WOLFGANG WERLING,
AERIAL SHOTS:
HANS-PETER WAGNER

THE BLITZ

Flying Wing with High voltage, part 1

You can find the flight video for the article at:
www.fmt-rc.de

After many tried and tested flying wings - such as the Hai family or the Jetbrett - I wanted to do something completely new: A really fast wing, both with and without motor, with flight performance like a conventional Hotliner. Of course, this is only possible with a thin and low-drag airfoil. Full GRP hotliners have airfoil thicknesses in the range of 10 to 12 mm. At the same time, they are light and stable. How do you achieve this with a wooden wing?

Two-bar trick

First, I thought about the profile and - based on my many years of experience - drew a new profile. To get enough strength in the wooden surface, I adopted the principle of foam waffles: Namely, I lengthened a CFRP plug in such a way that it also serves to reinforce the wing. However, one CFRP rod of 8 mm is not enough, but the thin profile does not allow much more. Only one thing helps, namely two rods next to each other, which increases the torsional strength at the same time.

In order to achieve as much wingspan as possible with little surface area, the only way is a high aspect ratio and thus a low wing depth. Since the whole thing should still be good-natured even with maximum equipment, the geometry of the wing was designed accordingly and flaps for a butterfly position were provided for landing.

General remarks

The Blitz is simple in construction despite very good aerodynamics. Highly stressed parts are made of poplar or even double birch plywood, low stressed parts are made of balsa to save weight. Due to the divisible wings and the short fuselage, the Blitz re-

I copied the principle from foam waffles: The plug is extended so far that it reinforces the wing at the same time. In the case of the Blitz, even twice!

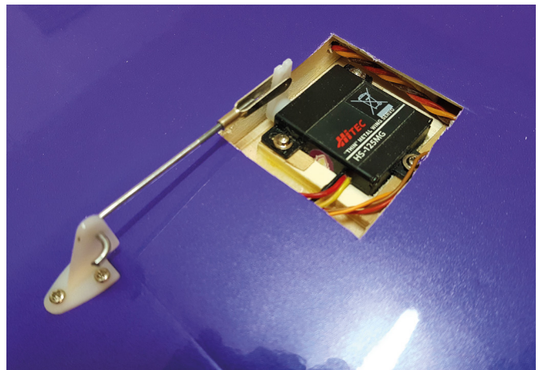
Measured values *

Setup	Current	Power
Hacker A 30 12 L V4 14 pole (143 g weight) with controller Jeti Master Spin 66 Pro, 3s-2.400 mAh LiPo (176 g) and propeller ACC 12×7".	approx. 47 A	approx. 510 W
Hacker A 30 12 XL V4 14 pole (180 g weight) with controller Jeti Master Spin 66 Pro, 4s-3.800 mAh LiPo (390 g) and propeller ACC 13×9".	approx. 52 A	approx. 740 W
Hacker B50 8L plus gearbox 6,7:1 (315 g weight) with controller Jeti Master Spin 100 Pro, 4s-3.800-mAh-LiPo (390 g) and propeller RFM 15×15S	approx. 68 A	approx. 1,000 W
Hacker B50 8L plus gearbox 6,7:1 (315 g weight) with controller Jeti Master Spin 100 Pro, 5s-3.800-mAh-LiPo (490 g) and propeller RFM 15×15S	approx. 85 A	approx. 1,500 W

** The measured values are strongly dependent on the battery status and temperature at high currents.*

On the elevator/aileron flaps of the Blitz I use the D145SW servos from Hitec.

On the flaps I use the HS-125-MG servos from Hitec.



This is the maximum motorisation: Hacker B50 8L plus gearbox 6.7:1, optionally with 4s or even 5s (!). The latter is reserved for experts.

Really takes off: The Blitz picks up fantastic speed with its new profile and definitely has hotliner qualities.

quires little space and is easy to transport. In the plan and in the milled parts, electric and glider variants are considered. Due to the extended nose of the glider version, only little lead is needed.

You can have a lot of fun with both, but on slopes you should ballast the glider variant, accordingly depending on the wind. Here, you can also replace the CFRP mating with steel. With the flaps lowered and the elevators raised, the Blitz can be landed well even on small places (slopes). Despite absolutely uncritical flight behaviour, where no stall is possible, you should already have flight experience due to the high flying speeds that can be achieved.

The wing profile...

... I orientated myself more on normal hotliner than on flying wing profiles. It has become very thin and needs only little S-beat and twisting, only this way you get a super-fast Wing. The flight performance is awesome. Due to the wing geometry and constructional design, the Blitz nevertheless remains very good-natured in handling and neutral over a very wide speed range. Since a stall is not possible, the Blitz is easier to land than some conventional hotliners, even with maximum weight. The profile is a real stroke of luck.

The drive options

The proposed drives are all designed for good performance, of course weaker drives are also sufficient for flying. The 3s version already allows vertical climbing and, due to the low total weight of the model, also good thermal performance. The 4s version goes in the direction of a hotliner with good all-round characteristics, whereby the fast glide improves even more with increasing weight.

The gearbox drive is then really hot, already at 4s the Blitz climbs vertically at half throttle. Nevertheless, it remains good-

Clean transition from spinner to fuselage: In all cases I use the 45 mm turbo spinner with 52/8 centre section (6 mm) from Hacker Motor.

With four-flap wings and butterfly position, the flash comes back to earth well and safely even with little space.

Parts list

Pos.	Amount	Component	Material
Hull			
1	1	Slip ring	Balsa 3 mm
2	1	Motor bulkhead	Birch plywood 3 mm
3	1	Frame	Birch plywood 3 mm
4	2	Frame	Birch plywood 3 mm
5	1	Frame	Birch plywood 3 mm
6	1	Frame	Poplar plywood 3 mm
7	1	Frame	Poplar plywood 3 mm
8	1	Threaded board	Birch plywood 3 mm
9	1	Threaded board	Birch plywood 3 mm
10	1	forward bottom of the fuselage	Poplar plywood 3 mm
11	1	Fuselage bottom/flap	Poplar plywood 3 mm
12	2	Front fuselage side panel	Poplar plywood 3 mm
13	2	Rear fuselage side panel	Balsa 3 mm
14	1	Frame long nose	Birch plywood 3mm
15	1	Front fuselage cover	Balsa 3 mm
16	1	Rear fuselage cover	Balsa 3 mm
17	1	Rear fuselage bottom	Balsa 3 mm
18	2	Harness hull	Pine 5×3"
19	2	Triangular ledge	Balsa 6×6 mm
20	4	Triangular ledge	Balsa 12×12 mm
21	1	Vertical stabiliser	Balsa 6 mm
22	1	Spur	Balsa 6 mm
23	1	Fin	Balsa 6 mm
24	1	Rudder	Balsa 6 mm
Area			
R1	2	Root rib	Birch plywood 3 mm
R2 bis R6	2	Plugging rib	Poplar plywood 3 mm
R7 bis R18	2	Rib	Balsa 2 mm
R19	2	End rib	Balsa 3 mm
F1	2	Surface dowel	Beech Ø6 mm
F2	2	Nose strip	Balsa 3 mm
F3	2	Auxiliary leading edge	Balsa 2 mm
F4	div.	Planking	Balsa 2 mm
F5	4	Assisting Spar	Pine 5×3 mm
F6	8	Main spar	Pine 5×3 mm
F7	div.	Latching on edge	Balsa 2 mm
F8	4	Rear auxiliary spar	Pine 5×3 mm
F9	2	Screw reinforcement	Birch plywood 3 mm
F10	2	End strip	Balsa 3 mm
F11	2	End strip	Balsa 6×40 mm
F12	2	Flaps	Balsa 6×40 mm
F13	2	Elevator/rudder	Balsa 6×40 mm
F14	2	Edge arch end trim	Balsa 6×40 mm
F15	4	Edge arch	Balsa 6 mm
F16	2	front mating tube	Alu, Ø8.1 mm (inside)
F17	2	Main plug-in tube	Alu, Ø8.1 mm (inside)
F18	2	Pipe	Brass, Ø4.1 mm (inside)
F19	1	front plugging	CFRP solid rod Ø8.0 mm
F20	1	Main plug-in	CFRP solid rod Ø8.0 mm
F21	1	rear plug	CFRP solid rod or steel Ø4 mm

Shopping list

(in addition to the milled parts, included in the material and milled parts set)
16 × pine strip 5×3 mm
2 × balsa triangular strip 6×6 mm
1 × balsa triangular strip 12×12 mm
10 × balsa board 2 mm
1 × balsa board 3 mm
2 × end strips 6×40 mm
1 × CFRP rod Ø8 mm
1 × aluminium tube Ø8.1 mm inside
1 × CFRP rod or steel Ø4 mm
1 × aluminium or brass tube Ø4.1 mm inside

Milled parts and material set

The quickest way to build the Blitz is with our routing parts set or the material and routing parts set:
- The **milling parts set** includes all components such as ribs and frames made of balsa and plywood in selected quality. Planking material and some battens are still needed.
Art.No.: 6211843, Price: 159,95 €.

- In addition to the routed parts, the **material and routed parts set** also includes the planking timbers and battens.
Art.No.: 6211844, Price: € 224.95.

VTH-Order-Service:
Tel.: 07221 5087-22, E-Mail: service@vth.de,
Internet: http://en.shop.vth.de

natured and responds to thermals. There are certainly not many flying wing hotliners with such flight performance on the market. At 5s you even have an audible stall at the propeller during take-off, after which the Blitz accelerates vehemently vertically. After three to four seconds, you have enough altitude to burn up. I thought long and hard about whether to list this 5s version at all. Because this option is only for experienced modelers who know how to handle such models and drives. Also, I must point out: With 5s and 1,930 g, both motor and model are at the limit. Long motor runtime and hard flight maneuverer are therefore to be avoided. In the table on the first double page, I have given the weight and power of each motor, so that you can also look for alternative motors. You should not save on the ESC, especially if you want to fly with 5s and BEC, as I do. So much for today. In the next issue we will start building the Blitz.

Blitz

Wingspan:	approx. 1,950 mm
Length:	approx. 830 mm
Flight weight glider:	from 1.250 g
Flight weight electric:	approx. 1,450 g (3s 2,400 mAh, Hacker A30 12 L)
Flight weight electric max:	approx. 1,950 g (5s 3,800 mAh, Hacker B50 8L 6.7:1)
Wing loading:	approx. 30 bis 50 g/dm²
LiPo:	3s to 5s, 1,800 to 3,800 mAh
Profile:	Lightning (own development)
RC functions:	Rudder, Elevator, Ailerons, Motor, Flaps
Servos Elevation/average:	2 × Hitec D145SW
Servos flap:	2 × Hitec HS 125 MG
Servo side:	Hitec HS 81
Receiver:	Jeti Duplex Rex 7

BUILDING INSTRUCTION 3201513 |

WOLFGANG WERLING,
AERIAL SHOTS:
HANS-PETER WAGNER

Flying wing with High voltage, Part 2

THE BLITZ

The Blitz is dynamic. With or without motor. With its thin profile, this new flying wing performs close to a conventional hotliner. And it's built entirely from wood! In the last issue we presented the general concept and the propulsion options, now we build and fly.

Building the area

As with all my models, I use thin super glue for the gluing and then reinforce the glued areas with UHU hard or PVA. The first thing to do is to check whether the intended plug fits into the holes in the ribs. The holes are intended for thin-walled tubes, for thicker ones you must drill out accordingly.

Since the wing is fully covered, the superstructure can be done directly on the planking. Cut the planking roughly to size and fix it on the plan, place a 2 mm strip at the back as shown in the plan to achieve the necessary twist. Sand the lower main spar F6 around the ribs F18 and R19 thinner - due to the low rib height. Then glue F6 to the planking, but only place the auxiliary spars F5 and F8 on the planking, they will be glued together with the ribs later. Now start with the ribs R3, R4 and R5, R1 and R2 will only be glued when the connectors are installed. R3 is glued to the main spar and in the rear area of the planking. Since it is not yet possible to press down in between and in the area in front of the main spar, the gluing is done later.

Continue in the same way with the ribs R6 to R19, always aligning them with the main spar. Then insert the upper main spar F6 and glue it in place; make sure that the ribs are correctly positioned, otherwise the wing will warp. Do the same with the upper auxiliary spars. The wing is now torsional stiff and can be removed from the building board. Now you can glue the ribs along the whole length: It is best to glue them with superglue and glue them with UHU hard over the whole surface. The auxiliary nose strip F3 and the end strip F10 complete the surface. When both halves have been assembled, start fitting the root ribs and the joints.

The first three ribs are attached; the auxiliary spars are aligned with the help of the ribs.

The upper main and auxiliary spars are glued, the wing is now already torsional stiff.

You can find the flight video for the article at: www.fmt-rc.de

The surface plugging

Cut the tubes and CFRP rods accordingly. Be sure to chamfer the edges of the aluminium tubes to avoid a notch effect on the CFRP rod. Start with the main mating: fit root rib R1 and mating rib R2 into the surface and push in mating tube F17. Then test fit the two halves together. Fix one half of the previously roughened tube with superglue, as well as the ribs on this side. Then check again if everything fits - and glue tube and ribs in the second half as well. Proceed in the same way with the F16 front joint.

When the rear plugging is also fitted, the openings of the tubes are closed with pieces of balsa to prevent the plugging from slipping in. The balsa blocks also ensure better force transmission into the planking. Now glue the joint with plenty of epoxy.

The latching of the spars must not be forgotten, because it increases the strength significantly. The grain of the wood is vertical here. I then cut the cut-outs for the wing servos in the planking. To glue the wing dowels F1 accurately, place the wing on the fuselage and align it.

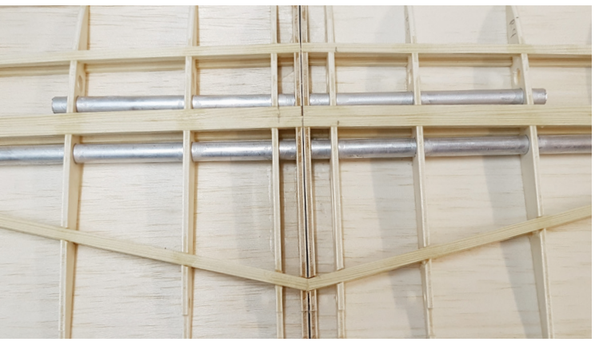
Planking of the top side

First you should sand over the top of the wing so that nothing protrudes - and pull in the servo cables. Then: cut the nose planking to size, moisten it slightly and pre-bend it slightly by hand or over a pipe and let it dry. This reduces the force required for planking and reduces the risk of warping.

However, it is essential to let the planking dry first and then glue it on. If you glue on the wet planking, the wing can bend while drying. Apply UHU hard to the ribs and spars and work quickly. Then: Put the planking on the spar and fix it with thin super glue and weights, only then press it forward to the leading edge and fix it with tape and pins. Allow to set well. Of course, you can also use PVA, but then you have to wait longer. Especially when planking the top side, the 2 mm strip must always be placed underneath at the back.

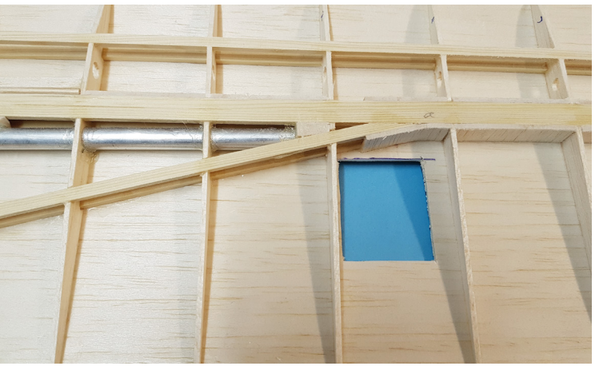
Then apply the remaining planking, fit the protruding nose planking to the auxiliary leading edge and glue the leading edge F2. Glue together the edge bow F15 from two parts; in my pictures you can still see the old version, which I had to thicken. The edge bow end strip F14 is slightly upwards according to the S-cut, the gluing is done directly on the drawing in the plan. Sand the edge bow slightly diagonally and glue it to the surface. To glue the end strip F11 to the wing, align both directly on the plan.

Now you can cut the rudders according to the plan and bevel them accordingly. Then place the wing on the fuselage and pre-drill the holes for the wing screws with 2 to 3 mm through the wing and fuselage. Then: Remove the wing and drill out to 6 mm, drill out the thread board with about 4.5 mm and cut the M6 thread. Harden the thread with superglue and cut it again. Alternatively, you can use drive-in nuts. Once this has been done, the entire body shell is sanded.

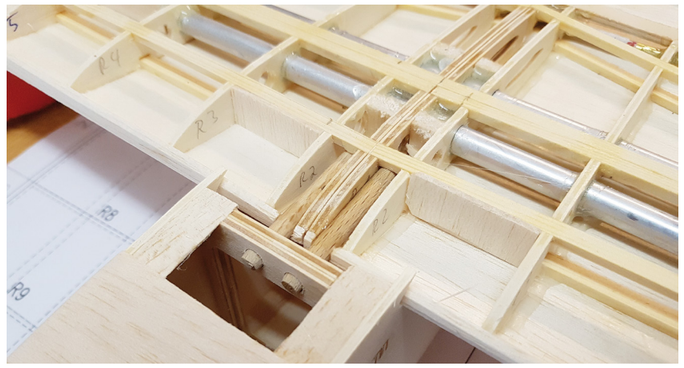


The exact fitting of the two connectors is very important to avoid twisting of the wing halves.

Do not skimp on the glue for the connectors.



The spars are latched with standing grain, the opening for the wing servos can now also be easily cut out.



The accurately fitting gluing of the wing dowels is done directly on the fuselage.

Now the fuselage

First glue the side panels together, these are made of poplar plywood and balsa. Then: Glue the double frame 4 together and glue it at right angles to one side panel, align it with the plan view and glue it at right angles to the second side panel. Now glue frames 3, 5, 6 and 7, making sure that the fuselage is straight. Only then insert the fuselage straps 18. For the motor bulkhead 2, the recess for the pin in the right-hand side panel must be widened slightly to achieve the side pull. First fix the motor bulkhead with super glue, then glue it all around with epoxy or UHU Plus Endfest. The bulkhead itself should be cured with thin super glue. Now you can glue in the triangular strips 19 and 20.

Next comes the fuselage floor 11, which can alternatively be provided as a flap for changing the battery. The rear fuselage bottom 17 is made of balsa, the front fuselage bottom 10 again of poplar plywood. Threaded boards 8 and 9 consist of two parts and should be glued well to the fuselage and frame 5. Before closing the fuselage with the cover 15, you should test-fit the drive unit and check whether there is enough space for the cables, especially in the case of outboard rotors. If there is not enough space, you can now make the necessary cut-outs in the triangular strips.

For weighting the planking, the old NiMH cells are clearly superior to LiPos.

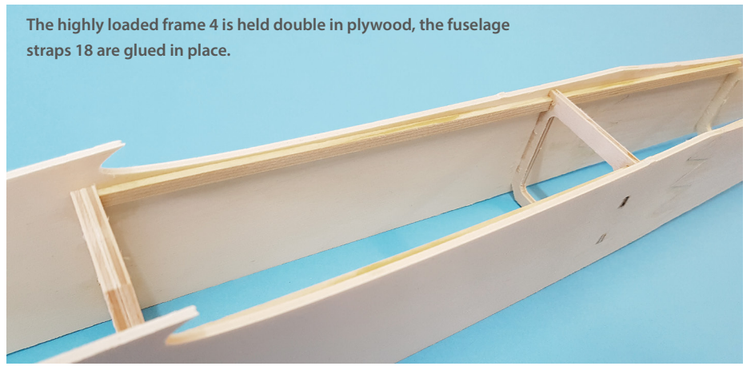
The rudder...

... is glued together from parts 21 to 24, depending on whether you want to link it or not. Push it into the fuselage, align it with angles and glue it in place. The end of the fuselage and the area of the spur 22 are lined with 2 mm balsa. The transition from tail to fuselage is reinforced with a triangular strip. The transition from fuselage to wing is also covered with a triangular strip.

Now you can lay the snake for the rudder linkage. You should fix it at several points or slide a CFRP tube over it as a stiffener. After that: Glue on the rear fuselage cover 16 and

The finished edge bow; the edge bow end strip has the same S-flap as the elevator.

Align the end slat F11 directly with the plan view.



The highly loaded frame 4 is held double in plywood, the fuselage straps 18 are glued in place.

sand the whole thing. Now glue the slip ring 1 to the fuselage head and make a suitable transition to the spinner. I screw in a broken motor and mount an old aluminium spinner that I can sand over.

Rudders and servos

Before ironing, the carcass is painted with Oracover heat-seal adhesive (100 ml, diluted 1:1). This makes the covering hold much better and prevents bubbles from forming later. I use the following films: Oracover Pearl White, Oracover Pearl Purple, Oracover Fun 3 Pearl Graphite Black. The rudders are ironed on at the same time - on the underside to achieve a surface as free of swirls as possible. The rudder gap on the upper side plays a less important role. Hinges are unsuitable here, by the way, because the pressure exchange causes strong turbulence, which has a negative effect on the rudder effectiveness.

For the controls use the new Hitec D145SW wing servos for elevator and aileron. They have hardly any play, a high positioning accuracy and fit exactly into the wing with their 10 mm. I screwed them to the corresponding frames

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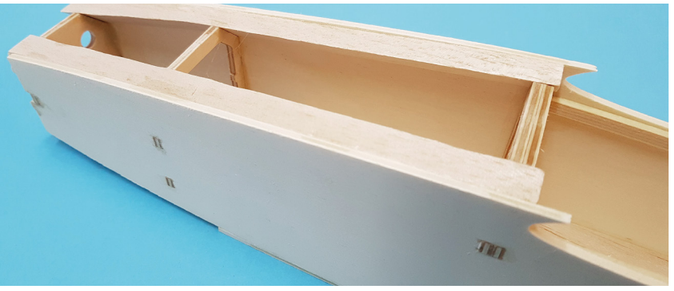

Motor bulkhead and triangular strips are glued in place. The battens reinforce the fuselage and allow the corners to be rounded.

For the cables of outrunner motors, you can leave out the triangular strips accordingly.

The two-piece threaded board is well glued to the fuselage and the bulkhead.

Finished. Before covering, I coated the wood with Oracover heat-seal adhesive. This makes the covering stick better and keeps it free of bubbles.

Blitz

Wingspan:	approx. 1,950 mm
Length:	approx. 830 mm
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Wing loading:	approx. 30 bis 50 g/dm²
LiPo:	3s to 5s, 1,800 to 3,800 mAh
Profile:	Lightning (own development)
RC functions:	Rudder, Elevator, Ailerons, Motor, Flaps
Servos Elevation/average:	2 × Hitec D145SW
Servos flap:	2 × Hitec HS 125 MG
Servo side:	Hitec HS 81
Receiver:	Jeti Duplex Rex 7

and then glued them in place with epoxy. A thin cover was then glued over them. Existing HS-125 MG servos from Hitec were used on the flaps and suitable frames were made from plywood remnants.

To get the motor into the nose without any problems, push an M3 threaded rod through the motor bulkhead from the front, pull the motor forward and screw it to the remaining holes. Please also balance the model around the longitudinal axis afterwards, otherwise you should not be surprised if the flying wing leaves one surface hanging.

Here the transition from the fuselage to the tail unit is still in its raw state.

The right settings

All values given below are based on the normal setting shown in the plan. For the first flight I recommend these rudder deflections: Elevator 15 mm up and down, aileron 14 mm up, 12 mm down. The flap deflection for landing and the addition of the elevator can be found in the plan. Attention: The flap alone acts as a depth and must be compensated with an elevator deflection. Of course, these are only suggestions for the first flight. For maximum maneuverability with smooth response, I fly on elevator and aileron with large deflections and mix in at least 50% expo.

It is essential to ensure that the deflection is the same for both elevators. For the take-off I do not trim the Blitz up additionally. The model is simply thrown slightly upwards with the engine running. Especially for the first flight, you should not start with full throttle, but with about 50 to 75% throttle.

Trust the Blitz

Since I didn't know how the thin profile would behave in practice when I first flew the Blitz prototype, I first used the tame, light 3s direct drive. During the first flight I always like to have my models tossed to have both hands on the sticks at the same time. Fellow pilot Hans-Peter Wagner took over the launch. The take-off was completely relaxed: The Blitz climbed away nice and steady, I only had to trim slightly for depth, as my S-stroke was too big. Once at safety altitude, I switched off the engine and checked the centre of gravity.

There is no stall at full altitude, only a slight bob. Then came the first stab for a fast flight. And lo and behold: the Blitz is really fast and glides extremely well. Looping and inverted flight are immediately successful and even fast rolls come as if pulled on a string. But the Blitz can also be slowed down nicely and circled in the thermals. The rudder effects are very balanced overall, and confidence in the model was immediately established. The butterfly setting for landing was also very good. I was totally happy.

This is what it looks like when sanded. The semi-circular opening is used for ventilation and it is easy to get to the rudder servo.

Also, with 4 and 5(!) s

Even though the Blitz went vertical with 3s, I still installed the gear drive I had planned from the beginning. The take-off with 4s again showed a strong increase in performance, the vertical climb now takes place with increasing acceleration. Both the climb and the noise are impressive.

However, I was surprised that despite the higher weight, the low-speed flight characteristics remained almost identical, but the gliding performance increased. By the way, since the battery sits almost exactly in the center of gravity with this gear drive, you can fly with 4s or 5s without any change. And how does the Blitz work with 5s? See video...

My conclusion

The Blitz is a model for all occasions and wind strengths. No matter whether for calmer gliding or Holliner Style, it is uncomplicated and powerful. Even with an inexpensive and light engine, above-average flight performance is achieved, the Blitz convinces with good all-round characteristics and high strength reserves.

With stronger and heavier drives, the dynamics increase, both in climb and in glide. With the rudder attached, turns and knife-edge flying are also feasible, but no spinning. The most fun is to rush across the field at high speed. And since the Blitz absorbs the energy very well, you repeat this right away from the other side. Landing is no problem, even with a full load, thanks to the good slow flight characteristics. So, it's a real fun model without any pitfalls. Using a new aerofoil is always exciting, but the Blitz exceeded all expectations.

▾ The aerodynamic transition from the wing to the fuselage is made by means of a triangular strip.