



The NEW RC Soaring Digest

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In The Air

My most excellent day at the beach.

[Terence C. Gannon](#)



Pacific City Triptych by Michelle Klement

The day started like any other: slowly, at our vacation rental up on the hill, just south of town. Then coffee and a couple of *Beach Buns* from the Stimulus Cafe which lies almost in the shadow of Cape Kiwanda at Pacific City, Oregon. We sat not on the beach, at first, but like the hungry brown pelicans watching the drift boats in the mouth of the Big Nestucca River as the anglers pulled the huge, slick, silvery steelheads out of the river one after another.

After a couple of weeks on the coast, and the prospect of one more before we had to trudge dejectedly back home, life was good. Life was *very*, very

good. It was a beautiful mid-September day and the month had been warm and dry. Warm and dry is what you tend to expect in September on the Oregon Coast, but it's never guaranteed.

Michelle and I then meandered over to Bob Straub State Park and found our usual nook in the sea grass crested dunes, set up our beach chairs, found our books and put the *Ahi* in the sand at our bare feet. Maybe the wind will blow today. Maybe it won't. When you're in a state of almost constant, deep relaxation, the things that might get under your skin at any other time of year just seem to quickly fade away without a trace.

But that day the wind was blowing gently from the northwest. Under these conditions, it's tempting to scale the lee side of Kiwanda and then fly off the north face. There, the lift is predictably good as it funnels up the huge mono-dune created by dried Columbia River silt from the north being blown up the comparatively hard, sandstone Cape.

But Cape Kiwanda was a long walk from where we camped for the day, and busy with the last of the summer tourists. So I just took the *Ahi* to the top of a dune nearby. Despite the wind nearly shearing almost 90 degrees to the fall line, I gave it a gentle toss.

Then the magic happened.

It was the single best flight I have ever had. The lift along the dune was light, but smooth and steady. There wasn't enough to gain altitude of any consequence, but rather just skim along the top of the dune; first upwind, heading north, followed by a quick left turn and back downwind, followed by another prompt turn, this time to the right, so as to never turn tail to wind. There was not enough inherent energy for any wild 'big air' or even VTPR aerobatics, or anything other than this gentle pattern of s-turns in the warm summer sea breeze. But it really didn't matter.

Quite simply, it was heaven.

High performance athletes refer to it as 'flow'. That moment when everything else recedes from consciousness other than the athletic task at hand. Some report that suddenly the basketball hoop looks like it's six feet across, or the cup on the green looks frisbee-sized. Fellow athletes appear to be moving in slow motion while you, the flow-state-intoxicated wunderkind, weave through traffic almost as if it's standing still. For me, at that moment, standing on top of that modest dune at Bob Straub State Park, I was in a state of completely euphoric, utterly intoxicating flow. It was like I could will the *Ahi* up when it began to fade below the crest line. In the muffled distance, I could hear only the sound of the surf, and the gentle rustle of the sea grass, and the laughter of beachgoers who had found their own version of heaven.

For a brief, precious, not-since-repeated moment, time stood still. And life was good. *Very, very good.*

I read, some time ago, about the concept of *state-dependent learning*, which proffers that memories made under certain, specific circumstances tend to be recalled when those same or similar circumstances are recreated. In 1993, authors Alan Poling and Jeffrey Cross wrote about a hilarious scene in Charlie Chaplin's *City Lights* that illustrates the concept. In this particular scene, 'the little tramp' has a decidedly on-again, off-again relationship with a drunk millionaire. In short, when the millionaire is pie-eyed, he's Charlie's best pal. When sober, he treats Chaplin like he has never met him. Over time, Charlie begins to understand the millionaire's memories of him are entirely state-dependent — to hilarious comedic effect. I can't possibly do it justice so do yourself a favour, fire up Netflix and see it for yourself when you can.

The reason I mention this is that I think we may have some quirky version of

state-dependent learning going on in this particular issue of the *NEW RC Soaring Digest*. It might have even made sense to call it the *Memories* issue because it features at least a couple of stories of events that happened many years ago. My theory is that in the presence of all this RC soaring coverage in one place since the NEW RCSD launched in January, the necessary conditions may have been set up to recover pleasant, RC soaring-related memories readers have had subconsciously locked away for many years. Under this RC soaring-rich environment, readers are triggered to fully recall these happy thoughts, and do so in amazing, intricate detail.

Jim Carlton paved the way for this in the February issue of RCSD with his very popular *What a Day for Soaring!* article, where he described his best RC soaring day ever. Then in this issue, Michael Berends', in his latest *RC Soaring Diaries* column, invites readers respond to his fascinating reminiscences with their own stories of how they got started in RC soaring. Then there is Chris Williams' *Flying Back In Time*, also in this issue, which are his recollections of precious — and quite hysterical — memories from his flying trip to France in 2007.

Like my day at the beach and all of these even better examples, above, I urge all readers to allow themselves to recall their 'best RC soaring day ever', put pen to paper (so to speak) and submit that as an article to RCSD. You can be sure the rest of us would love to hear about it, which might trigger even more of our own memories and cause us to write them down, too. And the virtuous (as opposed to vicious) circle continues 'round at least one more time.

In addition to the great stories above, we have lots of other great articles for you this month — even though we're in the midst of the dog days of summer — so I encourage you to flip to the first story using the link below.

Fair winds and blue skies!



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Cover photo: once again we have *Pierre Rondel* to thank for our cover this month. Pierre provided this very complete set of details of the photo which explain the interesting appearance of the wing accentuated by the angle at which the photo was taken:

"This scratch built JS4 belongs to Gérard Prat, a friend of mine. The fuselage was provided by Paul from Annecy who did the master and the moulds. The wingspan is 4.5m and using an evolution of modified RG15 airfoils: RG15, panel of 366mm, chord 240mm, 12% thickness, 2.6% camber; RG15, panel of 743mm, chord 230mm, 12%, 2.5%; RG15, panel of 514mm, chord 200mm, 11.5%, 2.4%; RG15, panel of 320mm, chord 160mm, 10.5%, 2%; RG15, panel of 175mm, chord 120mm, 10%, 1.5%; NACA63A412, 75mm, 10%, 1%.

Wings are veneered with a hardwood called Anigre, an African hardwood commonly used for plywood, interior furniture, etc. It is frequently sliced and sold as veneer. It is providing, after a careful sanding, a superb and hard surface. The wing covering is made with vinyl, the finish is very closed to composite wings."

Thanks again, Pierre, for the opportunity to feature your work, and this unique aircraft, in the pages of RCSD.

Here where you can find the [first article](#) in August, 2021 issue. Or go to the [table of contents](#) for all the other great articles. A PDF version of this

edition of In The Air, or the entire issue, is available [upon request](#).

So You Want to Be a Composite RC Sailplane Manufacturer?

Part I: The Road to Perdition Awaits

[James Hammond](#)



A commercially manufactured all-moulded Vector III, owned and flown by LP Hao in New Mexico, USA. (image: LP Hao)

In this new series of articles, I am going to use my experiences to lead you along the crooked path and across the many pitfalls that you are likely to encounter, that are all part and parcel of the frustrating process of realising your own moulded glider potentially suitable for commercial sale.

Let There Be Light

So, you have designed and made a really, really good model glider (guided by my design series, perhaps?) and when I say good, I mean darn good! It's been on your mind for a very long time. You've worked on it for months, maybe a year and now you've turned your ideas into your dream — you have made an actual flying model, the *Kloubblaster*. And not only that — just as you thought, it's amazing in every way and you love it — well you would, wouldn't you? Your friends have all flown it, and they love it too, and all have complimented you on its great looks and stunning performance. It's the light of your life and it's all making you feel really good — just as it should.

Day-um!

Uh Oh

And then comes that fateful day when one of your good flying buddies casually mentions: "Ya know dude...you could turn this beauty into a moulded glider, and sell it...I mean — shoot — I'd buy one." And that's it, the deed is done, the idea goes off in your head like an exploding sun. And that, ladies and gentlemen, is where the real itch starts, gets worse, and eventually takes over your life.



Photo 2: The very first Vector III glass fuselage/vacuum-bagged wings aerobatic sloper. But who is that devastatingly handsome dude holding it? (image: James Hammond)

My First Moulded Model Story — The Vector II

This is how it happened: after making moulded gliders for myself and a few friends at home in the UK for years, I finally realised that I might have something. Something that it was possible not only me, but many people would like. That model was a 2-meter aerobatic model that I called *Vector II*.

First, a Little Credit

Here I have to give a little credit to flying pal Chris Greengrass. Chris and I were avid man-on-man pylon race competitors on the UK racing scene in the early- to mid-

1980s. Chris, like me, designed and made his own designed models at home — there was no alternative because there was nothing commercially available. One of those designs, the *Vector*, turned out to be a really aerobatic and agile model, but at the smaller size Chris framed it (by that time he was in University digs with very limited space) it was not too competitive as a pylon racer. The *Vector* was eventually discarded in favour of the much larger *Sigma* series, again designed by Chris and this time (mostly) made by me which really was competitive — but that's another story for another day.



Photo 3: Ace UK pilot Greg Dakin's Vector III, made by me. (image: Greg Dakin)

The Seed of a New Design

Pondering a small, easily transportable model to fly at the slope and just fool around with — as we all do, I'd liked the smaller *Vector* a lot, especially its aerobatic prowess. So, I got out some paper, an eraser and a ruler, and proceeded to design the *Vector II* using Chris' original *Vector* as the seed, if you will. I intended to make one or two as usual, but as we all know, the best laid plans — it all came to naught as life caught up with me. For various reasons, principal of which was the desire start in a new place with a new, blank sheet of paper I decided to move, and not only around the corner.

I'd always had a strong wanderlust and had spent more time out of the UK for my work than actually at home. So that was it, decision made, I ripped up my roots, gathered up my close belongings, and headed lock, stock, and balsa knife to Taiwan to do a consulting job for the military — and that's all I can say on that part.

Taiwan Ho!

After moving to Taiwan in 1985, I didn't do much modelling for a few years as I was too busy making much bigger models for my job. I was still a bit active and I still had a Greengrass/Hammond *Sigma II* pylon racer that I had carted over with me from the UK, plus I'd discovered a couple of really good slopes not too far away. Here I should mention that when I came to this sub-tropical island, there were no people here slope soaring — zero, nary a one. Powered R/C

models, yes, but no slopers, so I was a bit lonely from time-to-time at the top of my gorgeous slope. Also the *Sigma* — my only model, was getting a little bit familiar. Therefore, was not surprising that I began to feel a strong urge to make the *Vector II* that I'd drawn up by that time over five years before. In actual fact for the most part the design work for the eventual *Vector II* was done in 1985 — and since the model is still in production, that makes it a sprightly 36-year-old!





Photo 4 (left): Greg Dakin's Hammond-made vector III makes a pass. **Photo 5** (right): Greg Dakin's Hammond-made Vector III gets it head down. (images: Greg Dakin)

Vector II Splashes Into the Picture

Thinking back, that pesky plane was always in my mind. As like old habits, old loves die hard. So after a while — it would have been around 1990 — my fingers started to itch again. The time had come to make the *Vector II*. My decision was made and my brief was set, so after a bit of scurrying around Hsinchu, my town of residence on Taiwan, I managed to find a shop that sold Chinese calligraphy paper rolls — the best I could do for drawing paper in those days. I had brought my drawing kit from the UK as most of it was antique and actually quite valuable. I bought an antique Chinese

calligraphy table from a friend who was returning to the USA, a couple of years before, so that made a good drawing board.

The model was soon drawn up — straight tapered wing, pretty curvy fuselage — it all went quite quickly as I'd had the design idea in my brain for quite a while. Actually, that's one talent I do have — drawing in my head down to the finest detail, and with total recall. No idea why I can do that, but I can. Normally, I'm hard put to remember my own cell phone number.

Starting to Plug Away

Soon I had some nice lengths of jelutong — a close-grained medium soft wood that's easy to carve — a bit like lime wood, laminated up and in no time had a fuselage plug made. When living in the UK I'd done it many times so it was no real difficulty to accomplish, and the project gave me the excuse to buy a few new carving and woodworking tools. I soon had a mould made and then a prototype fuselage done so that part went fast too. Vacuum bagged wings followed along with some 12mm solid carbon joiner rod and some tubes, and within a very short period I had a workable model.

The Pudding is Proved

Flying was really pleasant; highly agile and very responsive

with the SD8020 symmetrical section front and back; I was soon having great fun at the slope carving big aero's all over the sky. Even better, by that time there were a few more slopers showing up and my language skills had progressed a bit, so pretty soon, inevitably the rot set in and they wanted a *Vector II* too. In the end I think I made ten. My own models suffered the usual slope attrition, nothing whatsoever to do with my flying, mind you. I mean, darn it, as you know, sometimes the damn model just won't land properly; I have no idea what gets into them...

Then — Holy Coefficient of Drag, Batman! — a Mouldie Old Idea Re-Emerges

Of course, making models at home soon had me bored, and that time some kind soul had already suggested a fully moulded model. That got me completely hooked. Soon I was striding confidently on the road to perdition. Hell, I was so confident in those days. I was going to make a fully moulded all singing, all dancing, super performing and droolingly good-looking, ultimate slope aerobatics model — or die hideously in the attempt.

You Mean You Are Really Going to Do It?

With a lot of encouragement from SWMBO — yes, I'd got married by this time — I utilised the surprising amount of

information that had begun flowing onto the internet to find contact information for a few potential partners in Europe who might agree to make models for me, or maybe just make my designs and sell them by themselves. I had no idea whatsoever about the commercial possibilities, and worse I really didn't care. I mean I was going to make a flipping fortune — shoot, I already had my Blood Red McLaren 720S on order. (Or maybe not?)

I'll leave you there for now, but just look below...can you imagine?



Photo 6: This is where I wanted to be: the first all-moulded Vector III ever sold. (image: the late and very great Steve Dorling. RIP, Steve.)

Resources

- [James Hammond Sailplane Design Series](#)
- [The Aeroic Sine Wave Spar](#)

The second part of this series coming up in the September issue of the NEW R/C Soaring Digest. Read the [next article](#) in this issue, return to the [previous article](#) in this issue or go to the [table of contents](#). A PDF version of this article, or the entire issue, is available [upon request](#).

Flying Back In Time

Returning to the ageless Rétroplane event held in Hautes-Vosges, France in 2007.

[Chris Williams](#)



Author's one last flight with the Skylark before the long journey home.

In a world increasingly dominated by short attention spans and instant gratification, it's good to know that there are still some people around who aren't immune to some of the traditional values:

'You are old, father William' the young man said, 'And your hair has become

very white; And yet you incessantly stand on your head, do you think, at your age, it is right?'

OK, perhaps my outlook is being increasingly tempered by the advancing years, but I'll have you know I'm not the only one, and thus it was that three pilotes anciens Anglais went to France at the beginning of July to mingle with a polyglot bunch of blokes of a like-minded disposition at the 2007 *Rétroplane* event. This is a slope-based gathering strictly for vintage scale gliders, with a cut-off date around 1960, the idea being that the models entered should be of built-up construction: foam and glass kits, for instance, being frowned upon and likely to attract a De Gaulle style 'non'. As I understand it, this is the third *Rétroplane* meeting, the venue being changed annually to allow people to minimise the travelling, France after all, being a pretty large country. This year it was to be held in the Hautes-Vosges in the Alsace region on the slopes at Schweisel, not a stone's throw from Basle over the border in Switzerland.



Barrington Smallpiece and Captain Dave marvel at the ingenuity of the French Highway Code.

This year, Caen travelling companion Sideways Sid was unable to accompany Barrington Smallpiece and myself, so it was a chance for Captain Dave to get up off the substitute's bench for a bit of action. As an ex-BEA captain, Dave Stokes has a fund of aviation-related stories that can make a long

trip in a smelly van seem even longer, indeed, it would seem that in those days jets were powered by alcohol rather than kerosene!

Our arrival in Kruth, the tiny, but elongated village that was the nearest thing to civilisation, was bizarre to say the least; we arrived at the hotel to find that it, like the rest of the village, was shut. A series of phone calls elicited the information that three keys were placed cunningly under an alabaster statue, we let ourselves in to find the place in darkness and bearing a remarkable resemblance to the Marie Celeste. 'This reminds me of an overnigher in Budapest in '72' Captain Dave mused, ' it was strictly our sense of smell that led us directly to the wine cellar...'





Left: The Rétroplane prime mover: Vincent Besançon displays his exquisite ¼ scale Frankfort Cinema. **Right:** The Cinema's fuselage is made up of silver-soldered steel tube.

Having settled ourselves in, we then drove to the campsite where the Rétroplanistes were to be found, and discovered a hardy bunch indeed, some sleeping in tiny pup tents, didn't they know it was only July? (And anyway, where were the pups sleeping?)

Like any large, well-known event, there is always someone whose enthusiasm forms the core of the whole enterprise, and in this case it is serial model-maker Vincent Besançon, who welcomed us fulsomely, pointing towards the rickety bar which was staying upright only because captain Dave was

already propping it up. With modellers from many countries present: Switzerland, Holland, France, Ireland. We decided that English was to be the Lingua Franca, at least we three Brits did, everyone else seemed to go their own way — ah, c'est la vie.



A selection of gliders on the hill: there were three Fauvel flying wings in attendance.

The next morning (Friday) the heavens opened, mist swirled around the mini-mountains outside and the hotel remained resolutely empty. The three of us sat around until early afternoon talking aviation, possibly a new world record, a period during which I felt I had come to know every member of British European Airways personally. (Dave's best story

during this interminable time was of an overnigher in Dublin where he booked an early morning call at the hotel's reception. *'Dat'll be two shillin', sorr'* said the receptionist. In the morning the call duly arrived with the information that there would be no charge. When queried, the receptionist said, *'dat's all right now, it past nine o'clock anyway...!')*





Left: Frederick Marie with his rocket powered Opel Rak. **Right:** The Rak gets away minus the rocket power.

Miraculously the skies cleared and we hurried to the campsite to see what was happening.

Vincent Besançon has been known to scale soarers in the UK via his excellent website for a while now, and on display was his $\frac{1}{4}$ -scale Frankfort *Cinema*. This model is just about as scale as it's possible to get; the fuselage is built entirely from silver-soldered steel tube with all the cables, sticks and pedals connected to the pilot figure who performs all the appropriate movements; blimey, what a show off! After a while a convoy was prepared to go up to the Schweisel to

scope out the situation and maybe get in a flight or two. A twenty-five minute uphill grind ensued, the road zigzagging its way up above the tree line to where the flying site is, at around 4,300 feet. Here we found the secret that dare not speak its name...there was a fifteen minute walk to the top of the hill, what price the five sailplanes I'd brought along now?



Philippe Briquet's SG 38 primary glider flew well, despite having the efficiency of a half-brick!

When we arrived, puffing and panting, the view was breathtaking, as was the strength of the wind, quite literally. The going was tough, especially on the ankles, and there was a ditch running along the whole top of the Schweisel

which it seems was a First World War trench that the French used for ammunition supply. When you consider that during practically the whole trip from Calais we were passing the names of famous World War One battles, the scale of that war was unimaginable, so I kept the pain in my ankles strictly to myself not wishing to appear a wuss. Alas, wusses we three Brits were, not one of us wanting to trek to the van and back under these challenging conditions. (Joe from Ireland flew, but it was a plastic pig and he was lucky not to be blackballed, this being a vintage meeting).



Unfortunate launch did not end well for Armand Giraud's challenging Planeur Magnard.

By Saturday morning the Marie Celeste was showing signs of life with breakfast continental style (cornflakes, but no bowl to put them in) but that mattered not, because the sun was shining! A huge convoy snaked up through the passes and a parking nightmare ensued at the top as some seventy cars and vans competed for three parking spaces. Eventually, order was restored and the van doors flung back

to reveal, after two days of travelling and hanging about, the precious models we had brought all the way from the Royaume-Uni. As he was three-quarters of the way through building one for himself, Smallpiece got dibs on the *Skylark*, Capt Dave had his *Rhönbussard* and *Jaskolka* strapped to his patented carrying cradle leaving me with the mighty *Minimoa*. Oh how we huffed and we puffed as we trod our way to the summit like a trio of elderly steam engines, although it would have been child's play to any seasoned Crook Peak dweller.





Left: Laurent Beldame's 1:3.5-scale Habicht proved convincingly aerobatic. **Right:** Laurent prepares to launch the Habicht.

What a sight met our eyes though, at journey's end — the top of the hill was liberally coated with wood and fabric machines of every size, shape and description. Well, they don't call it *Rétroplane* lightly; the first thing to catch my eye was model of an early Lilienthal design, with Otto himself at the controls; gliders simply don't come any more vintage than that! Inevitably, the eye is drawn towards the larger machines, especially on the slope where the launching of such creations can be a sure source of entertainment. Erwan Plu's massive Waco troop carrier we have seen before, being

aerotowed at Caen, but up on the hill, on the shoulders of two hapless, sweating launchers, this model seems much more close up and personal. Erwan is not without a sense of humour though; quite what a fuselage full of combat troops would have thought of their aerial conveyance looping and rolling over the French countryside doesn't leave a lot to the imagination. Similar convolutions were required for the launching of Marc Hecquet's enormous version of the Penrose *Pegasus*, but once in the air this model's performance was smooth and convincing.



Two man launch for Marc Hecquet's enormous version of the Penrose Pegasus.

Whilst on the subject of aerobatics, for most of the day there was a rather tasty looking gull-winged machine with a blue sunburst finish flying some very smooth manoeuvres indeed, even if not in a scale fashion; this turned out to be the Sperber *Junior* of Uwe Gewalt, better known for his range of glass ships, although he has now apparently retired. I was more than a little interested in Laurent Beldame's *Habicht* as it sported a colour scheme I had marked out for my own version, thus shattering the illusion that I had found it first. Laurent put on a spirited aerobatic display, a hesitation roll along the slope being his speciality, and it was here that one downside of French flying manifested itself...they fly Mode 1, just like me. Insisting that I have a go, I gingerly poled the *Habicht* about for a minute or two before risking a roll, thus garnering the shouted comment 'look, ze Engleesh always roll to the left!' (To my shame, I couldn't think of a single comeback). Frederick Marie's Opel *Rak* is a bird with a difference: the original was rocket powered! Having followed Fred's build log for this machine on the *RCGroups* website I was looking forward to seeing a smoky demonstration, but unfortunately on the day, a problem with logistics prevented it happening, although the twin-boomed *Rak* flew very well without chemical assistance, especially as this was its first time out of the shed. It wasn't all about large models, of course, as there had been a group build competition for 1/10th-scale and smaller, and some of these diminutive machines were little pieces of museum art.



Jean Claude Bachetta's M200 gets under way.

After the launch of the *Pegasus* it was funny, I admit, to see two burly Frenchmen pretending to perform a committee launch on one of these tiny gliders. (Missed it, of course, the camera was turned off). The Fauvel series of flying wings are something peculiar to France, over a hundred being built, some home-built from kits. Great claims were made for the flying wing set up over more conventional sailplane arrangements, claims that never really came to fruition. Despite this, with a reflexed section over the entire wing and minimal CG changes whatever the weight of the pilot, the Fauvels proved safe and stable in flight with concerns only at the critical take-off and landing phases where the flying

wing's behaviour could become a little squirrely. Pascal Bissey's two-seat AV 22 and Frank Albrecht's AV 36 put on many excellent flights during the day and the AV 22, particularly, was thrown about with great gusto. Emulating the full-size behaviour, it was noticeable that unless the landing was an absolute greaser, the nose would bounce up and down mercilessly without a conventional fuselage and tailplane to smooth things out.



'Looping Fred' prepares to launch Walter Wachtler's Musger MG 19a.

Picking out the Man of the Match was a very difficult task indeed, especially as Vincent's steel-tubed *Cinema* seemed

to perform as well as it looked. At the end of the day, though, the Queen's Award for Industry must go to local hero Jean Claude Haller of the host CMHV club, whose trio of varnished wooden sailplanes were an absolute joy to behold. His early Grunau *Baby 1*, *Professor* and *Wien* models were immaculately built and finished and flown to great effect, the *Wien* especially, as it frequently skimmed the grass on the front edge of the slope to perform elegant chandelles at either end. The original full-size was a serial record-breaker in its day with its pilot, Kronfeld at the helm, and watching the model in flight it was possible to see in the classic, elegant, simplicity of the design, the heritage of which can still dimly be seen in today's modern glass sailplanes.







Left: Erwan Plu's extraordinary Waco nears Pegasus Bridge. **Centre:** The Fauvel AV36 gets the two man launch treatment. **Right:** A picture of absolute beauty: local hero Jean Claude Haller's lovely Wien.

As the day slowly wound to an end, and the trek back to the car park began, there occurred one of those magical periods that have kept my interest in scale soaring at full throttle these many years. The wind had eased somewhat, the sun was shining and the air as smooth as the finest woven silk. Wrestling my *Skylark* from Smallpiece's stubborn grasp I proceeded to enjoy one of those flights where you can see the results of the slightest movements of the controls and you know that anything is possible as the model skims the earth and rides the sky as though on the shiniest of rails.

Laurent Beldame wandered over and commented 'she seems very forgiving, n'est pas?



Captain Dave's Jaskolka in action.

I know a hint when I hear one, so I handed over the box and watched his smooth flying instead. Then we called Vincent Besançon over for a go too, and all in all it seemed a fitting end to a perfect day.



With all those sailplanes in one place, the sky got a little crowded at times: to wit, Uwe Gewalt's Sperber Junior and Jack Kaegi's Helios.

Not quite the end, though, as we still had to get back to the van. On the way up we had plenty of help with all the spare kit, but now we were the three last men standing and decisions had to be made. I gave Smallpiece this choice: the *Skylark* and my tranny case, or the big *Minimoa*. He chose the *Minimoa*, the poor sap, and by the time Captain Dave and I reached the car park he was still halfway up the track, face red and legs all bandy with the strain.



Christian Jungert's Racek ready for flight.

That evening, the Marie Celeste had burst into life, the huge restaurant was full and we were lucky to scrape in in time. As we discussed the days events we all confessed to being as tired as any of us could remember and we looked forward to the next day when we could do it all again.

In true French fashion, the best part of the next morning was dedicated to ceremony back at the base camp with speeches and a tabletop groaning with giveaways. (The serried ranks of wine bottles had Captain Dave drooling at the mouth). I was especially touched when Jean Claude

Haller presented me with a book he had put together entitled 'Recueil de plans trois de planeurs anciens', a book of vintage glider three-views no less, and I was very happy to include this amongst my collection of goodies. Still, never mind the Buzzcocks, let's go flying we muttered, piling in the van and struggling to find space amongst Captain Dave's empties.







Left: The Frankfort Cinema in flight. **Centre:** Some spirited flying from Pascal Bissey's AV 22 . **Right:** '...to perform elegant chandelles at either end' Jean Claude Haller's Wien

Alas, continental weather forecasters are no better than their UK cousins, and as we ground up the mountain passes the

clouds lowered and the heavens opened. As it was midday by now, we were faced with the choice of sitting it out at the hotel or making a mad, last-minute dash for the shores of Blighty, one day earlier than planned. Reluctantly, we agreed the latter, and for us *Rétroplane 2007* became history.

So, what can we conclude from the foregoing? Firstly, the art of building your own models is far from dead, and secondly, interest in vintage sailplanes is still alive and kicking.

Vincent's accomplishment is to have put together what must surely be the largest meeting of its kind in the world (unless you know better?) with nearly seventy entrants and probably going on for a hundred vintage gliders if you count all those left in the cars. All that's left is for me to thank Vincent and the CMHV club for their efforts, and on behalf of Smallpiece, Captain Dave and myself, our anonymous sponsor for supplying the van and the fuel.

If your interest lies in this area, and if you possibly can, I would urge you make your way to France some day for a future *Rétroplane* event... you won't regret it.







Left: Hand out time at the closing ceremony. **Centre:** Well, this is France! **Right:** The official Rétroplane 2007 logo. (image: Rétroplane)

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Resources

- <https://www.retroplane.net> Vincent Besançon's website is a must-visit: here you can download free plans and scale documentation packs, see videos on the art or steel tube silver-soldering and generally view workmanship of the highest quality.

All photos are by the 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](#). A PDF version of

this article, or the entire issue, is available [upon request](#).

RC Soaring Diaries

How it all started, and how it all came back around full circle.

[Michael Berends](#)



My mentor's Legion Air (photo: Mike Berends)

Thank you for tuning in for another month and hope the flying season has been treating you well!

My intentions with *RC Soaring Diaries* has always been to be exactly that. A diary and compilation of all my RC soaring adventures and experiences both past and present. This wonderful hobby, and pastime, always starts somewhere in our lives and I thought that it would be fun to share my

beginnings, as it has come around 'full circle' in a very interesting way.

I have loved flying models ever since a very young age. They are a big part of my first memories in life and something that has been a component of my very existence since.

It all began in a typical way of the era — I was around four years old when my dad bought a control-line Cox .049 *PT-19*. I remember him firing it up in a parking lot and I ran to the car crying into my mom's arms because the noise terrified me! I do however remember looking through my diminishing tears and the windows of my noise barricade mesmerised by this miniature yellow and blue airplane flying in circles. It was already apparent even at a very young age that engine noise was not something that agreed with me. It was the only time that my dad flew it and it sat on a shelf after that for years.

A couple of years later another memorable experience took place. The weekend newspaper was sitting on the table and there was an article on RC planes that caught my young, curious eyes. I was looking at the pictures of the planes and of course I had some questions that were directed towards my mother. She explained the man on the ground talked to the little pilot in the plane on the radio and told him what to do. Well, that just sent my imagination through the roof! The thought of having a small airplane and telling the pilot to do loops and rolls fueled my dreams for weeks!

All of this gave me a fascination with anything miniature that flew and I spent my youth building many balsa free-flight planes, control-line planes and model rockets. It was gliders however that always took precedence and were the one thing I focused on the most. I spent hours throwing hand launch gliders and launching towline gliders learning more and more every flight about trimming and aerodynamics.



Always fascinated by anything that took to the air. Here I am proudly displaying the Saturn V that my cousin and I built together. (photo: Mike Berends)

Fast forward to 1983 and my 15th birthday. My family took a road trip through the western United States from Canada. My parents asked me what I wanted for my gift and I had

been eyeing a four channel radio advertisement from Circus Hobbies in Las Vegas for a few weeks already, and with some hesitation asked for a radio. I was so happy when they agreed!

It was a painful few days of driving through a number of states sightseeing and doing the tourist thing. All I wanted to do was to get to Las Vegas and pick up my gift. Once we arrived it was straight to Circus Hobbies and eagerly purchased my shiny new radio. Then my dad gave in and agreed to stop at another hobby shop where I bought a *Gentle Lady* kit and some rolls of covering with money that I saved up! What a great day and all from Las Vegas, a place that ironically became a big part of my life years later and my home away from home.

After we returned from our trip a week later I jumped right into building my first RC glider, which didn't take long. I worked on it every waking hour for a number of days and it was ready to fly. I didn't have anyone to guide me or help me so the first flights all ended up in repairs of some sort. I kept repeating the pattern of flying, crashing and fixing over and over again, learning something more each cycle. The plane was getting heavier and heavier from the repairs but I was determined and was getting better with each flight.

A few weeks into this new challenge, I was sitting in the back seat of my parents car driving to a family member's birthday

party. As I looked into the distance I couldn't believe my eyes. I saw what looked like a glider launching at the top of a winch. Examining the sky up ahead carefully, I could see more gliders in the air! We passed the field with my nose pressed to the glass desperately asking my dad to stop the car, but he declined and continued on.

As we drove the last few minutes to my aunt's house, I remembered all the turns we made and how to get to that field. We finally arrived at our destination and I ran all the way through the winding streets in hopes that I could make my way back to all the gliders!

Out of breath but filled with excitement, I finally made it back to the field and walked straight to all the cars and the launch area. I couldn't believe what I was seeing — all these beautiful sailplanes that I read about in the various RC magazines: *Sagittas*, *Olympic 650s*, and a *Windrifter* to name a few. It felt like I was dreaming.

As I scanned the skies I saw another glider that I recognized. It was a *Legion Air*, lazily circling in what I knew had to be a thermal. The man flying it was fairly close to where I was standing. His legs shoulder width apart, head tilted back looking skyward at this dark blue glider that was getting higher and higher. With some trepidation I walked up to him and said hello and that I liked his *Legion Air*. His gruff response was "oh, you know what this is?" I responded

telling him that I started flying a *Gentle Lady* and I was getting better.

He was a man of few words so the conversation was short and we silently stood side-by-side looking up at his plane. Until a few minutes later, the alarm on his watch went off. He said "well, that's 20 minutes" then handed me the radio and walked away! I was in shock, looked back and he commenced to scold me for taking my eyes off the plane while he was grabbing a thermos to pour himself a cup of coffee!

I didn't dare touch the elevator but used the rudder to slowly nudge this beautiful flying machine around the sky with a stern and grouchy voice barking out things behind me like "turn right...your other right!", "you just flew through lift, I thought you knew how to fly!" Finally I could hear him utter, "well, I guess I'm going to have to get out of my chair!". Then he appeared at my side with his coffee in hand. Giving me stern commands guiding me through the sky. I didn't dare make a mistake as he was very abrupt and harsh in pointing out what I was doing wrong.

In the process I realized that the glider was getting higher and higher. I was focusing on his rough commands and listening to every word as he explained how the lift was affecting the plane and how to find the center of the lift and stay in it.



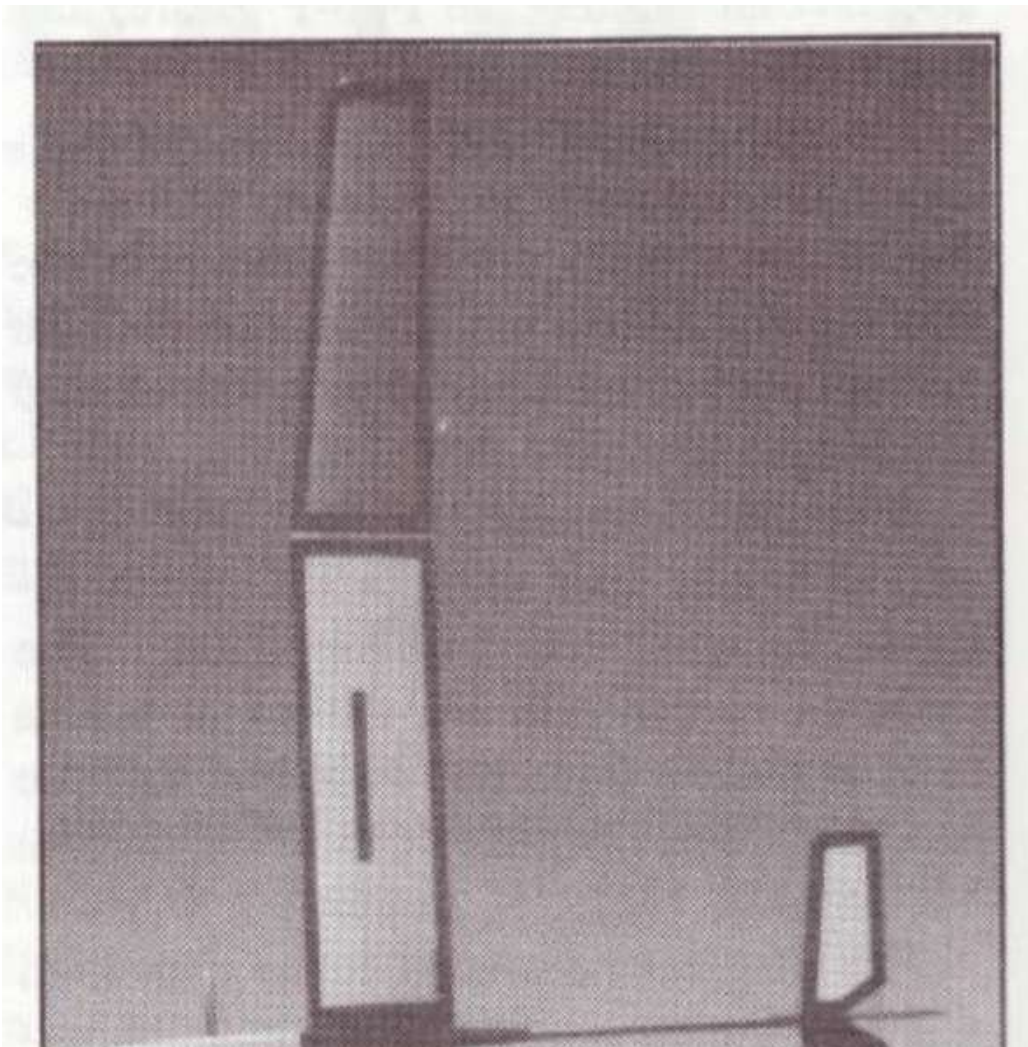
Painting of Steve, done by my good friend Chris Gregg. (photo: Chris Gregg)

Ten minutes later I was still in the air much higher than we started, and he didn't touch the sticks once! At this point he said that he wanted to sit down and finish his now cold coffee and I could land whenever I wanted.

Without his words and commands I slowly guided the *Legion Air* in very flat wide turns until it settled nice and level in the field a few hundred feet away! It was a success and I was on top of the world. Not even his brash remarks about how I landed so far away and already forgot all the things he taught me, could wipe the ear to ear smile off of my face and that sense of accomplishment.

After I retrieved the plane, admiring it the whole walk back, he told me that his name was Steve and with a subtle wink said that I should come back with my glider. I don't even remember the walk back to the family party. I was on cloud nine and had just accomplished that one thing that I dreamed about and desired so badly.

I did return with my *Gentle Lady* and Steve taught me more and more over the years of flying sessions. I realized that under the stern and sometimes grouchy demeanor, there was a man that was extremely passionate about RC gliders and really did have a big heart, always helping everyone around him.





Steve Yurchevich just after receiving the first Diamond Achievement award of the Canadian Soaring Society. (photo: MAAC)

His dedication to the hobby allowed him to achieve the first Diamond Achievement Award of the Canadian Soaring Society along with a multitude of other contest wins and awards. It was quite an honour to have him as a mentor. He was a gigantic influence to me and taught me how to always set my goals high and not stop till I achieved them!

The story does not end there though:

Five years ago, a very good friend of mine named Chris Gregg stopped by for a visit. We were chatting about old

times and Steve came up. I told him the story of how I met Steve and that memorable flight with the *Legion Air*. He looked at me, grinned, and said the most unbelievable thing, "I **have** Steve's old *Legion Air*!"

WHAT? I couldn't believe what I was hearing! I was in disbelief as he told me that he ended up with a number of Steve's planes after his passing. He then invited me out to his property to fly the *Legion Air* that weekend! I just couldn't believe this was real. How could this be true?

That Saturday I drove out to his acreage and there she was, the beautiful dark blue glider that I flew my first thermals in, leaning against the wall of the shop. As I touched the wings of this plane so many memories came flooding back. It was like I just went through a time machine!

We did some checks, set up the winch and it was time to relive that monumental day! With sweaty hands and nerves on the sticks, Chris sent the *Legion Air* up the winch line as I made sure she tracked straight. Once off the line I could feel the tears start to fill my eyes and Steve's voice barking out commands. Thirty-three years later I was reliving this epic day. It was a beautiful flight filled with emotion and happiness on a beautiful sunny day!



33 years later, ready to fly this beauty again (photo: Mike Berends)

Just after I landed, I looked at Chris and told him how deeply thankful I was. He just looked at me with a smile and said

"she's yours". I couldn't believe it! Not only did I get a chance to fly the plane that I flew my first thermals in but now it was mine? Do things like this really happen? It was all extremely surreal!

I still fly the *Legion Air* a couple of times a year. It's so great to let Steve's essence soar in the place that he was so passionate about. On those flights if someone with little experience stands beside me, I always quietly put the radio in their hands and walk away, just like Steve did with me all those years ago. There have now been a few more people that have circled in their first thermals with this veteran glider but this time with me barking commands and orders *at them*.



Just after a 20 minute flight at a recent contest day. (photo: Mike Berends)

Having a mentor was so important to my success in RC soaring. His guidance not only taught me how to fly but also gave me important life skills and taught me how to strive for my goals and achieve them. I hope that along the way I can give back all that he gave me.

This hobby is much more than the planes and the flying. It is

also about the experiences, friendships, adventures, achievements and making memories. That's my story and how it all came back around full circle. I would love to hear all of your stories of how it all began for you down in the *Responses* area below!

That's it for another instalment of *RC Soaring Diaries*. Until next time, happy flying!

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The Skyscraper Method for Fuselages

The conclusion of a two part series where the author breathes new life into some orphaned wings and tail feathers.

[Peter Scott](#)



The wings and tail are from a 40 year-old 3m Graupner Cirrus, and the new fuselage is the subject of these articles.

For readers who would like to review the first part of this article, you can find it in [the July, 2021 issue](#) of the NEW R/C Soaring Digest.

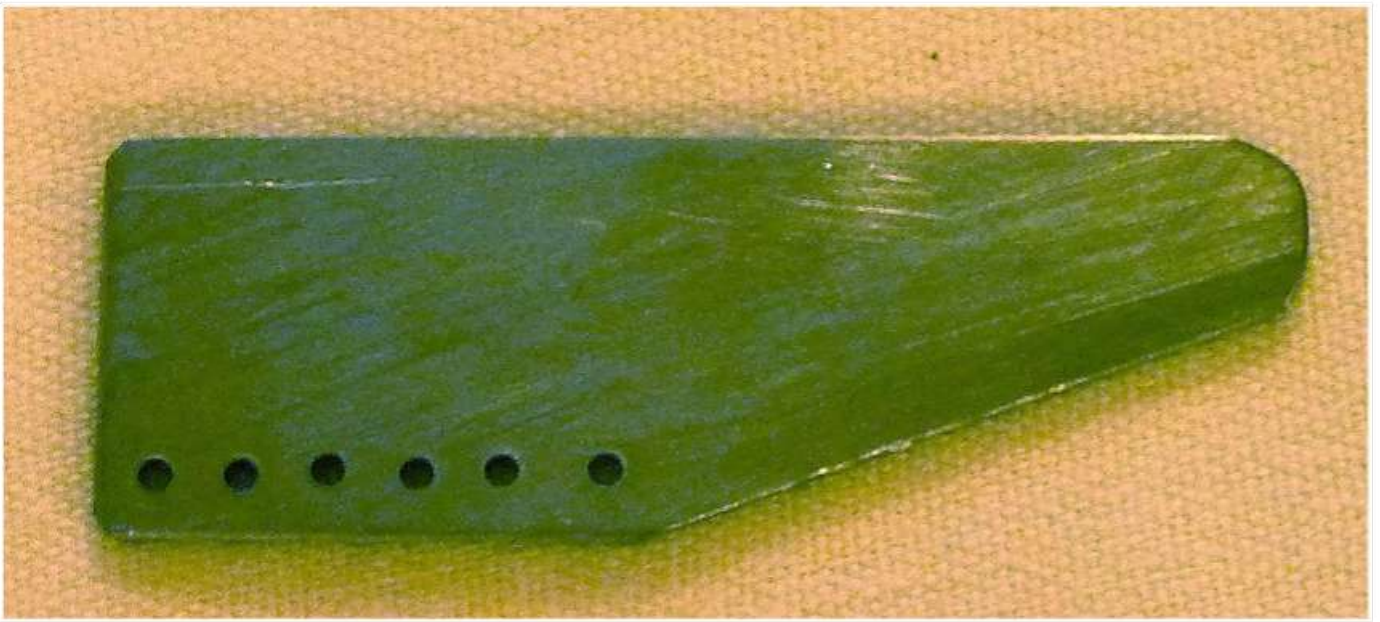
Skinning the Fuselage Pod

Last month, I left you at the stage where I was just about to give the fuselage pod a robust skin to absorb the rigours of future flying sessions. They say a picture (or four?) is worth a thousand words:

The All-Flying Tailplane Suspension

The *Sirius* — the name I had given this project — has all-flying tailplanes. This meant I had to find a way of mounting and pivoting them. I decided to install micro servos in the tail for the tailplanes and the rudder.

The bellcrank is the key component. I made it from 1mm titanium and it weighs 3.4g. It carries, in 3mm tubes, the two 2mm piano wires that plug into the tailplane halves. The holes for the 3mm brass tubes were drilled when the side cheeks were glued on. The row of 1mm holes is for the clevis on the end of the servo connection. This pushes it from below. I like titanium as it is only twice the density of aluminium but immensely tough and hard enough never to wear. It is about the same as mild steel for cutting and filing though drilling is slightly more difficult due to its springiness and poor conductivity causing heating. Apart from tiny holes, a bench drill press is required but these are cheap now.



I then laminated some strips for cheeks for the bellcrank and to form a box in which to mount it. I used 1mm ply on each side of some 2mm and 3mm balsa. This is the bellcrank with the thinner cheeks fitted. The cheeks were sanded, as were the inside surfaces of the box, so they rub smoothly. The rubbing area will give extra stability.



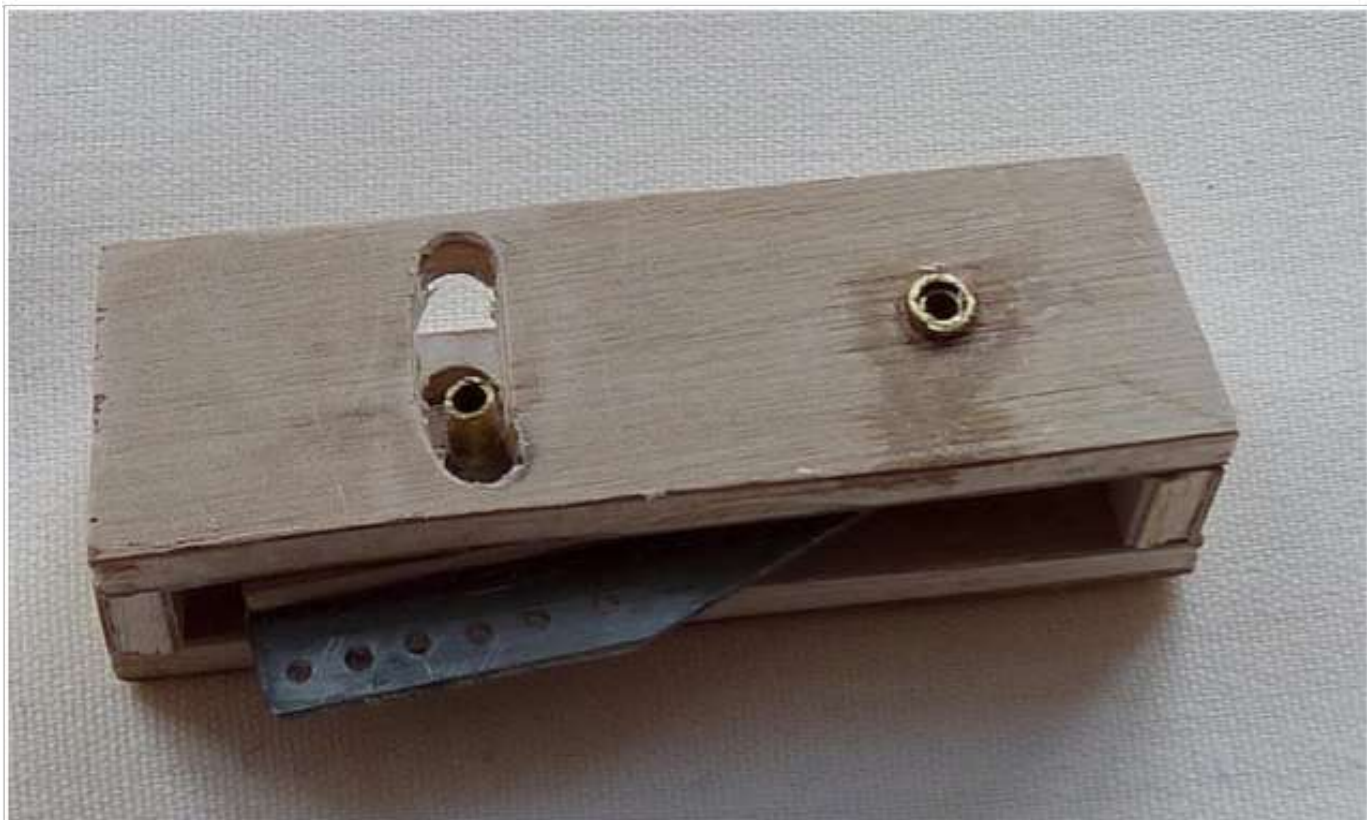
To form the bearings I used two sizes of brass tube. The smaller is 2mm bore for the tailplane mounting piano wires. This has an outside diameter of 3mm which is a perfect running fit in 4mm outside diameter tube. These were glued into the box to form bearings for the bellcrank to pivot. 2mm is a little small for the wires but this was the size in the original tailplanes. I imagine it was to keep the aft weight down. If I was building new ones I would use larger carbon fibre tubes.

The drilling and assembly order needed careful planning:

1. Mark and drill the positions of both bellcrank holes

using 3mm twist drill in a drill press.

2. Connect a servo with a tester. Put the bellcrank on 3mm drill as pivot.
3. Find the servo horn and bellcrank holes to give $\pm 15^\circ$ on full servo deflection.
4. Make sure the chosen bellcrank hole suits the metal clevis. Open up if necessary.
5. Cut two pieces of 2mm piano wire of the correct length for tailplanes.
6. Glue 3mm tubes in front and rear bellcrank holes with these wires in and the tailplanes connected.
7. Measure the distance from the rear of the fin leading edge to the front bellcrank hole.
8. Drill front holes in box sides using 4mm holesaw using this dimension.
9. Glue in 4mm brass bushes with 3mm tube in place to line them up exactly.
10. Cut the rear arcs in the box sides using 5mm holesaw and a 3mm drill in the front holes as pivot.
11. Smooth bellcrank sides and relevant sides of box sides.
12. Cut front and rear box spacers out of laminate to give slight clearance.
13. Test clearance under pressure from clamps.
14. Assemble box around bellcrank.



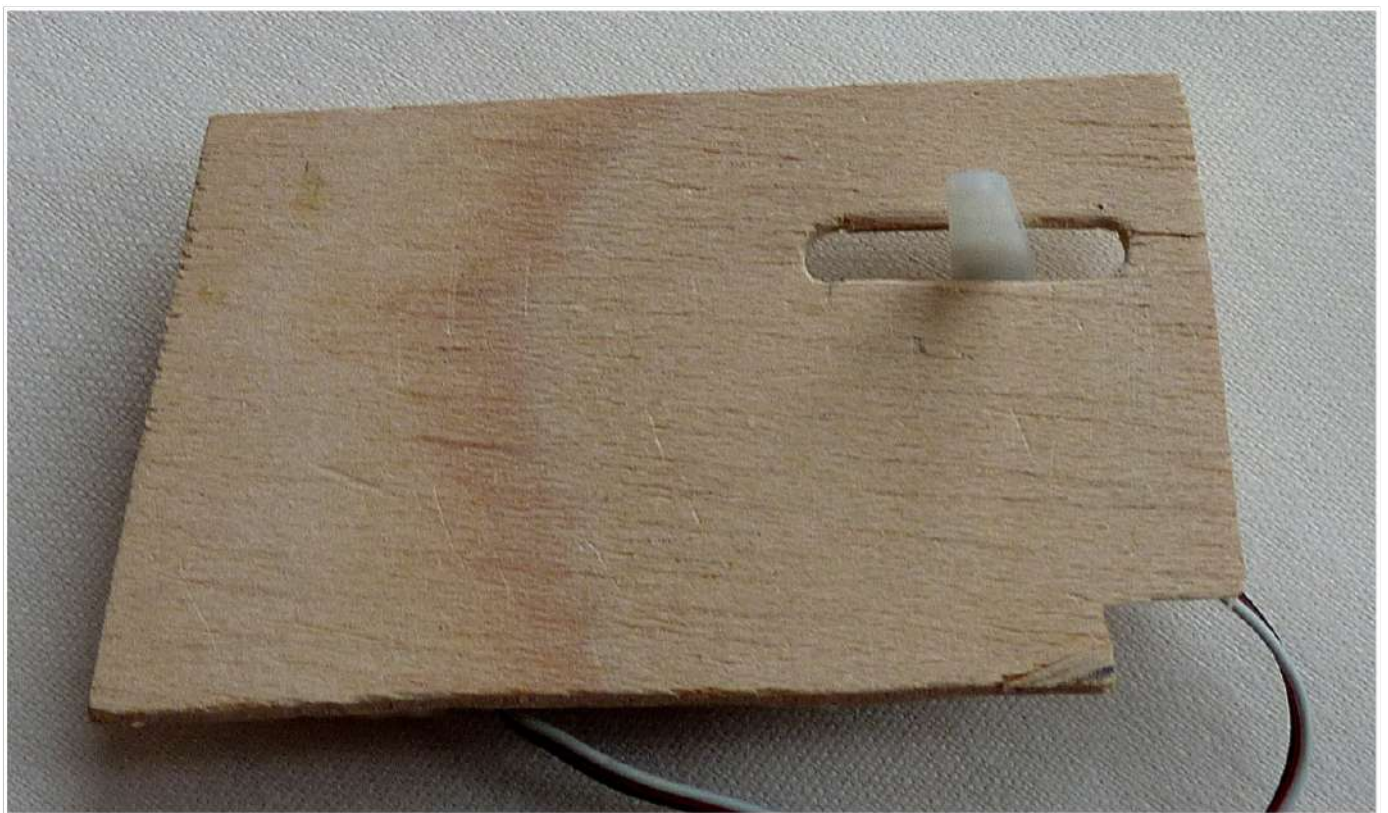
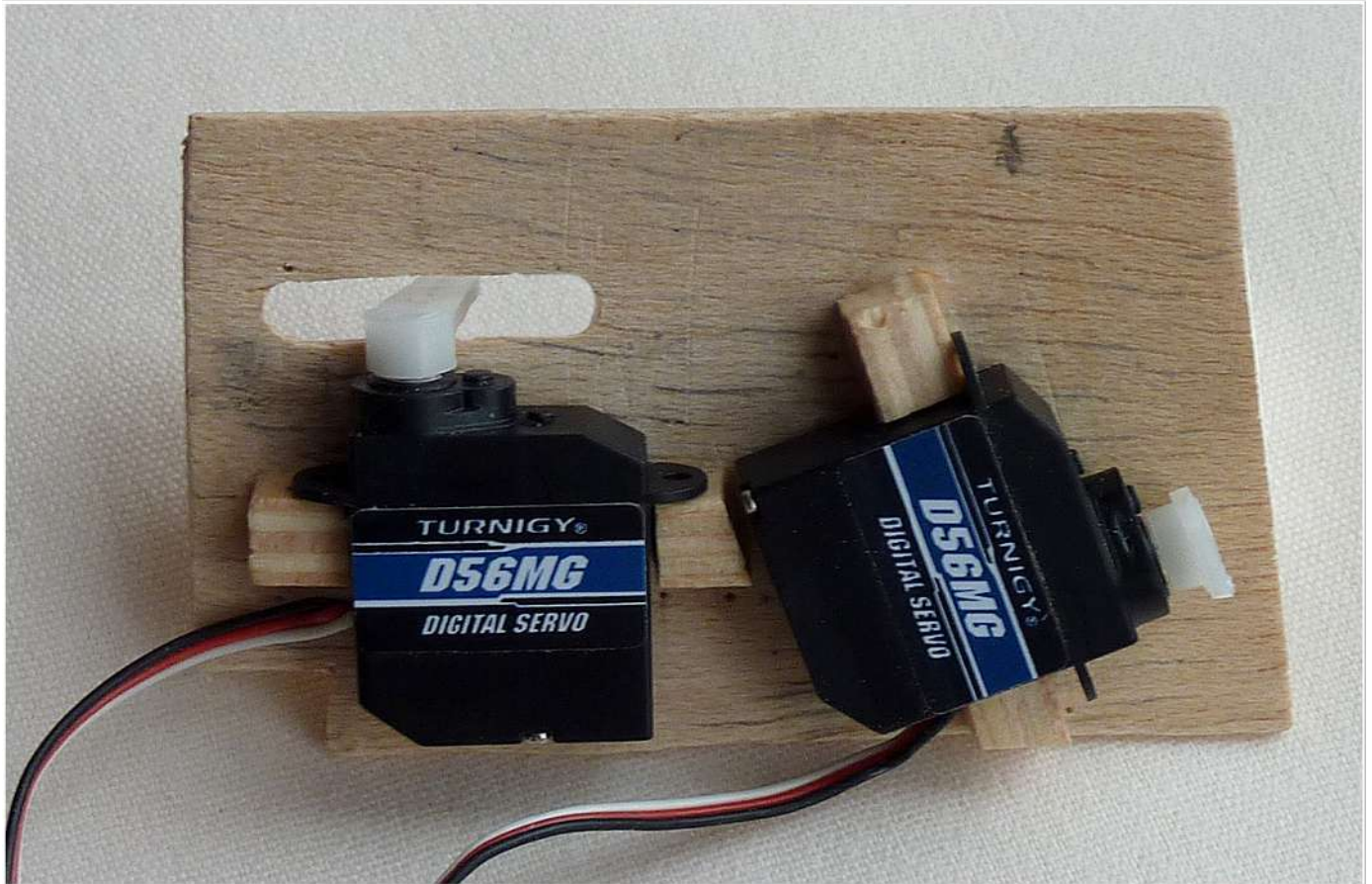
Left: Box complete. **Right:** Weight without clevis 11.9g.





Left: Box installed in fin with tailplanes. **Right:** The bosses for the sideplates screws have been added.

The two servos go into a box under the bellcrank box. Here is one side — the mounting plate. The servos are metal geared and quite powerful for their size. They are fixed with the normal screws. The deflection needed for the tailplanes will be small. Airspeeds will not be high so more important is the ability of the servo to hold the tailplanes steady, and the metal gears, and short, carefully drilled, connections should be more than good enough. After filing and sanding, the two sides are now covered with black Hobby King film.



This is the fin with shaped fairings, filled, coated with Eze-Kote and sanded. The area under the fin will be left unfinished until the model is complete. Lead might need to

be added. A balsa fairing will then be added and painted.





This shows the servos fitted into place and connected up. I removed the connectors, soldered the wires, and covered them with heat shrink. This saved both space and weight. Connecting to the bellcrank was a tricky little job. I tried all combinations of clevis and rod and in the end settled for the KISS (Keep It Simple — Stupid) approach. The wire in the bellcrank has a double bend. The other end is a simple plastic clevis.



The geometry isn't perfect but I can adjust that with differential throws in the transmitter if needed. On the elevator servo horn I used the hole nearest the centre. I had to, as the full horn fouled the other sideplate and I had to trim it. Full throw, tested with the transmitter not the servo

tester, gave a linear movement of 5mm in each direction. On the second from last hole of the bellcrank this gave 6° movement ($\tan^{-1}(5/45)$), which is just about right. If it proves not to be enough I can move to a bellcrank hole nearer the pivot.

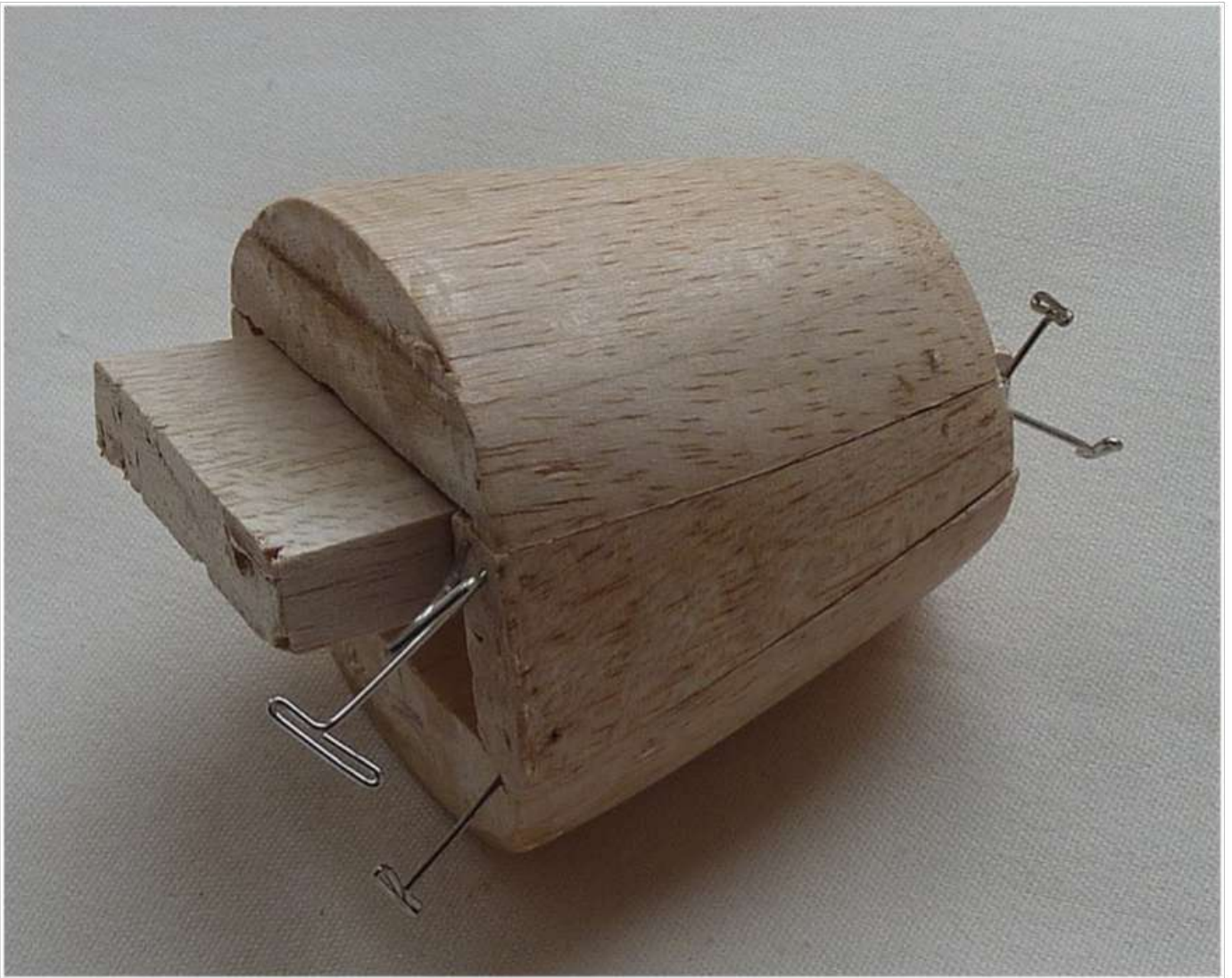
Making the Glass Fibre Cowl

The cowl needed to be elliptical tapering to circular at the spinner. I thought I would make a re-usable male mould out of balsa. The tapering sides would slide out releasing the tapering top and bottom parts. There would be a central key, which would push the parts outwards and would be removed first. I would shape the balsa mould then tightly cover it with cling film as a release agent. The cowl's inside finish wouldn't matter. If it went badly wrong and I couldn't slide the parts out I'd have to chew them out. However I hoped the mould would be re-usable.

The first question was a geometric one: for a given circle radius how thick would the sheet balsa have to be to allow the box shape to be trimmed into a circle? Dredging Euclid out of my brain I calculated the thickness to be 0.28 of the radius. If you calculate thickness using about a third of the radius then there would be margin for strength. Size the wood for the worst case which is the largest circular cross-section and the rest should be fine. Obviously square-ish shapes could make do with thinner wood. In the end,

however, I decided to have two layers of 10mm balsa top and bottom and a single layer for the sides. I made it several millimetres too long to allow for trimming rough edges.

All went to plan. I shaped the male mould and gave it two sanded coats of Eze-Kote to aid release. With a new scalpel blade I sliced the sides and tops apart. Note the taper to the back. I then pinned them back together with the key as shown here:



I stretched kitchen clingfilm over the mould with overlap at the edges to avoid sticking. I gave the clingfilm two sanded

coats of Eze-Kote, then one layer of 48 g/m² glass cloth. This was followed by two more sanded coats of Eze-Kote. I then trimmed the edges with the scalpel, pulled out the key and tried to spring the other parts apart. I only needed to prise one or two parts with a blade, otherwise it all fell apart easily.



First layers of glass removed from the mould: the resulting moulded cowl was much too flexible. I think Eze-Kote, being a single-part polyester resin, is less rigid than epoxy when cured, so I reassembled the mould parts and wrapped them

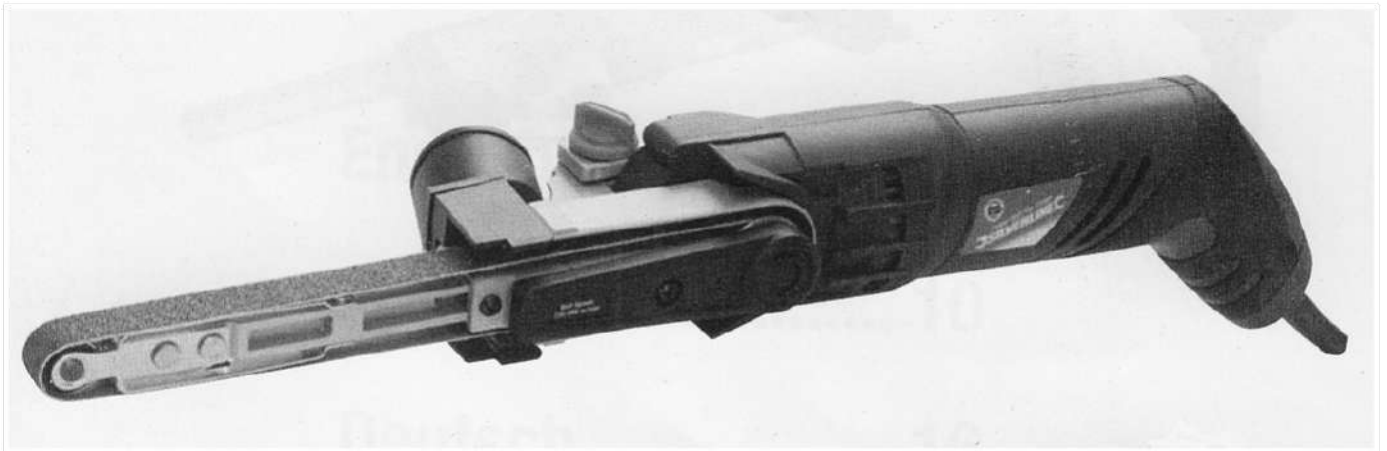
in some more clingfilm to avoid adhesion at the edges. I applied two more layers of 48 g/m² glass with several more coats of Eze-Kote, sanded between. This felt rigid enough but I decided to glue in ply annular shapes to make the ends even more rigid and to aid mounting on the fuselage. I made the ply out of four cross-laminations of 1mm birch ply glued with PVA.



After sanding some more I felt the surface still wasn't

smooth enough. I decided to apply several coats of primer with the airbrush. Still not good enough

Then I bought a great new tool, called a belt file. It's a Silverline one and cost £28.50 on eBay. I gave the cowl a real bashing with it on the slowest speed setting using a 120 grit belt. Then when I was happy that it was reasonably flat I applied some more glass, 24 g/m² this time, and coats of Eze-Kote.



The belt file from Silverline. (photo: Silverline)

The next step was to glue in the ply end plates and trim the fibreglass to length. The plates made the whole thing very rigid. Here is the completed cowl prior to painting. The rear view shows that the cowl is locked in position by the cutouts for the motor mount. I used a diamond holesaw to cut the hole in the front as that would be visible when the spinner was off.







I puzzled over how to fix the cowl to the fuselage. I considered screws but access was difficult both from front

and back. I decided to go for two pairs of neodymium magnets.

Even after cellulose filler, sprayed primer and top coats of acrylic, the final result wasn't perfectly smooth. The next will be better after lessons learned. However I proved that the method worked.

Final weight before painting was 13.2g and 14.6g after.

Making the Glass Fibre Canopy

Having learned the techniques from the *Sirius* cowl it was time to make a canopy for the same model. As it is a scaly model the front pod, and hence canopy, is quite large.

This time I decided to use release wax and possibly release agent on a polished male mould rather than cling film. As the canopy is open at the bottom there was no need to make a collapsible mould.

The first step was to make the mould. I laminated a rectangular blank from several sheets of 10mm balsa glued with white PVA. I then sanded it to the correct length using a belt sander on its side. This was so I could fit it in place and mark the curved edges on three sides: bottom, front and back.

I then planed it down using a David razor plane. Once happy

with the overall shape, I switched to sandpaper. One critical matter was how much smaller to make the mould to allow for the thickness of the glass laminations. In the end I reasoned that it was not critical after all as the canopy would be flexible prior to framing and so could be trimmed to fit. Rough measurement on a cowl gave a thickness of a bit under 1mm so I made the mould this much smaller all round except the ends.

Here you can see the rough planed mould in position on the fuselage:



Here is the sanded mould coated with Eze-Kote and polished. Its outer surface will be on the inside of the canopy so a high polish wasn't needed. The Eze-Kote layers on the moulding will be sanded to give the outside finish.



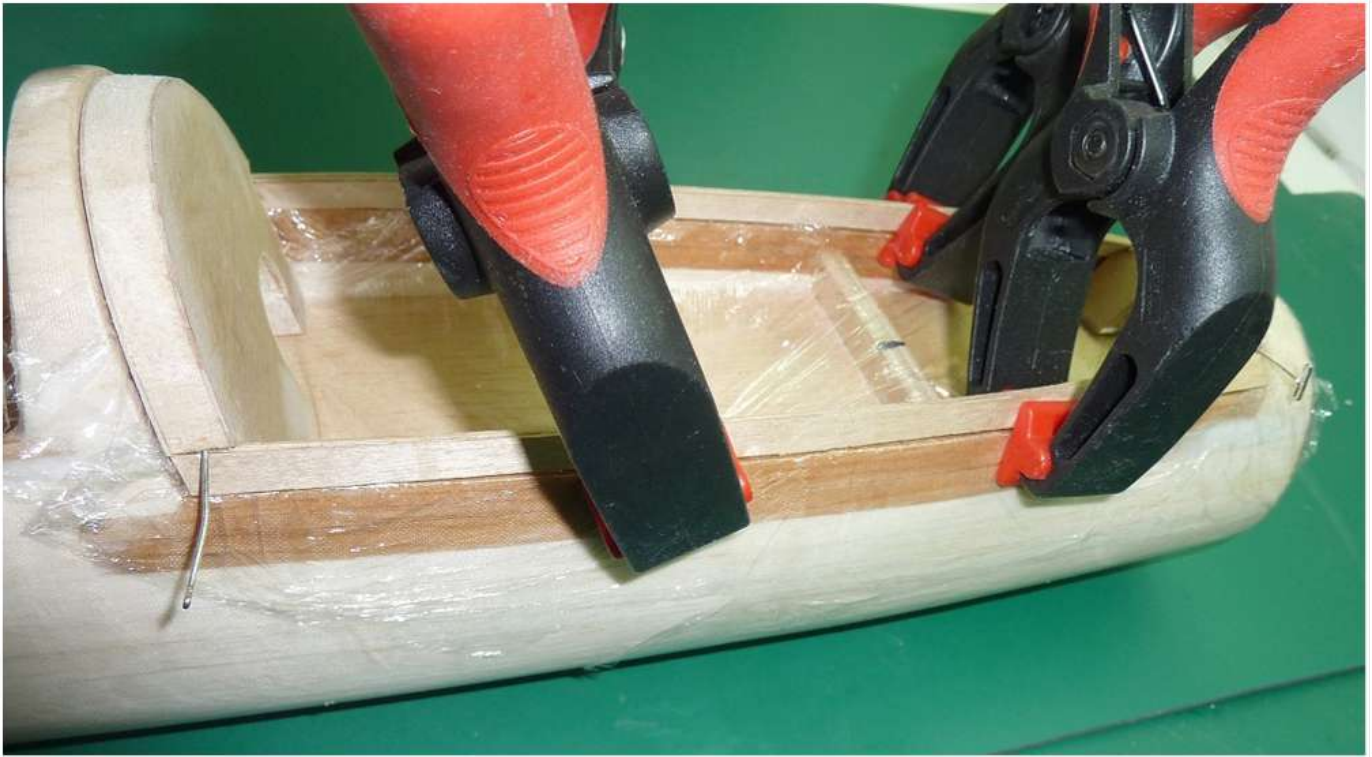
Before applying glass to the mould I experimented on some scraps of balsa to discover how many base layers of resin to use and how well the release agents work. I applied two layers of Eze-Kote to smooth the mould and three coats of mould release wax to each using a paper towel. You don't let the wax dry but clean each coat off with a cloth when wet. Then to one sample I added a single coat of PVA release agent using a soft brush. First time I didn't leave it long enough to dry. It takes an hour at room temperature (20 to 25°C). It seemed dry but the Eze-Kote dissolved it when I applied it. I found that wax on its own worked just as well as when I used PVA agent, so I didn't bother with PVA on the canopy mould.

I laminated three layers of 48 g/m² cloth with one of 24 g/m² cloth on the top to give a smooth surface. I lost count of the number of EzeKote coats but I'd guess about ten. Each dries quickly so delays are short. It popped off the waxed mould

very easily.



Eze-Kote is not as rigid as normal resin so, though this number of layers gives a fairly stiff shape, it could not be used as a structural component. To stiffen the canopy I framed it with ply and trimmed the ends of the canopy, which were moulded square, to give more realistic sloped ends.



The side frame parts both curve and twist. I tried to use spruce but it was too rigid. I cut strips of 1mm birch ply glued in threes with PVA and clamped in position. I covered the opening with cling film to prevent the new frame sticking.

I then air-brushed it with primer and white acrylic to contrast with the black fuselage.

I was pleased with my first major use of carbon fibre. It is light and stiff and does not change shape over time. One disadvantage is that all gluing must be done using epoxy, though possibly thick CA is an alternative. Not being water based, epoxy doesn't get lighter as it dries so you have to be as sparing as possible.

A cylindrical tube works well for a curved fuselage. I must try a square one for a square fuselage. It would make lining up

the formers and forming a balsa shell very easy.

Just a reminder from the first article as to why I call it the skyscraper method: such buildings now have a strong central core from which floors and walls are cantilevered. Then the glass is put on the outside. Apart from being rotated by 90 degrees my fuselage design is the same, as it has a very strong core with a light shell covered in glass (fibre).

The Wings and Tailplanes

Foolishly I didn't keep a photo record of doing the wings and tailplanes. I stripped off the old doped tissue covering using thinner and sanded and filled the frames. I could not get some patches off so relied on sanding those bits.

I modified the ends of the wings to take ailerons as the original was built with rudder and elevator only. I still had the original plans, though they needed some TLC with sellotape, so I made the ailerons the size shown on the plan. I used thin servos in the wings and cut slots in all of the ribs to run the wires through. I replaced the slightly corroded brass tubes in the roots with carbon fibre ones and generally strengthened the area without adding much weight. I installed boxes to take inboard airbrakes and fitted the servoless type as shown:



I used Hobby King shrink covering, which I find light, easy to use and a good shrinker. The low cost is a bonus. One aileron warped and I had to replace it with a laminated one.

The tailplanes were an easy job. The plastic root ribs were pulled a little out of shape when the covering was heated and shrunk. I had to unstick it from the root ribs, add a filler of balsa and restick the covering. It's not perfect but looks reasonable.

Finished!

At last it's ready for a maiden flight. Ulp! I used to hurl it off hills and tug it into the air with a bungee but have never hand launched under power. Knee trembles.



Launch Dolly

I will possibly hand launch once I have the model stably trimmed and have a good idea of the required air speed. Until then I decided to use a lightweight dolly built out of aluminium with 100mm plastic wheels. The main tubes are 25mm square with 1.5mm walls. The front bracer is 1.5mm sheet. It is bolted together with M5 screws and the wheels run on M6 axles. The wings rest on some 6mm liteply supports bolted to 20x3mm aluminium U-shaped frame. I might add a rear support if it proves necessary.



Balancing

I got the balancing stand out. All it needed to be a tiny bit in front of the specified centre of gravity was 15g at the front of the cowl area. Looks like all my efforts to keep the tail light paid off. The servos being in the tail didn't cause a problem.

(More) Lessons Learned

1. Collapsible male moulds for fibreglass are quite easy to make out of balsa.
2. Cling film works as a release agent but it is difficult to get it really smooth. It might be easier on a larger or

flatter cowl. I experimented with wax release agent on scrap wood. It worked. I also tried adding a layer of PVA paint-on agent as well. It was no better. Provided the parts can be separated any small internal ridges won't matter. I have now tried coating the wood parts on a different mould with three coats of a wax release agent. It worked a treat. The moulded part sprung off easily.

3. It might be possible to achieve moulding rigidity with fewer coats of epoxy or polyester resin. However, making several lots of two-part for a small component would be wasteful. Eze-Kote seems fine on this smallish cowl though. You need to use more layers of glass and resin. I think that the convenience of Eze-Kote makes this worthwhile and the end-plates removed any doubts about rigidity.
4. Don't be afraid to sand fibreglass mouldings aggressively. You can reapply glass and resin. It weighs very little as long as its thin. Keep the sandings off your skin and out of your lungs.
5. Cover the exposed part of the tail boom with a removable film of some kind before starting to glue things. Despite the greatest of care I have put some glue smudges on the polished surface. Provided you are willing to do planking, this is an excellent method for building accurate circular cross-section fuselages, especially when strengthened with glass cloth.

Model Data

- **Weights:** fuselage with wing mount and radio, 847g; wings, 753g; tailplanes, 59g; battery, 229g; total weight with battery, 1888g. Incidentally, the original without motor was about 1500g.
- **Areas, Loadings, Centre of Gravity:** wing area 52dm²; total area, 60dm²; wing loading, 36.3g/dm²; area loading, 31.5g/dm²; centre of gravity, 78mm back from root leading edge.

Suppliers

- **eBay:** carbon fibre fuselage tube and other carbon fibre items, titanium, glass cloth.
- **SLEC:** wood (of course!), Eze-Kote.
- **Hobby King:** batteries, motor, covering film, servos, air brakes, paint and varnish.
- **RCLife:** radio gear.

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A Great Little Sander

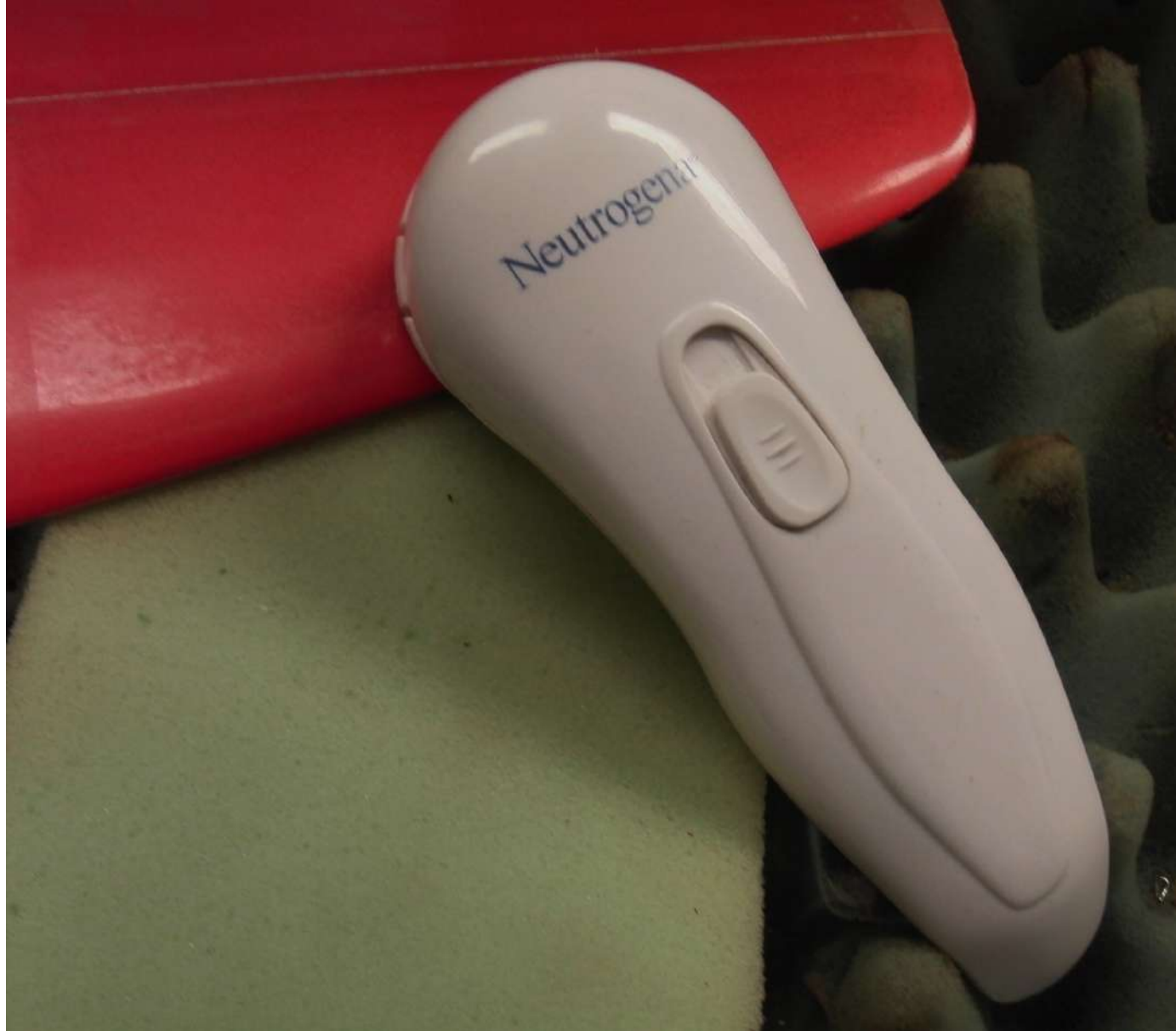
Improve the look of your skin by reducing wrinkles AND shape that wing tip block.

[Tom Broeski](#)



The Neutrogena® Healthy Skin Rejuvenator — “the anti-aging power treatment”. It sands your face.

There are times when my orbital sander is too big, or hand sanding too difficult. Here’s a little sander that I use in that situation. Mostly to sand and polish old clock crystals, my small wooden clocks, and small plastic parts. However, it is great for lots of things. It is especially useful for sanding balsa that is hard to hold or you only want to take off a tiny bit.





Left: It is battery operated has two speeds and really vibrates well. **Right:** It is hook and loop and comes with some fine face sanding pads.

Use it as shown above to reduce wrinkles for a younger looking you. Then shape that wing tip block as shown below.





Left: I just cut out some various grit disks and work down to whatever microns I need.

Right: Here's a craft punch I use to punch out the disks.

By laying small parts on sponge foam, I can sand pieces that would be near impossible to hand sand.





Left: Sanding a thin piece of balsa. **Right:** Very thin piece of walnut burl veneer. Nice smooth back for gluing in an inlay.

All photos are by the author. Read the [next article](#) in this issue, return to the [previous article](#) in this issue or go to the [table of contents](#). A PDF version of this article, or the entire issue, is available [upon request](#).

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5部。

[Norimichi Kawakami](#)



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4部](#) を読むことをお勧めします。

製作その16 エレベータ操縦系統

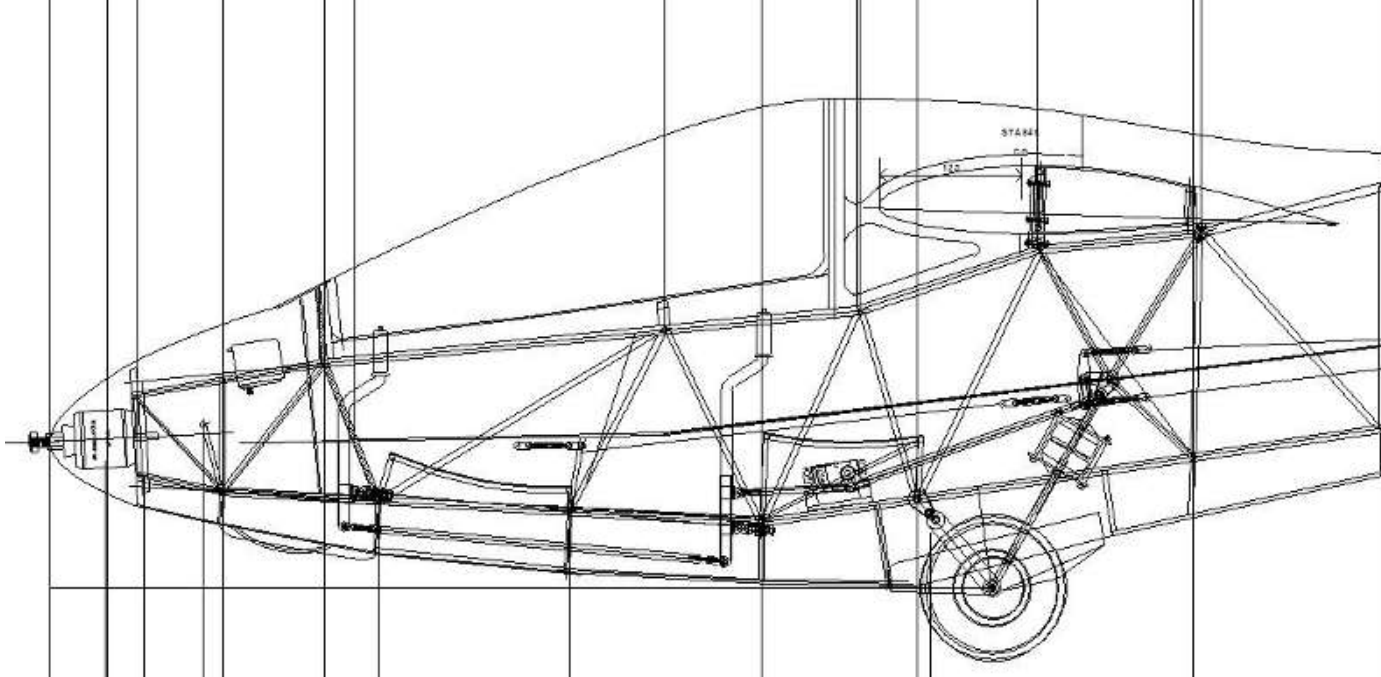
操縦桿ジンバル機構が出来上がったのでこれに繋がるエレベータ操縦系統を製作しました。製作過程で操縦桿ジンバル

システムに設計ミスがあることが発覚しました。その改修を行って、エレベータ操縦系統を製作しました。

エレベータ操縦系統の概要

実機のエレベータ操縦系統は、後席操縦桿のジンバルより上に取り付けられたヒンジから伸びるプッシュプルロッドが、後席の下を通して主脚を取り付けている台形トラス構造に取り付けられたベルクランクに接続され、そのベルクランクの両端から2本のワイヤーが伸びて、水平尾翼下のベルクランクに繋がります。両ベルクランク間を繋ぐワイヤーは構造上クロスさせています。つまり、前側ベルクランクの上部から伸びるワイヤーは後側ベルクランクの下部に繋がれ、前側ベルクランク下部から伸びるワイヤーは後側ベルクランクの上部に接続します。水平尾翼下のベルクランクからエレベータへの接続は、図面14と画像40に見る通りです。

後席の下を通るプッシュプルロッドは取付上の理由で、図面25の如く屈折しています。そこで、1/3模型では屈折部でロッドを2分して、間にサーボを入れることでエレベータと操縦桿の両者を動かす機構にしました。図面26がその図面です。



図面26 エレベータ操縦系統

この図面に基づいてエレベータ操縦系統を作っている過程で、ジンバル機構の設計ミスが発覚しました。

失敗その8 ジンバル機構の設計ミス

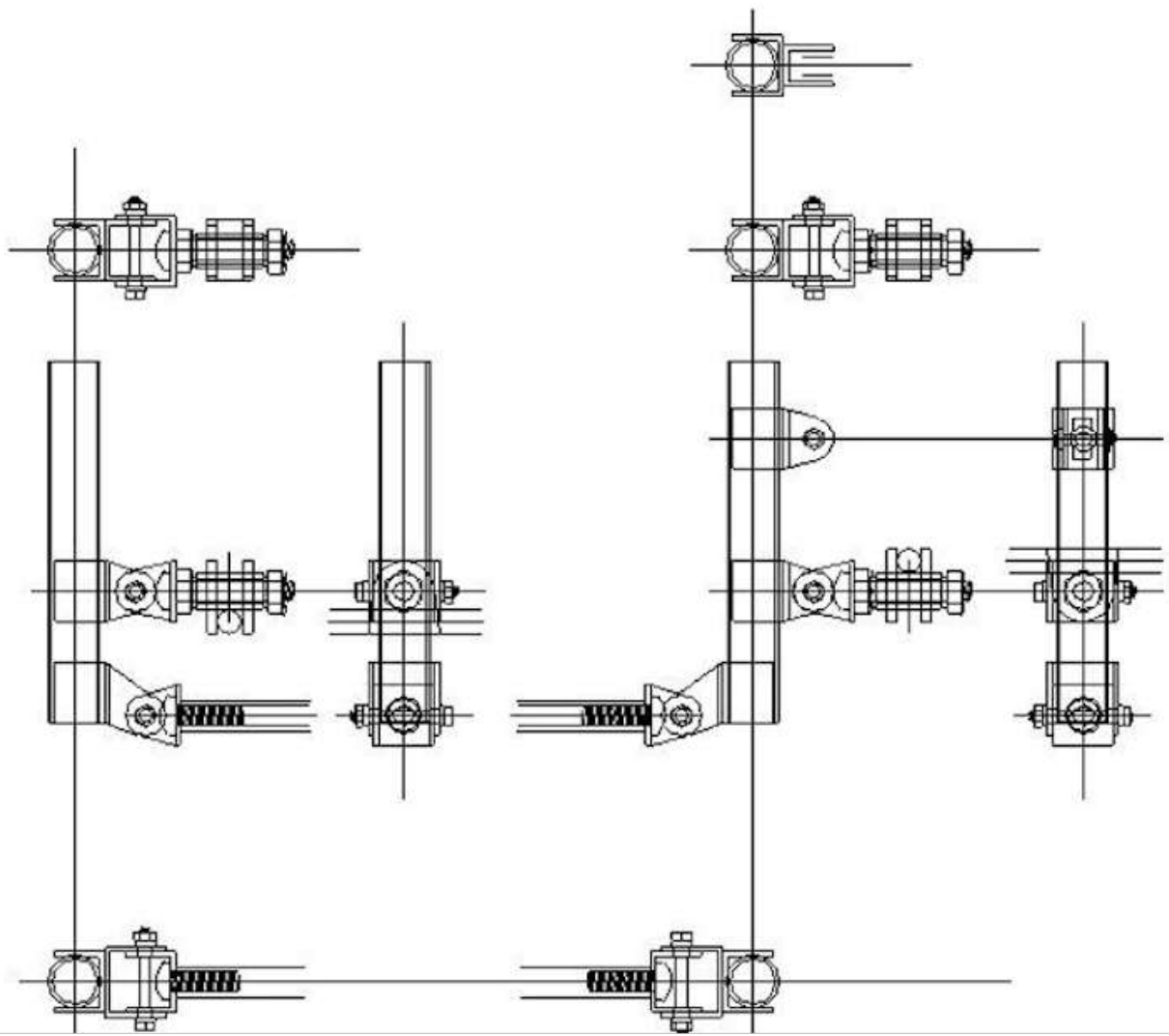
ミスは2か所ありました。一つは後席ジンバルの上に取り付けたプッシュプルロッドのロッドエンドの形式です。これはベアリング入りの回転型ロッドエンドにしていました。側面図ばかりに目がいていたのでこのようなロッドエンドで良いと思い込んでいましたが、プッシュプルロッドはエルロン操作に伴って左右にも振れます。しかしロッドの他端はサーボに取りつきますので、左右には動きようがありません。即ち、プッシュプルロッドの両端に取り付けるロッドエンドはそのような動きを許すために、スフェリカルベアリング形式でなければなりません。設計変更して、RCヘリコプターの操縦系統に用いる球面ベアリング入りロッドエンドに交換しました。

二つ目のミスは、前後席のジンバルを繋ぐ連結棒の取付機構です。ジンバルと連結棒の取付け剛性が不足して、エルロン操作で前後席の操縦桿の傾きに大きな差が発生してしまうことが判明しました。

通常のタンデム式操縦桿では前後席のエルロン軸が一本で繋がっており、それがトルクチューブとしてエルロン操舵力を伝えていますので、前後席の操縦桿はエルロン方向の操作に十分な剛性があります。しかし、本機の前後操縦桿のエルロン軸は繋がっていません。そのため、本来はエレベータ操作を連動させる連結棒がエルロン操作を連動させる役割も担っています。そのためには連結棒とジンバルの結合は左右方向に十分な剛性を持つ必要がありますのに、単純なロッドエンドで繋いだために剛性が不足してしまいました。改めて、実機のこの部分を調べてみると、画像81のようにかなりゴツイ金具で繋がれていることが判りました。

ジンバル改修

以上を踏まえてジンバルの改修図面を書きました。



図面27 改修ジンバル機構図

連結軸との結合部は実機同様の構造にしました。図面に基づいて改修したジンバルが画像87です。



画像87 改修後のジンバル機構

エレベータ操縦系統の取付

ジンバル機構の改修が済んだので、続いてエレベータ操縦系統も組み込みました。画像88がサーボと前側ベルクランクの連結状況です。



画像88 エレベータサーボと前側ベルクランク

次いで、画像89が前側ベルクランク部の拡大写真です。写真のピントがボケてしまいましたが、ベルクランクにはワイヤーの張力調整用にターンバックルを取り付けました。このターンバックルはミニ旋盤をお持ちのクラブ仲間に太さ5mmの真鍮棒から作ってもらいました。



画像89 前側ベルクランク拡大写真

画像90は胴体の中を後方向に見た写真です。





画像90 胴体内部を後方向に見る

後胴の中ほどに木製ステーが取り付けられていますが、これはクロスするワイヤーが互いに擦れ合うことを避ける為と、ワイヤーが振動で暴れることを防止するもので、実機にも同様なものが付いています。

最後に、後部ベルクランク部分の詳細です。



画像91 後部ベルクランク

未だワイヤーは仮留め状態です。

その17 中央翼プランクと翼胴結合金具

2018年の10月末、大分涼しくなってきたので屋外でのバルサのサンディングができるようになりました。そこで、夏前から放置してあった中央翼のプランク作業を行いました。併せて翼胴結合金具も製作しました。

中央翼のプランク

プラंकは2mm厚バルサ板で行います。中央翼は前縁から後桁の間が完全にプラंकされて翼型形状を確保すると共に、後桁ウェブと一体となってD型スパーを形成して翼の捩じり剛性を確保する役割を担います。前縁から後桁までの距離は翼上面で約280mmあります。通常バルサ板は80mm幅にカットされて販売されていますので、板4枚を繋ぎ合わせる必要があります。このバルサ板の繋ぎ合わせ作業は意外に面倒です。もう少し幅広の板が無いかと探したらワールドモデルズで販売している板が95mm幅であることが判りそれを購入しました。これならば3枚繋ぎで済みます。長さ900mmのバルサ3枚を繋いだ板を4枚用意しました。その板の表面になる側を軽くサンディングして凹凸を無くします。

まず下面のプラंकから開始しました。作業は中央翼組立治具の上に接着防止用の薄いポリエチレンシートを敷き、その上にプラंक用板を置いて上からリブ組立を載せて押さえつけ、低粘度瞬間接着剤を要所に垂らして留める、という要領です。リブと組立治具は元々一体であったものを切出していますから、2mmのプラंक材を挟んでもかなりシックリと合います。

接着が完了したら治具から降ろして、スポイラー部分を内側から切り取ります。この状態で、エルロンサーボ用の延長コードを組み込みます。コードは前縁付近を走らせて、少しでもテールヘビーになることを避けます。画像92は下側プラंकが完了した左側中央翼です。



画像92 下側プランクが完了した左側中央翼

続いて上側プランクです。上側スポイラー溝はプランク後に内側から切り取ることができないので予め慎重に位置合わせをして切り取っておきます（画像93）。



画像93 上側プランク材の位置合わせ

次いで厚板に載せた組立治具に翼を置いて、リブや桁、縦通

材にタイトボンドを塗っていきます。上側プランクは手が入らないので瞬間接着剤が使いません。タイトボンドの塗り残しが無いことを確認した上で、プランク材を慎重に位置確認した上で被せます。その上からヒノキの細棒を数本被せて、ゴムひもを厚板の側方に打ち付けてある釘に引っ掛けて組立治具ごと押さえつけます。



画像94 中央翼の上側プランク

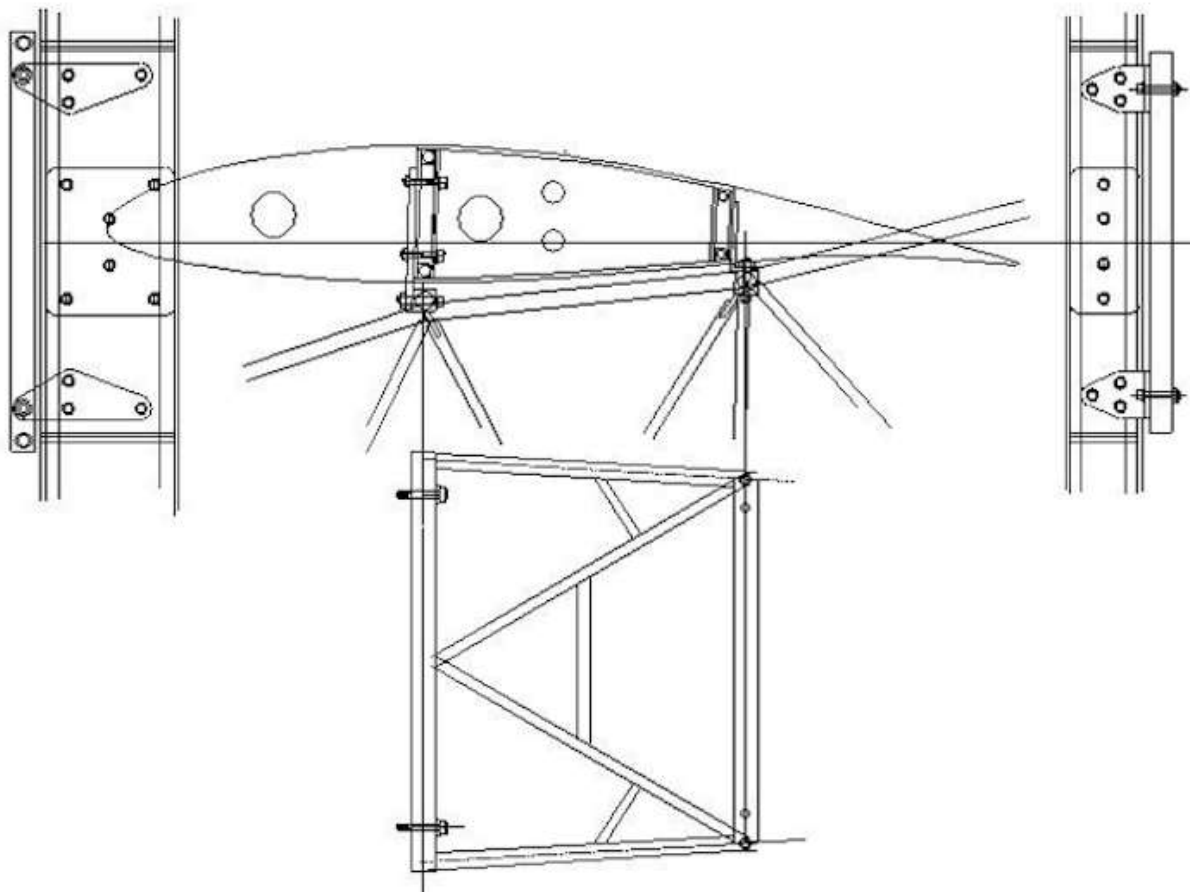
これでプランク材がリブや桁にしっかり密着することを期待している訳です。プランクが完了したら、幅15mmの細い棒を4mm厚のバルサ板から切出して前縁に貼ります。接着剤が乾燥したらサンディングして前縁形状を整形しました。

このようにしてプランク作業が完了しましたが以後注意すべきことが判りました。今回の1/3模型は流石に大きく、上側プランクの為に塗るタイトボンドの塗布範囲も可也の長さになります。タイトボンドは速乾性がうたい文句で、塗布後5

分以内に部材を密着させるように説明書に書かれています
が、中央翼の片側上面を塗布するだけで、5分を若干オー
バーしてしまいました。そのため、塗布したタイトボンドの
表面が乾燥を始めようとしているギリギリの状況でした。今
後の外翼では、もっと広い範囲のプラंकになりますからプ
ラंक板を二分して、作業を分ける必要があります。

翼胴結合金具の製作

続いて中央翼を胴体に取り付ける金具の製作に取り掛かりま
した。その部分の図面です。



図面28 翼胴結合部図面

前桁から下に伸びる金具が、胴体左右に走る梁から前方に突
き出した2本のボルトに取り付けられることは実機と同じで

す。しかし後桁と胴体の結合金具は実機と異なります。実機は画像95のような金具で結合されています。



画像95 実機の後桁と胴体の結合金具

この金具の製作にはフライス盤が必要ですが金属加工の得意なクラブ仲間もミニ旋盤しか持っていません。そこで、ホームセンターで手に入るアルミのL型チャネルで製作する構造に変わりました。

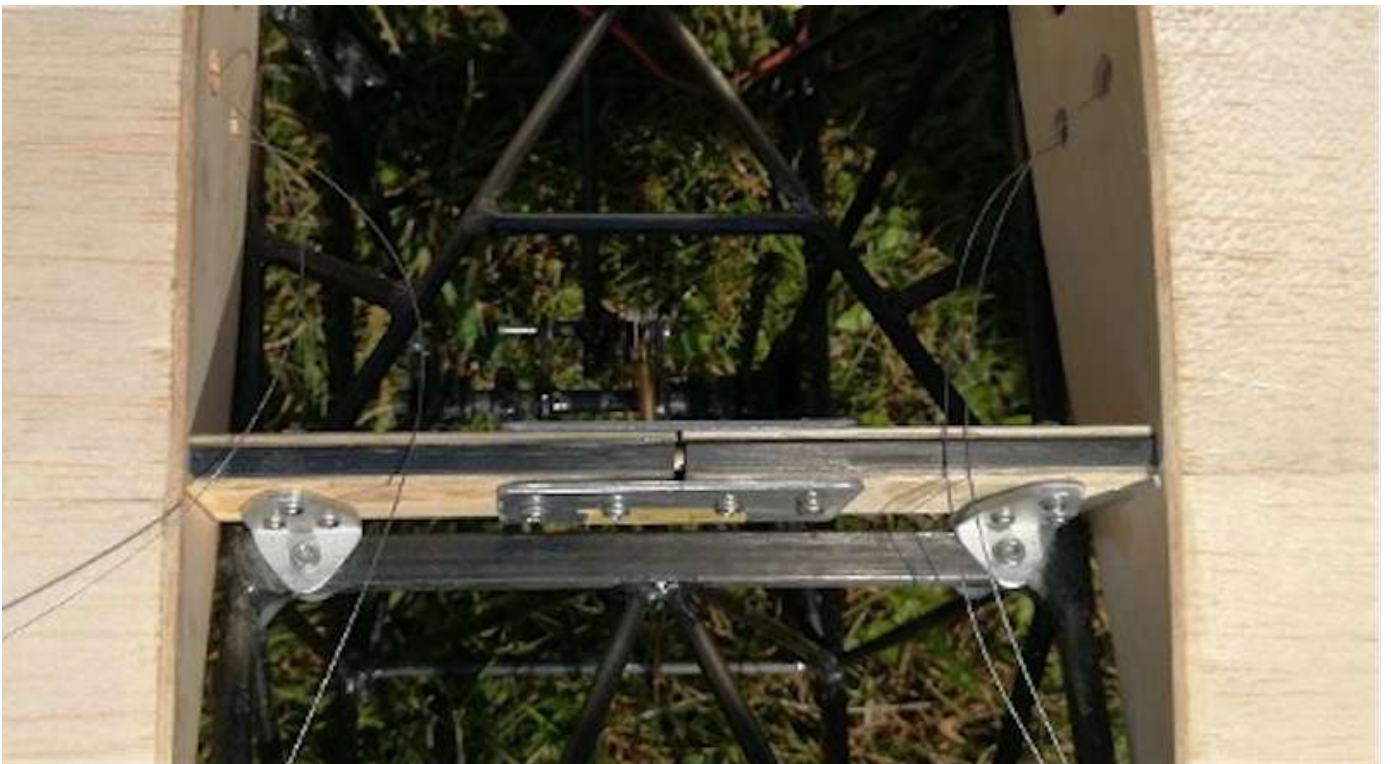
画像96が製作した金具です。



画像96 翼胴結合金具 上＝前側 下＝後側

前側金具は廃棄したラジコン固定翼の主脚に使われていた3mm厚の硬質アルミから切出し、後側は2mm厚L型チャネルから切出しました。

これらの金具をまず胴体に取り付けてから、中央翼を載せて取付位置を求めました。画像97は最終的に金具で胴体と中央翼を結合した状況です。



画像97 翼胴結合テスト 左=前側 右=

実は金具製作後この状態に達するまでが少々大変でした。最初は前側金具で翼胴を結合した状態で主翼と胴体の直角度を測ってみました。中央翼の翼端と胴体最後方の間に糸を張ってその長さを左右で比較する方法です。その結果は右側の糸

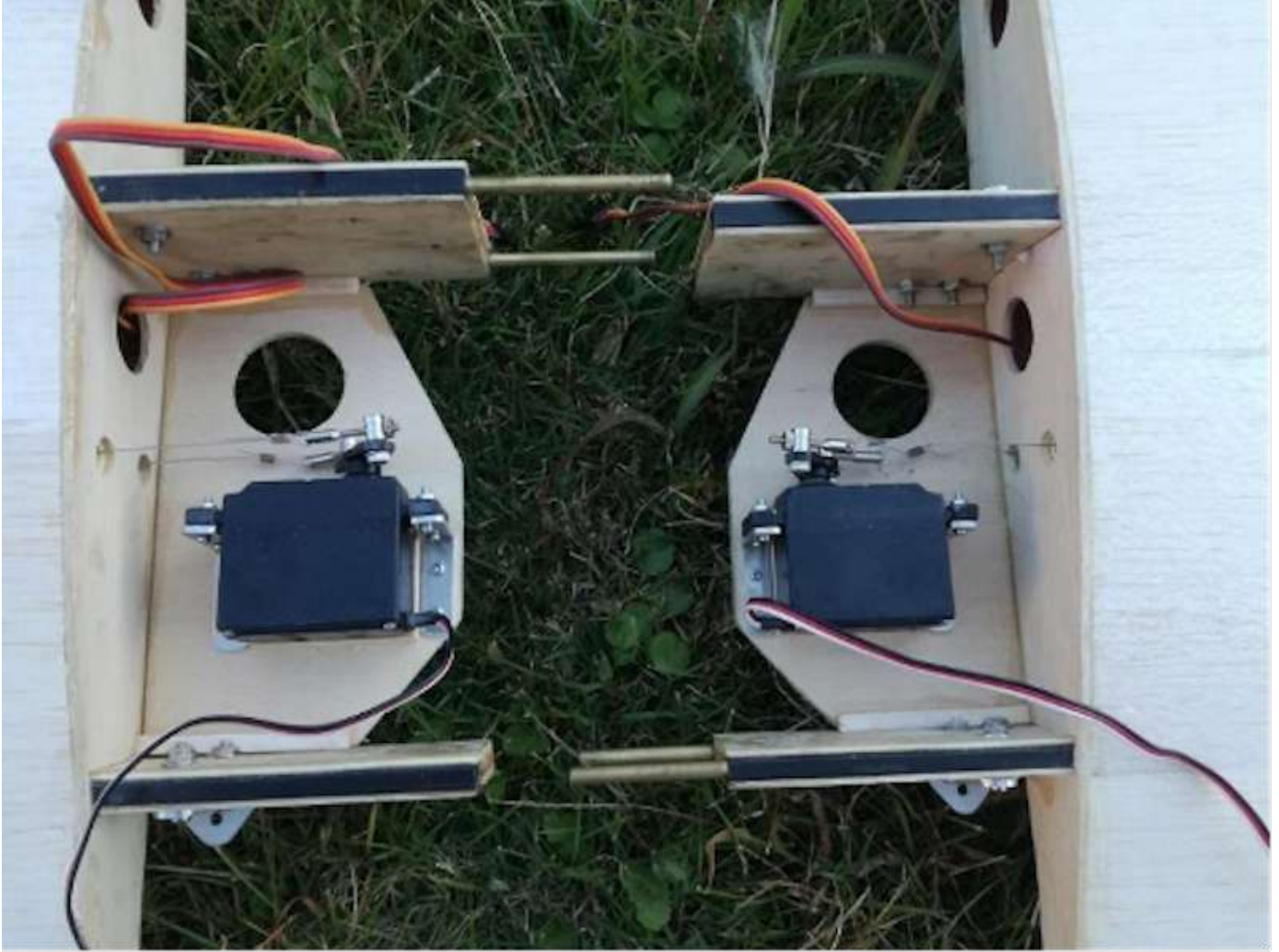
が左側より13mm程長いことが判明しました。つまり、主翼が胴体に対して若干左向きに取りついていることになります。

その原因は前桁を取り付ける胴体側の横梁が機軸に対して若干左向きになっている為と思われます。実はこの梁を取り付けるときにその直角度確保が極めて難しかったのです。胴体は上から見て後方にテーパーしていますので機軸が判りません。胴体組立治具の底面には機軸を示す図面を貼りつけてありますが横梁との間は200mm程の空間がありますので、横梁位置での正確な機軸が大変分かり難かった訳です。このため横梁が若干斜めに取り付いてしまったものと思われます。この不具合を修正するために、前右側取付金具と中央翼桁ウエブの間に0.5mmのシムを噛ませました。その結果主翼は胴体に直角に取りつきました。

次いで、前側を結合した状態で後側金具を取り付けてみると、左側はピッタリ合うのですが、右側金具と後桁ウエブの間が0.5mm程開いてしまいました。前側金具にシムを噛ませた影響です。仕方なくここにも0.5mmのシムを挟みました。

スプイラーサーボ取付と調整

中央翼が胴体に取りつくことができましたので、中央翼にスプイラーサーボを取り付けました。



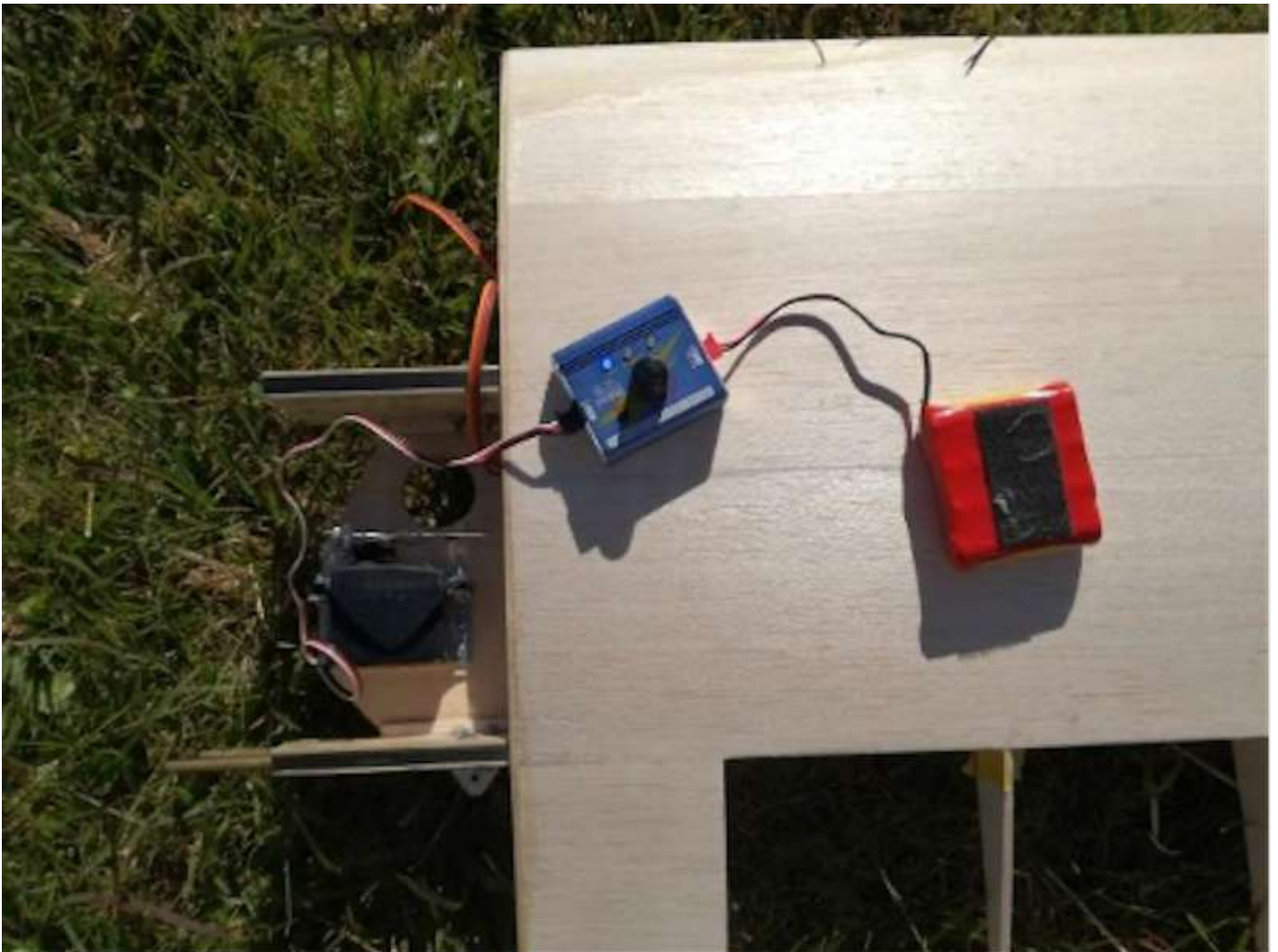
画像98 取り付けたスポイラーサーボ

スポイラー作動用ワイヤーとサーボが接続できましたので、スポイラーの調整を行いました。スポイラーの上面にはバルサの細板を貼りつけてあります。このバルサ細板は翼表面より多少飛び出して取り付けてありますので、スポイラー閉状態で翼表面に一致するように削る訳ですが、サーボの作動位置との兼ね合いを微妙に調整する必要があります。

スポイラー閉方向にサーボを作動していくとある位置でサーボがジッターを生じます。ジーと言う音を発生してサーボが小刻みに動く状態です。これはスポイラーが閉まっているのに更に閉めようとサーボが働いているためです。リミットスイッチが付いていない本機のようなスポイラー形式では必ず

発生します。

この状態では無用な電力を消費しますしサーボにも良くありません。また、下手をするとワイヤーが切れる恐れもあります。そこで、画像99のようにサーボテスターを取り付けて、サーボがジッターを起こす直前の位置を探します。その位置がスポイラー全閉位置になりますので、その状態でスポイラー表面が翼表面と一致するように上面に貼りつけたバルサを削って調節しました。これで画像100に示すようにスポイラー閉状態で平滑な翼表面になりました。



画像99 サーボテスターでスポイラーサーボ調整



画像100 スポイラー閉状態

次いでサーボテスターのつまみを反対方向に回してスポイラー開の状態を確認しました。





画像101 スポイラー開状態の確認 左＝上側 右＝下側

この時点ではこれで上手くいったと思っていたのですが、実はこのスポイラー飛び出し量が失敗3に記したように少な過ぎた訳です。

木地完成した中央翼

このようにして中央翼が完成しました。残すはカバーリングのみです。



画像102 木地完成した中央翼

因みに左が717g、右が737gです。右側が左側より20g重くなっていました。プランク材の重量ばらつきと、カンザシ受けのアルミチューブ周りに大量に塗ったエポキシ樹脂の使用量差が原因と思われます。

性能予測

目標重量の決め方の不備で計画より大幅な重量増加が避けられない事態になりました。それに伴って、グライダーとしての性能がどの程度変化するのかが気になります。そこで1/3三田式の飛行性能の予測計算を行いました。併せて、手持ちの1/5三田式との性能比較も行いました。

性能推算方法

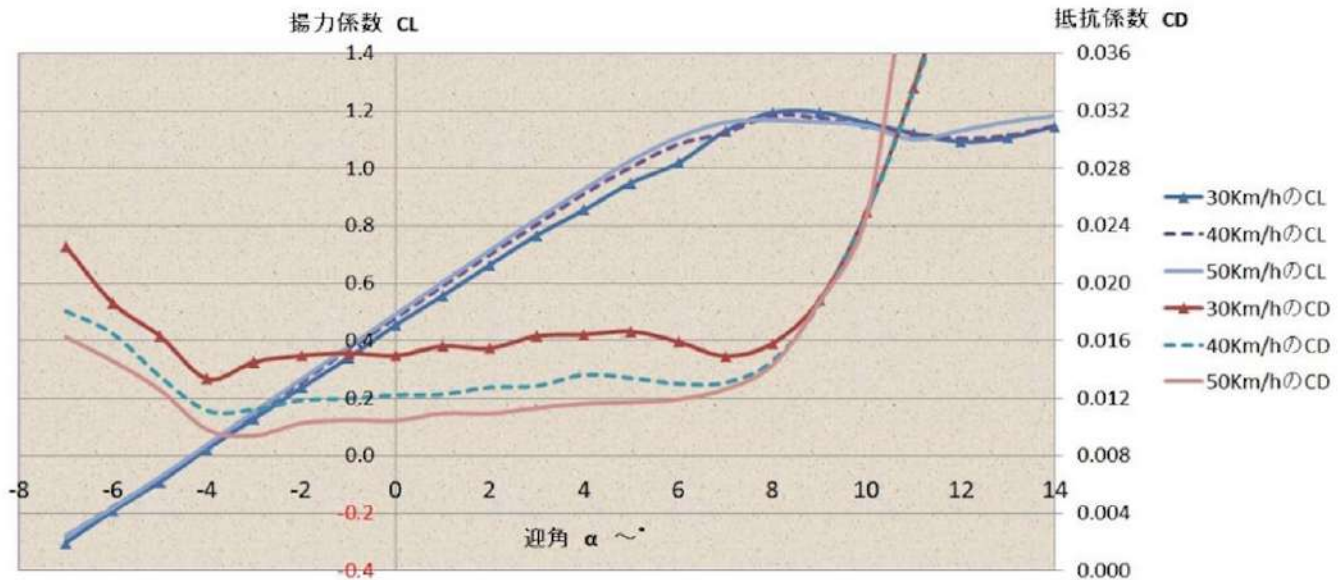
性能推算は東京大学出版会発行の加藤寛一郎 他「航空機力学入門」を参考に航空機の縦の釣合計算式をEXCELに記述して行いました。即ち、指定した速度で主翼、尾翼、胴体に働く空気力（揚力、抗力、ピッチングモーメント）が重心位置で重力と釣合うまで、降下角度と機体姿勢角およびエレベータ舵角を変化させて繰り返し計算しました。

翼型の空力特性

今回の性能推算で注意したのは翼型の空力特性（揚力特性、抗力特性およびモーメント特性）です。通常の航空機の性能計算では翼型の空力特性は無次元化した揚力係数 C_L 、抗力係数 C_D およびモーメント係数 C_M が飛行速度で変化しないとして計算します。しかし、基本構想その4で検討したように、本模型のサイズと飛行速度範囲では主翼翼型の空力特性がレイノルズ数 Re によって大きく変化する領域にあります。そこで、今回の性能計算では主翼翼型の空力特性を飛行速度に対応した Re 毎に与えてレイノルズ効果を考慮した計算と

しました。因みに速度30Km/h、40Km/h、50Km/hでの本機のReはそれぞれ193,000、258,000、322,000ですが、それらの速度での主翼の揚力係数CL、抗力係数CDは下図のようになります。

1/3三田式3型改1 主翼空力特性の速度による変化

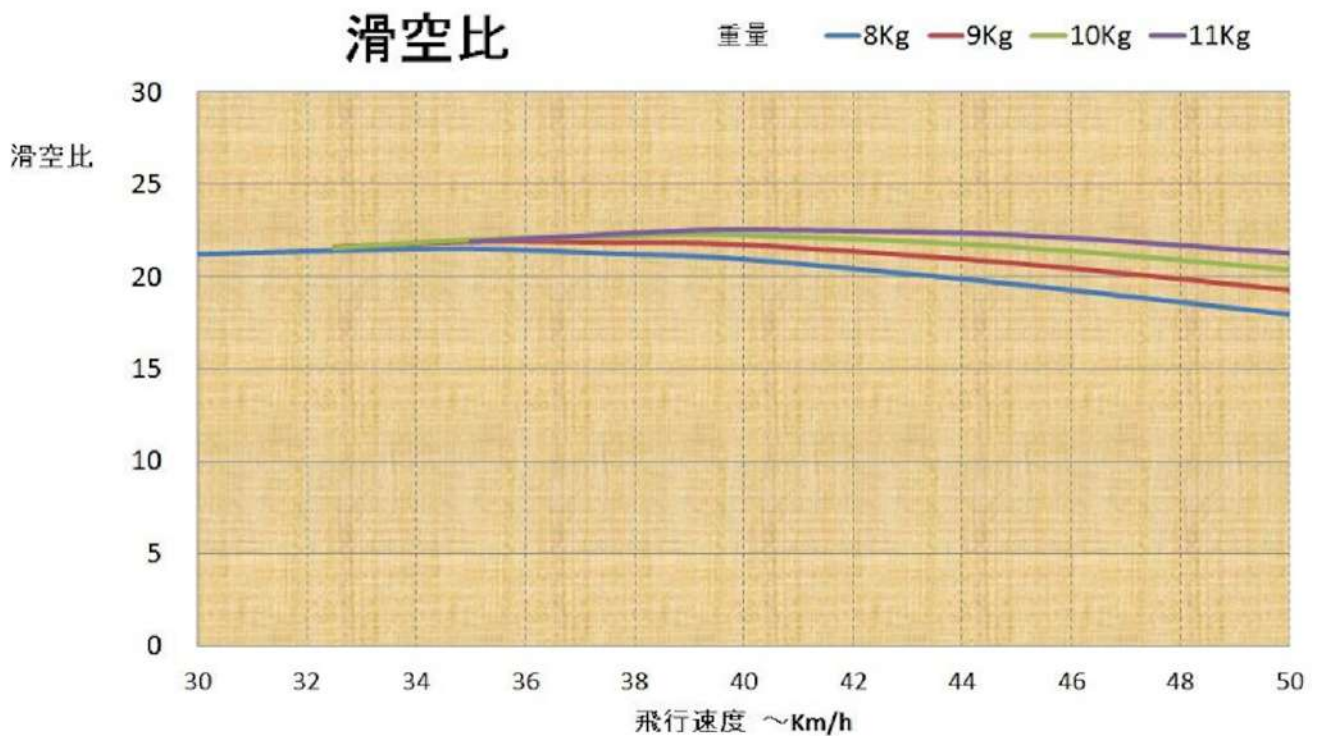


グラフ9 飛行速度による1/3模型の主翼翼型の空力特性変化

揚力係数には大きな変化がありませんが、抗力係数に大きな変化が認められます。速度が上がるほど、Reが上昇して係数が小さくなることが判ります。従ってグライダーとしての滑空性能も速度が上がるほど改善されます。因みに翼型の空力特性は米国マサチューセッツ工科大学（MIT）で開発されたソフトで、低レイノルズ数での翼型解析に定評のあるXFOILを内蔵したXFLR5を用いて計算しました。事前に低Reでの風洞試験データと計算値を比較して本ソフトの信頼性を確認しました。

1/3三田式の推定性能

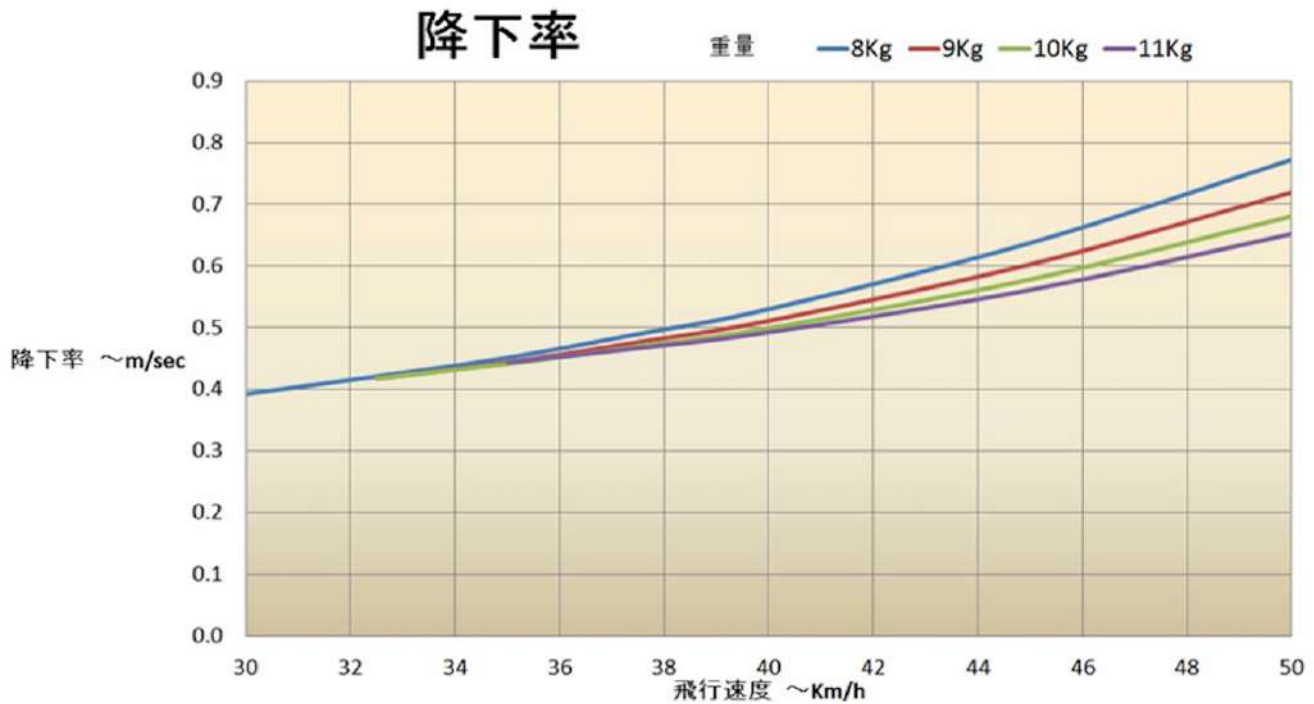
このような準備をして1/3三田式の性能を推算しました。まず、グライダーとして最も重要な滑空比の予測です



グラフ10 1/3三田式3型改1の予測滑空比

重量は8Kgから11Kgまで1Kg刻みで計算しました。最大滑空比は22を若干超える予想です。重量が増えるほど最大滑空比も増えますが、最大滑空比が得られる速度も増加します。通常のグライダーの滑空比は最良滑空比速度を超えるともっと急速に落ち込みますが、本機では速度増加に伴うRe効果で落ち込みが緩やかなことが判ります。従って比較的広い速度範囲で良好な滑空比が得られそうです。

次は降下率（沈下率）です。



グラフ11 1/3三田式3型改1の予測降下率

降下率は低速ほど軽量なほど小さな値になります。重量8Kgの時の最少降下率は時速30Kmで飛行した時に得られて、その値は毎秒40cmを切りそうです。重量ごとのカーブの始まる最少速度が異なっていますが、それより左側の低速域では失速して飛べないからです。最小降下率は軽量なほど小さくなり所謂「浮きが良い機体」になりますが、重量が10Kgになっても毎秒50 cmを切れそうです。

最小沈下率速度は失速限界付近にあるためスケール機を安心して飛ばすにはもう少し速度を上げる必要があります。面白いことに、失速を起こさない速度域では重量が重いほど降下率が小さいということです。従って重量増加にそれ程神経質にならなくて良さそうです。

重量が重いほど降下率が小さくなる理由は、グライダーの降下中の飛行に必要なパワーが機体のポテンシャルエネルギー

（位置エネルギー）の減少によって補われることから生じる現象です。

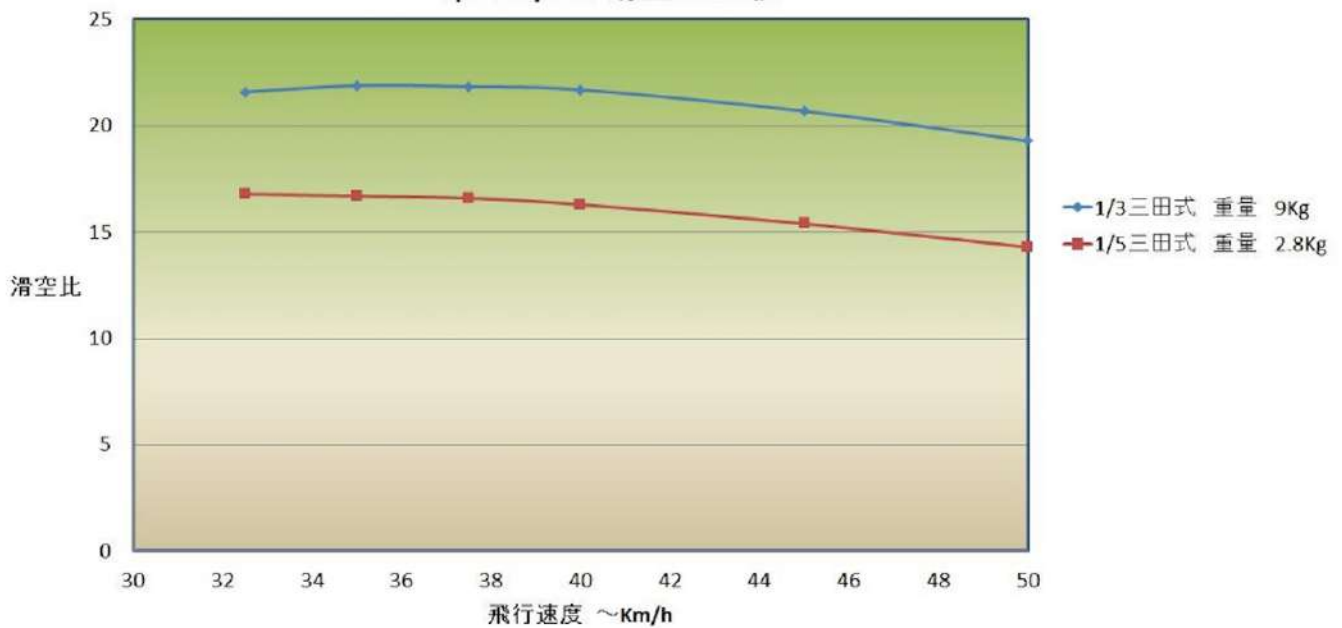
即ち、ポテンシャルエネルギーの減少は機体重量と降下率の積で与えられますから、同一降下率ならば重たい方が大きなパワーが得られます。一方、降下中の飛行に必要なパワーは重量によってそれ程大きな違いは在りません。その理由は、飛行に必要なパワーは機体形状から生じる空気抵抗（形状抵抗）と、揚力を発生することで生じる抵抗（誘導抵抗）の2つの抵抗が消費するパワーですが、これらの抵抗が重量によって殆ど変化しないからです。

何故なら、形状抵抗はグラフ9に示した翼型の抵抗特性で明らかのように、重量増加で迎角が多少増えても抵抗増加は微々たるものです。誘導抵抗は重たい程大きいのですが、速度が上がると指数関数的に減少するので、降下速度付近では非常に小さな値になるからです。そのために、重量増加による飛行に必要なパワーの増分に対して、重量増加によるポテンシャルエネルギーの増加の方が大きいので、結果として重たい方が降下率が少なくて済むことになります。

1/5三田式との比較

参考のために手持ちの1/5三田式の性能計算も行って1/3と比較しました。

1/3と1/5の滑空比比較

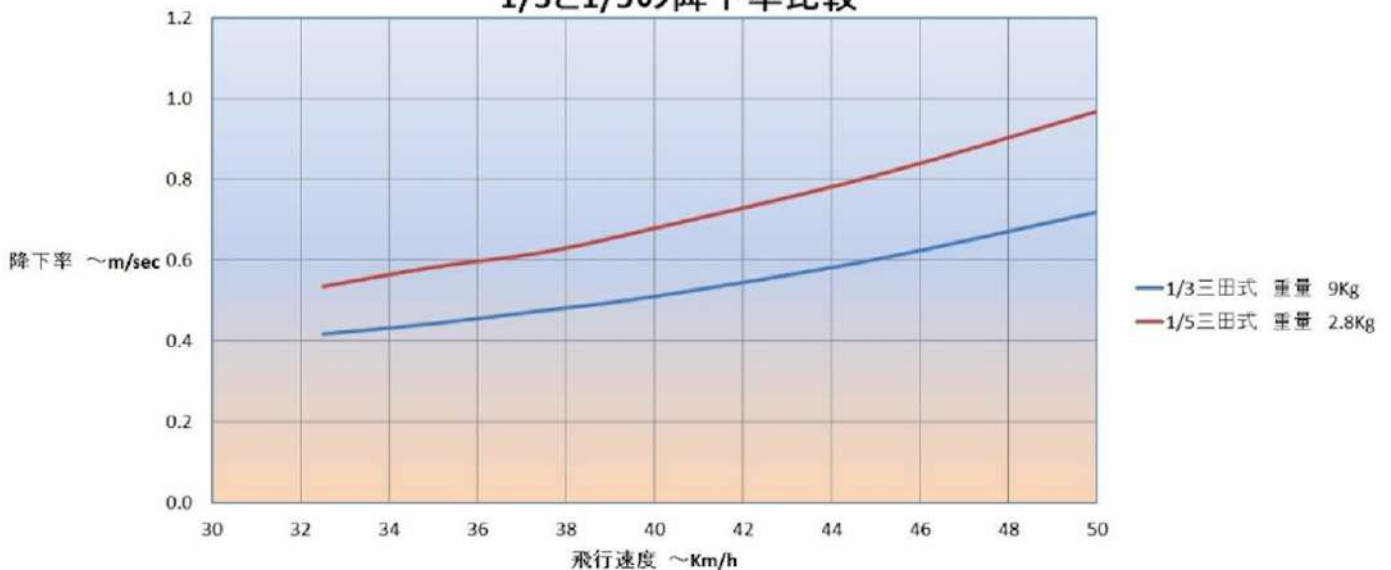


グラフ12 1/3と1/5の滑空比比較

滑空比の比較です。1/5の重量は約2.8Kgです。1/3は仮に9Kgとしました。1/5の最良滑空比は17程度しかありません。それでもグライドにそれほど不満を感じていませんが、1/3では30%程度改善されそう期待が持てます。

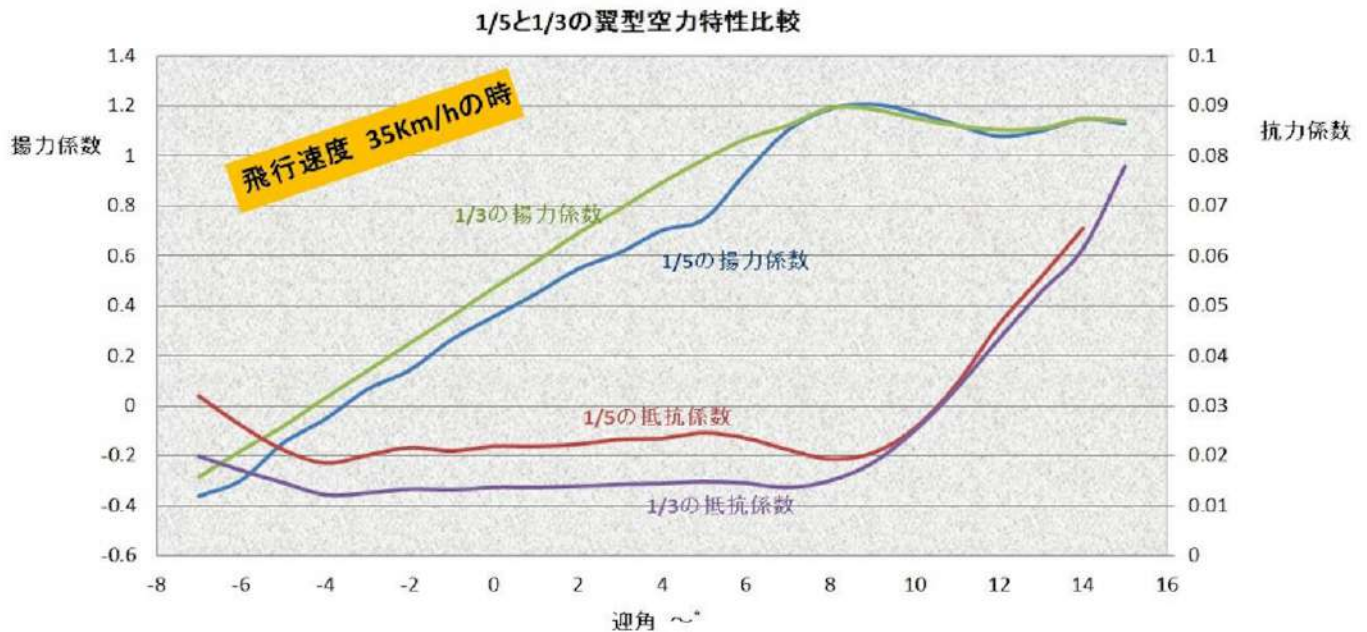
降下率も下のように改善されます。

1/3と1/5の降下率比較



グラフ13 1/3と1/5の降下率比較

これらの性能差の原因は1/3と1/5のレイノルズ数の相違による主翼の空力特性の違いです。飛行速度35Km/hでの両機の主翼の揚力係数と抗力係数を比較した下図を見れば一目瞭然です。



グラフ14 1/3と1/5の翼型空力特性比較

尚、実機はレイノルズ数が更に増えるので性能も模型より優れています。データによると最良滑空比は30.8ですが、その滑空比を与える飛行速度は80Km/hと、随分高速になりますし、最少降下率も72 cm/秒とのことです。翼面荷重が大きいのでこのような特性になります。

以上から、1/3の飛行性能は1/5よりかなり改善されて浮きの良い機体となり期待が持てそうです。また重量増加もそれほど気にする必要は無さそうです。

製作その18 外翼のプランク

中央翼のプラंकに続けて外翼のプラंकを行いました。

外翼下面のプラंक

外翼のリブ組は2018年8月初旬に完成していましたがプラंक作業はプラंक材のサンディングで大量のバルサ粉が飛びますので、暑く湿度の高い夏場を避けて11月まで放置していました。

まず左翼下面のプラंकから開始しました。下面プラंक板を切出す型紙を作って、それを用いてバルサ板から切出しました。次いで組立治具の上にポリエチレンシートを敷いてその上にプラंक板を置き、上からリブ組立を載せましたが、2.5mmのバルサ薄板製の治具は3か月の間にかなり反ってしまいましたので、プラंक板やリブ組立とシックリと合いません。色々変形させてどうやら落ち着いた所で、低粘度瞬間接着剤で一気に接着しました。しかしここで大きなミスを出かしてしまいました。

失敗その9 外翼の変形に気が付かずにプラंक

この時、3か月の放置期間中に生じたリブ組立の変形も良く確認しておくべきでしたが、治具の変形にばかり注意が行ってしまいました。下面プラंकが完了した時点で横から桁を通して眺めてみると、真直ぐであるべきカーボン製の桁フランジが僅かに湾曲しているではありませんか！



画像103 外翼桁の変形

リブ組立が完了した時点で撮影した写真は画像49に示すように桁が真直ぐに通っていました。瞬間接着剤を流す前にもう少し慎重に確認しておくべきと悔やまれましたが後の祭りです。最早修正のしようがありません。痛恨のミスです。



画像104 外翼後退程度の確認

気を取り直して、中央翼と接続して曲がった桁の影響程度を

確認しました（画像104）。本来は、中央翼と外翼の前縁は一直線ですが、外翼前縁が 0.57° 程後退角を持ってしまいました。スケール機としては大きな失敗ではありますが、救いは外翼は上反角を持っているので外翼前縁は殆どの場合、若干後退しているように見えます。このことは、前縁を真直ぐに通して製作できた1/5の写真（画像105）でも確認できます。つまり、見栄えとしては殆ど判らないであろうこと、更にこの程度の後退角は飛行特性に殆ど影響しないであろうと思われることと併せて、このままで行くことにしました。

上記の問題は右翼のプラंक前に発見できたので、左右対称とすべく、右翼は敢えて、わざと 0.57° の前縁後退角を付けてプラंकしました。

本来はリブ組立完了に続いて、間をあげずにプラंक作業も行っておくべきでした。

教訓5 翼の組立は一気にプラंक迄進めること。リブ組立のまま長期放置すると変形する。



画像105 外翼は常に後退して見える

エルロンヒンジの問題点発見

下面プラंकが完了した時点でエルロンを装着してみたたら、本来滑らかに接続しなければならない翼本体とエルロン下面との間に段差があることが見つかりました。しかもその段差がエルロンのスパン方向の位置によって差があり、最大で2mm程エルロンが上側に付きすぎていることが発覚しました。これでは折角のフリーズ型エルロンとしての機能も発揮できません。

失敗10 エルロン取付位置が不正確

原因は外翼後桁に付けたエルロンヒンジの位置が正確で無いためと思われます。このヒンジは桁に開けた穴に差し込んで止めたものですが図面位置通りに取り付かな

かったものと思われます。手作業で開けた取付穴に位置決め治具も使わずに取り付けてしまったことが原因と思われます。本来は下面プラंकが完了した時点で、エルロン下面との位置関係を慎重に確認してからヒンジを取り付けるべきでした。

仕方がないのでヒンジを取り外して再取付しましたが、ヒンジはカーボン製でシナベニア製の後桁ウエブとは瞬間接着剤でカッチリと接着したのでその取外しには大変苦勞しました。作業手順をしっかりと考えて工作しないとトンデモナイ目に遭う典型例となっていました。

苦勞して何とかヒンジ位置の修正を済ませエルロンサーボも取り付けて、上面プラंकに備えて上側ストリンガーも張りこめました。





画像106 下側プランクが完了した外翼

外翼上面のプランク

続いて上面のプランクに入りました。接着剤のタイトボンドの塗布後5分以内にプランク材を貼るために、中央翼プランクの経験から外翼上面はプランク板を2分割して別々に貼りました。そのために、分離位置のリブには同形のリブを貼ってプランク板の糊代が架かるようにしました。プランク板を貼ってから細いヒノキ棒とゴム紐で組立治具に抑え付ける工法は中央翼と同じです（画像94参照）。

ここまでは順調に作業が進んだのですが、中央翼と繋ぎ合わせてみて思わぬ不具合が見つかりました。下面プランクの際に外翼前縁が 0.57° 程後退角を持ってしまいましたが、その影響は中央翼に繋がる外翼最内端のリブが中央翼の最外端リブと並行では無いという形で現れました。下の写真のように両翼の前縁が約4mm程開いてしまいました。





画像107 中央翼と外翼の接続面が合わない!

これではいかにもみっともないないので修正しなければなりません。外翼は上反角を持っているために、この隙間を埋める作業は少々大変でした。2mmバルサを階段状に2枚貼りつけて、中央翼と繋ぎ合わせて様子をみながら慎重にヤスッテ何とか修正しました。同時に、貼ってあった前縁材も整形して翼形状として完成させました。（画像108）





画像108 修正した境界

上手な人がやれば隙間が見えないほどになるのですが、小生の工作技量ではこの程度で可としなければなりません。

エルロン及び翼端取付

プラंकが完了した外翼にエルロン前縁上部に覆い被さるリップを取り付けてからエルロンを装着して、その作動範囲を確保するようにリップの長さを調整しました。その後、翼端を取り付けて主翼コンターと翼端がスムーズに繋がるように、翼端を整形して外翼の木地を完成させました。



画像109 木地完成した外翼

主翼組立

外翼を既に完成している中央翼と繋いで一つの主翼に組立てて胴体に載せてみました。



画像110 木地完成の主/尾翼を胴体に搭載してみる

中央翼の真ん中のスポイラーサーボがある部分は、むき出し状態ではみっともないので、実機と同じような翼カバーを被せました。

だんだん航空機の形状が現れてきてテンションが上がります。

第7次重量重心計算

中央翼と外翼の木地が完成して前胴と後胴も繋がったので重量重心を再計算しました。中央翼は現状で1,715gです。残作業はカバーリング190gと塗装30gと見込めます。外翼は左が818g、右が833gで、残作業はカウンターウエイト搭載とカバーリング&塗装で、左右それぞれに155g、154gを見込みます。胴体は完成済が1,340g、残作業として上下左右への張出構造に264g、モーターマウント50g、ラダーサーボ系統70g、機首フェアリング324g、キャノピー550g、カバーリング75g、塗装70g、その他50gで合計1,453gと見込みます。これらを元に重量重心計算表を改定すると次のようになります。

7次重量重心	2018/11/25	実績率		59.21	%		
	予想重量	STA	モーメント	実績重量	残作業予想重量	目標重量	△(予-目)
左外翼	973	890	865,970	818	155	700	273
右外翼	987	890	878,430	833	154	700	287
中央翼	1,935	890	1,722,150	1,715	220	1,720	215
胴体	2,793	869	2,427,117	1,340	1,453	2,160	633
垂直尾翼	212	2,450	519,400	172	40	240	-28
水平尾翼	378	2,270	858,060	266	70	400	-22
モーター	418	43	17,974	0		361	57
プロペラ&ハブ	50	-10	-500	0		50	0
受信機用電池	155	200	31,000	0		155	0
LiPo	600	340	204,000	0		600	0
その他搭載物	186	250	46,500	0		634	-448
合計	8,687	871	7,570,101	5,144	2,092	7,720	967
目標重心位置		846					
追加Weight	322	160	51,522			0	322
ノーマル飛行状態	9,009	846	7,621,623			7,720	1,289

1/3三田式3型改1重量管理表



表8 第7次重量重心計算

合計8,687g、重心合わせの錘322 g と併せて総計9,009gと見込まれます。先に予想したように主翼と胴体重量の目標値が小さすぎました。実績率は59.2%に達し今後は余り軽量化余地がありません。

[次の記事を読む](#) | [前の記事を読む](#) | [目次](#) | この記事または他の記事のPDFをご希望の場合、または問題全体のPDFをご希望の場合は、お問い合わせください。

The Trailing Edge

Wrapping up the impromptu 'Memories' issue and turning once again to the future.

[The NEW RC Soaring Digest Staff](#)



A magnificent sunset photo of a 1/4-scale Rhönbussard taken at Oltingen, Switzerland by Andreas Skaletzka. Use of this photo facilitated by the tireless efforts of Peter Simon, the owner and pilot of this gorgeous aircraft. Read more about it's fascinating provenance below.

No sooner than it got under way, the August issue is now over. We hope you enjoyed our informal trip down memory lane and, once again, we encourage you to record your own memories along these same lines and have them featured in a future issue of RCSD. Thank you, so much, to all those who

contributed such great stories. We simply could not do this without you. Finally thank you, the reader, for eagerly gobbling up each issue that we somehow manage to cobble together each month.

As you likely know by now, *The Trailing Edge* is where we feature just one photo each month that captures that wonderful, end-of-day feeling when all is well with the world. Even if we do say so, we think we have outdone ourselves this month, which features Peter Simon's gorgeous *Rhönbussard* at sunset overlooking Oltingen, Switzerland. The beautiful photo was taken by Andreas Skaletzka.

When asked about the aircraft, Peter provided a most intriguing answer: the builder was 'unknown'. The same was the case for the year of construction: also 'unknown'. Then all became clear when Peter said 'it was found in a barn in Bern, Switzerland in 2014'. Peter — who started flying models at 12 and continuously for the 44 years since then — brought the *Rhönbussard* back to life through what was an undoubtedly a very challenging project. But now it once again flies beautifully. This is such a fascinating project, Peter, and we really hope that you'll take the time to tell the whole story in the pages of RCSD at some point.

Thanks to both Andreas and Peter for enabling us to use this beautiful photo.

In The Store



This is the [April](#) edition of the becoming-more-famous-by-the-day and very collectible *RCSD Cover Photo T-Shirt*. It features Pierre Rondel (who again provided the cover *this* month) launching his *Shinto* at the Col des Faïsses in the French Alps. Or you can get the [January](#), [February](#) and/or [March](#) editions if you prefer. All proceeds go to keeping RCSD forever free. We ship worldwide.

Of course, readers will notice that we have at least four additional issues for which there is not yet a *Cover Photo T-Shirt*. That's nothing more than having too much on the go and not enough time to get through it all. But if you're super keen to be the first to add the May, June, July or August *Cover Photo T-Shirts* to your collection, please don't hesitate

to [let us know](#) and we'll make sure there is one in the store on a very tight turnaround.

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Trying to recruit talent for your electric aviation startup, green tech or even RC soaring-related company? There's no better audience for your onboarding message than RCSD readers. We're putting together our *Friends of RCSD* program that will help you promote your brand in a positive way and also help support your favourite RC soaring journal. If you feel it might be for you please [get in touch](#).

Don't Want to Miss Future Issues of RCSD?

If you don't want to miss the September 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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Read the [previous](#) article or go to the [table of contents](#). A PDF version of this article, or the entire issue, is available

upon request.