

The new Hai 1 Evo First



It's the first time I'm revising one of my sharks. Shark 1 is already 11 years old and still popular. It started the shark family - so it deserves an update! After all, the original shark was still designed for a Speed 400 brushed motor and NiCd cells. With brushless and LiPo, you can now achieve many times the performance with significantly reduced weight. Reason enough to modernise the design as well.

The modifications

The surface is now pluggable, which makes the Hai 1 Evo extremely backpackable. And the construction is much more stable, as today's drives are lighter but also much stronger. The wing has been given more span and a higher aspect ratio, which significantly increases glide performance in conjunction with the optimised profile. The Evo is also visually more elegant thanks to the curved leading edge and the redesigned fuselage. The fuselage has a battery hatch at the bottom, so the wing does not have to be removed to change the battery. The indicated canopy serves only the optics.

What has remained is the good-naturedness, spinning is not possible. And the simple and inexpensive construction. But not the flying fun, which has increased just as much as the flight performance.

As a new drive...

... a Hacker A20-12 XL Evo brushless motor (76 g), a 41/3.17 mm centre section and a 38 mm turbo spinner are recommended. The battery is a 3s-LiPo Lemon from Pichler with 1,350 mAh and 30C (115 g), the controller is a Pichler XQ 40 Ampere with BEC. A current of 26 amps was measured with an aero-naut Cam Carbon 10x6 propeller. The flying weight is 670 grams, and the model climbs vertically from 3/4-gas. I don't even want to mention here that with an 11x6 propeller the current rises to 33 amps and the Hai 1 Evo climbs like an angel that is homesick...

With an A20-26 M (42 g) and a LiPo 3s 800 mah (73 g) on an aero-naut Cam Carbon 9x5 it is 11 A. This drive is almost 90 g lighter in combination with a 20 amp regulator and is sufficient for a good climb of 45°.

Vertical stabiliser?

I retrofitted my Evo with a hinged rudder. At first the shark doesn't really care, in normal flight there is practically no reaction. Unless you leave the throttle at full throttle and put all the rudders in. Then there are wild rollovers over several axes, no idea what that's called. Shark roll? However, after two or three turns, it stops by itself, because the current on the wing doesn't break off. If you want to try this or fly a turn with the Evo, proceed as follows: Cut off the rudder directly at the fuselage and widen the resulting rudder blade with 3 mm balsa by approx. 20 mm. Without the widening, the rudder will not work at all.

The glider version

Because the centre of gravity is far back, the glider-only version requires only a small amount of lead in addition to the battery and receiver. The very light Evo is grateful for this with further improved thermal properties, but also loses some of its power. For windy slopes, you should take some ballast with you. Or install a motor after all...

The construction

The simple balsa fuselage is light and stable. Thanks to the triangular strips, the fuselage can be sanded nice and round. The wing has two pine spars and a nose planking with 2 mm balsa. This makes it very torsionally stiff and robust.

The twisting of the wings, which is necessary for flying wings only, is simply achieved by placing a strip under the ribs, as shown in the plan. This way the rib end always has the same height, but due to the decreasing rib thickness towards the outside, the leading edge is lowered and the wing is thus twisted.

Construction of the fuselage

Fix the two side parts at the end of the fuselage with a clamp (do not glue them yet!) and align them on the plan, making sure they are in the same position and have the same deflection. Now glue frames 4 and 5 in place.

To glue motor bulkhead 2 and bulkhead 3: Fix the fuselage on the plan with weights and test-bend the two side parts together. If one side is more stable than the other, moisten it and bend it slightly by hand. Now place frame 2 between the two side parts and adjust the side pull according to the fuselage plan. The engine camber must be taken into account according to the plan. First fix it with super glue and then secure it with UHU hard or epoxy.

The mortise and tenon joint of the frames with the side panels ensures a fast and warp-free assembly.



The fuselage is very stable due to the installed longitudinal straps and triangular battens.



Anzeige

Thanks to the triangular strips, with a little sanding work you get a shapely fuselage.



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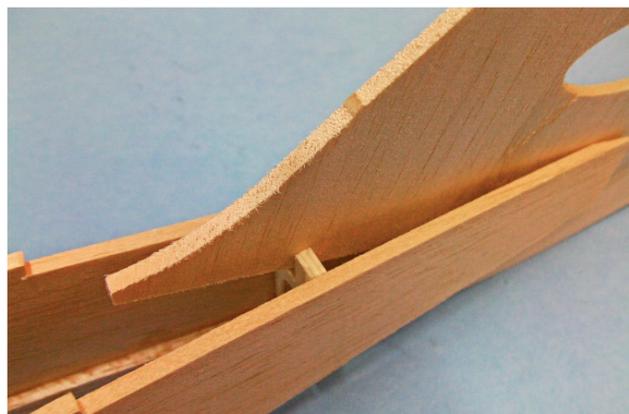
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▲ The rudder is fixed exactly by cut-outs in the bulkhead.

◄ The transition between fuselage and tailplane is also designed with triangular strips and reinforced at the same time.

◄ The battery hatch on the underside of the fuselage is made of poplar plywood.

tack the spar F5 to it. Place a 3 mm thick strip under the back as shown in the plan to achieve the necessary twist. In the area of the planking for the wing servos, either the planking must be the same or an additional 2 mm must be placed under the strip, as the ribs R6 and R7 are otherwise 2 mm thinner.

Glue the plug-in ribs R2 and R3 to the planking. The root rib R1 is not fitted until the plug-in is installed, so there is only a small gap between the surfaces. Fix the ribs R4 to R11 one after the other. Now glue the upper spar and the surface strip F7. The auxiliary leading edge strip F3 is attached to the lower planking.

The surface plugging

Test-fit the plug-in and plug the wing together. Align everything and file the holes slightly if necessary. The two root ribs R1 are also fitted here. Fix the joint on one side of the wing with superglue. The tubes must be sanded beforehand so that the glue sticks. Finally, put everything together. When everything fits, fix the mating in the second surface side with superglue, then glue it in place with plenty of hard glue. Seal the mating tubes on the outside with a piece of balsa so that the steels cannot move. Then glue the dowel F1 to the root rib and do not forget the screw reinforcement F8. It is also essential to latch the spars (with the grain on edge), it increases the strength significantly.

When all installations in the wing are done (incl. the servo cables), the ribs are lightly sanded over and the upper side is planked. The wing must rest completely on the building board and the 3 mm strip, otherwise it will warp. Then adjust the leading edge planking to the bend of the auxiliary leading edge strip and glue the leading edge strip F2 in place.

Now cut out the edge bows F14, in addition two pieces of the end strip F16 are needed. The position and the V-position of the edge bend are shown in the plan. Finally, glue the end strip F6 and cut and fit the control surfaces F13. Finally, sand the surface thoroughly using a sanding board and sanding block.

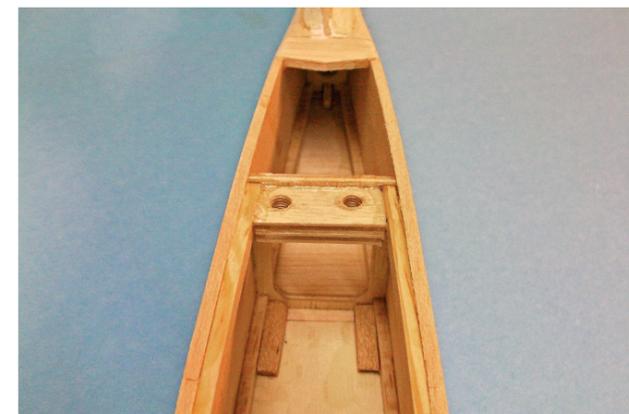
Connection of wing and fuselage

Place the wing on the fuselage, file out a little on the bulkhead if necessary until the wing dowels fit. Pre-drill the holes for the wing screws with 2 mm when the wing is in place and aligned, then remove the wing and drill out to 5 mm. Drill out the threaded board with approx. 3.5 to 4 mm and cut the thread with M5. Harden the thread with superglue and then recut - this will last forever. Alternatively, you can of course use drive-in nuts.

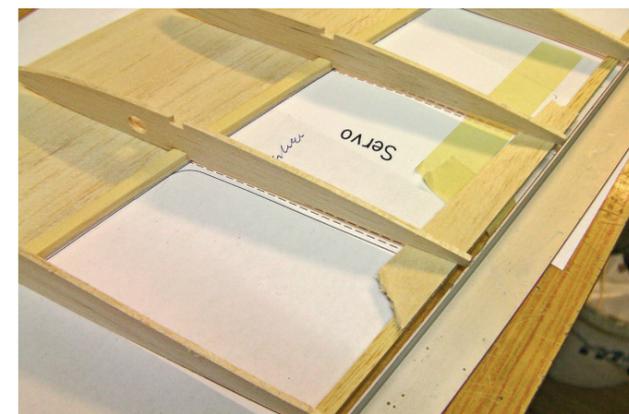
A few notes on finishing: I always harden corners that are particularly vulnerable during transport - such as the outer tips of the rim bows or the rudder - with a little super glue.

The prototypes are covered with Oracover light, the rudders were ironed on directly. It is important, however, that both the bottom and the top of the rudder are ironed on, then the film will hold permanently.

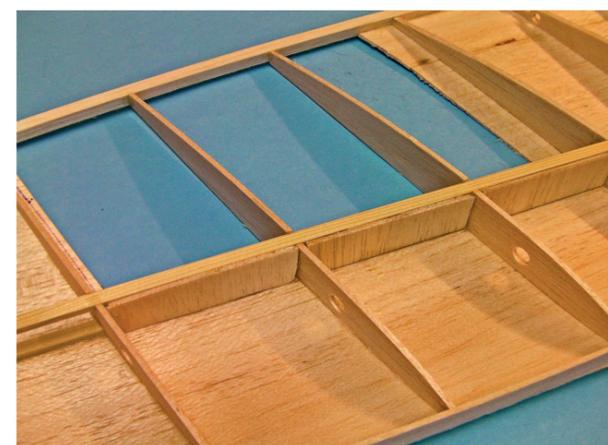
Here you can see the position of the threaded board and the fixation of the battery door by two balsa strips.



In the rear area the 3 mm strip for the twisting is underlaid, the balsa strip replaces the still missing planking near the servo.



Fix the surface connector with super glue and finally glue it permanently with a generous amount of hard glue.



Good to see: the auxiliary leading edge and standing spar latching of the wing.

To glue the triangular strips 7: Bending is no problem with soft to medium balsa, with hard wood you have to water and pre-bend by hand or make some cuts across the bend with a saw. Even if the strip breaks, it is not a problem, as it is only used for sanding.

Attach the fuselage straps 13, threaded boards 14 and frame 6 with plenty of glue. Fuselage cover 10 and fuselage bottom 8 are applied crosswise with the grain. The battery hatch 11 made of poplar plywood facilitates battery replacement. A small stop is sufficient as a holder at the front, a screw is used at the rear, magnets are also possible here.

You assemble the rudder from the individual parts. The skid 16 is made of poplar plywood, in the prototypes it was still made of balsa and therefore somewhat prone to breakage. Fit the tailplane to the fuselage and

sand it down. Align it to the fuselage and check the squareness with the wing in place. Bevel the end of the two fuselage side parts on the inside to get more gluing surface.

The front slip ring 1 made of balsa facilitates the adjustment of spinner and fuselage. The fuselage should now be sanded vigorously until the triangular strips are revealed. I pre-carve as far as possible with a sharp carpet knife and only then sand. If the sanding is too much work for you, you can of course leave the fuselage square.

The wing construction

Sand the ribs diagonally according to the arrow on the spar, end and leading edge moulding, otherwise you will have no gluing surface. Roughly cut the bottom planking and

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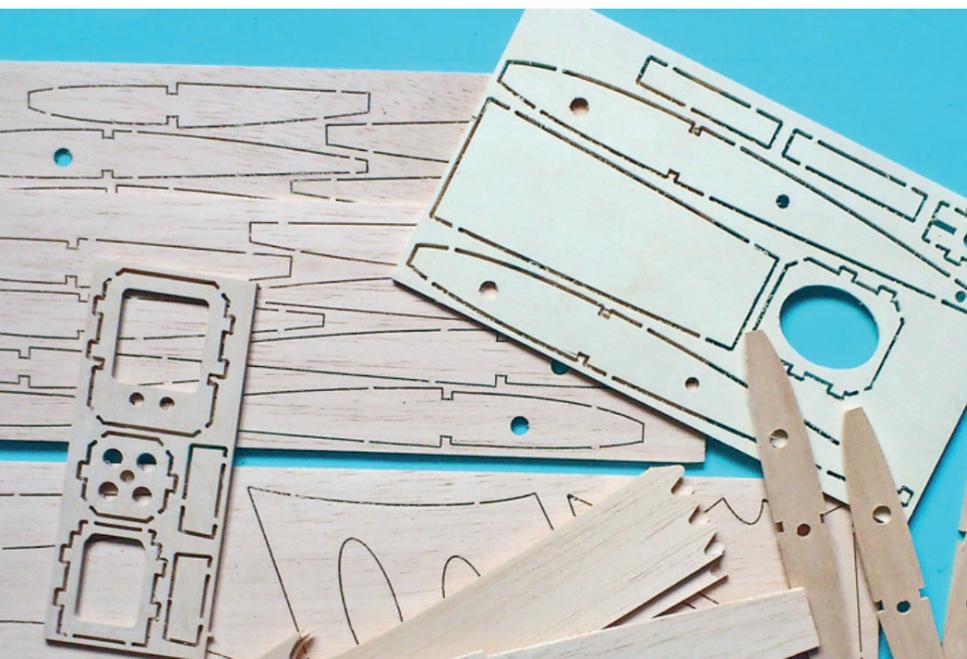
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Finally, the wing is planked and latched.



The revised, re-freshed design of the Hai 1 Evo can already be seen on the rim bow.



SHOPPING LIST
(in addition to the milled parts)

- | | |
|---------------------------------|--------------------------|
| 1 balsa board 3 mm | 1 balsa board 6 mm |
| 1 balsa triangular strip 6x6 mm | 1 brass tube 6x5.1 mm |
| 2 end strips 6x40 mm | 1 brass tube 5x4.1 mm |
| 5 pine slats 5x3 mm | 1 spring steel wire 4 mm |
| 5 balsa boards 2 mm | 1 Spring steel 5 mm |
| 1 beech rod 6 mm | |

REFERENCE OF THE MILLED PARTS

A milling parts set of the Hai 1 Evo (Art.No.: 621 1583, Price: 59,- €) is available in the VTH shop at en.shop.vth.de, Tel.: 07221 508722, e-mail: service@vth.de

First flight settings

To maintain the centre of gravity, the flight battery sits far back. Balance the Evo around all axes. Pay attention to equal deflections, especially of the elevators. If, for example, the control horns do not have the same distance to the axis of rotation of the rudder, this will already be noticeable.

The rudder deflections for the first flight are as follows (the values correspond to the setting „Normal“ shown in the plan, the end bar is - S-stroke - slightly upwards):

- Elevator: up 14 mm, down 12 mm
- Aileron: up 18 mm, down 14 mm (differentiation)

If the rolls become out of round, the differentiation is usually too low. I fly with even larger deflections and mix about 50% expo on all rudders to get a soft response.

For take-off, you should trim the elevators up again by about 2 mm, starting from the Normal setting. This avoids sagging - especially when you are throwing yourself, this is very helpful.

The model is thrown slightly upwards with the engine running. Otherwise, the engine camber will pull the model down first until the rudders have sufficient inflow. After a few familiarisation laps, the centre of gravity should be checked: If the Evo goes down strongly even with slightly pulled elevator and cannot be slowed down, the centre of gravity is clearly too far forward. If the shark becomes unsteady with the elevator slightly pulled or tilts with the elevator fully pulled, the centre of gravity is too far back.

Conclusion

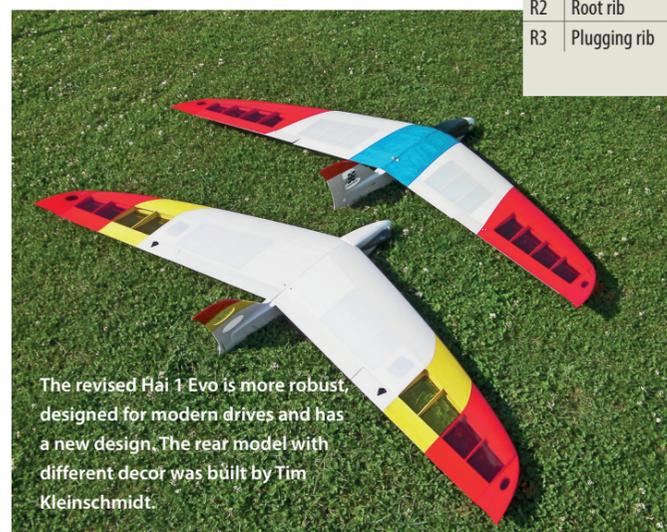
The new one is still a Hai 1, but more modern and better. After 11 years of experience with 6 Hai types, you already know where you can still optimise... Everywhere I have flown the Evo so far, the other pilots and spectators have been surprised by the flight performance and manoeuvrability. You can have a lot of fun even with small models. What do you mean, you don't have a Shark yet? Then it's about time - and the Evo is the perfect introduction.

TECHNICAL DATA | Hai 1 Evo

Wingspan:	1.480 mm
Length:	635 mm
Flight Weight:	Glider: from 490 g Electric: from 580 g
Drive:	Hacker A20-26 M to A20-12 XL Evo
Battery:	from 2s-LiPo 800 mAh to 3s-LiPo 1,800 mAh
Airfoil:	MH 63 mod.
RC functions:	Elevator/aileron via mixer, motor control

PARTS LIST | Hai 1 Evo

No.	Designation	Material	Amount	No.	Plugging rib	Balsa 3 mm	2
1	Slip ring	Balsa 3 mm	1	R4 to R11	Rib	Balsa 2 mm	2
2	Motor bulkhead	Plywood 3 mm	1	F1	Surface dowel	Beech 6 mm	2
3	Fuselage frame	Poplar chip 3 mm	1	F2	Nose strip	Balsa 3 mm	2
4	Fuselage frame	Plywood 3 mm	1	F3	Auxiliary leading edge	Balsa 2 mm	2
5	Fuselage frame	Plywood 3 mm	1	F4	Tie bar latching	Balsa 2 mm standing	div.
6	Fuselage frame	Poplar chip 3 mm	1	F5	Holm	Pine 5x3 mm	4
7	Reinforcement	3-sided balsa 6x6 mm	4	F6	End strip	Balsa 6x40 mm	2
8	Fuselage bottom	Balsa 3 mm	1	F7	Surface strip	Balsa 6 mm	2
9	Side part	Balsa 3 mm	2	F8	Screw reinforcement	Poplar chip 3 mm	2
10	Fuselage cover	Balsa 3 mm	1	F9	rear plug	Brass tube 4.1 mm inside	2
11	Battery door	Poplar chip 3 mm	1	F10	front plugging	Brass tube 5.1 mm inside	2
12	Reinforcing strips	Pine 5x3 mm	div.	F11	Rear steel	Steel 4.0 mm outside	2
13	Hull straps	Pine 5x3 mm	2	F12	Front steel	Steel 5.0 mm outside	2
14	Threaded board	Plywood 6 mm	1	F13	Rudder end bar	Balsa 6x40 mm	2
15	Rear planking	Balsa 3 mm	1	F14	Edge arch	Balsa 6 mm	2
16	Skid	Poplar chip 3 mm	1	F15	Edge arch - support	Balsa 6 mm	2
17	Tail unit	Balsa 3 mm	1	F16	Edge arch - End strip	Balsa 6 mm	2
18	Barrier	Balsa 3 mm	1	F17	Planking	Balsa 2 mm	2
R1	Tail unit	Balsa 3 mm	1				
R2	Root rib	Poplar chip 3 mm	2				
R3	Plugging rib	Balsa 3 mm	2				



The revised Hai 1 Evo is more robust, designed for modern drives and has a new design. The rear model with different decor was built by Tim Kleinschmidt.



Designer Wolfgang Werling with his new first shark, the Hai 1 Evo.

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