
Radio Controlled
Soaring Digest
October 2021
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The NEW RC Soaring Digest

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Volume 36, No. 10

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In The Air

We belong to a very exclusive club. That is not the good thing we might think it is.

Terence C. Gannon

The three active glider guiders from the Eutawville Fliers in Eutawville, South Carolina. From left-to-right: a YellowJacket 3.5 meter flown by Gene Guthan, a Pulsar 3.2 meter flown by Mark Sturgis and a K3600 3.6 meter flown by Gary Quiring. (photo: Gary Quiring)

In the 1970s I had the great fortune to attend the model airplane air show held at the then-mothballed Boundary Bay airport in Delta, British Columbia. About the only specific logistical detail I can remember is that it was organized by the Radio Control Flying Club of British Columbia (RCFCBC). Perhaps taking its cue from the popular and nearby Abbotsford International Airshow, the model show featured a structured program of flying demonstrations and even included a PA announcer, just like the big show

across the valley. All-in-all, it was quite the event.

What I also remember is that it seemed to draw a huge audience, many of whom were seeing RC model aircraft for the first time. The gorgeous, exotic planes seemed to be *everywhere,* in all shapes and sizes. They were all powered aircraft— there were no gliders — but it didn't matter. This was like having arrived in Xanadu after traipsing through a featureless, barren desert for most of my young life. It galvanised my interest in the hobby and I likely couldn't get home fast enough to mow some more lawns so my brother and I could eventually afford to buy our own radio and sailplane kit. Perhaps we dreamt about being able to join the elite community at the Boundary Bay model air show some day with our own, magnificent aircraft and have the assembled masses ooh and ahh at our breathtaking manoeuvres.

Often its best *not* to go and re-examine dreams that we had when we were kids. Within a couple of years, Boundary Bay was re-opened for General Aviation — a good thing for that equally compelling interest, but really bad for its smaller scale brethren. The air show, if it ever ran again, was quickly shoo-ed away by the reanimated airport authority. The RCFCBC is still alive and well. I would be genuinely be interested to know how it compares to the robust, thriving entity it appeared to be at the beginning of the final third of the 20th century.

It's unknowable whether, without that RCFCBC event, I would be sitting here at least 40 years later thinking and writing about a pursuit I've loved for virtually all of my life. But it sure as heck didn't hurt. What I do know is that I was not alone — countless people undoubtedly went forth from that same event and have been RC modellers ever since. Maybe some of these folks were even inspired to take up aviation as a career — either in the cockpit or on the engineering staff. So, extremely belatedly, thank you the unthanked, unnamed organisers of the RCFCBC model airplane show in the late 1970s.

Thank you for changing my life in a very positive and very beneficial way.

The Eutawville Fliers home field located in Eutawville, South Carolina.

What made me think about this was a delightful note I received from Gary Quiring in late September. If that name seems familiar, it's because you just read it in the caption of the key photo for this missive, above. Gary is on the right. In one of his emails, he said: "The club is called Eutawville Fliers and is located in Eutawville, South Carolina…[it] is small at 23 members [and] we are desperate for some new members. We would love to get a few more sailplane pilots…we have three active sailplane members which are all in that photo". Gary also sent along another photo and I was stunned at how beautiful a locale they have for their club field — and apparently no airport authority to chase them off any time soon.

The good news is that if you live anywhere near Eutawville (pronounced 'utah-ville' as Gary confirmed) there is a club which is ready, willing and more than happy to take your particulars and wrap their arms around you in

a warm, welcoming embrace (figuratively speaking, of course!) The bad news is that a club with apparently *everything* going for it that you can still get all the glider guiders in one photo — with plenty of room left over for the quite exquisite composition that Gary somehow captured with a remote shutter while balancing his camera on his portable work table. Clearly a man of many talents.

Before I continue with what RCSD intends to do to help Gary and clubs like his all around the world, let me just say that there is nothing in the world that says clubs *need* to grow. Or even exist, for that matter. There are *plenty* of RCSD readers who are perfectly content — in fact, they prefer — to fly on their own, or with a small informal cohort of friends or even in a more formal club where they have known all of the members for as long as they can remember. I'm not here to preach to you that you must somehow try and hunt down others with whom to comingle while pursuing your unearthly endeavors. If that's you, it's **perfectly OK** to stop reading now —that is, so long as you click to the next article and keep reading this issue of RCSD!

But for those who are still with me, and may have the same concern that my new friend Gary has, here is my pitch for why our hobby needs to grow in a very broad sense. Serendipity being what it is, our Bob Dodgson blast-from-the-past this month is entitled *I'll Get a Real Job Tomorrow!* It's Bob's gritty, authentic account of what it was like being in the RC glider kitting business for two decades. It's great reading for everybody but, in particular, it should be **required** reading for anybody who finds themselves in the same or a related business today. I think much of what Bob recounts will be *very* familiar. Without stealing any of his thunder, here's my observation: much of what Bob encountered, and that which frustrated him, was from the market for his excellent products was **so darned small**.

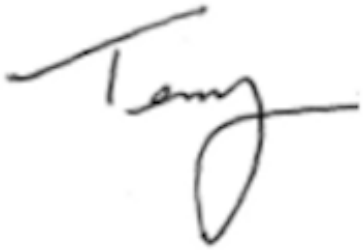
For the life of me, I don't understand why RC gliding isn't way more popular

than it is — it has just so much going for it, none of which I have to sell you on because you already know. And I'm sure you already do your bit to advocate for it with your friends and family. But I would also argue that nothing can quite compare to a big event like that Boundary Bay show all those years ago — something that practically speaking only active, viable clubs can stage. So even if you don't intend to join one any time soon, we all have an interest in clubs not just surviving, but in growing and perhaps growing a lot. A critical factor in that effort will be determined by our ability to reach beyond the boundaries of our familiar communities. To reach out to those who may not have heard from us for a while. Or maybe have never heard from us at all.

For RCSD's part, here's what we're going to do: I'm hoping that with Gary's co-operation the Eutawville Fliers will soon be featured as our first RCSD *Club of the Month*. They'll be featured in an article in issue of RCSD with no limit to the amount of text or the number of pictures they want to include. That article will then be added to the RCSD *Clubs of the Month List* which will serve as a resource for those looking for a club to join. And how about *your* club? Are you interested in being an RCSD *Club of the Month*? If so, we want to hear from you!

Having, in all probability, already overstayed my welcome I'll keep the rest of this brief: we have a truly amazing issue for this month with some authors that while they are new to RCSD's pages, will be very familiar to you. Who are they? Well, there's only one way to find out, click the link below and head off to the first article in our October 2021 issue. I only hope that your reading enjoyment is commensurate with the pride the RCSD staff has felt bringing it to you.

Fair winds and blue skies!



***Cover photo**: For the October issue, we're featuring the always breathtaking photography of the firm* Speedamigo-Modellflugfilm. *In this particular shot their FW-Models LS 6c is captured against that inimitable 'cielo azzurro italiano' near Cantiano, Italy. We love the light in this picture — summer with just a tinge of fall. Check out Speedamigo's YouTube and Instagram feeds: they're amongst the best we've found.*

*Here's where you can find the **first article** in the October, 2021 issue. Or go to the **table of contents** for all the other great articles. A PDF version of this edition of* In The Air, *or the entire issue, is available **upon request**.*

Letters to the Editor

Our readers take their turn at the editorial typewriter.

The NEW RC Soaring Digest Staff

For those who might not be familiar with them, these are called postage stamps. They are used to send paper versions of emails. Have one you would like to contribute our glider stamp montage? We would love to hear from you. (images: Wikimedia and Flickr)

We have had a number of readers suggest that bringing back this venerable institution that predates — by a couple of centuries, at least — all the noisy social media channels that we have at our disposal today. But the slow motion, moderated medium which encourages carefully considered and respective dialogue still has much to recommend it, so we are more than happy to oblige. We're delighted to kick off this series with reader Rex Ashwell's thoughtful reply to our question about postal contests posed in the September issue.

Postal Contest Primer

You ask in [September]'s *In The Air* if anyone remembers participating in a postal competition.

I'm here to inform you that in New Zealand we fly the National Decentralised Competitions (NDC) every month throughout the year. This is organised by Model Flying New Zealand (MFNZ), the governing body of aeromodelling in this country, and has been running continuously for roughly as long as anyone can remember. This link will take you to the NDC page on the MFNZ website which gives a brief overview of the competition rules, results, and a calendar of events for this year: MFNZ — Model Flying New Zealand — NDC Results

As you will see, the basic competition rules allow anyone affiliated to MFNZ to compete in a range of events posted on the calendar. There are five categories, Soaring, Vintage, Free Flight, Control line and Pylon and each month there are several events in each category. If we stick to Soaring, because that is my interest (and yours too) there are four events this month, Thermal D and Thermal J which are winch launch events, plus ALES 200 and ALES Radian which are for electric soarers. These can be flown on any weekend day during September and each event must be completed on the day it was started, after which the results are posted via the website, collated by a Recording Officer and ultimately appear on the website.

The whole thing is an honesty system although most clubs that compete have an individual organiser. I am the local organiser here in the small town of Blenheim, where we have about ten reasonably keen participants, mostly retired and of varying ability using a wide variety of models. While people can fly individually, and some do, we prefer to fly as a group, so the norm is that I keep an eye on the weather and when an acceptable day looks in

prospect I'll e-mail the guys and we all front up on a Saturday morning and fly the nominated competition. It's treated as a serious fun thing by most, but it fulfils the function of providing a competition schedule and allows us to fly with and against our club members and challenge the rest of the country with our scores.

There is that in-built weakness in this style of competition that variable weather brings, but everyone understands that and it's swings and roundabouts as far as conditions are concerned. No-one feels particularly modest when the scores come out and you find yourself well ahead of Joe Wurts, even if you know that he was flying in a hurricane while we a had a day with endless lift, but we all know it's not going to be a regular occurrence. It seems strange to me that relatively few people are interested in competition, especially when the most popular soaring events here are flown with basic Radians, but that seems to be a common thing around the world.

What I can say about NDC is that it has provided me with some very enjoyable flying in my retirement. I started flying 10 years ago, got hooked on soaring early on and was part of a fledgling group of inexperienced modellers who found that competition provided something that we needed. Without the NDC framework to get us started there would be no soaring competition in this area, in fact probably not much soaring, and without NDC I could not boast of twice being NDC Soaring champion and having held three NZ records, at an age when I would have thought such things impossible. Postal competitions — highly recommended.

By the way, I must compliment you on producing a wonderful e-magazine. I really missed RCSD when it ceased and I'm elated to see it 'soaring' again.

Regards,

Rex Ashwell
Blenheim, New Zealand

Thank you so much for that complement, Rex! Also, on behalf of all RCSD readers, thank you for bringing us up to speed on postal contests in your part of the world. We hope that others take your lead and start postal contests of their own. They're an institution that despite their long history, are still well suited to the times in which we find ourselves.— Ed.

Send your letter via email to ***NewRCSoaringDigest@gmail.com*** *with the subject 'Letter to the Editor'. We are not obliged to publish any letter we receive and we reserve the right to edit your letter as we see fit to make it suitable for publication. We do not publish letters where the real identity of the author cannot be clearly established.*

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****.*

Welsh Open F3F 2021

The latest edition of the most attended slope racing event ever.

Kevin Newton

The Bwlch Mountain in South Wales where the Welsh Open F3F event has been held for the last 25+ years. It's not hard to see the attraction.

F3F is slope racing against the clock, covering 10 legs of a 100m course. It is flown one up, rather than man-on-man, which has pretty much died out across the UK due to the attrition and associated cost and time. F3F planes and pilots need to fly fast, turn faster and adapt to changing conditions immediately before and during their run. It's an easy thing to do but a hard thing to do well.

The *Welsh Open F3F* has been run every year for over 25 years. The entry is

limited to 55 pilots and is usually over subscribed. Relatively easy access to the UK, slopes with roads to the top and a good track record of completing events make the *Welsh Open* a great festival of sloping with pilots from many countries taking part. In fact, the maths of so many competitors attending over so many years may make it the most attended slope racing event ever — flame suit on!

All slopes across the world have their own nuances so getting to know a hill you haven't flown before the event is a wise move. Common sense and courtesy ensure adequate practice time with no bureaucracy.

This year, COVID restricting travel and an unfavourable weather forecast meant a number of overseas competitors dropped out at the last moment. Disappointing but understandable. Thirty-three high quality competitors remained from across Austria, Germany, Spain, Switzerland and the UK, so all we needed was the weather to play ball.

Day 1 — Friday 17 September

The forecast for Day 1 was for decent wind on the 'Back of the Wrecker' slope — also known, not very affectionately, as *El Bastardo* as it's probably the least favoured slope and has no land out options when conditions are light.

At 9:30 on Day 1 there was some low cloud ('clag') but the organisers dragged everyone across to the slope as the relatively high temperatures and favourable forecast suggested it would quickly clear. It was important to get as many rounds in as possible as the forecast for the following days was not good.

The course was quickly put up and once visibility and conditions were stable we were off! It is a strange fact that often the fastest flight of the day tends to happen early in the day. And thus it came to pass that Andy Burgoyne in only the ninth flight of the day set the fastest time of the whole event with a well executed 35.88 using his trusty *Freestyler 6*. Second in the round was Peter Gunning with a *Freestyler 6* in 36.75 and third was Mark Treble with a *Pitbull* in 37.20.

That was the early indication of an interesting trend — there are many

variations on the theme but there are arguably three main styles for flying F3F: energy management (EM), reversals and bank-and-yank. Sometimes, in a crosswind, a combination of different styles can be most effective.

Generally speaking the EM style can generate greater speeds but at the same time tends to cover more ground as the turns are wider and the trajectory less direct. Some slopes respond really well to this, making EM noticeably more effective overall. On some other slopes the extra speed versus more distance neutralises itself, meaning there is little overall advantage to either style. Other times EM just doesn't work on a particular slope or in a particular wind direction or strength.

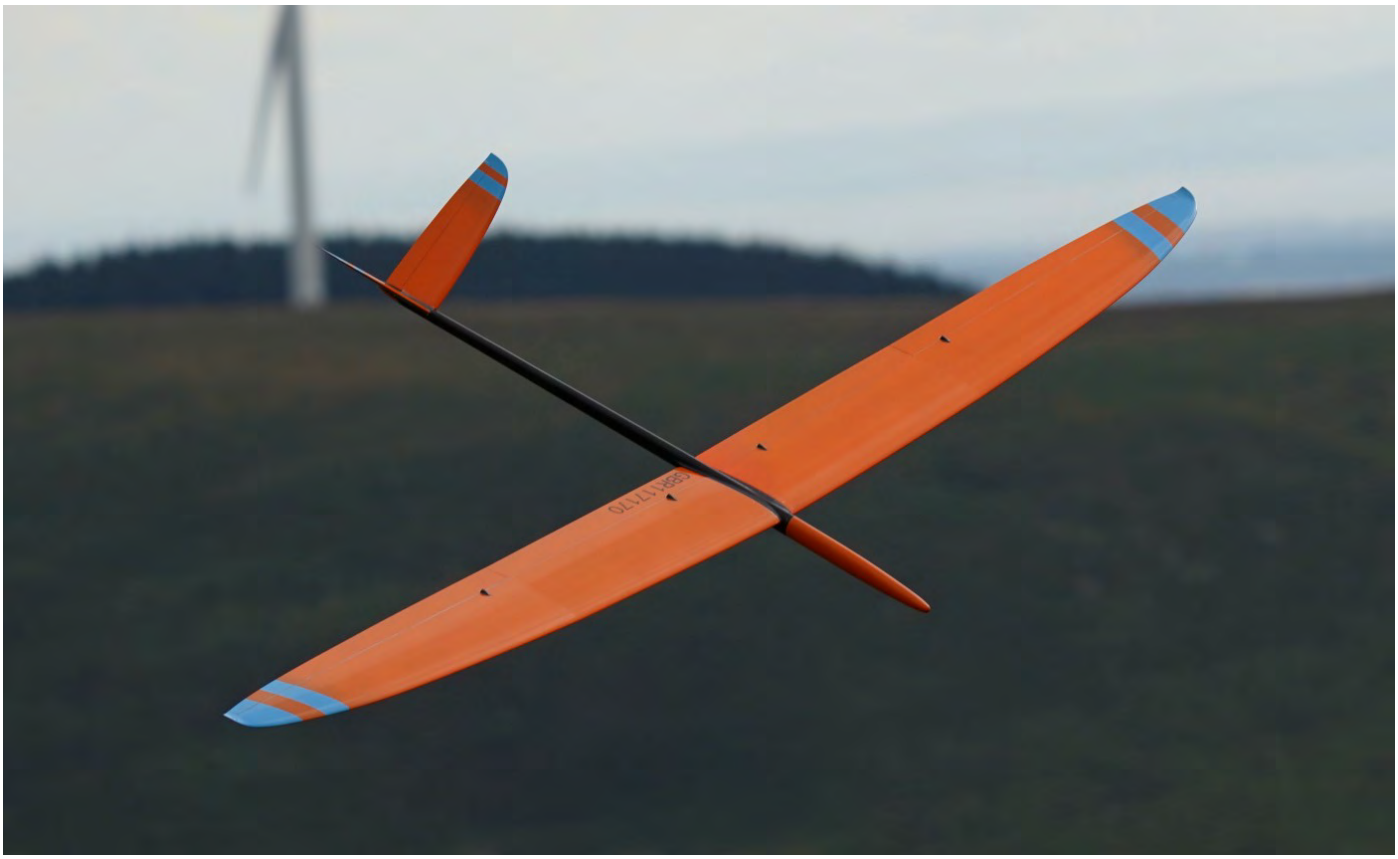
On *El Bastardo*, on Day 1, the equation seemed to be that EM was faster but that speed didn't quite cancel out the extra distance. The two videos below go someway to illustrating the point. Clearly though there are other variables than just the styles used in determining the times achieved in these two examples. However over the course of the next few days I think it's reasonable to say that even brilliantly flown EM offered no perceivable advantage over reversals or bank and yank. Of course on other slopes, or in different conditions, the situation can be totally reversed; it's no coincidence that so many records have been set using EM!

This is Andy Bergoyne's flight predominately using reversals. (video: Riccardo Kuebler)

This is Thorsten Folkers' flight using the energy management technique.

By the end of Day 1 we'd completed nine rounds, which was near enough 300 competitive flights. Peter Gunning (*Freestyler 6*) was leading from Stefan Fraundorfer (*Mamba*) in second and Mark Redsell (*Freestyler 6*) in third.

Three rounds were won by *Freestylers*, three by *Mamba's* and one each by a *Vantage*, *Ultima* and *Caldera*.



The Caldera used by Mark Abbotts to win round 2 in 36.65. I maintain this is the prettiest plane the world has seen, hence having one on my living room wall!

Manuel Rath prepares to launch Stefan Fraundorfer’s Mamba to win Round 7 in 40.32.

The Vantage flown by the author to win Round 4 in 37.63. (Photo: Paul Fram)

Day 2 — Saturday 18 September

The forecast was for light winds to swing from east to west. This was a pretty hopeless forecast so the organisers decided to stick with *El Bastardo* (southerly facing) as the wind might settle that way for a while as it can sometimes pick up a bit of a sea breeze coming in from the Bristol Channel.

As the slope land out options are nil the minimum safe windspeed is deemed to be 4m/s. After some careful positioning of the windmeter (always a contentious topic!) we just about managed to record sufficient and consistent wind to get underway.

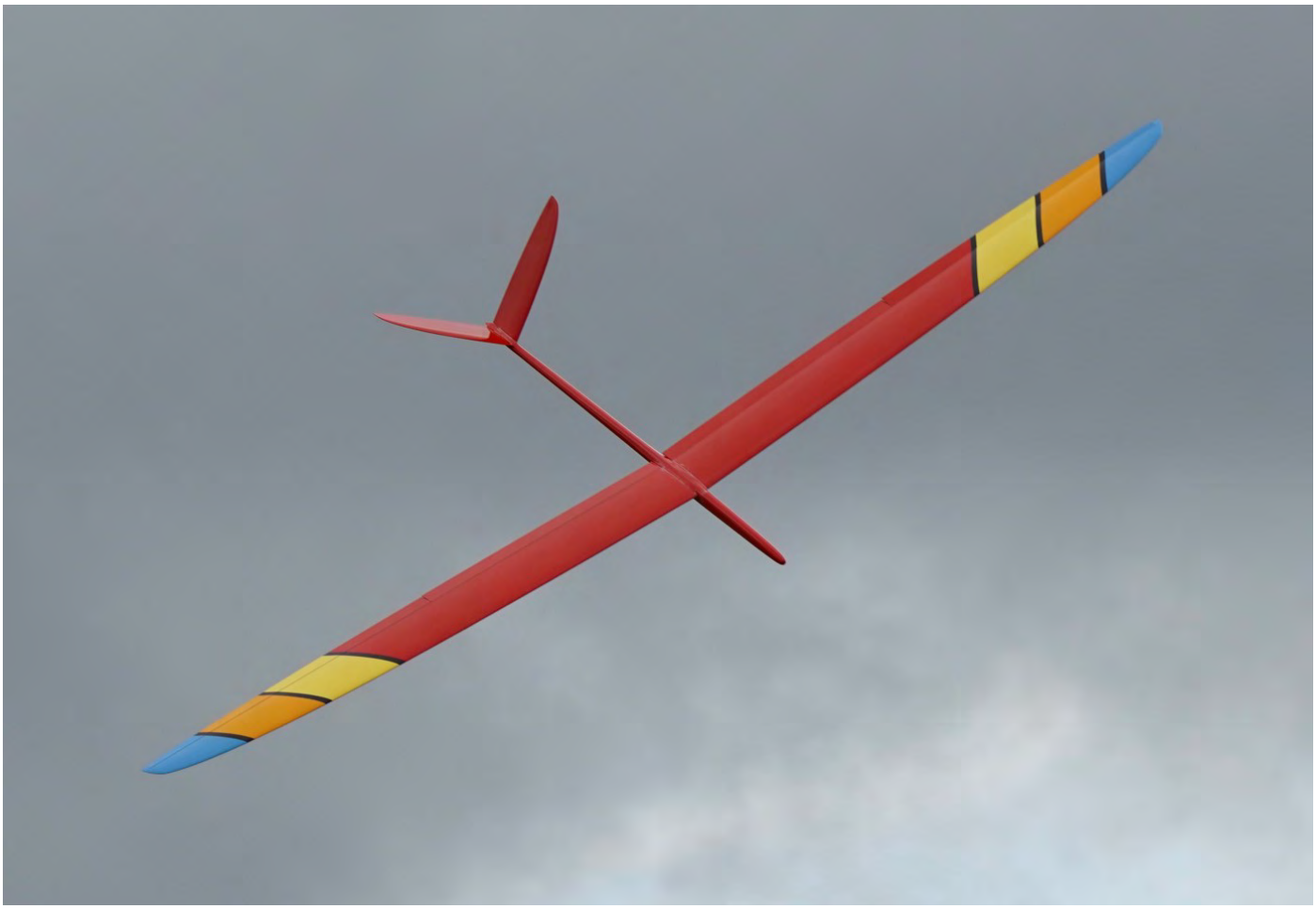
Thorsten Folkers prepares to launch a Pitbull 2

John Phillips, keeping all entertained with his most excellent and exuberant style won two rounds with his *Freestyler 6* and Manuel Rath won one with his Freestyler 6.

John Phillips launching Ian Mason’s Harrier.

Mike Shellim's Pile Precision 2 getting up close and personal at Base B.

As we got toward the end of the day, not long into the fourth round of the day, the wind dropped to virtually nothing and shifted a fair way off the slope. The brave sport flew for a while but the wind stayed below legal and was cocked off the slope, directly reflecting the forecast. After the requisite 30 minutes of no competiton due to the illegal conditions the round in progress was lost.



Daniel Schneider's Pitbull with a most excellent colour scheme.

With apparently no chance of any more rounds that day, and already feeling quite lucky to have got three in, we decided to call it a day. Utterly bizarrely, and beyond any experience, forecast or reason, within minutes of us calling it the wind came up and gave some tremendous sport flying. We considered reversing the decision but some had already left, keen for a bit of R&R after two long days. We probably lost a round, which was a shame but good decisions the previous day and earlier on this day meant we were still up compared with expectations.

Mark Treble was one of several Pitbull pilots and he found a great line on El Bastardo that consistently gave him great rewards.

After three rounds on Saturday and 12 in all, Peter Gunning was still in the lead, Mark Redsell had jumped to second and Stefan Fraundorfer had dropped to third.

Stefan with one of his Mambas.

Day 3 — Sunday 19 September

After a delayed start for rain and clag we were briefly teased with some flying on the westerly slope before the wind swung over 45 degrees off to the north. We lost the round in progress and made the bold move to the northwest slope, which turned out to be exactly the right thing to do.

Thorsten Folkers puts in a 48.59 with some incredibly accurate flying for fifth in Round 13.

In Round 13 Mark Redsell took several seconds from Pete Gunning, which was enough to snatch the lead. Joel West climbed to third after taking eight seconds from Stefan who had some unlucky air.

Mark Redsell snatched the lead with his Freestyler 6 in Round 13.

Round 14 and Peter hit back to regain the lead and poor Stefan lucked out on the air again and lost another place. So, at the end of Round 14 we had Peter Gunning leading from Mark Redsell, with Joel West in third, John Philips in fourth and Stefan Fraundorfer in fifth.

Most, other than Peter, were hoping we'd have enough time for Round 15 as that's when the second discard of your lowest round score kicks in and with the variable conditions just about everyone felt that would benefit them more than the next pilot. As the final pilot finished round fourteen we were indeed three minutes ahead of the deadline beyond which we couldn't start another round, so on we trotted to do it all one more time.

The author flying the Vantage to fourth in Round 14. (photo: Paul Fram)

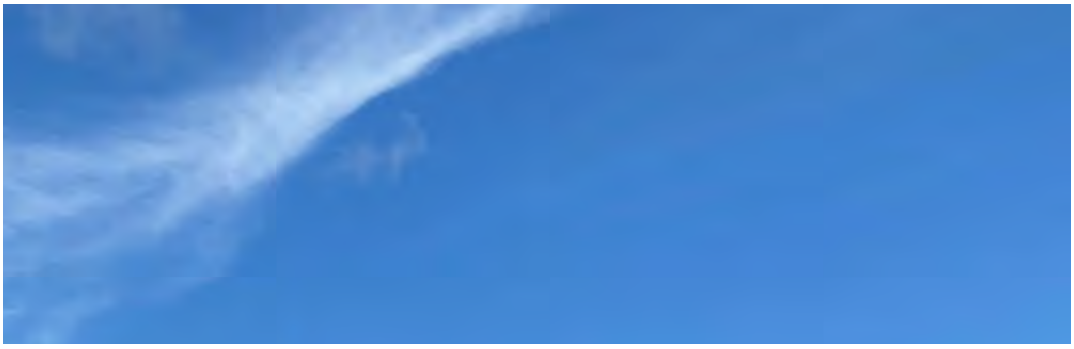
As it turns out, the fourth pilot up in Round 15, Mark Treble, made great use of some abnormally good air to put in a storming 38.78. This trashed almost everyone else in the round making the fifteenth round most peoples' second discard anyway! In fact just about the only change of position as a result of the final round was Mark leapfrogging me into sixth — grrr!

So there you have it, after nearly 500 competitive flights, Peter won, Mark was second and Joel was third, all three flying *Freestylers*. The full results are below in *Resources*.

Peter Gunning guided his Freestyler 6 to victory.

Pilots

The standard of flying was high. Any good air was sure to be pounced upon and exploited. The range of styles was interesting and in general those pilots that were able to adapt faired better. I specifically mentioned ‘in general’ as you needed enough rounds of decent air to work with otherwise no amount of adapting would make a difference!



Left to right. Joel West, third. Peter Gunning, first. Mark Redsell, second. Huge thanks to MKS once again for their generous sponsorship.

Peter flew a tight course and had that knack of not looking spectacular but being blisteringly quick — very Jenson Button like for any F1 fans out there.

Mark in second was always thinking, adapting, trying things and flys a very tight course. And Joel in third is always just damn fast!

It has to be said that the German and Austrian competitors flew with incredible precision but suffered from a scarcity of good air and from their preferred EM style just not clicking on the slopes in the prevailing conditions.

Planes

It's never particularly wise to draw absolute conclusions about planes, not least as the margins are fine, personal styles and air can impact and very few people will spend enough time with a range of top planes to be able to make well informed, first hand comparisons.

There were five *Freestylers* in the top 10, placed 1, 2, 3 and 4! The rest of the top 10 was comprised of three *Pitbulls*, a *Mamba* and a *Vantage*.

Does that mean the *Freestyler* is the best? Of course not! Does it mean they are not the best? Of course not! What I think is clear is that over the last 10 years or so design and construction has improved to the point where there are at least a handful of designs I wouldn't hestitate to compete with and that has to be a good thing.

Interestingly, as we strive for more and more optimised performance I wonder if the days of a design for all conditions might be numbered and some might go for different airframes for different conditions. I'd have baulked at that years ago but I'm coming around to the possibility that the benefits may outweigh the downsides. I could, of course, be wrong.

And on that bombshell…TTFN.

Resources

- knewt.com Lots more photos and other F3F-related material

Welsh Open F3F 2021 Final Classification

1	Peter Gunning	12,337.84
2	Mark Redsell	12,240.59
3	Joel West	12,132.90
4	John Philips	12,063.71
5	Stefan Fraundorfer	12,021.10
6	Mark Treble	11,927.60
7	Kev Newton	11,823.88
8	Graeme Mahoney	11,740.46
9	Manuel Rath	11,708.49
10	Daniel Schneider	11,704.48
11	Andy Burgoyne	11,633.00
12	Stefan Bertschi	11,572.96
13	Rich Baygo	11,458.56
14	Greg Dakin	11,444.13
15	Thorsten Folkers	11,443.82
16	Aleix Ingles	11,419.99
17	Mike Shellim	11,400.22
18	Paul Stubley	11,245.66
19	Wiliam Fourie	11,243.95
20	Tobias Reik	11,194.91
21	Mike Evans	11,118.23

22	Dave Rumble	10,959.27
23	Jon Edison	10,790.25
24	Ian Mason	10,675.65
25	Keith Wood	10,439.70
26	Mark Passingham	10,314.84
27	Bruce Hudson	10,220.99
28	Allen Elliott	10,018.88
29	Jason Bioletti	9,974.91
30	Mark Abotts	7,591.64
31	John Treble	7,448.79

Fastest time: 35.88 by Andy Burgoyne in Round 1

*All photos and videos by the otherwise unless othewise 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**.*

Three Is the Magic Number

Why you need to turn off your television set and give GPS Triangle Racing a go.

Iain Medley-Rose

Valenta Chilli GPS and Baudis Calvados just before a ballistic flight. (photo: author)

My glider is launched and it is climbing at 16m/s and passing 150m. All of a sudden the plane has started to climb faster and is climbing at 20m/s. The thermal is marked by a circling bird and the lift is moving from left to right in relation to where I'm facing. At 420m it's motor off and a left turn, that takes

the glider out of the lift — the audio vario confirms this. Continuing the left turn to chase the thermal I check the altitude readout on the phone mounted on my transmitter, 408m altitude, and the GPS speed on the clock is 90km/h. Squeeze down elevator and the speed hits 105km/h and the altitude shows as 390m. In my headphones I hear “task started”.

Almost immediately the vario tone has gone up and I’ve got the glider into a thermal turn. So, do I stick with this thermal and take as much height as I can? Do I just take a couple of turns as it drifts towards the first turn point and get going on the task? A quick glance back to the third turn point confirms that I had seen a bird circling at about 100m height some 400m to my left. Okay, that makes the decision, the third turn in this thermal will take the glider to the first turn point and it looks like there will be more lift to hook into. As soon as the turn complete notification plays in the headset the glider is on course to the turn point directly in front of us.

It looks like the second pilot to enter the course is taking another turn or two to gain height. The third pilot has not taken any turns but has flown to turn one with thermal flap. As a result, even though they started after me their glider is now about the same distance around the first lap as mine but a bit lower, maybe 440m to my 480m. Both gliders get to the second turn point at about the same time. As we turn them towards the third turn point the air seems neutral but our gliders are facing more into wind. Hmmm. Mine is losing ground and I select my first speed flap setting. The two gliders are at the same sort of pace now but it looks like I am flying with less ballast. How is that going to play out? Both gliders round turn three, mine slightly behind but still higher. About 40m into the leg the vario gets all excited and we have both started circling. It’s breezy up there and we both keep our gliders circling across the start line, it’s strong lift.

“Completed one lap, twenty six minutes remaining, 530m” in the headset.

Oh, that's gone cold. The sink has been strong today, I'm taking as much as possible out of this climb. Not the same decision as the other pilot in the thermal has made though. Have they done the right thing, will they fly out the thirty minutes, have they seen another lift source that I haven't? Here comes the third glider, much lower but they have made the thermal having flown from the third turn in the sink we can now feel on the ground.

There are another twenty five minutes to sustain the glider in flight and complete as many triangles as possible. Who has made the best decisions? Who will fly the full task? Who will get the most laps? If there is a tie for laps, who is going to have the best average speed? *What is going on?*

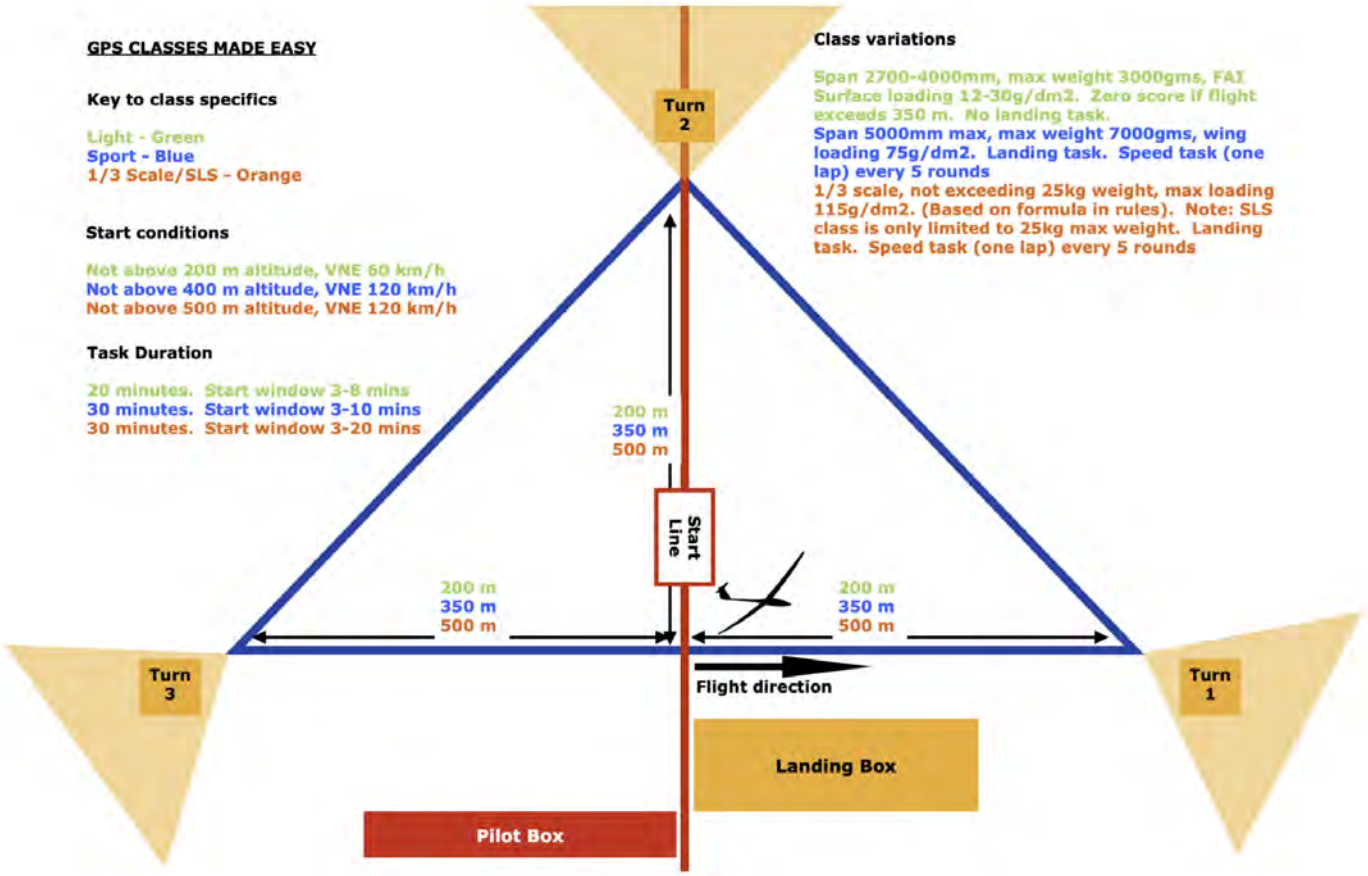
We are GPS Triangle Racing, that's what.

Launching a Valenta Chilli GPS Special. (photo: Greg Fitzpatrick)

So, for anyone who doesn't know, here is a quick run down of GPS Triangle Racing and the classes. There is plenty of stuff covering the history elsewhere on the web so I'll skip that in this article.

In essence there are three variants/classes. All use a triangular course with three GPS defined turn points. The diagram of the course (see below) shows you how the task is defined and the colour code shows you the different course parameters for each class. The *1/3rd-Scale/SLS* class aircraft are scale gliders that fly on the biggest course. *Sport* class has a span limit of 5m and a max weight of 7kg (with wing loading limited to 75g/dm²). *Light* class gliders are limited to 4m span and a max loading of 35g/dm². You will need to read the rules for each class before committing because there are more details than this article can present and the *1/3rd-Scale/SLS* class needs formulae to calculate allowable weights and loading.

The tasks have limits on flight time, entry height and speed (see diagram for the details). The laps are always flown in an anti-clockwise direction. Flying sites are flat fields and there should not be any slope lift. With the exception of the *1/3rd-Scale* class planes every other class uses electric power to get the planes to the start height. For *1/3rd-Scale* class you'll need a tame tug pilot and a suitable tow plane. The landing strip needs to be a minimum 80m x 25m for every class other than *Light* class for which there is no landing task. There is a diagram that shows the key elements for all classes below:



(drawing: author)

Okay, let's have a quick look at the tech. There are several systems available but in essence you need a glider pack that has a GPS sensor, a variometer and a method of sending the data back to a ground station.

Simon Thorton setting up his ground station. In the UK more pilots use mobile phones mounted on their transmitters to run their Albatross software. Some use tablets on tripods — which is seen a lot more in Europe. Both offer advantages and it pays to talk to pilots to help make your selection. (photo: Mike Shellim)

The ground station needs to translate the data for the pilot and present some key items. As a minimum you need to know where to steer the glider to complete the course. You need altitude and speed data. If you have the vario you also get to know when you are in good, bad and ordinary air. The kit I'm using does all of this and more as well as displaying the data via an Android application. In addition to the audio vario, the turn points are announced into the pilot headset. The capabilities are immense and again need a subsequent article. Importantly the tech also records the key data for scoring the tasks. Once the data is recorded it can also be uploaded to the

supporting league website which also supports competitions.

The Elvira from PCM.AT. At the end of a good day flying. First test flight on the course yielded nine laps without any ballast. (photo: author)

I want to talk about gliders next. As I don't currently fly *1/3rd-Scale/SLS* I'll talk about *Sport* and *Light* class planes. Inevitably this will have a UK-biased view, and being a tiny island in the middle of lots of wet stuff, this means we've some slightly less favourable flying conditions that limit some planes' potential. It is well worth looking at the GPS Triangle League (see *Resources*, below) to see what people are posting scores with in both competition and when submitting mega league scores, but the 'best' scoring plane isn't necessarily the best plane for you. We have short lift cycles here in the UK and it is rare for lift to be on the course for more than 20 minutes and with anything more than 2m/s climb. If you fly where the lift cycle is longer, slower moving and more powerful then you can pick faster more aggressive planes.

Some of the pilots from the UK Nationals in September 2021. There are some new planes that have been test flown since the event and some more new toys on order ready for the 2022 season. (photo: Greg Lewis)

Taking *Sport* class as a for instance: In the UK the *Valenta Chilli* (especially in

'GPS Special' form) is a highly competitive aircraft and it has been on the top spot in European international competitions as recently as 2018. It is a solid plane and will give you sound scores in the UK. In comparison the *Baudis DNA Racer* doesn't work well in our relatively poor lift conditions and sticky air. However, in Berlin where the weather is different the better plane would be the *DNA Racer*. That said the reality of the *Sport* class is that anything over the four metre span criteria that can thermal, go in a straight line at 60km/h without losing more than 130–140m of height for 1700m of distance (so a bit better than 12.5:1 glide angle) is a good starting point. There's a list at the end of the article of the planes we are flying here in the UK.

An old NAN Shadow F3J re-purposed for Light Class. It sits just under the max weight for the class and has turned in some good scores. (photo: author)

Light class is another case where the 'best' plane might not suit your location. Currently the *Samba Prestige 2PK* is the probably the leading choice for light class, along with any of the latest low camber thin airfoiled stuff from Vinco, Nan, Infinity and the like. However here in the UK where 12 laps is the best score we are seeing things like a *Shinto J* and an old *Nan Shadow* being flown to good scores.

In all cases what you need to do is set your glider up really well. Get it just so in thermal setting to extract the best from the lift with the lowest level of pilot input. In a straight line make sure the glider actually flies in a straight line and doesn't feel like it is a ball bearing on a tray to control. Do a proper glide test: you want maximum efficiency from your plane, but you do not want the thing on the banzai end of super twitchy. The set up of gliders for GPS is a

massive topic and that exceeds the focus of this article.

So, after all that vagueness and evasion, the things about selecting a plane to take from this article are that you need to pick:

- A glider that flies well for you in your normal soaring environment
- It needs a decent glide angle
- It needs to allow you to achieve the task duration in your local conditions
- It should be capable of flying efficiently without too much pilot interference
- You need to invest in the time required to set it up really well

The authors GPS Special and a Shinto J racing at the UK Nationals. Although a challenge at big altitudes it is possible to get started with a 3m glider. (photo: Greg Fitzpatrick)

Hopefully we now have enough information for a recap: for the purpose of this discussion we are flying electric powered gliders from a flat field, around a defined triangular course as many times as possible in a defined time. We are using some clever tech to tell us where to fly our glider and how to

maximise the flight. In addition that tech can calculate the ‘raw score’ of each flight and in a competition upload it to the scoring website. Obviously this data can also be used by pilots to improve their results in the future, understand the flight, or provide memories of fantastic conditions and epic achievements.

What, then, makes this so engaging? Well, for a start flights are a good duration, and the ratio of flying per £/€/$ spent on toys is therefore very favourable. The flying task and decision making are properly challenging. You get to set your gliders up to fly really well, which usually means you spend lots of time flying.

These bubbling behemoths, arrived with 800m of altitude available, before the gliders were touching the bottom of the cloud, and we were using full on speed flap for twenty minutes. Very exciting. (photo: author)

Flying to a specific purpose or task really sharpens your skills, this task will really make you a better pilot. Your perception, decision making and capability to adapt to conditions will be improved; and your accuracy as a pilot will be better. As a soaring pilot you will find your understanding and use of lift will be improved, which will cross over into your other flying. One of the things that has been most enjoyable is when we get a one-on-one competition going and have eight to ten planes in the air at once. It is proper racing.

Chilli GPS Special on final approach. At up to 7kg these efficient gliders look magnificent around the landing approach and can reward pilots with spectacular greaser landings. (photo: Steve Burns)

Useful links are presented with this article to lead you deep into the world of GPS Racing.

So come on in and join the fun.

Simon Thornton launching his Ikura which is not a purpose designed glider for GPS racing. Nevertheless it has a good glide angle and climbs well and handles poor conditions well. (image: Mike Shellim)

About the Author

I've been playing with radio controlled gliders for 40 years, starting off with a Neville Mattingly *Phoenix 100* and a Chris Foss *Middle Phase*. Along the way I've flown many soarers and been an active soaring flyer, competing in F3F; F3B; Open Class (F3J); Aerobatics; 60in pylon racing; open pylon racing; a few cross country events; and local club events. All great fun and they all demand different skills from pilots.

The author with his Valenta Chilli. (image: Jocelyn Medley-Rose)

My personal view is that F3B is probably the most skilful event to fly well: because it demands a well rounded pilot; capable of accurate flying; the mastery of several tasks; a good understanding of the glider to extract good

performance; good understanding of the air mass; and good decision making in the tasks. Better still two of the three tasks are flown against several pilots. Over the course of a day there is also a reasonable amount of flying to be had.

Much as I enjoyed many years of F3F the biggest negatives are the lottery of conditions (especially in large rounds) that can hugely affect the results. Also, perversely, the better you get the less time you spend flying.

In the last two decades I have mainly flown for fun and have usually found myself slope soaring. I am lucky to have slopes between 20 minutes to an hour from my house. With limited time I have still been grabbing the occasional three-to-four hours and managed at least one to two hours soaring in those sessions.

Life has moved on and my interest in competition has resurfaced. I was interested in the *Scale* GPS classes when they started to appear in the model flying press and on the various forums, but there are so few locations to fly that size of glider within sensible travel distance of me it seemed unlikely that this would be a possibility. In 2020 I saw reports of the relatively new GPS *Sport* class, and that became a hugely interesting proposition, and it has now become a bit of an obsession. The big advantage of the *Sport* class is that the 5 metre span limit means finding a flat field site to launch from is a lot easier than it is for big scale gliders.

My flying has been reinvigorated as a result of trying a new competition, and the new skills I am learning are stacking up alongside re-aquired skills that had become dormant.

Resources

Websites

- GPS Triangle: rules and lots of additional resources
- GPS Triangle League: “next generation glider racing”

Video

- Valenta Chilli Flying GPS Triangle Six Laps (listen in stereo!)

Video Series: ‘In the Air Tonight’ GPS Triangle Racing with Greg Lewis

- Introduction to GPS Triangle Racing
- Trimming and Sailplane Setup

Video Series: GPS Triangle Racing with John Copeland

- From The Start
- Setting Up Gear and Flying the Task
- Tuning and Trimming

Planes List for the UK

Sport Class	Light Class
Baudis Calvados	Samba Prestige PK2
Valenta Chilli GPS Special	Samba Pike Perfection
Aer-O-Tec Ikura	Mistral
PCM Elvira	Nan Shadow F3J
Valenta Thermik XXXL	Aer-O-Tec Shinto J
Simprop Solution XL	Infinity Models Infinity
Baudis GP Racer	
Baudis DNA Racer	
Aer-O-Tec Shinto J	

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Flying Back in Time

The posse head back under the sea to La Belle France.

Chris Williams

Phil Hoegger's new L213A looks to be a good aerobatic performer.

Customs men are not usually noted for their sense of humour, but when the three of us, myself, chauffeur Barrington Smallpiece, and Transit ballast Sideways Sid were stopped at the British entrance to the channel tunnel and enquiries made as to the contents of our van, the official response to our reply was 'you just couldn't make that up!' Nevertheless, the back doors still had to be levered open to show that the contents really did consist of a load of large model aeroplanes. Customs men can't have very long memories though, because it was that time of year again when the SSUK Expeditionary

Force prepares for the annual peaceful Normandy landing in preparation for storming the flying field of the Caen Aeromodelles Club for the occasion of their annual aerotow event.

Left: ean-Pierre Voisin's Ventus 2C, a picture of elegance. **Right**: The S2G Minimoa launches: on the right, the last tug pilot standing (just before he had to sit down!)

This event attracts modellers of the scale soaring persuasion from far and wide, the main attractions being the laid back French organisation, the nearly always perfect weather and the opportunity for lots of flying. It has become traditional over the years for the British contingent to arrive a day or so early in order to take over the flying site for our own purposes and, as Friday dawned, the previous day's (month's!) rain became a distant memory as sunshine and light winds became the dominant condition. How do they do it?

Heavy plastic! Andy Schafer's super-elegant 3rd scale DG 500M Elan.

This year's fleet from the UK mainland was to be a pretty impressive one, and included a new 3rd scale Blanik L213A (yet another of Phil Hoegger's aerobatic mounts), Steve Davis' 3rd scale Wilga tug and Andy Schafer's usual collection of heavy plastic. Also included, my new 3rd scale C-Falke motorglider, christened 'Humphrey' over the weekend by Steve Davis, a name that I'm afraid is likely to stick. Also joining the day's festivities were two German sailplane manufacturers in the persons of Ekkerhard Hermann of Rosenthal fame, and Thomas Budseus who specialises in the manufacture of 'grossmodelles', or 'big 'uns' as we say this side of the Manche. Blowing in from Switzerland to complete the line up was the 'all electric Chris Garrod show' combining no less than three 'up-and-go' electric glass ships (*Nimbus*, 2-seater *Nimbus* and *Ventus*) and his always impressive *Rascal*

electric tug.

Bilingual welcome from the Caen Aeromodelles Club.

The weather seemed perfect, no wind, sunshine, and a welcome rise in temperature after the long winter, so we set to with a will, just another day in

paradise.

Now tugs are temperamental creatures, always prone to spraining a gusset, but five tugs represent money in the bank, as it were, so it caused some consternation when three of them became unserviceable as the day progressed. Sid's Wilga was the first to succumb, and then Steve Davis' Wilga became silent when its expensive transmitter threw a digital wobbly and then, to put the tin lid on it, Barrington Smallpiece suffered fly-in-the-eye syndrome and was able to fly only sporadically for the rest of the weekend. Despite these setbacks, a full programme of flying took place until the sun, wearying of the spectacle, started its descent to the western horizon. It was then that Humphrey came into his own; in the flat evening's calm he purred gracefully at low level over the crop, slow, majestic and scale-like, the perfect combination of virtues. With photos and video in the can, this represents to me the culmination of a long project, whatever happens now there will always be pictures and a movie to torture the grandchildren with! So, after the obligatory Barbie, it was back to the Gallic B&B, too spent to even take the wee-wee, able only to fall into the sack to rest in preparation for the start of the event proper.

The Chris Garrod all-electric show. Three electric up-and-goes and the Rascal electric tug.

By the next morning the weather was starting to warm up, and first model to catch my eye was the superb 3rd scale Castel 25S being rigged by French modeller Andre Gaborit. Bearing a similar colour scheme to Humphrey, lots of red and see-through fabric, I was really impressed by the way the wings rigged to the fuselage, exactly as the full size, with metal plates in the wings locating with plates on top of the fuselage, joined together by steel pins. In the air, as you might expect at this size, the model was slow and realistic, the only downside being a tendency to land in the crop rather than on the strip. Talking of Normandy landings, this event usually ties in the with the annual commemorations, last year being the big one, so it was fitting indeed to see a rather large model of a Waco troop carrier being assembled. With the scale towing strop being attached to two points in the side of the fuselage, this

would no doubt have been a moving sight to any World War II veteran as the Waco descended over the crop to land on the strip.

A glider queue argument between two Frenchmen is always an impressive sight, with plenty of passionate shouting and no small amount of gesticulating (well, they can't do you for it) and such was the level of their toe-to-toe commitment that I felt unable to risk my execrable French on one of them to gather details of his large-ish Schweizer 1–26 that seemed to spend more time in the air than on the ground. Maybe next year.

It's always amusing to chart the progress of the day's events at this aerotow: first there is a leisurely rigging of models and a period of prolonged chat to the background noise of Brit aerotowing. A bit more chat follows, followed by the ceremonial opening of bottles of wine, a bit more chat, and then, wouldn't you know it…time for lunch. Pausing between mouthfuls for a bit more chat, lunch is consumed after a period of an hour or two, by which time we assemble for the briefing. The briefing (consisting largely of chat) is in French, of course, well, you can't blame them for that, and then one of guys manfully struggles to translate into 'Frenglish' and I wonder if we could do any better at one of our events? With bewildering suddenness, a French tug fires up and, as if by magic, a lengthy glider queue forms out of nowhere and then it's non-stop aerotowing until about six-thirty, when it's time to stop and gather in the big marquee for the evening meal with lots of food and wine and — oh yes — more chat. Now, if you happen to have a motorglider and you get out there during the chat periods you will find, like Chris Garrod and I, that self-launching has its attractions, especially when the sun is shining and the wind is light.

The next day we saw more of the same, only this time it took even longer to get around to the pre-flight briefing, so once again the motorgliders sawed their way into the sky without hindrance. Having suffered the symptoms of

the old trouble recently, Minimoalitis that is, it was with the reluctant fascination of a reformed alcoholic confronted by a beer festival, that I saw that there was not just one, but two examples of the type on display. The first, belonging to Bertrand Gillot, was from the Krick kit, examples of which must have first seen the light of day many years ago now. Bertrand had modified the wings to accept Schempp-Hirth airbrakes rather than the more usual barn door spoilers, and admitted, as many before have too, that there were certain difficulties in setting the model up to turn properly. These have always been difficult models to fly on the slope, but aerotow allows them to come into their own, and this one seemed to fly pretty well. The other example, belonging to M'sieur Aymeric, was from the S2G stable, of which there are a few around now. This one flew very well, suffering only from a lack of glide path control, there being no airbrakes or spoilers, relying un the raising of the ailerons instead. When the three Minimoas, these two and mine, happened to be parked near to each other I at once spotted the photographic opportunity.

You wait all day for one Minimoa, but here are three. Author's in background, the S2G version in the middle and the Krick model in the foreground.

Lining the three up together, I lay down and sighted through the viewfinder, as I have done a thousand times before. Little did I realise that this action was to give rise to a new saying, for the chosen spot turned out to be the site of an ants nest. Leaping and hollering in a fashion calculated the raise the eyebrows of even the most laid back Frenchman, I slapped myself silly, all the while thinking:' the ants in France crawl mainly up your pants'. Ah, the things a roving reporter has to put up with.

Chris Garrod’s electric Rascal tug, now re-engineered for longer flight times.

Having once slept through an entire French lesson at school without discovery, it will come as no surprise that yours truly is a uni-linguist, and it’s always difficult at this event to grill the pilots the way I can back home. So,

during the lunchtime festivities in the marquee, I was interested to note that the guy next to me was grilling the feller opposite and writing a load of stuff down on his notepad. Gads! A French version of me! So intense was his concentration, he didn't notice me leaning over his shoulder and cribbing shamelessly, something else I learned at school. Thus did I learn that the owner/builder/pilot of the nice orange Fauvette I've been photographing for the last three years is one Andre Lambert and his model flies on the same set of Quabeck wing sections as most of my machines.

As the day wore on, the tug attrition rate intensified; one tipped over and landed on its tail, another lost its tuned pipe in the sea of crop and yet another split a gusset of some sort, leaving one young guy with his *Red Bull*. (*Red Bull*: a Rosenthal kit that has proved a very popular machine for tugging). Hour after hour he plugged away, knees slowly bending until he had to sit down to fly, fatigue pulling him ever lower in his chair. Eventually he had to draw the line, and he drew it in front of my Minimoa, drat him, still there's always next year.

The best place to garner information: Sunday lunch, French style!

Once again, the Caen Aeromodelles Club had provided a splendid weekend for all their guests, and as Sid, B.S. and myself headed once more for the Tunnel, we vowed to do it all again next year, assuming we could get all the ants out of our fuselages first.

All images by the author. First published in the much missed Quiet & Electric Flight *in 2006. 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****.*

Lentus: Elapor at Its Best!

Inspired by prestigious modern full-scale gliders, does the latest Multiplex offering make the grade?

Pierre RONDEL

1: This picture highlights the absence of the pilot in the canopy — too bad!

It has been six years since the *Heron* was released but its big brother, the *Lentus*, has been finally announced at the end of last year and it is already a dazzling success as Multiplex was quickly out of stock and had trouble meeting demand. With a 3m wingspan, semi-scale look, wings and flaps, towing hook, retractable gear and speed sensor as possible options, the Lentus sets the bar high on paper. Available in a simple kit or ready-to-run (RR) versions, it is the review of this second version, almost ready to fly, that is the focus of this article.

A Particularly Successful Aesthetic

2: Definitively a semi-scale look.

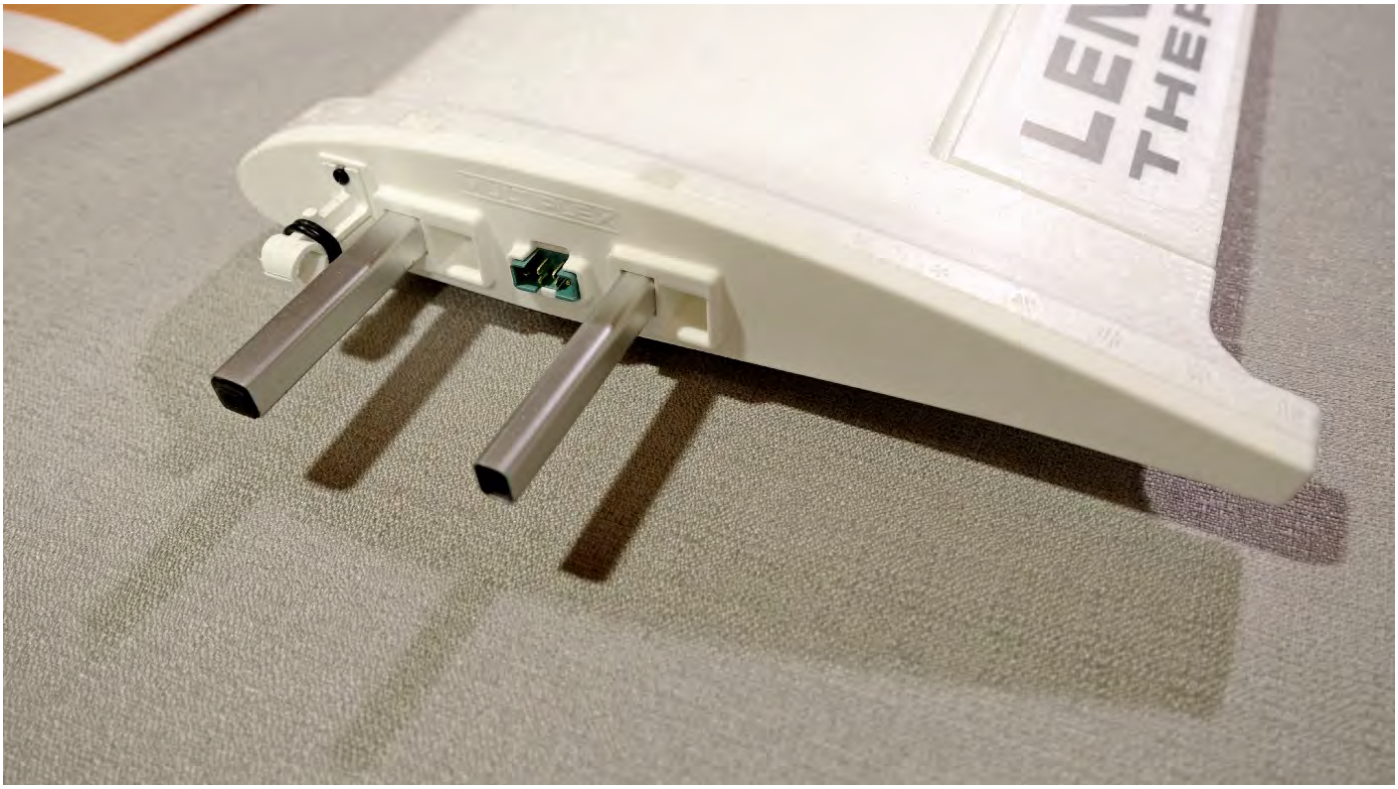
Multiplex has had a very nice pencil stroke with this *Lentus*, which is inspired by prestigious modern full scale gliders right up to its name. The wing planform is indeed reminiscent of that of the Ventus and the fuselage rather the shape of the fuselage of an LS8, this could indeed explain the name *Lentus*. In any case, it's very well done, curves are elegant, well balanced, and this from any view angle, personally I love it! And as we often say that 'what is beautiful flies well', all this is a good omen for the chapter about flying! Multiplex's know-how in the world of foam gliders is well known, so let's take a closer look at the contents of the kit.

An Ever More Complete Kit

3: The RR kit composition, all the assembly work has been nicely done for you!.

When opening the impressive cardboard box, which can also be used as for transportation, you will find the different elements carefully packed and wedged in bubble plastic sheets. First of all the two wings: In this RR version, they are completely finished, decorated and equipped with two servos per wing. The molding quality is impressive, no mark of extraction nozzles or injection points. The surface is perfect and slightly glossy. On the lower surface, you can distinguish two carbon/aluminum spars, the longest of which goes all the way to the winglet. The second spar is shorter and goes up to the mid wingspan. This should provide good bending and torsional stiffness to the wing. The control surfaces also have aluminum insert as a stiffener. The wing decoration is finished with a very good quality adhesive decoration and perfectly adjusted. The leading edge is protected by a transparent adhesive. The four Hitec HS-65HB servos are perfectly integrated in their housing, with a plastic cowl protecting the servo horn and its control rod. Wires are neatly routed in their guides and covered with

transparent adhesive. At the root is the large plastic rib which integrates the housing for the opposite wing joiner ends and the wing lock system. Unlike the *Heron*, this time the fuselage wing connection is using a green 6-pin plug, a very welcome addition!



4: The root rib with the two joiners/spars, the lock system and the green plug.

The tail plane is stiffened by a flat carbon rod, and is screwed to the top of the fin by two plastic screws. The elevator control is based on the *Heron* system with a simple bent piano wire that connects into a plastic part with an integrated sliding tube. It is extremely convenient to assemble or remove, and absolutely slop-free!

Let's now move on to the *Lentus'* pretty large fuselage. It uses the Multiplex *M-Space* technology which consists of a large carbon tube 20 mm in diameter in the rear boom that ends with a plastic reinforcement that goes up into the fin. The latter receives the two Hitec HS-65HB servos for elevator and rudder. The top of the fin ends in a plastic inserted part which receives

the tail. The front of the fuselage is reinforced at its bottom with a 10mm square fiberglass tube plus fiberglass flat rods on the sides. The canopy is perfectly adjusted, and seems to use a softer and therefore less brittle material. On the other hand, the canopy seat is hopelessly empty! A pilot, even a simple silhouette would be more than enough and would add much more realism in flight! The canopy lock uses a clip system. I find it lacks a little firmness, so watch out for it during the first flights. For the brave, the addition of a small magnet at the front can secure it.

At the front of the fuselage, which really offers a lot of space, the ROXXY C35–48–990kv motor is mounted in its plastic housing which also reinforces the front end of the fuselage. The speed controller, a ROXXY BL-Control 755 S-BEC is mounted on the side. The wiring is clean and wire lengths are suitable for any kind of cabling layout. The landing gear location is closed by a removable Elapor part which can be glued with cyano if you don’t want the retractable landing gear option. Just behind the motor is a space for the towing hook servo. The servo is optional but the hook system is provided with accessories.

That’s it for the overview of the kit. The quality of the moldings or assemblies, the technical solutions chosen, the choice of radio or motor/ESC components, everything is well thought out and carried out, this is really a premium kit and Multiplex shows once again its know-how and its advance on the foam models market.

Assembly in Less than Five Minutes

9: The front part of the fuselage with the ESC fixed on the side, letting lots of space for the battery

In this RR version, the only operations to be carried out are gluing the Elapor part to close the wheel hole, sticking the adhesive pad which is a thick and flexible vinyl that ‘hugs’ the shape of the fuselage without making folds, and finally mounting the receiver. I made a corrugated plastic cardboard receiver support to position the two antennas at 90°. The support is then slid in the bottom of the fuselage and blocked with some foam. I also added a small wire between the wing locking pin and the fiberglass rod on the side of the fuselage so that I never lose the pin which always remains in the fuselage.

10: The receiver tray, made of corrugated plastic cardboard

Let’s quickly move on to the programming of the transmitter to take full advantage of its quadroflap configuration, which starts with three or four flight modes: a normal phase, a thermal phase with a little camber, eventually a second thermal phase with more camber, a speed phase with the control surfaces slightly up by 1mm, no more, and a landing phase. All phases are using the quadroflap mix (ailerons to flaps) to have a better roll rate in any situation. The left slider manages the motor throttle and allows launching with the right hand (I’m piloting in Mode 1); the throttle stick continues to manage the air brakes like a ‘pure’ glider. Here we are ready for the first flight. I forgot to tell about the flying weight which is a good surprise with only 2335g including a 2500mAh 3s battery. But expect to go up to 2600g in case you decide to install the retractable landing gear and some other options.

11: The author holding the Lentus gives a good idea of the big size of the glider.

A Real In-Flight Presence!

12: Fly-by of the Lentus at the local club slope.

Let’s start with the motor, ESC and propeller combo: I liked the *Solius* and

Heron, I liked the *Lentus* just as much. The climbing rate is excellent at full speed allowing fast climbs of a few seconds under an angle of about 45°. I was able to measure a climbing rate of 7m/s. This is equivalent to about 20 seconds of motor to reach 150m. You can therefore expect 10 to 12 climbs for a 2500mAh battery, so plenty of flying time. My very first flight lasted 45 minutes with a small 1800mAh battery thanks to some small thermals here and there.

Let's turn-off the motor and observe the glider's behavior: first observation, the cruise speed is rather high, with a very good gliding ratio. The *Lentus* is stable thanks to the winglets, precise on all axes, the rudder is very efficient as the ailerons thanks to the Quadroflaps mixing! The glider clearly marks lift variations. The *Lentus* gives the illusion of a much larger glider as it swallows distances, easily crossing through sinking air areas. If the air is really bad, you can even escape quickly with the speed position. The *Lentus* can thus cover a very large flying volume, which makes thermal flying so interesting and highlights the flight strategy.

13: An elegant glider whatever the view angle.

The circle holding is very good as long as you keep a minimum speed. However, if you slow down the glider and tighten the circle too much, stall is likely to happen, so you have to stay soft, particularly with this efficient rudder. The tip stall is gentle, comes out easily after half a turn, but nevertheless surprises you the first time, so be warned! You immediately understand that the *Lentus* must be flown in three axes at low speed, you engage the turn or the circle with the ailerons and the rudder, and then you maintain the rudder in the direction of the turn with the ailerons at the opposite, as on a bigger glider. However, in thermal flight with a low bank, it is possible to fly the *Lentus* only with the rudder.

14 : Butterfly in action for a short landing!

By using a little camber, the glider nose rises immediately, so a some down trim compensation is necessary to retrieve the correct flying attitude for this flight phase. Increasing the camber (flap and ailerons aligned) increases the lift in the thermal, but also a bit of drag. I found that its use should be limited to the exploitation of thermals, the rest of the time the smooth airfoil gives a better compromise. If your radio allows it, I recommend you to program two

positions of thermal flaps which will allow you to have a position with very few flaps allowing you to explore a wide area, and a second position to exploit a narrower lift zone. On the other hand, the speed position accelerates the glider. The *Lentus* flies even faster, still as stable. This position also allows you to better ride upwind, to escape from a sinking air zone, or to do a little aerobatics.

I admit that I wasn't necessarily expecting the Lentus in this aerobatic exercise and yet the glider does rather well considering the wingspan, the aspect and taper ratio of the wing. The roll or four point roll with a prior dive to accelerate goes perfectly, vertical manœuvres such as reversal, Cuban eight or looping also. You can cheat a bit by using the motor to increase this amplitude even more. Wings bend very slightly during the resources at the beginning or the end of the manœuvres, but all in all, I found the overall stiffness at the level! Finally, inverted flight requires pulling the stick a bit with the original center of gravity, but improves if you move it backwards as the speed flight mode can also help.

Nothing to report concerning the landing phase, the comfort brought by the crow braking is real and allows to land safely on rather narrow areas. Also, if you are at high altitude and want to fly down and land quickly, just pull out everything, decide on the down slope angle and the *Lentus* will execute without accelerating until the final touch down!

21: The Lentus is posing for the camera before take-off

Conclusion

Picture 22: Onboard picture using the Mobius Mini V2 on a pod

What can I say at the end of this *Lentus* if not that it is a particularly

successful glider both aesthetically and in terms of flight performance, especially considering that it is an Elapor glider with a 3m wingspan! The RR kit is flawless with only quality components and a well thought out and perfectly made assembly, not forgetting a contained flying weight. The *Lentus* offers a very wide flight envelope for a foam glider and will satisfy a large number of pilots, although it is not aimed at the beginner, as it is positioned more as a transition or improvement glider, with real capabilities, and more glider than 'foamy'.

23: The Lentus in the snow.

Characteristics		Settings	
Wingspan	3000mm	Centre of Gravity	67 à 70mm
Length	1410mm	Elevator	+/- 12mm
Aspect Ratio	18.60	Rudder	+ /- 30mm
Chords	210 / 190 / 130 / 60mm	Ailerons	2mm up / 12mm down
Flying Weight	2300–2600g (mine is 2335g)	Flaps	12mm up / 8mm down
Wing Area	52,6 dm²	Camber Thermal Position	
Wing Loading	44–49 g/dm²	Flaps	4mm down
Number of Channels	7 (with an option for 9)	Ailerons	aligned
		Camber Speed Position	
		Flaps	2mm up
		Ailerons	aligned
		Camber Speed Position	
		Flaps	25mm down
		Ailerons	24mm up
		Elevator Compensation	3mm down

24: Summary of setup parameters for the Lentus.

In any case, I can tell you that I really enjoy flying this *Lentus*, even though I am used to competition gliders. I never get tired of doing flybys or chasing thermals. In short, Multiplex produced a beautiful glider, which will bring you a lot of satisfaction. Good flights to all of you!

25: The Lentus on the ground: an elegant glider!

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****.*

Cross Country Soaring with a Rabbit

The case for not using a retriever line when using a dolly.

John Marien

John Marien (right) with Carl Thuesen on the cross country course in Muncie, Indiana at the 2021 AMA Soaring Nationals. (photo: Wally 'By-Golly' Adasczik)

I love cross country soaring. To me, it is the best type of soaring with the most fun shared with friends working together as a team and competing against each other. Driving down the road with the wind in your hair, your hat strapped on, and using your transmitter as a bug deflector is just, well, fun! Pro tip: keep your mouth closed.

I also like the older style cross country sailplanes. Recently, I found someone selling one of these nearby. This sailplane was a Bob Sealy *Catalina* and

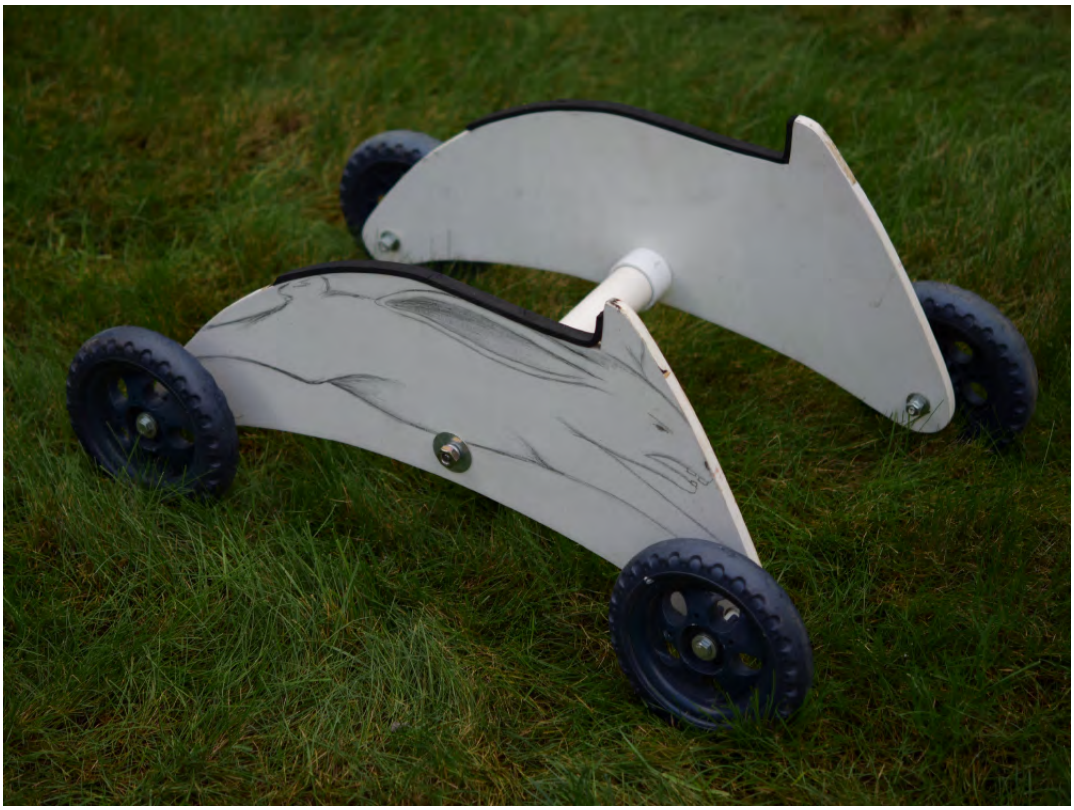
probably built in the early 90's and was rudder, elevator, and flaps. She had wear on her but still had a lot of good flights left in her. So, I bought her, took her home, and updated the radio gear, fixed a couple minor cosmetic and functional items including new batteries and a state-of-the-art telemetry system.

John Marien (left) and Jeff Carr on the cross country course in Muncie, Indiana at the 2021 AMA Soaring Nationals. (photo: Wally 'By-Golly' Adasczik)

Off to the field I went with this beauty and set off for the mandatory hand tosses to ensure the balance was right as well as the elevator neutral setting. It was during these hand tosses that I realized my aging shoulder would no longer tolerate throwing a 4kg (8.8lbs) sailplane while hanging onto the

transmitter in the other hand. Doing this on a winch seemed even more troublesome. The original owner had recommended against rise-off-ground (ROG) launching because he had experienced bad results from it. So, I was stuck with how to launch this plane by myself at a field for practice. The solution was using a sailplane dolly for launching the sailplane.

A quick message to my friend Tom Broeski — and fellow RCSD author — and the *Rabbit Dolly* was on its way to me. Now, for those that might not know what a sailplane dolly is, let me briefly describe it. It cradles a sailplane on the ground in a flying attitude. The dolly has four wheels, though sometimes there are three-wheeled version available. Tom's dolly, the *Rabbit*, had one central axle instead of a front and rear axle and this allowed the dolly to run over uneven grass that may exist on the flying field.



The Rabbit Dolly.

The idea is that you rest your sailplane on the dolly, connect the winch to the sailplane and then as you step on the pedal to activate the winch, the

sailplane's weight pulls the dolly along. Once the sailplane's wings have begun to fly, the sailplane rotates off of the top of the dolly and the sailplane is being winch launched in the usual fashion from there. That's the theory. But being an engineer, I know that in theory, there is no difference between theory and practice. But in practice, as we all know, there **is** a difference

So now let's talk about the real world.

The field I fly from is not so much of a flat field as you might think. In fact, it is the somewhat flattened top of a capped landfill that the local club has secured as a flying site. But as you leave the groomed field top, the slope all around the field goes downward at about a 50 degree angle for more than 100ft then there is a solid rock trench surrounding the landfill. Yes, they cut down until they got to the bedrock. After the bedrock trench, the slope goes upward again at a less steep climb until you are level with the original field.

The capped landfill surrounded by a solid rock trench that is my home flying field.

Mind you freshly excavated rock has sharp edges. We string our winch from the top of the field's side of the land fill across this chasm and up the other side until we are level with the winch. This takes about 300m of line out and 300m of line back. To keep the winch line from falling back into the chasm after a launch and dragging against these sharp rocks, we use a hands-free retriever. That also saves a trip down the slope to fetch the chute. As soon as the sailplane releases the winch line, the retriever is activated and drags the lines back to the winch before they fall onto the sharp rocks.

I called my friend Robert to join me and help out where needed. The *Catalina* was ready for her first winch launch. The winch was set up in our usual way and a full pedal test flight of the winch with a 4m thermal duration composite sailplane was performed and everything was ready.

"Robert, can you throw the *Catalina* as I winch it?" I asked.

"Heck no. Didn't you bring the dolly?" Robert replied.

"Why, yes, I did. Good call, let's use the dolly" I answered.

And so, we assembled the dolly and placed the sailplane on it and pulled the dolly, sailplane, and winchline back about 20ft from the edge. We were ready. In theory.

The Catalina on the Rabbit Dolly ready for launch.

Picture the sailplane sitting on the dolly, the winch line attached to the tow hook via a parachute and a retrieve line attached to the end of the bridle. I step on the winch pedal and the dolly rolls forward about 10ft picking up speed and the sailplane leaps for the sky! All good so far, but then the dolly follows the sailplane into the sky. Yikes! How strong is that wing anyway?

The *Catalina* is not only lifting itself, but also the three-to-four pound dolly easily into the sky. So, at about 30ft off the ground, I disengaged the sailplane from the winch line and the dolly falls not 30ft but 50+ft because it is now over the edge of the chasm and falls to the soft ground on the slope. That small parachute never had a chance. No damage. Apparently, the retrieve line wrapped around the front wheel axle and the rest was history. I was flying the *Catalina* from a 'short line launch' and I asked Robert to get

the dolly. Next thing I hear is the retriever running. He used the retriever to pull the dolly, which had landed on its wheels, and winch line back up the hill. At least something worked.

We decided the retrieve line was the problem and used ROG launches after that. First real flight she easily went up to 1,200ft AGL. That's when I went to full flaps (90 degrees down) to get her down and she still kept climbing since of course, she was in good lift. So, I'm flying with full flaps and the elevator fully deflected for down elevator and the sailplane is holding its altitude. Finally, I released the flaps and elevator and pulled up into a stall. From there, I went into a spin and spiraled down to about 500ft. It was more of a diving spiral than a true spin after the first two turns. That large polyhedral wing likes to fly. I made a note to increase both the rudder throw and the down elevator throw.

Then we heard the sound of an electric ducted fan motor whining and we're looking for the other plane. But there was no other plane — we were alone at the field. The MonoKote at the leading edge of the horizontal stab had separated the clear top from the color layer and was buzzing in the air as we flew and slowly peeling itself back across the stabilizer. This was the original MonoKote and it was old and brittle. A little tape fixed that — we had more flights to make. On the next flight, the same thing happened to the leading edge of the other half of the horizontal stabilizer. Same fix. I plan to cover those again with new covering, someday. All in all, five great flights easily making it to +1,200ft AGL three times according to the recorded telemetry.

What we learned that day was not to use a retriever line when using the dolly. The *Catalina* loved being launched ROG fashion. This old girl loves to fly and we needed plenty of rudder and elevator throw to keep her in a spin to get her down at the end of the day.

The *Catalina* and the *Rabbit* have become good friends and are stored next to each other waiting for another day to go flying together.

*All photos by the author unless otherwise note. 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**.*

So You Want to Be a Composite RC Sailplane Manufacturer?

Part III: Welcome to the Hotel California

James Hammond

An older 3.5m Sigma II rests in between flights. One of my later designs. (photo: Hammond Collection)

In the third of this series, I am going to continue telling my story, as it transpired, in the hope that you can use some of my experiences to avoid costly mistakes. Hopefully after reading this comedy of errors you'll go more safely along the crooked path and across the many pitfalls in your own quest. — JH

So where had we got to? OK, I remember: we'd done the factory tour, which quickly illuminated several problems — none insurmountable, plus more

importantly brought up a number of important questions which would need to be answered. The meeting then continued in the VIP Meeting room where the VIP in question, myself, had given a thorough quiz on line drawings, CAD conversion and then CNC machining.

The Facts of the Matter

I had been surprisingly well satisfied there, so I moved on to my more ‘difficult to politely address’ questions, such as how the heck were they running a factory with a very slender portfolio of two models and only two workers to make them — and this is where it got even more interesting. After a bit of hesitation, the story began to come out. What had happened is that the owner — an enthusiastic modeler and F3A flyer in his own right — had perceived an opportunity to start up a factory to make model gliders, and so without much further thought, that was exactly what he had done.

A Strega 3m F3F model heads for the timing line. My last design. (photo: Hammond Collection)

Being a power flyer, and with limited information available to him, what he had not realized is that the glider fraternity — or at least those like us, my dear readers, who tend to spend a lot of money on our toys — are really picky. A few months of copying other manufacturer's gliders had resulted in two mould sets: a very dated 3m thermal model, and a 3m scale *DG600*. Close examination of the models they had bought in, and training the workers from information available in China had given some basic construction knowledge, but as I had seen, this was sadly lacking indeed. More information found on the internet through bootleg server connections had added to the knowledge base but it was not enough by a very long shot. The models were rubbish.

Game Over

Despite aggressive sales efforts to market the copied models, the results were disappointing with just a couple of requests for free samples, and no feedback after that. During the dialogues, they'd rapidly found out that making copies of existing products was, to say the least, severely frowned upon by most of the dealers they'd approached in the west, and especially those from whom they'd ripped off the first models.

A Typhoon 2m in its element. The first of my designs and possibly the best selling moulded 2m model ever. (photo: Hammond collection)

Finally realizing that a) they did not have the unique designs that they needed to attract a good customer base, and b) in any case they did not have skills needed to make the products, followed by c) they couldn't solve those problems. The company was forced into the first processes of closing down. The real catalyst for this severe decision was not the lack of knowledge or the lack of products, but the impossibility obtaining them. This was about the point where I showed up.

A Sliver of Light at the End of the Tunnel

Following a lot of at times heated discussion, it was readily apparent that IF — and it was a massive IF — the yawning gap caused by the first two 'missing links' could be shored up, then the owner was sure that he and his team had the time, the money and the resources to do a good job. Hearing this, my interest, that had been had been emulating a depleted uranium parachute on news of closure, rapidly started to escalate again.

The very first Typhoon 2m out of the moulds. It flew very well, and is still sold. (photo: Hammond Collection)

The day ended with no conclusions; but I'd promised to give the whole thing a lot of thought, and so after checking into the horrible hotel — I'd dubbed it the *Hotel California* — the entire company of seven persons and myself went out for a nice Henan cuisine dinner — which was great — as long as you don't mind eating some *very* unusual cuisine. But the beer was good and the steamed rice exquisite. Even better was the expressions on the faces of the assembly when I revealed, finally that I had a pretty fair knowledge of Mandarin Chinese. A good night as I recall.

Welcome to the Hotel California

The iconic Eagles song rang through my mind as I checked out of the hotel at 7am the next day. The establishment had turned out to be just as bad as I'd thought. Believe me, I'm a very experienced China hand and I have stayed

in dozens of hotels all over China. I'm also not an anti-smoking evangelist, but I'd had enough. Forget second hand smoke — at the *Hotel California* I was dealing with multiple tiers of the damned inescapable toxic haze. About one and a half of every three cigarettes smoked in the world is smoked in China, and I was sure that most of them were smoked in my hotel, and more specifically in my 'non-smoking' (it said so on the door!) hotel room. At breakfast — a harrowing experience, most of the males ate and smoked simultaneously, which was disturbing to the extent that it made me feel quite unwell. Of course, I'd seen this behavior many times before, but for some obscure reason this time it affected me more than normal. Probably something to do with the 'unusual' food, good rice and great beer the previous night.

I'd already checked out so I grabbed a couple of bread rolls and bolted; exiting those toxically vaporous halls as rapidly as I could. Legging it outside, clutching my backpack I went to wait in the comparatively fresh air — where at least a dozen people were smoking but thankfully there was a breeze and I found the upwind side — fast. Happily, soon I heard the stentorian announcement of the dreaded van's imminent arrival in the distance which at least indicated that my pickup would not be late.

Could It…Would It Work?

I'd gone over the entire thing in my mind at the hotel the previous evening, and after writing down the pros versus the cons as is my habit in such cases, I'd found a lot of hope in finding a solution to the problems. I'd also started to believe that this really could be a godsend, as if I could get the standard of the models up to *acceptable*, maybe even *pretty good* standards, but keep the prices affordable, then many more people who wanted to fly moulded models would have the chance. To do that I had also realized that just about everything that had been done would need to be changed so later, in the

Company VIP room, the VIP's got down to some serious business. I had things to say and I hoped that they wouldn't be too resistant. If they had been I would have politely asked to be taken back to the airport, and that would have been it.

The Die Is Cast

Knowing that it would take far more time than I had to go through all the reasons why I wanted to do the things that would have to be done, I first gave them a simple idea: *listen to what I say, let me do the things that I want to do in your manufacturing processes, don't ask me why — and you will be happy*. The reasons, I explained, would become apparent later. I followed that with the proposition that IF they could accept that doctrine, then we would go forward, and after a really short discussion, the deed was done. I was taken to the airport, and after giving the owner some advice about the van's exhaust, and a lot of happy, waving bye-byes, I headed back to Shanghai.

Mike Evans at an F3F competition with a Strega. (photo: Mike Evans)

Epilogue

The Good

Well, I was on a mission again. I really hoped that this venture might allow models to be well-designed, well-made and sold for affordable prices. I'd hoped to do something good that would allow the many younger or not so well-heeled flyers to at last be able to enter the market. And this is how it started — as well as it could. With some effort, some time, and quite a lot of expense I taught the company — now renamed and re-invented — how to make good models and to help them along the way I designed a succession of planes that were received well by the market. Indeed, a 2m all-rounder I designed is still in high demand after over a decade in production, so I must have done something right.

I never had any commercial aspirations, I never asked for or received any

money, I paid much of my own way, including flights, and although I was made partnership promises, they never materialized. You will probably think me a fool. You'd probably be right, as things — as they tend to — took a series of nose dives during the next two years. After a year of actual sales, the company was growing quite fast and by that time they had four of my designs in production, all of which they were marketing albeit with my help, very successfully.

The Bad

Then, sporadic at first, a few concerns started to arise. I was hearing a growing number of complaints about the models. Not the designs or the performance, but rather the construction. Of course, I contacted the company to try to find out what was going on. I should add that at the time, they had attracted a number of new investors who did not know the business. At first, I was assured that the quality problems were just a temporary, training-related glitch and that things would return to normal immediately. Well they didn't. I finally found out that the new investor 'policy' was that if the models were more fragile and broke more easily, then they would be replaced more often — hence more sales. I argued strenuously against this, but alas, money talks.

Strega passes close by. (photo: Hammond Collection)

The Ugly

A short while later I was told that my design services would no longer be required, and that from that point only world champions would be qualified as the company model designers. As the final straw, to add insult to injury, the company completely removed any reference to me or my designs on their website and the credits were all reassigned to themselves. When I asked about all the promises they'd made, I was told — "oh that, well, we changed our minds…" It seemed that as I'd put no actual money in, nor yet asked for any financial returns, my 'book' value was zero despite all I'd done.

Even with long experience in China, and dealing with Chinese companies that was quite shocking, and from that point it deteriorated even further, so I

tried as hard as I could to get away from all of it. Now here I am, a long time later and a long way down the rocky road having accumulated an awful (sometimes literally) lot of experience, and running another model glider design and manufacturing business, though on completely different principles.

Sunbird down and dirty. (photo: Hammond Collection)

Water well under the bridge now, but with the benefit of 20/20 hindsight what went wrong? What should have been done differently? Given the chance, what would I have done differently?

Next time I'll tell you.

Resources

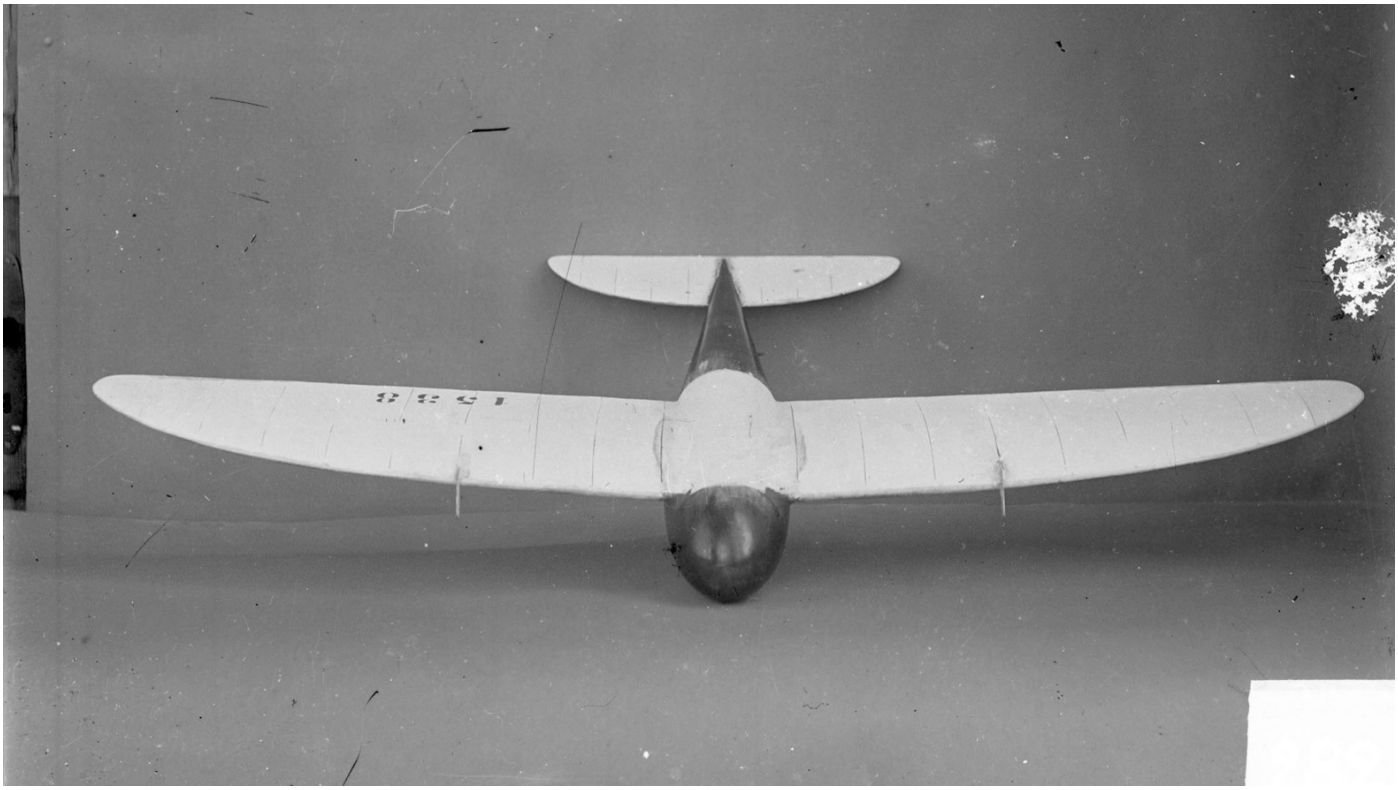
- So You Want to Be a Composite RC Sailplane Manufacturer? Part I: The Road to Perdition Awaits
- So You Want to Be a Composite RC Sailplane Manufacturer? Part II: Inside the Devil's Fireplace
- James Hammond Sailplane Design Series
- The Aeroic Sine Wave Spar

The fourth part of this series coming up in the November issue of the NEW RC Soaring Digest. *Signed up for the **RCSD mailing list** to be notified when that's out. 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**.*

Kinetic Theory and Drag

The second in a two part series which returns to an examination of first principles.

Peter Scott



A model of a Falke glider used in early, Versaille Treaty-compliant wind tunnel research in Germany, taken in 1921. (image: Deutsches Zentrum für Luft- und Raumfahrt via Wikimedia under Creative Commons Attribution 3.0 Germany [CC BY 3.0])

In the September issue of RCSD you would have found my article entitled Kinetic Theory and Lift. *I have since had an email conversation with Philip Randolph Patten about drag. He sent me his excellent paper about the subject, which triggered a need to write my own. Links to my article and to Randolph's full, and very thorough, paper can be found in* Resources *at the end of this article.*

Kinetic Theory

For those who did not read my first article here is a summary:

All gases are made up of tiny molecules, which we can call particles. At sea level the volume of the particles is about one thousandth of the volume of the gas. They move at random, on average at the speed of sound. They bounce off each other and solid objects. The hotter the gas the faster the particles move. Gases store heat energy in the form of this kinetic energy which increases with the square of their average speeds. The particles do not stick to each other but adhere a little to a solid surface. Hence the boundary layer on a wing. They bounce perfectly elastically, so no energy is lost that way.

Drag is a mechanical force. As we are dealing with physical matter, it should be possible to explain drag in terms of molecular motion as Isaac Newton did. Newton was fond of particles. He also said that light was particles, which made everyone fall about laughing until the discovery of photons.

Newton showed that force is the result of a change in momentum. Momentum is mass times velocity (mv). When a particle bounces off a solid boundary it imposes an impulse on it. An impulse, according to Newton, is a change in momentum and is equal to force times the time of contact. Newton's equation therefore is impulse Ft = mv. Divide through by t. As v/t is acceleration we get to the modern version of Newton's Second Law which is F = ma. Forces, like all vectors, can be resolved into two (or three) components at right angles to each other.

What Is Drag?

When a solid object moves through a fluid — a liquid or a gas — or a fluid moves around a stationary solid object — the object experiences a force

called drag. For a moving object this opposes the movement. In powered aircraft, the engine must produce a forward thrust as big as the drag to maintain a steady airspeed in level flight. A glider must tilt its nose downwards so a small component of its weight pushes it forward through the air to generate lift. The less drag the glider has the less this tilt — called the glide angle — needs to be and the further it can travel from a given height. For high performance gliders it can be as high as 1 in 40. For a *Bixler 3* it is around 1 in 6 in still air (a *Bixler 3* glides at about 12 knots or 6 ms-1 and sinks about 10 m in 10 s, both measured by me using FrSky telemetry).

How Can Particles Create Drag?

What follows only applies to gases, in other words aerodynamic drag. Liquids have other drag inducing effects. Philip's paper includes liquid drag which is why I wanted to write my own.

In wind tunnels, airflow is modelled using streams of smoke, or with bits of cotton, called tufts, glued at one end to the objects. The lines are called streamlines and show how the air flows round objects. They are not real lines, any more than the field lines drawn round a magnet. They are just models to help us think. These streamlines can be seen in these wind tunnel pictures (figures 1 and 2).

Figure 3 is the classic set of diagrams to illustrate flow and drag. Intuitively you can see why a flat plate at right-angles to the flow will experience the most drag. But hold on a minute! At no point does the air in the pictures actually touch the objects, only flowing round them. How then can it impose a force on them? The only force would be from the viscosity of the air which is low. The percentages are relative drag compared with the plate at the bottom.

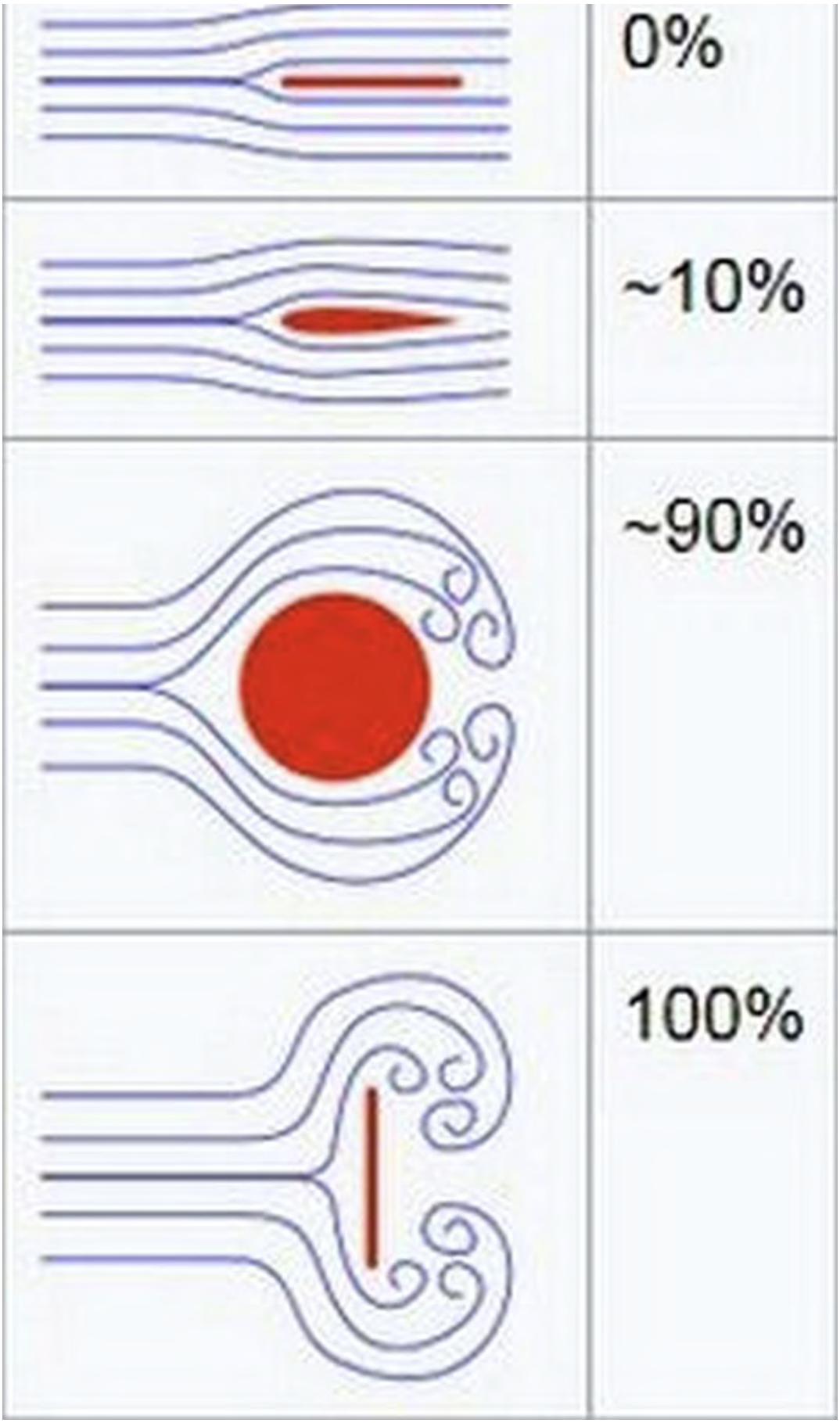

0%
~10%
~90%
100%

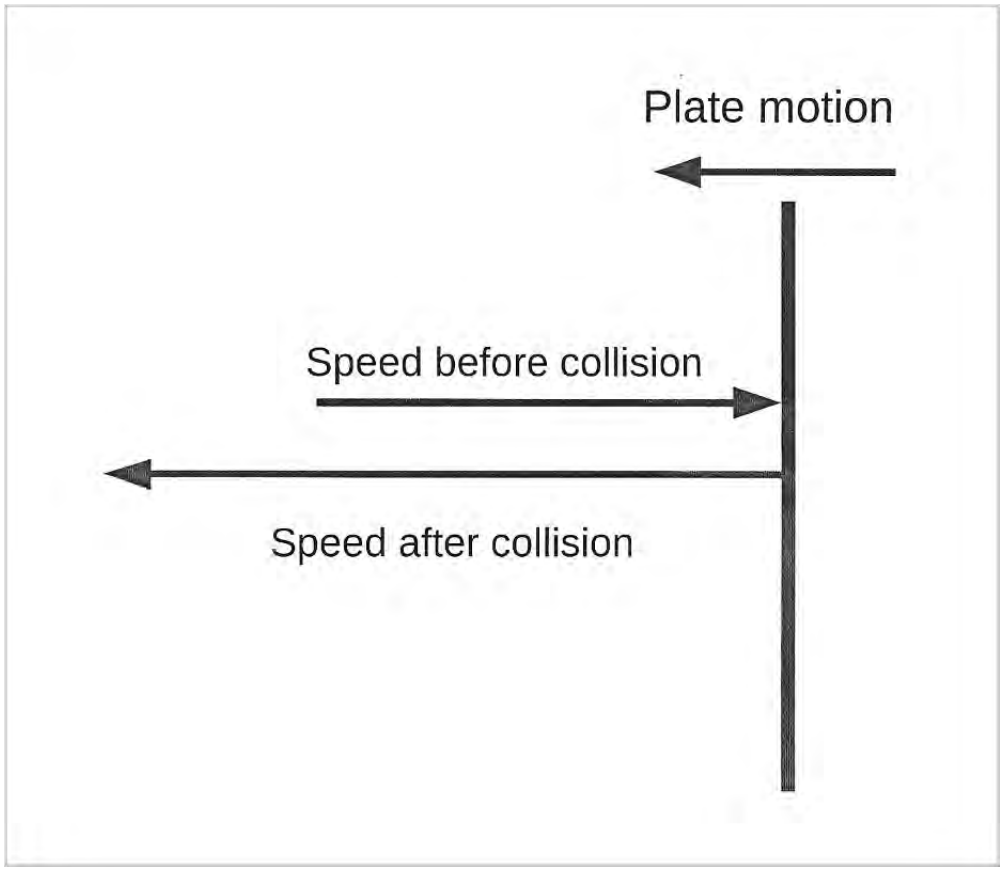
Figure 3: Flow and drag.

Notice that the frontal area is the most important. The sphere experiences little less drag than the plate despite its curved shape. The wider the object the more air particles it collides with. Patten quotes from Newton's *Principia* book '…the resistance…arises from the inertia of matter…' Inertia is mass, which is part of momentum.

How Particles Impose the Forces

Figure 4 below shows an air particle, which is itself moving, colliding with a moving plate at right angles. As its motion and momentum is reversed it imposes an impulse (momentary force) on the plate. Because it collides at right angles all of the impulse opposes the motion of the plate. The sum of all impulses are a major part of the drag.

Where a surface is curved, as in figure 5, the situation is more complicated. The particles at, or near to, path A give impulses similar to those on the plate above. Those in path C bounce at a shallow angle so only a small part, or component, of the impulse force acts in the direction of motion. Thus it makes only a small addition to the drag. Path B is somewhere in between. Again, adding up the components of all the impulses in the direction of the motion are a major part of the drag.



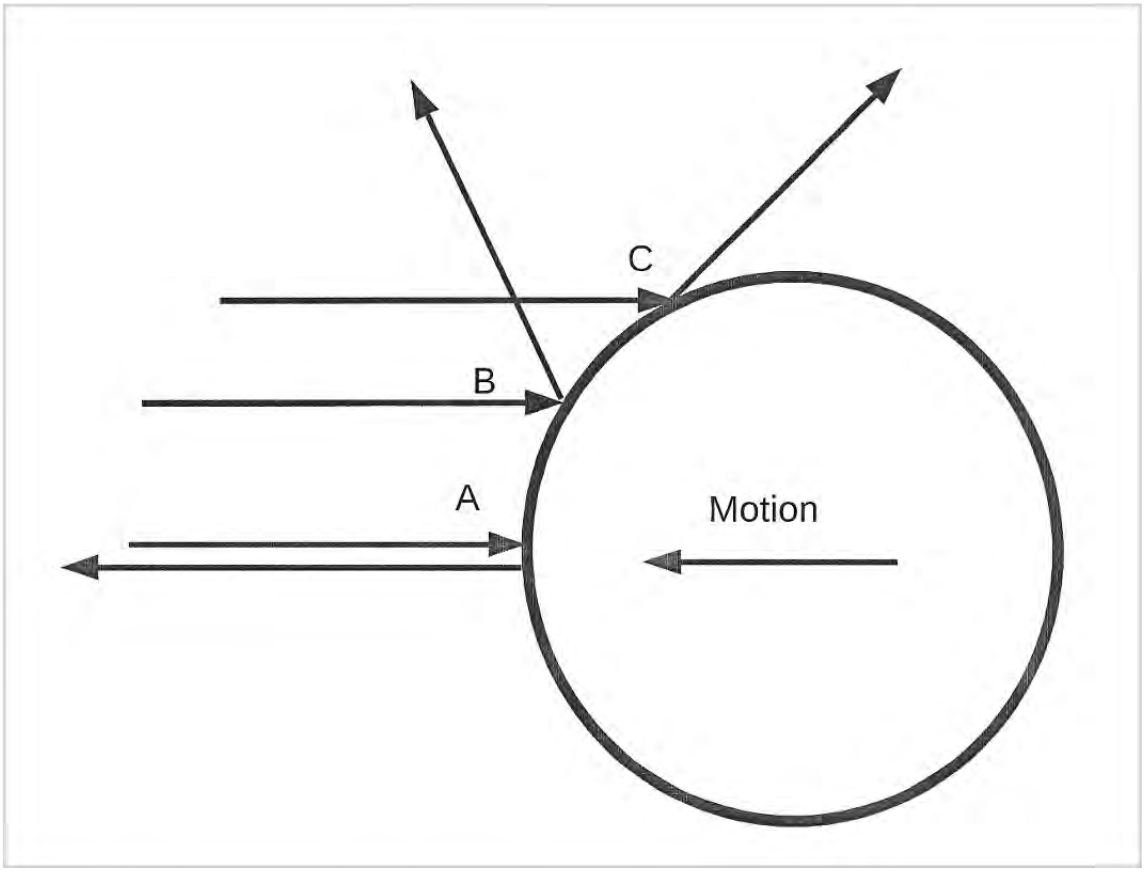


Figure 4 (left): an air particle colliding with a moving flat plate. **Figure 5** (right): air particles colliding with a curved

surface.

Aerofoils

These comprise a mix of curves. Some aerofoils are similar to the horizontal plate in the table above. These are the ones designed for high speed in, for example, the English Electric *Lightning* and the Lockheed F-104 *Starfighter*. Here the impulses are just on the front surface, which is tiny, and on the slight curvature. Of course drag isn't 0% on the wings as shown in the table.

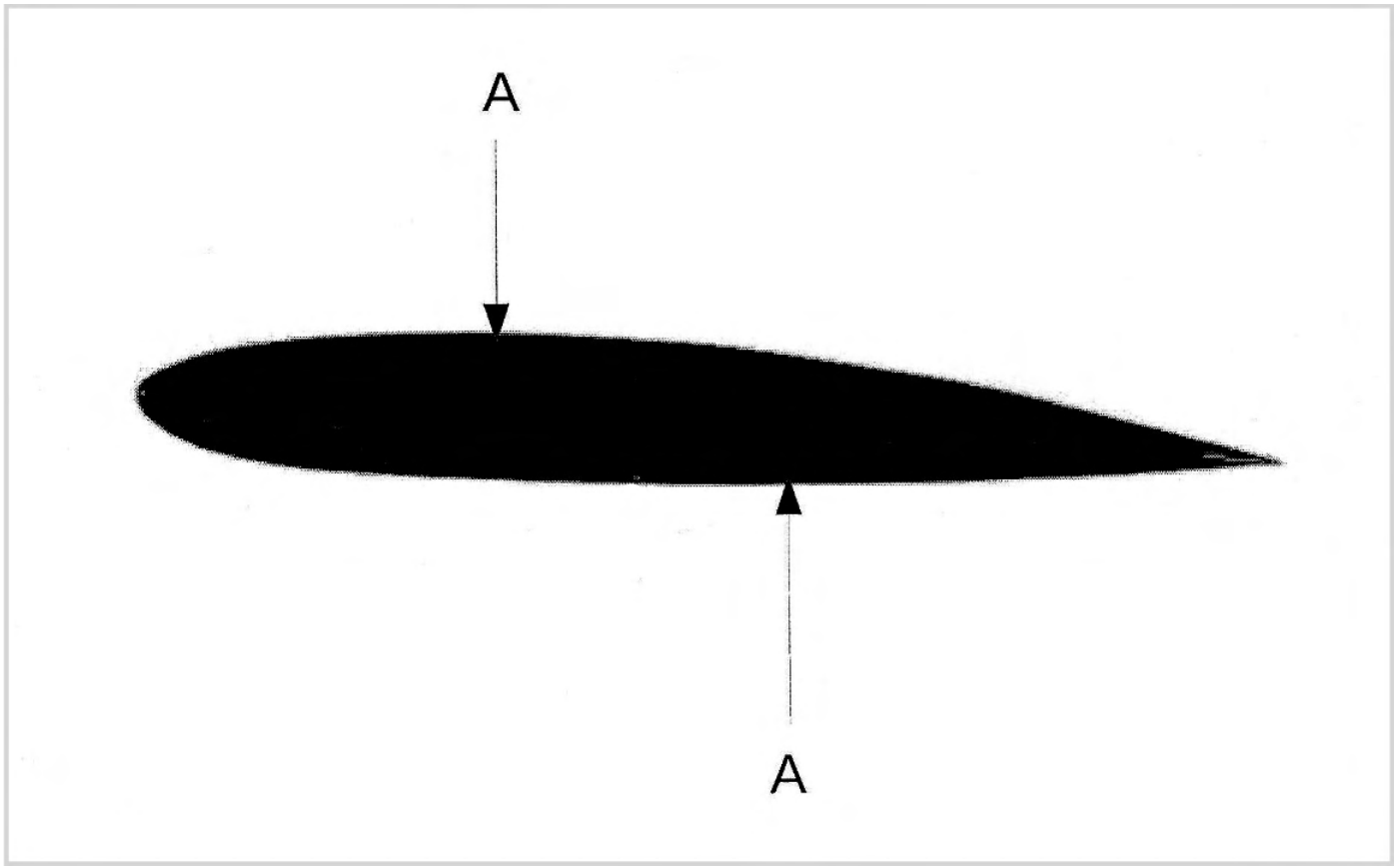


Figure 6: The arrows point to where the surface of the wing is parallel to airflow.

The A arrows point to where the wing surface is parallel to the airflow so can no longer experience a drag component from the impulses. The A for the lower surface is further back because of the tilt of the aerofoil due to the angle of attack.

Applying the ideas from the sphere you will now be able to see how the impulses push on the aerofoil to a greater or lesser degree depending on the angle at which they hit the surface.

The nature of the aircraft's surfaces will also affect drag. Anything that has a projection facing the air flow will increase drag, for example proud rivets, control surface actuators and air brakes. Howard Hughes increased the speed of his H-1 *Racer* by getting his builders to grind the rivet heads off flat. That was just before he had his spectacular crash flying it. One of the reasons for the speed of the de Havilland DH.98 *Mosquito* was the smoothness of its wood surfaces. I wonder how much speed was lost due to the tail wheel that didn't fully retract.

Another Source of Drag

There is also drag due to air viscosity. This applies all over the aerofoil including behind the points A. The viscosity of air is about fifty times smaller than water. James Clerk Maxwell and his wife did the first experimental study of gas viscosity around 1860 by measuring flow through capillary tubes. These of course have very narrow bores. Aircraft are surrounded by relatively 'free' air so we might expect viscous effects to be less. The Maxwell's work assumed that fluids flow in layers, each called a lamina. The 'friction' between the laminae is what causes viscosity. Remember this is only a simple model. The reality will be more complicated. A model is only useful whilst it matches reality. Perhaps the notions of layers and gas viscosity are an unnecessary complication?

The stationary gas layer next to a solid surface is stuck to it by adhesion and is called the boundary layer. In fluid flow in general, as you move away from the solid surface, successive layers move faster until you reach the fluid moving at full speed as shown in figure 7. You can see this clearly in liquids. It

is after all how you win at *Poohsticks* (from Winnie-the-Pooh) where you must throw your stick into the centre of the stream as it goes under the bridge, not the edge where the flow is less.

The picture is only true for laminar flow, which is where each lamina layer does not mix with its neighbours. At a certain speed however the layers start to mix, an effect we call turbulence. Going back to *Poohsticks* for a moment, it is best to use a slow flowing stream. In faster ones there will be visible turbulence making it more difficult to win. Figure 2, above, shows turbulence forming on a stalled plate.

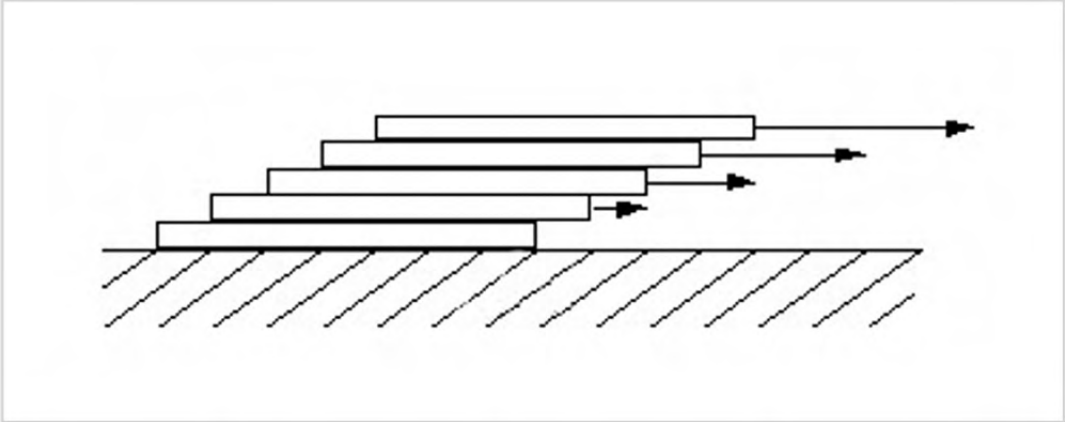


Figure 7: The effect is a speed gradient.

Viscosity, though measurable, is an abstract notion. What I wanted to do was to explain viscous drag in gases using particle impulses. Unlike liquids, gas particles have no cohesion, a word that means forces holding them together. There is a small attraction effect, one of the so-called *Van der Waals* forces. These are very small and only apply when the particles are very close.

Thought Experiments

Einstein and others used thought experiments to imagine puzzling phenomena. Newton explained how the moon stays up by imagining firing a cannon ball more and more powerfully until it was going so fast it moved no

nearer to the earth, but just went round in a circle. Einstein came up with special relativity by imagining he was riding on a beam of light. He asked what would the world look like to the light beam? Weird, but instructive, was the answer.

Can we do the same for air viscosity? I imagined myself as an air particle in the boundary layer of a moving surface. I am sort of attached to the surface but I am not still. I am vibrating and faster air particles are flying by. They do not move in straight lines but are moving at random within a kind of moving sphere and colliding with other particles. I don't duck quickly enough and one whacks into me. It's not hard enough to dislodge me but it makes me vibrate more, so my temperature goes up a little as I absorb some kinetic energy. The other particle slows a little, not only in its random motion but also linearly. I act as a drag on this particle and all the others near to it. Wey hey, there's the word — drag. I notice that this particle also collides with others further out as they go past, so the effect is a speed gradient just as shown in figure 7. And the great bonus of this is that we don't need to use notions like viscosity. It's all in the particle movement and collisions, just as Newton suggested using the term 'shear friction'.

How Can We Explain Turbulence?

At the moment I am still attached to the surface. However the surface is speeding up so the nearby particles are going faster and faster. In the end one whacks me so hard that I can no longer stay attached to the surface. Nor can my neighbours, so we all swirl around at random. Can it really be that simple? Reynolds created a simple equation in the 1880's that produces the *Reynolds Number* that defines the speed at which a fluid will become turbulent.

Summary

1/3rd Scale Mita Type 3 Production Notes

The seventh part of a twelve part series.

Norimichi Kawakami

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

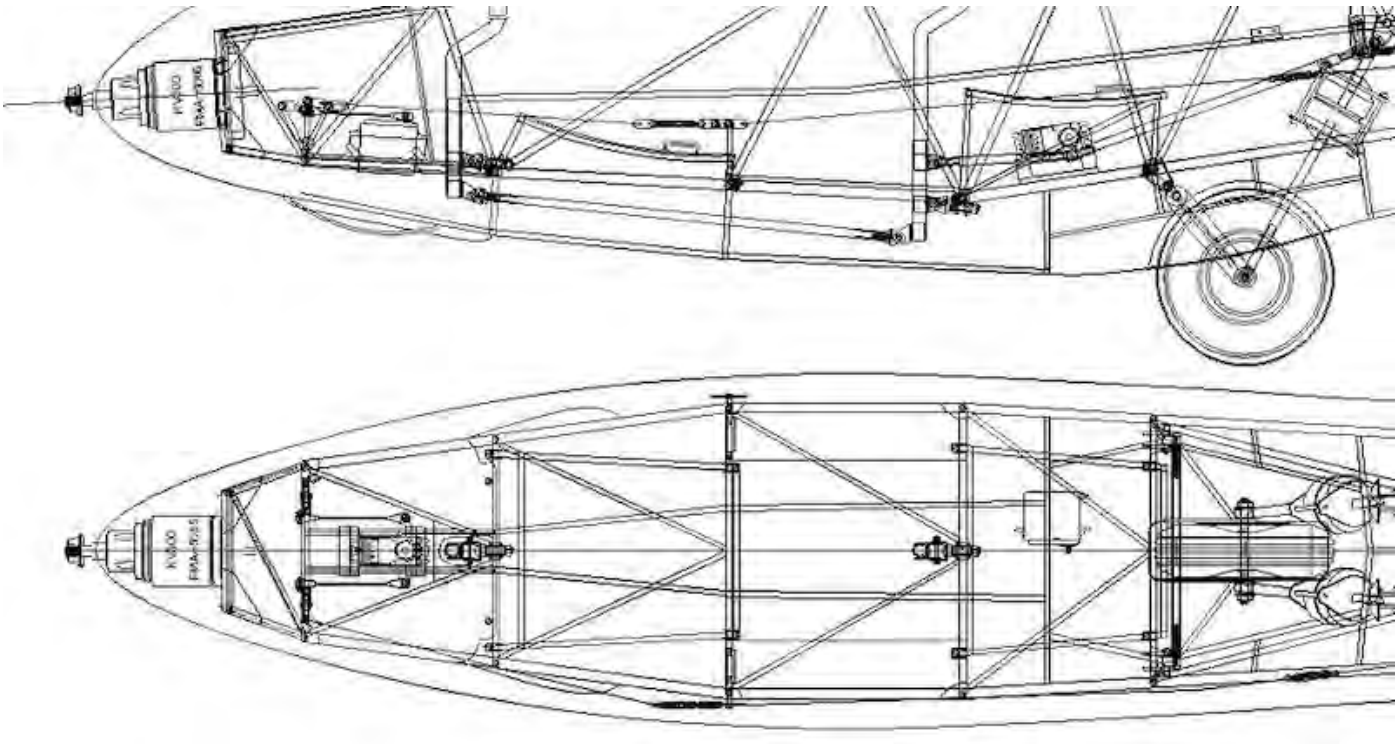
Fabrication Part 27: Seats and Cockpit Floors

Seats and Cockpit Floors of the Mita

The Mita Type3 is a tandem double-seater, so it has two seats, front and rear. The seats are made of steel tubes welded to form a frame and covered with boards, and the backs are made of cloth and can be adjusted in length

and angle. This time I made the ‘seat’.

The cockpit floors are provided to the minimum extent in order to reduce weight. The front seat has an aluminum floor in front of the control stick, and the rear seat has two thin wooden floor panels on both sides between the rudder pedals and the seat. This is what the drawing looks like.



Drawing 37: Seats and cockpit floorboards.

The seats are not rectangular when viewed from above, but have a trapezoidal shape with the back side narrower than the front. When viewed from the side, it is not flat, but concave downward. The front legs are longer than the back legs. This is because the steel tubes at the bottom of the fuselage, where the seats are attached, become higher the further back you go. Furthermore, the front legs of the front seat are tilted backward. This is probably because the fuselage structure that receives the front legs is not in an appropriate position.

The front seat simply has four short legs, but the rear seat has longer legs in

order to look forward over the head of the front seat passenger. For this reason, diagonal braces are placed between the front and rear legs in order to secure rigidity.

It is not possible to drill holes in the truss structure of the fuselage steel tubes to install the seats directly. I was curious to know how the seats were attached, and found small lugs were attached to the end of the feet, and “lug holders” were attached to the corresponding position on the fuselage structures to fix the seats. The feet touch the steel tube of the structure to support the weight, and the seat is fixed with these lug brackets. I will follow this method in the model.

Fabrication

The steel tube parts of the seat cannot be made of carbon because of its curvature. So I used 4mm diameter bamboo rods. After soaking the bamboo strand in water overnight, I sandwiched it between the jig in photo 136 and bent it to dry.

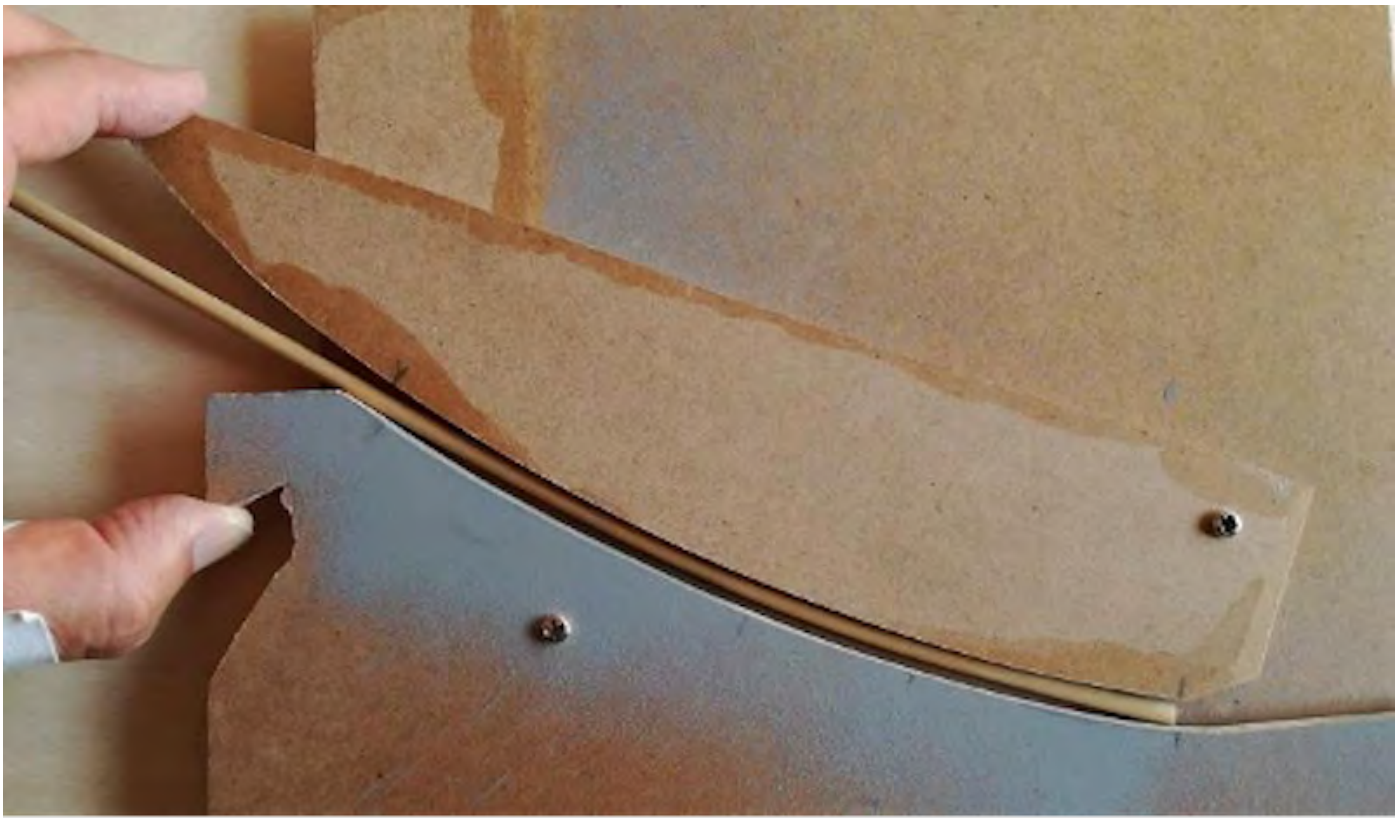


Photo 136: Jig for bending bamboo rods.

For the seat boards, I soaked 1.6mm thick plywood in water, then tied it along a curved tube and let it dry to add the bend. The bamboo strips and plywood were placed on the assembly jig (photo 137) and glued together with epoxy adhesive to make a concave ‘seat’.

Photo 137: Assembly jig for the seat board and bamboo rods.

After attaching the legs to the seat, the lugs must be attached, but they need to be aligned with the ‘lug holders’ on the fuselage. Therefore, the ‘lug holders’ were attached first.

Photo 138: The 'lug holders' attached to the fuselage structure.

These have a 2mm claw nut attached to them from the underside. I placed only the lugs on them, then placed the seat with the feet on them, and temporarily attached them with CA. After that, I removed the lugs with the seat and applied epoxy adhesive to fix them. Finally, I painted the steel pipe equivalent part white and the seat part maple.

The floorboard of the front seat is made of aluminum in the actual machine as mentioned above, but in the model it is made of 1.6mm thick plywood to avoid radio interference. In the actual model, the aluminum panel is bent around the perimeter to ensure rigidity, but this was omitted in the model. The floorboard of the rear seat is made of 4mm thick balsa.

Completed Seat and Floorboards

These are the completed seats.

Photo 139: The completed seats.

You can see that the seatboards are curved and the front legs of the front seat are tilted. When viewed from above, you can recognize the trapezoidal shape of the seats.

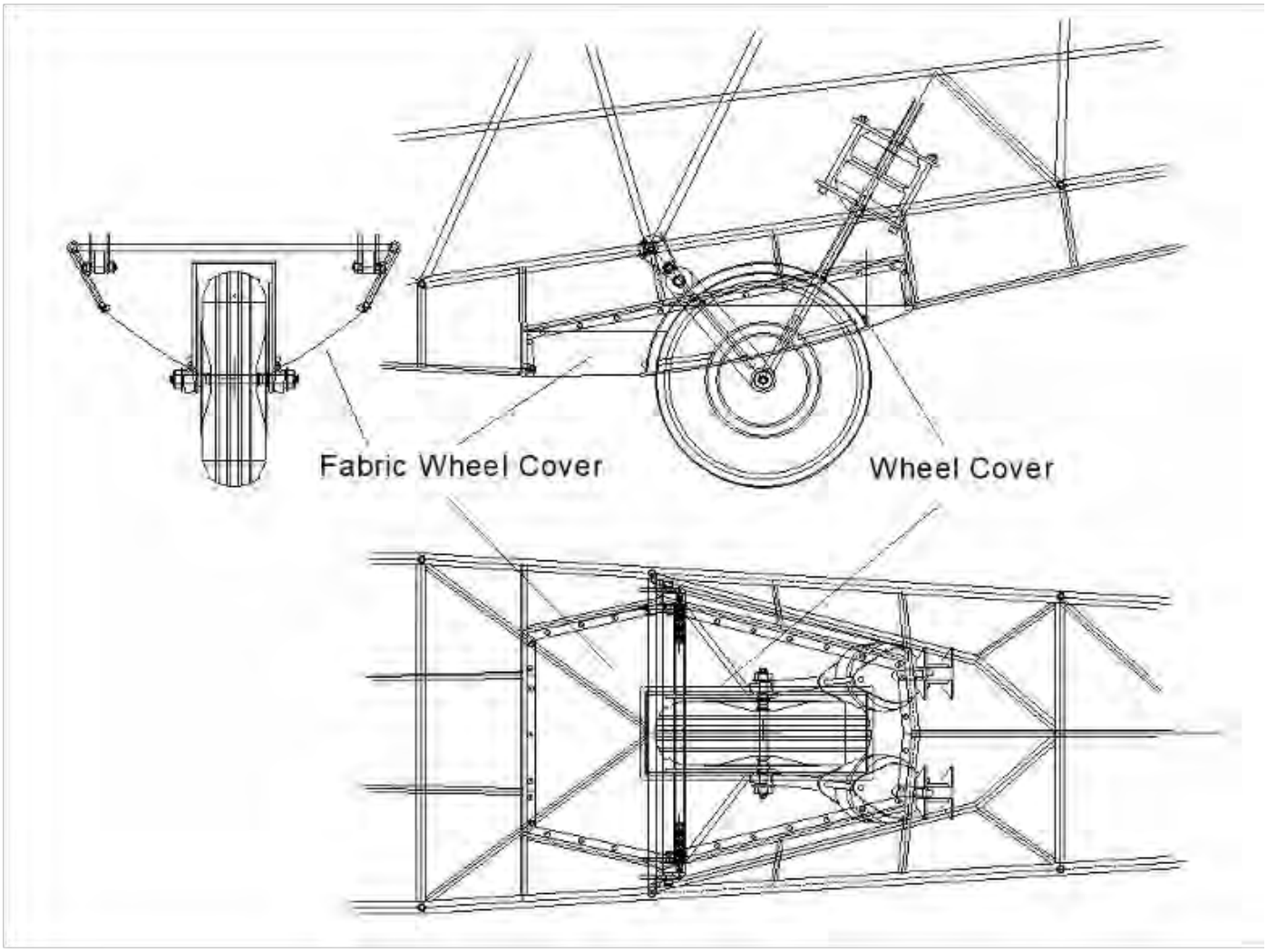
Photo 140: The seats seen from above.

The white brackets right and left at the rear edges of the seats are the shoulder harness holders. I attached them to the fuselage together with the floor plate. When the rear seat is attached, the elevator servo is hidden and it looks more like the actual machine.

Fabrication Part 28: Wheel Covers and Body Access Door

Wheel Cover

On the actual model, the upper half of the main wheel has a cover. At first, I was going to omit it from the model, but I learned from the Shizuoka Aviation Museum that the lower end of the cloth cover that covers the main wheel is tied to this cover, so I decided to install it. Here is the drawing of the main landing gear area.



Drawing 38: Wheel covers.

The top of the fabric wheel cover is screwed to the structure. The upper wheel cover of the actual model is supposed to be made of FRP, but in the model, it is made of 1.6mm thick plywood side panels and 1mm thick balsa. In the actual model, the side panels are located inside the front support plates of the main landing gear, but at the stage of making the main landing gear model, it was planned to omit this upper wheel cover, so the gap between the front support plates and the wheel was made too narrow for the side panels of the cover to fit. Therefore, in the model, side panels were attached to the outside of the support plates. The finished upper wheel cover is shown in Photo 142.

Photo 142: The upper wheel cover.

On the actual model, a cloth wheel cover is tied to the bottom of the upper wheel cover and the string is screwed to the cover to prevent the cloth cover from shifting upward. In the model, there is no space for screwing, so I put bamboo string stoppers a little above the bottom edge of the cover. The lower part of the cloth cover is planned to have a rubber ring instead of a string.

In the process of making the upper wheel cover, I came to think that the cover is not only for fixing the cloth wheel cover. If it was just to hold the cloth cover in place, there would be no need to cover the circumference, and only the lower part of the side panels would be needed. It seems to me that it plays a role in preventing airflow from entering. If there is no cover, the airflow will flow to the rear of the fuselage through the gap between the

wheel and the cover. This is because there are many gaps near the tail fins. This internal airflow will act as drag and degrade the performance of the glider. I don't know the quantitative size of this drag, but I suspect that the glider is designed with the drag as minimum as possible, which is why this cover was installed. It may also be to prevent water droplets from wet tires from entering the fuselage.

Fuselage Access Door

Mita Type 3 has an access door on the left side of the fuselage, just below the center wing, to facilitate maintenance and inspection of the internal mechanism. The door is made of aluminum plate and hinged on the lower side to open downward. In the model, this door is made of 1.6 mm thick plywood to avoid radio interference. The door of the actual model covers the fuselage, so the thickness of the door juts out from the fuselage contour. In reality, to increase the rigidity of the thin aluminum plate, the door is slightly bent with a radius around it, so it protrudes more than the thickness of the plate. In the model, the door is aligned with the fuselage contour in order to minimize drag. Photo 143 shows the completed door.

I would really like the door to go down to the bottom, but since the hinge hardware I used only opens this far, I have no choice.

Actually, painting the flat door was quite tricky. In order to get the feeling of a smooth aluminum plate, I applied sanding sealer, dried it, polished it with sandpaper №400 three times, and then sprayed white surfacer before painting. Even so, the unevenness was still noticeable, so I had to fill in the putty, sand again, and then apply the surfacer and paint.

Attachment of a Dummy Aileron Servo

Operation of the Control Stick of the 1/3 Model

The gimbal mechanisms of the control sticks are connected to the elevator servo, so they move back and forth by the servo movement. However, the aileron direction is free because the servos are attached to the main wing. Therefore, the left-right position of the control sticks will not be fixed unless some support is provided. So, I installed a dummy aileron servo for the control sticks to make them tilt left and right along with the aileron operation.

Installation

I replaced the rear gimbal mounting shaft with a 50 mm long bolt and attached a horn to the end of the shaft to rotate the gimbal with a mini servo. This shows how they are installed.

Photo 144: Dummy aileron servo installed.

The large servo next to the mini servo is the elevator servo. The control stick has not been fabricated yet, and the mounting pipe is visible. Since the mechanism is under the rear seat, it is hardly visible from the outside, so it does not spoil the feeling of the real aircraft. The mechanism was tested with a servo tester to make sure there was no problem. Now all three control systems work as in the real aircraft.

Fabrication Part 29: Release Mechanism for Winch Towing

Towing Cable Release Mechanism of Mita

The actual Mita Type 3 has two cable release mechanisms, one for winch towing and one for aerotowing. The former is installed at the lower part of the fuselage just before the main wheel, and the latter is installed just before the nose skid. Since I and my RC club do not own winches nor towing machines for gliders, I did not plan to install these release mechanisms at first. However, during the production process, I gradually wanted to try car towing if I had a chance. So I decided to make a cable release mechanism for winch towing. The cable release mechanism for winch towing of the actual machine is located at the lower part of the fuselage as stated above, but its inner mechanism is unknown because it is covered by a case. However, since the installation method is known, I asked the Shizuoka Aviation Museum to take photos of it. I decided to make it while imagining the internal mechanism based on the photos.

The release mechanism is activated by the spherical knobs located on the left side of the front and rear seats that can be pulled to open the hook. The knobs are connected to the release mechanism by a wire. The outline of the mechanism as seen in the photos are as follows.

1. The pulley at the top of the mechanism bends the wire 90 degrees downward to enter the mechanism.
2. When the wire is pulled, the hook rotates to the front side to open the lock.
3. A circular ring is attached below the hook to prevent excessive side force from being applied to the hook when the tow rope comes off the axis.
4. Two towing rods extending from the fuselage structure are attached to the rear of the mechanism to transmit the towing load to the fuselage. The towing rods form a ‘inverted V’ shape and are attached to the lower main longerons of the fuselage.

Interestingly, the mechanism is not located on the center axis of the fuselage, but about 100mm to the left. This is to avoid interference with the rear seat control stick, aileron and elevator control rods, which are located on the central axis of the lower front fuselage where the mechanism is installed. According to Mr. Kimura, the former owner of this glider, it is needed to step on the left rudder pedal significantly at the start of takeoff because of this offset installation.

Designing the Release Mechanism

Initially, I didn't think too much about it. So I cut a 2mm thick steel plate and made the release mechanism. When the upper lever is pulled up by a wire, the lower hook is opened by a cam mechanism.

Photo 145: Prototype of the release mechanism: closed (left) and open (right).

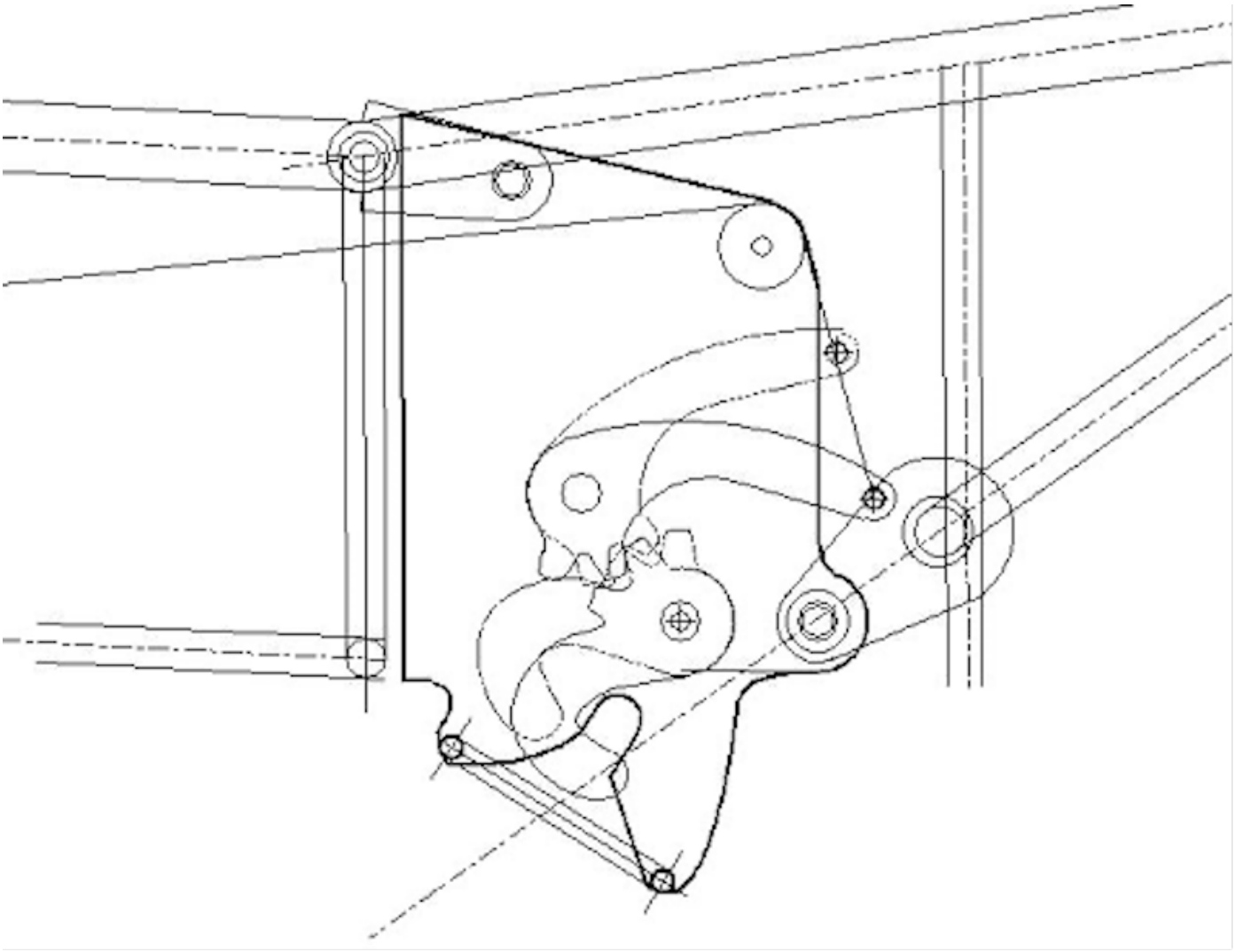
This prototype helped me to understand the main points of the design. The prototype has the following problems:

1. When the tow rope is attached to the hook and tension is applied, the load is applied in the direction of opening the hook.
2. The wire can pull up the lever, but it cannot close the hook.

The solutions for these problems were as follows:

1. The rotation axis of the hook should be placed on the line connecting the position where the tow rope hangs on the hook and the center of the circumferential hook.
2. The lever or the hook should be equipped with a spring and they must be connected so that when one of them returns, the other also returns.

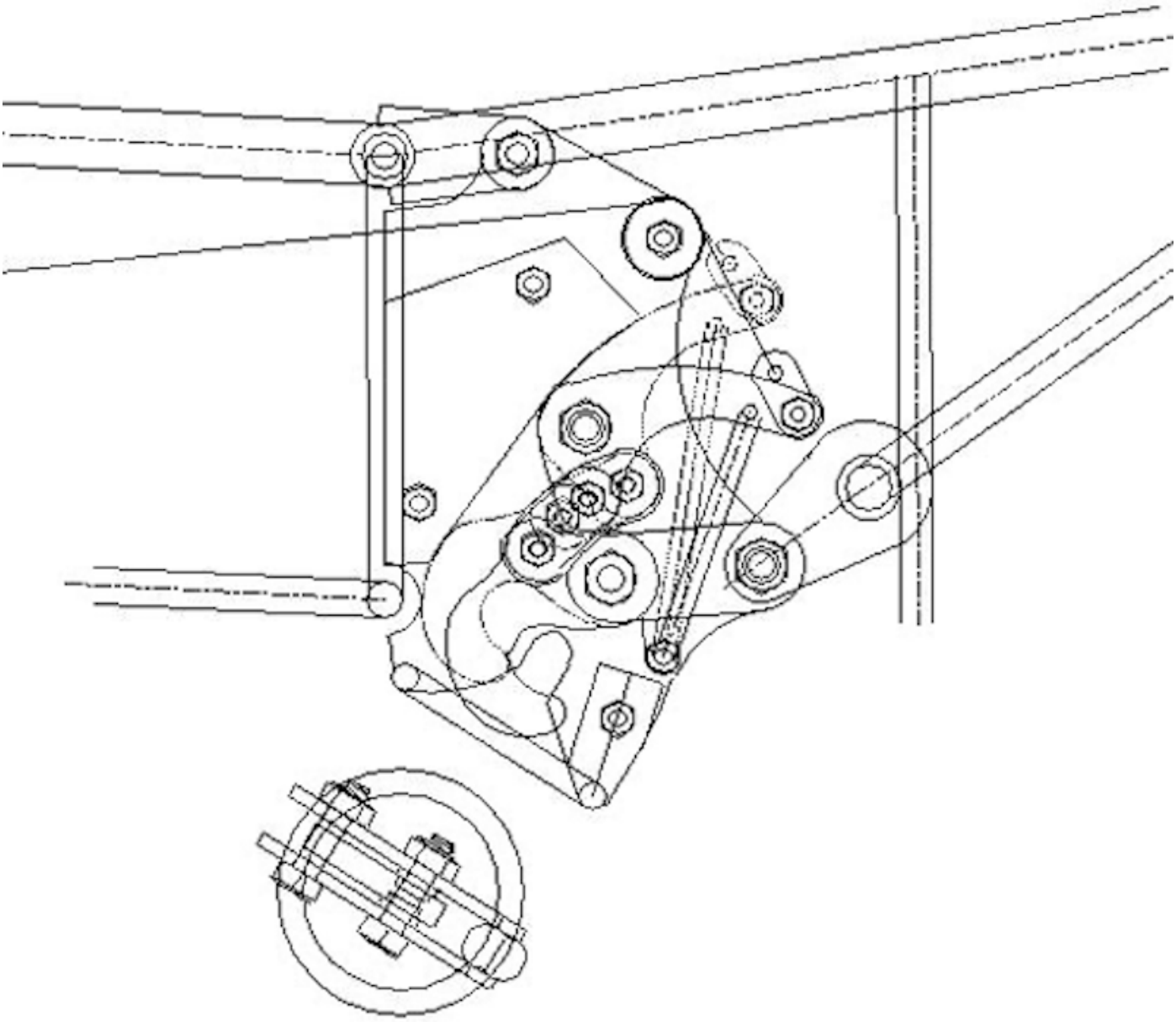
I reconsidered the mechanism with the above conditions in mind. The first thing I thought of was a release mechanism using the same cam system as the prototype.



Drawing 39: Cam type release mechanism.

The cam is geared to meet the requirements of problem 2, above. This way, if you attach a spring to the lever, the hook will return with it. However, a small cam requires a certain level of precision.

It would be difficult to make this by hand. So the next idea was to use a link-type release mechanism.



Drawing 40: Link-type release mechanism.

The lever and hook are connected by a small link. The lever is pulled upward by a wire through a pulley at the top, and it opens the hook by rotating the hook clockwise through the link. A small spring is attached to the lever to return it to its original position when the wire tension is lost.

These mechanical parts are assembled between the two side panels left and right. The side plates enclose these parts and also transmit the tension of

the tow rope from the hook to the fuselage. For this purpose, the rear part of the side plates are like a lug, and two tow rods extending from the fuselage side are connected to it. Between the rotating shaft of the hook and the lug, two reinforcement plates in the shape of a band are attached right and left to prepare for the towing load. A ring is attached to the underside of the side panels. This design seems to work more accurately than the cam type, even if it is made by hand. So I decided to make the mechanism with this design.

Fabrication

First, I cut out the parts:

Photo 146: Parts of the release mechanism.

The lever and hook are cut out of a 3mm hard aluminum plate. The link that connects them is made of 2mm aluminum. DURACON bearings are inserted into these mounting holes. The pulley is a 9mm diameter one that I had on

hand. The side plates are made of 1.5mm aluminum plates, and since the two plates are assembled with a 5.5mm gap between them, I made spacers with MDF plates of the same thickness. For the ring, I used a steel ring with a diameter of 25mm, which I found at Home Depot attached to the end of a chain.

Assembly Completed

I assembled above parts, but since the parts themselves were cut out with a hand saw and file, and the holes were drilled with a hand drill, the accuracy was limited. As a result, the lever and hook hardly moved at all during the first assembly. It took quite a bit of work to carefully find and fix the points that were hit and file them little by little, but finally the hook started to open and close smoothly. Photo 147 shows the release mechanism that was finally assembled.

You can see the pulley and spring on the rear side. The two ends of the spring are parallel, but for installation reasons, the spring was twisted 90 degrees, which caused the spring to twist slightly and the lever to lean to the left. I'll fix this later. This is the open/close test of the hook.

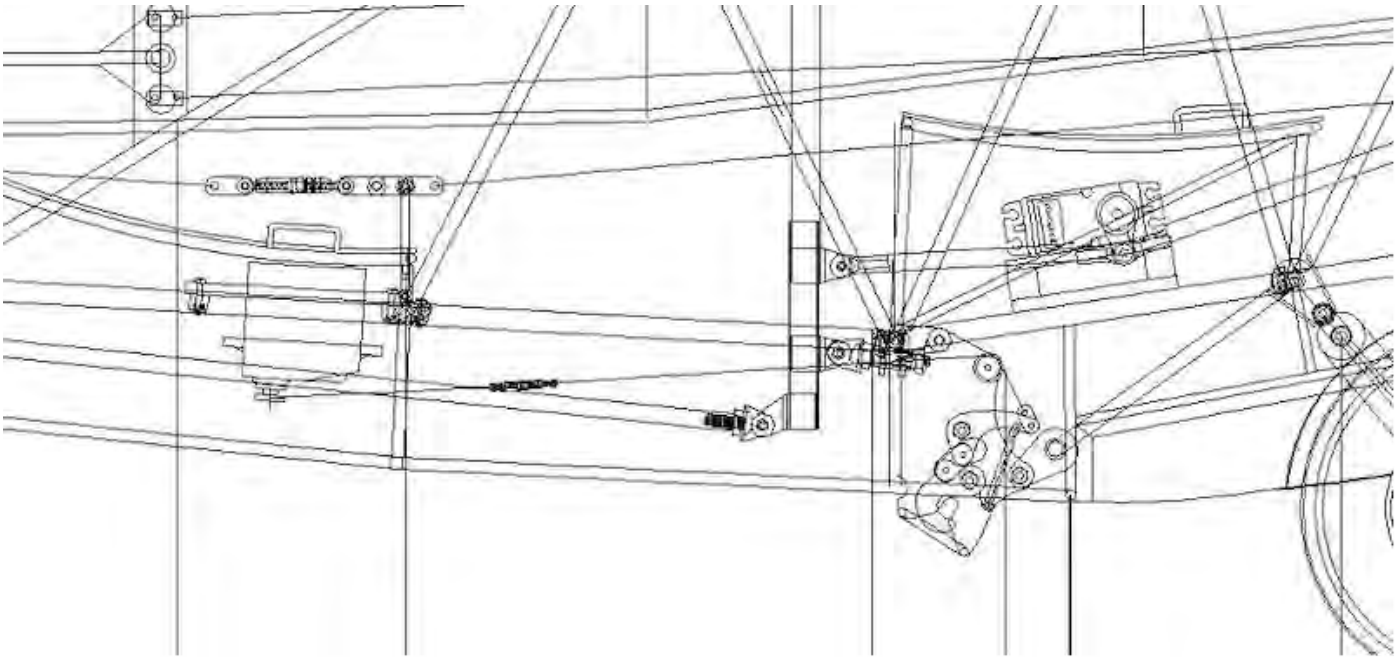
Photo 148: Hook open/close test: open (left), closed (right).

Later, before installing the mechanism, I found the ring was easily detached, so I modified it. Since the side plates of the mechanism are made of aluminum, the ring cannot be soldered. I bought some metal glue to attach the ring to the side plates, but once it was attached, the mechanism could not be disassembled. Since the inside is a linkage mechanism, I have to be prepared to disassemble it in case of failure. To solve this problem, I attached 1mm thick brass plates on the outside of the side plates (Photo 149) and soldered the ring to it. This will maintain the disassembly condition. It took a lot of work, but the mechanism is almost as expected.

Image 149: Release mechanism with brass plates.

Installation Drawing

The release mechanism is attached like this:



Drawing 41: Attachment drawing of winch towing cable release mechanism.

The mechanism is mounted on the truss where the rear stick gimbal is mounted, a little over 30mm to the left of the centerline. The tip of the mechanism sticks out of the plane. The rear of the mechanism is attached to a carbon mounting bracket. From the mounting bracket, two rods extend in an “inverted V” shape and are attached to the left and right longitudinal members of the lower fuselage. These rods transmit the traction force of the winch. The upper part of the mechanism is fixed to another mounting bracket coming out from the truss bar where the gimbal is attached.

The servo that opens the hook is located under the rear of the front seat. A mini-turnbuckle, which is not found in the actual model, is attached in the middle of the wire for ease of installation and removal.

Minor Modifications to the Fuselage and Fabrication of the Attachment Structure

The fuselage was assembled without taking care of the release mechanism, so I made some modifications before building the mounting structure. First, I

removed the parts that were in the way of the mechanism attachment area. For this purpose, I removed the diagonal part toward the rear gimbal mounting axis and the part extending backward from the bottom of that part as shown in photo 150.

Photo 150: Parts to be removed.

There, I assembled the mounting structure for the release mechanism:

Photo 151: Assembly of the release mechanism mounting structure.

The photo above is difficult to understand, so I turned the fuselage over and took a photo from the underside.

Photo 152: Back side of the release mechanism attachment structure.

You can clearly see how the ‘inverted V’ rods that transmit the traction force are attached. On the lower side of the photo (nose side), there is another fitting that supports the upper part of the release mechanism.

Installing the Release Mechanism

With this preparation, the release mechanism was installed.

This is how the servo is positioned:

Photo 154: Release mechanism and its open/close servo.

When the release mechanism is attached, it becomes more mechanical, which is quite nice.

The servo is the same as the one used for the spoiler, with the following specifications:

Name	FUTABA S3151	Digital Servo
Torque	3.10Kg-cm	(@4.8V)
Speed	0.21Sec/60°	
Weight	42g	
Size	40.5×20.0×36.1	(L×W×H)
Bearing	Single bearing	

Fabrication Part 30: Fabric Wheel Cover

Mita's Fabric Wheel Cover

Zuk (canvas) cover is attached around the main wheel of the Mita Type 3. The upper end of the cover is held by a thin aluminum plate and screwed to the fuselage structure, and the lower end is tied to the lower part of the wheel cover with a string. Drawing 38 shows how this is done.

Fabrication

The cover of the real aircraft is made of zuk, but it is too thick for a 1/3 model, so I cut up some old chinos and used them. The cover has a three-dimensional shape, with a rectangular top and a nine-sided base. Moreover, the base of the cover is not on the same plane. There are severe undulations. It is quite difficult to cut out a shape from a single piece of cloth that fits this shape perfectly.

First, I drew a development drawing, and then cut out the shape from the scrap cloth and tried to make it fit the fuselage. However, due to fabrication

accuracy problems, the cloth did not fit perfectly. I took the actual dimensions from the real thing and corrected the development drawing before cutting out the cloth. Even so, the first piece of fabric I cut out was not long enough to form a shape.

This is the picture of the finished product after I revised it again.

Photo 155: Fabric wheel cover.

The top is made into a bag around the perimeter, and an elastic cord is passed through the bag and tied to the bottom of the wheel cover. I folded and sewed the baggy part, but as I haven't used a needle since elementary school, the needle marks were uneven and messy, so I decided to glue it. Around the hem area, I folded thin aluminum plates with a width of 5mm, sandwiched the cloth, and screwed them to the structure side. Photo 156 is what it looks like when viewed from above.

Photo 156: Fabric wheel cover seen from above.

You can clearly see the overall shape. This is what it looks like from the back side (inside the fuselage).

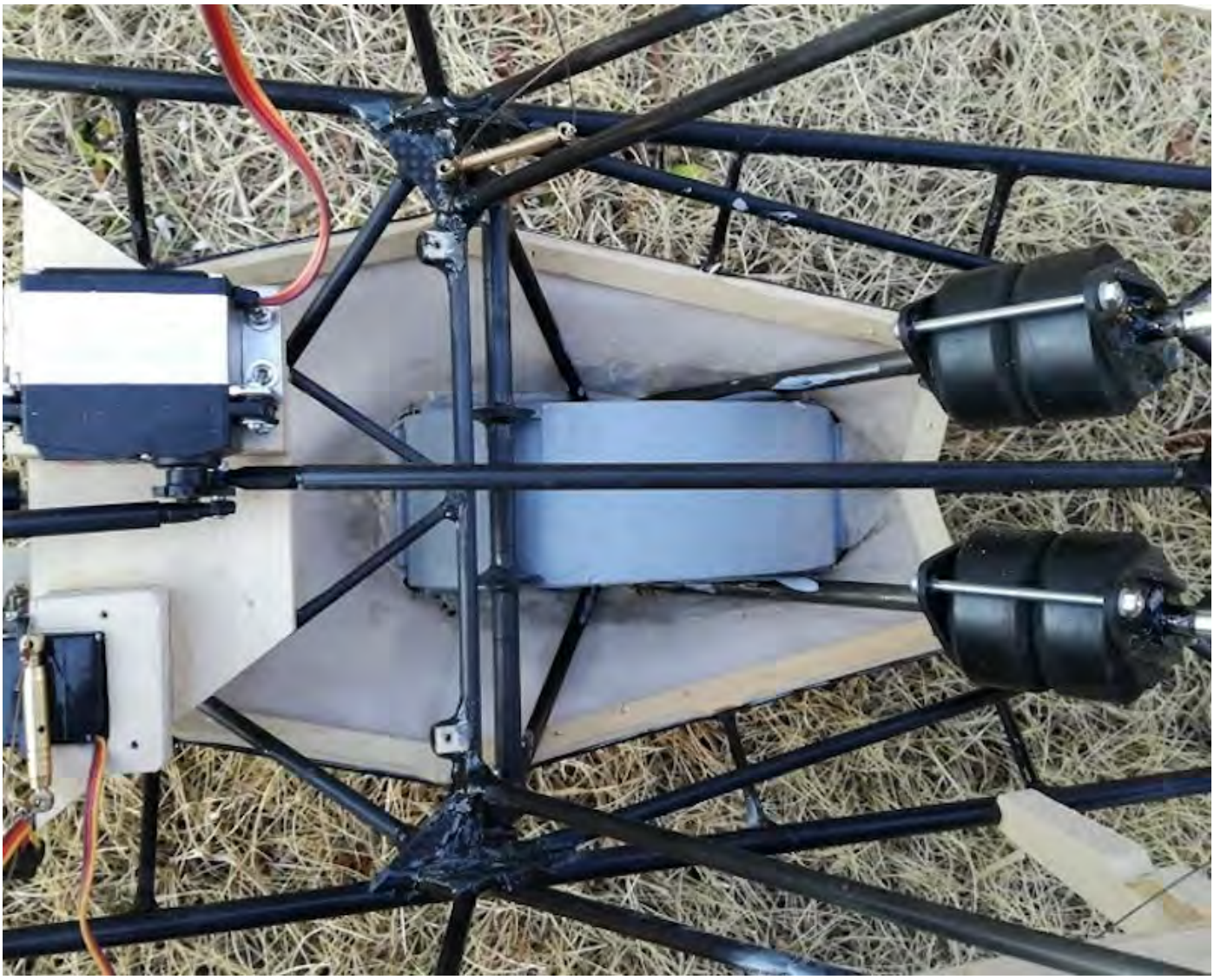


Photo 157: Wheel covers from the inside of the fuselage.

Drawing of the Nose Cowling

I started to make the FRP cowling for the nose. This is the first experience for me to make FRP parts. I proceeded through the processes gathering various information on the internet.

Cowling fabrication requires following processes: 3D shape drafting → wooden mold fabrication → female mold fabrication → and FRP resin application. The first step is to draw the three-dimensional shape.

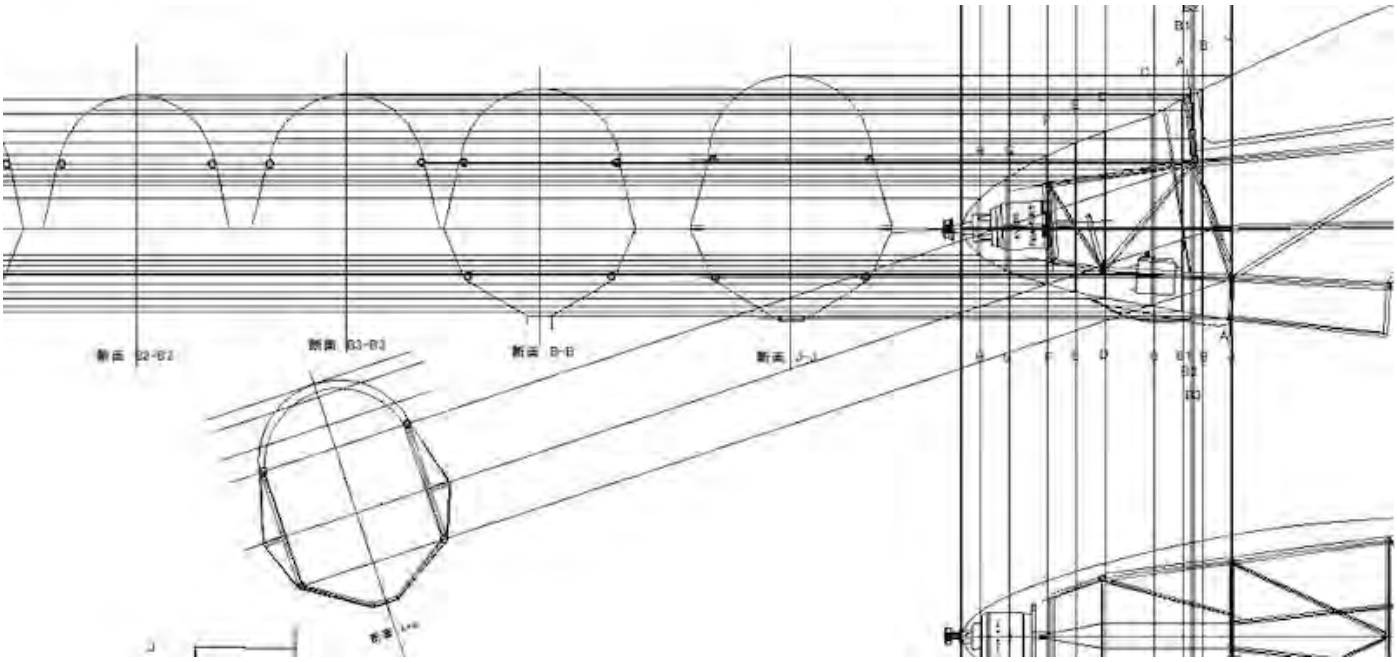
Nose of the Mita

The nose of the actual Mita Type 3 Revision 1 is covered by an FRP cowling. The rear part of the cowling that connects to the fuselage structure has a cross-sectional shape of the semicircular canopy on top of the octagonal fuselage structure, but the tip is oval. In other words, the cowling is a three-dimensional structure whose cross-sectional shape deforms in complex ways. A 3D drawing of the structure is required for fabrication.

The fuselage structures I have built so far are octagonal, and I was able to create the cross-sectional shape from the plan and side view, but this is not possible for the cowling. If I could use 3D CAD, this work would be relatively easy, but since I can only use 2D CAD, I must design the 3D outline shape of the cowling with it.

Creating the Primary Cross-Sectional Shape

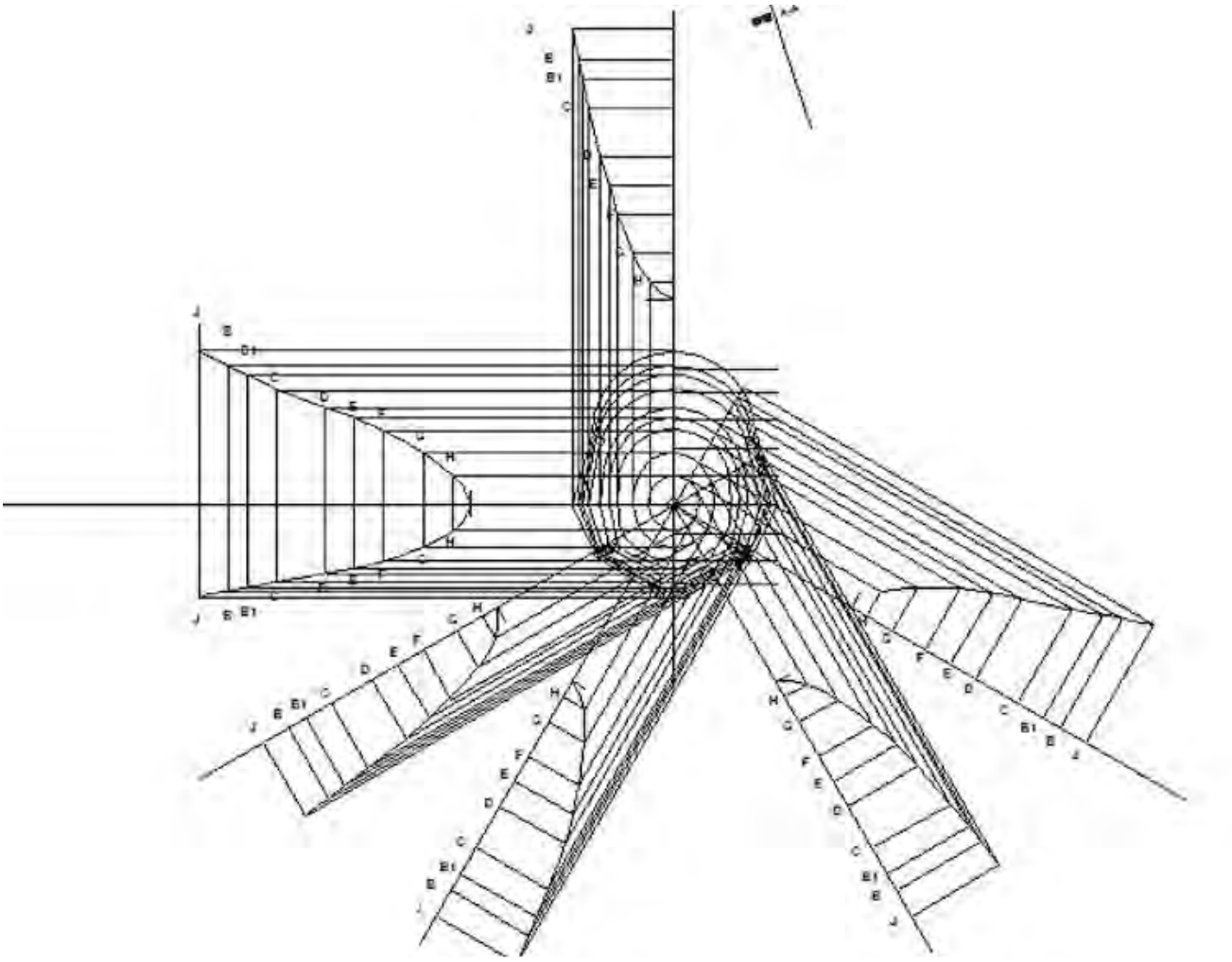
First, I cut the cowling vertically in several places in the side view and drew the cross-sectional shape of the area while imagining it. From the plan view and the side view, I picked up the parts where I could see the width and height of the structure, and drew lines imagining the space between them. I was careful not to touch the motor or mounts that are wrapped in the cowling. The rear end of the cowling is not flat, but bent like a folding screen, so draw a cross-sectional view (cross-section A-A) of that part as well.



Drawing 42: Primary drawing of the cross-sectional shape of the nose cowling.

Checking and Correcting the Undulation of the Cross-Sectional Shape

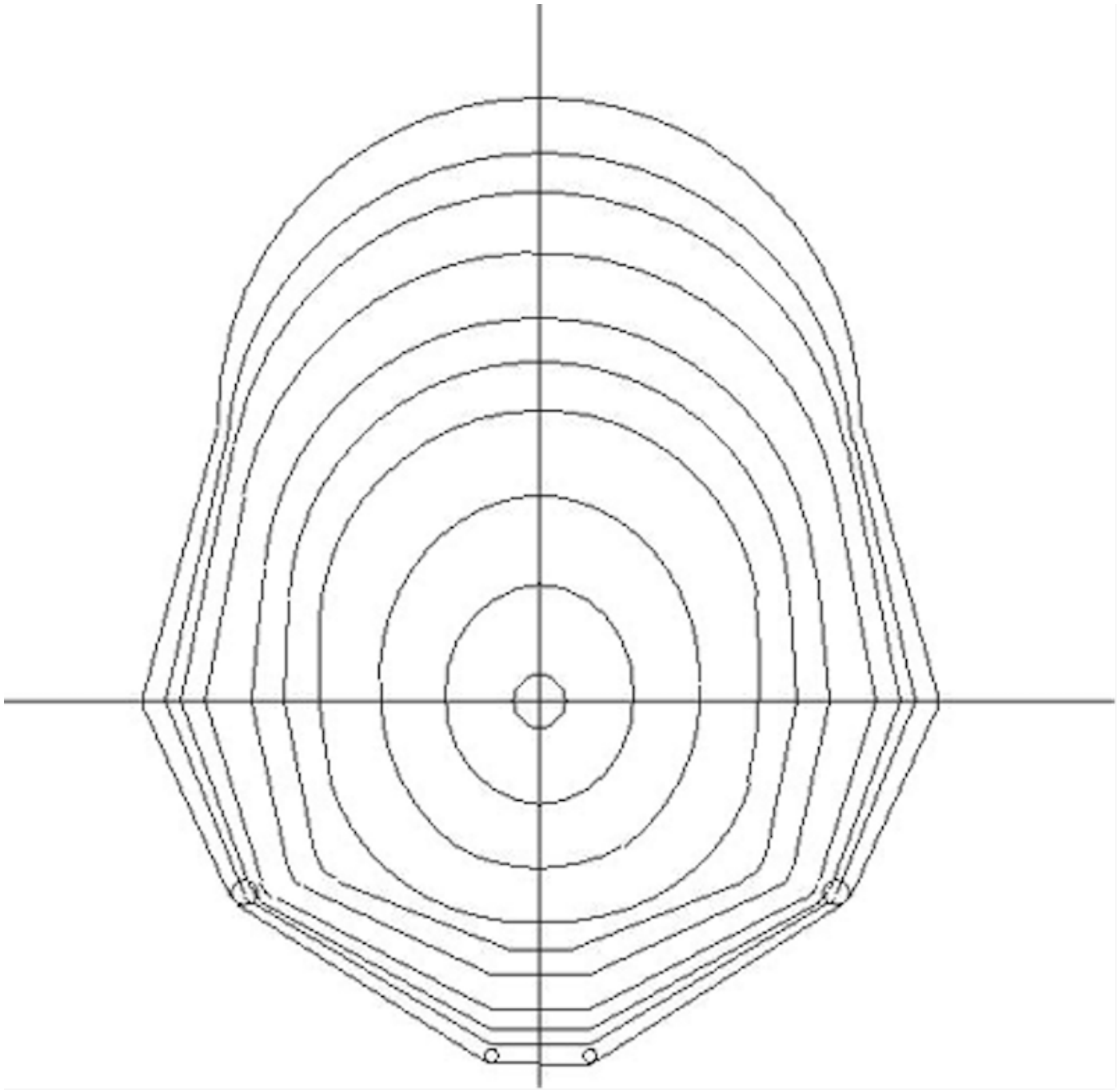
There is no guarantee that the cross-sectional shapes drawn in such a way are smoothly connected. Therefore, I piled them up and made radial lines every 30 degrees from the front, and drew seven longitudinal section drawings by finding the intersection points with the cross section drawing (Drawing 43). If there was any undulation in the longitudinal section drawings, the cross-sectional drawings were modified. In this way, I found the cross-sectional shapes that are smoothly connected.



Drawing 43: Checking the undulation of the cross-sectional shape.

Completed Cowling Cross-Sectional Shape Drawing

In this way, the cross-sectional shape of the cowling was finally completed:



Drawing 44: Cross-sectional view of the completed nose cowling.

Fabrication Part 31: Wooden Mold of the Nose Cowling

Making the Wooden Frames

Using the finished 3D shape drawing of the nose cowling, I cut out the parts

that would become the wooden frames from balsa wood. There are 11 cross sections and 4 cross sections at 90 degree intervals cut lengthwise. The skeleton was divided into two longitudinal sections, each of which was assembled and then pasted together. This is to make it easier to stand the cross-sectional parts at right angles. A skeleton was made by assembling these parts.

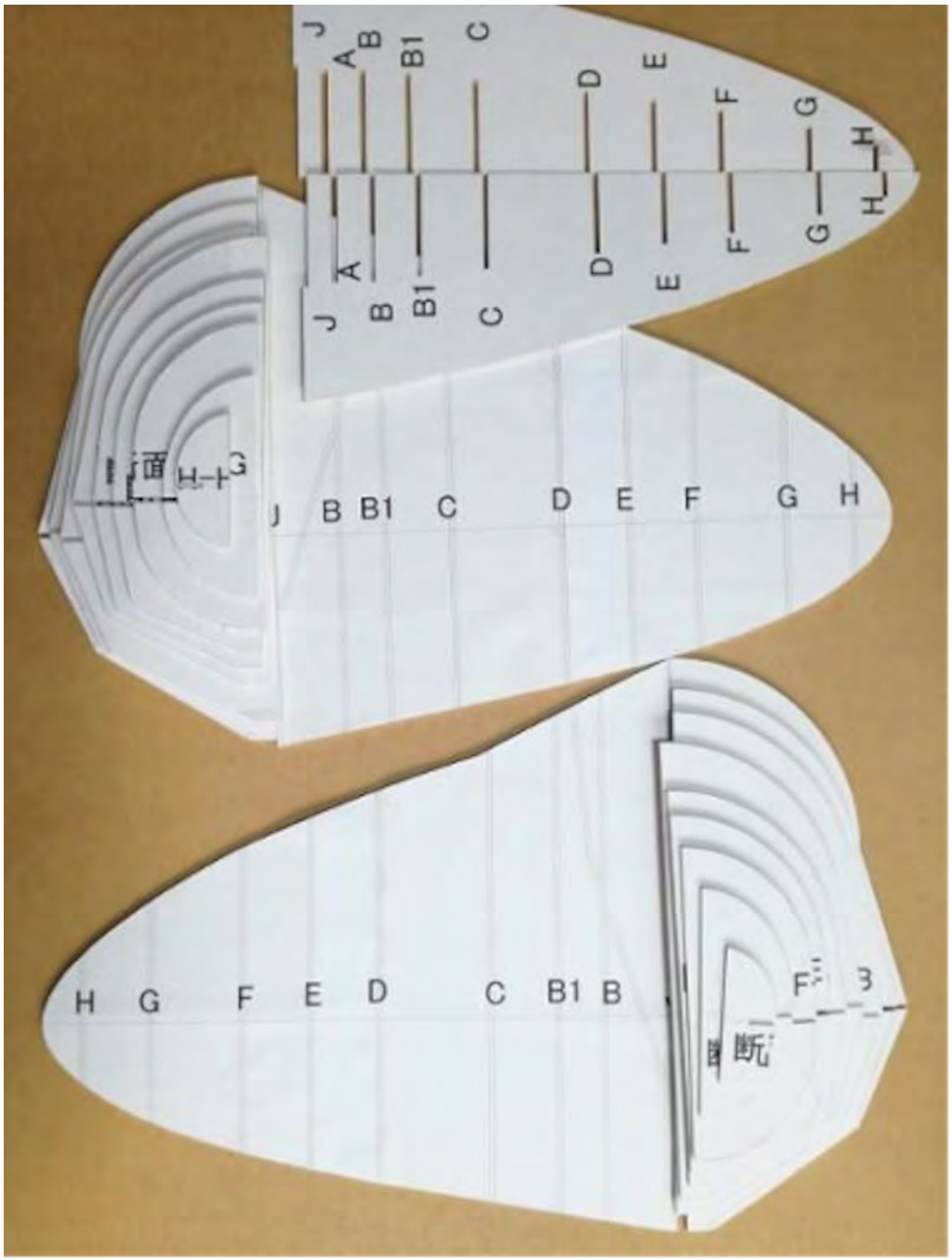


Photo 158: Cowling wooden skeleton.

Pasting and Shaping the Outer Surface

There are various ways to make the outer surface, such as filling the spaces between the skeletons with styrofoam or clay. At first, I thought styrofoam would be easy, so I went to buy some styrofoam, but I couldn't find anything suitable, so I bought some clay. However, I needed a lot of clay to fill the

spaces between the skeletons. I thought about filling the center of the skeleton with dummy stuffing and then filling it with clay, but since I had no experience with clay, I didn't know how much it would shrink when it dried, I began to feel uneasy. So I decided to use balsa, which I was familiar with, to fill the spaces between the skeletons. After roughing the surface, I filled the large holes with putty and shaped them.

Photo 159: Pasting and shaping of the outer surface.

So far, so good, but from then the hard work had begun. In order to be used as a wooden mold, the surface must be smooth and free of any dents. Since the final shape was created from a polygon with many balsa boards between the skeletons, I had to file, fill in with putty, and apply a sanding sealer over and over again. When I applied the lacquer surfacer after I thought I had completed much of the work, the small scratches, dents, and undulations on

the surface came out clearly. I had to start the process all over again from sanding.

This is what I managed to get close to completion:

There were still a few minor dents, so I had to fill them in and then polish it up with some 1000-grit water-resistant paper.

After this, I was going to make a female mold from plaster, but I changed my mind to gain experience with the simpler center wing fairing first, and then start on the nose cowling.

By doing some research, I found that there were many cases where the wooden mold did not come out of the plaster mold properly, and the mold was broken.

If the FRP cowling does not fit well with the fuselage, it may be necessary to go back to the wood mold and fix it. In fact, I wanted to make the mold to match the actual dimensions of the fuselage structure, but the motor mount was in the way and I could not measure the actual dimensions well. So I had no choice but to make the wooden mold according to the drawing. If the accuracy of the fuselage structure or the mold is not good, I will have to modify the cowling or the structure.

*This is the seventh 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**.*

I'll Get a Real Job Tomorrow!

A missive from across the decades about the decidedly mixed blessing of being an RC glider manufacturer.

Bob Dodgson

Flying the Maestro across the street from our Camano Island home/factory in about 1974 or 1975. My parents still owned the farm where I grew up so I could just walk over there across the street with my gliders and fly, test and evaluate them in private. I liked to test the flying characteristics and structural integrity of my designs away from prying eyes so I could correct problems before the designs were seen in public.

From the constant flurry of new and eager entrants, you know that the glider kit manufacturing business is a great business to get into. The joys of seeing your designs fill the contest skies and even win a contest now and then has got to be a real hoot. Being able to be a modeler full time, to talk gliders all day long and not have to go to work is every glider flier's dream.

This dream has been my life for twenty years now. As far as I know, I am the sole (glider kit only) manufacturer who has been able to sustain this dream for more than a few years. The others enter the field with the dream fresh and the enthusiasm high only to fade away, with a few of their creations dustily hiding in forgotten closets as the only clue that a dream once lived, soared with the eagles and died. The few glider kit manufacturers who survive, branch out into other, more lucrative phases of the hobby. They switch over to the manufacture or marketing of power kits, electrics, helicopters, adhesives or radio gear where the profit margins are more reasonable and where the potential market is much larger.

Holding the Todi in our house back yard on Camano Island overlooking the Saratoga Passage about 1973. The garage/factory was about 100 feet beyond the house.

What are the problems and frustrations with this seemingly idyllic dream that can turn it into a nightmare? Why is it that a long-time veteran like myself would even consider leaving it all behind and getting a real job? Am I crazy or what? How can such a dream-come-true be anything but a constant rush and the ultimate in self-actualization?

Like, in many fields, actual performance and innovation are not what drives the market. What drives the market is the perception, not the reality. People want to fly the gliders that are perceived as the top performers and big contest winners. Unfortunately, the gliders that are the highly publicized contest winners are the gliders that are being flown by a few of the highly publicized, top flyers of the day and thus they garner undue coverage in the model press. This has been the order of the day for as long as I can remember.

For example, in 1972 and 1973, the rage was Mark Models *Windfree*. It was a simple two channel, straight-winged, built-up glider. Mark Smith's flying made the glider look unbeatable. In reality, the *TODI* was a truly innovative glider with a better airfoil (E-387), the mother of our modern day control systems and a fiberglass pod fuselage. In parts of the country where the two gliders were both flown by good pilots, the *TODI* was clearly superior. Not so in the pages of RCM where Preston Estep Junior's soaring column made the *Windfree* sound like the design breakthrough of the age. The next great rage was the *Wind Drifter* followed by a long string of other break-through polyhedral kits — and finally, the present-day tips eclectic polyhedral-revival-design has joyfully taken soaring journalism to a new level of bliss!

One of the benefits of having been in the hobby as long as I have is that it gives me a unique (if slightly jaded) sense of perspective. It is easier to see the big picture. While in the beginning of my career, I was easily outraged by what I perceived as injustices, bias and just plain asinine and incompetent reporting in the model press. I was pleased to see that I have mellowed to the point where last year when an inane rave review came out and headlined that a pathetically documented tips-up polyhedral retread was the 'ultimate glider kit', I hardly even lost sleep!

Possibly one reason for the constant flow of hopeful new entrants to the

glider kit market is that it may be too easy to get into the glider kitting business. There are no enforceable kit completeness, quality or performance standards. In fact, anyone can design a relatively good glider if they do not depart too far from the specifications and structural systems of other successful glider designs. This is particularly true now that glider controls have been standardized and are no longer part of the kit. Now, most of the high-performance kits simply have the controls being handled electronically by computer enhanced transmitters.

If you are a good contest flyer and local hero it makes things even easier because you can claim that your design dominates the competition in your area. You then send out press releases to all the magazines with photos and creative verbiage. With luck, your design will be plastered around in every soaring column sounding like the greatest performance breakthrough of all time. This is heady stuff. You are featured right up there amongst the greats of soaring, whom you have only read about before.

Magically, the orders start to roll in. Now is the time that you find out whether or not you can actually produce kits! The people at the magazines simply publish what you send them, as an item of interest to the readers. That is unless you are able to press a hot-button and get them to do creative journalism including enthusiastic speculation as to their performance expectations for your kit. Whether or not you have what it takes to deliver the goods is another matter.

Launching the Todi across the street from our Camano Island home/factory in about 1973.

Simply doing proper plans and building instructions is a monumental task that in the past would have been considered an absolute necessity. This truism has gone by the wayside recently, however, as the aforementioned tips up kit was born to market on the raves and accolades of an orgiastically enthused model press. The kit had very sketchy plans and no building instructions at all! There has been no hint of these and other similar kit deficiencies in any of the magazine reviews or in any of the miles of soaring column coverage, written to enlighten the unwary soaring public. It would appear that these trivial deficiencies are obviously of no consequence anymore. Perhaps we, in the business, have been spending too much time on such mundane matters in the past.

Once the plans are complete, the production molds are built and the jigs and

templates are ready to go, the first kit rolls out the door. This is indeed a day of jubilation. Soon, however, the true cost of doing business starts to hit home. This includes the cost of boxes, plywood, balsa, fiberglass, carbon fiber and all the many hardware items, not to mention the costs associated with publicity.

To make matters worse, you begin to find, that your production efficiency is down due to divided demands on your time. One of the more enjoyable aspects of making glider kits is talking to glider flyers around the country who call you. Unfortunately, while you are spending several hours every day handling the phone, no production is being done on your orders so you are not making any money. Oh to have been paid a dollar an hour for all the thousands of hours I have spent on the phone!

Best of all, you find that you are besieged by calls from around the country by people who want to help you out. Some of these philanthropists want free kits for writing a kit review that they think they can get published in a magazine (very few of these reviews seem to get published, however). Everyone knows that one way to sell kits in an area is to have the top flyers in the area flying your kits. You get dozens of letters and calls from flyers asserting that they dictate the market in their given areas and for the meager price of a free kit or hefty discount they will direct the local rabble to your product. Then there are the endless contest gift solicitations to flood into your office.

A related phenomenon that you are bound to experience is that you will find many of your customers to be people of considerable wealth. Many of these benefactors of the American Dream think nothing of charging up to $150 per hour or more for their time and yet they can't stand to see you make over $5 an hour for your time on the kit you sell them. In the end, if you give in to many helpful promotional giveaways and good-guy discounts you will be

hopelessly in debt and out of business before you even get started.

On one hand, if you keep your expenses to an absolute minimum, do most of the work yourself, keep your designs current, work out of your garage and are willing to give up on having any free time, you can eke out a near-poverty-level-living long-term in the business. On the other hand, if you hire people to do the work, rent manufacturing space and travel around to the major soaring events in the country to take your bows, you had better have another source of wealth or you will be broke and out of business in two or three years or less.

Like tin soldiers, I have seen a constant flood of new glider manufacturing companies emerge and walk across the killing fields of this brutal hobby only to fall silent and be forgotten within a short time. Though I am a participant, I cannot remember most of the names. They were names like Mark Models, T&H Enterprises, CraftAir, Southwest Models, Nelson Models, Hobie, Superior Flying Models and Flightglass Laminates.

Naturally, if you work out of your house you have the problem of the phone (unless you divert needed cash to pay for a separate business line). People will call you at all hours of day and night and be totally surprised if you are not eager to chat with them. "Oh, have I caught you at a bad time?" is the understated phrase you hear just after you have stumbled out of the shower with soap in your eyes at 10:00 PM to talk long distance to a cheery modeler. I have received business calls at 3:00 AM! For a while, I resorted to an answering machine after my 5:00 PM business hours but this was a hardship on my family in receiving personal calls.

Eventually you begin to realize that you have created a monster that you can't control. Even going to the flying field becomes a chore. Everyone is laying in wait for you to show up so they can tell you about a mistake they

found in a kit or a better idea that they are sure they are the first person in the world to have thought of. Perhaps they just want you to remember to hand-deliver some two-bit kit part to the field so they can save the shipping charge. Rather than enjoying the spontaneous, relaxing and exhilarating sport of soaring you find that you have to defend your design philosophy and be harangued by complaints and better ideas, every time you put in an appearance. Forget going to contests and being able to concentrate on your flying!

The logo was designed by Sandy and I in 1972. She came up with the glider concept and we worked it out together and then I drew it up. We did all of our ads in house too. Dodgson Designs was a family operation.

About 10 years ago I was at a major contest where Lee Renaud of Airtronics was present. One disgruntled modeler came up to me and said I can't believe it, I wanted to talk to Lee Renaud about ordering a part for my Sagitta and he just told me to call him at the office on Monday during business hours! I'm glad you're not like that! I chuckled to myself when I heard the story because I knew that Lee had it figured out much better than I did. It is a

real shock to discover that you can no longer use your hobby to get away from your work.

You may now logically ask me why I am still in the glider kitting business if I believe that the pay is poor, the work hours are long and if I cannot escape my work, even by going flying? I ask myself that same question several times a week. No, I do not have a divine calling to kit gliders like Mel Culpeper, who according to his writing is kitting for Jesus. More mundanely for me, the pluses (so far) outweigh the minuses. It is the simple things. I like the people who soar. I like their diversity. And yes, I do enjoy the notoriety of being a kit designer. Most of all, however, I have not found any other job that utilizes my weird assortment of abilities as well as kit design and manufacturing. Though my degree is in Architecture, I always felt like a misfit in that field. With Dodgson Designs, the computer plays a big role in my job satisfaction. I rely on it for doing glider design analyses, for writing and desk-top publishing the building instructions, catalogs, etc. as well as producing the CAD generated drawings. You see, my job would be just great if someone else actually did the nitty gritty work of manufacturing, invoicing and shipping the kits — and if the glider kitting business was more lucrative. On the other hand, I probably won't go looking for a real job tomorrow! There are still more glider kits for me to design in the next few years — I can't give it up yet!

*All photos and drawings are by the author. Read the **next article** in this issue, return to the **previous article** in this issue or go to the **table of contents**. A PDF version of this article, or the entire issue, is available **upon request**.*

Drag due to frontal area and to the relative motions of particles running parallel to a surface can both be explained solely by particle motion and collisions. As a bonus we can see how turbulence occurs at a critical speed defined by the *Reynolds Number*. Please pick holes in these ideas and let me know where I have gone wrong.

Turbulence naturally occurs on wings usually in the rear half of the chord. The resulting draggy 'bubbles' can be kept under control by turbulators. In my article on lift I asked whether the action of turbulators could be explained using these ideas. I haven't cracked that one yet nor has anyone else suggested an answer. However I have found several research papers and other sources that will I hope clear the fog from my brain. Here they are if you want to inquire yourselves.

Resources

- **Kinetic Theory and Lift** by Peter Scott
- **Isaac Newton's Falsely Dismissed Theory of Inertially Caused Pressure Resistance** by Philip Randolph Patten
- **Modeling and Analysis of Active Turbulators on Low Reynolds Number Unmanned Aerial Vehicles** by Seth R. Short
- **Effects of Turbulators on Airfoil at Low Reynolds Number in Turbulent Flow** by Juan Delnero, Julio Marañón Di Leo, Mariano Martinez, Federico Bacchi, Jorge Colman Lerner, A. Scarabino and Ulfilas Boldes
- **Boundary Layer, Vortex Generator & Turbulator Experiments and Background Information** curated by Julian Trubin
- **Poohsticks** from Wikipedia

*All figures provided 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**.*

Tool Stands

Get them out of your drawers.

Tom Broeski

I often use many different tools in the course of a project. Having to find the right toolbox and drawer for these tools became a real pain. So… I started grabbing scraps of wood and drilling holes and strapping tools to the sides. The result was having many many tools accessible and easily moved to whatever bench I was working on. The space-saving is amazing. Each tool has its own place, and the stands being close by make it easy to just put the tool right back after use.

Here I took a couple of pieces of scrap and made a trough. I then took some scrap leather (thick fabric should work as well) and stapled it over the sides of the tools I wanted. I didn't feel the need to make anything fancy, just

useful.

There’s also room for markers in the slot and rulers on the side. This would take up a lot of drawer space in several different places.


Memory System
STABILO
STABILO

I also took a piece of plastic pipe and made a holder for my most used Dremel tools. It's a matter of having a place to put them that is easy to find. The chargers are over on my charging bench. There's a magnet on the end of the stand to hold the little wrench. If you can't strap it or the hole for the handle would be too big, get creative.


DREMEL
STYLUS

I have screwdrivers I made and put different bits in for the project I'm working on. It is actually easier than changing the bits on just one.

Leather tools, brushes, and squeegees. Magnets on the ends of the stands let me temporarily keep things like scissors or a tool from elsewhere I might need.

I have many of these stands for just about every small tool I use on a regular basis. Often I use a dozen different tools on a jewelry or craft project. I made Corian bases for several of them to keep them from falling over.

That's a lot of tools taking up very little space. The application is nearly endless, so simply use your imagination.

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The Trailing Edge

Trick or treat?

The NEW RC Soaring Digest Staff

This spooky photo was captured at the 2017 Welsh Open F3F. In this issue you can read an excellent account of this year's version of the event ably written by Kevin Newton. Fun fact: Kevin also provided this great photo for this month's edition of The Trailing Edge.

While it is not celebrated universally all around the world, Hallowe'en is a big deal here in North America. What's weird is that recently it seems to be celebrated more and more by grown adults revelling in what some now call 'cosplay'. That's short for 'costume play' which pretty much sums it up. Don't get me wrong, we love seeing the kids who can barely comprehend what they're dressed as come knocking on our door and inaudibly whisper something while their parents stage whisper 'trick or treat' from the sidewalk. The pint-size ladybug or the Teenage Mutant Ninja Turtle still has

the power to make our hearts melt. Seriously. We love it.

That's the treat part.

The trick part is that retailers used to have the common decency to *not* put up Christmas decorations until after Hallowe'en. But now it seems that at the first hint of the leaves almost imperceptibly changing from vivid green to barely visible yellow (or vice-versa in the Southern Hemisphere) that's all the incentive they need to roll out the pumpkin spice everything, the 'seasonal decorations' and the pervasive, inescapable Christmas music. In December, we get it — even enjoy it — but in mid-September? C'mon. And in what we think a Tom Clancy-esque novel might proffer, the supply chain and shipping nightmare we're currently experiencing might actually be some dark web conspiracy to make us get to the shops even sooner.

But there's an inescapable truth in the headlong, near panic rush to start the holiday season — 2021 is pretty much over. It was supposed to be a better year than 2020 and while we don't know about you, it has still been a distinctly mixed bag for us, to be entirely candid. But we can help but think about what it is for which we have to be thankful — and there is plenty, to be sure — while we hope that 2022 is another measured step back to the life we loved. Ain't anything wrong for hoping for better days ahead, is there?

Speaking of things of arriving fast, it is never too early to start thinking about next month's issue. Like right now, with the deadline for submission for the November issue being *later this month*. Yep, **October 31st** — Hallowe'en! Given that you may be cosplaying it up towards the end of the month, you may just want to get started on that magnum opus now.

New in The RCSD Store

In case you're ever wondering how we manage to provide all this great, commercial-free content for **FREE**, it's through the hard work of the RCSD Store. Their recent efforts have resulted in the **June** edition of the quickly-becoming-very-collectible *RCSD Cover Photo T-Shirt*. Photography is by our good friend and RCSD contributor Stéphane Ruelle taken on June 6th, 2021 at the site of the US GPS Triangle Nationals at the Siskiyou County Airport in Montague, California. Or, if you prefer, you can order the **January**, **February**, **March**, **April** or **May** editions of the *RCSD Cover Photo T-Shirt* in the Store. We manufacture and ship worldwide. Be the first kid at the field or slope to have one. And, our comments above notwithstanding, it's never too early to order for the holidays!

Make Sure You Don't Miss the New Issue

If you want to be absolutely sure you don't miss the November 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**.

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

Now get out there and fly!

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