Radio Controlled

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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 comparitively 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 conciousness 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 decidely 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

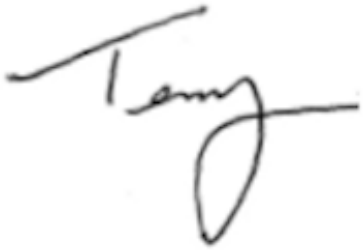
state-dependent learning going on in this particular issue of the *NEW RC Soaring Digest*. It might have even made sense to call it the *Memories* issue because it features at least a couple of stories of events that happened many years ago. My theory is that in the presence of all this RC soaring coverage 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 subconciously 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!



***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.

— JH

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 *Kloudblaster*. 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 overnighter in Budapest in '72' Captain Dave mused, ' it was strictly our sense of smell that led us directly to the wine cellar...'


NC24185
C4
NC24185

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 overnighter 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 ¼-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 diminutives 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 squirrelly. 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.


Fauvel
F-CBSM

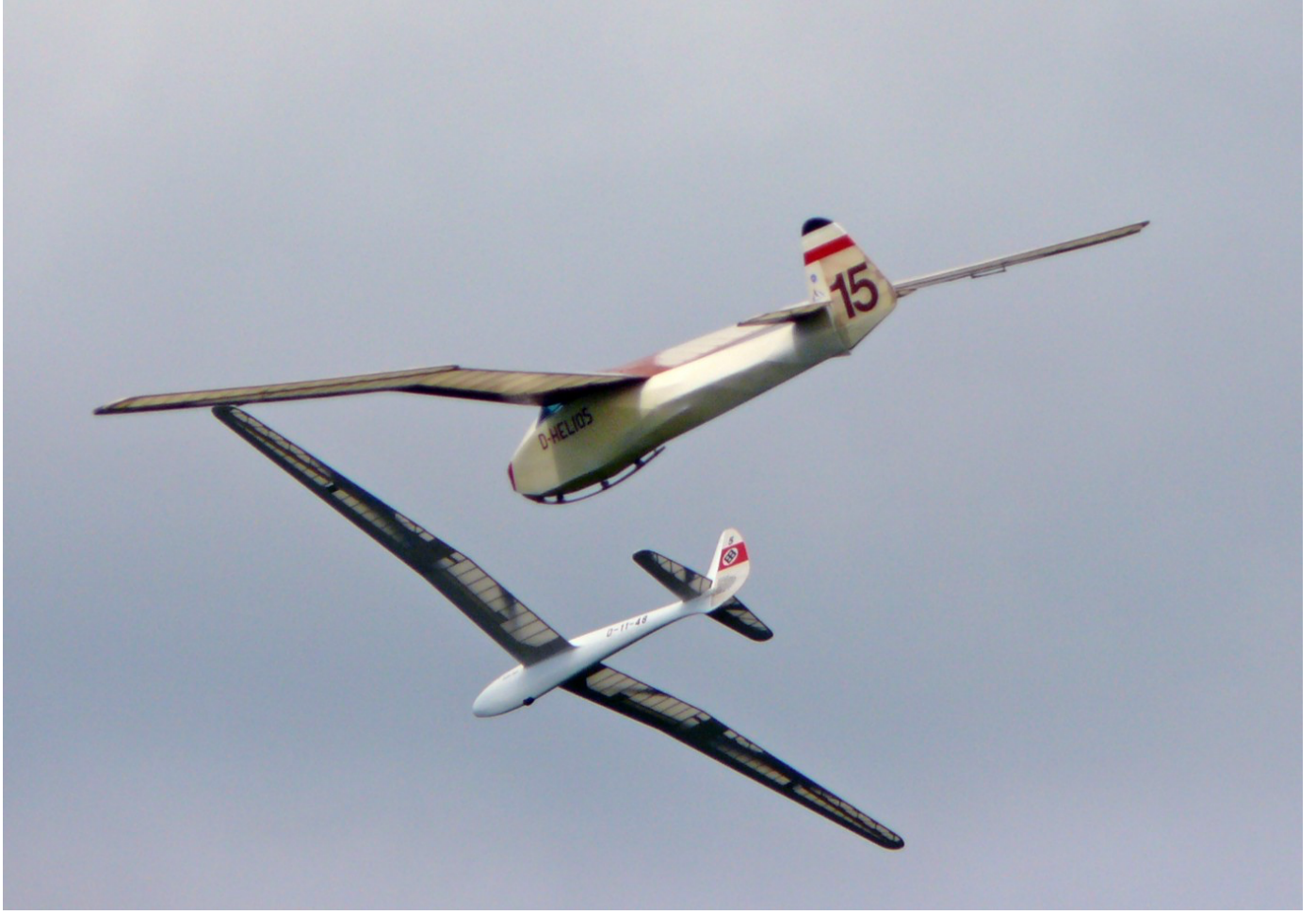
Left: Erwan Plu's extraordinary Waco nears Pegasus Bridge. **Centre**: The Fauvel AV36 gets the two man launch treatment. **Right**: A picture of absolute beauty: local hero Jean Claude Haller's lovely Wien.

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.

F-CD

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.


Rétroplane
Rétroplane
2007


Edouard
EDOU
CRÉMAN

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

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 650*s, 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.

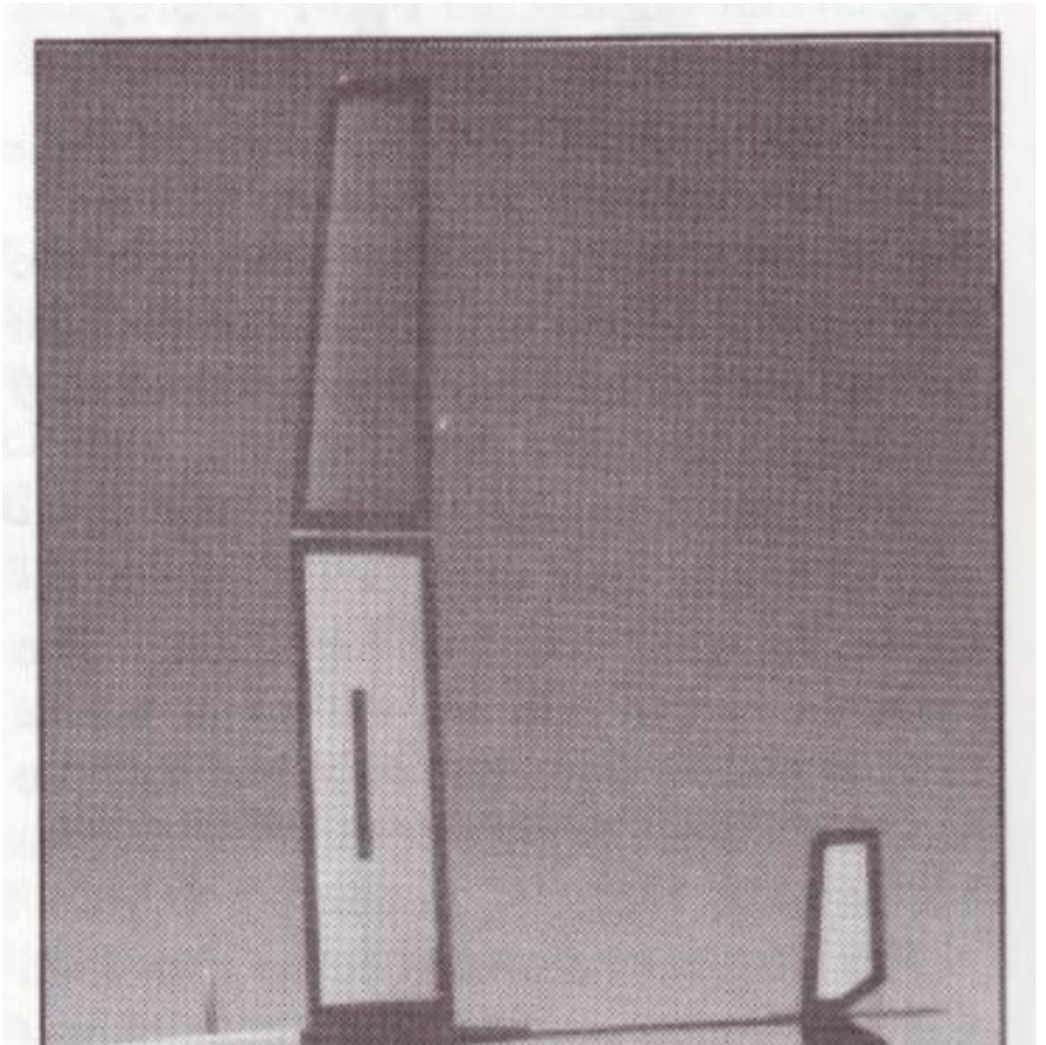
Painting of Steve, done by my good friend Chris Gregg. (photo: Chris Gregg)

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!

*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**.*

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.*

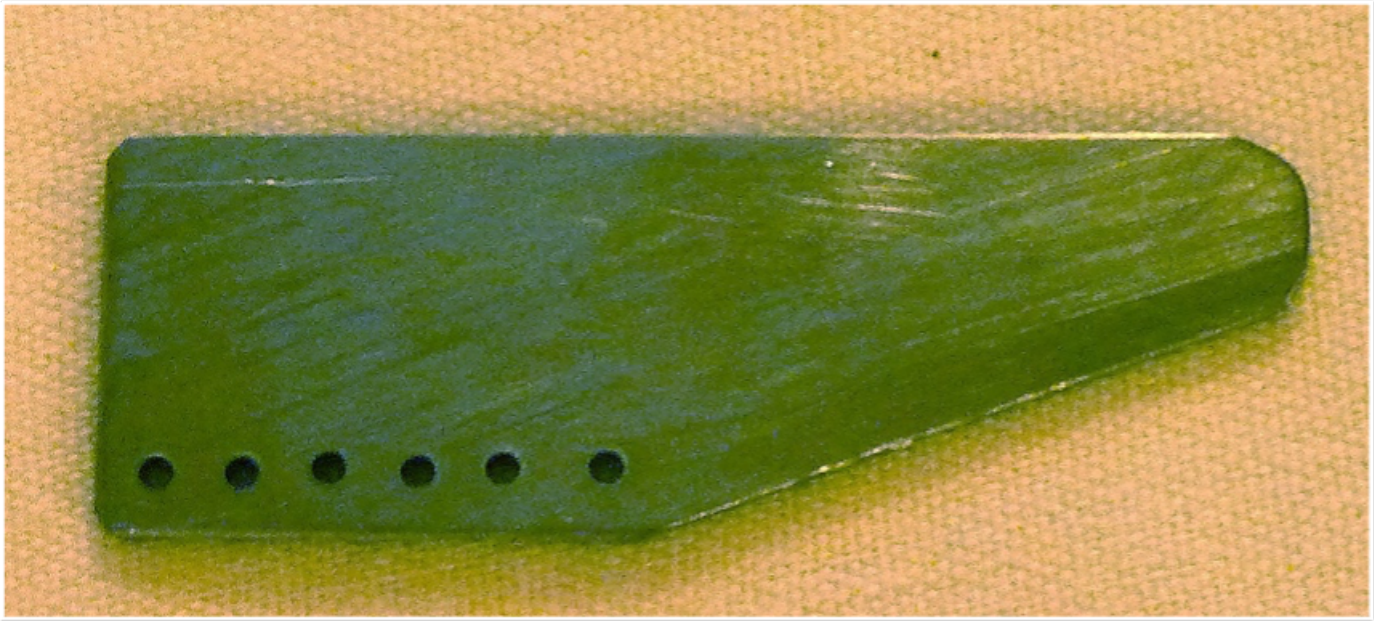
Skinning the Fuselage Pod

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:

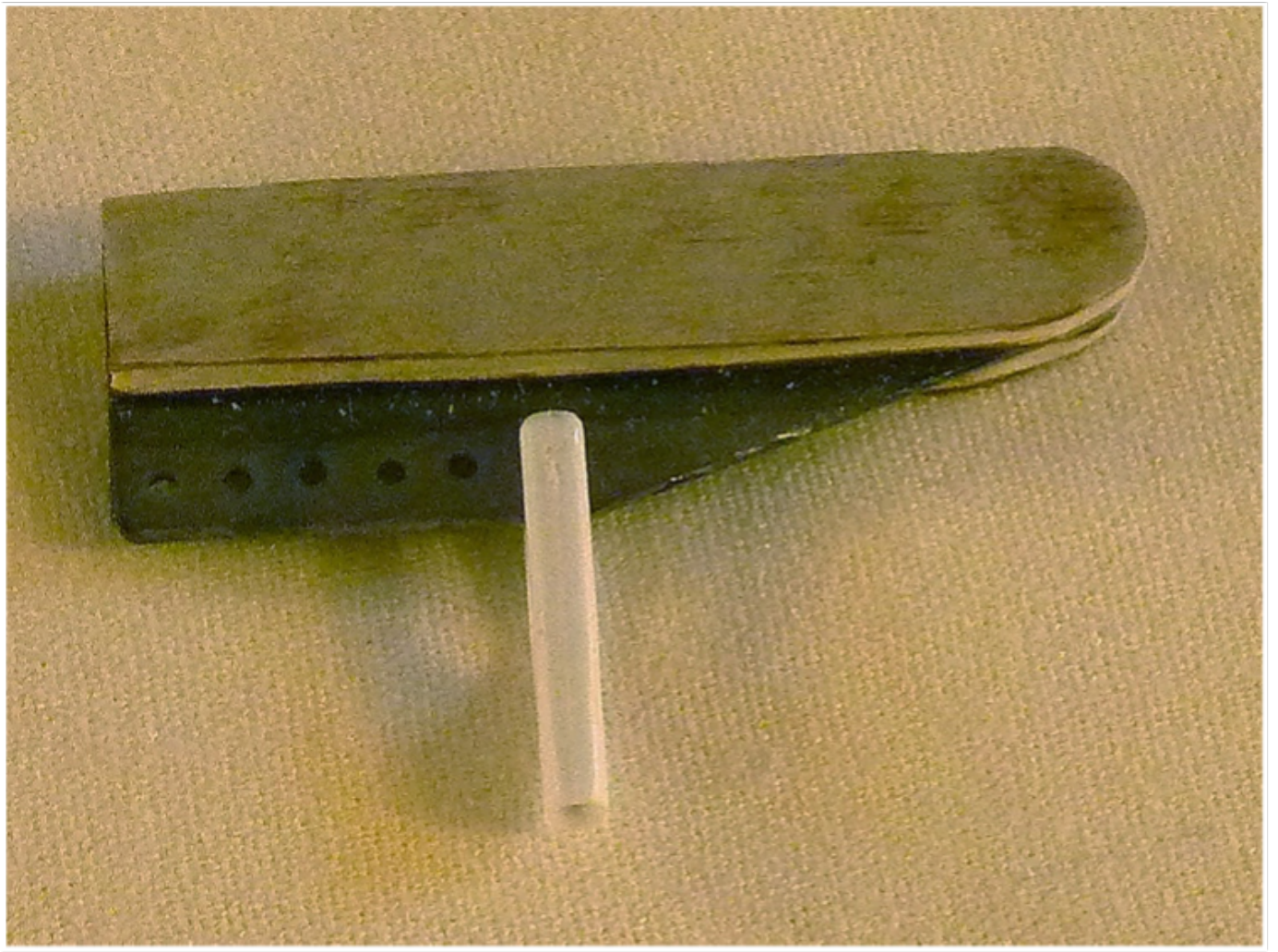
The All-Flying Tailplane Suspension

The *Sirius* — the name I had given this project — has all-flying tailplanes. This meant I had to find a way of mounting and pivotting 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.



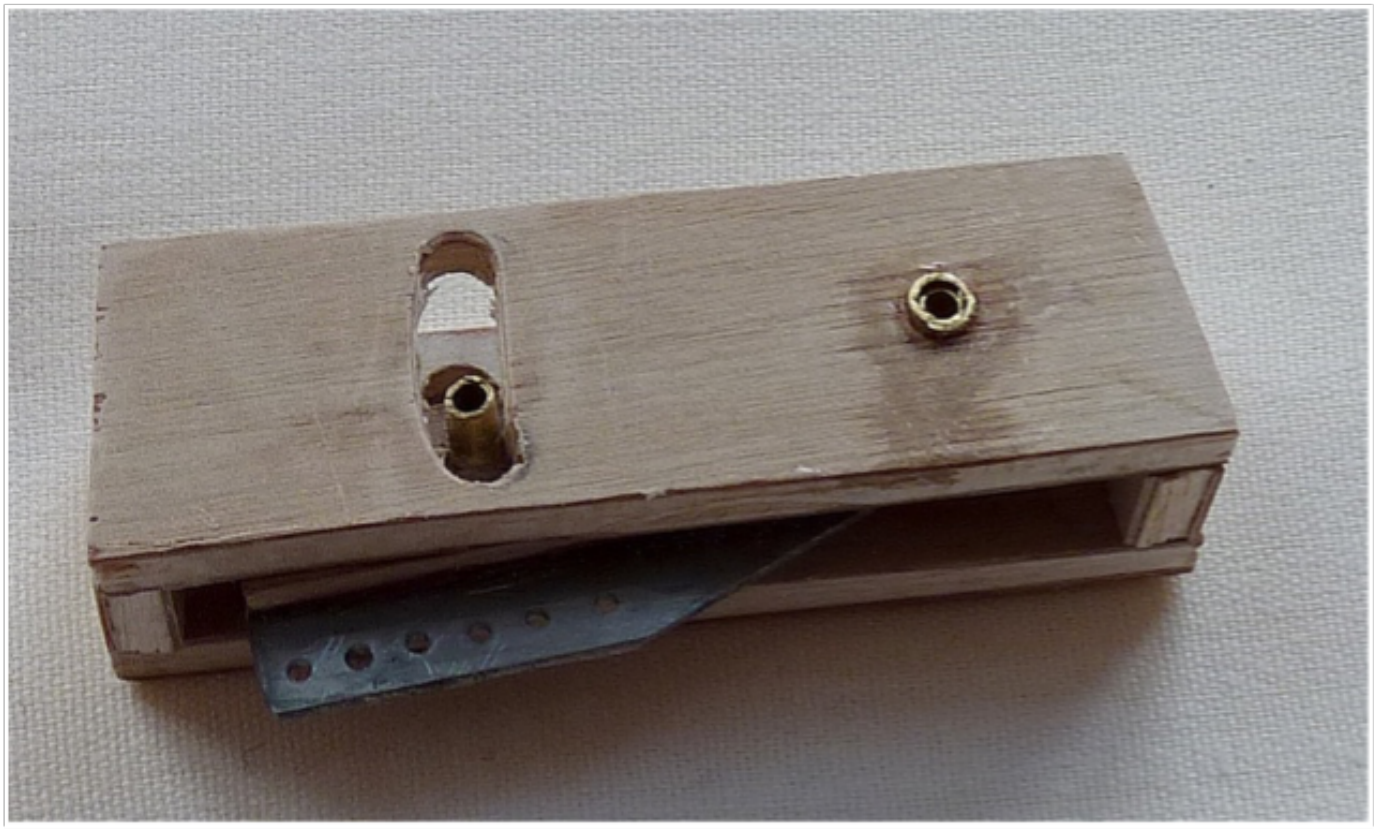
To form the bearings I used two sizes of brass tube. The smaller is 2mm bore for the tailplane mounting piano wires. This has an outside diameter of 3mm which is a perfect running fit in 4mm outside diameter tube. These were glued into the box to form bearings for the bellcrank to pivot. 2mm is a little 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.

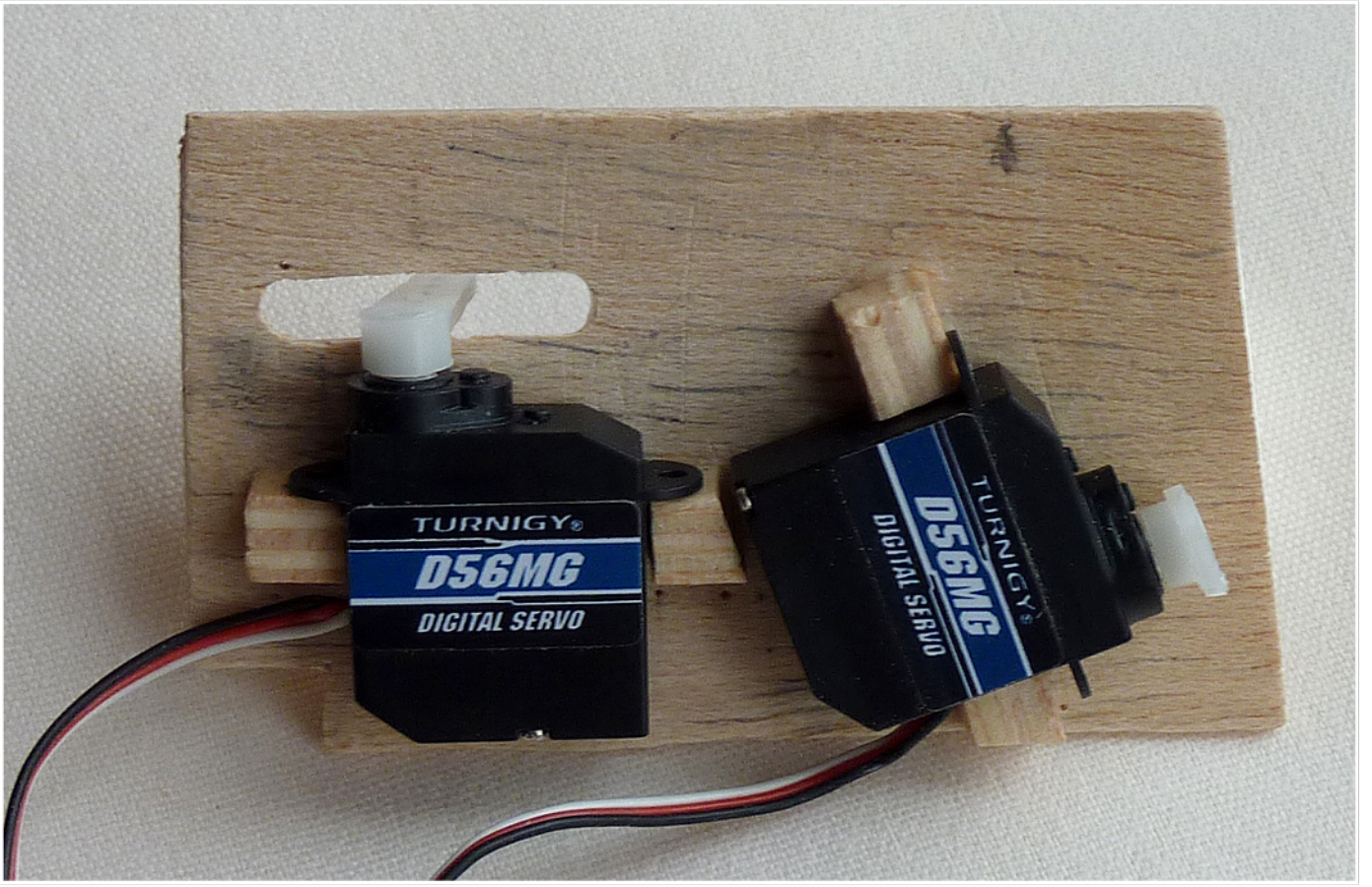
2. Connect a servo with a tester. Put the bellcrank on 3mm drill as pivot.
3. Find the servo horn and bellcrank holes to give ±15° on full servo deflection.
4. Make sure the chosen bellcrank hole suits the metal clevis. Open up if necessary.
5. Cut two pieces of 2mm piano wire of the correct length for 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.

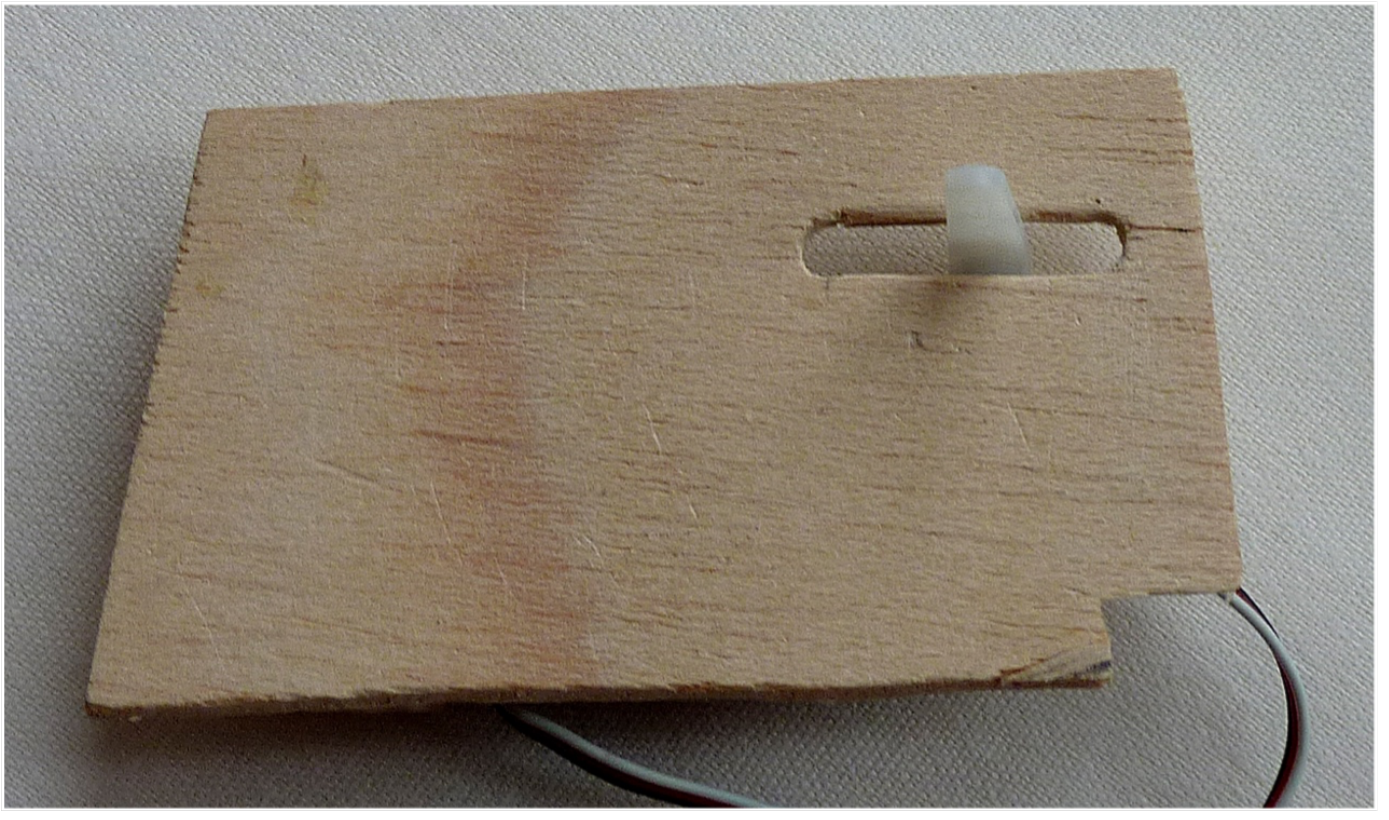


Left: Box complete. **Right**: Weight without clevis 11.9g.

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

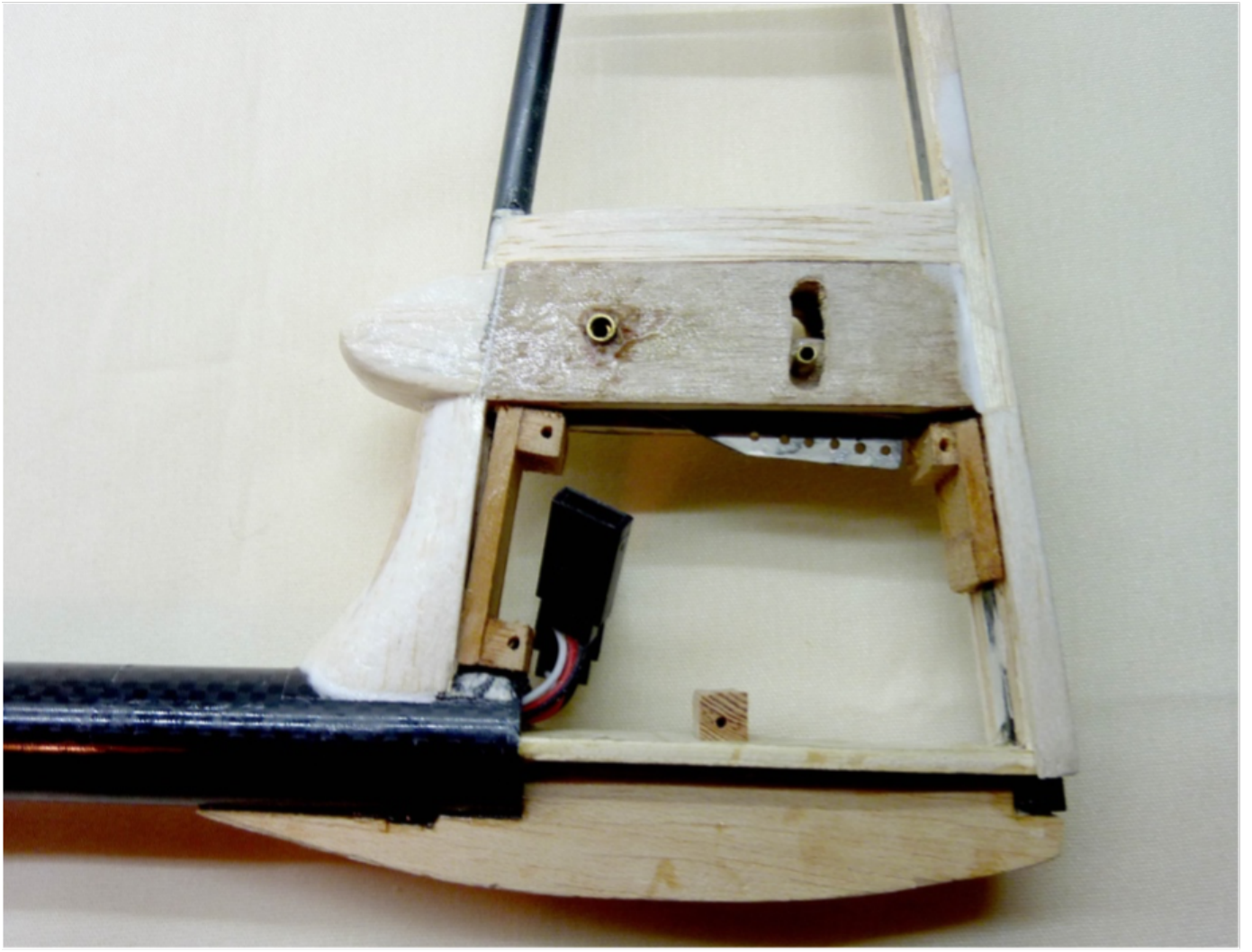
The two servos go into a box under the bellcrank box. Here is one side — the mounting plate. The servos are metal geared and quite powerful for their size. They are fixed with the normal screws. The deflection needed for the tailplanes will be small. Airspeeds will not be high so more important is the 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.





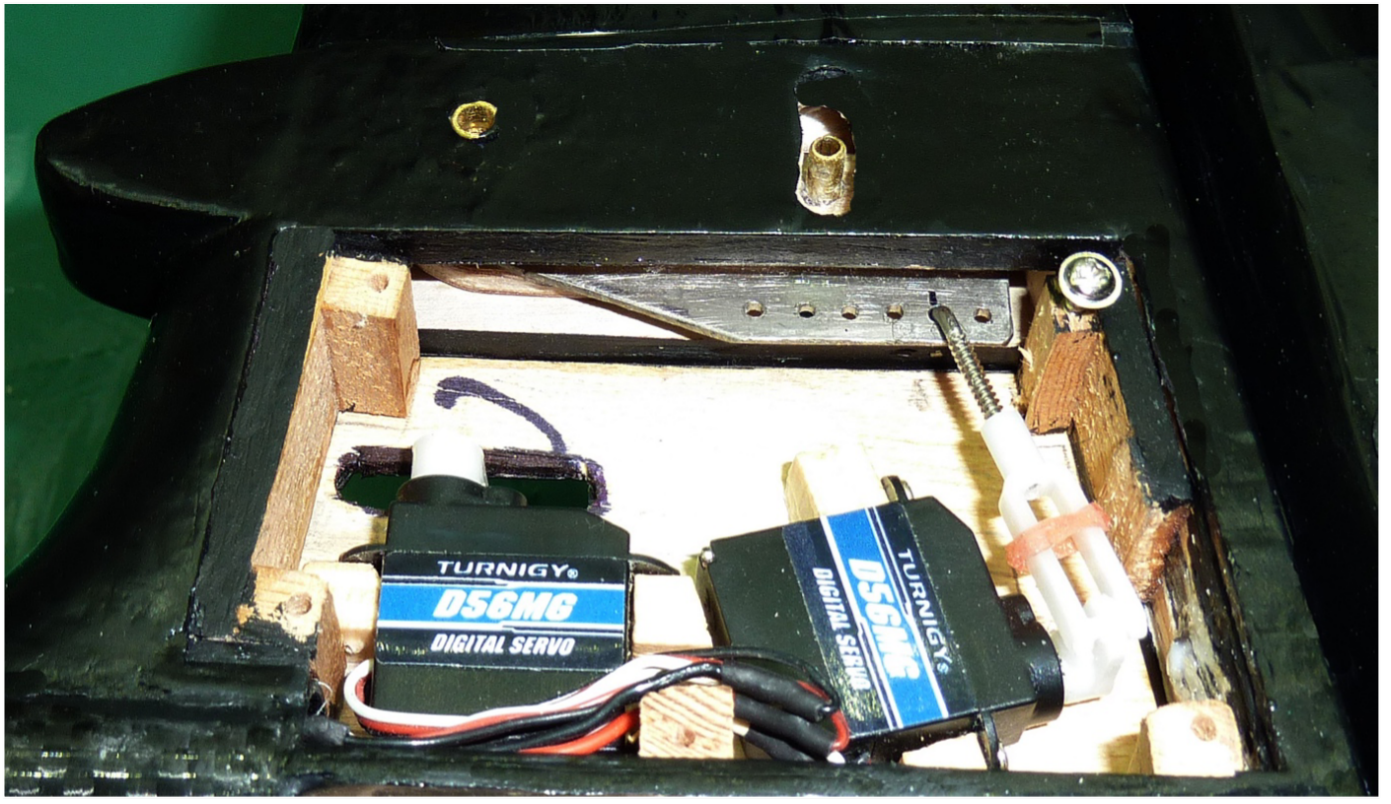
This is the fin with shaped fairings, filled, coated with Eze-Kote and sanded. The area under the fin will be left unfinished until the model is complete. Lead might need to

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



Detail of the servo box and all-flying tail suspension.

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.

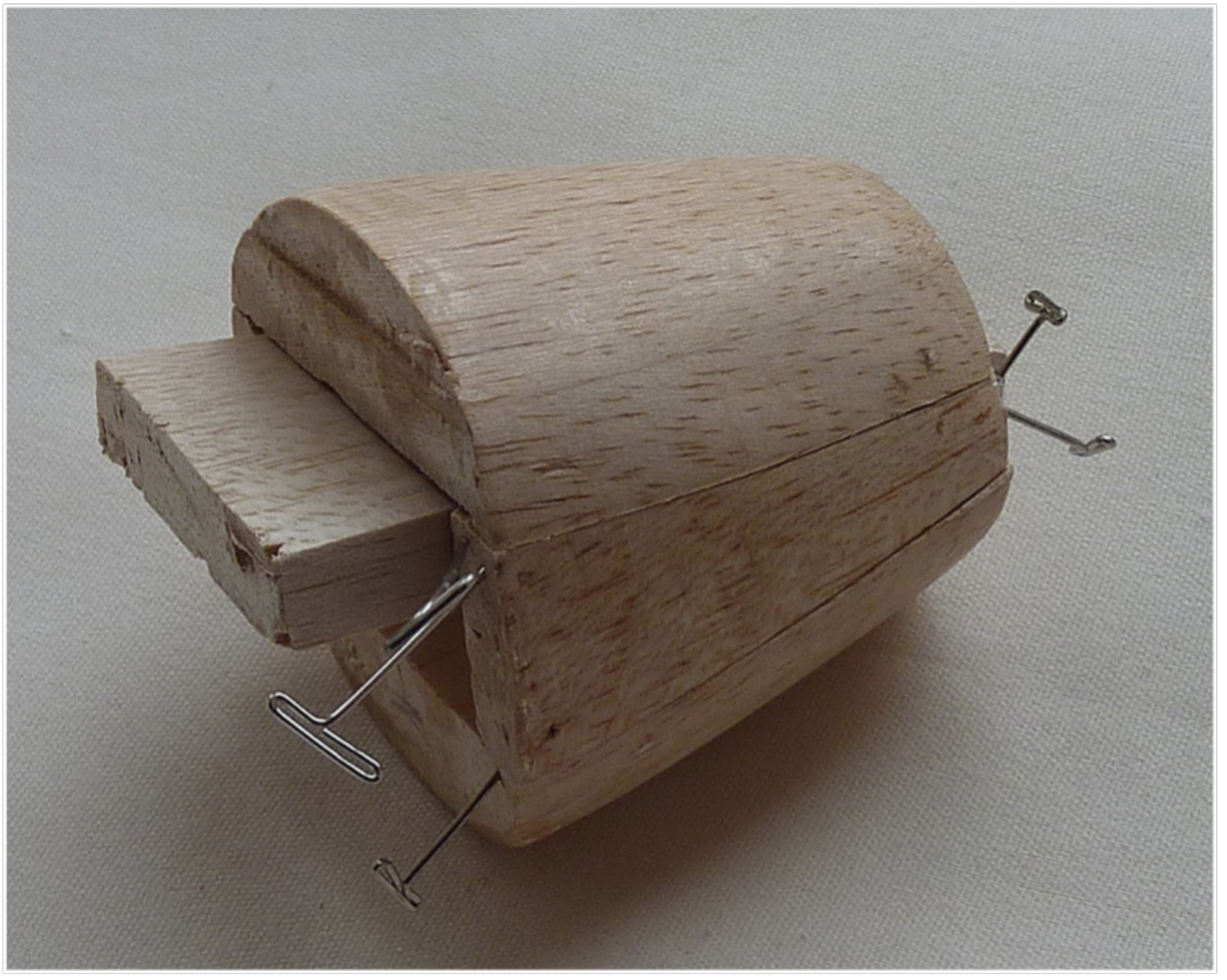
Making the Glass Fibre Cowl

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.

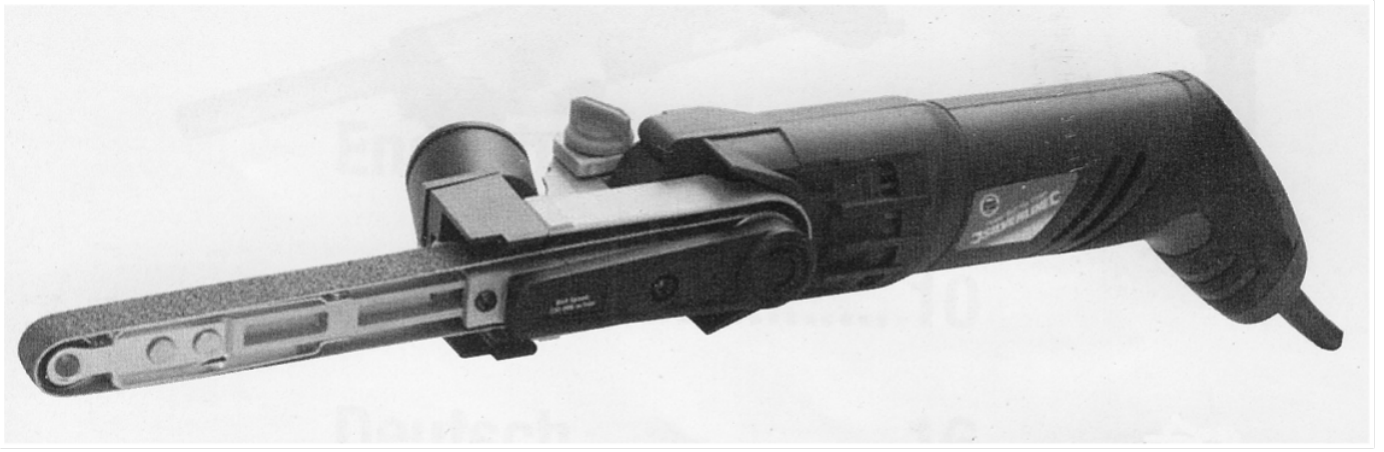
First layers of glass removed from the mould: the resulting moulded cowl was much too flexible. I think Eze-Kote, being a single-part polyester resin, is less rigid than epoxy when cured, so I reassembled the mould parts and wrapped them

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 scalish 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.

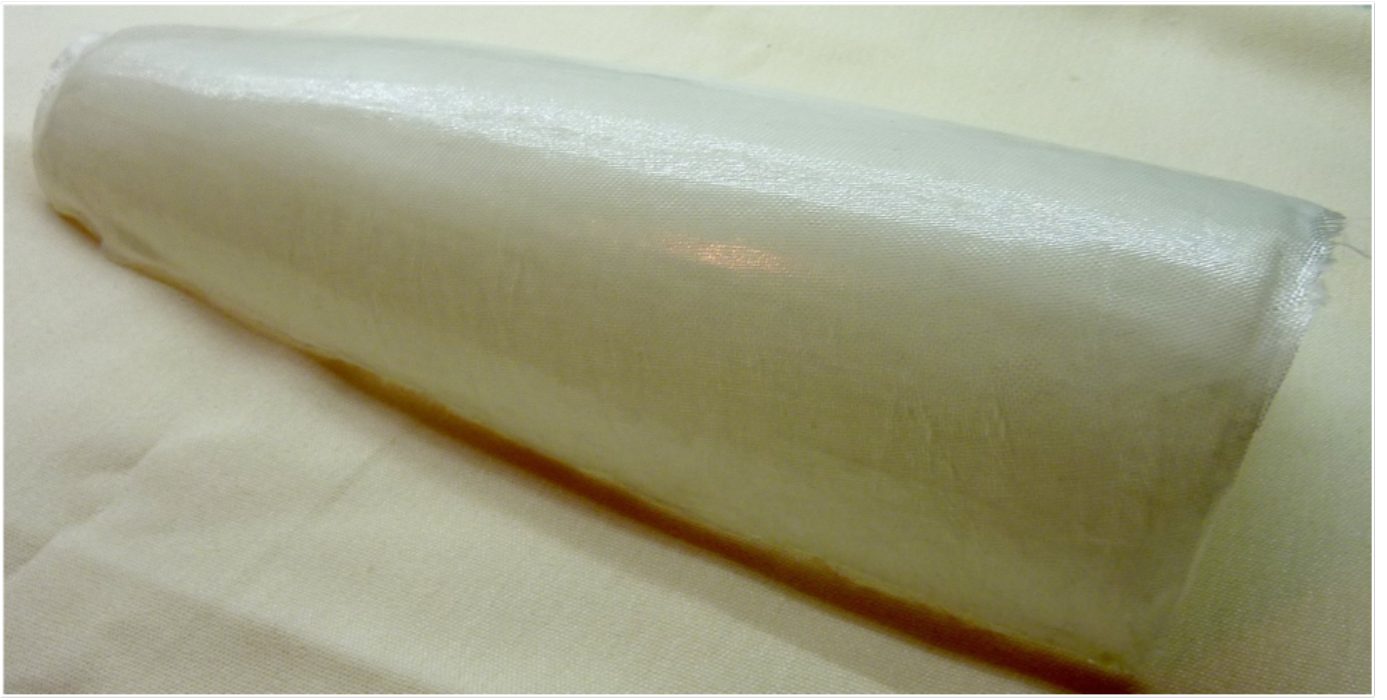
Here you can see the rough planed mould in position on the fuselage:

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.

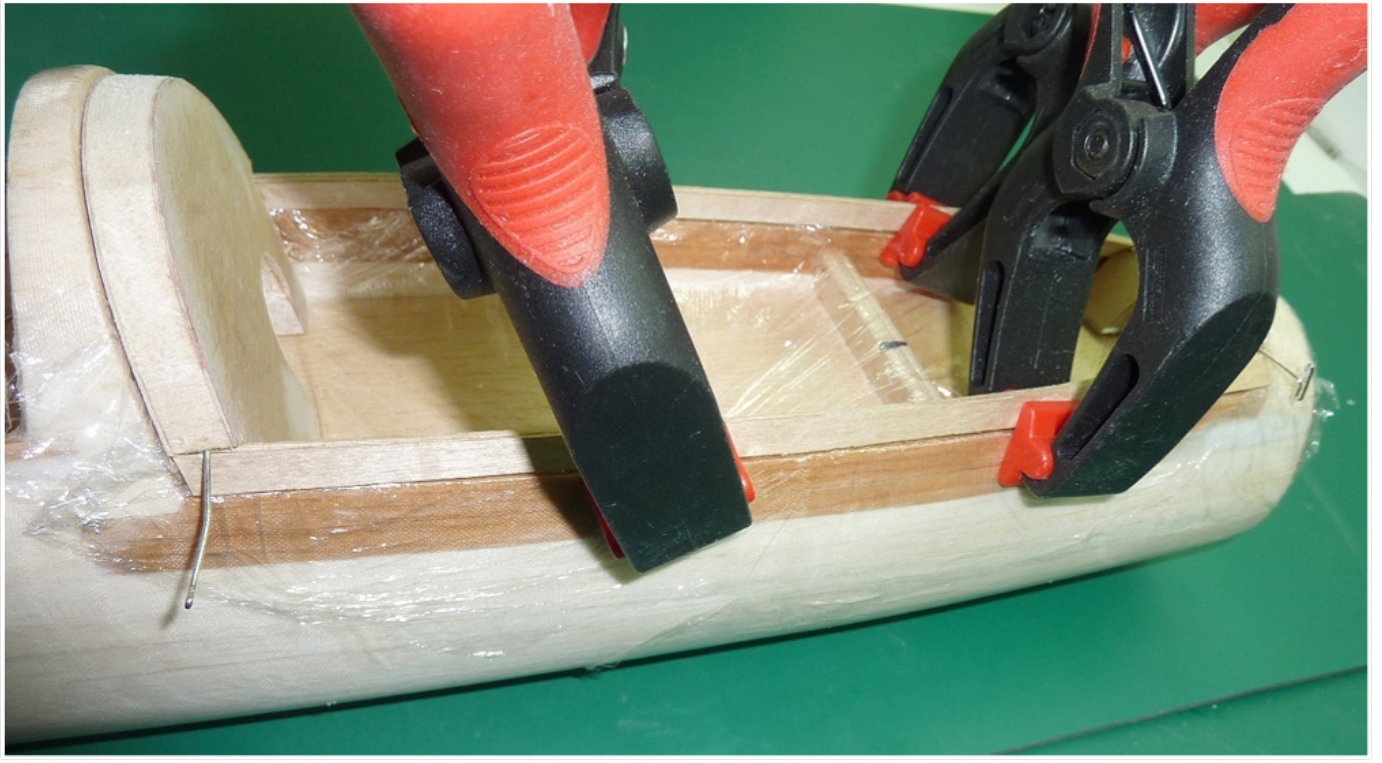
Before applying glass to the mould I experimented on some scraps of balsa to discover how many base layers of resin to use and how well the release agents work. I applied two layers of Eze-Kote to smooth the mould and three coats of mould release wax to each using a paper towel. You don't let the wax 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.

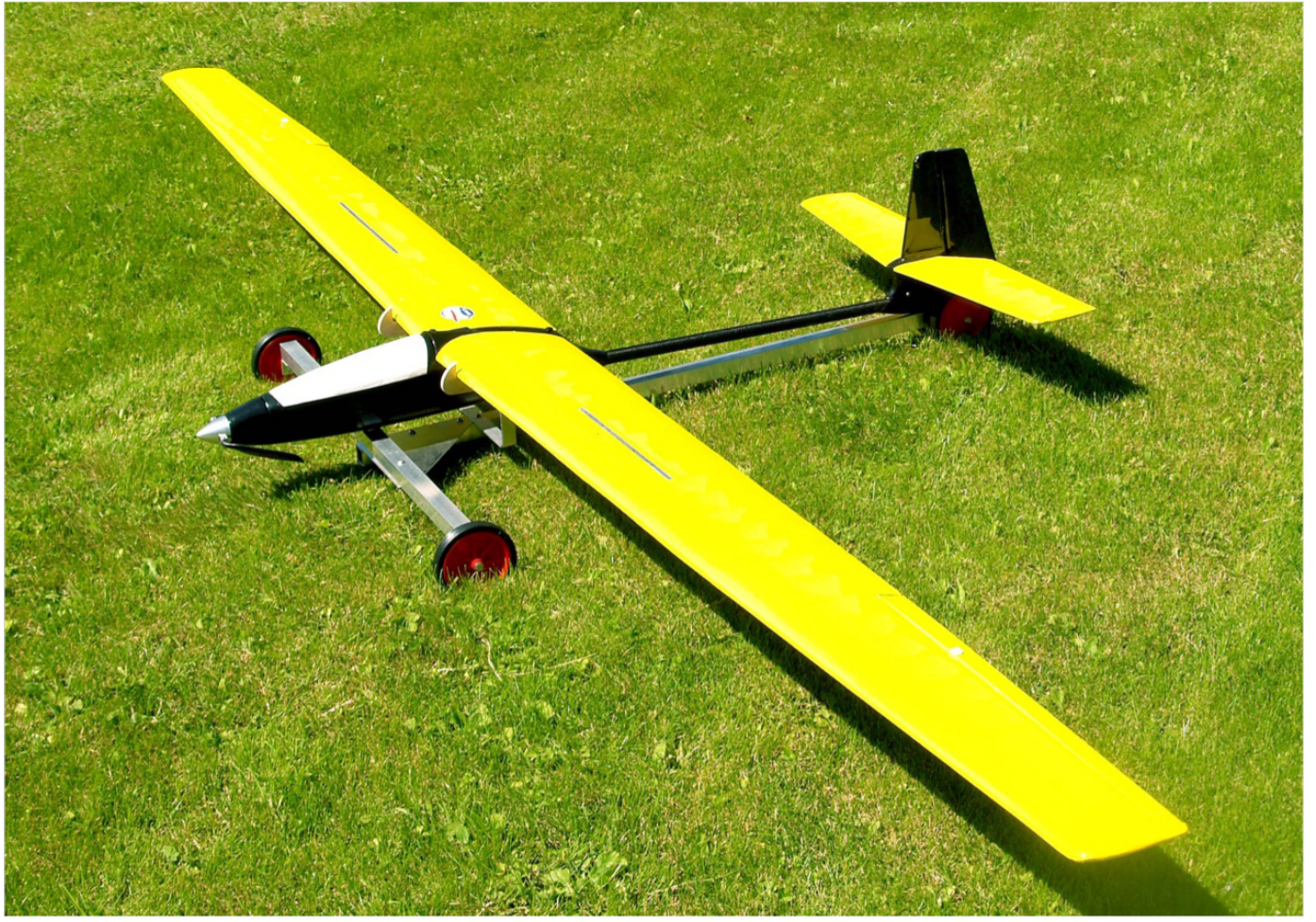
The tailplanes were an easy job. The plastic root ribs were pulled a little out of shape when the covering was heated and shrunk. I had to unstick it from the root ribs, add a filler of balsa and restick the covering. It's not perfect but looks reasonable.

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.

*All images 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**.*

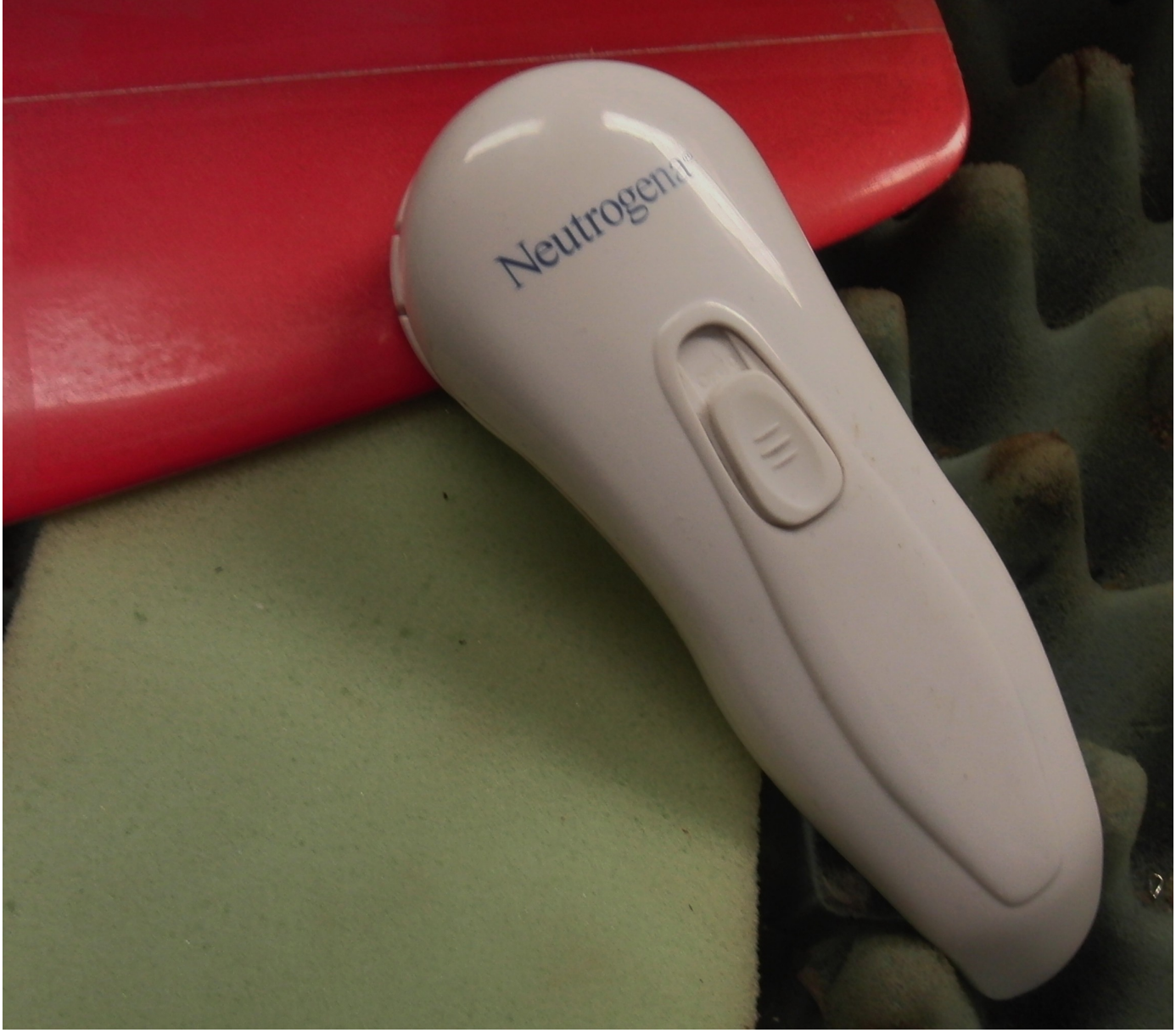
A Great Little Sander

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.


Neutrogena

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.


P400

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**.*

1/3rd Scale Mita Type 3 Production Notes

The fifth part of a multi-part series.

Norimichi Kawakami

You may want to read the fourth part of this series before proceeding to this article. Also if you prefer, you can read this article in its original Japanese.

Fabrication Part 16: Elevator Control System

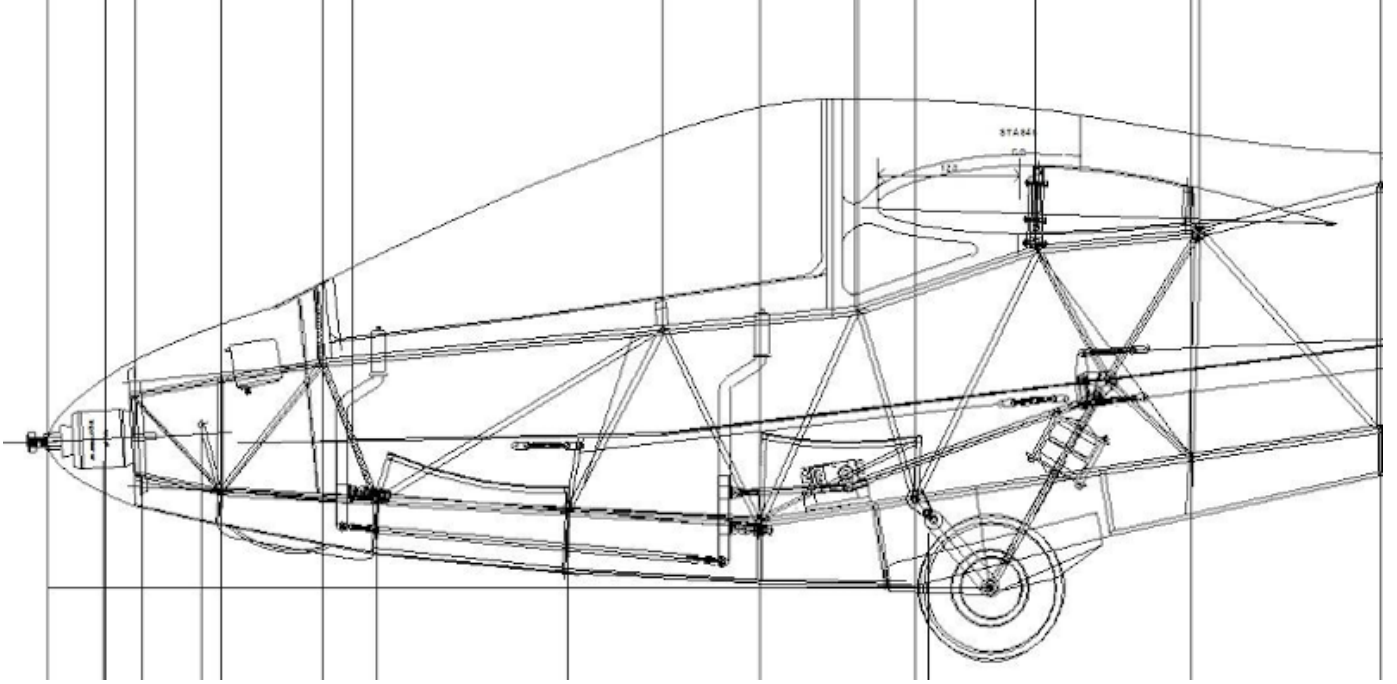
Now that the control stick gimbal system was completed, I made the elevator control system connected to it. During the

fabrication process, it was discovered that there was a design error in the gimbal system. I modified the gimbal system and fabricated the elevator control system.

Overview of the Elevator Control System

The elevator control system of the actual aircraft consists of a push-pull rod extending from a hinge mounted above the gimbal of the rear control stick, which passes under the rear seat and connects to a bell crank mounted on the trapezoidal truss structure that holds the main landing gear. Two wires extend from each end of the bell crank and connect to the bell crank under the horizontal tail. The wires connecting the two bell cranks are crossed for structural reasons. In other words, the wire extending from the top of the front bell crank connects to the bottom of the rear bellcrank, and the wire from the bottom of the front bell crank connects to the top of the rear bellcrank. The connection from the bellcrank under the horizontal tail to the elevator is as seen in drawing 14 and photo 40 in the 3rd edition (June).

The push-pull rod that passes under the rear seat is refracted for mounting reasons, as shown in drawing 25. Therefore, in the 1/3 model, the rod is divided into two parts at this point, and a servo is inserted in between to move both the elevator and the control sticks.



Drawing 26: Elevator control system.

In the process of building the elevator control system based on this drawing, I discovered a design error in the gimbal mechanism.

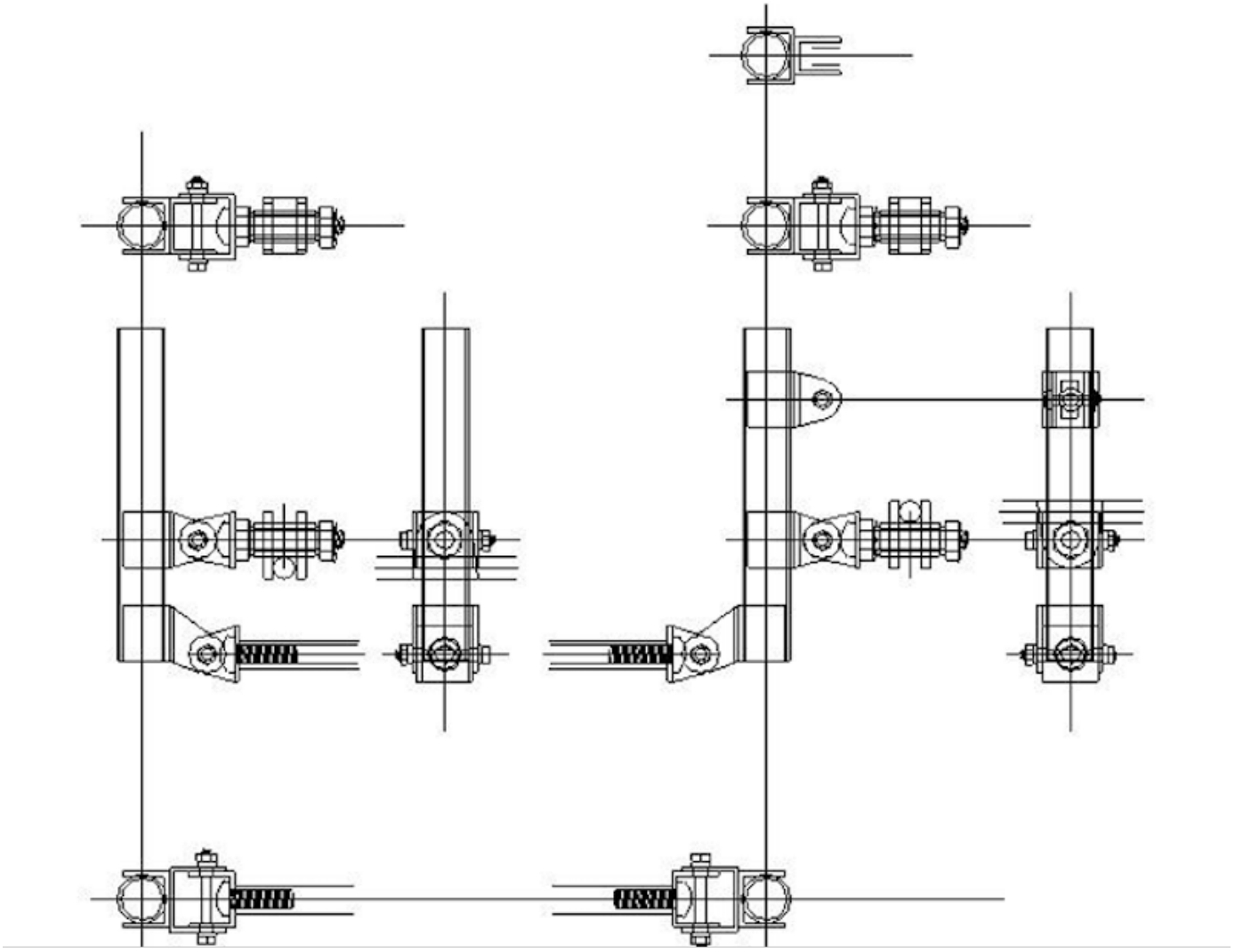
> ***Mistake 8:*** *Gimbal mechanism design error*
>
> *There were two mistakes. One was the type of the rod end for the push-pull rod mounted on top of the rear gimbal. This was supposed to be a rotating type with a bearing. However, the push-pull rod also swings left and right as the aileron is operated. But, since the other end of the rod is attached to the servo, there is no way to move left or right. In other words, the rod ends attached to both ends of the push-pull rod must be spherical bearing type to allow such movement. I redesigned the rod ends and replaced them with spherical bearing rod ends used in RC helicopter control systems.*

> *The second mistake was the attachment mechanism of the connecting rod that connects the front and rear gimbals. It was found that the mounting rigidity of the gimbal and connecting rod was insufficient, causing a large tilt angle difference between the front and rear control sticks when the aileron is operated.*

In a normal tandem control system, the aileron axles of the front and rear gimbals are connected with a single pipe, which transmits the aileron steering force as a torque tube. However, the aileron axles of this aircraft are not connected. Therefore, the connecting rod, which originally links the elevator operation, also plays a role in linking the aileron operation. For this reason, the connection between the connecting rod and the gimbal must have sufficient rigidity in the left-right direction, but the simple rod ends connection I had adopted resulted in insufficient rigidity. By examining the actual aircraft again, I found that the rod was connected with very tough metal fittings as shown in photo 81.

Gimbal Modification

Based on the above consideration, I modified the gimbal drawing.



Drawing 27: Modified gimbal mechanism.

The coupling parts with the connecting rod have the same structure as the actual machine. Photo 87 shows the gimbals modified according to the drawing.

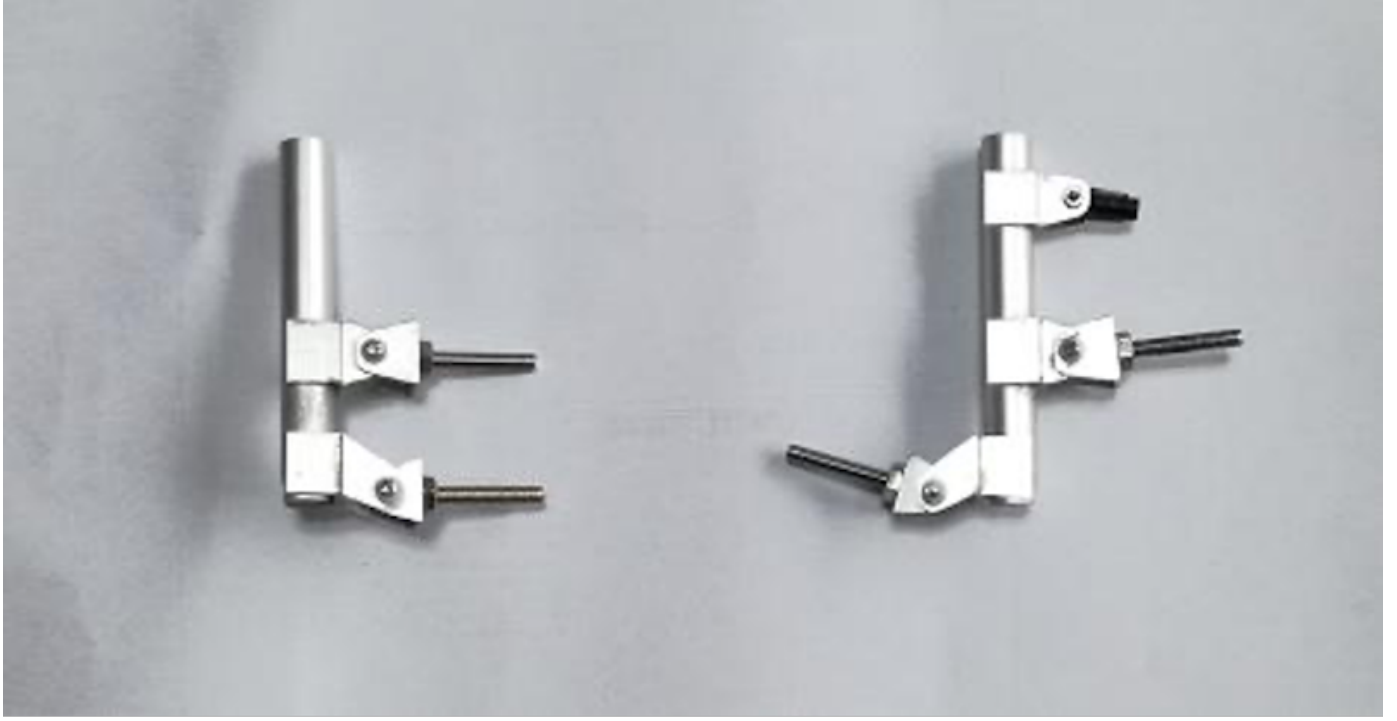


Photo 87: Gimbal mechanisms after modification.

These modified gimbals were attached to the fuselage, and this time, it is very rigid and there is no angular difference between the front and rear sticks when they are tilted left and right. I also confirmed that the rear gimbal and elevator servos are well connected.

Elevator Control System Installation

Now that the gimbal mechanisms have been modified, the elevator control system has been installed. Photo 88 shows the connection between the elevator servo and the front side bellcrank.

Photo 88: Elevator servo and front side bellcrank.

Next, photo 89 is an enlarged photo of the front side bellcrank. The picture is out of focus, but you can see two turnbuckles on the bellcrank to adjust the wire tension. The turnbuckles were made from a Φ5 brass rod by Mr. Takamura who has a mini-lathe.

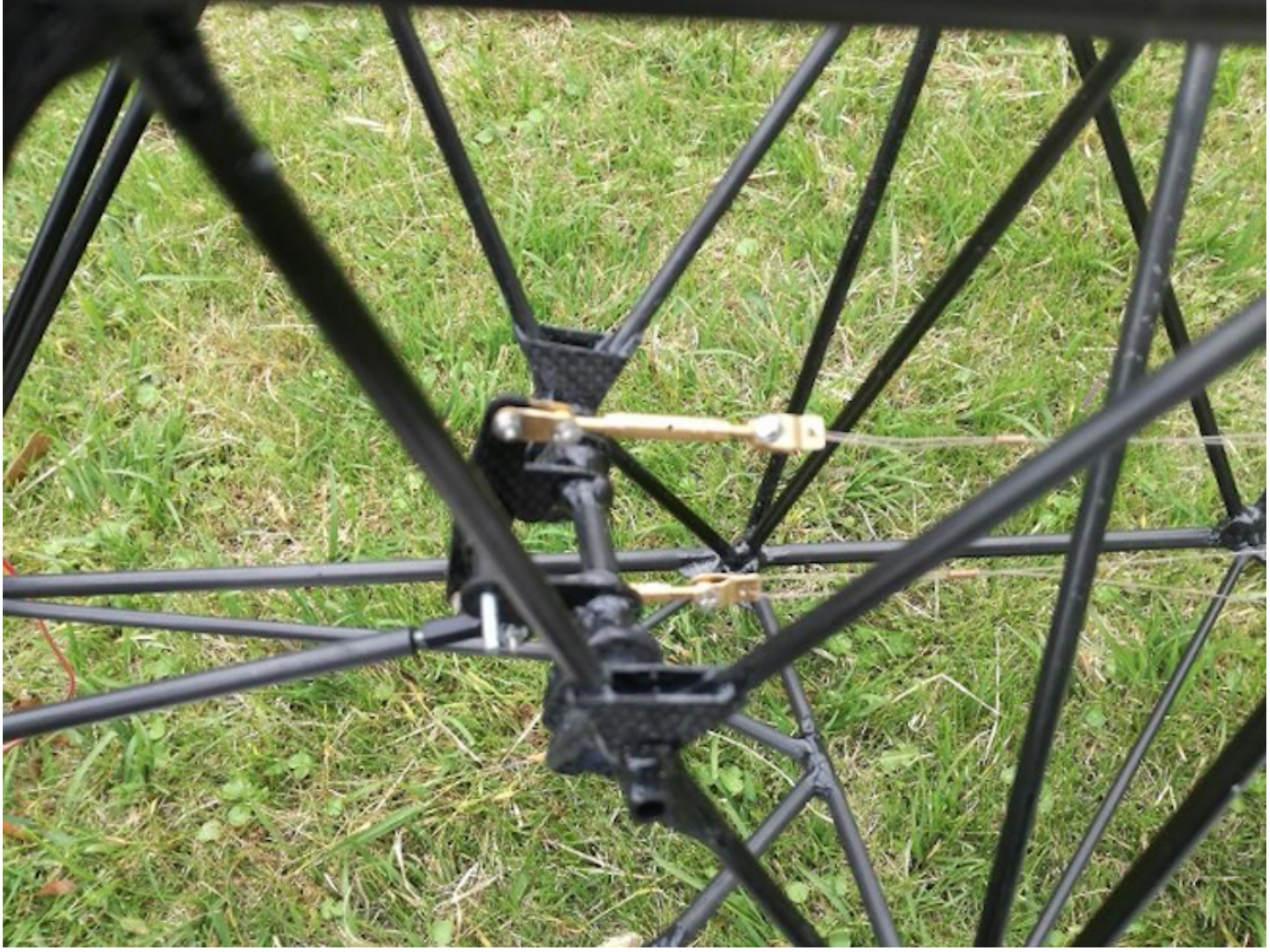


Photo 89: Enlarged view of the front bellcrank.

Photo 90 is a rearward view of the inside of the fuselage.

Photo 90: Left, rearward view of the inside of the fuselage. Right, looking backward inside the fuselage.

A wooden stay is attached in the middle of the rear fuselage to avoid the crossed wires from rubbing against each other and to prevent the wires from vibrating.

Finally, here are the details of the rear bellcrank.

Photo 91: The rear bellcrank.

The wires are still temporarily fastened.

Fabrication Part 17: Center Wing Plank and Wing Fuselage Joining Hardware

At the end of October 2018, it became much cooler and I could sand balsa outdoors. So I started to plank the center wing, which I had postponed since before summer. At the same time, I made the wing-body joint fittings.

Planking of the Center Wing

Planking is done with 2mm thick balsa boards. The center wing is completely planked between the leading edge and the rear spar to secure the airfoil shape, and also plays a role in securing the torsional rigidity of the wing by forming a large D-shaped spar in unison with the rear spar web. The distance from the leading edge to the rear spar is about 280 mm on the upper surface of the wing. Normally, balsa sheets are sold cut into 80 mm widths, so it is necessary to join four sheets together. The process of piecing the balsa boards together is rather troublesome. I looked for a wider board, and found that the boards sold at World Models were 95mm wide, so I decided to use them. Four boards were made of three pieces of balsa, each 900 mm long, joined together. I lightly sanded the surface side of the boards to remove any unevenness.

Planking started with the undersides. The procedure is as follows: lay a thin polyethylene sheet on the assembly jig to prevent adhesion, place a planking board on top of the sheet, put the rib assembly on top of the board, press it down, and apply low viscosity CA to the key points. Since the ribs and the assembly jig were originally one piece, and they were cut out, they fit together quite nicely even with a 2mm plank material in between.

After gluing is completed, take it down from the jig and cut

out the spoiler part from the inside and the extension cord is inserted for the aileron servo. I set the cord near the leading edge to avoid any tail-heaviness. Photo 92 shows the left center wing with the lower plank completed.

Photo 92: Left side center wing with the lower plank completed.

Next is the upper side plank. The upper spoiler groove cannot be cut out from the inside after planking, so carefully align and cut it out beforehand.

Image 93: Aligning the upper plank material.

The next step is to place the wing on an assembly jig placed on a thick plate, and apply titebond to the ribs, spars, and stringers. The upper plank is inaccessible from the back, so instant adhesives cannot be used. After making sure that there is no residue of the titebond, the plank material is carefully positioned and then covered. Next, cover the plank with a few thin cypress sticks, hook the rubber band to the nails on the side of the base plate, and press down the entire assembly onto the jig.

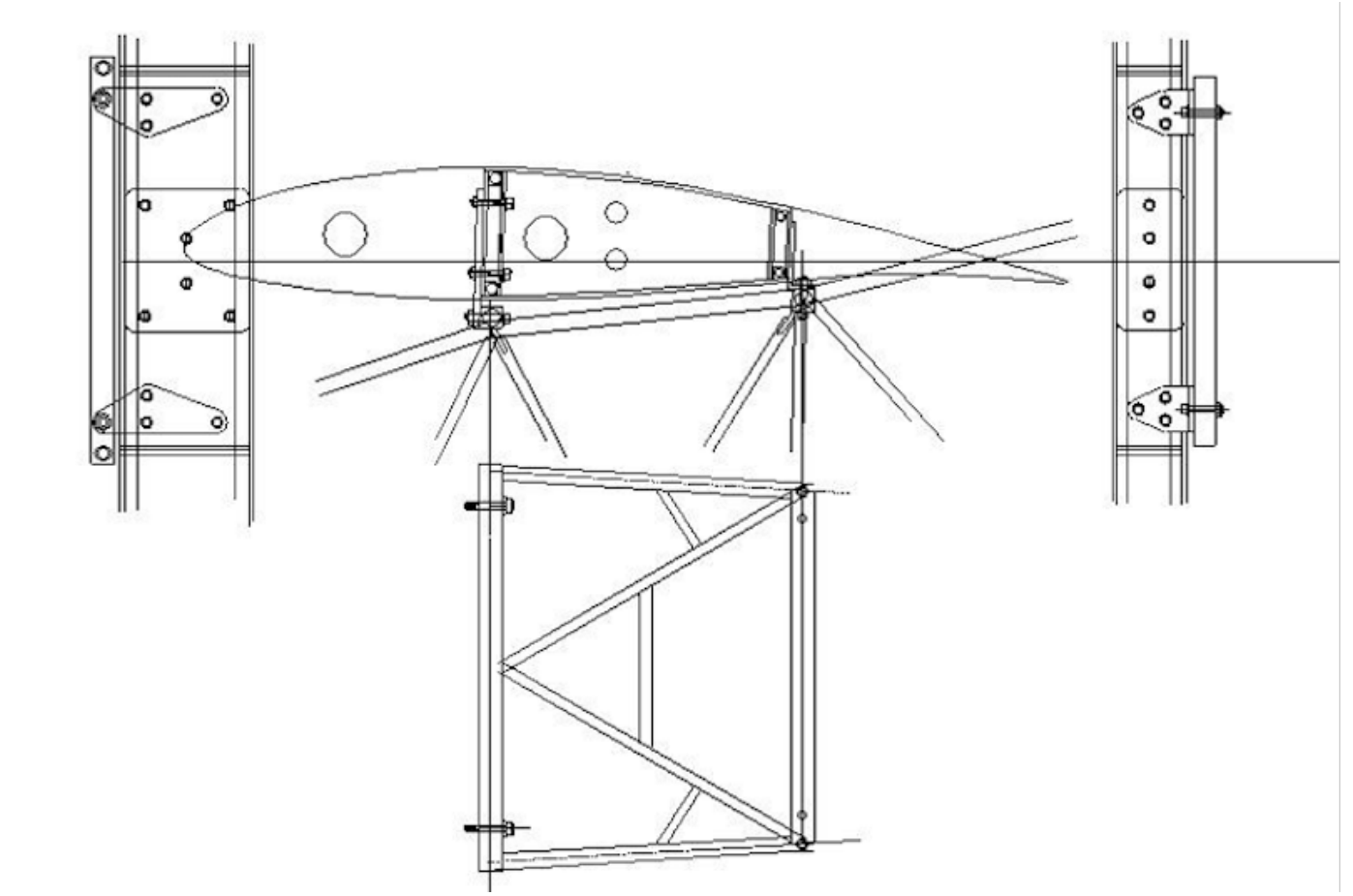
Image 94: Upper plank of the center wing.

This is to make sure that the plank material adheres to the ribs and spars. When the glue dried, thin 15 mm wide bars were cut from a 4 mm thick balsa board and attached to the front edge. Then,I sanded and shaped the leading edge.

Through this planking work I got a lesson that I should pay attention afterwards. This 1/3 model is quite large, and the area of the titebond application for the upper plank is also very large. The instruction manual says that the titebond should be applied within five minutes, but it took a little more than five minutes to apply it. Therefore, the surface of the applied titebond was just about to start drying. In the future, the outer wing will be planked over a much larger area, so it must split the plank board into two and separate the work.

Fabrication of the Wing-Body Joint Fittings

Next, I started to make the fittings to attach the center wing to the fuselage. Here is the drawing of this part.



Drawing 28: Wing-body joint.

The fittings extending down from the front spar are attached to the bolts protruding forward from the square crossbeam running across the left and right sides of the fuselage, the same as in the actual model. However, the fittings between the rear spar and the fuselage are different from the actual model. In the actual model the fuselage is connected to the rear spar by the fittings as shown in photo 95.

Photo 95: Fittings of rear spar and fuselage of actual model.

To make these fittings, you need a milling machine, but even my clubmate who is good at metal working only has a mini-lathe. So I changed the fitting to an aluminum L-shaped channel, which is available at home centers.

Photo 96 shows the fittings I made.

Photo 96: Wing fuselage joint fittings: top, front side; bottom, rear side.

The front fittings were cut from 3mm thick hard aluminum that was used for the main landing gear of a discarded RC fixed wing, and the rear fittings were cut from 2mm thick L-shaped channel.

These fittings were first attached to the fuselage, and then the center wing was placed on the fuselage to find the mounting position. Photo 97 shows the final fuselage and center wing joined by the fittings.

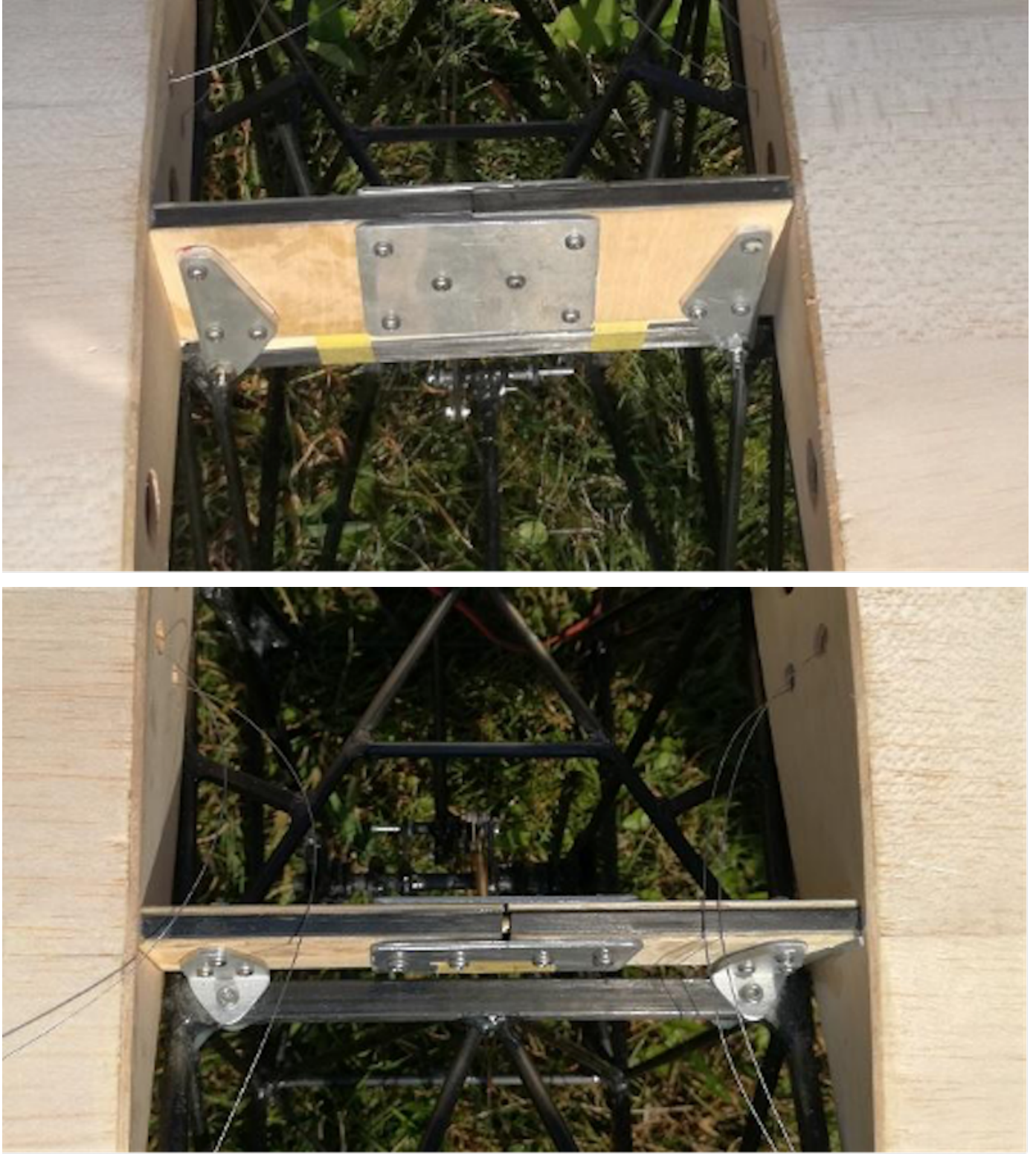


Photo 97: Fuselage joint test: left, front side; right, rear side.

Actually, it was a little difficult to reach this state after making the fittings. At first, I measured the squareness of the main wing and fuselage with the front side fittings. I stretched a string between the wing tip and the end of the

fuselage and compared the length of the string between the right and left sides. The result showed that the right side string was about 13mm longer than that on the left side. This means the main wing is attached to the fuselage slightly yawed to the left.

The reason for this is that the crossbeam on the fuselage to which the front spar is attached is slightly yawed to the left of the aircraft center axis. In fact, it was extremely difficult to secure the right angle of this beam when installing it. The fuselage is tapered backward, so it is difficult to find the center axis of the fuselage. The drawing showing the center axis of the fuselage is pasted on the bottom of the fuselage assembly jig, but there is a space of 200mm between the drawing and the crossbeam. This is the reason why the cross beam was attached at a slight angle. To correct this problem, 0.5mm shim was inserted between the front right side fitting and the center wing spar web. As a result, the main wing is now attached to the fuselage at right angles.

Next, I installed the rear fittings with the front fittings in place. The left side fit perfectly, but the space between the right side fitting and the rear spar web opened up by about 0.5mm. This was due to the shim inserted in the front fitting. I had no choice but to insert 0.5 mm shim here as well.

Spoiler Servo Installation and Adjustment

Now that the center wing is attached to the fuselage, the spoiler servos are installed on the center wing.

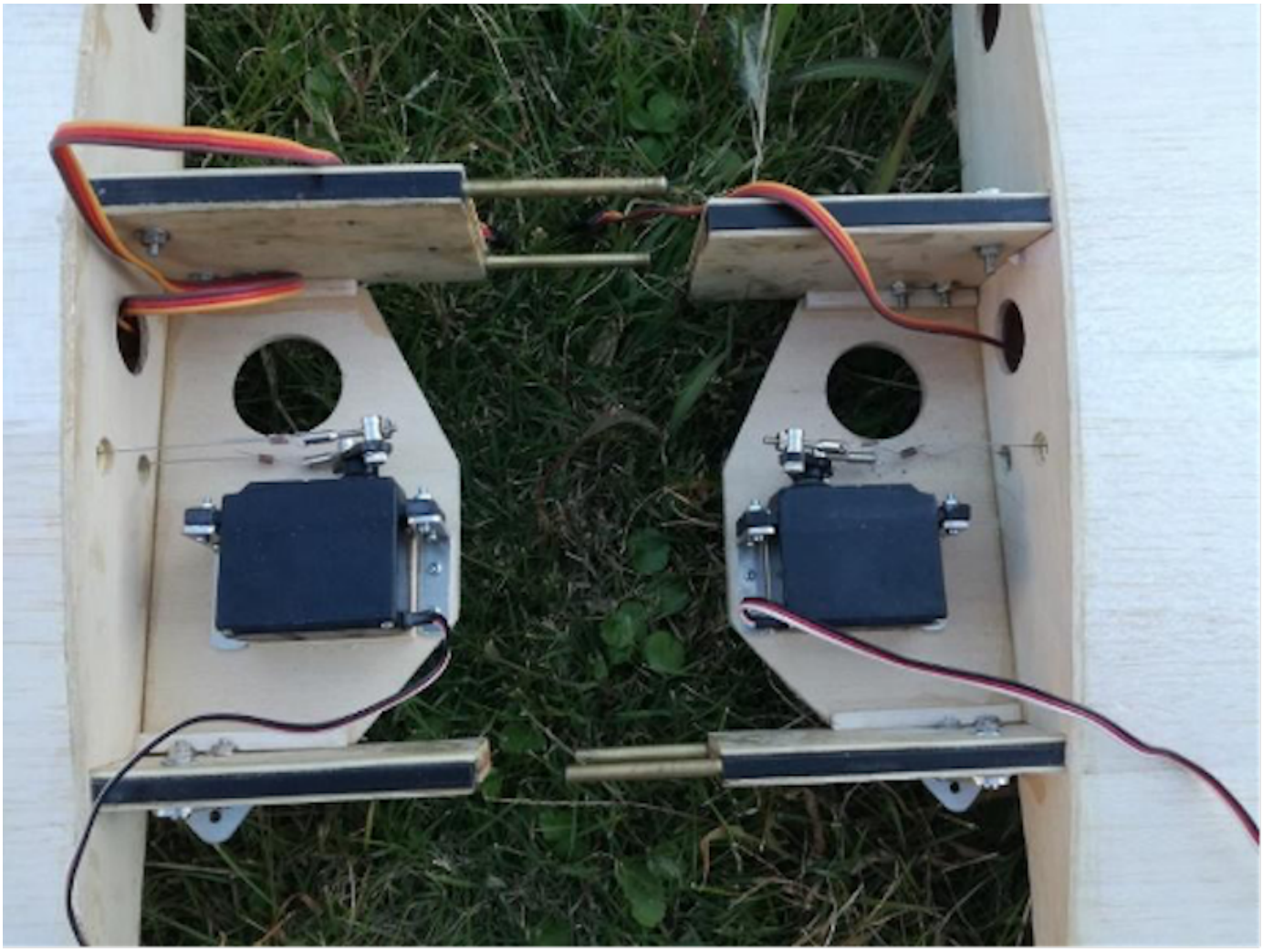


Photo 98: Spoiler servos installed.

Then I adjusted the spoilers. Thin balsa sheets are attached to the tops of the spoiler. These balsa plates are slightly protruding from the surface of the wing. They are shaved to make a smooth contour with the wing surface when the spoilers are closed.

If you operate the servo in the direction of spoiler closing, the servo will jitter at a certain position. This is because the servo is trying to close the spoiler even though it is already

closed. This condition always occurs in a spoiler model such as this one, which does not have a limit switch.This condition consumes unnecessary power and is not good for the servo. In addition, if it is not done properly, the wire may break. So, I installed a servo tester as shown in photo 99 and found the position just before the servo starts to jitter. This is the position where the spoiler is fully closed. Then I shaved the balsa attached to the top surface so that the spoiler surface matches the wing surface. This resulted in a smooth wing surface with the spoiler closed, as shown in the photo 100.

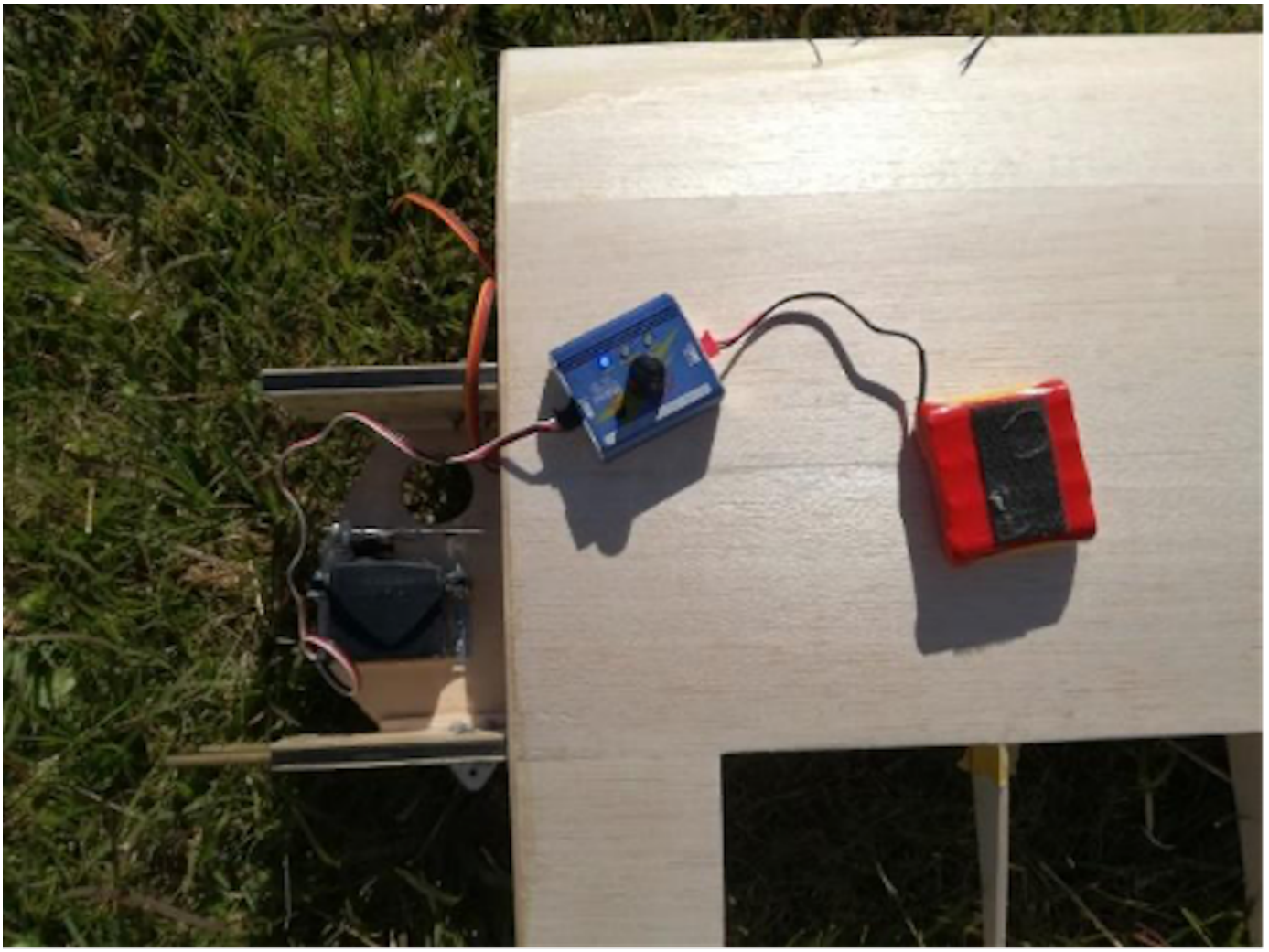


Photo 99: Adjusting the spoiler servo with a servo tester.

Photo 100: Spoiler closed.

Next, I turned the knob of the servo tester in the opposite direction to check the spoiler opening status.

Photo 101: Checking the spoiler open state: left, upper side; right, lower side.

At this point, I thought it worked well, but in fact, the amount of spoiler protrusion was too small, as described in Mistake 3.

Completed Center Wing Assembly

This is the center wing assembly completed. Only the covering remains.

Photo 102: Finished center wing.

The left side is 717g and the right side is 737g. The right side is 20g heavier than the left. This is probably due to the weight variation of the plank material and the difference in the amount of epoxy adhesive used, which was applied in

large quantities around the aluminum tube of the wing connecting pipe receiver.

Performance Prediction

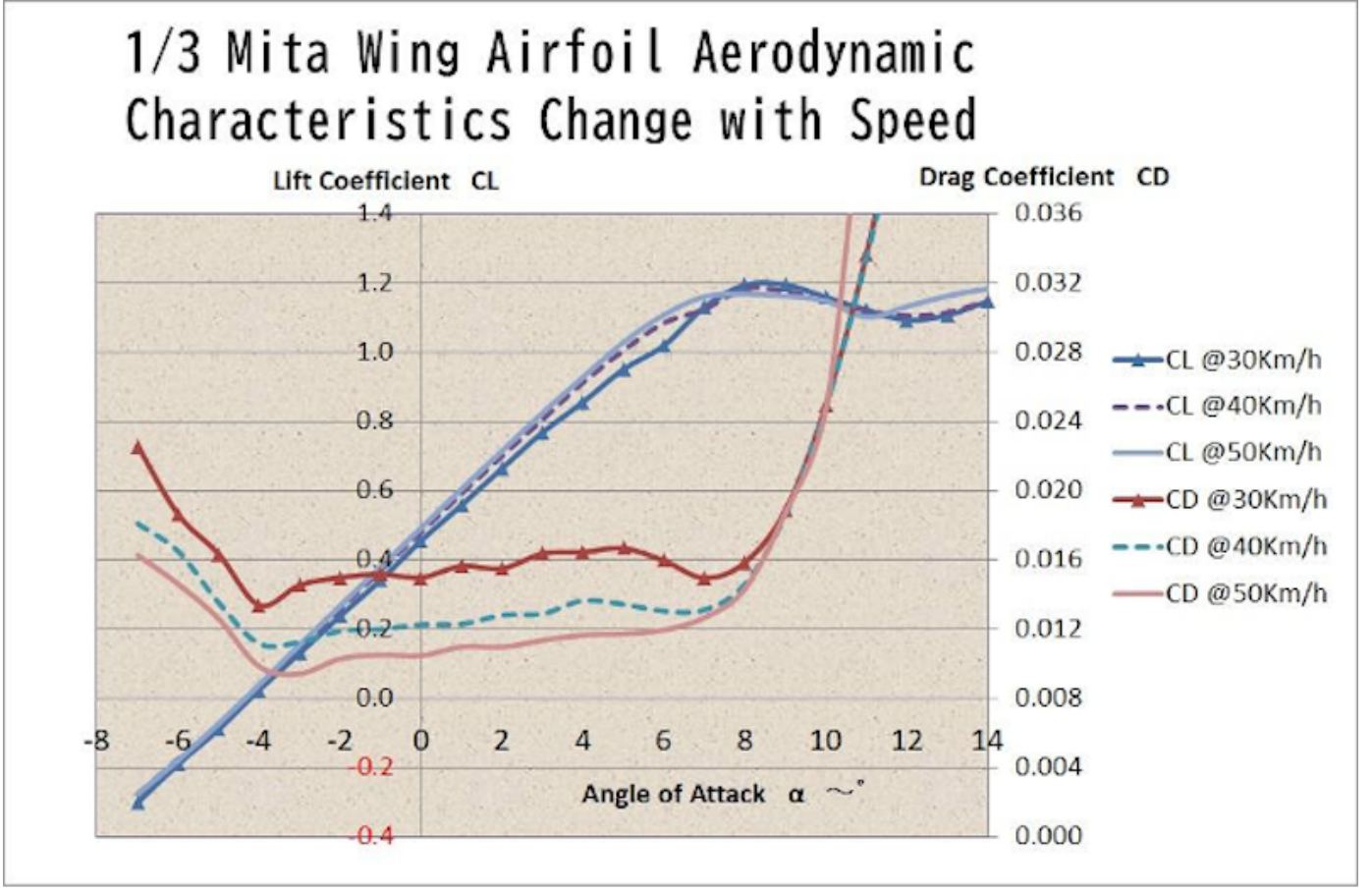
Due to a flaw in the way the target weight was determined, a significant weight increase over the plan is inevitable. As a result, I was wondering how much the performance of the glider will change. Therefore, I made a calculation to predict the flight performance of the 1/3 Mita. At the same time, I compared the performance of the 1/3 Mita with that of my 1/5 Mita.

Performance Estimation Method

The performance estimation was done by describing the longitudinal forces and moment balance formula of the aircraft in EXCEL, referring to “Introduction to Aircraft Dynamics” by Kanichiro Kato et al published by the University of Tokyo Press. In other words, the calculation was repeated by changing the descent angle, aircraft attitude angle, and elevator angle until the aerodynamic forces (lift, drag, and pitching moment) acting on the main wing, tail, and fuselage at the specified speeds were balanced by gravity at the center of gravity.

Aerodynamic Characteristics of Airfoil

I paid special attention to the aerodynamic characteristics of the airfoil (lift, drag and moment characteristics) in this performance estimation. In normal aircraft performance calculations, the aerodynamic characteristics of the airfoil are treated assuming that the non-dimensionalized lift coefficient CL, drag coefficient CD and moment coefficient CM do not change with flight speed. However, as discussed in the basic concept №4, the aerodynamic characteristics of the wing airfoil changes significantly with Reynolds number, Re, in the size and flight speed range of this model. Therefore, in this performance calculation, the aerodynamic characteristics of the main wing are given for each Re corresponding to the flight speed, and the Reynolds effect is taken into account. The lift coefficient CL and drag coefficient CD of the main wings at these speeds are shown in the figure below. The Re of this model at speeds of 30 km/h, 40 km/h, and 50 km/h are 193,000, 258,000, and 322,000, respectively.

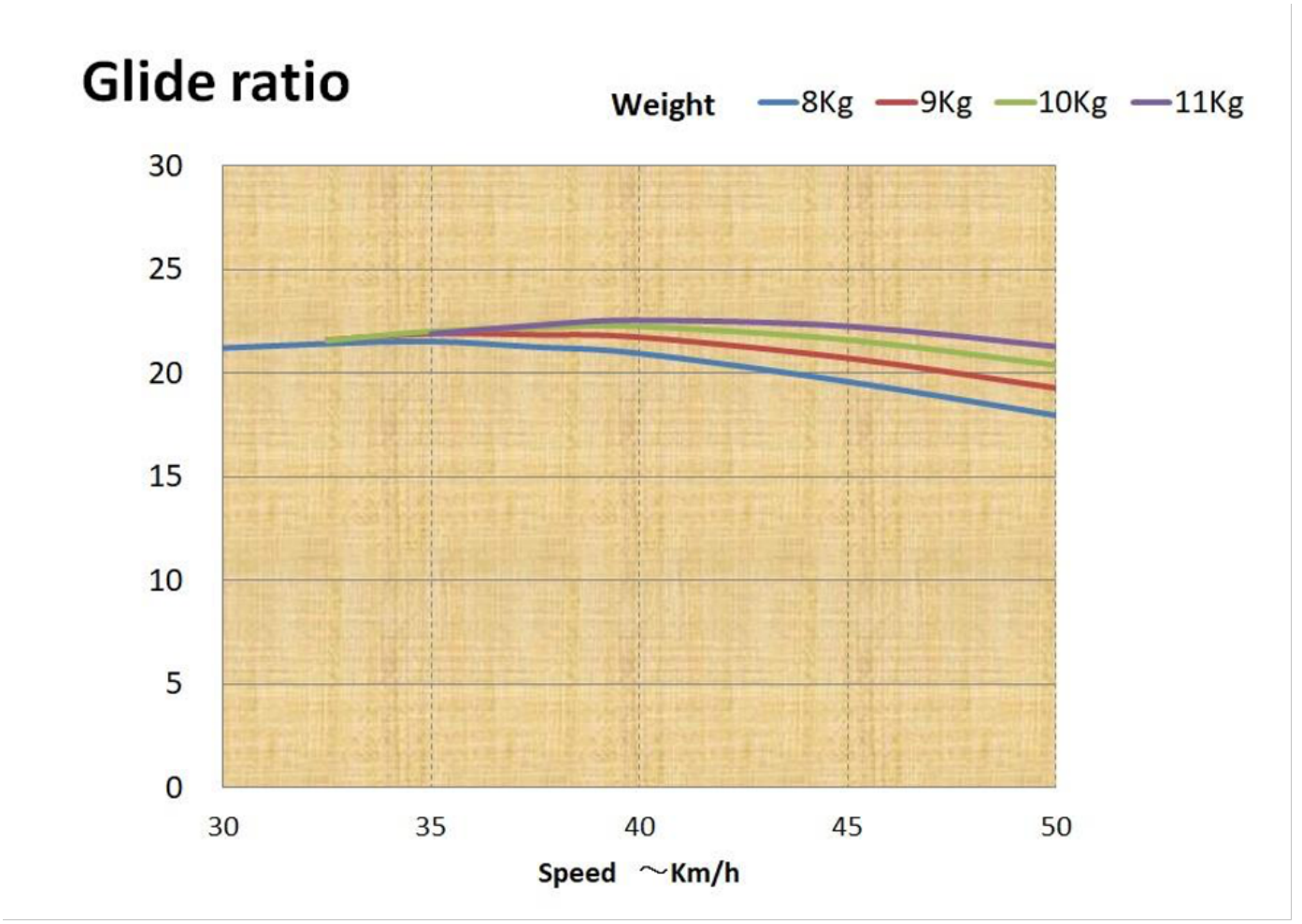


Graph 9: Wing Lift and Drag coefficients change as a function of flight speed.

There is no significant change in the lift coefficients, but there is a significant change in the drag coefficients. It can be seen that the higher the speed, the higher the Re and the smaller the coefficient. Therefore, the gliding performance of this 1/3 Mita also improves as the speed increases. The aerodynamic characteristics of the airfoil were calculated using the XFLR5 which includes the XFOIL, a software program developed at the Massachusetts Institute of Technology (MIT) in the U.S. XFOIL has an established reputation for analyzing airfoils at low Reynolds numbers. I checked the reliability of this software and confirmed it by comparing the calculated values with wind tunnel test data at low Re in advance.

Estimated Performance of 1/3 Mita

With these preparations, I estimated the performance of the 1/3 Mita. First, below is the glide ratio, which is the most important performance index for a glider.

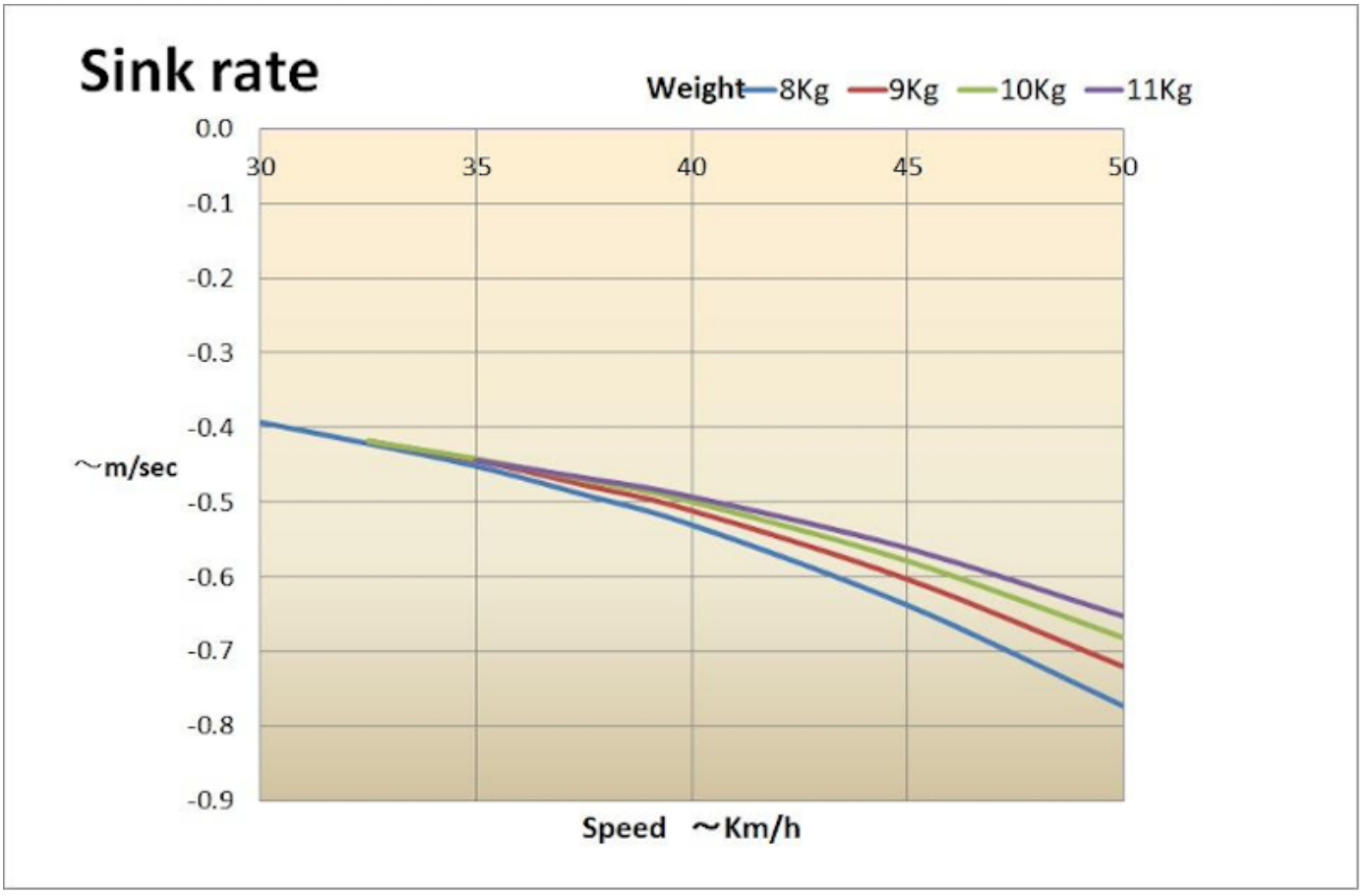


Graph 10: Predicted glide ratio of the 1/3 Mita Type 3 Revision 1.

The calculation was conducted with a weight range from 8 Kg to 11 Kg in 1 Kg increments. The maximum glide ratio is expected to be slightly over 22. As the weight increases, the maximum glide ratio increases, but the speed at which the maximum glide ratio is achieved also increases. The glide ratio of a normal glider drops more rapidly above the best glide ratio speed, but with this glider, the drop is slower due

to the Re effect of increased speed. Therefore, it seems that a good glide ratio can be obtained over a relatively wide speed range.

Next is the sink rate.



Graph 11: Predicted Rate of Descent for 1/3 Mita Type 3 Revision 1.

The lower the speed and the lighter the weight, the smaller the sink rate will be. The minimum sink rate for a weight of 8 kg is obtained when flying at 30 km/h, and the value is less than 40 cm/sec. The minimum speed at which the curve begins for each weight is different, because the aircraft will stall and can not fly at the lower speed range to the left. Even with a weight of 10 kg, it seems to be able to cut 50 cm per second sink rate.

The minimum sink rate speed is near the stall limit, so I need to increase the speed a little more to fly the scale plane safely. It is interesting to note that the heavier the weight, the lower the sink rate in the speed range where stall does not occur. Therefore, it seems that I don't need to be so nervous about weight increase.

The reason why the sink rate decreases with weight is that the power required to fly the glider during descent is supplied by the decrease in the potential energy of the aircraft.

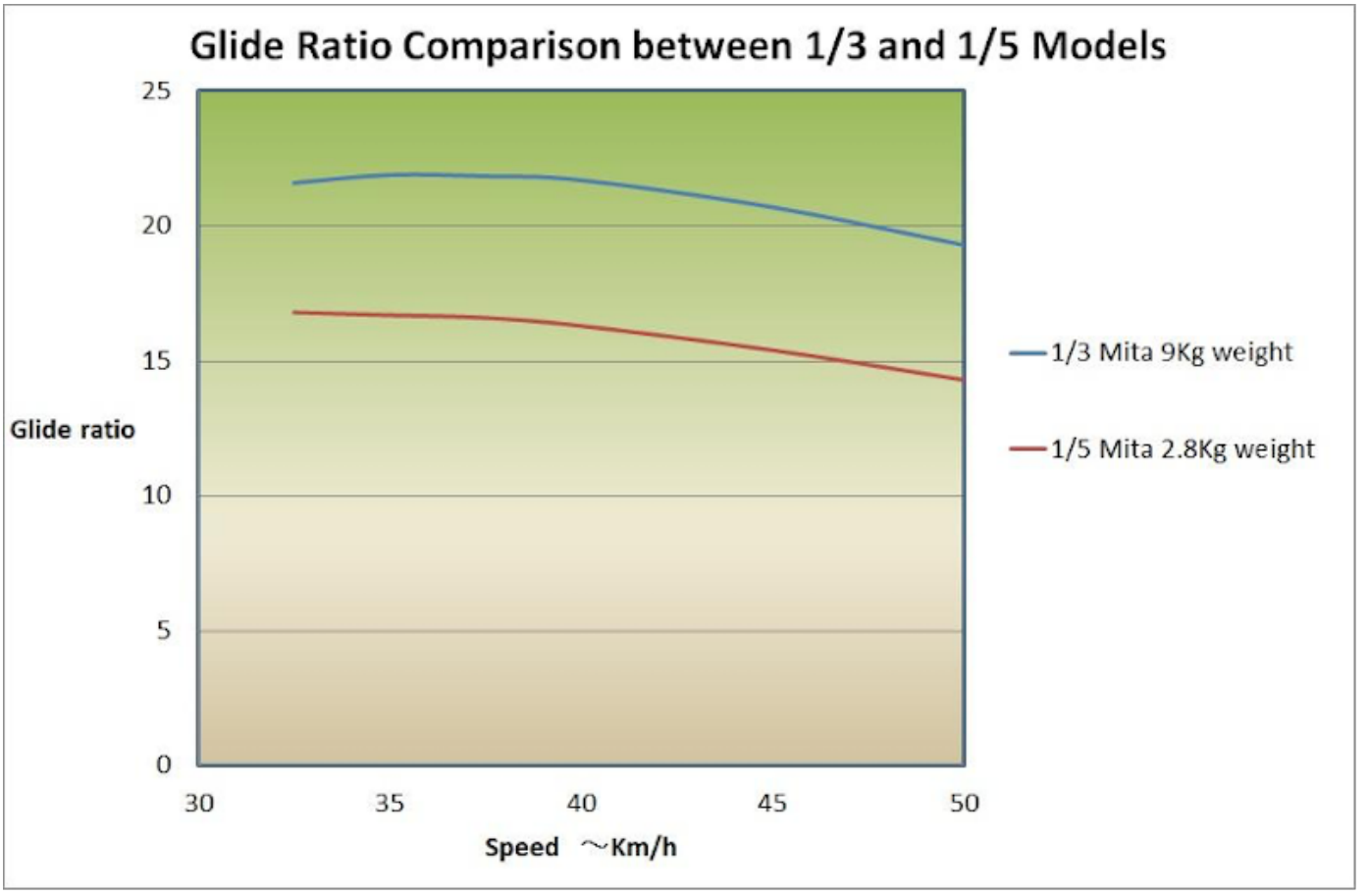
The decrease in potential energy is given by the product of the weight of the aircraft and the sink rate, so the heavier the aircraft is, the more power it can generate if the sink rate is the same. On the other hand, the power required for flight during descent does not differ significantly depending on weight. The reason is that the power required for flight is consumed by two types of drag: the profile drag and the induced drag, and these drag hardly change with weight.

This is because, as shown in Graph 9, the drag coefficient of the airfoil clearly shows that the increase in the profile drag is negligible even if the angle of attack increases slightly due to the increase in weight. Of course the heavier the aircraft, the greater the induced drag, but it decreases exponentially as the speed increases, so that it becomes a very small value near the best sink speed. Therefore, the increase in potential

energy due to the increase in weight is greater than the increase in power required for flight due to the same increase in weight, and as a result, the heavier the aircraft, the less sink rate is obtained.

Comparison with 1/5 Mita

For reference, I also estimated the performance of my 1/5 Mita and compared it with the 1/3.



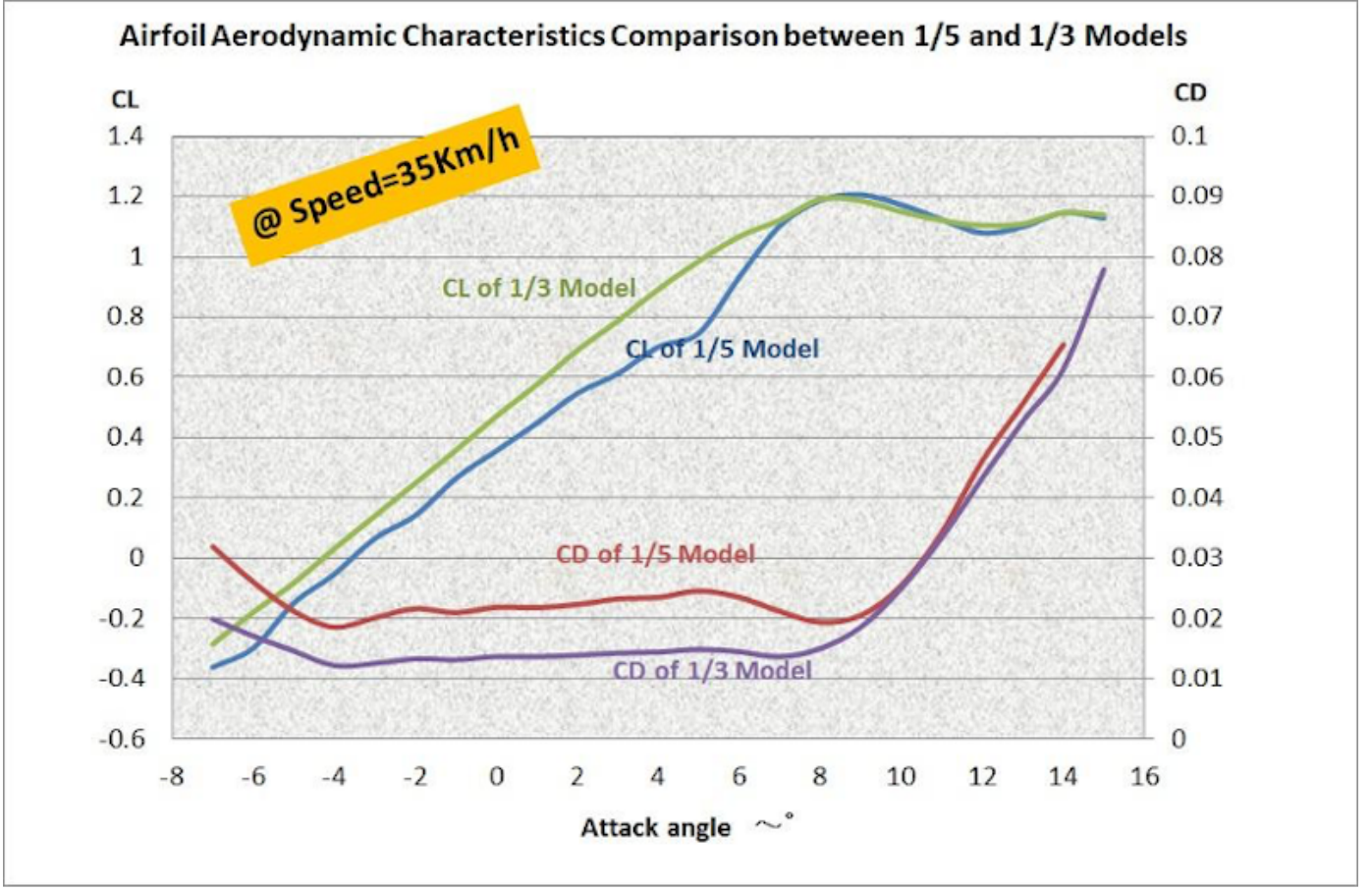
Graph 12: Comparison of glide ratio between 1/3 and 1/5.

Here is a comparison of glide ratios: 1/5 weighs about 2.8 kg, 1/3 weighs 9 kg. The best glide ratio of the 1/5 is only about 17. I am not so dissatisfied with this glide ratio, but the 1/3 is expected to improve it by about 30%.

The sink rate also improves as shown below.

Graph 13: Comparison of the sink rate between 1/3 and 1/5.

The reason for these performance differences is the difference in the aerodynamic characteristics of the main wings due to the difference in Reynolds number between 1/3 and 1/5. Following graph compares the airfoils lift and drag coefficients of the two aircrafts at a flight speed of 35 km/h.



Graph 14: Comparison of 1/3 and 1/5 wing airfoils aerodynamics.

The performance of the actual aircraft is superior to the model because the Reynolds number is even higher. According to the data, the best glide ratio is 30.8, but the flight speed that gives this glide ratio is 80 km/h, which is much faster, and the minimum sink rate is 72 cm/sec because of large wing loading.

From the above estimation, it seems that the flight performance of the 1/3 will be much better than that of the 1/5, and I can expect it to have good floatability. Also, there seems to be no need to worry about the weight increase.

Fabrication Part 18: Outer wing planking

Following the center wing planking, I planked the outer wings.

Planking of the Lower Surfaces of the Outer Wings

The rib assembly of the outer wings were completed at the beginning of August 2018, but the planking work was left until November to avoid the hot and humid summer because a lot of balsa powder flies when sanding the planking material.

I started planking the left lower surface first. Having made a paper pattern, I cut out the plank plate from the balsa board. Next, I laid a polyethylene sheet on the assembly jig, placed the plank plate on it, and put the rib assembly on top of it. But the jig, made of 2.5 mm balsa sheets, had warped considerably over the past three months, so it didn't fit the plank plate and rib assembly perfectly. I fixed it in various ways and when it seemed to have settled down, glued it all together with low viscosity CA. However, I made a big mistake here.

> ***Mistake #9:*** *Planking without noticing the deformation of the outer wing rib assembly*
>
> *At this time, I should have carefully checked the deformation of the rib assembly that has been left untouched for the last three months. But I paid too much*

attention to the deformation of the jig. When the lower surface planking was completed, I looked through the spar from the side and found that the carbon spar flanges, which should be straight, were slightly curved!

Image 103: Deformation of the outer wing spar.

The photo 49 (June issue) taken when the rib assembly was completed showed the spar went straight through. I regretted that I should have checked more carefully before dropping the CA, but it was too late. There was no way to fix it. It was a painful mistake.

After regaining my composure, I checked the effect of the bent spar in connection with the center wing (photo 104).

Normally, the leading edges of the center wing and the outer wing are in a straight line, but the leading edge of this outer wing has a swept back angle of about 0.57°. This is a big mistake for a scale aircraft, but the saving grace is that the outer wing has an dihedral angle, so its leading edge appears to be slightly swept back in most cases. This can also be seen in my 1/5 model (photo 105) where the leading edge was made straight through. Therefore, I decided to leave the wing as it is because it will be almost indistinguishable in appearance and this degree of retraction will have little effect on the flight characteristics.

The above problem was discovered before the right wing planking, so the right wing was intentionally planked with a leading edge swept back angle of 0.57° in order to achieve symmetry. Ideally, the planking work should have been done without delay following the completion of the rib assembly.

> ***Lessons Learned 5:*** *When assembling the wing, proceed to the plank at once. If you leave the rib assembly for a long time, it will be deformed.*

Photo 105: The outer wing always appears to be swept back.

Problem with the Aileron Hinge Was Discovered

When I tested the installation of the aileron after completing the lower surface planking, I found there were steps between the wing and the lower surface of the aileron, which should be smoothly connected. The amount of these steps are different in the span-wise direction, the aileron was attached to the upper side by a maximum of 2mm. This means the aileron cannot function as a frise-type aileron.

> ***Mistake #10:*** *Aileron mounting position is incorrect*
>
> *The cause seems to be the aileron hinges are positioned incorrectly on the rear spar of the outer wing. This is probably due to the fact that the hinges were installed*

> *into the mounting holes drilled by hand without using any positioning jig. I should have carefully checked the positions of the hinges with the aileron attached before they were glued.*
>
> *I had no choice but to remove the hinges and reinstall them, but it was tough work to remove them because the hinges were made of carbon and were tightly bonded to the rear spar web with CA. This is a typical example of a problem that can occur if the work procedure is not carefully considered.*

After a lot of hard work, I managed to fix the hinge positions, installed the aileron servos, and positioned the upper stringers in preparation for the upper surface planking.

Photo 106: The outer wings with the lower plank completed.

Planking the Upper Surfaces of the Outer Wings

Next, I started to plank the upper surfaces. In order to apply the plank material within five minutes after the application of the titebond adhesive, I divided the plank sheet into two and attached them separately based on the experience with the center wing. For this purpose, a rib of the same shape was attached to the rib at the separation point to make a glue margine. The method of attaching the planks and holding them down on the assembly jig with thin cypress sticks and rubber straps is the same as for the center wing (see photo 94).

The work went smoothly up to this point, but when I connected the outer wings to the center wing, I found an unexpected problem. As the leading edge of the outer wing has a swept back angle of 0.57°, its effect appeared as the innermost rib of the outer wing was not parallel to the

outermost rib of the center wing. There is about a 4 mm gap between the two wing's leading edges.

Photo 107: The connecting surfaces of the center wing and the outer wing do not meet!

This was not acceptable and I had to fix it, but since the outer wing has a dihedral angle, it was a little difficult to fill the gap. I attached two pieces of 2mm balsa sheets in a staircase shape on the innermost ribs of the outer wings and then, by connecting them to the center wing, fixed it carefully with a file while checking the condition. At the same time, the leading edge was shaped to complete the wing shape.

Photo 108: The revised connecting surfaces.

I’m sure if a person who is good at crafting did it, the gap would be invisible, but with my skill, I have to accept this level of completion.

Aileron and Wingtip Attachment

After attaching the lip that covers the top of the leading edge of the aileron, the aileron was attached and the length of the lip was adjusted to secure the aileron operating range. Then, I attached the wingtips and shaped them so that the outer wing contour and wingtip are smoothly connected.

Photo 109: Finished outer wings.

Main Wing Assembly

I connected the outer wings with the already completed center wing to make one main wing and put it on the fuselage with tail wings.

Photo 110: Main and tail wings assembled on the fuselage.

The shape of the aircraft is gradually becoming clearer and clearer, which makes me excited.

7th Calculation of Weight & balance

I recalculated the weight and balance because the skeleton of the wing and the fuselage were completed. The weight of the center wing is 1,715g at present. The remaining work is expected to be 190g for covering and 30g for painting. The

outer wings weigh 818g on the left and 833g on the right. The remaining works are expected to be 155g for the left wing and 154g for the right wing, due to the counterweight, covering and painting. Based on these data, the revised weight and center of gravity calculation table is as follows.

7th Weight & Balance	2018/11/25	Completion Ratio		59.21 %			
	Predicted Weight	STA	Moment	Actual Weight	Estimated Remain Weight	Target Weight	Predicted-Target
Outer Wing Left	**973**	890	865,970	818	155	700	273
Outer Wing Right	**987**	890	878,430	833	154	700	287
Center Wing	**1,935**	890	1,722,150	1,715	220	1,720	215
Fuselage	**2,793**	869	2,427,117	1340	1453	1,600	1,193
Vertical Tail	**212**	2,450	519,400	172	40	240	-28
Horizontal Tail	**378**	2,270	858,060	266	70	400	-22
Motor	418	43	17,974	0		361	57
Propeller & Hub	50	-10	-500	0		50	0
Battery for Radio	155	200	31,000	0		155	0
LiPo	600	340	204,000	0		600	0
Others	186	250	46,500	0		634	-448
Total	**8,687**	**871**	7,570,101	**5,144**		**7,160**	1,527
Target CG		**846**					
Weight	322	160	51,522			0	322
Normal Flight Condition	**9,009**	846	7,621,623			**7,160**	1,849

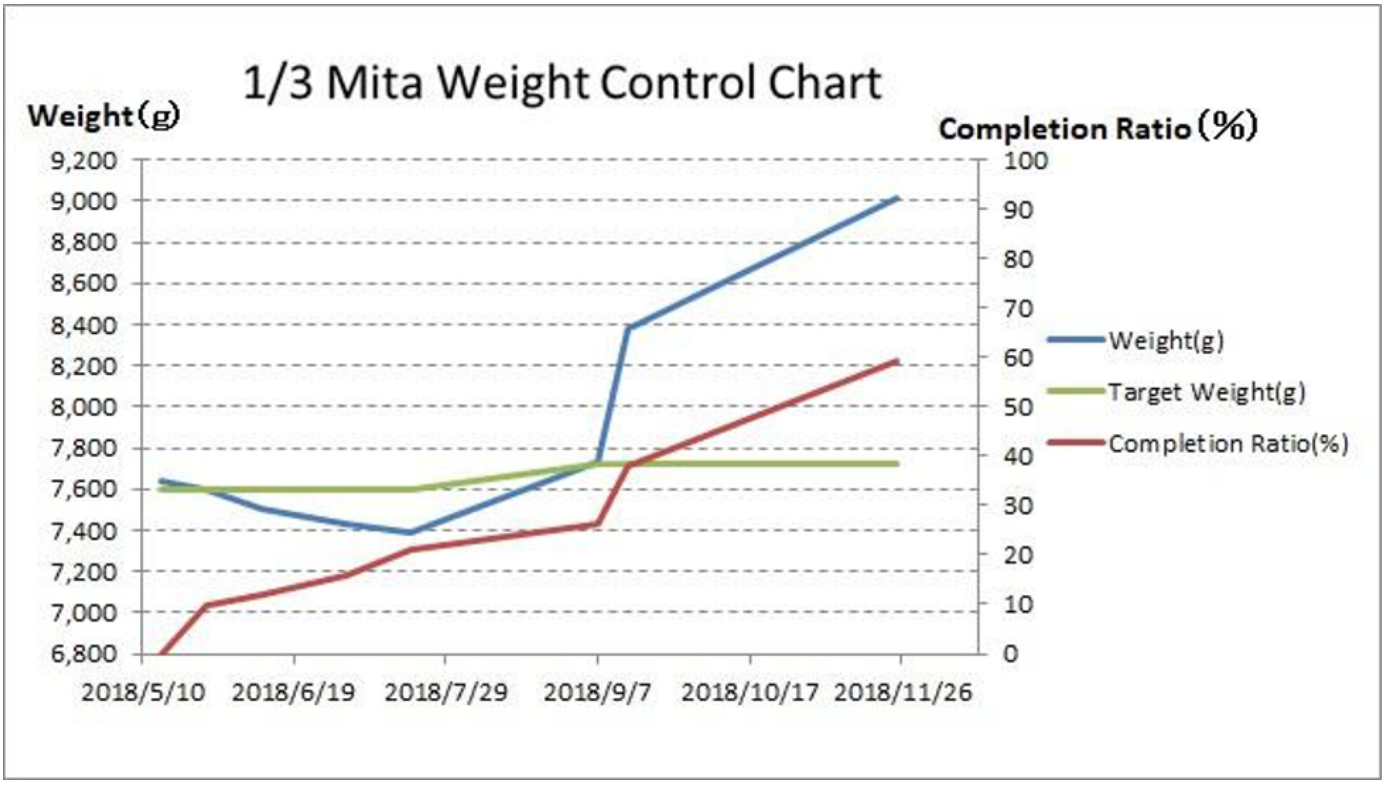


Table 8: The 7th calculation of weight and center of gravity.

The total weight is expected to be 8,687g, and together with the 322g weight required to balance, the total weight is

expected to be 9,009g. As predicted earlier, the target weight for the wing and fuselage were too small. The completion ratio is 59.2% and there is not much room remaining for weight reduction in the future.

*This is the fifth part in this series. 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**.*

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 as 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.

Another Way to Support RCSD

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!

*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.