

VGC News

No. 152 - Spring 2018



Rally Reports
Down Under



Bydgoszczanka
more than skin-deep



We Remember
Oleg Antonov Part 2



and much, much more...



FEATURE ARTICLE – BYDGOSZCZANKA

Bruce Stephenson
and based on the original build log of Vincent Besançon

Beauty...only skin deep?

Some may wonder as to why a simple model of a simple glider should be featured here? After all, to many, such a basic structure represents a simplicity that really doesn't command, or deserve, much attention at all. Its all bit like comparing the lines of a tractor to that of a sleek sports car carved from skilled

hands of the finest automotive studios; a mere maid, in comparison to a Parisian diva. But those that dismiss these simple lines, the hidden sensual natural curve of an unmade face, the random freckle bold as a ladybird upon a leaf, are looking, but not observing the detail of life itself.



concealed within the bowels of a generous fuselage.

So as we take fresh look at the humble, we can now begin to appreciate the consummate skill and extraordinary lengths to which these craftsmen go in creating some of the unique machines of the past, in miniature, as they bring them back to life. It is nothing less than a form of art itself.

But before we introduce the lady of our story, first let me introduce our hero and creator, Vincent Besançon. Vincent is one of those extraordinary characters who dreams more than most, but are amongst those relative few that are adept at making those dreams reality. So perhaps it is not surprising to learn that Vincent is the architect to a highly idiosyncratic, but hugely successful series of meetings and gathering of enthusiastic modellers who specialise in early glider designs, Retroplane.



Modelling, Retroplane style! Enthusiasts immerse themselves in Retroplane on more than one level.

And so it is in the gliding world. Many of us are inspired by the romance of an era where the varnished line of a sleek body, further enhanced by the grace of a gull-wing, will readily associate to the form and beauty of an embodiment of a higher place that we hold dear in our subconscious.

But, of course, simple open Primary gliders, were once the very bedrock of our sport... pure life itself. As anyone who has sampled their basic delights will testify, they are as raw and visceral as they are uplifting. The typical flight time may have only lasted seconds, but often these humble flights carved a deeper emotional reminiscence than most other flights we may have tackled in later life.

But getting back to the subject of building such a model. Whilst the lines of that gull-wing beauty is as heavenly as it is, it nevertheless, rather akin to Botticelli's masterpiece, the Birth of Venus. In order to achieve perfection however, first the masters had to study the makeup of the human anatomy, endlessly studying the

structure of what lay beneath the pale silky skin in order to get the detail and hidden line to that compelling state of visual perfection. And that's what this is all about, what lies beneath the skin, all that varnish and wood. The bits that make the machine itself, in all its finest detail and all of it on display in its raw, visual glory, right down to every last turnbuckle and bolt.

Now maybe you will begin to understand why this article is so fascinating when one considers the challenges of building a scale model of such a structure where the challenge is to conceal the obvious. All that radio equipment, wires and furthermore, the vital energy that powers it all, the batteries. Just how do you achieve all of that? Sure that varnished gull-wing creation is maybe more compelling and graceful in the air as any swallow on the wing. But with all its gleaming varnished form, one can easily conceal all the trickery of modern electronics needed to convey the actions of a small gimbal to a radio signal that will be processed into a controlled and coherent movement, all conveniently

Over the past few years, this dedicated band of enthusiasts have met on a regular basis, in steadily growing numbers from all over Europe (and further afield). Gathering at various locations for a few days, they show off and share their modelling experiences in an intimate and unique way. Last year's event saw modellers converge on the coastal village of Vauville, Normandy, with the remit of models designed before 1925 (see model section of Issue 151).



The early first version of the Bydgoszczanka (note position of the rudder). Photo: Skrzydlata Polska via www.piotrp.de

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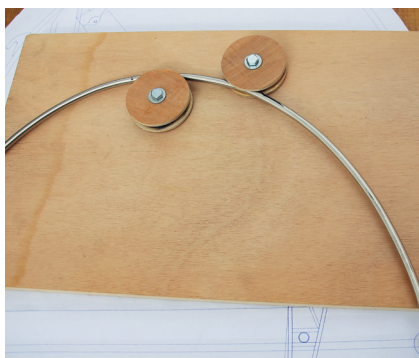
With this in mind, Vincent soon settled upon a totally rare and unique design, the almost forgotten Polish glider, the Bydgoszczanka. Pronounced Bie-goch-tchanka, the design was the brainchild of two Polish brothers, Stanisław and Mieczysław Działowski. In the early 1920's, Stanisław, was head of aircraft assembly at the military flying school at Bydgoszcz (hence the gliders name). Stanisław, and his brother, Mieczysław, began design of the glider in early 1925, which they duly entered in the 2nd Polish Gliding Competition in Oksywie, near Gdynia (17.05 - 15.06.1925).

A rather curious and bulbous design, if one is to compare the lines of the lady of our story, then in human terms I would not be in the least surprised that the Bydgoszczanka may remind some of a portly Aunt. But there is something compelling to this rotund old lady who looks more at home ambling along in a rather Edwardian way; which come to think of it in a more mechanical Edwardian air, doesn't take much imagination to draw parallels akin to a Penny-Farthing bicycle either!

But let's get back on track again. Success at Oksywie appears to have been limited, with the longest glide being recorded at 1min and 12 seconds, covering a dizzying distance of 500m. In the course of its short history, there were three versions of the glider. The first of these revisions was the result of a launching incident which saw damage to the empennage and the rudder was later moved to a higher position (as modeled by Vincent) and the third and final version, curiously saw the removal of the wheels and replaced by 2 short skids (see photo).



The scale for Vincent's masterpiece was a generous and popular 1/4 scale, which given the complexity and detail of the project, was no doubt easier to work with and gave a wingspan of 2.56m. So let's start on a fascinating journey and learn just how Vincent achieved scale perfection, Bydgoszczanka style!



Building the Bydgoszczanka

The fuselage was constructed from 9x 0.25mm stainless steel tube (sourced from Spain) for both strength and rigidity. Here a bending jig has been fabricated to work in those lovely rounded fuselage tubes which were filled with sand first to prevent



the walls from collapsing during bending. All joints were soldered using a small gas torch, phosphoric acid-based flux and silver-solder brazing rod with a tin content of 50%.



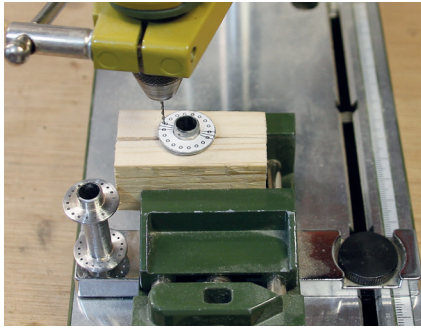
The fuselage comes out of the jig with a happy Vincent displaying all his hard work which has only just begun!



Now comes a tricky and labour-intensive part, the spoked wheels. First the rims were fabricated by cutting 0.6mm strips of mild-steel sheet and then bending them in, yep you've guessed it, a Pasta Roller! The ends are then brazed together to form a ring before moving onto the next step. The completed rings are now positioned into a plywood jig and gently beginning to alternatively fold the edges down a little at a time with a small hammer to help prevent any creep until the sides are flat against the ply jig.



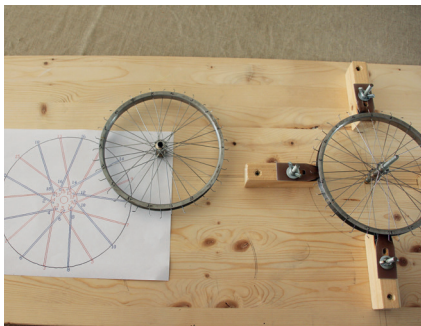
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The axle hubs are fabricated from some 6mm tubing with some washers soldered to the axle itself before the spoke holes are laboriously drilled in a jig utilising a paper template. The hole is drilled using a 0.9mm drill to accept 0.8mm spokes which were bent at one end to secure to the hub.



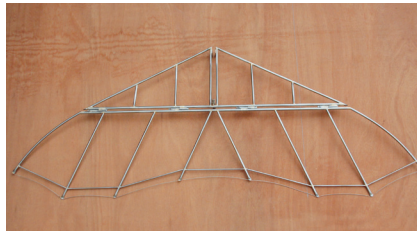
The same treatment was applied when drilling the rims which had a paper template glued to the hub with the rim being rotated 10 degrees for each hole.



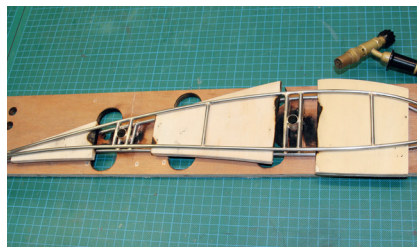
The wheels were then put into a jig to make sure that they ran true before soldering the spokes to the rims.



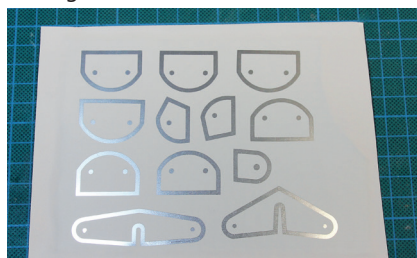
The finished product with a bronze tanning technique using a rapid chemical bronze process that is commercially available under the brand-name, Klever and 15mm diameter neoprene foam for the tyres. Scale valves were also added for authenticity before the wheels were mounted on the undercarriage. The finished wheels were 195mm in diameter and weighed 117g.



The finished stabiliser weighed 175g and has a span of 950mm. The trailing edges are made from 0.8mm wire cable.

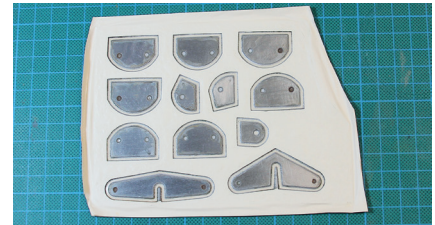


The two root ribs (MS535-2, a popular modelling profile) are constructed from 4mm tubing and assembled on a jig to space them before final brazing together. The wing ribs will have a brass tube glued into them to accept the wing pins which pass through the locating tubes on the root ribs here attached to the fuselage. Precision is required to ensure that the wings will form a perfect cross with the fuselage.



Now begins the manufacture of all those detailed bits that are laid naked to the eye, the metal fittings. These were cut using the acid cutting method similar to the secrets of craftsmen from years past when etching amour suits. A technique still used by some jewellers today, chemical etching and cutting is a process where first the 0.6mm sheet is thoroughly cleaned and brought to a shine.

Electronic drawings were produced for the desired part with a 2mm outline and then cut out in vinyl utilising a Craft-Robo Graphic Cutting Plotter printer. The vinyl is then carefully applied to the metal plate, ensuring ALL areas are adequately adhered before removing the pre-cut 2mm outlines, leaving the exposed areas that will be etched. The rear face of the metal plate is covered entirely of vinyl.



The plate is then immersed in a mixture of 3 parts of water to 1 part of hydrochloric acid (at 23%) + 1 part of hydrogen peroxide (at 130 Vol 35%). Oxidation starts immediately, (the yellow colour) and corrodes the exposed metal whilst sparing the areas protected by the vinyl. When it's not bubbling, oxygenated water can be added. Note: Always wear suitable overalls, rubber gloves, safety glasses and wear a facemask when dealing with both hydrogen peroxide and hydrochloric acid! Also a must, DO NOT ALLOW THESE SUBSTANCES TO BE STORED WITH OTHER HOUSEHOLD CLEANERS OR COME INTO CONTACT WITH CHILDREN!

It takes about 3h to dissolve the 0.6mm steel. The cutting time is however, very random. It all depends on the dosage, the strength of the mixture and the surface to be cut. You must monitor and stop when the vinyl on the reverse side begins to appear. The plate is carefully removed and then rinsed well with water to neutralize the oxidation.

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The finished product, the cut pieces without any physical effort.

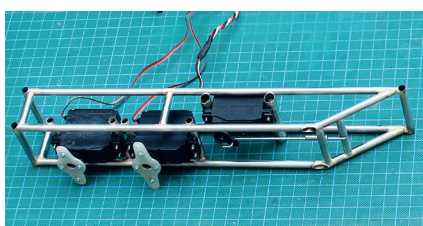


Now for the myriad of turnbuckles and fittings for the rigging. The fork-ends were made from 0.6mm steel strip of 0.6mm, 7mm wide. The strip is bent into a U and a 3mm nut is silver-brazed to the inside. A drill is then passed through the centre of the nut to drill out the 6mm strip in the correct location before re-tapping the thread. The clevises are made from 3mm machine screws with the ends flattened with a hammer and drilled with a 1.2mm hole.

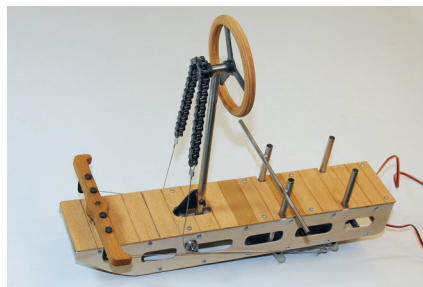
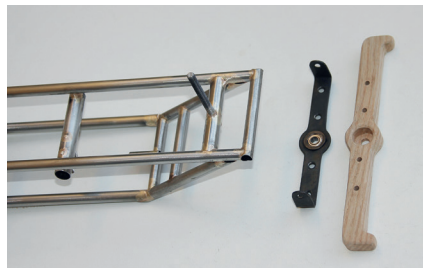
The shackle pins are made from 2.7mm diameter nails with the heads re-profiled, then drilling a 0.9mm hole for the 'R' clips, which were formed from 0.8mm piano wire before the entire lot was given a patina of bronze.



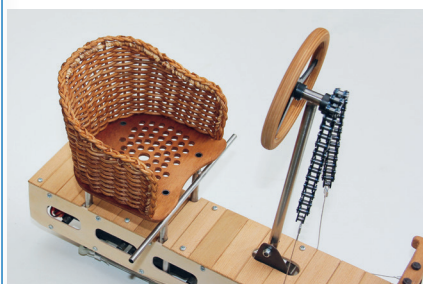
Some of the fittings now in place, all braced with 1mm control cable.



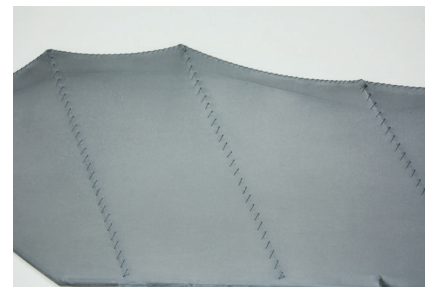
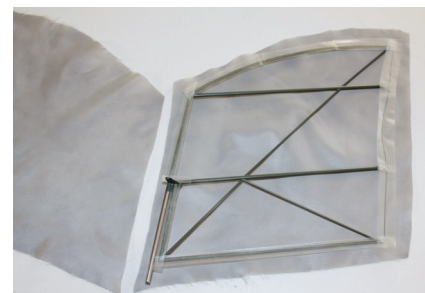
Now to the business end of the project, the office. This was one of the areas where the eye was going to get naturally drawn to and in many ways, represented a major focus of attention for the casual viewer. First a tube frame was manufactured, within which the servos and tow-control release would be housed. It is to this structure that the seat, the rudder and the control wheel will be mounted before the entire assembly is soldered to the fuselage.



The rudder bar was then made in ash and screwed to a 1mm steel plate with a bearing which will be connected directly to the rudder servo. Wooden sides were then added, with the entire assembly being scaled to a larger size than the original in order to house and camouflage the radio equipment. The control wheel, control column and rudder are connected to the servos. (Note the detail of the control wheel and sprocket).



The seat was then constructed using a drilled plywood base and some cane up-rights. A 2mm aluminium wire around the top, was wrapped in Raffia fibre (commonly available in most gardening centres). The rest of the seat was then woven, again using 2mm cane strips before the wooden seat was stained and finally the entire assembly is soldered to the fuselage.



Covering the tail-feathers was achieved with an airtight fabric, Diatov 1000 which had been tinted with a wood tint, in grey (Liberon 'smoked effect'), brushed on and then wiped. Adhesive strips of Diacov are held in place with glue. After heating the fabric on the cable trailing edges, the glue becomes flexible and sticky and adheres to itself by folding the fabric.

The canvas is then sewn to the tubes, with Diacov strips then laid over the stitches. These strips are cut from a piece of Diacov pre-tinted grey and a slight tint of yellow, thus giving this grey-green appearance reminiscent of the colour of the fuselage.



The rudder is protected by 3 layers of V33 matt varnish. The markings cut from adhesive vinyl (utilising the Craft Robo) and are then used as stencils to paint the markings with Matt Black Humbrol paint.

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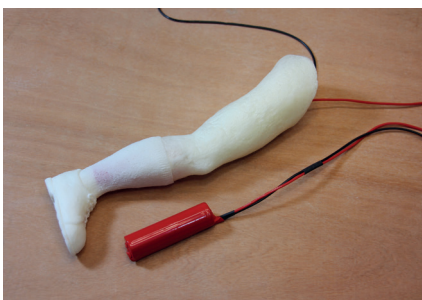


Now to the nut behind the wheel...well not quite. That particular nut is actually firmly on the ground acting as a back-seat driver through his radio-control set. In that case, let's call him our stunt-double....our pilot szybowcowy. Only our intrepid Polish hero is entirely scratch built and conceals a few secrets...read on.

Again a labour of love, the moulds for an earlier project saw a ¼ scale pilot being manufactured in-house by, would you believe it, first constructing a human skeleton from a 3-D puzzle! Scaled to ¼ scale and laser cut, it was glued together before the subsequent laying up the entire assembled skeleton with plasticine strips. These plasticine strips then allowed shaping of the completed figure to take place, before being placed in an oven to cure and harden the plasticine.



The limbs are then separated from the figure before silicone moulds were made of all the constituent parts. As silicone is very flexible, the moulds can be rolled off the cast parts like a sock and the insides covered with a releasing agent for the final cast of flexible silicone limbs.



Bionic leg? Well not quite, but then it's a great place to conceal the two Sony US18650V3 Li-Ion batteries which are integrated into the silicone moulds of the legs.



The flexible polymer is poured directly on to the batteries needed for the radio control receiver and servos. I told you there were a few secrets up his sleeve-leg!



Painted and now looking a bit more complete. Now to give him some period character of a Polish gentleman.



The hair and beard are made of flocking made from plumbers hemp cut to around 4mm lengths. The head and facial areas are then painted with vinyl glue with the flocking brushed on and allowed to dry.

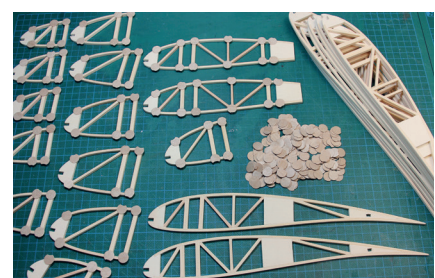
The first layer was sparsely applied before two more layers were applied. The end result was a rather random direction of fibres but the results looked quite realistic with the basic product looking a little unkempt and unruly, but nevertheless, his anatomy was largely complete, save a haircut and trip to the Barber!



For the well-healed Polish pilot of the 1920's, nothing but the best, with the famous French designer, 'Joëlle' (Vincent's wife!) designing and making this rather dapper uniform. The buttons are made of plastic, painted in patinated gold. The harness buckles are cast in 1.5mm epoxy, whilst the harness is made of tinted cotton twill tape.

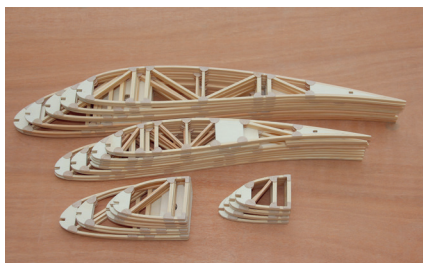


December 2015 and progressing at a steady pace. All of the fuselage components are together with all the control and rigging wires in place. The entire tubular structure was painted in a primer and painted in a grey/green colour (RAL 7009), before assembly of all sub-components largely outlined above. The entire weight of the completed fuselage, including radio, pilot and a lead counter-weight, weighs in at a total of 2.78kg. It only remains to build the wings ...



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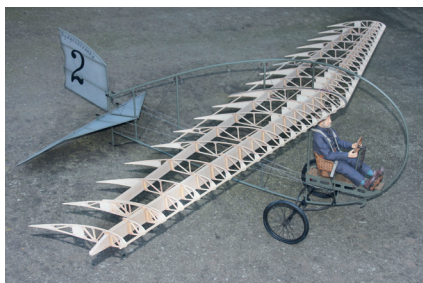
The first ribs out of the jigs. With a cord of 500mm at the root and a rib spacing of 140mm, Vincent increased the thickness of the pine wood sections from his more usual 3mm x 2mm, to 5mm x 3mm.



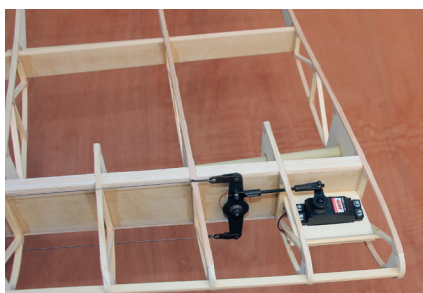
32m of chopsticks and 760 gussets later, finally the 38 ribs are completed!



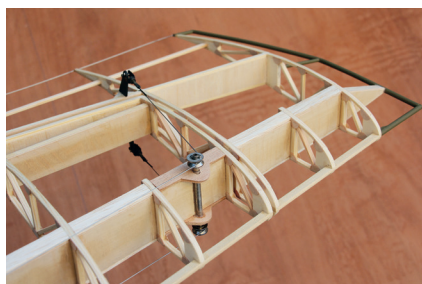
The main-spars are primarily composed of 1mm ply webbing and 10x5mm spar-caps made from samba (obeche) wood. The rear spars are made of 6x6mm samba spar-caps and 1mm ply webbing.



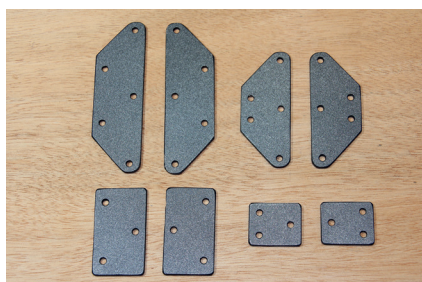
The partially completed wing. Note the sheer detail of the rigging wires, which have to be seen to be believed! (More were to come). At this stage the assembled model weighed 4.7kg.



Details of the aileron servo (Power HD 9110MG) with control horn and wires at the root end of the wing. The controls and wires run on the outside of the wing as per the original glider.



Where it all goes to at the other end via pulleys. The pulleys are commercially available 'V'-groove ball bearings. Note the detail of the wing-tips and the wire trailing edges.



Brackets for the wing wires were CNC manufactured from 2mm duralumin.

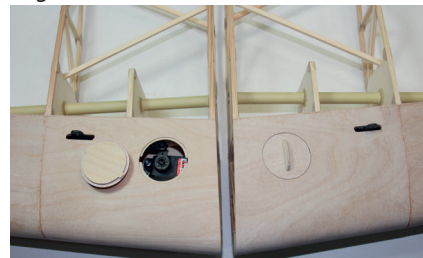


Even more rigging wires!



It was now down to applying the leading-edge D-boxes and covering. The leading edges were laid up using 0.6mm ply laying

up the D-box in exactly the same manner as we do with our full-size gliders, utilising the scarfing method for the overlapping edges.



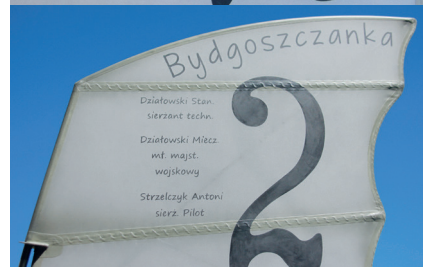
Even inspection covers were skilfully replicated down to the last detail.



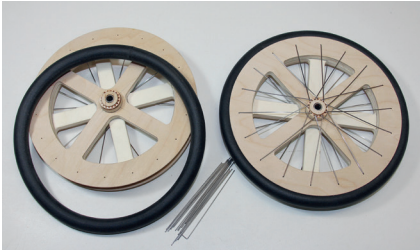
The wings were covered in Diacov in the same way as the tail empennage, with the D-boxes being tinted in dark oak.



February 2016. The final details are now almost complete. Once again, the competition identification numbers are applied to the upper and lower surfaces of the wings in the same manner as described for the fin. Meanwhile the fin gets some more text!



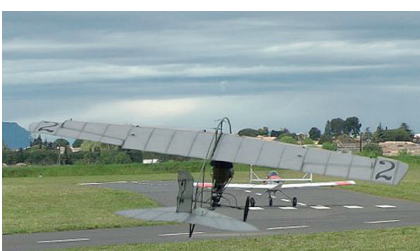
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A pair of more robust wheels were made for the first test-flights to preserve the original spoked wheels from damage in case of any hard landings, which was to later prove perceptive indeed. The hubs were covered in fabric and the tires again utilised neoprene tubing. Note the exquisite detail of the entire undercarriage assembly.



Completed at last after countless hours! The results reflect the absorbing hours and skill that went into the build. Now comes the nail-biting bit, flying!



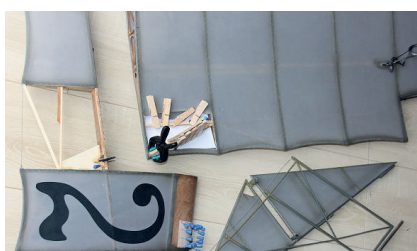
The big day, Sunday, 17th April 2016 at a towing meeting in Baillargues, southern France. Vincent takes up the story of the first nerve-racking flight.

Aligned behind the towplane, the Bydgoszczanka quickly becomes airborne in only a few meters. With its generous wing area, the glider is pulled aloft like a kite. The controls are reactive in all 3-axis, so there are no problems with the tow. Once the tow-line is released, I have to put a few notches of trim in to keep Bydgoszczanka flying in a straight line. The first flight is made in the morning without any wind, so the glider flies for only a few minutes. We do not expect more with this kind of machine which does not process any great finesse, however proves easy to land.

The second flight was around 1300L and again towed by Pascal's tow-plane. The wind has risen a little, but is perfectly manageable at around 15km/h. After casting off from the tow-plane and after a few minutes of flight, suddenly the Bydgoszczanka enters into spiral dive. It does not respond to my counter controls, my actions on the gimbals have no effect! On the spot I suspect that there has been a catastrophic loss of the radio signal as the Bydgoszczanka performs 3 spirals before impacting the ground with the front of the fuselage and a wing. Unfortunately, I did not even have the time to do a centering test. At that moment I was not sure what had gone wrong? Was it a radio problem or unwanted deflections when centering the controls?

The post-crash diagnosis made for sober viewing. The right wing was broken with much work needed to repair the damage, whilst the fin had broken in two. A retaining tab had been broken off the stabiliser which meant it had to be completely stripped of its fabric to allow the repair. Worst however, was the fuselage, which was completely twisted and would require a complete rebuild if the Bydgoszczanka was ever to fly again!

After 10 days of intensive work with Joëlle, version 2 of the Bydgoszczanka is taking shape. The wings had some damage, formwork, interlining, a fin was broken in 2, a retaining tab of the stab to be re-brazed, it was necessary to strip the solder area and the drift was bent. All these elements are fully repaired, interfacing, finishing, lettering, aging



The tubing of the original fuselage was too badly bent to do anything useful with. Due to the extent of the damage, it was decided to increase the wall thickness of the tubing to 0.5mm wall thickness instead of the original 0.25mm on the first version. The same method for bending the tube on the original fuselage was again used. The undercarriage was also reinforced.

The radio was sent away to be checked but there was nothing that could be found to cause the problem. The wiring connections were re-done as this can be a problem area with some Futaba radio systems. The receiver was also replaced and range tests carried out. Tests were also carried out on the servos to ensure there were no voltage drops, thus trying to re-boot the receiver.

Finally, by May, all of the repairs to the Bydgoszczanka were finished and the fuselage rebuilt. All that was left was surgery to rehabilitate our stunt-double, the pilot!



With only ten weeks to go before RETROPLANE 2016 and two weeks of intensive care to rehabilitate our pilot szybowcowy, all is well again!

The saga was to continue. With the weather for the 2016 Retroplane preventing Vincent from flying the Bydgoszczanka, he postponed flying it again until the Retroplane meeting in 2017 where at long last it was to all come together on the 23rd July 2017, at Retroplane 2017, Vauville...

