



#### WOLFGANG WERLING

To build a prototype-like old-timer flying wing for leisurely flying, as a glider or motor glider, that would be it. So I quickly went on the internet, searched worldwide, and the result: nothing!

What I found did not correspond to my ideas or had already been on the market as a model for a long time. After several weeks, I decided to simply design the model as I imagined it could have looked as an original. That's how the Willy came into being, to be built as a motor Willy or a thermal Willy. And everyone who has seen the model so far has asked me about the original. Apparently other modellers discover a certain resemblance to a man-carrying aircraft, regardless of whether it is a flying wing or a normal layout. Goal achieved!

#### The model design

The Willy is a model for flying around and relaxing. In terms of strength, looping and turning are possible, even a roll is still quite possible. With a wingspan of 2.6 m and split wings, the Willy has a small transport size, but it is still a „grown-up“ model with good performance in soaring flight. With an inexpensive

and light 3S drive, the model already reaches altitude very well. Due to the design as a flying wing and the rather long nose, even the glider version requires only little trim lead.

The slight dihedral of the wings provides good flight stability and also improves the effectiveness of the large rudder. However, you don't necessarily have to steer it on, even the flaps are not a must.

The inner flaps can be used to optimise flight performance. They are particularly advantageous when landing on short places or on slopes: you move them down for braking and the outer flaps (elevator/transverse) up to the butterfly position.

The large bonnet makes it very easy to attach the surfaces and change the batteries, because people are getting older and value comfort.

#### The flight characteristics

Flying the model is quite easy, especially as a stall is almost impossible with the correct centre of gravity. However, you should have some experience to build it. Simple aerobatics are possible, but much nicer are leisurely fly-bys and circling in the thermals. The modified MH 63 has relatively little drag and also allows

flying in stronger winds. However, the Willy is not really fast, the wing loading is too low and the fuselage too thick. On the other hand, the Willy has an impressive appearance in the air and a rather unusual flight pattern for a flying wing. When the light shines through the fabric-covered wings, you can relax wonderfully while flying ...

#### Building the wing

Start with the wings so that you can later adapt the fuselage to the socket. Cut out the ribs according to the plan and adjust the holes for the mating to the diameter of the mating used.

Glue the spars F1 and F2 together from 2 battens, but not over the whole length (see plan). Assemble directly on the plan without planking. Fix the lower spar on the plan, put on the ribs and underlay them at the back with an SxS mm strip to obtain the necessary twist. The ribs must lie neatly here. Glue the ribs in place, fit the upper spar and glue it in place. Cut the auxiliary spar F3 to length according to the plan and glue it in place. Then the rear end strip planking follows and the spars are latched with 2 mm balsa (standing). The aim is to make the wing frame as twist-proof as possible in order to maintain the twist before removing it from the board.



The Willy is a model for unproblematic, relaxing flying.



◀ The pilot emphasises the prototypical appearance of the flying wing.

Jürgen Rambusch with his pre-series model of the Willy. ▼



Now lay the wing on top and glue in the additional webs S3 - S17 to reinforce the control surfaces. Apply the nose planking of the upper side and the planking of the wing root. Make sure that the wing is not twisted. Glue the auxiliary leading edge F4 to the ribs and the upper planking. Assemble both wing halves as far as they will go.

#### Surface plugging

Test-fit the mating tubes, push the wings together, align them and, if necessary, file the holes slightly. Fix the mating on one side of the wing with super glue; be sure to sand the tubes first so that the glue sticks. If everything

fits, fix the joint on the second half of the surface with superglue. Reinforce the glued areas with epoxy resin or hard glue. Do not forget to latch the joint; this increases the strength and improves the transmission of force.

Before attaching the bottom planking, pull in the servo cables and prepare the servo mount. The servos sit on a plywood board that is recessed into the planking. To do this, small reinforcements must be added to the inside of the planking to support the servos and to screw them on. This can also be done later. Slightly bevel the rear end batten planking according to the plan and plank the 2nd side, as well as the centre of the wing and the

nose. Apply the rib glue completely. Glue the leading edge strip FS and the edge bow F14. Sand the surface completely.

Cut out the rudders: mark as shown in the plan, use a sharp carpet knife and a ruler for the longitudinal cuts. Go back and forth several times with little pressure, then the ribs will also be cut through perfectly. Use a small saw to make the cross-sections for cutting the rudders to length. Since the cut-out rudders will still be latched, the rudders must be cut smaller accordingly (also with a knife and ruler).

Place reinforcements (balsa blocks or pieces of cardboard) to hold the rudder horns between the planking, then box and sand everything.

#### Tail unit

The tail unit is built up completely on support feet, only then is the rudder cut off. If you do not want to link the tail unit, simply leave it in one piece.

Place the ribs S1 - S8 on the plan and glue them to the spars L9. Then attach the strips L10 and only at the end separate the tailplane at the spars L9. Box with strips L8 (they serve to reinforce and hold the hinges). Part of the tailplane is planked to provide a gluing surface for the fuselage planking.



◀ The milling parts set for Willy is available at VTH.

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**Fuselage**

Place the side parts 8 on the back and insert frame 3. This creates a straight support and you can align the components exactly. Allow to harden and only then turn over.

Insert frames 5, 2 and 7. The gluing of the frames to the fuselage sides can be reinforced with triangular strips. Finally, glue in motor bulkhead M 1 (glue in TI for the glider version).

The battens 16 reinforce the transition between the planking parts. Check that the recesses in the frames are large enough, bevel the battens slightly as shown in the plan and push them in. Then plank the lower part of the fuselage with boards 10.

The front lower part of the fuselage between frames M1 and 2 cannot be planked. The bending is too strong here. Therefore, glue several balsa blocks to frame M1 and frame 2, preform with a knife or saw and then sand. As an alternative, a styrodur block can be used, also rod construction and covering are possible. Make and adapt transition 1 for the spinner.

Now install the connectors in the fuselage. Cut the plug-in tubes to length according to the plan (take into account the wing contour on the fuselage) and push them in, do not glue them yet! Attach the wings and align them to the fuselage. Then glue the cardboard rib R1an to the fuselage, slide on the plywood rib R2 and attach the wings up to the mating tubes. Make sure both wing halves are the same distance from the fuselage!

Check everything again and glue the plywood ribs to the mating tubes so that there is no gap to the surface. If necessary, support them with small pieces of balsa. Now glue the tubes to the fuselage.

Peel off the surfaces, add spars to the surface moulding and plank with some overhang. Sand the planking flush with plywood rib R2, this gives a clean transition with the smallest possible gap. To attach the wing halves to the fuselage, turn a screw through the fuselage side wall into a thread in the wing. This is very easy and ensures that the wings fit neatly to the fuselage.

**Removable bonnet**

The removable canopy is built directly onto the fuselage, then it fits exactly. Tape the fuselage with adhesive tape to avoid accidental gluing. Place frame 9 on the fuselage, glue formers 2a and 5a, then formers 3a and 4. Water both sides of planking 11 and glue with little pressure. Apply little pressure, otherwise the canopy will warp. If necessary, divide the planking into several strips. Close the top with the cover 12. The cockpit window 18 is made of packing material.

**Finish**

For the rudder, glue another board into the fuselage as a support for the tailplane, align the tailplane with the wings pushed on and glue it in place. Glue the reinforcement strip 17 in the back of the fuselage. Glue the first planking board to the back of the fuselage and fit it as close as possible to the tail unit at the rear. Now finish the back of the fuselage.

If a wheel is to be fitted, cut out the fuselage bottom accordingly, a skid can also be fitted.

If necessary, fill the surface (e.g. Moltofill instant) and sand cleanly.

**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 (use a Hoover and a lint brush). When covering with foil, the rudders are ironed on at the same time. Alternatively, fix them with adhesive tape.

My Willy is covered with white Oratex fabric, and the decorations are also made of Oratex. Processing is just as easy as with normal iron-on film. Oratex is a little heavier, but very durable and the matt surface and the slight translucency suit the Willy very well.

The receiver sits behind the battery, the antennas are led out of the fuselage on both sides. Especially with wooden fuselages, this should also be done at 2.4 GHz.

**First flight**

The centre of gravity is adjusted on the Willy by moving the battery. The model should be carefully balanced, also around the longitudinal axis. For take-off, the elevators are trimmed upwards by approx. 3 mm from the basic setting stated in the construction plan. This prevents the model from sagging during take-off. This is especially helpful if the pilot throws the model himself. The model is thrown slightly upwards with the engine running, otherwise the engine camber will pull the model downwards first until the rudders take effect.

The Willy is easy and comfortable to fly and has very responsive flight performance. The purists get by with only the combined elevators/ailerons and with motor control, so they only need 2 servos for the Willy.

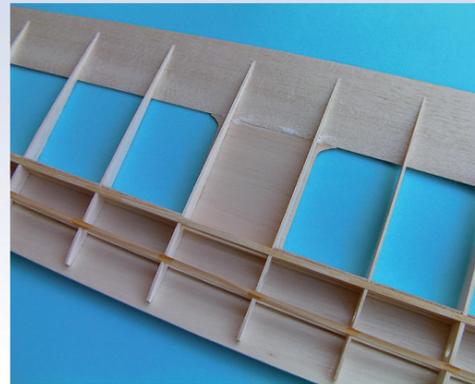
If you want more, and can do this on the transmitter side, you can also use flaps and rudder and mix the flight behaviour that suits you best. The flight pattern is wonderful in both cases and flying is really fun.



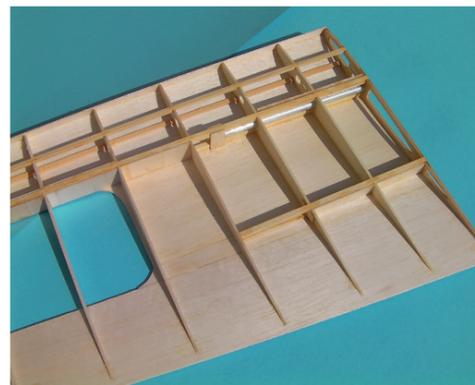
Structure of the surface. Note the underlaid rib ends.



The top of the wing, including the servo shaft, is planked.



Gluing in the lower auxiliary spar.



Installation of plugging and latching.

**Climb onto altitude**

Both drive proposals are easily sufficient for powerful climbing flights with 3SLiPos. The motors could also be operated with 4S LiPos, but a vertically climbing Willy looks a bit strange. Alternatively, you could certainly tow the model.

If you are building the glider version and want to fly on a slope, you should take the low wing loading into account and ballast the Willy a little in stronger winds.

**Setting values**

Values based on the **normal flight** setting shown in the plan

Elevator (top/bottom): 25 mm/22 mm

Aileron (top/bottom): 25 mm/18 mm

Flap (top/bottom): 3 mm/4 mm

Rudder: 40 mm

Deflection for landing: Flap approx. 20 mm downwards, elevator 15 mm upwards

**Attention:** the flap acts as a down rudder and must be balanced with the elevator!

With the aileron you can also easily take the flaps with you, this increases manoeuvrability.

These are suggestions for the first flight. For maximum manoeuvrability with soft response I fly on elevator and aileron with large deflections and mix in at least 50 % exponential.

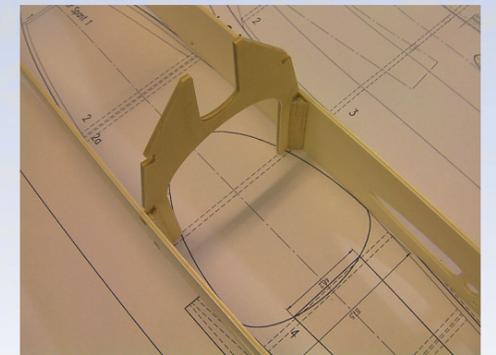
**Technical Data**

Wingspan:	approx. 2,600 mm
Length:	approx. 860 mm
Profile:	MH 63 mod.
Flight weight (electric):	from 1,800 - 2,300 g
Flight weight (glider):	from 1,600 g
Body shell weight:	approx. 900 g (without covering)
RC functions:	Elevator, aileron, rudder, motor

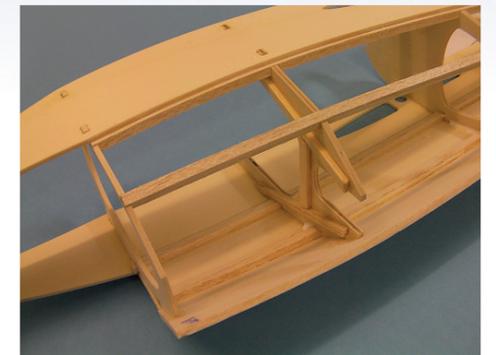
The Shell of the fin. ▶



The installation positions of the frames are reinforced with triangular strips. ▶



Reinforcements on the chassis bulkhead. ▶



◀ The servo cables are pulled in before planking the underside.

◀ The rudder is first built up in one piece.

**Drive proposals**

**Drive 1**

Engine: Hacker A 40 12S V2

Battery: 3S-LiPo, 2,500 mAh, FP

Controller: Hacker Master Basic 5S BEC

Batten: aero-naut CamCarbon 14x8 (55 mm centre section)

**Drive 2**

Engine: Pichler Boost 40

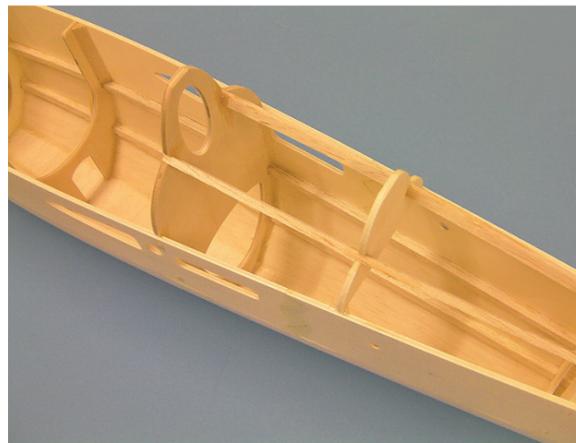
Battery: 3S LiPo, 2,500 mAh, Lemon RC

Controller: Pichler XQ 50 BEC

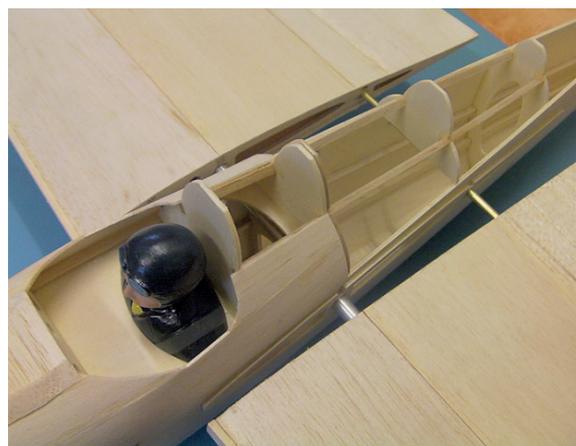
Batten: Graupner Cam 13x7 (55-mm centre piece)

**Parts list**

Position	Amount	Designation	Material
<b>Fuselage</b>			
1	1	Transition	balsa, 3-5 mm
M1	1	Motor bulkhead	birch sphz., 3 mm
T1	1	Glider bulkhead	poplar, 3 mm
2	1	Frame birch	spar, 3 mm
2a	1	Canopy bulkhead	poplar, 3 mm
3	1	Frame birch	spindle, 3 mm
3a	1	Hood frame	poplar spar, 3 mm
4	1	Hood frame	poplar spindle, 3 mm
5	1	Frame	birch spindle, 3 mm
5a	1	Hood bulkhead	poplar spar, 3 mm
6	1	Frame	poplar spar, 3 mm
7	1	Frame	poplar spar, 3 mm
8	2	Side panel	poplar spindle, 3 mm
9	1	Canopy frame	poplar spar, 3 mm
10	4	Fuselage planking	balsa, 3 mm
11	2	Planking	balsa, 2 mm
12	1	Cover	balsa, 5 mm
13	1	Cover	balsa, 3 mm
14	1	Bottom	balsa, 3 mm
15	1	Spur	steel wire
16	8	Reinforcement strip	balsa, 5x5 mm
17	2	Reinforcement strip	balsa o. pine, 5x3 mm
18	1	Cockpit disk	Packing material
<b>Tailplane</b>			
S1-S7	1	Rib	Balsa, 3 mm
S8	1	Rib	Balsa, 5 mm
L8	2	Rib	Balsa, 3 mm
L9	4	Spars	Balsa, 5x5 mm
L10	div.	Battens	Balsa, 10 mm
<b>Wing</b>			
R1	2	Rib	poplar sphz., 3 mm
R2	2	Root rib	birch sphz., 3 mm
R3	2	Root rib	birch sphz., 3 mm
R4	2	Mating rib	poplar sph., 3 mm
R5	2	Ribs	poplar spindle, 3 mm
R6	2	Rib	balsa, 2 mm
R7	2	Rib	balsa, 2 mm
R8	2	Rib	balsa, 3 mm
R8a	2	Auxiliary rib	balsa, 3 mm
R9-R17	2	Rib	balsa, 2 mm
R18	2	Rib	balsa, 3 mm
R18a	2	Auxiliary rib	balsa, 3 mm
R19-R20	2	Ribs	balsa, 2 mm
S3-S17	2	Ribs	balsa, 2 mm
F1	2	Spar	pine, 5x3 mm
F2	2	Spar reinforcement	pine, 5x3 mm
F3	2	Auxiliary spar	pine, 5x3 mm
F4	2	Auxiliary leading edge	balsa, 1.5 mm
F5	2	Leading edge	balsa, 4 mm
F6	div.	Planking	balsa 1,5 mm
F7	2	Brass tube	ID = 8.1 mm
F8	1	Round steel	AD = 8 mm
F9	2	Brass tube	ID = 4.1 mm
F10	1	Round steel	AD = 4 mm
F11	4	Reinforcements	pine, 5x3 mm
F12	2	Latching surface	balsa, 1.5-2 mm
F13	2	Latching rudder	balsa, 3-4 mm
F14	2	Edge bow	poplar sphz., 3 mm
F15	4	Bracing	balsa, 5 mm



View of the back of the trunk.



Detailed view of surface plugging and surface connections.



The finished planked back of the fuselage.



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