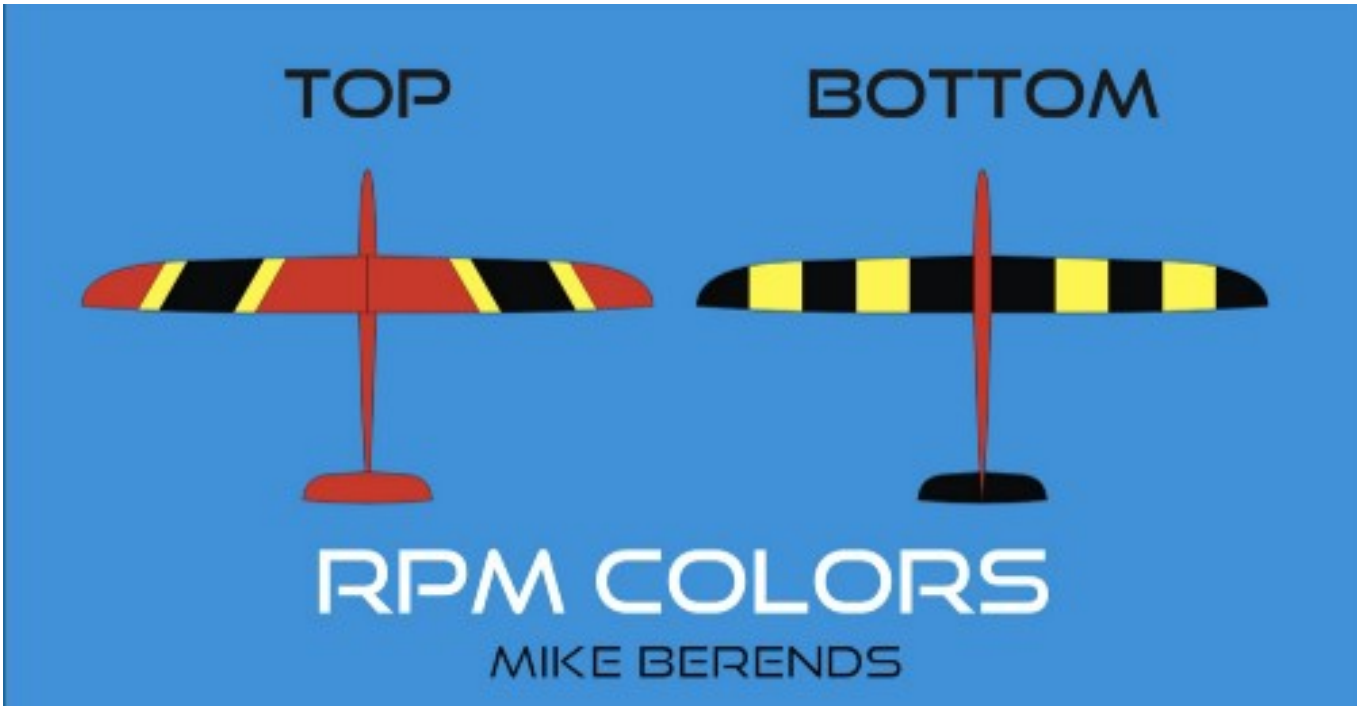
The *RPM* is a 71" DS plane that was designed to push the 300mph mark. It wasn't designed to crush world speed records but to be a stable platform that you can put into the air and find the 'groove' at your site on the given day, before you break out the heavy hitters. It also flies well on the front side unlike some of the other DS ships in it's size category. It all sounded great to me so I couldn't resist!

The process was started which spurred lots of conversations with Kevin. A new friendship was building and the airplanes weren't even started yet! This is one of the beautiful things with this past time. It's not always about the planes and the flying, but also the friendships and people you meet along the way. Some of my best friends are people I've been flying with for decades, creating good memories both on and off the flying field.

I quickly found out that he was an extremely genuine guy with a passion for everything he does. Not only a fine craftsman with the gliders that he produces but also puts the same pride into other things he does outside of the hobby. As a matter of fact, through our conversations it was found that we both have built theatrical props for movies. Some of Kevin's handiwork can be seen in one of the installments of *Pirates of the Caribbean*.

As he was finishing some of the other planes that were ahead of mine, I had a chance to come up with a color scheme, something he does for all the people that order from him. I really wanted to make sure that these planes were vivid and stood out against not only the sky but terra firma, as half your flight is typically below the hill. Wanting to keep some of the beauty of the bare carbon fiber, I opted to go with red and yellow with black

stripes for both ships. Top and bottom differ to keep good track of orientation, red the primary color on top with diagonal accent stripes. Yellow and black 'invasion stripes' on the bottom. All easy to see even on a cloudy day with flat lighting.



Drawing 2: The picture of the vivid color scheme that I designed. (image: Michael Berends)

The morning soon came when I woke up to some messages and photos that Kevin had started on my planes. The excitement started and as the days unfolded the photos just kept coming. It was just great to see all the pieces of composite cloth, resins, paint and molds all working together to give birth to my new speed machines. I was along for the ride during the whole process and even though I was familiar with building molded ships, and have done some myself, Kevin had some techniques that he has honed over the years that were very enlightening. He has always shared his knowledge and has an active YouTube channel where has has published some of his builds.

Here is one of his videos showing how much work goes into a *Windburner* wing:

Laying up a hollow molded wing.

Video 3: Laying up a hollow moulded wing. (video: Kevie Built RC Planes)

From a world where I've always built the majority of my own composite gliders for light weight, I was amazed at how much carbon and glass cloth were put into these planes. Layers and layers stacked on top of each other. I was clearly seeing why his planes had a reputation for being extremely strong. Stories of cartwheel landings on top of rocky slopes where they were picked back up, had the dust blown off and sent back in the air were common.

Photo 4: RPM composite fabric layup. (image: Kevie Built RC Planes)

"I was amazed at how much carbon and glass cloth were put into these planes. Layers and layers stacked on top of each other."

Photo 5: Windburner wing in the mold. (image: Kevie Built RC Planes)

After an enjoyable few weeks of watching the progress, the planes were completed. After seeing the finished pictures I was really happy with my color choices. They looked exactly as I envisioned them. He replicated the pictures perfectly. He even took the time to make some custom *Maple Leaf* decals to honor their new home in Canada.

Photo 6: Both planes completed and ready to ship to their new home half way around the world. (image: Kevie Built RC Planes)

I received word that they had been packed up and shipped out. I was eager for them to arrive but knew that their trek would take awhile. I was pleasantly surprised when the package tracking showed that it was actually moving very quickly across the world. It was received at my door in just over a week.

Once the package arrived, in a very sturdy box, I carefully opened it up to find all the pieces neatly wrapped for protection and fully intact. The first thing I noticed was how robust everything was. All the pieces were built like tanks — literally rapping my knuckles on the wings with no worries of any denting or damaging. The wings were like carbon riber *Ginsu* knives ready to slice the air like butter!

After ogling over the workmanship of my shiny new machines it was time to start getting radio gear into them so they can take to the air. I had already ordered some KST X10 servos and had them on hand ready to go. They fit in all the servo bays easily and mounting them was done as recommended. First scuffing up the cases and then using epoxy to lock them on the wing skins with a fillet attaching them to the spar for rigidity. The supplied carbon control horns then needed to be mounted into the control surfaces. This was accomplished by marking out their location on the skin of the wing surface, then using a rotary tool to carefully cut through the skin and making sure that the slot went all the way down to the bottom skin but not through the bottom skin, which took some patience but worked out really well.

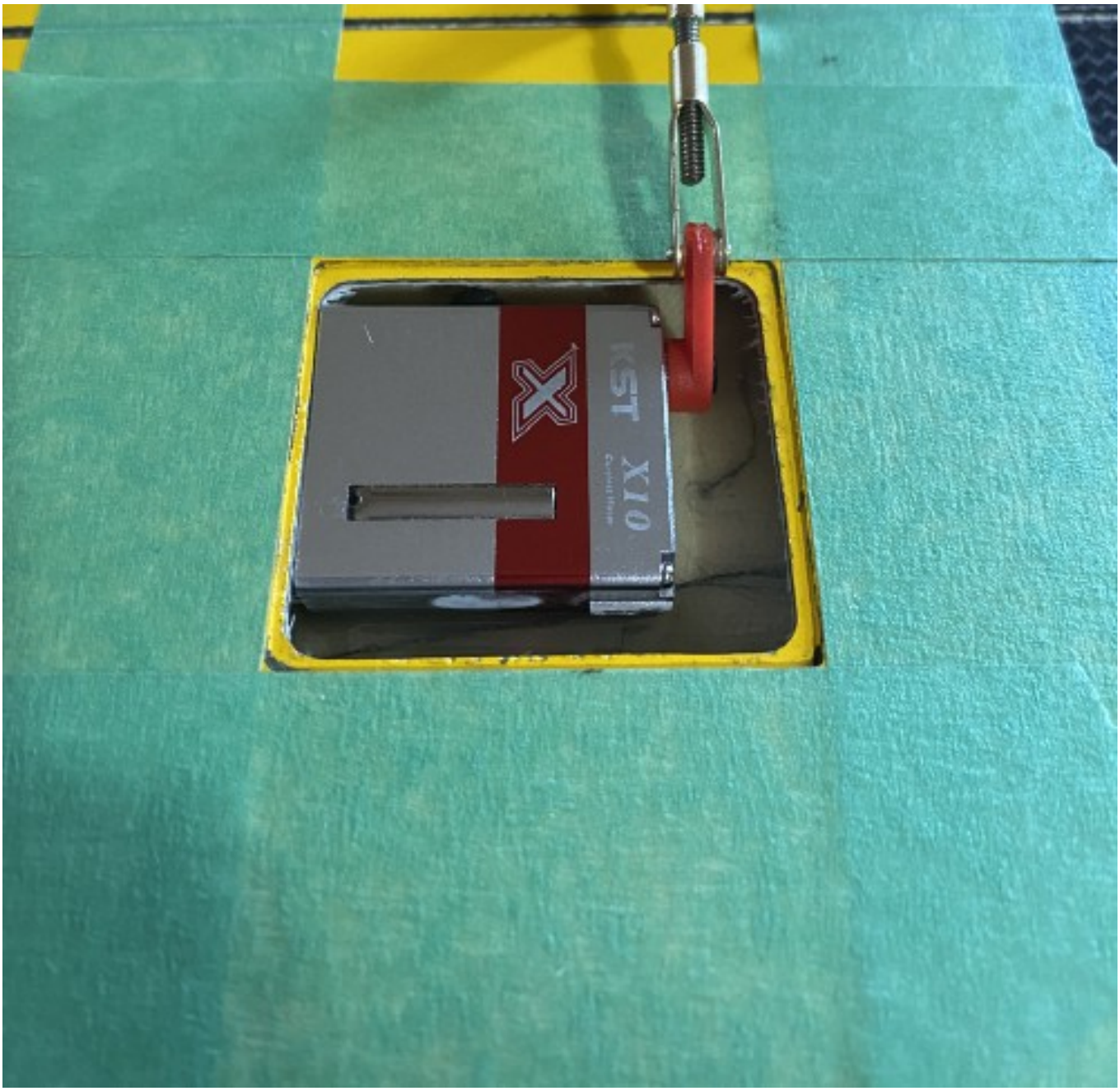


Photo 7: KST X10 servos were used on all surfaces of both planes. (image: Michael Berends)

The control horns were then cemented in place with an adhesive that I've never used before but about which I was informed by a fellow *RPM* owner, *JB Kwik-Weld*. At first I was a little apprehensive but after doing a few of them I knew that it was the right choice. Much like a five minute metal epoxy, it allowed me to mount all seven control horns in less than two hours one after an other in succession. Using masking tape and taking it off within a few minutes of potting the control horns gave me nice fillets with crisp edges. This will now be my preferred way of mounting control horns in the future. No taping and propping things in place until the epoxy cures. Each horn takes around

five minutes and you're ready to move onto the next one. So a big shout out to Jeremy DeFrisco for that tip! Thanks my friend!

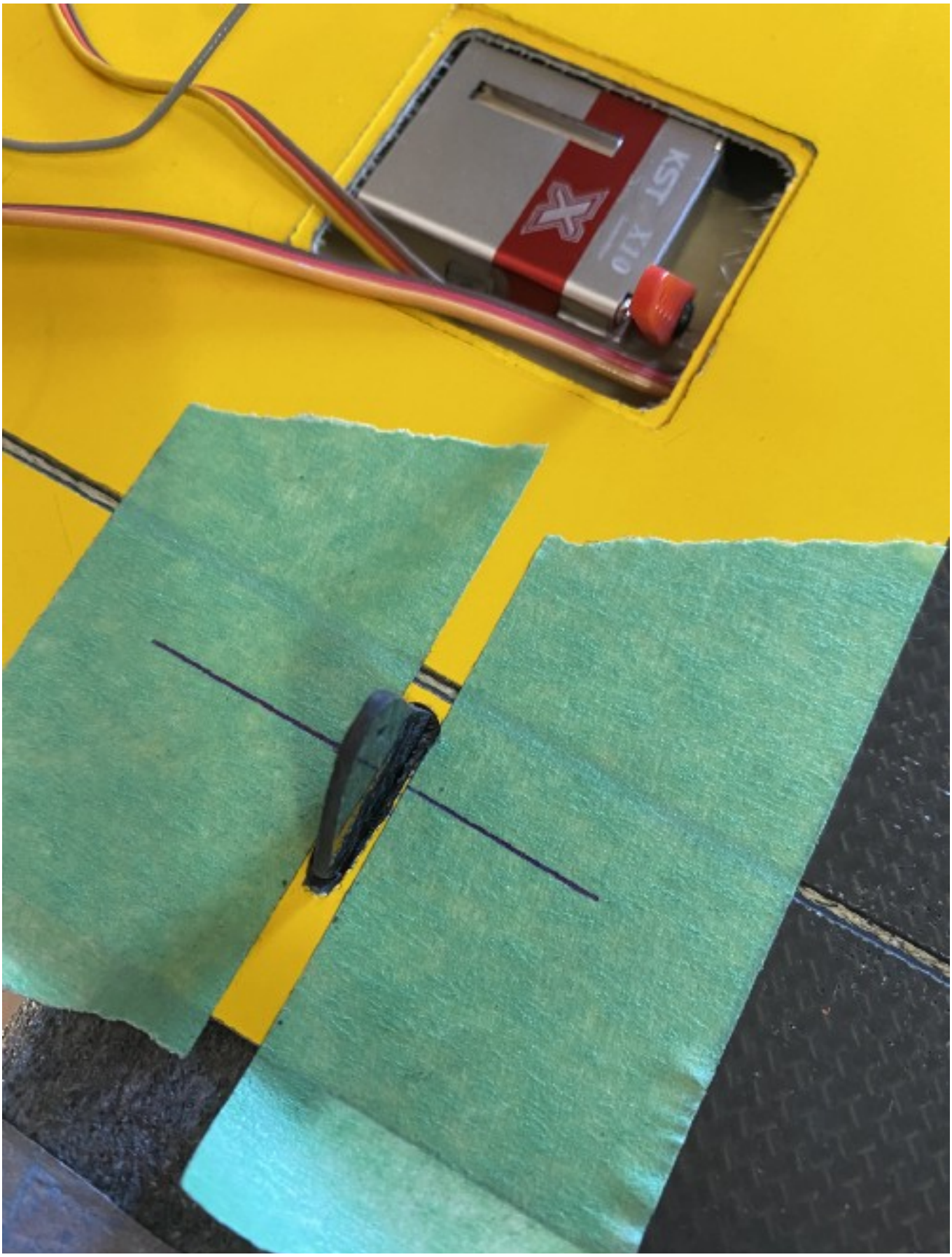


Photo 8: Control horn put in place just before potting in place with JB Kwik-Weld. (image: Michael Berends)

After that was accomplished all that was left to do was to make some 4–40 pushrods and install them. Easily done with threaded rod and good end links. One end was screwed on and secured to the rod with *JB Kwik-Weld* to prevent it from turning and the other end was left to rotate in case any adjustments needed to be made. Kevin was always there to guide me through the whole process and with his help that was in the form of diagrams, messages and pictures of his own plane, the geometry of everything worked out perfectly! Getting proper flap geometry can some times be troublesome but I was so happy to see that everything worked out first attempt and hassle free. Once again a good testament to the amount of care and customer service that he always provides with a sense of cheer.

All control throws were setup exactly to the settings prescribed on the info sheets for the planes. This was easily achieved due to the proper geometry described earlier. Using the stroke of each servo to utilize the servos power and resolution properly.

Battery and receiver installation was nothing out of the ordinary. I chose to go with NiMH *Eneloop* battery packs for stable chemistry in case there is ever a crash. I would never have to worry about any type of fire hazard.

The last thing was setting up the proper center of gravity (CG). For this I made a quick balancing rig out a piece of scrap lumber and some dowels with nails sticking out of them, pointy side up. I wanted to insure a very accurate CG setting, especially with the *Windburner*. Flying wings are very sensitive to CG and even moving them a millimeter in either direction makes a difference. Multiple layers of masking tape on the bottom of the wing that was marked at the proper measurement protected the wing skin from the nail. Filling a small sandwich bag taped to the nose of the plane and slowly filling it with lead shot until it was almost balanced but still on the tail heave side was a good start. I then put the planes on their nose put all the weight in the nose and poured some epoxy on top of it letting it ooze around all the weight securing it in place. The final balance was done with small pieces so that I could remove or add weight as needed to fine tune.

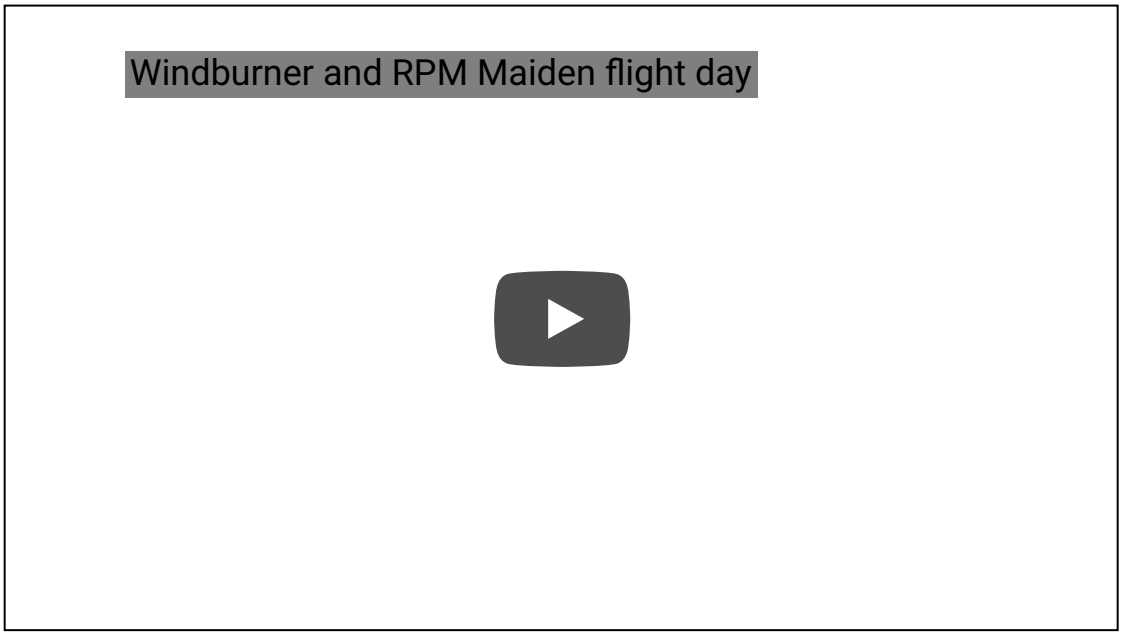
That’s it! They were done and ready to fly. Assembly was enjoyable, straightforward and quick. It really took me very little time to get these beauties ready for the air. On top of

having some new planes I also gained a number of friends around the world in the process. Other *Windburner* and *RPM* owners from around the globe helped me decide on radio gear, building techniques and a variety of other choices I needed to make on this extremely gratifying journey.

As of this date I haven't had the chance to do any dynamic soaring with these flying razor blades due to scheduling and the very odd spring weather that we have seen here, but have had them out on the front side to feel them out and put them through their paces. They both flew well setup the way Kevin recommended with no changes needed other than some expo dialed in for personal taste. You can see the maiden videos on the link below!

Hoping to get these doing some dynamic soaring laps soon to see what kind of speeds I can reach! If you're in the market for some DSing machines, get hold of Kevie Built RC Planes through his Facebook page (see *Resources* below). He will definitely help you out and get you some quality planes that you'll be 'rippin' around!

Thanks for joining me again this month! Happy flying and we will see you next time.



Video 10: RC Soaring Diaries: RPM and Windburner Maiden Flights. (video: Michael Berends)

©2021 Michael Berends

Resources

- RC Soaring Diaries (YouTube)
- Kevie Built RC Planes (Facebook)

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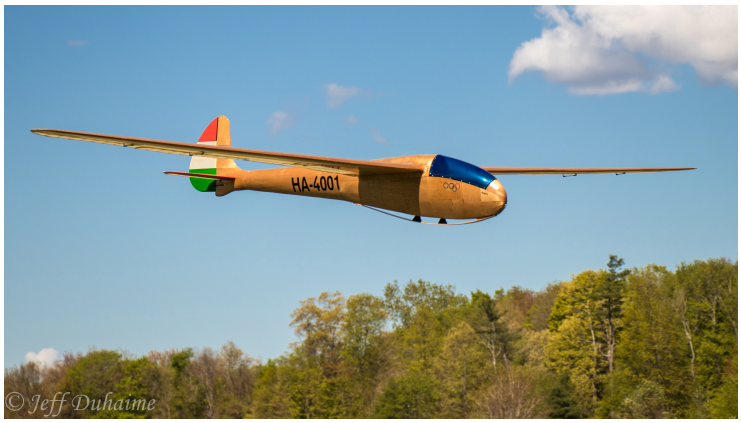
Green Air! The 2021 New England Scale Soaring Aerotow

Big tow planes and even bigger gliders. What's not to love?

Steve Pasierb Follow
Jun 15 · 5 min read

As the United States continues to reopen from the pandemic, 30 pilots, several dozen spectators and a supportive local flying club made the May 2021 edition of this annual event a complete success. Four days of flying spectacular blue skies and big lift air was the capstone to a beautiful long weekend of weather.



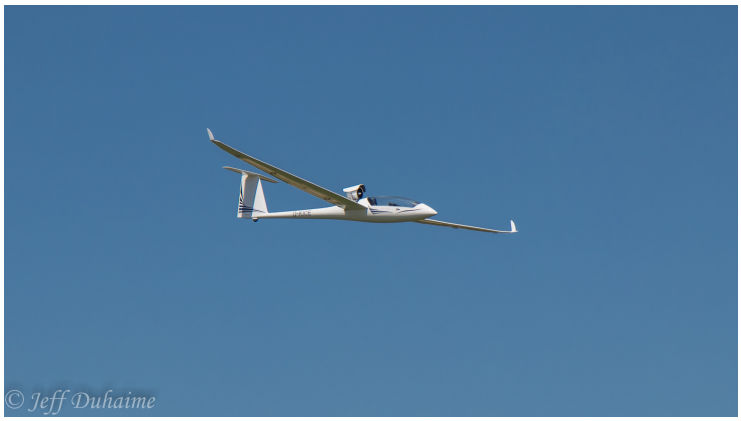
The *RC Propbusters* located in Salem, Connecticut is a large fuel and e-power club located on a rented patch of land at the center of farm fields. The open spaces and surrounding areas which are ideal for a power club also provide perfect conditions for RC soaring. The combination of powerful tow planes powered by 100–150 cc motors continually towing and a nice range of sailplanes made for a great variety of aircraft to share the sky and fun viewing from the pits. Across the four days, participants flew vintage designs such as the *Reiher*, *Minimoa* and *Nemere* to *1–26*s and *K8*s to the sleek modern-day 6.6 and 8 meter *Arcus*, *DG-1001*, *Duo Discus*, *Shark* and a range of other glass ships. 1:3 scale models overwhelmingly dominated with a few much larger and a couple smaller.

Encouraging new flyers and thermal duration converts to towing is a big part of this event. Those interested in flying a range of electric sailplanes were also welcome to attend in the hope they will want to take a turn flying one of the giant scale sailplanes. We know it only takes a small taste to get someone hooked. Fortunately, there are always a few models up for sale should one seek instant gratification and a lighter wallet.

Towing power was provided by a diverse group of models including a nice pair of Hangar 9 *Pawnees* powered with DA-120 motors, a TopModel *Bidule 111* on DA-100, a Peter Goldsmith Design *Chmelak Z-37* on DA-150, an Aviation Concepts' 1:3 scale *Cessna 185* on DA-150 and an Aeroworks' *Carbon Cub* also sporting DA-150 power. Cannisters on all but the *Chmelak* were the order of the day. There was essentially little to no waiting to get a sailplane airborne. Emphasis is always on flying as much as those in attendance want or can tolerate!

Like other recent meets, one sign of the evolution in our hobby was seen as more front electric sustainer (FES) and retractable electric ducted fan (EDF) units are appearing in sailplanes. Among the EDFs zipping around over the weekend was a RC Flight Academy 6-meter *Duo Discus* on a Mig Flight JETEC 120 running 12S, a 5.33-meter EMS *Arcus* running a Schubeler unit on 12S,and a 4.4-meter *Valenta Fox* on a Mig Flight JETEC 90 running 10S. In the FES category, a 6-meter Mibo Model *DG-1000* had its maiden after adding a Torcman unit with NT530–35/14 turning a 18x11 propeller. While it flew beautifully, it was clear this model could step up to a 20x13 for more robust climb. A

Hangar 9 *ASH-31* 6.4-meter with FES also made many impressive rise off ground (ROG) takeoffs each day.



Lunch is often as important as good lift and kudos go to the club members who stepped forward to man the grill. Simple hotdogs and hamburgers were served with a good dose of humor and sarcasm provided to those waiting in the lunch line. On Sunday, one of the participants, Bob Morrow, provided sandwiches and snacks for all the hardy souls who stayed on for day four — or day five for those who arrived on Wednesday afternoon!

This event regularly draws participants from a 5–7 hour drive radius. The pandemic kept 2021 attendance down. The ample open spaces also see a number of camping trailers and tents while the less hardy head to hotels and a nice dinner in one of the nearby seacoast towns. All are looking forward to the 12th annual event in May of 2022.

The discussion forums at ScaleSoaring.com (see *Resources*, below) contain a complete listing of aerotow events in the eastern United States in addition to a wealth of information on scale sailplanes and tow planes. There are typically one-to-two large meets each month starting with Cumberland, MD in March right through the Turkey Tow back in Salem, CT in late November. The crew responsible for the New England Aerotow also put on the Sky High Aerotow at a gorgeous private flying site in Muncy Hills, Pennsylvania each September. Sky High is set for September 9–12, 2021.

Our sincere thanks to RCSD and Managing Editor Terence C. Gannon for helping to promote our events and for your kind support of everyone who loves the multifaceted hobby of RC soaring!

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Resources

- ScaleSoaring.com (website)

- Sky High Aerotow (listing on the RCSD *Events* page)

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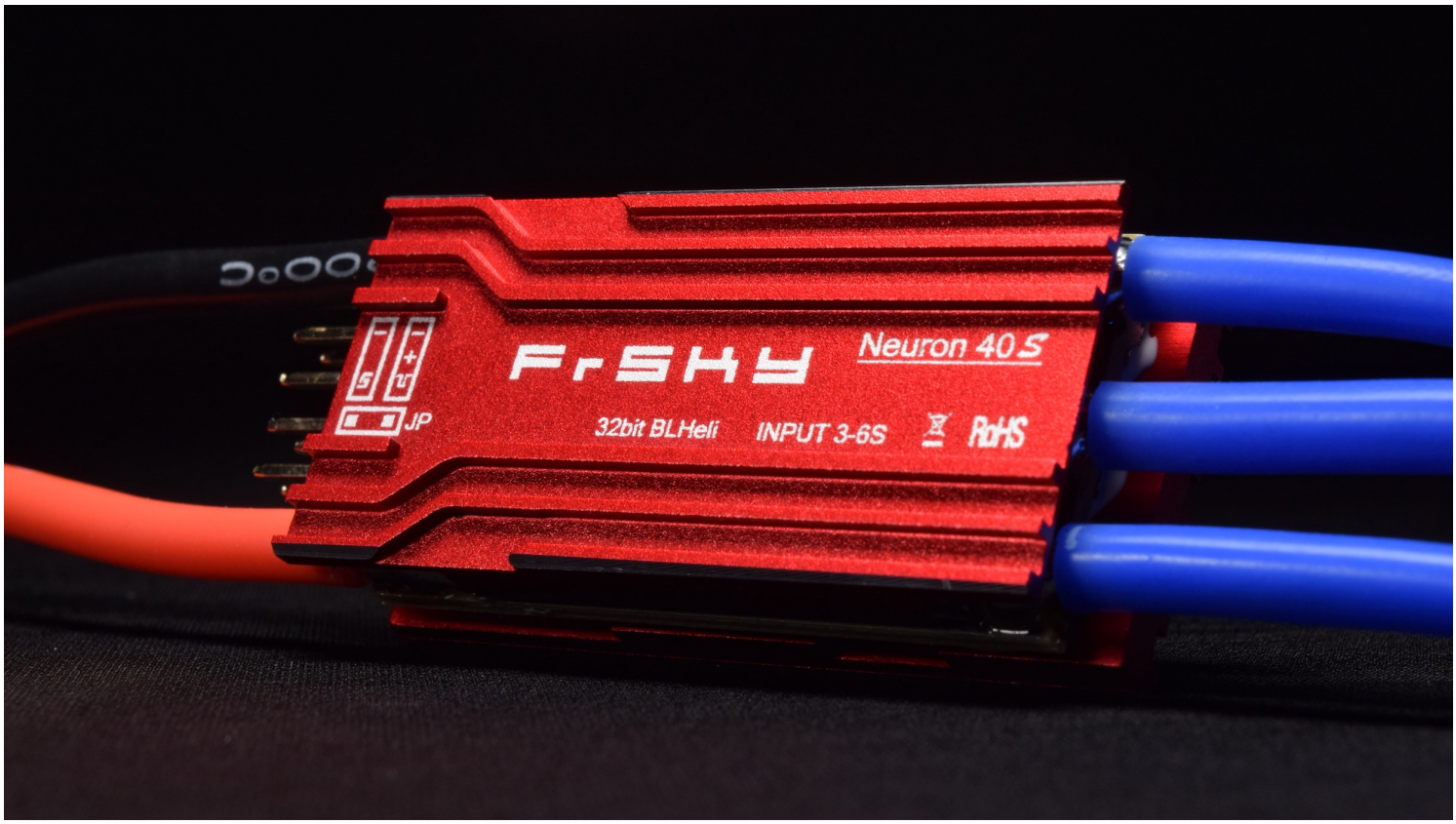

The FrSky Neuron 40S (image: Aloft Hobbies)

FrSky Neuron Electronic Speed Controller

It packs plenty of performance and features into a surprisingly small package at a reasonable price.

Peter Scott Follow
Jun 14 · 8 min read

First impressions were very good. The FrSky *Neuron* electronic speed controller (ESC) comes packed in foam in a solid plastic box, and is very strongly made with a thick aluminium plate top and bottom. All sides are open. There are two servo-style connectors for leads to go to the receiver — one for the throttle/battery eliminator circuit (BEC) lead pulse width modulation (PWM) and the other for the Smartport (S.Port) telemetry feed. You need leads with both ends female (socket rather than pin). You will need to cut the red core on the PWM lead if using a separate receiver battery,

but this is a separate lead so you are not cutting one that is permanently connected to the ESC. The ESCs are compact with good heat sinks and are available in 40, 60 and 80 amp versions with 50% extra capacity for short times (burst). All versions are the same size and weight, though different prices, and can be connected to 3S through 6S lipo batteries.

I tested the *Neuron* 60 in detail. After soldering on XT90 and 4 mm bullet connectors and sleeving, the device weighed 76 g. This is exactly the same as a Turnigy *Plush* 60A, though of course the latter has no telemetry. The sizes are: *Neuron*: 60 x 33 x 16 mm *Plush*: 72 x 30 x 17 mm so the *Neuron* is just a bit shorter. Later in this article I will describe even smaller versions.

Photos 2 and 3: The Neuron 60 top and side views.

The *Neuron* includes a range of FrSky telemetry. I tested the telemetry using a Taranis *X9D* plus transmitter running OpenTx V2.2.2 and a freestanding *X8R* receiver. Initially no motor was connected, so the current, RPM and mAh consumption data were zero. I allowed the ESC to power up the receiver through the BEC and the voltage shown in RxBt telemetry was 4.9V. Using a voltmeter I checked whether this was the voltage sent by the BEC and it was, so the BEC appears to default to 5V, though the voltage can be changed. It can provide 7A.

After using `Discover New Sensors` on the Taranis all of the data appeared as follows:

Data Names	Values During Test	Description
EscV	16.71 V	Lipo voltage
EscA	0.00 A	Motor current
EscR	0 RPM	Motor speed
EscC	0 mAh	Power consumption
EscT	44° C	ESC temperature
0E50	2560804	'Encrypted BEC values' — presumably the ESC setup data

Figure 4: Observed values on Taranis transmitter.

As you see the data (sensors) have different names from the ones created by separate telemetry devices. You can change them if you want but they seem meaningful. All have the same device ID (17). If using two of these ESCs in a twin motor model you would have to change the device ID for one of the ESCs.

I then added the new data to a numeric telemetry transmitter screen. I decided also to add `EscA+` and `EscR+` so that I could have a reading of the maximum current and motor speed during the flight. These will be essential to make sure that I have the correct propellor fitted. To get maximum safe power I want about 95% of the maximum current for the motor when the prop is unloaded in the air.

Then I connected a sizable 4Max motor and ran it up, hand held, without a propellor. Sensors `EscA`, `EscR`, `EscC` now generated data. `EscR`, the RPM one, showed over 30000 RPM which puzzled me until I remembered that RPM has to be calibrated for the number of coils in the motor, and defaults to one. I edited the sensor to the six coil pairs for the Eflite Power 46 that it will be connected to when I install the ESC in a model. The defaults appear to work fine for fixed wing, though I think braking is set on as the motor stopped quite sharply. You will want this for folding props anyway.

Neuron S Versions

More recently FrSky issued updated versions of the *Neuron*, designated 'S'. I bought a *60S* and a *40S*. They are very much smaller as you can see from the photograph

comparing the *60* and the *60S*. FrSky has done an amazing job squeezing the speed control circuitry and the telemetry into such a small device. The S has a jumper to select whether the BEC is used.

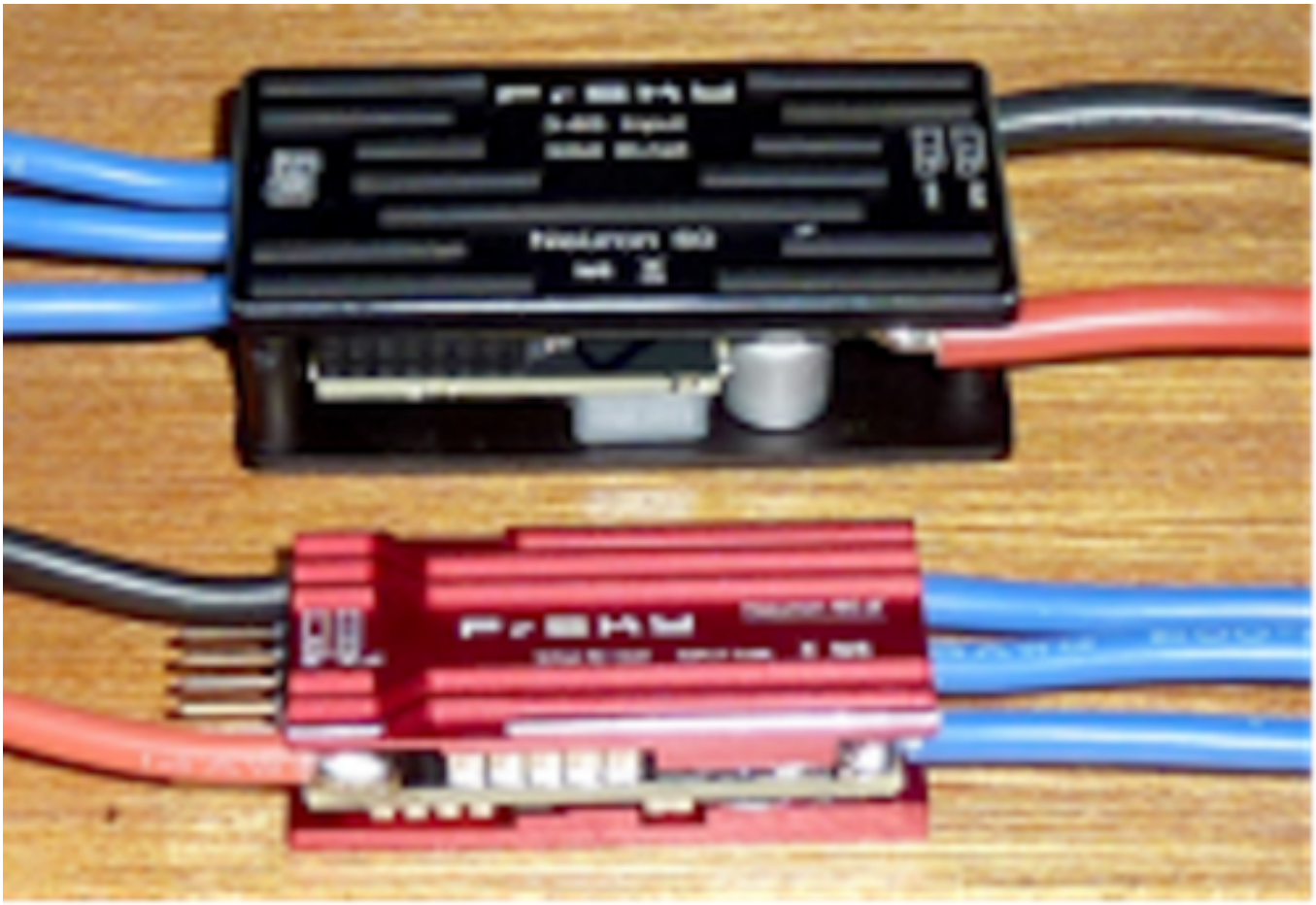

Photo 5: 60 — 76g 60 × 33 × 16 mm; 60S — 47g 45 × 22 × 12 mm. In both cases weights are with one XT90 and three 4 mm bullet connectors.

I have installed a *40S* in my Acrowot foam-e. It fitted perfectly in the original position. I don't need to connect the battery balance lead for voltage telemetry so the wiring is much neater. And now I'll know when I've used 1500 of the 2200 mAh in the battery 'cos the nice lady (Amber) will tell me. I used the default 5V BEC on the *40S*. I put the *60S* into a larger model. It was so much smaller and lighter than the current Turnigy *Plush* ESC that I was able to put it in a more convenient place and add a NiMH receiver battery and switch. As always, in both cases the telemetry data was found by the Taranis without a problem.

Advantages

Size

The dimensions of the *Neuron* are good compared with other makes especially the *S* variants. No further sensors are needed so the whole setup takes up much less space. Glider pilots might want separate variometer and/or GPS sensors, though the former is now built in to some FrSky receivers.

Weight

The *Neuron* is no heavier than most ESCs and you will not need to install other sensors with their associated wires. To match the *Neuron* you would need lipo voltage, current and speed/temperature sensors which add up to about 27g plus wires. We are not told what the current sensor will read up to, but I assume that it will be at least the current capacity of the ESC.

Cost

Neuron 40 £45.60 ($60), *40S* £55.20 ($70), *Neuron 60* £55.20 ($70), *60S* £60.00 ($78) *Neuron 80* £63.60 ($83). Unless you need an air speed, vario or GPS sensor, that's it. The cheapest FrSky sensors are: lipo £10.44 (2.8g), current £17.00 (17g), RPM/Temp £14.50 (6.7g). That's another £42 ($55) you would pay over the cost of a simple ESC. Dynamic soaring pilots unfamiliar with FrSky should not get excited by talk of an ASI sensor. It only goes up to 360kph (224mph). That's only mach 0.3.

Throttle Calibration Using the Transmitter

I fitted the *60* ESC into my motor test bed, running a Turnigy 3542 motor on a 4S lipo battery. To start I used a self-powered servo tester to provide the throttle signal. I connected the battery. The ESC made quite a few beeps but when I pushed the tester to full throttle the motor turned quite slowly. Clearly throttle calibration is needed for the non-*S* ESCs. The throttle on the *S* variant did not need calibrating. It presumably defaults to 1000 to 2000 ms.

While you will want to consult the documentation (which you should consider as definitive) here is my simplified summary of the procedure:

1. Push the throttle stick to maximum.
2. Connect the ESC battery.
3. You then get — wait for it — three fast rising beeps.

4. One long low beep — signal detected.
5. Four slow high beeps — measuring setting.
6. Three sets of four fast rising beeps — max throttle stored.
7. Silence.
8. Pull the throttle to minimum.
9. Four slow lots of two low beeps — measuring setting.
10. Three sets of four fast falling beeps — min throttle stored.
11. Then the startup, arming tones.
12. Three rising tones — power on.
13. One long low tone — signal detected.
14. One long high tone — zero throttle detected.

That's almost enough to orchestrate as the theme of a symphony. I wonder what would happen if I fed it to the phone app that recognises tunes?

And then, on throttle up, the motor ran full chat. There was no need to disconnect the battery to reset it. Next I connected the *Neuron* to an *X8R* receiver on the test bed, powered with a separate battery. I had to go through the calibration again for the *X9D* transmitter throttle stick. All the telemetry sensors produced good data after discovery.

I am getting to like the tune. Maybe I'll write a rap to it celebrating the joys of FrSky. Then a Spektrum, Futaba or Hitec lover can write another and we'll do a battle rap on the flying field.

Flight Testing

Setup

For flight testing I fitted a 60 in a Wot trainer with a separate receiver battery. This has an Eflite Power 46 turning a 13 x 8 prop. Motor current ratings are 40A continuous and 55A burst. I set up my telemetry screen to display current, maximum current, RPM,

maximum RPM, consumption (mAh used) and battery voltage. The battery was a fully charged 5 Ah 4S Nanotech with internal resistances of about 3mΩ.

Current and Power

Full throttle current was 55A static and 40 to 50A in the air. This rose to 52A in manoeuvres. This makes the maximum power about 52 x 14.4 = 748W. The motor spec shows 800W. Cruise current was 20 to 30A in level flight and taxiing was around 15A.

Consumption

I also checked the consumption figures. I landed after nine minutes having used 3000mAh. The iSDT charger pushed in 2870mAh to full charge, so the error was 4%. This is excellent for a low cost device and good enough to rely on for maximum safe flying time.

RPM

According to the motor specification it should be 14.4 x 670 = 9648 (volts x kV). I checked that I had the number of motor coils correct for the RPM sensor. The spec gives 12 pole so I edited the sensor to 6 pairs and got a reading of just over 9000, so once again accurate.

Power

After carrying out the flight tests I realised that I could have recorded power as well. I created a calculated sensor called `Watt` by multiplying current and voltage and set the unit to watt W. I selected integer value so avoiding decimal places. I displayed `Watt` and `Watt+` on the screen, and carried out a static test. Clearly the current is measured in amps not milliamps as the simple multiplication gave watts. With a fully charged battery I got a reading of just over 900W. The full charge voltage is 16.8 so multiplying this by 55A gives 924W. Therefore the calculation seems to give a correct result. It also shows that under full charge the motor is being asked to produce slightly more than the specified power.

Word of Warning

Make sure you disable the power feed to the receiver if using a separate receiver battery. If not the ESC bursts into flames. Yes, I did exactly that.

Conclusions

This is a great advance by FrSky and I will only be buying the *Neuron* in future. The telemetry gives very good results. The *S* versions are astonishingly small.

Thanks for reading and please let me know your thoughts. Or if you want to have that battle rap next time we're at the field together.

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The Simple Stand with an Aquila XL. This article is about the Simplest Stand that replaced it.

My Simplest Stand

Perfection is achieved when there is nothing left to take away.

Tom Broeski Follow
Jun 14 · 4 min read

There are all kinds of plane stands out there. From PVC pipe, bicycle stands, to big boxes and the like. So far I've designed many plane stands and improved others. Some were complex and had lots of adjustments for use with and without wing support extensions. I found I really didn't use the stand without the supports.

A couple of years ago I designed the *Heavy Duty Stand*, a heavier version of the *Better Stand* I designed in 1997 — for more support and wider cord for my cross country planes — and the *Simple Stand* (see key photo above).

My recent goal was to design a really simple and small, yet totally supportive stand. The *Simple Stand* was close, but had some unnecessary curves and the base had angles that were difficult to cut and a bit harder to assemble. You adjusted it by moving the supports in and out. I found the *Heavy Duty Stand* worked a bit better, but had a lot of parts and I had to use my CNC to get the grooves right.

Soooooo…I eliminated the side curves, got rid of knobs and such and ended up with this one — my *Simplest Stand*.

Photo 2: My Simplest Stand. Perfection is achieved when there is nothing left to take away. (With apologies to Antoine de Saint-Exupéry for butchering his quote.)

You can copy it and adjust the dimensions to whatever suits you.

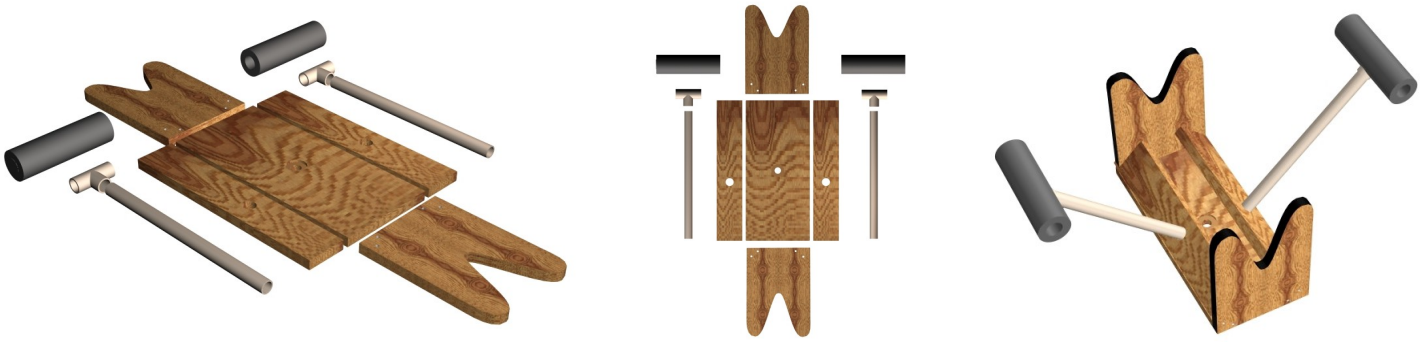
Photo 3 (left): The flat-heads hold the stand together. **Photo 4** (rig): I added a piece of 80 grit sandpaper to one end of each side part. If you have a really heavy wing, you might add a piece on each end.

Photo 5 (left): The pan-heads let the side supports adjust and are tightened when you have it positioned where you want it. **Photo 6** (right): All the stands have Velcro loop on the ends and use Velcro hook to secure the planes.

Parts List

- 1 piece — 5" x 11" x 1/2" plywood base with 1 1/4" center recessed 1/8" with 1/2" hole drilled through to accommodate a 3/8" T-nut.
- 2 pieces — 5" x 7" x 1/2" ply with V-grooves — Wider and deeper in front. Higher and narrower in back to fit most fuses.
- 2 pieces — 2" x 11" x 1/2" ply with 5/8" holes a bit forward of center to allow support without hitting flaps.
- 2 pieces — 1/2" ID pvc pipe 10" long with T's and 5" long pipe insulation.
- 2 lengths of velcro loop around the ends. A couple strips of hook to hold the plane down.

- 4 — #8 flat head screws counter sunk in ends (you can just glue and nail together if you want)
- 4 — #10 x 1 1/8" pan head screws. These hold the side pieces that adjust to hold the wing supports. I just tighten them where I want them. You can go though the trouble of using knobs, but I found it unnecessary.



Drawings 7, **8** and **9**: CAD renderings which provide most all the information you need to make your own.

Perhaps you can come up with a stand which is even simpler than the *Simplest Stand*. But that's going to be a challenge! If you think this can be improved, by all means, please leave a response to the article. Thanks very much for reading.

'Til next month!

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1/3 スケール三田式 3 型改 1 製作記

マルチパートシリーズの第3部。

Norimichi Kawakami Follow
Jun 10 · 4 min read

*If you prefer you can read the English translation of this article, which was provided by the author. この記事に進む前に、このシリーズの **第2部** を読むことをお勧めします。*

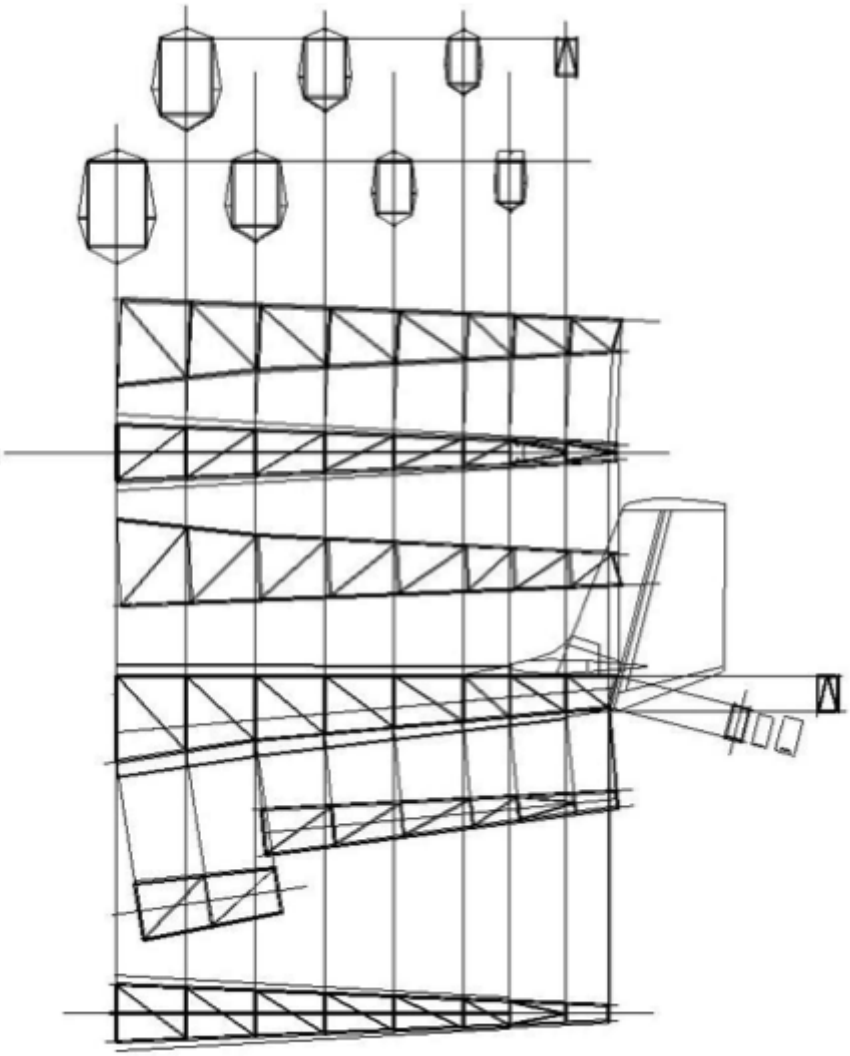
製作その5 後部胴体

いよいよカーボンパイプ製後部胴体の主要トラス構造組立の製作開始です。

後部胴体の構造

図面10が後部胴体の構造図面です。

胴体を輪切りにカットした時、長方形の形状をしている部分が主要構造トラスです。強度、剛性はこの部分が受け持ちます。これの上側と下側に縦にそれぞれ一本の縦通材が走ります。上側縦通材は長方形上辺の中央から立ち上がる一本の支えで支えられ、下側縦通材は長方形の下側両隅から伸びる支えで支えられて三角形のトラス構造になります。長方形の左右２辺の中央よりやや下には、板状の縦通材が走り、カットした時に張出となります。これらを外皮が覆いますので、断面形状は８角形となります。



図面10 後部胴体構造図

側面図と上下面図でみると、主要構造トラスの４隅を構成する４本の縦通材が前後に走り、略等間隔で縦および水平の部材がこの縦通材を繋いで梯子状のトラス構造を構成しています。これで後部胴体の上下・左右曲げ強度と剛性を確保していま

す。梯子の各ステップの間には斜めの部材が一本ずつ入って捩じり強度と剛性を受け持っています。

後胴主要構造トラスの材料

主要構造トラスは全てカーボンパイプで製作することは基本構想の策定時に決定しています。一番の強度メンバーである縦通材は7×5（外径7㎜、内径5mm）のパイプで、上下、左右の梯子のステップに相当する部分は5×3、斜め部材は3.5×2のパイプを採用することにしました。

カーボンパイプの切断

私にとってカーボンパイプでの工作は初めてです。その切断方法に多少迷いがありましたが、ミニルーターに百均で購入したダイヤモンド丸鋸を取付けて万力で咥えたミニカッターを作り、これでパイプを廻しながら切ると、割と簡単にカットできることが判りました。但し、カット中はカーボンの黒い切り粉が飛び散りますので屋外で行います。

画像29 カーボンパイプ切断用ミニルーター

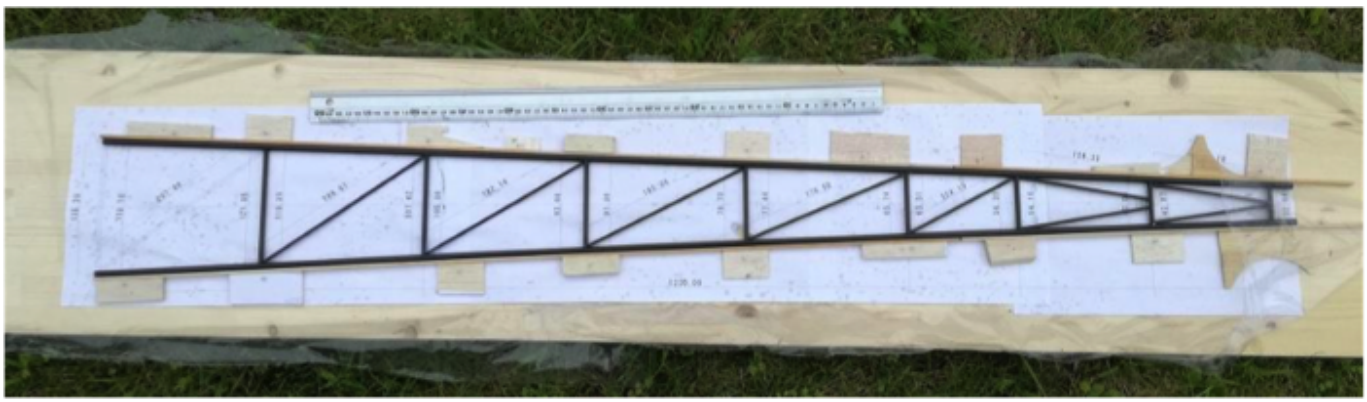
カット面は接合相手が円形ですので、これまた百均で購入したダイヤモンド粉を塗布した丸ヤスリで整形しました。これは屋外ではやりにくいので掃除機の吸い込み口を近くに置いて切り粉を吸引させながら行いました。

上面パネルの製作

まず最初に後胴の上面パネルの製作から始めました。原寸大で焼きだした図面を平板の上に広げ、その上に薄いポリエチレンシートを被せて接着剤が平板に垂れるのを防ぎます。その上で、縦通材の外側線に沿って細いヒノキの角材を平板に釘で固定します。これで縦通材の位置決めをするためです。

次いで、梯子のステップに相当する部材を切出して端面を一本一本丸ヤスリで縦通材にピッタリ合うように整形して配置します。２本の縦通材の間に嵌め込んでいく訳ですが、余りきつく嵌めると枠から外した時に反る可能性があるので慎重に長さ調整をして嵌め込みます。ステップ材はΦ5、縦通材はΦ7ですのでステップ材の下には１㎜厚のヒノキの細棒を敷いて高さ調整をします。

全てのステップ材を嵌め込み終わったところで浮きなどが無いことを確認してから接合部に瞬間接着剤を垂らしました。これは仮留めで本留めは全てが組み上がってから接合部にエポキシ樹脂を盛ります。



画像30 後部胴体上面パネルの製作風景

ステップ部が済んだら斜め部材を同様にして取り付けます。斜め部材はΦ3.5ですので、下に敷く細棒も厚いものに替えます。同様にして後胴下部パネルも製作しました。画像30が上面パネルの製作状況です。

> **失敗その5** *順調に製作できたと満足していましたが、思わぬ落とし穴がありました。組み上がった上部パネルを後方から透かして見ると、なんと直線であるべき縦通材が曲がっています。*

ヒノキの細棒で位置決めして作ったのですからそのような筈は無いと、当初は原因不明で頭を抱えました。原因は意外なところにありました。図面が曲がっていたの

です。私はA4プリンターしか持っていません。これは幅210㎜のコピー紙しか入りませんが、長さ方向はプリンターソフトのユーザー定義機能を使うと1,100㎜迄OKです。この上部パネルは最大幅が約120㎜、長さが1,230㎜ですので長いコピー紙を使えば一回の貼り合わせで原寸図が得られます。そこでA3紙を３枚、幅210㎜に切って貼り合わせて210×1,200㎜程度の長い紙にして1,100㎜弱の部分を印刷し、残りをA4紙に印刷してから慎重に貼り合わせました。この貼り合わせは注意して行ったので狂いは無いのですが、曲がりはA3紙３枚を貼り合わせて印刷した部分にありました。

長い紙をプリンターに入れると慎重に入れてもプリンターの送りロールに垂直には入らず若干斜めになってしまいます。そのため、1,100㎜も紙を送っているうちに左右どちらかに紙が寄ってきて紙送り装置の縁に当たります。そこで紙は左右どちらかへの寄りが制限されるため、直線が正しく印刷されないことになります。1,100㎜もある印刷物は一見したところ問題は発見できませんが、定規を当てて確認したところ最大1～2㎜のうねりを生じていました。このうねりに沿って、押さえの細棒を固定したので、当然出来上がったパネルもうねってしまった、と言う訳です。下部パネルは短いのでそのような不都合は生じていないことを確認しました。上部パネルは瞬間接着剤の仮留めですので、衝撃を与えると分解できます。折角注意して作ったものですが、分解しました。

組立順序の重要性

上部パネルを再製作する前に、２枚の下部パネルを組立てる治具を作るつもりでその材料も揃えたところで、またまたやり方がまずいことに気づきました。

下部パネル2枚は「く」の字型に角度を持って接続されますので、その角度を持った治具を作り、その上で組み立てることを考えていました。パネルが大きいので治具もかなり大型になると思っていました。しかし、図面をよく見ると側面は同一面上にあるではないですか！ これは側面パネルを上面パネルと同じようにして２枚先に作れば、それを垂直な部材で繋ぐことで、下部の「く」の字型折れ曲がりも治具無しで作れてしまいます。何も考えず、上面1枚、下面2枚のパネルを計３枚作ってそれを組立てるものと思い込んでいた自分が恥ずかしくなりました。

> **教訓3** *組立手順の良否で治具の要不要も変わる。手順検討が非常に大事*

画像31 後部胴体サイドパネルの製作

そんな訳で、上面パネルの再製作は中止してサイドパネルを作ることしました。但し、下部パネル2枚は製作済みですので、今回は若干変則的なサイドパネル製作となります。画像31がその製作状況です。

左側が下面で手前が前方です。従って上が右サイドパネル下が左サイドパネルです。この写真は既に右サイドパネルは出来上がり下面パネルに組み付けた状態で、左サイドパネルを製作しているところです。下面パネルを平板に垂直に立てる治具を噛ませて組立てています。尚、今回の図面印刷はA3紙を210㎜幅に切ったものを一枚ずつ印刷して、印刷終了後に貼り合わせました。これですと印刷の長さは420㎜ですので曲がって印刷されるリスクも減ります。これも教訓3と同じ手順の話です。

完成した後胴主要トラス構造組立

このように失敗と反省を交えながら後部トラス構造が組み上がりました。

画像32 組みあがった後部胴体主要トラス構

今度はかなり正確に組み上がりました。前側から見たのが画像33の写真です。

画像33 後部胴体を前から見る

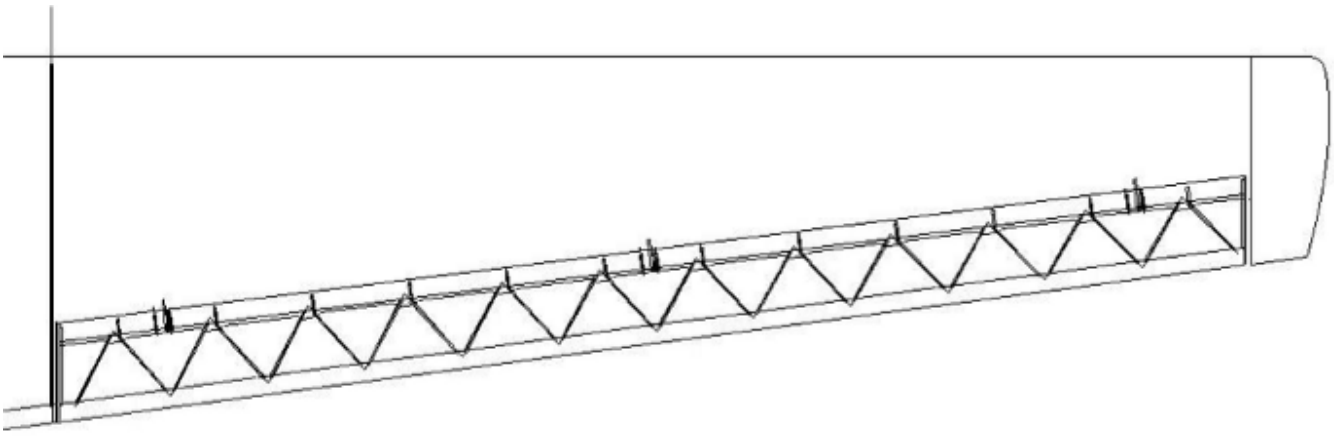
縦通材も真直ぐに通り、梯子のステップに相当する上下左右の部材も綺麗に揃って組み上がりました

製作その6 エルロン

続いてエルロンの製作に入りました。

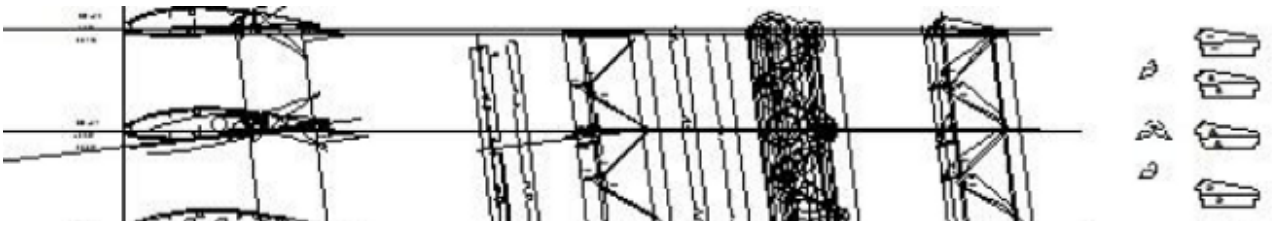
設計

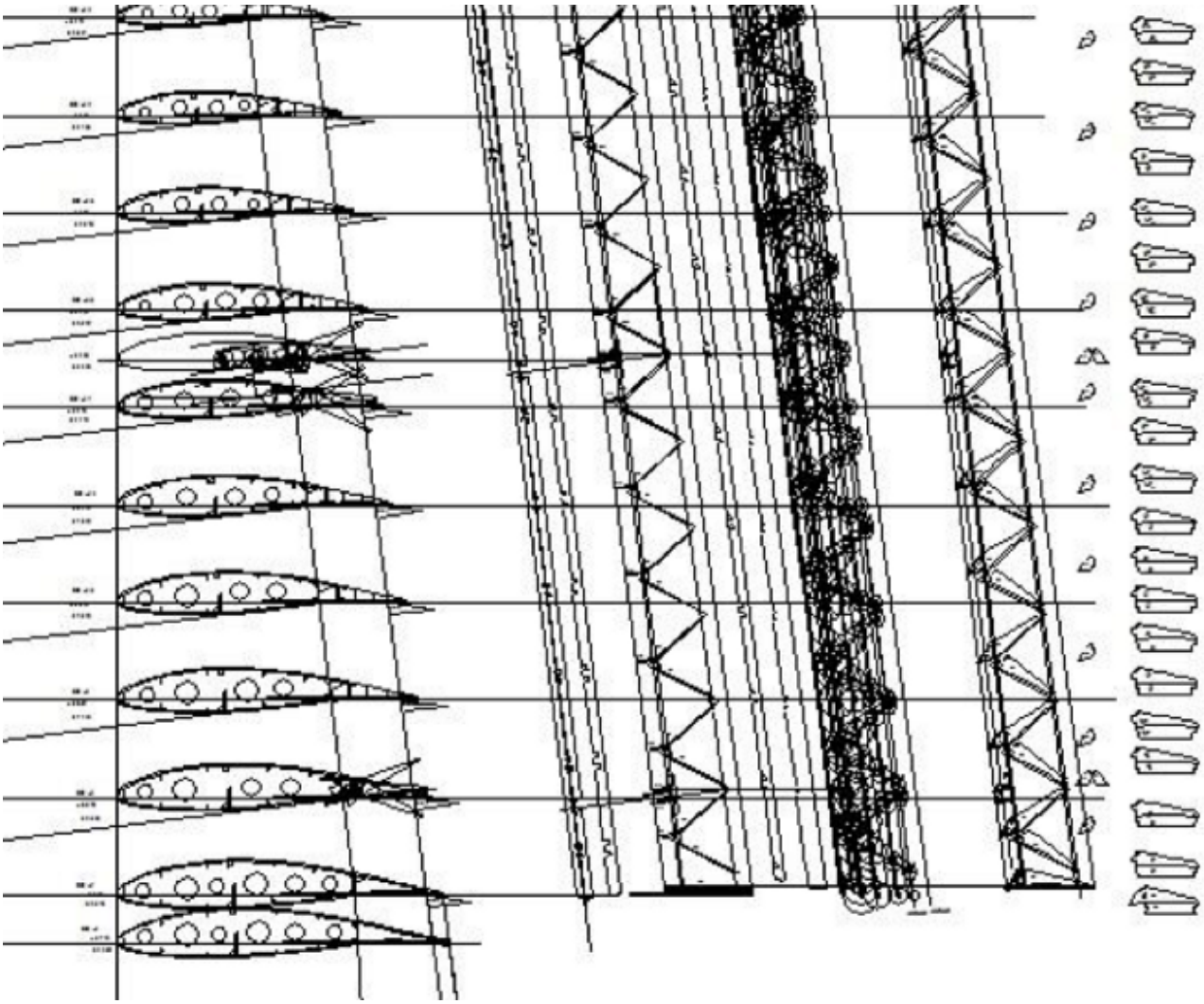
図面11が右エルロンの図面です。長さは約1,100mm、内側の翼弦長が90㎜、外側のそれが81㎜で若干テーパーしています。



図面11 右エルロン平面図

一見シンプルに見えますが、エルロンの設計は本機の設計で一番大変でした。リブが全て斜め方向に走っていることはラダーやエレベータと同じですが、エルロンでは片翼に26枚ものリブがあります。しかも最内端と最外端のリブは気流方向です。また、フリーズ式のエルロン前縁は翼の後桁に並行ですから、その断面は当然後桁に垂直に定義しなければなりませ。この形状を2次元CADで求める作業が大変でした。結局この作業に2018年6月の約一月を費やしました。図面12がその設計過程の図面です。





図面12 エルロンの設計過程

しかし、こんなことで文句を言うわけにはいきません。実機が製作された1960年代の後半では未だCADも電卓も無く、当然T定規、三角定規、雲形定規、コンパス、計算尺等でこの作業を行ったはずです。これは大変な作業であっただろうことは想像に難くありません。2次元とは言え、一応CADが使える我が身の有難さを痛感すると共に、先人の忍耐強さに敬意を抱きました。現代では3D CADが全盛ですから私の苦労も観方によっては徒労かも知れません。

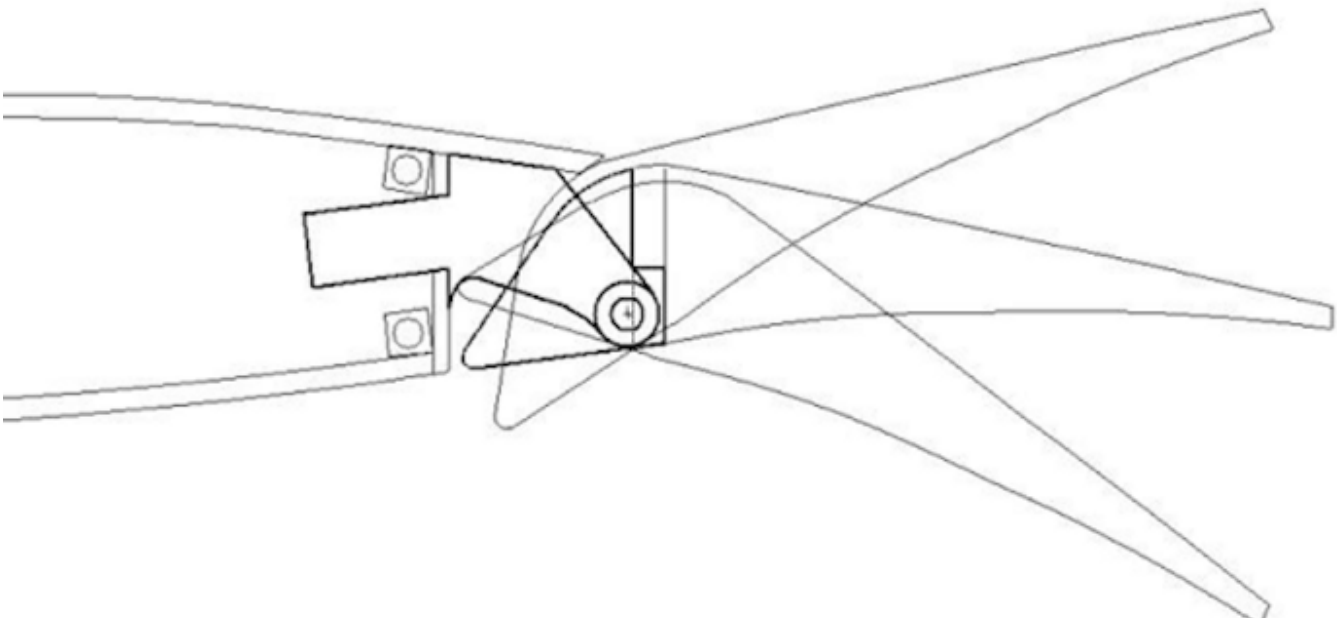
設計で悩んだことは前縁構造とヒンジ形式です。フリーズ式前縁なので上面は桁にRを持って接続しますが、下面は桁より前方に約20mm程伸びます（図面13参照）。つまり、前縁断面は桁と上面、下面で囲まれた三角形状になります。因みに1/3の大型機とは言え、桁高さは約15㎜程度しかありません。これをどのように作るか悩みました。

方法は2種類です。一つはエレベータで採用した方法で、厚さ20㎜程度のムク材を桁に貼ってそれを整形する一体構造です。他の一つは、ラダーで採用した方法で、桁に垂直に小さなリブを建てて上表面を1.5㎜厚程度のバルサでプランクする組立構造です。

一体構造方式は剛性確保の上で有利ですが、1,100㎜もの長さで若干テーパーした上に下面は桁に垂直ではなく下方へ張り出した形状のものを、精度良く整形することに困難があります。組立構造方式では、リブは16㎜×13㎜程度の小さなもので、これで精度を保てるかが心配事項です。結局、決め手が見つからないまま、組立構造方式にしました。

ヒンジは当初ロバートソンの棒ヒンジ方式にすることにしていました。これは簡単で確実なヒンジですが、取付位置精度の確保に難があります。主翼後桁ウエブとエルロン前縁に穴を開けてヒンジ両端を挿し込んで固定しますが、今回のフリーズ式エルロンでは主翼上面から伸びて来る外板とエルロン前縁のクリアランスの精度確保が重要です。ヒンジ取付穴を多少大きめに開けておいて、組み建て時にクリアランスを観ながら固定することも考えられますが接着剤を付ける手が入りにくい形状のために困難が予想されます。結局、エレベータに採用したものと同じようなヒンジを自作することにしました。これですと、比較的ヒンジ位置精度を確保し易い上にエルロンの取り外しができるメリットがあります。主翼翼端を取外し可能な構造にして、エルロンを外側から差し込んで翼端で押さえる構造としました。

フリーズ式エルロンと採用したヒンジの形状を図面13に示します。



図面13 エルロン装着図

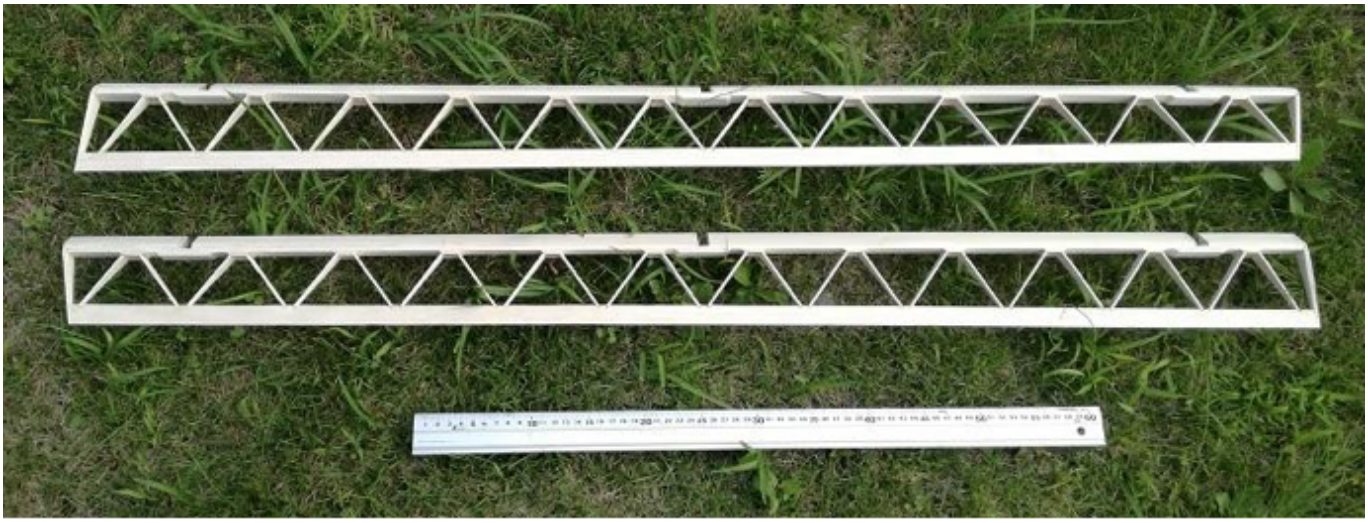
製作

画像34が製作したヒンジです。

画像34 エルロンヒンジ

主翼から伸びるヒンジをカーボンと3Φの竹ひごで作り（画像34の上側）、エルロンに取り付けるヒンジ受けをアクリル板で作った（画像34の下側）こともエレベータと同じです。尚、エレベータでは片翼に2か所のヒンジでしたが、エルロンは長いので片翼に3か所のヒンジを設けました。それぞれ微妙に寸法が異なります。この写真では切出し用の型紙が貼りついたままの汚らしい状態ですが、これを外してしまうと、間違える恐れがあるからです。カーボンの切り出しが大変で手が真っ黒になりました。

リブと治具、桁、後縁材を切出してからいつものように最初に原寸図の上で組立治具を組立てました。次いで治具の上でリブを桁と後縁に挟み込みました。桁と後縁材には切込があり、リブを挿し込む構造になっています。すべてのリブを挟み終わったところで上にスチール製のL材を載せて、リブを治具に密着させてから瞬間接着剤で固定しました。それから、桁に前縁リブを垂直に挿し込んで固定して下部前縁プランク材を貼ります。その後、上部前縁プランク材を貼ってエルロンの組立が終わります。ヒンジ位置の前縁を幅12㎜切欠いて、アクリルのヒンジ受けを取り付けました。出来上がったエルロン組立が画像35です。



画像35 完成したエルロン組立

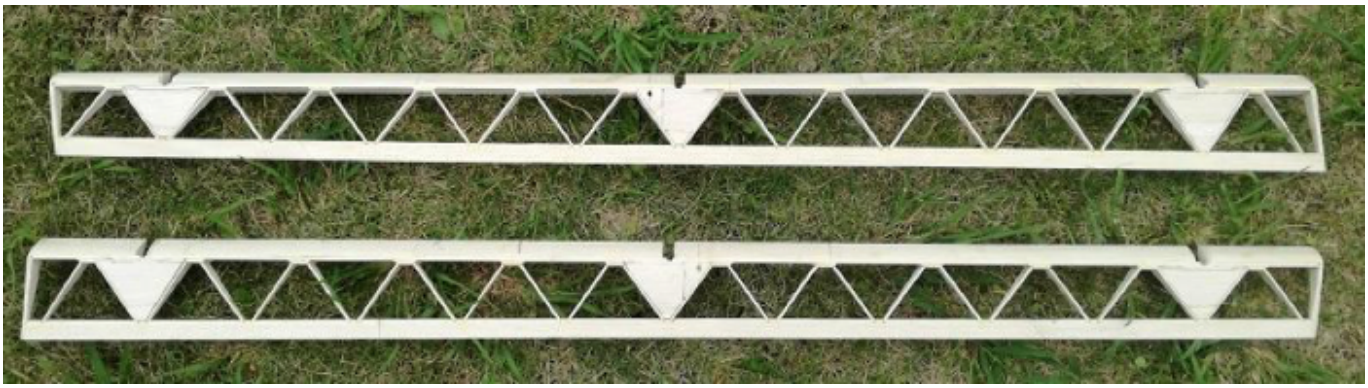
設計時点では幅80～90㎜、厚さ十数mmしかないのに長さが1,100㎜もある構造なので、曲げ及び捩じり剛性が心配でしたが、組み上がってみると三角形のフリーズ型前縁が閉じ断面を形成しているお蔭で、思いのほかガッチリとして剛性も確保できています。当初、剛性が不足する場合はサーボを片翼に二個用いて捩じれ対処することも考慮していましたが、その必要は無さそうです。リブの組立精度を見るために斜めに透かして見たのが画像36です。

画像36 エルロンリブ組み立ての精度チェック

未だ後縁の整形等が残っていますが組立治具のお蔭で綺麗にリブが揃っています。但し、小さなリブをプランクした前縁はその整形精度に若干の不満が残りました。後日紙やすりで整形して、歪みの大きいところはパテで補修しました。

エルロンの改修

後日、東海大学グライダー部OBのSさんを通じて、教官をされていたAさんから実機の構造図面を頂きました。詳細に図面を眺めていると製作した上のエルロンに間違いがあることが判りました。間違いは、ヒンジを挟むリブの取り扱いです。画像35では何もしていませんのでヒンジ位置では前縁が切り欠かれて、その部分の強度・剛性が著しく低下しています。実機の構造図面ではこの部分のリブ間に三角形の合板がプランクされてその低下を防いでいることが判明しました。1/3模型ではリブが小さいので、それを削ってプランクすることは困難です。そこでこのリブの間をバルサブロックで埋めて改修しました（画像37）。これで、ヒンジ部の強度・剛性も大きく向上しました。



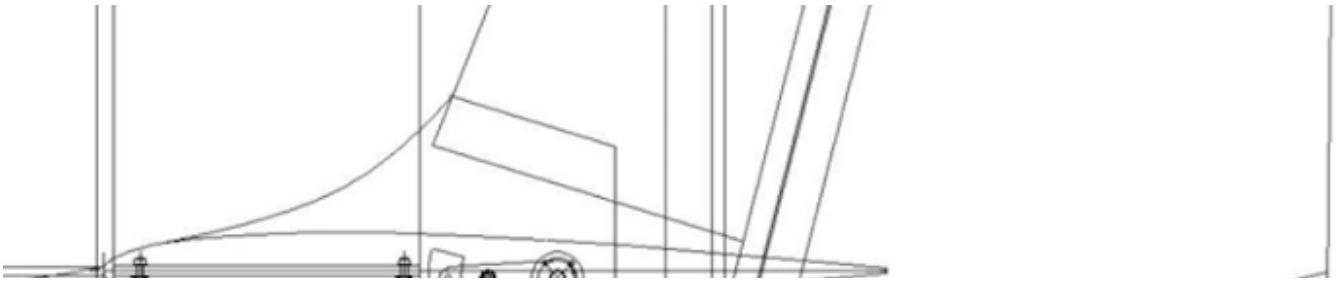
画像37 改修後のエルロン

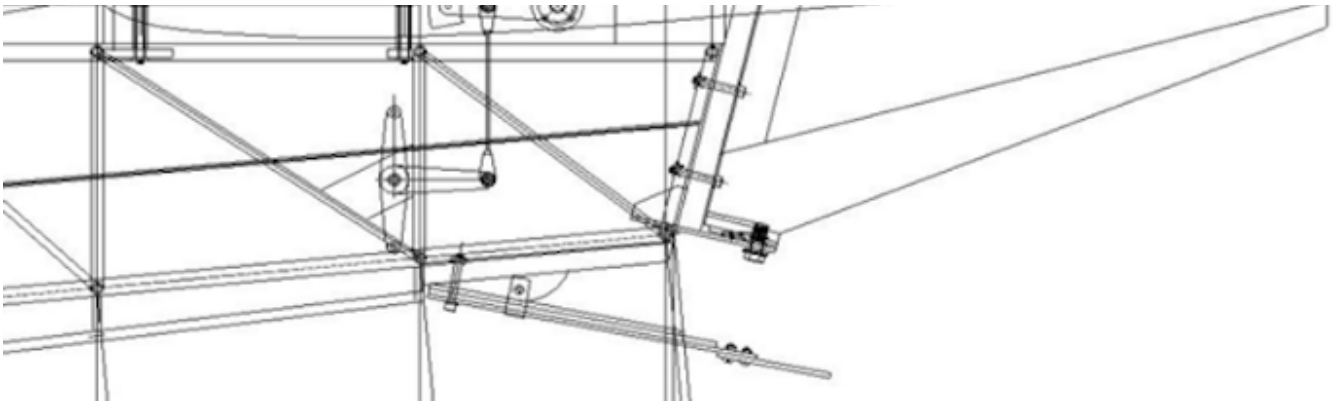
製作その7 尾翼取付機構等

外翼リブの切り出しを始めましたが片翼で36枚、両翼合わせて72枚にもなります。その組立治具部品と合わせると150枚程度になり飽きてしまいますので、気分転換に後部胴体の最後部に取り付く水平、垂直尾翼の取付機構と、エレベータのリンク機構およびテールスキッドを製作しました。

設計

まず図面（図面14）を描きました。





図面14 尾翼取付機構等

水平尾翼は取付ポイントとして中央に４mm厚のシナベニアが埋め込まれています。後胴上面に外径Φ7、内径Φ3の支柱を３本建てて、シナベニアに接するようにしました。水平尾翼上面からM3ボルトを挿し込んでシナベニアと支柱を貫通して、支柱下部に設けた爪付きナットに締め込む構造です。

垂直尾翼は桁を２本のM3ボルトで胴体最後部に設けた板に取り付けます。垂直尾翼は主翼と直交する必要がありますので、未だ主翼が完成していない現時点では後で取付角度の微修正が可能なように、一本のボルトだけにしてあります。

テールスキッドは実機と同じ構造にして板ばね部に2mm厚カーボン板３枚、地面と接触する摺動部は2mm厚アルミ板で製作します。

エレベータ作動用のベルクランクは実機は鋼管を組み合わせて溶接して作られています。当初、カーボンパイプで似たような構造を試作してみましたが、パイプに穴を開けるとパイプが縦に割れてしまいうまくいかないことが判りましたので、2mm厚カーボン板とΦ5のカーボンパイプで作ることにしました。エレベータ側のホーンとはRCヘリコプタの操縦系統で用いられている、嵌め込み式ロッドエンドを持つリンクで繋ぎます。

テールスキッドとエレベータ用ベルクランク

図面に基づいて製作したスキッドとベルクランクが画像38です。

画像38 テールスキッドとエレベータ用ベルクランク

スキッドは固い花梨の木に取り付けました。この写真には写っていませんが３枚の板ばねは最前方のボルトで友締めされますが、互いに滑ってスプリング効果を出せるように、中間付近は左右へのブレを抑える金具で纏めただけです

尾翼取付用支柱、他

画像39が後胴に取り付けた尾翼取付用支柱等とそれに仮取り付けした尾翼です。

画像39 尾翼取付用支柱等

支柱が長いのは大半が水平尾翼の中に納まるからです。写真には垂直尾翼取付ボルト用の爪付きナットと、エレベータ用ベルクランクを取り付ける受板も見えます。ベルクランクは受板に挿し込んだΦ3のジュラコン製軸受を通してM3ボルトで留めます。

スキッドとベルクランクも取り付けてみました（画像40）。

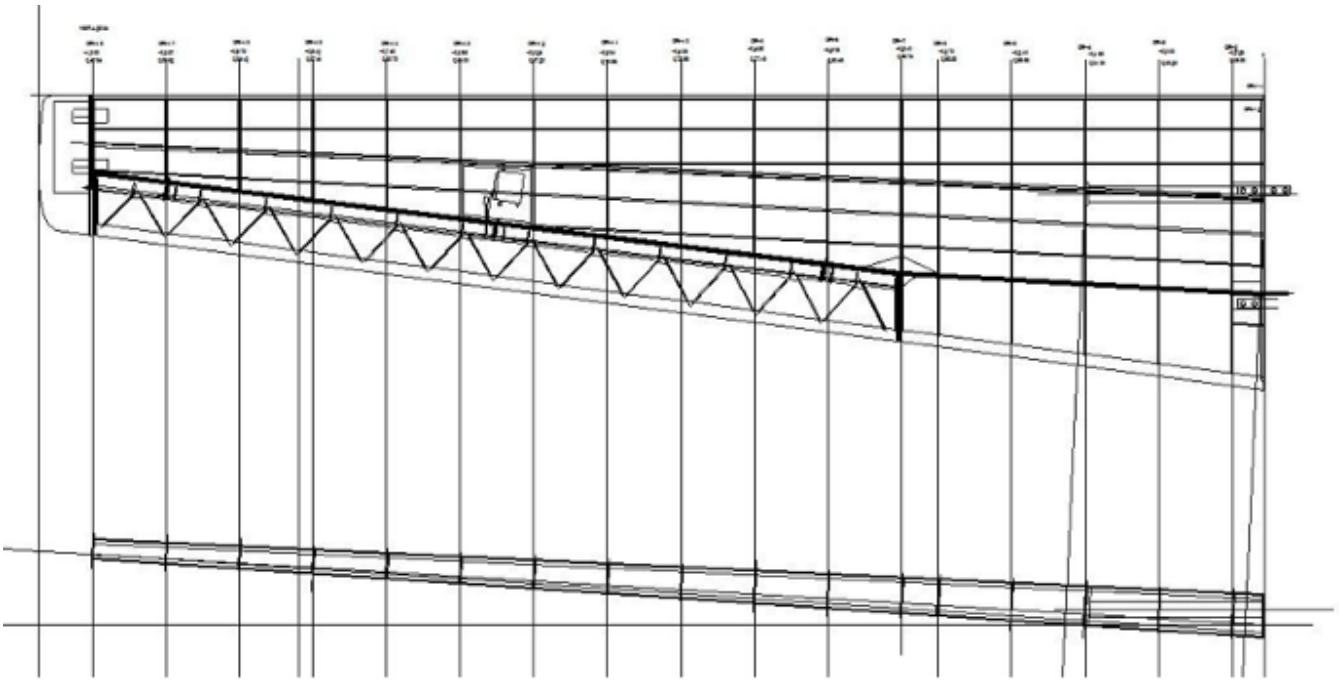
画像40 スキッドとベルクランク

製作その8 外翼リブ組み立て

漸く外翼のリブ切り出しが終わってそれを組み立てました。

外翼の図面

図面15が左側外翼の図面です



図面15 外翼図面

外翼はテーパーして最内端は中央翼と同じ400㎜翼弦長ですが最外端は180㎜になります。従ってテーパー比は0.45になります。長さは1,667㎜もあります。先端の70㎜は翼端になるので、リブを組立てる長さは1,600㎜弱です。この間に18枚のリブが配置されます。基本的にリブは2.5㎜厚バルサから切出しました。但し付け根付近の後桁より後方がプランクされない部分のリブは3mm厚としました。

平面形がテーパーしているため、桁も前進角を持ちます。前桁フランジは5mm角で内部にΦ4の空洞があるカーボンパイプで、後桁のそれは4mm角で内部にΦ2.8の空洞を持ったカーボンパイプで作成します。桁ウエブは1.6㎜厚のシナベニアとします。中央翼との連結用カンザシは前桁ウエブ位置に配しました。

中央翼は上反角がありませんでしたが、外翼は3.45°の上反角を持ちます。しかしカンザシは上反角を持たないようにする必要があります。前桁ウエブに切込を入れてそこにカンザシ受けのアルミパイプを挟みますが、前進角と上反角を持つウエブに

水平なカンザシ受けを挟ませる切込の設計は注意深く行う必要があります。外皮は中央翼と同じ2mm厚のバルサ板で後桁より前方部分をプランクします。

切り出しを終えたリブ

切り出しを終えた片翼分のリブが画像41です。

画像41 外翼用リブ（片翼分）

一番リブから7番リブまでは全翼型形状をしていますが、８番リブより外側はエルロンが付くので後桁より前方部分だけです。12番リブと13番リブは前後桁間の部分が一枚づつ余分に切出されています。これはそのリブ間に設置するエルロンサーボアクセス用に下面外板を切欠き、蓋を取り付けるためです。

桁ウエブと前後縁材

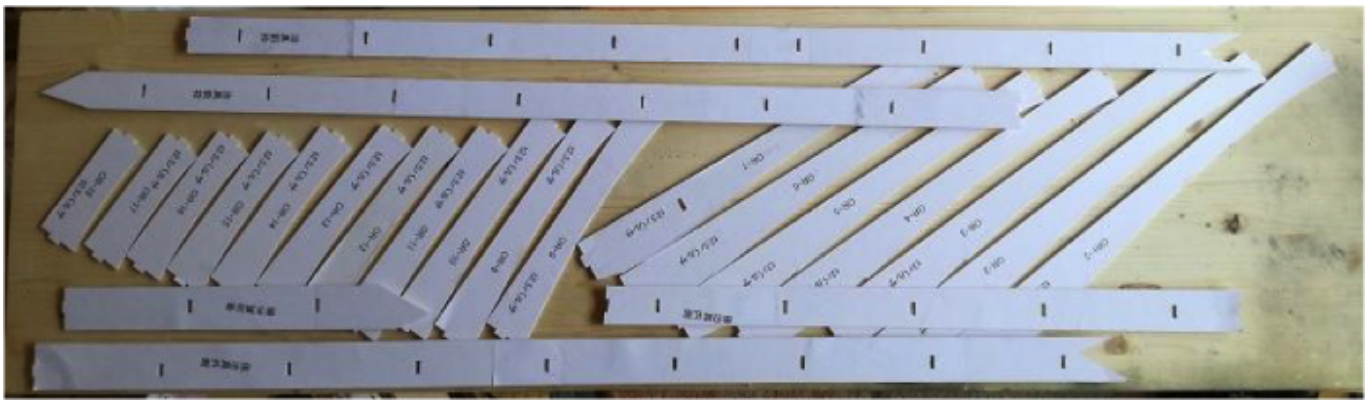
画像42が切出された桁ウエブと前縁材、後縁材です

画像42 外翼用桁ウエブと前縁材、後縁材（片翼分）

桁ウエブや前縁は約1,600㎜の長さがありますが、材料のシナベニアやバルサ板は900㎜の長さで売られています。そのため、これらは2分割して切出してから繋ぎ合わせる必要があります。各部品に多数の切込が設けてありますが、ここでリブと噛みあわせるためです。前桁ウエブの根本付近の切込に注目してください。これが前述したカンザシ受けを挟む部分です。カンザシは上反角を持たないので上反角を持つウエブに対して斜めに切り込まれています。カンザシ受けの直径は21㎜で一定ですが、ウエブが前進角を持っているため、切込幅は外側に行くほど広くなるカーブを描いています。

組立治具部品

画像43は組立治具の構成部品です。



画像43 外翼組立治具部品（片翼分）

主要部分はリブと一体で切り出しました。これらを前後の枠で押さえて階段状の箱に組立てます。前後の枠材はやはり2分割して切出したものを接続します。主要部分の前後には突起を、枠には小窓を設けてあり突起を小窓に挿し込んで組立る方式にして、精度確保に期待しています。

以上が左側外翼の構成部品一式の切出し状況です。実際には右翼分も切り出しましたので部品数は倍になります。切り出しに2週間強かかりました。

工業製品ではないシナベニアやバルサはその板厚が一枚ごとに微妙に異なります。多くの場合公称板厚より若干厚めに製材されているようです。そのため、公称寸法で切込を入れた部品は、そのままではキツクてうまく噛み合わない場合がありますので、一枚づつ摺合せが必要となります。

外翼組立治具の製作

まず組立治具の組立から開始しました。切出し完了した治具部品を原寸大に焼きだした図面の上で組立たものが画像44です。

画像44 左側外翼の組立治具

これは左側の外翼組立治具です。この治具のリブを受ける部分は１度のねじり下げを持っています。治具にリブをきっちり合わせて組み立てれば正確にねじり下げが付いた外翼が完成します。

この治具を組み立てる途中で少々困ったことに気が付きました。切出された治具部品の長さと原寸大に焼きだした図面の長さがかなり食い違うのです。一番内側のNo1リブ位置に部品を正確に置き順次外側に向かって部品を組立てて行きましたが、図面のリブ位置と実際に部品が組み合わされる位置が徐々にずれてきます。図面のリブ位置が実際の部品位置よりも徐々に外側になって行くのです。最外側のNo18リブ位置では図面と部品の切込み位置に3～4㎜の違いが出ています。

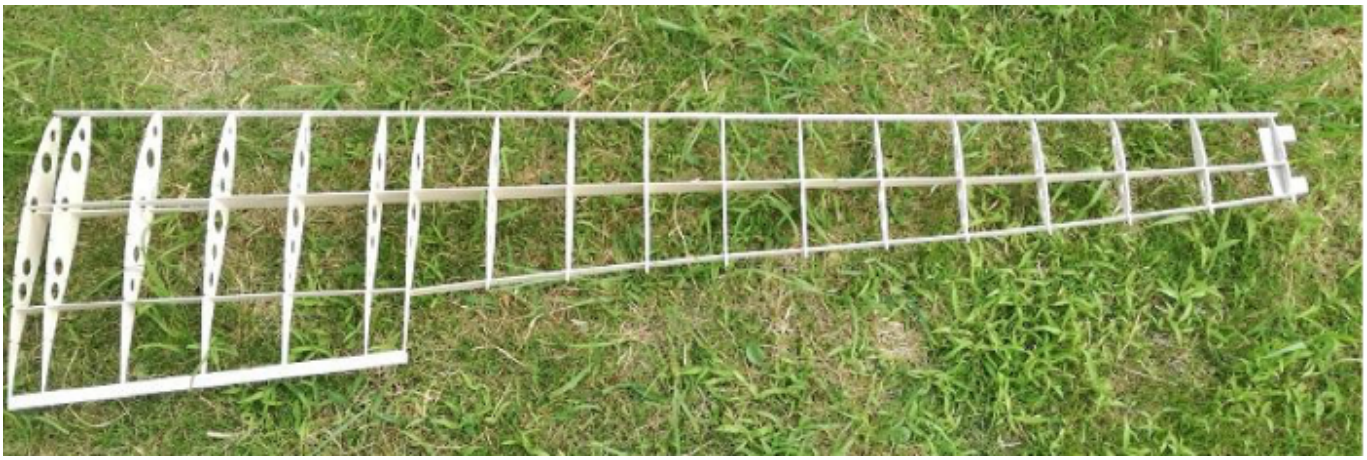
原因は図面の伸びです。これを組み立てた季節は８月の盛夏です。高温ですので図面の印刷はクーラーの効いた室内で行いました。治具の組み立てはクーラーの無い私の工作室で行わざるを得ません。簡易湿度計でクーラーのある部屋と無い部屋の湿度を測ってみると20%程度は差があります。ネットで湿度による紙の伸縮率データを調べてみると10%の湿度でおよそ0.2%強伸縮することが判りました。外翼治具の長さは1,600㎜ありますから0.2%で3.2㎜になります。図面を印刷した時、治具を組立てた時それぞれの正確な紙の湿度は不明ですが、以上の考察から3～4㎜のズレが生じておかしくありません。

現作業環境ではこのようなずれは致し方ないものと諦めてこのまま作業を進めました。

リブと桁ウエブ等の噛み合せ

いよいよ外翼の組立です。最初にリブと桁ウエブ、前縁、後縁の噛み合い部分を噛み合わせました。

画像45が右外翼の噛み合わせ状況です。右端の金具は翼端を取り付けるための金具で、2mm厚のアルミ板から作りました。この部分を翼端に挿し込む計画です。



画像45 リブと桁ウエブ等の噛み合わせ

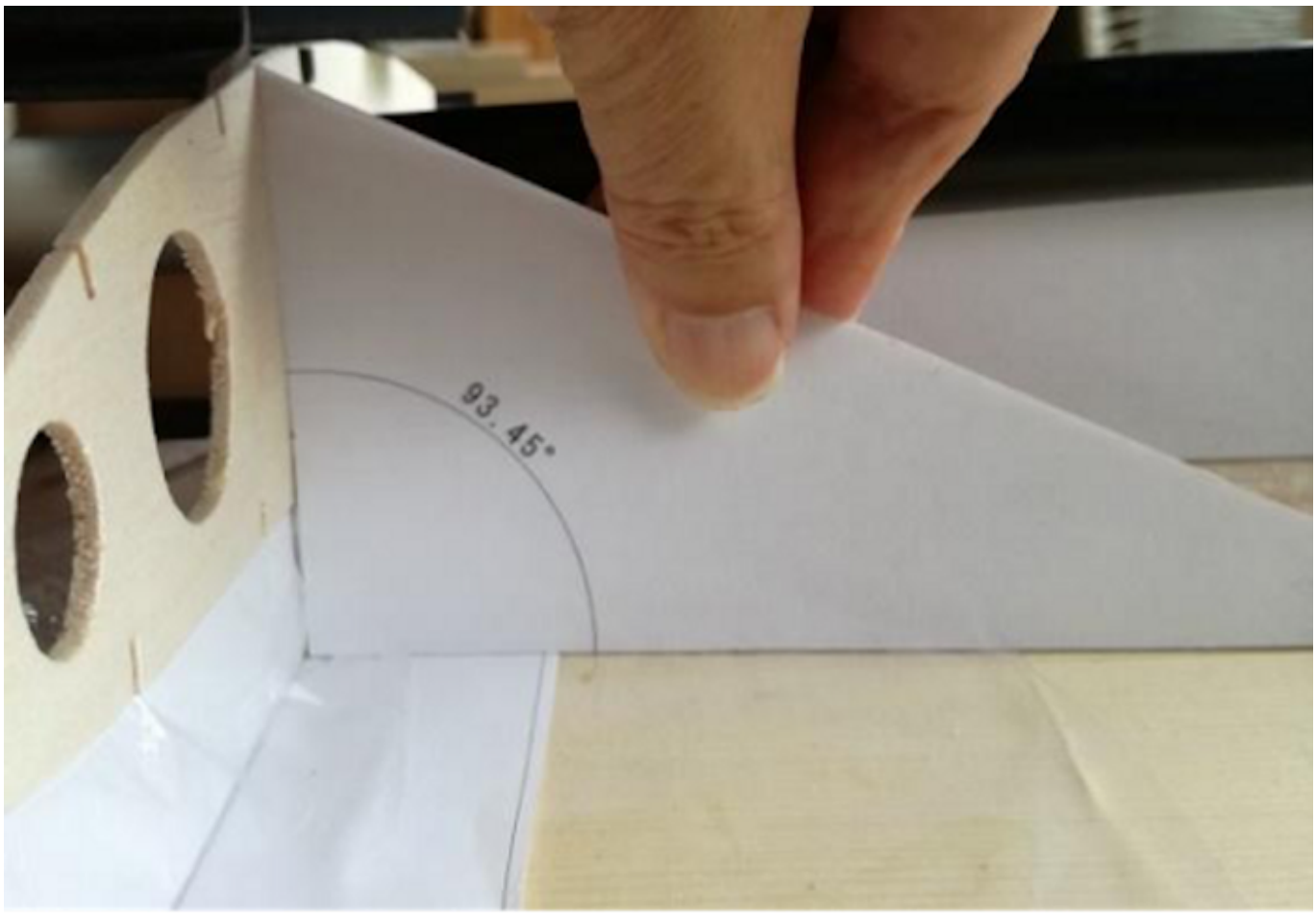
この状態では未だ接着剤は塗布していません。各部を噛み合せただけです。部品は噛み合い位置に正確な切込を入れてありますので、各パーツの位置関係は正確ですが、角度関係は不正確です。特にこの外翼のようにリブと桁が直交していない組立は、このままでは直交方向に大きくずれています。

リブと桁の角度調整および接着

この噛み合い状態のリブと桁ウエブを組立治具の上に置いて治具に合わせてリブと桁ウエブの角度を修正します。ほぼ正確な角度が実現できたらカーボン角材の桁フランジを埋め込み、上から重たいスチール製L材を2～3本載せて治具に密着させます。各部が十分正確に治具の上に載っていることを確認できたら、噛み合せ各部に瞬間接着剤を垂らして接着します。（画像46）

画像46 角度調整が完了した外翼リブ組立

外翼は3.45°の上反角を持って中央翼に取りつきますので、No1リブは垂直ではなく93.45°傾いています。対応する位置の桁ウエブもその角度で切り出していますが、治具を当てて角度を確認してから接着しました。（画像47）



画像47 №1リブの角度調整

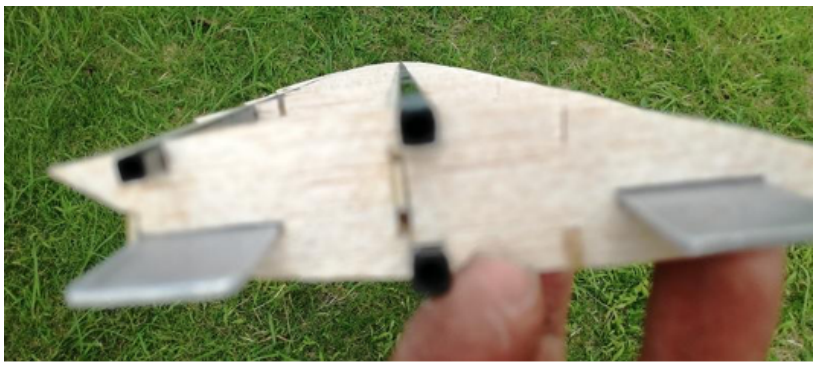
カンザシ受けの取付

次いで、カンザシ受けを取り付けます。No1～No3リブには対応する位置にΦ21の穴が開けられています。また前桁ウエブにはカンザシ受けを挟むスリットが切られていますので、かなり正確に取り付けられますが、カンザシが上反角を決定しますのでカンザシを挿し込んで治具を当て、角度を確認してからエポキシ樹脂で接着しました。（画像48）

画像48 カンザシの角度確認

外翼骨格の組立完了

以上の工程を経て外翼骨格の組立が完了しました。組立精度も良好で、カーボン製の桁は真直ぐに通り、リブの頭も揃っています。（画像49）



画像49 完成した外翼リブ組立

左翼にエルロンを仮取付してみました（画像50）。エルロンヒンジが3か所あるので、組み付けが難しいかと危惧しましたが、それほど苦労しないで取り付けられることを確認しました。エルロンの作動もスムーズです。

画像50 エルロンの取付チェック

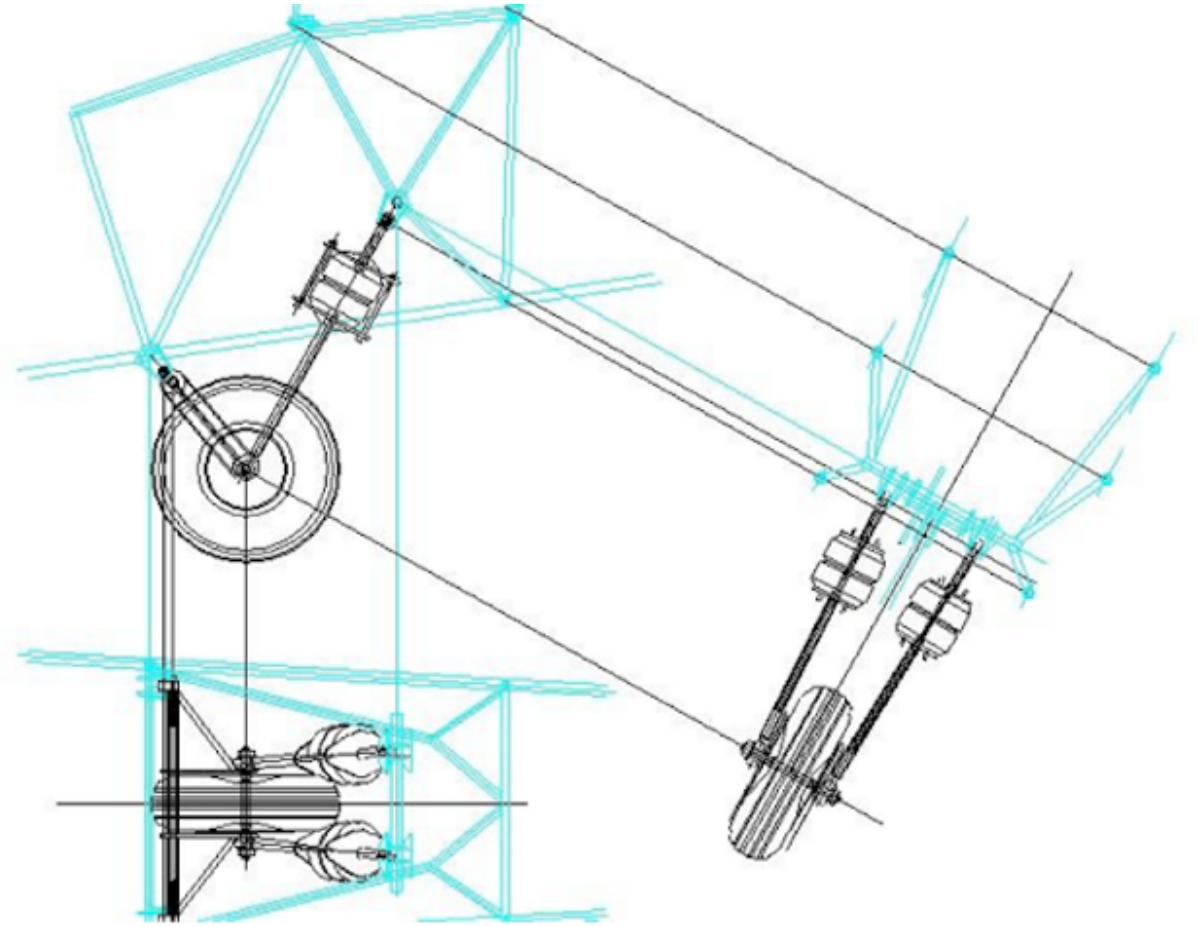
先に製作してある中央翼骨格と並べて記念撮影しました（画像51）。未だ翼端が無いので完成品より140㎜程度短いですが、半端ない大きさです。

画像51 完成した主翼リブ組立

製作その9 主脚組立

図面

図面16が主脚組立の図面です。



図面16 主脚組立

主脚は一輪式で、その車軸は前上方へ伸びる左右2枚の支え板と後上方へ伸びる2本の支柱で支えられています。支え板の他端は機体左右方向に向いた軸に固定され、その軸の両端に短いステーが固定され、ステーの他端は左右方向に走る下部胴体構造の受け金具に取り付けられます。支え板と軸の間には斜め方向の部材が固定されて、支え板および車輪の左右方向のブレを抑えています。

後上方へ伸びる支柱の途中には大きなゴムダンパーが取り付けられて着陸の衝撃を緩和します。ゴムダンパーから上に伸びる支柱は胴体内部に設けられた台形のトラス構造に取り付けられます。このトラス構造にはエレベータとエルロンの操縦系統のリンクも取り付けられますが、本模型ではエルロンは主翼内に設置したサーボで駆動させますので、エレベータ用のリンクだけを取り付けます。

部品製作

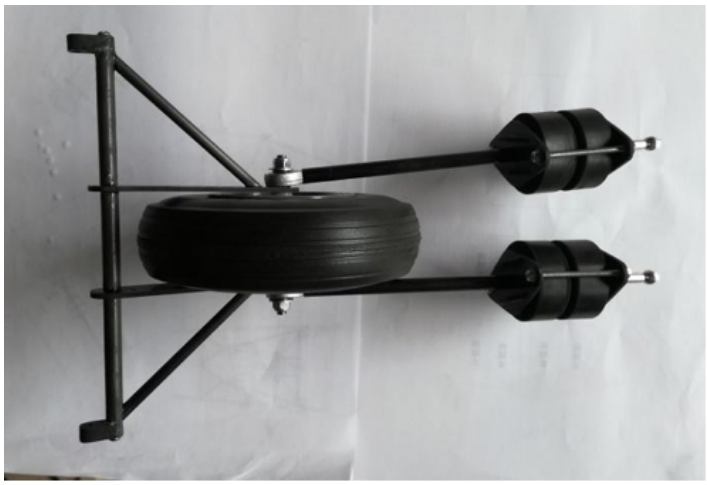
主車輪はデュプロ製の直径5インチのホイールにしました。それにΦ5mmの車軸を通して、支え板と支柱を取り付けます。車軸は金属加工が得意なラジコン仲間に製作して貰いました。支え板や支柱は2mm厚のカーボン板と5,6,7mmΦのカーボンロッドから作ります。支柱と車軸の取付には5mmの、ゴムダンパーより上の支柱と台形トラスの取付には3mmのベアリング入りのロッドエンドを用います。

まずこれらの部品を製作・購入しました（画像52）。

画像52 主脚構成部品

組立

全ての部品が揃ったところで組立を開始しました。部品点数が少ないので容易に組立られます。画像53が組み上がった主脚組立です。



画像53 完成した主脚組立

ゴムダンパーはΦ40㎜、長さ40㎜のゴム円柱をホームセンターで購入して、小型旋盤を所有している金属加工の得意なラジコン仲間に穴開けと、表面の加工をお願いしました。ダンパーの外側には2本のM3ボルトで押さえています。上下の抑え板とボルトの間は着陸時に多少の滑りを生じなければなりませんので、ジュラコンのブッシュを噛ませてあります。

かなり実物に近い主脚組立が完成し満足です。尚、完成重量は353ｇです。この重量は前胴の目標重量の内数になります。

製作その10 エルロンカウンターウエイト

実機のエルロンカウンターウエイト

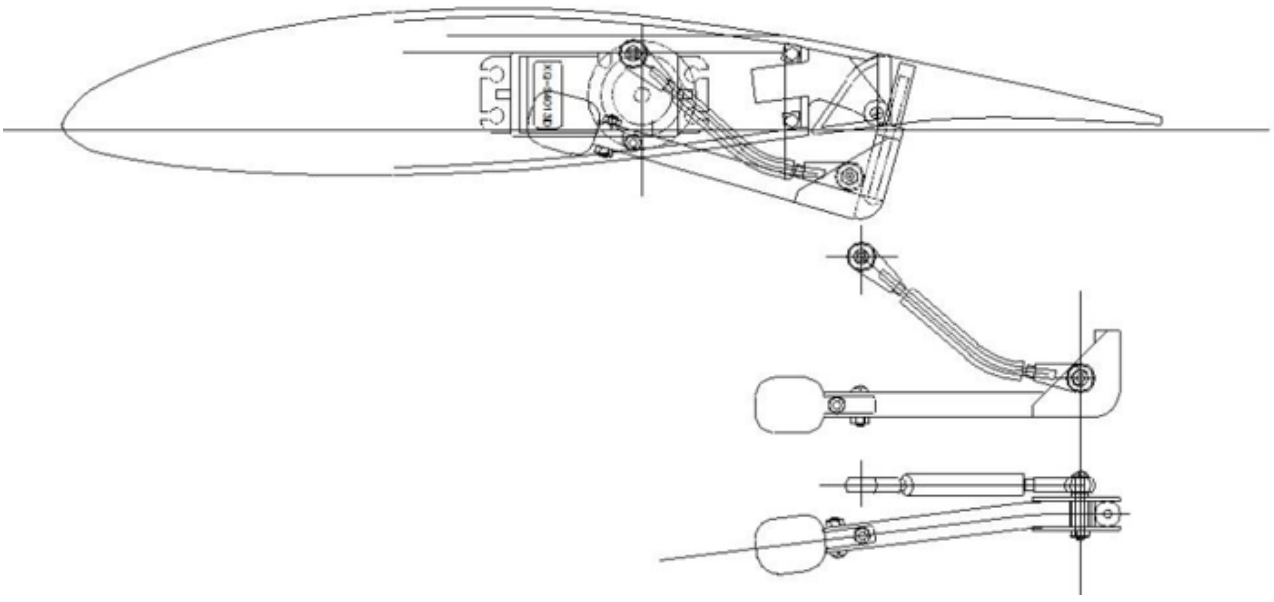
エルロンのフラッターを防止すべく実機にはカウンターウエイトが取り付けられていて、下から主翼を覗いたときに一つのアクセントになっています。画像54がその写真です。

画像54 実機のエルロンカウンターウエイト

カウンターウエイトは、エルロン作動用のリンケージが取り付くホーンから伸びる腕に鉄アレイ状の錘がボルトで取り付けられています。この錘はエルロンを上げた時に翼下面から飛び出しますが、通常は翼内に隠れています。そのため、翼の下面には錘を収納できるように穴があいています。右側の写真が収納時を翼真下から見上げたものです。エルロンコントロールロッドも翼下面から突き出しますので、同じように穴が開けられています。このカウンターウエイトとエルロンホーン及びロッドの模型を作るのが今回の目的です。

図面

まずいつも通り図面を書きました（図面17）。



図面17 エルロンカウンターウエイトとリンク

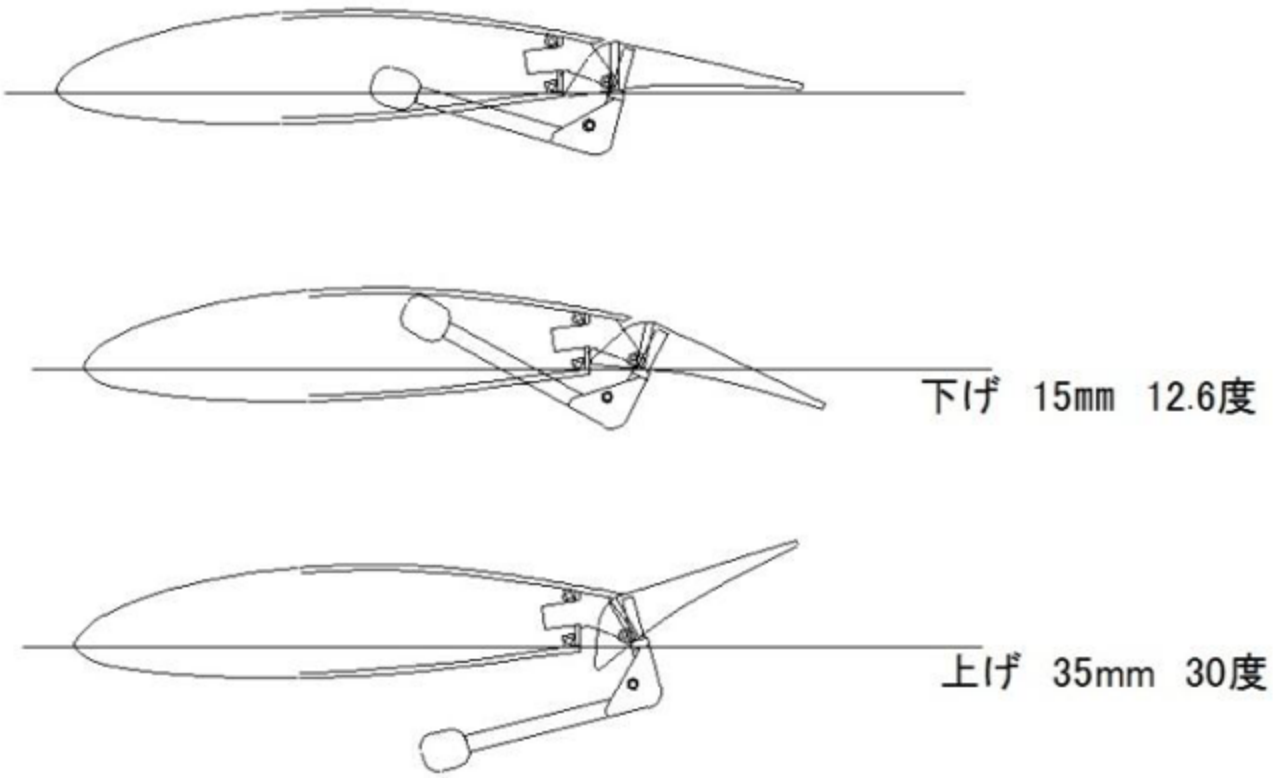
この図面を書いているうちに疑問が発生しました。エルロンは上下に20～30°可動できるように取り付けるものだと思い込んでいましたが、それでは下げ舵の時にカウンターウエイトが翼上面に飛び出してしまいます。上下舵角に差を設けるエルロンディファレンシャルと言う方式も良く用いられますが、その目的は下げ舵の抵抗が上げ舵の抵抗より大きいことで起こるアドバースヨーの発生を避ける為に、下げ舵の舵角を上げ舵のそれより少なくする方式です。因みにアドバースヨーとは意図した旋回方向の反対方向に機首を向けようとするヨーイングモーメントのことです。例えば右旋回をしようとして、右バンクするために右翼のエルロンを上げ、左翼のエルロンを下げます。上下舵角を同じにすると、上げ舵の右翼より下げ舵の左翼の抵抗が大きくなって機首を左に振るようなモーメントが発生してしまいます。これは意図した右旋回とは逆方向の向きに機首を向けることになり、極めて操縦がし難くなります。これを避ける目的でエルロンの上下舵角に差を設ける訳で、私の1/5三田式のエルロンもそのように設定してあります。

しかし実機および今回の1/3模型のエルロンはフリーズ式です。このエルロン形式は上記のアドバースヨーを解消するために考案された形式で、上げ舵時にエルロン先端が翼下面から飛び出して抵抗となるようにしたものです。私はフリーズ式エルロンを採用した本機は最早アドバースヨーの心配はないのでエルロン舵角は上下同量と思い込んでいました。ところが翼内にカウンターウエイトを収納する本機では、上下同量の舵角とすると精々10数度の操作量しか取れません。

不思議に思って静岡航空資料館にお願いして実機の舵角を調べて頂いたところ、上下舵角に差があるディファレンシャルであることが判明しました。下げ舵が12～13°、上げ舵が30°近くあり、相当のディファレンシャルです。フリーズ式エルロンだけではアドバースヨー対策として不足なのでディファレンシャルも併用したものか、カウンターウエイトが翼上面に突き出すことを回避した結果ディファレンシャルになったものか、その真相は不明ですが、これで疑問点が解明でき設計が進められました。

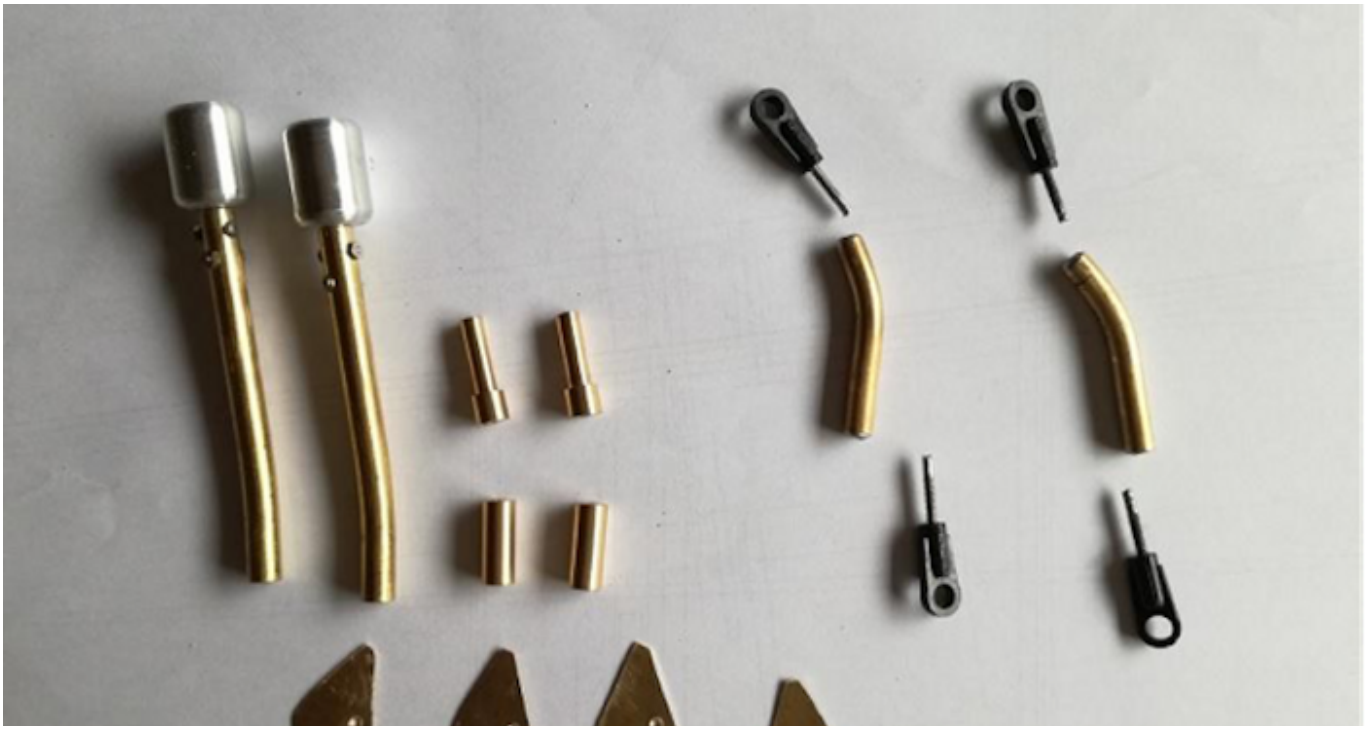
図面18が1/3模型のエルロン作動範囲図です。尚、エルロンコントロールロッドは当然エルロン前縁に垂直ですが、カウンターウエイトの支柱は気流方向を向きます。エルロン前縁は外翼がテーパーしているために前進角を持っています。そのため、カウンターウエイト支柱は外側に開くように曲げられています。またエルロンコン

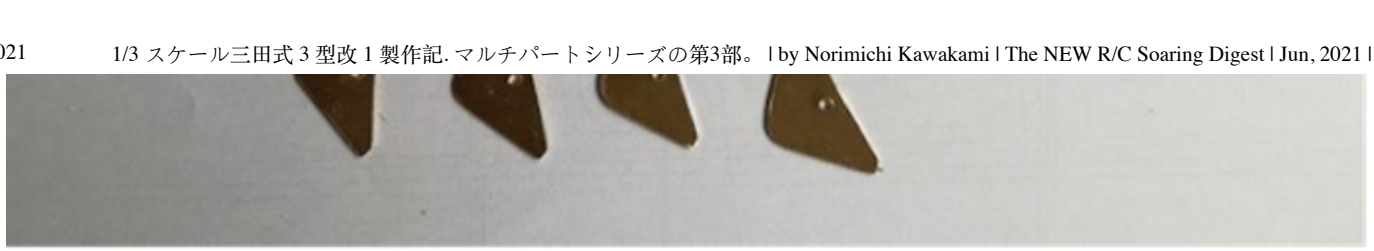
トロールロッドも主翼後桁下部にぶつからないように湾曲しています。これらを踏まえて作図しました。



図面18 エルロン作動範囲

部品製作





画像55 エルロンカウンターウエイト等の部品

カウンターウエイトはアルミ丸棒から削り出して中を中空にしてあります。この中に鉛を溶かして埋め込めるようになっています。これを支える支柱はΦ6の真鍮棒で、エルロンコントロールロッドは同じくΦ5の真鍮棒で作られています。これらは金属加工の得意な友人に製作して貰いました。支柱とロッドが取り付くエルロンホーンは0.5㎜厚の真鍮を切出して作りました。ホーンの三角形状の後部にはΦ2の穴があいたΦ6の真鍮スペーサーが取り付けられ、エルロンには同じくM2のネジが切られたΦ4のロッドを埋め込みます。スペーサー下部から長いM2ボルトを挿し込んでこのロッドに取り付ける構造です。

エルロンコントロールロッドの両端にはRCヘリコプターのリンケージに用いられる長さ調整が可能なロッドエンドを取り付け、サーボホーン及びエルロンホーンの両方に付けたΦ5のボールに嵌め込みます

組立完了

これらの部品を組立てて半田付けし、完成した組立が画像56です。

画像56 完成したエルロンカウンターウエイト等

未だ、アルミ製のカウンターウエイトの中に鉛を溶かし込んでいません。ほぼ期待通りのものが出来上がり満足していましたが、後日実際にエルロンに装着したところ不具合が発覚して再作を余儀なくされました。

> **失敗その6** *不具合は回転方向の拘束力が弱く少しの力で回ってしまうのです。*

原因は2つです。

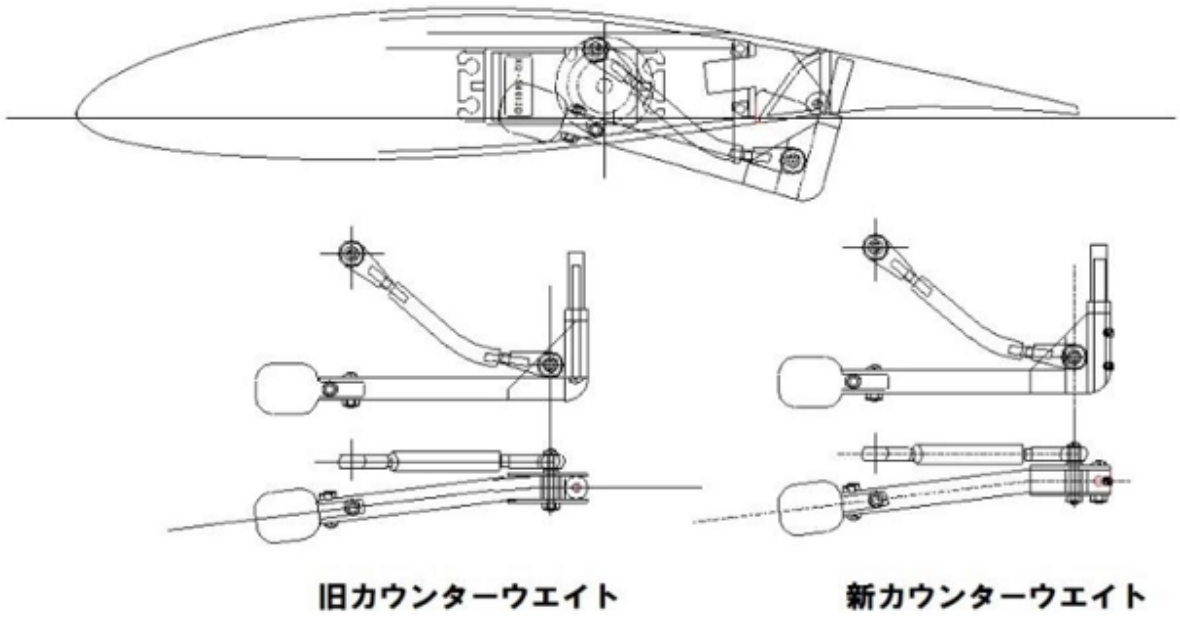
1. 全体を主に真鍮で製作したために重く、慣性力が大きいこと
2. M2ビス一本で取り付けているので回転方向の拘束力が弱いこと

エルロンカウンターウエイトの再作

上の2つの原因に対して次の対策を施した改良設計をしました。

1. 全体を主にアルミで作って軽量化する
2. 3mmピアノ線に挿しこむ取付方法に変更し、イモネジ2個で固定する

新旧の比較を図面19に示します。



図面19 新旧カウンターウエイト比較

新しい図面に基づいて再製作したカウンターウエイトが画像57です。

画像57 再作したエルロンカウンターウエイト等

真鍮部分がエルロンに埋め込まれる部分です。この中に3mmピアノ線が固定されていて下方に伸びています。ピアノ線はカウンターウエイトが取り付けられているホーン後端のアルミ角柱の中を通り抜けています。アルミ角柱には2個のイモネジが見えますがこれがピアノ線を固定します。両端にロッドエンドが付いたカーブしたロッドがエルロンサーボに繋がり、カウンターウエイトと一緒にエルロンを動かします。

カウンターウエイトと言いながら慣性力軽減のために鉛を溶かし込むことは止めました。実機より遥かに低速なのでフラッターの心配は無いと踏んで、慣性力軽減を優先した訳です。穴はパテで埋めました。因みに完成した新カウンターウエイトの重量は1個19ｇです。旧カウンターウエイトは約35ｇでしたので46%軽量化できました。イモネジの回転拘束も良好でカウンターウエイトが回ってしまう不具合が解消できました。

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Bob Jennings' Fouga Magister in the moonlight at the Great Orme. (image: Phil Cooke)

The Trailing Edge

Wrapping up June and heading into July.

The NEW RC Soaring Digest Staff Follow
Jun 14 · 3 min read

I said to Phil Cooke, who provided the beautiful photograph for this month's edition of *The Trailing Edge*, "the only problem we're going to have with this is convincing readers it's a model glider and not the real thing." But Phil tells the story so much better than we can:

> *"The moonlit Magister! Bob Jennings flying his 1.7m span PSS Fouga, built from the Island Models kit and complete with working nose light! The photo was taken well after 9pm during the last half hour of daylight at the end of a successful PSSA event on the Great Orme*

> *in May. The forecast for the following day was, by contrast, very poor and a small group of flyers elected to miss their evening meal and fly on until dark to capture the very most from the day. Slope soaring scale models can be so enthralling, it's very difficult to leave the slope in such perfect conditions. De-rigging and loading the car in the dark is equally challenging as we soon found out!"*

It's a unique, moving and inspiring image, Phil, and thank you for the opportunity to use it. It conjures up perfectly the notion of 'summer night' as we approach the solstice and the attendant desire to stretch out a magnificent flying day as long as we possibly can. If we're really lucky, beyond sunset and into the moonlight as the PSSA folks did.

Once again, we want to thank all those who contributed the great articles for this issue and to you, the readers, for reading them. Hopefully you wrote some *Responses* or added some *Claps* for the authors so they know you appreciated their hard work. June is done and the inexorable march towards July begins. For those who would like to contribute an article (or two, like Kawakami!) the July deadline is **2021–07–11**. If it seems like these deadlines come really fast, it's because they *are* coming really fast. By December of this year, we hope that issue and subsequent issues come out on the first calendar day of each month — very easy to remember and anticipate.

All proceeds from the sale of this product directly support the operating costs of the NEW R/C Soaring Digest.

I guess the one downside with RCSD is all the advertising you have to wade through to get to the good stuff. Oh, right, **there isn't any**. We think that's the ideal experience for the reader and we're quite sure you agree. However, that doesn't mean RCSD doesn't cost anything to produce — it costs quite a bit, actually. So you'll forgive us if we hawk a little merch to help keep the wheels spinning and keep RCSD free. But you can help out, if you so choose, with the purchase of one of the soon-to-be-collectable *RCSD Cover Photo T-Shirts*. You can get the January, February, March and April editions now and May and June will be out shortly just as soon as we have our new, European-based manufacturing ramped up.

Also, we're still putting together our *Friends of RCSD* program (previously known as the *Corporate Sponsorships* program). If you feel that it might be a program for you, with all of the corporate goodwill spin-offs that go with it, we would love to hear from you so please get in touch.

If you don't want to miss the July issue when it comes out, please subscribe to our mailing list. Also, follow us on Facebook, Instagram and Twitter for even more complementary content.

So how did we do? Let us know your thoughts. Thank you all so much for reading and until next time…fair winds and blue skies!

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