Radio Controlled

Soaring Digest

February 2022

Vol. 37, No. 2

The New RC Soaring Digest

February, 2022
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In The Air

Bird? Like. Bird-like.

Terence C. Gannon

Vincent de Bode's Slingsby Gull on tow. You can read the entire story of Vincent's latest project in this issue. (image: Raymond Esveldt)

Sometime in the mid-1970s, the cinematic rendering of Richard Bach's mega-hit book *Jonathan Livingston Seagull* had arrived in the movie theatres of Vancouver, BC. By the time our family got to the *Vogue* on Granville, the near street level marquee had already been defaced: some selected letters had been stolen, and the booty undoubtely used as an *aide-mémoire* for a would-be cinephile to help write up a review for his crappy mimeographed newsletter.

The movie was — well — 'complicated'. That, of course, is a 21st century

metaphor for 'not very good'. Incomprehensible for a 12 year old, certainly. The super-cinematic, timeless soundtrack music by Lee Holdridge and Neil Diamond, on the other hand, was (and is) out of this world — I still listen to it to this day. But not even *that* was the reason why our family stood in a long line to see the Hall Bartlett film. I will reveal that in a moment.

The Vogue theatre on Granville Street in Vancouver, BC circa 1973. (image recreated with Pixelmator)

To be entirely honest, I don't think I ever read Bach's book, at least not when it was first published in 1970. Many years later — perhaps? — but even then I didn't think it was a patch on Richard Bach's other books written before *Seagull*. My favourites were *Nothing by Chance* followed closely by *Stranger to the Ground*. Incidentally, these are must-reads for anybody even remotely interested in anything that flys. But *Jonathan Livingston Seagull* does make it plain what readers might have had a hunch about after reading Bach's earlier works — that is, Richard Bach might well have been much happier if he had simply been born a bird.

I exchanged emails with Bach a number of years ago (regarding a podcast I was working on at the time) and his very polite albeit terse comment back then was "I've just stopped interviews…I've done a number of them and today it's been difficult to summon the energy to do more." His huge success as a writer paid for a very nice life, I'm assuming, but the care and attention

required to sustain the earthbound dreams of his admirers — including me — was simply draining for him by the sounds of it.

A bird, on the other hand, just flys. That's all. Well *that*, eat and mate of course. But it's a mercifully short list of things to do. Perhaps that was the point of *Jonathan Livingston Seagull*: flying all day, and every day trying to do it just a little bit better, was really Bach's idea of heaven.

I can relate. Perhaps we all can, a little.

Short of achieving the impossible dream of some Bach-ian nirvana, perhaps the next best thing to actually *being* a bird is flying an aircraft that draws some strong design cues from them. There are few illustrations more appropriate than the 'gull' configuration of the wing as beautifully illuminated by Vincent de Bode's Slingsby *Gull* featured in a richly-detailed article in this issue. It is also pictured above, on tow. Then there is Thomas Martino's modern take on the configuration in his articles simply entitled *The Gull* which ran in the December 2021 and January 2022 issues of RCSD. Of course, there is the beautiful work of Chris Williams in his *Petrels I Have Known and Loved* which ran in the July issue last year. Suffice to say there are no shortage of examples of those drawn to the gently canted wings of the bird-like form.

There are other examples. My favourite aircraft for testing out a new slope for the first time is Michael Richter's *Alula*. It is obvious the designer took inspiration from the coastal raptors near his home. I think the wing shape resembles a turkey vulture — their hideous appearance up close is a stark contrast to the utter grace when they are on the wing. But it turns out the pretty configuration of Richter's *Alula* results in a glider which can turn on a dime and remain aloft — in hands other than my own, of course— seemingly in the slightest hint of lift. In this case, function follows form rather than the

other way around.

Then there are the amazing bird-like renditions enabled by the new, lightweight-material 3D-printing processes. The best example I've seen so far is the appropriately-named *Seagull* from PlanePrint in Innsbruck, Austria. They have somehow managed to reverse engineer the real bird in almost every detail. The resemblance is uncanny. That said, I don't think there are too many seagulls with electric ducted fans — but never having had the opportunity to discuss it with a seagull, I can't say for sure they *don't* want one. However, a glider-only option is available. As and when I build one — make that print one out, I guess? — that's definitely the version I will choose. It only seems right.

However, I somehow take consolation that in a world where there is no shortage of very exotic, gorgeous airframes made of unobtanium and resulting in spectacular performance— the CCM *Vantage*, in this issue, for example — there are still lots of people who want to return to the simple, original form of those humble creatures who actually invented this thing we love to do.

Back to *Jonathan Livingston Seagull* the movie for a moment, to answer the question of why it was necessary for all five members of the Gannon family to rush to the *Vogue* in the icy-cold winter rain. That was because the November 1973 issue of Don Dewey's *RC Modeler* magazine had the story of how the late, great Mark Smith had had his door knocked on by Hollywood. His reputation had reached there as **the guy** to build a radio-controlled seagull for their new movie.

The *RC Modeler* article describes the profound difficulty — back in the days way, way, *way* before computer radios and gyro stabilisation — to build a faithful rendition of the eponymous *Jonathan Livingston Seagull*. What's

more, it wasn't sufficient for the bird-like model to limp around the massive, you-could-fly-a-brick lift found at Torrey Pines. Rather the movie's producers' expected JLS to perform a challenging aerobatic card as well. I'm pretty sure barrel roles made it to the screen. Mark eventually had to concede a little ground to the real birds and ended up adding small, transparent disks to the model bird's wingtips to make it even vaguely flyable. And only then in his extremely capable hands. If you look closely at the film, you can just about see the stabilising disks in some of the frames.

The article was one of many in my dog-eared copies of *RC Modeler* which crowned my bookshelf as a kid. If it could be done in a manner which respected whatever residual rights are still out there, I would love to feature not only the JLS article in the *New RC Soaring Digest*, but a number of other really great articles which appeared in that magazine over the years. If you're in a position to help with that, by all means, please get in touch!

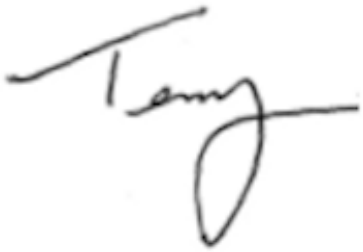
As usual, I have overstayed my welcome and run out of space — and readers' patience, to be sure.

However, if you'll pardon one last thing I wanted to add: that is, to warmly welcome a brand new contributor from a part of the world which has not been represented in our pages previously — Dr. Gurmail Singh Malhi, Associate Professor, Department of Aerospace Engineering at Chandigarh University, Mohali, Punjab, India. He provides a great write-up for the *Sky High Aeromodelling Competition* which he organized this past September. One of my goals for RCSD in 2022 is to broaden and diversify our audience, and I can't think of a better way of doing that than this article, while simultaneously encouraging the next generation of RC glider guiders. I really hope you enjoy the article as much as I did.

Beyond that, there's too much in this issue to list here so suffice to say we're

very proud of what we have managed to assemble for February and we genuinely hope you enjoy reading it and thankful that you do.

Fair winds and blue skies.



Resources

- **Jonathan Livingston Seagull** — The full-length feature film by Hall Bartlett on Amazon Prime.
- **Jonathan Livingston Seagull** — motion picture soundtrack by Lee Holdridge and Neil Diamond on AppleMusic.
- **Nothing by Chance** — paperback book on AbeBooks.
- **Stranger to the Ground** — paperback book on AbeBooks.

Cover photo: *We have the honour of announcing the inaugural member of the* RCSD Three-Timer Cover Club. *Alexandre Mittaz's beautiful photography has graced our cover — you guessed it — three times. This month's features a Baudis* SkywalkerXL *over a beautiful snowy landscape near Gadmen in the Gruyère region of Alexandre's native Switzerland. The elegant 5m, 7.5kg ship is being held aloft by a northeast 'Bise' wind that was blowing on December 26, 2020. Alexandre also asked us to share credit with his friend A. Ramirez, which we are happy to do, of course.*

*Here's the **first article** in the February, 2022 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***.

Silent Arrow® Conducts First Overseas Operations in Middle East

Two GD-2000 autonomous cargo gliders successfully deliver 465kg of payload ending with “zero sink rate” auto-flare.

The NEW RC Soaring Digest Staff

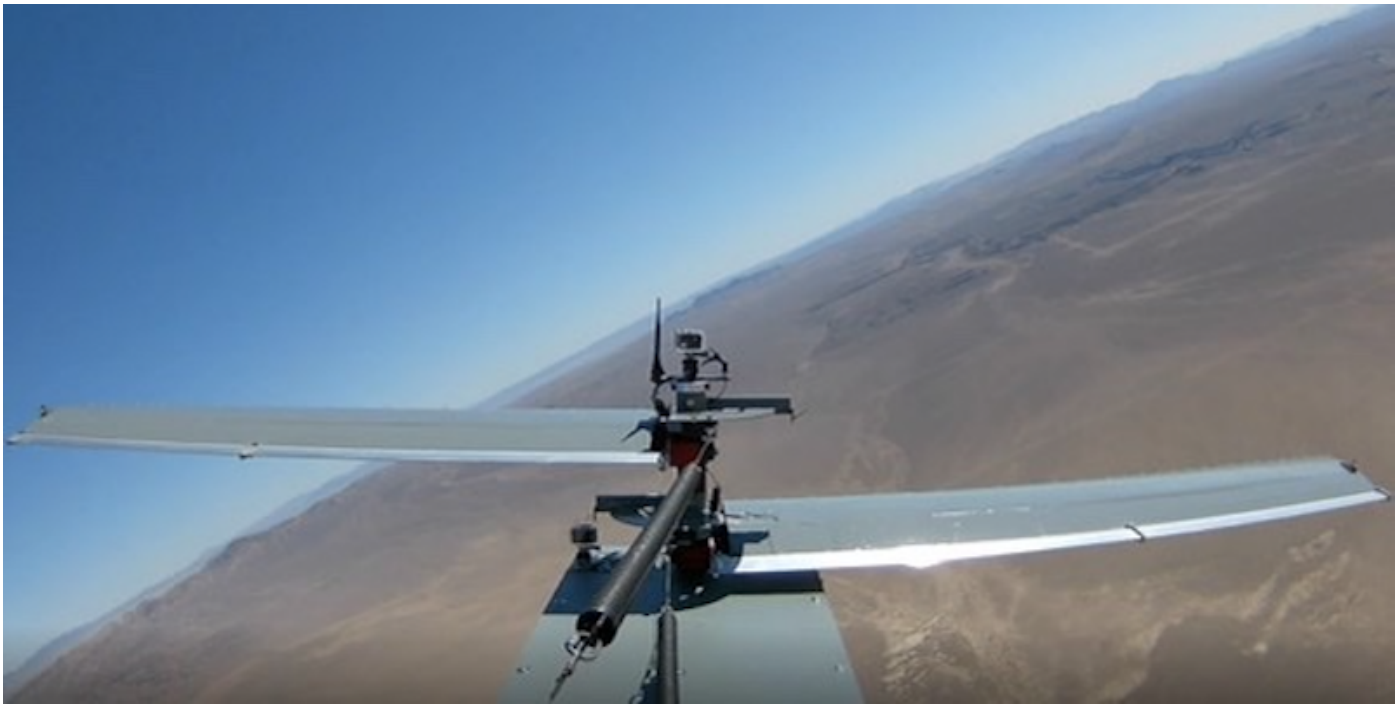
“A Silent Arrow® GD-2000 is deployed from a C-130 by rolling backwards and safely separating from the cargo ramp over an undisclosed desert test range.” (image/caption: Yates Electrospace Corporation)

LOS ANGELES, January 31, 2022 — Under the terms of a $1.5 million contract to evaluate their operational capability in the field, the Silent Arrow self-guided cargo-carrying gliders have achieved their first real-world mission objectives. The GD-2000s delivered a total of 465kg (1025lb) of payload over a distance within the glider’s 65km (40mi) stand-off capability

after the two gliders were rolled out of the rear cargo doors of two C-130 *Hercules* delivery aircraft flying at an undisclosed altitude. The mission was conducted in conjunction with an allied government in the Middle East over a desert landscape.

Once out on their own, the GD-2000 gliders flew completely autonomously including waypoint selection and navigation. During the autonomous sequence at a pre-designated landing zone, the GD-2000s were able to achieve a near "zero-sink rate flare".

THE GD-2000 glider has a certified maximum gross weight of 907kg (2000lb) and a payload storage capacity of 736L (26 ft²). The recent Middle East flights were at take-off (ie. drop) weight of 689kg (1520lb), meaning future flights could carry as much as 218kg (481lb) of *additional* cargo per aircraft. Originally designed to replace GPS-steered parachutes (JPADS) under contract from the U.S. Marine Corps, Silent Arrow cargo gliders have been supplied or won contracts directly with all four US military service branches.



"A Silent Arrow GD-2000 turns on course at an undisclosed desert test range after C-130 deployment as seen by an image captured from its onboard video streaming capability." (image/caption: Yates Electrospace Corporation)

"As we prepare for mass production, it's encouraging to see foreign allied governments as enthusiastic about the new capabilities of Silent Arrow," said Chip Yates, Silent Arrow's founder and CEO. "We have distribution agreements in place for 37 countries so far and are working hard to become the worldwide standard for airdrop logistics."

This is a story the *New RC Soaring Digest* has been following since our February 2021 issue, with our interest based on our belief it is a unique project in that it uses, on a commercial basis, glider technology which will be quite familiar to our readers.

"We are really excited by the enthusiasm RCSD has expressed for the Silent Arrow project over the past year," said Yates, in a follow up, exclusive interview with the *New RC Soaring Digest*. "Given our pending plan to move from LRIP [low rate initial production] to FRP [full rate production] of thousands of GD-2000 units in 2023, the future is very bright for those with the skills common amongst RCSD readers. Given the aircraft's unique capabilities, I visualise autonomous cargo gliders being in common use for a wide-variety of both military and humanitarian roles. Of course, we believe Silent Arrow will be at the centre of these developments," Yates added, smiling.

The *New RC Soaring Digest* will keep reporting the evolving story of this compelling project as it continues to move to full commercialization.

The NEW RC Soaring Digest Staff

*Read the complete collection of stories on the **Silent Arrow in RCSD**. 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**.*

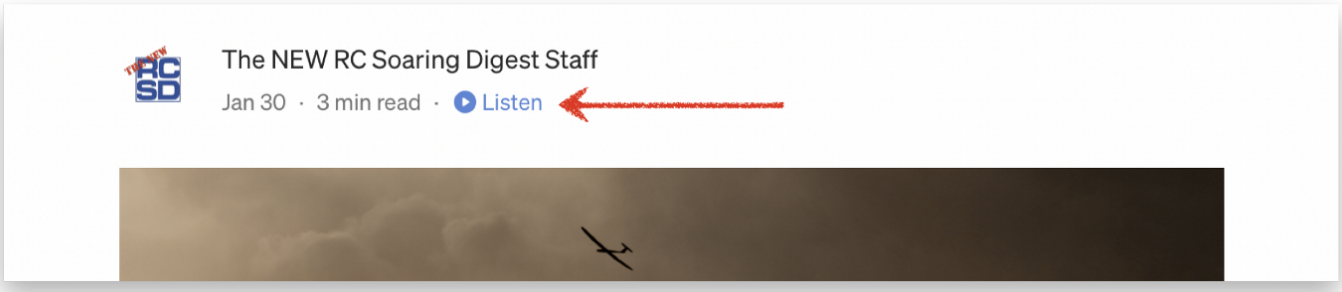
Would You Listen to RCSD Articles?

Our publishing platform Medium is currently testing a new audio option — we're in the test group and we love it.

The NEW RC Soaring Digest Staff

No, this is not how you have to listen to the New RC Soaring Digest. (image: Wikimedia)

It may be the next time you click an article in the *New RC Soaring Digest*, you will notice something new and really exciting:



If you click that button you will be able to select from one of six different accents and a variety of playback speeds and **listen** to your favourite RCSD articles. Haven't been able to glue in wing ribs or sand that fuselage while trying to read RCSD at the same time? Problem solved. You would be able to listen while you work. Or drive. Or take the bus. Or whatever.

"What excites me the most, actually, is that this opens up RCSD to a whole new and very important audience — the visually impaired," commented RCSD Managing Editor Terence C. Gannon. "We are truly thankful to Medium for trying to make this happen", Gannon added. "In addition, what with the incredible popularity of podcasts, we have thought for a long time that there was also an audience in that domain who really preferred that format — they just aren't readers. So we would open up that channel as well — it would be a real win-win for everybody."

Candidly, the text-to-speech services which we've used in the past leave a little bit to be desired. They range from vaguely stilted to downright robotic. But this new service being tested by Medium is a quantum leap. It's very natural — in fact, we have been using it as a proofreading tool. The voices actually sound more natural (as opposed to less) the more you listen to them. We do appreciate that's a subjective judgement — other listeners will have other opinions, of course — but we like it. We really, *really* like it.

That said, that would not make RCSD a full-blown podcast— that is, something you could find on ApplePodcasts or Spotify, for example. You

would still have to bring up the article to which you want to listen on your device (desktop, tablet or phone) and then click the listen icon at the top. However, we'll be watching the popularity of this new channel and can easily see making RCSD a podcast available on your favourite podcasting platform at some point if that demand where to be there. We'll be guided by you **telling us what you think**. We'll pass along your thoughts to Medium for their consideration.

"This is very much in alignment with our commitment for 2022 to 'more content in more formats' that we made at the beginning of this year," remarked Gannon.

Watch this space for developments on this front!

The NEW RC Soaring Digest Staff

Resources

- **We're Testing Audio on Medium** — A description of the potential new service by , VP at Medium.

*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**.*

First UK Slope Flights for the Alpenbrise

Initial impressions from pilot Iain Medley-Rose after the third airframe from the production moulds is committed to the air.

The NEW RC Soaring Digest Staff

The *Alpenbrise*, the latest design from Aeroic Composite's James Hammond, has been seen flying on a slope in the UK. A modern take on the classic four metre *Alpina* from Multiplex, this brand new glider looks like a significant step forward in many respects. The *New RC Soaring Digest* was provided with exclusive access to the pilot Iain Medley-Rose's initial comments:

"Because of the poor weather there was no one to launch for me, so I had to

do it myself. It's always a slightly nervous moment, the first seconds of a new plane's flight. This is even more pronounced when you are embarking on flights of a new design," said Iain. "Of course, the *Alpenbrise* has already been flown in Germany, so I know it works, but calculating the CG and setting your control settings from scratch adds a little uncertainty. Obviously the basic concept of —if it looks right, it'll fly right, applies here — but having the controls well balanced on the first flight would be nice."

"Waiting for the clag to burn off in the weak winter sun was frustrating and we nearly gave in…luckily the third round of 'let's give it another twenty minutes' payed off" as Medley-Rose went on to further describe the days events. "Obviously it's a moulded plane so it's no surprise that no pilot interference was needed after launch. The conservative first flight CG only needed a few beeps of up trim."

"Once a few metres of sky had been arranged under the glider, a few stall turns and wing overs showed good pace and energy retention. Normal turns

need very little rudder input. Loops and rolls were all pretty easy, but adding a bit more snap flap will be done for the next flights," Medley-Rose continued. "A quick dive test confirmed the feeling about the forward CG. Stalling was quite hard to achieve and it took full up and some effort to get fully into the stall. Crow brakes were also given a quick test — just a slight change to the down elevator mix and a bit more up aileron are required."

"A few very weak pockets of lift appeared and thermal flap showed that the *Alpenbrise* has a good climb. A bit more swooping and whooshing around showed that the turn of speed is good and the low level of noise suggests that the drag from the airframe is low. It feels and flies like a thoroughly modern design, so it has good tracking and holds its line beautifully," said Medley-Rose. When asked what was next, Iain said:

"I'm really looking forward to getting the *Alpenbrise* out again and giving it a damn good thrashing!" And we'll be here to write about that, too, Iain!

*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 Vantage

An F3F design suitable for light conditions while still being race competitive — have Mario Perner and CCM hit the mark?

Pierre RONDEL

Photo 1: The Vantage from CCM in the spring grass and flowers.

Introduction

The *Vantage* is an F3F competition glider designed by Mario Perner from Austria, well known and talented pilot on the F3F scene, also team manager for several years of the national Austrian F3F team.

Photo 2: The Vantage at Col du Glandon.

It is manufactured by CCM (Chekh Composite Models — see *Resources* below for this and other links mentioned this article) also known for the *Optimus* F3J model, the *Toy*, and more recently for the *Liberty* F5J, and distributed by Mahmoudi Modellsport in Europe. As you probably know, competition is always an eternal quest for *un mouton à cinq pattes* (‘five-legged sheep’), but at the end is more a story of compromise, so design choices. This is exactly what motivated Mario following the F3F world championship in 2018, when he started to design the *Vantage*, his second design after the *Thor* in 2012, wanting a model this time to address weak to medium conditions around and below 50s as a complement of other competition models often more specialized for medium-to-strong conditions. Let’s see in this review if the target has been reached!

Presentation

We are lucky enough that Mario shared in detail on the RC-Network forum

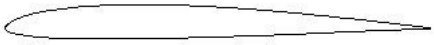
his choices and design process, therefore I thought it interesting to quickly summarise them so you know where you go. Main requirements were to carry as much as possible of ballast during the starting phase (pumping), around the turn, and during the whole flight. The *Vantage* should also track well to avoid multiple correction at the sticks, and the most important, the plane should outperform the best sellers in small conditions and should not conceed too much time to them even in good-to-very-good conditions.

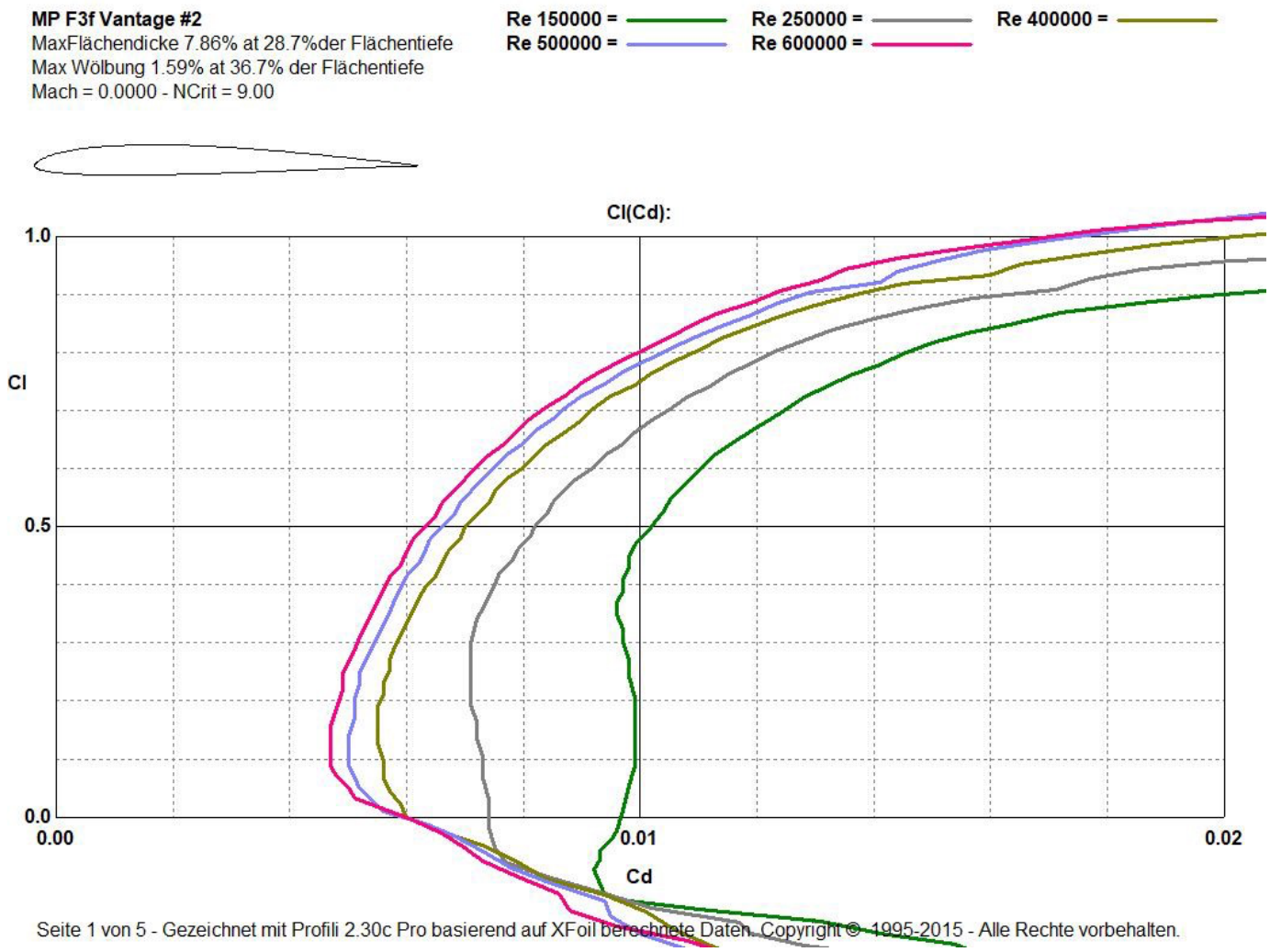
Photo 3: The Vantage along my favourite fence.

Mario then created a series of five airfoils going from 8.27% to 6.51% of thickness and 1.65 and 1.56% of camber, distributed along the wing and optimised for a coefficient of Ca (ie. axial force) of around 0.25 (typical Ca for a F3F model is between 0.15 and 0.45).

MP F3f Vantage #1
MaxFlächendicke 8.06% at 29.4%der Flächentiefe
Max Wölbung 1.62% at 36.9% der Flächentiefe
Mach = 0.0000 - NCrit = 9.00

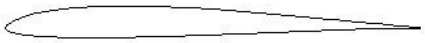
Re 150000 = **Re 250000 =** **Re 400000 =**
Re 500000 = **Re 600000 =**





MP F3f Vantage #3
MaxFlächendicke 7.57% at 26.3%der Flächentiefe
Max Wölbung 1.58% at 35.4% der Flächentiefe
Mach = 0.0000 - NCrit = 9.00

Re 100000 = Re 150000 = Re 200000 = Re 300000 =



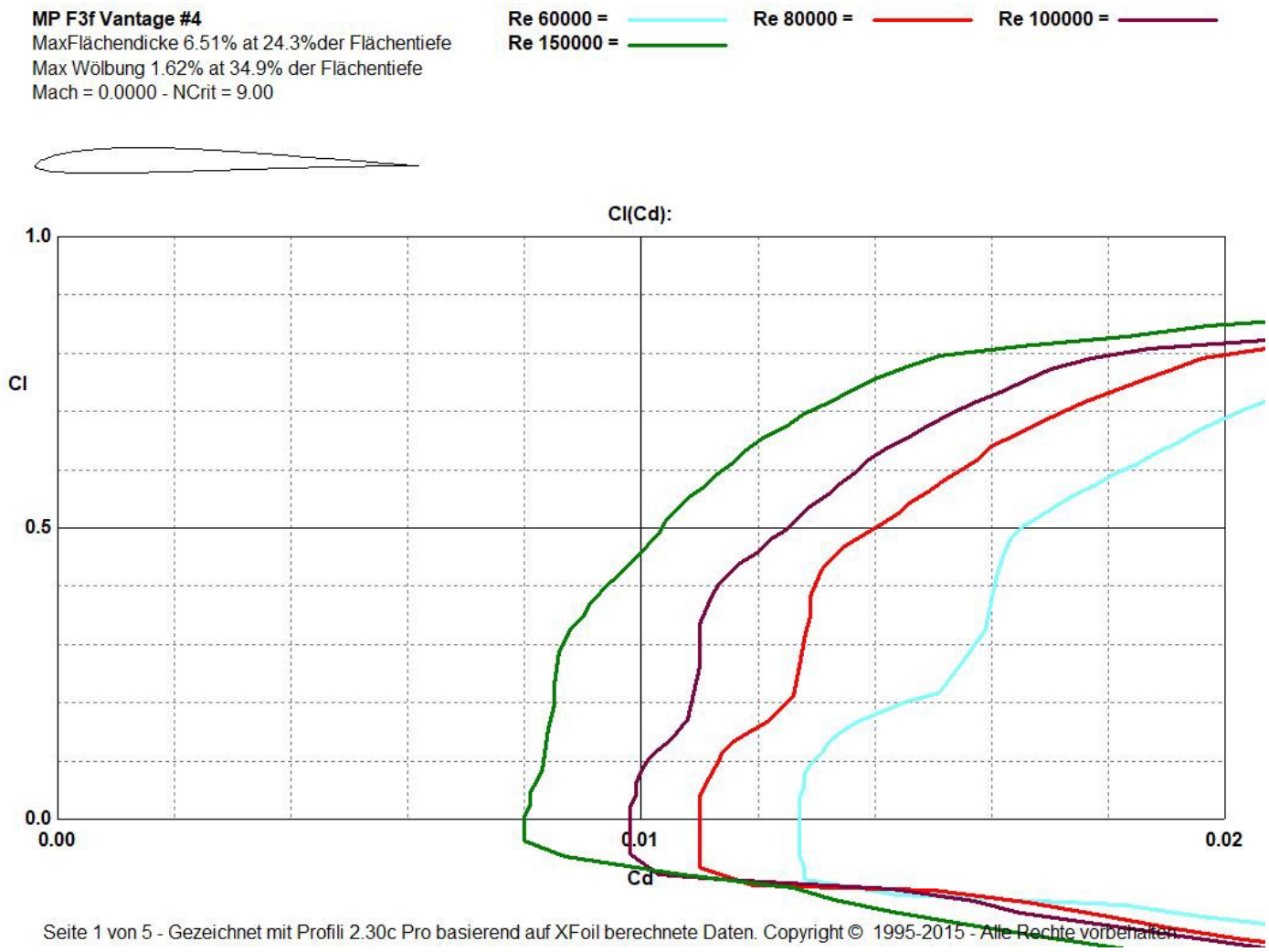


Figure 4 through 7: A few polars of the different sections along the wing.

For the tail, Mario started from the well-known and popular TP29 at 7%, which he modified a bit. Curiously, the elevator chord is around 20% only of the tail chord which is unusual, compared to the 30% trend.

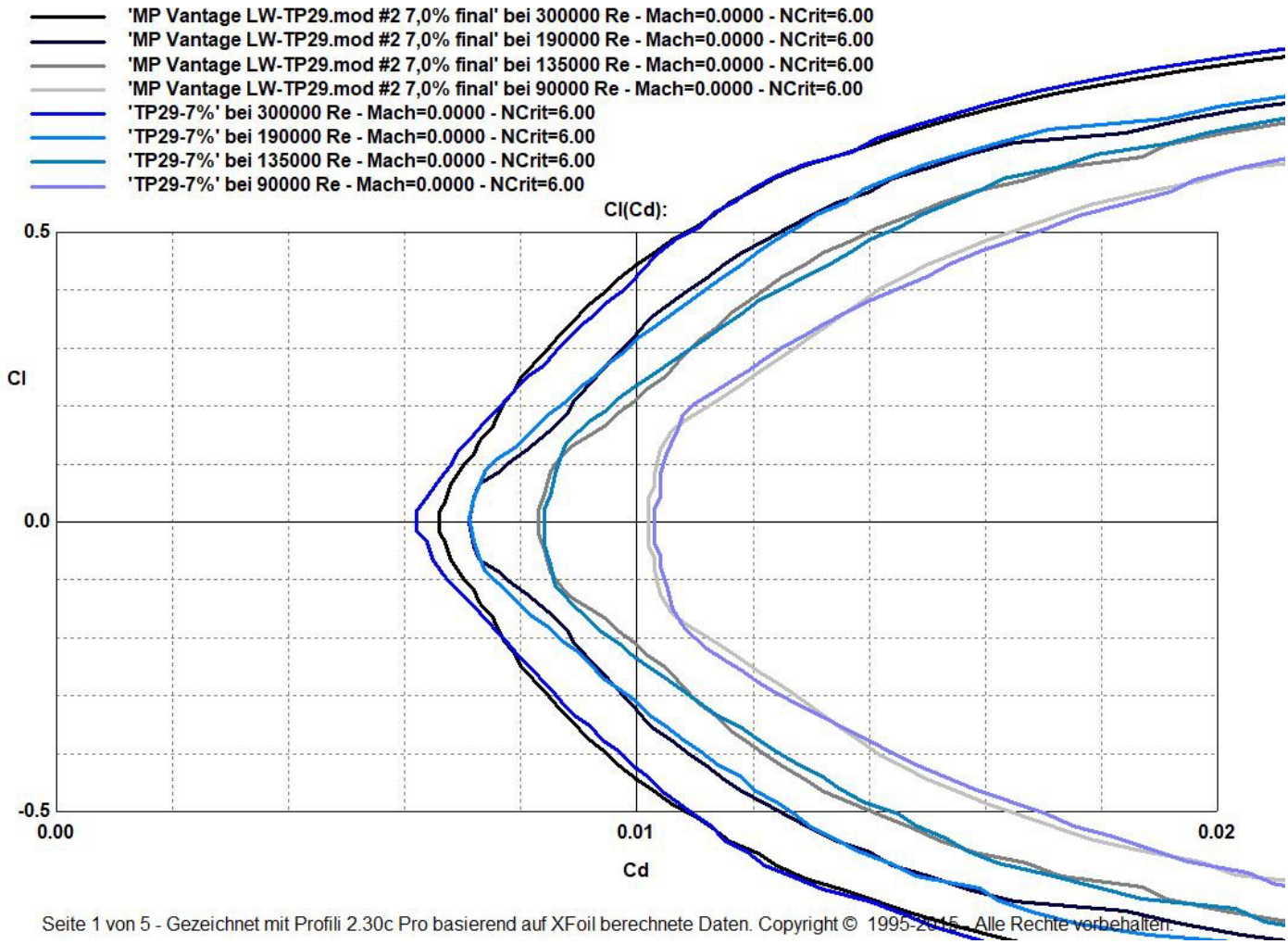


Figure 8: Comparison between the original TP29 and the modified version used on the Vantage.

Overall, the model is 2980mm wingspan, 1430mm long, and can carry up to 2880g of ballast which is way too much for the max FAI weight.

Kit Inspection

The kit arrived in a solid, five layer cardboard box. Components come in nice bags and the quality of the different parts is absolutely astonishing.

Photo 9: The kit arrives complete and higly preassembled. Just missing the spacers.

Every detail is just superbly done, join lines are almost invisible, and the paint is beautiful as the colour scheme, in neon orange and red in my case. Fit of the different parts together is second to none, with no blocking point and no slop. In brief, the craftsmanship is just fantastic, the best I have ever seen! Below the weight of the different components:

Fuselage:	305g	**Right Wing:**	720g
Right Tail:	28g	**Left Wing:**	707g
Left Tail:	28g	**Joiner:**	129g

The *Vantage* is available in two versions, F3B and F3F, mine being an F3F layup which is made of an outer double layer of spread carbon 40g/m² and some reinforcement at the wing root, AIREX® 71, the inner fabric being a spread carbon 80g/m² with an extra layer of 160g/m² carbon on ailerons and flaps to provide a better stiffness in torsion. Also servo locations receive some carbon reinforcement too. Wings appear really strong and stiff when manipulating them.

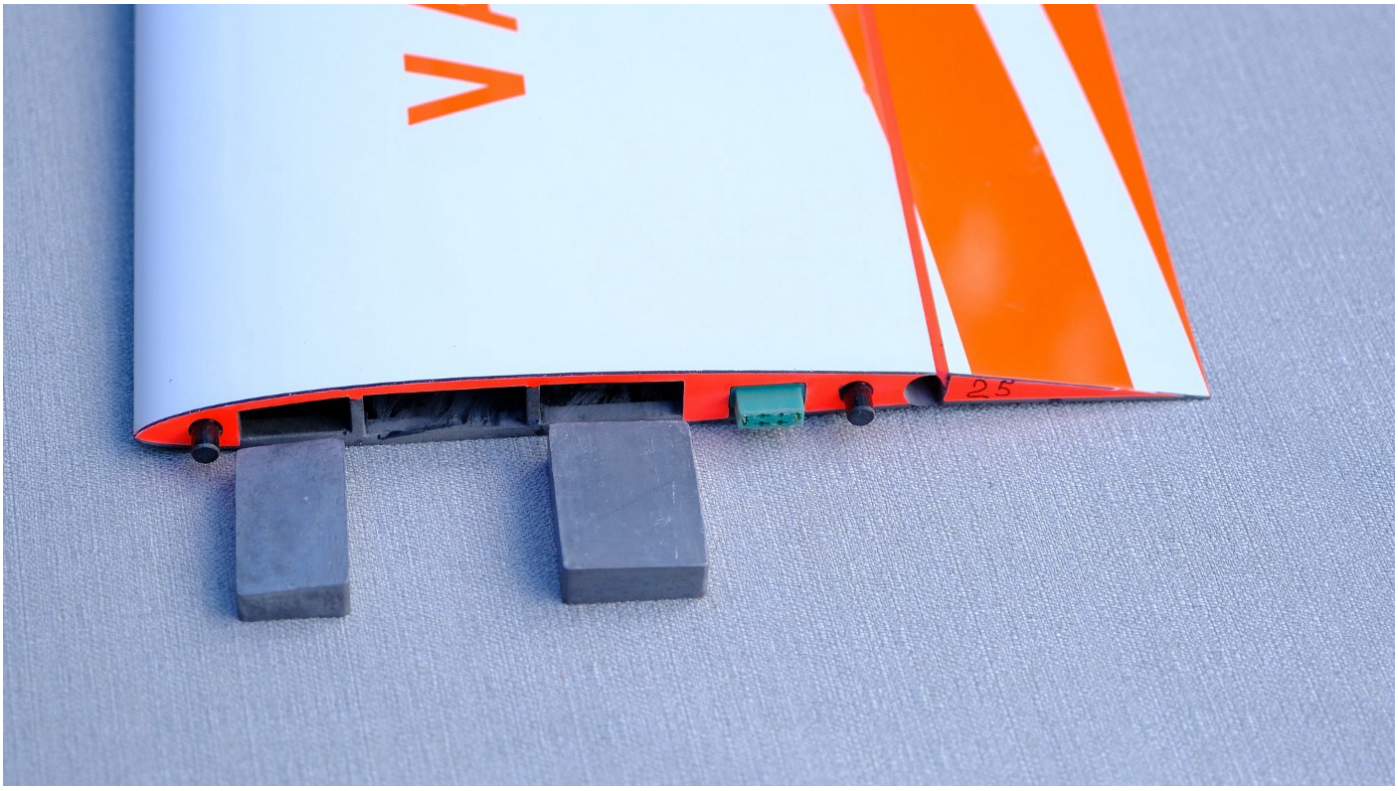


Photo 10: Wings are hosting two ballast compartments, for a better weight distribution.

No ballast in the fuselage or the wing joiner, a very robust piece of carbon with an inner foam core, everything is in the wings with rear and front compartments. The rear compartment, centered on the centre of gravity (CoG), can host 14 slugs of 140g each, when the front compartment receives 10 slugs of 92g each.

In addition to the amazing finish and fit quality, the noticeable point that really makes the difference is that the *Vantage* arrives with servo frames and and integrated drive system (IDS) from Servorahmen GmbH, wiring harness and green plugs preinstalled. This makes the assembly must easier and faster, and finally error free!

On my model, the joiner box is surprisingly larger than the joiner by 1mm. I read on a forum that it was on purpose, a design habit coming from the F3J/F5J category, but in F3F it is better to have the joiner tightly maintained in the joiner box because when you land with lot of ballast in the wings, any forward movement of the wing can damage the fuselage. CCM immediately reacted and has already made a new joiner with a new size 34mm which is now delivered in the kit.

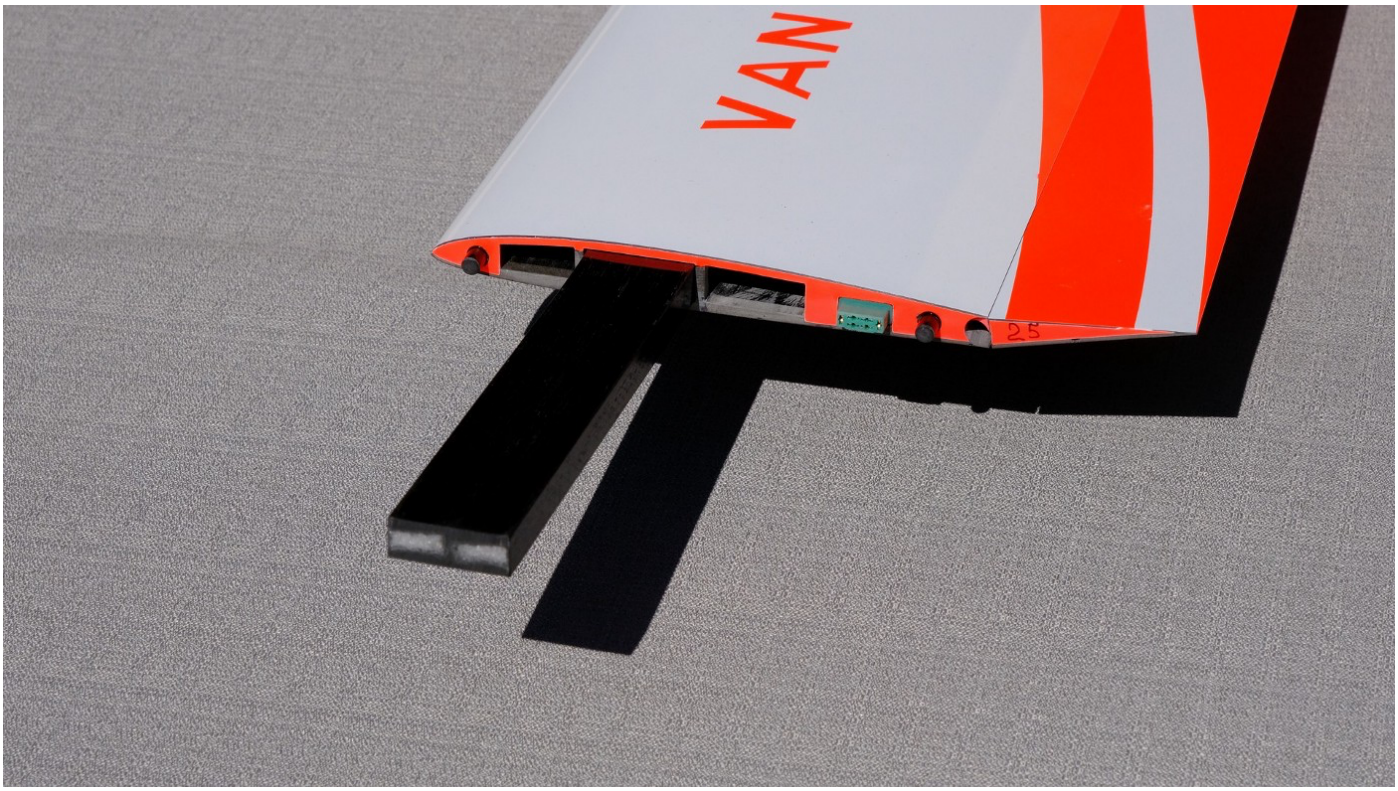


Photo 15: The robust wing joiner in place, it doesn't host any ballast.

The tail joiner is a 5mm diameter carbon rod instead of the usual 6mm rod we can find on most planes. 5mm is more than enough given the 28g of each tail, and light tail plus lighter joiner means less balance lead in the nose. Below, an overview in picture of the kit content and some details:

A Lightning Fast Assembly

Given the state of the kit, the assembly is really quick, very few hours maximum if you take your time. The work on the wings only consists in screwing the servos on the servo frames. I used the MKS HV6130 for flaps and ailerons. I just ground a little bit off the screws before using them in order to be sure that they are not making marks or deformations on the upper side skin. The servos head must be in the correct neutral position. Then I connected the control rod and installed back the metal axis, close the compartment with the transparent servo covers, and that is all!

There is a little more work on the fuselage side. A nice epoxy plate servo tray is provided in the kit. I used it as my two MKS HV6100 servos were fitting well without any modification. The plate is glued in place either with cyanoacrylate or 30-minute epoxy. Then you cut the plastic sleeve and adjust/cut the carbon rod to the correct length before to glue and pinch the threaded couplers on it. I replaced the nice M2 metal clevises by two plastic MP JET clevises because they are thinner, have no slop and fit perfectly in this tiny fuselage without needing any grinding.

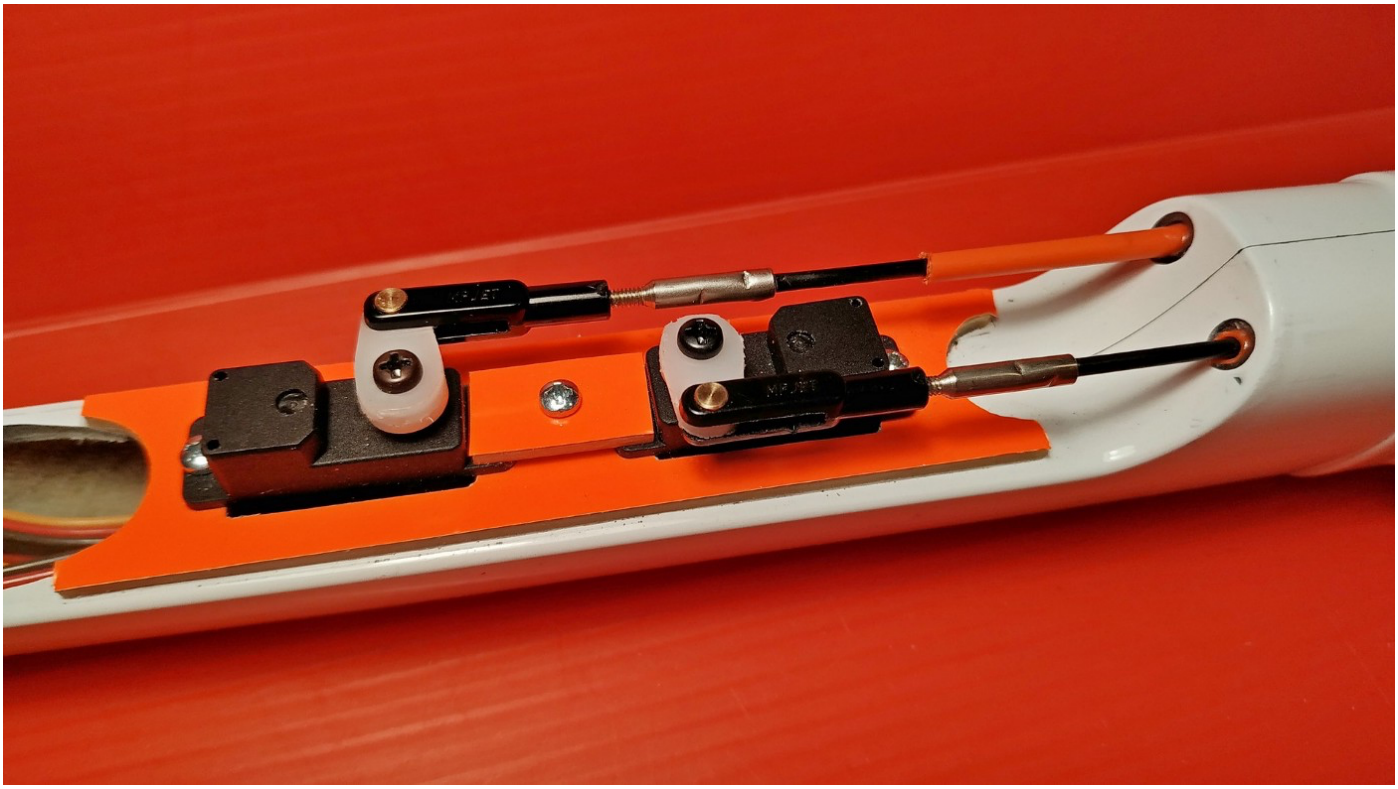


Photo 35: The elevator servo layout which could be optimized to save some horizontal space.

To be transparent, I found the elevator servos installation not optimum, losing a lot of horizontal space between the exit of the elevator rods, and between the servos. I think it would be possible to save around 1.5cm on length which would allow placing the receiver vertically between the servo tray and the battery. Without this optimisation, the receiver is placed horizontally, which means you need a tiny receiver such as the REX 6 from JETI or an equivalent from other brands. Some people are removing the

receiver case to save even more space, but I don't like the solution that exposes the receiver too much. Another solution would be to use shorter cells, like the Li-Ion 18500, but you lose capacity, 2000mA instead of 3000mA, so precious flying time. Personally, I stayed with a 2S Li-Ion 18650 battery that offers a full afternoon of flying.

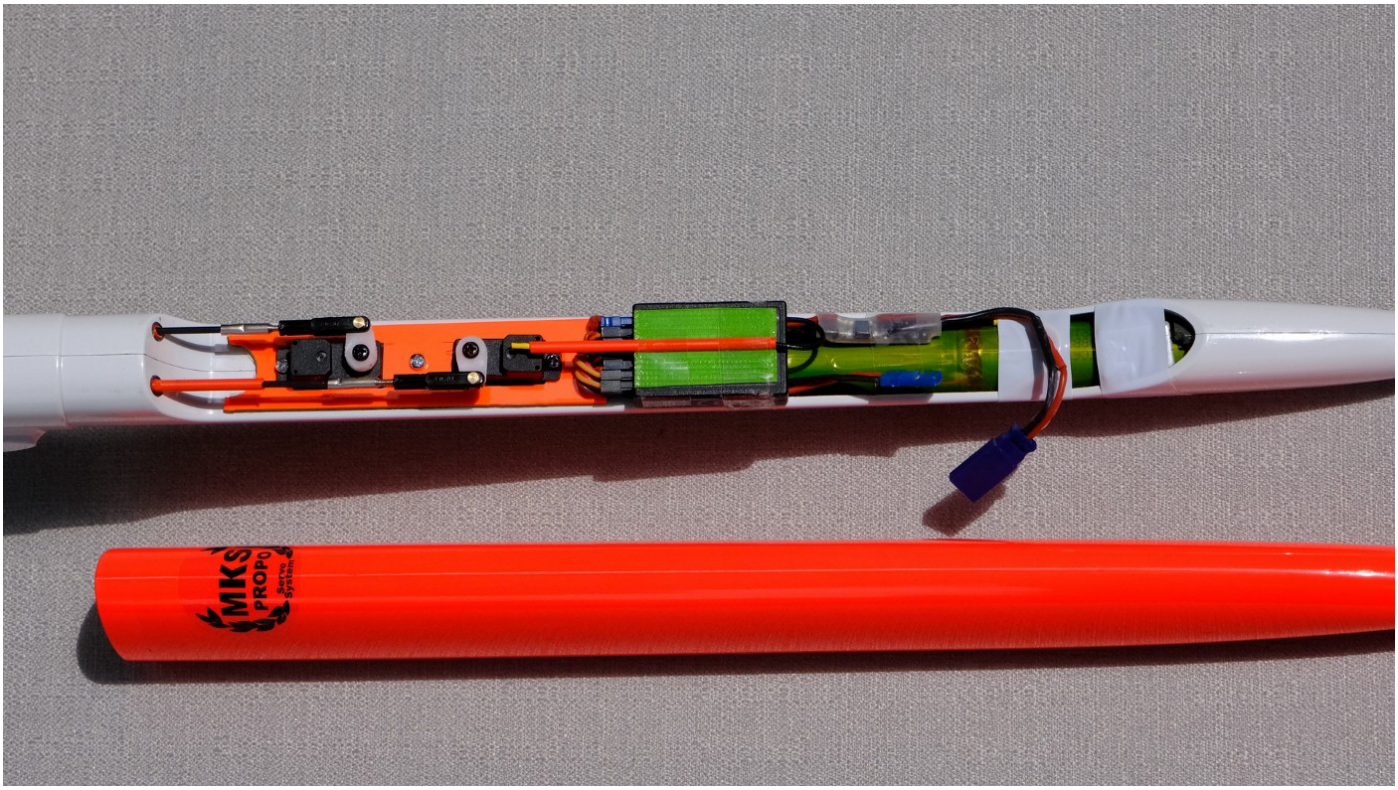


Photo 36: The radio installation, with the receiver installed horizontally. No space left when closing the nose cone!

On the CoG electronic scale, I needed 110g of lead in the nose to obtain the 99mm CoG (recommended range is between 98 and 100mm). Finally, the *Vantage* is weighing 2270g, which is a good weight for a F3F glider, light enough for small conditions.

Aside the model assembly, I have designed and 3D-printed spacers for the two wing ballast compartments, and also two 'elastic' spacers of each type.

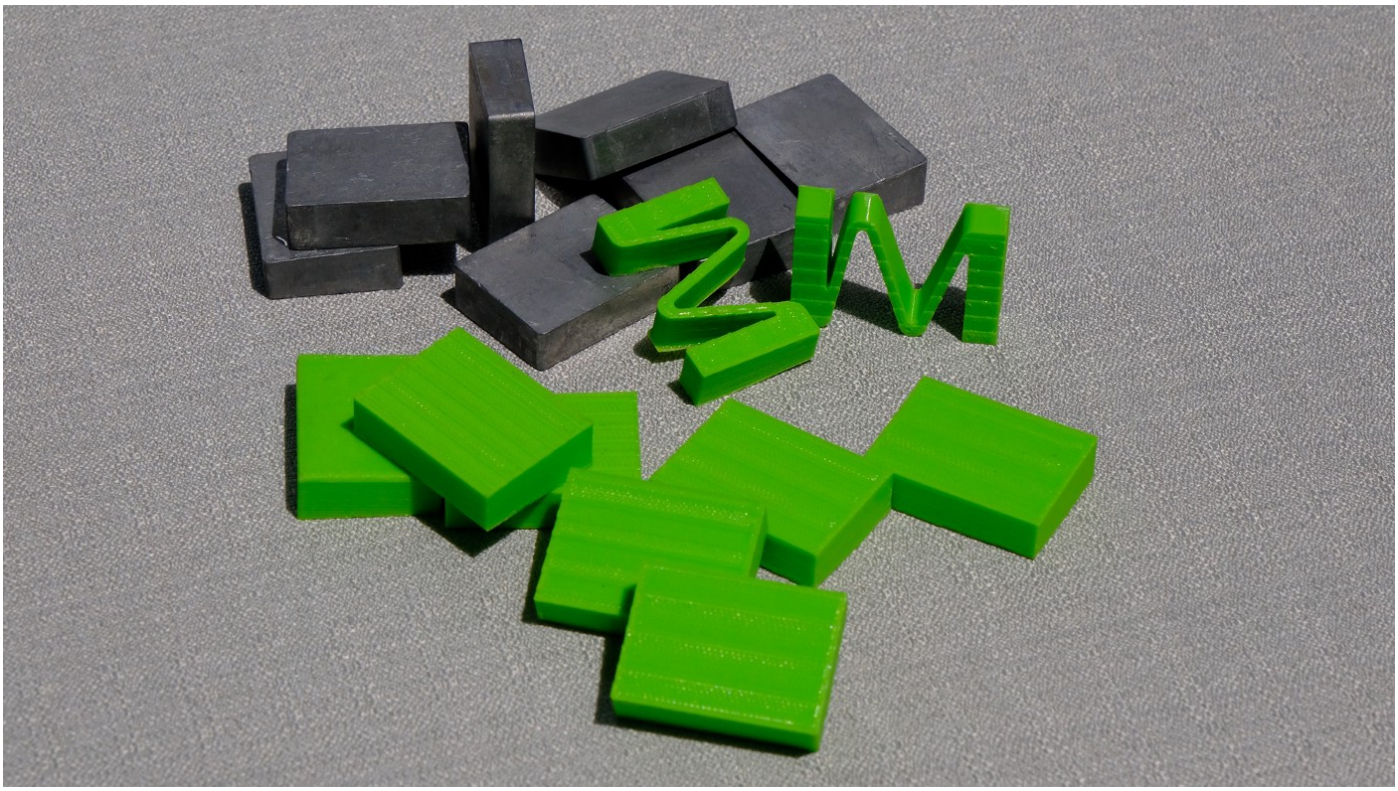


Photo 37: Home made spacers and ‘elastic’ spacers.

The *Ballast Management* mobile application I’m using, developed by my friend Joël Carlin and once provisioned with all the plane and ballast data, indicates that first you load the rear compartment, to reach 4.2kg, while the CoG is not moving. Then you load the front compartment, but only three ballasts are needed to reach the maximum FAI weight. Doing so, you need to remove some lead from the nose as the CoG is moving forward very quickly.

To finish with the assembly, I fixed the difference of size between the wing joiner and the joiner box by gluing a flat carbon profile on the side of the joiner with some cyano, easy fix and perfect fit.

After some radio programming with the usual mixing (four flight modes, snap-flaps, in addition to snap-flaps ratio, butterfly elevator compensation and ailerons differential on digital trims for in flight modifications) it is time to go to the slope and discover the *Vantage*!

Photo 38: The Vantage is waiting for its maiden flight.

Flying the Vantage

I personally like discovering a new F3F plane during the maiden flight, a mixture of excitement, a little stress, lots of observation; I like to feel the plane and its reactions, trying to understand its temperament before to start to dig into the settings.

Photo 39: Time to launch the Vantage for the first time!

The *Vantage* was first flown for three afternoons, mainly in small conditions around 5m/s. This corresponds to the conditions it was designed for. The lift was smooth and consistent, and I must admit that I was impressed by what I could oversee. In such conditions, with a 2.2 to 2.4kg flying weight, the *Vantage* accelerates extremely well and quickly, but more than that, keep the speed a long time even with no or little lift on the edge. Bank and yank turns are very tight, fast with no deceleration even with low wind, and I did not notice any tendency to stall even when pulling the stick hard in turn. The plane is precise and agile in any condition, even if I recognize that I have a bit more ailerons than recommended (I *like* nervous planes). In fact, mechanically, it is possible to achieve much more travel than needed.

Video 40: The maiden flight.

Those days, I could also enjoy some thermalling and few aerobatics even if the plane is not primarily designed for this.

The thermal position is working well; the *Vantage* indicates the lift clearly. Circling is a no brainer and allows gaining altitude quickly. All usual aerobatic manoeuvers are possible, benefiting of the good acceleration, and agility of the plane.

Video 41: Onboard picture while flying at Col du Glandon.

But let's return to F3F, as few days later, I could fly in a more vertical slope with a wind around 9 to 10m/s, and then I discover a new plane carrying ballast well, able to do upturns or energy management turns pretty well with plenty of energy retention, with a flying weight from 2.9 to 3.2kg. Another good indicator of the efficiency of the airfoils is that, when 'pumping', the *Vantage* is going high with little start altitude.

Video 42: The Vantage in medium wind from 9 to 10m/s.

What I like with the *Vantage* is that it can adapt easily to the pilot style, or to the slope. One day, you fly the plane smoothly in light conditions with pylon style turn with the less possible of travel along the slope. The next day, in higher wind and different spot, you can fly the plane aggressively, from horizontal to vertical trajectories, the *Vantage* just delivers!

Photo 43: The Vantage at launch during the french qualifier for the next WC (image: Matthieu Mervelet)

Mid-June, I had an F3F National team qualifier contest. We have flown nine rounds in various conditions on two different slopes. I switched to the *Vantage* for the last five rounds and ended at a nice 3rd position in the ranking at the end of the contest despite two very bad rounds at the beginning of the contest, one with 18s of marginal conditions (crossed wind at more 45°). I felt in confidence with the plane and could concentrate on the flying strategy, and trajectories.

Also, ballasting without having to add or remove balance lead from the nose, and this up to 4.2kg is a plus, because in the real life how often are you flying

above this weight, once a year maybe?

Photo 54: My friend Serge launching my Vantage for the maiden flight.

Some additional videos of the *Vantage* in action:

Video 55: Practicing with the Vantage in a good wind, around 12m/s

Video 56: Some laps with the Vantage from CCM. Flying weight is 2.7kg, and wind is around 7 to 8 m/s a little bit crossed from the right.

Video 57: Onboard video during a sport flying session at Col du Glandon

Because We Must Conclude

After flying the *Vantage* in various conditions and different slopes, and in competitions, I can say for sure that the objective to obtain a formidable F3F competition plane has been reached; I must salute Mario's work on the

design. Not only is the *Vantage* kit quality astonishing, but plane performances are there and do not blush in front of plane references.

Personally, I don't see the *Vantage* as only a complement of other planes, because it can be enough on its own and can become your primary competition plane. In short, definitively a nice and competitive plane to own, and to fly!

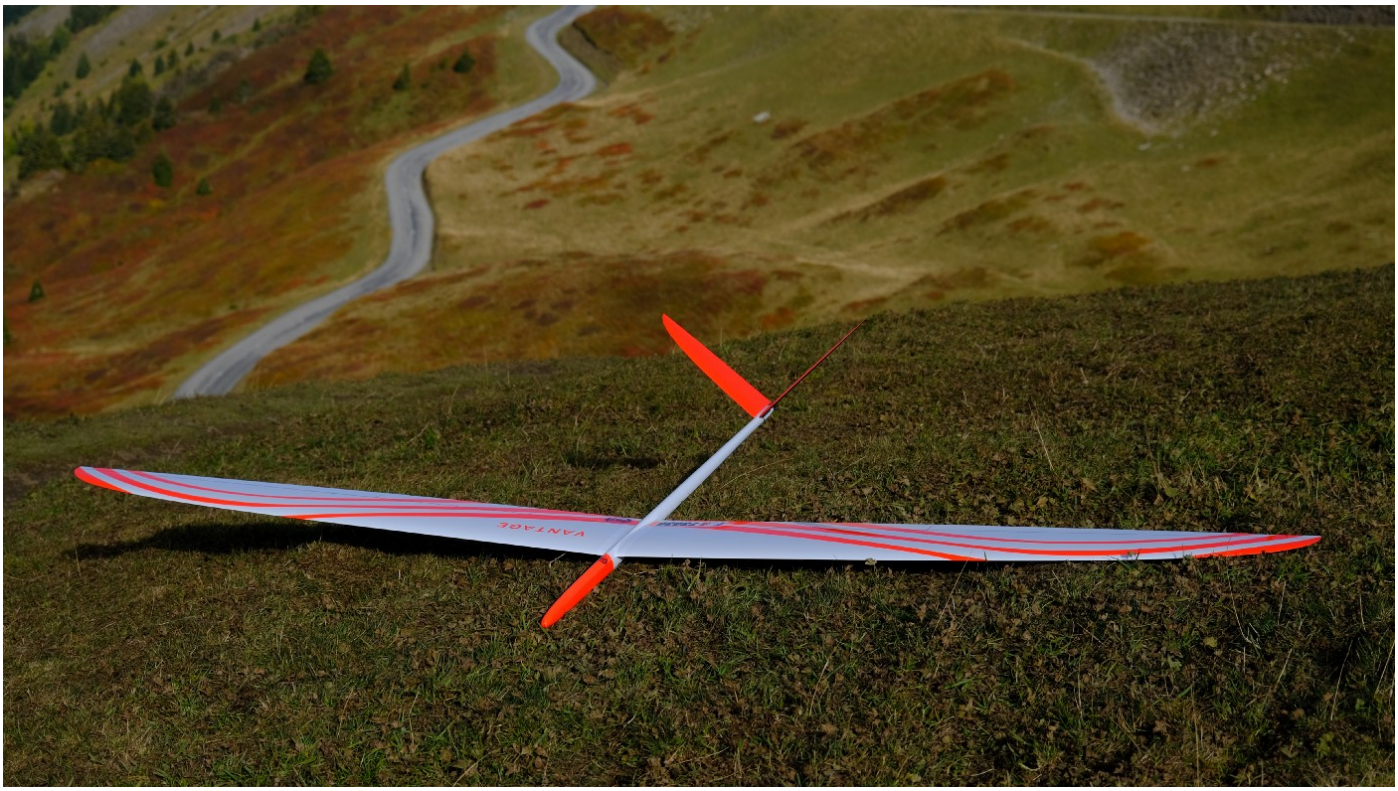
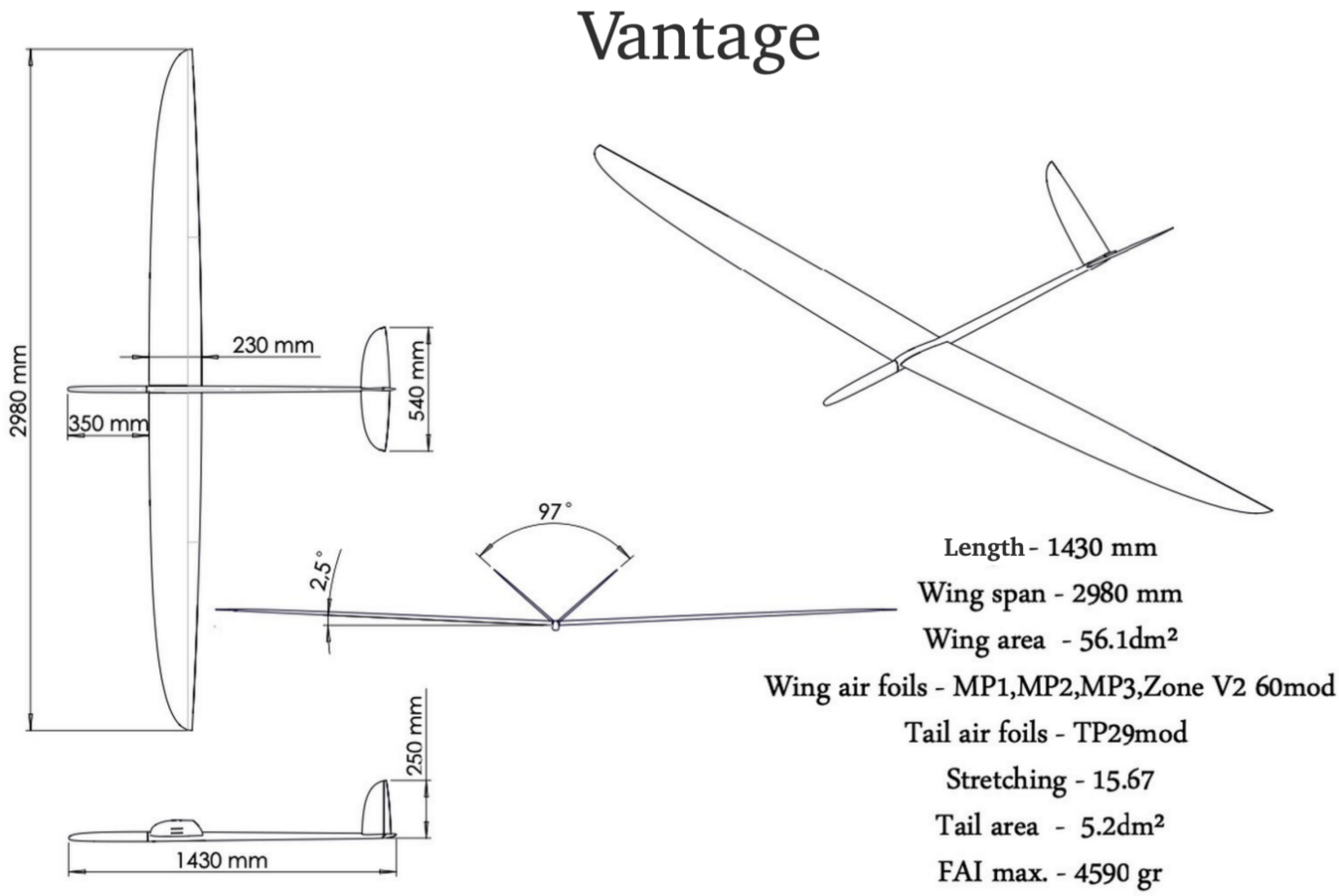


Photo 58: The Vantage relaxing before next flight at Col du Glandon.

Characteristics

Wingspan:	2980mm	**Wing Airfoils:**	MP series
Length:	1430mm	**Tail Airfoil:**	TP29 (modified)
Wing Area:	56.1dm²	**Flying Weight:**	2270g
Tail Area:	5.2dm²	**Max FAI Weight:**	4590g
Aspect Ratio:	15.67	**Manufacturer:**	CCM
		Distributor:	Mahmoudi Modellsport

Three View Drawings



Drawing 60: As provided by CCM.

Resources

- CCM (Chekh Composite Models)
- Mahmoudi Modellsport
- AIREX® — rigid foam core materials
- MP JET — clevises
- JETI REX 6 — six channel receiver compatible with JETI EX & EX Bus protocols
- Ballast Management — mobile application by Joël Carlin
- RC-Network F3B, F3F, F3J-Modelle — forum with design discussion by Mario Perner
- Servorahmen GmbH — integrated drive system (IDS)

- **MKS Servo** — HV6130 and HV6100

*All videos and images by Joël Marin & Pierre Rondel 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**.*

The Road to Gruibingen

Or how I was going to spend 2021 flying more slope aerobatics but ended up flying thermal soarers on an airfield near Tortosa, Spain instead.

Iain Medley-Rose

An early slope flight with the Chilli. Ringstead, Dorset, UK.

A Journey to the GPS Triangle World Masters

2020was the year where all our lives turned upside down! During the turmoil it became apparent that I could retire two years early — a purely personal decision that would halt the physical decay that driving a desk brings. Early retirement would also allow me to spend more time flying toy planes, particularly slope soaring gliders.

How I thought my first year of retirement would play out: slope soaring for hours…

After the decision was made I looked around at what I would do. Initially I had some vague idea that building a new version of my slope glider from 1989 and spending many days walking up my favourite hill to fly it, that would be a good start to life without work. Inevitably I was also expecting to hoon my faster planes around in the compression zone of my favourite hills a lot more than I have in the last two decades.

I have, however, always been interested in the GPS Triangle Racing reports that originally featured just large scale gliders. A few years ago I did look at the possibilities, but they were discarded as I just didn't have access to suitable sites for 7m wingspan gliders.

Roll on to 2017/2018 and there are reports appearing that talk about a relatively new class called *Sport Class*. After a bit of research it became apparent that this class was much more accessible if you don't have an airfield with space and a runway or closely mown strip. During August 2020 I started talking to friends from my dim and distant F3F and F3B days who had taken up GPS Racing. Many long conversations later and the order for a Valenta *Chilli GPS* was made and I'd even thought about what international competitions I could do.

Once the calendar had flipped to October I was hooked, totally distracted — and I had not even flown a triangle yet. So hooked and committed was I that I'd even hit the enter button on the first *GPS Triangle World Masters 2021 — Sports-Class* planned for 18th through 21st August 2021, at Gruibingen, Germany. I knew I was retiring, I had a plane on the way and the weather from April 2020 had been incredible for practicing GPS Triangles — so 2021 would be the same.

Having read the rules, watched the YouTubes, chatted extensively with flyers whose skills I've always looked up to I was apprehensively confident that with enough practice I could avoid the bottom part of the leader board at the *World Masters* in August 2021. My biggest concern was could I still thermal soar? Thirty minutes of soaring whilst flying a distance/speed task was not something I had ever done. In fact the last time I had flown from a flat field the duration task of ten minutes was a challenge unless I was using an F3B plane and a winch. Did I mention my natural habitat was slope soaring?

During the planning for this adventure I'd reconnected with Greg Lewis over social media and the phone. We'd spent hours on the phone catching up on our lives and discussing GPS racing. Greg had dropped out of F3F racing in the early 1990s to pursue his career. He'd come back to the sport early in the 2000s and then became one of the top F5B flyers in the world. His encouragement and motivation helped tip me over the edge to commit to GPS Triangle Racing.

Much research and many webinars later I was full of virtual learning but the plane I had ordered with an expected delivery date of late October or early November 2020 had still not shipped by Christmas. Still — the weather in the UK is usually pretty horrible between January and early March — so plenty of time to build it when it had arrived.

Which it didn't. COVID was hitting hard where it is manufactured.

Fettling, polishing and fitting avionics in my first GPS plane, a Valenta Chilli.

Luckily, someone was persuaded to sell their *Chilli* and one cold wet and miserable day in February I met face-to-face with Greg Lewis for the first time in thirty years. He'd collected the *Chilli* from its previous owner David Woods. David had built the *Chilli* and tried GPS Racing but was not really using the plane. At a slope event in 2019 David and I had discussed the whole GPS Racing thing and little did I know at that time his *Chilli* would change hangers. So, with massive thanks to Greg and David, I was in the game. Fettling and polishing took place. New motor, speed control, GPS kit and flight batteries appeared in the workshop and took their place in the airframe.

Working out how all the RC Electronics stuff hooks up. Jeti and RC Electronics kit work well together but setting up back channel comms, Albatross application switching from the transmitter and making sure everything does what you think it does takes some figuring out first time around.

Getting Started in GPS Triangle Racing

> *Before getting into this intriguing form of competition, I would suggest that you look at some of the online material. I'll put some links at the end of this (see Resources) with my recommendations. The thing you need to consider before diving in to all the materials is your learning style. My preference is to gather, assess and question as much information as I can. The disadvantage of that approach with GPS Triangle Racing is that the amount of information can be overwhelming and in some cases even lead you down a path you may find doesn't work for you.*
>
> *Nothing beats meeting up with a couple of experienced pilots and seeing what they are doing. Luckily in the UK John Greenfield has run some excellent events where he has set out some basic information in the class*

> *room and then the participants can reinforce the learning in the air by trying out the key learning. As a community in the UK there are now several of us who will support these types of activities to help people make the first steps. Setting up the airborne kit is another area where you can work it out for yourself, which helps your detailed understanding, but it is often better to have some help so that you can avoid some of the nuances of the package.*
>
> *The challenges of getting the whole GPS set up to work can burn a lot of time and having someone to help is a massive benefit.*

Test Flying the Chilli

One blustery, grey day in March 2021 I was at my 'local' slope with the *Chilli* and the incredibly supportive good lady, *Doctor of Chiropractic*, her indoors driving the camera. As is the way, much anticipation and a little trepidation turned into a huge anticlimax. Obviously a good tool for the job, good glide angle and not twitchy to fly.

The day of the test flight. Win Green, Wiltshire, UK.

Another session on another local slope followed a few days later and this time all the GPS kit was hooked up. I flew a few triangles on the backside of the slope. Again it was blustery and the usual grey spring skies in the UK prevailed, but it was a very successful outing that allowed me to get some

early understanding of the kit and the data that is available.

Finally on the 30th March 2021 Greg and I meet up at his local field with David Woods for my first attempt at GPS Triangles. The day was not great from a lift perspective and Greg only managed seven laps in the sweet spot of the day. We then flew together and he flew five laps and I managed four in the same air. Okay, this is not so bad a start. Elsewhere in the UK other more experienced GPS flyers were doing similar scores so this feels like something where I can be competitive relatively quickly. Lots was learnt during this first session, especially about high workload, and the level of information available!

Coming through the headphones are more bits of information than I have ever had when flying a toy glider. However, the ability to thermal in the plane is incredible so flying out a thirty minute task would not be a problem when the lift is there. My usual slope soaring flights tend to be forty to fifty minutes so the concentration for the task wasn't an issue. Focussing on the audio and visual information is a huge learning curve and working out what is the most important for each part of the flight takes time. I'd rarely flown a plane above two hundred metres for over twenty years, so hitting 400m plus was a little eye opening!

When I set out on this journey my goal was 120 quality flights recorded on the GPS Triangle League site. Over and above that flying with other GPS pilots and at any event where I could develop the new skills was going to taken. You remember the plane I'd got on order? Still not made, the manufacturer was really badly affected, like many they were struggling with the effects of COVID-19 — sickness and the measures to protect their staff was having a huge effect on their operation. But, on the other hand, the importer had promised me the loan of his if my new one hadn't appeared in time for me to fit it out and have it ready for 18th August 2021. What a

fantastic offer!

Four flying sessions in April 2021 felt great. Every flight yielded some new learning and some improvement. I hit a 13 lap flight which was stunning and rewarding. Over and above that we had a GPS training event at the BMFA Centre at Buckminster. A combination of lectures, discussions and flying on the Saturday with a light hearted competition on the Sunday was fantastic. Meeting up face to face with a few more people from my flying past was a blast. John Greenfield ran the event and has been incredibly generous with his time and knowledge. He has been very successful at GPS Triangle Racing in both Scale and Sport classes so to have access to his experiences is incredible. As an aside this is one of the attractive elements of the class and community. People are incredibly open and helpful which makes this a very attractive tribe to join.

Greg Lewis giving Paul Eisner's Chilli a chuck. The BMFA National Centre at Buckminster, UK, has hosted several GPS events.

Luckily the Valenta *Chilli* is a well known plane here in the UK so getting a decent start point for how to set up the plane is easy. With F3B and F3F experience I was able to draw on that to get to a reasonably useable set up whilst still flying the new task. I would say though — set your plane up before you attempt triangles. Learning how to fly the task, use the technology and trimming your plane represent a very high workload. After a couple of months you will be able to draw two or three threads of information from each flight — but from day one the learning curve is pretty steep. Bear in mind also that you will likely end up with several flight modes to fine tune. I seem to have eight, although some are related, that need to be assessed

and flown enough to analyse their effectiveness and efficiency. Add into that the ballast options for even more things to consider.

At the end of the April training event, where three of the four UK pilots who had entered the event in Germany were present, we had a long discussion about the logistics of getting to and returning from Gruibingen. Realistically we all knew that it was very much in the balance — but with the event being in August we had some optimism it would go forward.

Young Simon Thornton uploading a score from his ground station. Some people use tripod mounted tablets, some use transmitter mounted phones. You need to find a solution that works well for you as the Albatross information is vital for GPS racing.

Even though it was light-hearted it was still a competitive event and getting third place behind Greg and John (1st and 2nd respectively) was encouraging. It was interesting as an event because Greg creamed all of us with 1000 pts in each of the rounds. I was very happy to get within 25 points

in the third round though.

Then May happened. The weather was rubbish! It wasn't until the 31st May 2021 that I finally managed to fly GPS again. This was a competition (Challenge Cup), again at Buckminster, for the British Association of Radio Control Soarers (BARCS) Radioglide event. I had a slight technical issue with my plane and that definitely created some ripples in the force for me. However, good learning, and my preparation for events has improved as has my selection of items for the flight box. This event yielded another third place.

June was a little better weather wise and three sessions of GPS yielded some flights, but only nine that I felt worthy of being entered into my analysis tool. Analysis tool I hear you say? Well, in a competition that is about aggregating marginal gains being able to assess where to focus your efforts is important. I've created a spreadsheet that allows me to assess each flight for quality and identify opportunities to improve. Using the graphic on the *Albatross* or GPS Triangle League, the spreadsheet and your memory of the flight allows you to quickly assess and then target what you need to focus on. During June I managed to improve my indexing and didn't have to trawl though hundreds of laps of data to see that. Additionally I was getting better at entering the course nearer the 400m maximum altitude consistently.

After a few months of flying the effort I put in early on to make sure the glider flew well showed. However there is a big take away from this class that gives you a really solid platform. Setting your plane up to be efficient and well balanced sounds obvious. In reality though it is not something that people do. One of the benefits of the tech on board is that you can work out your glide angle and speed in still air and then compare all your changes to a baseline. In addition you can take into account the turns — assuming you can fly repeatable turns at each turn point. Once you do that you can then

change your control settings to maximise efficiency. Tuning out adverse yaw, excessive movements and balancing the control inputs for thermal turns is time well spent.

July was a load of saggy pants! One session and then weather and other commitments conspired against any practice. On top of that we'd had notification that the event at Gruibingen had been cancelled. Hardly a surprise, but nonetheless very disappointing. The restrictions and uncertainty around travel to and from the UK to Europe were against us.

This is summer in the UK, just not Summer 2021! This was June 2020 where the sun shone and the wind blew off the sea and slope soaring happend — in distinct contrast to the Summer of 2021.

August. Oh be still, my beating heart! Summer in the UK finally arrived and

every week I got to whizz my toy plane around triangles. I hit my highest lap score in an amazing flight in lift I've never felt the like of before. I don't think I've ever had a toy plane so high. At 800m you could hear the planes whistling. When I got home I set up a new speed flap setting, super fast! I also set my personal best for accuracy and flew an index of 114 on one lap. Nearly thirty recorded flights also brought the number of flights to near the original target per month.

With the cancellation of the trip to Gruibingen we tried a midweek event at the Phoenix MFC site. This site near London Colney is John Greenfields home field so he acted as host and we managed to have seven pilots attending and mostly seven airborne in each round. However, the weather was not very conducive and although the storm force winds failed to appear the general moistness in the air was a bit 'meh'! Needless to say the 2016 Welt Meister (aka John Greenfield) won. Simon Thornton hit the second spot and I sneaked a third place. What is encouraging is that we had some good showings from people who have been flying GPS for a reasonable time and some really good performances from a new kid on the block. This event was a good build on previous training sessions and lots of information and coaching was passed through the community. Bringing everyone on and making things more competitive is a very good way of pushing up the standard at all levels.

BMFA Nationals, some of the competitors at the end of the day. (image: Greg Lewis)

The end of August brought the BMFA UK Nationals. As seems traditional for the UK this event had a forecast that inspired duvet racing rather than GPS racing. In spite of the indifferent forecast I set off for the BMFA Buckminster site at just after 0600hrs. Two hundred miles later I arrived in time for slightly moist air, low cloud and banter at 0900hrs. However, the clag started to lift and we flew. The first round at 1015hrs was not blessed with any notable lift and those of us that tried to soar handed Simon Thornton an easy one lap win, with a score of four laps.

The second round was far more interesting and in no small way due to the local farmer turning over the upwind field, which did us a huge favour. Simon Thornton, Greg Lewis and I all scored eight laps and were separated by a mere seven points. Simon and Greg took far more height, whilst I took the get moving approach. This is where analysis of data vs outcome comes into this event. If my indexing was as good as Simon and Greg's I'd probably have won the round.

After five rounds we had a discard that, when we got to tea and medals,

gave me another third place. Over and above that lots of learning about the tactics required and the areas where improved flying will yield significant gains.

Down the Rabbit Hole

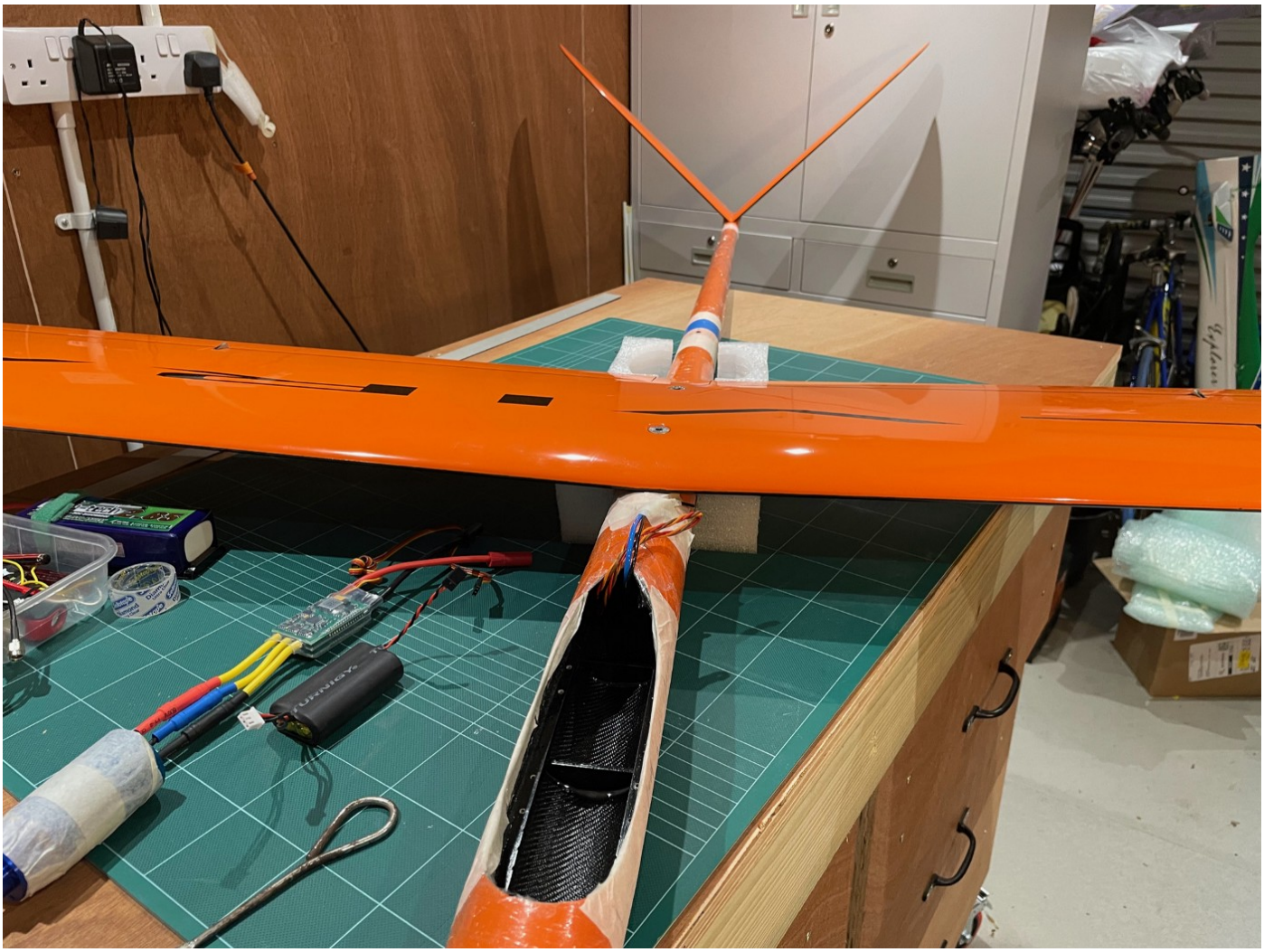
> *Let's be clear, at a certain level GPS Triangle Racing is about making marginal gains. However, to make those marginal gains you need to sort out a few basics. Two places where you can gain quick performance benefits in your flying are:*
>
> - *Getting the best start*
> - *Getting your indexing/accuracy around the course consistently below 115%.*
>
> *Assuming you have made your glider as efficient as it can be and can control it adequately without using too much energy the two points above are well worth practicing.*
>
> *A good start in Sport Class is about your plane being as close to 400m going at as close to 120km/h as possible. Once you hear the "task started" voice prompt you then pull up to gain as much height as possible. Obviously a tail wind will not give a great zoom, but a headwind will. If you can gain 40m after the start, not stall and settle your plane into cruise you're already half a lap up.*
>
> *Indexing, or the measure of accuracy around the course, is a more difficult challenge. Your first investment is in the time you take to set your glider up. Get the glide speed right for all flight phases and make sure it tracks well. You want your plane to fly in a straight line at the best glide speed with minimal input from you the pilot. The balancing act is getting*

> *the best glide out of your plane with the best tracking and most settled handling — sometimes best glide doesn't always mean best handling. This actually takes a fair number of trimming flights and some very accurate data analysis. Once you have that nailed your next challenge is to stick your plane on the best line between each turn point.*
>
> *Even with the GPS trace showing on your ground based Android device, the audio data telling you how far inside/outside the line, and the stereo indications of on or off track for the next turn — flying a consistently low index takes practice. The main issues you will find is that you have to think about a few things whilst flying accurately to the course. They include: which trim/flight mode you need to apply; where the lift is; how you are going to use the lift; what strategy you need to apply to get the most laps at the highest speed; where the lift is going to be next lap; what the wind is doing at the altitude you are flying at and how it affects your effecting of a good course; what turn style you need for the conditions; flying your glider efficiently to minimise pilot induced losses; where everyone else planes are and what you've got to do to miss them and also follow the rules for collision avoidance; and whilst you're at it — if there are any no fly zones you need to avoid them too.*
>
> *So, on day one of your GPS journey that is a lot to do and you will probably struggle to put it all together. After a few flights some of the basics will get easier and for most of us the best way to improve our performance is to do enough GPS flying to reduce our workload by practicing until lots of the skills become second nature. Ultimately you need to look to maximise the attention you pay to the decision making by taking the workload of all the functional stuff down to the minimum.*

Meanwhile, Back on the Road to Gruibingen

Having covered a couple of items of technique, above, it's time to come out and get back on the road to Gruibingen. Obviously this was now *route barrée*. In one of the GPS groups the RC Model Flying Ranch annual Challenge Cup kept popping up. As September was yielding less opportunity than I wanted for GPS flying I mentioned the event to Greg Lewis, and with a very little planning we were booked in for the event.

At the beginning of September I managed a quick outing with my light class plane where I grabbed a nine lapper in some ferocious lift. After the flight I massively reduced the elevator travel in the GPS flight modes as the plane was extremely nimble! Life commitments and weather seemed to be stacked against me and I missed some good days. I also decided that as I was off to Spain to compete I needed to have a second plane. Luckily I was very close to finishing a PCM *Elvira* for GPS and as soon as the final tiny part finally made it through the post I was ready to test fly, on the 21st September 2021, loads of time before departing for Spain on the 5th October then.

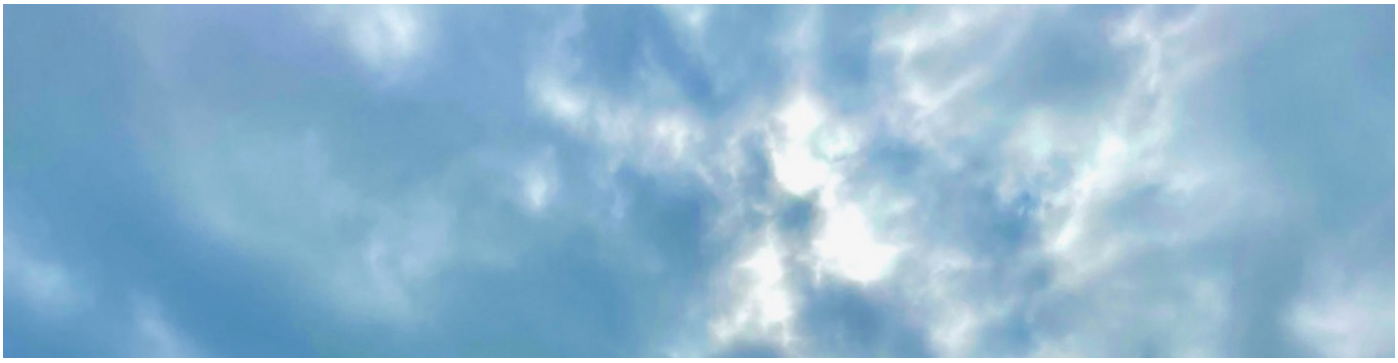


New GPS plane in the workshop. PCM.AT make this, it is an Elvira. The fuselage is very slim so fitting the full fat GPS set up is an exercise in space management.

As it turned out three GPS flights giving me six scores was enough. Although I was cautious with my ballasting the quality of the Elvira shone through. Nine laps on a test flight was a good start and even though I would have liked more stick time I didn't feel apprehensive about making the *Elvira* my primary plane for Spain.

All the power and avionics for a GPS racer ready to fit. This install uses the RC Electronics Swift which takes up a little more space. A Sparrow would be a simpler option.

Taking the overnight ferry on the 5th October we embarked on three relatively easy driving days, with some light sightseeing en-route, through France. This despatched the 1400km (900miles) between home and the RC Model Flying Ranch at Roquetes near Tortosa.



Pre-flight rigging at MFR Tortosa. Baudis Calvados at the front. Baudis DNA Racer to the left. PCM Elvira to the right.

As a site the RC Model Flying Ranch is best described as rural. Surrounded in the main by olive and citrus groves it is an almost perfect venue. There is

decent surfaced runway and a similarly sized grass runway. A hangar and bar complex are supplemented by showers and toilets. For flyers there are tables under a sun shade. If you are looking for a fault the only one I can come up with is the tall tree that sits well within the Sport Class triangle that can obscure your glider if you are super low on the final lap heading for turn three. There's nothing to hit but flying out of sight for quite a few seconds clenches things that a middle aged chap shouldn't clench!

Looking out at the runways from the pits at MFR Tortosa

So, here we are on the 9th October 2021, standing in the middle of an airfield in Spain about to commit GPS Triangles. Although not as many as we would have liked there are enough competitors in Sport Class to give us an idea of what we need to work on for the future. There are also many Scale/SLS Class gliders at the event. Although not unknown in the UK these planes are less common, and this is a chance for Greg and I to assess them for the future. Because this is a Challenge Cup there are no defined flying slots and the trick is to fly when you can get the best scores. It is a different set of skills to racing man-on-man. It becomes apparent that the relatively stable airstream isn't golng to yield mega scores, but there will be times when it is worth being airborne and times where saving energy by not flying is the right thing to do. Initially my goals had been highly competitive but this changed in the run up to event when I realised that my new plane was really good. This trip was an ideal opportunity to get a winter's worth of flying in a week so the

amount of flight time would be a good opportunity to set up the plane for 2022.

The hanger at MFR Tortosa. Lots of very desirable toys in there.

Although we often get some nice days November to March in the UK they can be few and far between and if the real world interferes the chance for some quality flying can be minimal. Although I already have one *Elvira* as a slope soarer the set up and dynamics of the two planes are worlds apart so, here was a chance to set up and acclimatise to the *Elvira* as a GPS contender. As a result my goals became simple and very achievable.

Greg Lewis launching. Author flying his new PC Elvira. Seventh ever flight, but the capabilities of the design were already shining through. Jos Medley-Rose photo.

Goals and Targets

> *One of the key things I have found with GPS racing is that you need to approach things with a clear plan and set yourself clear targets for each session. This is something that all sports encourage but this is not always seen in soaring pilots. One of the things that will help on the GPS journey is a clear understanding of what to work on and what steps you can realistically achieve.*
>
> *Try to do too many things in a session and you will probably go*

> *backwards and will also lack any clear understanding of what to work on next time around. You will need to iterate as well. Taking indexing as a for instance. Your first session will net you an improvement. After a few more sessions where you may work on your turns, your flap settings and the way you use the information from the Albatross application you need to go back to indexing and spend another session making your plane progress around the course as close to perfection as you can.*
>
> *Because you have improved your turns and become more instinctive with your use of flight modes you will find that you can focus more on the index and will likely improve it again. So, in simple terms, break down the event into chunks that work for you and keep focussing on them in sequence. If you try to do it all at once you will end up taking longer to improve as there are so many variables to assess.*

Back at the RC Model Flying Ranch

Picking our moments to fly allowed both of us to rack up some good scores and Greg was always on top of the leader board. On day one I was cautious with my ballast as this was a new site and a plane I had yet to fully set up. One thing I took a couple of landings to get used to was the rock hard runway. So used to flying in the UK where there is a lot of moisture to soften the ground I found the glider was far less keen on stopping!

Some of the scale fleet, and aerator and the view to the north, MFR Tortosa. (image: Jos Medley-Rose)

The second day's first job was to up the ballast content to maximum and double check the CG positions with the different ballast loads. Once done we flew, and flew, and flew. I beat Greg on one day and on the final day we managed to do some still air flying to compare performance and ballast strategy. Although low key the event yielded a first place for Greg and a third place for me. We racked up a winters worth of flying and learnt some valuable lessons in seven days. A very worthwhile trip.

Well what are you supposed to do when the flying has stopped? Settle down for a few drinks and something to eat.

Next year is looking a little more hopeful, if the World Masters event is

rescheduled and travel restrictions remain how they are or get easier, we will be entering and competing at the 2022 GPS Sport Class World Masters at Gruibingen. So maybe the road to Gruibingen will be the one that is actually travelled!

Stop Press

Oh no, it won't!!! Announced in the hour I was re-reading this before sending it in is the GPS World Masters has been scheduled for July 2022 in Ulm, Germany. Watch this space for the report!

Metres of carbon fibre waiting to get airborne.

The river De L'Ebre in the centre of Tortosa. The whole area is worth a visit. The town has some significant history and reflects the development of Spain during the 1930s whilst still showing off its early history. A good base for a family break with something for everyone whilst toy planes are flown.

Resources

Videos

- Tortosa MFR Event
- 'In the Air Tonight' GPS Triangle racing — Greg Lewis
- Valenta Chilli Flying GPS Triangle

GPS Triangle Racing Webinar Series with John Copeland

- Nº1 — 25 April 2020

- **Nº2 — 9 May 2020**
- **Nº3 — 23 May 2020**

Useful Links

- **GPS Triangle League** — GPS Triangle scorekeeping website
- **BARCS Radioglide Event**
- **Albatross** — pilot navigation assistance Android app
- **PCM (Podivin Composite Modellbau)** — source for the *Elvira*
- **Valentamodel** or **eSoaring Gadgets** — sources for the *Chilli*
- **RC Electronics** or **eSoaring Gadgets** — sources for GPS kits
- **RC Model Flying Ranch** — *"a hotspot for all kinds of model flying. But especially the friends of gliding will find a thermally strong area here, which invites to hours of flights in the mild air of the Mediterranean climate…"*

My Chilli on final approach. (image: Jos Medley-Rose)

*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.

The Quarter Scale Slingsby Gull

Building a faithful replica of a classic design can have its ups and downs.

Vincent de Bode

The Quarter Scale Slingsby Gull in its natural element. (image: Raymond Esveldt)

After I had finished the new fuselage of my small 1/8th-scale *Nemere*, I was looking for a new project , a vintage glider of course. First I wanted to build the Fokker *FG-1*, but it looked very similar to the *FG-2* which I had already built (see *Resources* below). I like gliders with varnished plywood sheeting. Talks with friends started about the different flying characteristics of the vintage gliders. Because I usually fly on a flat field that is an important matter. The Fokker *FG-2* is beautiful to watch it fly, but it comes down very quickly. What do you expect, with all those rigging wires? On a slope with a

lot of wind it's okay, but on a flat field it gives not much flying joy. A friend mentioned the beautiful *Fafnir* from the early 30's. I started reading more about it. The gliders from that period had very thick wings, they were made more for minimal sink rate than for speed. The *Fafnir* and the *Petrel* have a profile of almost 20% thickness with a very blunt nose. To get better flight characteristics in a model, you would have to choose a thinner profile. Unfortunately the aircraft will look very different then.

Thanks to Martin Simons' very nice book *Slingsby Sailplanes* I did find a few pre-war, clear-varnished plywood gliders with more modern profiles. I chose the Slingsby *Gull T-12*, partly because of its gull wing. It also has spoilers, for me, a must to land such a glider. Another nice thing about this plane is that the first ten were made with struts and a the last *Gull* produced flew without. This was the *Gull III*, the *T-15* or the *Cantilever Gull*. This was also the first British glider to cross the English Channel.

The documentation is rather limited: a description, some pictures and a drawing in A4 format in the Martin Simons' book and info on the site of *Scale Soaring UK* (see *Resources*) .

This one I wanted to build, but how? Unfortunately digital drawing is not yet in my toolkit — I should really do something about that! I did it the old fashioned way; I enlarged the A4 drawing to the one-to-four dimensions, but unfortunately the lines became very thick. From this drawing I started building, with the construction details of the fuselage in mind but not on paper yet. The order of building is unfortunately a bit chaotic, you can't finish the fuselage without wings and wings without fuselage. However, in this report I put them in a sort of logical sequence.

Wing

Rob Ten Hove had already started to digitally design the ribs of the wing. The real *Gull* has a profile of NACA 4416 up to the aileron and then tapering to RAF 34 at the tip. It is nice if you can use a thickness similar to the real thing. Rob has reduced the thickness from 15% at the root to 12% thickness at the bend, which is camouflaged by the bend itself.

In addition, the two inner ribs behind the main spar are 'stretched', just like the real *Gull*. This is actually the start of the fairing to the fuselage. Rob's proposal was to build the wing spar from a lower and upper spar, stiffened with 0.6mm plywood web plates.

Wing Joiner

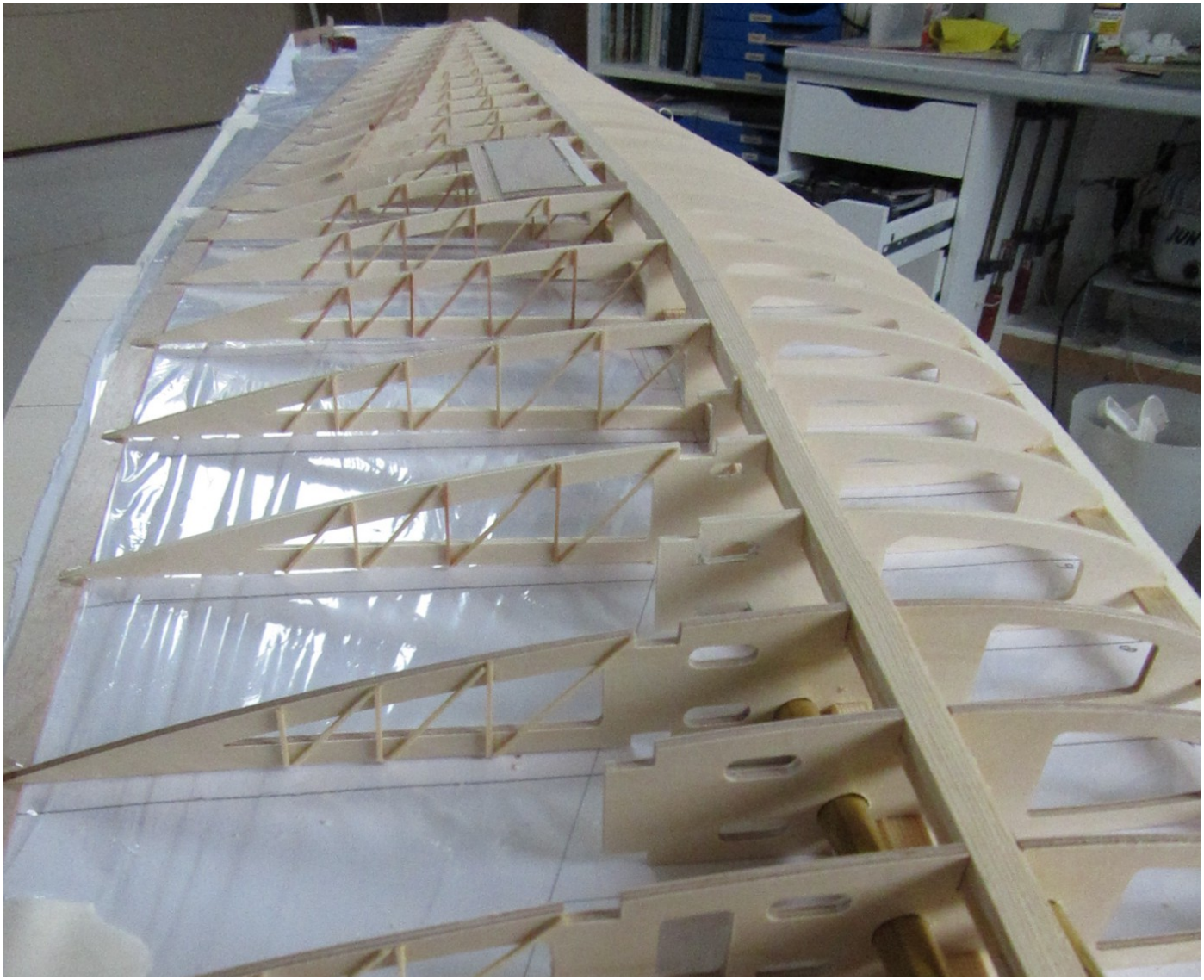
Because of the large dihedral in the centre section the positioning of the wing joiner proved to be tricky. The upper and lower spars are each 10mm thick, so there's not much length left for a solid straight wing joiner. I decided to place one joiner in front of and one behind the spar. The brass tubes of the wing joiner (10mm round steel/carbon) are glued to the web plates of the main spar with glass tape and epoxy.

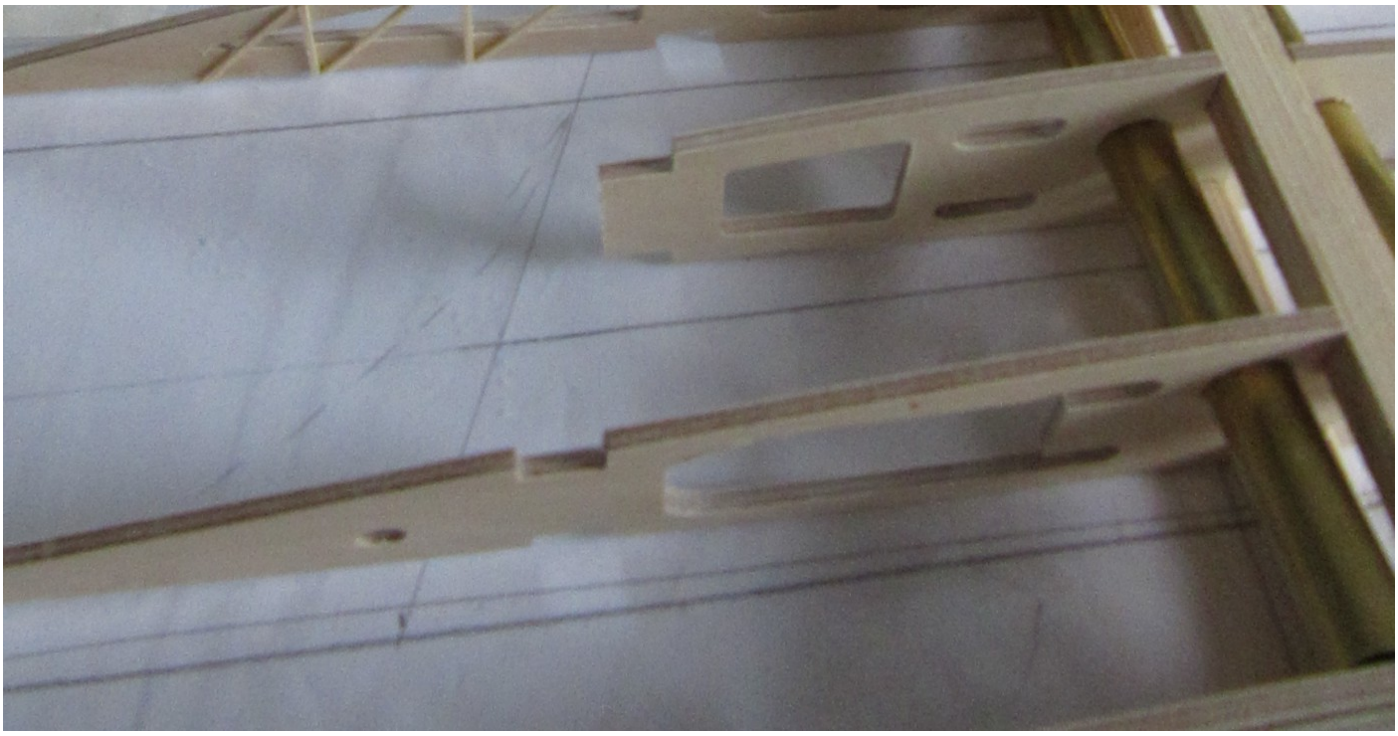
I can use carbon rods combined with struts for light winds and steel rods only with more wind, flying it as the *Gull III*. They are about 400g heavier and that's not bad with strong winds. After these important and decisive first steps I started building.

Spars

The upper and lower spars are built up from 10x2mm strips, laminated from five layers at the root to one layer at the tip. I had to have lengths of almost two metres. I made these by scarfing two 1m battens and gluing them with epoxy thickened with wood dust.

From these battens I laminated the spars with PVA (that is, white wood glue) incorporating the ‘gull’ curve. Fortunately I remembered just in time that the upper and lower spars are not interchangeable. I made a drawing on which the wing could be built. Because of the bend in the wing I had to make a building board with a bend. First I made bearers of two battens (42x18mm), which I glued on each other to obtain that bend. This bend runs over 75mm, so I rounded off the bearers. On these two battens I screwed two pieces of plastic coated chipboard of 400mm wide and 20mm thick, not over the bend of course. On top of the chipboard I glued — with dots of contact glue — 4mm poplar plywood, with the thread across. One piece nicely curved over the open part of the bend. After these steps I could start building.





Wing skeleton, aileron hinges are already in place.

Ribs

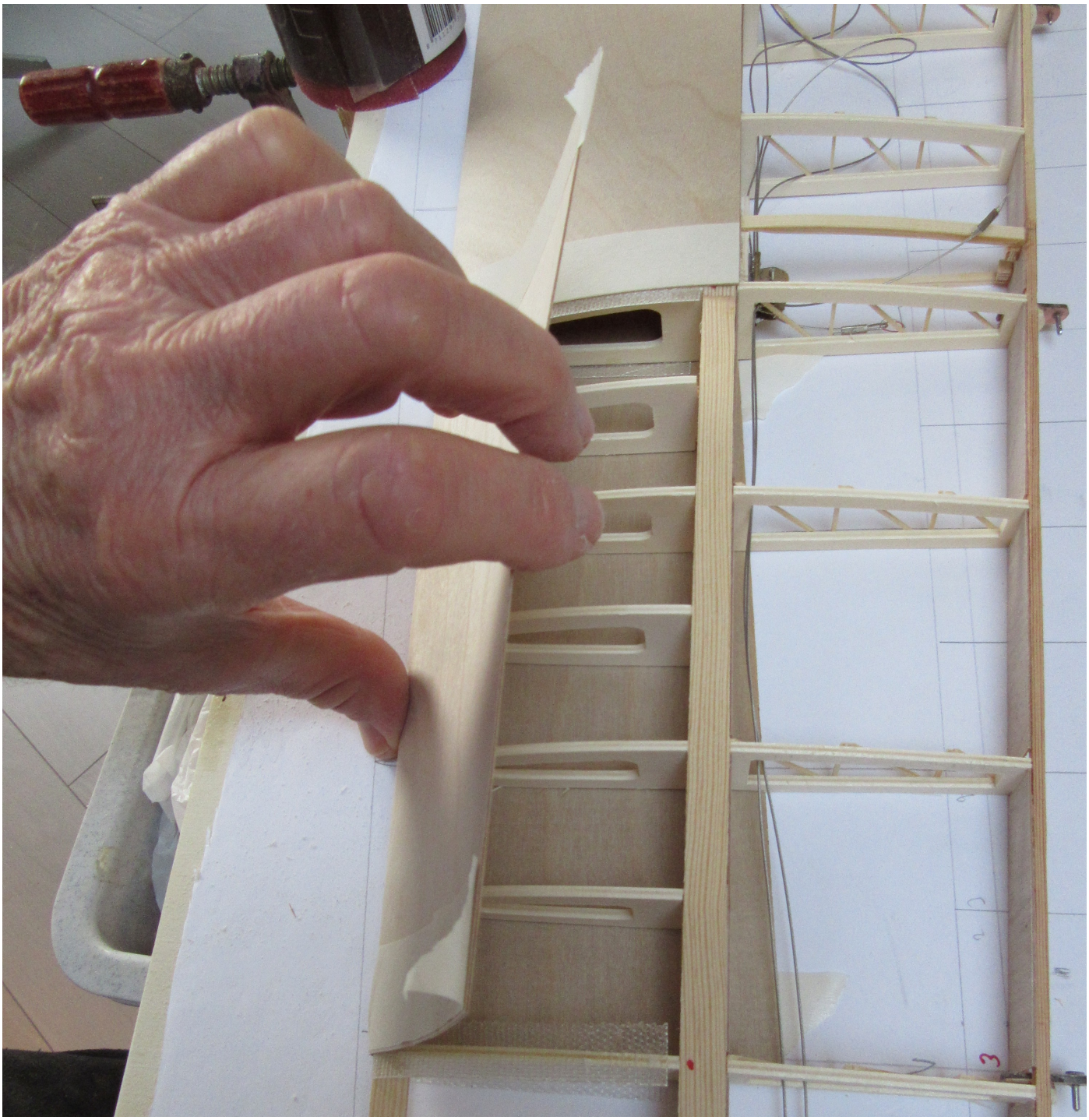
My friend Adri Brand was willing to CNC mill the ribs. He suggested to do that from 2mm poplar plywood and the five root ribs from 3mm plywood. I first thought of building the ribs from spruce battens but Adri also suggested to make large lighting holes in the plywood ribs and glue thin battens over them. When Adri had milled the ribs, it turned out to be easy to glue the battens on; it makes them stronger and it gives a lot of building satisfaction. After all these preparations the wing was glued together quite quickly.

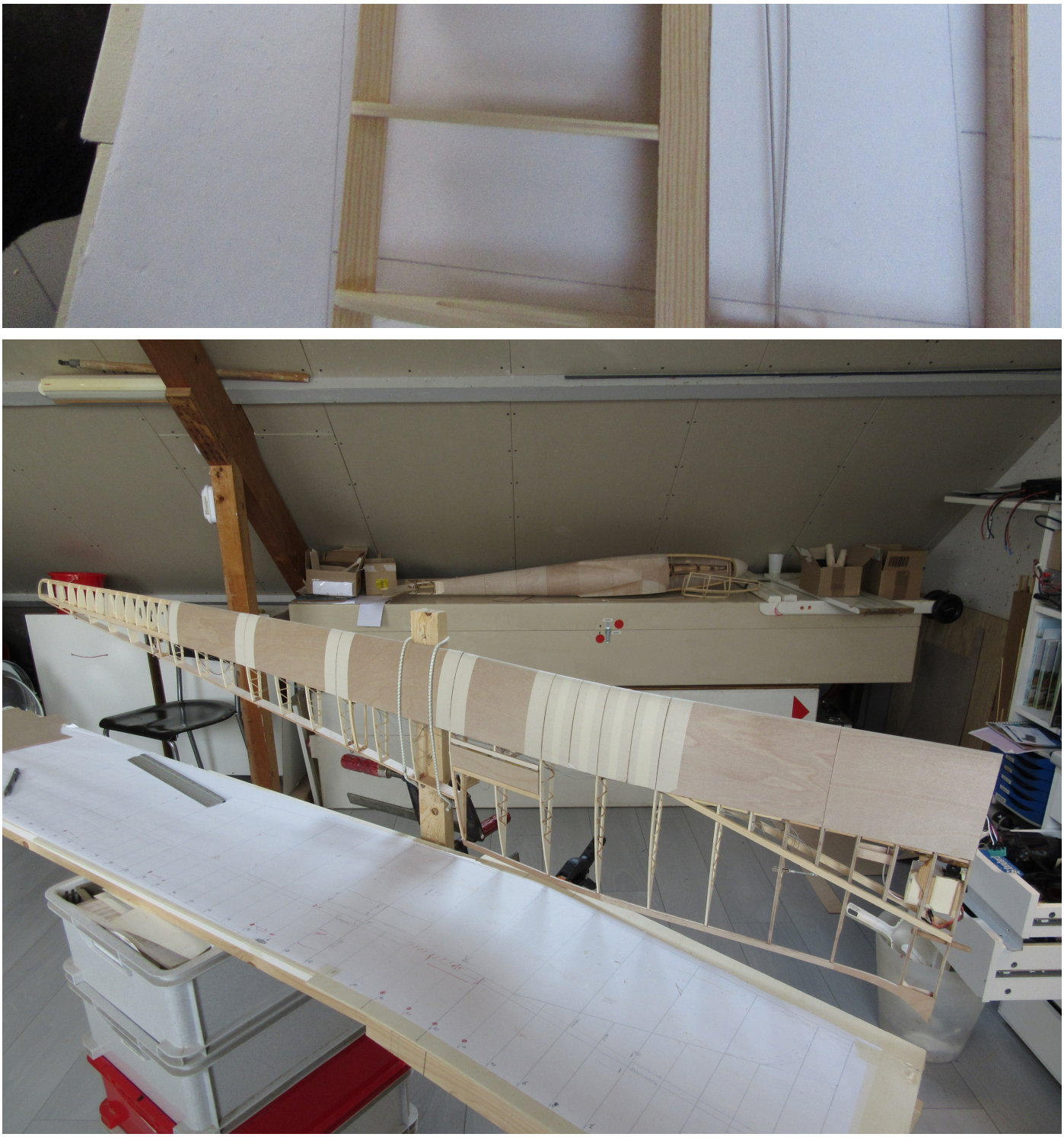
Trailing Edge

Because the trailing edge is curved as well, I build it as a sandwich; 0.6mm plywood bottom, 3mm balsa; sanding it down and covering it with 0.6mm plywood on top.

Sheeting

The D-box had to be sheeted with 0.6mm plywood. On the pictures of the restoration you can see that the plywood panels stretches over three ribs. So there will be many joints in the wing, with additional joints in the ‘gullwing bend’. Here again the question: butt or scarfed joints? Butt plates in the wing are difficult, because the joints have to be in line with the wing rib, which means the ribs have to be 0.6 mm smaller.





Left: The sheeting is already glued to the front frame with CA. The butt strips of glass epoxy can just be seen. | **Right**: Gluing the panels to the front frame went better with the wing vertical.

I then remembered that in the construction of wooden sailing boats (real ones that is) a lot of glass epoxy reinforcement is used. Glass tape with epoxy is much thinner than wood and this is how I tried to get around this

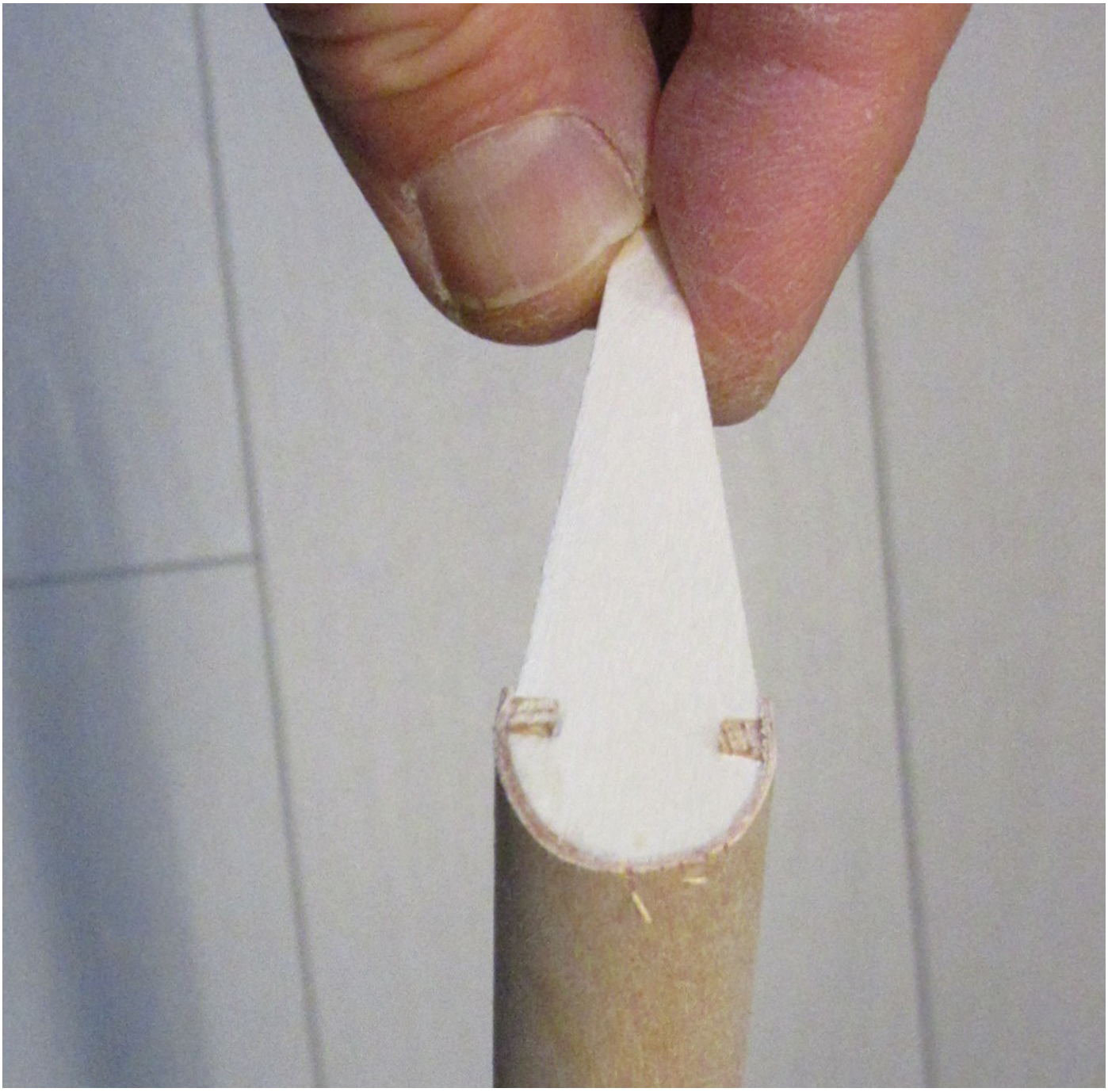
problem. I laminated strips of glass tape with epoxy on a flat surface, let them harden and then cut them in half, and used this as a butt plate. Such a strip is very flexible and I could easily glue it to the rib with thick CA.

The sheeting with 0.6mm plywood went as follows. I made a template from thick paper, and using that template, I cut out a slightly larger piece of 0.6mm ply. I bent it while running boiling water over it and dried it with a hairdryer.

Left: Put a sheet of plywood under tension and pour boiling water over it. | **Right**: Clothes pegs put on; you can get unlikely sharp bends in it. (See also a video of this procedure in the Resources sections below.)

After that I sanded it to a nice fit. I put tape along the outside of the panel to

avoid cyanoacrylate (CA) glue getting on the ply. I first glued the leading edge (LE) with thick CA and put the panel in place. After a minute or so, the glue was partly hardened, I bent it open on the underside, applied glue to the ribs and main spar, when pulled and pressed the panel into place, the top in the same way. Then I cut off the excess plywood behind the main spar. Somehow I got used to doing that with CA, there are many other ways such as with white glue (PVA).



Ailerons

I built the wings including the ailerons to cut them off later. I made hinges from 1mm epoxy plate with a glued-in nail as hinge pin. I had drilled the holes for the aileron hinges had glued the hinges on the ribs with the pins through the holes, before assembling , so I didn’t have to worry about the alignment. After the wing was sheeted, I cut all the ribs through, sanded the aileron leading edge round with a long sanding batten and the ribs of the wing with a power file hollow. I covered the front of the aileron with pre-bent 0.6mm

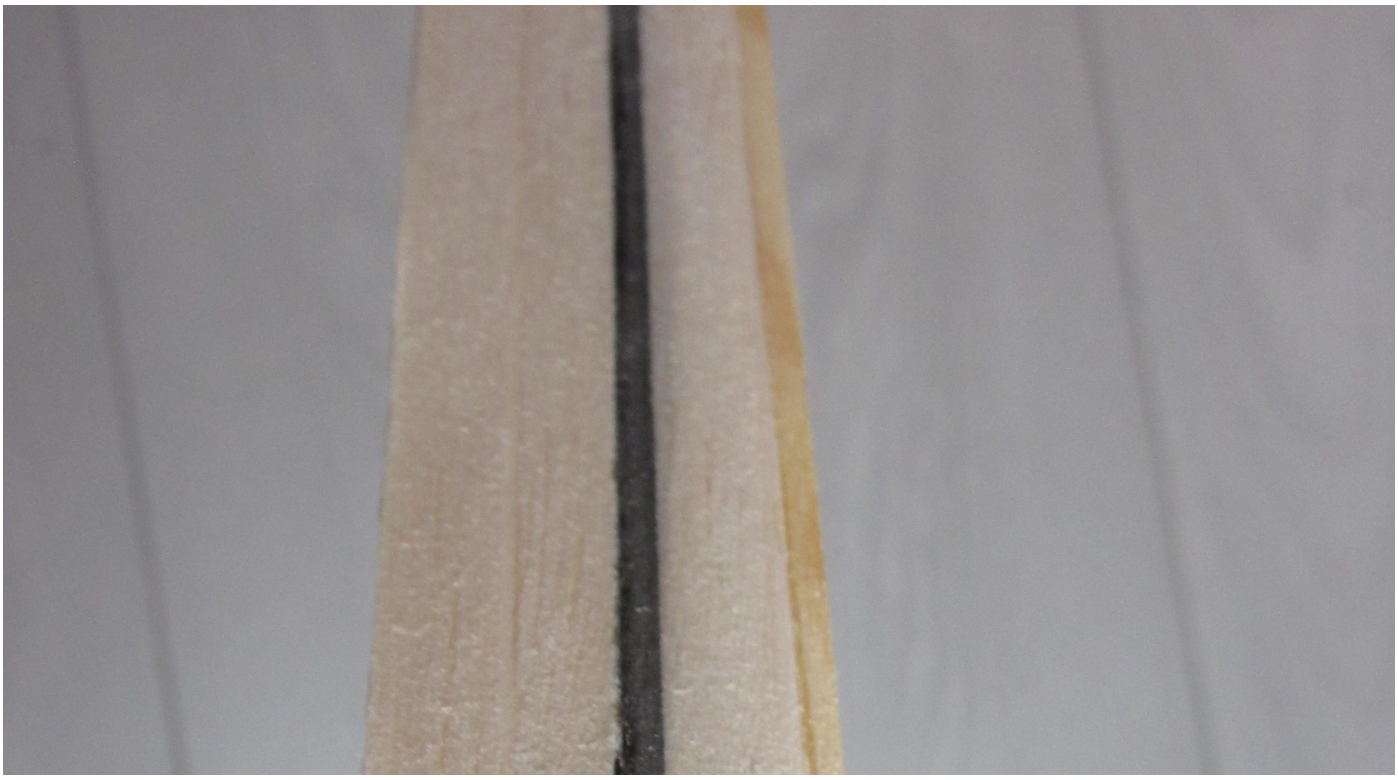
plywood, light and torsion-resistant.

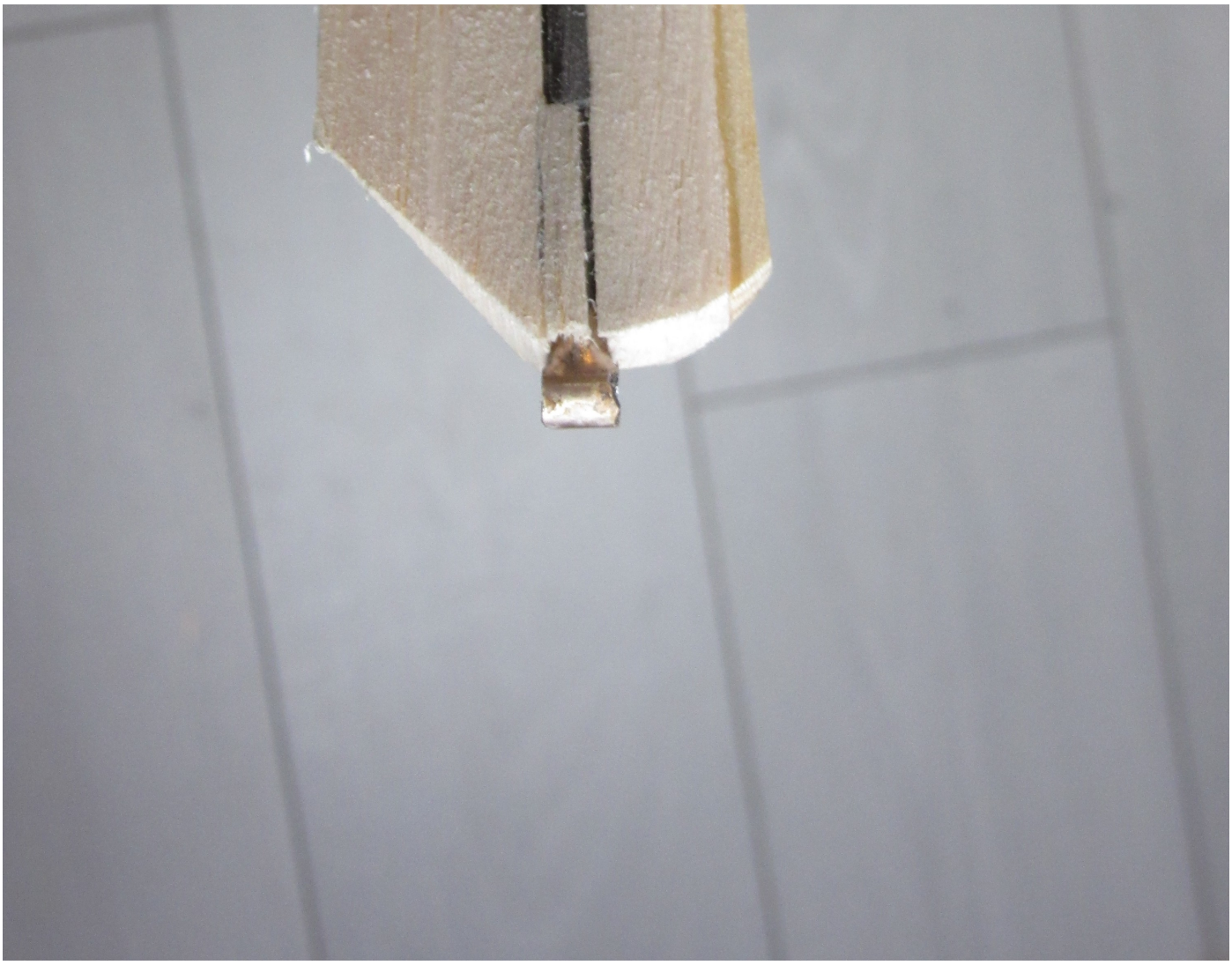
For fidelity to the original design, I wanted the aileron to be operated with pull-pull wires. These had to go around 90 degrees with pulleys. After thinking long and hard, I decided to put a large servo in a kind of box in the root of the wing, so it could be removed. Later I made an inspection hatch in the root of the wing, so I could adjust the tension on the wires when the wing was finished.

I made the horns at the aileron and their controlling servo arms with the same throw so the cables will always be taut. Afterwards, there appeared to be quite a bit of friction because of the flexing of the wires over the pulleys, so the servos didn't come very well to their neutral position. I then made the servo lever throw half as large. To get the correct geometry I made an angle in the servo lever, resulting in better centering.

Struts

I wanted to make the struts of steel tube with a wooden streamline body (just like the real thing). I had some 4mm thin-walled stainless steel tubing (from the Fokker *FG-2*) lying around, which would do nicely. I measured the length, cut it off and also two short pieces for the mounting M3 bolts. With silver solder I soldered it together. The tube felt a bit flimsy and was afraid to bend it while handling the plane. I glued 1x4mm carbon strip on top and bottom of the tube and balsa at the front and rear. and also a spruce leading edge (LE). I planed and sanded this all into a teardrop shape and sheeted that with 0.4mm plywood.

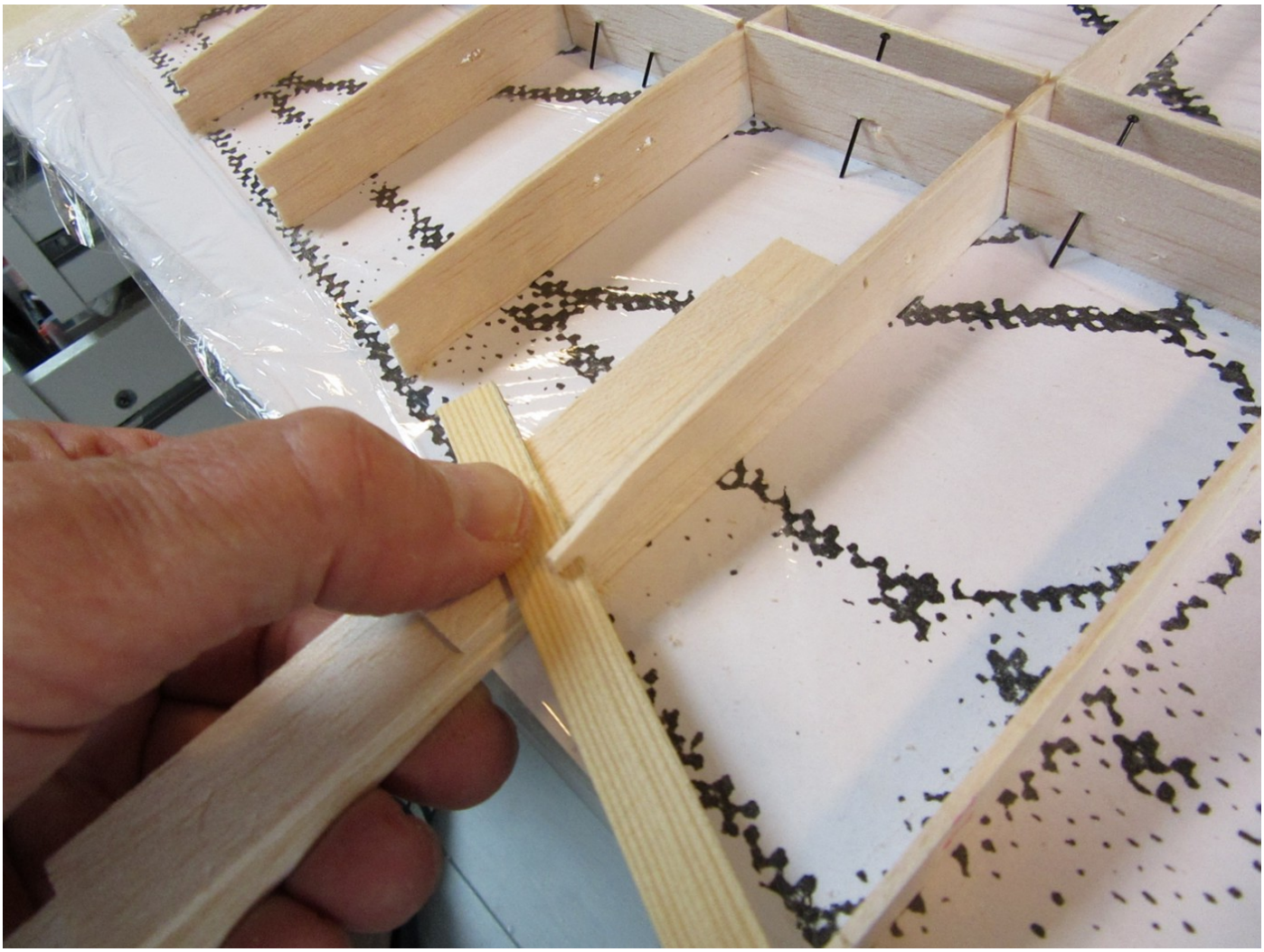




Left: The strut in front is ready for assembly. | **Right**: Ready to glue on 0.4mm plywood.

Empennage

Because I didn’t succeed in making ribs for the horizontal stabilizer the old fashioned way, I went for a shortcut: I pinned strips of 2mm balsa, slightly higher than the profile is thick, upright on my building board, with glued paper rib templates on the inner and outer strip.

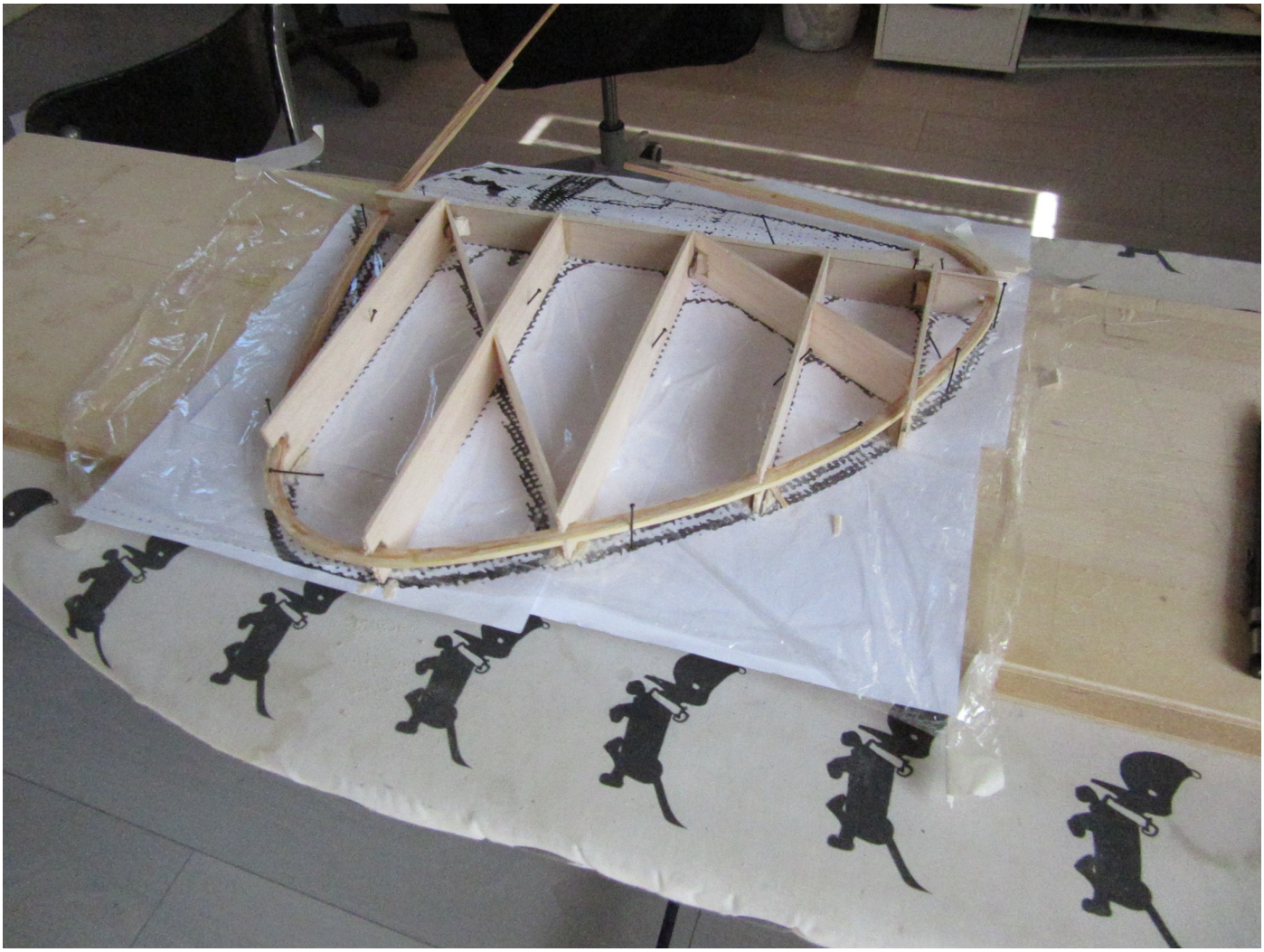


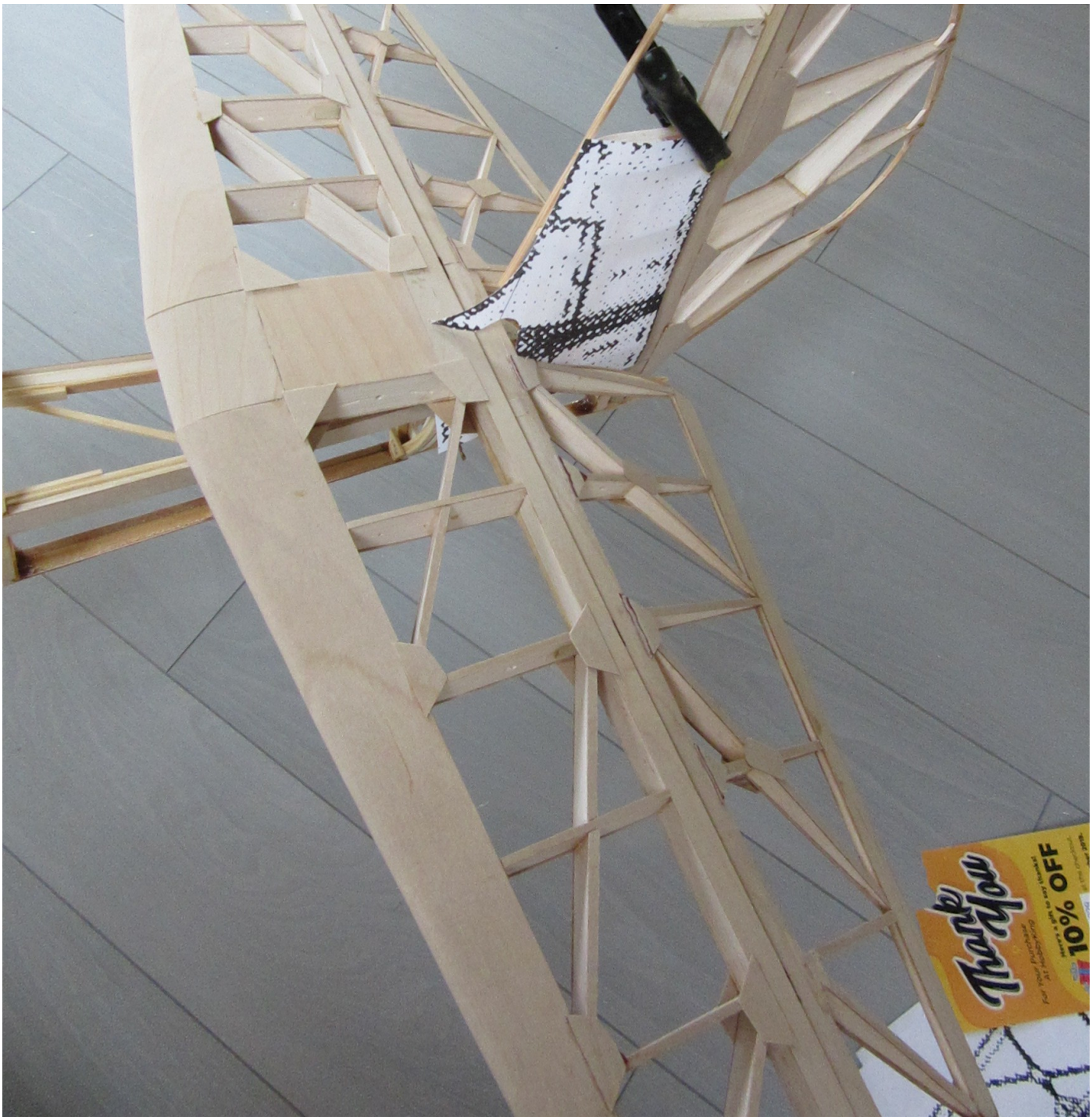
With a sanding bar and a spacer block. CNC would be more convenient!

With a long sanding stick and several other sanding tools, I sanded the notches for the 2x2mm spars, and LE. I glued in the spars and sanded the whole assembly in profile. Then I sheeted the nose with pre-bent 0.6mm plywood. On the centre bottom of the horizontal stabiliser I glued four vertical epoxy strips, with 1mm holes that just glide outside similar four strips on the fuselage. With two long 1mm wire pins I can attach the horizontal stabiliser to the fuselage. To mount it, the stabiliser slides under the front of the fin and there is just enough space to hook the control rod to the control horn of the elevator.

The rudder is similar to the stabiliser, except for the trailing edge. Instead of

a sandwich of 0.6mm plywood and 3mm balsa as core, as for the wing and stabiliser, I laminated the trailing edge from three strips of 2x3mm and let it continue all around the rudder. Of course I sanded it down later. The hinges are basically identical. I did make it easy to disassemble, for ease of transport.



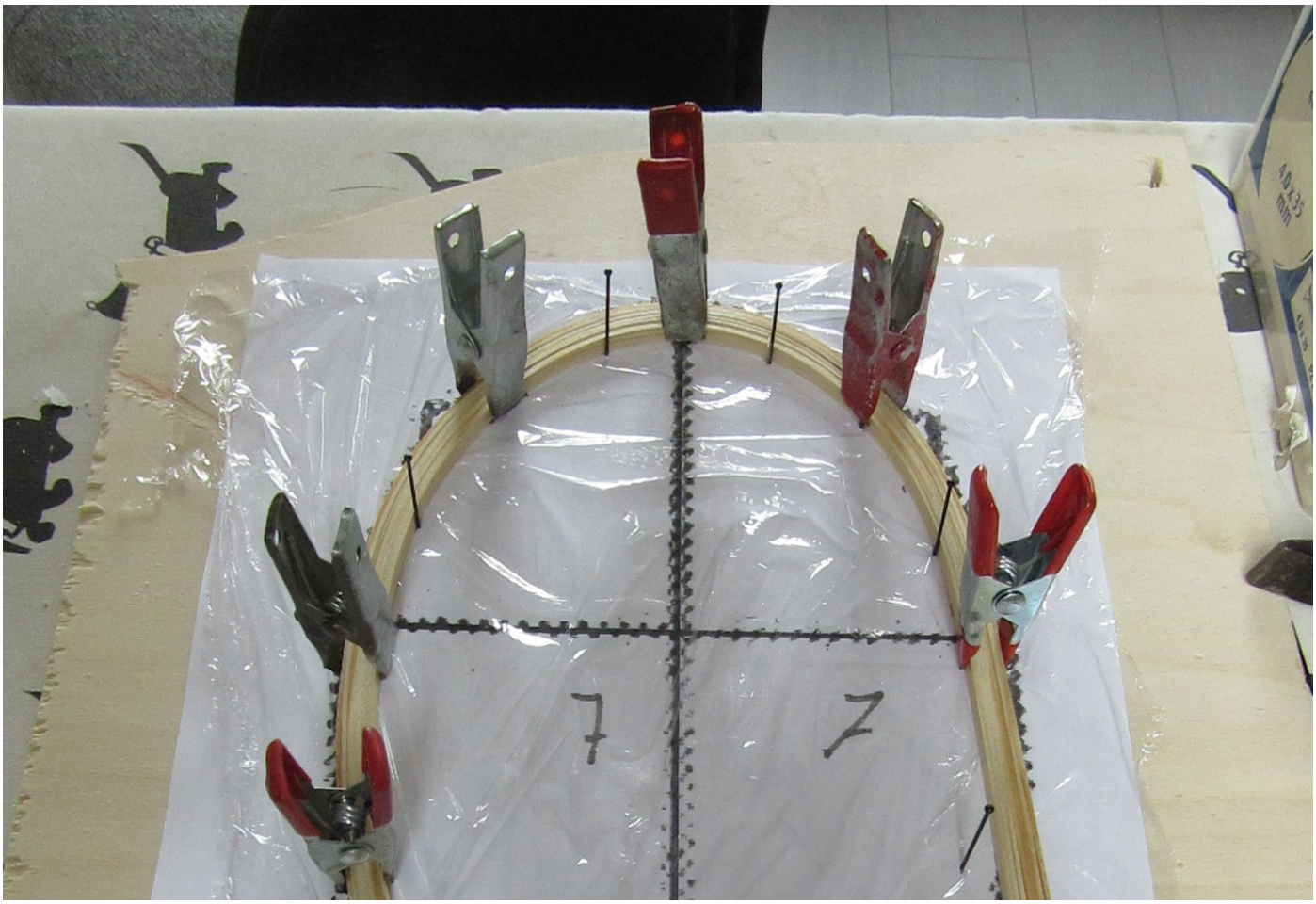


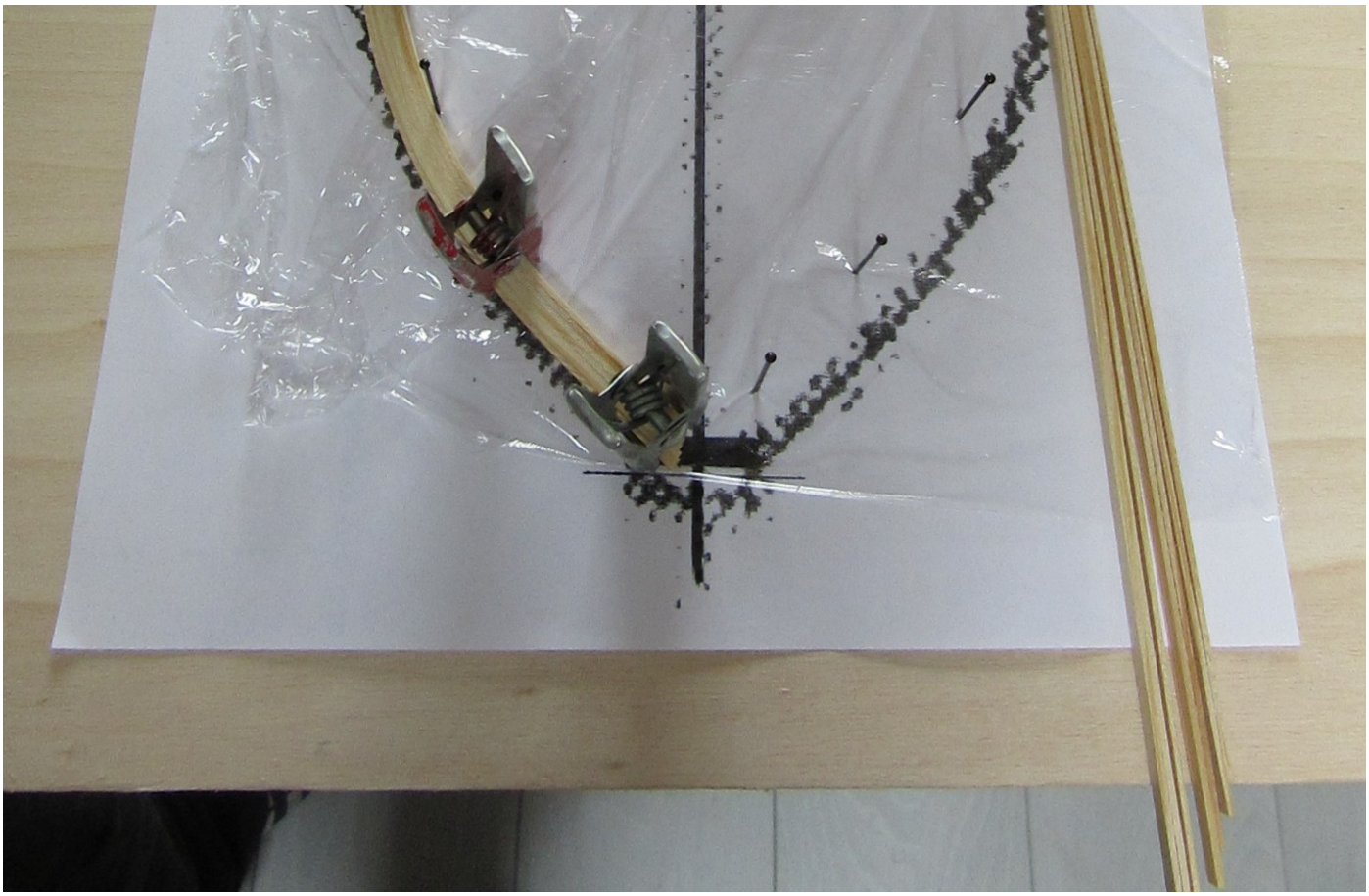
Left: The laminated TE actually runs all around. | **Right**: Horizontal and vertical stabilizer in place — they are quite a challenge.

Fuselage

The starting point are the fuselage frames. I wanted to laminate them, because I have some experience with that process and it is good

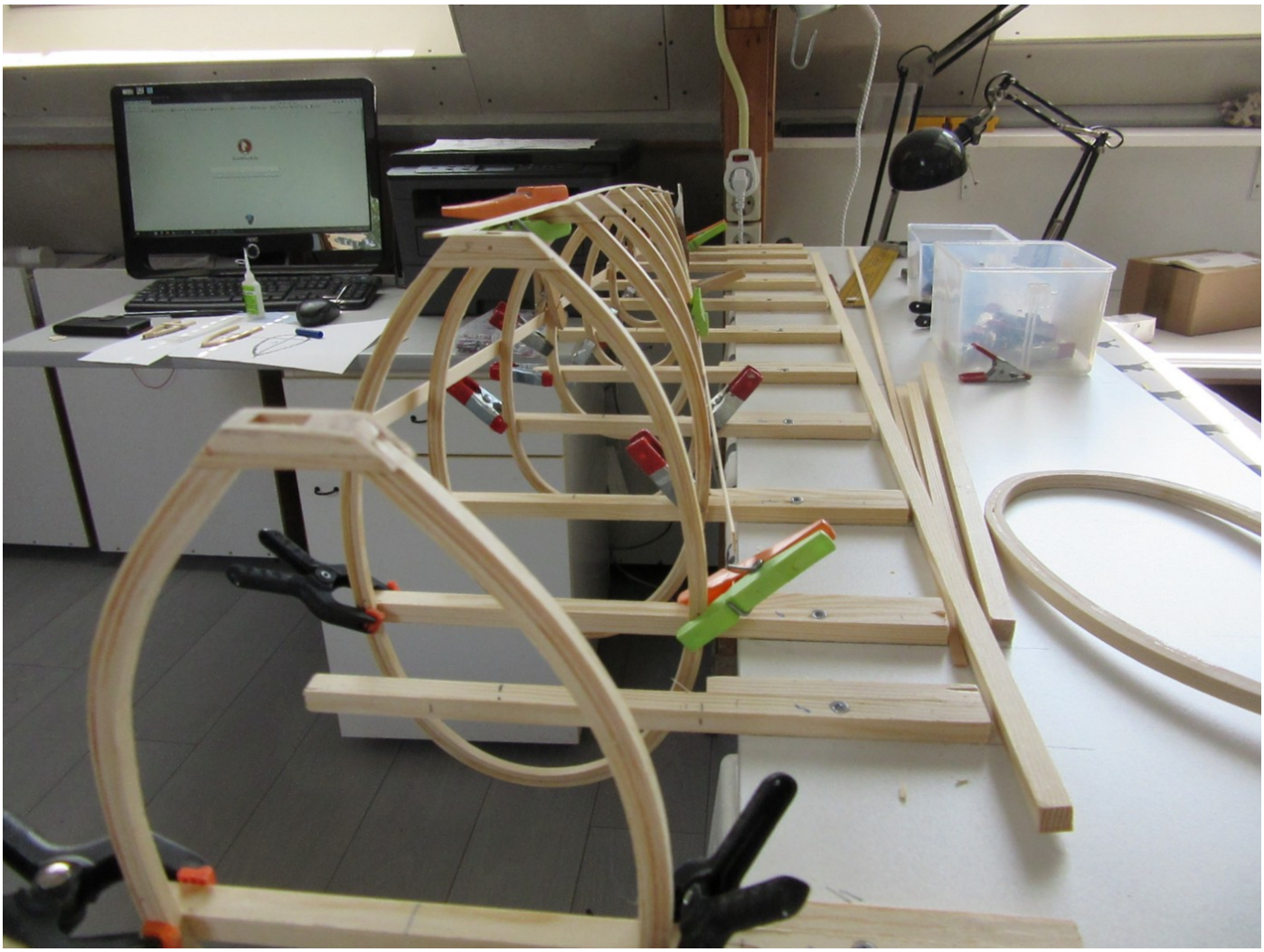
engineering. They are laminated from 5x1mm spruce strips, the main frame from 10x1mm strips. Lamination goes like this: I put cling film over the drawing of a frame and then stick in pins on the estimated inside of the frame, adjusting them later, so the outside of the frame fits the drawing. I bent a package of five strips around them, the larger frames I can bend dry, with the smaller frames I have to use boiling water to avoid breaking. How is that done? With a kettle and a flat oven dish, I pour boiling water over the strips in the flat dish and bend them into the right shape, sometimes I have to repeat this until they are right. It's a good idea to try it with some strips to get an idea what you can do with wood. Be careful not to burn your fingers — if you are afraid of that it might be a good idea to wear household gloves. With the help of more pins and clamps I make sure that the bundle of strips comes into shape. Then I apply a generous amount of thin CA and after a few minutes I can separate the frame from the cling film.





Laminating the fuselage frames. It’s easier than it looks.

Before I removed the frames from the drawing, I drew the centre lines on them. Also a horizontal line where the 10x10mm battens were to be placed to hold the frames in place. I glued 10x10mm strips and which in turn were screwed on a building board to complete the setup.



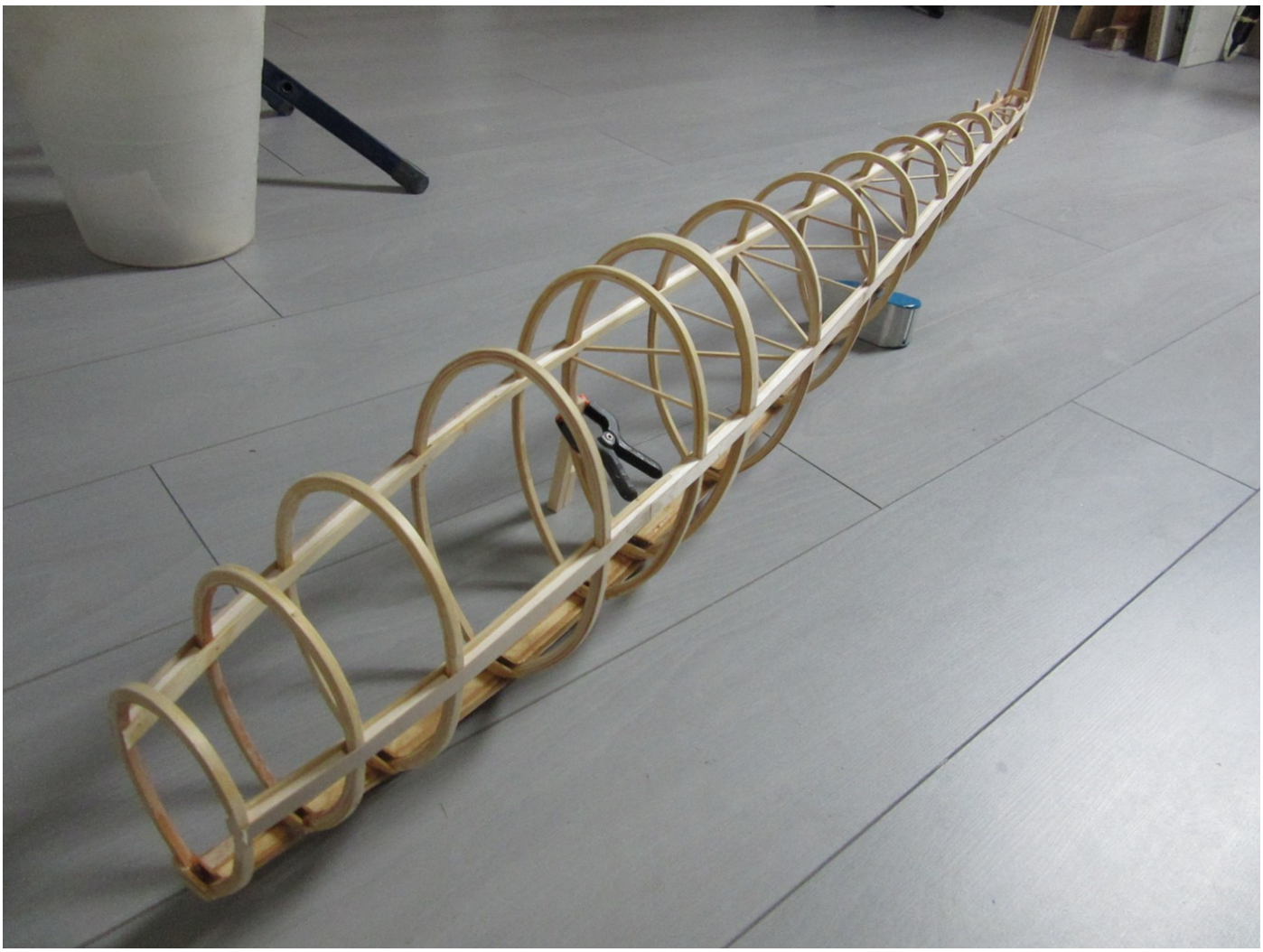
The fuselage frames set up on the building board.

I had to adjust some frames because the lack of accuracy through the enlarging of the plans. Checked them with a long thin batten (called a spline in shipbuilding) to find high and low spots. I sanded the high spots down with a long sanding stick and had to fill up some low spots with some extra strips glued on the frames. Now I had a nice, sleek skeleton ready to sheet.

I wanted to make the joints of the plywood on the fuselage also as a butt joint. A scarfed joint, if done properly, is technically the best solution. The advantage of a butt joint is that you get an optically clean joint and it is easier to make. My idea was to make a long butt strip for the horizontal joints instead of stringers and glue butt strips over the frames for the vertical

joints.

I glued the horizontal butt strips of 0.6mm plywood over the frames. To make that more rigid, I glued pieces of 4mm balsa between the frames, sanded the balsa smooth with the inside of the frames and glued a spruce batten of 8X2mm on it, making these sandwich stringers very stiff.



Removed from the building board, with a bottom stringer and two side stringers. These are constructed from a plywood strip on the outside (this is also the welding strip), balsa filler and an 8x2mm pine batten inside. The diagonal braces are temporary.

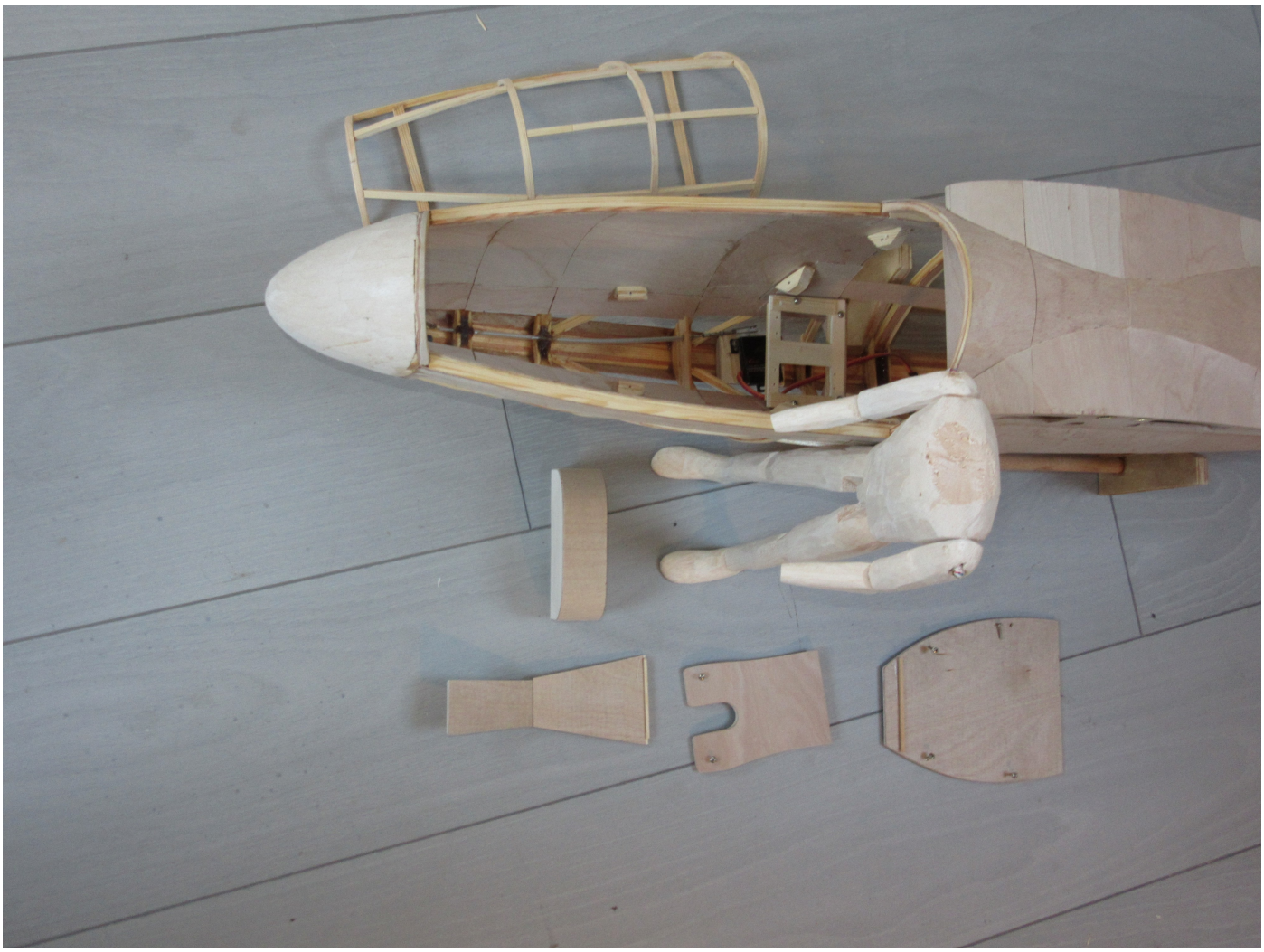
Next was the bottom centre stringer or keel, 2mm thick spruce, wide at the front where the skid should come. After chamfering the stringer I glued plywood strips to it as well. The fuselage was now so stiff that I could take it

off the building board and turn it around, enabling me to make an epoxy fillet between the keel and the plywood strips.

Before sheeting I needed the wing-fuselage connection. I made a sort of centre wing piece, consisting of the metal wing joiner tubes glued between ply plates, and two 3mm thick ply root ribs. This centre piece fits over the mainframe. Having this sorted out I sheeted the top of the fuselage with 0.6mm ply glued with thick CA, leaving some slots open for the wing centrepiece. I glued in pieces of 3mm balsa sheet to support the ply sheeting later. On this base I glued pieces of pre-bent 0.6mm plywood, to make a nice fairing.

With this complete, I went on with the front part of the fuselage. I sheeted the inside with plywood and the servo tray's of poplar ply were glued in.

Next, the nose cone. A tricky part, with all those narrow curved panels. I read that one restorer of a full size *Petrel* spent six months on it. I started with a hollow cone made of ten layers 10mm balsa. The glue joints give, as with plywood, an idea of what you're doing! After roughly sanding it into the right shape, I tried to sand it so the panels will fit, these can only be bent in one direction. For the rear half of the nose, the panels go from rounded to flat, forming a decagon. At the front, the flat panels curve to the nose point. I chose veneer for the sheeting, you can sand it without showing the layers as in ply.



Left: View into the cockpit with the removable backrest and seat. The base for the instrument panel is not on it, but I glued it in later. Pilot, built up from 10mm and 20mm balsa. | **Right**: Nose cone with sheeting in the making.

Interior Details

In my opinion, no scale project is complete without a detailed, authentic, scale interior — which includes the pilot of course. Thus:

Pilot

To make the interior of the cockpit I needed the pilot. I made it from 10mm and 20mm thick balsa. Knee and elbow joints are Robart hinges, the hip and shoulder joint I made from a piece of shock cord under some tension. My

sister Hans made the clothes for the pilot. I made the hollow head out of *Super Sculpey*, and my wife painted the head (see *Resources* section for the great tutorial from Josh Foreman).

Seat and Canopy

Next the backrest , the seat and the floorboard. I made the safety belts, the 'Sutton harness', from woven elastic tape, sewed leather strips from an old wallet on. Then I pressed in copper rings, I found the copper bushes that you get with servos very suitable. From balsa I made a mould for the canopy and had it vacuum formed on it.

Instrument Panel

I couldn't find a picture of the instrument panel at first, but thanks to *Scale Soaring UK*, I got the right image. Actually it is not a panel but a kind of box. Nice place for a receiver battery I thought. Also I saw in the few pictures of the interior that there is a kind of narrow table in front of the instrument panel. I made a kind of shelf with the on/off switch under it. The box itself I made of 0.6 plywood, except for the back where the instruments should come, that became three layers. With a circular cutter, a kind of compass with a knife, I cut round holes in the plywood for the instruments. The visible side the hole corresponding with the instrument. In the second layer I cut holes that were a few mm larger (that's where the photo plus glass fits) and behind that a closed layer. I glued these three layers only at the sides and the top, I didn't glue the bottom. I cut out the 'instruments' out of a photo of the instrument panel.

For the 'glass' I took 0.2mm of transparent plastic, left over from some package. After painting the whole thing black I could slide the cut out instruments with the 'glass' in it and because they are locked in the holes in the middle layer it didn't need to be glued. Another nice detail is the pitot

tube, a very clumsy thing with transport. For ease in transport I made it dismountable. I soldered the solid pitot tube in a brass square tube, which fits exactly in a larger brass tube, which I in turn glued in the fuselage. With a magnet it is held in place.

Finishing

There are many options to stain the plywood. I use bister, an old brown water-soluble pigment, available at art stores. I start with a very diluted solution, darkening is no problem, just do it again. Because it is so watery I apply it with a brush and spread it with a sponge.

After this I apply two layers of dope with filler and a layer of PU yacht varnish which is different from clear varnish. The covering was done with *Diacov*, a woven material.

First Flights

Quite suddenly, it seems, the *Gull* is ready to fly. Fortunately, after the COVID-19 limitations were eased, we were allowed to use the field again and the weather was nice too. Rob wanted to tow, Raymond equipped the *Gull* full of camera's and I checked everything again — are the ailerons really going the right way? Always exciting the first time, but after a few metres in the air I noticed its responding well, some aileron trim and after uncoupling it needed some elevator trim, it flew fine! A beautiful sight, just like the real thing. The transparency of the covering is really nice. Because of its size and weight it flies like the real thing, with enough speed in a strong wind. Also when landing it looks more and more like a real plane, you can just see that there is more mass involved. Fortunately the relatively small spoilers do quite a bit. The second flight I had some thermals. The *Gull* circled in the lift nicely, leaving me with a satisfied feeling!

Slingsby Gull First Flights (video: Raymond Esveldt)

I hope to fly many hours with it, but it still needs a vario. Secretly I had hoped to keep it a bit lighter, that's always a challenge.

I would like to thank Rob for drawing and towing, Adri for milling, Raymond Esveldt for the video, all the other club members as well as *Retroplane* and *Scale Soaring UK* for their support!

Epilogue

After flying a whole season with the *Gull*, not on slopes but on flat fields, I found the flying performance a bit disappointing. I guess it's a bit to heavy and I am not happy with the choice of the wing profile. At *Retroplane 2021* there was not much wind, I couldn't fly the Gull, so it has not flown on a slope — more's the pity.

That triggered me to build another glider, the Slingsby *King Kite* which will be the subject of a future article for *RC Soaring Digest*. I managed to build the *King Kite* lighter and with a better wing profile. It just made its first flights and it seems to perform much better, which is nice if you don't have slopes close by — I live in the Netherlands after all!

The classic, retro aesthetic of the Slingsby Gull.

Resources

- **Dimensions**: weight 6200g; span 382,5cm; wing area 92.9dm²; wing loading 66.7g/dm². The 'scale' weight should be 4438g, so it's a bit heavy.
- **The Folker FG–2** — My first article which appeared in the *New RC Soaring Digest*.
- **Scale Soaring UK** — An invaluable reference resource. From their website: "*We are a group of people with interests in Radio Control Large Scale gliders and Sailplanes and Tugs. If you have interest in the following, then why not join in with our discussions on the forum. Maybe you can even help others with your views and ideas.*"
- **Slingsby Sailplanes** by Martin Simons — "*This work describes every Slingsby sailplane and glider from the British Falcon of 1931 to the last motorless aircraft produced — the Vega. Each type is illustrated with a*

full-page three-view drawing, with photographs and text outlining the background to the design. The drawings are based on the original workshop plans."

- **Vliegtuigtriplex 0.6mm Buigen (Bending Aircraft Plywood 0.6mm)** — This video shows how "*I bent [the sheeting] under running boiling water over it and dried it with a hairdryer."*
- **Bending 0.6mm Ply across the Grain** — "*How to bend 0.6 aircraft ply at right angles with the grain, in this case for making the fuselage/wing fairing of a scale vintage glider."*
- **Sculpey 101 Class 1: Tutorial on How to Sculpt a Head with Polymer Clay** — "*We start with building the basic structure for a humanoid head. I tried to come up with a way for beginners to be able to get the proportions correct."*
- **Slingsby Gull at Halle** — "*Scale model Slingsby Gull III at a retro aerotow meeting in Halle, Germany."*
- **Slingsby Gull Scale 1/4** — As it originally appeared on Retroplane.

*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**.*

Sky High Aeromodelling Competition

Over 300 student teams from across India compete in this flagship event from Tech Invent 2021.

Dr. Gurmail Singh Malhi

A screenshot from just one example of the many student videos entered in the competition.

This article was prepared jointly by the author and Ms. Maanvi Thakur, a student at Chandigarh University.

Tech Invent 2021 — organized by Chandigarh University located in Gharuan, Mohali, Punjab, India in the fall of 2021—was a multidiscplinary conference focusing on the effort to "*reimagine, recreate & reposition our living style through our exciting flagship events, conclaves, talk series [and] discussions.*"

We know that with COVID-19, social distancing has become the need of the hour. However, it was high time to come up with activities to keep students engaged who are interested in aerospace and related engineering disciplines and provide a unified national platform to everyone and motivate students to keep their dreams and imaginations 'sky high'.

To that end, one of the flagship events of *Tech Invent 2021* was a customised glider making and flying competition named *Sky High Aeromodelling Competition* which commenced on 2nd of September and concluded on 4th of September, 2021. Participation from all over the country poured in for the competition. Students from renowned colleges and universities participated in this event with full gusto. More than 300 participants had taken part in the competition and made the event a success.

> "Aim for the sky, but move slowly, enjoying every step along the way. It is all those little steps, that makes the journey complete." — Chanda Kochhar

Aspirations

- To enable students and other participants with technical skills to showcase their talent.
- To enhance the team work among students in such critical time also.
- To gain and practically implement knowledge.
- Make participants understand on how to achieve maximum flight time.
- Make them aware about exciting opportunities that technology can create.
- To gain knowledge on the standards of measurements and other calculation.

Competition Rules and Guidelines

- The competition requires participants to design and fabricate a glider and a catapult mechanism to launch it. (Commercially-made models are not allowed.)
- Wingspan should be a maximum of 50 cm.
- The glider should be launched using a catapult mechanism and should not have any additional power sources.
- The catapult launch mechanism should be in such a way that it has a maximum rubber loop of 1/16in or 0.15875cm of cross section rubber loop.
- It should be a 100% mechanical device and no use of electronics or electrical power is allowed.
- Students should design, build, and demonstrate a glider and a catapult launch mechanism with the goal of achieving maximum endurance/flight time.
- Each team needs to submit an abstract on their aircraft, which…must document the basic design of the aircraft (dimensions, wing area, velocity, etc.) and should also explain how their design is suitable for the given problem.
- Along with the abstract, participants must also send a zip file containing at least 5 and no more than 10 photographs of the aircraft while it is being built.
- The flight time is measured as the time from launch to landing. Participants should record a video and submit the same.
- Teams with the highest flight time will be selected as winners.

Glider Construction

The gliders for the competition don’t require a specific type of material to be build. Entrants can use balsa wood, Thermacol, cardboard, wooden sticks,

bass wood, foam board and many more, it's totally up to one's imagination on how they want to build their glider.

Some important things to keep in mind are: the aspect ratio for a glider should be 6:1. The ratio of the area of the vertical stabilizers to the wing area should be 1:10. The ratio of the area of the horizontal stabilizers to the wing area should be 1:5. The ratio of the fuselage length to the chord of the wing should be between 4:1 and 6:1. Once one had done with selecting material and have finished all the required calculation, they are ready to go and make your first glider!

To help you with a basic tutorial on how to build a glider, here are a few steps below.

Results

The organizers were delighted to see aerospace enthusiasts from all around the country taking part as this event. Students showcased with various innovative ideas about material utilisation, designs and launching mechanisms. The winners were:

Position	Team Name	Name of Members	Institute/ University
1st	Vajra	Arpan Bhatta, Asutosh Khatua	Hindustan Institute of Technology and Science, Chennai
2nd	Chetak Flyer	Jashanpreet Singh, Gursharanjeet Singh, Swayman Singh	Chandigarh University, Mohali
3rd	Akshara	Chaithra K.	Tagore Engineering College, Chennai

This was a very nice competition idea for beginners and learners, especially school students who are from poor countries and live in outskirt areas where they can try to make gliders from daily used materials. A similar competition will be organised in 2022 at Chandigarh University.

Resources

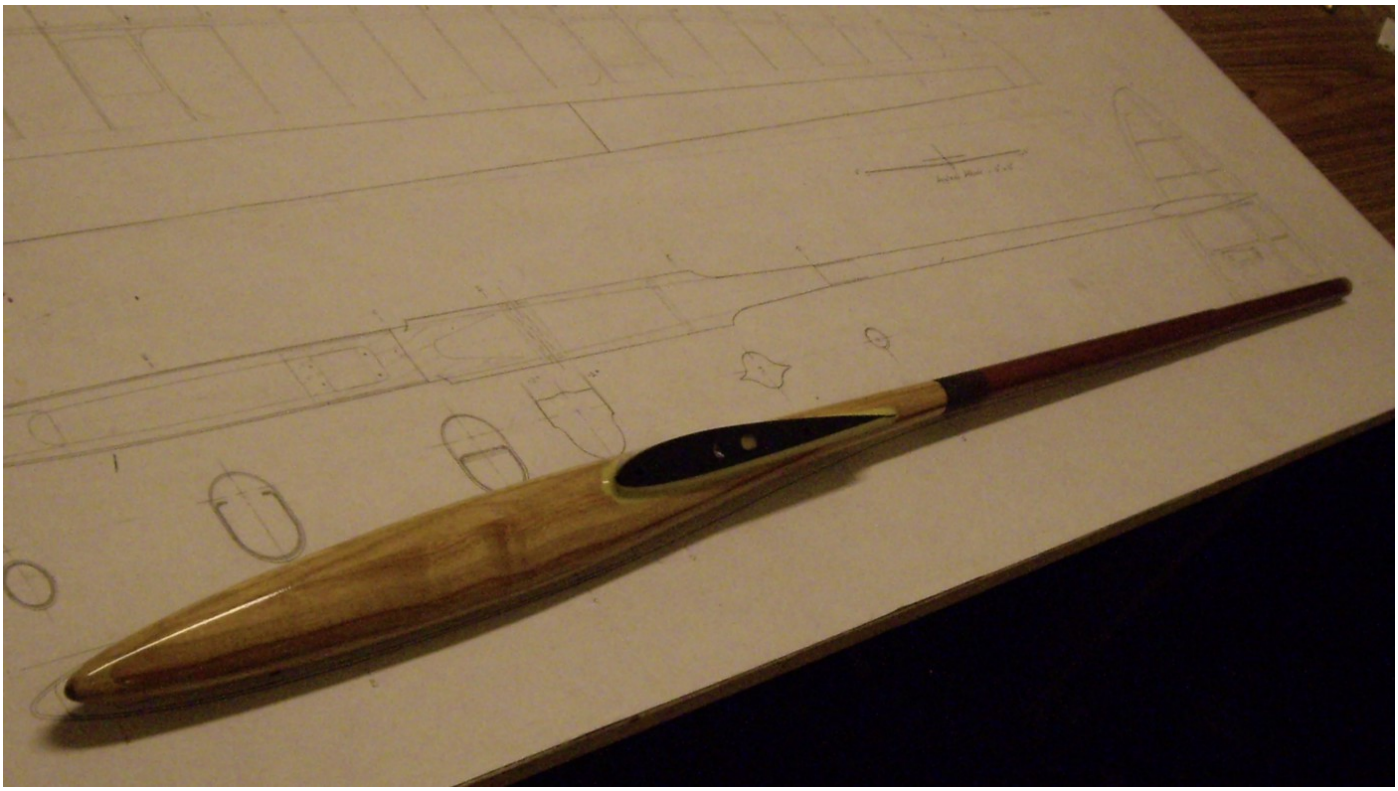
- **Tech Invent 2021** — "*promotes the idea of a world free from poverty, hunger, diseases, inequality and environmental degradation. After all, it's only in the pursuit of an ideal world that we can heal our beautiful planet.*"
- **Sky High Aeromodelling Competition Rules** — official, detailed rules of the competition.
- **Dr. Gurmail Singh Materials & Design** — YouTube channel featuring some of the student videos.

*All images 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**.*

Shinobi | A Home-Grown Moulded Fuselage

Part III: We Prepare to Make The Slip-On Nose Cone

James Hammond



Here is the Shinobi fuselage in all its shiny glory with the fishing rod back end section (that we'll use later to make the boom) attached.

*Readers who have not already done so may want to read the **previous parts** of this series before continuing with the article below. — JH*

So how can we make a removable slip-on nosecone from solid plug that's all in one piece? Because we carefully planned the operation well in the beginning.

The Parting Board and Frame

In the case of the *Shinobi*, we have four different components to make: Fuselage body, inner nose assembly, outer nosecone, and boom; so, although it's maybe a little complicated for a first project, the various parts will serve to demonstrate slightly different methods of making the moulds. For the Fuselage body, and outer nose cone assemblies we will use the same parting board, so we'll begin there.

The moulds will be made as two halves, left and right in this case, and so now we need to set the plug into a parting board, so first we need said parting board. I normally use a kind of vinyl coated plywood that is used for making kitchen furniture that's available to me locally but if you can find any thin — ¼″ to 3/8″ — plywood with a nice smooth coating, you will be in business. If not, you will have to finish the surface of your own board somehow. I have seen many fast ways to do this, but the one I liked the most was using lines of clear 2″ packing tape.

Shinobi fuselage plug is placed on the parting board and the cutting outline has been drawn.

Mark the Outline but Add a Bit

Mark the centre line on your parting board then place the fuselage plug on it. You can hold the plug temporarily with a couple of blobs of modelling clay (Plasticine) and then mark around the outline. Ideally your line should be a bit larger than the plug, so I use a thin *Sharpie*-type marker pen taped to a square piece of wood to act as a guide. Using this way, you will end up with a profile line that's larger than the plug by about half the width of the *Sharpie* pen — or about ⅛" (3mm) to 3/16" (5mm) which is just what we want.

Sawing Out the Plug Profile and Joining to a Support Frame

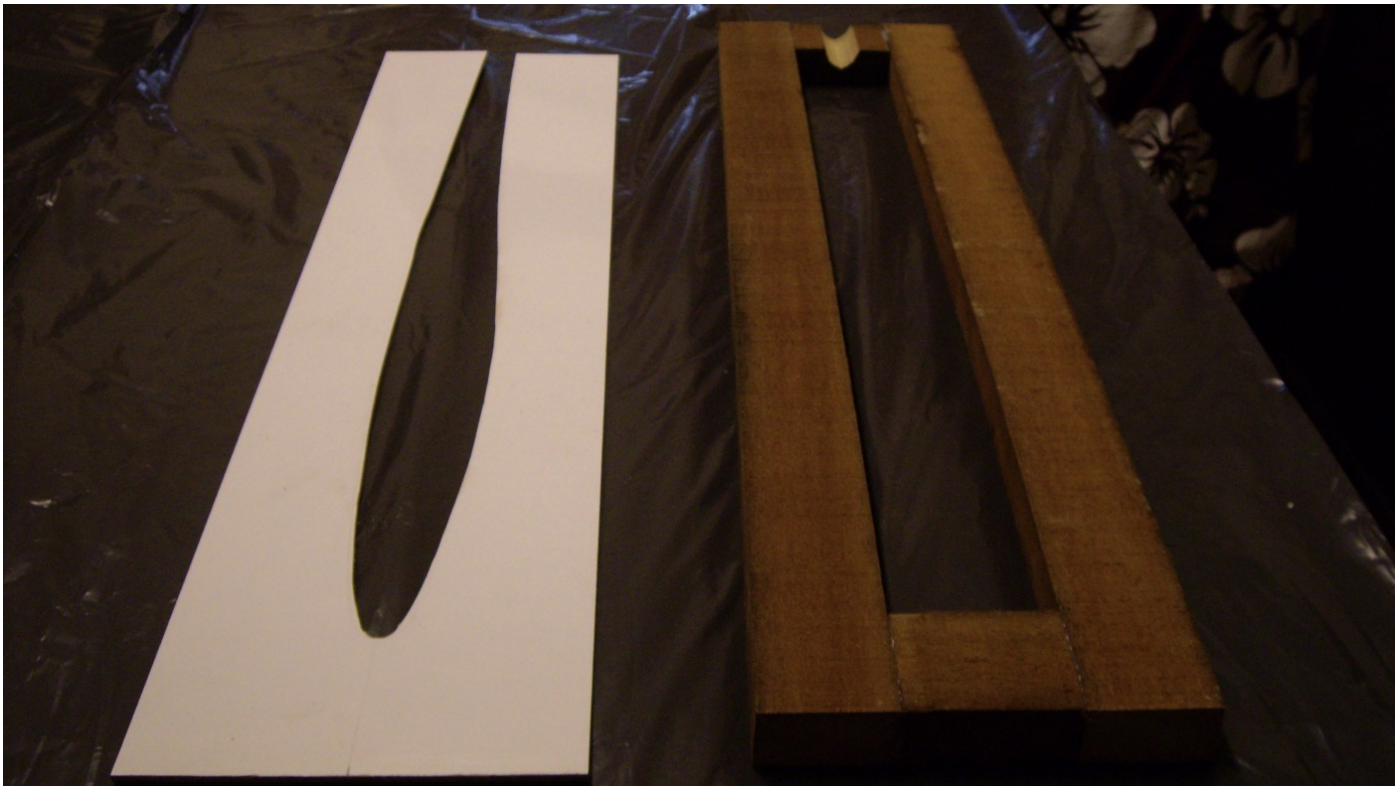
Using a saw — jigsaw, scroll saw, bandsaw — anything is OK, cut around the outline you have marked. Use a fine blade and try not to fray the edges too much when sawing. I usually put some masking tape around the outline to be cut so that the saw blade doesn't tear the surface up too much. Normally the outline to be cut can still easily be seen through the tape.

> ***Advice:*** *Mark the outline larger than the plug all around by ⅛" to ¼".*
>
> ***Advice:*** *Use blobs of modelling clay to hold the fuselage plug in place when marking the outline.*
>
> ***Advice:*** *Use tape around the marked line when sawing to protect the cut edges.*

The Parting Board Frame

The next job is to make a simple support frame for the parting board and the plug. Basically, anything that will support the plug and the parting board above the work surface will be OK. Glue the parting board to the support

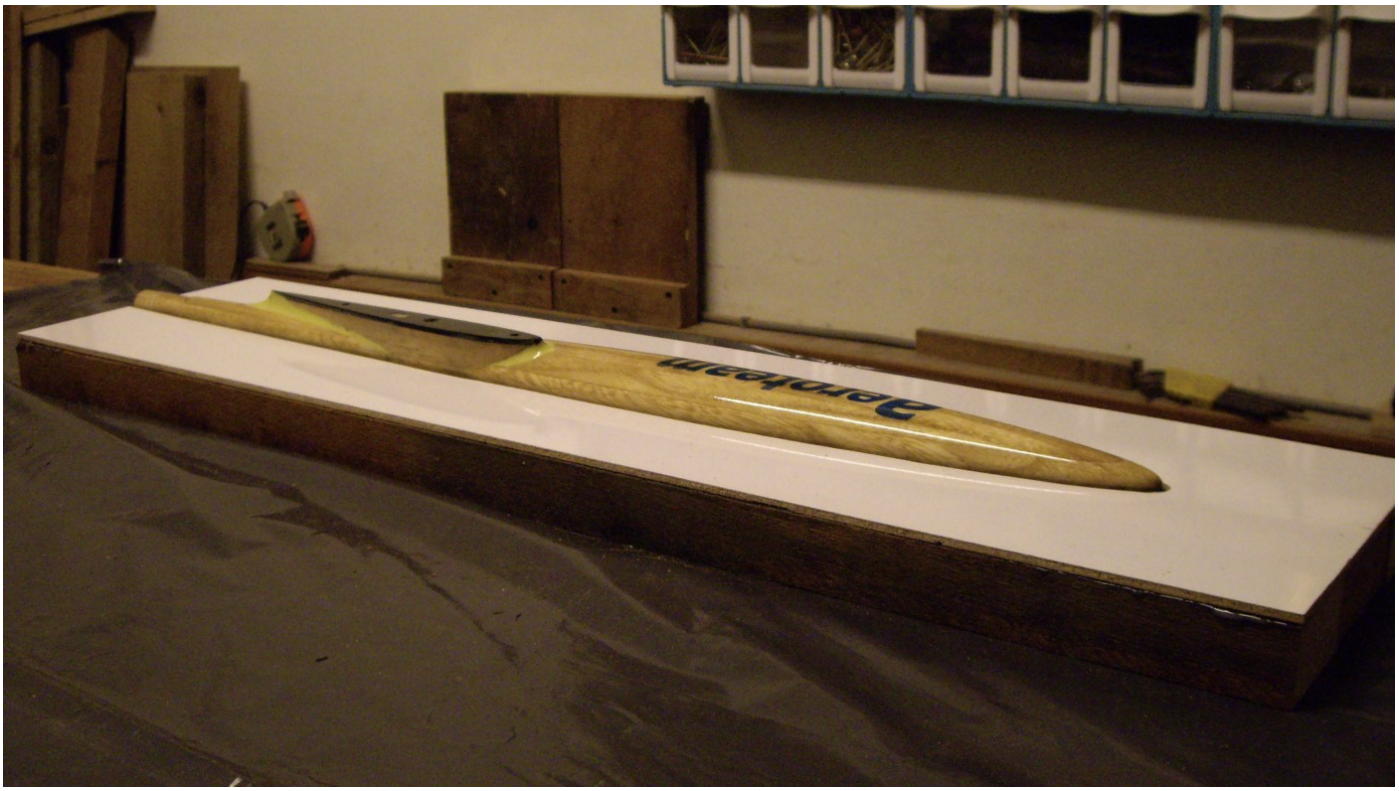
frame at this point. The next thing to do is to add a couple of cross braces to the frame support in order to provide a place for the lower half of the plug to rest during the moulding process. These do not have to be accurate and are better left a little low so that blobs of modeling clay can be used to adjust the plug centre line height.



The parting board plug outline has been sawn out and the support frame is ready. Note that the outline of the plug is ⅛″ to ¼″ larger than the plug.

Setting the Plug into the Parting Board and Frame

This is the fun part — some would say the tricky part, but as with all things moulding, prior planning and preparation make all the difference. First set the plug into the frame/parting board. It should be slightly lower than the centre line. Don’t fix it in yet as we’ll need to move it a bit.



The plug is set into the parting board slightly deeper than the centre line, but not fixed.

Preparing to Make the Nose Cone Component

From the beginning of this series I mentioned that its best to think this (or any) project through thoroughly before starting. Here's the first example of where thinking things through saves a lot of time and effort. We wanted a cool slip on nose cone, but the problem is — it's still attached to our fuselage plug. So how to separate from the plug for moulding? The answer is not to — we just use a mould fence to form the end of our nose cone mould at the place where it will join the finished fuselage.

The mould fence for the nose cone.

As the nose cone will be a separate component and the first part of the fuselage assembly, we need to make the mould for it. This is the first moulding job, and to do it we need a mould fence to separate it from the rest of the plug. Make a fence to fit across the plug and as with the parting frame, make it a little larger where it will fit the surface. Make sure you know the position in which it will be placed. I normally make a couple of light pencil marks on the parting frame surface as a reference.


aeroteam

Everything is ready for the modelling clay bead.

Preparing the Working Area and the Parting Frame

The first job is to thoroughly clean the work surface the parting frame, and the plug. Unwanted debris or hairs etc. can cause endless trouble when working with modelling clay. Now make a few clay rolls about 3/8″ thick and keep them on the clean work surface. Then make a couple of small 1″ (25mm) modelling clay blobs and stick them on your plug support pieces inside the parting frame. It's a good idea to begin waxing the parting frame, the plug, and the mould fence with a good release wax. I don't think it matters which release wax you use, but it might be a good idea to use only one type. Give everything at least four coats, following the manufacturer's instructions. Then repeat the process with four more coats.

Setting the Plug into the Parting Frame

Working from one end, squeeze your clay roll on to the cut corner surfaces of the parting board, making sure some of the clay is above the centre line and some inside and below it, work along the profile using more of your modelling clay rolls until you have a nice 3/8″ (10mm) clay bead all around the outline.

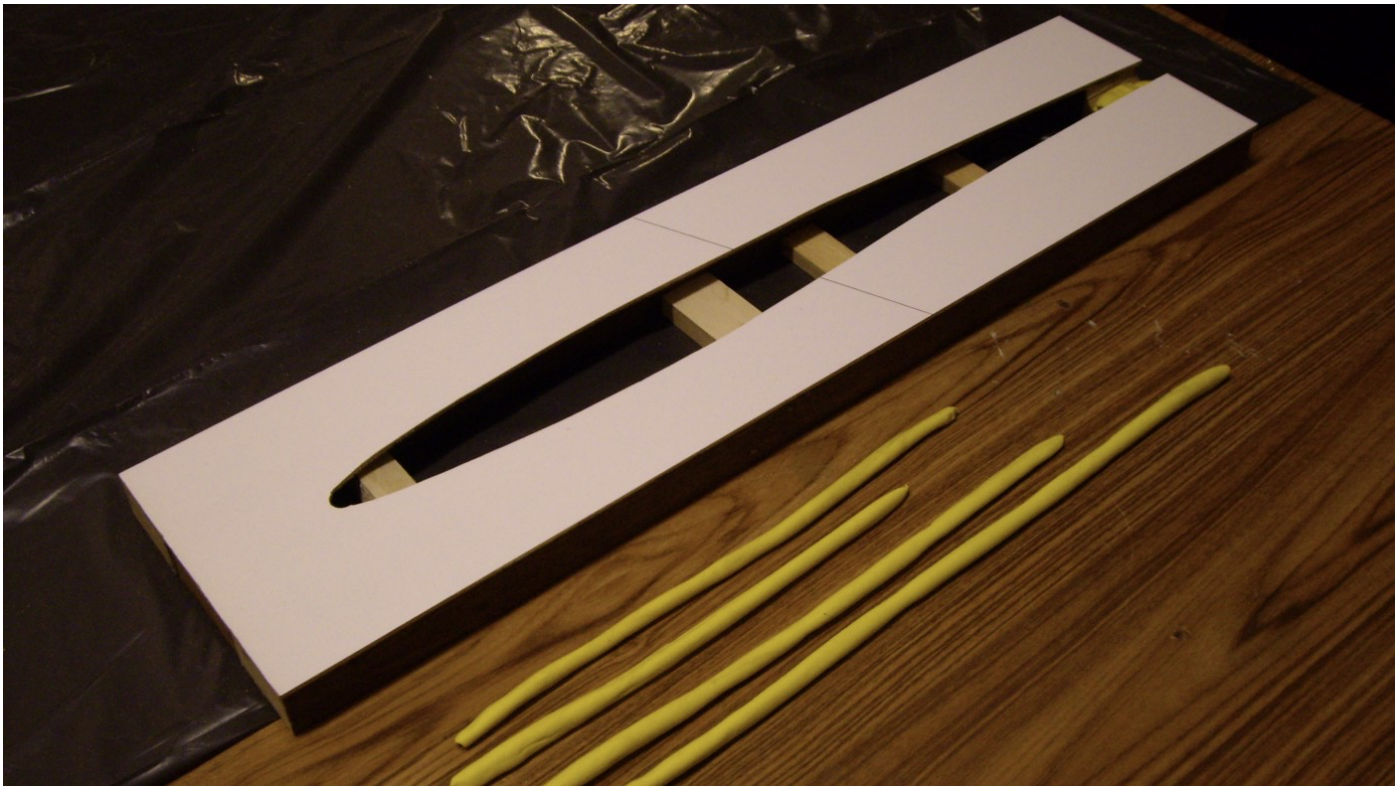
Next, gently push and set the plug down into the modelling clay on the parting frame. Try to the right depth to give you a centre line that is parallel with the parting frame surface. The blobs of modeling clay on the cross braces will help with the final positioning. If it's not positioned right, either on the centre line or in the vertical plane, then do it again until you are certain its

correct.

When you are sure the plug is in the right position or very close, squeeze the clay bead using your fingers simultaneously above and below the parting board to set it firmly around the plug/parting frame gap.

> ***Advice:*** *If you are not happy with the centering of the plug in the parting frame, do repeat the process until it's all aligned properly.*
>
> ***Advice:*** *The plug can be raised slightly and maneuvered inside the parting frame by squeezing the blobs or gently pushing or pulling the plug to centre it.*

Next time we make the seam and begin the mould making process.



The parting frame is prepared and ready for setting the plug into the modelling clay — note the mould fence position marked on the parting board, clay rolls ready to go, and the plug support cross pieces inside the frame.

If you have any questions please don't hesitate to post them to the

Responses section below and I will do my best to answer them. Putting them here also means others will benefit from both your question and my answer.

*All images 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**.*

Electricity for Model Flyers

Part III: How Brushless Motors Work

Peter Scott

Brushless motors come in almost infinite number of sizes and configurations. Here are a just a few of my collection.

This is the third part of a nine part series which goes through a comprehensive explanation of everything an RC modeller needs to know on the subject. Readers who have not already done so may want to read Part II before proceeding with this article. — Ed.

Magnetic Fields

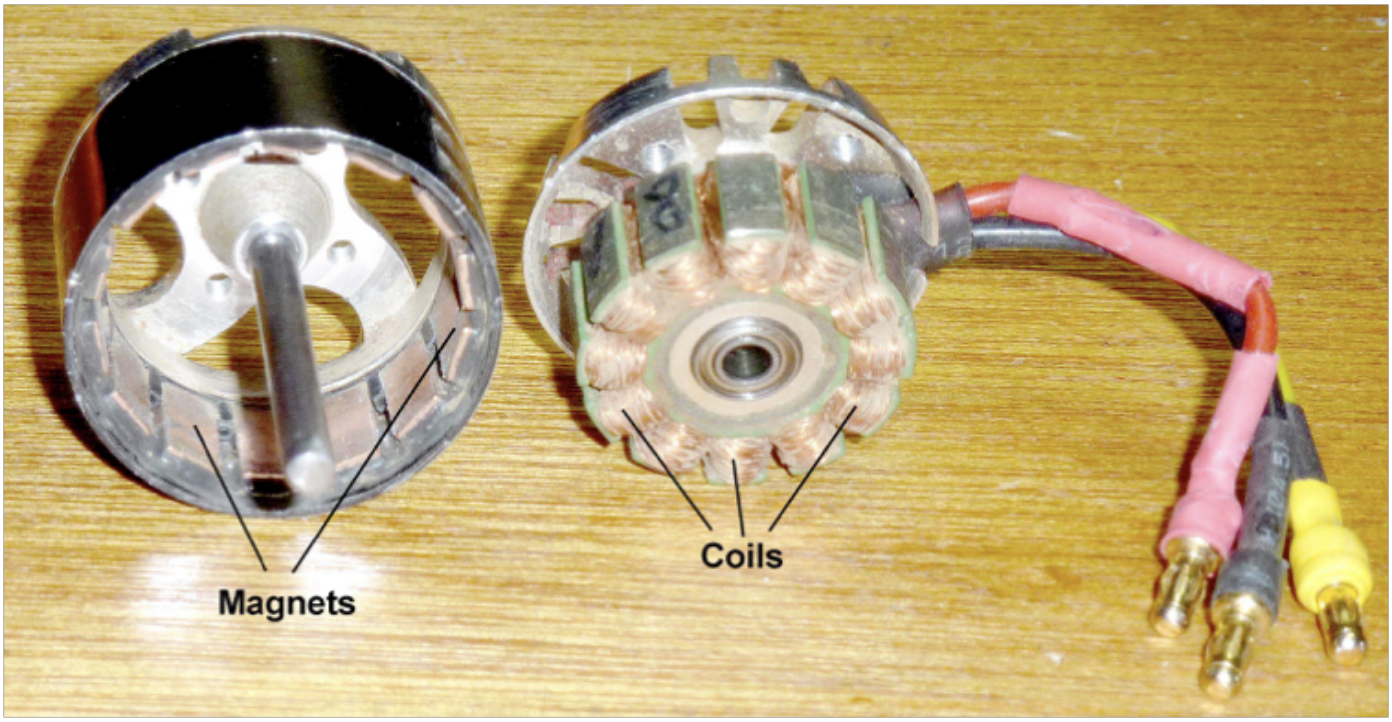
We have all played with magnets and know that north attracts south and north repels north. To make a force we need two magnets or fields. A magnet may be permanent, where a solid object has magnetism built in by

lining up its atoms, or made by an electric coil, called an electromagnet. Modern permanent magnets use rare earth elements, such as neodymium or samarium, to make very strong fields. Electromagnets have many turns of insulated or lacquered wire, usually copper, wrapped round an iron core. The iron greatly increases and concentrates the field but does not hold the magnetism when the current stops. The iron core is in thin sheets (laminated) to reduce induced currents.

Fields in Motors

An electric motor has two sets of magnets in it. Both might be electromagnets or one might be permanent. Brushless motors are the latter. Electric motors have a rotating part called a rotor and a fixed part called a stator. The outrunner motors that we mostly use have the electromagnet coils in the central stator. The permanent magnets are on the spinning outer case, hence the name outrunner. This has the advantage that the outer case holds the magnets firmly even at high speeds and acts as a flywheel.

The reason that brushless motors are more difficult to explain is that the coils produce a magnetic field that effectively rotates around the shaft axis. This field drags and pushes on the permanent magnets on the rotor to turn it. To reverse the rotation you simply reverse two of the wires.



Brushless motor internals.

So how is the rotating field produced? There are three sets of coils connected as a three-pointed star or a delta shape. This is similar to the three-phase motors used in industry (see *Resources*, below). Industrial ones connect to the three mains phase wires (red, green, blue). The alternating currents in these run 120° out of step (phase) to each other. These produce the rotating field. The rotating field creates (induces) currents in heavy wires in the rotor and then pushes on them. That is why they are called induction motors. In our brushless motors it is the permanent magnets that are pushed. The difference between mains and our motors is that in mains there is a fourth wire for a neutral return.

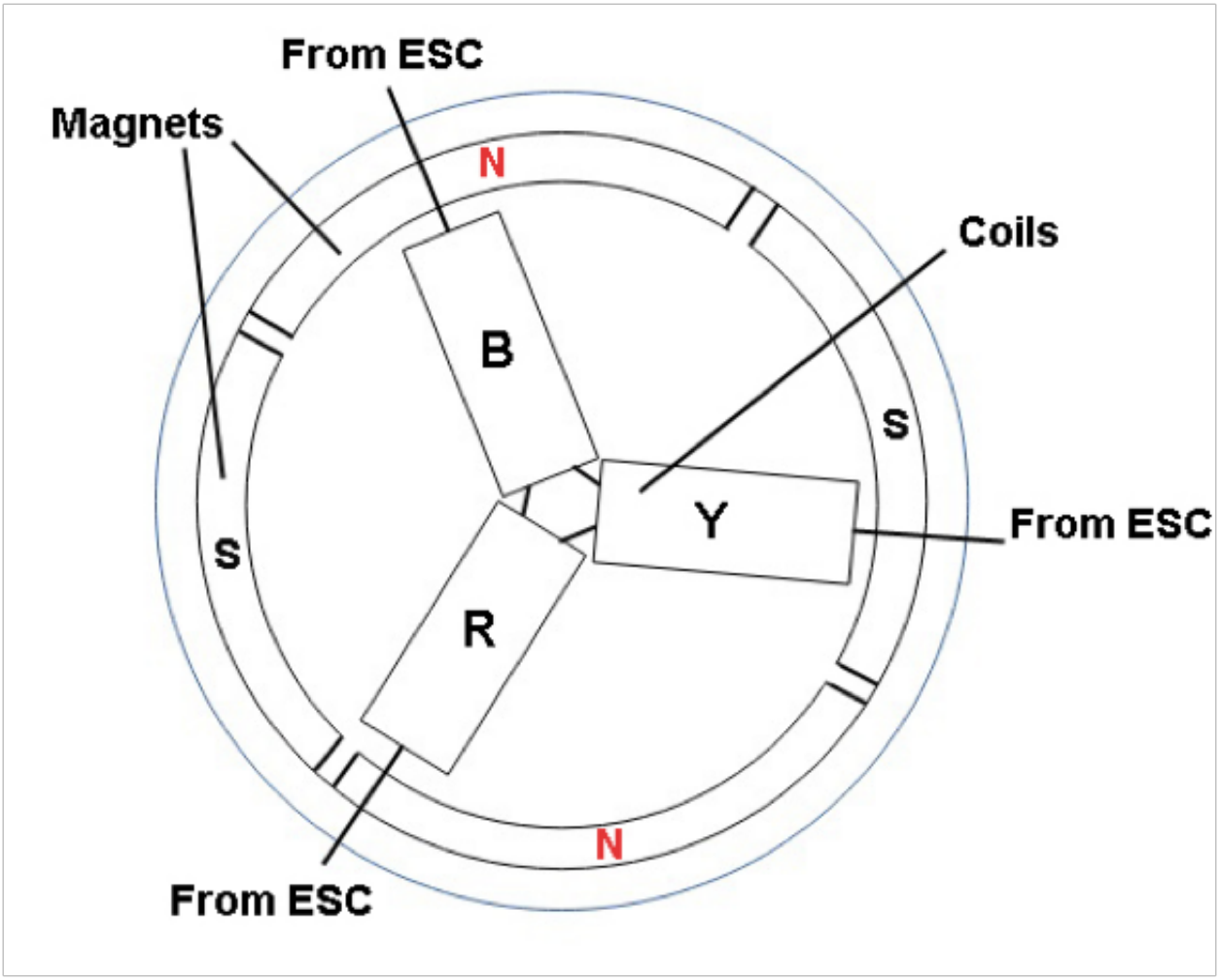
If you stop the rotor the field rushes past and the largest torque (rotational force) is produced. That is why our motors need caution. A finger in the propellor will not permanently stop it but actually give it more force, so after chopping off one finger it will move on to remove the next.

Types of Brushless Motors

There are two types of brushless motor. Sometimes the permanent magnet rotor is inside a static outer casing looking more like a conventional motor. These are called inrunners and are most common in gliders. More common are outrunners where the magnets are on the inside of the outer casing which rotates. The picture above is of an outrunner. Brushless motors are sometimes referred to as BLDC (**B**rush**L**ess **DC**) motors.

Numbers of Coils

The drawing below is the standard simple diagram of a brushless motor. The Ns and Ss show the magnetic pole on the inside of the magnet.



Brushless motor diagram.

In the drawing there is a single set of three coils. Such a motor would work but it would probably run roughly. It is shown in this way to make it easier to understand how they work. In practice there are several sets of coils, usually between six and fourteen, and many magnets. You can see this in the photo above, for example.

Our motors are not connected to the mains. Something has to produce the three phases from the direct current battery, known as an Electronic Speed Controller (ESC). That is why there are three wires coming out of the ESC. If you swap two of the wires the field rotates the other way round, which is how you reverse the motor.

Electronic Speed Controllers (ESC)

ESCs are clever devices. They don't produce pure sine waves like the mains but switch the three coil sets on and off in six combinations to give the greatest force. However the idea of a rotating field is correct. Two coil sets are switched on and one is switched off at any one time. The one that is off has a reverse voltage, called back electromotive force (back-EMF), induced in it by its collapsing magnetic field. The ESC senses these voltages and therefore 'knows' the speed and direction of the rotor. Inrunner brushless motors sometimes use one of two different sensors called magnetic Hall Effect or optical detectors. Not only do ESCs do this switching many thousands of time a second but can handle huge currents, as much as 300A. For aircraft, 120A at 24 V is usually enough, producing 2.9kW or 3.9HP.

To learn more about ESCs read next month's article in this series.

What Size Electric Motor Do I Need?

You need to know the weight and flying style for the model. Provided you have fitted the right propeller — which will be the subject of a later article in this series — the following table gives you a guide to the power needed for your model. For aerobatic models you also need to know the thrust but that must be measured in a test rig or on a tethered model using a luggage scale.

Watts per Kilogram Guidelines

Slow and Park Flyer:	110–149W
Trainers, Light Gliders and Slow Scale:	150–199W
Sport Aerobatic, Heavier Gliders and Fast Scale:	200–239W
Advance Aerobatic and High-Speed:	240–289W
Light Loaded 3D and Ducted Fan:	290–329W
Unlimited 3D and Aerobatic:	330W +

As mentioned above, I will be covering additional details regarding the electronic speed controller (ESC) in next month's article. Until then, if you have any questions, please feel free to add them in the *Responses* section below and I will do my best to answer as many as I can. Thanks very much for reading.

Resources

- Three-Phase Electric Power (Wikipedia)

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Contest Performance Improvement Process

Ryan Woebkenberg

Pilots ready their planes before the second day of the 2021 Southwest Classic F5J.

Part II: Evaluate the causes for falling short of the target group's score.

This is the second part of this series. Readers who have not done so already may want to go back and read **Part I** *before continuing with this article.*

The first part in this series covered the first three steps of a ten step process. These steps were:

1. Determine Your Contest Goals

2. Evaluate How You Compare to Your Goals
3. Evaluate the Scores of the Group You Aspire to Join

By necessity, as you will see in a moment, this part of this series will be dedicated to just one step:

Step 4: Analyze How Much Your Scores Need to Improve and Evaluate the Causes of Your Score Delta

The purpose of this step is to evaluate your contest performance to evaluate how far your scores are from your goals and theorize possible causes for your shortfalls. You can do this after each contest or after a season. You can do this by yourself or you can work on this analysis with a flying partner or coach. I mentally perform this analysis on the drive home from each contest I attend and then perform more in-depth analysis at the end of each season. Next I will provide some examples.

In the previous article in this series I analyzed the *2021 Southwest Classic F5J* contest that I attended in February 2021 (see *Resources*, below, for my detailed report on that event). Breaking into the top 25% would have required averaging 906 points per round. The raw score averages were 9:18 out of a mazimum possible 9:59, 49 landing points out of a maximum of 50, and averaging 130m start height. Next lets see how my scores in the 2021 SWC 2021 F5J fared:

First, I should mention that in Round 7 I had a failure of my F5J switch. The failure was because I messed up the arming routine before flight and inadvertently caused the switch to think I had performed an in-flight motor restart which the switch will blink out a zero.

Otherwise my average flight time was within about 60 seconds, or about

10% of my target group, my average landing was within about 15 points, or 30% of my target group, and my average start height was 215m or within about 65% of my target group.

An analysis of the above shortcomings in my contest performance compared to my goal you can see at the *2021 SWC*: I fell short in all three areas of scoring. In Round 7 I also made a mistake due to not having enough contest experience with my F5J switch that cost me a zero in a round, which probably didn't hurt my score that much because it may have been dropped anyway. Assuming my start height was close to my average for the contest the flight time and lack of a landing that round would have resulted in about 450 points which would have been my dropped round either way.

The area that I had the largest gap in was start height. I was on average climbing way higher than other competitors in this contest. At the time given the performance of my plane (more on that later) and the conditions, I felt that launching high was the best way I could ensure I was able to get close to the flight task time which I was within about 10% of overall. Ensuring I don't launch over 200m, because the altitude penalty increases greatly for starts over 200m, is something that I do need to work on to improve my F5J contest performance.

For the remainder of the 2021 season I was only able to fly one more F5J contest, the *LASS F5J Lite* event. It is mostly flown by the F5J rules except it allows pilots to used fixed cutoff ALES (ie. altitude limited electric soaring) style switches. After the *SWC F5J* I upgraded to a second hand *Optimus EL*. It is a 55oz, 3.85m all carbon modern F5J plane. Although it isn't the absolute newest design it is quite a bit more modern than the 59 ounce 3m *Graphite* I flew at the *SWC F5J*.

Interestingly, at this contest I achieved my goal of placing in the top 25% but

my average flight time and landing was slightly worse than at the *SWC* event. My average start height was much closer to the average of the first pilot in the top 25% at that event. This could be due to the *LASS F5J Lite* event having less highly competitive pilots or it could be due to the conditions at this event being more unpredictable. Conditions can be brutal at Muncie.

As an additional data point, I attended three ALES or mixed launch events. Some pilots flew off winches while some pilots used electric models with ALES switches set to 150m contests in the midwest with the *Optimus*. My scores are below. Note I converted the landing score to the F5J landing scoring system for comparison purposes:

In the two contests I placed in the top 25% — and especially the one I came closest to my goal of winning a contest with at least 20 pilots — my flight times and landings were pretty close to where I would have needed to be to finish in the top 25% at the *2021 SWC F5J*. Overall in these three contests I had a much better landing average and about the same average flight time.

My concluding analysis is that where I was falling short in flight time and landing scores I did improve in both areas in the second half of the 2021 contest season. I partially attribute this to more practice with full house electric sailplanes in electric contests. In both of the first two contests I flew this year I made mistakes with my equipment that cost me heavily in scoring. I also partially attribute my improvement to upgrading to a more modern sailplane.

I encourage the reader to do this kind of analysis on your contests and evaluate how much you need to improve to meet your contest goals. It is also possible to theorize possible reasons for the shortcoming in your scores. Even if you can't address the reasons you have identified as the causes of your shortcomings you could potentially work on options to improve in other

areas to try to make headway towards your contest goals.

One typical example of this is if you are flying F3K and your physical abilities limit your launch height and you theorize that is a source of your contest performance shortcomings. In that instance you could heavily focus on air reading, improving your quick decision making, and improving your turn arounds to try to make headway on the score sheet.

Another common example is you may theorize your current plane is the source of your contest performance shortcomings. That certainly may be the case. If you are not in a position to upgrade your plane don't fret. I was in that situation for years. Try to find ways to continue to improve on the skills that you **can** improve upon so that when you are able to upgrade that you are positioned to really take advantage of it. I'll be covering that more in the next several instalments of this series.

Thank you for reading. If you have any questions, please leave them in the Responses section below and I'll do my best to answer them. This will allow others with similar questions to benefit from the additional information provided.

Resources

- **My Southwest Classic F5J 2021 Experience** — My report here in RCSD from this great contest held annually near Phoenix, Arizona.
- **2021 Southwest Classic F5J** — The Academy of Model Aeronautics event listing for last year's event.

*All images and tables 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**.*

Where Have All the Glider Kits Gone?

Filling the yawning gap between your first kits and the carbon fiber of your dreams.

Bob Dodgson

Remember when you used to get a paper one of these in your mailbox twice a year? It was the next best thing (or maybe better?) than getting the Sears Christmas Wish Book.

This story originally appeared in the much-missed in-house publication of Dodgson Designs Second Wind*, Number 94–2 in 1994. Therein, it appeared under the title* The Plight of the Homeless. *We think Bob's article is still every bit as relevant today as it was back then— Ed.*

I have watched the glider kit industry slowly polarize over the last few years into the two extreme ends of the cost and philosophical spectrums — leaving a barren wasteland as the home of the middle ground in soaring. In the

1970s and 1980s, you had a good choice of beginner kits, intermediate kits and high-end kits. There were cost effective progressions as one's building and flying skills increased — allowing the soaring enthusiast to proceed comfortably to whatever level he desired.

Many flyers opted not to progress to multichannel performance. Our kits were the top of the high-end and the only multichannel kits available through the 1970s and most of the 1980s. The point is that there was a wide choice of affordable options between the beginner kits and the top-end kits. There was an affordable and comfortable home for any glider flyer, at any level of expertise and desire. Now, it appears that there are the inexpensive beginner's kits at one end of the market and then there are the pricey "mortgage-busting" prefabricated clone gliders at the other end with little in between — leaving those who want to progress in an economical manner pretty much on their own.

This problem is becoming more pronounced as fewer soaring pilots are taking the time to learn the basic building skills. Meanwhile, the once rich pool of quality builder-kits is fast drying up; leaving a void between the entry-level beginner kits and the prefab clones. Just how many above-entry-level builder-kits do you think are currently on the market that can be built without vacuum bagging and other exotic equipment? How many moderately priced kits are capable of serious contest performance? You are hard pressed to find any! Needless to say, it is this neglected affordable, performance, builder-kit, market for which our *Anthem*, *Saber*, *V-gilante*, *Wee-gilante* and *Pivot* are the answer. I fear that the profusion of costly prefab clone looking gliders are serving an ever diminishing pool of flyers. How many crashes of these costly, hard-to-repair gliders can most flyers survive before they decide that the rewards of the hobby are no longer worth the financial toll on domestic bliss?

In the past, a hobbyist would buy a kit at a do-able cost and then invest 40 or more hours of his own skilled building time to construct his glider. If disaster struck and a serious crash occurred, the builder could usually repair the damaged ship. Even if the glider was totally destroyed, the major investment was the personal time of the flyer. The crash did not cause a financial tsunami that could wipe out the financial viability of the entire family. As discouraging as it was to see the results of your effort wiped out, you always knew that you could afford to buy another kit and that you could do an even better building job the next time! You were not unceremoniously drummed out of the hobby by cataclysmic financial loss, as if you were a highrolling Las Vegas gambler whose luck had run out!

The result of this lack of viable economical performance kits is that fewer people are staying in the hobby very long. So we have more and more expensive prefab kits fighting over an ever dwindling market —a market that is not being refueled by new flyers moving up through cost effective performance kits. Happily, the *V-gilante* and the *Wee- gilante* seem to have hit the bull's eye in the heart of that forgotten market! Sure, there is still a significant market for the trendy, expensive, 'bullshitically correct', prebuilt clone gliders. They allow anybody with the bucks to buy their way into a competitive performing ship. Interestingly, these clone gliders, with all of their appeal, have robbed some of the magic from the sport of soaring. This is partially because wittingly or unwittingly, the clone gliders appear to have been optimized for maximum towing performance rather than for maximum thermaling and soaring performance.

True, in contest work tow height is important, but it is not everything and it is not what soaring is really about as many contest flyers are discovering. In parts of the country where short contest flights are the norm and landings are the measure of the man, the slender, smallish, high zooming gliders work fine. In parts of the country where the premium is on soaring and the tasks

are longer, the light lift performance and long distance visibility become of utmost importance. The smallish, pencil fuselaged, clone gliders with their compromised sinking speeds, become noncompetitive.

Ironically, by present cost standards, our (Dodgson Designs) once 'expensive' kits are now 'moderately priced' and offer the builder a significant option. They offer him the best thermal performance that money can buy at a price that intermediate flyers can comfortably afford. And, sadly, our kits are about the only high-performance quality 'builder-kits' presently available to the glider flyer. Unlike the costly clone gliders of today, all of our gliders are optimized for soaring performance rather than being optimized for winch performance. They are designed to milk the weakest subtleties out of marginal lift. Their scale-like fuselages are designed for maximum visibility so that they can be easily seen and successfully flown higher and further away than other gliders in their respective classes.

Visibility is both a safety factor and a very real competition advantage. All of our kits are good on a winch yet they are also able to launch well off a hi-start — even a short hi-start! Unlike most other high performance gliders, our kits can be slowed down 'almost to a walk', for gentle landings and practical, accessible, small field flying! Now, there is a clear choice for money-conscious flyers who want to move up to a quality kit and who want top competition performance on the weekends and yet who want to have fun sport flying off a hi-start the rest of the time.

For many of us, building is part of the soaring growth and discovery experience and being free from a bulky, cumbersome winch is a liberating experience in itself. Why do you think that hand-launch has become so popular in recent years? As the hobby becomes too complex, the true soaring soul inside us all cries for the simple joy of riding thermals as efficiently as possible with a minimum of incumbrances. The antitheses of

this 'less is more' philosophy was overheard by me this summer at the local flying field. Several of us were up flying in marginal thermal lift. I use a short high- start with my *V-gilante* to get about a hundred foot launch. By arduously working tiny bubbles, I and others were getting long, satisfying, flights with altitude to burn on occasion. A flyer, with the latest hi-torque winch, the latest clone pencil profile glider saw that the lift was momentarily good. He shot his winged arrow up on his super winch for a seven hundred foot tow and headed straight for the nearby ridge that most of us had been avoiding as a 'give me'.

With the wind blowing up the ridge, this hi-tech pilot had no trouble staying in the air. However, in about five minutes he was seen doing a thrilling hi-speed pass across the field and he landed. Someone said to him "Are you down already? I thought you were in good lift a few minutes ago!" The high-winching pilot replied "Oh, I was in lift all right but to me the real fun in soaring is launching and landing!" I must say that this is a different perspective on soaring than I have ever had.

The significance of this new revelation finally hit me! I had been designing gliders that would stay in the air the longest possible time under the most diverse range of conditions. Instead, I should have been designing them for the biggest thrill during winch launching and frequent landings! At any rate, I am proud that the homeless souls who want high performance gliding on a limited budget and who are willing to invest a little quality building time to achieve that goal still have a home at Dodgson Designs!

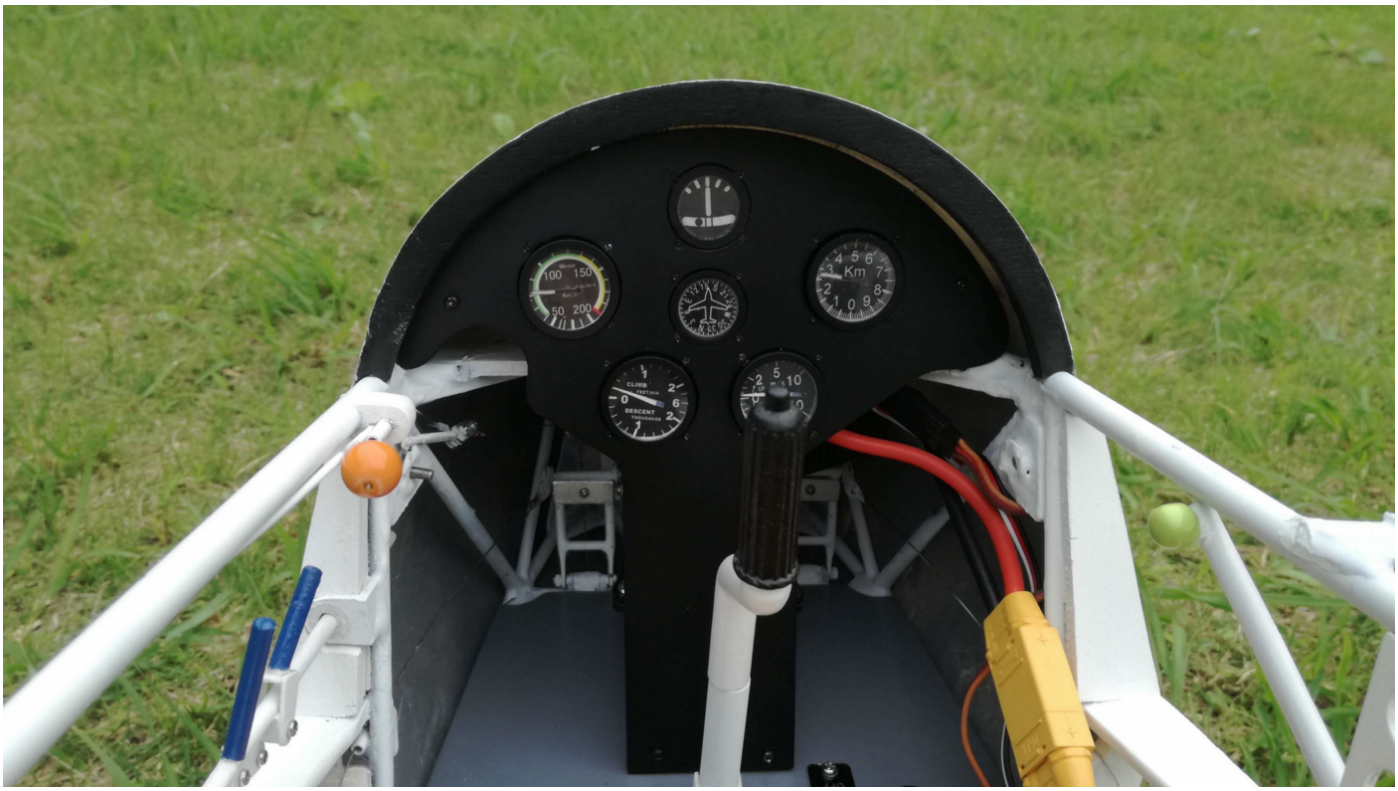
Read the collected works of Bob Dodgson in the New RCSD: see **The Dodgson Anthology**. *Also, are you a fan of the retro* ***Dodgson Designs logo****? Otherwise, now read the* ***next article*** *in this issue, return to the*

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 eleventh part of a twelve part series.

Norimichi Kawakami



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

Fabrication Part 49: Completion of the Instruments Panel

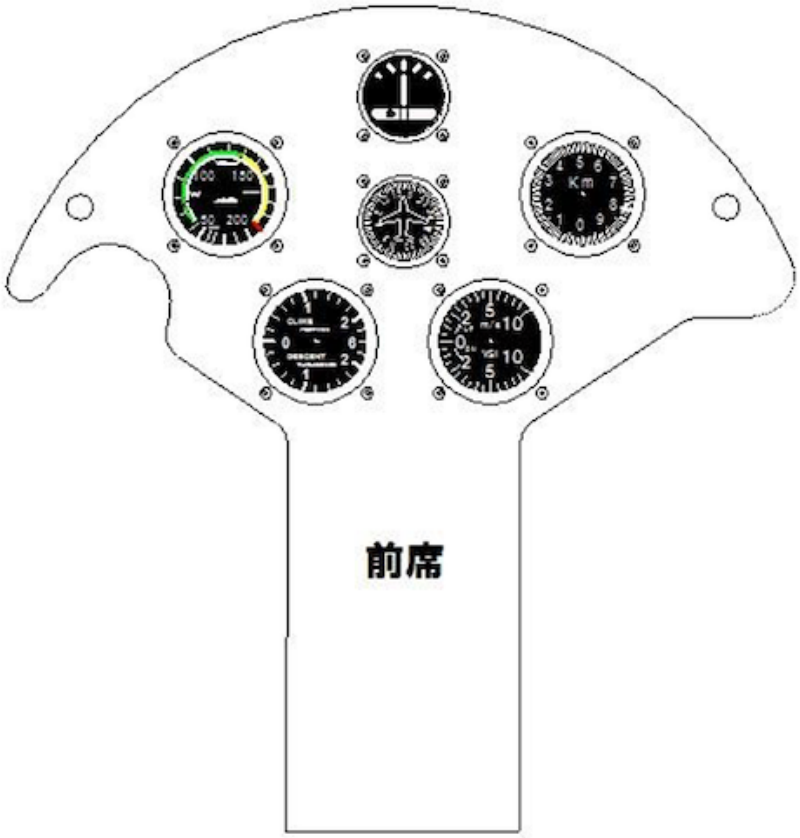
The instruments panel is ready to be completed by attaching the scale drawings to the cases of the instruments already made

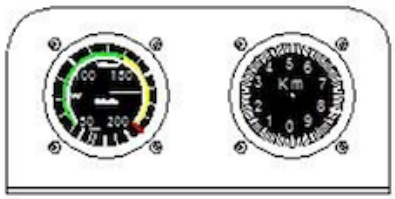
Making the Instrument Scale Drawings

The instruments of JA2103, the original plane of this 1/3 model, seems to have changed over the years. I wanted to have a clear picture of the instruments, so I asked the Shizuoka Aviation Museum to take a picture of them for me.

However, the instruments on the current aircraft at the museum seem to be different from the ones when the plane was in service, and they were installed when the aircraft was donated to the museum. Furthermore, there is a rear seat instrument panel, but no instruments are installed.

For these reasons, I drew a scale drawing of the instruments based on the instruments in the museum, with some modifications. This is the CAD drawing.





Drawing 63: Scale drawing of the instruments.

I printed this drawing on a photo paper and pasted it inside the instrument cases. For the front seat, there are four large and two small instruments. The upper large instruments are a speedometer (left) and an altimeter (right), and the lower ones are both altimeters. The left side is in ft/min and the right side is in m/sec. The small instruments are the attitude indicator on the top and the heading indicator on the middle. For the back seat, there are two large instruments, a speedometer on the left and an altimeter on the right.

The two-dimensional CAD system I use only allows circles and rectangles to be filled in, so I can't draw needles with sharp points. So I had to cut and paste the needles separately. The altimeter does not have a pressure compensation knob, which is strange, but I made it the same shape as the actual one in the museum.

Finished Front Seat Instruments Panel

Photo 252 is the finished front seat instruments panel. It is painted in matte black. I think it looks almost real. Initially, I thought of using a pin to hold the needle above the scale, and I had drilled a hole for it in the case, but it was not easy to insert a pin into the needle, which is less than 1mm wide, so I gave up. The needles are attached to the case.

Photo 252: The completed front seat instruments panel.

Mounting the Instrument Panel on the Fuselage

The instrument panel is now installed on the fuselage.

Photo 253: Front seat instruments panel installed.

This is the rear seat instruments panel.

Photo 254: Rear seat instrument panel.

Photo 255 shows the panoramic view of the instrument panels. Once the instruments are installed, it looks much more like the real thing.

But why is the red line on the speedometer drawn at 190 km/h?

This speedometer scale diagram was made to match that of the actual aircraft on display at the Shizuoka Aviation Museum, but I later found that the speed limit of the actual aircraft is 180 km/h. This means that the speedometer of the exhibited aircraft is wrong.

As one of the pillars of the famous Nikko Toshogu's Yomei gate was intentionally built upside down, this case can be accepted as it is.

Photo 255: Panoramic view of the instruments.

Fabrication Part 50: Completion of the Horizontal Tail

The horizontal tail, which was already planked, was covered with *Oracover* and painted.

Finished Horizontal Tail

The structure of the horizontal tail was finished a year ago, but I had run out of *Oracover* (*Oratex*) for the covering, so it was left unfinished. Now I procured *Oratex* and completed it. Soon after the completion, I attached it to the fuselage together with the vertical tail and tail fin fairing that were already completed.

Photo 256: Completed horizontal and vertical tail.

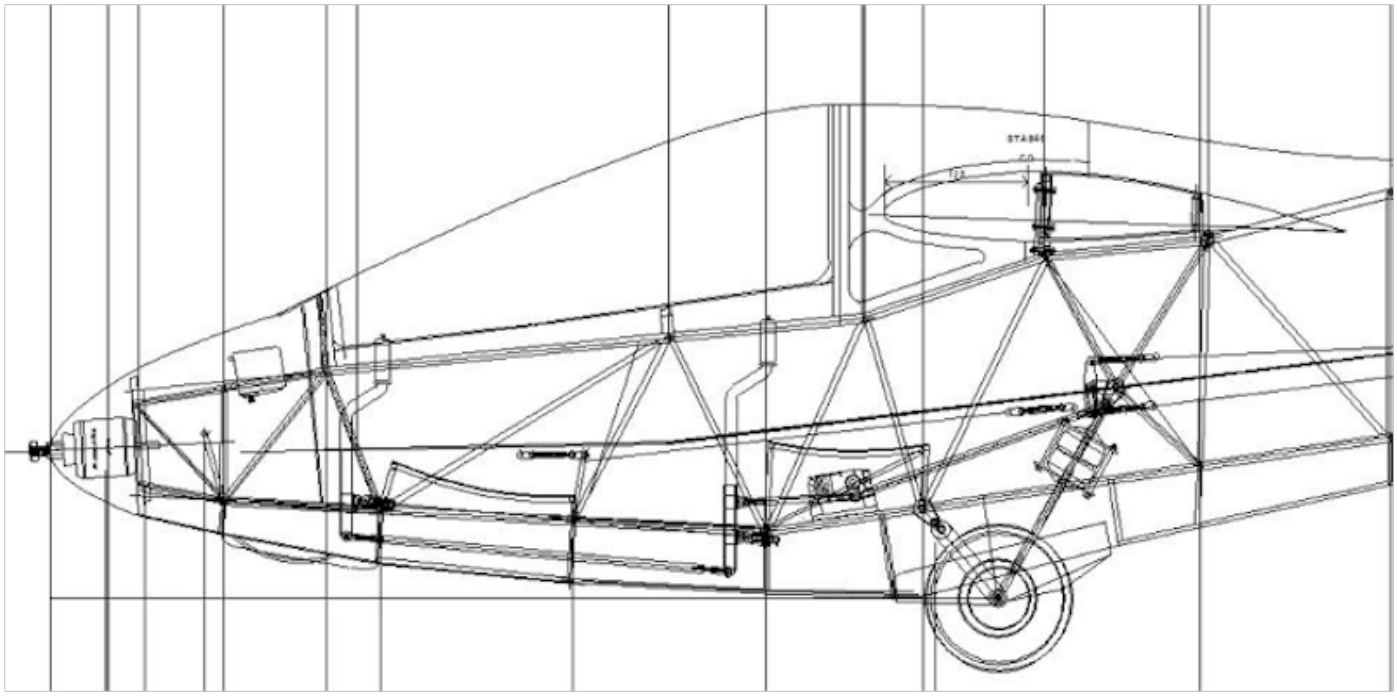
The paint is matte white. The dummy trim tab is located on the trailing edge of the right elevator. In the real aircraft, the angle of the tabs is adjusted by moving the lever on the right side of the front seat up and down to match the subtle changes in the center of gravity position with each flight, so that the steering force becomes zero during steady flight. This is not necessary for this RC plane because it is a FBW (fly-by-wire) machine. However, since it exists in the actual aircraft, it is installed as a dummy.

This is a photo taken from the other side.

Photo 257: Left side horizontal tail

It looks pretty good. Next, I connected the elevator to the control system and checked its operation range.

The rear seat control stick was found to hit the rear seat, so it was adjusted. After adjustment, I confirmed that it did not hit anywhere. However, I didn't notice it at the time of adjustment, but looking at this picture, the downward elevator angle is a little too large compared to the upward one. This is because there is a difference between the plane of the fuselage substructure where the elevator servo is attached and the tilt of the elevator control rod that the servo moves.



Drawing 64: Elevator servo and control rod.

This is because the servo horn was mounted at right angle to the rod so that there is no difference in the sensitivity of the elevator angle. This has been corrected later.

Next, I checked that there was no contact with the elevator with the rudder swung to the maximum left and right.

In these conditions, I moved the elevator up and down and confirmed that it did not hit the rudder. The horizontal tail plane is now complete.

It weighs 346g including the three M3 mounting bolts, which is 54g lighter than the target.

Installation of Elevator Mass Balance

Since the elevator was relatively large, its weight caused a large elevator down moment around the hinge, which put a strain on the servo. A jittering sound was always generated, which was unpleasant to my ears.

At the tip of the elevator horn, there is a mass balance attachment space just as in the actual machine to prevent elevator fluttering. But at first I did not plan to attach any weights to reduce the tail weight and I was sure that there would be little concern about flutter. But later, when I measured the center of gravity, I found that it was a little too far forward, so I decided to install a mass balance to prevent jittering noise as well.

This is the elevator horn with the mass balance installed.

Photo 260: Elevator mass balance installed.

I added 38g of lead to the tip of the horn. This amount of lead is not enough to balance the elevator perfectly, but I gave up because I could not mount

more than this due to space limitations. Even with this, the load on the servo has been greatly reduced and the jitter sound has disappeared. In addition, the mass balance moved the center of gravity back a little less than 2% MAC to 34% MAC. I think this is just the right center of gravity position.

Fabrication Part 51: Main Wing Is Completed

After covering the main wing, I finished painting it.

Outer Wings

Oratex was applied to the main bodies and ailerons, then painted matte white. After that, I attached the already completed counterweights and wing tips to complete the outer wings.

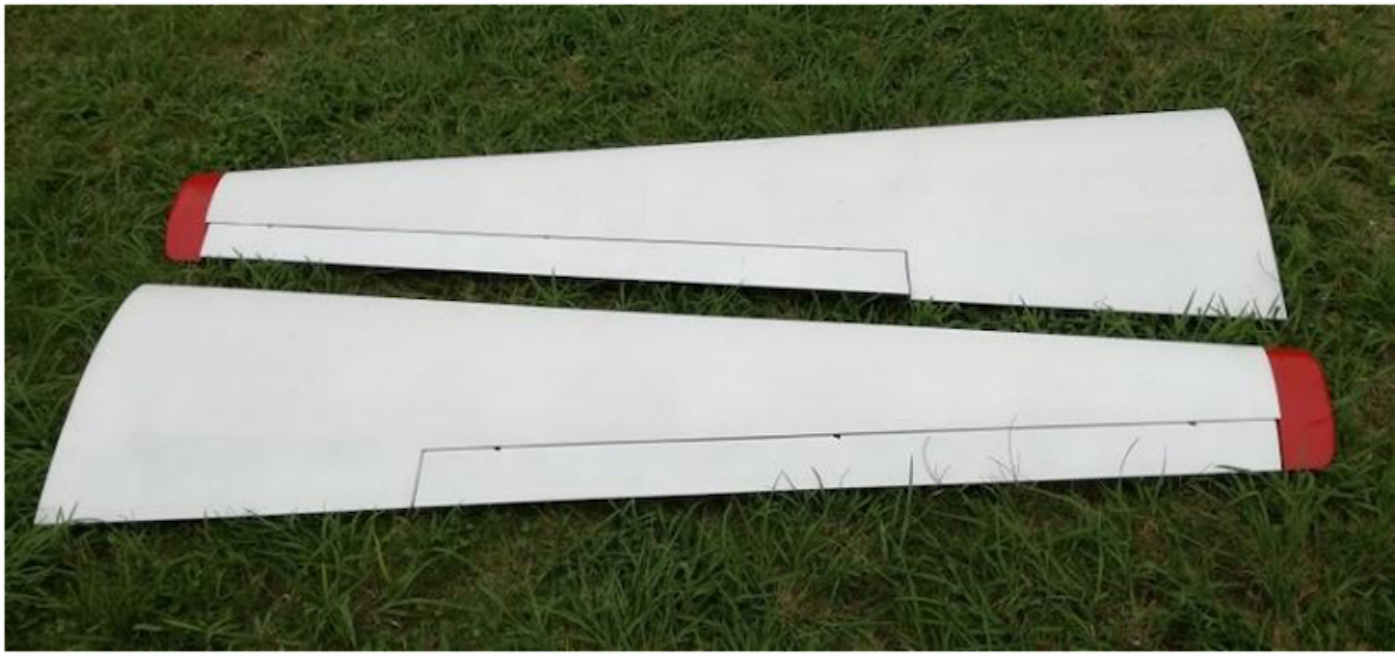


Photo 261: Finished outer wings: upper surface (top), lower surface (bottom).

The counterweights are visible on the underside. It took some time to adjust the aileron differential travel.

Center Wing

Covering and painting was done the same as for the outer wing. Spoiler adjustment took some time.

Photo 262: The completed center wing.

I lined up the center wing and outer wings on the top and bottom. These are the components of the main wing.

Photo 263: The completed main wing.

The total weight is 3,925g: 1,002g for the right outer wing, 988g for the left outer wing, 866g for the right center wing, 850g for the left center wing, 55g for both center wing fittings, and 163g for the wing connecting pipes. The

right wing weighed 1,977g and the left wing 1,947g, making the right wing 30g heavier. It looks like I need to load the left wing with weights to balance it out.

Wing-Body Connection

I mounted the wing on the fuselage (Photo 264). It looks very nice. I need to paste the JA number on the center wing but it will be done later because of lack of material.

At first, I tried to assemble the main wing and then attach it to the fuselage, but it was too big and too heavy to attach well. So I disassembled the main wing and attached the center wing to the fuselage first, and then attached the outer wings. It seems that the installation procedure is very important.

Photo 264: Wing-body connected.

I would like to cover the fuselage next, but it will be difficult to access various parts of the fuselage when the fuselage is covered, so I will wait until there is no remaining work. One thing that is bothering me at the moment is how to install the 1kg LiPo for power. I need to fix it firmly, and I'm wondering how to fix it to the truss structure without losing the sense of scale.

The Ninth Check of the Weight and Balance

Now that the horizontal tail and main wing are completed, let's examine the 9th weight and balance.

9th Weight & Balance	2019/7/24	Completion Ratio		91.16 %			
	Predicted Weight	STA	Moment	Actual Weight	Estimated Remain Weight	Target Weight	Predicted-Target
Outer Wing Left	988	890	879,320	988	0	700	288
Outer Wing Right	1,002	890	891,780	1002	0	700	302
Center Wing	1,934	890	1,721,260	1,934	0	1,720	214
Fuselage	4,410	663	2,923,830	3,580	830	3,360	1,050
Vertical Tail	222	2,450	543,900	222	0	240	-18
Horizontal Tail	346	2,270	785,420	346	0	400	-54
LiPo	1,050	530	556,500	1,000	50	600	450
Total	**9,952**	**834**	8,302,010	**9,072**	**880**	**7,720**	**2,232**
Target CG	same as 1/5model	846					
CG range	FWD(30%MAC)	825					
	AFT(40%MAC)	860					
Weight	81	2,300	185,680				
Normal Flight Condition	**10,033**	846	8,487,690			**7,720**	**2,313**

Table 12: 9th check of weight and balance.

There is no significant difference from the results of the 8th examination. The completion ratio is 91.16%, so it seems that there will be no significant change in the future.

Fabrication Part 52: Tray for LiPo

I made a tray to put LiPo power supply on the fuselage.

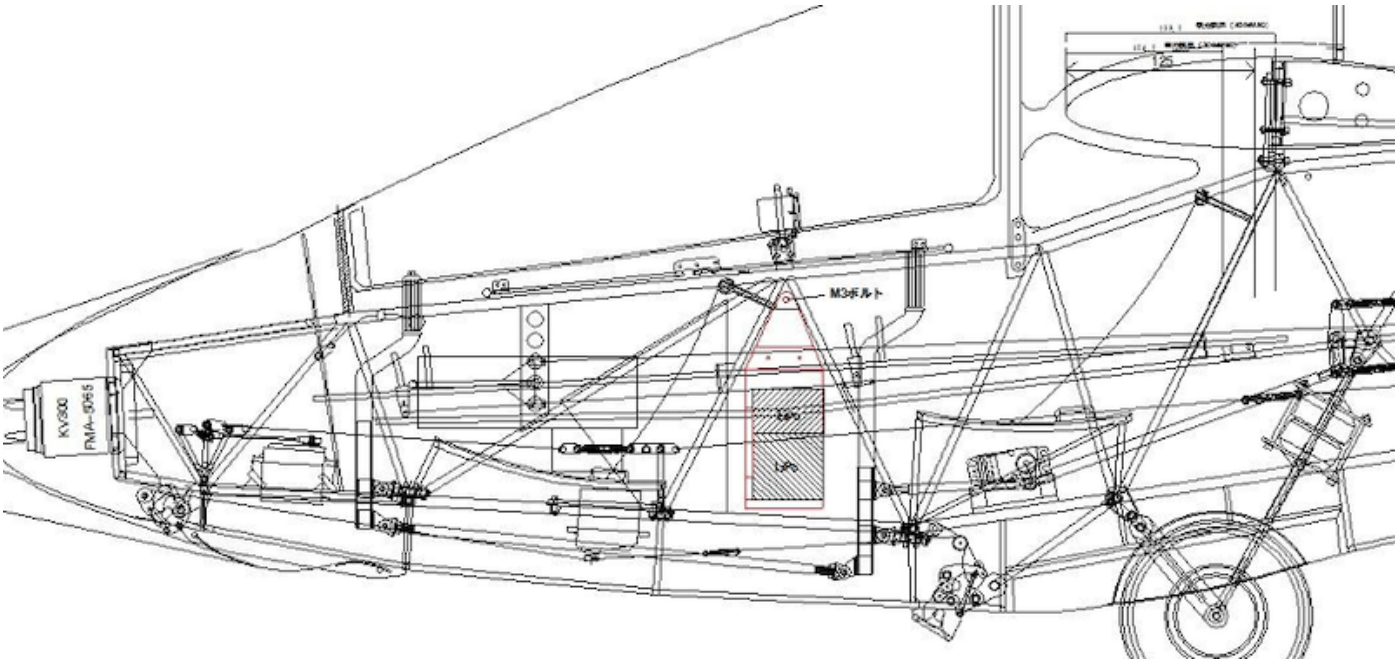
Drawing

The power supply is an 8-cell LiPo. It consists of 5,100mmAh 5 cells and 3 cells in series. The total weight of the power supply is exactly 1 kg, so the center of gravity will be shifted if it is moved by the acceleration of the aircraft motion. Therefore, it is necessary to fix it firmly. After examining the center of gravity, I decided to place it around STA530. I was very worried about how to fix it without destroying the sense of scale.

If the two LiPo batteries are distributed between the front and rear seats, the center of gravity of the batteries will be near STA530. However, I couldn't find a good way to secure the batteries and had to give up it. In the end, I decided to use the tray method, which is expected to secure the batteries.

Drawing 65 shows the tray. The red line is the tray, which will be hung from a

triangular piece of wood with an M3 claw nut embedded at the intersection of the diagonal members of the fuselage side truss structure near STA530. The two LiPo's are placed on the tray and fixed with Velcro.



Drawing 65: Tray for LiPo battery.

The Tray I Made

This is the LiPo tray that I fabricated based on the drawing (Photo 265).

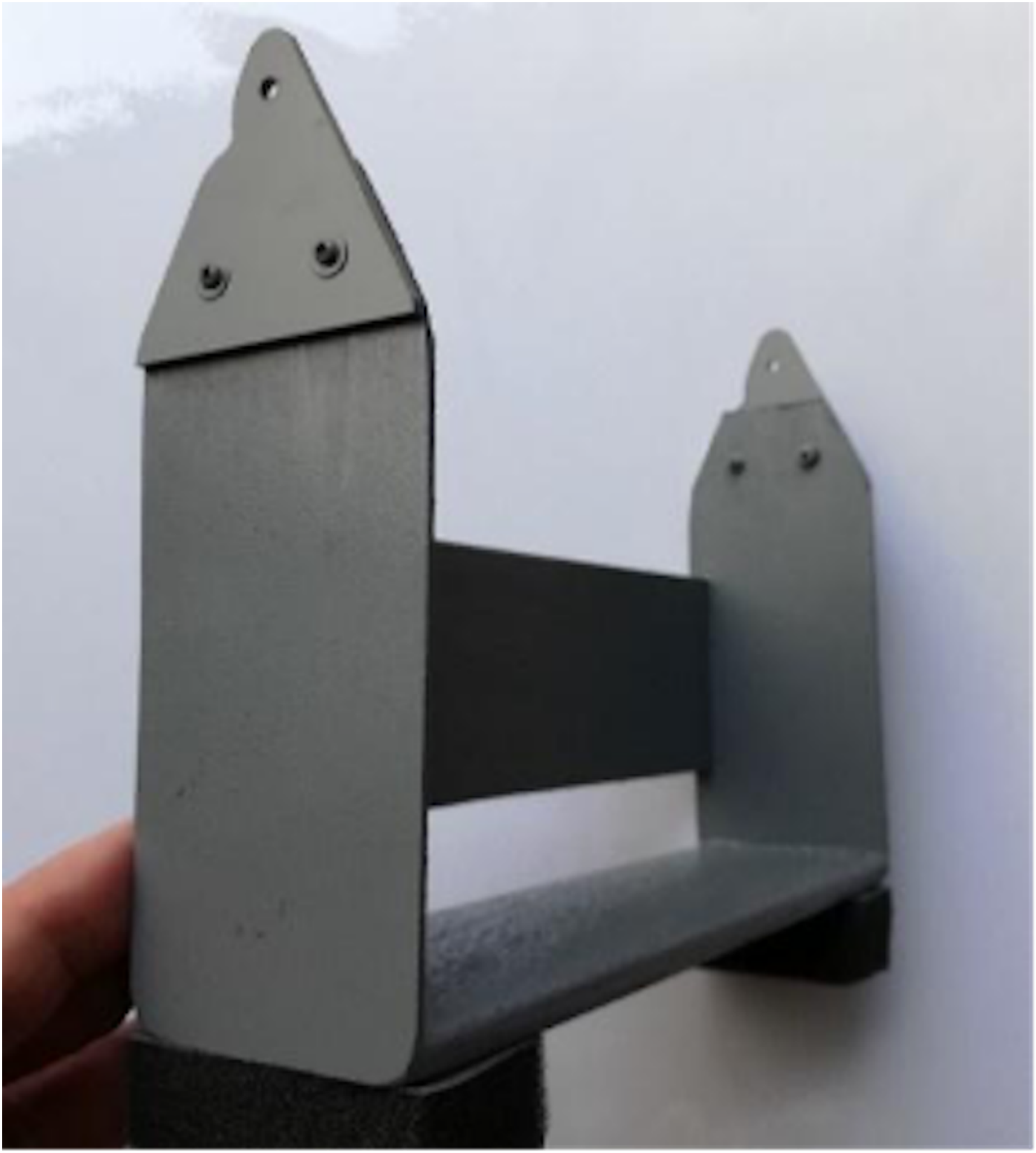


Photo 265: LiPo tray.

Made of 5.5 mm paulownia wood, 1.6 mm plywood and 2 mm acrylic board. A 20mm thick urethane sponge is attached to the bottom. The urethane

sponge shrinks when it contacts the floorboard of the rear seat, distributing a percentage of the weight to the substructure, and the frictional force keeps the tray from swinging back and forth.

Installation

I installed it on the aircraft.

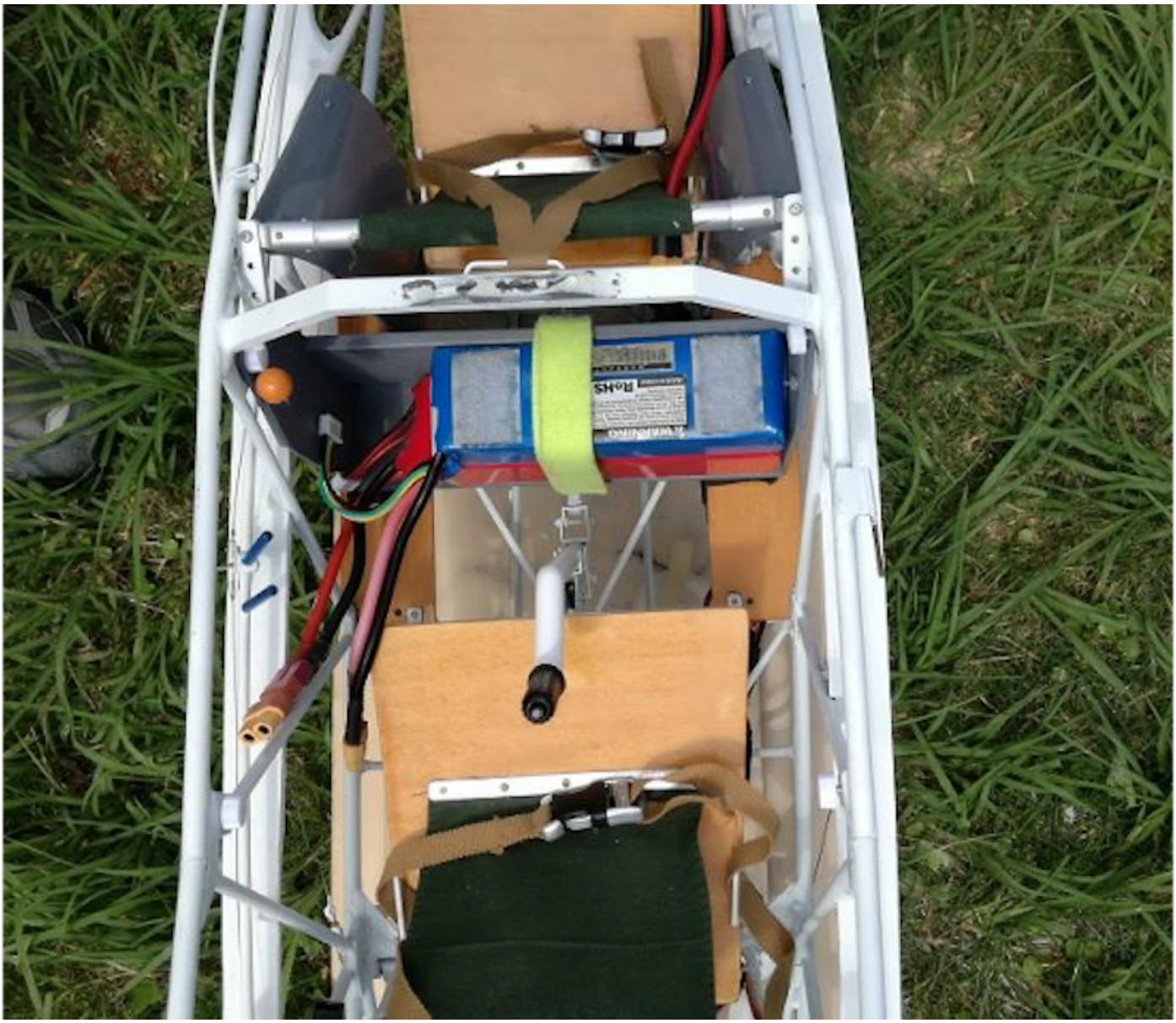


Photo 266: LiPo tray installed: from the side (left), from the top (right).

It is attached with M3 bolts with white knobs on both ends, shown in the image from above. I don't have a lot of Velcro on hand, so only one is applied, but this should be at least two. The cord that connects to the ESC runs along the side of the front seat and is an eyesore, so I plan to modify it to run under the floor at a later date.

It came together quite well. It did not interfere with the rear seat controls. However, considering its shape and mounting method, it might be more appropriate to call it a 'palanquin' rather than a 'tray'. This tray (palanquin) is

usually left off and installed just before flight to keep the sense of scale.

Fabrication Part 53: Covering the Body

Covering Film Used

Picture 267 shows the covering film and glue used in this project. The film is SIG's KOVERALL. This is a large, thin polyester cloth measuring 1520mm x 4500mm, which shrinks when heated. Since the cloth is not coated with adhesive, apply COVER GRIP to the required area on the fuselage side. This is an adhesive that sticks when heated.

In the past, I have always used Oratex, a silk-grained Oracover, whenever needed to apply silk-grained film. This is a very easy to use film that has adhesive applied to the entire backing.

Photo 267: Covering film and adhesive used.

In this project I used *KOVERALL* instead of *Oratex* for the following three reasons.

1. The body is a truss structure, so only a small part of the film needs to be glued. *Oratex*, which is coated with adhesive on the entire surface, is

useless.
2. The length of the body is over 2m, so the *Oratex* sold in 2m length is not enough. It must be specially ordered.
3. It is very light (42g/m2; *Oratex* is 110g/m2) and cheap.

For these reasons, I used *KOVERALL* for the first time, but the result was not so satisfactory, as described below.

Applying KOVERALL

This time, I applied *KOVERALL* to the top and bottom of the fuselage first, and then to both sides. The first step is to apply *COVER GRIP* to the fuselage structure with a brush and wait for it to dry. *COVER GRIP* dries quickly, so when I was painting the end of the fuselage, the first part began almost dry. Cut the *KOVERALL* into pieces slightly larger than the area to be covered. However, I already felt it was difficult to handle here. I usually cut *Oratex* with a cutter, so when I used the same technique to cut the *KOVERALL*, it frayed and the cut edges became very dirty. So I switched to a pair of scissors, but the cut edges still frayed a bit because there was no adhesive on the back. With the *Oratex*, I could cut it to the correct size with a cutter after applying it to the body, but I found that this was not possible with the *KOVERALL*.

The shrinkage of *KOVERALL* itself is not that different from *Oratex*. I was able to eliminate the wrinkles after applying it with an iron in the same way, but the *COVER GRIP*'s adhesiveness was a little weaker than that of *Oratex*, and when I shrunk the *KOVERALL*, some parts peeled off, which was difficult to deal with. After the top and bottom sides were attached, another problem occurred when attaching the two sides. In the area where the film covers the top and bottom surfaces, *COVER GRIP* is applied on the *KOVERALL* already attached. I had to apply *COVER GRIP* a little wider than the width to be attached. This means that the adhesive will stick out, and the laminated

surface will not be beautiful. With *Oratex*, the adhesive is applied to the film, so there is no overflow. I thought about wiping off the overflowing adhesive with a petroleum-based solvent, but it would have rubbed the edges of the *KOVERALL*, causing the fibers to fray and making it look even dirtier. In the end, I had to put up with the glue sticking out.

After finishing the entire surface, the next step was to cut off the excess on both sides. I decided to use a good razor blade for this. But this was also a failure. I couldn't cut straight. Also, parts of the fabric would come undone. Basically, it seems that the fibers of *KOVERALL* should not be pulled . Photo 268 shows the edge of the film cut with a razor blade.

Photo 268: KOVERALL film edge cut with a razor blade.

The cut edges are not straight and are partially frayed. For comparison, Photo 269 shows the film edge of the 1/5 Mita that was applied with *Oratex*.

Photo 269: Edge of Oratex.

It has a much sharp edge. Because of this, I once gave up covering with *KOVERALL* and left it for a while. However, the large size *Oratex* has to be ordered from Germany. I have to be prepared for quite a few days. So I changed my mind and decided to reattach both sides with *KOVERALL*. This time I decided to cut the protruding parts with a rotary cutter, which improved things a bit.

Painting

The paint is matte white. Acrylic spray cans are used. But here's another problem: the *KOVERALL* is a very thin cloth with no adhesive backing, so it has a fine grain that allows the paint to escape. The instructions suggest that you need to apply two coats of dope to seal the eyes before painting. Dope is hard to come by, so I brushed on a dark clear lacquer and then sprayed on a white acrylic lacquer. With *Oratex*, a light spray or two is all that's needed, but *KOVERALL* is so thin that I had to apply three or four coats to get an even finish. In the end, this probably reduced the light features of the film.

Finished Fuselage

I managed to finish the covering and painting of the fuselage after such hard work. Photo 270 shows the completed fuselage.

Photo 271 shows the edges of the two sides cut by the rotary cutter.

The grade is much lower than if I had used *Oratex*, but I'll put up with it this time. I'd like to fly it first to make sure there are no problems. In the future, if I have a chance, I would like to replace the covering film with *Oratex*.

Fabrication Part 54: Completion of the Canopy

Transparent Part of the Canopy

The transparent part of the canopy was made by Mr. Tohyama (handle name: tkinnsann) in Nagano, who has a lot of experience in vacuum manufacturing. It was completed and sent to me in early August 2019. This is the transparent part.

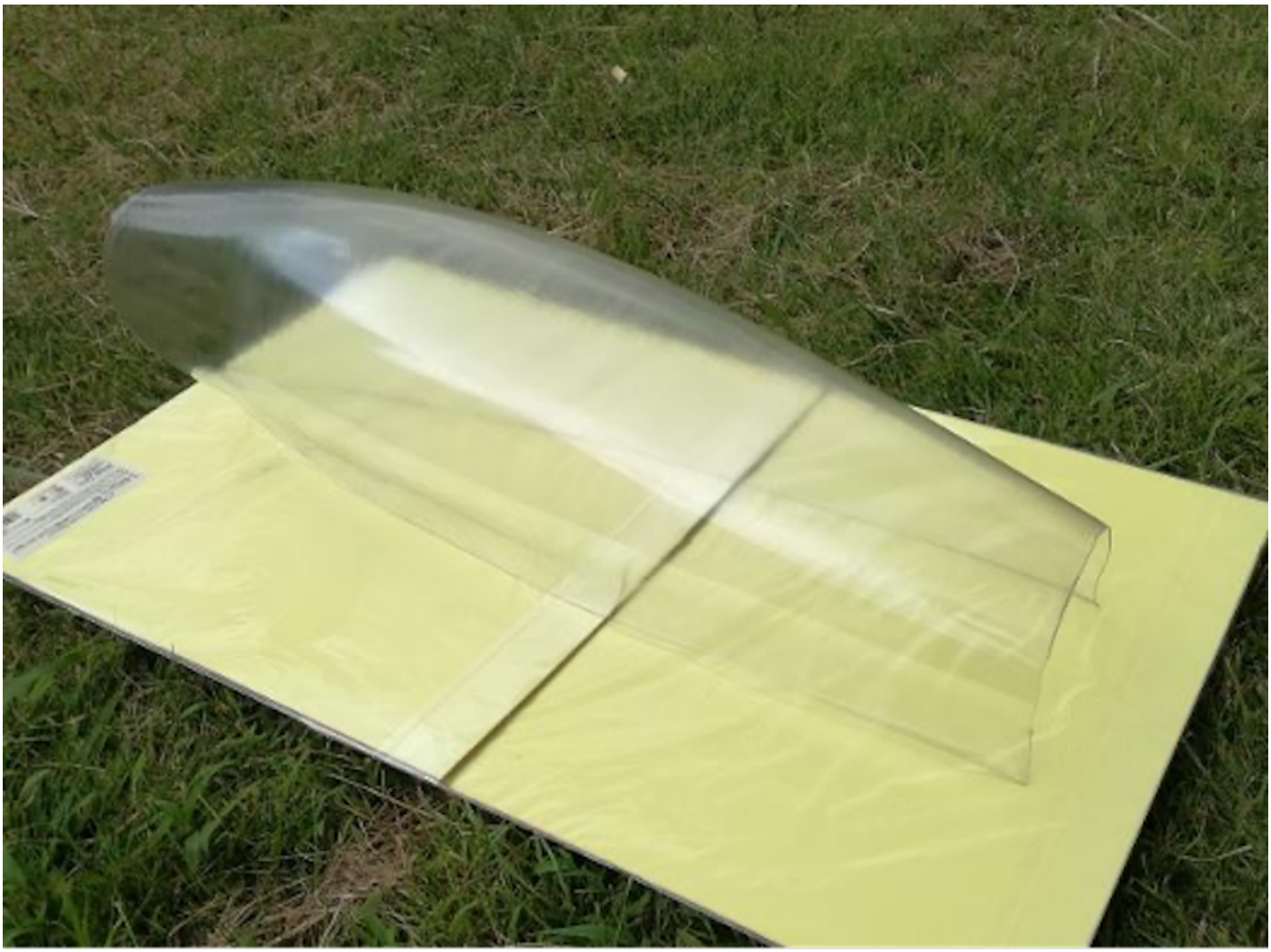


Photo 272: Transparent part of the canopy.

This is a 1mm thick PVC that was made to fit a wooden mold using the vacuum process. The wooden mold was also made by Mr. Tohyama, and it must have been very difficult to make because it was the largest one in his experience. I am very grateful to him for his hard work. Thanks to Mr. Tohyama, I was able to get the transparent parts much earlier than expected.

He sent me four transparent parts. One of them trimmed off the unnecessary parts and was attached on the canopy frame that I had sent for reference.

Making the Canopy Assembly

I was ready to paint the canopy sent back from Mr. Tohyama and I tried to put it on the fuselage, but I found the wooden frame was slightly twisted with the transparent part attached. I also found the rear canopy that holds the main wing was deformed and there was a gap. This is probably because the wooden frame is not rigid enough for its size. It seems that it is necessary to attach the transparent parts with the wooden frames on the fuselage.

Mr. Tohyama had kindly assembled the canopy for me, but I removed the transparent parts from the wooden frame and reattached them. The gap between the transparent part of the rear canopy was too big, so I cut it out from the spare transparent part that was sent to me and reattached them.

Before gluing the transparent parts, I sanded the wooden frame and painted the inside gray. After that, I glued the transparent parts with Cemedine SuperX and cut off the unnecessary parts at the bottom of the frame. I then painted the outside of the frame matte white, and after it dried, I attached the canopy accessories. This time I also made glare shields for the front seats and attached them to the wooden frame.

The Completed Canopy

This is the completed canopy.

Photo 273: The completed canopy.

Small sliding windows are also provided right and left. When you turn it over and look at the inside, it looks like this.

Photo 274: Inside of the canopy.

The lower parts of the frame shown in Photo 233, which prevented the frame from breaking during production, have been cut away. You can also see the glare shield for the front seats.

The finished weight of the front canopy is 250g and the rear canopy is 117g, for a total of 367g. The planned weight was 550g, so the total weight is reduced by 183g. The reason for this is that the thickness of the transparent part was calculated to be 1 mm on the whole surface, but the actual product is stretched to be 0.4 mm thick in a large area.

Mounting on the Fuselage

I immediately mounted it on the aircraft.

Photo 275: Confirmation of canopy mounting.

The rear canopy is attached to the side of the fuselage with 3mm screws as in the actual model.

Photo 276: Rear canopy fixing bracket.

It looks more like a real aircraft. The volume is also quite huge. The canopy is now complete.

Finished!

At the end of August 2019, everything was assembled and checked for operation to make sure there were no problems. The weight and center of gravity was also measured and was OK. Now it is complete.

Final Assembly

I took a break from the autumn rain and assembled everything into its

completed form.

Photo 277: The completed 1/3 Mita Type 3 Rev.1.

It's big. It fills the yard of my work shed. Let's take a look from behind. It looks good.

Photo 278: Rear view of the 1/3 Mita Type 3 Rev.1.

I operated all controls in this condition and confirmed that there were no problems. This is the spoiler test.

Photo 279: Spoiler test.

As I mentioned earlier, I did not realize that the amount of spoiler protrusion was too small at this point. I was satisfied that the function was OK. This was discovered after the first flight. I also confirmed that the motor turns without any problem. This is the cockpit area.

Photo 280: Cockpit area.

I was able to reproduce the appearance of the Mita Type 3. Since it is a good opportunity, I took one more picture with the canopy open.

Photo 281: Cockpit with the canopy opened.

The sense of existence is enough.

Weight and Balance

I measured the final weight and center of gravity with the completed model. As this is such a large model, it was difficult to measure the weight and balance of a whole machine. So I measured its components and made a calculation. Here are the results.

Weight & Balance of the completed configuration				
	weight	CG(from Wing LE)	moment	ref
Main Wing	3,930	20	78,600	
Fuselage & tail wings	4,640	0	0	FWD canopy included
LiPo	1,074	-326	-350,124	
AFT canopy	118	-95	-11,210	
Wing fairing	61	150	9,150	
Main wing cover	18	80	1,440	
Total	**9,841**	-28	-272,144	
CG		**111**	(32%MAC)	
FWD CG LMT		104	(30%MAC)	
AFT CG LMT		139	(40%MAC)	
(ref) 1/5 Mita		125	(36%MAC)	

Table 13: Calculation of the center of gravity in the completed configuration.

The total weight including the LiPo for power was 9,841g, and the center of gravity was 32% MAC from the leading edge of the main wing. Thermal Studio's 1/5 Mita model flies at 36% MAC without any problem, so it may be better to set the center of gravity a little aft.

(Note) As described in the section "Completion of the horizontal tail", I added 38g weight as elevator mass balance, so the total weight is 9,879g and the center of gravity is 34% MAC.

The initial target weight of this project was 7,600 g, so I exceeded the target weight by 2,241 g (29.4%). This is an extremely shameful result. The reason for this was, as I mentioned earlier, the difficulty in determining the target weight. It was a problem before weight management. Fortunately, I have confirmed through strength and performance calculations that there will be no major inconvenience to the strength or flight performance of the aircraft, but I must have avoided such a situation. This is the reason I developed the statistical weight estimation formula which I presented at the first part of this story.

Next Work

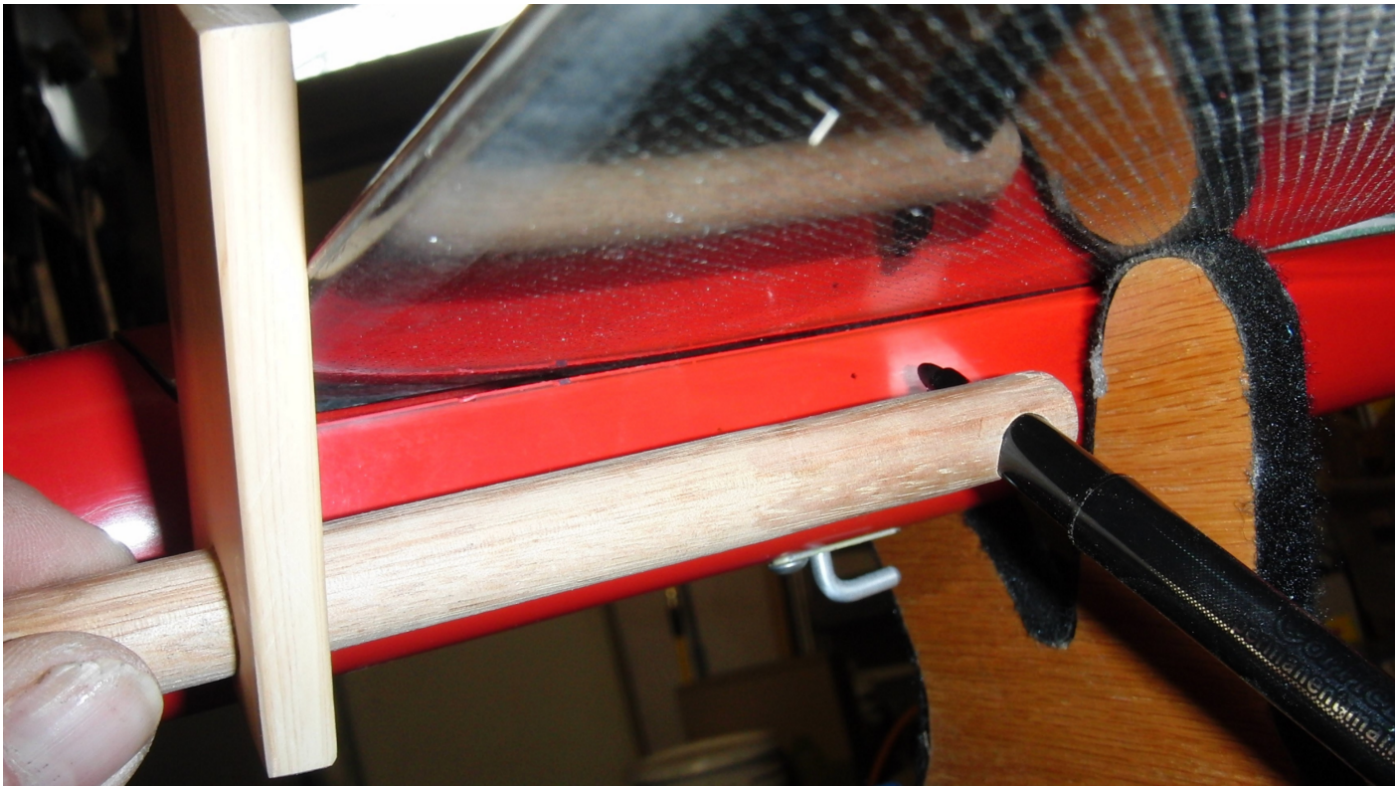
I would like to start flight testing immediately, but it can't be. In order to disassemble this large aircraft and transport it to the airfield, I need jigs to set it up in my car. Also, since it weighs almost 10 kg, it is impossible to launch it by hand. A dolly for takeoff is needed. So there remains further work for these equipment before the first flight.

*This is the tenth 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**.*

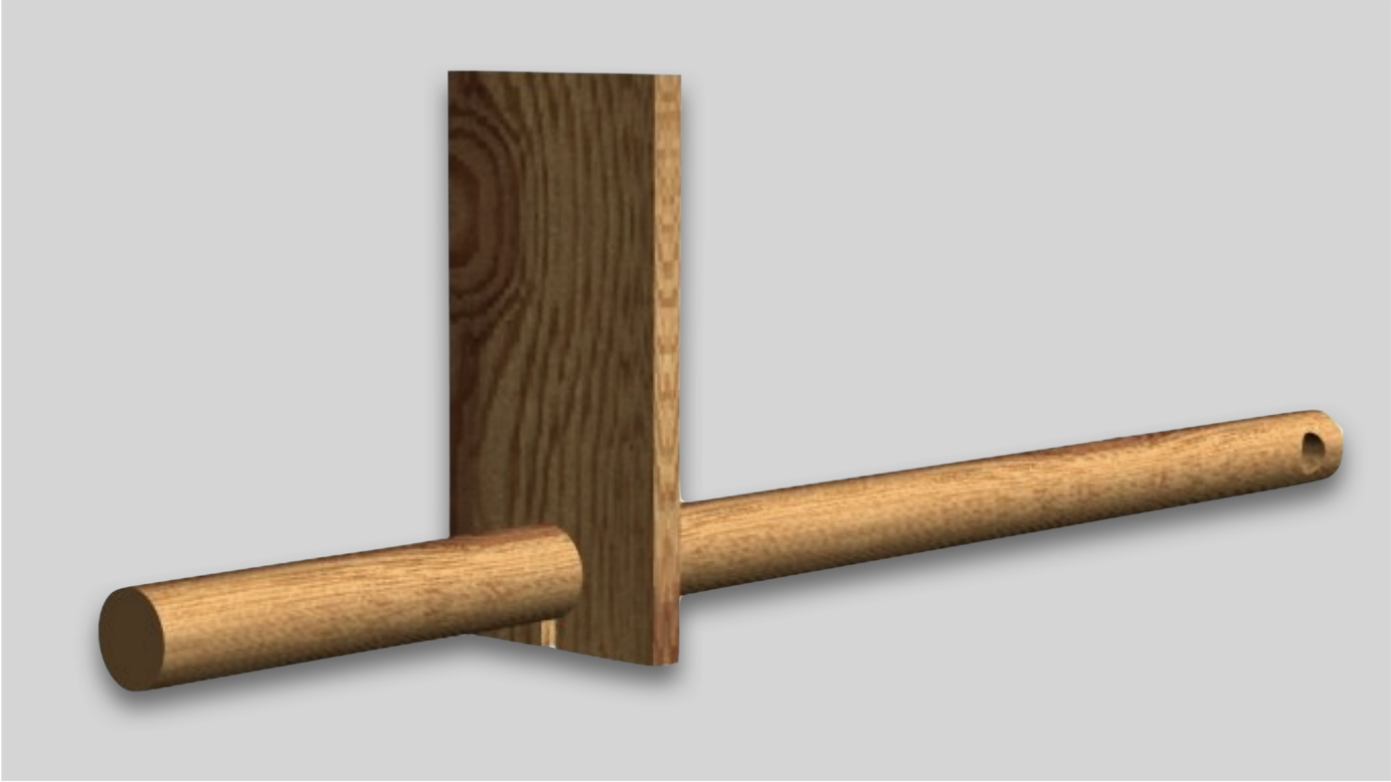
Simple CG Marker

Eliminate measuring errors when marking the center-of-gravity.

Tom Broeski



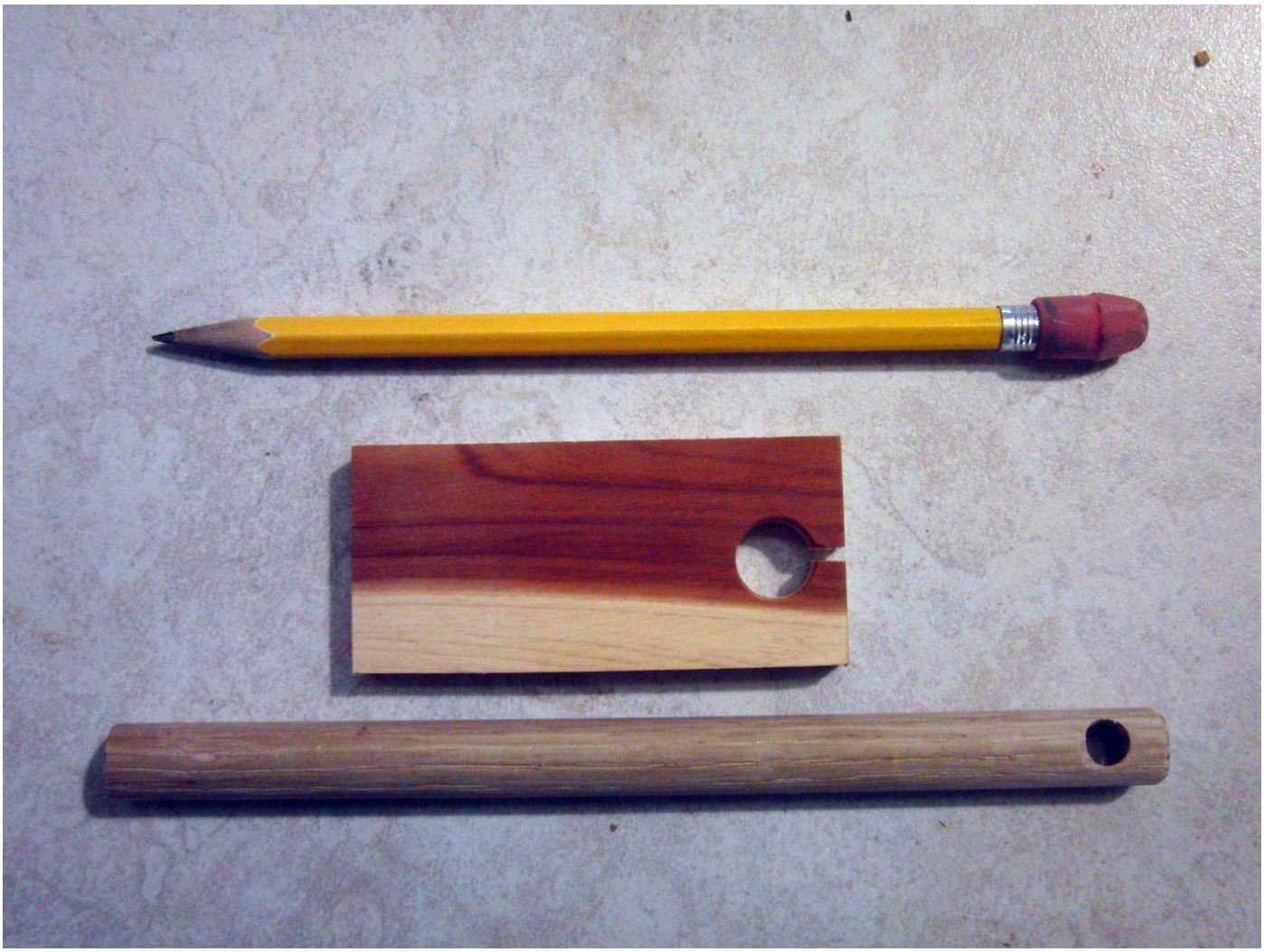
I have always measured the CG on my planes with a rule. I could never get it just right with the curved wing surface. Soooo…I made a simple tool:



Materials

- 1 — Dowel (1/2" for pencil or 5/8" for both pencil and Sharpie) appoximately 8" to 12" long. Some of my scale planes need the longer dowel.
- 1 — 1.5" x 3" x 1/4" (approximate) block of wood

The first one I made was for a pencil, so I used a 1/2" dowel and drilled a 9/32" diameter hole in the block:



I then decided I wanted one that would do both a pencil and a Sharpie. I used a 5/8" dowel and drilled one end 9/32" for pencil and the other 13/32" for felt tipped marker. I drilled a 5/8" hole in the block. I also cut a notch to the hole to prevent end splitting. Not much to it. About 15 minutes including sanding and finishing:

The dark marker for light surfaces and the light one for dark colored surfaces. Here's how to use it in practice:

As always, have at it and let me know if you have a need to do something but not the tool to do it. Thank you for reading!

All images are by the author. Check out all of ***Tom's Tips*** *here in RC 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****.*

The Trailing Edge

Let's keep this juggernaut rolling.

The NEW RC Soaring Digest Staff

Last flight of the day at the Great Orme. (image: SkyLance Media)

It has been an exciting month here at the home office of the *New RC Soaring Digest*. Not only did we get a buzz out of being able to report some late breaking news — quite conceivably on our pages before you heard it anywhere else — but we were also able to bring you great feature articles from some of our favourite contributors both old and new. We also had the distinct honour of being able to feature great continuing series which have been warmly embraced by readers and form a firm foundation for each issue. We're thankful to all for their great stories, and we are very thankful to readers for tearing through them. There is nothing quite like the feeling of

getting an issue out in the hands of those who truly appreciate it.

We also feel we're delivering on our commitment to deliver "*more content… in more formats*": we are truly excited about our new audio offering, and our fingers are crossed that our plans for the *RCSD Podcast* continue to evolve. Before you know it, you may be able to ditch whatever it is you're listening to now on your way to and from work and replace it with something truly interesting.

Finally, keep in mind that RCSD is a **reader-written** publication. That means readers like you. Do you have a great story to tell — we want to **hear from you**!

New in the RCSD Shop

The New RC Soaring Digest Embroidered Beanie. (background image: Jonathan Knepper)

We have the perfect head gear for those chilly days on the slope — of which

there are still many to go here in the frozen north. In five great colours, this embroidered beauty has a snug fit that ensures you're going to feel cozy and warm: 60% cotton, 40% acrylic; breathable cotton blend; form-fitting shape; one size fits most. Already torture-tested to -25C in the recent cold snap here at the home office. So why wait, the ***New RC Soaring Digest Embroidered Beanie*** is available now in the *RCSD Shop*.

Ever wonder how the *New RC Soaring Digest* keeps coming to you in a pristine, commercial-free format? It's because all proceeds from the *RCSD Shop* go directly to supporting the considerable ongoing operating costs of RCSD.

Make Sure You Don't Miss the New Issue

If you don't want to miss the March issue of the *New RC Soaring Digest* make sure you subscribe to our **Groups.io mailing list** or connect with us on **Facebook**, **Instagram**, **Twitter** or **LinkedIn**. And please share RCSD with your friends — we would love to have them as readers, too.

That's it for this month! Thanks again to all of our contributors and above all, thank you, the RCSD reader — without you, we're nothing.

Now get out there and fly!

*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**.*