In The Air

That was fun, can we do it again?

Terence C. Gannon

Getting ready to launch a Dream-Flight Alula at Beachside, Oregon in late summer of 2015. (image: Michelle Klement)

Welcome to the February, 2021 issue of the NEW R/C Soaring Digest. In last month's column, my first *In The Air*, I introduced myself and talked a little bit about RCSD's history, where things stand today and where I hope to take it in the future — with your help — as each new issue is published.

The time since the January issue was published has been filled with all sorts of exciting developments, some significant challenges and, yes, a few surprises I wasn't expecting. But mostly, I look back on the past month and my thoughts are about the new things I have learned and in particular the great new people I have met, some of whose work is featured in this issue. Without exception everybody has been very supportive of what it is we're all trying to achieve with the NEW RCSD. Everybody has been really nice and I'm both proud and thankful to now count them amongst my friends. My heartfelt thanks to you all for that.

The reception the January issue received was, to be frank, a little stunning. The RCSD publishing platform, Medium, provides a ton of fine-grained data which enables some pretty detailed, objective measurement of the performance of the issue. In the back of my mind I had some expectations of how the first issue might do. I'm thrilled to report that January sailed past those more-or-less on the first day. The only downside of having a 'hit', I've discovered, is you instantly wonder what it is you can do to top that in the next issue. Once all the metrics are thoroughly understood and digested I look forward to presenting at least some of that information to you, the reader. I think you'll find it very interesting.

In answer to 'how you top the previous issue', that question seems to have answered itself, thankfully, at least for this new issue. The articles which have been submitted are simply breathtaking. I'm in utter awe of the creativity, expertise and enthusiasm with which each of them were prepared.

If you want history to come back to life — *literally* — you will want to check out Vincent de Bode's article simply entitled *The Fokker FG-2*. For an analysis of discus launch gliders (DLG) that would not be out of place as a PhD thesis, see Theo Volkers and Tjarko van Empel's *The Aerodynamics of a DLG Unravelled*. For an essay which captures the magic we all feel when we have a really good day at the flying field, you simply have to read Jim Carlton's *What a Day for Soaring!* We have also engaged the turn-back-time-machine with Rene Wallage's *RC Soaring in Israel*. I'm honoured and humbled to have these remarkable authors' work grace these pages.

To use a familiar metaphor, I feel like I've arrived at the slope to discover the sun is warmer than I expected, the wind is blowing from just the right direction and I'm standing there, glider aloft, just drinking in the moment before the fun really begins. I only hope I can impart some of that feeling to you through the selection of articles presented this month and in future issues of the NEW R/C Soaring Digest. As always, thank you so much for reading.

Fair winds and blues skies!

The beautiful cover photo for this issue is by Régis Geledan and was taken above Gez-ez-Angles in the Hautes-Pyrénées, France in 2015. The camera used was a XiaoYi YI taped to the left wing of his Espen Torp RaceM, with an image being captured every three seconds. Régis did a little post-processing on the one image he selected to achieve the beautiful, watercolour-like palette. You may recognize his unique style: Régis also provided the image for The Trailing Edge *in last month's issue. Merci beaucoup, Régis, pour votre excellent travail!*

Now, we would be honoured if you read the ***first article*** *of this issue or go back to the* ***table of contents*** *to see what's on tap this month.*
Downloadable PDFs: coming soon

Autonomous Glider Technology Wins Air Force Contract

Aviation pioneer Chip Yates scores another win on the road to widespread commercialization of his Silent Arrow® technology.

The NEW RC Soaring Digest Staff

The Silent Arrow® testing being conducted near Pendleton, Oregon. (image: Silent Arrow® / Yates Electrospace Corporation)

In just a little over three years since receiving its first government contract, Yates Electrospace recently announced its Silent Arrow® has been awarded a new contract from the US Air Force. The new program is intended to produce a downsized variant capable of being deployed from a CV-22 Osprey tilt-rotor aircraft.

The Silent Arrow® is a fully autonomous, one-time-use cargo carrying glider. Once it has been dropped from its host aircraft after being carried within proximity of its eventual target destination, the four spring-loaded wings rotate into their flight position and onboard avionics guide the glider to its landing zone. At present, Silent Arrow® variants are delivering payloads for both military and humanitarian missions around the globe.

(image: Silent Arrow® / Yates Electrospace Corporation)

RCSD is always looking for stories about commercial applications of R/C soaring technology and it doesn't take a great deal of imagination to see the obvious overlaps between the two domains. We are excited the see the potential the Silent Arrow® demonstrates and hope readers will perhaps be inspired to think about their own commercial applications for the R/C soaring technology.

And for those who are wondering, yes, it's *that* Chip Yates, the American inventor and innovator famous for his record-setting electric aircraft and electric motorcycles along with a long list of other remarkable achievements.

In a late-breaking development on February 24th, 2021 the Silent Arrow® was nominated for the illustrious National Aeronautic Association's 2020

Robert J. Collier Trophy. Past winners of the Collier include Orville Wright, Howard Hughes, Glenn Curtiss and Bill Lear, putting Yates and the Silent Arrow® in some pretty elite company, to say the least.

In a recent conversation with the RCSD Staff, Mr. Yates committed to a future article which will tell the entire story of the Silent Arrow® from its initial conception, through the development phases to its present status. We hope he will even speculate a little as to what the future holds for this fascinating program. As he said to us:

"The story is good and should be told!" Candidly, Chip, we can't wait to help tell it.

*Read the **next article**, return to the **previous article** or go to the **table of contents**. Downloadable PDFs: coming soon*

The Fokker FG-2

Bringing aviation history back to life at 1/5th scale.

[Vincent de Bode](#)

The Fokker FG-2 flying over the Atlantic at Retroplane 2017. (image: Retroplane 2017 Media)

The challenge for Retroplane 2017, which took place in Vauville (France), came at the exact moment I finished my 1/6th scale Nemere, built in ply. The challenge was to build a glider of which the prototype was built before 1925. It was possible to reserve a specific glider, but that naturally gave the moral obligation to build it.

I very much wanted to participate, so I started looking for a suitable glider. Rob, a friend modeller, nudged me in the direction of a Dutch glider and showed me some documentation of Fokker gliders. I saw the FG-1 and FG-2, FG is an abbreviation for Fokker Glijdvliegtuig (Fokker Glider), and I thought: “Well a biplane is something different, why not?” I guessed the simple straight wings should be no problem (that turned out somewhat different) and I decided to build the FG-2. My provisional registration for

Retroplane 2017 was accepted.

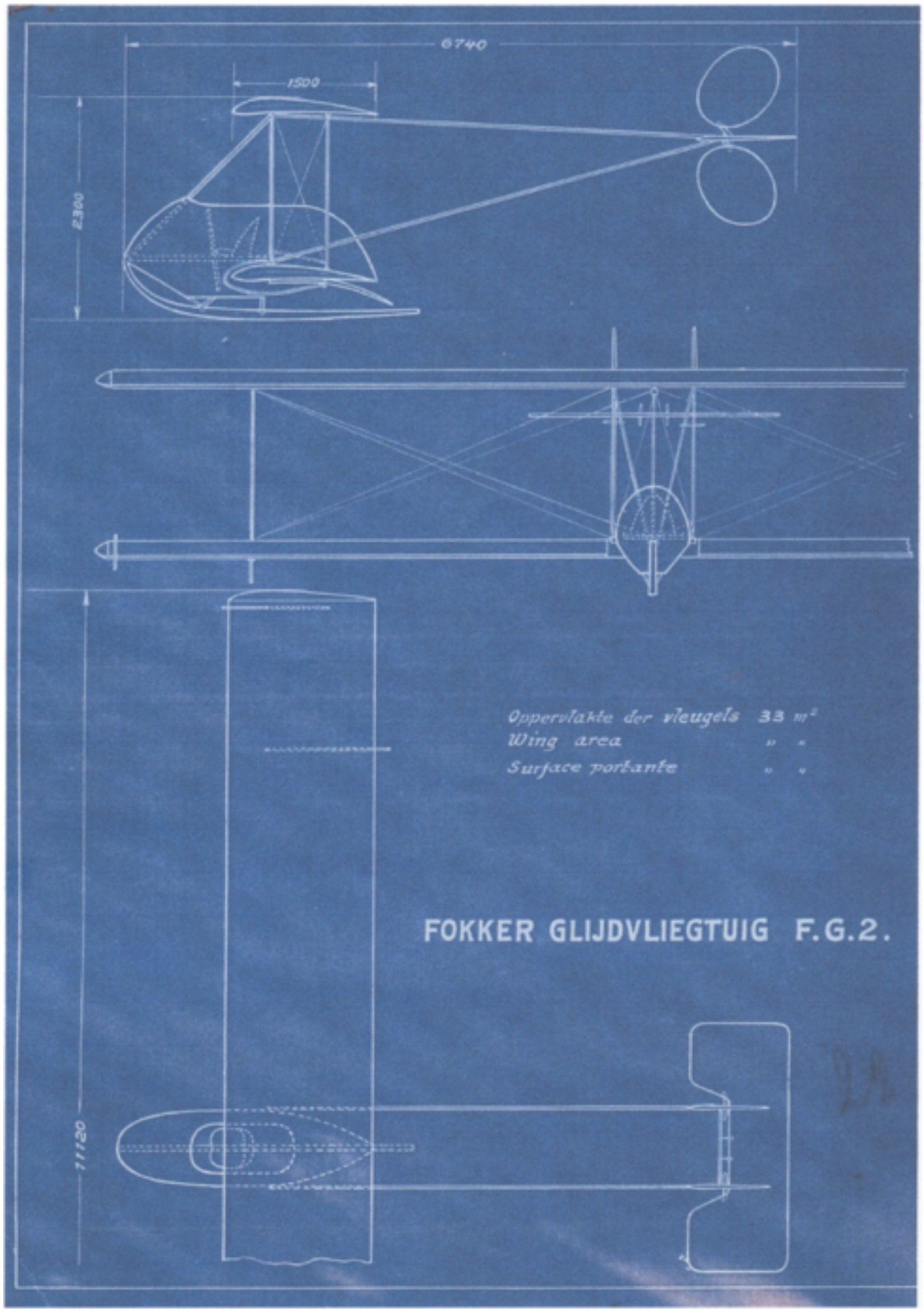
The Investigation

The FG-2 is mentioned in the German gliding museum with records as the first glider with a passenger at the Wasserkuppe and Ilford Hill.

This is the first conversion of the FG-2. Left on the photo someone is changing the rudders. Nice detail; the FG-2 stands on some wooden crates, its empty weight is just 93 kg. This picture gives a lot of info about the rudders, elevator and rudderhorns. Also visible is the internal cross bracing of the wing. (image: Hans Disma Collection)

I tried to gather information, which turned out to be quite limited. All the drawings I could find were different. Luckily there was some footage of the FG-1 (a very similar single seater) and FG-2 flying. The Aviodrome (a Dutch aviation museum) and Hans Disma provided me the original drawing and some nice photos, two of which were really sharp. Slowly I started to realise that this was a completely different plane from anything I had ever built. At first I thought the FG-2 was built completely out of wood, but a lot of beams and struts were too thin in the photos to be made of wood, they had to be metal tube. Just recovering from that shock, I discovered that there was only one photo with ailerons and that on all the other photos and footage there wasn't an aileron to be seen! That meant this glider used wing-warping, a conclusion with great implications. This wasn't going to be a simple plane to build after all.

I started to read a lot about Anthony Fokker and watched a documentary about his life. A funny coincidence; he visited the same secondary school that I had in the sixties, I even recognised the physics classroom! At the Aviodrome I had a close look at the Spin (Dutch for 'spider', Fokker's first plane) to get an idea of how he worked with wood, steel, wires and canvas. Via the museum I came in contact with Hans Disma and the Historical Fokker Foundation. With all the gathered information I tried to reconstruct the development of the FG-2. In my view there have been 4 variants:



This plan is from the Aviodrome museum. I got it just after I finished my drawings, or rather sketches. It shows the long tail boom (but without a frame), the fuselage is the one I built. I assumed the overall dimensions are correct; span 11.12 m, length 6.74 m, empty weight 93 kg, fully loaded 260 kg. (image: The Aviodrome)

1. The original FG-2. The skin of the cocoon-shaped fuselage (nacelle) was attached to the skid. The fuselage extended until behind the trailing edge. The aircraft had a short tailboom, without internal bracing or frame.

2. First alteration, the left rudders were enlarged, with square extensions at the top and bottom.
3. It seems to me that it still didn't fly well and Fokker made a drastic change. A much longer tailboom was made, with a frame and internal crossbracing with wires. The rudders were changed back to original. The nacelle was also changed and the number of stringers (made from tube) reduced from 8 to 5 and the nacelle was shortened at the rear.
4. The wing-warping was replaced with ailerons. There is only one good photo of the FG-2 in this configuration, I couldn't find any documentation of it flying.

It is claimed that the FG-2 is the first glider ever to take a passenger, which by the way, was also filmed flying. Fokker (as a pilot) experimented also flying along the slope instead of flying directly into the valley. There are two duration records with his name. One was a flight of 37 minutes at Ilford Hill, which was later beaten by captain Ottley at the same location.

This is the glider I built, long tail boom with a frame, internal cross-bracing, normal rudders, altered fuselage with two tubes per side and the fuselage covering free from the skid.

I got the impression that the FG-2 was made as an easy to (dis)assemble and transport glider. There is footage of the FG-1 and FG-2 in a kind of cradle on a small open truck. The tail consisted of four steel tubes (the original tail-boom) and the wings could be separated from the fuselage. It looks like Fokker designed the FG to get a very low wingload to get a low sink rate, with the glide slope ratio being less important. This was a common design philosophy at the time. I couldn't find anything about more FG-2s being produced.

After all this research I decided to build the third variant and I started to make some sketches. Some dimensions were known, but the wingspan for example was 12 m in some drawings, and 11.12 m in others. Luckily I got the original drawing, indicating 11.12 m. A major issue in building this variant was the wing-warping. This principle was already used by the Wright Brothers and also by Fokker. But how much wing deflection was needed? Luckily a colleague Retroplaneur built a Willy Farner and I learned a lot reading his building story, albeit in French.

The principal dimensions of the model (scale 1:5) would be a wingspan of 222.4 cm, length 135 cm, height 48 cm. The wing struts, tailboom, empennage and stringers of the fuselage should be made of steel tube. The skid and support of the chairs are wood with metal fasteners, like the Fokker Spin.

Building

Because I only had a vague idea of how the front of the fuselage was made I started with the wings. I couldn't find a drawing or other documentation about how the wing was built, only the distance between the two spars (55 cm) and the chord (150 cm). The transparancy of the wings is very characteristic on the photos. Normal ribs don't have this effect, I guess. On the Retroplane forum lots of old gliders are built with ribs made from thin battens — in French “nervure aux baguettes” (sounds wonderful) — strong and light. So I decided to have a go for it! Luckily all the ribs were the same, so that’s good news. When I was half way making the ribs I found out I miscalculated the amount of ribs. This had something to do with two wings, of course.

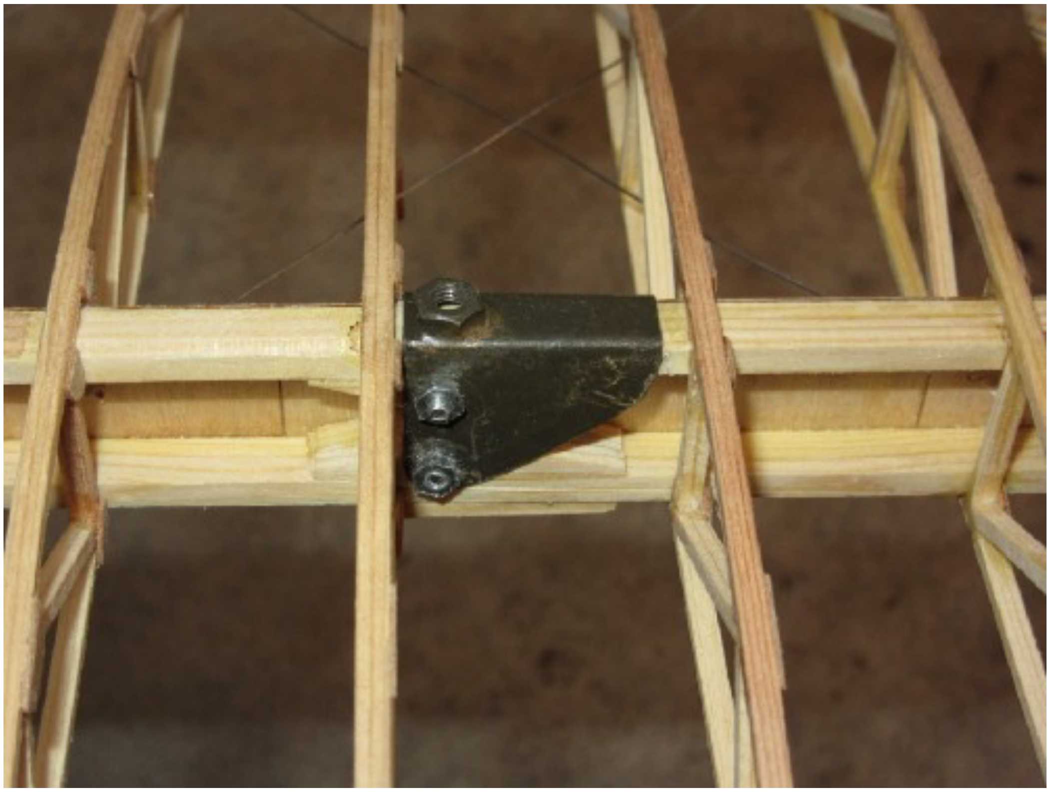
Wing rib production at full speed. In the foreground the milled jigs from Delrin. Behind that the gusset plates, about 2000in all ! All the wooden battens have been cut to size. (image:)

My friend Adri milled rib templates from Delrin (later I found out that Paolo Severin has already been using Delrin for a long time, beautiful website by the way). Lots of spruce battens from 2x3 mm were used. Also lots and lots of webbing plates, thanks to Adri who did all the milling! Just before my summer holiday I had 140 ribs finished.

Returning from the holiday I started building the wings. Originally in one piece, but Rob came with the idea to divide the wings in three parts, a small middle section fixed to the fuselage with two outer detachable sections. I wanted to keep this connection as invisible as possible, so the joining construction should be as thick as the spars itself.

All the components for the wings. The wing joiners are kept within the spar profile. The filler pieces are needed for the strut fittings. (image:)

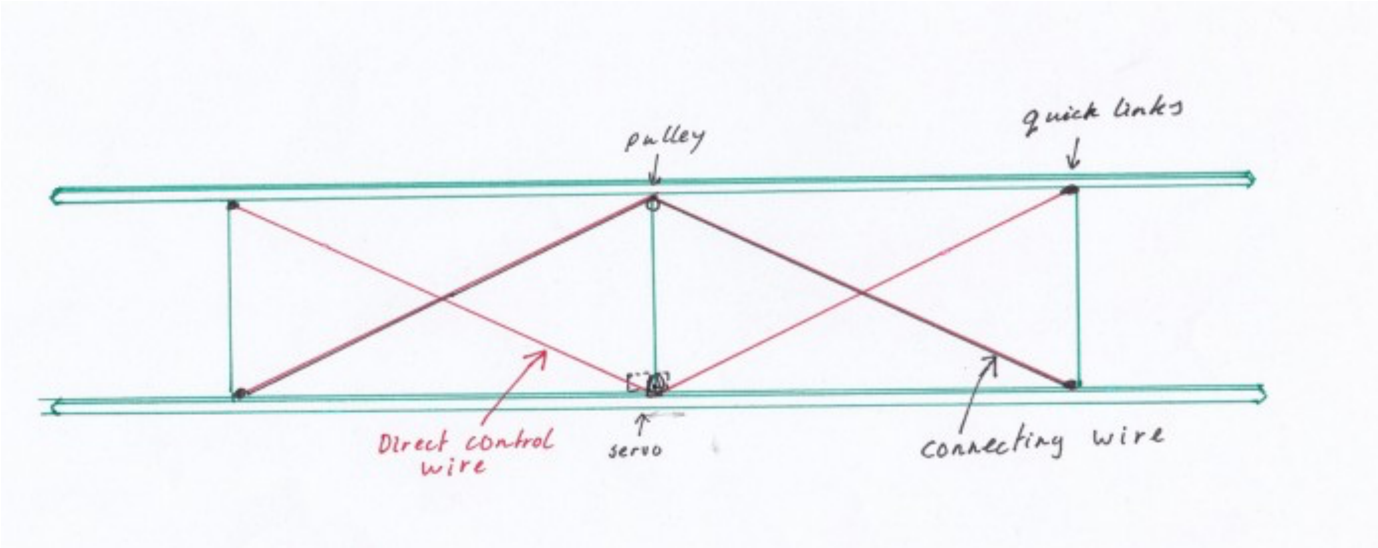
I made the spars from 8x4 mm spruce at top and bottom, connected with 0.6 mm plywood as webbing plate. Not a boxbeam, the wing should not be stiff in torsion, that was a strange thing for me! For the wing joiner in the front spar I used a steel strip of 1x10 mm, in the rear spar 3 mm round steel, both in brass profiles. These profiles are glued in the spars with thickened epoxy. The M4 nuts and bolts for the struts just fitted in. Thanks to the beautiful photo from Hans Disma I could figure out how all the ribs were placed. I started with the central wing parts, the rest followed quickly.



Homemade U-profile with an M4 nut soldered on it, attached with two M3 bolts to the spars. (image:)

The fastening of the struts required some headscratching. I planned to let a short piece of M4 bolt protrude out of the wing, over which I could put the strut (6x0, 5 mm stainless steel tube), secured with a 1 mm steel wire clip through the tube and an oversize hole in the bolt, to give some room for movement. Because a 4 mm hole in an 8x4 mm spruce batten weakens the wood too much, I made a U profile from 0.5 mm metal sheet, silver soldered a M4 nut on top, in which I could put a short piece of M4 bolt later. This U profile was fastened with a M3 bolt through a filler piece in the spar.

Wing-Warping

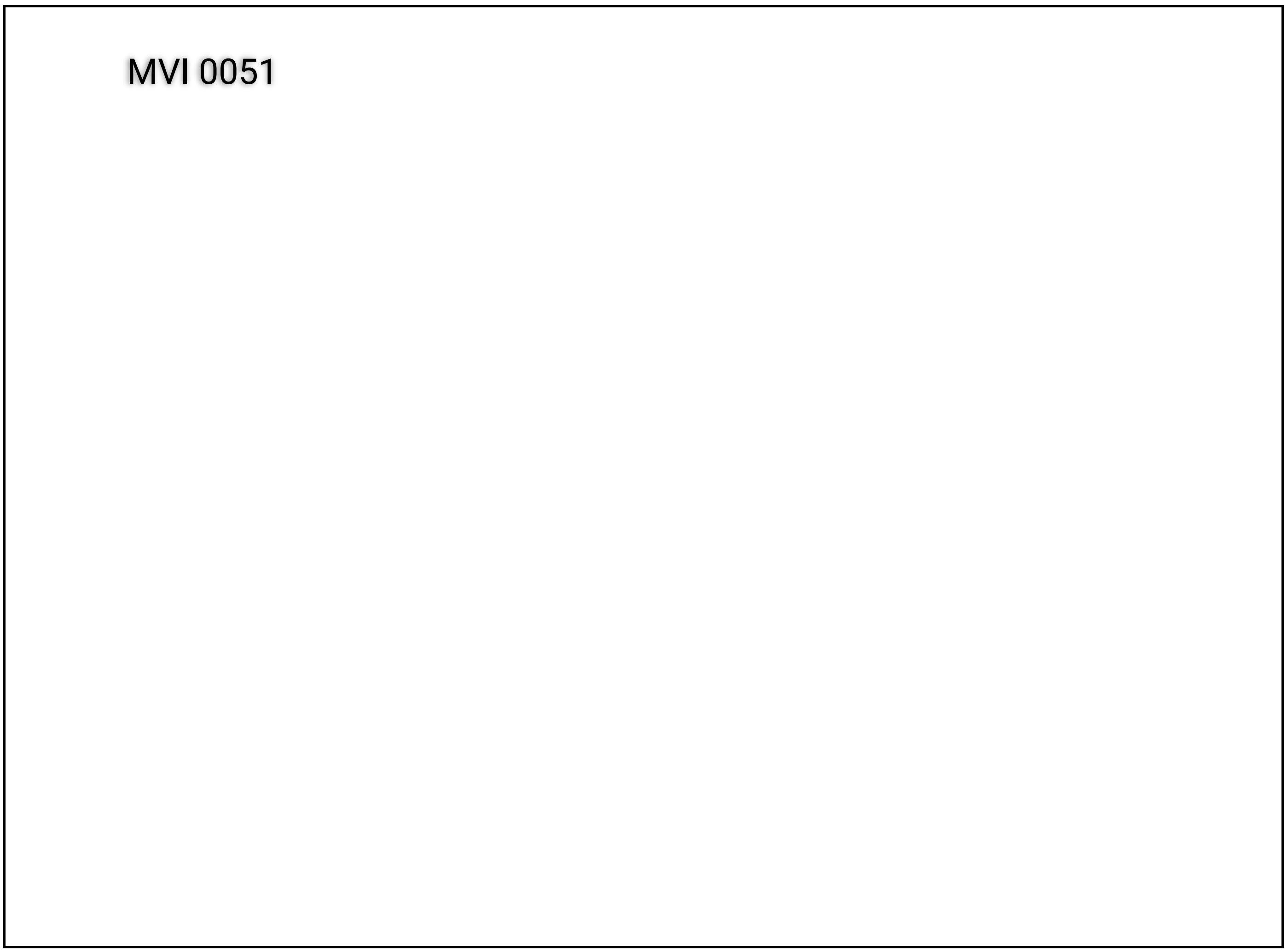


A sketch to explain the wing-warping principle. (image:)

Slowly I started to understand how I would construct the wing-warping. At the bottom of the rear central strut is the operating device. In the model it's a big servo, in the real airplane it was a sector plate which was connected with the control stick via a torsion tube under the wing.

Detail of the modified servo sector plate. The quicklink is drilled out and is connected with an M3 bolt through a bush. This is a vital and heavy loaded part of the controls . At full throw the servo consumes 2A, at half throw it's 0.7 Amps. The servo is rated for 2.5 Amps. (image:)

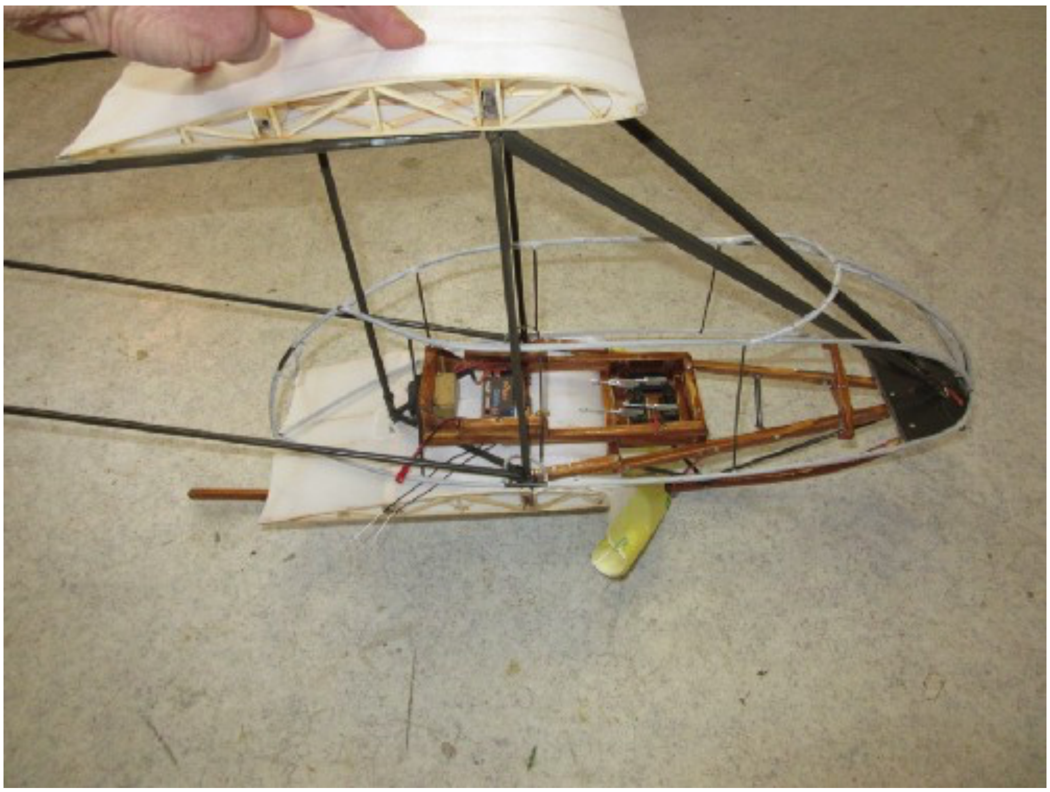
The sector plate of the servo is connected with rigging wire to the topsides of the outboard rear struts. When the sector arm pulls a wire, the strut on that side will lower. With a second wire which runs over a pulley on the topside of the rear middle strut, the strut on the other will rise. Because the front struts are made rigid by means of crossbracing, the wings have to warp. Difficult to explain in words (especially in a foreign language) but very logical when you see it. The servo used has 14.5 kg/cm torque and draws max 2.5A. To my relief it functioned well, the servo consuming 1.7A at maximum travel.



The wing-warping mechanism in action. (video:)

The Fuselage

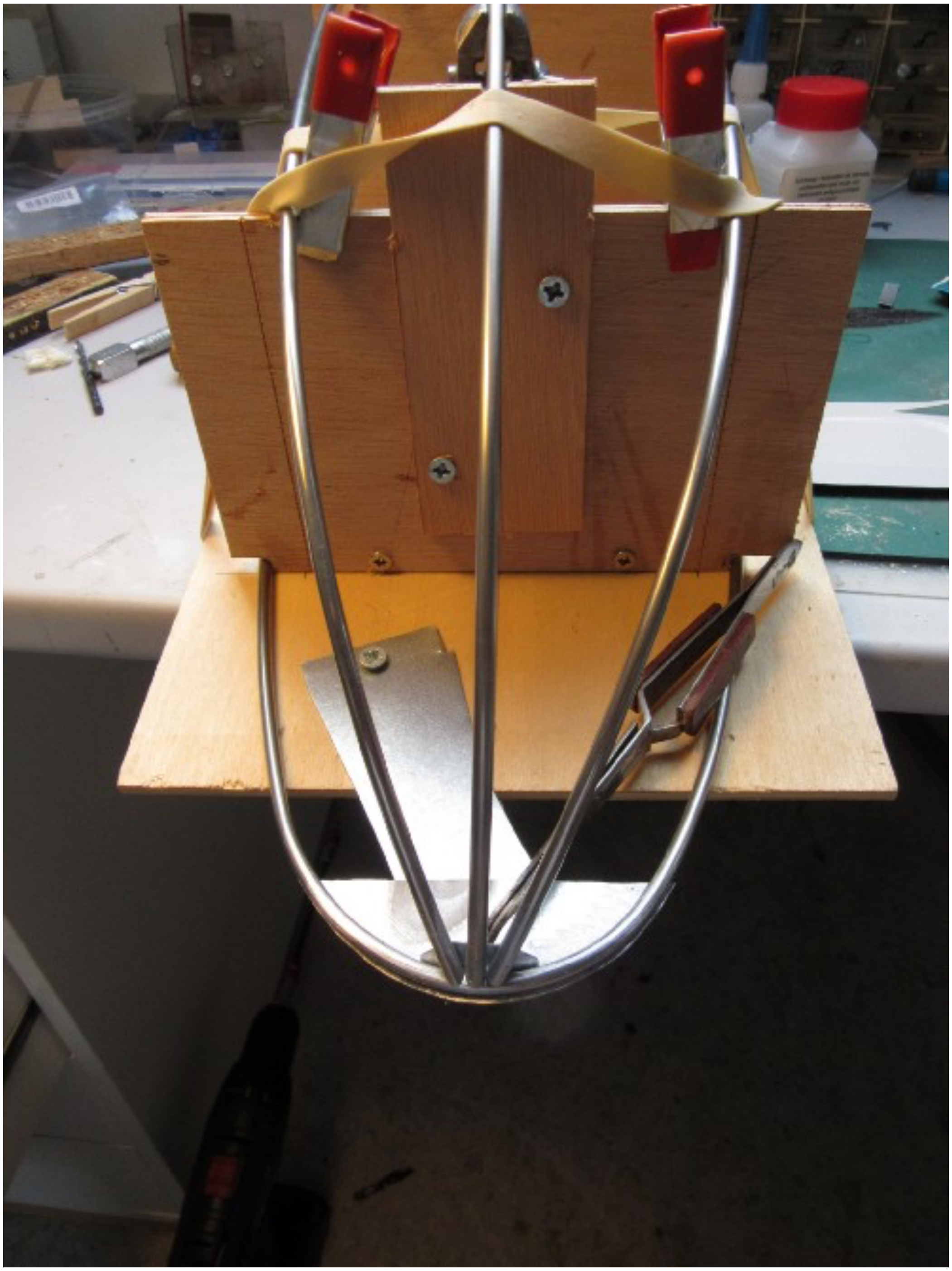
First, some remarks about the metal tube used in this glider. Nowhere I could find any dimension, so I had to guess it, put it in place and compare it with photos. I also hesitated about the thickness, 0.5 mm or 0.25 mm. It happened quite often that I had to remake parts, just because they didn't look good. It is difficult to measure on photographs, they are often not very sharp. I ended up using 4x0.5 mm tubes. The tubes were bought at 'Tubos Capilares' in Spain, delivered in lengths of 2 meters. All the tubes were silver soldered for enough strength. I had to learn that, which took time! A lot of trial and error was involved. The tubes were bent with steel cable inside to prevent buckling.



An overview of the front of the fuselage. Almost everything is connected to the central front struts, the rear strut only determines the angle between the wing and the fuselage. The placement of the RC components and the servo for the wing-warping is visible. (image:)

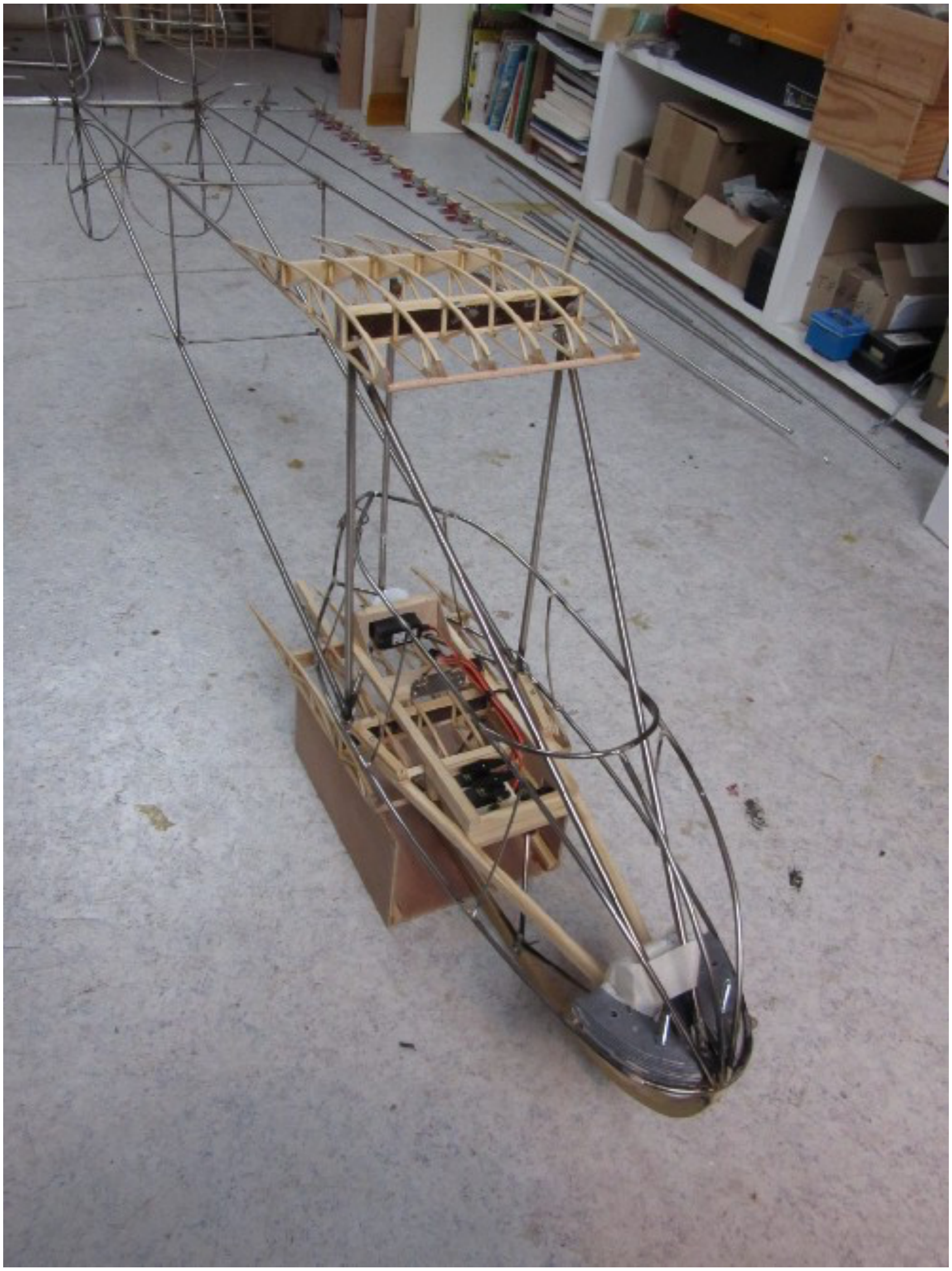
From scrap ply I made a kind of jig to keep all the tubes in position. A small and a big torch were used for soldering, depending on the size of the joint. I used a lot of flux (looks like yogurt) to solder it. The solder likes to flow to the hottest place, so there is a way of 'steering'. It took time to learn and in the beginning I had to start over a number of times: clean everything up under the water tap and have a new go. Complex joints have to be soldered in one go which can be challenging, so you have to think well in advance!

Now it was time to make the rear of the fuselage, which was completely uncharted terrain for me. The tail boom consisted of four stainless steel tubes 6 mm diameter. I started with a wall thickness of 0.5 mm, which was very heavy, so I replaced that with 0.25 mm thick tubes. The tail boom is attached to the two forward middle struts. These two struts are literally the centre of the glider, almost everything is attached to it: the tail boom, the rear central strut with spacers and crosswires, the nose section, both wings with the load bearing spars and the rigging. The central rear strut, cross braced to the two front central struts, only keeps the wing in the correct angle of incidence. My guess is that on the real airplane the tail and wings were removable. That probably changed with the third version, due to the extra frame in the tail boom. In my model I made the tail and two short middle wing sections fixed to the fuselage. On the real airplane the wings were in one piece.



Soldering aid for the front of the fuselage. It looks a bit disorganised, but with some notches, clamps etc. it all fits nicely together. (image:)

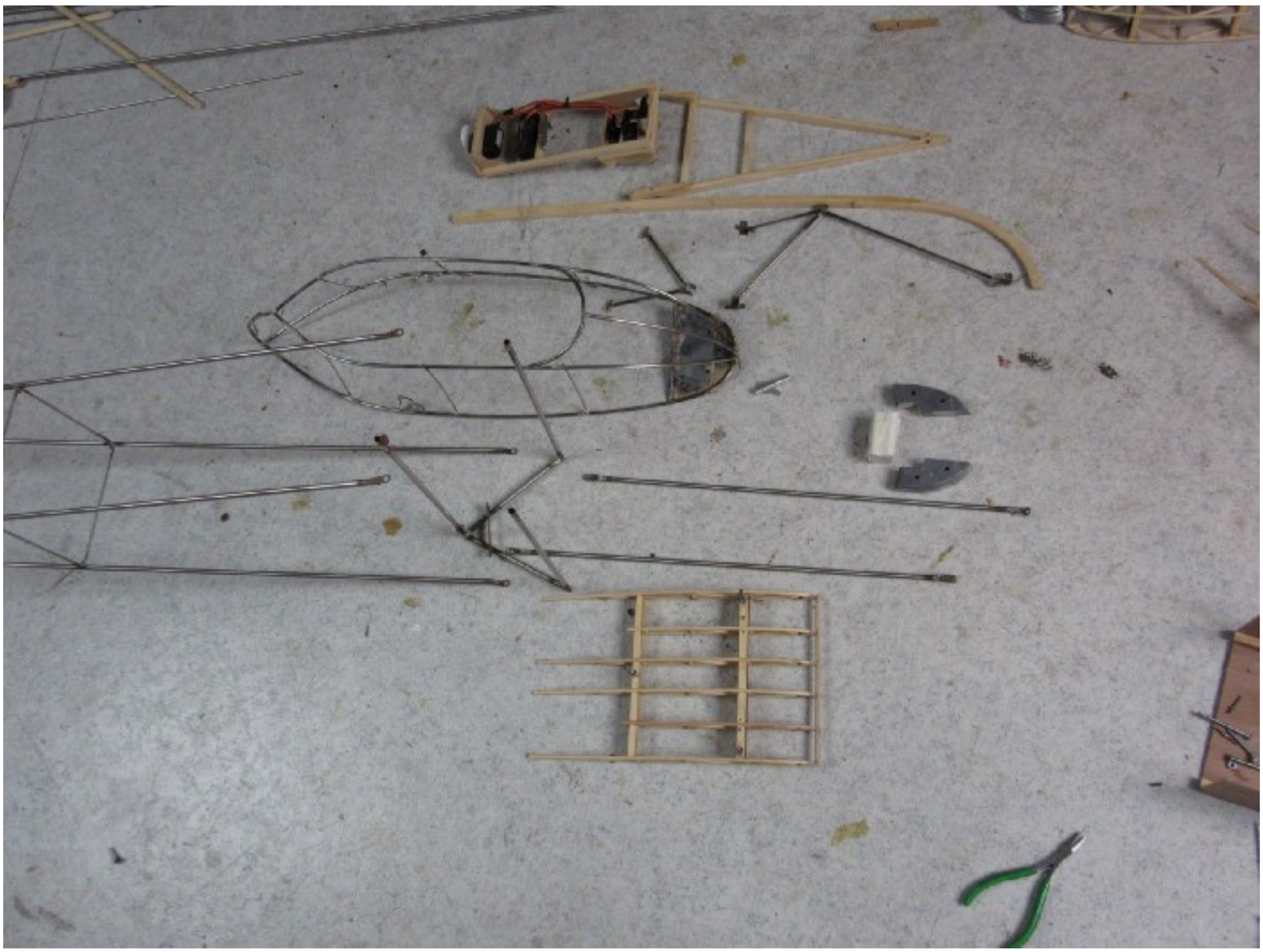
The nose section of the fuselage consist of a wooden A-frame, attached with two diagonal struts to the central middle struts. I made the wooden A-frame from 8x8 mm spruce, glued and on visible places connected with metal plates and M2 bolts and nuts. On Fokker's planes that seemed to be common practice. On this frame I made a demountable wooden rectangle for the seats on top and the servos and receiver underneath. Under this frame are supports for the control column. The column can be moved, but it’s not connected to the servos — that was too big a challenge at that stage for me. On the front side of the A-frame are the rudder pedals, made of wood. I laminated the skid from 5 layers 8x2 mm spruce. I had to put the spruce in boiling water to get it in the right curve. All the wood was coloured with bister, an organic, water soluble colour powder for a nice antique tint. After that I laminated glass rovings with epoxy resin on the skid to make it stronger, which is almost invisible. The skid is attached with M2 bolts and nuts to the metalwork. The streamline body consists of several bended tubes, covered with Diacov.



The fuselage in its early stages, a strange combination of wood and metal. Wood is certainly a part of the load bearing construction: the crew sits on it. When looking at the photos and some footage, I think I got that right. In the real airplane the fuselage was just a streamlined affair, in the model I used it as an integral part of the construction. (image:)

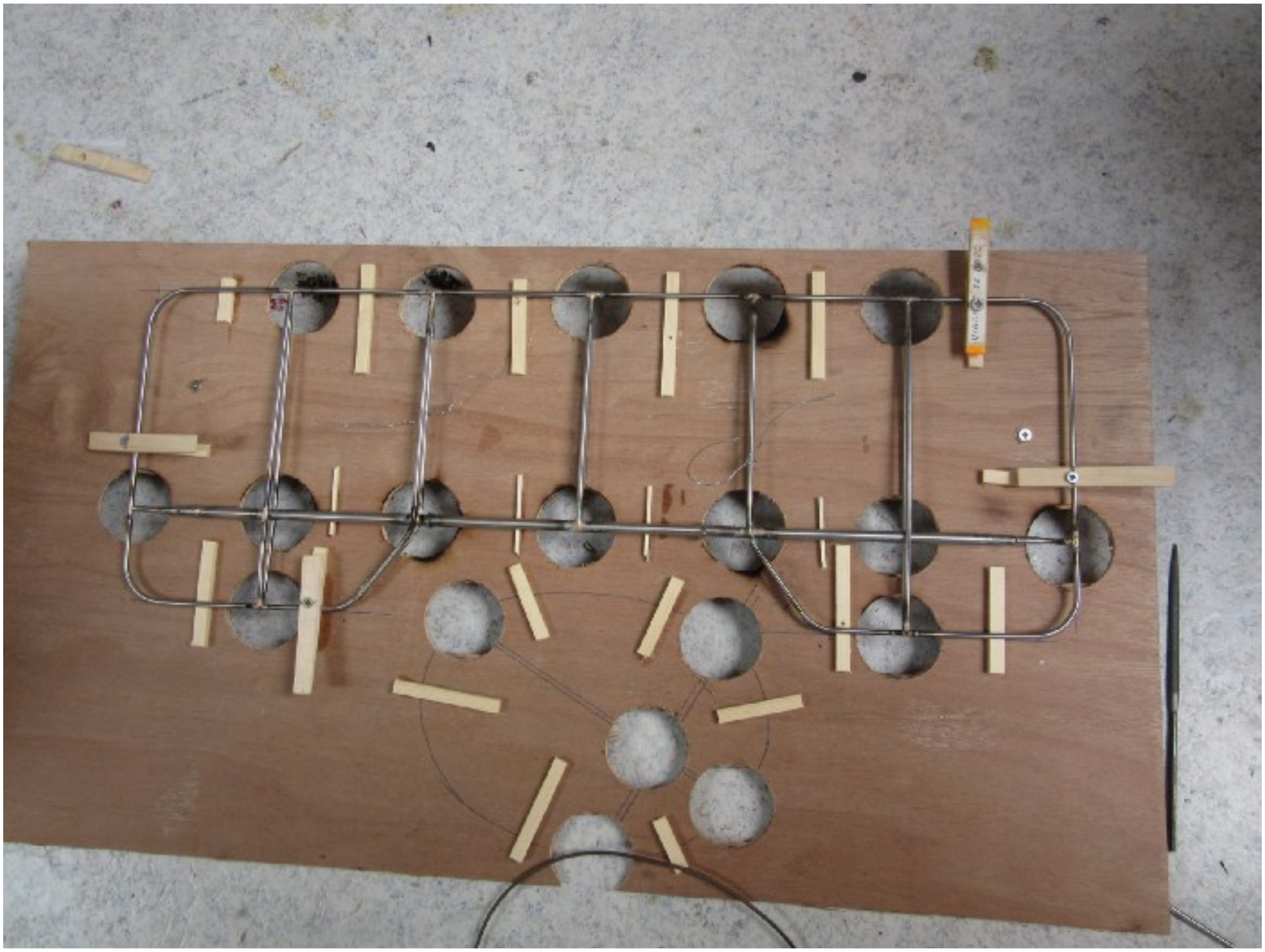
The connection with the middle, front struts at the lower wing is a complex construction. At each side an M4 bolt sticks out of the wing. Several parts come together here: the wooden A-frame (with a metal strip), the tailboom, the streamline body (with a gusset plate), a strip for the front crossbracing of the wing and finally the strut itself, all secured with a 1 mm clip through a hole in the M4 bolt.

The tailboom itself looked quite straightforward, but it had its challenges! The frame, all the thin tubes and gusset plates must be positioned in the correct position to solder it in one go. Regularly I was short of hands and when the metal isn't red anymore, it still can be hot. The tailboom ends in two short vertical tubes, connected with gusset plates for the rigging wires and horizontal stabilizer hinges. Through these vertical tubes I put thinner tubes to which the rudders are attached.



Most of the components of the fuselage are displayed here. All is kept together with the two middle front struts (with the 1 mm steel clips). Fitting everything together like a puzzle was quite a headache. The wooden rectangle with all the RC components must stay demountable even in the finished model. (image:)

The Rudders and Horizontal Stabilizer



The soldering jig for the empennage. My guess is that Fokker chose to have top and bottom rudders to avoid torsion of the tail boom. The two sets are probably for ease of construction. I got the impression the glider was designed to be easily disassembled. The tail boom consisted of four tubes, wings in one piece and the fuselage looks demountable, as a dome tent long before its time. Apparently to improve its flying characteristics Fokker had to lengthen the fuselage. The FG-2 was intended as a floater, with low wingloading and low sink speed. (image:)

I built these in the same way as the original. Somewhere on the internet I found photos of the building of a replica Fokker fighter, which gave me a good idea of how they were constructed from metal tube. From a scrap piece of ply I made a jig with big holes in it, so I could solder with a flame (bucket of water at hand!). Stainless steel tubes of 3, 4, 5 and 6 mm with a wall thickness of 0.25 mm were used. Very quickly I had a stabilizer! To cut all the tubes I used a diamond cutting disc on a Dremel, more expensive than the thin carborundum discs, but they don’t break.

A rudder under construction. Because of the thin walled tube, one covered rudder weighs only about 30 gram. (image:)

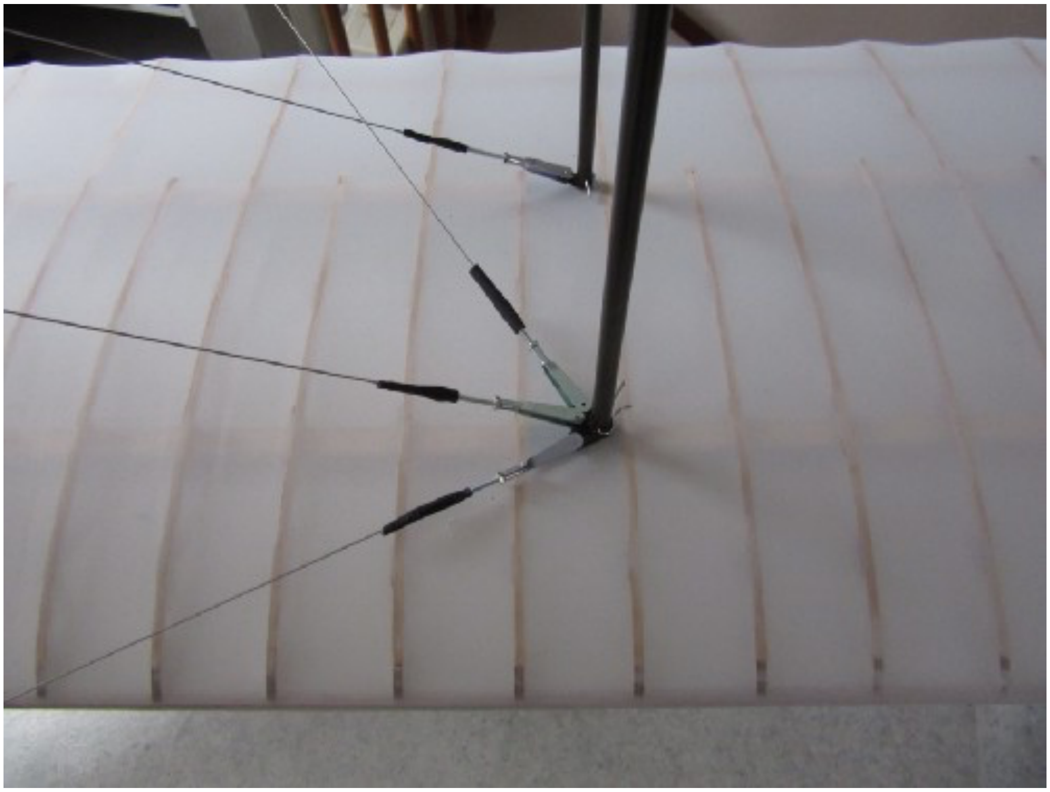
The rudders are made in a similar way. The central tube is 6x0.25 mm in which a 5 mm tube is soldered, this 5 mm tube goes through the 6x0.25 mm vertical tubes of the tailboom and the bottom rudder slides over it, secured with a 1.5 mm steel pin. One rudder weighs about 30 grams. The actuation of the rudders is exactly the same as in the real airplane. The rudder horns were made of 0.7 mm metal sheet (a side panel of an old PC), soldered to the central tube of the rudders. They are connected with steel wires (strength 40kg) to the servo horns which are located under the pilot seat.

Covering

Before covering, the metal had to be painted. After counselling with some Fokker connaisseurs I went for a specific dark green. The local paint shop filled a spraycan with a primer/paint in that custom colour. The nasty thing with spraying all those tubes is that more than 90% of the paint will not reach the tubes. I have a kind of spraybooth, but somehow a lot of green paint ended up outside the booth. For covering I chose Diacov, which looks like fabric. The width of the material was sufficient to cover the wing in one go. Because the trailing edge was a steel wire of 0.6 mm I had to fold the Diacov about 5 mm around the trailing edge. Covering the fuselage was a little more complicated, lots of small corners and gaps to cover. To make it less transparent I doubled the Diacov. The underside of the fuselage was even more daunting. I guess the real plane had a steel wire from the top of the main spar over the LE to the bottom of the mainspar running through a seam in the cloth. I can’t model that, so I made a wooden replacement for that. I laminated this part on which the cloth is ironed. There were no wrinkles and it’s obvious the cloth isn’t directly attached to the wing, just as on the real airplane.

The Rigging

Now that everything was covered it was time to make the rigging. I had no experience with functional rigging and encountered several problems. For the static rigging in the fuselage I used 0.6 mm massive steel wire, for all the other rigging and control cables I used stranded steel wire, max strength 40 kg, with clamping bushes.



Detail of the demountable struts. I soldered metal plates on the ends of the tube with holes for the quicklinks. With a 1 mm steel wire clip it is secured (with oversize holes to allow movement) to a short section of an M4 bolt, which is screwed in the nut in the wing. (image:)

The loads on the wires are substantial and as the whole structure is very stiff, the peak loads on the wires during hard landings are very high. This caused the wires to slip through the clamps. I put an extra loop through the bushes and that solved the problem. Another problem was the opening of the wing-warping quicklinks under high loads. I modified the quicklinks by replacing the quicklink pins with M3 bolts, nuts and spacers and I am confident that it’s strong enough now. The other quicklinks are now secured with a home made spiral spring which I can slide over the quicklink. During transport it takes a lot of effort to keep all the wiring tidy, but the wires are a vital part of the looks of this glider.

The Crew

The crew is very visible in this aircraft, so the pilots had to look as good as I could make them. They also had to be quite flexible, otherwise it’s impossible to get them in. It’s very cramped in the Fokker! I made the figures from balsa with knee and elbow joints made of Robart hinges. The hip and shoulder joints are made of elastic band (same stuff as used in clothing). The heads have a 6 mm peg, which fits in the bodies. I made the heads from Super Sculpey. This clay-like material hardens at 140C, simply in the kitchen oven. I found some wonderful tutorials which show how to do the sculpting. The heads stay detachable, it’s then so much easier to put the clothes on. My sister Hans had a good look at some photos of Fokker and his passenger and she made great clothes for the pilots. She added a big shawl which flaps in the wind, which looks very dynamic.

Instruments

There are only two instruments onboard. On the left diagonal strut a woollen thread as a slip indicator, and on the right diagonal strut a “anemometre Wilhelm Morell” a kind of universal airspeed indicator from World War I. The latter is a very characteristic item, so it’s vital that it look good. Luckily very good drawings are available. I was thinking about printing it in 3D, but lack the knowledge to do so. I counselled my friend Adri, he looked at the drawings and told me to have some patience. After a week he turned up with a beautifully crafted anemometer in 1/5th scale. Lathed, milled, pressed, glued and to my big surprise even functionally turning! My day couldn’t be better! He also cut decals with number ‘4’ and a small “Fokker” logo.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PRODUIT DE FIXATION
CILINDRISCH BEVESTIGEN
Fort - Hoge sterkte
5 ml

Left: The two intruments. The "anemometre Wilhelm Morell" rotates when the aircraft is flying! **Middle**: The housing, two beautiful crafted pieces of brass. **Right**: The final result, later sprayed grey. (images: Ari Brand)

Flying at Last

Finally the FG-2 was finished and on a well cut meadow I put it together for a photo shoot. After the photos were taken, it was very tempting to make some hand tosses. They did not go that well. First of all it’s an awkward plane to grab and secondly there was almost no wind. The Fokker responded weakly to the wing-warping. It had some hard landings with damage and the bushes in the wing rigging had slipped.

So back to work: I altered the rigging bushes and the wing-warping. The wing tip travel is now seven degrees up and down. We decided to make an aerotow start. I made a basic dolly and we went to our flying field. Rob has a Piper as tow plane, which we estimated to be just powerful enough. The tug started, scary, a lot of work and a lot of unknown variables. The Piper had to work hard, but it went well, the FG responded properly, just a bit sloppy on the ‘ailerons’. It was a beautiful sight, the transparency of the wings with the shadow of the top wing over the bottom wing, wonderful!

It was a rewarding moment to see the Fokker flying after all the trouble to figure everything out. I saw a Fokker that looked very much the same as the one I saw on the old photos and footage. A piece of history which has come to life again. As expected the plane has a steep gliding angle, like a glider with the spoilers open, it’s coming down at an amazing rate. Later it appeared the CG was a bit too much forward, so I took out 220 gr lead and it flew better.

First flights of the Fokker FG-2 model

First flights of the Fokker FG-2. (video: Raymond Esveldt)

Retroplane 2017

The launch over the Atlantic Coast at Normandy during Retroplane 2017. (images: Retroplane 2017 Media)

Finally we stood with all the participants of Retroplane 2017 on a hill, 150 meters high at the Atlantic coast in Normandy. A fantastic location suitable for SW through NW winds. A nice sloping hill with ample room for landings. When the wind should drop it was still possible to land 50 meters below the starting position. The wind was 20 knots plus and there was a lot of flying, but very few models of planes before 1925. I decided to have a go, the Fokker was a bit more than 4 kg. It was scary to launch this museum piece, but my flying mates Sjoerd and Claude provided me with some moral support. No guts no glory! Sjoerd is very good at tossing models, so it was his turn. It’s an awkward model to handle, but the launch was OK. A quick correction and the Fokker flew beautifully. There was ample lift, the Fokker was in its element. It steered nicely and it was spectacular to see such a biplane soaring over the ocean. It was a rewarding moment.

Then I realised I had to land it. In flight this airplane is a bit like a normal glider with the airbrakes fully deployed, it’s just impossible to pick up speed. I managed to land it, but I have to learn to master that better. I made some more flights that Saturday and the Fokker handled quite nicely, it once dropped a wing (or should I say two wings?), but it was easy to recover. On Sunday the wind was less and it became sunny, good for the pictures. Sunday night the Fokker won the Challenge 1925 award, something of which I am very proud.

It was a very rewarding project, finding out how this plane was built, the building itself and the flying combined with all the feedback from the Retroplane forum.

Additional building details for my Fokker FG-2 can be found on the Retroplane Forum. Also, for those who are interested, here are some of the other entrants in Retroplane 2017.

*Read the **next article**, return to the **previous article** or take me back to the **table of contents**. Downloadable PDFS: article issue*

What a Day for Soaring!

That we should all have an unforgettable day like this.

Jim Carlton

(image: Paul Naton / Radio Carbon Art)

This story was written almost 10 years ago but after stumbling across it as of late, I thought "how fitting" with the new soaring season just a few weeks away and the uncertainty of our times, a look back at simpler times. Follow my flight…

Tuesday was a day that exemplifies, to me, what this great activity is all about. I wish I could wax poetic about my experience but, alas, I will make an attempt to describe the enjoyment of this day. What a day!

Early up and out is always the best welcome to a day of soaring but typical life duties called and thus we got started about 10:30 am. Setting up the winch the air felt active and light with a whisper of wind coming out of the east but I decided to go ahead and launch into the prevailing west. If anything it would be good practice for downwind launches and then I could land back towards the flight line. Simple. Only one other pilot was to join me for the day and he soon arrived. The air was rich with activity; bugs being chased by thermal birdies, hawks roaming the field for an early lunch and buzzards at altitude scoping out their next lift and who knows what else. Skies were partly cloudy with many cumulus forming and high stratus indicating a great day of thermal activity ahead.

Good karma was already sending out vibes as my partner for the day found his recently treed DLG, sitting pretty in the woods beneath the behemoth that ingested it about a week prior, no worse for wear than a slightly dinged leading edge. He had spent hours prior attempting to dislodge it without causing any more stress on such a fragile toy, but the woods were not done with it, until today! Nice! Let’s get in the sky!!

Buzzards in the distance! (image: Jim Carlton)

I staggered out to the line while Larry assembled his Icon2. My trusty Genie LTS was feeling light and responsive as I hooked her up to the line and I prodded her to make quick work of the winch and fly to the clouds. And fly she did! Certainly not as strong as my “recently departed to faraway skies” Pike Perfect, but with an adequate and snappy zoom none the less, off she was! Right off launch, I hit buoyancy, and ***up, up and away*** she went. (Reminded me of the old commercials for my dad’s trusty airlines, ***TWA***, from days past. Actually started humming the tune and now have an earworm to go with it!)

Up and out she went, left turn, right, any which way was just all up air. As JW and others have so eloquently stated, having the right bird for the mission is important but getting to know your ship, as intimately as possible, will yield much more than the latest wizbang setup could to the unpracticed. The Genie was proving she was the ship for the trip today! What a great flight. Ten minutes of task time (as Gordie so often states that “it’s the task that’s important”) elapsed so I decided to bring her in to see what my fellow pilot was up to. I brought her in for a leisurely hand catch to gently thank her for such outstanding service. Sweet!

Genie LT/S and Monarch in the queue to fly! (image: Jim Carlton)

Hooking up to our trusty FLS winch, his Icon2 majestically soared skyward on launch but as all birds tend to at some time, needed a bit of coaxing and prodding to fly, and upon return to earth revealed that a mighty flap had gone dead, in need of servo surgery. Sorry to see him hangared at such an early time in the day but necessary for future flights of fancy. My companion eagerly retrieved the line and retired for the day as I continued on and upward with the Genie.

I again shot the Genie skyward and again was rewarded with outstanding air. Circled up and out to the east, over the trees and towards the stables and road at the far end of the property. Spotting a gaggle of buzzards low and away out, I pushed onward to see if I could hook up with the avians. Knowing that this was a kind of "hero or zero" move, I decided to range far and intercepted the thermal at the base, and joined the flock. Great indicators of lift, these birds, but also known in these parts as suckers for sink, I was held true and rewarded with an amazing climb rate and soon, five buzzards and one Genie, danced to cloud base! What an incredible ride, all in formation, feeling out the air and each other and riding the "up" elevator! I couldn't make out the stab for the life of me nor my recently corrected 20/20 vision. As my fellow fliers took wing for other areas of the sky, seemingly bored with this composite animal flying in their airspace, I slowly arrived over the field and descended to an altitude easier to be seen.

I played with settings and rates, highs and lows, 1-to-2 and 1-to-4 differential, coupled and uncoupled rudder, reflex, cruise, and thermal modes, all in the expanse of excellent skies. Per Mike Smith and his knowledge base documented on DVD from Radio Carbon Art and Paul Naton, I re-tuned the Genie and soon began seeing the magic let out of the bottle! Fun stuff with predictable performance. I decided to bring her down to a wingspan-high gopher fart altitude and pushed myself to spec out again. Riding and coaxing the gentle thermals down low, turning the Genie into a big DLG, I stood her on a wingtip, not nearly wary of a stall and rode her out, up, over the field, past the lake, over the far trees, and out again to heights that made any magic carpet look silly! What another great ride! Easy ten minutes and up, another task time made. What stinking pop-offs to worry about? Just low launches! Great practice for that inevitable contest silliness.

Upon locating the runway and landing the Genie, ever so close to that hunskie spot on the tape, a chorus of birds cackling overhead sang out tempting me to again chase the air in their domain, one actually shaking his tailfeathers at me as he circled overhead, taunting us to come play. Up we launched once more to dance with the clouds and chase thermals all across the sky. What a perfect day for soaring!

As the time flew by, another landing attempt was to be made with a simple drop to the spot, points on the tape if needed... and now time to pack up and retire. It felt a shame to leave such a perfect day of flying for other activities. A round of golf this afternoon was just a walk through the park with eyes drawn skyward, following the clouds and birds as they danced through the rising air, wishing I was again in their domain, enjoying such flights of fancy. As my partner stated upon leaving, it was too bad to leave one of our best days in memory at the field, but wonderful to know we were given the gift of experiencing such an amazing day of flying! I hope everyone that attempts R/C soaring gets to experience a day just like today!

*Here's where you can find the Radio Carbon Art Master Class in Soaring DVD mentioned in the essay. Read the **next article**, return to the **previous article** or take me back to the **table of contents**. Downloadable PDFS: coming soon*

The Aerodynamics of a DLG Unravelled

A practical analysis of this popular form of R/C soaring.

Theo Volkers

Co-author (along with Tjarko van Empel) Theo Volkers demonstrating textbook DLG form. (image: Trudi Volkers)

We have been enthusiastic discus launch glider (DLG) pilots for several years. It started with a classic, the Highlight, then a second-hand Twister II, a home-built one, then the first stream NXT and then two more. The flight performance of the DLG models has increased dramatically in recent years and we are very curious where it is now. On the one hand just out of interest and on the other hand to build a second model with such flying performance, or even better.

We have measured the latest model and analysed its aerodynamics, to find out what flight performances we can expect. It fits well with our background. Theo has worked as an aerodynamic specialist and Tjarko is good in mechanics. We try to bring theory and practice together in this story and hope to unravel the secret of a good DLG. We start with some joint test flights.

Photo 1: The two recently purchased DLGs

We get a launch height of 35 to 45 m (we are better at math than at throwing). Figure 2 shows what that means for flight times on an evening with very little wind. From 45 m height over two minutes is feasible . Now it comes down to whether we are on the right track. Are these good flight times at these heights or is there more to it?

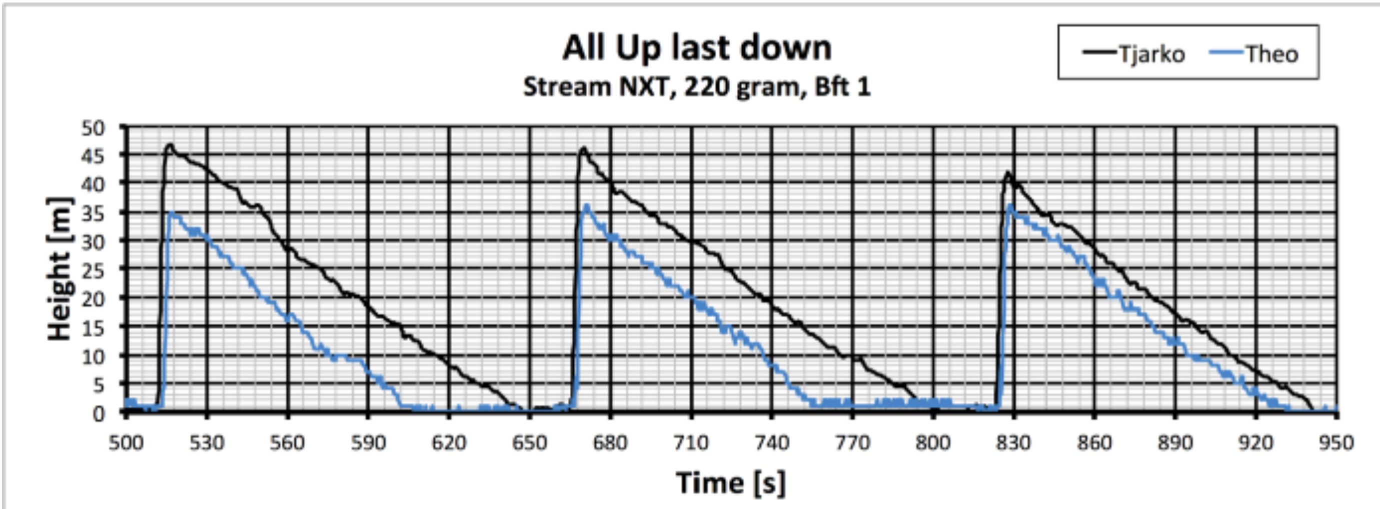

Figure 2 : Comparison of measurement results during an evening with very little wind

To answer this question, we try to calculate the performance. For this we need to know exactly the dimensions of the model and the airfoils. This is also interesting for the DLG self-builder. This new model uses a better airfoil than for instance the previously popular Zone V1?

Measuring airfoils : To find out the airfoils, we make moulds of the airfoil in three places on the old NXT from Theo. We take the airfoil at the root, 34 cm from the wingspan (mid) and 10 cm from the tip. We want to keep the wing intact, so the moulds have to separate properly from the wing. First I stick thin transparent tape on the wing. Then a thin layer of wax is applied. On photo 3 you can see the 4 mm plywood templates that I saw on approximately 1 mm accurate with the airfoil. The moulds are then placed on the wing at the bottom with polyester filler. With a piece of balsa that is in the span direction and glued to the plywood, I ensure that the templates remain exactly perpendicular. When the filler is a bit hard after 30 minutes, the wing is turned over and it is on the three templates. I make guide strips with some leftovers of balsa. The top moulds can now be used as guillotine knives, with another layer of polyester filler. On the front and back, the plywood templates are about 2 cm cold on top of each other. This is useful later when measuring as a zero reference. When the polyester is really hard after about five hours, the exciting moment comes. Is it coming loose? And do we have a beautiful mould? It went well in one go!

To measure the airfoil shape very precisely, I use the milling column on my lathe. This has a digital readout with 0.01 mm resolution. I file a screwdriver a bit thinner and serves as a measuring head. With the X slide, the airfoil is placed in chord direction with 0.1 mm precision and then measured vertically every 5 mm. At the nose every 0.5 and 1 mm. The drill column is a bit stiff as a measuring device, but with too much measuring force the tip pushes into the filler. With some practice I get 0.02 mm repro. At each position I repeat the measurement three times to avoid outliers. The measurements are processed in Excel. The airfoil now appears for the first time. You can see an impression of that measurement in photos 3 and 4 .

Photo 3: Imprint of the tip airfoil. **Photo 4**: Measuring on the milling column, with 0.01 mm resolution

After the measurement, the coordinates are corrected for the 35 µm thickness of the protective adhesive tape on the wing. Close to the nose some points are corrected by hand. You measure there on an inclined sloping piece, which is not always good. To make a comparison, the coordinates are normalized to chord length 1, see Figure 5. The Y-axis has been scaled up, airfoil shown thicker, to better see the differences .

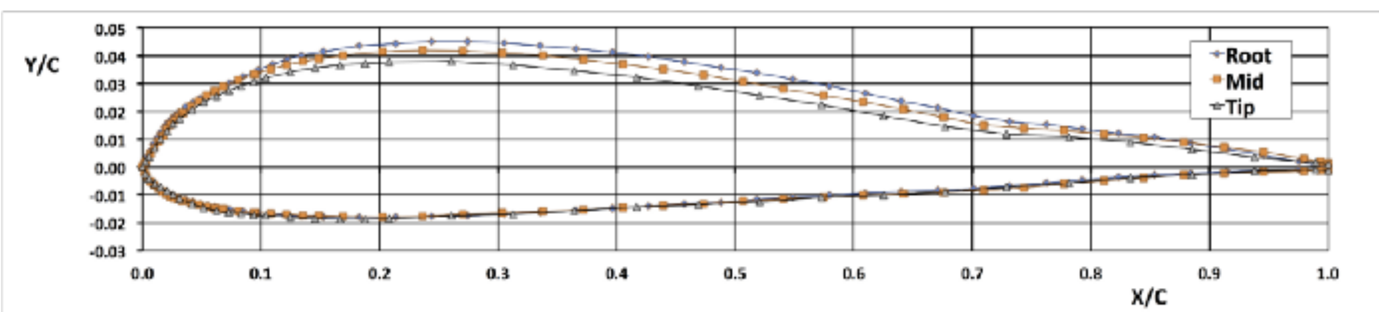

Figure 5: The measured airfoils

The airfoil has a thickness of 6.3% at the root, 6.0% at the mid and 5.6% at the tip. The lower side of the airfoil is at the three measured spanwise locations exactly the same. The first 2% of the nose on the upper side of the airfoil is quite straight. We ask ourselves if this is for a reason or is it a construction deviation? It is on all three moulds. Our new models don't seem to have that straight. In the back you can clearly see the flap hinge line. The flap is here at 0 mm deflection. This is the start position. We use 2 mm deflection down for cruising flight and 5 mm to 8 mm for thermal flight. This equates to a flap deflection of 2.3 degrees on cruising flight and 5.7 degrees to 9.2 degrees on thermal flight. At 2.3 degrees flap deflection, the airfoil has the most streamlined shape.

Calculating section properties: The airfoil coordinates are input in the program XFOIL of Mark Drela. Theo interpolates the measured coordinates to 121 points with the "PANE" option. In this way you realize a point distribution over the chord that is optimal for that program. The result of the point distribution and the aforementioned flap deflections results can be seen in Figure 6.

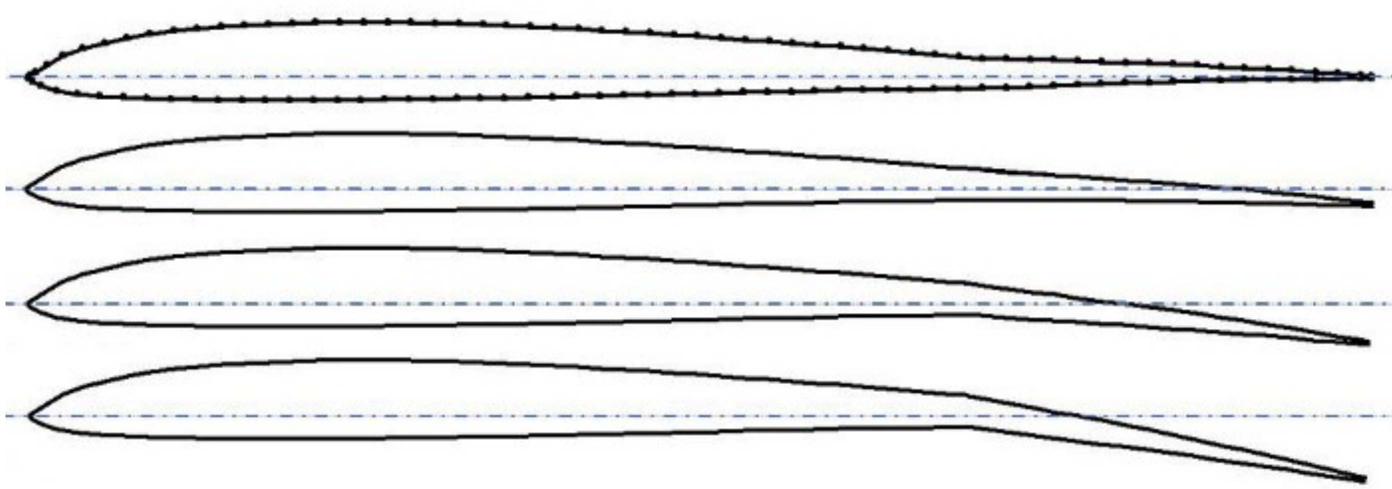

Figure 6: The geometry of the airfoil at 34 cm wingspan with flaps 0, 2, 5 and 8 mm

In XFOIL, the option is used to vary the Reynolds number by the lift coefficient. You then only need to enter the Reynolds number corresponding to lift coefficient = 1. For the other lift coefficients, the program then calculates the corresponding flight speed and Reynolds number. This Reynolds number is very important for calculating the airfoil properties for model aircraft in general. It stands for the so-called scale effect. You calculate it by multiplying the flight speed with the chord and the air density and then dividing it by the dynamic viscosity of the air. Model builders often use the following approximation formula : Re = 70 x Velocity[m/s] x chord[mm]). You see in Figure 7 that the airfoil of the tip with 96 mm chord has a significantly greater drag coefficient than the root with 164 mm chord. While that tip airfoil is still 0.8% thinner than the root airfoil. This is an example of the said scale effect. In this article, the applied airfoil properties are calculated for a wide range of Reynolds. This varies from a little below the Re = 25,000 for the tip airfoil at the lowest flight speed up to almost Re = 200,000 for the root airfoil at the maximum flight speed.

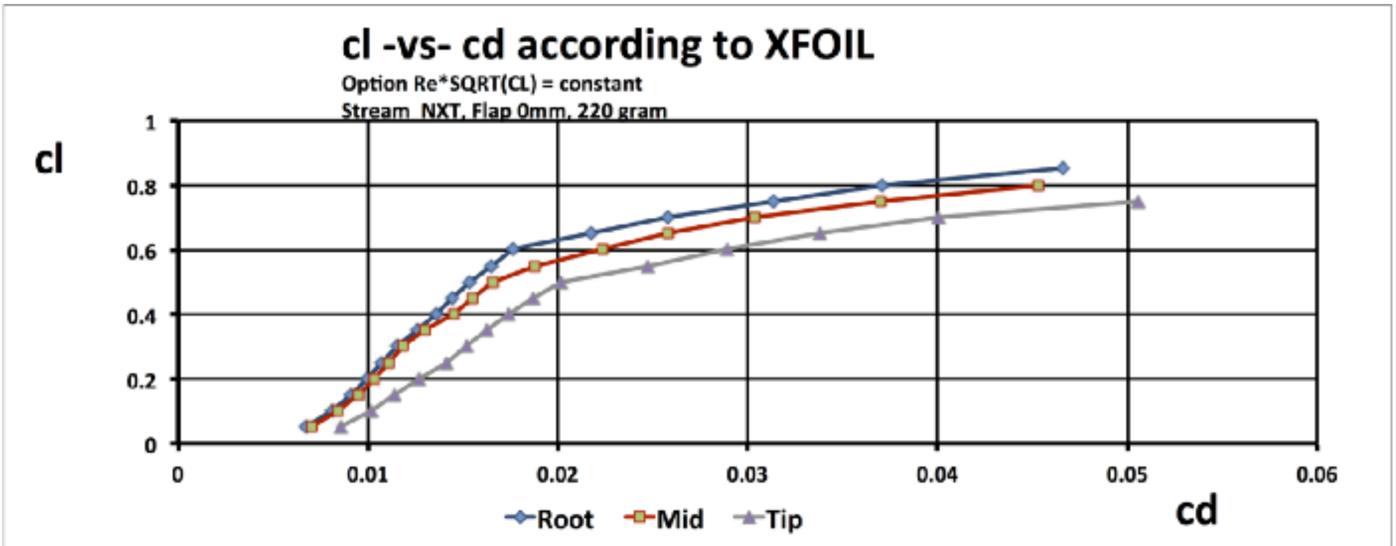

Figure 7. Example calculated airfoil properties for flap deflection of 0 mm

The calculations were made for the three measured airfoils and for each of them also all four flap positions. The influence of the root, mid and tip airfoils are included for 25% , 50% and 25% respectively. The implicit assumption is that the lift coefficient across the wing span is constant. This is a reasonable assumption because the plan shape of the wing has no washout, is substantially elliptical and the flap hinge line is at a constant percentage of the chord over substantially the entire span constant.

Air drag build-up whole model: Now you need a calculation of the parasitic drag of the fuselage + tail surfaces + protrusions + gaps and a calculation of the induced drag. Figure 8 shows the individual drag contributions and the total drag. All drag contributions are expressed here in CD value, non-dimensionalised with dynamic pressure and wing area. In this way the relative contributions are easy to compare.

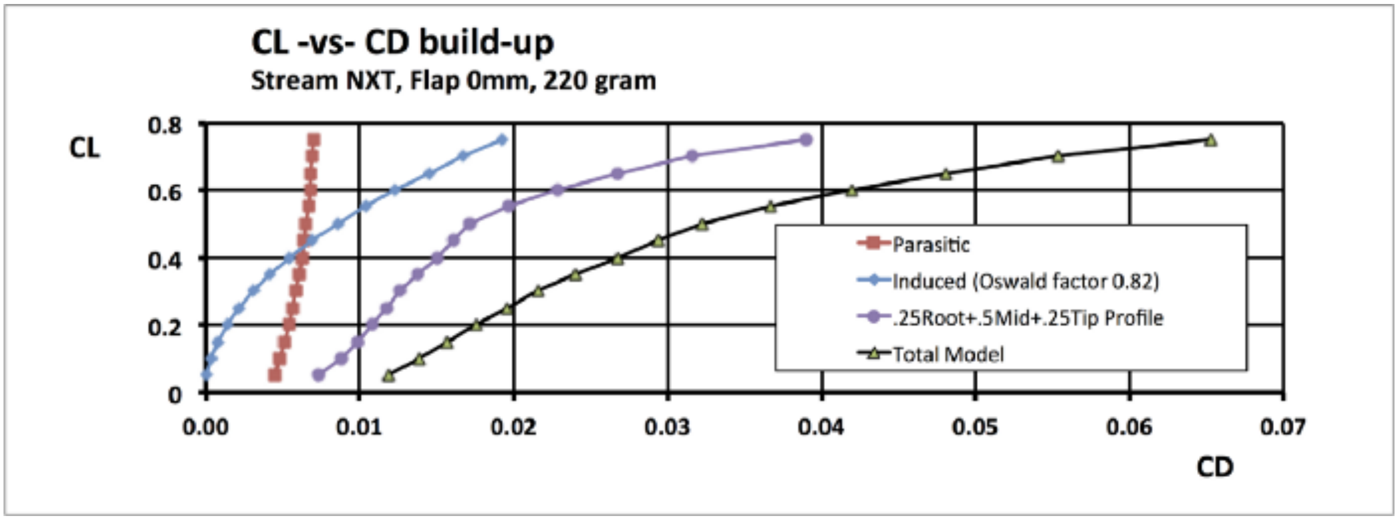

Figure 8: The main drag coefficients, non-dimensionalised with dynamic pressure and wing area.

The drag of the fuselage is defined by a Reynolds number-dependent coefficient of friction for the turbulent boundary layer. This may give a slight overestimation of the fuselage resistance because the boundary layer on the nose will be laminar. The contributions of the tail surfaces were determined with XFOIL calculations on a NACA 006 airfoil. Thereafter, the said contributions have been multiplied by their respective area and divided by the wing area. The result is shown in Figure 9. From 4 to 20 m/s, the Reynolds number increases so much that the drag coefficient almost halves. The air drag does not increase by a factor of 25, but only by a factor of 12.5. For the protrusions such as the control horns and the throwing pin, a constant Cd value of 0.1 has been assumed, estimated using the information from the book "Fluid Dynamic Drag" by Hörner. The drag of the parts is non-dimensionalised with dynamic pressure and wing area, as a comparison of the contribution to total drag. The contributions are: control horns + throw pin (= 0.00010), aileron gap (= 0.00005), stubwing under stabiliser + interference (= 0.00012) and the wing / fuselage interference (= 0.00043). The negligible contribution of the aileron gap surprised us. According to Hörner, it is 0.004 * (gap length * gap width) / wing area. This is because the gap is deeper than it is wide. A vortex inside the gap acts as a kind of “roller bearing” and guides the flow across the gap.

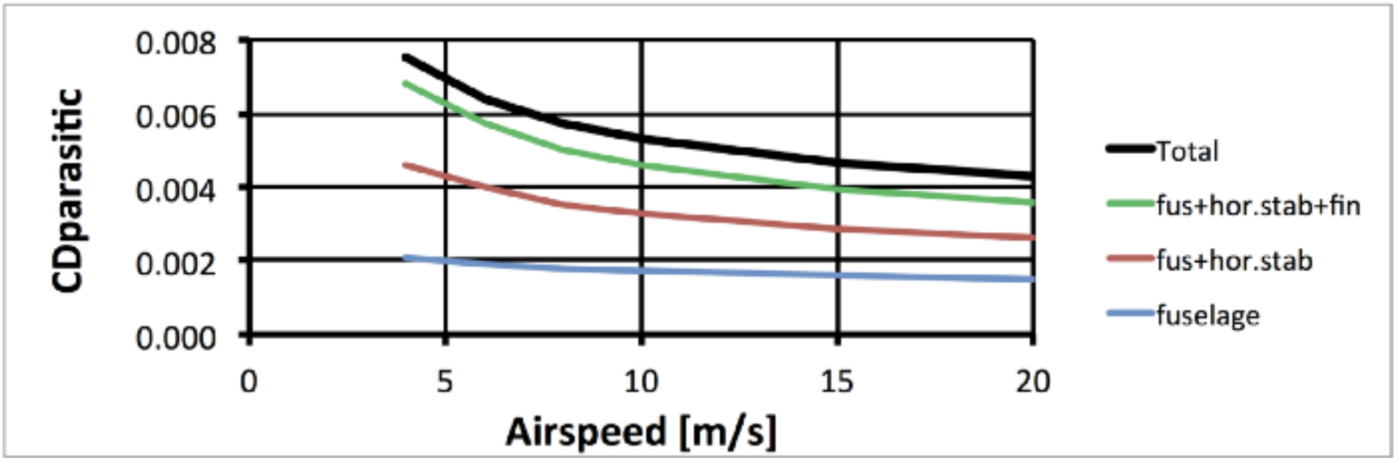

Figure 9: Build-up of the Parasitic drag.

Performance calculations: Using the data described above one can calculate the sink speed as a function of the airspeed. This is shown in Figures 10 through 12.

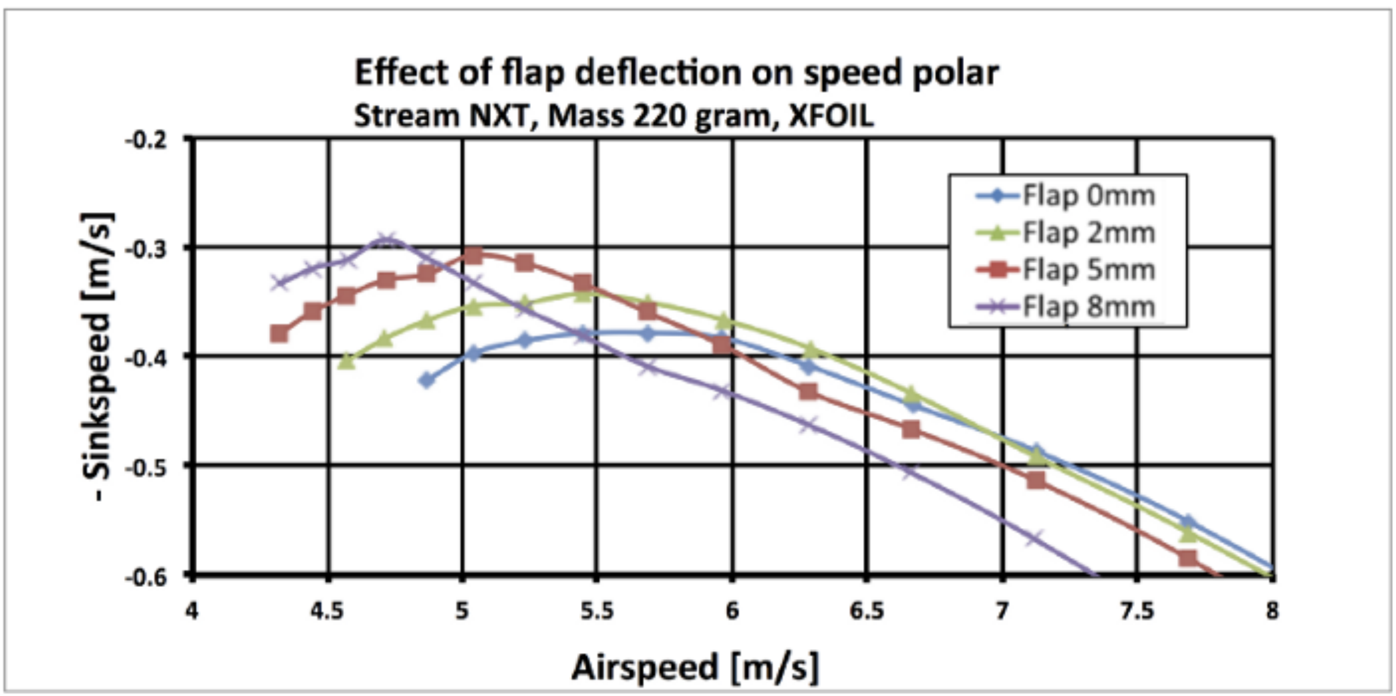

Figure 10: Effect of flap deflection on the speed polar.

You can read a number of important properties. Successively, you will find something about minimum sink speed and selecting the correct flap deflection. Then you will find something about the glide angle and what to do in downwind and headwind. Finally you find information about the reason for adding ballast.

Minimum sink speed and selection of the correct flap angle: In Figure 10 you can see that the calculated minimum sink speed of approximately 0.30 m/s is found with a flap deflection of 8 mm at a flying speed of 4.7 m/s. With flap at 0 mm, the launch position, it is 0.38 m/s, more than 25% worse. The measured sink speed at the beginning of this article was between 0.33 and 0.38 m/s, slightly higher, but it was also not perfectly still air. We fly in quiet conditions usually with flap at 5 mm. While turning in the thermals we give some elevator deflection with the result that the flap deflection is also increased, to about 8 mm. The optimal flight speed is now even lower so you can fly smaller turns. The flap deflection of 2 mm is indicated by the manufacturer for cruise flight. In Figure 10 you can see that it is indeed a good choice for finding areas with thermals faster. At slightly increased air speeds between 5.5 m/s and 7.0 m/s, this gives the least loss of height. If you want to move more quickly to another area, then flap deflection of 0 mm is even better. This result teaches us a lot about selecting the correct flap deflection.

Glide angle and what to do in sinking areas and headwind: The tangent line from the origin to the polar (red dotted line) in Figure 11 gives the point with the best glide angle. This is the same as Figure 10, but now on a slightly different scale. At between 5 and 6 m/s air speed, the glide angle is optimal with a flap deflection of 5 mm. If you have to cross a sink area, you should increase the airspeed significantly to, for instance, 8 m/s and select flap of 0 mm. That shows the blue stripe-dot line in Figure 11. The same applies in case of headwind, even then you have the best glide angle at increased air speed and corresponding flap position. The blue dash-dot line shows this for a 3.3 m/s headwind.

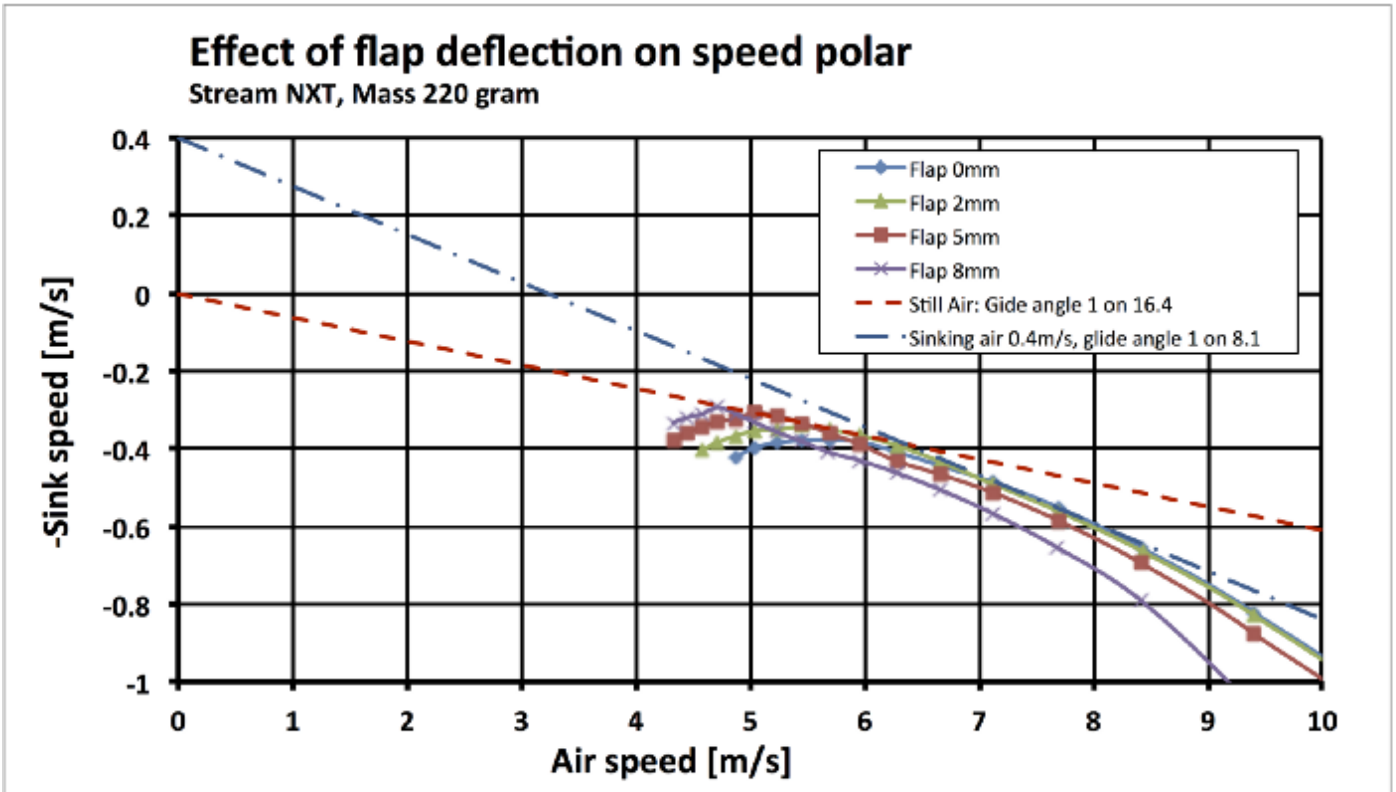

Figure 11: Effect of Flap deflection on speed polar with glide angle indication

The why of adding ballast: In Figure 12 you can see what to do if there is a headwind of 5 m/s. This is almost at the end of the Beaufort 3 scale. You will then add ballast to penetrate into the wind better. The red dotted line indicates a better glide angle than the blue. By adding 40 g ballast the sink speed at best glide is than reduced from approx . 0.82 m/s to approx . 0.72 m/s. You can then fly back with a glide angle of 1 to 6.1 instead of 1 to 5.4. You can then fly approximately 13% further in a thermal downwind. Perhaps that is an extra circuit in the thermal. You have to weigh that against the slightly lower climb rate in the thermals, because the minimum sink rate increases a bit.

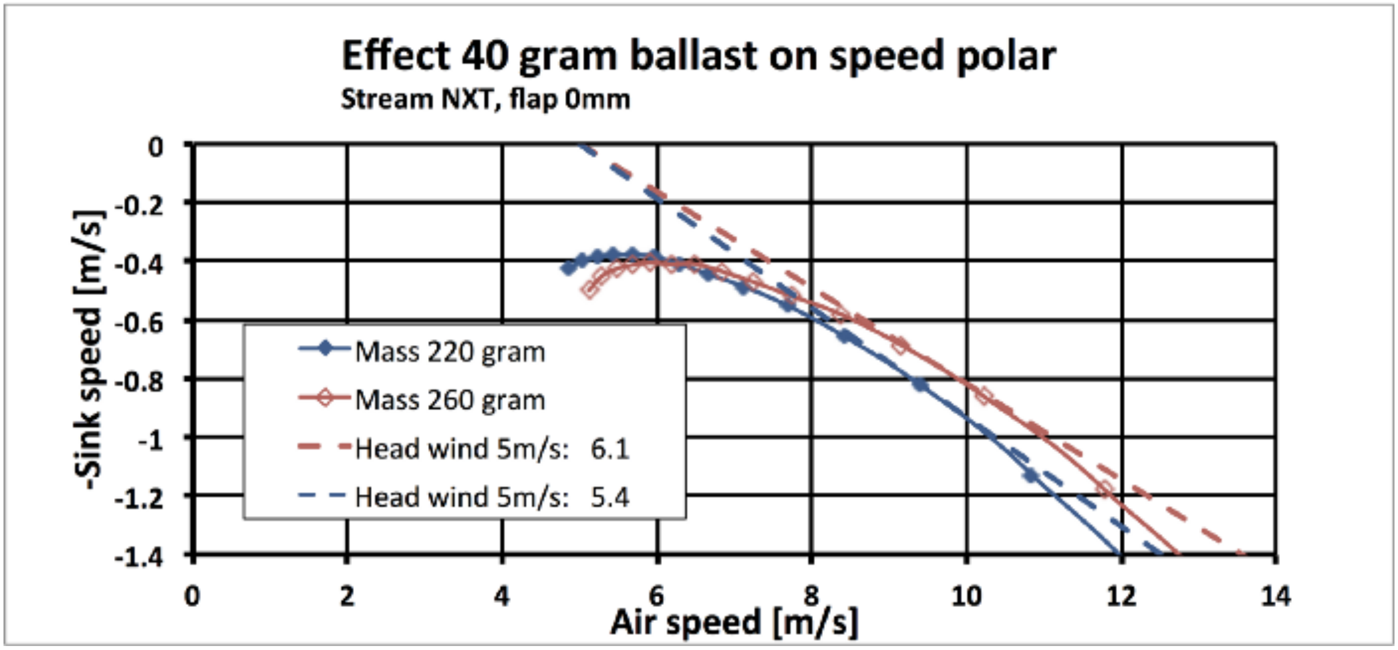

Figure 12: Influence of 40 grams of ballast on the glide angle.

There are a number of other aspects of ballast. The stall speed and sink speed increase with the square root of the mass ratio. So in this case with √(260/240) = 1.04, so with 4%. The response and sensitivity to sudden changes in wind speed and wind direction (gusts and thermals) decreases. And usually you throw the model a little bit higher.

Accuracy: To get an idea of the accuracy of these calculations and measurements, we have done a number of analyses:

- Measurement errors in sink speed of Figure 2: The air is not 'still' — air can always have some movement in it. And how accurate are the altimeters? Tjarko uses JETI equipment with 0.1 s and 0.1 m resolution. Theo uses an FD-A altimeter with 0.25 s and 1 m resolution. Measurements in still air (as far as possible) give values around 0.25 to 0.30 m/s.
- Measurement errors in the geometry of the airfoils. In particular, the "0" position of the flap may not be entirely correct. The flap is set to zero at the root (flush with the fixed mid-section above the fuselage). Due to the extensive use of the model, small geometry deviations have arisen. We estimate this error to be -0.2 mm and have therefore

neglected it. However, we dared not measure on our new models, so as not to damage them.

- Approaches in XFOIL: The default value for stability of the boundary layer (N = 9) is used. The program calculates the location of the transition point from laminar to turbulent boundary layer itself. Roughness of wing surface combined with the very low Reynolds number can greatly affect the airfoil properties, especially on the drag coefficient. The rudder gap has also been "sealed up" in the calculations. I have seen that the contest participants do not seal the rudder gap with a tape, so I assume that the effect is not too bad in practice.
- In this article, the trim drag has been neglected. If the horizontal tail plane provides a positive lift, the wing does not need to provide as much lift at the speed at which you fly. This leads to a small decrease in the induced drag of the wing . The trimming resistance can be both positive and negative and depends on which centre of gravity you have chosen. A simplified consideration of the forces- and moment balance shows that at minimum sink rate, the lift on the horizontal tail plane is slightly positive at 5 mm flap deflection. In this case, this leads to a negative trim drag of about 1% and thus to a favourable effect of 1% on the sink speed. All this with a centre of gravity of 70 mm from the nose. For a centre of gravity location of 65 mm, this consideration has a favourable effect on the minimum sink speed of only 0.2% This is perhaps an important reason why competition pilots always look for the most rear location of the centre of gravity.
- Deviation from the airfoil shape: At the first two millimetres of the leading edge the measurement process is not accurate. It seems that our new models have a somewhat more rounded nose than that we measured on than the older models. Here the airfoil has been recalculated with XFOIL, now with a slightly modified nose. Rounding the nose has no effect at low lift coefficient. However at higher lift coefficients an improvement has been found which results in a

reduction of the sink speed by a maximum of approximately 1.4%.

- The estimate of the parasitic drag is based on measurement data from the literature and is not always entirely applicable at these low Reynolds numbers. In particular, the drag contribution of the throwing peg is difficult to determine. It's slightly streamlined, but is relatively thick (~ 30%) at a Reynolds number between 3,000 and 24,000. It is also located close to the tip, where the flow direction can vary greatly. Its contribution to the total, however, is of the order of 1% of the minimum drag of the overall model (important for the launch height) and in the order of 0.2% on the minimum sink speed.

If you could add these inaccuracies, this would lead to a possible improvement of the minimum sink speed in the order of 0.01 m/s. Thus from 0.30 m/s into 0.29 m/s for a flap deflection of 8 mm.

Using the Zone V1 airfoils: Figures 13 and 14 show a comparison that is interesting for self-builders. In the XFOIL calculations, the measured airfoil coordinates are replaced by the Zone V1 airfoils often used by self-builders. These are optimized for Reynolds numbers 52000, 40000 and 25000. The airfoils for the root, mid and tip respectively are thinner by 0.17%, 0.70% and 0.63% than the NXT airfoils.

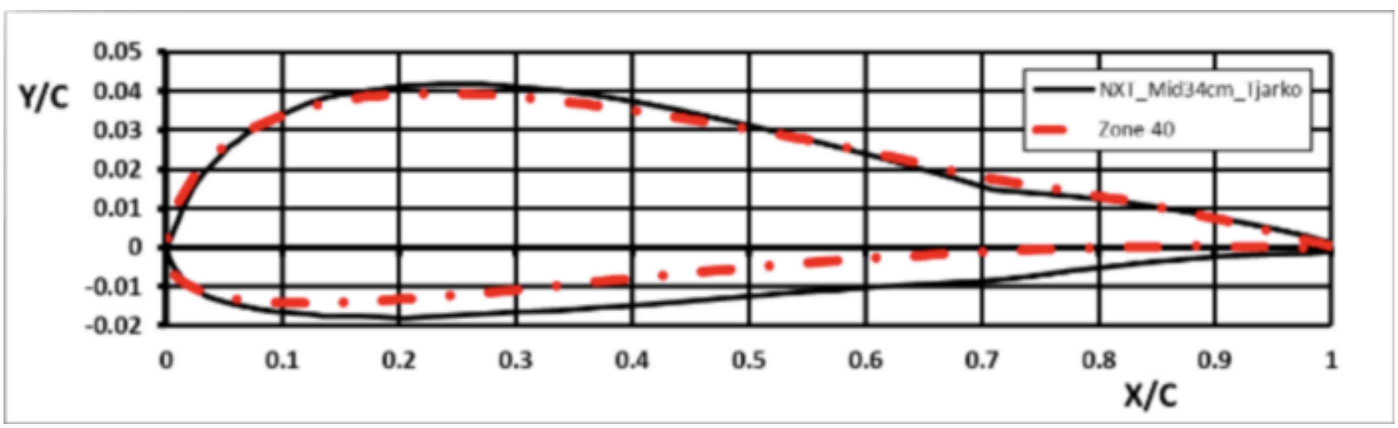

Figure 13: Comparison geometry measured NXT airfoil at 34 cm from the root with the V1 Zone — 40 airfoil.

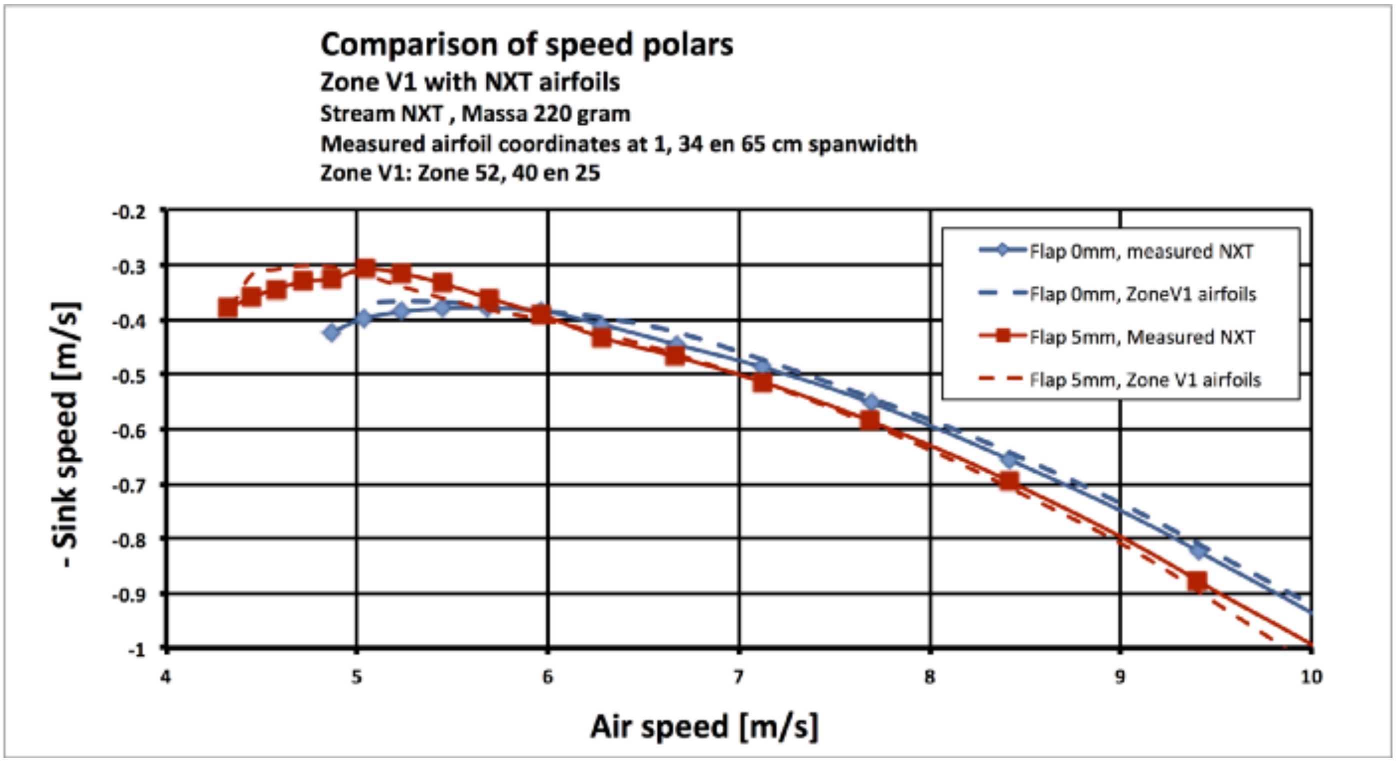

Figure 14 : Comparison of speed polars.

Although the airfoils are quite different, the performance together hardly deviate from each other. However, the XFOIL calculations for the Zone V1 airfoils stopped at a slightly lower maximum lift coefficient. This indicates a possible different stalling behaviour.

Subjective impressions: From the measurement of the airfoils and the total aerodynamic analysis we have got a good idea of the NXT. The wing plays the leading role in overall performance, with airfoil drag being the largest contributor to overall drag. Yet it is not the determining factor of this model, the difference with the well-known Zone V1 airfoils is minimal. So what makes the performance difference in the generations of DLGs we fly with? We are seeing an ever-decreasing flight weight from say 300 grams to 220 grams. Better materials are used and there is nowhere a gram can be wasted. This is particularly important in conditions with low wind speeds. But with some wind we will soon add 20 to 40 grams of ballast in the NXT. The wings are getting slimmer, this gives less drag when launching and gives a better glide angle. Yet there is perhaps an aspect that we cannot figure out: the calculation of the flight stability. This may determine a big difference between the model equipped with the Zone airfoils and the NXT airfoils. The Stream has a very good natural behaviour compared to my other DLGs and in turbulent weather it is able to turn its laps while maintaining height. Whereas my earlier DLG in turbulent conditions just steps down, the NXT is able to climb neatly back after a gust to almost its original altitude. It may be hidden in the polar in Figure 14, where the curve of the NXT airfoils continues a little further at low speeds. But it could also be due to the beautiful long and very light tail boom.

Conclusion: This type of analysis has given us a good idea where we stand with the tuning and flying with our DLGs. The calculation results help us to understand which flap position to choose in the various flight conditions. The sink speed that we are able to achieve corresponds to what seems possible via calculations and it therefore mainly comes down to improving the launch heights. Of course, all of this says nothing about the art of finding the areas with favourable air again and again. You can only learn that by flying a lot and challenging each other to do better than the other.

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R/C Soaring in Israel

Sun, sand and favourable winds the whole year round.

Rene Wallage

Yoav Harari and his daughter Shira fly at Bat Yam under the watchful eye of Yoav’s brother, Eiran. (image: Ariel Erefrid)

This article originally appeared in the April, 2007 issue of the R/C Soaring Digest. It appears here with the permission of the author.

The aeromodelling history of Israel is as old, if not older, than the State of Israel itself (i.e. 58 plus years). The Israel Aero Club (AMA equivalent) has faded black & white pictures of old timer free flight and early RC models with various propulsion systems. The Israeli RC community is very diverse and vibrant. We even sport some international champions!

The slope soaring community is slightly younger. It started after the introduction of affordable RC systems. Most slope soaring is done along the Mediterranean coastal dunes and cliffs, although there are some spectacular sites in the Negev desert in the south, and the Golan Heights in the north. One of the best things I like about the slope community (as opposed to the Israeli RC community in general), is the enormous diversity of backgrounds. We have kids, students, and manual laborers rubbing shoulders with aeronautical engineers, senior surgeons, and high tech professionals. We even have a regular visitor from the US, who is captain on one of the airlines having layovers in Tel Aviv! It's just more proof that RC slope soaring is a great equalizer. Our weekends are Fridays/Saturdays. Some pilots are religious observant and fly only Fridays, but there are plenty of others flying both days (weather and family permitting). Being on the eastern Mediterranean coast, there is no real defined 'slope season'. Most slope days year round we enjoy winds ranging from 10 to 20 mph.

Two tailless foamies chase each other up and down the beach. (images: Ariel Erefrid)

Drinking water, a hat, sunglasses and sun screen are a must almost all year round. We do get some winter storms, when winds reach 50–60 mph (or more), rarely with rain, and sometimes even as cold as +10C! Those are the days we huddle around the air conditioner set to “heat” and work on our next project.

Although we do have slope soaring competitions, the emphasis is on fun flying. The foamies far outnumber the crunchies on the slope, and we usually either give each other a wide berth, or one group grounds itself voluntarily to let the other group get some airtime as well.

That blue frame building is about 600 meters away, but Ariel's 270mm telephoto lens makes it look much closer. (image: Ariel Erefrid)

By far the most popular slope soaring site for the past few years is in Bat Yam, just south of Tel Aviv. The site is a dune about 35–40 meters high, with a 50 by 70 meters rocky/sandy/grassy landing area. Most of the time it is accessible by regular family car. The nicest feature of the site (apart from the people) is the fact that in front of the slope is about one kilometer stretch of beach towards the sea. This means that if Mother Earth calls your plane for a consultation, there is no chance of a 'splash'. This feature makes it very attractive for beginning slope soarers.

There are other sites with better/higher slopes (or cliffs), but lack the stretch of beach and/or have no way of descending to the beach to retrieve a lost glider.

The past few months the wind has been very iffy at best, but now with spring in the air I've recycled my slope soaring packs, cleaned up my MiniWeasel, MonsterMugi, MPX Easy Glider and Unicorn, and am anxiously following Windguru. Wind forecast this weekend: due West 16–18 mph.

Yeeehaaaaa!!!

Shachar and Eli, shooting the breeze after a hard day flying. (image: Ariel Erefrid)

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Unleash Your Inner Hemingway

Answers to the age old question "what should I write about?"

The NEW RC Soaring Digest Staff

(image: on)

The NEW R/C Soaring Digest is a reader-written publication. We mean that quite literally: if you, the reader, don't write anything then there will be nothing for the rest of us to read. We understand the toughest part can simply be getting started: what some call 'the tyranny of the blank page'. However, you'll likely find once you get rolling the words come naturally and in prodigious quantities. So here are some ideas to get you past that merciless white sheet of paper sitting in your Smith Coronamatic.

My Best Day Flying Ever

It as this very subject which served as the original inspiration for *Unleash Your Inner Hemingway*. RCSD Writer Jim Carlton submitted his article *What* *a Day for Soaring!* which is just as the title implies. But then we started talking about some of the other things he might write about in the future. Hence this article which hopefully many will find helpful.

Keep in mind the ‘best day’ in the title is relative. If you only ever had one day flying then, by default, that has to have been your best. If you have had two, then it’s a coin toss — it was one or the other. All we’re trying to say is that if asked “so what was your best day flying ever?”, virtually **everybody** has an answer. So write that down and submit it as an article. Include any pictures and videos you captured on that day so you can transport your readers to that exact place and time and what it was that made it so special.

What I’m Building Right Now (AKA Build Logs)

There was a time not *that* long ago when the only way of getting a plane to the field or slope was to build one. Those days are long gone but there are still lots of people out there who have some amazing projects on the go and, rest assured, the rest of us want to hear about them. We think *The Fokker FG-2* by Vincent de Bode in the February, 2021 issue officially set the bar for this type of article.

You are welcome to break your article into multiple parts and publish it over a few issues. The only word of caution we offer in this regard is that you should feel fairly confident of being able to finish in a timely fashion. A tough question to have to answer from some future reader is “so whatever happened to your … project?” If you assess yourself as a better project **starter** than project **finisher** then consider writing *all* of the parts before publishing *any* of them.

One other question we get quite often is “how much detail should I provide?” In short, as much as you want! The digital-first platform RCSD has chosen imposes exactly **zero** limits on how much you write or how many photos, videos and other material you include. That said, there’s no guarantee that *everybody* will read *everything* you have written, but that’s no reason to deny them that opportunity.

Product Reviews

Any sort of product review are always of interest. Newly-released products are best in this regard. However, before you put pen to paper a few words of caution. First, if it’s *your* product about which you want to write a review, the reader needs to be informed of that. If you want to claim your product is the best thing that’s ever been designed that is your right to do so. The reader, on the other hand, also has the right to take that comment with a grain of salt given you clearly have a vested interest in not saying the product ain’t so hot. Probably a better course of action would be to find someone *else* to review your product. Somebody who has paid full retail for it is likely the most objective reviewer and we think that’s best if it can be arranged. Our goal is to make sure that when something is reviewed in RCSD, readers are getting the straight dope without any distracting encumbrances that may make the review less than trustworthy.

Deep Tech

Amongst RCSD’s readership we have many who have developed a deep understanding of a particular R/C soaring-related subject, coupled with an ability to convey that understanding in a way that makes it accessible to a broader audience. If you are lucky enough to have those gifts then we strongly encourage you to write a Deep Tech article on your particular subject of expertise. There is no limit to the amount of detail you can include: column inches in our digital age are officially free. A great example of an excellent Deep Tech article is *The Aerodynamics of a DLG Unravelled* by Theo Volkers and Tjarko van Empel in the February, 2021 issue.

Competition and Event Coverage

While these stories don’t write themselves (actually, few do) the plot is already there, it’s simply your job to capture it effectively. There’s usually lots of great photo and video opportunities whenever people and planes gather en masse. The biggest challenge can be capturing the details accurately so when one of your subjects sees their name in print they’re not disappointed when they see you spelled their name wrong. But the good news is the same device you’re using to capture all those photos and video is also pretty good at recording voice notes. Consider using it for that, as well.

While it’s not a perfect science, event stories are a little more time sensitive than other subjects. You should really strive to report ‘news’ of the event while it’s still — well — **new**.

The other thing which might conceivably happen is two people covering the same event and both submitting stories about it. That becomes a tough editorial call where at least one person is going to have their heart broken. If this becomes a common problem, we can adopt some method (probably using the still-in-development RCSD Event Calendar) where you can put your name on the event so as to at least provide fair warning that you intend to cover and report on the event. Until that is in place, we can use the RCSD Twitter to announce your coverage of a particular event, if you want. Just let us know if we can help in that regard.

For What It’s Worth

We’re pretty sure we’re not the only ones who read Don Dewey’s *R/C Modeler* magazine (it’s been gone for a couple of decades, at least) but there was a section in there called *For What It’s Worth*. Today, these would be called ‘life hacks’: little, simple ideas intended to save time, money or both. As we write this we’re not 100% sure how exactly how we will adapt this to RCSD but the concept is valid so we’ll figure it out.

For example, we could never quite get a grip on how to Monokote those inverted Horner wingtips that were all the rage at one time. If somebody had a little trick or two on how to do that, we would have read that story or (these days) watched that video in a heartbeat. The nice thing about this type of article is none would (or should) require a lot of time or effort to write. A short video, a page of text and maybe a couple of pictures. Again, if there were enough of them, we could have a *For What It's Worth* subsection in each issue to cover all of those received in a given month.

R/C Soaring Adjacent

A hobby is just that: something we do in our spare time because we enjoy it. For most of us, it's a break from our everyday, work-a-day lives. However, there are some still admittedly quite rare examples of where the core technologies we use have found their way into areas which are 'adjacent' to the hobby. Some of these are commercial in nature. For example, in the February, 2021 issue we introduced a project called Silent Arrow®, which is a commercial cargo carrying glider. It's built at a scale not all that different from the quarter and one-third scale monsters which are out every weekend somewhere in the world. The Silent Arrow® is not R/C soaring, per se, but it does not require much imagination to see the substantial overlap between the two domains. That's what makes it 'adjacent'. So if you come across a project or activity that would seem to fit this description by all means write it all down and let's get it out there.

Ready to level up from writing one off articles? Here are some more substantial commitments to multi-part and/or an ongoing series of articles. Candidly, we want you to think long and hard before you take on one of these. Or consider involving a partner (or two) to help create some continuity over the long term without having to shoulder all the burden yourself. By the way, putting your name to one of these officially makes you a 'columnist' which is both a blessing and a curse.

R/C Soaring 101

Although realistically it’s a ways down the road, we do have the ambition to get some sort of beginners series going. It would start with the very basics of construction of a really simple design and eventually proceed to flight testing and then mastering the basics of soaring flight. Of particular interest would be those who, either out of choice or necessity, may not have access to a club or other enthusiasts from whom to get some help.

For the life of us we cannot understand why R/C soaring isn’t **way** more popular than it already is. We truly believe that it’s waiting to be discovered by the paragliding, windsurfing and kiteboarding crowd and if they do… watch out!

We should also mention that if you flip through any issue R/C Soaring Digest you will likely notice something pretty obvious about the demographics of a vast majority of the participants. We want to encourage diversity of any and every kind. If a beginners’ program can be put together which helps achieve this goal in some way, then so much the better.

CAD/CAM/CNC 101

Somewhat similar to the above, we would love to have a series that would walk though the whole, cradle-to-grave computer aided design and computer aided manufacturing process. In other words, start with a glimmer in the designer’s eye, capturing that in a preferably free CAD tool like Onshape, then creating the output files which could be fed into CNC equipment like laser cutters or 3D printers. It is our hope we can convince a real expert (or experts) to share their vast knowledge with the RCSD readership. Maybe in conjunction with some vendor support? For instance, we could feature Onshape as the tool, and they can help us with content and inexpensive (free?) pro licenses. Again, not a fully developed concept but we’re happy to share the idea with you so you can noodle on it.

Composites 101

Essentially the same exercise as immediately above but as it relates to using the miraculous materials to which we have access these days. Again, we might seek some vendor support for this where we employ materials out of their catalogue as well as have access to their in-house expertise to help create the content.

Mass Build

Our good friends at the Power Scale Soaring Association in the UK have done a magnificent job with their mass build projects. In short, these are exercises where everybody builds the exact same design at exactly the same time. They tend to have a single location mass fly-off to cap off the event which may be a little impactical for RCSD's global readership. Maybe that could be expanded to multiple sites on a given day or some such thing? On a day where the 'shoulder season' weather may be similar in both the northern and southern hemispheres? Again, this is not a fully developed idea but something worthy of discussion we believe. We may simply ask the PSSA if we can somehow piggyback on their efforts — they do so much of it really well.

Did we miss something? By all means, let us know and we'll add it to the list above. Or maybe you have something amazing which doesn't fit into *any* of these categories. We want to see those, too! So, are ready to get started? Check out *Writing for RCSD: Steps, guidelines and a few Pro Tips for authors* for all the details.

Finally, a good rule of thumb: write that articles you would want to read and you won't be far off the mark. Good luck and we look forward to seeing your first (or next) submission really soon!

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The Trailing Edge

Wrapping up this issue, and looking forward to the next.

The NEW RC Soaring Digest Staff

A sunset flight at Torrey Pines. (image: Aaron Smith Wallace)

We conclude the February issue with this outstanding photo from our friend Aaron Smith Wallace, who tells this great little story: "The photo was taken in December, 2009 with an iPhone. The gentleman in the photo is Alvaro Corzo who had just tossed the HKM ASW-27 off the cliff at Torrey Pines. Alvaro restored the plane from a crash and eventually sold it to me. It is very well made and and is an exceptional flier." Which reminds us broken airplanes never die, they're simply 'awaiting repair'.

We think Aaron's image totally captures that wonderful feeling of a great day on the slope. If we could only hold off the sunset for just one more hour, we would just keep right on flying. Thanks for this contribution Aaron — it's a perfect way to bring this issue to a happy conclusion.

If you have enjoyed the stories in this issue we encourage you to let the authors know by clapping for them — Medium *Claps* are the equivelent of *Likes* you find on other social platforms. Or leave some words of encouragement in a *Response*. And a reminder to think about putting pen-to-paper and contributing your own story for RCSD readers around the globe to enjoy. The deadline for the March issue is 2021–03–21.

Finally, a quick word regarding the soft launch of the RCSD store. It's nothing fancy at the moment and we have just one product: our inaugural monthly *RCSD Cover Photo T-Shirt*. Because it was a such huge hit on the RCSD Instagram, it features Phil Cooke's beautiful image of Bob Jennings' beautiful, one-of-a-kind, tiger-striped Fouga Magister carving it up above the Great Orme. Please get yours today with all proceeds supporting the ongoing operating costs of RCSD.

That's it for our February issue. How did we do? We're always interested in your feedback so please get in touch and let us know what you think.

Until next time…fair winds and blues skies!

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