aero-naut

Pepper

Order No. 1336/00

PEPPER is a sleek model with a considerable speed range. Building materials are mostly laser-cut balsa and light-ply to achieve a light yet strong structure, spruce is used to enhance the strength of the wing spars. For electric power choose a 28 mm brushless motor with a power of about 200 W. They all have a bolt circle diameter of 19/16 which will fit the model´s motor mount.

Construction should be according to the step-by-step instructions provided in this manual. Use the parts list to identify the included stripwood and hardware. Always check that parts fit perfectly and correct, if necessary, before you glue. Give glue sufficient time to dry or cure, before you proceed to the next step.

We recommend white glue (if not otherwise noted) for gluing, which offers good strength and low weight. White glue retains a certain degree of elasticity after the glue has cured and will stand up to any loads which occur during flying.

Technical Data

Wingspan:	ca. 1,220 mm
Length:	ca. 950 mm
Weight:	from 840 g
Wing area:	ca. 21 dm²
Wing loading:	from 40 g/dm²
RC-functions:	elevator, ailerons, motor control

Recommended Equipment

- Brushless, 28 mm, ca. 1,500 kV, from ca. 200 W
  Recommendation: Hacker A20-8XL
- ESC: 30 to 40 A *
- 3 × micro servo, 24 × 22 × 12 mm
- 3S-LiPo, 2,400 mAh
- Propeller ca. 7 x 6“ *
- Spinner 38 mm, Order No. 7252/01-04

* compare recommendations with data sheet of motor

Tips & Hints

Attention! Make sure you follow instructions carefully.

Note! Additonal information for current building step.

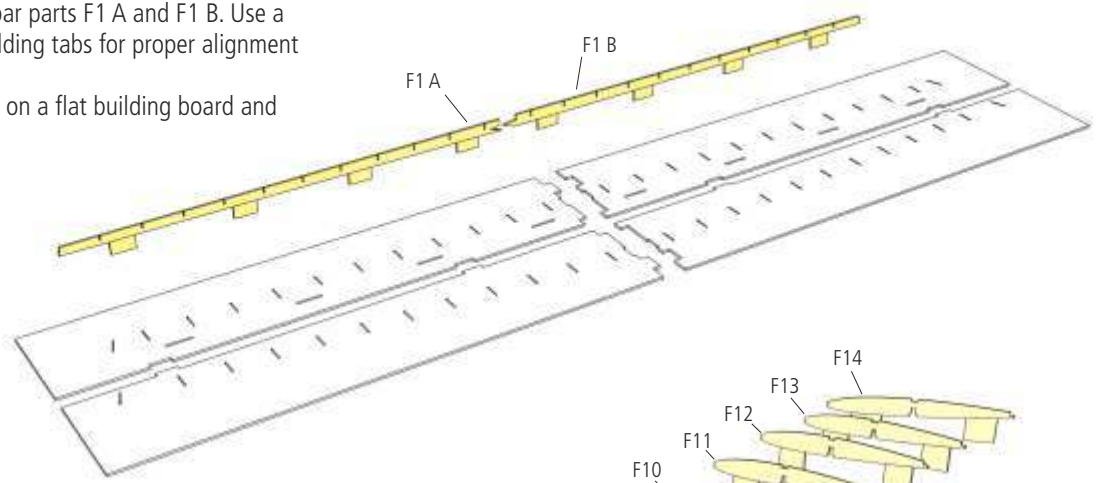
Use a sharp modeller´s knife to cut the tabs. Do not remove parts by hand to avoid damage!
We recommend our modeller´s knife, Order No. 8185/00

Sand off retaining tabs of laser-cut parts for best results.

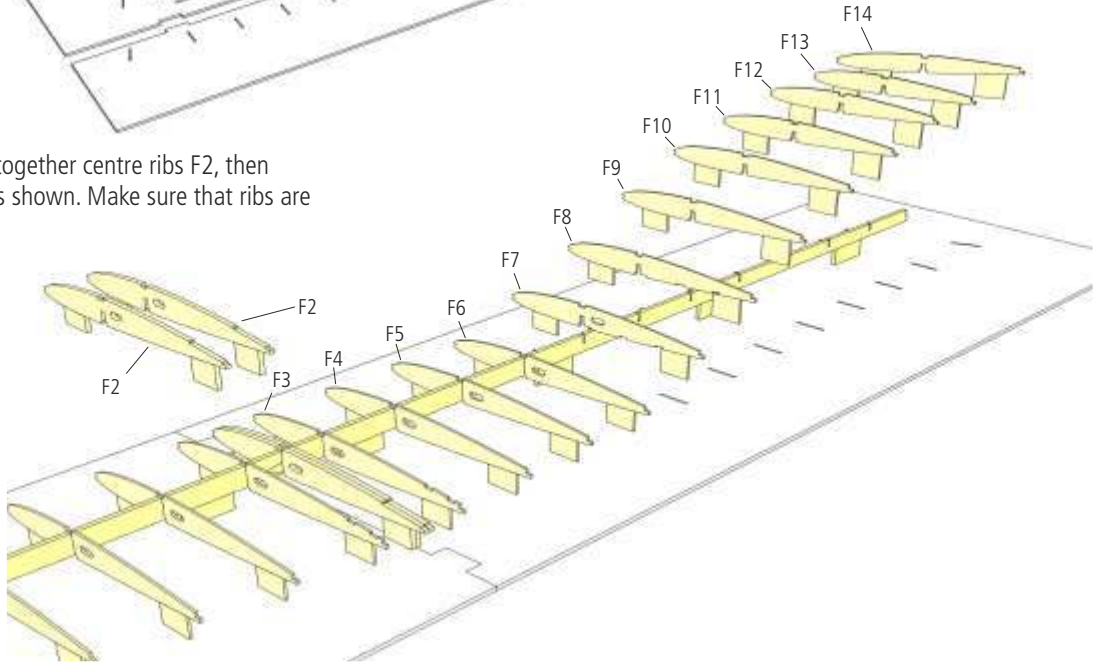
For building we recommend our aero-pick modeller´s pins, Order No. 7855/02

We recommend our PONAL wood glue, Order No. 7638/10 (225 g bottle)

1 In a first step glue together main spar parts F1 A and F1 B. Use a straight edge against the spar´s building tabs for proper alignment and secure with tape.
Assemble the 4-part wing jig, place on a flat building board and secure with tape.



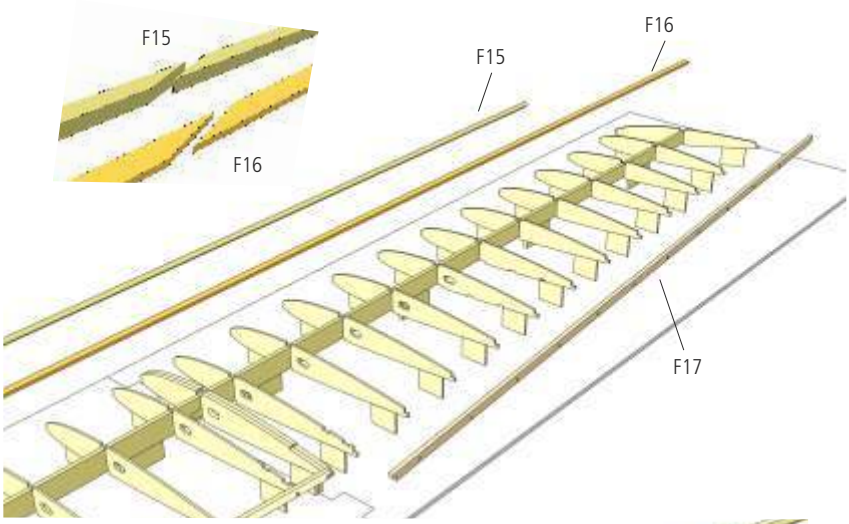
2 Insert main spar in wing jig. Glue together centre ribs F2, then glue ribs F2 to F14 to main spar as shown. Make sure that ribs are fully seated in main spar and jig.



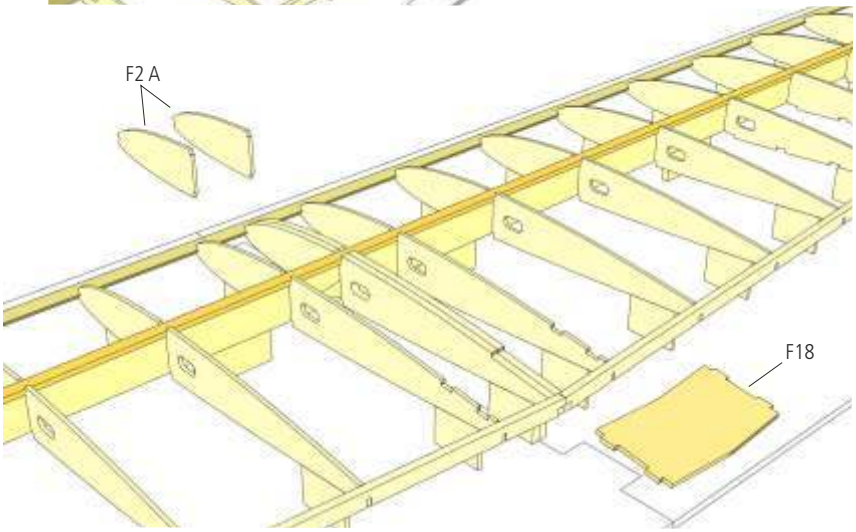
3 At one end only splice leading edge F15 (4×4 mm obechi) and both spruce spars F16 (5×2 mm spruce) over a length of ca. 15 mm. Leading edge and spars must have a length of 1,110 and 1,150 mm, respectively.

Fit and glue in place upper spar F16. Glue leading edge F15 to front of ribs and secure with pins inserted in wing jig just in front of leading edge.
Slightly chamfer contact surface of both auxiliary spars F17 at centre ribs and glue to rear end of ribs.

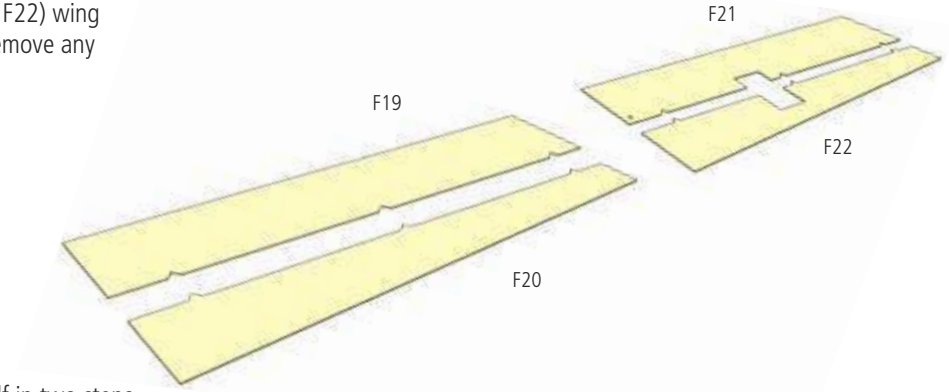
Note: Place large cut-out of F17 at wing centre.



4 Glue riblets F2 A to either side of centre ribs and secure with small clamps. Then glue reinforcement F18 for wing retaining screw to ribs and auxiliary spars.



5 Glue together upper (F19 + F20) and lower (F21 + F22) wing sheeting and place on a flat surface. Immediately remove any excessive glue and secure with tape until dry.

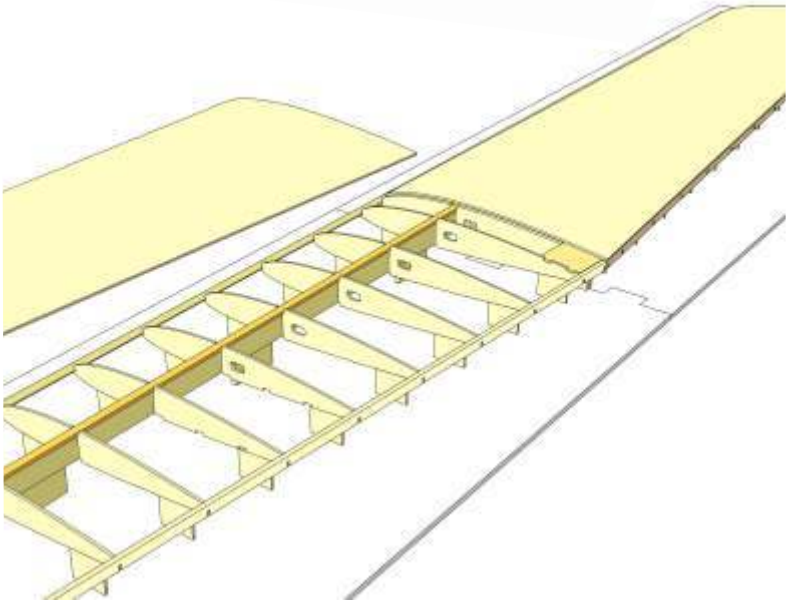


6 Glue in place upper wing sheeting of each wing half in two steps.

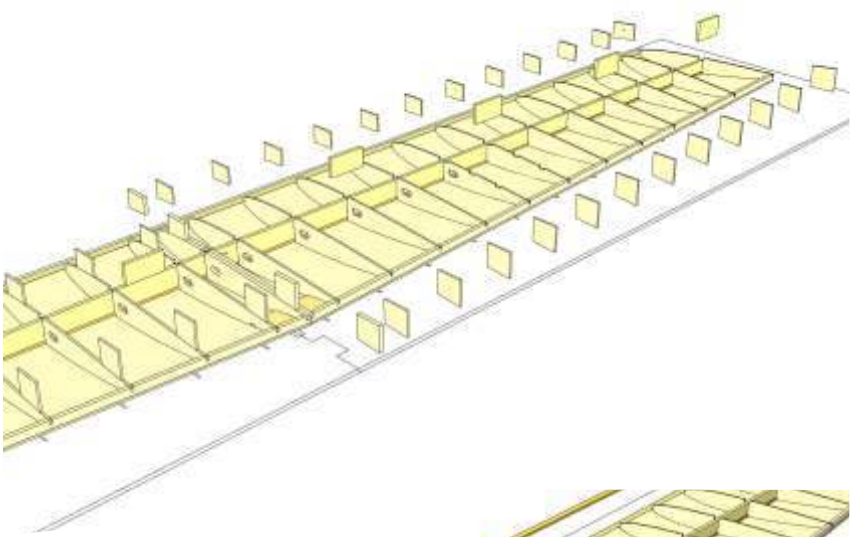
Slightly chamfer front edge of upper wing sheeting for proper fit at leading edge. Apply glue to contact surface of leading edge and the first 5 mm of ribs. Fit upper wing sheeting in place on leading edge and secure with tape. Leave to dry.

Apply glue to top of ribs (with the exception of centre ribs!), to upper spruce spar and to auxiliary spar. Slightly press on wing sheeting and secure with pins and tape. Make sure that wing sheeting is in good contact with ribs.

Repeat for opposite wing half. When glue has dried, remove wing from jig, turn upside down and from the inside apply glue to wing sheeting at centre rib position. Replace wing in jig and secure wing sheeting with pins and tape at centre rib position.

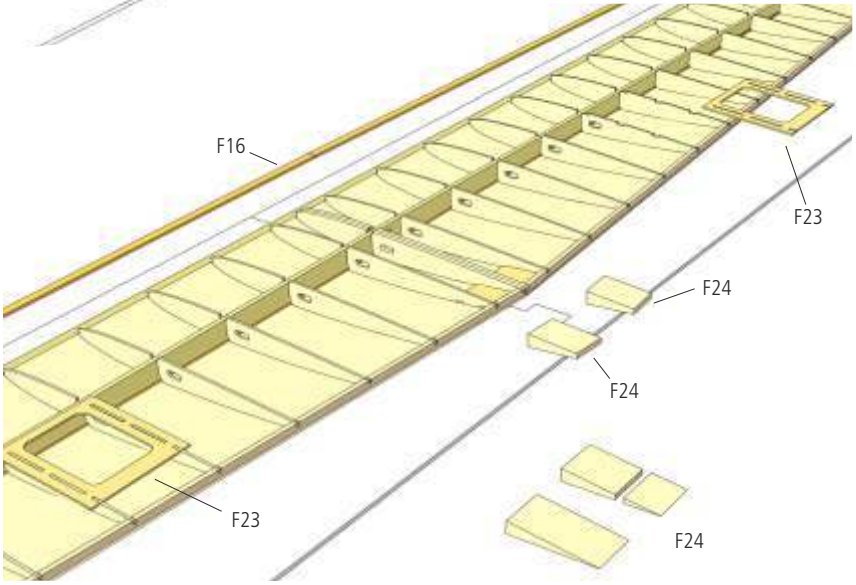


7 Remove wing from jig and turn upside down. Break off building tabs and sand lightly to achieve a smooth contact surface on main spar and ribs.



8 Glue in place lower spruce spar F16 and servo frames F23.

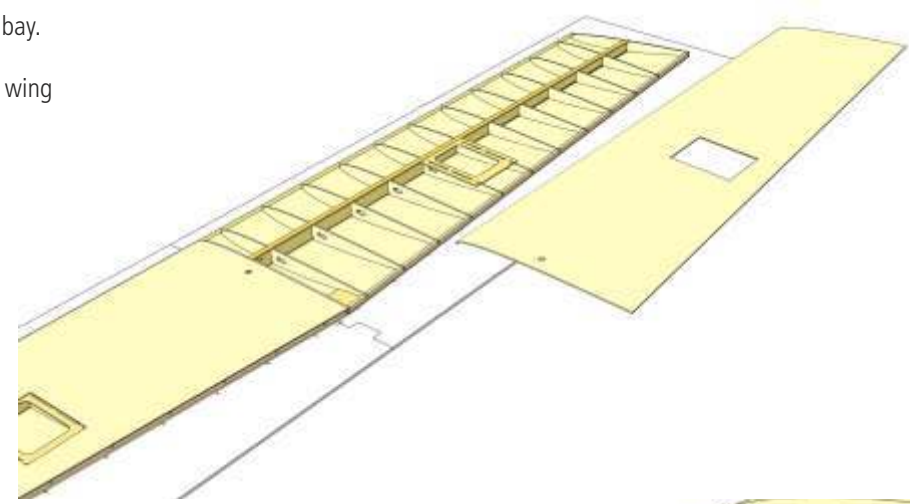
From trailing edge triangular stock (8×40 mm) cut off two ca. 25 mm long pieces F24, then fit and glue in place next to centre ribs as shown.



9 Install servo leads in wing and secure with tape in servo bay.

Route opposite end of servo leads through hole in lower wing sheeting and glue wing sheeting in place.

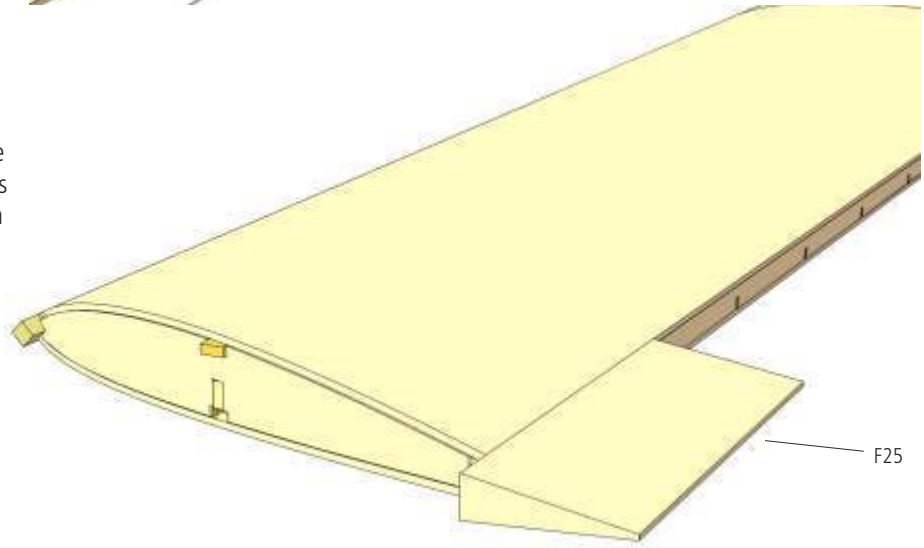
Use same proceedrue as with upper wing sheeting.



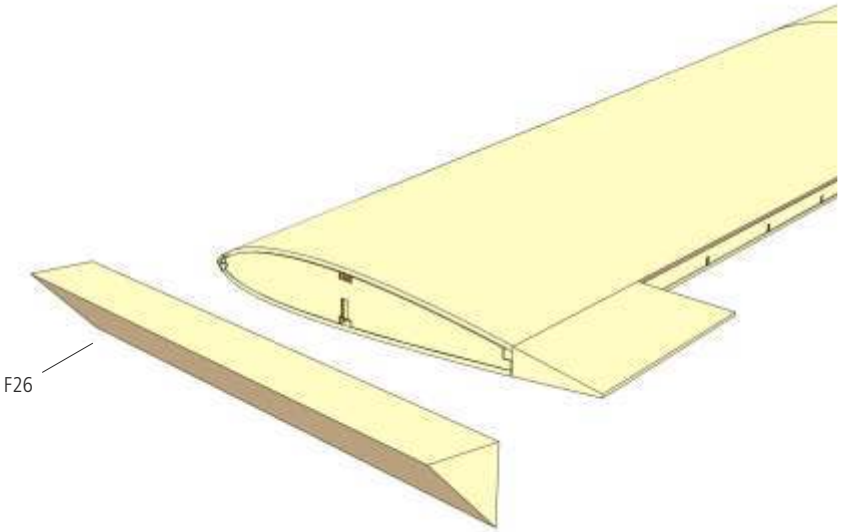
10 Carefully sand flush rear edge of wing.

Cut off one ca. 80 mm long piece of either trailing edge triangular stock F25 (8×30 mm) and glue to wing tip as shown. Make sure that projection of end rib meets with rear edge of trailing edge profile.

See also following building step.



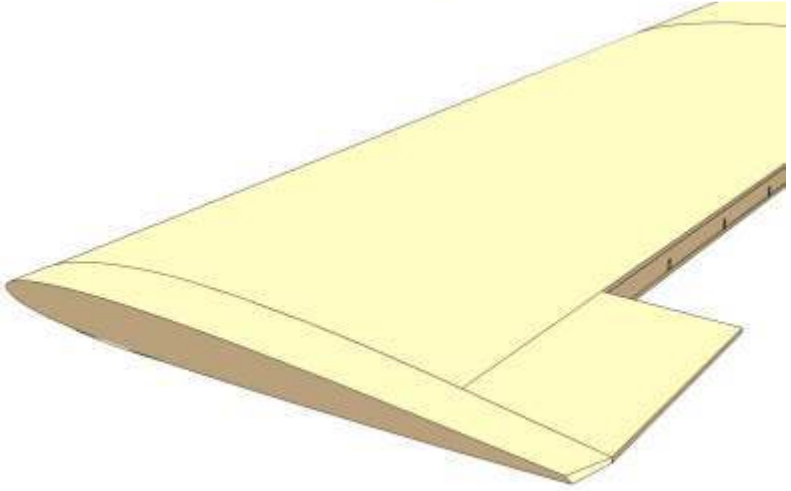
11 Cut off spars, leading and trailing edges at end ribs and carefully sand flush with contact surfaces of end ribs. Glue in place wing tips F26 (balsa triangular stock, 20×20 mm) on end rib and secure with pins.



12 When dry, sand wing tips and leading edge to shape and give wing a smooth surface.

Note: Wing tips are shaped automatically when upper and lower wing sheeting are sanded to a smooth finish with a sanding bar.

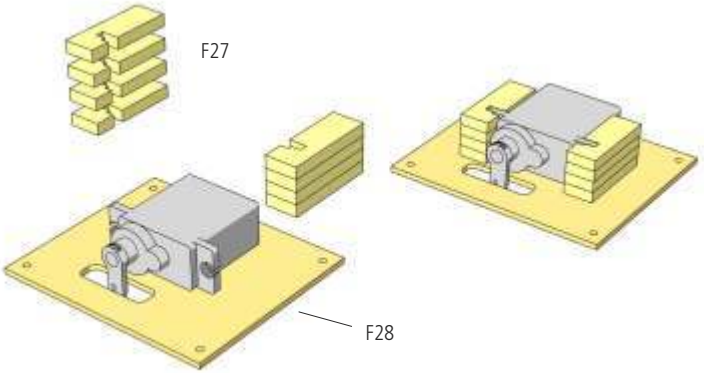
Finally lightly chamfer edges of wing tips.



13 Glue together aileron servo mounts from 4 pieces F27 each. Align servo with servo arm centred in slot of servo tray F28, hold in place and glue servo mounts in place with a drop of medium CA.

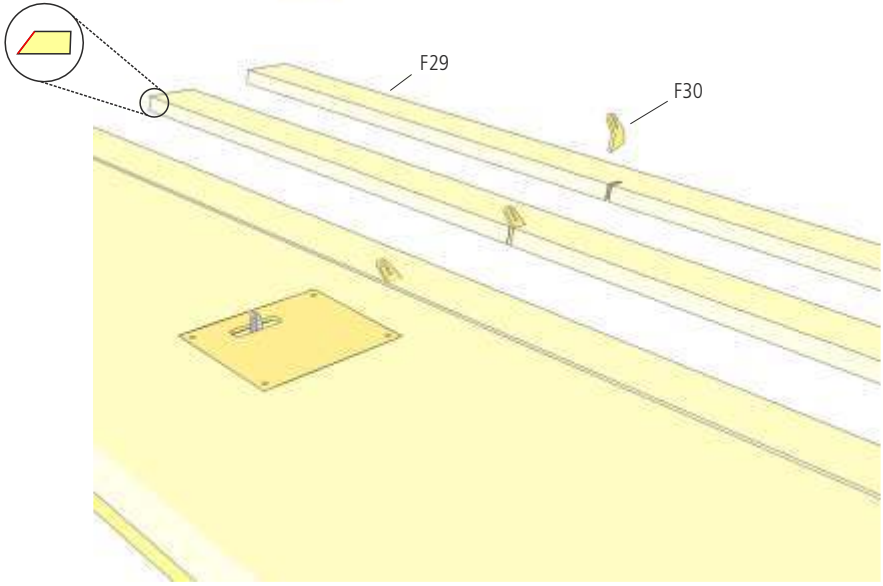
Insert servo in servo mounts and install servo tray in wing. Drill servo frame F23 with 1.5 mm and temporarily install screws F31.

Note: Servo is held in place by servo mounts. No glue required.



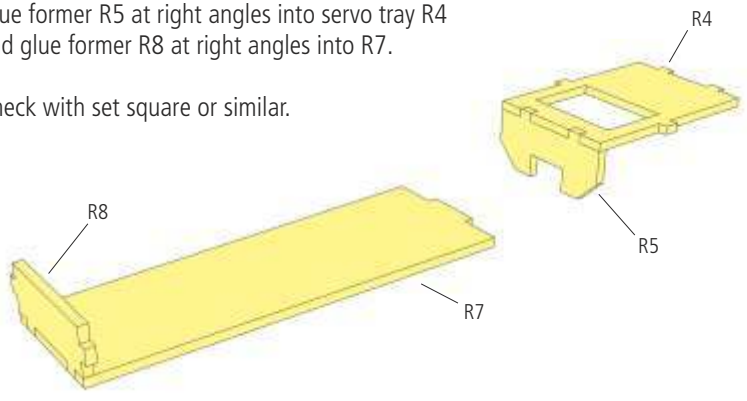
14 Bevel front edge of ailerons F29 (trailing edge triangular stock 8×30 mm) and temporarily attach to wing with tape.

Mark position of control horn F30 on aileron and cut slot with razor saw or file into aileron. Glue control horn in place after covering.

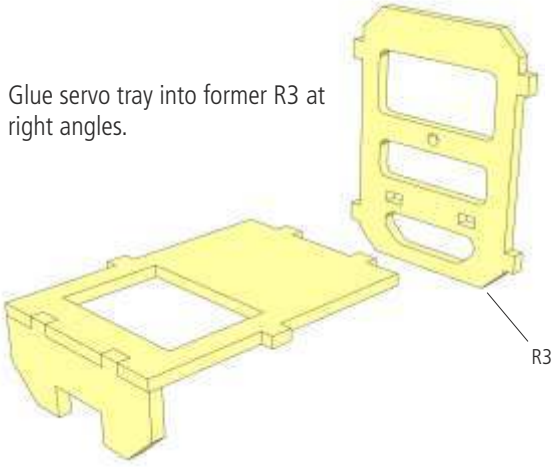


15 Glue former R5 at right angles into servo tray R4 and glue former R8 at right angles into R7.

Check with set square or similar.



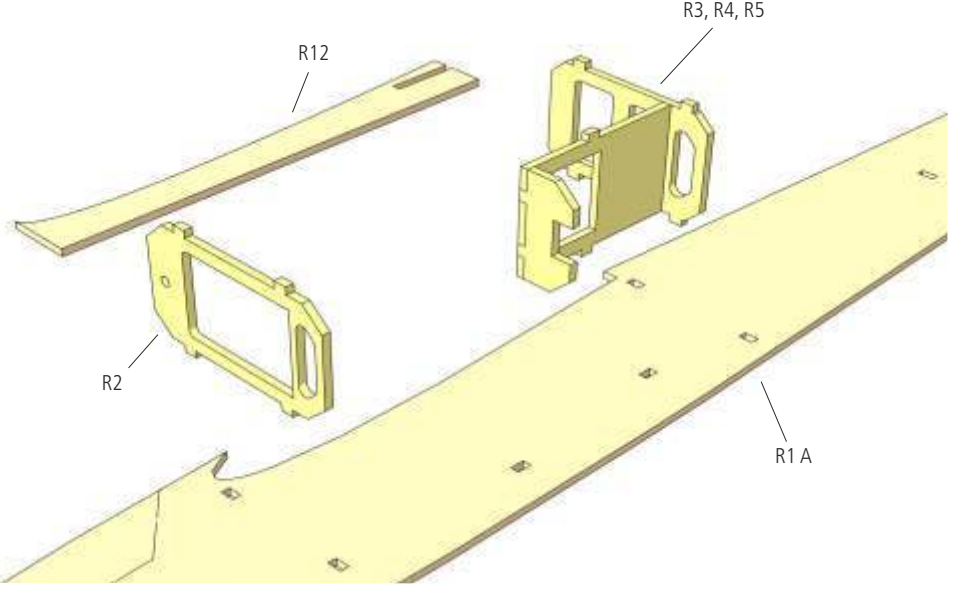
16 Glue servo tray into former R3 at right angles.



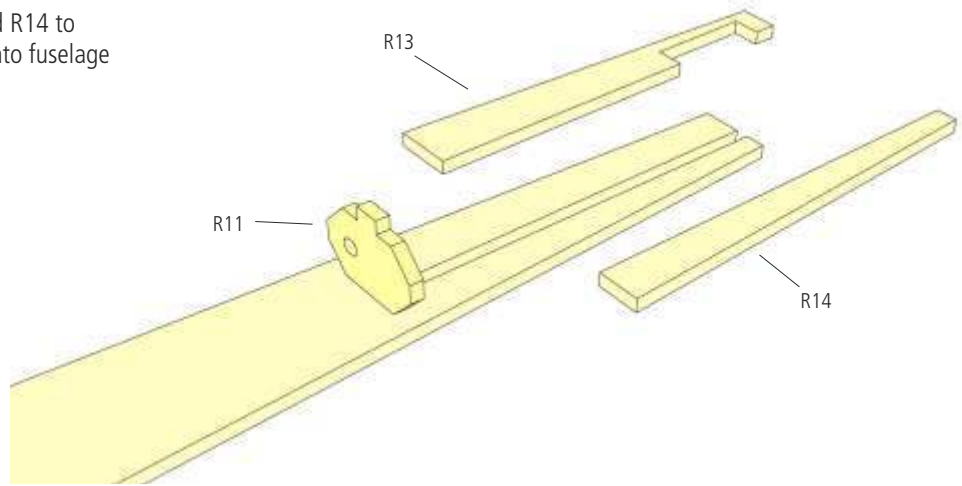
17 Place right fuselage side R1 A on flat building board and secure with pins.

Insert former R2 and assembly R3, R4, R5 in fuselage side. Do not glue!

Glue in place wing saddle R12 and make sure contour matches contour of fuselage side perfectly. Remove any excessive glue from slot in R12.



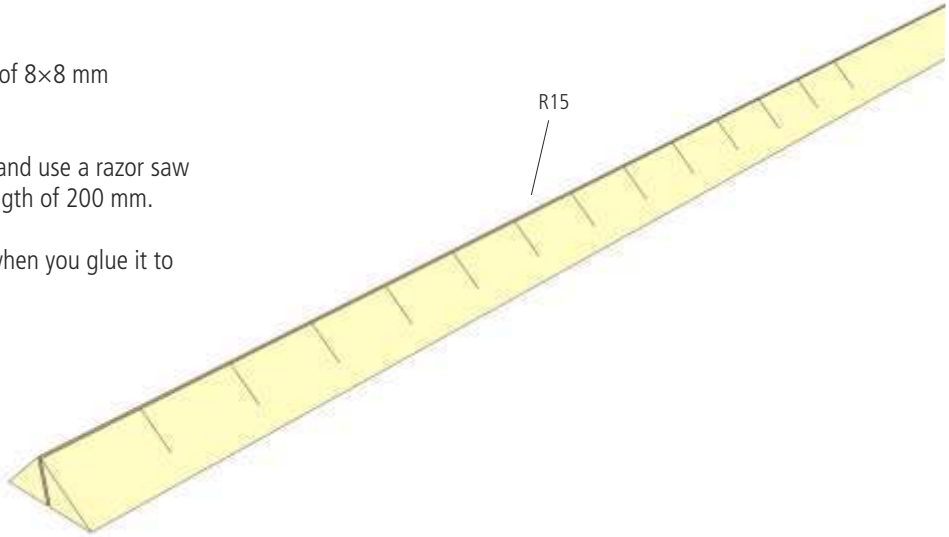
18 Glue reinforcements for tailplane slot R13 and R14 to fuselage side. Temporarily insert former R11 into fuselage side as an end stop.



19 Cut off two 375 mm and two 225 mm long pieces of 8×8 mm triangular stock R15.

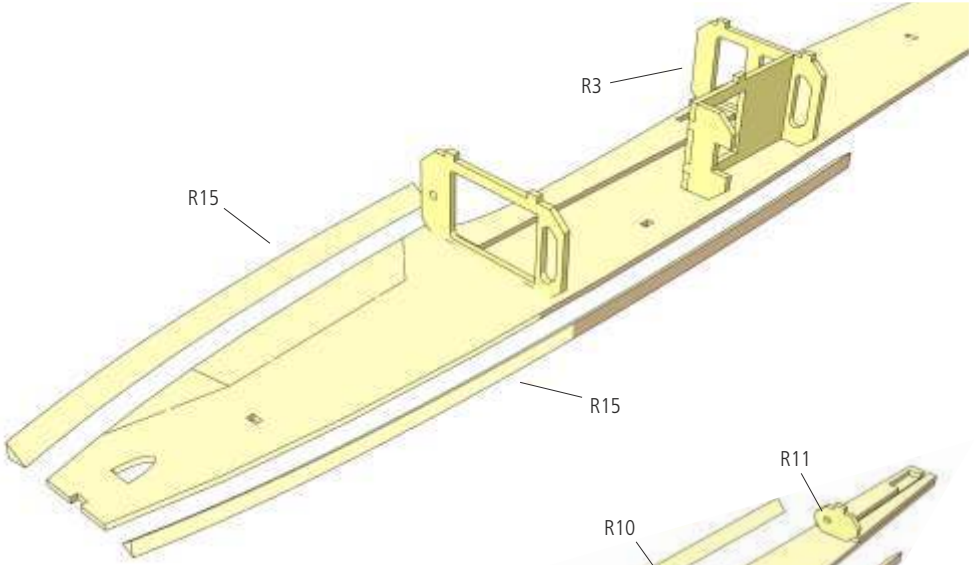
Place triangular stock on building board as shown and use a razor saw to make cuts at intervals of 15 to 20 mm over a length of 200 mm.

This will make the triangular stock easier to bend when you glue it to the fuselage side.



20 Glue triangular stock R15 on fuselage side along top and bottom contours as shown and secure with pins.

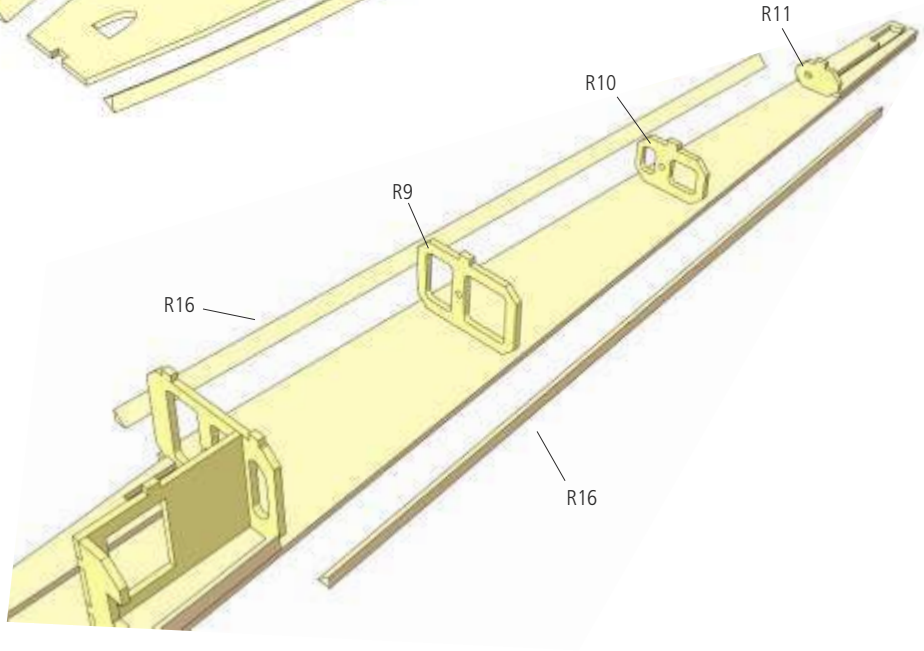
Note: Bottom strip ends in front of former R3.



21 Cut to length four pieces of 6×6 mm triangular stock R16 for top and bottom rear fuselage contours.

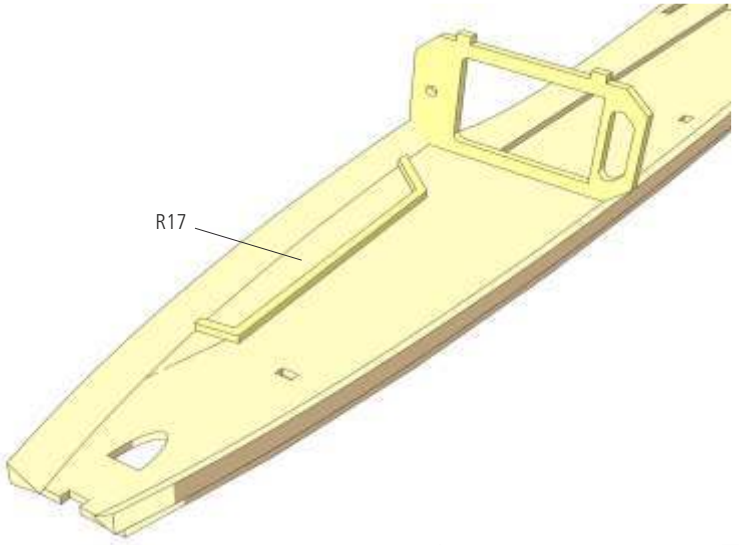
Temporarily insert formers R9 and R10 into right fuselage side, glue triangular stock in place and secure with pins.

Remove formers R9, R10, R11.



22 Glue in place canopy frame R17 on fuselage side along canopy cut-out.

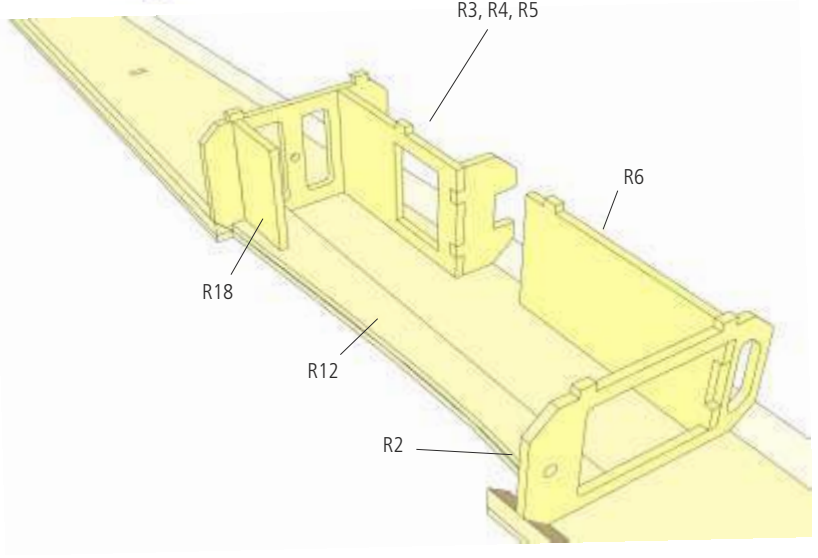
Remove any formers/assemblies from right fuselage side and build up left fuselage side R1 B accordingly.



23 Glue former R2 as well as assembly R3, R4, R5 in place on right fuselage side.

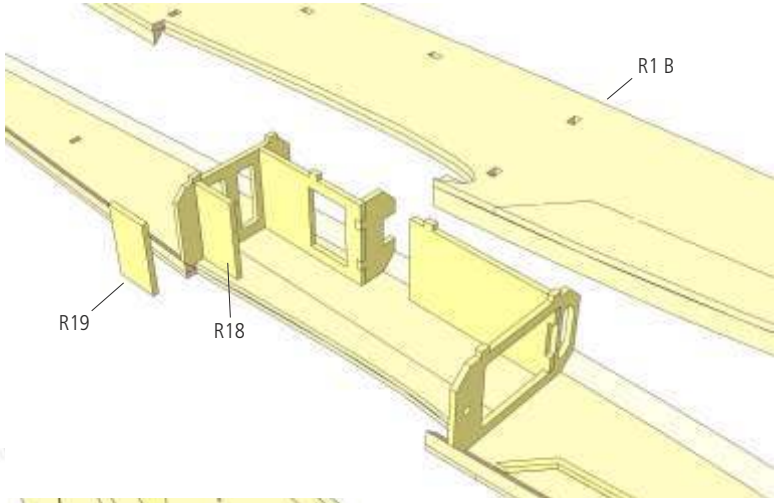
Note: R2 is at right angles on fuselage side.

Glue in place battery tray R6, insert and glue wing retainer R18 in slot in R12.



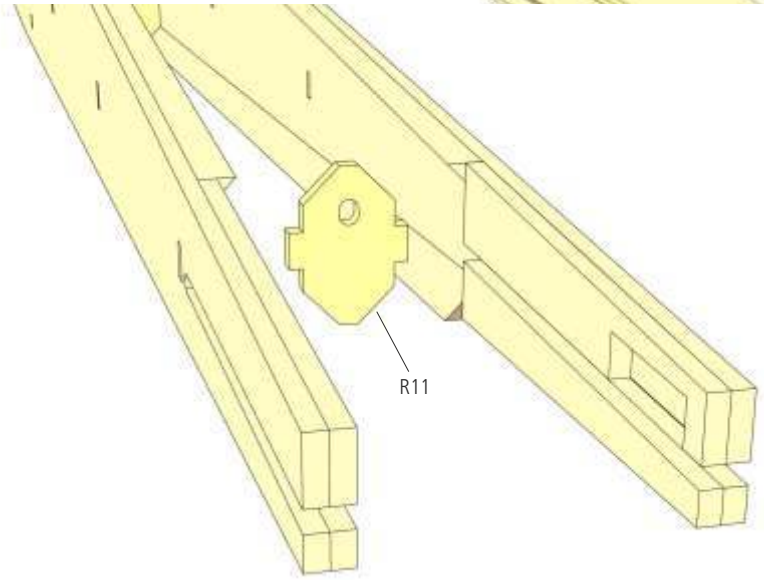
24 Make sure that left fuselage side R1 B fits perfectly on formers before you glue. Make corrections as necessary.

Then glue in place left fuselage side on formers and glue R19 onto wing retainer R18.



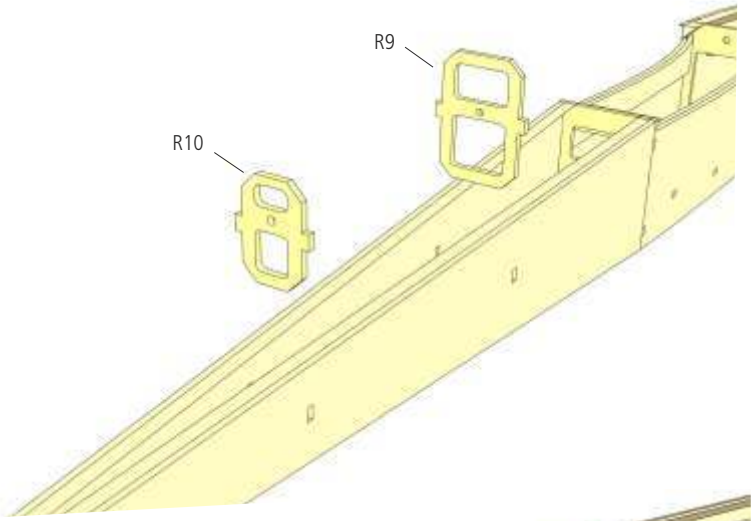
25 Glue former R11 into rear of fuselage (bore for elevator control faces up), glue together rear end of fuselage sides without sanding reinforcements R13, R14. Secure with clamps.

Note: Width at rear end of fuselage must not be reduced. Elevator control exits between fuselage sides.

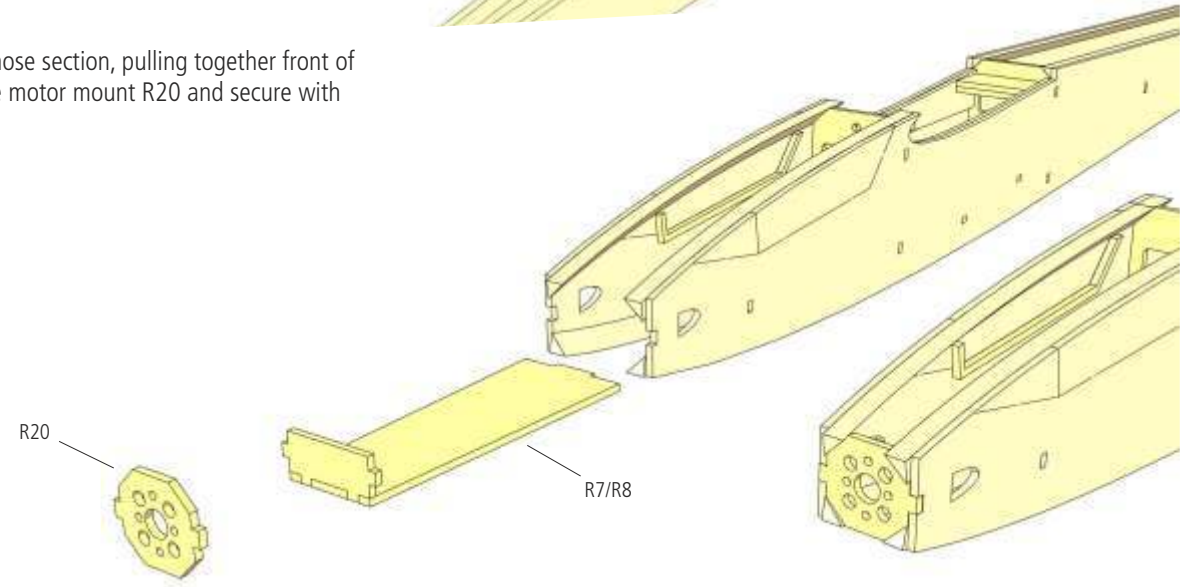


26 Glue in place formers R9 and R10. Please note that bores for elevator control are located in upper half of formers.

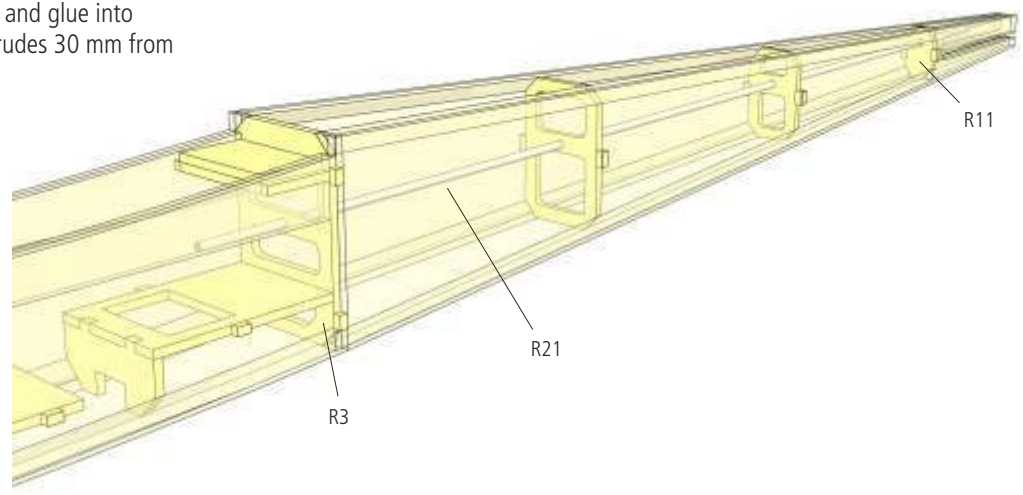
Secure with tape wrapped around fuselage.



27 Insert and glue R7/R8 into nose section, pulling together front of fuselage sides. Glue in place motor mount R20 and secure with clamps and tape.



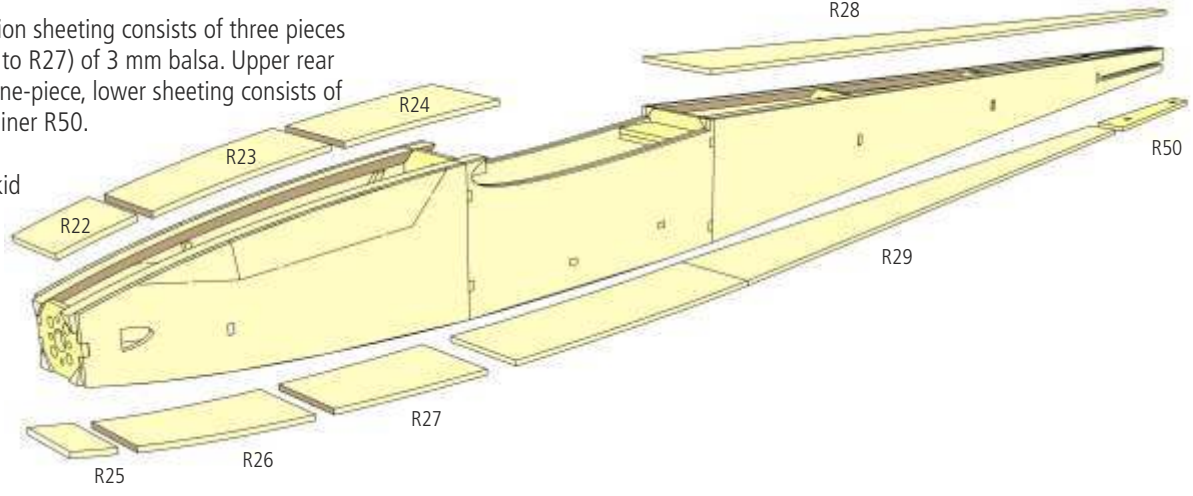
28 Cut snake outer R21 to a length of 485 mm and glue into formers with 5 minute epoxy, so that it protrudes 30 mm from former R3 and 45 mm from former R11.



29 Carefully sand top and bottom contact surfaces of fuselage, then glue in place fuselage sheeting.

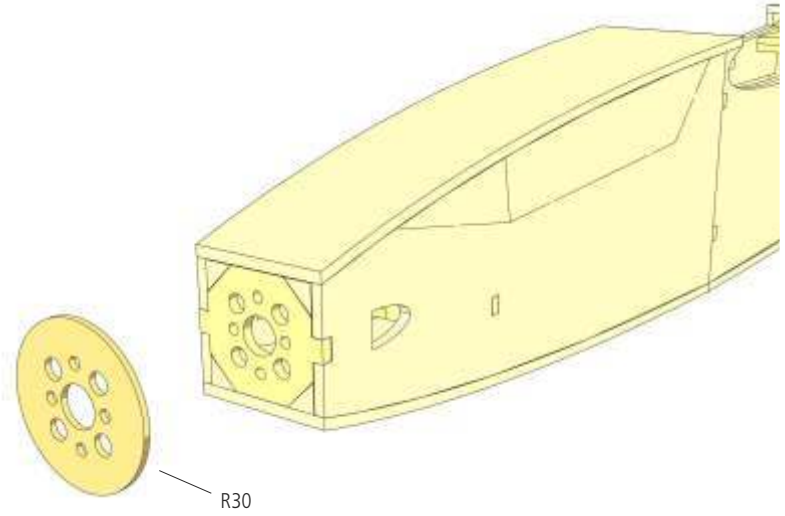
Upper and lower nose section sheeting consists of three pieces each (R22 to R24 and R25 to R27) of 3 mm balsa. Upper rear fuselage sheeting R 28 is one-piece, lower sheeting consists of parts R29 and tail skid retainer R50.

Note: Glue in place tail skid R51 after covering.

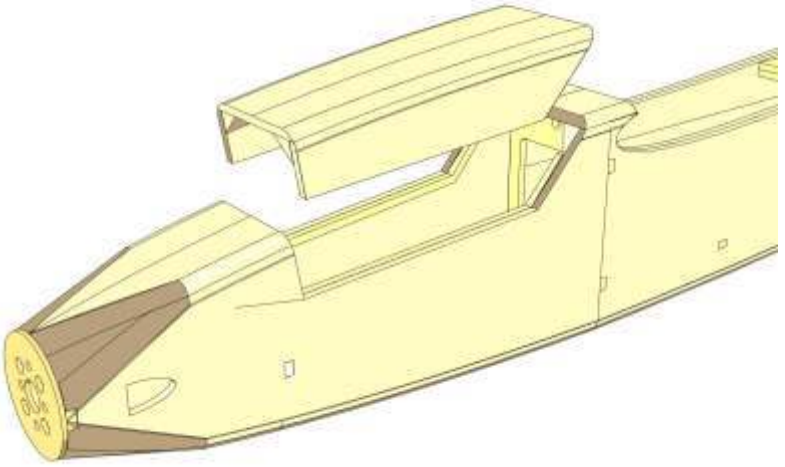


30 Cut off sheeting material and triangular stock and sand flush with motor mount. Glue in place motor mount cover R30 (1.5 mm birch ply). Make sure bores in R19 match bores in motor mount perfectly.

When glue has dried, sand fuselage to shape and round off edges.



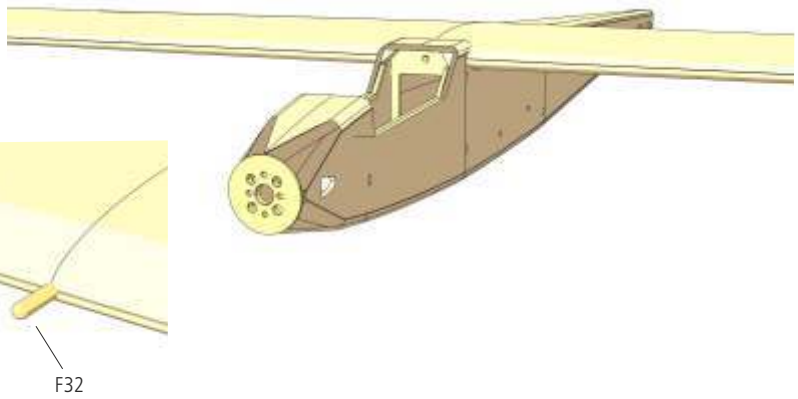
31 With a razor saw cut out canopy and remove from fuselage. Sand contact surfaces until canopy rests on fuselage without binding.



32 Fit wing into wing saddle and align with centre of fuselage. Through bore in former R2 mark position of wing dowel, then drill with 4 mm.

Insert wing dowel F32 in wing and slide wing in place on fuselage. Make sure wing and dowel fit perfectly and without binding.

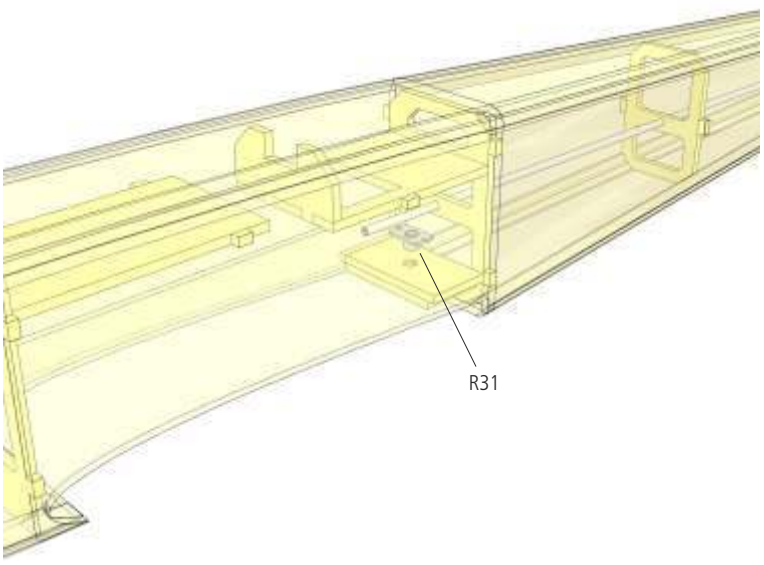
Correct, if necessary, then glue dowel in place.



33 Position wing on fuselage and align with centre line.

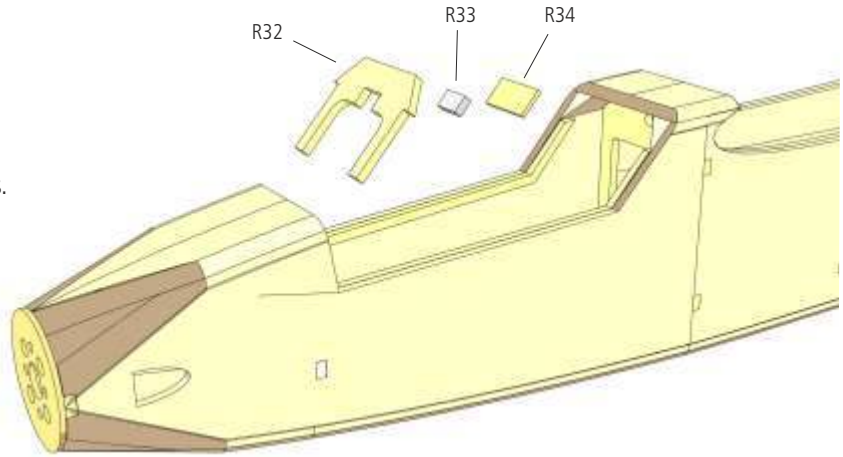
12 mm from the rear of the wing drill with 4 mm through centre of wing and into R18/R19. Drill through R18/R19 with 5 mm and from below epoxy in place retaining nut R31.

Note: Fuselage turned upside down for clarity.



34 Fit canopy former R32 in place in fuselage. To achieve best results, bevel off contact surfaces with upper sheeting, triangular stock and canopy frame.

From behind glue magnet R33 and retainer R34 to former (epoxy), then glue former R32 in place and secure with clamps.

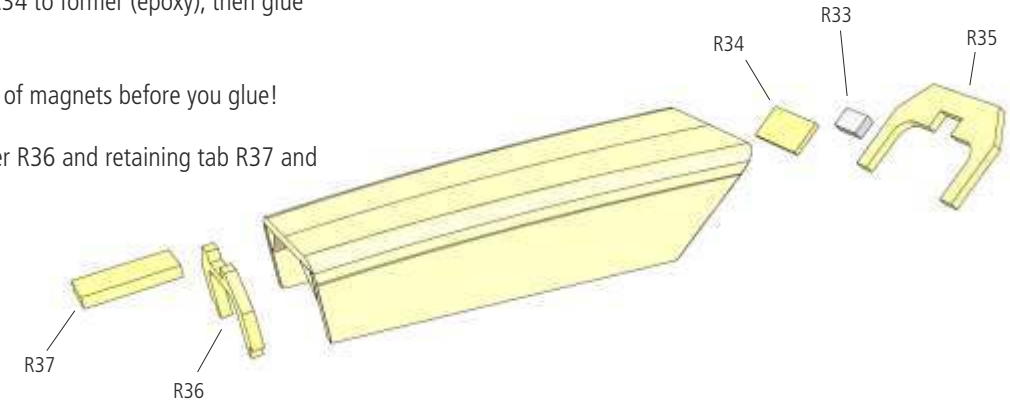


35 Fit canopy former R35 in place in rear end of canopy. To achieve best results bevel off contact surfaces with upper sheeting and triangular stock.

From behind glue magnet R33 and retainer R34 to former (epoxy), then glue former R35 in place and secure with clamps.

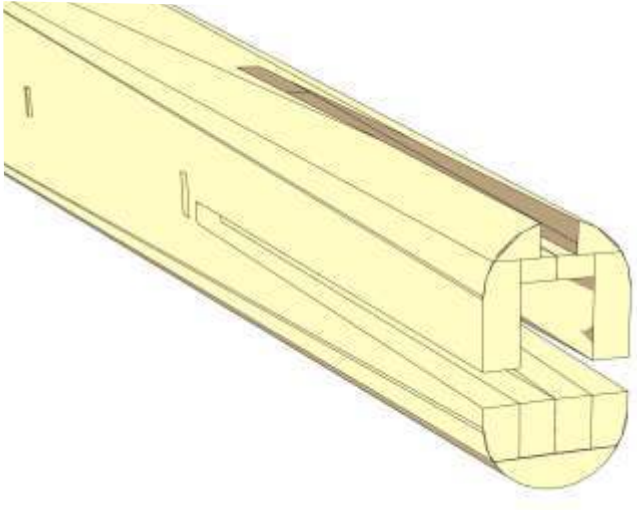
Attention: Make sure you check polarity of magnets before you glue!

At front end of canopy glue in place former R36 and retaining tab R37 and secure with clamps.



36 With drill and file make an opening in rear end of fuselage so that clevis for elevator control can move freely and without binding (ca. 6 mm wide, 7 mm high).

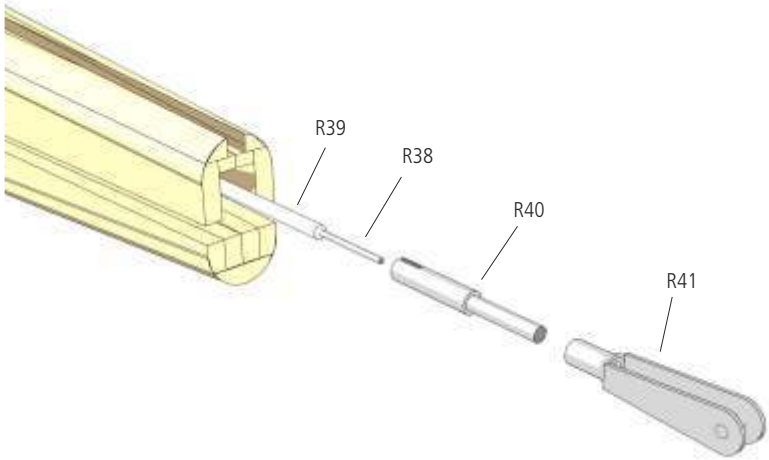
If necessary, correct opening when elevator control is installed.



37 Insert 0.8 mm piano wire R38 in snake R39.

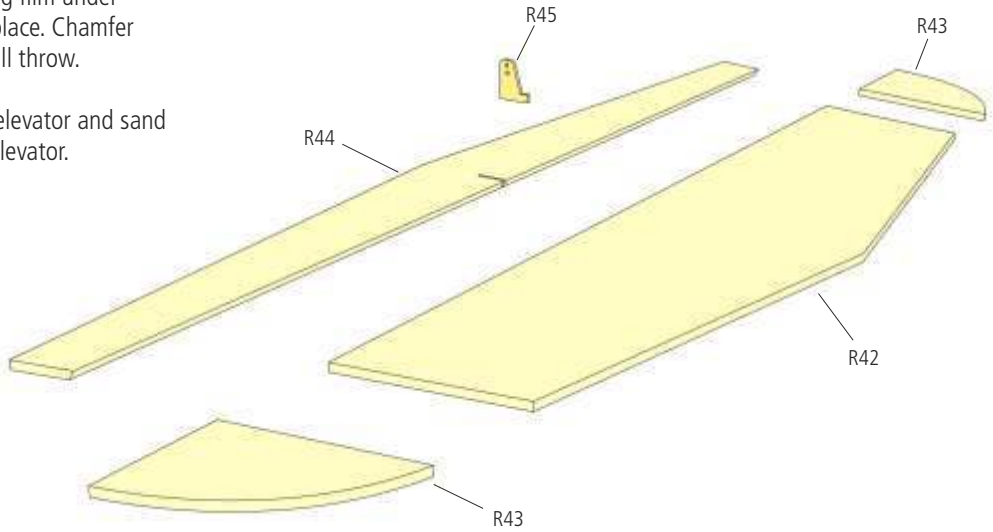
Rough up snake at one end, epoxy or crimp clevis extender R40 to snake and screw on clevis R41.

From the rear slide snake into snake outer. Make sure that clevis moves freely and without binding between fuselage sides.



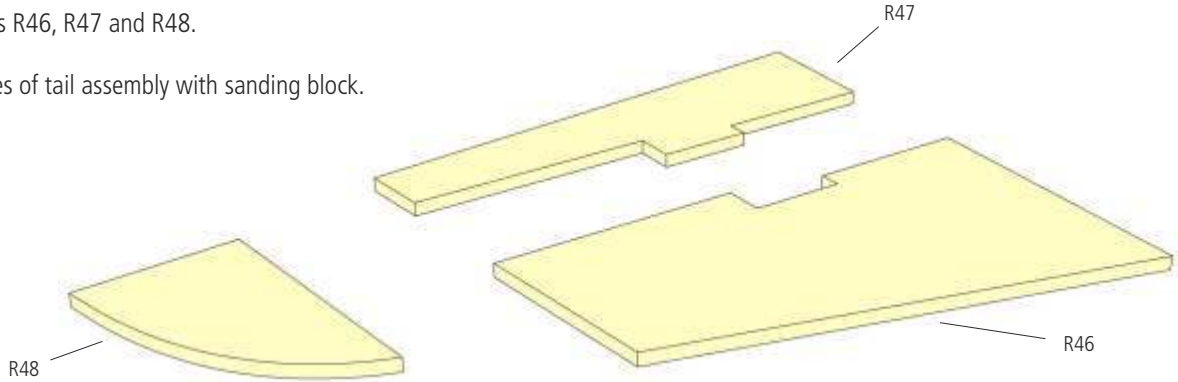
38 Place tailplane R42 on building board (put cling film underneath), secure with pins and glue tips R43 in place. Chamfer front edge of elevator R44 for sufficient controll throw.

From above glue in place control horn R45 in elevator and sand front of control horn flush with front edge of elevator.



39 Glue together fin from parts R46, R47 and R48.

Finally, round off front edges of tail assembly with sanding block.



40 *Completing the model*

Mark contact surfaces of fin and tailplane and do not cover. Then cover components of model with your favourite covering material.

Iron-on film is the quickest method to achieve an attractive finish. Because of ist texture we suggest you use for your Pepper iron-on fabric, which is available in many attractive colours. As an alternative you may want to cover your model with paper and apply a semi-gloss finish. Due to its low weight and aerodynamic advantages this kind of finish will considerably enhance the model´s performance and flying characteristics.
In any case, we recommend you choose bright and contrasting colours for the model´s finish. This will make it easier to identify the model in the air.

Glue in place tail skid R51 in R50 (see building step 29). Attach elevator to tailplane with hinge tape (top and bottom!). Glue tailplane and fin in place. From the rear slide elevator control snake into snake outer and attach clevis to control horn. Install pushrod connector R49 to elevator servo arm, install servo and slide elevator control snake into connector.

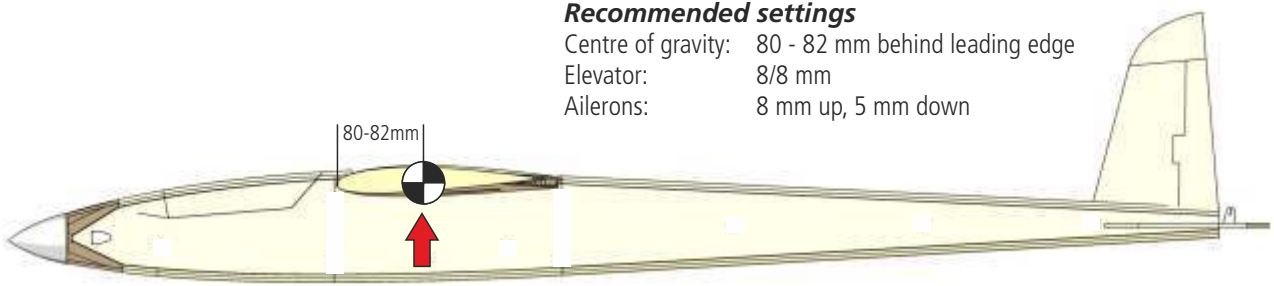
Attach ailerons to wing with tape (top and bottom!). Install aileron servos in servo trays, install servo trays in wing and secure with screws F31. Install clevises F34 on threaded pushrods F33, cut threaded rods to length and make a Z-bend at free end .

Install motor and radio equipment, connect servos and adjust to neutral position. Connect ailerons and elevator and adjust control throws. Control throws for elevator are +/- 8 mm, for ailerons 8 mm up, 5 mm down.
Place battery in fuselage beneath the wing and adjust centre of gravity (80-82 mm behind leading edge). Secure battery with hook abd loop tape at established location.

Have fun with your ***Pepper***!

Recommended settings

Centre of gravity:	80 - 82 mm behind leading edge
Elevator:	8/8 mm
Ailerons:	8 mm up, 5 mm down



Parts List

Pq0	Description	Pieces	Material	Sheet	Type	Dimensions
R1 A	right fuselage side	1	balsa	1	laser-cut	3 mm
R1 B	left fuselage side	1	balsa	2	laser-cut	3 mm
R2	former	1	light ply	5	laser-cut	3 mm
R3	former	1	light ply	5	laser-cut	3 mm
R4	servo tray	1	light ply	5	laser-cut	3 mm
R5	former	1	light ply	5	laser-cut	3 mm
R6	battery tray	1	light ply	5	laser-cut	3 mm
R7	cabin floor	1	light ply	5	laser-cut	3 mm
R8	former	1	light ply	5	laser-cut	3 mm
R9	former	1	light ply	5	laser-cut	3 mm
R10	former	1	light ply	5	laser-cut	3 mm
R11	former	1	light ply	5	laser-cut	3 mm
R12	wing saddle	2	balsa	1, 2	laser-cut	3 mm
R13	reinforcement tailplane slot	2	balsa	1, 2	laser-cut	3 mm
R14	reinforcement tailplane slot	2	balsa	1, 2	laser-cut	3 mm
R15	triangular stock	4	balsa		cut part	8 × 8 mm
R16	triangular stock	4	balsa		cut part	6 × 6 mm
R17	cabopy frame	2	light ply	5	laser-cut	3 mm
R18	wing retainer	1	light ply	5	laser-cut	3 mm
R19	doubler for wing retainer	1	light ply	5	laser-cut	3 mm
R20	motor mount	1	light ply	5	laser-cut	3 mm
R21	snake outer	1	plastic		cut part	c ŭ
R22 - R24	top fuselage sheeting	je 1	balsa	3	laser-cut	3 mm
R25 - R27	bottom fuselage sheeting	je 1	balsa	3	laser-cut	3 mm
R28	top fuselage sheeting	1	balsa	3	laser-cut	3 mm
R29	bottom fuselage sheeting	1	balsa	3	laser-cut	3 mm
R30	motor mount cover	1	birch ply	6	laser-cut	1.5 mm
R31	wing retaining nut	1	steel		ready made	M4
R32	canopy former	1	light ply	5	laser-cut	3 mm
R33	magnet	2	metal		ready made	10 × 6 mm
R34	magnet retainer	2	birch ply	6	laser-cut	1.5 mm
R35	canopy former	1	light ply	5	laser-cut	3 mm
R36	canopy former	1	light ply	5	laser-cut	3 mm
R37	retaining tab	1	light ply	5	laser-cut	3 mm
R38	elevator control	1	piano wire		cut part	c ŭ
R39	snake, elevator control	1	plastic		cut part	c ŭ
R40	clevis extender	1	metal		ready made	M2

Pq0	Description	Pieces	Material	Sheet	Type	Dimensions
R41	clevis	1	metal		ready made	M2
R42	tailplane	1	balsa	4	laser-cut	3 mm
R43	tailplane tip	2	balsa	4	laser-cut	3 mm
R44	elevator	1	balsa	4	laser-cut	3 mm
R45	control horn	1	birch ply	6	laser-cut	1.5 mm
R46	fin	1	balsa	4	laser-cut	3 mm
R47	fin	1	balsa	4	laser-cut	3 mm
R48	fin tip	1	balsa	4	laser-cut	3 mm
R49	pushrod connector	1	metal		ready made	c ŭ ŭ
R50	tail skid retainer	1	light ply		laser-cut	3 mm
R51	tail skid retainer	1	light ply	5	laser-cut	3 mm
F 1 A, F1 B	main spar	je 1	light ply	5	laser-cut	3 mm
F2	centre rib	2	balsa	1, 2	laser-cut	3 mm
F2 A	riblet	2	balsa	3	laser-cut	3 mm
F3 - F14	rib	je 2	balsa	7, 8, 9, 10	laser-cut	1.5 mm
F 15	leading edge	1	obechi		cut part	4 × 4 mm
F 16	spar	2	spruce		cut part	5 ŭ
F 17	auxiliary spar	2	balsa	1, 2	laser-cut	3 mm
F 18	reinforcement wing retaining screw	1	birch ply	6	laser-cut	ČBD Ö Ö
F 19	upper wing sheeting	2	balsa	7	laser-cut	1.5 mm
F 20	upper wing sheeting	2	balsa	8	laser-cut	1.5 mm
F 21	lower wing sheeting	2	balsa	9	laser-cut	1.5 mm
F 22	lower wing sheeting	2	balsa	10	laser-cut	ČBD Ö Ö
F 23	servo frame	2	birch ply	6	laser-cut	1.5 mm
F24	filler	2	balsa		cut part	8 × 40 mm
F25	trailing edge	2	balsa		cut part	8 × 30 mm
F26	wing tip	2	balsa		cut part	20 × 20 mm
F27	servo mount	16	light ply	5	laser-cut	3 mm
F28	servo tray	2	birch ply	6	laser-cut	1.5 mm
F29	aileron	2	balsa		cut part	8 × 30 mm
F30	control horn	2	birch ply	6	laser-cut	1.5 mm
F31	servo tray screw	8	steel		ready made	2.2 × 6.5
F32	wing dowel	1	beech		cut part	c ŭ
F33	threaded rod	2	metal		ready made	M2
F34	clevis	2	metal		ready made	M2
F35	wing retaining screw	1	plastic		ready made	M4
H	wing jig	1		0	laser-cut	

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