



# Elektro-Krähé

## An unusual motor glider

WOLFGANG WERLING

When I was a little child, I saw the Raab motor crow in action at an air show. The pilot flew very low and slowly over the field and casually waved to the spectators. The unusual flight pattern and the sound of the rear-mounted engine fascinated me at the time.

Barely 30 years later I remembered this and decided to build a model of the Motor Crow. I found neither construction plans nor a kit on the internet or in the VTH archives. There were probably already model replicas of this machine, but they needed large amounts of lead to maintain the centre of gravity or had problems with the linkage of the rudders and the stability of the fuselage.

So it was clear that I would base the design of the model on the motor crow, but give priority to a simple and functional design.

### General remarks

The model is relatively light and surprisingly robust. The construction is no more difficult than that of a „normal“ model. The wing is divisible and withstands all bastings in the air.

The use of CFRP tubes makes the rear of the fuselage light and stable. The servos locat-

ed under the tail units ensure a rudder linkage without play and are hardly heavier than linkages that are much more complicated to install. The wing is reminiscent of the Amigo from Graupner and the double V-shape allows the Crow to be flown with rudder only.

The profile used was a SO 7037 mod. This airfoil is a real all-rounder with the advantage of a centre of gravity far to the rear. In order to place the centre of gravity even further back, the tailplane was also raised slightly. This has another advantage: when the throttle is opened, the tailplane is pushed upwards, which prevents the model from rearing up due to the engine being far below the wing. The model could also be used as a pure glider; since the engine is omitted behind the centre of gravity, only a little lead is needed in the fuselage nose.

### Flight characteristics: amazing!

The flight characteristics are absolutely uncritical, a stall is hardly possible with the correct centre of gravity. You wouldn't actually believe the model's sailing performance, but the large wing carries really well. The wing loading is very low at 25 g/dm<sup>2</sup>. If you mainly

want to sail comfortably, you should set the angle of attack of the wing to 2°. I fly with an angle of attack of 1.5°, so the model flies a bit faster and even allows taxiing and inverted flight without any problems as well as fast cross-country flights at full throttle. However, I then have to trim up a little for sailing. Since the wing is only screwed on at the top, the angle of attack can easily be changed at any time by placing balsa strips under the front or rear.

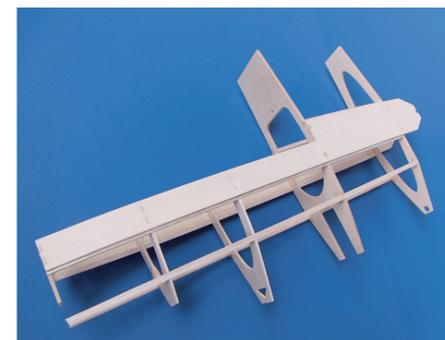
### The Power unit

The Hacker A 30 12 M is very light, weighing 105 g, and at 1,370 UN it is just right, as the propeller must not be larger than 8 inches.

Measured values with 3S-Lipo with 3.300 mAh, Graupner folding plate CamCarbon Bx6: 12.000 min-1 at 10,5 V and 29 A.

The performance is amazing despite the small batten and is sufficient for climbing flights at a 45° angle. Half throttle is easily enough for model-like flying.

The aeronaut Cool Nose with 40 mm diameter and 42 mm centre section is very suitable as a spinner. Due to the shape of the spinner and the Graupner blades, you have a stop at the front, which prevents the blades from hit-



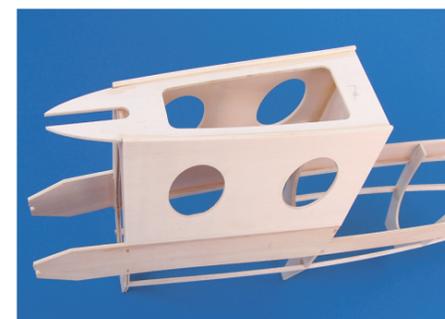
Construction of the fuselage front section from poplar plywood



Bonding the CFRP tubes into the empennage girder



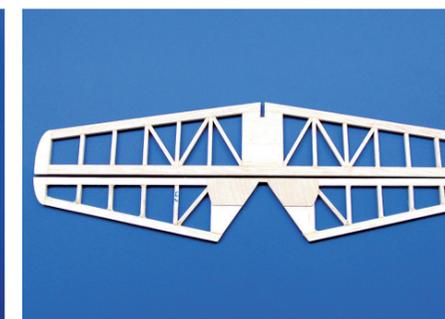
View of the seat of the tail boom and the engine mount



The electric crow's surface layer



The fuselage nose before sanding with mounted wheel



The tailplane is built using the flat construction method



The open cabin, sanded and ready for installation

ting the fuselage, even at abrupt full throttle. However, a rigid propeller or 3-blade blades would also be conceivable.

With the 300 g lipo you still need about 20 g lead in the nose, also 8-10 cells Ni-xx would be suitable, if someone still has something like that lying around.

### Building the wing

Important: use one end rib per side; if you make 2 centre sections from one end rib, the other will not be enough for both outer wings! First adjust the hole of the ribs to the used spar. Cut the lower leading edge planking to size and staple the lower spar 43 to it. Place the ribs on the spar and glue them in place. Do not glue the root ribs R1 in place until the spar is installed. Important: where the ribs will be planked later, i.e. root and plug-in area, must

be underlaid with 1.5 mm balsa, otherwise the installation height will not be correct.

Glue in the upper spar 43 and the rear auxiliary spar 44. Glue in the outermost rib RS at an angle according to the V-shape, then the aileron will also run with a small gap without jamming.

Assemble both centre sections and fit the joint. Roughen the tubes beforehand, test fit them together and only then glue rib 1 in place, making sure that the gap between the surfaces is as small as possible. Close one end of the joint tube so that the joint cannot be pushed out on one side. Glue and box the tubes, using plenty of glue. Now glue end strip 45 in place. Cut the auxiliary leading edge 41 from 1.5 mm balsa and glue it in place, sand it over.

Next build the outer wings. Place the end rib under the outside (see plan), this results in a slight negative twist and the model flies better. Rib R6 is left out for the time being, otherwise the construction is the same as for the centre section. Sand the V-shape, place the wing outside accordingly. Adjust the buckling reinforcements 47 and 48. Attention: the side with the hole is on the outside, here the overall height and the height of the amplifier are lower. Glue the main spar first, then the auxiliary spar. Now cut the ribs RS and R6 accordingly and glue them in place. Glue in all the fairings 46. Glue in the rudder strips 49, otherwise the

rudders are too soft. Glue 4 mm sockets in the wing to fix the support struts, the struts then get the mating connector.

Grind over ribs and auxiliary leading edge, pull in servo cable or empty tube. Do not forget screw reinforcement 56, otherwise it will pull the planking down. Glue the upper planking, sand the nose and attach the leading edge 40. Also attach the edge bows 51. Sand the surface completely. Finally, cut off the ailerons: mark the position, run a sharp knife along a steel ruler, back and forth several times. Alternatively, use a fine-toothed saw blade (hacksaw).

I have not retrofitted the interface, but only ironed it, the strength is sufficient and you save weight behind the centre of gravity. For the same reason, the ribs are not glued on.

### Technical Data

Wingspan:	2.020 mm
Length:	1.110 mm
Weight:	1.500 - 2.000 g
Wing load:	from 35 g/dm <sup>2</sup>
Airfoil:	SD 7037 mod.
Drive:	Hacker A 30 12 M
Controller:	Hacker SB 40 Pro BEC
Battery:	3S-LiPo 2.500 - 4.300 mAh / 8-10 cells Ni-xx
RC functions:	Elevator, Rudder, Aileron Motor

### Fuselage

Plug the frames 5 and 6 together with the side parts 18, align them and fix them with super glue. Then glue frame 3 in place. The support foot on frame 3 is only for alignment on the building board and will be removed later. Glue the support strips 26 in place and bevel them for the planking 19 and 20. Glue the two threaded boards 15 and 16 and the wing support 7 in place. Plank the bottom of the fuselage with balsa 22, do not forget the cut-out for the tyre.

Fit the canopy frame 12 to the fuselage and glue the formers to the canopy frame. Close the canopy with parts 25 and 24. Unlike the canopy, the fuselage has no frame on purpose, but can be adapted to the canopy later, e.g. with the battery mount. Roughly cut, glue and sand the fuselage nose 23.

### Tail boom

Cut the carbon tubes 29 and 30 to length (Dremel or hacksaw), lay them on the plan, align them and glue them to the tail boom 31. Roughen the glue joints well, tack them with superglue and glue them again with epoxy. The tail boom must be centred on the tube, it will later be covered with balsa on both sides. Grind the upper tube holder in the fuselage at a slight angle so that tube 29 dips in and has more gluing surface.

Then align the fuselage on the plan, both in the top view position and standing at right angles. Insert both tubes, draw the insertion length from the plan with a pencil on the tubes. Sand the upper tube at an angle so that it does not protrude at the top and screw it lightly into the upper socket with a thin screw; this makes alignment much easier. Align the tail boom, both with regard to the insertion length and the angularity, and of course in the longitudinal direction according to the plan view.

Lightly fix the lower tube 30 with superglue. Check everything again. If the alignment

around the vertical axis is not correct, loosen the upper screw and correct it, then fix it with superglue. If everything is correct, glue it in place with plenty of epoxy. Then support the tubes with parts 13 and 14.

To align the tailplane, try screwing the wing onto the fuselage. To do this, cut threads in the threaded boards and harden them with super glue or use drive-in nuts. Assemble the tailplane from parts 32 to 34 and mount it on the tailplane mount 31. Check the angularity of the components when the wing is screwed on.

The tailplane mount 31 is now planked on both sides with 1.5 mm balsa, the planking runs over part 34 and reinforces the transition. Glue the tailplane together from parts H1 to H9 and test fit it into the tailplane mount. Now the servo cables should be pulled into the CFRP tube, alternatively glue them under the CFRP tube. Test-fit the servos for elevator and rudder. You can also iron the tailplane first and then glue it in place, but be sure to observe the angle of attack.

Finish the rear fuselage section: Glue engine bulkhead 11 between the two side parts 18, plank the engine compartment top and bottom, sand the slopes, fill with balsa and sand. Glue shaped bulkhead 9 to the engine compartment planking. Cut the end strips 21 to size and glue them together with the formers 8 and 10. Close the frame with planking 35. It is easiest to attach the wheel after ironing.

### Completion

Assemble the model on a trial basis. When everything fits and is sanded, you can cover the model. It is important that the parts are free of sanding dust. This can be done very well by vacuuming the model with a lint brush. When covering with Oracover, the rudders are ironed on at the same time. Alternatively, fix them with adhesive tape. The receiver is also located at the front, the antenna can be laid on the underside of the fuselage and the CFRP tube, or use 2.4 GHz.

### First flight

The crow should be launched from the hand during the first flight. Don't worry, nothing will happen to the pressure bar, because firstly the hand is always faster than the model and also the bar is covered by the lower tail boom.

A light throw is enough, the motor is powerful. Ground launching is also possible. To do this, attach steel wire supports with 4 mm gold contact plugs to the left and right of the wing (removable for transport). When launching, pull fully and counterhold with aileron and rudder.

On concrete it goes quite smoothly, on grass the wheel and the fuselage create some resistance and so the crow goes slightly on the nose. To avoid a headstand, I put a small skid in front of the wheel. Alternatively, you could also mount a small bipod landing gear. If you don't want to do a ground take-off, you can leave out the supports.

### Rudder deflections for the first flight

Elevator: top / bottom 20 mm Aileron: top 20 mm, bottom 12 mm Rudder: both sides 25 mm

Depending on your flying style, you can later increase the deflections significantly and tune them softly with Expo.

### Flying

Comfortable low overflights, sailing in thermals and good-natured flight characteristics provide stress-free flying pleasure. But also loops, rolls, inverted flight and especially turns are very successful, because the rudder is blown directly by the propeller. The original flight pattern and the sound of the pressure propeller make the model unique. Despite the high fuselage, no oscillation of the model or particular sensitivity to wind could be observed. The model is also well suited for illuminated night flying or as a camera carrier due to the rear-mounted propeller and is not overburdened in terms of weight.



With the propeller folded in, the electric crow shows amazing sailing characteristics

The Motor Crow is an uncomplicated fun model!

### Shopping list (in addition to milled parts)

- 1 m CFRP tube, 8 mm
- 3 m balsa strip, 12x6
- 1 m balsa strip, 10x6
- 2 m balsa strip, 6x6
- 3 m balsa strip, 5x3
- 2 m balsa strip, 15x3
- 2 m end strip 6x35
- 2 m balsa strip, 4x10 (for leading edge)
- 4 pine slats, 5x5
- 2 pine slats, 5x3
- 1.5 Balsa boards, 3 mm
- 1 balsa board, 6 mm
- 5 balsa boards, 1.5 mm
- 1 Steel, 6 mm + brass tube
- 1 Steel, 4 mm + brass tube

### Milling parts set

The milling parts set for the electric crow can be obtained from the VTH-Order-Service

**Art.No.:** 621.1281 , **Price:** 99,00 €

**Phone:** 07221-508722

**E-Mail:** [service@vth.de](mailto:service@vth.de)

**Internet:** <https://en.shop.vth.de>

Parts list			
Position	Amount	Name	Material
<b>Hull</b>			
1	1	Poplar frame	poplar, 3 mm
1a	1	Half-frame poplar	poplar, 3 mm
2	1	Poplar frame	poplar, 3 mm
2a	1	Half-frame poplar	poplar, 3 mm
3	1	Poplar frame	poplar, 3 mm
3a	1	Half-frame poplar	poplar, 3 mm
4	1	Poplar frame	poplar, 3 mm
5	1	Main frame	plywood, 3 mm
6	1	Main bulkhead	plywood, 3 mm
7	1	Surface support	poplar, 3 mm
8	1	Formwork	poplar, 3 mm
9	2	Poplar shaped bulkhead	bulkhead, 3 mm
10	2	Formed poplar	bulkhead, 3 mm
11	1	Motor bulkhead	plywood, 3 mm
12	1	Canopy frame	poplar, 3 mm
13	1	Support	poplar, 3 mm
14	1	Support	poplar, 3 mm
15	1	Threaded board large	plywood, 6 mm
16	1	Threaded board small	plywood, 6 mm
17	1	Skid	poplar, 3 mm
18	2	fuselage side panels	poplar, 3 mm
19	2	fuselage planking	poplar, 3 mm
20	2	Fuselage planking	balsa, 3 mm
21	2	End trim	balsa, 3-4 mm
22	1	Fuselage bottom	balsa, 4-5 mm
23	1	Fuselage nose	balsa block
24	1	Canopy cover	balsa block
25	2	Canopy planking	balsa, 3 mm
26	6	Support strips	balsa, 5x3 mm
27	3	Chip reinforcement	pine, 5x3 mm
28	1	Cockpit pane	packing material
29	1	Upper CFRP tube	d=8 mm, L approx. 485 mm
30	1	Lower CFRP tube	d=8 mm, L approx. 510 mm
31	1	Tail boom	poplar, 3 mm
32	div.	Strips	balsa, 12x6
33	div.	Strips	balsa, 5x6
34	1	Balsa	strip, 3 mm
35	2	Planking	balsa, 1.5 - 2 mm

Parts list			
Position	Amount	Name	Material
<b>Elevator</b>			
H1	1	Center piece	Balsa, 6 mm
H2	2	Edge bow	Balsa, 6 mm
H3	2	Filler piece	Balsa, 6 mm
H4	2	Strip	Balsa, 10x6 mm
H5	2	Strip	Balsa, 10x6 mm
H6	2	Strip	Balsa, 12x6 mm
H7	2	Strip	Balsa, 12x6 mm
H8	div.	Strip	Balsa, 6x6 mm
H9	2	Connectors	pine, 5x3 mm
<b>Wing</b>			
R1	4	mating rib	poplar plywood, 3 mm
R2	2	mating rib	poplar plywood, 3 mm
R3	2	rib	balsa, 2 mm
R4	6	rib	balsa, 2 mm
R5	4	rib	balsa, 2 mm
R6	2	rib	balsa, 2 mm
R7-R14	2	rib	balsa, 2 mm
40	2	leading edge	balsa, 4 mm
41	2	auxiliary leading edge	balsa, 1.5 mm
42	div.	planking	balsa, 1.5 mm
43	4	Main spar	pine, 5x5 mm
44	4	Auxiliary spar	pine, 5x3 mm
45	2	end battens	balsa, 6x35 - 40 mm
46	div.	latching upright	balsa, 1.5 mm
47	4	front connectors	poplar, 3 mm
48	2	rear connectors	poplar, 3 mm
49	4	rudder strips	balsa, 15x3 mm
50	div.	latching rudder	balsa, 1.5 mm
51	2	edge bends	balsa block
52	1	Round steel	d = 6 mm (outside)
53	2	Brass tube	d = 6.1 mm (inside)
54	1	Round steel	d = 4 mm (outside)
55	2	Brass tube	d = 4.1 mm (inside)
56	4	Screw reinforcements	Plywood, 3 mm



Bonding the ribs to the spars and lower nose planking



Care is needed when installing the panel connector



Look at the wing root: Note the bearings of the wing bolting and the balsa block that prevents the wing steel from slipping through.