HACKER® MODEL PRODUCTION

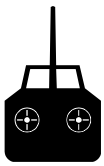
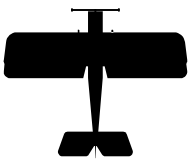
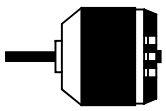
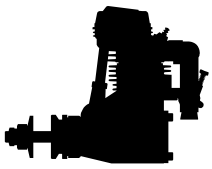
No. HC 2201

The Royal Aircraft Factory S.E.5a

ACES R/C AIRCOMBAT

KNOWN SEMI SCALE BIPLANE FIGHTER OF THE FIRST WORLD WAR
SUITABLE FOR AIRCOMBAT ACES WW1

Technical data:

						
4	1000mm	815mm	>1160g	MFORCE 3536CA-8	ASP FS30 (5ccm)	1:8

20201001

Introduction

Congratulations and thank you for purchasing the SE5a (Scout Experimental) fighter. The Royal Aircraft Factory S.E.5 was a British biplane fighter aircraft of the First World War. It was developed at the Royal Aircraft Factory. It was one of the fastest aircrafts of the war, while being both stable and relatively maneuverable.

This is a semi-scale model in 1: 8 scale designed according to the rules for flying air combat in the model category WW1 ACES. The whole model structure is subject to this. The model must be light but durable and easy to repair. Therefore, it can be disassembled and the individual units can be easily and quickly replaced if damaged. The shape of the model corresponds to the original, but has slightly enlarged tail surfaces and simplified details.

The model is designed by Czech combat ace Pavel Dvořák. He has been flying aircombat with RC model airplanes for several years and has achieved many successes (for example, he is the European Champion in 2009 and the World runner up Champion in 2018 in the WW2 ACES category). With this SE5a built especially for the Aircombat World Championships in 2018 (WASG 2018), he won several national and foreign competitions in 2018 and 2019. He also won the European Cup (a series of European contests) in both 2018 and 2019. The structure is therefore thoroughly tested.

The model can be equipped with an electric motor or a glow 4-stroke engine. The only difference in the design of the engine is the mount. It is also possible to convert from the electric version to the combustion version and vice versa.
The model is designed for electromotor size 3536 (35mm diameter and 36mm length) and glow motor size 30 – for example ASP FS 30 (OS Max, Saito).

Using this instruction manual

Before you start gluing and sanding, take some time familizing yourself with the plans and looking through this entire Instruction manual. It is designed to guide you through the construction process step by step. Building options, as well as balancing, setup, and flying the model are covered in the text.
Like a full-size airplane, the SE5a is built from basic structures (stabilizer, fin, wing, etc.), and then assembled into the complete airplane.
Special procedures or comments will usually be explained before a step, so you will be prepared. If a step begins with a statement like "Note," "Warning," or "Important," it is a good idea to read through the step before doing it.
A check-off box appears at the beginning of each step. Check these boxes as you build, so you can tell at a glance what steps you have completed. Some steps are repeated and must be marked twice, for example the left and right wing panel.
Some of the instructions deal with general procedures. Boxes are not needed for these sections.

Important Safety Precaution

Your SE5a is not a toy, but a sophisticated working model that functions like a full-size airplane. Because of its performance, if you do not assemble and operate the SE5a correctly, you could possibly injure yourself or spectators and damage property.
To make your R/C modeling experience totally enjoyable, we recommend that you get assistance with assembly and your first flights from an experienced, knowledgeable modeler. You'll learn faster and avoid risk to your model before you're truly ready to solo. Your local hobby shop has information about flying clubs in your area whose membership includes qualified instructors.

Safety Precautions

1. You must assemble the plane according to the instructions. Do not alter or modify the model, as doing so may result in an unsafe or unflyable model. In a few cases the instructions may differ slightly from the photos or plan. In those instances the text should be taken as correct.
2. You must take time to build straight, true and strong.
3. You must install all R/C and other components so that the model operates properly on the ground and in the air.
4. You must test the operation of the model before the first and each successive flight to insure that all equipment operates correctly. You must also make certain that the model has remained structurally sound.
5. Get help from an experienced pilot when learning to operate motors. Use safety glasses when starting or running motors. Do not run the motor in an area of loose gravel or sand; the propeller may throw such material in your face or eyes. Keep your face and body as well as all spectators away from the plane of rotation of the propeller as you start and run the motor. Keep these items away from the prop: loose clothing, shirt sleeves, ties, scarfs, long hair or loose objects such as pencils or screwdrivers that may fall out of shirt or jacket pockets into the prop. The motor gets hot! Do not touch it during or right after operation.

The electric motor or glow engine and battery used in your SE5a are very powerful and the spinning propeller has a lot of momentum; therefore, if you touch the propeller while it is spinning it may inflict severe injury. Respect the motor and propeller for the damage it is capable of and take whatever precautions are necessary to avoid injury. Always disconnect and remove the battery until you are ready to fly again and always make sure the switches are turned off before connecting the battery (version electro).

NOTE: We, as the kit manufacturer, can provide you with a quality kit and great instructions, but ultimately the quality and flyability of your finished model depends on how you assemble it; therefore, we cannot in any way guarantee the performance of your completed model and no representations are expressed or implied as to the performance or safety of your completed model.

Please inspect all parts carefully before starting to build. If any parts are missing, broken or defective, or if you have any questions about building or flying this airplane, please give us a call at +420 313 562 258 or e-mail us at shop@zoomport.eu and we'll be glad to help. If you are calling for replacement parts, please reference the part numbers and have them ready when calling.

Glues

The most popular type of glue modelers use for general construction of R/C models is Cyanoacrylate or CA glues. Modelers build with CA because it cures fast (immediately in some cases) and the pieces do not have to be clamped or pinned together as they do with traditional adhesives. CA's do, however have their own set of special procedures and precautions that you should follow. Always use CA in a well ventilated area. Open some windows or place a fan in the room to circulate the air. Do not lean directly over your work when you use CA and look away while it cures or “sets off.” CA can cure immediately upon contact with skin so if you accidentally bond your fingers, do not use vigorous motion to separate them. Use CA Debonder or acetone (nail polish remover) or soak your fingers in warm water for a few minutes. Never point the tip of a CA bottle toward your face and be especially careful when you unclog a CA tip.
CA Applicator Tips (thin teflon tube) are highly recommended and will help keep the bottle from clogging. Keep paper towels or tissues close by to immediately absorb excess CA dropped on your model or work area.
Read all the warning labels on your CA bottle. There are different viscosities of CA's intended for different conditions you will encounter when you build. Thin CA is great for “tack-gluing,” for glue joints that fit well and for parts that are already joined but need to be permanently bonded. Medium CA is used for general construction where you apply glue to one part, then join it to another part. Thick CA is great for glue joints that don't fit perfectly or parts that require a little time for positioning before the glue cures. You will encounter many other conditions that require one or the other types of CA. For the SE5a all you really need is thin CA. If necessary, apply the CA several times to make strong joint. All joints described later in the manual are glued with thin CA, unless otherwise stated.
CA Accelerator (CA kicker) is a chemical that you can spray over uncured CA to make it cure immediately. A mist spray of accelerator will do the job. Do not inhale the vapors! Some modelers “preprime” the parts to be glued with accelerator, join them, then add the CA. This way the CA is guaranteed to cure immediately. This prepriming is especially handy when you use thin CA because it will cure before

all of the glue soaks into the wood away from the glue joint. We do not recommend you build your entire model with this method and use accelerator only when necessary.

Another glue used in the assembling of SE5a is the contact glue UHUPOR "for hard foams". It is primarily intended for gluing polystyrene, but it also glues plastics and wood very well and flexibly. It is suitable for joints that will need to be "disassembled" later without damaging the surrounding structure.

This kit is designed for gluing parts with thin CA glue. If you use another glue, we can't stop you. However, it is possible that some parts will be difficult and uncomfortable to glue together.

Storage

The model has a solid construction. Store it in such a way that it can not curl or bend. Damage may also occur if the model is left in a heated car or in the very hot sun. Do not wash stickers with alcohol and solvent based products. Use dishwashing liquid e.g.!

Flying

The SE5a is a great-flying model that flies smoothly and predictably. The plane does not, however, possess the self-recovery characteristics of a primary R/C trainer and should be flown only by experienced R/C pilots.

Takeoff

Remember to takeoff into the wind. When you're ready, point the model straight down the runway, hold a bit of up elevator to keep the tail on the ground, then gradually advance the throttle. As the model gains speed decrease up elevator allowing the tail to come off the ground. One of the most important things to remember with a tail dragger is to always be ready to apply right rudder to counteract motor torque. Gain adequate speed before gently applying up elevator, lifting the model into the air. Be smooth on the elevator stick, allowing the model to establish a gentle climb to a safe altitude before turning into the traffic pattern.

Flight

For reassurance and to keep an eye on other traffic, it is a good idea to have an assistant on the flight line with you. Tell him to remind you to throttle back once the plane gets to a comfortable altitude. While full throttle is usually desirable for takeoff, most models fly more smoothly at reduced speeds. Take it easy with the SE5a for the first flight, gradually getting acquainted with it as you gain confidence. Adjust the trims to maintain straight and level flight. After flying around for a while and while still at a safe altitude with plenty of battery life or with fuel in fuel tank, practice slow flight and execute practice landing approaches by reducing the throttle to see how the model handles at slower speeds. Add power to see how she climbs as well. Continue to fly around, executing various maneuvers and making mental notes (or having your assistant write them down) of what trim or C.G. changes may be required to fine tune the model so it flies the way you like. Use this first flight to become familiar with your model before landing.

Landing

To initiate a landing approach, lower the throttle while on the downwind leg. Allow the nose of the model to pitch downward to gradually bleed off altitude. Continue to lose altitude, but maintain airspeed by keeping the nose down as you turn onto the crosswind leg. Make your final turn toward the runway (into the wind) keeping the nose down to maintain airspeed and control. Level the attitude when the model reaches the runway threshold, modulating the throttle as necessary to maintain your glide path and airspeed. If you are going to overshoot, smoothly advance the throttle (always ready on the right rudder to counteract torque) and climb out to make another attempt. When you're ready to make your landing flare and the model is a foot or so off the deck, smoothly increase up elevator until it gently touches down. Once the model is on the runway and has lost flying speed, hold up elevator to place the tail on the ground. One final note about flying your model. Have a goal or flight plan in mind for every flight. This can be learning a new maneuver(s), improving a maneuver(s) you already know, or learning how the model behaves in certain conditions (such as on high or low rates). This is not necessarily to improve your skills (though it is never a bad idea!), but more importantly so you do not surprise yourself by impulsively attempting a maneuver and suddenly finding that you've run out of time, altitude or airspeed. Every maneuver should be deliberate, not impulsive. For example, if you're going to do a loop, check your altitude, mind the wind direction (anticipating rudder corrections that will be required to maintain heading), remember to throttle back at the top and make certain you are on the desired rates (high/low rates). A flight plan greatly reduces the chances of crashing your model just because of poor planning and impulsive moves. Remember to think.

Building Supplies and Tools

- ❑ Thin CA Adhesive
- ❑ CA accelerator
- ❑ CA applicator tips
- ❑ Contact glue UHU Por for hard foams
- ❑ Soldering iron with solder and flux
- ❑ Hand or electric drill with drill bits
- ❑ Sealing Iron
- ❑ Heat Gun
- ❑ Razor Saw
- ❑ Knife handle
- ❑ Common pliers
- ❑ Diagonal pliers
- ❑ Screwdrivers
- ❑ Hex key set
- ❑ Paper masking tape
- ❑ Sandpaper (80-120, 250-320)
- ❑ Wooden sanding blocks (small and big)
- ❑ Plastic wrap
- ❑ Curved and straight scissors
- ❑ Pencil, marker
- ❑ Paints (fuelproof for glow engine version) by color scheme
- ❑ Spray putty
- ❑ Plastic primer spray
- ❑ Self adhesive transparent tape (for hinges)
- ❑ Other basic tools

Accessories & Additional Items

- ❑ 5-ch RC set with 4pcs servos 10-15g **MF A-1109MG** No. HC4310
- ❑ Servo extensions cable 2pcs **300mm** No. HC4483
- ❑ Servo extensions cable 2pcs **150-200mm** No. HC4480
- ❑ Covering (rolls coverting etc.)
- ❑ Heatshrink tube for servocables, lenght aprox. 5cm

Electro version:

- ❑ Electromotor **Master Force 3536CA-8** (350W) No. HC3512
- ❑ ESC 45A **MC-45A** No. HC3375
- ❑ LiPo Battery 3S 2200mAh or 4S 1500-2200mAh
- ❑ Propeller **APC 11x5E** (3S) or **APC 10x5E** (4S)

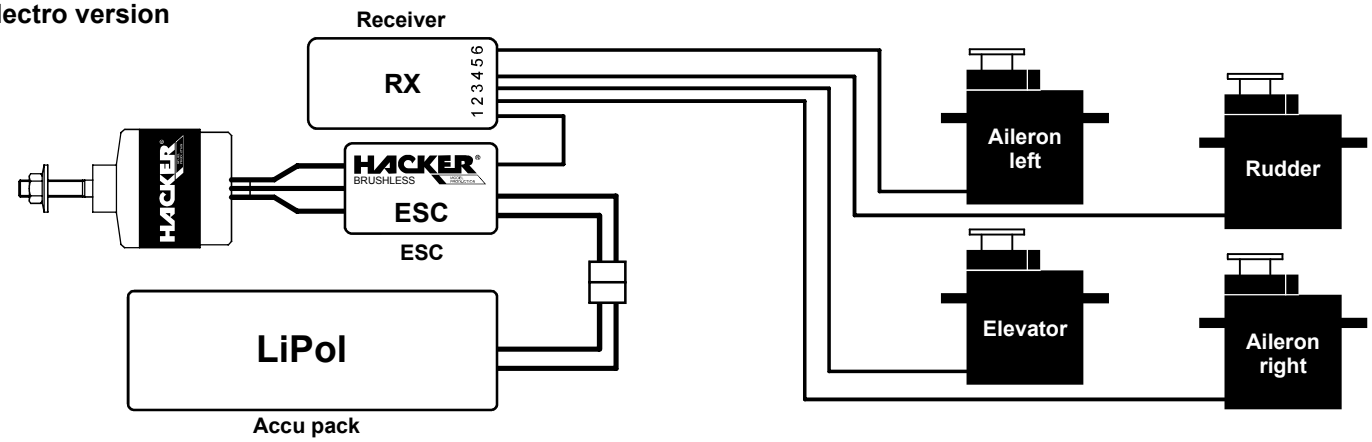
Glow engine version:

- ❑ 4-stroke engine 30 size, e.g. ASP FS 30 (OS MAX, Saito)
- ❑ Fuel tank 150-170ml
- ❑ Fuel silicon tube
- ❑ Servo for throtle 9-15g **MF A-1109HB** No. HC4301
- ❑ Propeller **APC 10x4 Sport** (for glow engine model)
- ❑ RX battery

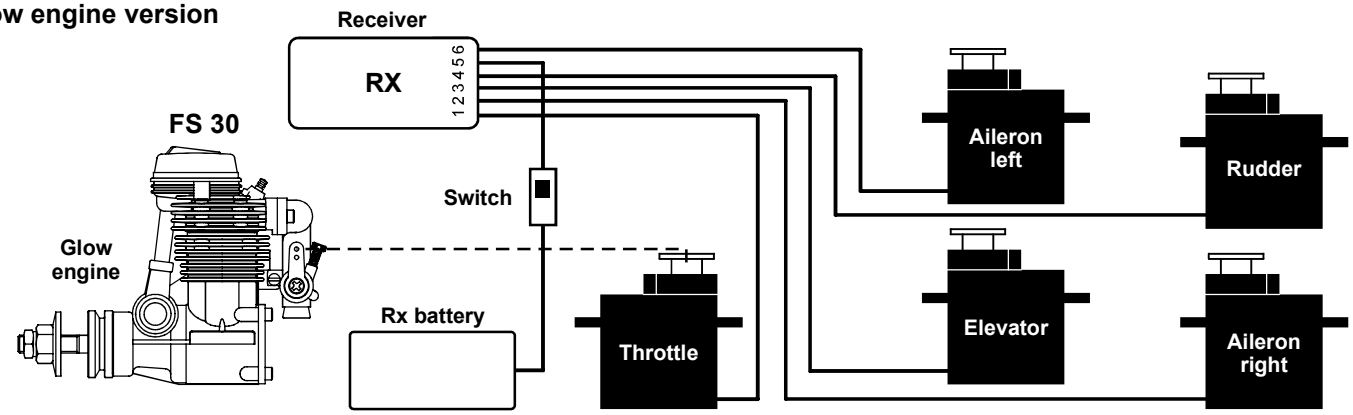
Special thanks to my friend Olga for english translation correction.

R/C - scheme

Electro version

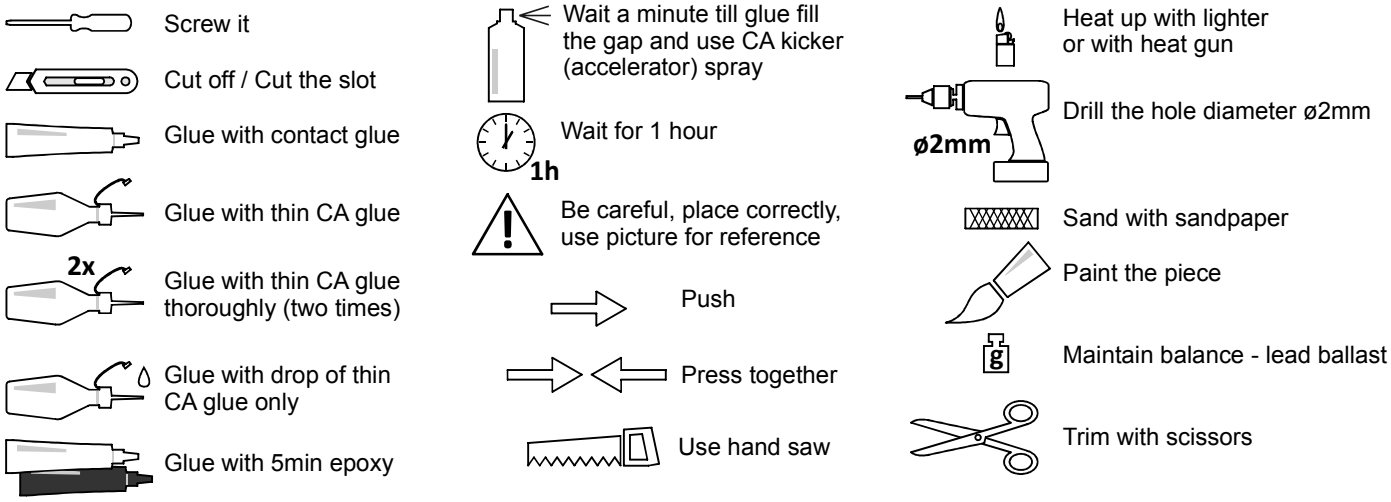


Glow engine version



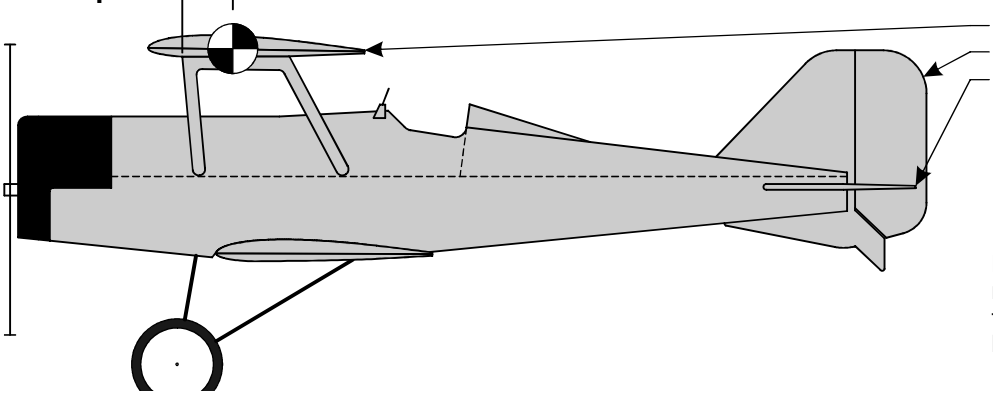
Note: Assigning servos to the channels can be different by receiver producer.

Symbols and marks used in manual



RC airplane settings

Schwerpunkt **42-51mm**

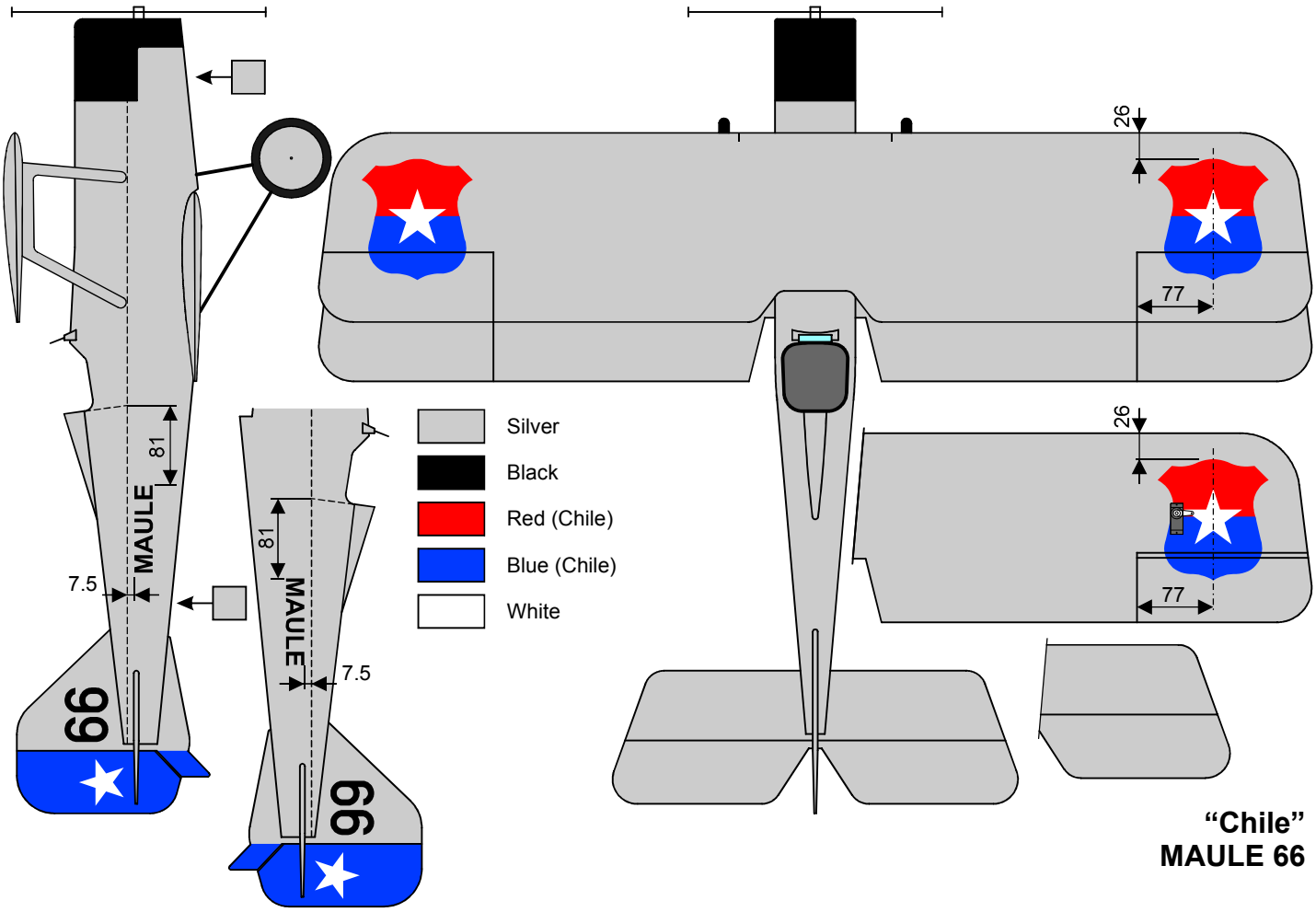


Rates, EXP:

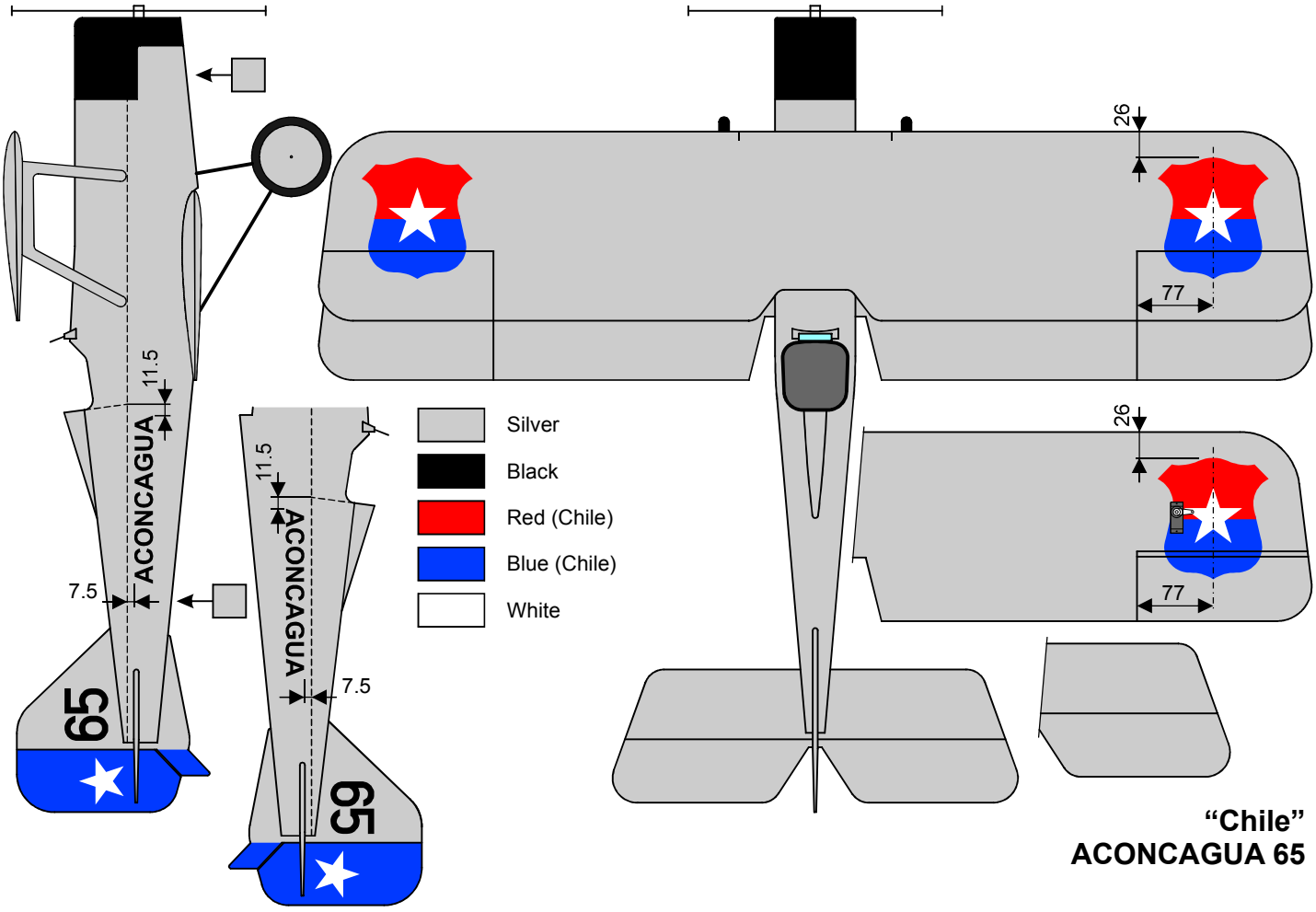
Ailerons	+20 / -15	30%
Rudder	+16 / -16	30%
Elevator	+18 / -18	30%

Note: Rates are in milimeters and are measured on the trailing edge furthest from the hinge. Customize exact settings by your taste.

Color scheme

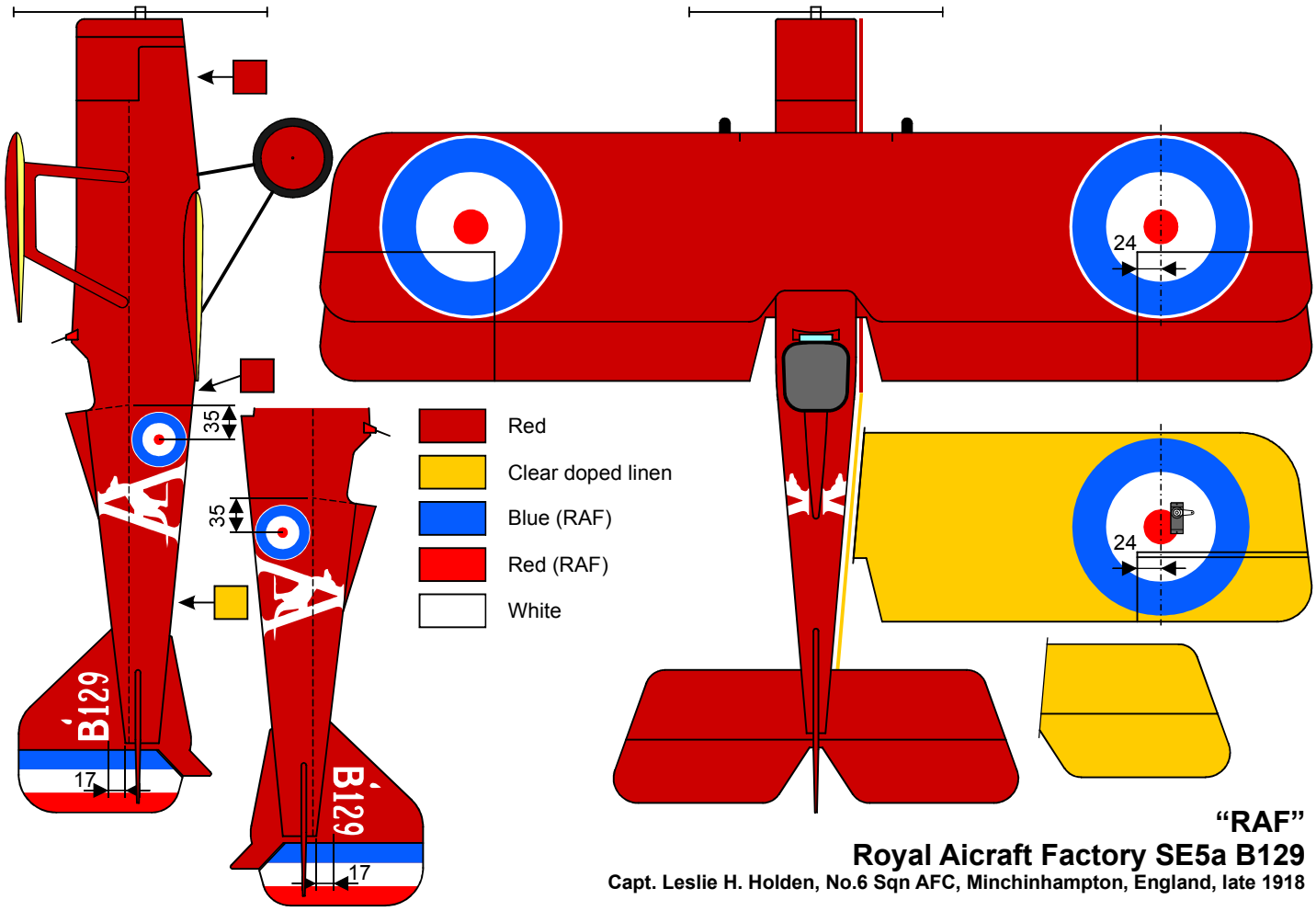


“Chile”
MAULE 66

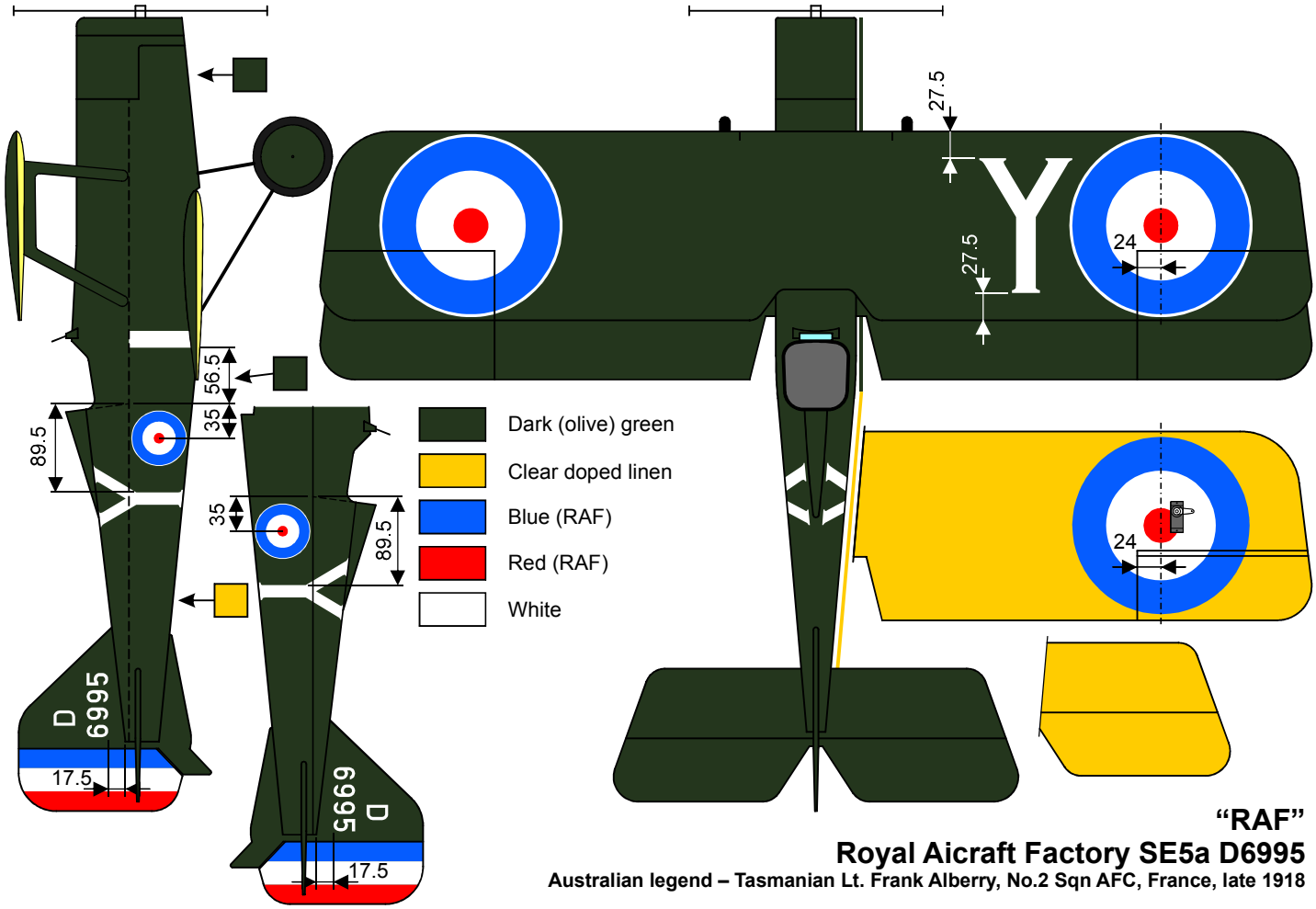


“Chile”
ACONCAGUA 65

Color scheme

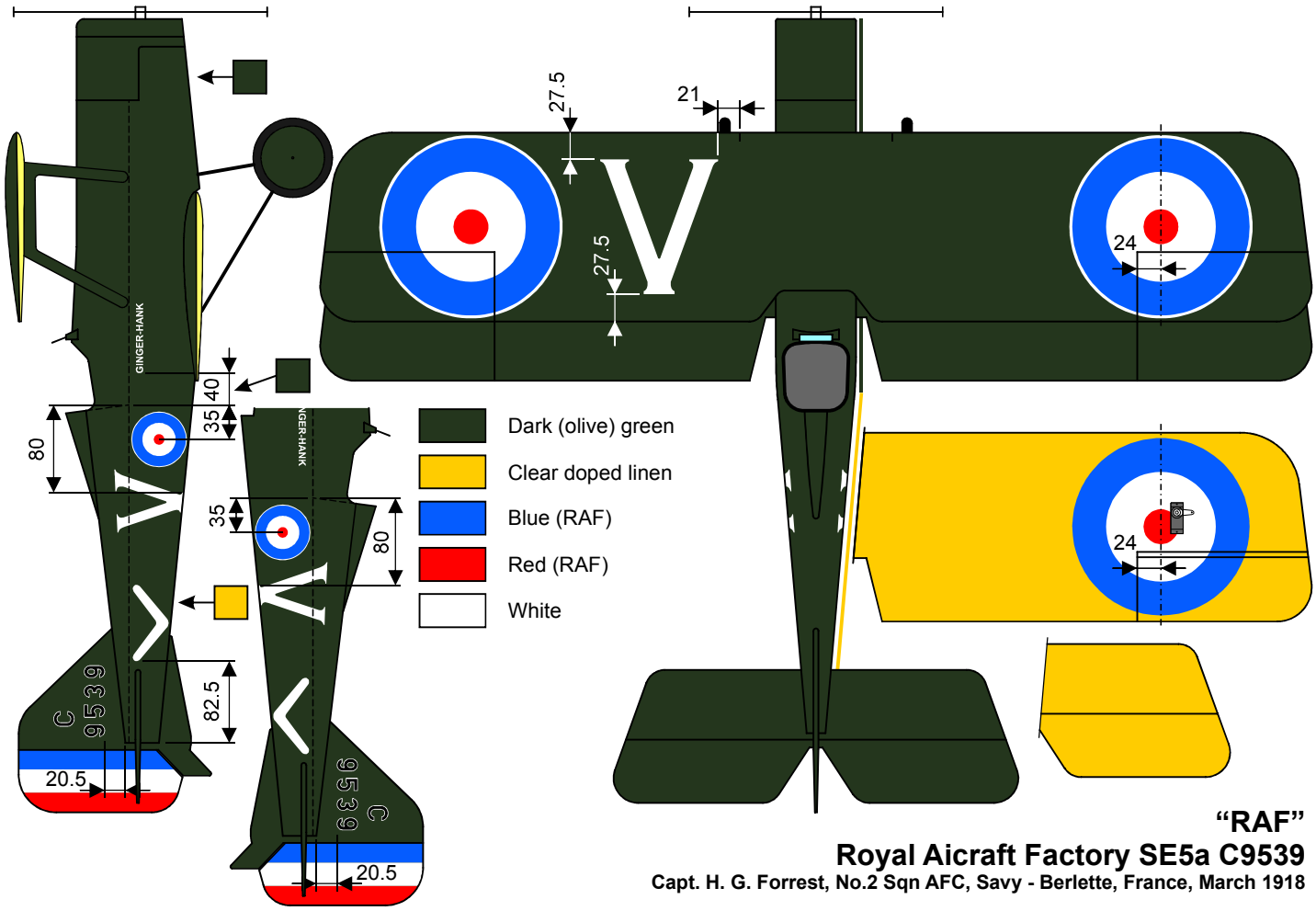


“RAF”
Royal Aircraft Factory SE5a B129
Capt. Leslie H. Holden, No.6 Sqn AFC, Minchinhampton, England, late 1918



“RAF”
Royal Aircraft Factory SE5a D6995
Australian legend – Tasmanian Lt. Frank Alberry, No.2 Sqn AFC, France, late 1918

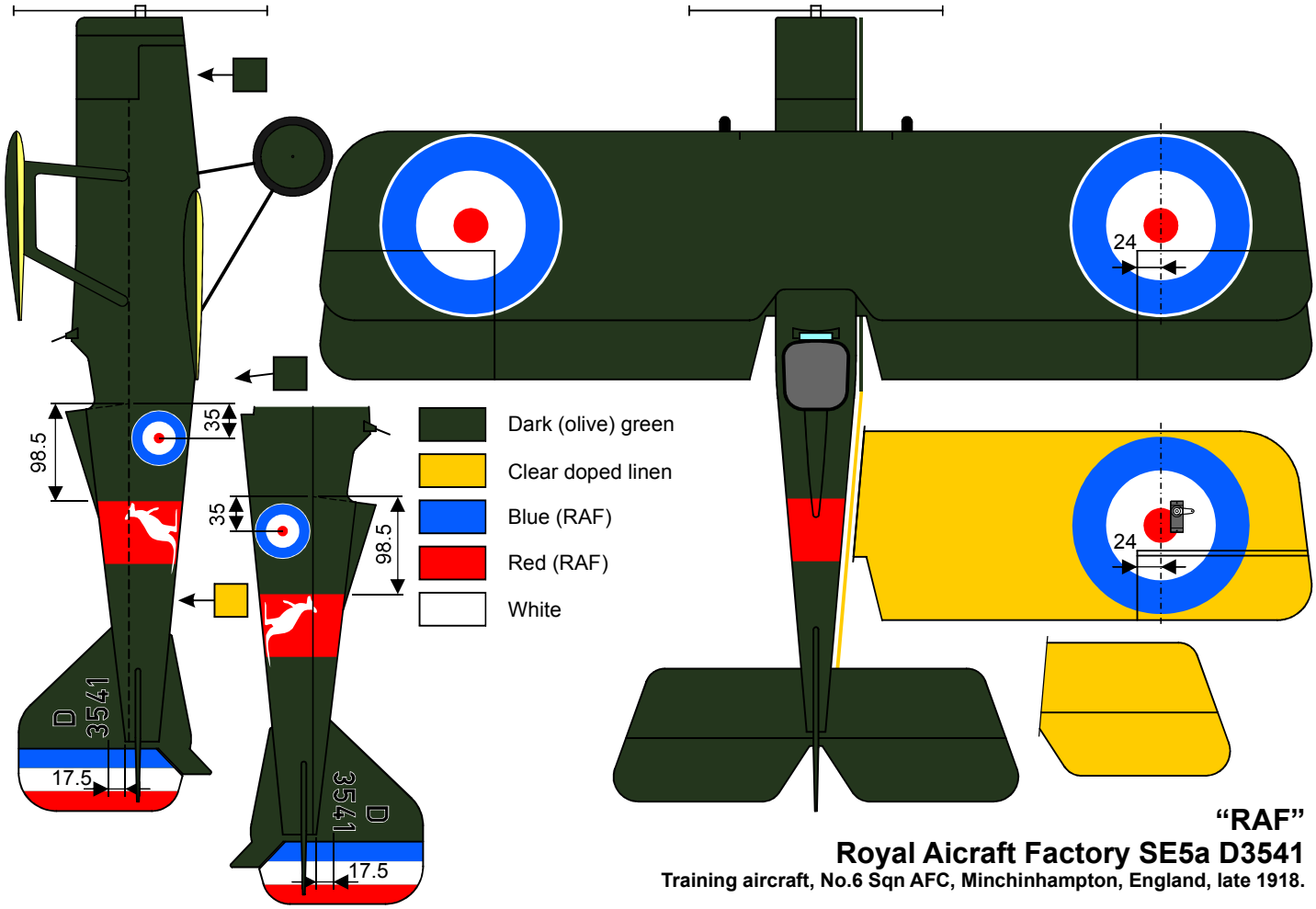
Color scheme



“RAF”

Royal Aicraft Factory SE5a C9539

Capt. H. G. Forrest, No.2 Sqn AFC, Savy - Berlette, France, March 1918



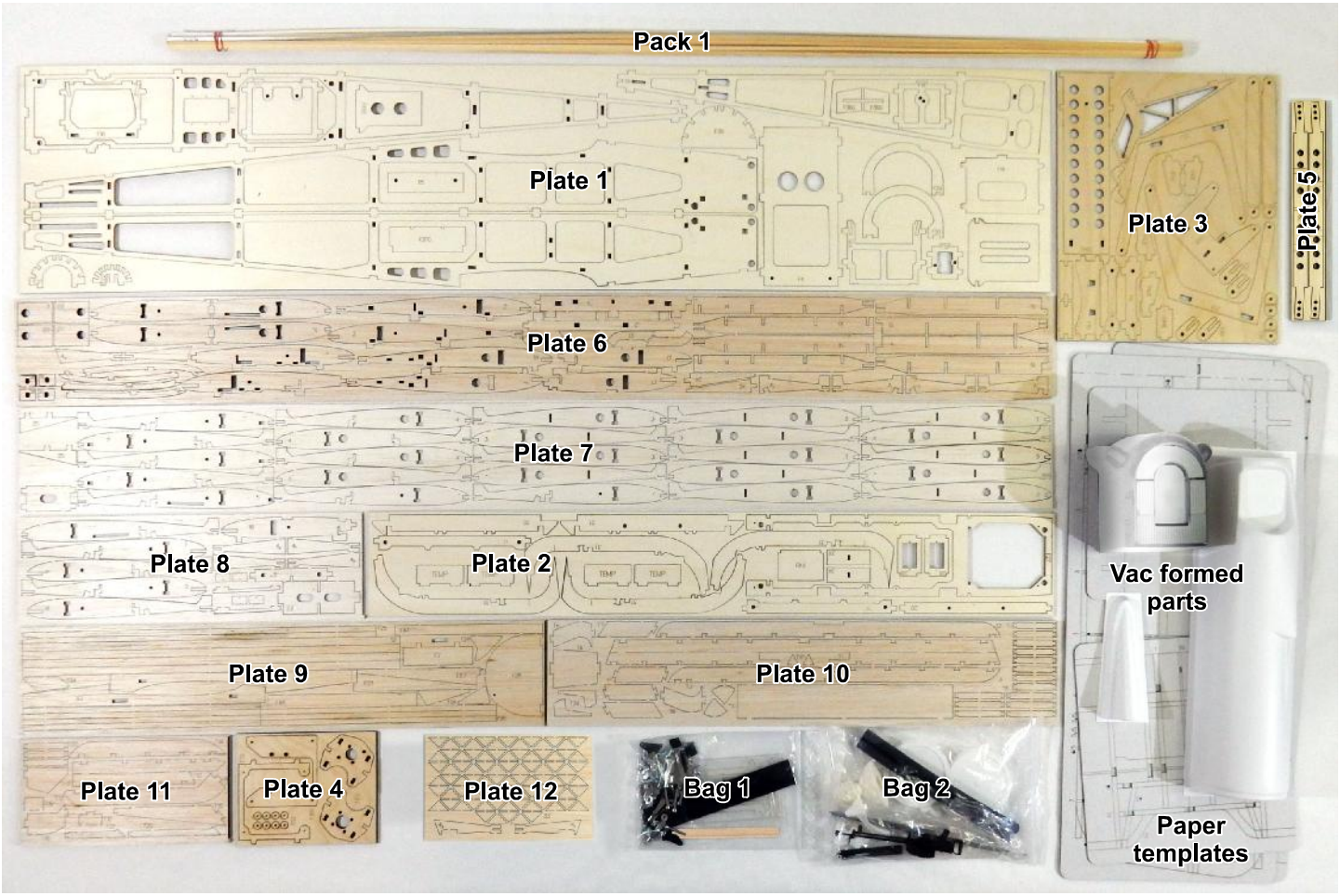
“RAF”

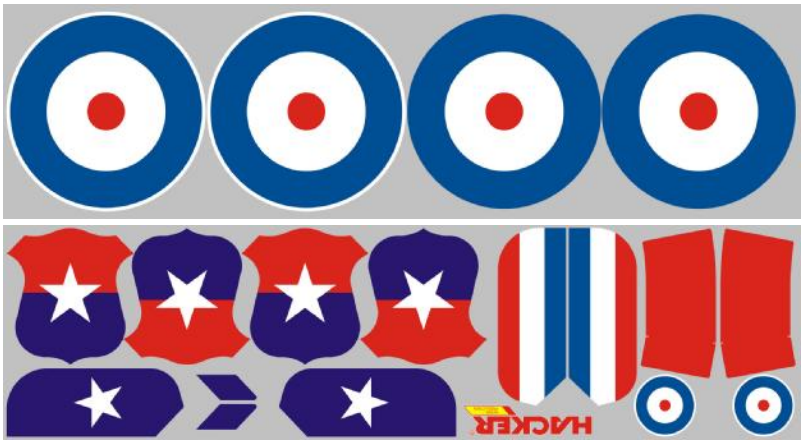
Royal Aicraft Factory SE5a D3541

Training aircraft, No.6 Sqn AFC, Minchinhampton, England, late 1918.

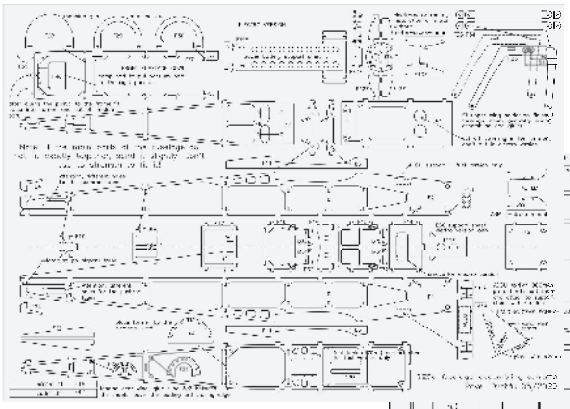
Kit includes

Main parts:

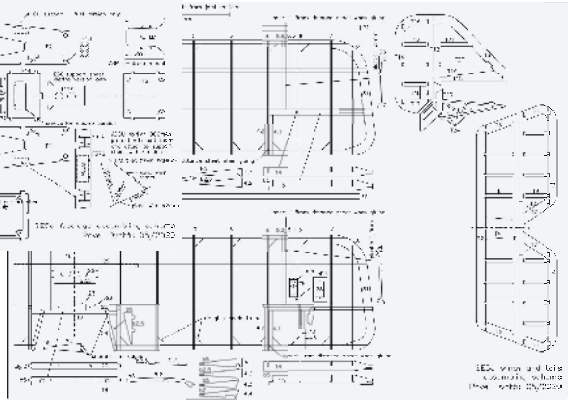




Stickers

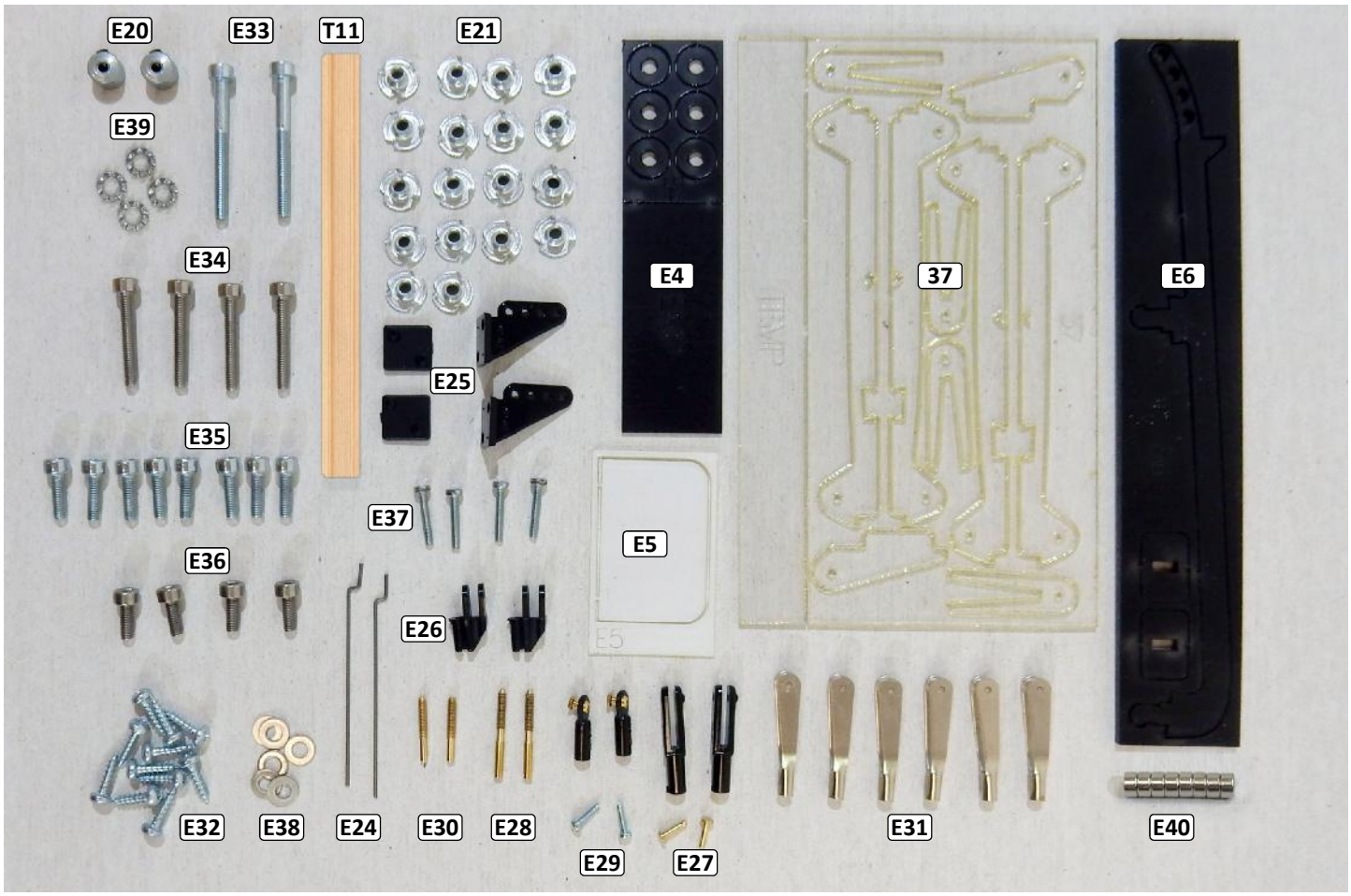


Drawings (schematic)



Pack 1 - spars, Al wires ø1.6mm, pushrod tube ø3/2mm
Plate 1 - light plywood 3mm
Plate 2 - light plywood 3mm
Plate 3 - hard plywood 3mm
Plate 4 - hard plywood 5mm
Plate 5 - hard plywood 5mm
Plate 6 - balsa 5mm
Plate 7 - balsa 2,5mm
Plate 8 - balsa 5mm
Plate 9 - balsa 3mm
Plate 10 - balsa 5mm
Plate 11 - balsa 5mm
Plate 12 - balsa 2mm
Bag 1 - small parts
Bag 2 - small parts
Paper templates
Vacuum formed parts - front fuselage cowl, pilot head cowl, motor cowl
Stickers
Drawings (schematic) - 2xA3 format

Bag 1:


E20
E33
T11
E21
E39
E34
E4
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E6
E25
E35
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E36
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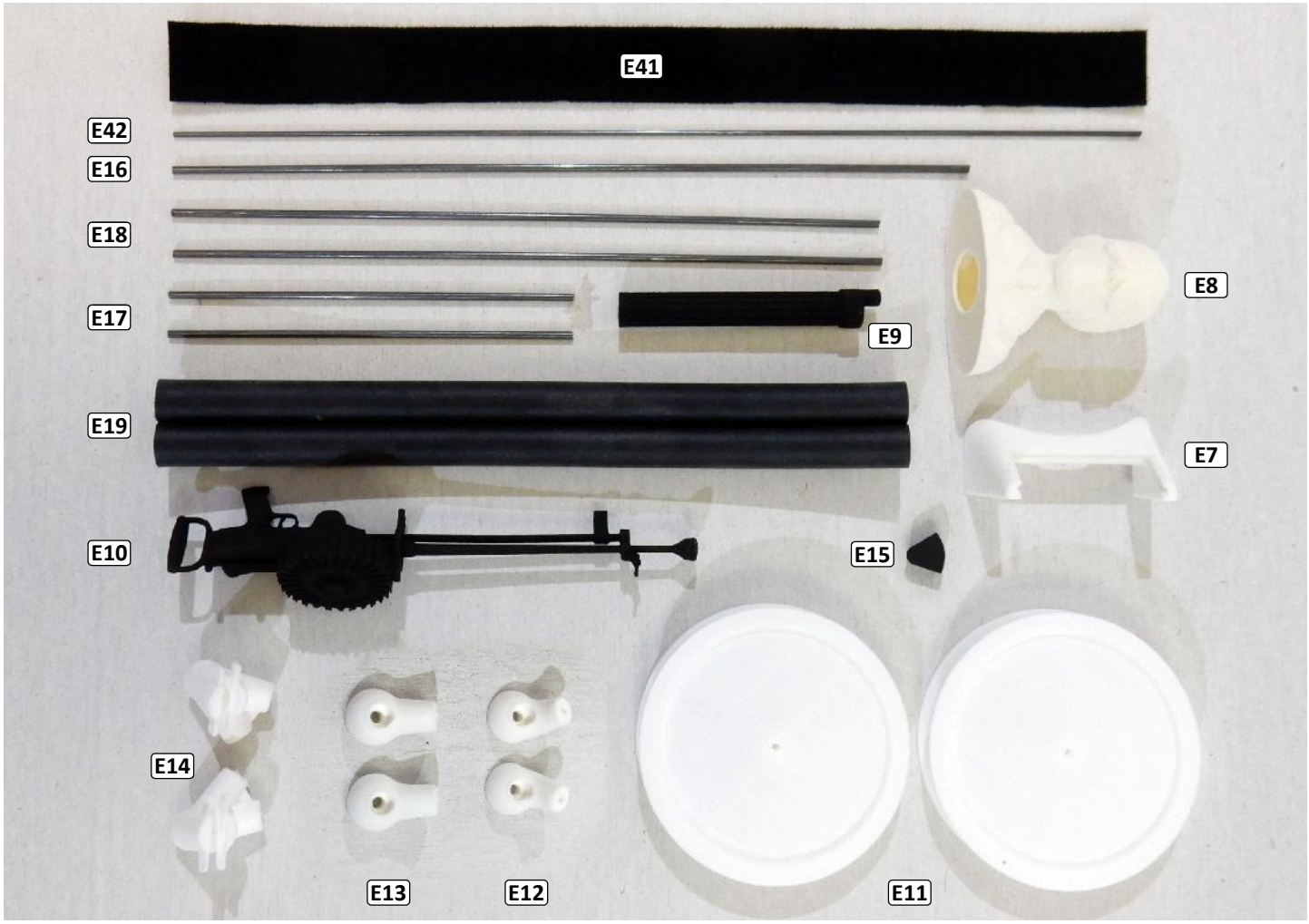
E27

Bag 2:


E41
E42
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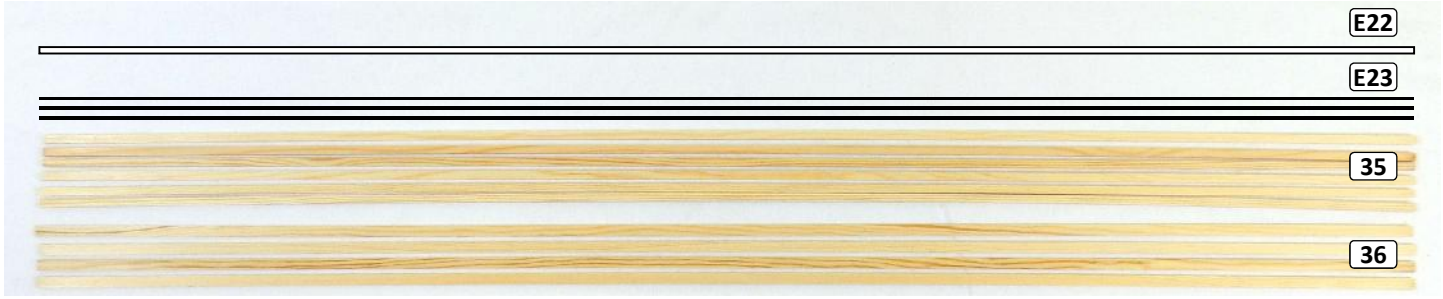
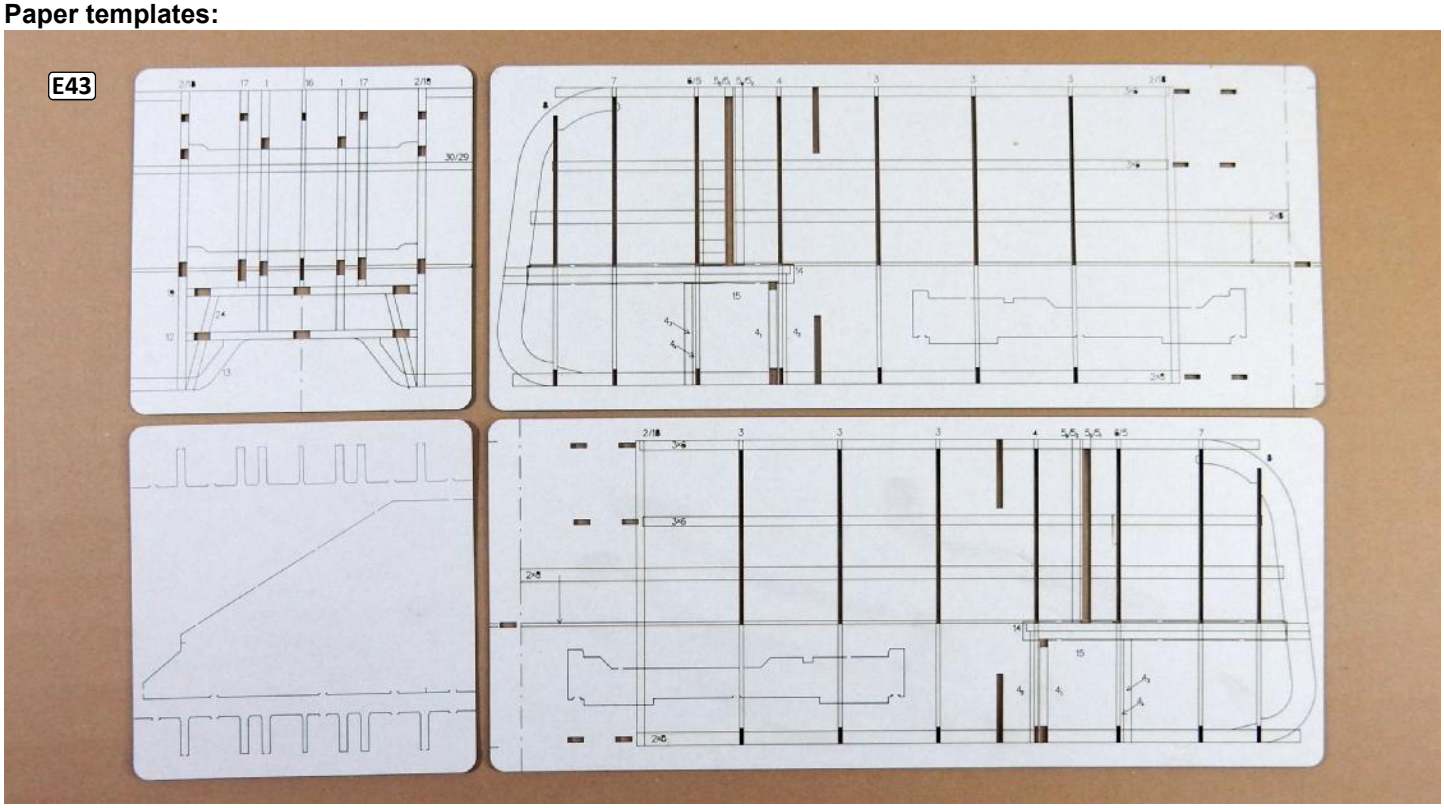
Pack 1:



Vacuum formed parts:

Paper templates:



Parts list:

No.	Pcs	Sheet	Description
Wings			
1	2	Plate6	Rib, center part, short (B5)
2	2	Plate6	Rib, center part, long (B5)
3	12	Plate7	Rib (B2.5)
4	4	Plate7	Rib (B2.5)
4.1	4	Plate6	Aileron edge rib (B5)
4.2	4	Plate8	Rib doubler (B2.5)
4.3	2	Plate6	Rib doubler - aileron horn (B5)
4.4	2	Plate12	Rib doubler - aileron horn (B2)
5	2	Plate7, 8	Rib - aileron servo (B2.5)
5.1	2	Plate6	Rib - aileron servo (B5)
5.2	2	Plate6	Half rib - interplane strut (B5), Bot.
5.3	2	Plate8	Rib doubler - aileron servo (B2.5)
5.4	4	Plate8	Servo mount doubler (B2.5)
5.5	2	Plate6	Rib - interplane strut (B5), Up.
5.6	2	Plate6	Half rib - interplane strut (B5), Up.
6	2	Plate7	Rib (B2.5)
7	4	Plate7	Wing tip rib (B2.5)
8	4	Plate8	Wing tip rib, short (B2.5)

No.	Pcs	Sheet	Description
9	1	Plate7	Filling, wing center part (B2.5), Up.
10	1	Plate2	L.E., wing center part (PL3), Up.
11	2	Plate2	T-nut plate (PL3)
12	1	Plate6	T.E., wing center part (B5), Up.
13	4	Plate6	Shape T.E., wing center part (B5), Up.
14	4	Plate6	False T.E. (B5)
15	4	Plate6	Aileron L.E. (B5)
16	1	Plate8	Rib, wing center part (B2.5), Bot.
17	2	Plate6	Rib, wing center part (B5), Bot.
18	2	Plate6	Rib, wing center part (B5), Bot.
19	1	Plate6	T.E., wing center part (B5), Bot.
20	1	Plate2	Screws plate (PT3)
21	1	Plate2	L.E., wing center part (PT3), Bot.
22	1	Plate8	Filling, wing center part (B2.5), Bot.
23	1	Plate8	Filling, wing center part (B2.5), Bot.
24	2	Plate6	Shape T.E., wing center part (B5), Bot.
25	2	Plate7	Shape T.E. support (B2.5), Bot.
26	4	Plate6	Filling, rear screws support (B5), Bot.
27	4	Plate6	Filling, front screws support (B5), Bot

No.	Pcs	Sheet	Description
28	2	Plate2	Aileron servo mount (PL3)
29	1	Plate5	Dihedral brace (PH5), Bot.
30	1	Plate5	Dihedral brace (PH5), Up.
31	4	Plate2	Wing tip (PL3)
32	4	Plate9	Wing spar shear web (B3)
33	set	Plate12	Wing gusset (B2)
34	2	Plate2	Machine gun support (PL 3)
35	6	Pack1	Spar 3x6-1000mm (W)
36	4	Pack1	Spar 2x8-1000mm (W)
37	1	Bag1	Sheet (clear plastic 1.5)
37.1	2		Interplane struts holder, Up.
37.2	2		Interplane struts holder, Bot.
37.3	2		Aileron horn
37.4	4		Ailerons connection horn
37.5	1		Distance sheet 1.5mm “TEMP”

Fuselage (F)

F1	1	Plate1	Side right (PL3)
F2	1	Plate1	Side left (PL3)
F3	1	Plate1	Upper sheet (PL3)
F4	1	Plate1	Bottom front sheet (PL3)
F5	1	Plate1	Bottom front sheet doubler (B3)
F6	1	Plate1	Bottom rear sheet (PT3)
F7	1	Plate9	Bottom rear sheet reinforcement (B3)
F8	1	Plate3	T-nut plate front (PH3)
F9	1	Plate3	T-nut plate rear (PH3)
F10	1	Plate3	Fuselage former (PH3)
F11	2	Plate9	Fuselage side doubler (B3)
F12	1	Plate4	Motor mount holder (PH5)
F13	9	Plate4	Fuselage side reinforcement for screws (PH5)
F14	1	Plate1	Fuselage former (PL3)
F15	1	Plate1	Fuselage former (PL3)
F16	1	Plate1	Fuselage former (PL3)
F17	1	Plate1	Fuselage former (PL3)
F18	1	Plate1	Fuselage former (PL3)
F19	1	Plate1	Fuselage former (PL3)
F20	1	Plate1	Fuselage former - upper rear (PL3)
F21	1	Plate1	Fuselage former - upper rear (PL3)
F22	1	Plate1	Fuselage former - upper rear (PL3)
F23	2	Plate9	Fin mount (B3)
F24	2	Plate10	Fuselage tail doubler (B5)
F25	2	Plate9	Spar 5x3x342mm – rear fuselage (B3)
F26	7	Plate9	Spar 5x3x230mm – rear fuselage (B3)
F27	1	Plate2	Front fuselage cowl support sheet (PL3)
F28	1	Plate9	Front fuselage cowl former (B3)
F29	1	Plate1	Front fuselage cowl former (PL3)
F30	1	Plate1	Front fuselage cowl former (PL3)
F31	2	Plate10	Corner reinforcement (B5)
F32	4	Plate3	Upper wing holder (PH3)
F33	2	Plate3	Upper wing mount (PH3)
F34	2	Plate3	Upper wing mount plate (PH3)
F35	4	Plate3	Upper wing mount plate doubler (PH3)
F36G	2	Plate1	Battery mount sides (PL3)
F37G	1	Plate1	Battery mount platform (PL3)
F38G	1	Plate1	Fuel tank platform (PL3)
F39G	1	Plate4	Motor mount (PH5) – 5ccm (ASP, OS MAX, Saito)
F40E	1	Plate3	Motor mount electro (PH3)
F41E	1	Plate4	Motor mount electro - firewall (PH5)
F42E	2	Plate3	Motor mount electro - reinforcement (PH3)
F43E	2	Plate3	Motor mount electro - reinforcement (PH3)
F44E	1	Plate3	Motor mount electro (PH3)
F45E	1	Plate1	ESC platform (PL3)
F46E	set	Plate3	Battery platform (PH3)
F47	1	Plate9	Landing gear wing - front (B3)
F48	1	Plate9	Landing gear wing - rear (B3)
F49	1	Plate2	Fuselage former - helper (PL3)

Tails (T)

T1	1	Plate10	Elevator, middle spar (B5)
T2	1	Plate10	Elevator L.E. (B5)
T3	1	Plate10	Elevator T.E. (B5)
T4	1	Plate10	Elevator center (B5)
T5	2	Plate10	Elevator (tailplane) tip (B5)
T6	2	Plate10	Elevator tip (B5)
T7	2	Plate10	Elevator rib (B5)
T8	6	Plate10	Elevator (tailplane) rib (B5)
T9	8	Plate10	Elevator rib (B5)
T10	2	Plate10	Elevator triangle corner reinforcement (B5)
T11	1	Bag1	Elevator joiner (W5)
T12	1	Plate11	Rudder middle spar (B5)
T13	1	Plate11	Rudder (fin) L.E. (B5)
T14	1	Plate11	Rudder T.E. (B5)
T15	1	Plate11	Rudder (fin) rib (B5)
T16	1	Plate11	Rudder tip upper (B5)
T17	1	Plate11	Rudder tip bottom (B5)

No.	Pcs	Sheet	Description
T18	1	Plate11	Rudder reinforcement (B5)
T19	1	Plate11	Rudder reinforcement (B5)
T20	1	Plate11	Rudder (fin) rib (B5)
T21	1	Plate11	Rudder (fin) rib (B5)
T22	3	Plate11	Rudder rib (B5)
T23	1	Plate3	Tail skid (PH3)
T24	4	Plate9	Tail skid filling (B3)

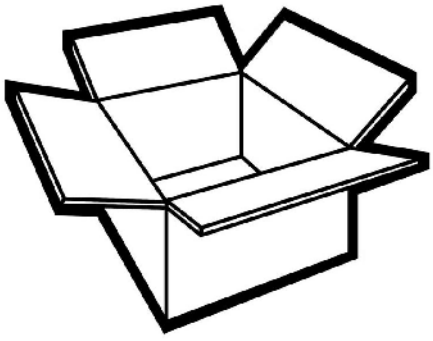
Other parts (E – equipment)

E1	1		Vac formed front fuselage cowl (P)
E2	1		Vac formed cowl under the pilot (P)
E3	1		Motor cowl (P)
E4	1	Bag1	Motor cowl washers (P) and distance sheet 1mm “TEMP”
E5	1	Bag1	Pilot wind shield (P)
E6	1	Bag1	Wing machine gun support (P)
E7	1	Bag2	Pilot wind shield holder (3D)
E8	1	Bag2	Pilot (3D)
E9	1	Bag2	Fuselage machine gun (3D)
E10	1	Bag2	Wing machine gun (3D)
E11	2	Bag2	Wheel (3D)
E12	2	Bag2	Front landing gear holder (3D)
E13	2	Bag2	Rear landing gear holder (3D)
E14	2	Bag2	Landing gear joiner (3D)
E15	1	Bag2	Tail skid slider (3D)
E16	1	Bag2	Landing gear shaft ø2-206mm
E17	2	Bag2	Front landing gear leg ø2-103mm
E18	2	Bag2	Rear landing gear leg ø2-181mm
E19	2	Bag2	Tire
E20	2	Bag1	Landing gear wheel stopper
E21	16	Bag1	T-nut M3
E22	1	Pack1	Pushrod tube ø3/2-1000mm
E23	3	Pack1	Aluminium wire ø1.6-1000mm
E24	2	Bag1	Aileron pushrod Z-bend
E25	2	Bag1	Elevator / Rudder horn
E26	2	Bag1	Pushrod clevis keeper (FasLink)
E27	2	Bag1	Clevis + pin ø1.6mm
E28	2	Bag1	Threaded coupler M2-1,5mm
E29	2	Bag1	Ball link
E30	2	Bag1	Threaded coupler M2-1mm
E31	6	Bag1	Metal clevis
E32	11	Bag1	Screw 2.5x10mm
E33	2	Bag1	Screw M3-30mm
E34	4	Bag1	Screw M3-20mm
E35	8	Bag1	Screw M3-10mm
E36	4	Bag1	Screw M3-8mm
E37	4	Bag1	Screw M2-12mm
E38	6	Bag1	Washer
E39	4	Bag1	Lock washer
E40	8	Bag1	Neodymum magnet 5x3mm
E41	1	Bag2	Velcro two-sided 250mm
E42	1	Bag2	Piano wire (throttle servo pushrod) 250mm
E43	set		Paper template

Stickers

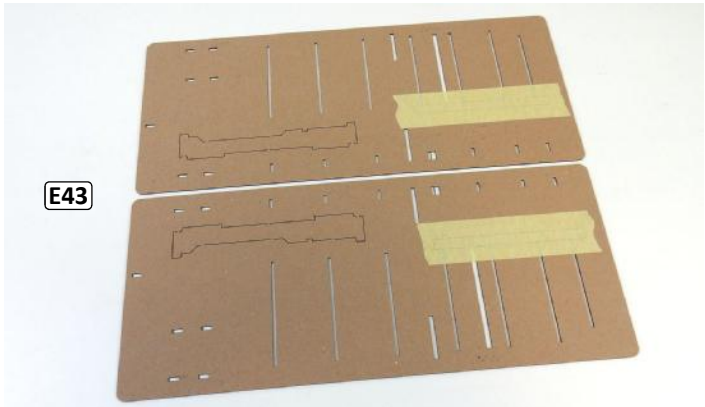
Legend:

Bot. - bottom wing
Up. - upper wing
B - balsa
PL - lite plywood
PH - hard (birch) plywood
W - wood spruce / pine
P - plastic
3D - 3D printing

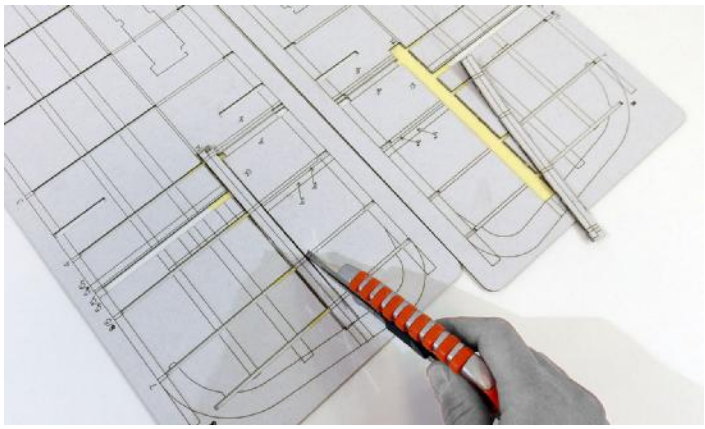


Check the package contents according to the list in the manual. Inspect the parts for damage. Read the entire manual carefully. The various assembling operations follow each other and cannot be skipped.

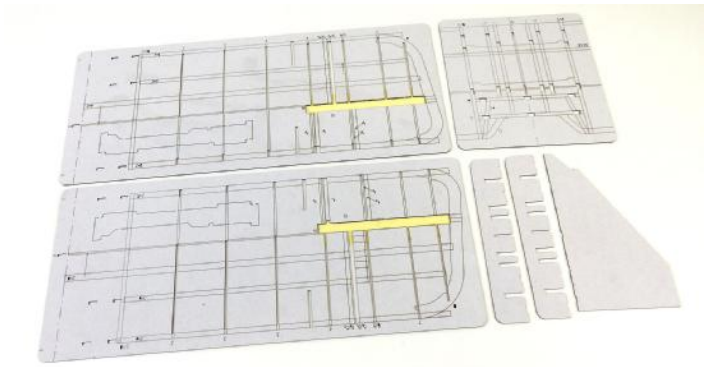
Preparing of paper templates



❑ **1.** Apply paper masking tape on the bottom of the paper template.

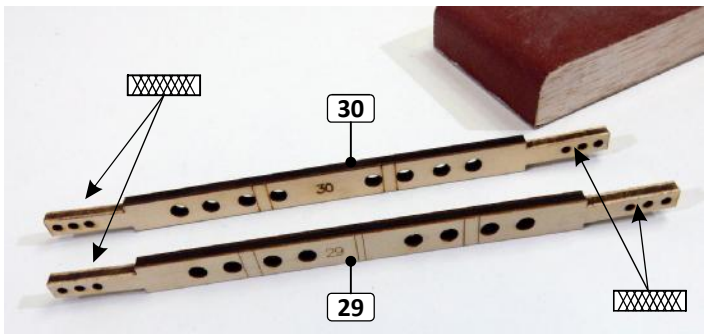


❑ **2.** Cut out small tabs on the template.

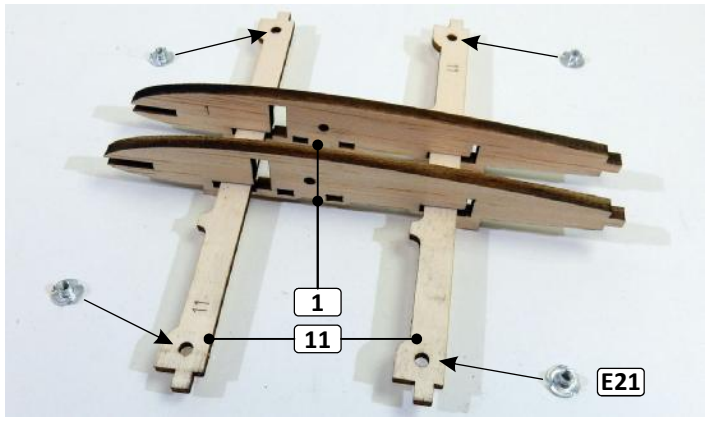


❑ **3.** Remove cut pieces from the template. Now the templates are prepared to use.

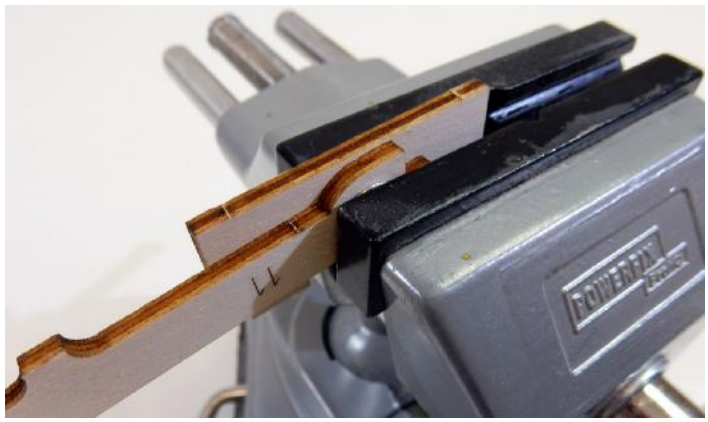
Wing assembly - center section



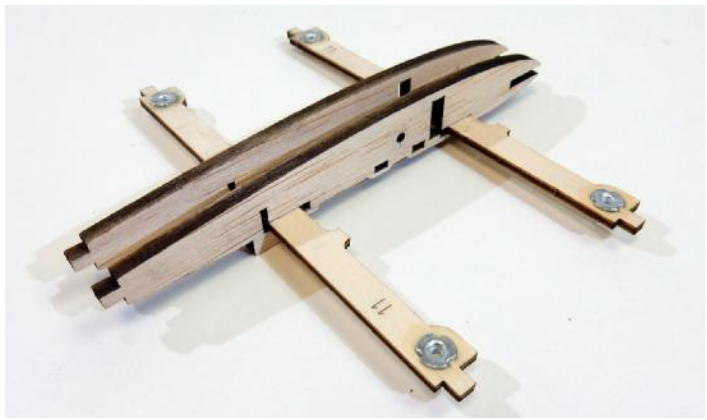
❑ **1.** Lightly sand dihedral braces **29** and **30** at both ends.



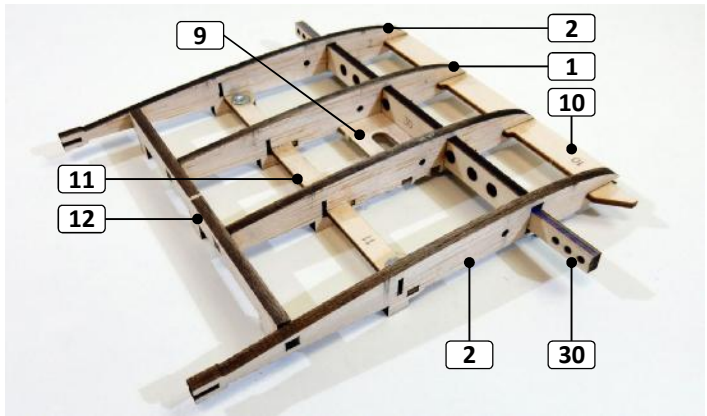
❑ **2.** Insert the parts **11** into the ribs **1** before pressing the T-nuts **E21** into the parts **11**. Don't glue!



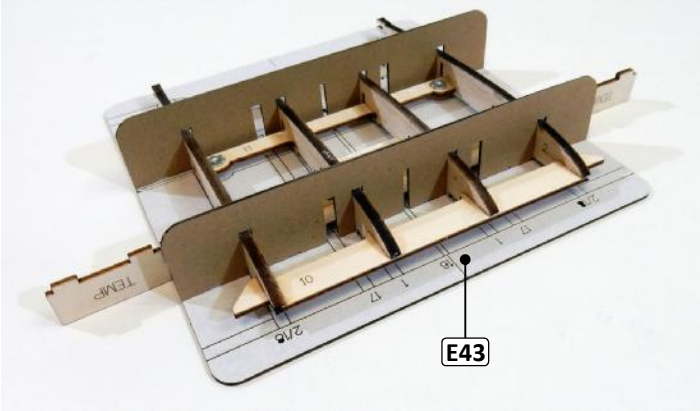
❑ **3.** Press the T-nuts **E21** into the parts **11**. Use a vise, not a hammer! Underlay the parts with a plywood scrap (the T-nut is higher than the thickness of the part).



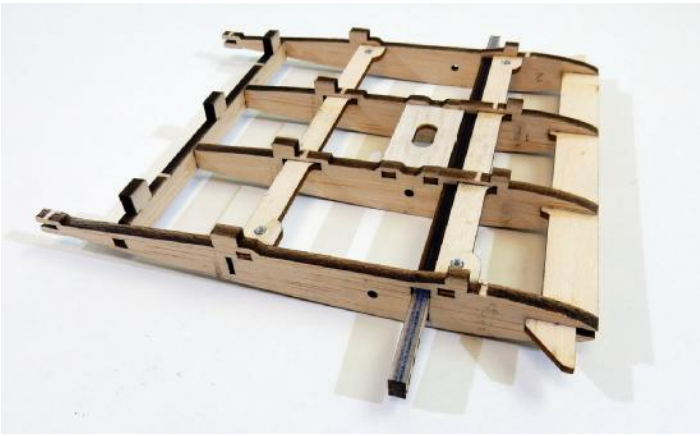
❑ **4.** Glue T-nuts **E21** into the parts **11**.



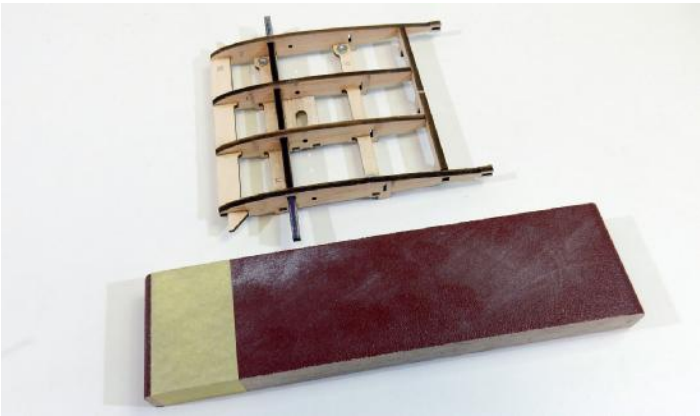
❑ **5.** Dry-assemble the wing center section. Don't glue!



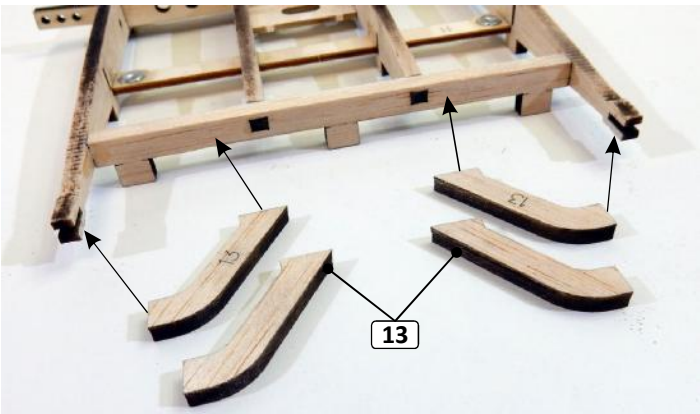
❑ **6.** Put the center wing section parts into paper the template. Use the template with slots to keep the ribs vertically. Align dihedral brace **30** with template borders using ply “TEMP”. Use drops of CA to join the center wing section parts in place.



❑ **7.** Take out the center wing section from the template and glue all joints. Glue thoroughly, but use it sparingly.



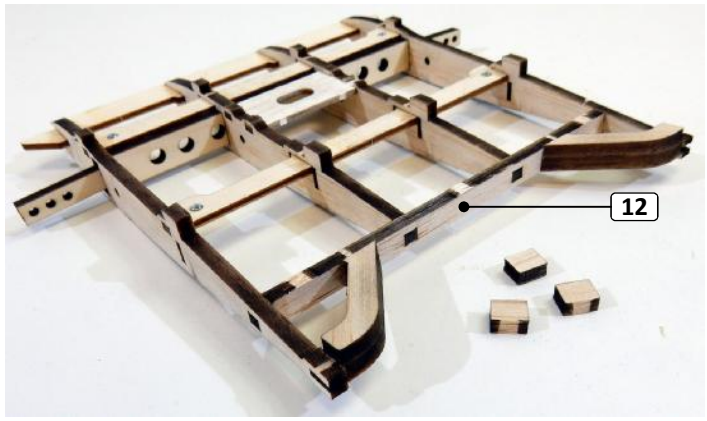
❑ **8.** Sand the rear part of the center wing section surface with a sanding block.



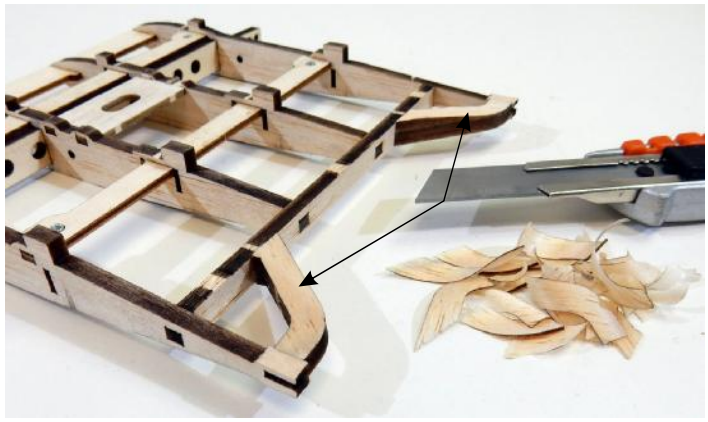
❑ **9.** Attach parts **13** into corners of the center wing section.

❑ **10.** Sand the side of part **13** into a bevel.

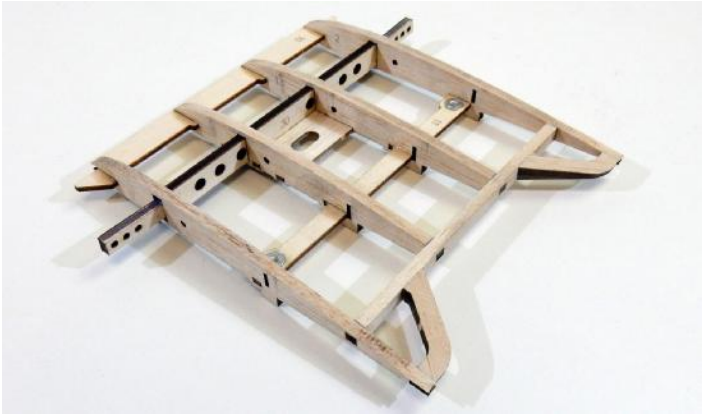
❑ **11.** Glue the two parts **13** to the center wing section aligned with the upper surface.



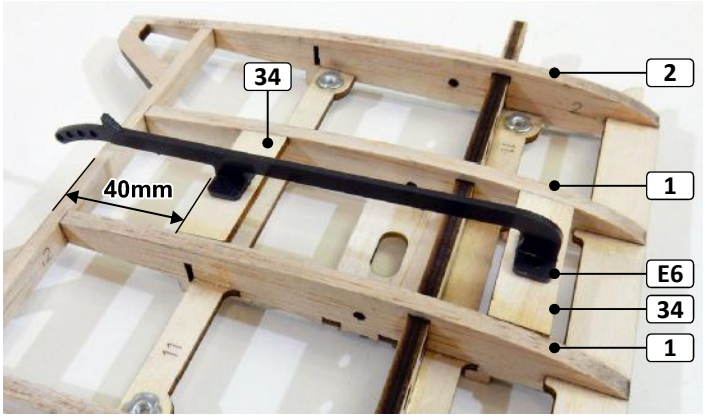
❑ **12.** Glue the remaining two parts **13**. Cut off the supports from part **12** (not others).



❑ **13.** Cut the parts **13** on the bottom surface with a knife or with small hobby planer.

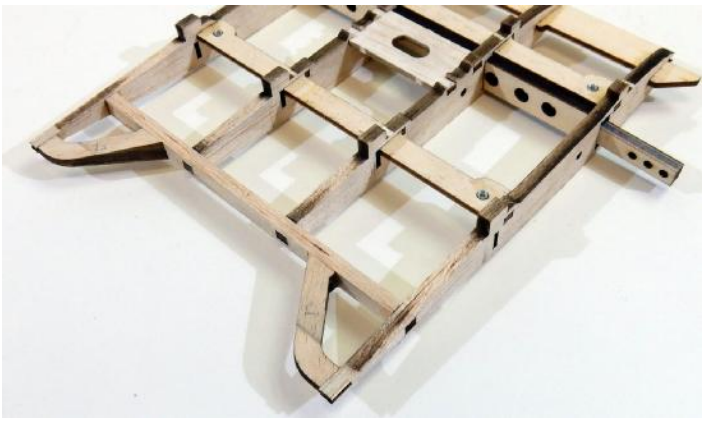


❑ **14.** Sand the entire upper surface to remove burnt areas as much as possible.

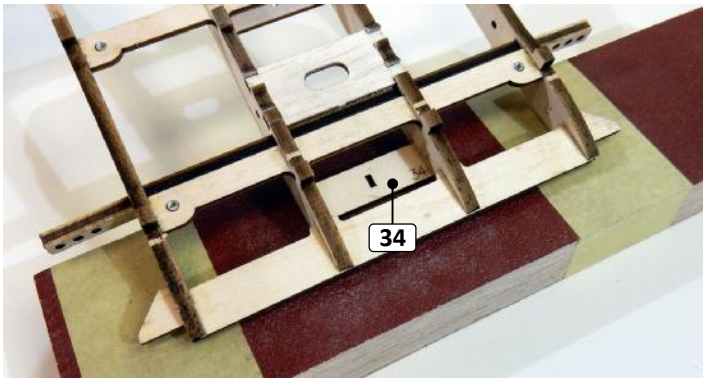


❑ **19.** Glue parts **34** between the ribs **1** aligning with the upper surface. Keep a distance of 40mm between the rear edge of the center wing section and the rear edge of part **34**.

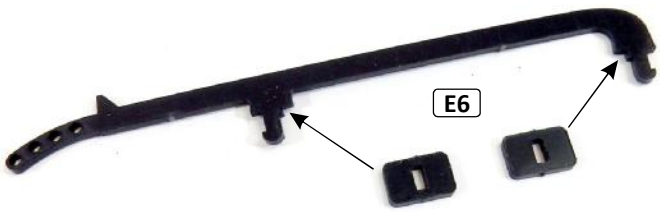
❑ **20.** Remove holder **E6**, use the flexibility of the material.



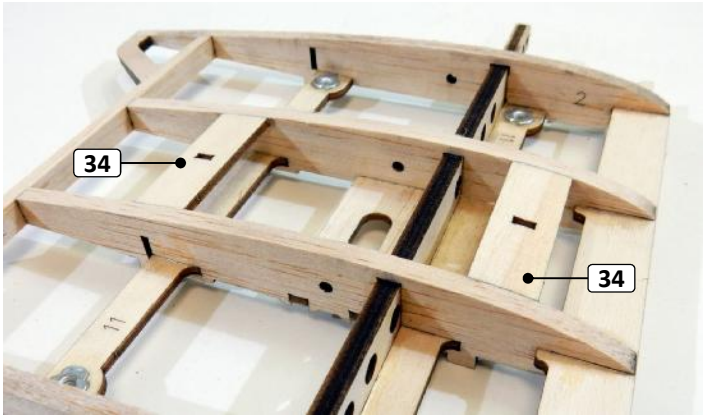
❑ **15.** Sand the bottom surface too, but the rear area only.



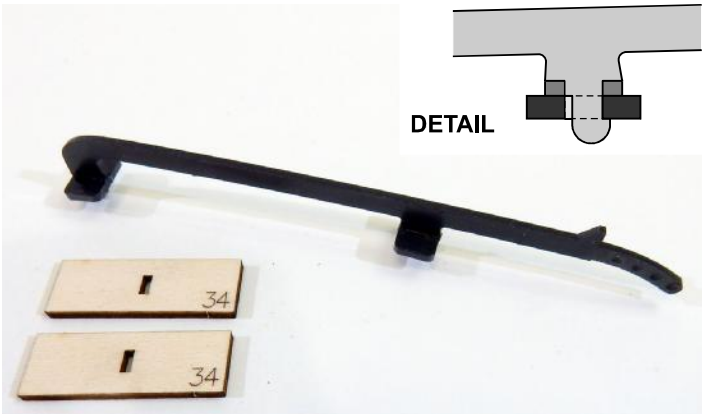
❑ **21.** Sand parts **34** with the surface of the ribs. Apply paper masking tape on the sanding block to sand only where it is needed.



❑ **16.** Prepare the wing machine gun holder parts **E6**. Clean the edges with sandpaper.

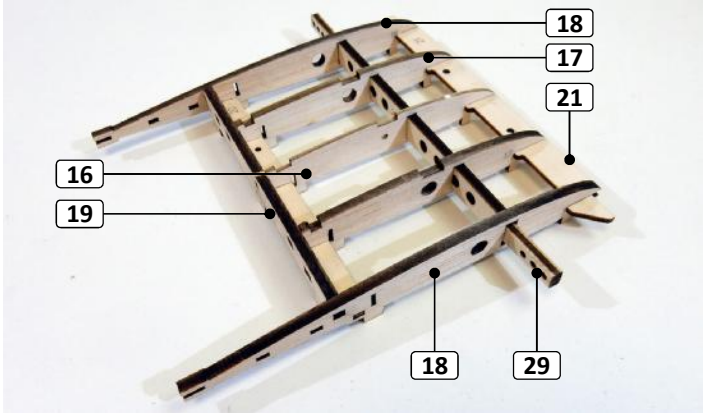


❑ **22.** Parts **34** are sanded with the ribs surface. The upper center wing section is ready to assemble the entire wing. The bottom surface stays unsanded!

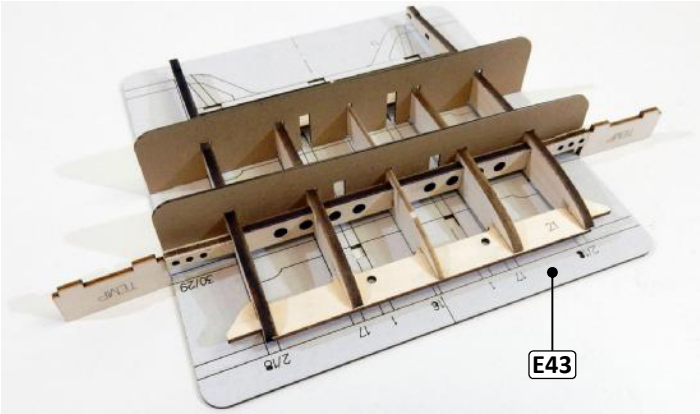


❑ **17.** Fit machine gun holder parts **E6** and glue in place.

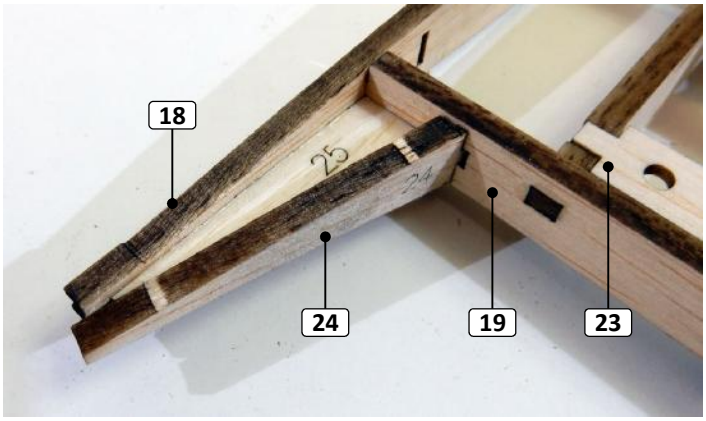
❑ **18.** Insert holder **E6** into holes in parts **34**, see detail.



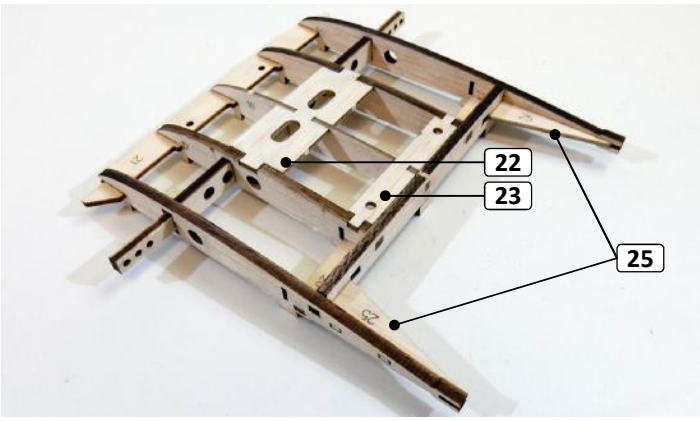
❑ **23.** Repeat the same steps as on the upper wing center section and dry-assemble bottom wing center section parts.



❑ **24.** Put center wing section parts onto paper template. Use the template with slots to keep ribs vertical. Align the dihedral brace **29** with template borders using ply “TEMP”. Use drops of CA to join the center wing section parts in place.

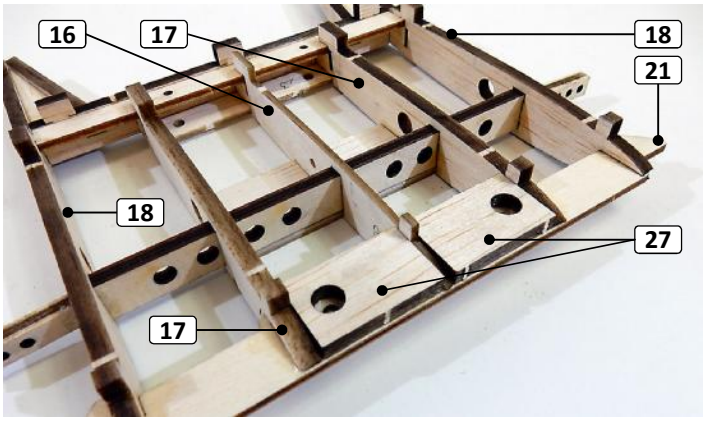


❑ **29.** Glue the parts **24** to the T.E. (trailing edge) **19**, to the reinforcements **25** and to the ribs **18**.

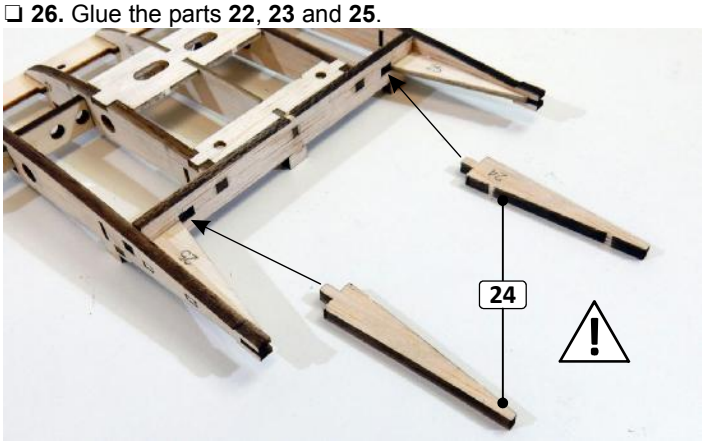


❑ **25.** Take the center wing section out of the template and glue all joints. Glue thoroughly, but sparingly.

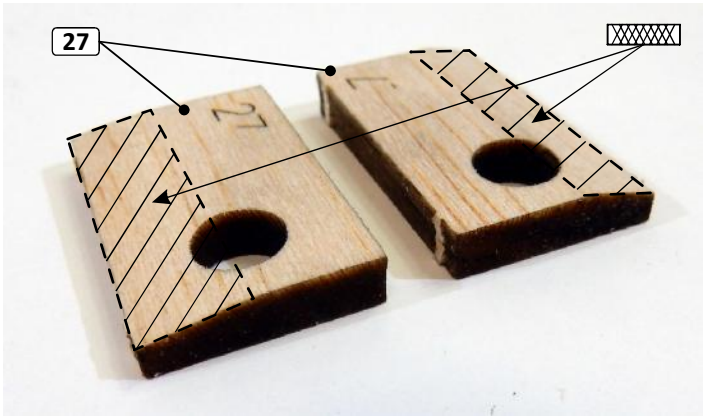
❑ **26.** Glue the parts **22**, **23** and **25**.



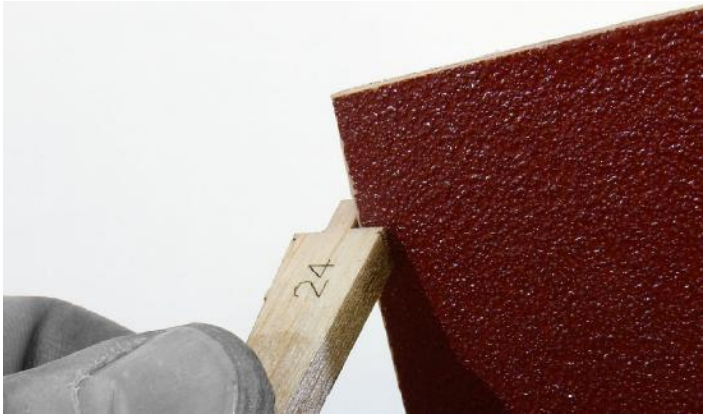
❑ **30.** Glue the two parts of filling **27** between the ribs **16** and **17** so that the holes in the filling **27** are above the holes in part **21**.



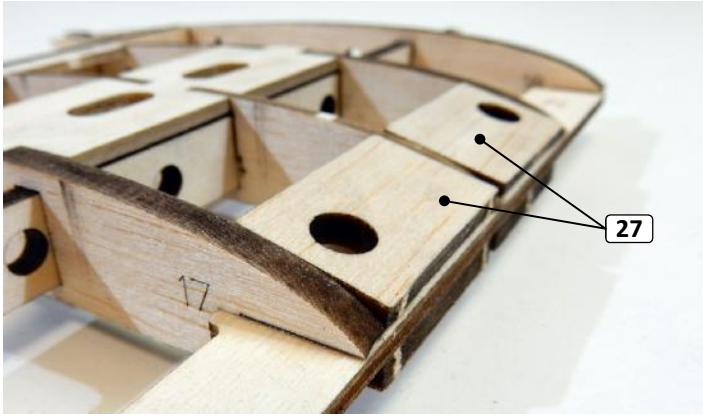
❑ **27.** Ribs **24** are glued to the back of the center wing section. Pay attention to their orientation, the bottom side is almost straight. The “tenon” on part **24** needs to be sanded first.



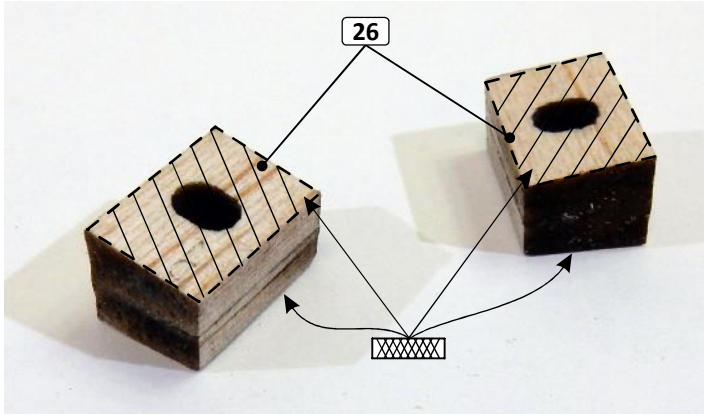
❑ **31.** Bevel the remaining two parts **27** at the edges. Make sure they are left and right.



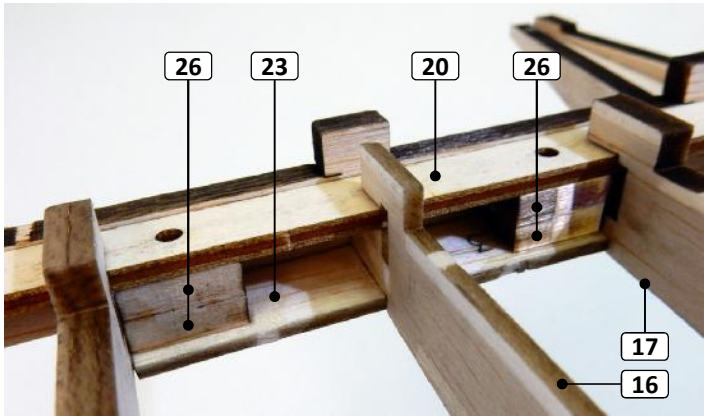
❑ **28.** Sand the front side of parts **24** to bevel according to the marks. **Warning!** One will be left and the other right.



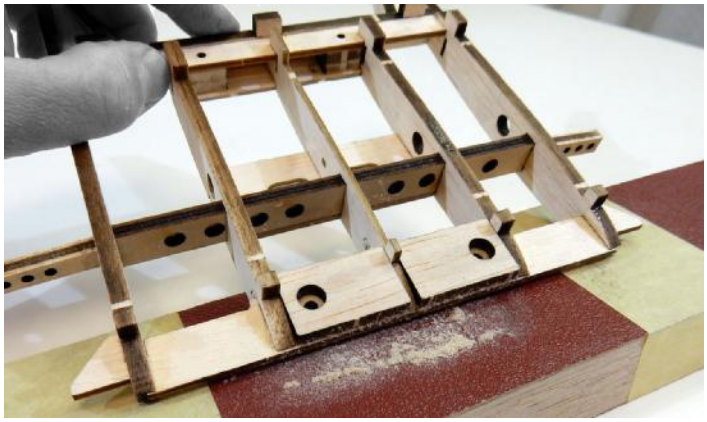
❑ **32.** Glue the sanded parts **27** from above between the ribs **16** and **17** so that the holes are above the holes in the part **21** and also so that the parts **27** are aligned with ribs surface.



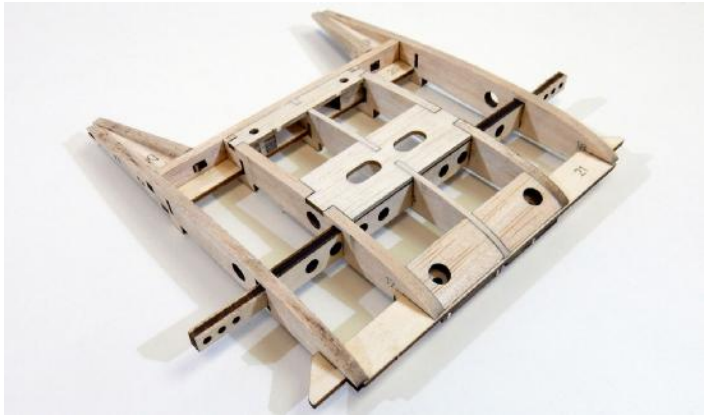
❑ **33.** Glue the two parts **26** together and sand them into a slight wedge.



❑ **34.** Glue the sanded parts **26** between parts **20** and **23**.

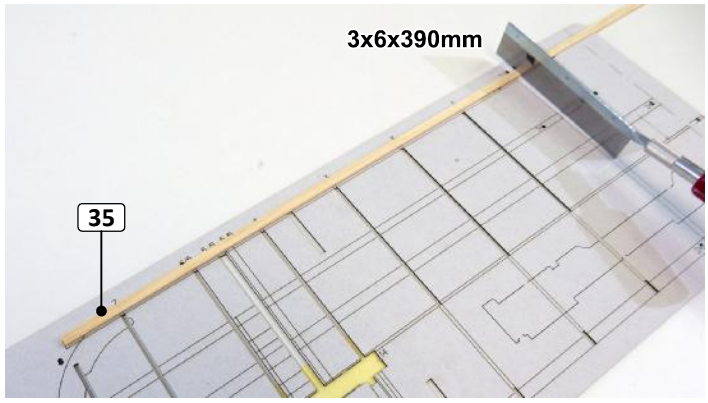


❑ **35.** Sand the filling **27** with the surface of the ribs. Apply paper masking tape on the sanding block to sand only where it is needed.

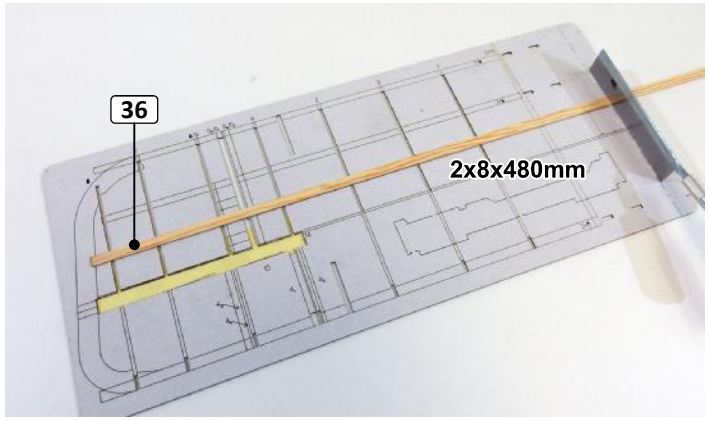


❑ **36.** Sand the entire upper surface to remove burnt areas as much as possible. Pay attention not to make holes or scratches. The bottom center wing section is ready to assemble the entire wing. The bottom surface stays unsanded!

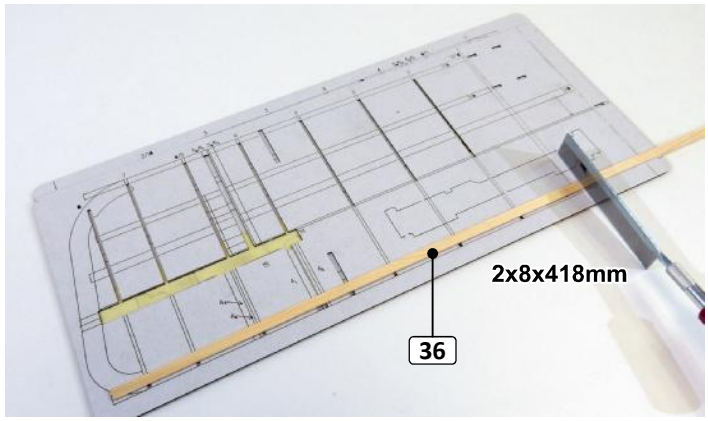
Wings assembling



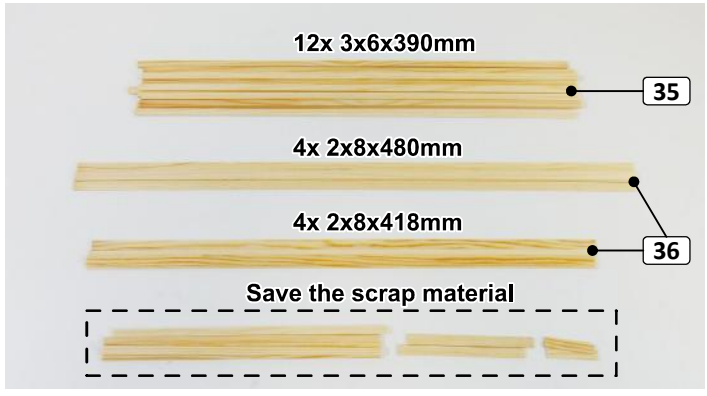
❑ **1.** Cut the spars **35** (3x6mm) to a length of 390mm, use the drawing of the spars on the template. We recommend a razor saw for cutting. You will make a total of 12 spars.



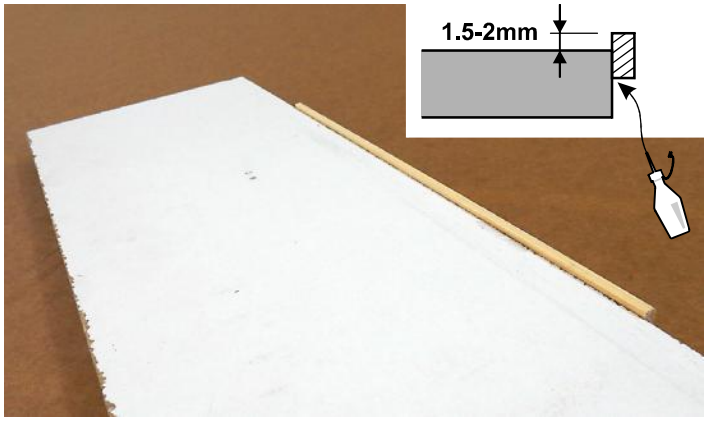
❑ **2.** Cut two spars **36** (2x8mm) to a length of 480mm, use the drawing of the spars on the template. We recommend a razor saw for cutting. You will make a total of 4 spars.



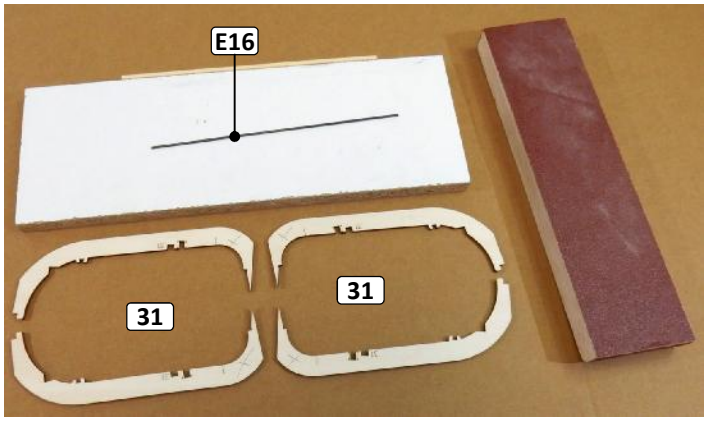
❑ **3.** Cut two spars **36** (2x8mm) to a length of 418mm, use the drawing of the spars on the template. We recommend a razor saw for cutting. You will make a total of 4 spars.



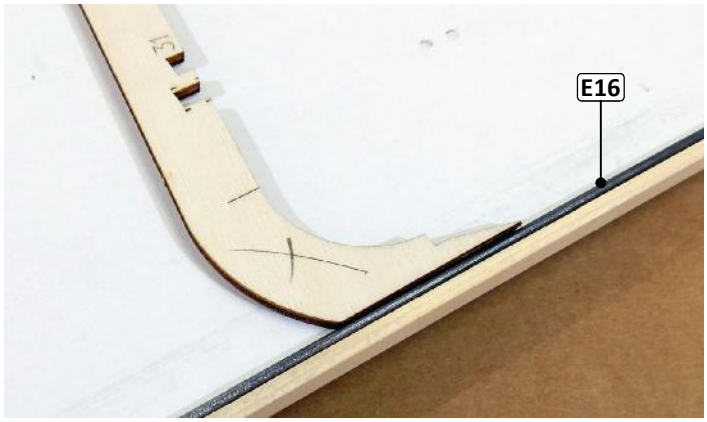
❑ **4.** You should have 12 spars 3x6x390, 4 spars 2x8x480mm and 4 spars 2x8x218mm. Save the scrap material!



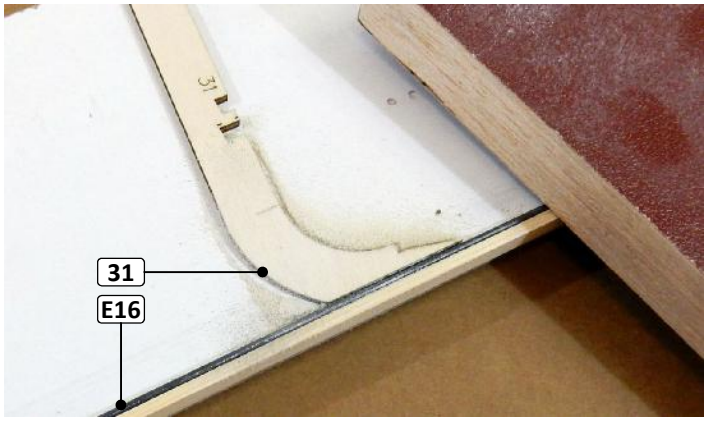
❑ **5.** Use some of the rest flat board, eg furniture laminated sheet with size approx. 13x35cm, glue the rest of the spar **35** from the side so that it protrudes 1.5-2mm. It will work as a stopper.



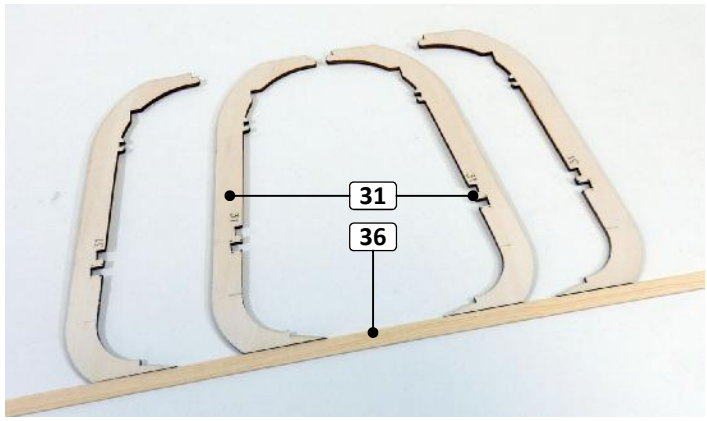
❑ **6.** Prepare the wing tips **31** and shaft **E16**. The bottom end part of the arc **31** needs to be sanded to a thickness of 2mm. Sand to the line marked about 30mm from the rear edge. We recommend marking the areas to be sanded with a pencil. The sanded surface will be on the bottom of the wings. You need two wing tips for the right side and two for the left side.



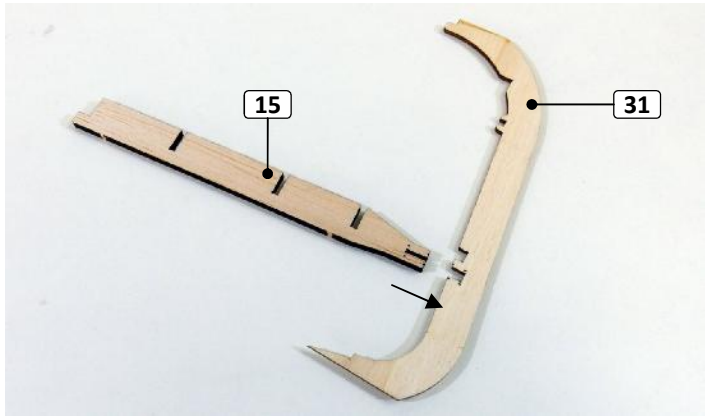
❑ **7.** You can use the **E16** shaft as a spacer. Sand the end of the wing tip **31** to a thickness of 2mm.



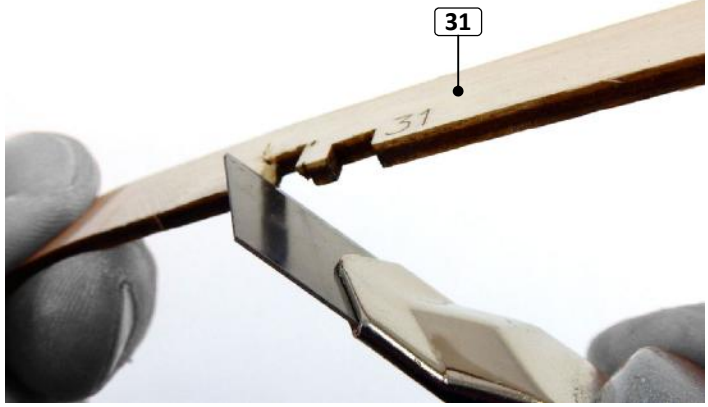
❑ **8.** Sand up to the shaft **E16**.



❑ **9.** Check the correct sanding by attaching it to the spar **36**. The thickness of the wing tip **31** and of the spar must be the same.

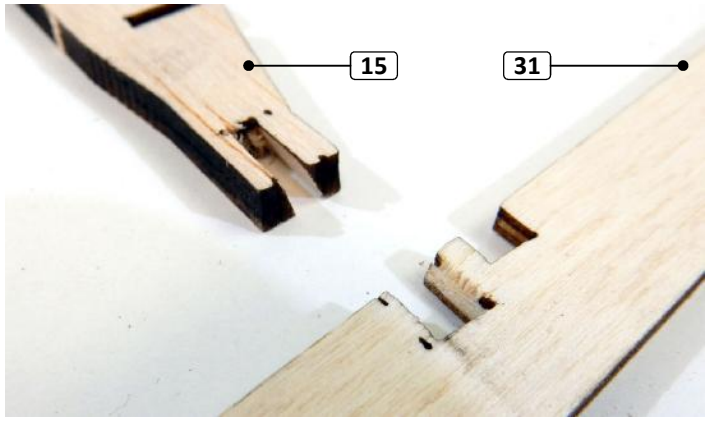


❑ **10.** Parts **15** and **31** fit together and are oblique to each other. The joint of the parts therefore need to be adjusted.

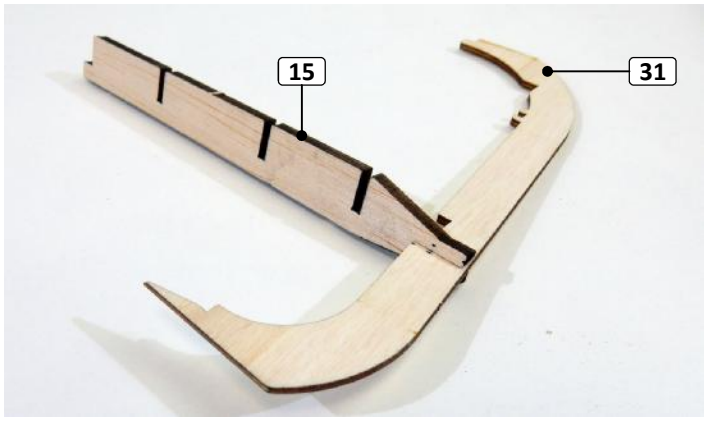


❑ **11.** Cut the edges diagonally with a knife according to the marks.

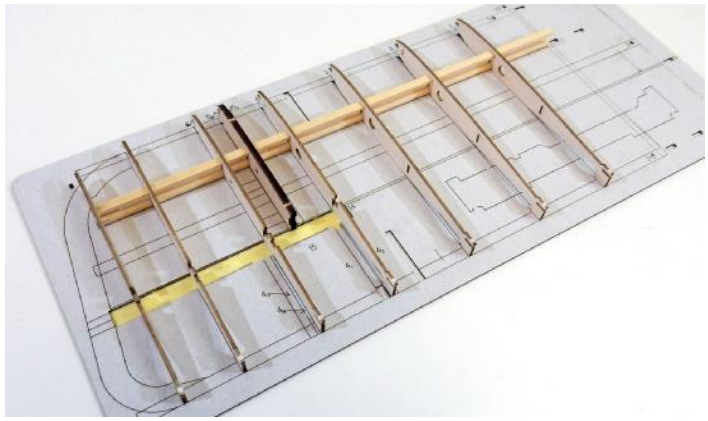
❑ **12.** Adjust all wing tips **31**. **Warning!** Trim the parts so that you have two wing tips for the left side and two for the right side.



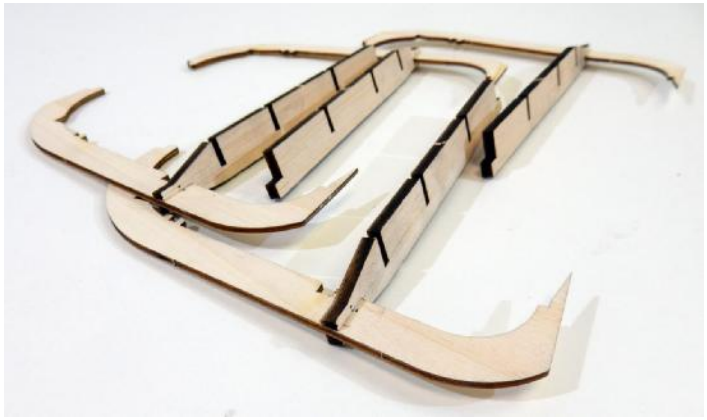
❑ **13.** Adjust all parts **15** in the same way. Warning! You must adjust two for the left side and two for the right side.



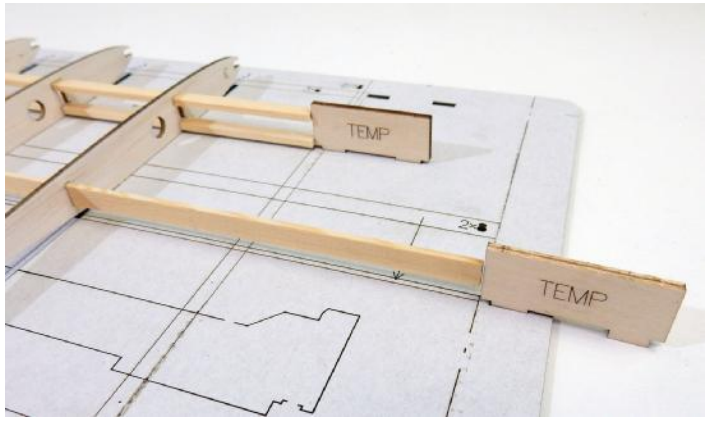
❏ **14.** Parts must fit easily. Don't glue!



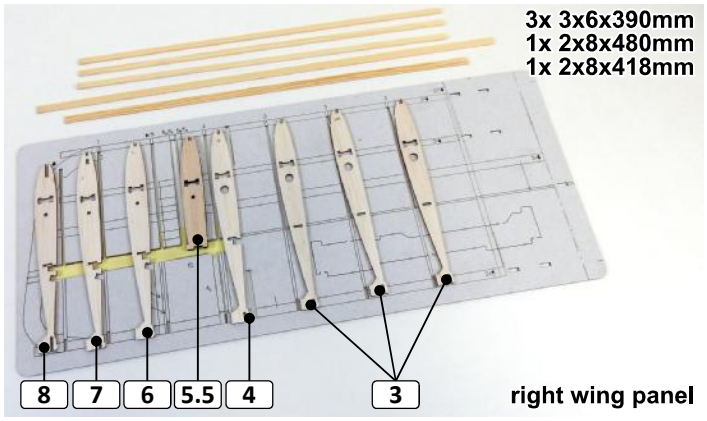
❏ **18.** Carefully insert the entire assembly into the holes on the template. The balsa ribs are fragile, be careful not to break the ends on T.E. side. Don't glue! The wing is assembled upside down.



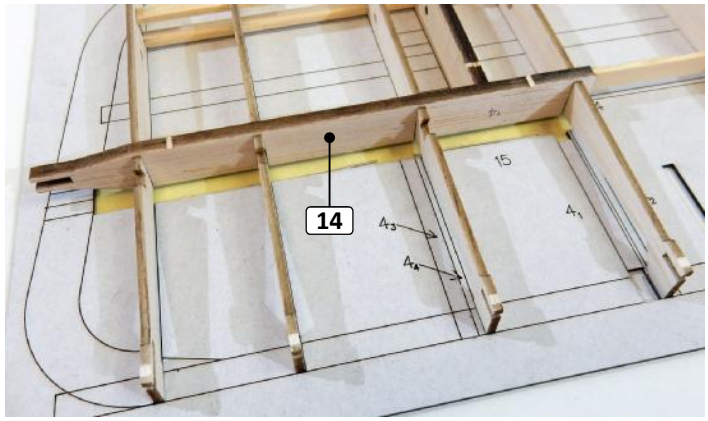
❏ **15.** Don't glue finished assemblies!



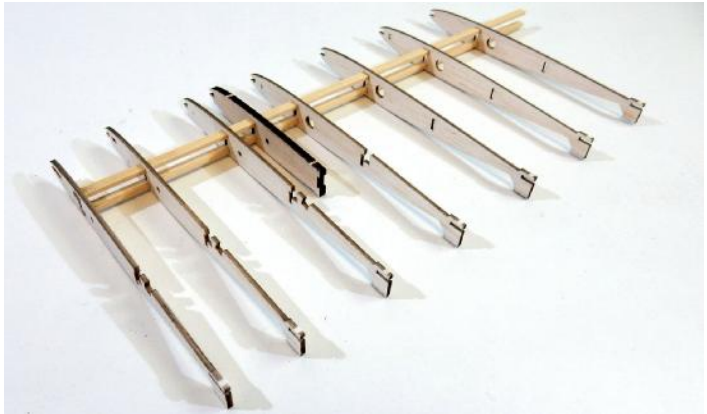
❏ **19.** Align the ends of the spars with the drawing on the template using the “TEMP” ply shape.



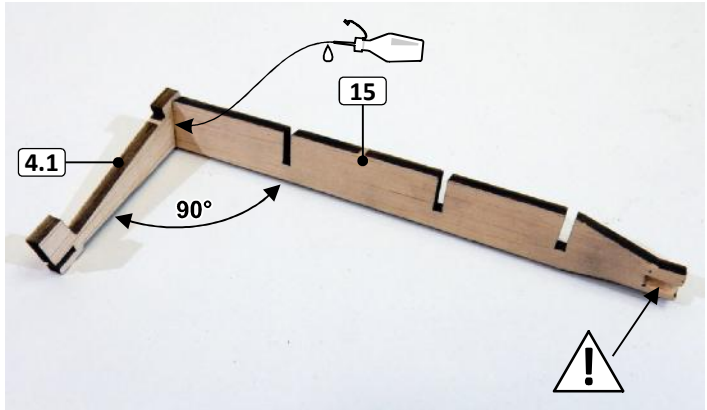
❏ **16.** Prepare the ribs and spars for the construction of the upper half wing panel according to the drawing.



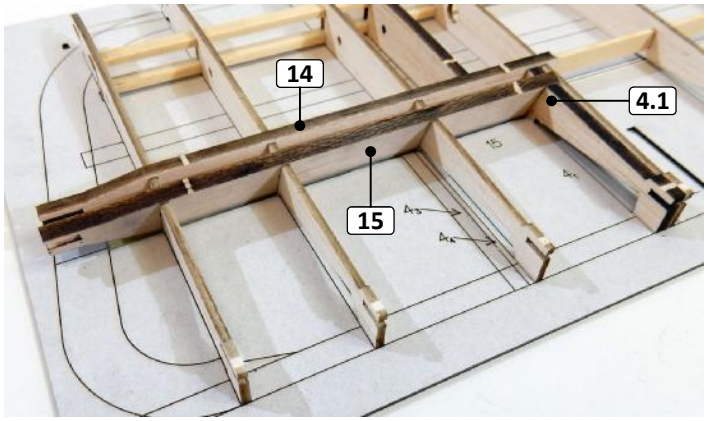
❏ **20.** Carefully insert part **14** into the slots in the ribs. Don't glue!



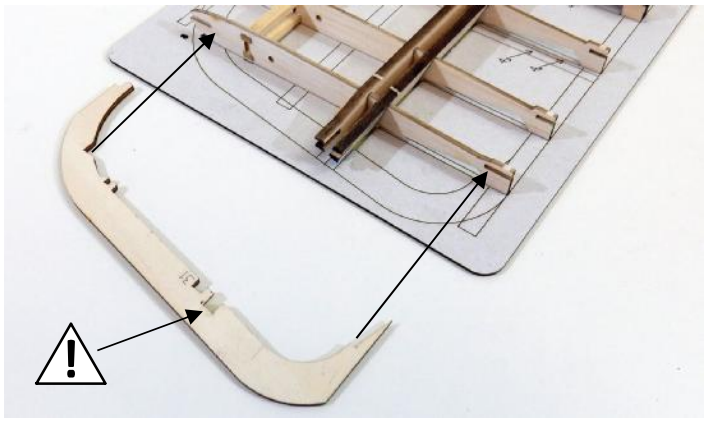
❏ **17.** Carefully thread the ribs onto the spars. You can slightly round the ends of the spars for easier threading. Don't glue!



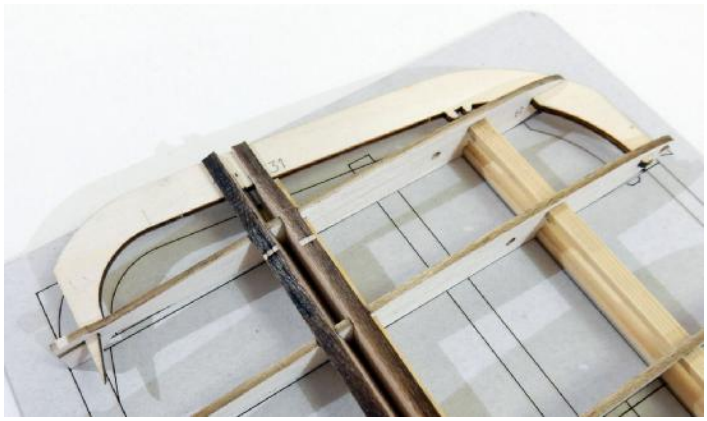
❏ **21.** Glue the rib **4.1** to part **15** with a drop of CA. Be careful to select part **15** with the correct cutout! Keep an angle of 90° between the parts.



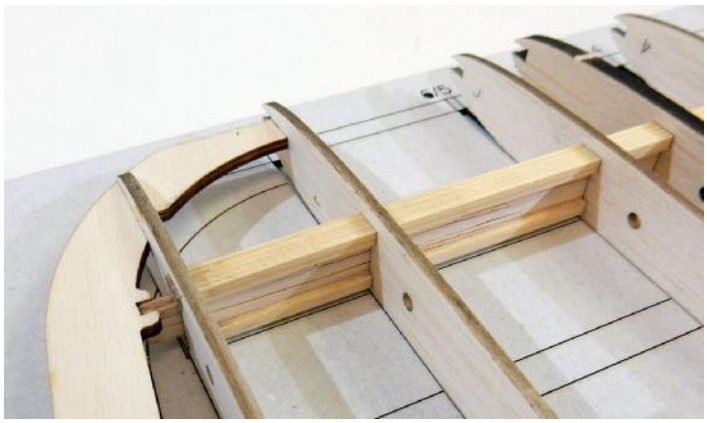
❑ **22.** Insert the assembly **15**+**4.1** into the structure. Don't glue!



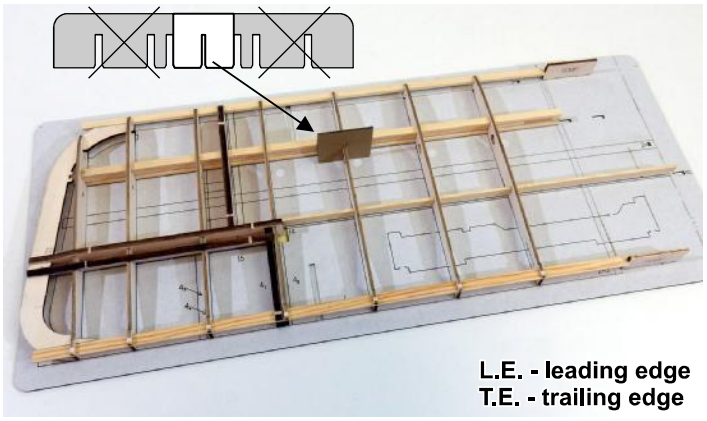
❑ **23.** Prepare the wing tip **31**. Be careful to select the wing tip with the correct cutout!



❑ **24.** Insert the wing tip **31** into the wing structure. Don't glue!

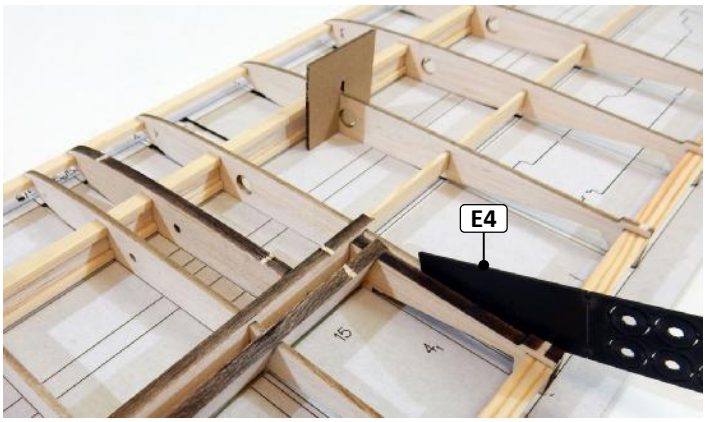


❑ **25.** Insert the shear web **32** between the front spars. Press the shear web **32** up to the slot in the wing tip **31**. Don't glue!

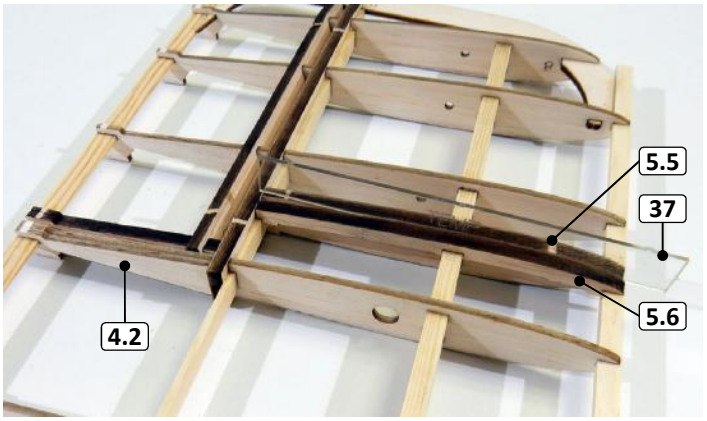


❑ **26.** Attach L.E. and T.E. Use "TEMP" ply shapes to align L.E. and T.E. with the drawing. Don't glue!

❑ **27.** Use the template with slots to keep ribs vertical.



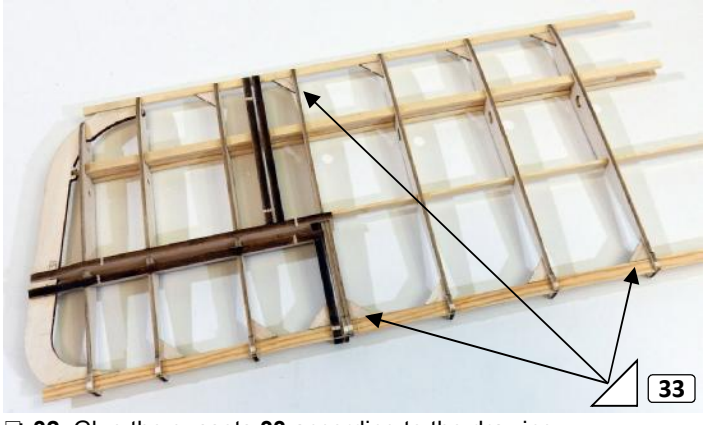
❑ **28.** Check the entire structure once more and glue all joints with drops of CA. Insert spacer "TEMP" from sheet **E4** between the ribs **4.1** and **4** to keep distance of 1mm.



❑ **29.** Remove the wing from the template.

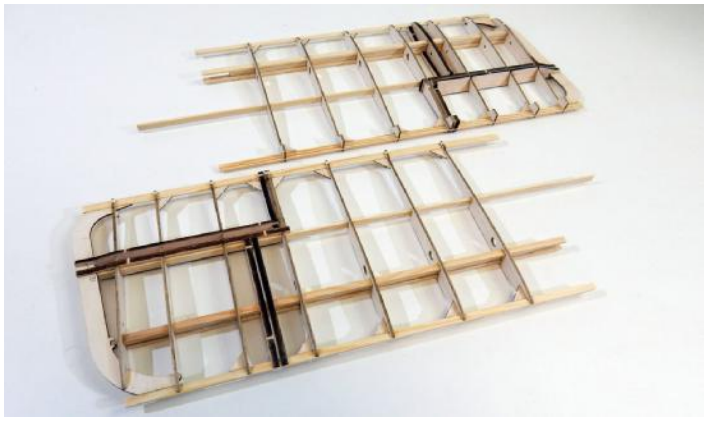
❑ **30.** Glue the rib **4.2**.

❑ **31.** Glue the rib **5.6**. Insert spacer "TEMP" from sheet **37** between the ribs **5.5** and **5.6** to keep a distance of 1.5mm.

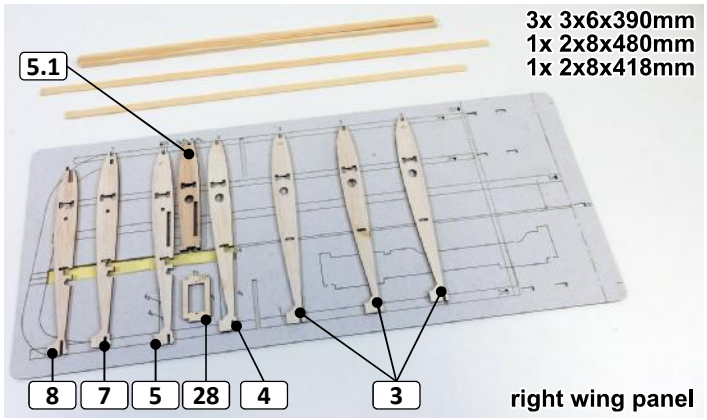


❑ **32.** Glue the gussets **33** according to the drawing.

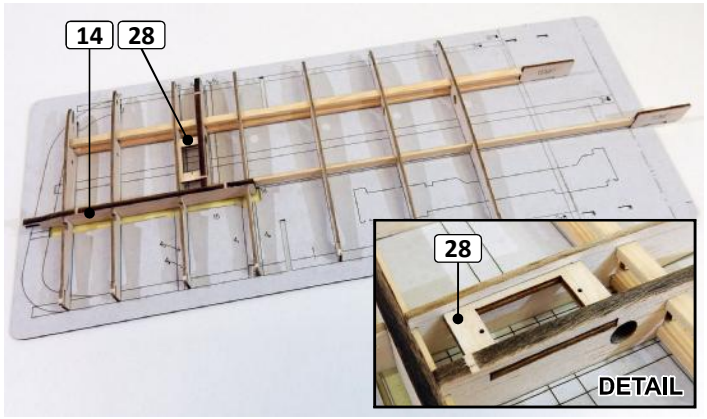
❑ **33.** Glue all joints of the whole wing structure perfectly.



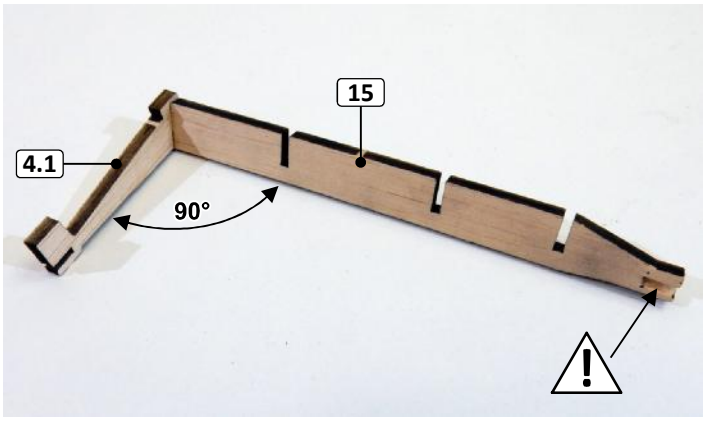
❑ **34.** Follow previous steps to assemble the next panel of the upper wing. Be careful not to confuse left and right wing panel!
Note: You can build both wing panels in two templates at once.
❑ **35.** With the same steps as you assembled the wing panels of the upper wing, you will assemble the wing panels of the bottom wing. The steps are similar, so the instructions are shorter and only the differences are highlighted.



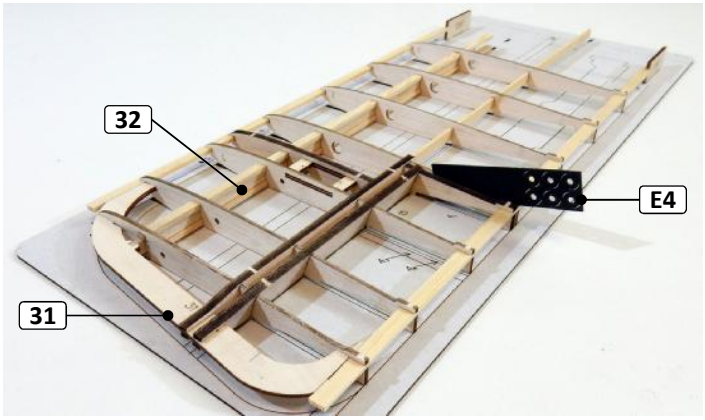
❑ **36.** Prepare the ribs and spars for the construction of the bottom half wing panel according to the drawing.



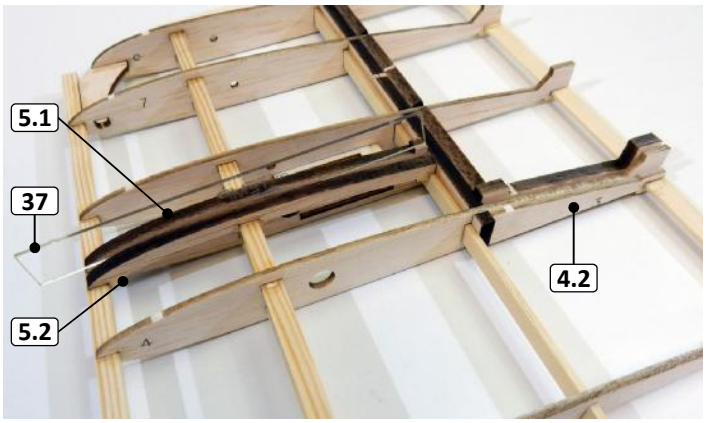
❑ **37.** Carefully thread the ribs onto the spars. You can slightly round the ends of the spars for easier threading. Don't glue!
❑ **38.** Be sure to insert the aileron servo mount **28** between the ribs **5** and **5.1**. Don't glue!
❑ **39.** Carefully insert the entire assembly into the holes in the template. The balsa ribs are fragile, be careful not to break the ends on T.E. side. Don't glue! The wing is assembled upside down.
❑ **40.** Align the ends of the spars with the drawing on the template using the “TEMP” ply shape.
❑ **41.** Carefully insert part **14** into the slots in the ribs. Don't glue!



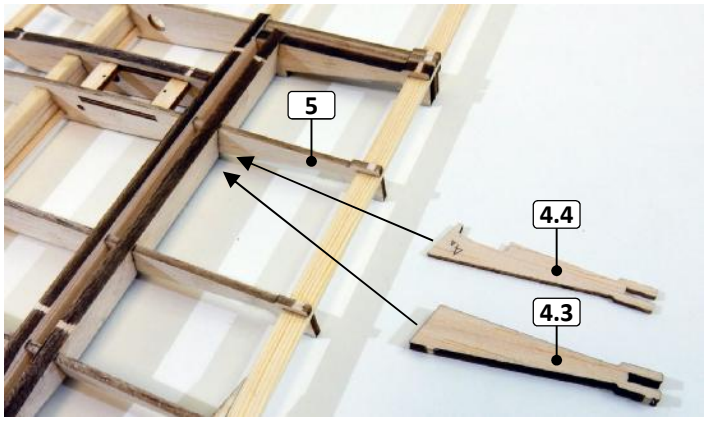
❑ **42.** Glue the rib **4.1** to part **15** with a drop of CA. Be careful to select part **15** with the correct cutout! Keep an angle of 90° between the parts.



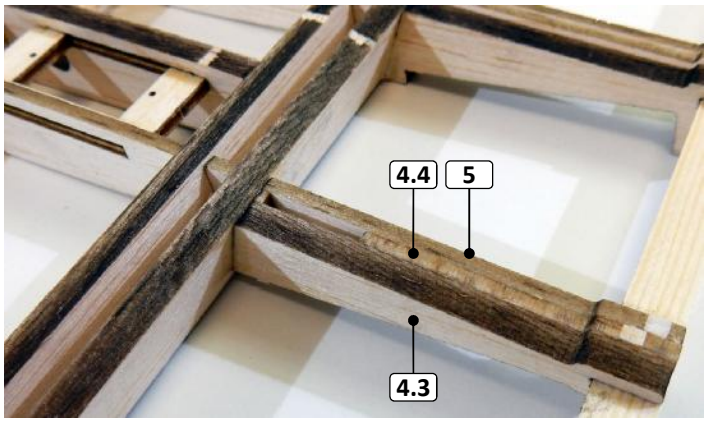
❑ **43.** Insert assembly **15**+**4.1** into the structure. Don't glue!
❑ **44.** Prepare the wing tip **31**. Be careful to select the wing tip with the correct cutout!
❑ **45.** Insert the wing tip **31** into the wing structure. Don't glue!
❑ **46.** Insert the shear web **32** between the front spars. Presst the shear web **32** up to the slot in the wing tip **31**. Don't glue!
❑ **47.** Attach L.E. (leading edge) and T.E. (trailing edge). Use “TEMP” ply shapes to align L.E. and T.E. with drawing. Don't glue!
❑ **48.** Use template with slot to keep ribs vertically.
❑ **49.** Check the entire structure once more and glue all joints with drops of CA. Insert spacer “TEMP” from sheet **E4** between the ribs **4.1** and **4** to keep distance of 1mm.



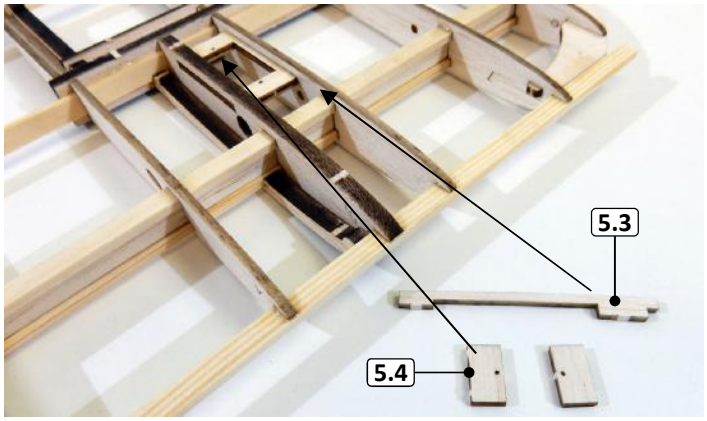
❑ **50.** Remove the wing from template.
❑ **51.** Glue the rib **4.2**.
❑ **52.** Glue the rib **5.2**. Insert spacer “TEMP” from sheet **37** between the ribs **5.1** and **5.2** to keep distance of 1.5mm.



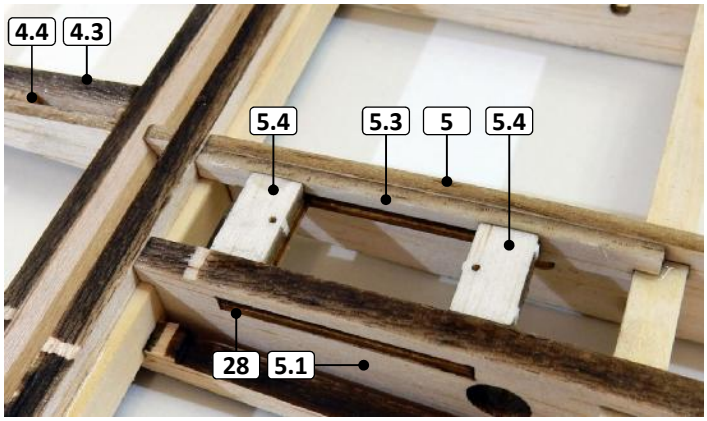
❑ **53.** Prepare ribs **4.3** and **4.4** to reinforce rib **5** in the aileron. The aileron control horn will be glued to this reinforcement later.



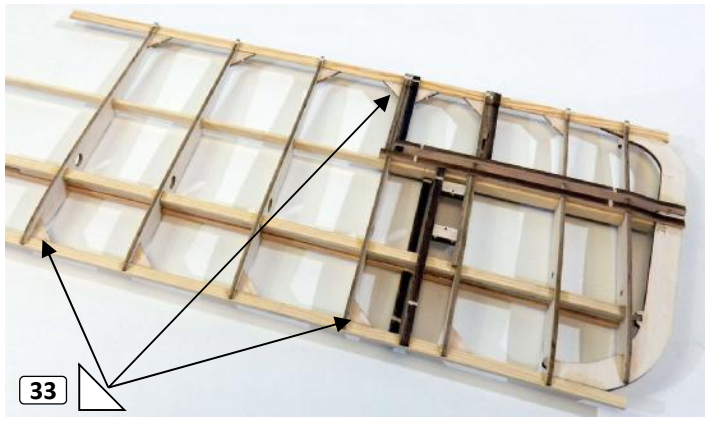
❑ **54.** Glue ribs **4.3** and **4.4** to rib **5** and to the aileron L.E. **15**. **Warning!** Be careful to glue the ribs on the correct side of the rib **5**.



❑ **55.** Prepare parts **5.3** and 2pcs **5.4**, which will be glued around servo mount **28**.

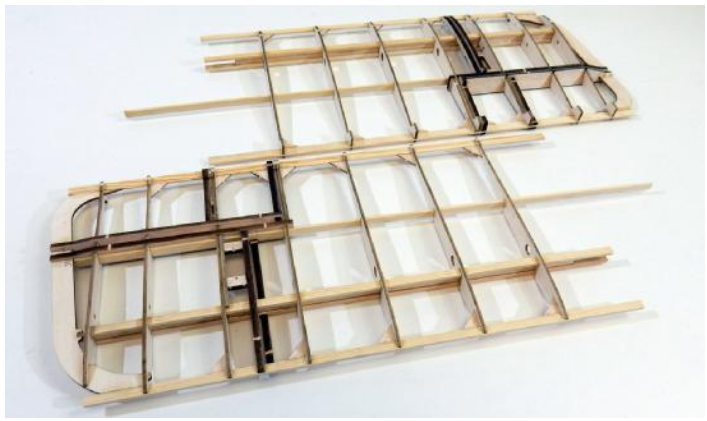


❑ **56.** Glue parts **5.3** and 2pcs **5.4** to the servo mount **28** and to the other parts of the wing. Align parts **5.4** with the edges of the servo mount **28** when gluing.

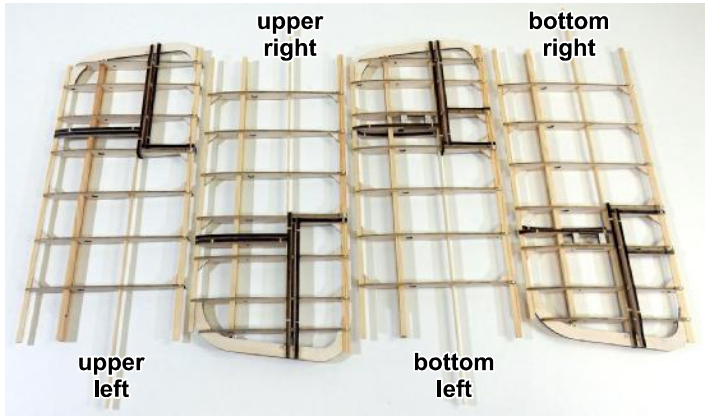


❑ **57.** Glue the gussets **33** according to the drawing.

❑ **58.** Glue all joints of the whole wing structure perfectly.



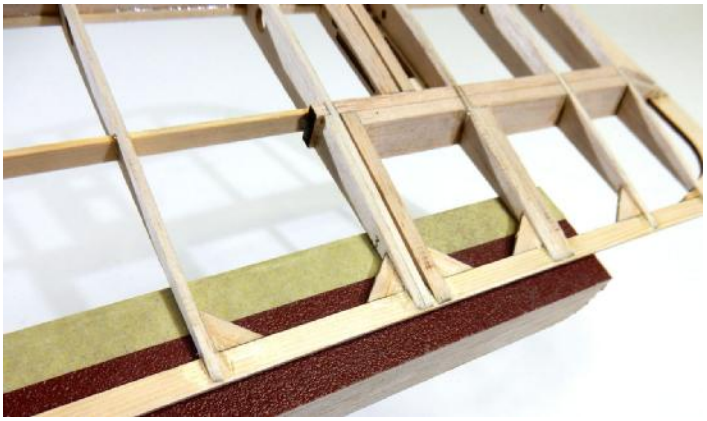
❑ **59.** Follow previous steps to assemble the next panel of the upper wing. Be careful not to confuse left and right wing panel! **Note:** You can build both wing panels in two templates at once.



❑ **60.** You have completed the construction of the wing halves. Probably the most difficult part of assembling the model will follow - sanding the wing structure. When sanding, a larger amount of balsa dust is generated. We recommend using a respirator when sanding.

❑ **61.** Carefully cut off the supports from all ribs.

❑ **62.** When cutting the supports, leave a larger overlap. You'll sand it in a while.

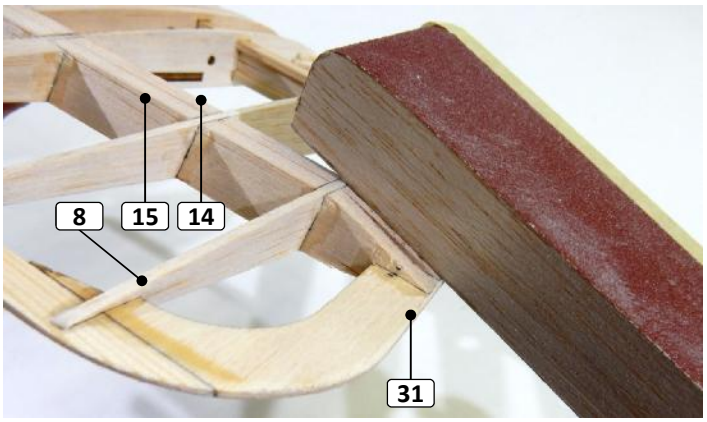


❑ **66. Warning**, the bottom side is arched inwards. Use a narrower sanding block.

❑ **63.** Apply paper tape onto the sanding block. This will prevent you from sanding areas where you do not want to sand.

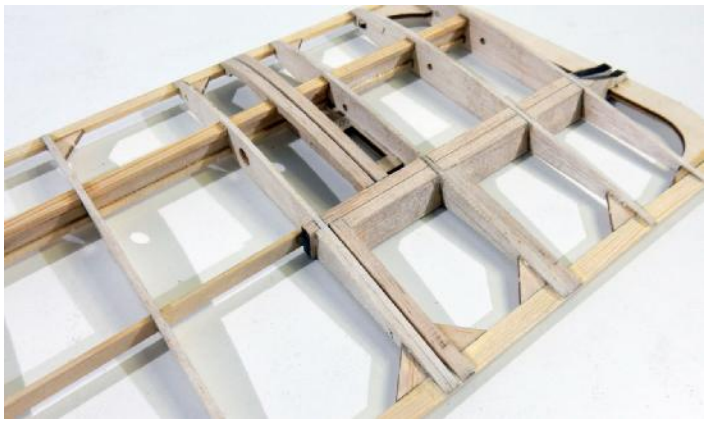
❑ **67.** Cut out L.E. and T.E. ends.

❑ **64.** Sand off the high spots on ribs around the T.E. Sand the ribs until follow the T.E.

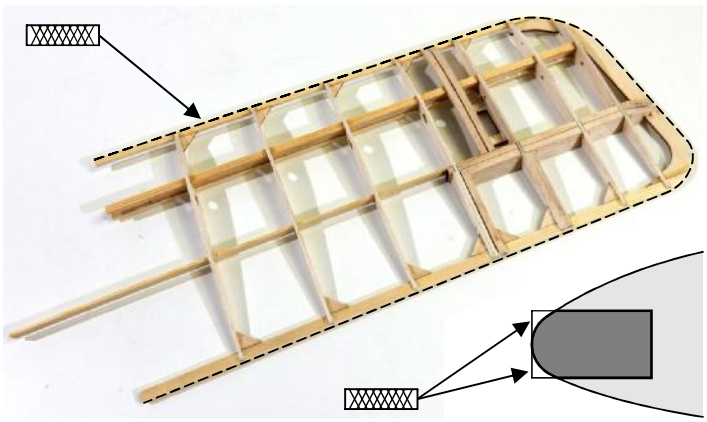


❑ **68.** Round off the wing tip **31** edges.

❑ **69.** Sand the ends of the wing false T.E. **14** and aileron L.E. **15**. Use a smaller sanding block. The sanded edges must be straight.

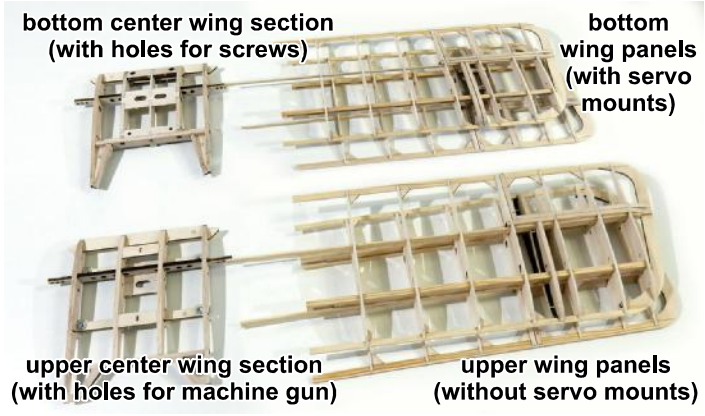


❑ **65.** Flat sand the entire wing to blend the surfaces and remove burnt areas as much as possible. Pay attention not to make holes or scratches, or you will lose shape of the ribs.

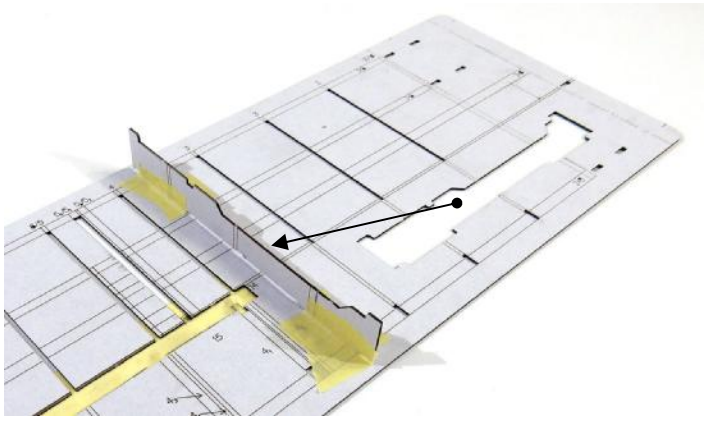


❑ **70.** Round off the edges along all wing. It is easier to round off the edges now than on the entire finished wing.

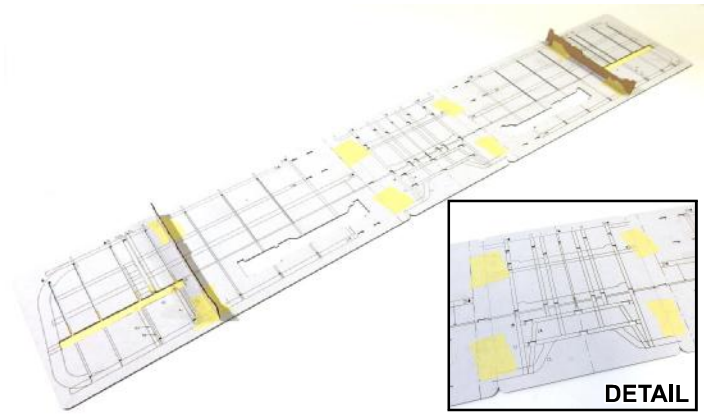
❑ **71.** Follow steps *61-70* with other wing panels.



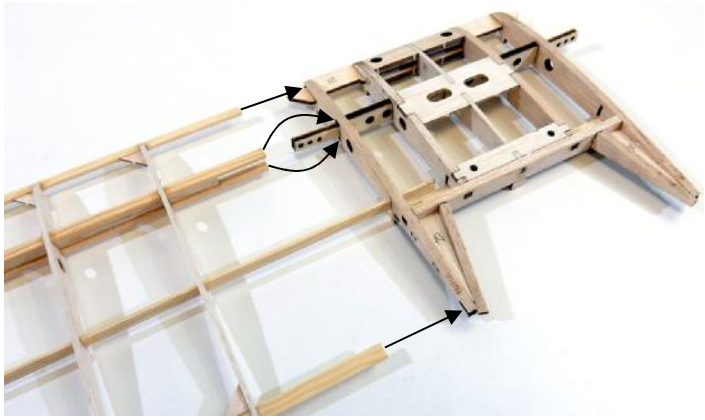
❑ **72.** Prepare the parts of the wings. Be careful not to put the bottom wing halves to the center wing section of the upper wing and vice versa. Follow the drawing.



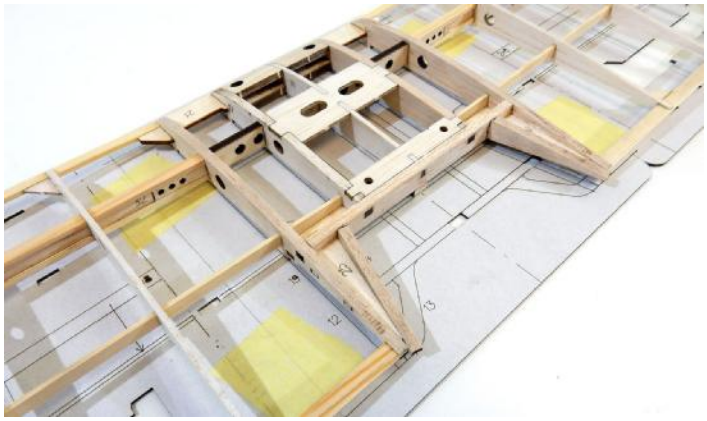
❑ **73.** Assemble the template. Cut out the support and tape it to the holes with paper tape. Assemble the template for both halves of the wing.



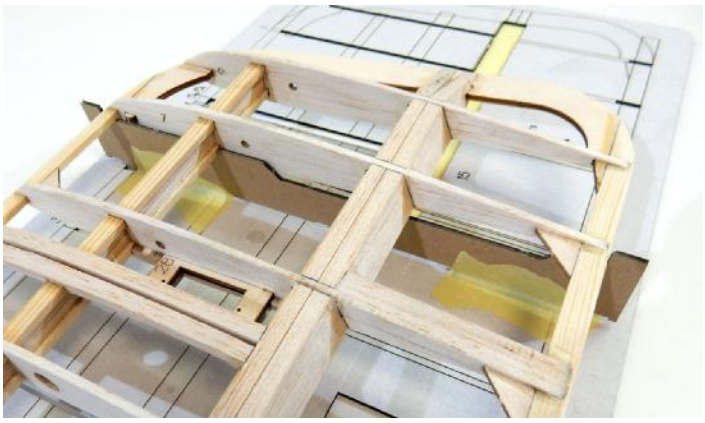
❑ **74.** Assemble the template from all parts (halves, center). Tape everything with paper tape together.



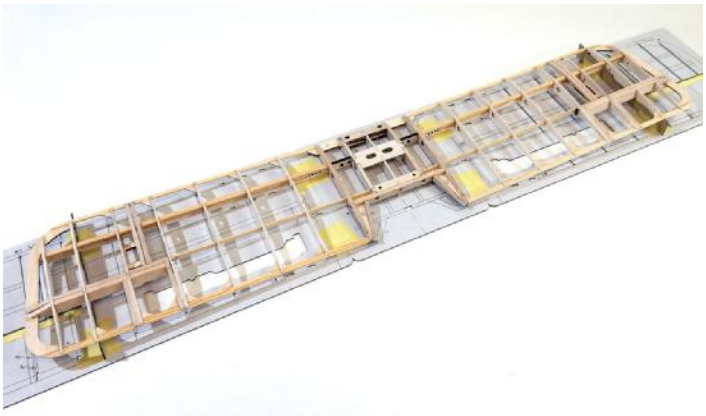
❑ **75.** Attach the wing panels into the center wing section. Slide the spars into holes in the center wing section. Don't glue!



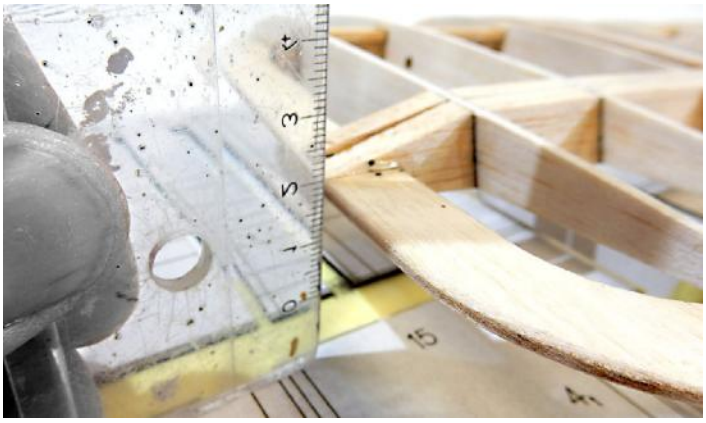
❑ **76.** Insert the assembled wing into the template. The supports that remain in the center wing section will fit into the holes of the template.



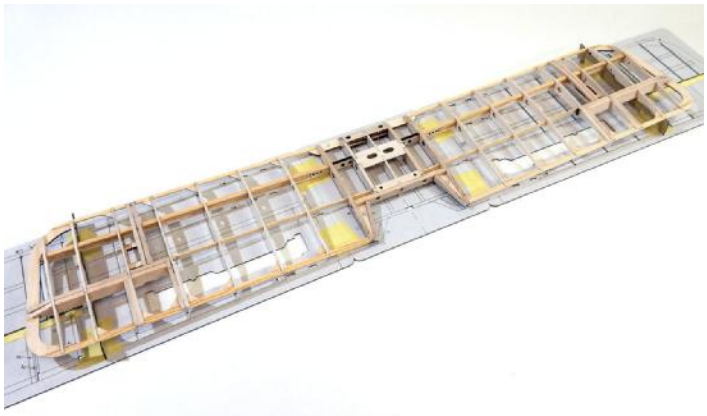
❑ **77.** The wing must fit exactly into the template. If something does not fit, adjust the length of the spars that are inserted in the center wing section.



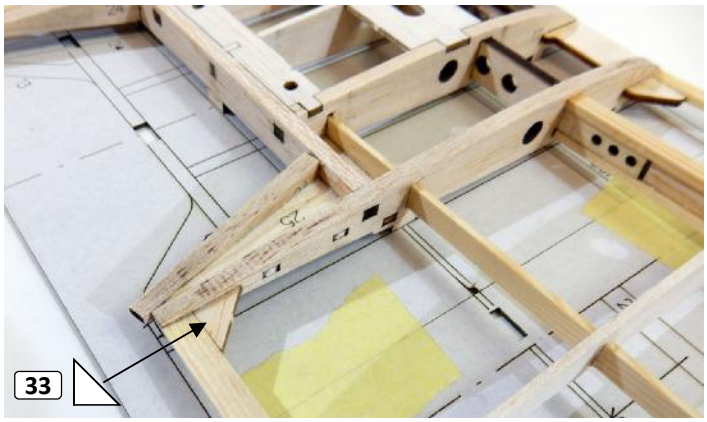
❑ **78.** Take real care of the alignment of the wing. Everything must fit perfectly. Don't glue yet!



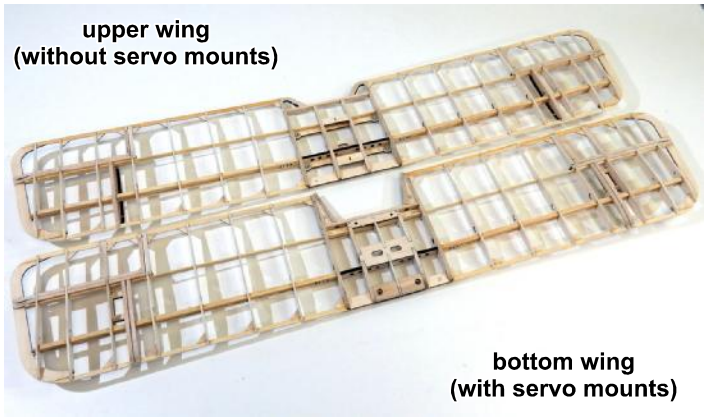
❑ **79.** To be sure, you can check that the wing tip is the same height on both sides.



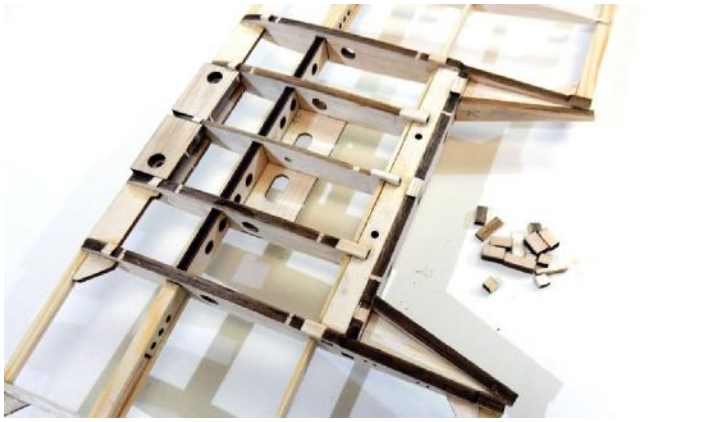
❑ **80.** Now you can glue all the joints of the wing panels and the center wing section. All you need is a small amount of glue so it doesn't get stuck to the template.



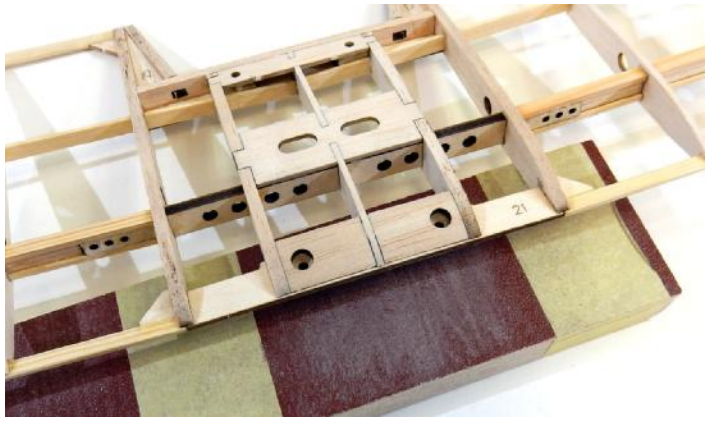
❑ **81.** Glue the gussets **33** according to the drawing to both sides of the center wing section.



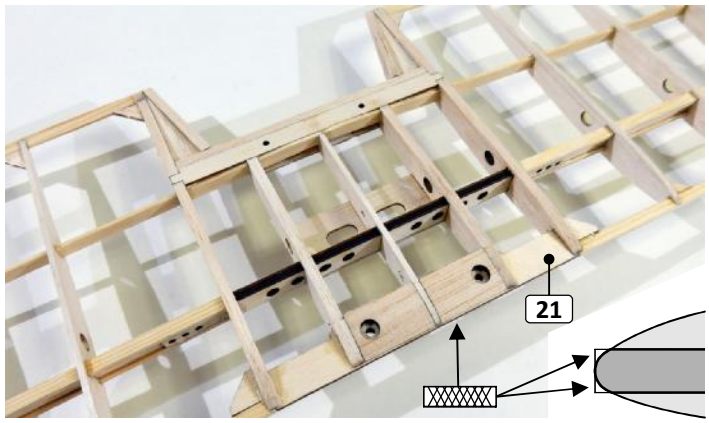
❑ **82.** Follow previous steps *75-81* to complete next wing.



❑ **83.** Cut off the supports on the bottom side of the both center wing sections.

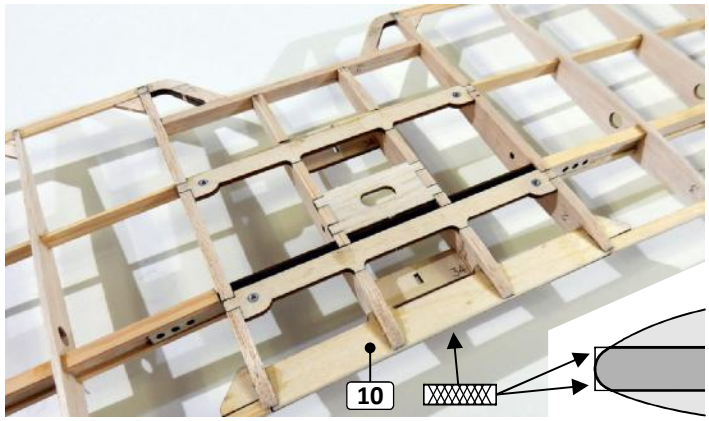


❑ **84.** Flat sand the bottom surface of the center wing section. Again, the tape on sanding block helps you to sand only where it is needed.



❑ **85.** Sand the L.E. and T.E. to blend with the center wing section.

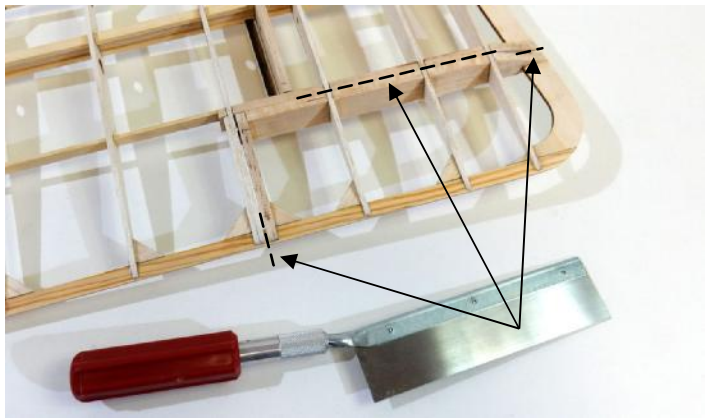
❑ **86.** Round off the center wing section L.E. **21**.



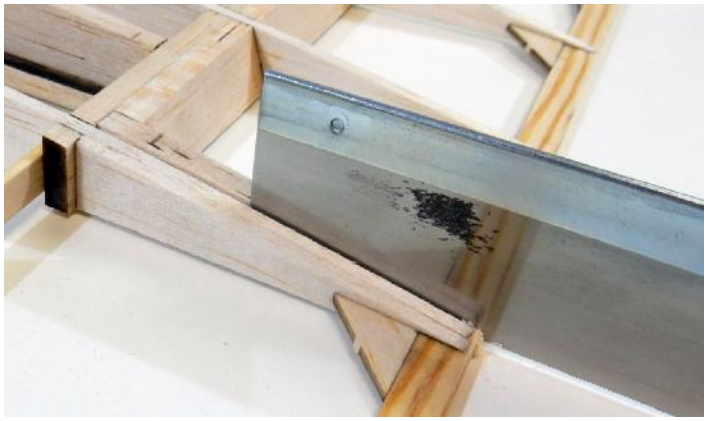
❑ **87.** Flat sand the bottom surface of the center wing section including nuts protruding above the surface.

❑ **88.** Sand the L.E. and T.E. to blend with the center wing section.

❑ **89.** Round off the center wing section L.E. **10**.



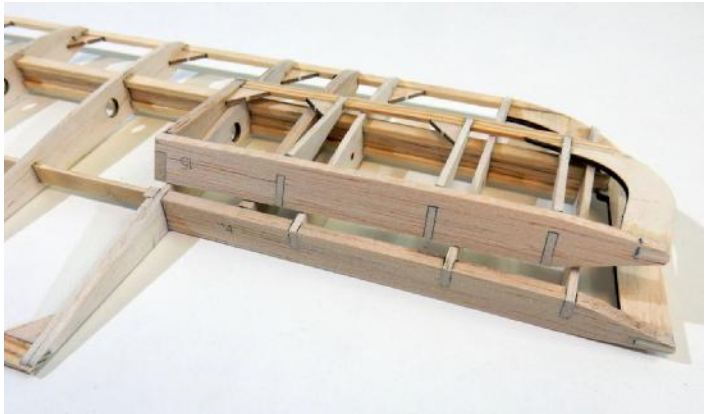
❑ **90.** The ailerons will be cut off from the sanded wing.



❑ **91.** Cut the T.E.

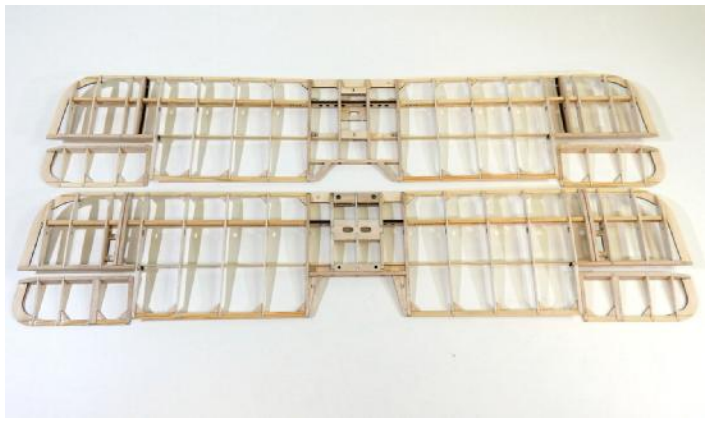
❑ **92.** Cut the ribs. Start as shown on the picture.

❑ **93.** Finally, cut off the wing tip 31. The aileron is separated.



❑ **94.** Sand the wing around the aileron place and aileron edges to blend the surfaces and remove high spots.

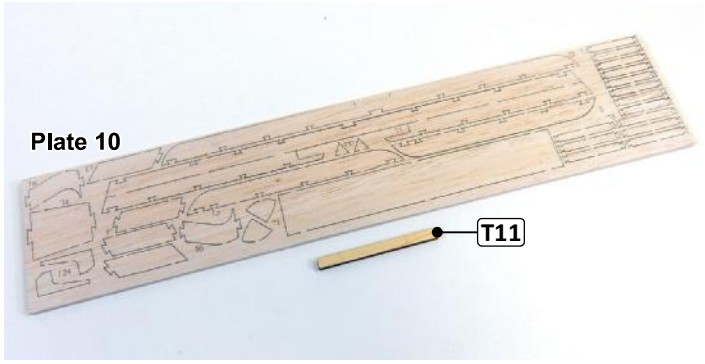
❑ **95.** Sand the aileron L.E. **15** to keep a gap of approx. 0.8-1mm between the wing and aileron. Wing T.E. must be aligned with aileron T.E.



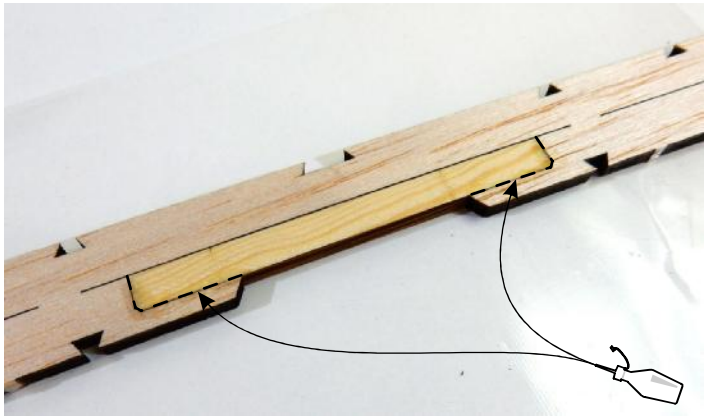
❑ **96.** Follow previous steps *91-95* to adjust remaining ailerons. This completes the construction of the wing and it is ready for covering.
Warning! The ailerons are not the same. Bottom wing ailerons have reinforcement to insert the aileron horns.

Notes:

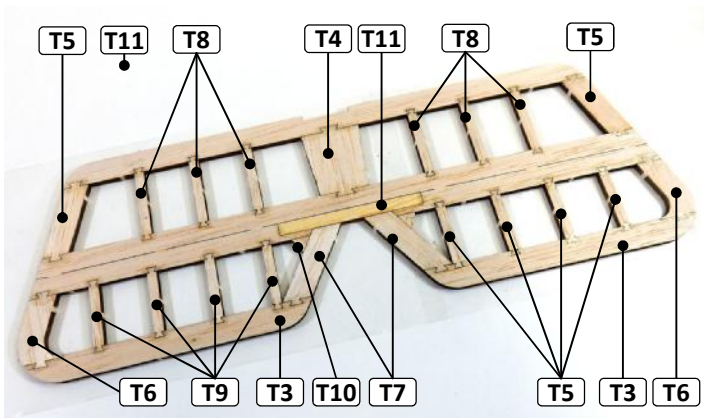
Assembling horizontal stabilizer



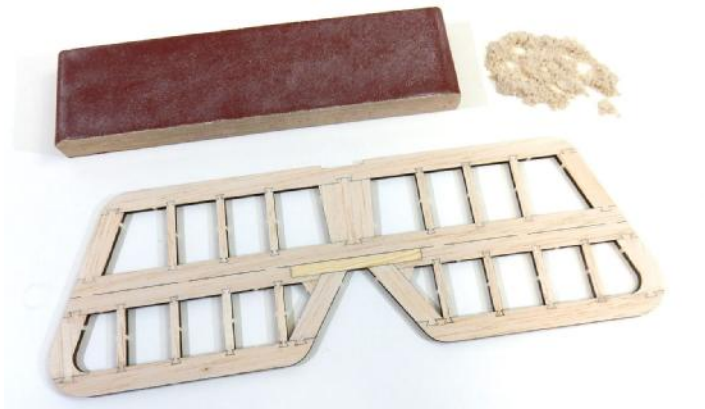
❑ **1.** Prepare the parts for assembling the horizontal stabilizer. Lay the parts over the building board covered with waxed paper or plastic wrap.



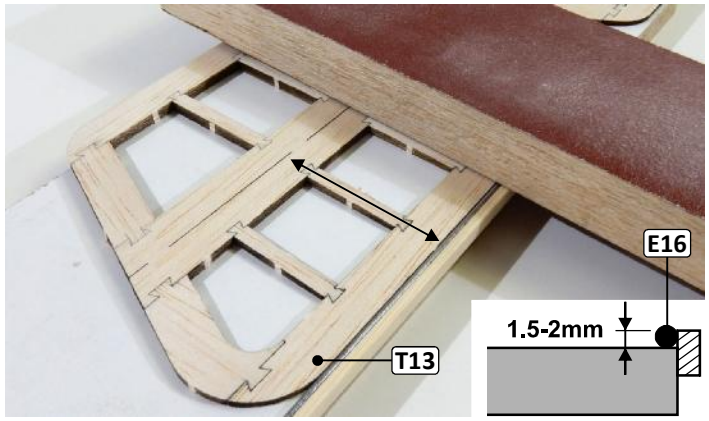
❑ **2.** Glue the joiner **T11** into the balsa stick **T1**. Use glue only on the ends of joiner **T11** as shown on the picture.



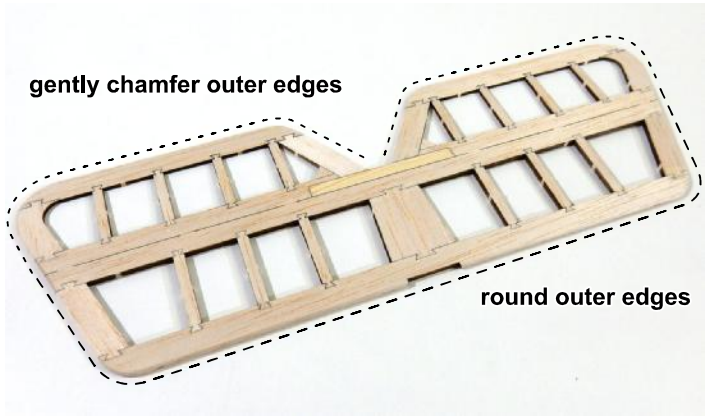
❑ **3.** Dry-assemble stab/elevator construction. When satisfied with the fit, glue in place. Don't forget to glue gussets **T10**.



❑ **4.** Flat sand the stab/elevator assembly on both sides. We recommend using a respirator when sanding.



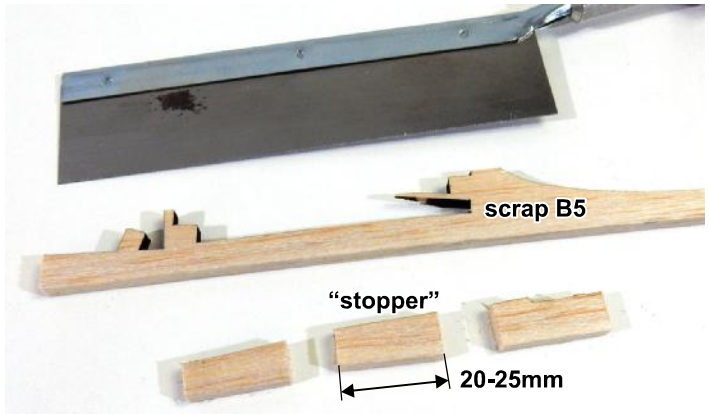
❑ **5.** Taper the elevator with sanding block. You can sand only one side. Use the set up you made before during assembling the wing with spacer made from shaft **E16**.



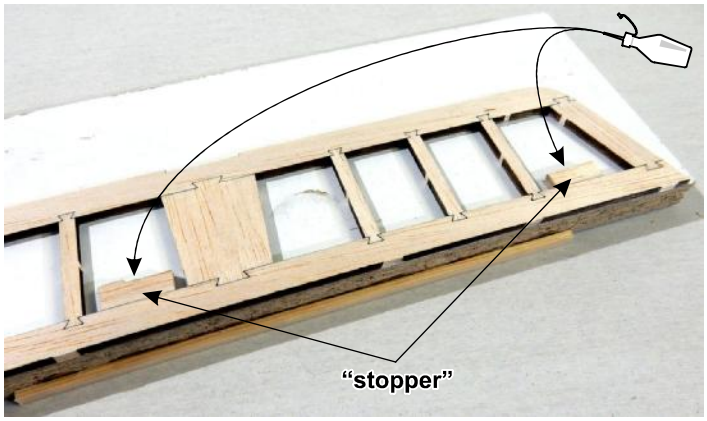
❑ **6.** Sand outer edge to remove burnt areas.

❑ **7.** Round L.E. and tip edges, gently chamfer other outer edges.

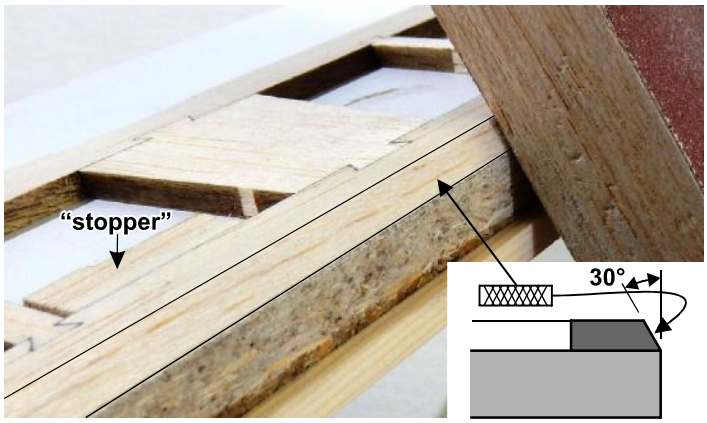
❑ **8.** Carefully separate the stab from the elevator.



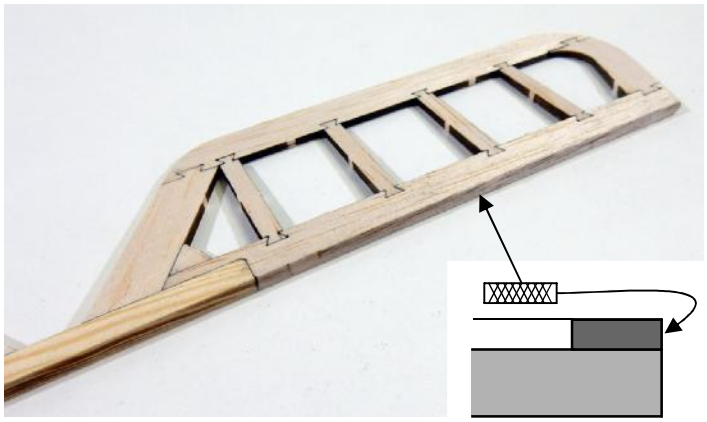
❑ **9.** Take scrap of balsa 5mm thickness and cut a few pieces of “stoppers” with length approx. 20-25mm.



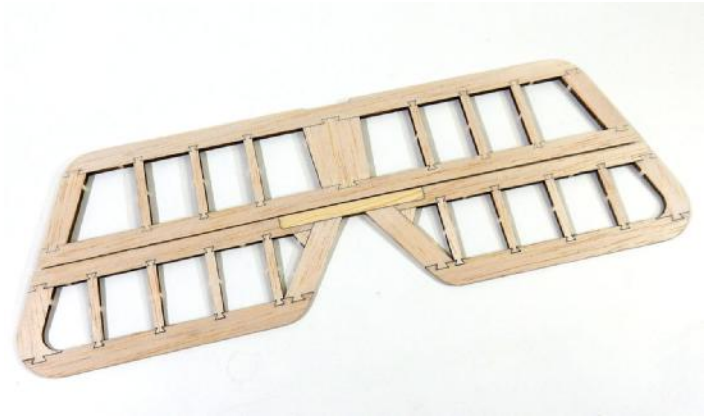
❑ **10.** Align stab T.E. with board edge and glue "stoppers" to the board.



❑ **11.** Sand stab T.E. in angle aprox. 30°. Use board edge as a guide for the sanding block.

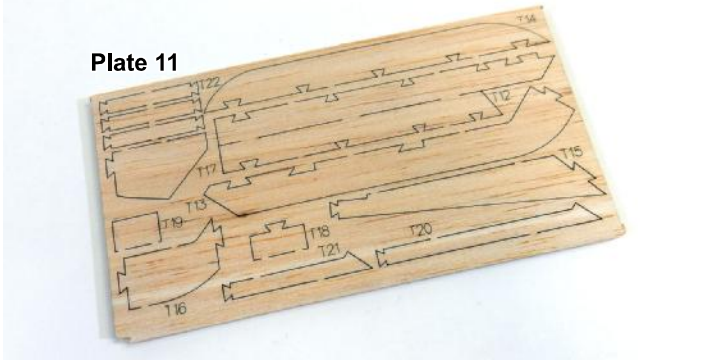


❑ **12.** Sand the elevator L.E. to be straight and to remove burnt areas.

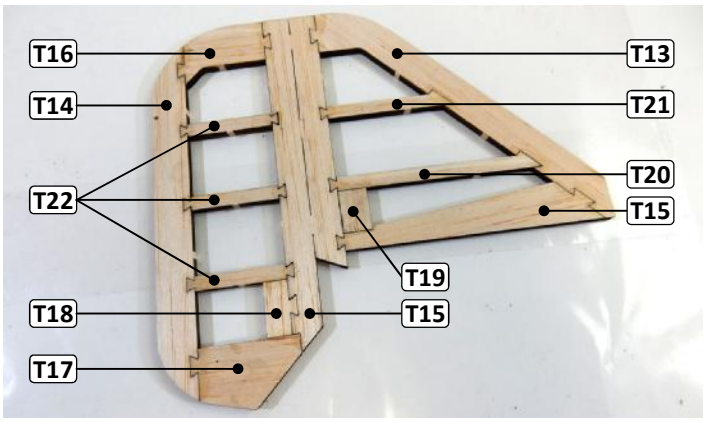


❑ **13.** Stab/elevator are ready for covering. Check that the stab T.E. and elevator L.E. edges are perfectly straight. If not, repair it.

Assembling vertical stabilizer

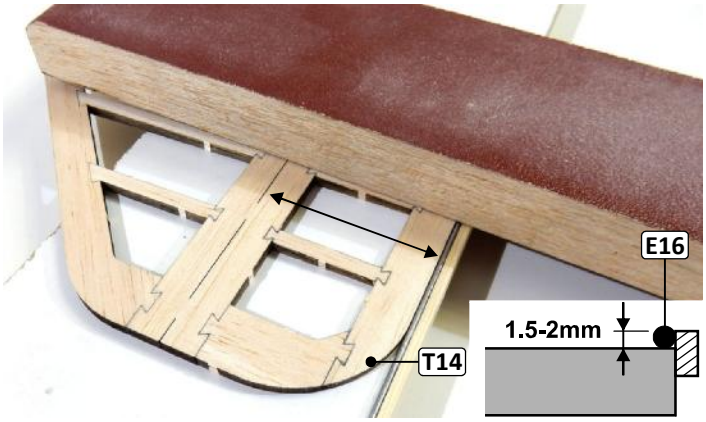


❑ **1.** Prepare the parts for assembling the vertical stabilizer. Lay the parts over the building board covered with waxed paper or plastic wrap.

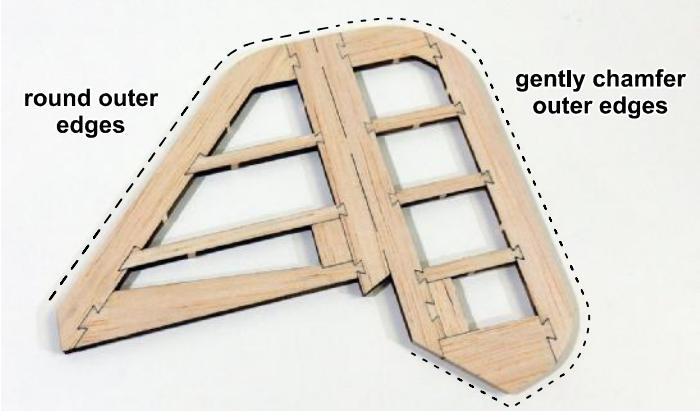


❑ **2.** Dry-assemble stab/elevator construction. When satisfied with the fit, glue in place. Don't forget to glue reinforcements **T19** and **T18**.

❑ **3.** Flat sand the stab/elevator assembly on both sides. We recommend using a respirator when sanding.



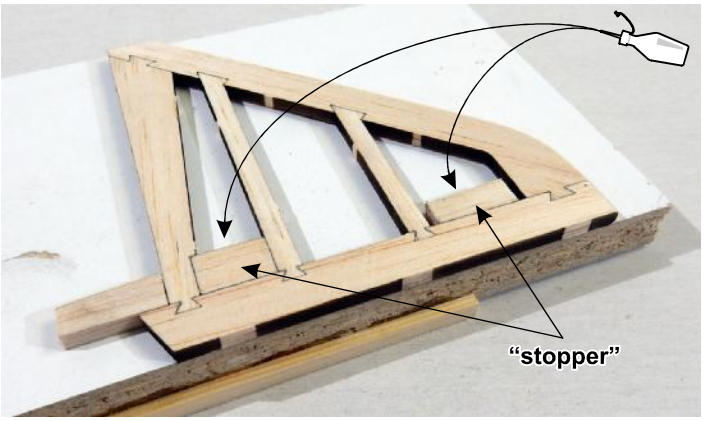
❑ **4.** Taper the rudder with sanding block. You can sand only one side. Use the set up you made before during assembling the wing with spacer made from shaft **E16**.



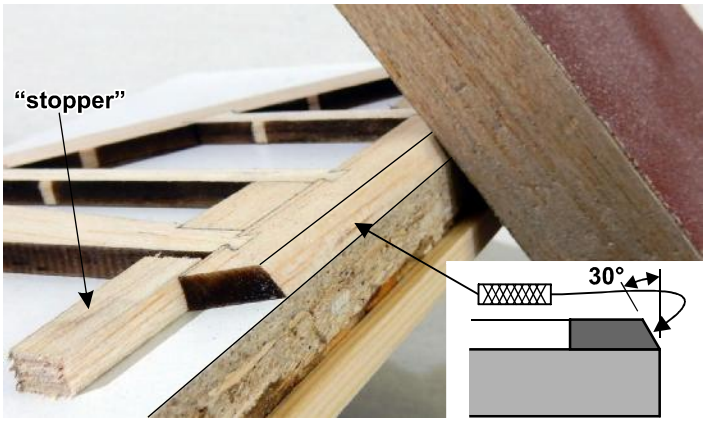
❑ **5.** Sand outer edge to remove burnt areas.

❑ **6.** Round L.E. and tip edges, gently chamfer other outer edges.

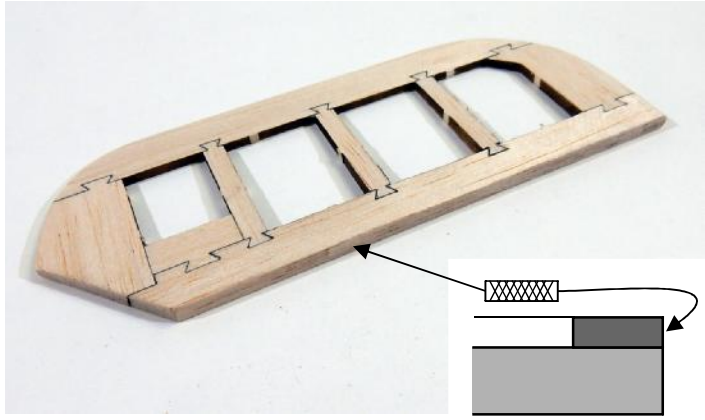
❑ **7.** Carefully separate the fin from the rudder.



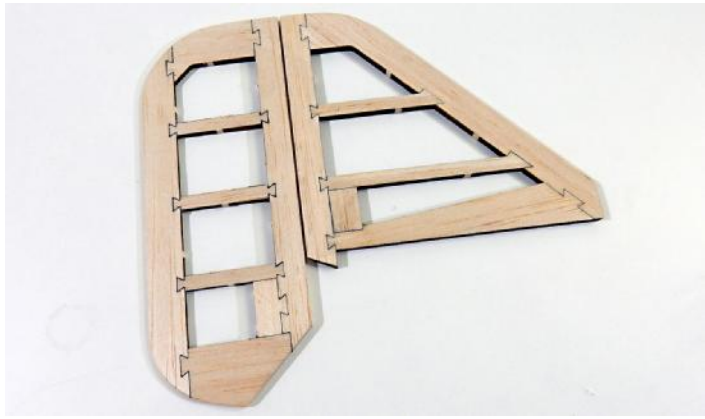
❑ **8.** Align fin T.E. with board edge and glue “stoppers” to the board.



❑ **9.** Sand fin T.E. **on the left side** in angle aprox. 30°. Use board edge as an guide for sanding block.



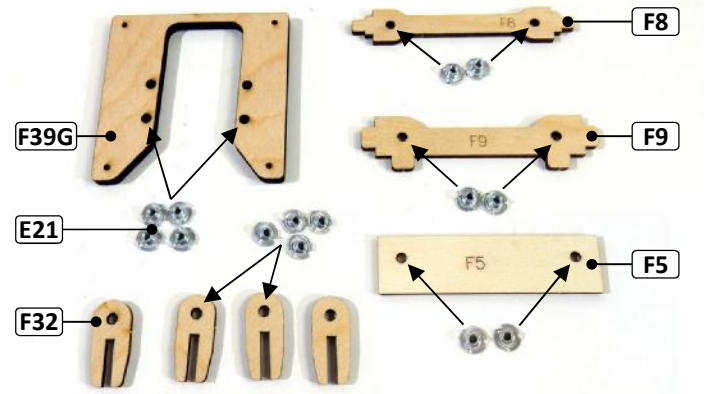
❑ **10.** Sand the rudder L.E. to be straight and to remove burnt areas.



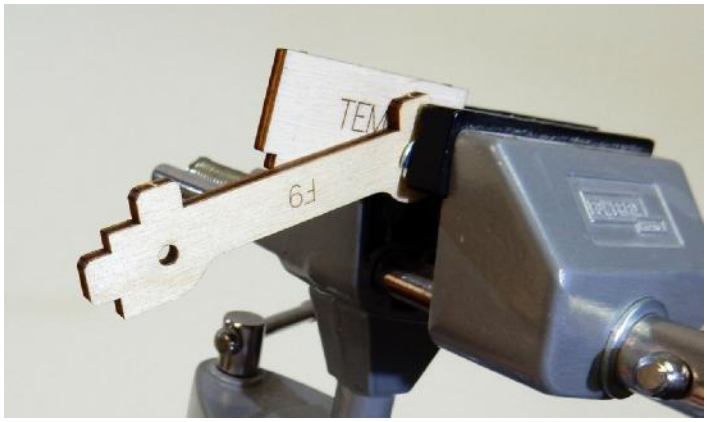
❑ **11.** Fin/rudder are ready for covering. Check that the fin T.E. and elevator L.E. edges are perfectly straight. If not, repair it.

Notes:

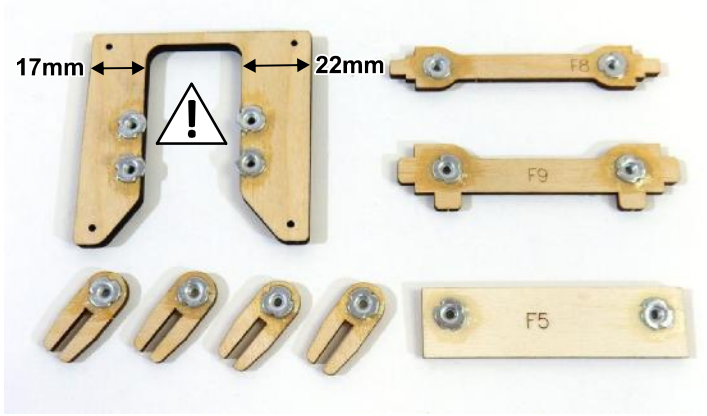
Assembling fuselage



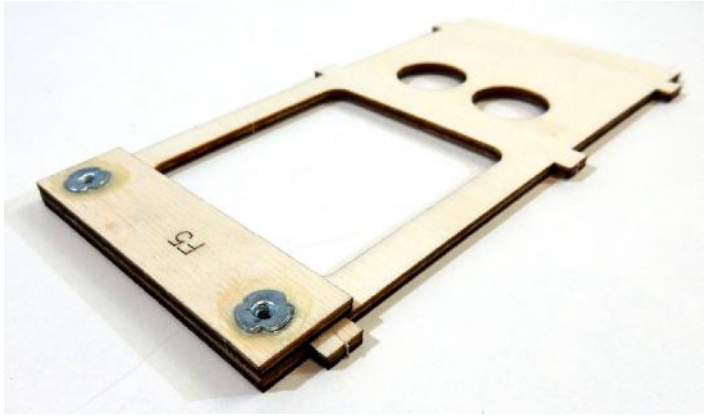
❑ **1.** Prepare the parts for insert T-nuts **E21**. Motor mount **F39G** is for glow engine version only.



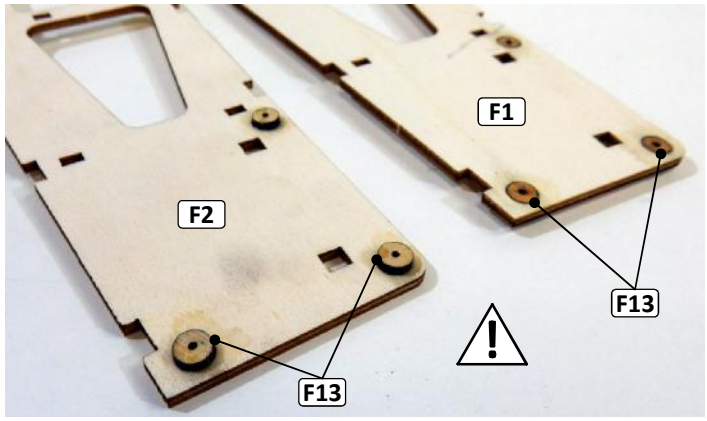
❑ **2.** Press the T-nuts **E21** into the all parts. Use a vise, not a hammer! Underlay the parts with plywood scrap (T-nut is higher than the thickness of the part).



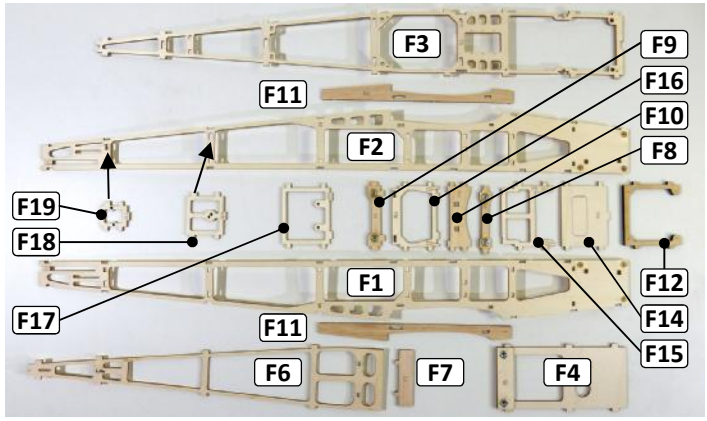
❑ **3.** Glue the T-nuts **E21**.
Warning! You must place T-nuts to right place in part **F39G** to keep right side thrust angle! Do it as shown on the picture.



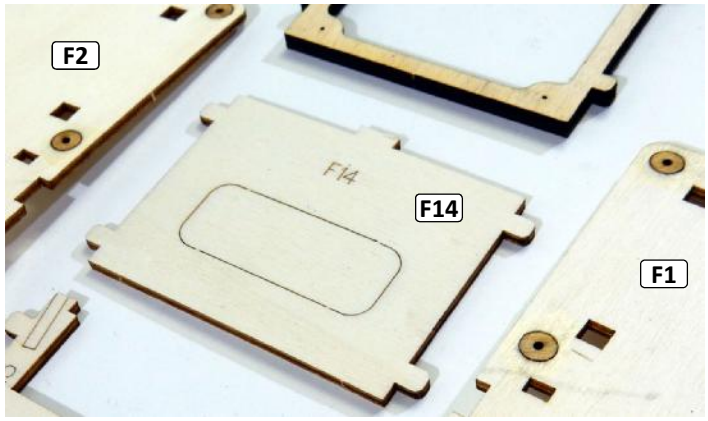
❑ **4.** Glue the doubler **F5** with T-nuts to the fuse front bottom sheet **F4**.



❑ **5.** Always glue three insertions **F13** to the **F2** and **F1** fuselage sides. Align the insertions **F13** with the outer surface of the sides. Be careful to glue them correctly (see picture)! Side panel **F1** is right, **F2** is left.

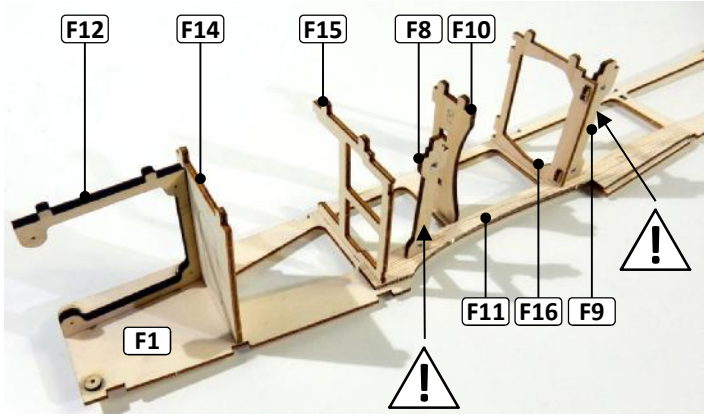


❑ **6.** Prepare the basic parts needed to assemble the fuselage. The arrows indicate where the enlarged former protrusions (**F19** and **F18**) will be inserted.

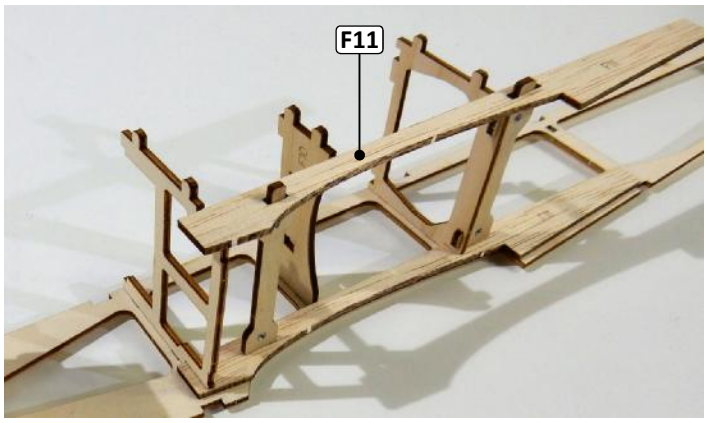


❑ **7.** In electro version you can remove the inner part of the former **F14**. Don´t remove this in glow engine version.

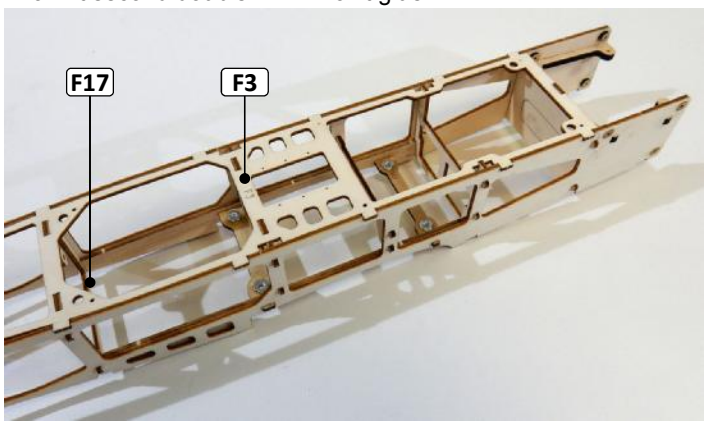
Note:
- Fuselage parts, like most other parts of the model, are made on precision CNC machines. Nevertheless, especially due to tolerances in the thicknesses of the materials used, it may happen that the parts do not fit together exactly. Please use adequate force when assembling the fuselage. If the parts do not really fit together, adjust their shape or thickness by gentle sanding. If you should sand too much, something is wrong. Check if you are doing the correct thing.
- The whole model is designed for gluing with thin CA glue.
- Be careful when assembling the fuselage. We recommend first “dry-assemble”. Check whether something is missing somewhere and only then glue the joints together with only a small amount of glue. This way you will assemble the whole basic structure of the fuselage and if everything is OK, the fuselage is not twisted and nothing is missing anywhere, then glue the joints properly.
- Glue the fuselage joints in the position with upper sheet on the work board and press it to a flat work board each time it is glued. This is the only way to ensure that fuselage will not be twisted.



❑ **8.** Put doubler **F11** onto the side **F1** and insert other parts into holes on side **F1**. Don't glue! Pay attention on parts **F8** and **F9** with the T-nuts.



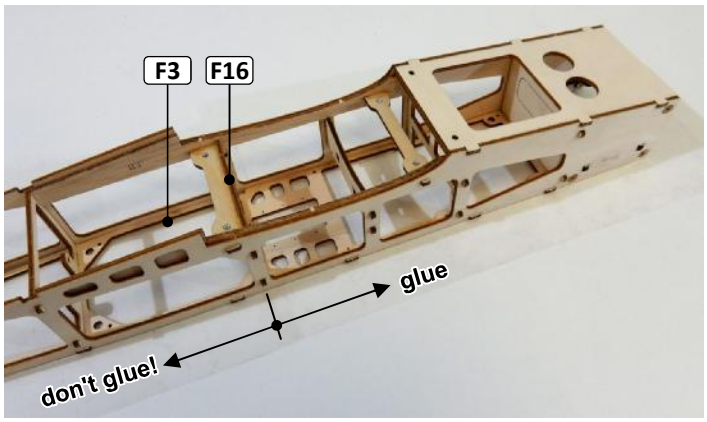
❑ **9.** Fit second doubler **F11**. Don't glue!



❑ **10.** Fit second side **F2**. Don't glue!

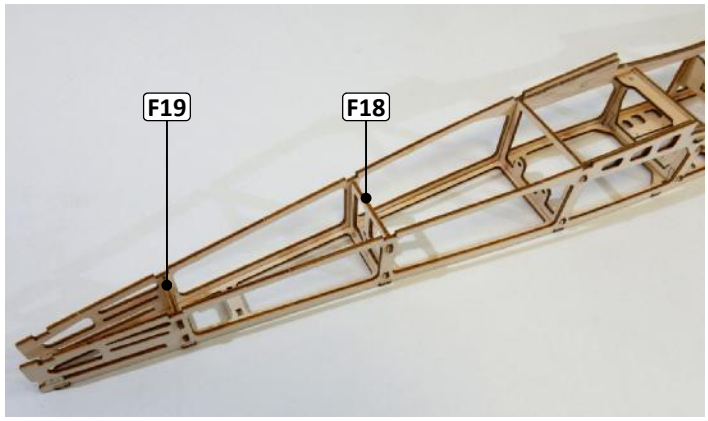
❑ **11.** Insert former **F17** between sides. Don't glue!

❑ **12.** Fit fuse upper sheet **F3**. Don't glue!

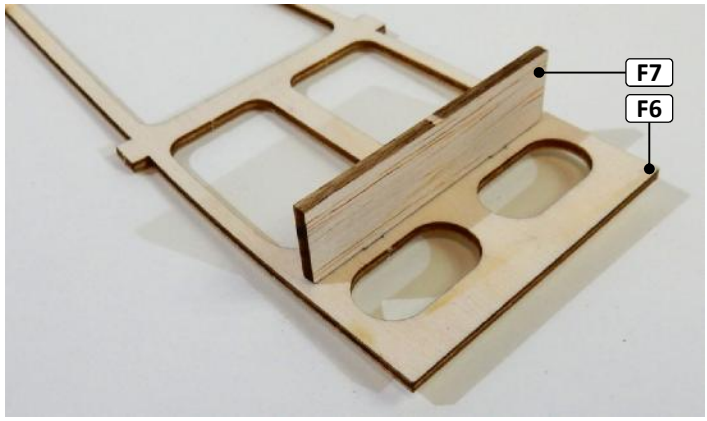


❑ **13.** Put fuselage with upper fuse sheet to flat work board covered with waxed paper or plastic wrap.

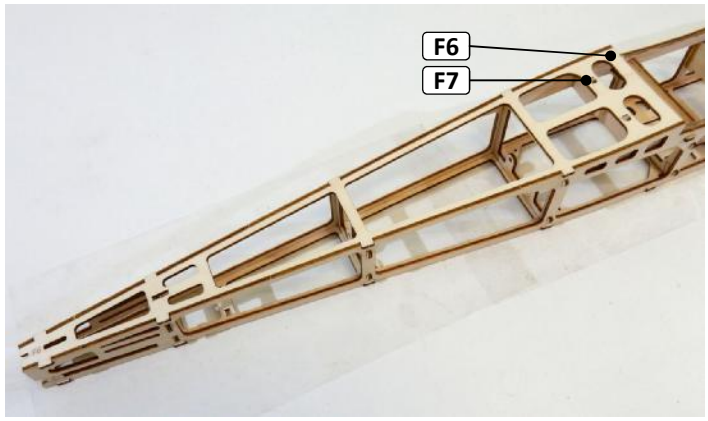
❑ **14.** Start on the nose and glue joints using small amount of glue. Continue to the former **F16**. Press the fuselage to the work board permanently. Don´t glue rear part of the fuselage now.



❑ **15.** Insert formers **F18** a **F19**. Don't glue!



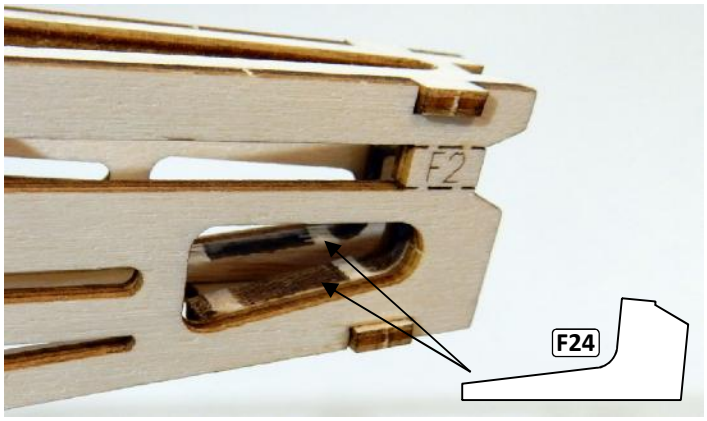
❑ **16.** Glue the reinforcement **F7** to the fuse rear bottom sheet **F6**.



❑ **17.** Fit the fuse rear bottom sheet **F6** to the fuselage. Don't glue!

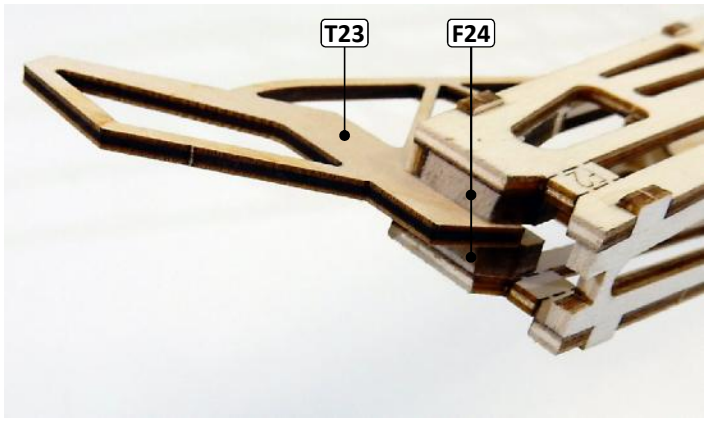
❑ **18.** Start in former **F16** and continue backwards to glue the joints using small amount of glue. First glue the parts laying on the work board. Press the fuselage to the work board till the glue cure.

Note: When applying the glue, you can turn the fuse, but then immediately put it with upper fuse sheet to flat work board until the glue is cured. Follow in small steps applying the glue until the entire fuse holds together.



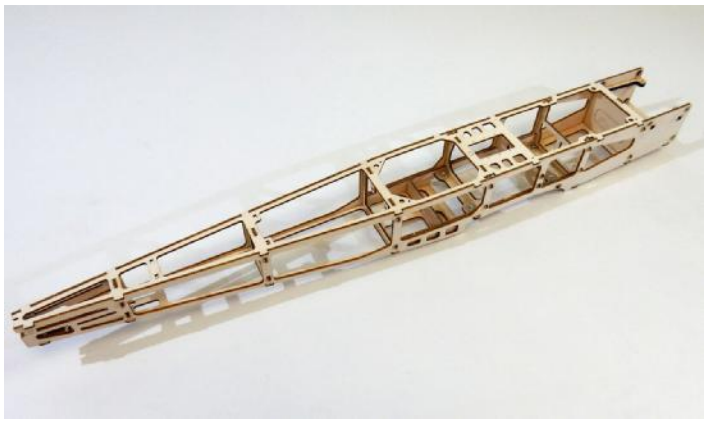
❑ **19.** Fit and glue 2pcs rear doublers **F24** to the fuselage sides.

❑ **24.** Thoroughly sand the sides of the fuselage on the wing saddle area.



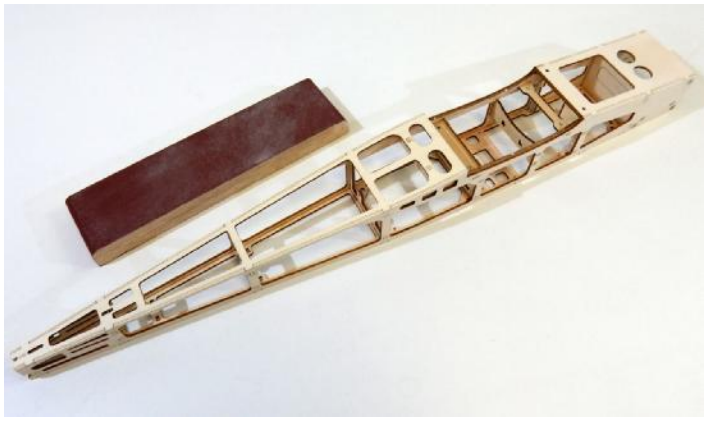
❑ **20.** Flat sand the rear of the fuselage and adjust the doublers **F24** with a small file or sandpaper to make slot for tail skid **T23**. Don't glue!

❑ **25.** Sand all “sharp” edges with fine sandpaper (250-320).



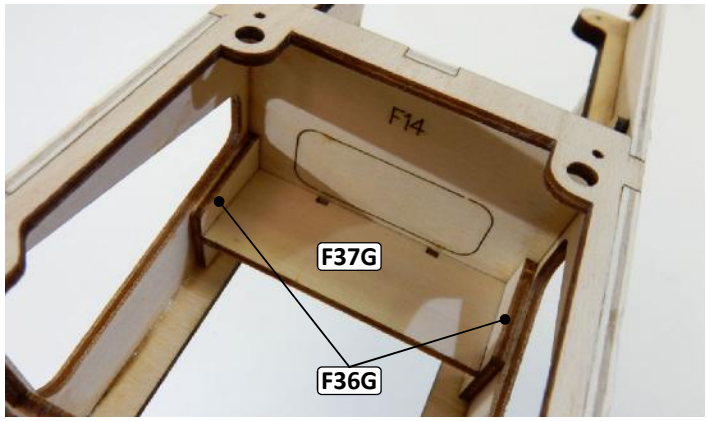
❑ **21.** Glue the whole fuselage thoroughly. Take a look at the next steps so that you don't put too much glue unnecessarily in places where it could get in the way later, such as the holes for inserting the **F32** holders.

❑ **26.** The basic part of the fuselage is done. If you have been careful the upper side should be perfectly straight.

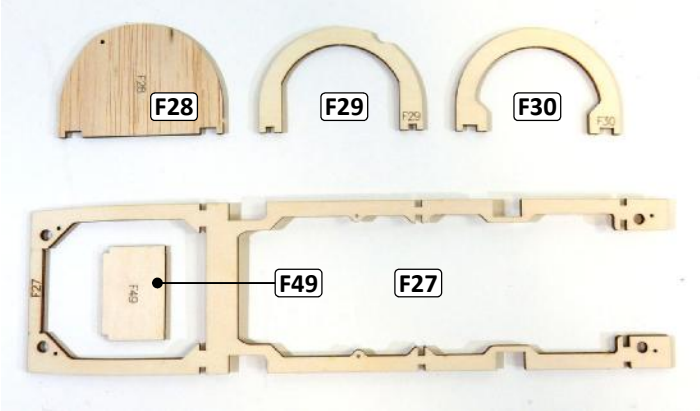


❑ **22.** Thoroughly sand the sides of the fuselage.

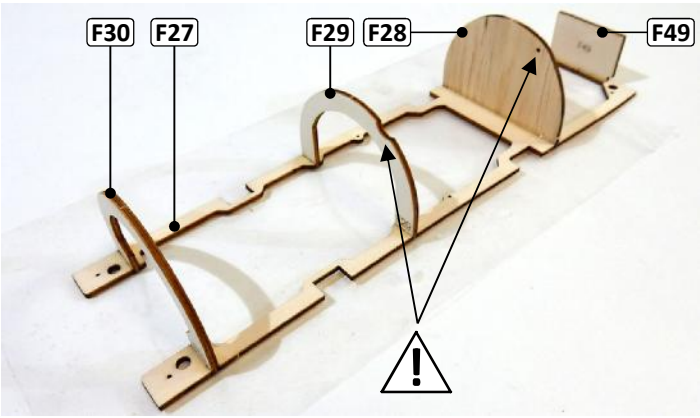
❑ **23.** Thoroughly sand the upper, lower and nose of the fuselage.



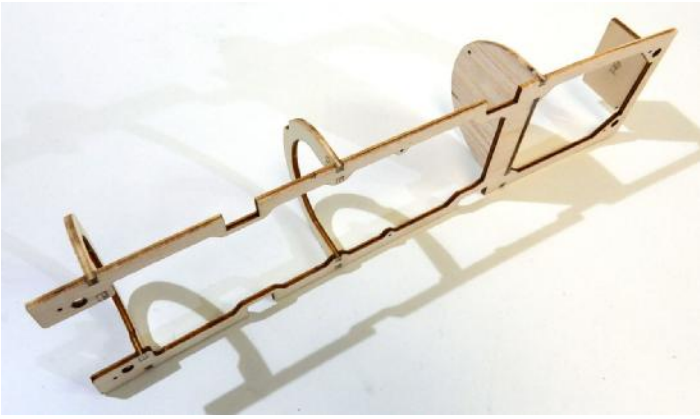
❑ **27.** Fit and glue Rx battery platform **F37G** with sides **F36G**. For glow engine version only!



❑ **28.** Prepare the parts for assembling the frame of the front fuselage cover.

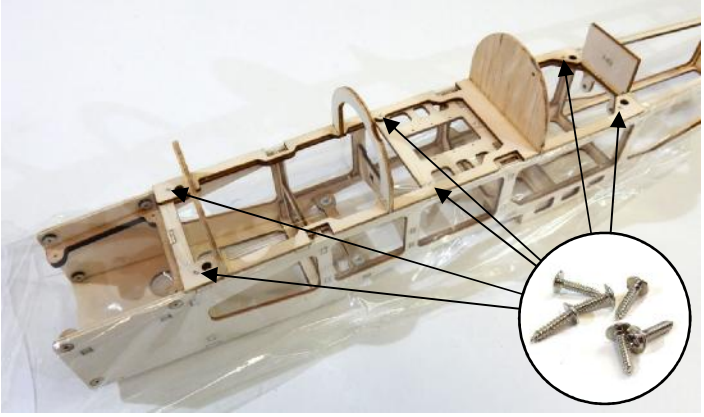


❑ **29.** Glue the cover frame thoroughly. Pay attention to the orientation of formers **F29** and **F28**. Glue it according to the picture. Part **F49** is only auxiliary and just glue it with a drop of CA. Make sure that the formers are glued perpendicular to the **F27** base.

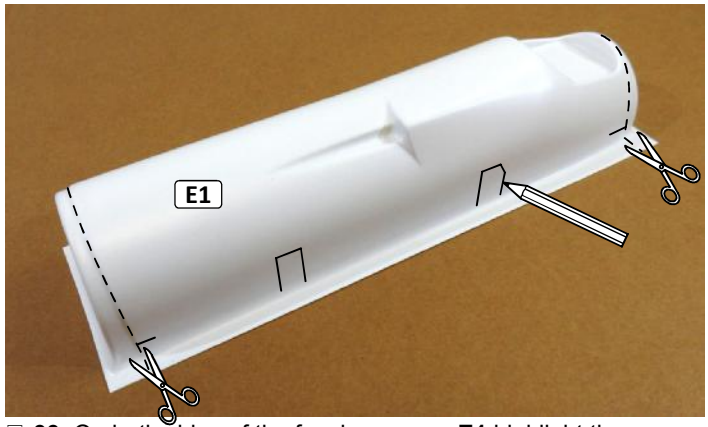


❑ **30.** Sand the bottom side in places of the glued joints.

❑ **31.** Lightly sand the outer edges of the all parts to remove burnt areas (sanding the part part **F49** not needed).

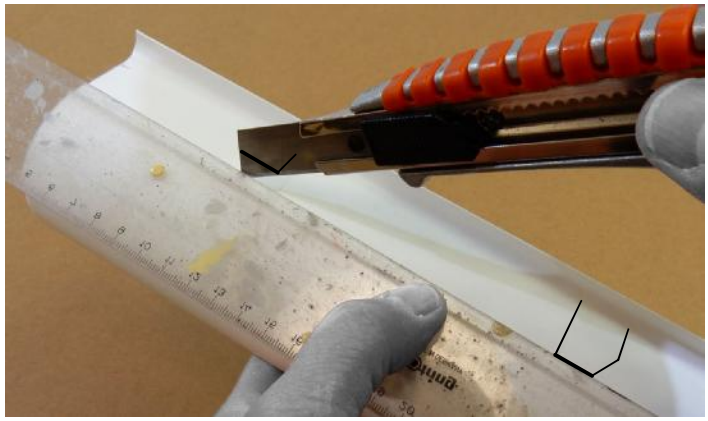


❑ **32.** Screw the frame to the fuselage with six small servo screws. Insert a separating layer between the parts, eg wrap foil. Insert the screws from the bottom of the fuselage!

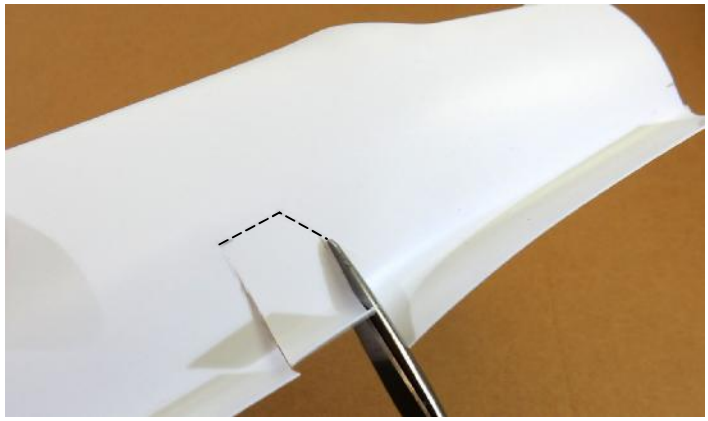


❑ **33.** On both sides of the fuselage cover **E1** highlight the marked trim lines with a pencil.

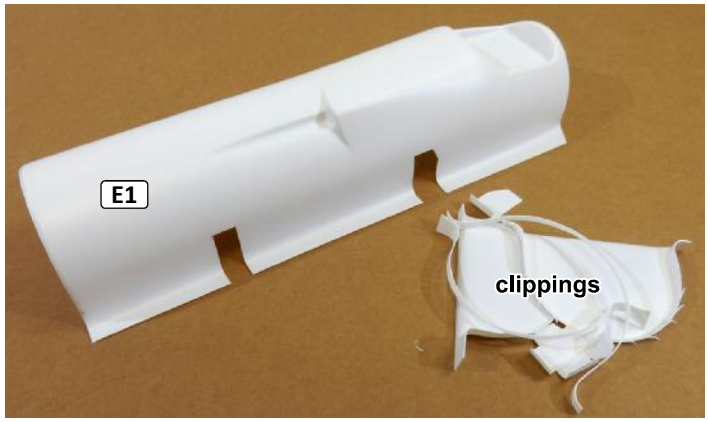
❑ **34.** Use scissors to cut the front and back of the cover according to the trim lines. It is better to cut two times. First a short distance from the edge and then exactly along the trim line.



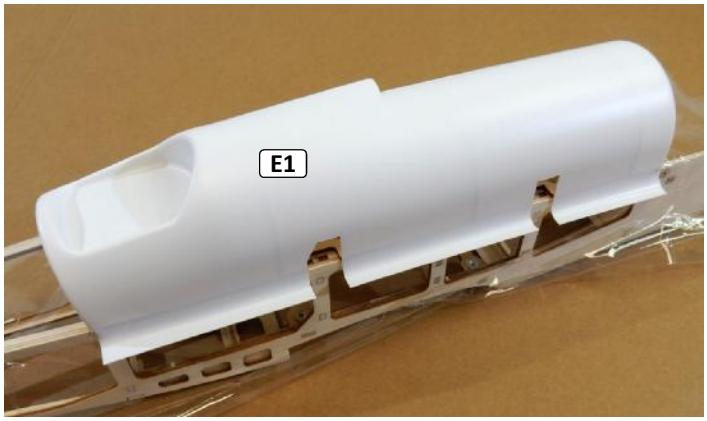
❑ **35.** Cut the upper edges of the smaller holes with a knife.



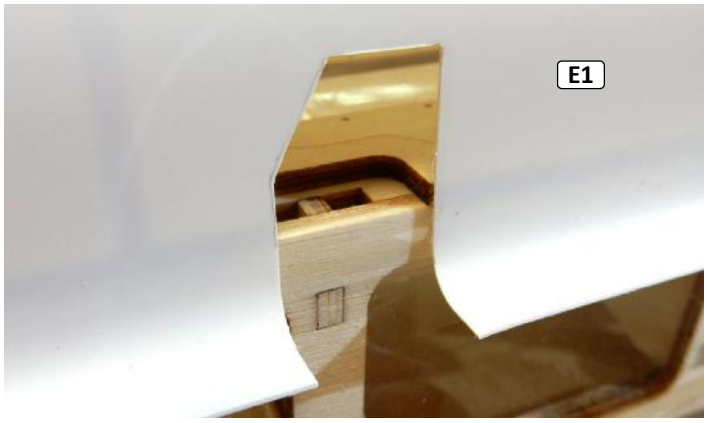
❑ **36.** Cut the side edges with scissors.



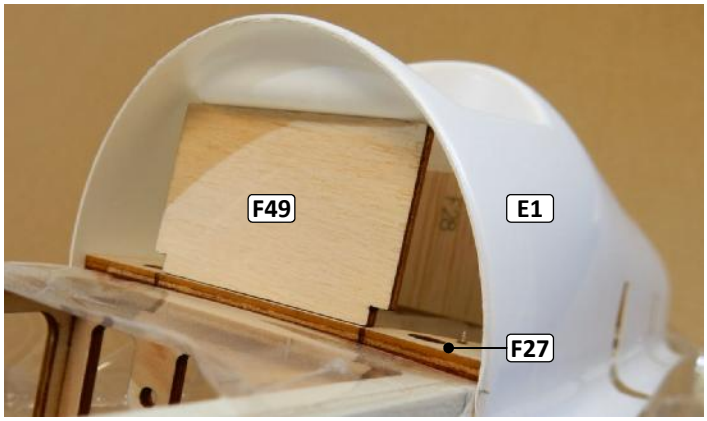
❑ **37.** You should have a trimmed cover. If you have worked cleanly, there is no need to further modify it. You will sand it later.



❏ **38.** Fit the cover **E1** to the fuselage. Don't glue!

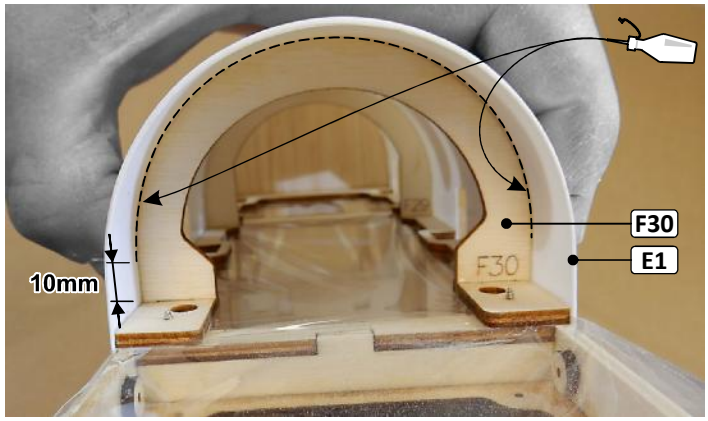


❏ **39.** Align the cover **E1** with slots on cover frame (base sheet **F27**). Don't glue!

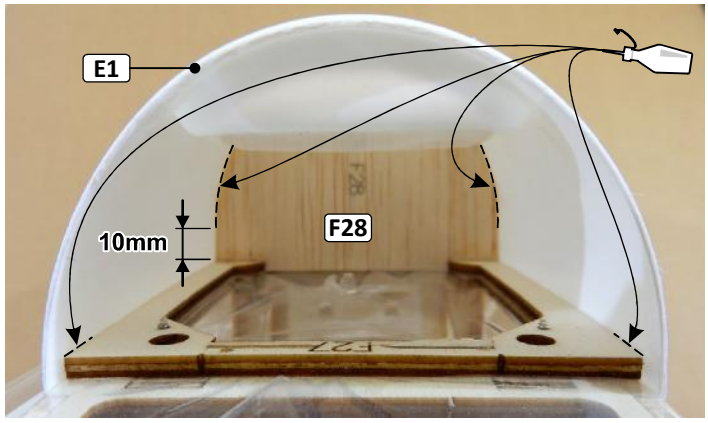


❏ **40.** At the rear, cover **E1** rests on the auxiliary partition **F49**. Don't glue!

❏ **41.** The lines marked with pencil on both sides on the front of the cover should be placed similarly against the fuselage. Don't glue!

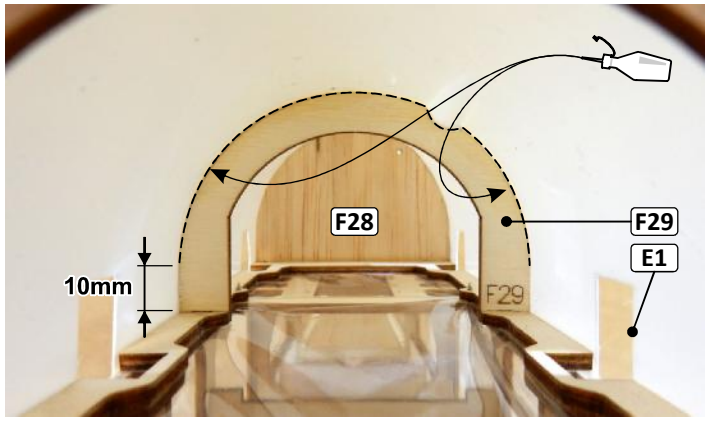


❏ **42.** Use drops of CA to glue the cover **E1** to the former **F30**. Keep distance approximately 1cm from base sheet **F27**. Don't glue the cover **E1** to the base sheet **F27**.

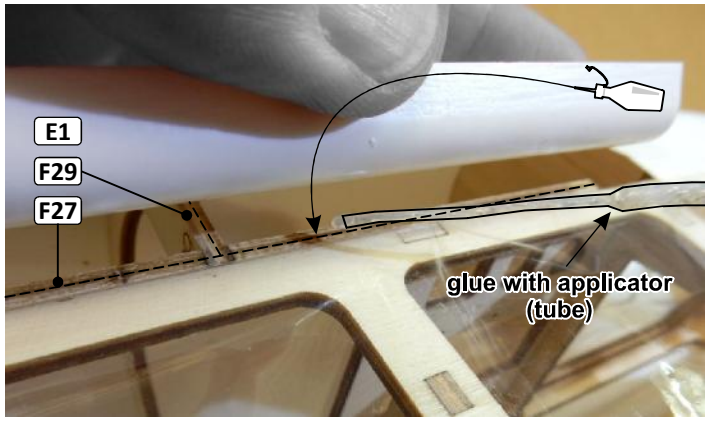


❏ **43.** Use drops of CA to glue the cover **E1** to the rear of base sheet **F27**. Then remove the former **F49**.

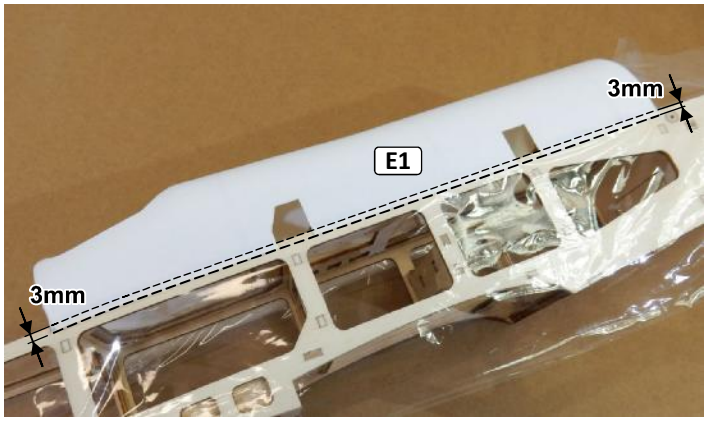
❏ **44.** Use drops of CA to glue the cover **E1** to the former **F28**. Keep distance approximately 1cm from base sheet **F27**.



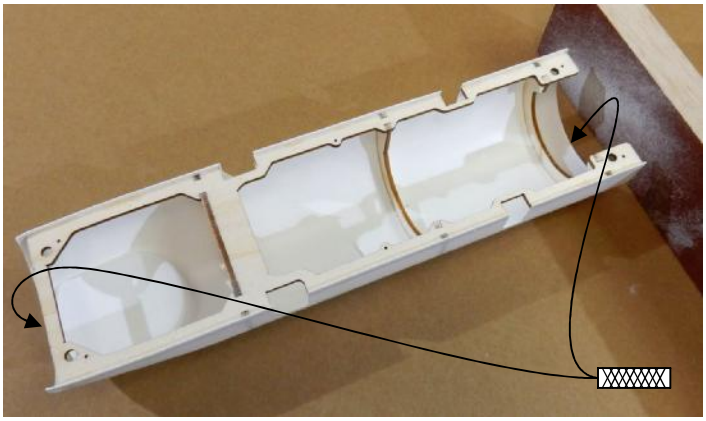
❏ **45.** Use drops of CA to glue the cover **E1** to the former **F29**. Keep distance approximately 1cm from base sheet **F27**. Don't glue the cover **E1** to the base sheet **F27**.



❏ **46.** Glue the cover **E1** with drops of CA (really small amount of glue) to the base sheet **F27** edges. Apply the glue on the base sheet **F27** edge and push the cover **E1** to the edge.

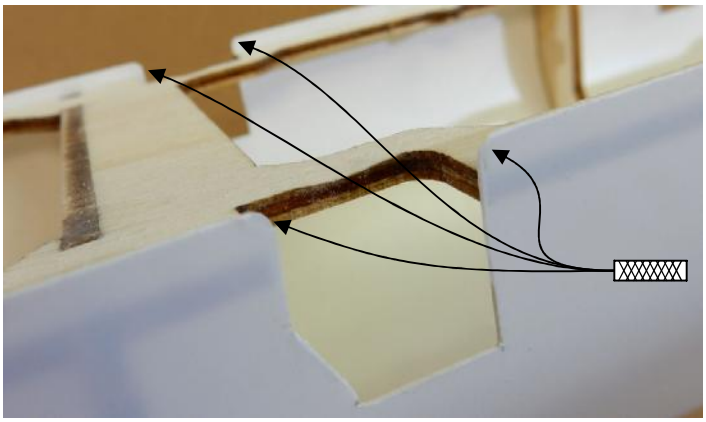


❑ **47.** Cut the cover **E1** on both sides according to the ruler so that it extends approx. 3mm over the edge of the fuselage.

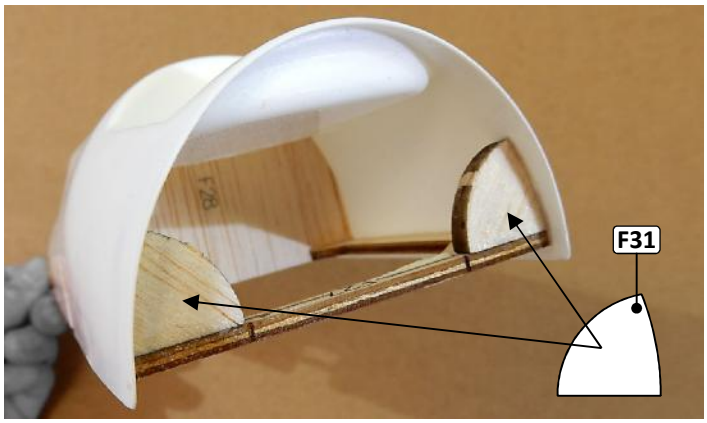


❑ **51.** Flat sand with sandblock front and rear of the cover **E1**. The front of the cover **E1** will probably need to be adjusted later when fitting the **E3** engine cowl.

❑ **48.** Separate the cover **E1** from the fuselage - remove the screws.

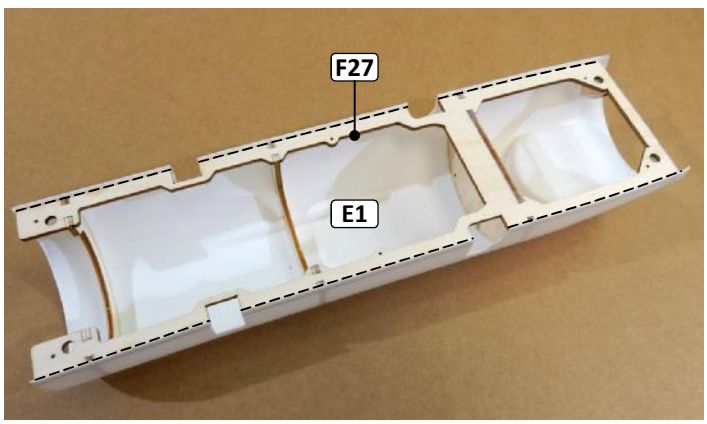


❑ **52.** Round all outer corners on the cover **E1** with fine sandpaper (250-320).

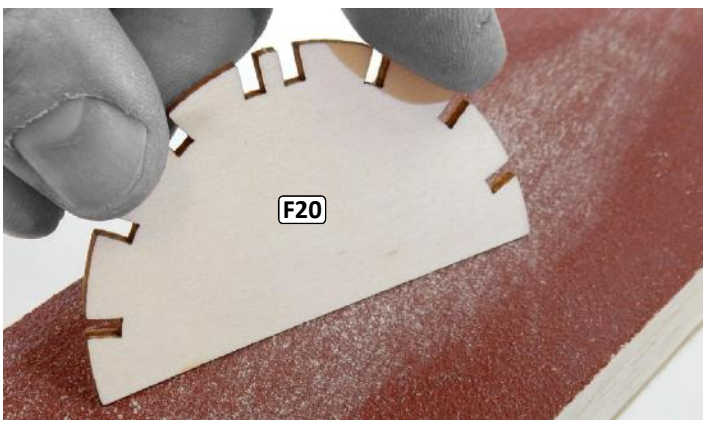


❑ **49.** Glue the gussets **F31** to the corners between cover **E1** and base sheet **F27** on the rear of the frame.

❑ **53.** Bevel all cover **E1** edges with fine sandpaper (250-320).

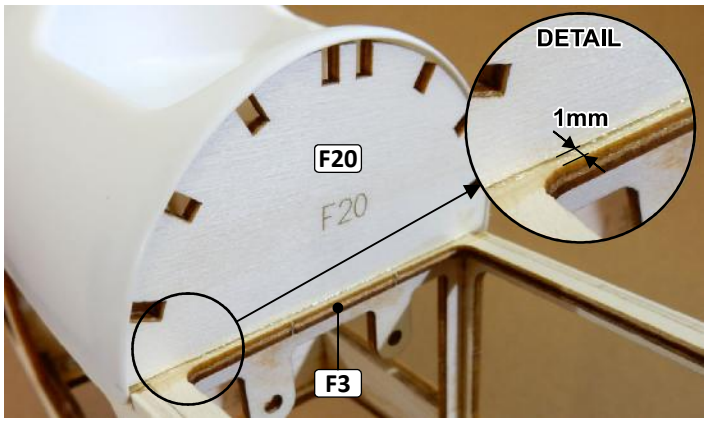


❑ **50.** Thoroughly glue all joints between the cover **E1** and the wooden frame from the inside of the **E1** cover. Be careful that the glue does not spill into the edge (marked in the picture) between the cover **E1** and the base sheet **E27**. It could then prevent a precise fit on the fuselage.



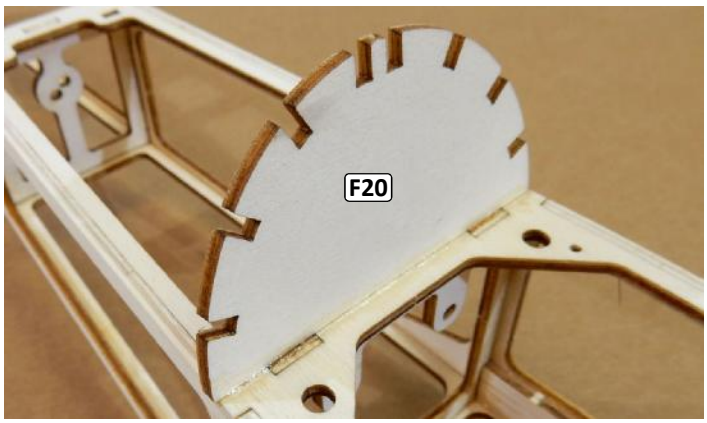
❑ **54.** Chamfer the bottom edge of the former **F20**.

❑ **55.** Adjust the former **F20** edge to follow the edge of the base sheet **F27**.

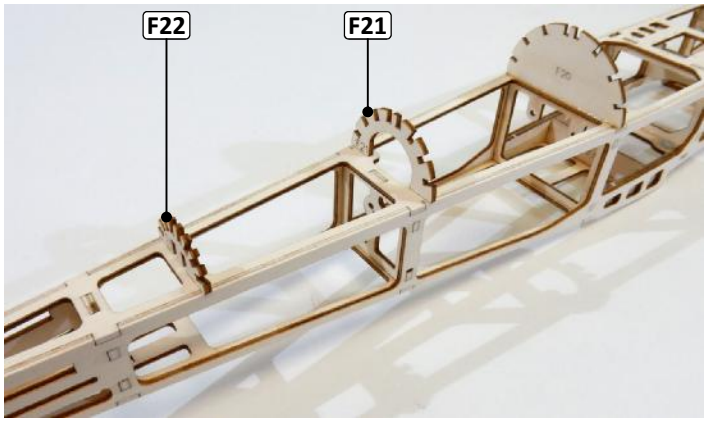


❑ **56.** Insert the former **F20** into the cover, place it on the fuselage and slide it to keep a gap of 1mm between the edge of the former **F20** and the edge of the upper fuselage sheet **F3**.

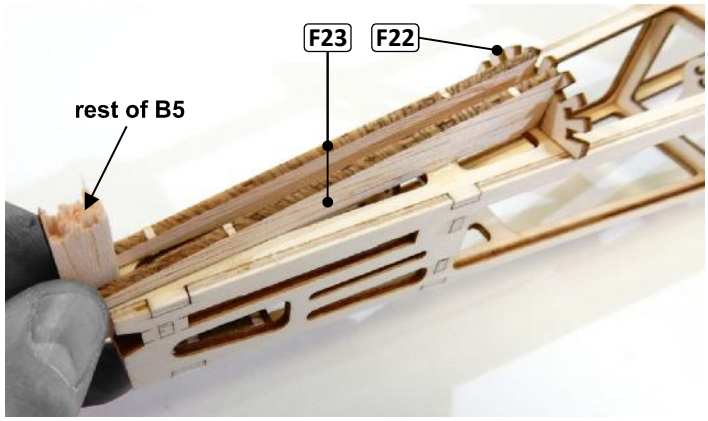
❑ **57.** Glue the former **F20** with a small amount of glue to the upper fuselage sheet **F3**.



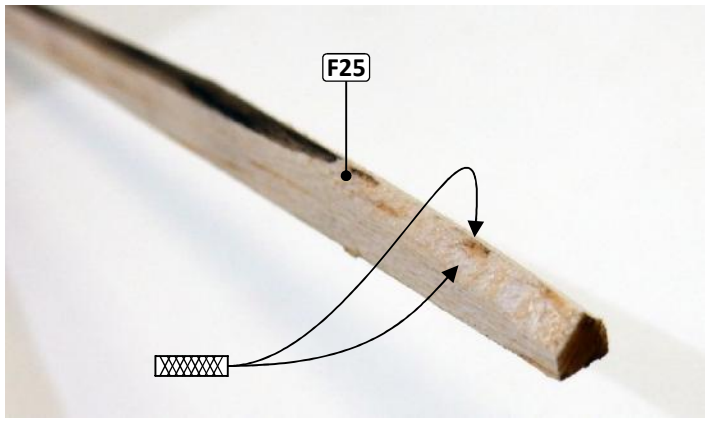
❑ **58.** Glue the former **F20** thoroughly to the fuselage.



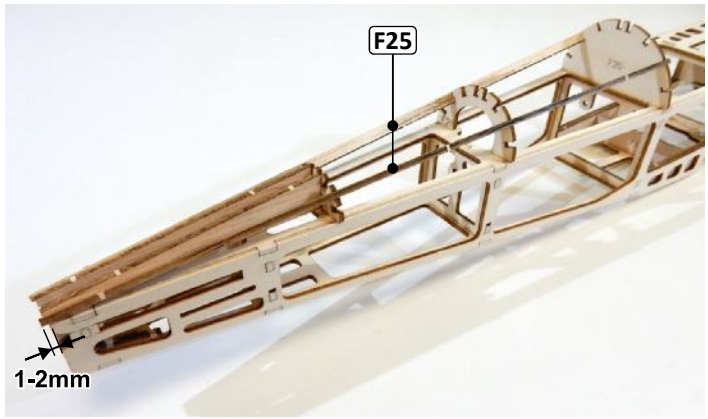
❑ **59.** Glue formers **F21** and **F22** to the fuselage.



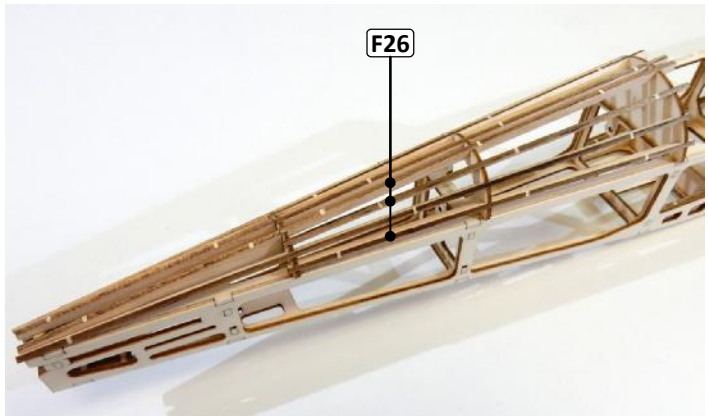
❑ **60.** Insert a rest of balsa 5 to the slot at the rear of fuselage. It will make stopper for sides **F23**. Glue the sides **F23** to the fuselage.



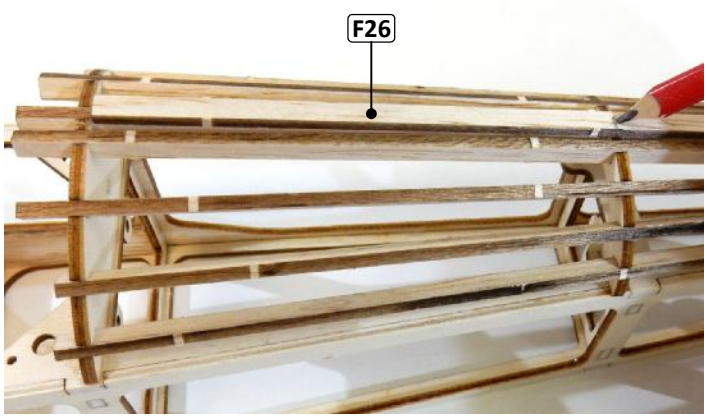
❑ **61.** Sand the ends of the two **F25** balsa spars as shown so that they fit into the corner between the upper fuselage sheet **F3** and the side **F23**.



❑ **62.** Insert the **F25** balsa spars into the cut-outs in the formers **F20**, **F21** and **F22** so that they extend over the rear of the fuselage approx. 1-2 mm. Glue the **F25** balsa spars.

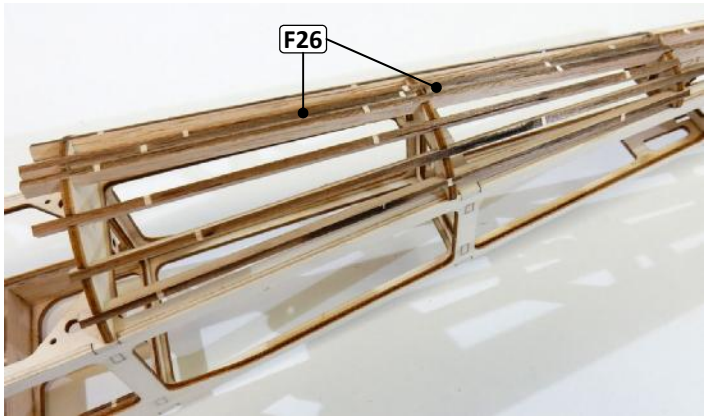


❑ **63.** Fit and glue 6pcs balsa spars **F26**.

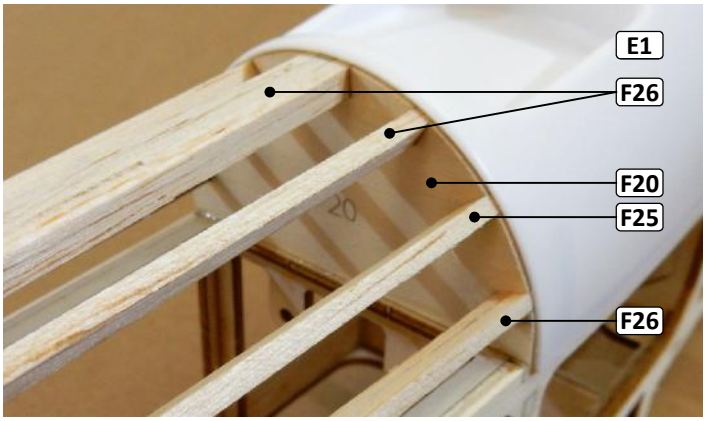


❑ **64.** Use last balsa spar **F26** to make two fillings between spars on top of the fuselage.

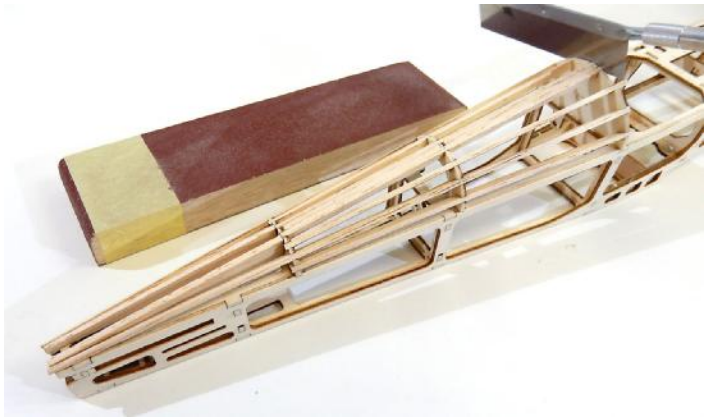
❑ **69.** Flat sand rear of the fuselage.



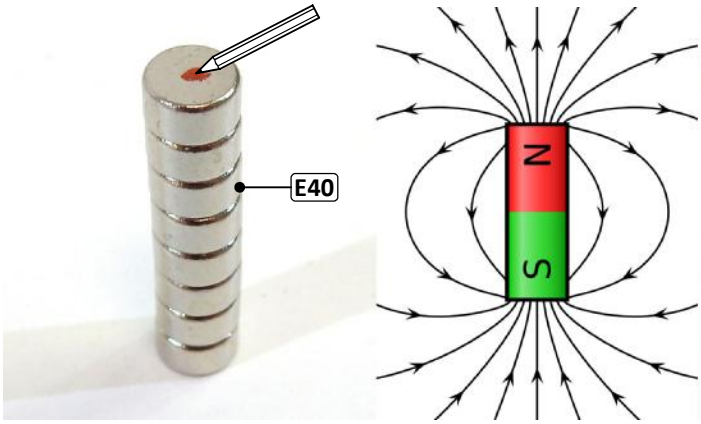
❑ **65.** Fit and glue fillings made from balsa spar **F26** between the spars on top of the fuselage. Let them protrude slightly.



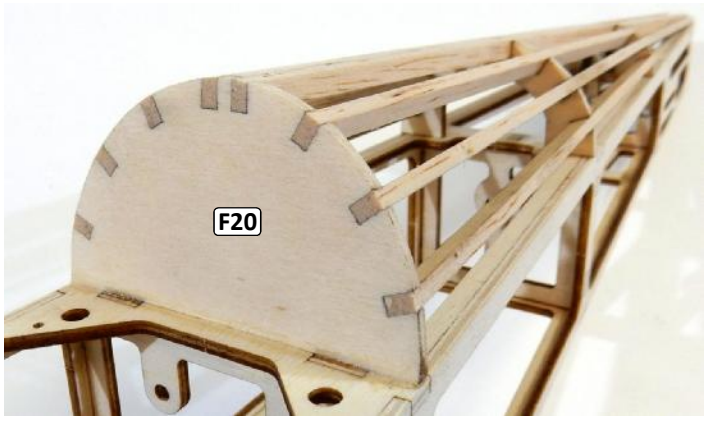
❑ **70.** If necessary, adjust the shape of the former **F20** by sanding so that the cover **E1** fits perfectly.



❑ **66.** Sand surface of the spars **F25** and **F26** to follow edges of formers **F20**, **F21** and **F22** and to remove burnt areas.
❑ **67.** Cut off the spars extending over the former **F20**.

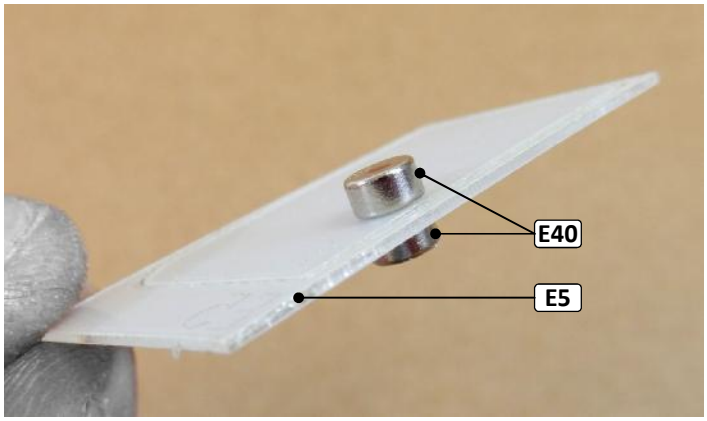


❑ **71.** Mark the polarization on the **E40** magnets with a marker.

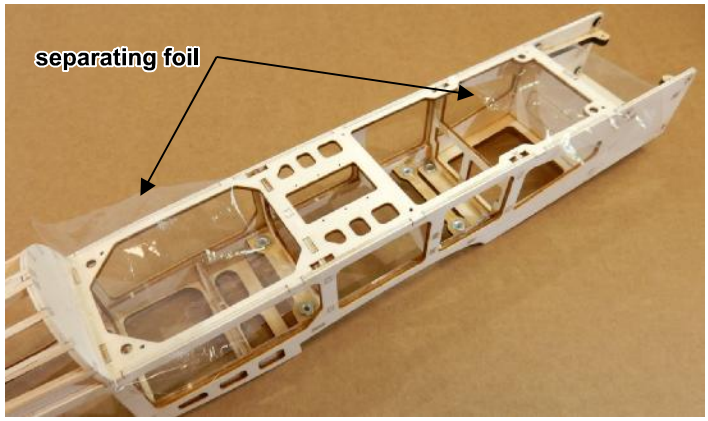


❑ **68.** Sand the spars **F25** and **F26** ends to follow the former **F20** surface.

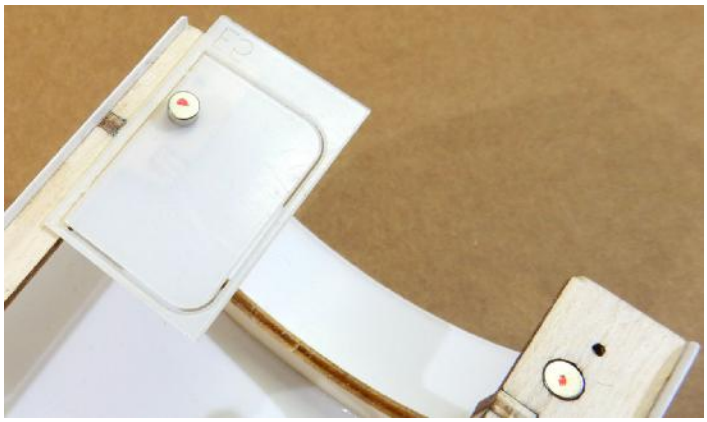
❑ **72.** It doesn't matter which side of the magnet you mark. It is important that it is the same on all magnets.



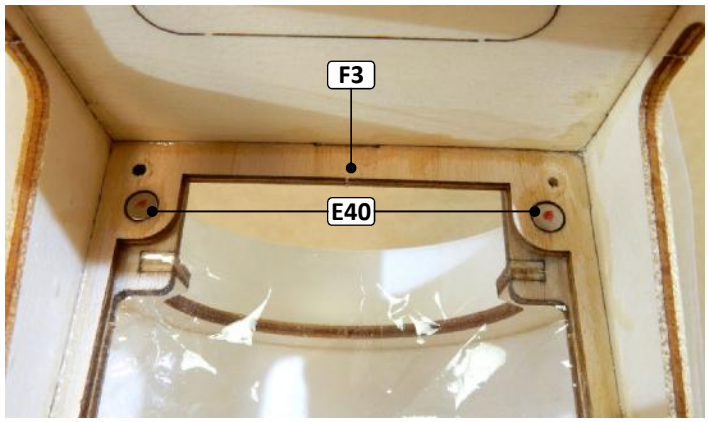
❑ **73.** You can use the **E5** pilot wind shield plate to make it easier to insert magnets into the fuselage cover frame. Do not peel off the protective foil from the **E5** plate!



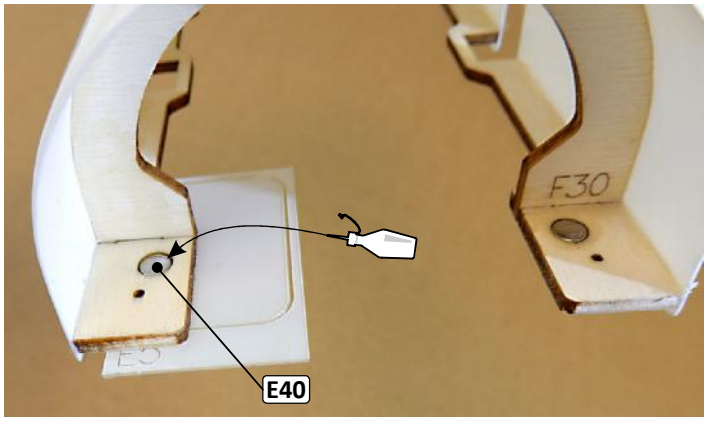
❑ **77.** Place a separating foil (wrap foil) on the fuselage in place of the magnets.



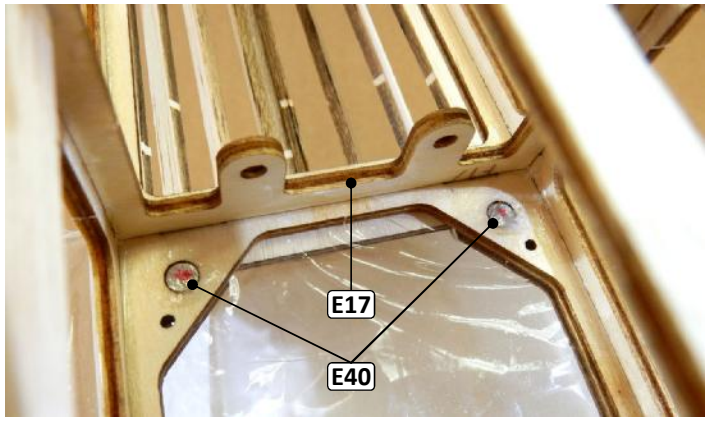
❑ **74.** Insert magnet **E40** into the hole, press plate **E5** against base sheet **F27**.



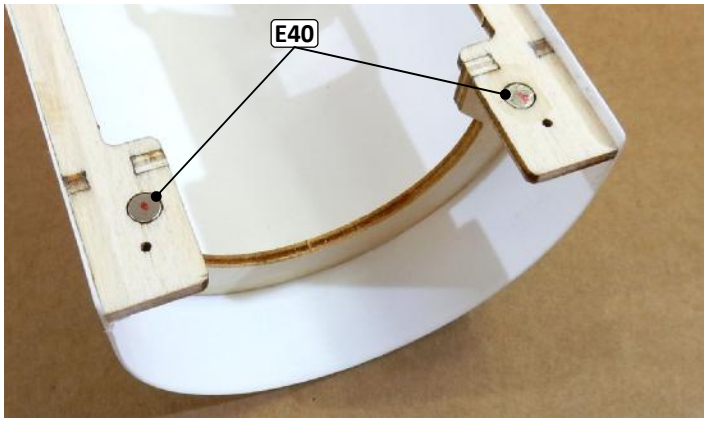
❑ **78.** In the front part of the fuselage, insert and glue the magnets **E40** into the upper fuselage sheet **F3** from the inside. Push the magnets firmly to fit the magnets in the fuselage cover.



❑ **75.** Glue the magnet **E40** to the cover base sheet **F27**.

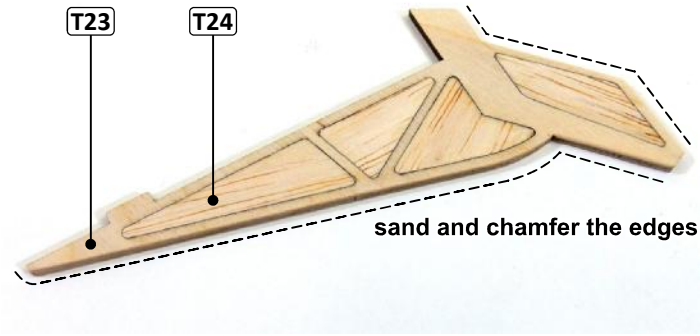


❑ **79.** Glue the remaining magnets **E40** near the former **F17** in the same way.



❑ **76.** Glue the remaining three magnets to the cover base sheet **F27** in the same way.

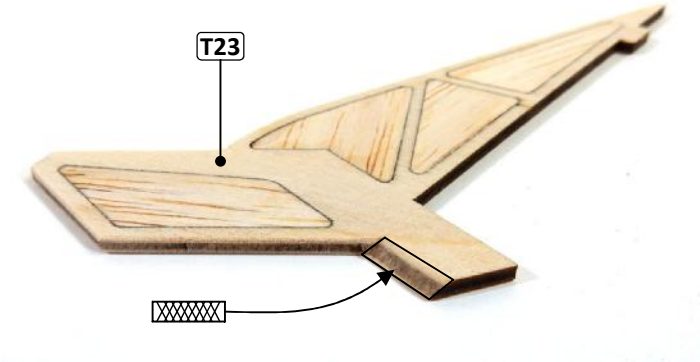
❑ **80.** Cut out the tabs in the horizontal stabilizer slot and sand the edges to blend the surfaces and remove high spots. Use sandpaper or a small file.



❑ **81.** Glue balsa fillers **T24** into the tail skid **T23**.

❑ **82.** Flat sand the entire tail skid on both sides.

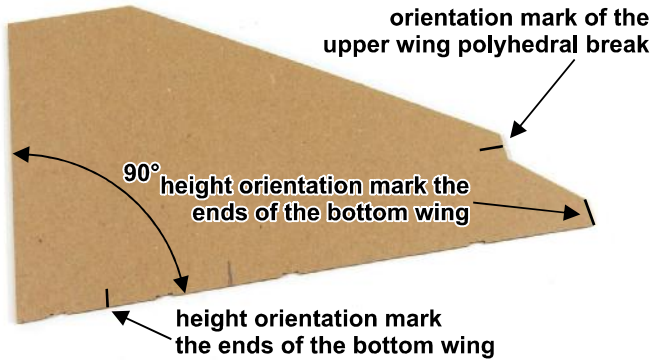
❑ **83.** Lightly sand the outer edges to remove burnt areas. Lightly chamfer the outer edges.



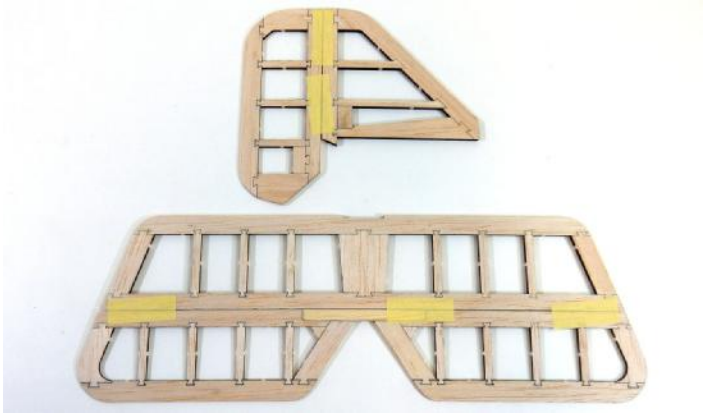
❑ **84.** Chamfer the edge of the tail skid **T23**. Be careful, it must be chamfered on the same side as on the vertical stabilizer.

Notes:

First assembly (temporary)



❑ **1.** Use the template when assembling.

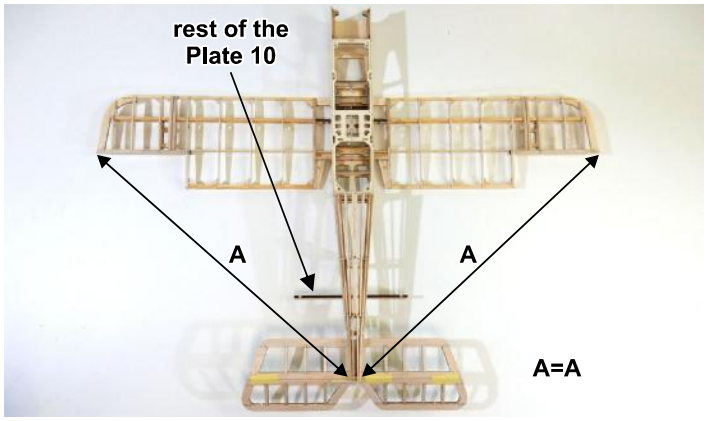


❑ **2.** Use paper tape to join fin / rudder and stab / elevator parts.

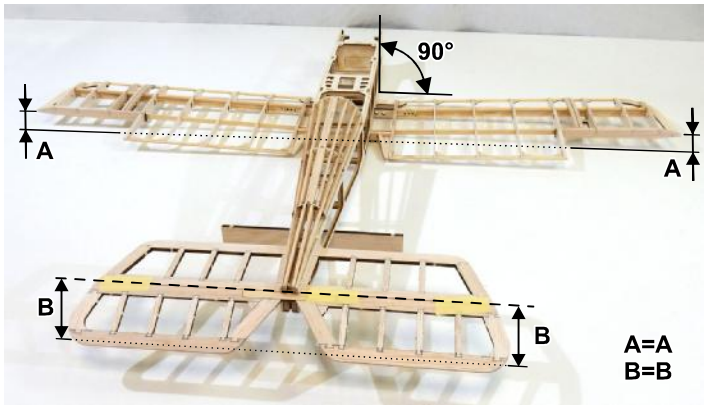
❑ **3.** Insert the tails and the tail skid into the slots in the fuselage. Don't glue! Make sure everything fits. Correct any inaccuracies.

❑ **4.** Screw the bottom wing to the fuselage using screws 2pcs **E33** (M3x30) and 2pcs **E34** (M3x20).

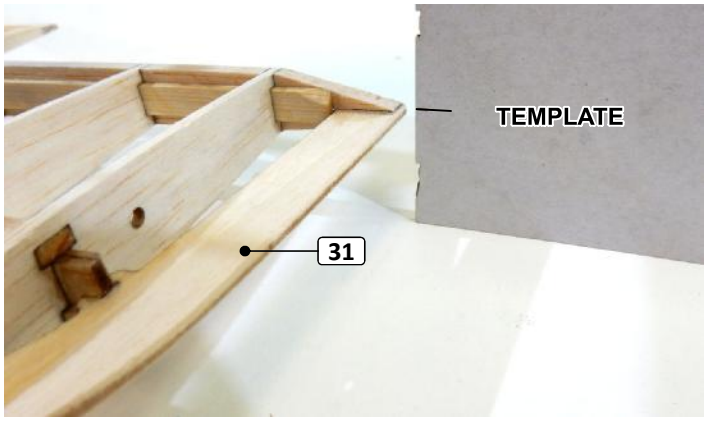
❑ **5.** You can remove the tails.



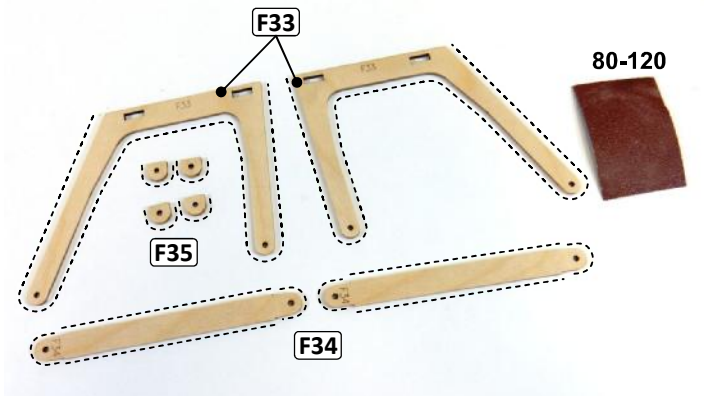
❑ **6.** Measure from the wing tips to the back end of the fuse, making sure the wing is square with the fuse. Use rest of balsa 5 from **Plate 10** to support the fuselage.



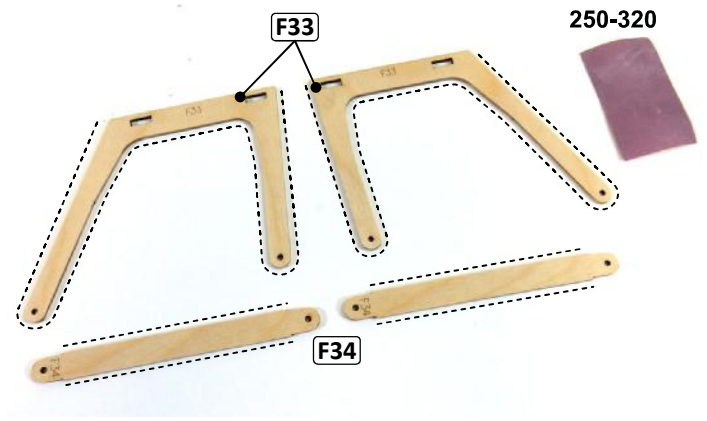
❑ **7.** Level stab with respect to the wing. Measure tips distance from the flat board. It must be the same (A=A, B=B). If necessary, sand the stab slots to provide a good, level fit for the stab.



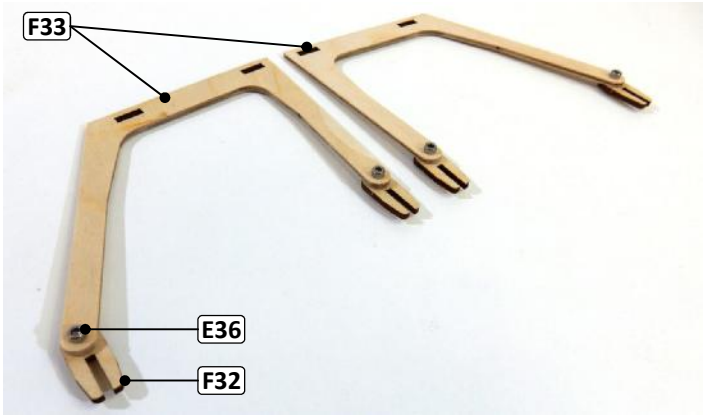
❑ **8.** Check the height of the wing tip using a template. The wing tips do not have to be exactly at the height of the mark, but they must be the same height on both sides of the wing.



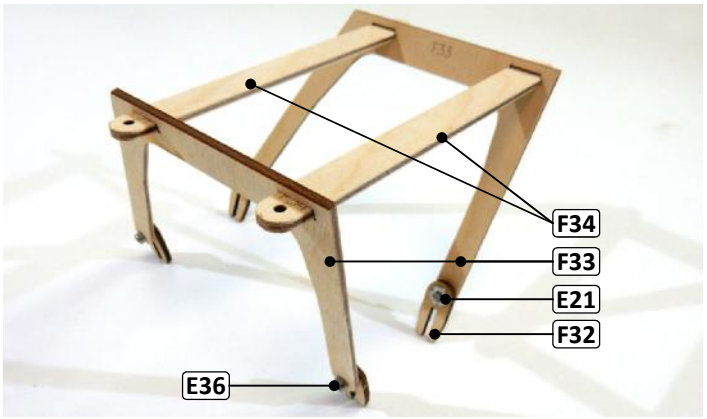
❑ **9.** Prepare the parts of the upper wing saddle. Use a sandpaper (80-120) to remove burnt areas on the edges.



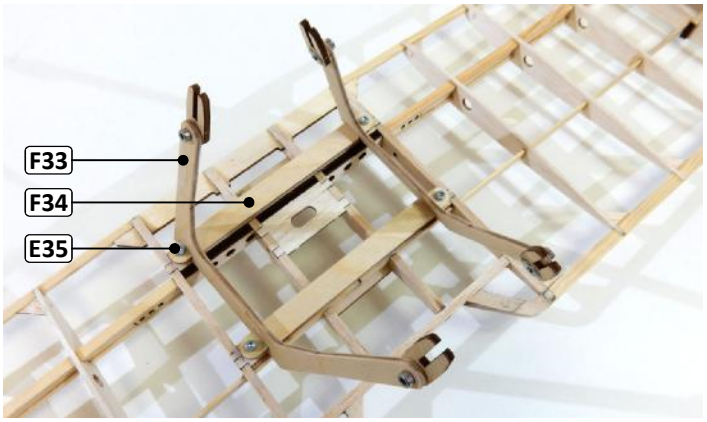
❑ **10.** Use fine sandpaper (250-320) to chamfer the edges according to the picture. Lightly flat sand all parts surface on both sides. If you will not sand it now you will sand it on assembled saddle and it will be more difficult.



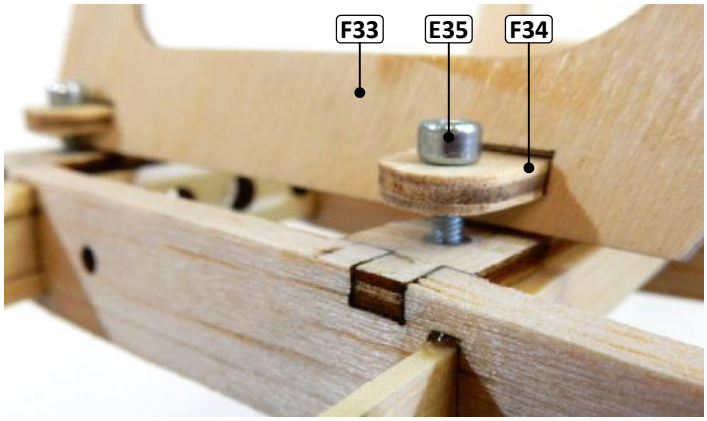
❑ **11.** Join parts **F33** with holders **F32** using screws **E36** (M3x8). Tighten lightly.



❑ **12.** Dry-assemble upper wing saddle. Don't glue!

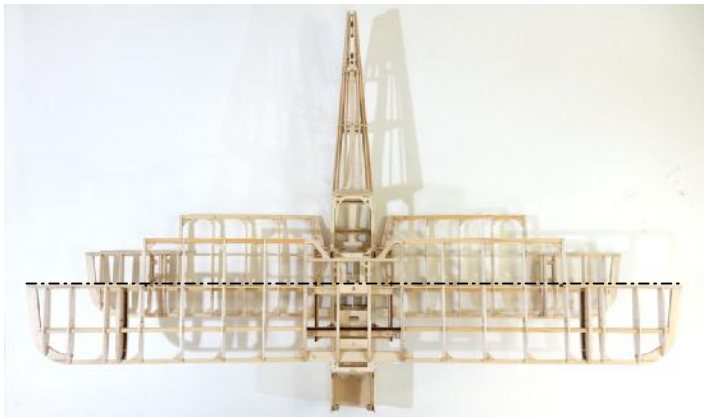


❑ **13.** Join the saddle to the upper wing using 4pcs screws **E35** (M3x10). Don't glue!

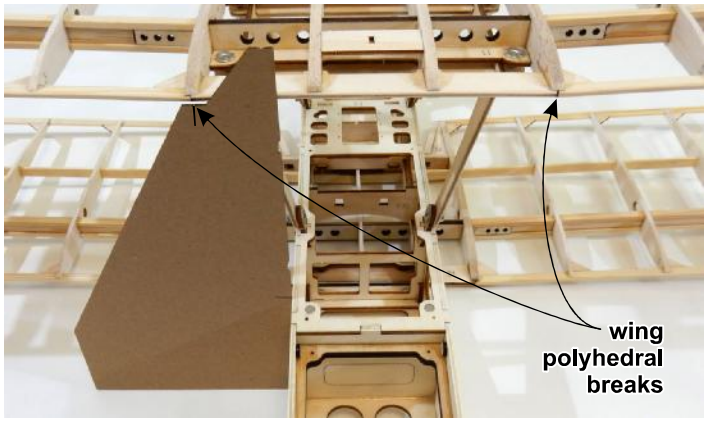


❑ **14.** Tighten the **E35** screws only so that the coupling **F34** does not bend and the side part **F33** is tilted to the side as much as possible. Don't glue!

❑ **15.** Insert the holders **F32** into the holes in the fuselage as far as it will go. Don't glue!

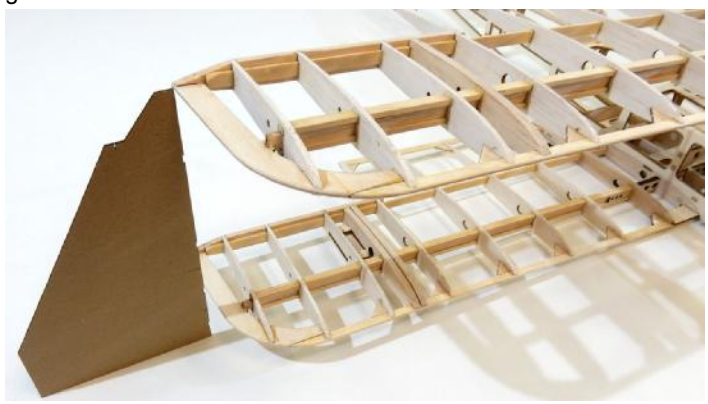


❑ **16.** When viewed from above, check the alignment of the upper wing with the bottom one. Don't glue!

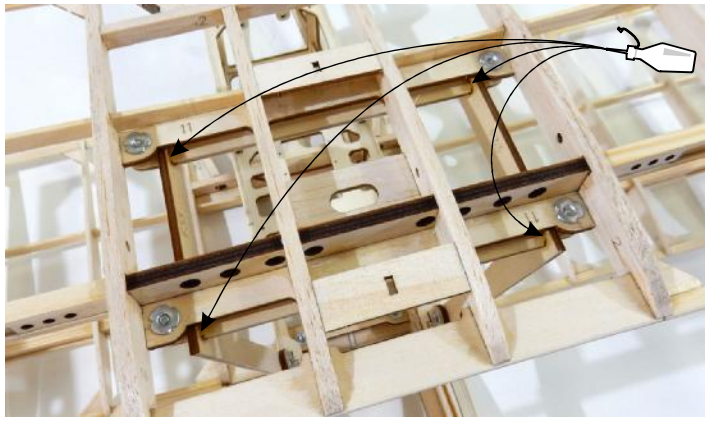


❑ **17.** Use the template to adjust the position of the upper wing. Align the mark on the template with the polyhedral break. Don't glue!

❑ **18.** The wing polyhedral break needs not to be exactly on the mark, but the position of the break must be the same on both sides of the fuselage relative to the mark on the template. Don't glue!

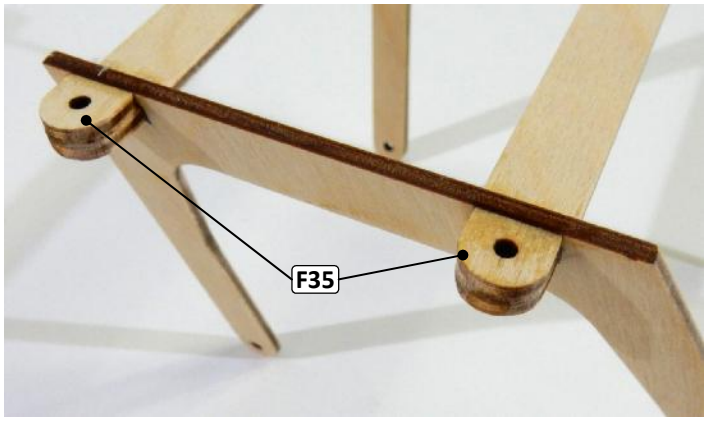


❑ **19.** Check the height of the wingtip using a template. The wing tips do not have to be exactly at the height of the mark, but they must be the same height on both sides of the wing.

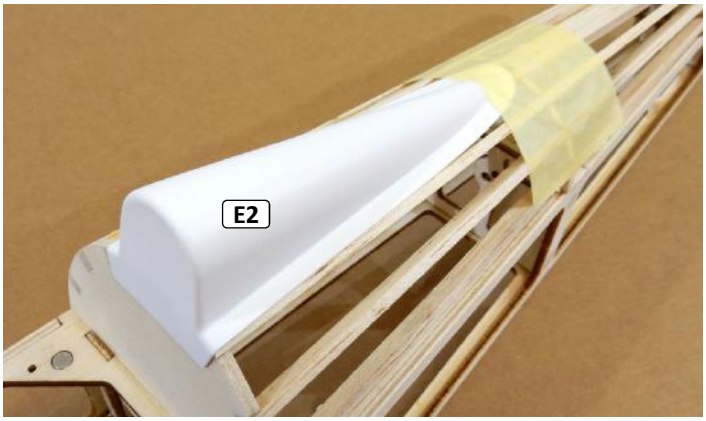


❑ **20.** When the upper wing is in the correct position, glue parts **F33** and **F34** with a small amount of glue.
Note: It might seem appropriate to glue the holders **F32** to the fuselage now. But you will sand the saddle after assembling to fit upper wing perfectly. In addition, glued holders **F32** would interfere with the covering of the fuselage.

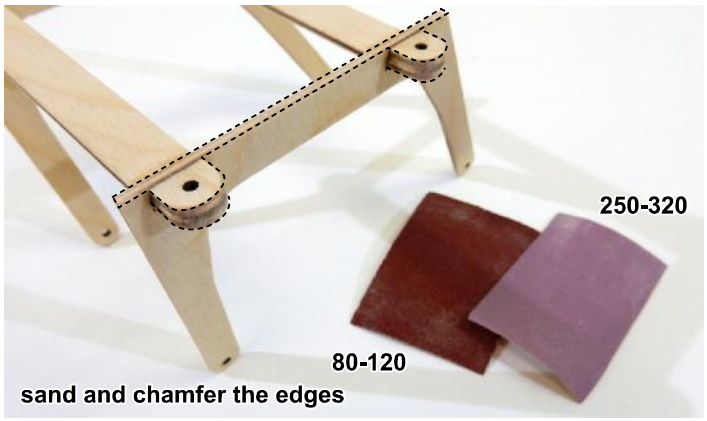
❑ **21.** Remove the upper wing saddle from the fuselage including the holders **F32**.



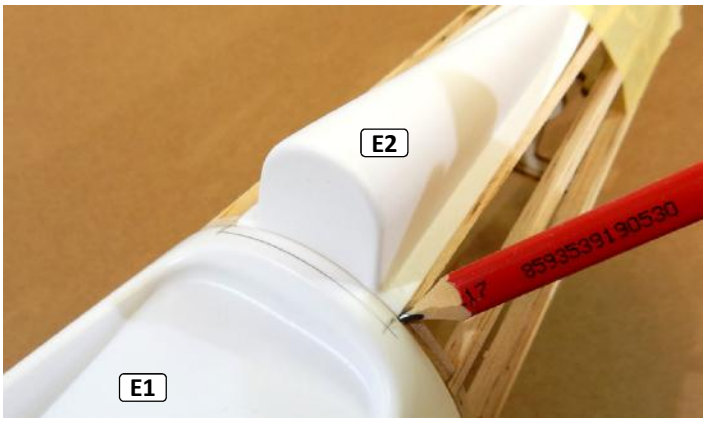
❑ **22.** Fit and glue 4pcs doublers **F35** and glue all joints thoroughly.



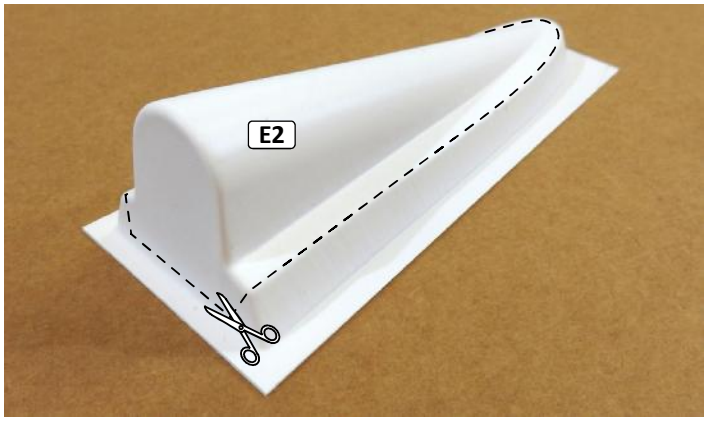
❑ **26.** Fit the vac-formed part **E2** to the fuselage and use paper tape to fix it in place.



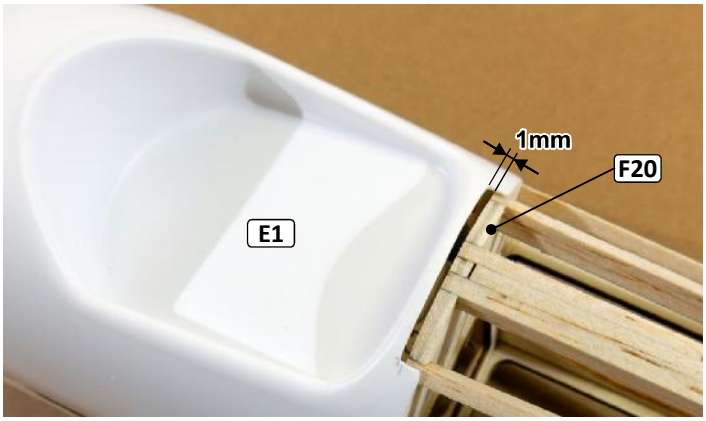
❑ **23.** Flat sand upper surface of the upper wing saddle. Sand doublers **F35** edges and bevel all “sharp” edges with fine sandpaper. Upper wing saddle is prepared for painting.



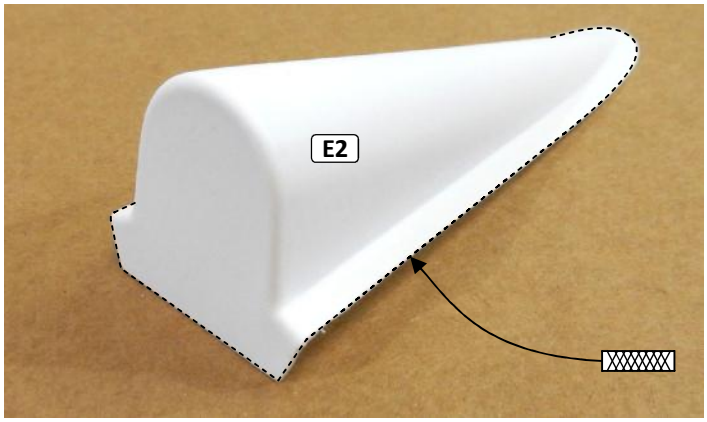
❑ **27.** Attach the fuselage cover **E1** and mark the position of the cut-out for the vac-formed part **E2** with a pencil.



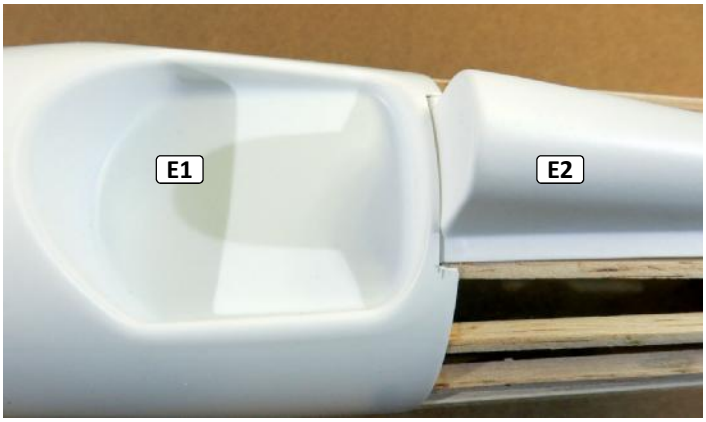
❑ **24.** Remove the part **E2** from its vac-formed sheeting by carefully cutting along the trim lines, as shown above.



❑ **28.** Make a cutout in the cover **E1** so that there is a gap of approx. 1 mm between the edge of the cover and the former **F30**.

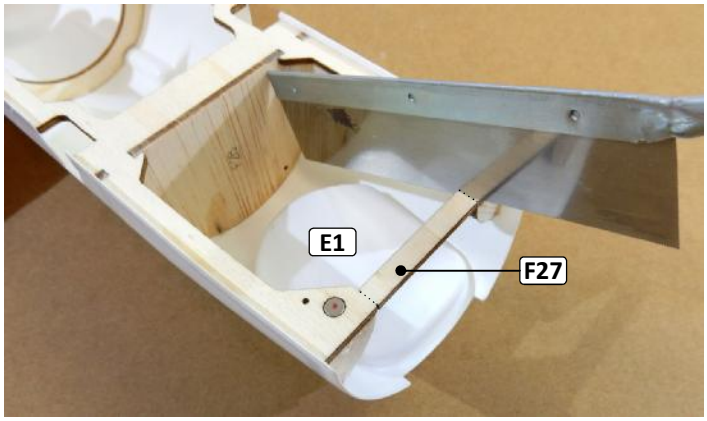


❑ **25.** Bevel outer edges with fine sandpaper (250-320).

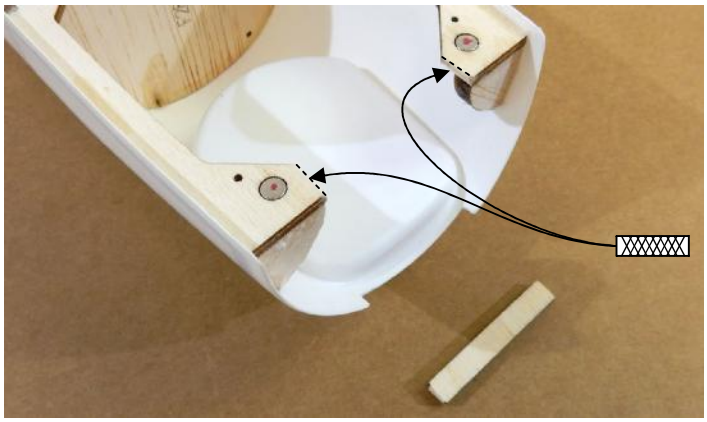


❑ **29.** Attach the vac-formed part **E2** and check that everything fits. Don't glue!

❑ **30.** Bevel cutout edges on cover **E1** with fine sandpaper (250-320).



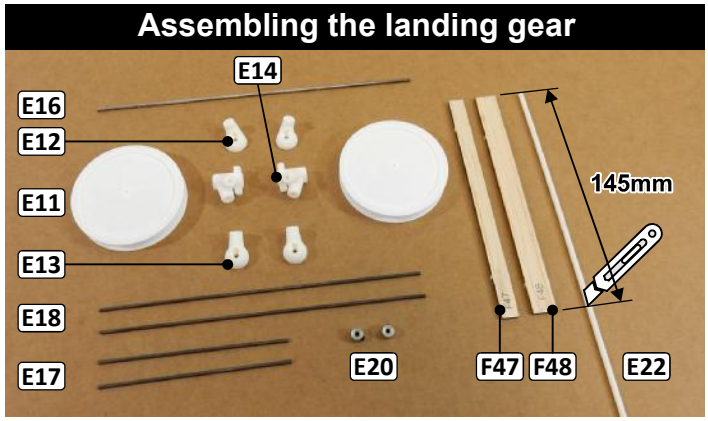
❑ **31.** Cut with a saw blade the piece of base sheet **F27**.



❑ **32.** Sand the cut edges with fine sandpaper (250-320).

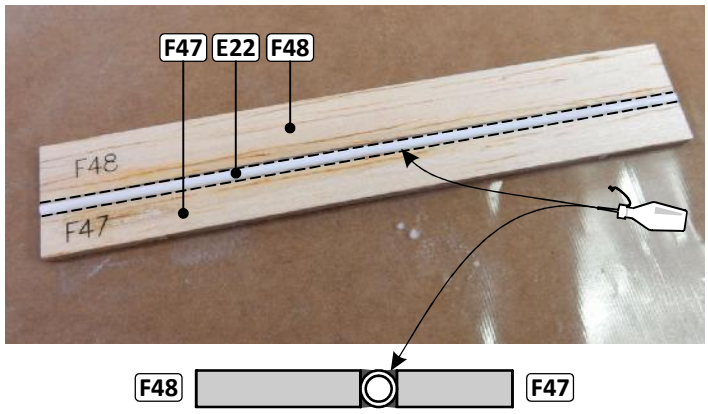
Notes:

Assembling the landing gear

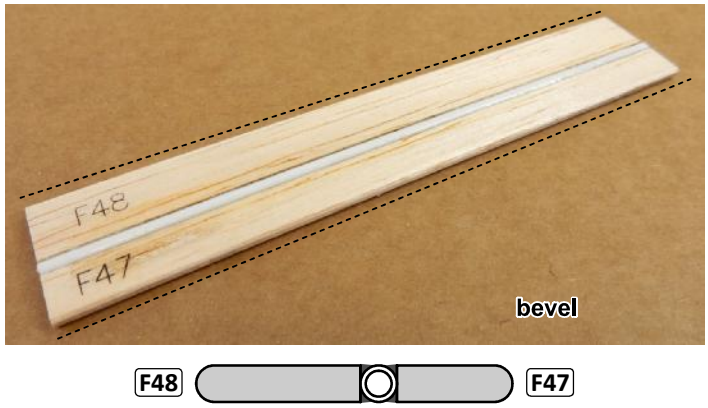


❑ **1.** Prepare parts of landing gear.

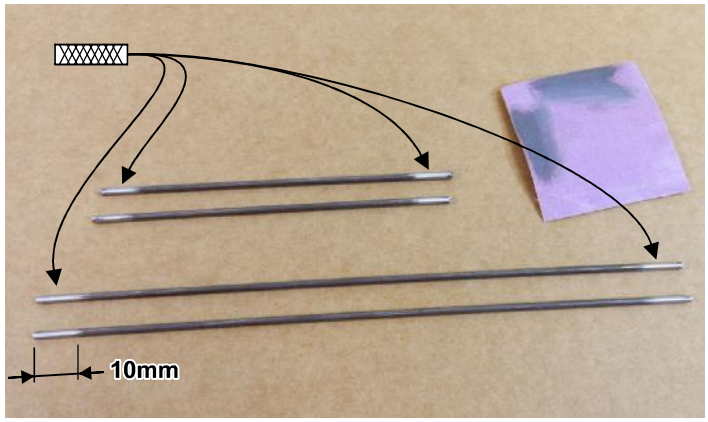
❑ **2.** Cut a 145mm piece (same as the length of parts **F47** and **F48**) from the **E22** tube.



❑ **3.** Glue the cut part of the **E22** tube between the landing gear wing parts **F47** and **F48**. Use a separating pad (wrap foil, wax paper, etc.).

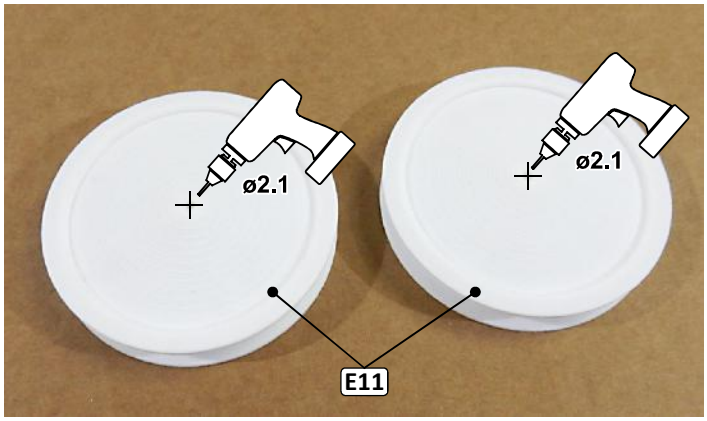


❑ **4.** Flat sand landing gear surface on both sides and bevel long edges on parts **F47** and **F48**. Sand short edges to blend with tube and to remove burnt areas.

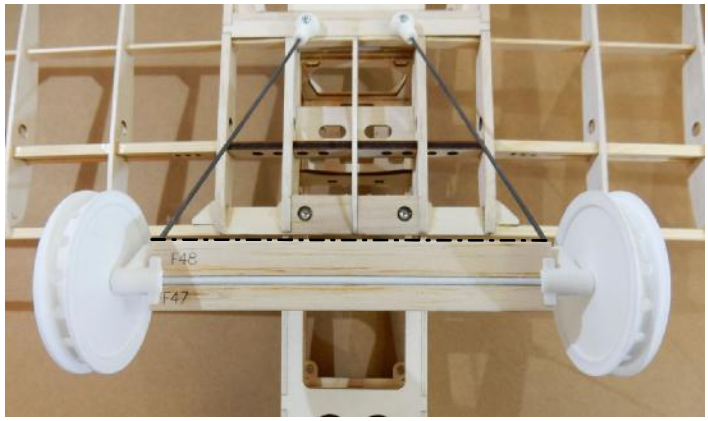


❑ **5.** Sand lightly ends of wires **E17** and **E18** with lenght aprox. 1cm for better glue adherence.

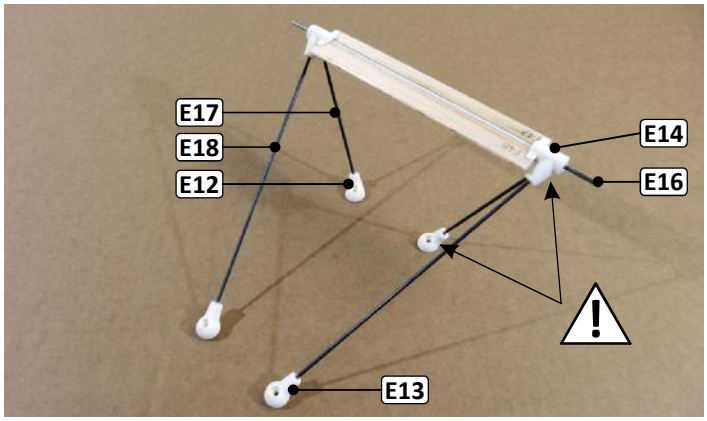
❑ **6.** Clean wires **E17** and **E18** with alcohol or acetone.



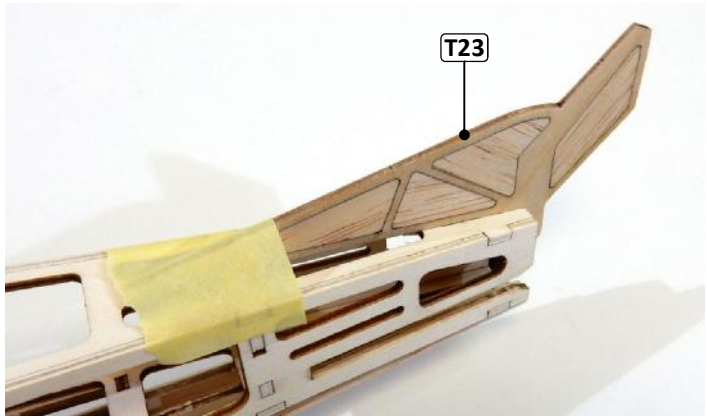
❑ **7.** Drill the centers of the wheels **E11** with a drill bit ø2.1mm.



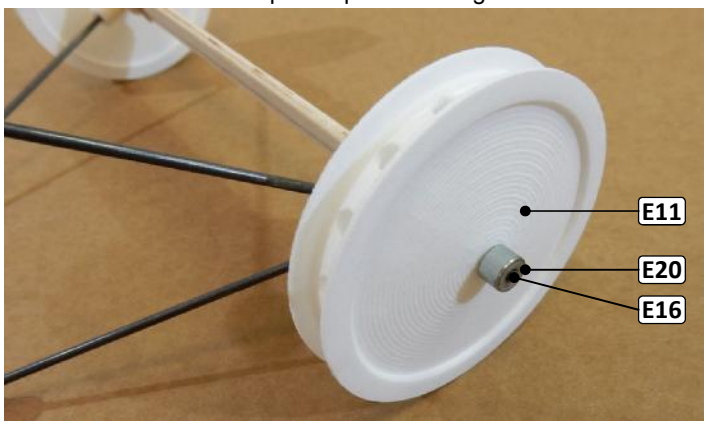
❑ **11.** When viewed from below, adjust the landing gear so that the landing gear wing is parallel to the bottom wing.



❑ **8.** Dry-assemble the landing gear. Insert wires **E16**, **E17** and **E18** into plastic parts **E12**, **E13** and **E14**. Pay attention to the correct orientation of the plastic parts. Don't glue!

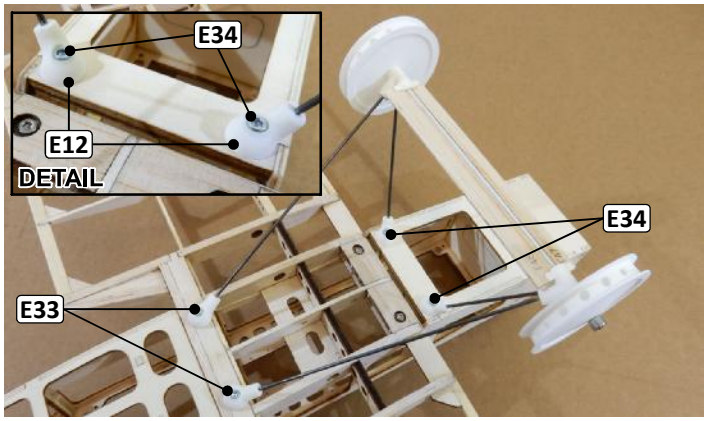


❑ **12.** Temporarily attach a tail skid **T23** to the fuselage.

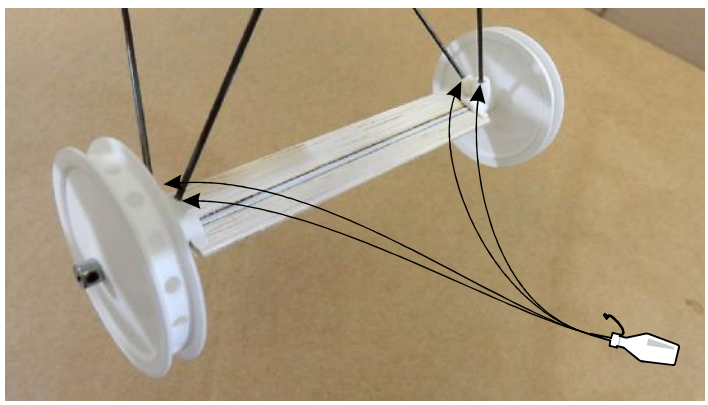


❑ **9.** Place the wheels **E11** on the shaft **E16** and secure them with the wheel stoppers **E20**.

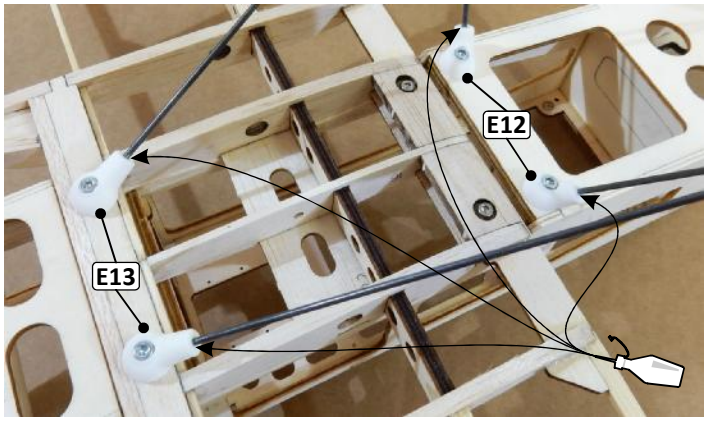
❑ **13.** Place the model on the landing gear and use the template to check that the wing tips on both sides have the same height from the table. Make a mark on the template with a pencil. You can change the geometry of the landing gear by moving the plastic parts on the wires.



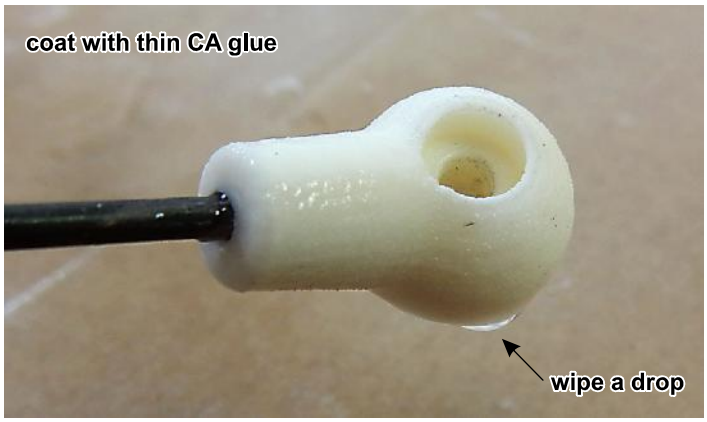
❑ **10.** Screw the landing gear to the fuselage with two screws **E33** (M3x30) and two screws **E34** (M3x20). Don't glue!



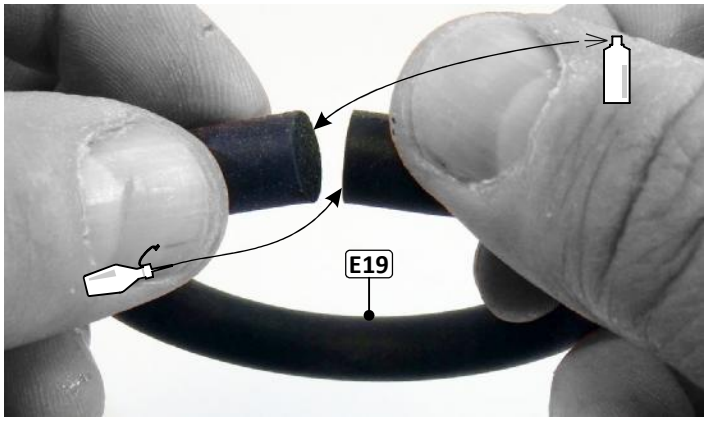
❑ **14.** When the landing gear geometry is OK, glue the joints of the wires and plastic parts **E14** with drops of CA.



❑ **15.** Glue the joints of wires and plastic parts **E12** and **E13**. Do not glue the shaft **E14** to the plastic part **E16**!
❑ **16.** Remove the landing gear from the fuse and disassemble.



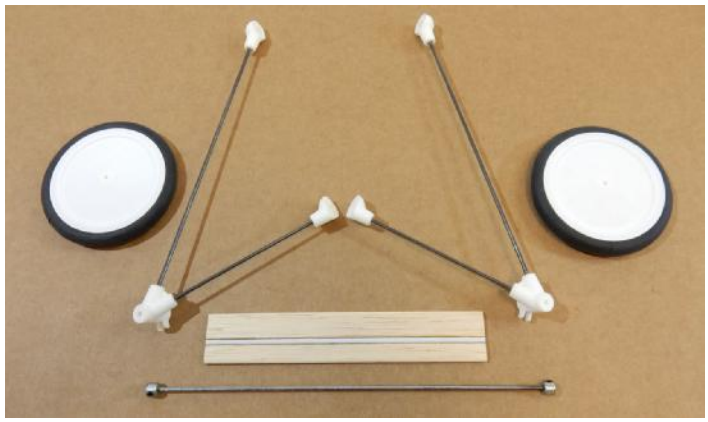
❑ **17.** Thoroughly soak all plastic parts **E12**, **E13** and **E14** with thin CA glue. Apply glue to the parts until they soak. Wipe off excess glue with a tissue.



❑ **18.** Glue two wheel tires made of moss rubber **E19**. Coat one end with slightly thin CA glue, lightly spray the other with activator.

❑ **19.** Press the ends of the rubber together.

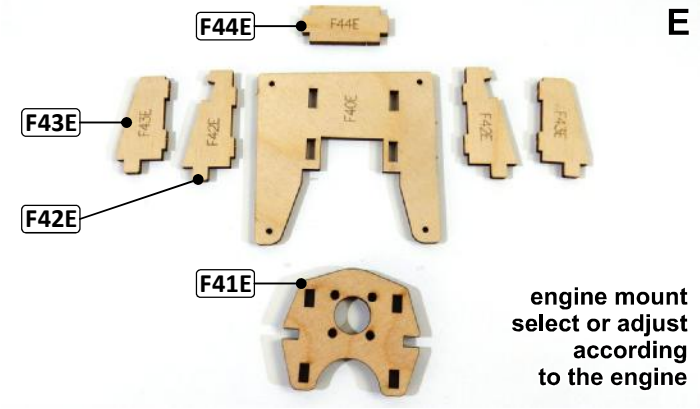
❑ **20.** Put tires **E19** onto **E11** wheel discs. Do not glue the tires on the discs! It is not necessary and would also interfere with painting of the discs.



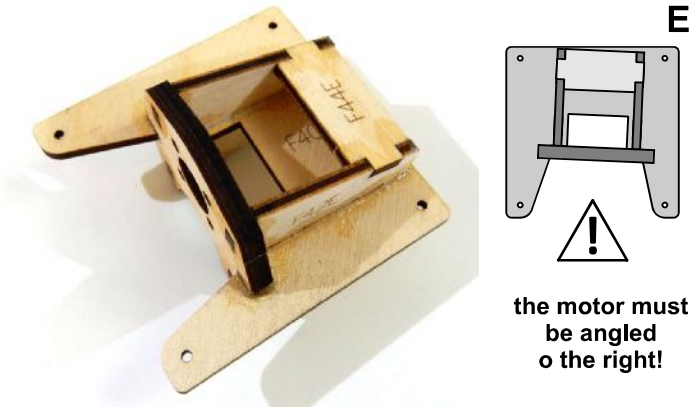
❑ **21.** Landing gear parts are ready for final assembly (painting, covering).

Notes:

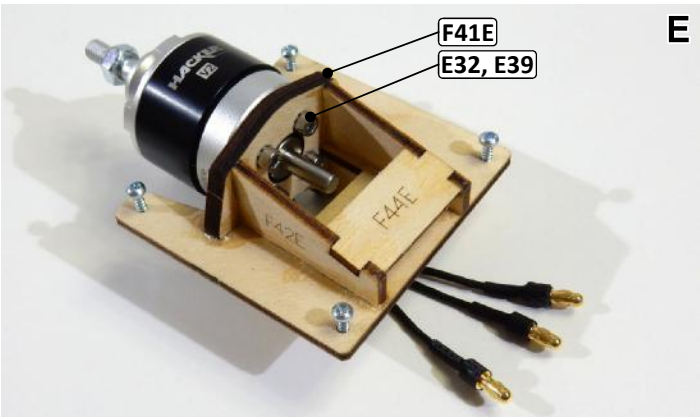
Motor / engine installation, motor cowl



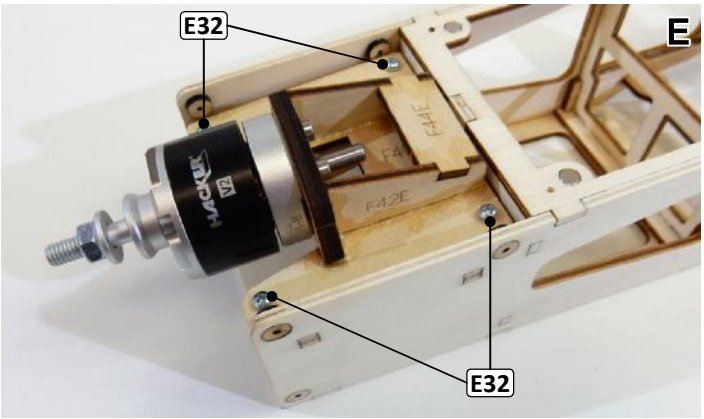
❑ **1.** Prepare motor mount parts - electric version.
Note: electric version - **E**, glow engine version - **G**



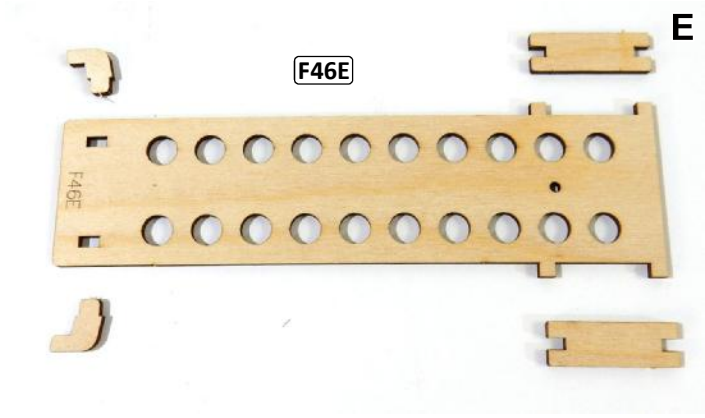
❑ **2.** Glue the motor mount really thoroughly. Pay attention to the correct orientation. The motor must be angled to the right.



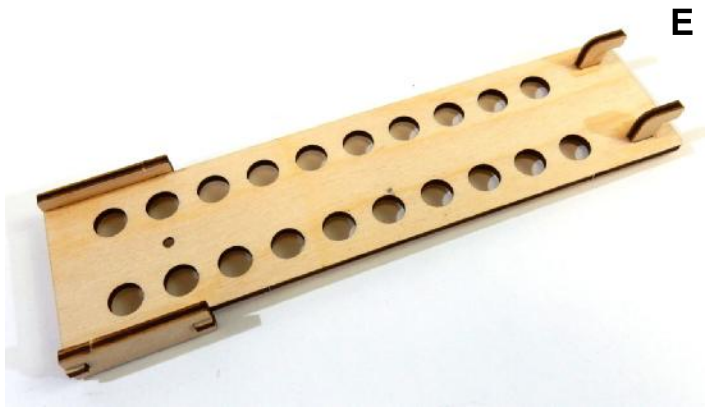
❑ **3.** Assemble the motor and screw it to the firewall **F41E** with screws **E35** and washers **E39**. Use a ball end hex key.



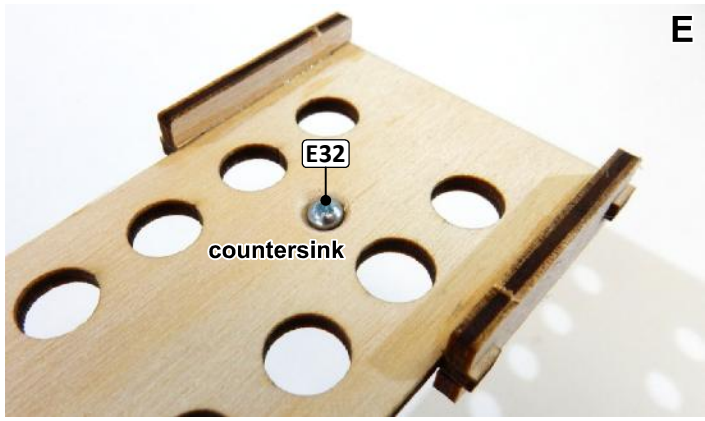
❑ **4.** Screw the motor mount to the fuselage with four screws **E32**.



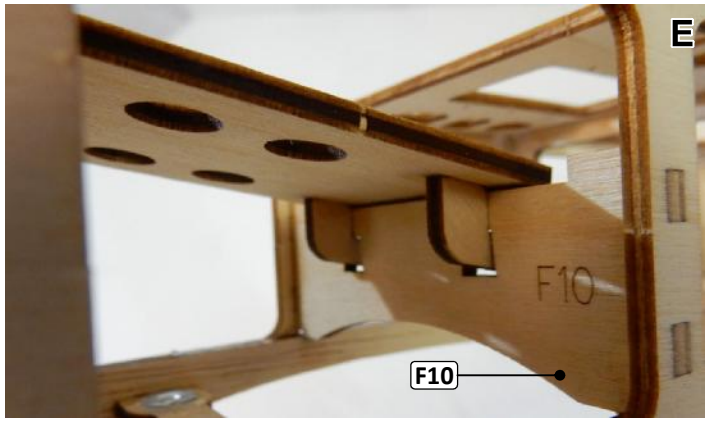
❑ **5.** Prepare the parts of the battery platform **F46E**.



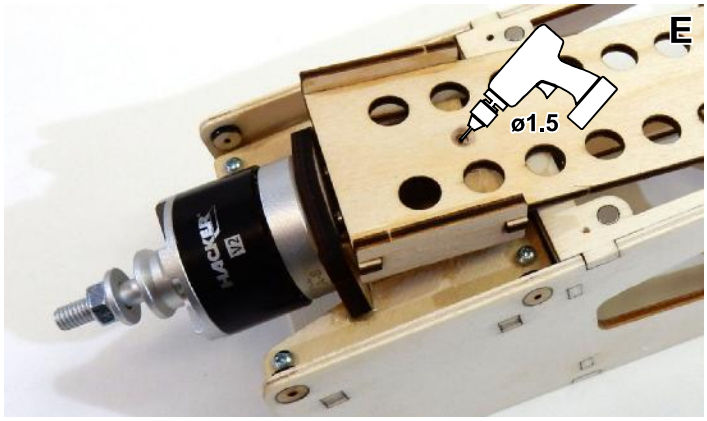
❑ **6.** Fit and glue the battery platform.



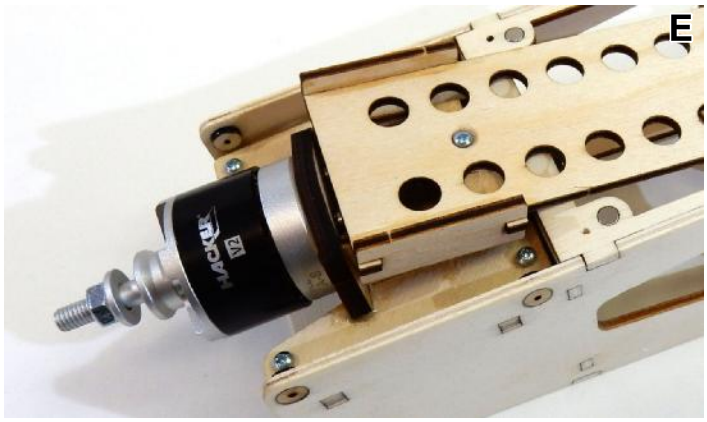
❑ **7.** Make a countersink for the screw **E32** using countersink drill bit.



❑ **8.** Insert the battery platform into the fuselage. Insert the hooks into the partition **F10**.



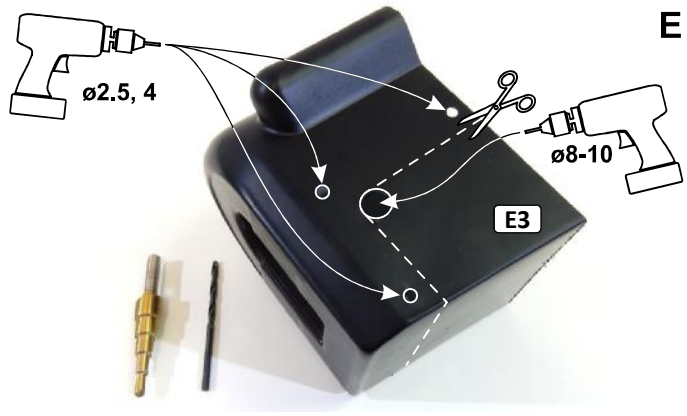
❑ **9.** Drill the battery platform with the motor mount. Use a drill bit ø1.5mm. Make sure that the battery platform is exactly in the middle of the fuselage.



❑ **10.** Screw the battery platform to the motor mount.

❑ **11.** Adjust the motor cowl **E3**. Cut a hole in the front of the cover. We recommend using step drills and drilling some of the material first. Cut the rest with a knife.

❑ **12.** Sand the edges first with a coarse sandpaper (80-120) and then a fine sandpaper (250-320).



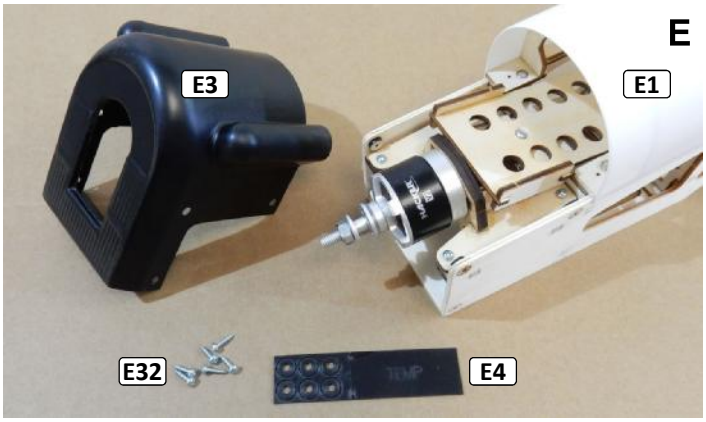
❑ **13.** Pierce the cowl **E3** on the sides in the marked places with a needle. The hole will be a guide for the drill.

❑ **14.** Gradually enlarge the holes with a 2.5-3mm drill bit and finally drill with a step drill bit to a diameter of 4mm. Hold the drill bits in your hand (do not use a drilling-machine).

❑ **15.** Drill 8-10mm holes in the inner corner before cutting. The inner corner will be rounded and it will be easier to trim the cowl.

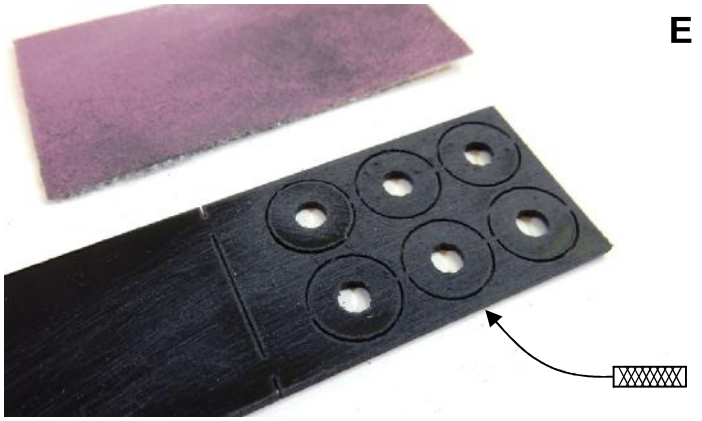
❑ **16.** Trim the **E3** cowl with scissors according to the trim lines. It is better to cut two times. First a short distance from the trim line and then exactly along the trim line.

❑ **17.** Bevel outer edges with a fine sandpaper (250-320).

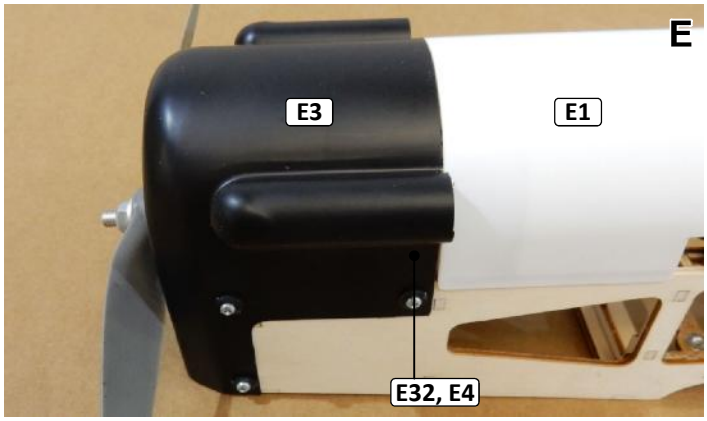


❑ **18.** Prepare parts and materials for mounting the motor cowl on the fuselage.

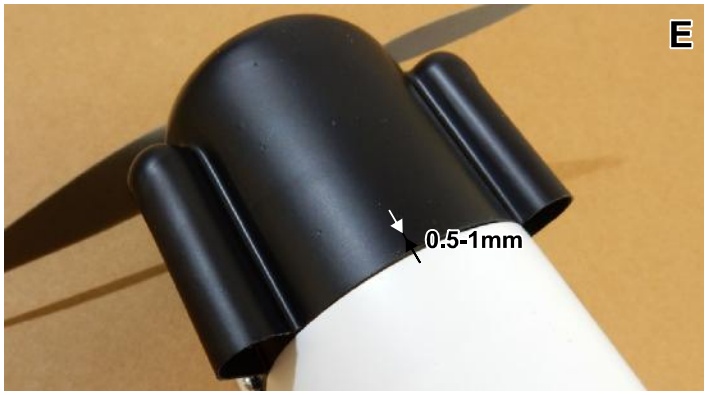
Note: The black motor cowl is used for better clarity, it is white cowl in the kit.



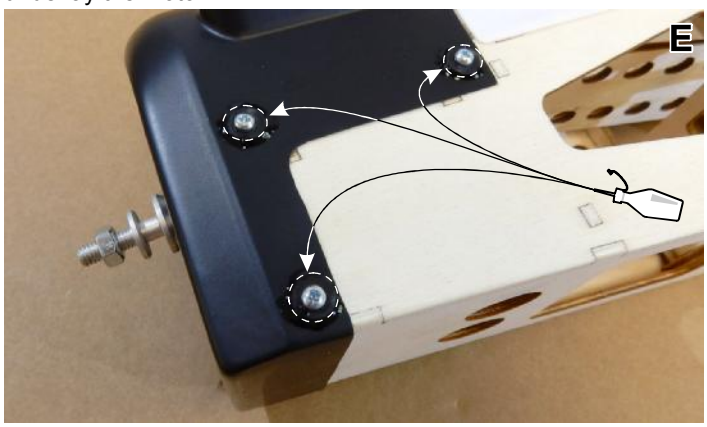
❑ **19.** Sand the surface of the washers in the **E4** plate on one side.



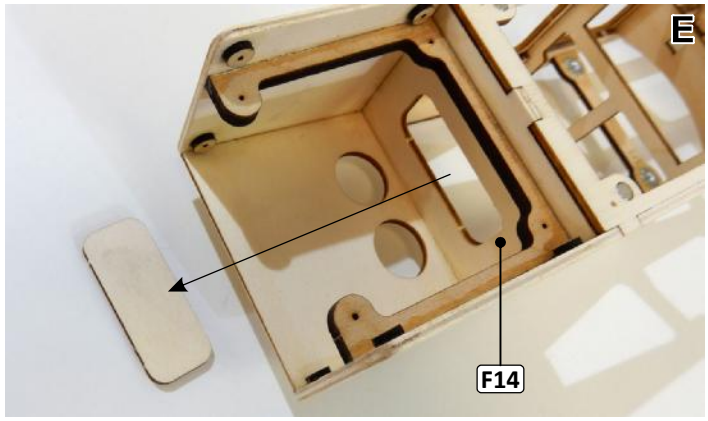
❑ **20.** Place the motor cowl on the fuselage and secure with the screws **E32** with the **E4** washers fitted (sanded side to the cowl).



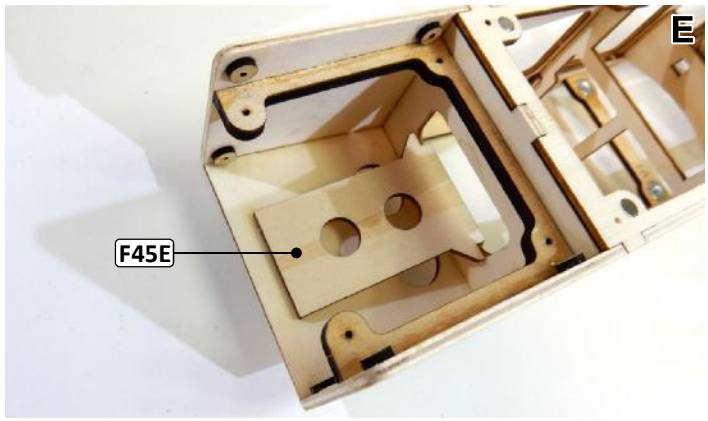
❑ **21.** Align motor cowl **E3** with cover **E1** and tighten screws **E32**. There should be a gap of approx. 0.5-1mm between motor cowl **E3** and cover **E1**. Adjust the gap width by sanding the cover **E1** (it is easier than adjusting the motor cowl).
Note: We recommend installing a propeller to ensure that the motor cowl is fitted correctly. If the propeller rubs against the cowl, it is easiest to underlay it on the shaft with a washer or to underlay the motor.



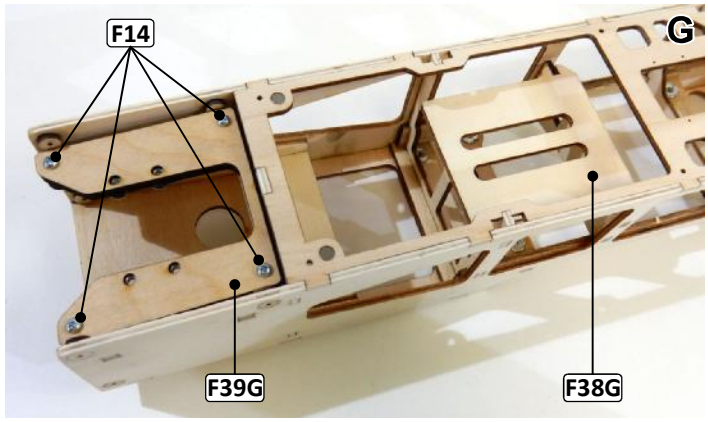
❑ **22.** Glue the washers **E4** to the motor cowl **E3**. Be careful not to glue the screws **E32** as well.



❑ **23.** Remove the motor cowl, battery platform and motor mount. Break off the filling in the former **F14** (electro version only).

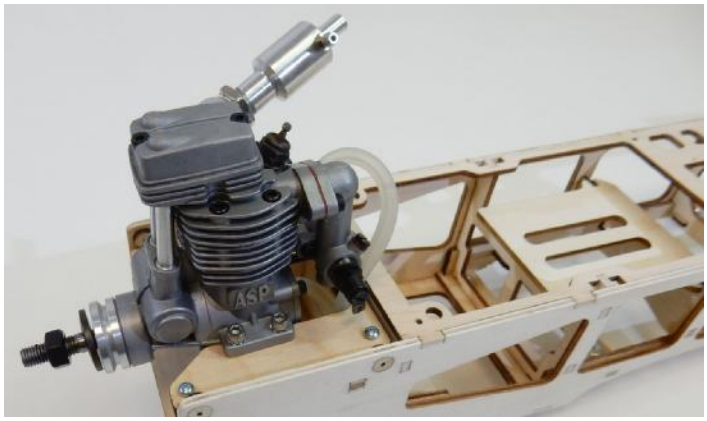


❑ **24.** Glue the ESC platform **F45E** to the front of the fuselage.



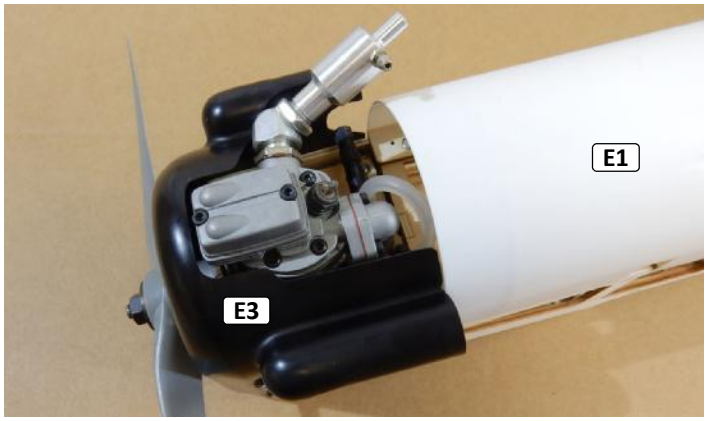
❑ **25.** Screw the glow engine mount **F39G** to the fuselage with four screws **E32**.
❑ **26.** Glue the fuel tank platform **F38G** into the fuselage.

❑ **27.** To install the engine cowl for glow engine version proceed in the same way as for the electrical version (steps *11-17*). Keep a gap of about 0.5-1mm between the motor cowl **E3** and fuse cover **E1**.



❑ **28.** Remove the engine cowl.

❑ **29.** Install the engine (ASP, OS MAX, Saito) with screws **E35** (M3x10) and with washers **E39** to the engine mount **F39G**.



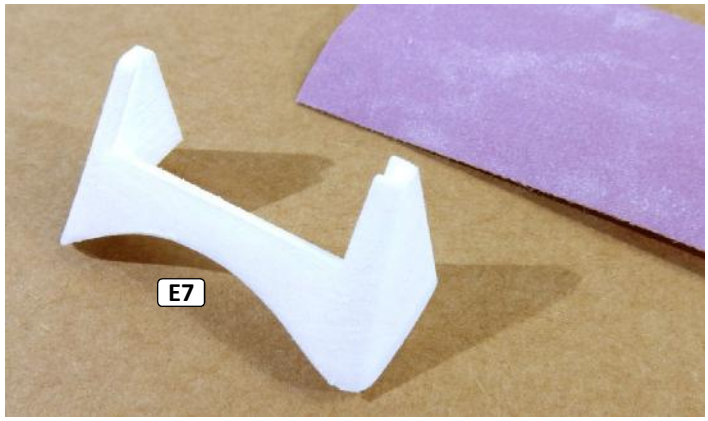
❑ **30.** Trim the cowl around the engine. The distance between the engine and the cowl should be at least 2mm.
Note: We recommend installing a propeller to ensure that the motor cowl is fitted correctly.

❑ **31.** Remove the cowl and engine from the fuselage for next steps.

Notes:

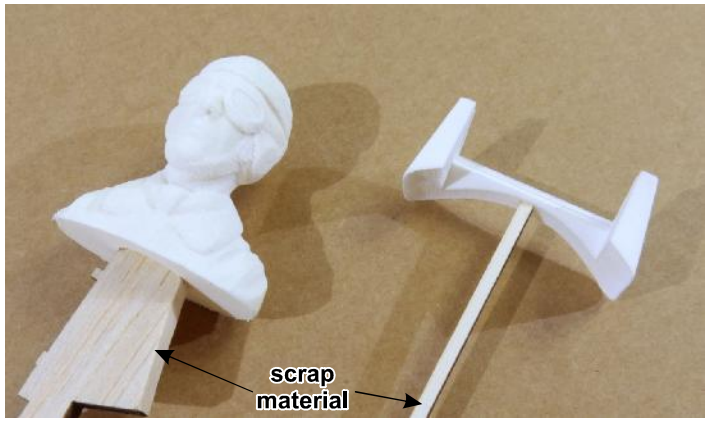
Painting

Introduction:
- Select the colors especially with regard to the drive variant. For the electro version, just use ordinary acrylic spray paints. For the combustion version, you must use fuel-resistant paints, preferably two-component (paint + hardener).
- Parts must be prepared before painting. Spray both wooden and plastic (3D printing) parts with a filler before painting. After each spray, sand the surface with a fine sandpaper 250-320. Use the filler until you are satisfied with the surface. Usually 2-3 layers are enough. Do not believe that imperfections will be hidden by the final color. It won't hide it!
- Plastic vac-formed parts cannot be painted directly, the paint would sooner or later peel off. Lightly sand the surface with an abrasive fleece and spray with a plastic primer (clear spray). You can spray paint on such a surface. The thin vac-formed part **E2** (support behind the pilot's head) must also be sprayed from the inside, otherwise it will twist!
- When painting, use gloves so that you do not transfer grease from your hands to the painted parts.

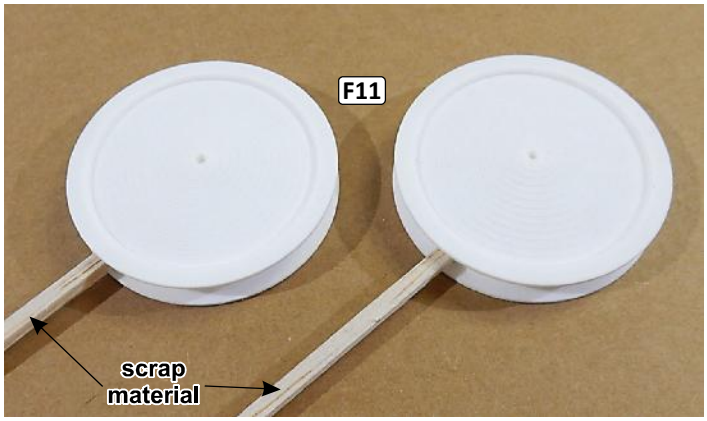


❑ **1.** Sand the wind shield holder **E7** until smooth.

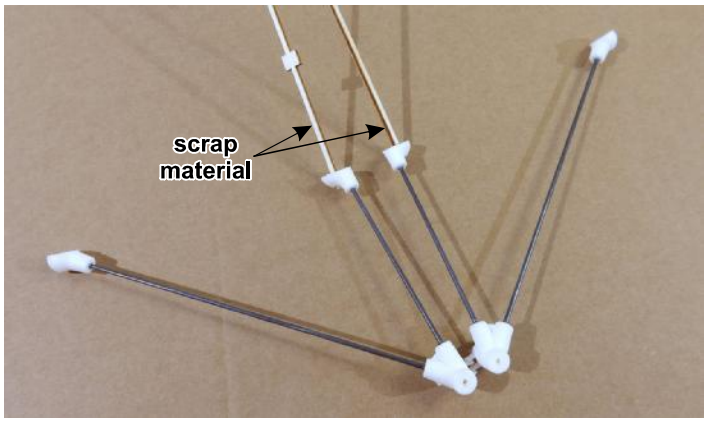
❑ **2.** Check whether the pilot **E8** fits well into the cockpit in the **E1** cover. Use sandpaper to adjust the pilot if needed.



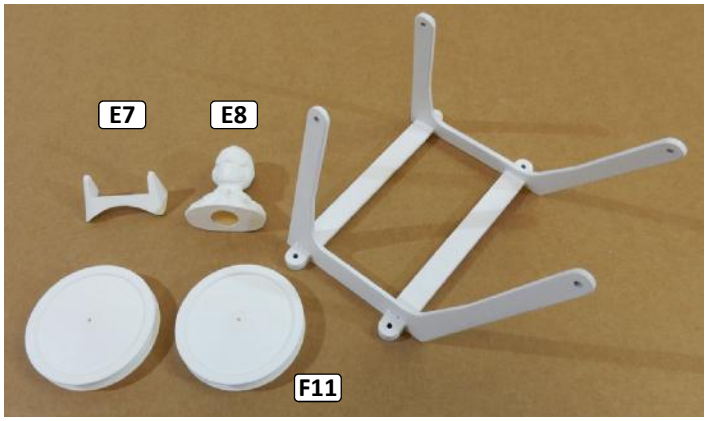
❑ **3.** Use scrap material from the kit to make holders of painted parts.



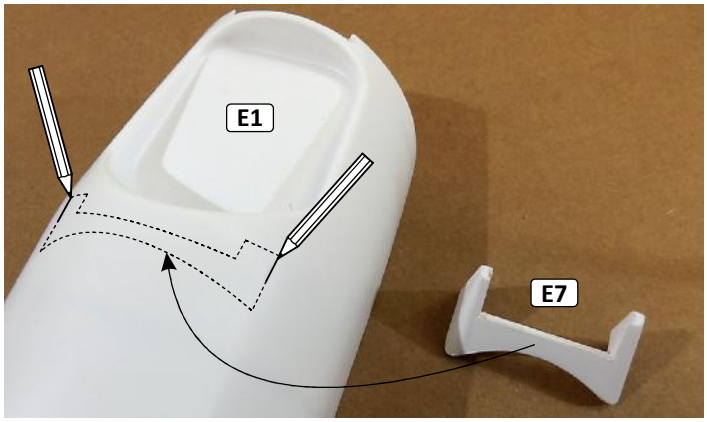
❑ **4.** Use scrap material from the kit to make holders of painted parts.



❑ **5.** Use scrap material from the kit to make holders of painted parts.



❑ **6.** Spray the parts with a filler (already sprayed and sanded parts are in the picture). Parts are prepared for the paint spray.

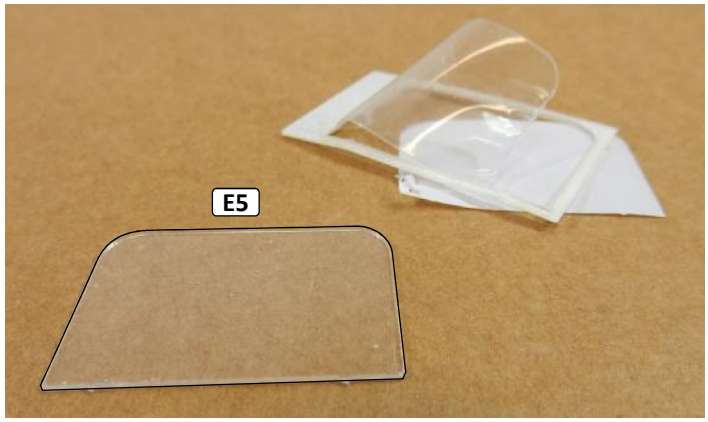


❑ **7.** Highlight the marks for placing the windshield holder **E7** to the cover **E1** with a pencil.
❑ **8.** Glue the windshield holder **E7** to the cover **E1**.

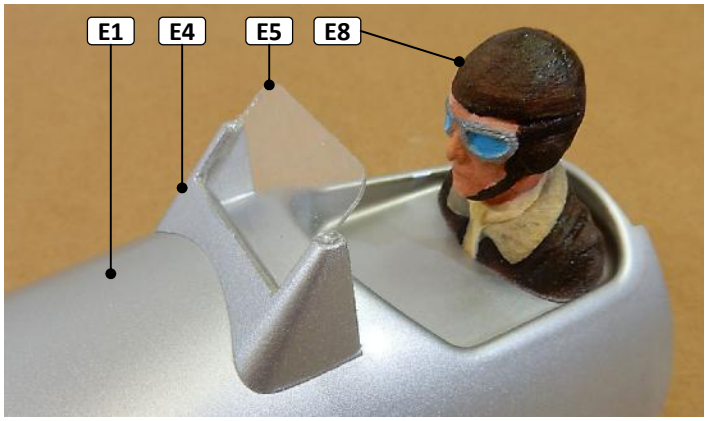
❑ **9.** Vac-formed parts prepared for spraying with a plastic base and for painting.

❑ **10.** Painted parts. Don't forget to paint the vac-formed part **E2** even from the inside, otherwise it will twist.

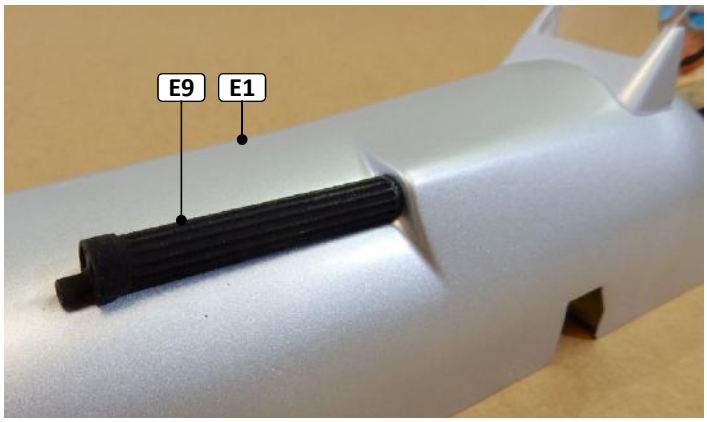
❑ **11.** You can paint the pilot **E8**, for example, with paints for plastic model kits. For the glow engine version, we recommend finally spraying the pilot with a two-component matt varnish.



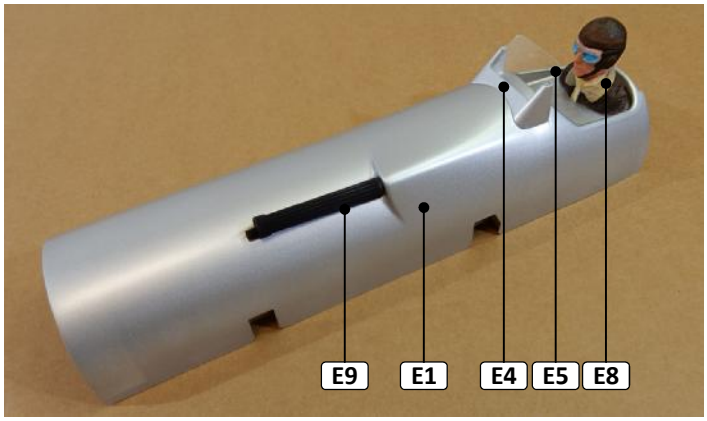
❑ **12.** Remove the protective foils from both sides of the windshield **E5**.



❑ **13.** Glue the windshield **E5** to the holder **E4** and glue the pilot **E8** to the fuselage cover **E1**. Use UHUPOR, not CA glue!



❑ **14.** Glue the machine gun **E9** to the fuse cover **E1**. If necessary, adjust the end of the machine gun by sanding so that it fits into the cover **E1**.



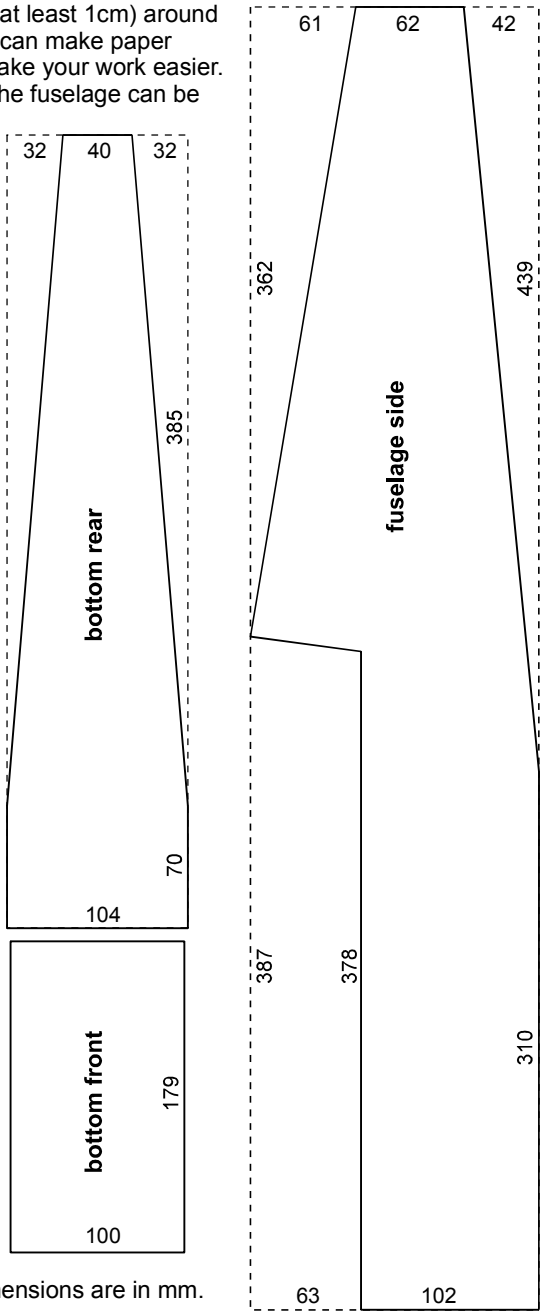
❑ **15.** Finished assembled fuselage cover with machine gun, with windshield and with pilot in the cockpit.

❑ **16.** Install tires **E19** onto the discs **E11**. Gluing is not required.

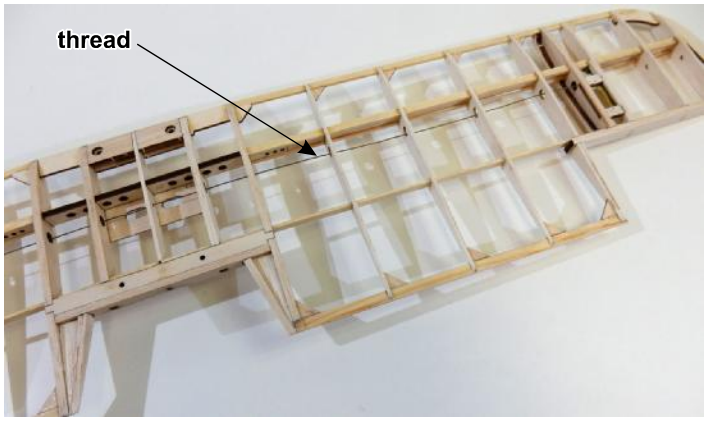
Covering

Introduction:

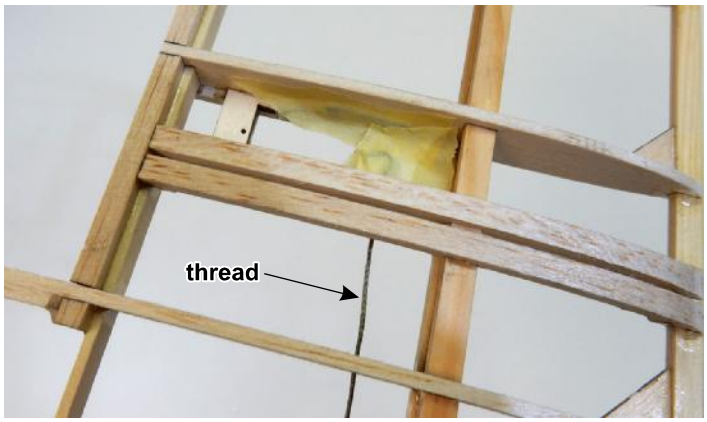
- There are several ways to cover the frame of a model airplane. You can use tissue or linen and then paint the surface. In this manual, the model is covered with colored polyester covering shrink film. Working with film is fast, "clean" and not difficult. However, covering the wing and especially the wing tips requires some experience. This model is definitely not suitable for your first experiments with foil.
- Read the instructions carefully to use the film. Set the covering iron to the proper temperature. Test it by laying a small strip of covering over a scrap piece of balsa and firmly pressing with the iron. Make sure the iron is hot enough to activate the adhesive, but not so hot that it burns the covering. When connecting the covering, always keep an overlap of at least 5 mm!
- We recommend that you apply the covering by first ironing the covering around the edges of the structure with an iron set to a lower temperature. Apply covering on both sides of the structure. Only then you can start to shrink the covering by heating it evenly on both sides of the structure. Finally, iron the covering onto the ribs. This will prevent the structure from twisting during covering. For the wings, ailerons and tails, it is necessary to ensure the removal of heated air from the structure by making several "venting" holes.
- Sand the entire structure with a fine sandpaper (250-320) before covering and then remove dust.
- To make the best use of the covering, consider the layout of the covering pieces. Be sure to leave extra material (at least 1cm) around all pieces. You can make paper templates to make your work easier. Templates for the fuselage can be found below.



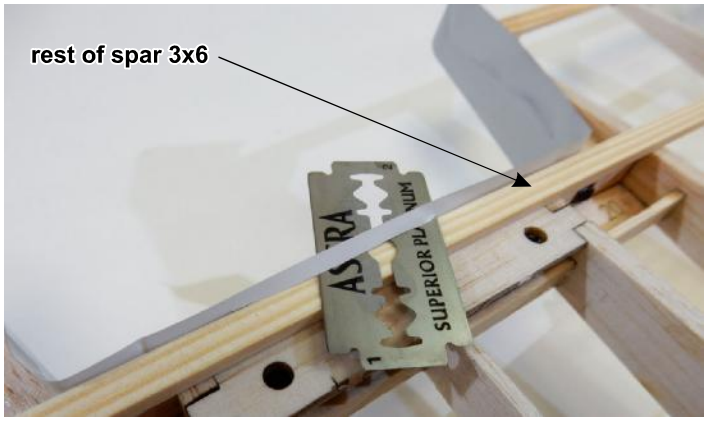
Note:
The stated dimensions are in mm.



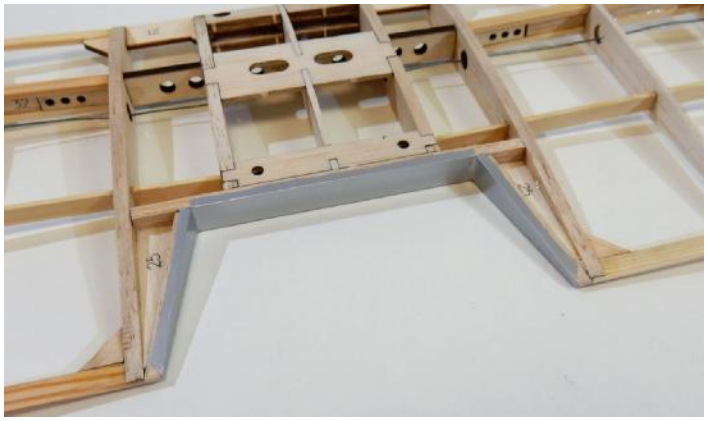
❑ **1.** Before covering the wings, insert a thread into the structure of the lower wing for later pull-through the servo cables.



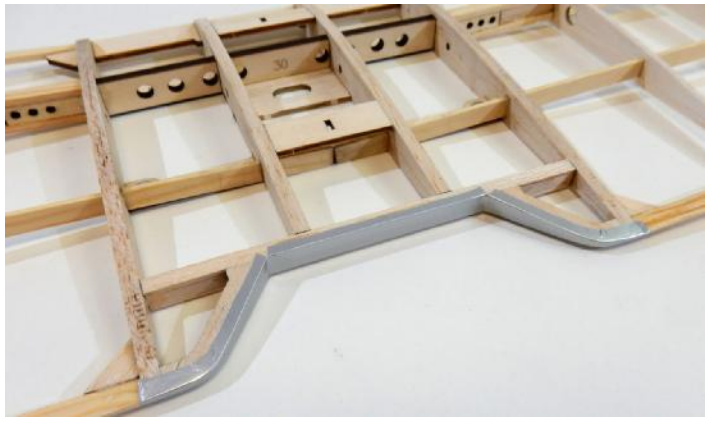
❑ **2.** Use pieces of paper tape to fix ends of the thread on both wing sides - on servo mounts. Make the thread a little longer.



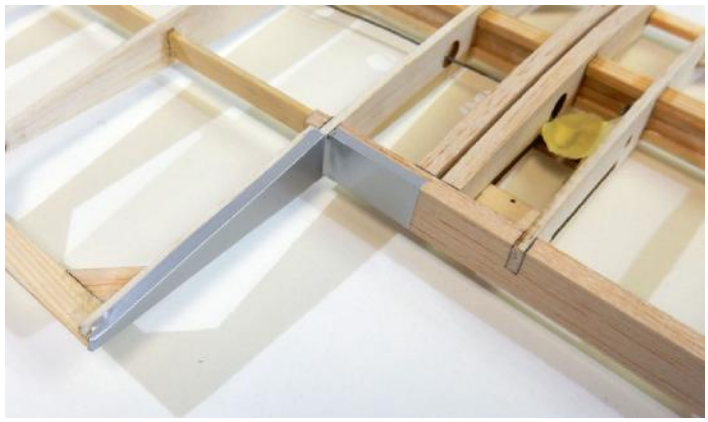
❑ **3.** Before covering the surface cover the inner edges. Iron the foil in spots on the structure and cut off the exceeding pieces. You can use rest of spars 3x6mm as a spacer.



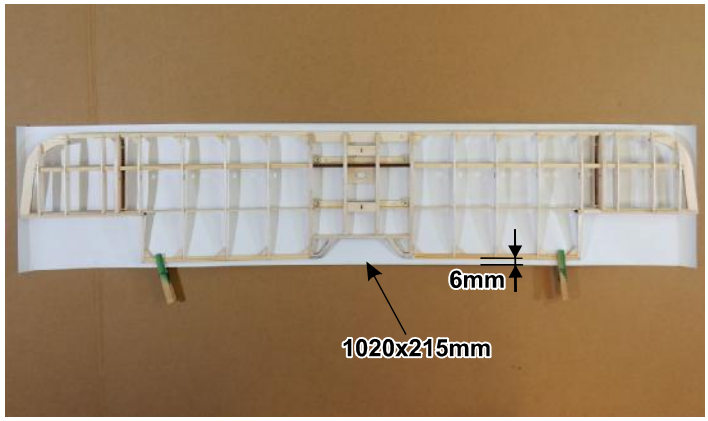
❑ **4.** Cover T.E. of the bottom center wing section.



❑ **5.** Cover T.E. of the upper center wing section.

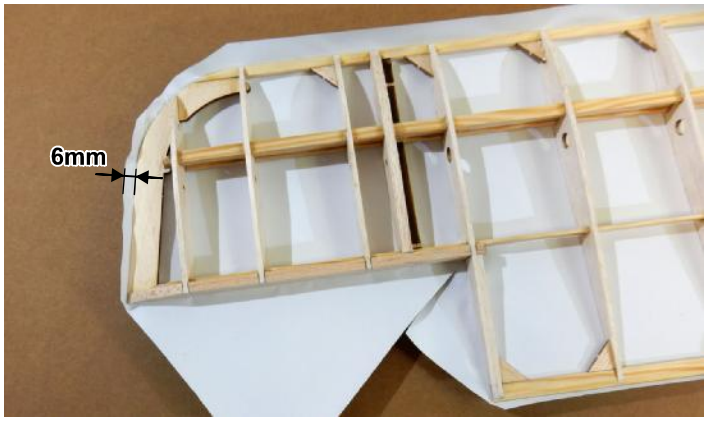


❑ **6.** Cover the inner corners at the ailerons.

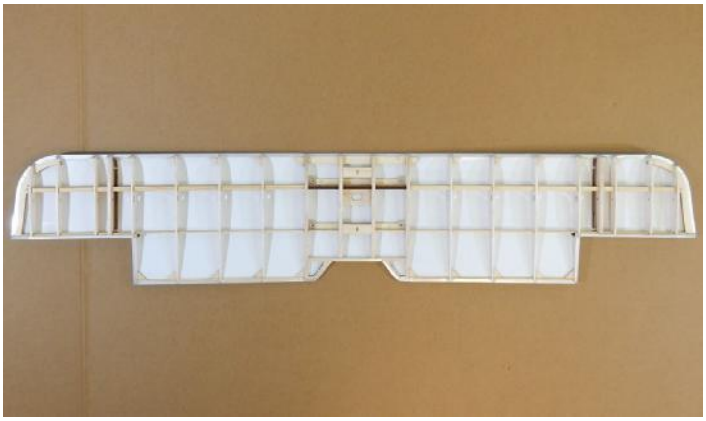


❑ **7.** Cover the bottom surface of the wing. Cut a covering piece of 1020x215mm and hold it on the T.E. with an overlap of approx. 6mm using two clothes pegs.

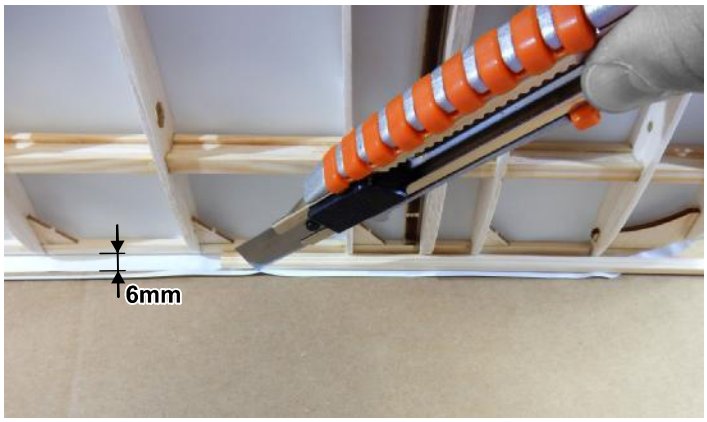
❑ **8.** Set the iron to a lower temperature (to activate the glue, but the foil does not shrink too much) and iron the cover to the outer wing edges. Don't worry if it doesn't look so nice.



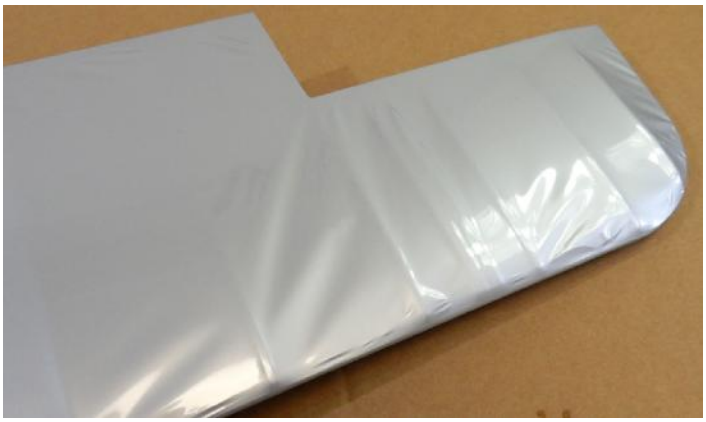
❑ **9.** On aileron place cut, fold and iron the covering over the edges. At the wing tip cut the foil with an overlap of approx. 6mm.



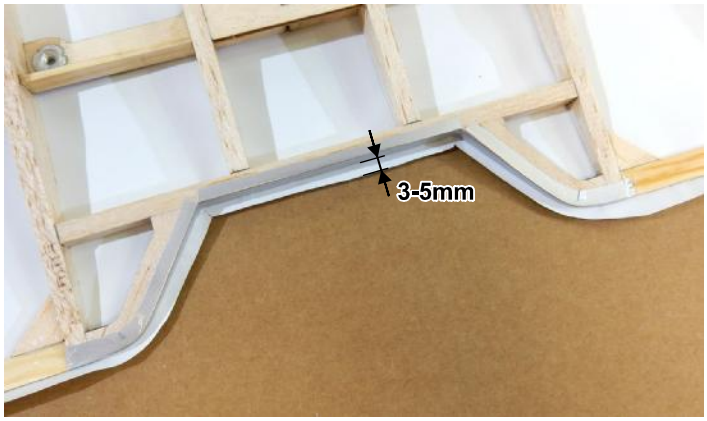
❑ **13.** The covering must be ironed over the edges to the upper surface of the wing.



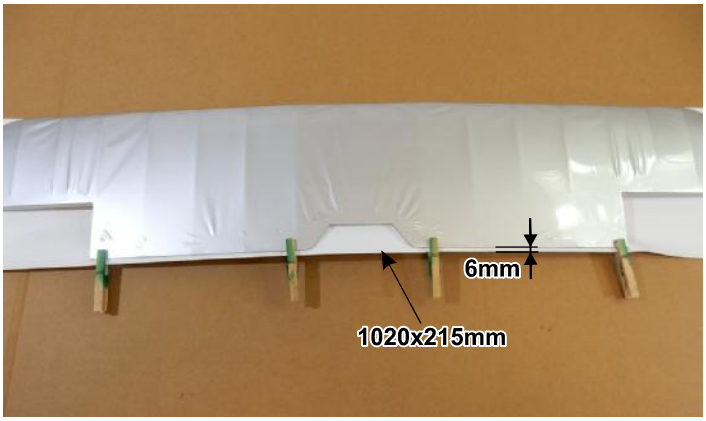
❑ **10.** Cut the covering along the L.E. with an overlap of approx. 6mm. You can use rest of spar 3x6mm as a spacer.



❑ **14.** Only iron the foil around the edges, do not shrink it or iron it to the ribs yet! It doesn't matter that the covering is corrugated now.



❑ **11.** Cut the covering along the T.E. of the center wing section with an overlap of approx. 3-5mm.



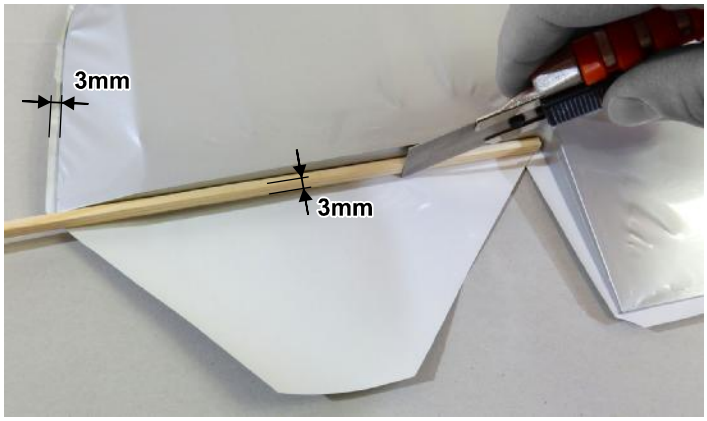
❑ **15.** Cover the upper surface of the wing. Cut a covering piece of 1020x215mm and hold it on the T.E. with an overlap of approx. 6mm using two clothes pegs.

❑ **12.** With the iron set to a higher temperature, carefully iron the covering around the entire edges of the wing.

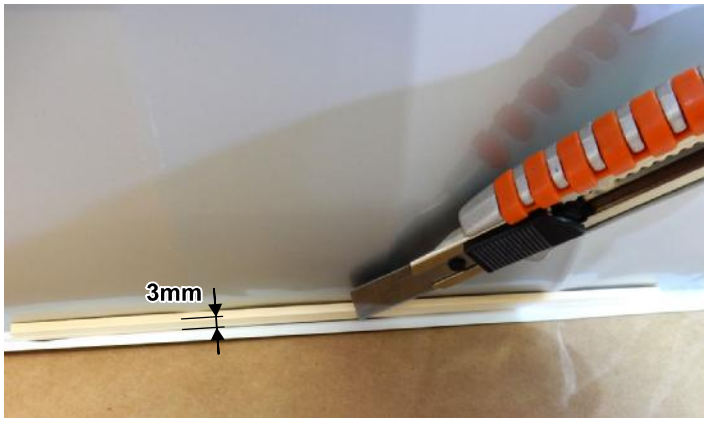
❑ **16.** Iron the covering (set lower iron temperature) to the center wing section side ribs and L.E.

❑ **17.** Set the iron to a lower temperature (to activate the glue, but the foil does not shrink too much) and iron the cover to the outer wing edges. Stretch the covering on wing tips.

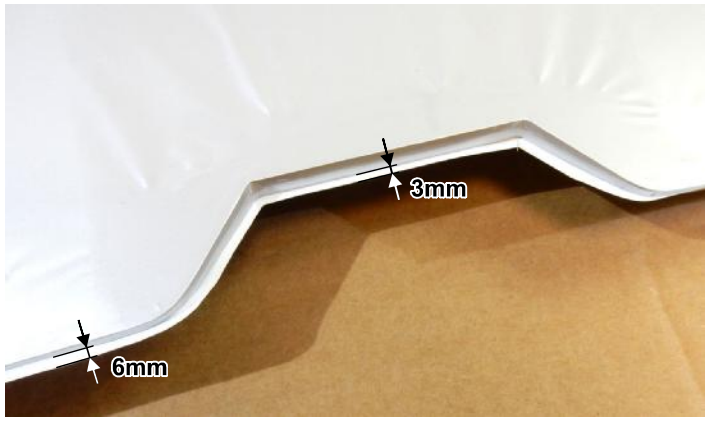
❑ **18.** The most difficult is the ironing of the wing tips. When ironing, stretch the covering so that wrinkles do not stick to the edge.



❑ **19.** Cut the covering along the outer edges with an overlap of approx. 3mm. You can use rest of spar 3x6mm as a spacer.



❑ **20.** Cut the covering along the L.E. with an overlap of approx. 3mm. You can use rest of spar 3x6mm as a spacer.

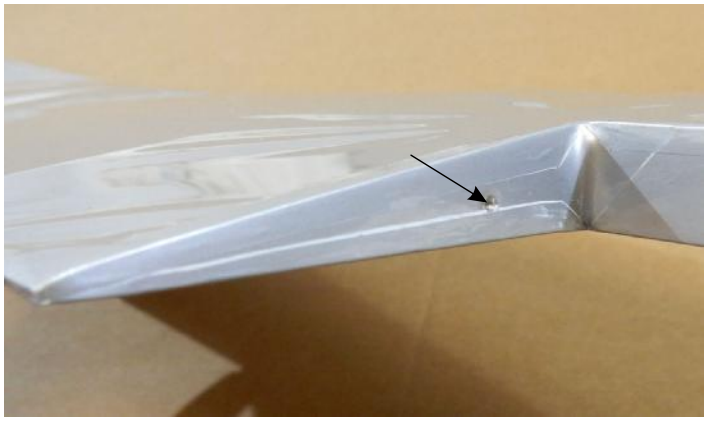


❑ **21.** Cut the covering along the T.E. of the center wing section with an overlap of approx. 3mm. On other parts of T.E. with an overlap of approx. 6mm.

❑ **22.** Only iron the foil around the edges, do not shrink it or iron it to the ribs yet! It doesn't matter that the covering is corrugated now.

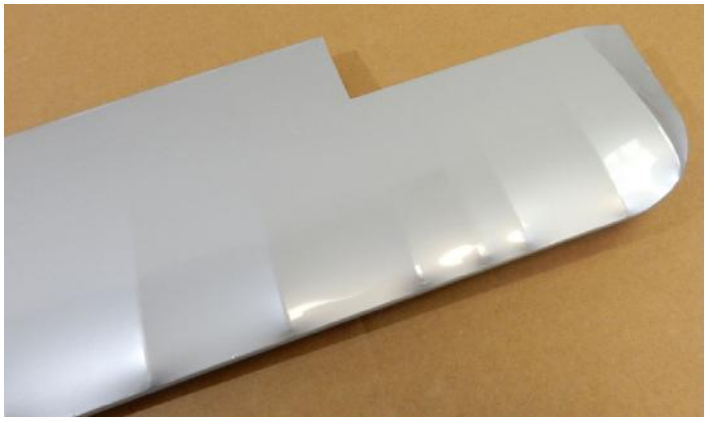
❑ **23.** Before shrinking the entire wing cover, shrink the covering on the wing tips. It looks scary, doesn't it?

❑ **24.** Set the iron to a higher temperature and press the covering onto the end rib. Shrink the covering between the wing tip and the end rib. Better now, isn’t it?



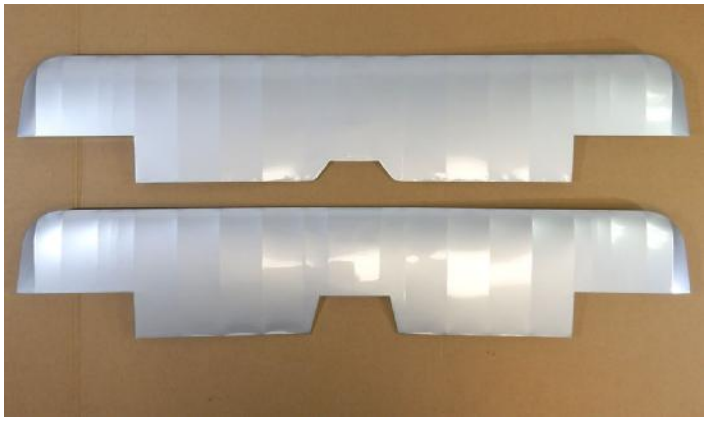
❑ **25.** Pierce a hole in the rib at both ends of the wing, eg with a needle, pin or small nail. The opening serves for the escape of heated air from the inside of the wing.

❑ **26.** Shrink the covering by heating it evenly on both sides of the wing with a heat gun. Be careful not to burn the covering.

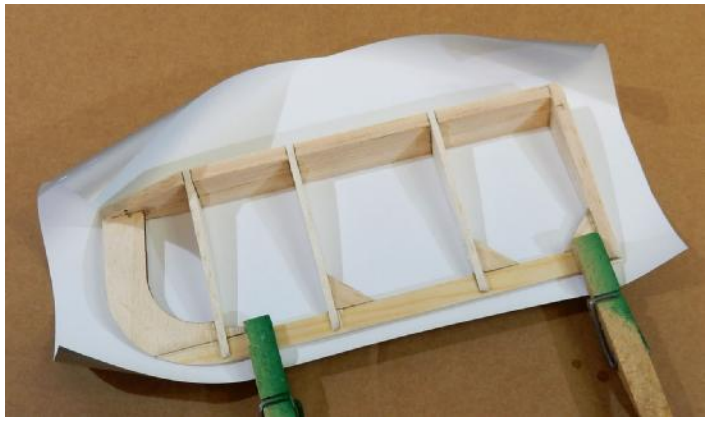


❑ **27.** When shrinking, make sure that the covering does not start to come loose (slip) at the edges.

❑ **28.** Iron the covering to the ribs with an iron set to a higher temperature.

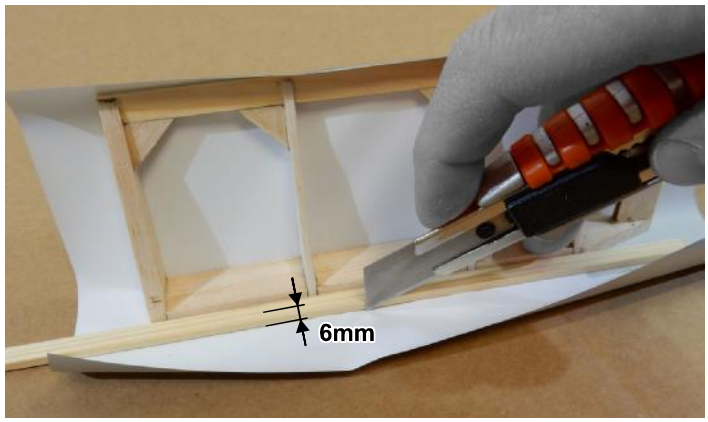


❑ **29.** Cover the second wing in the same way.

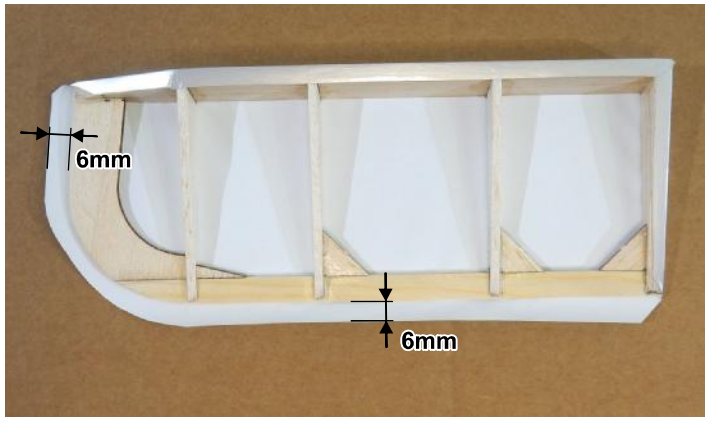


❑ **30.** Place the aileron on the underside on the covering and hold it with pegs.

❑ **31.** Iron the covering to the outer edges of the aileron.



❑ **32.** Cut the covering along the L.E. with an overlap of approx. 6mm. You can use rest of spar 3x6mm as a spacer.



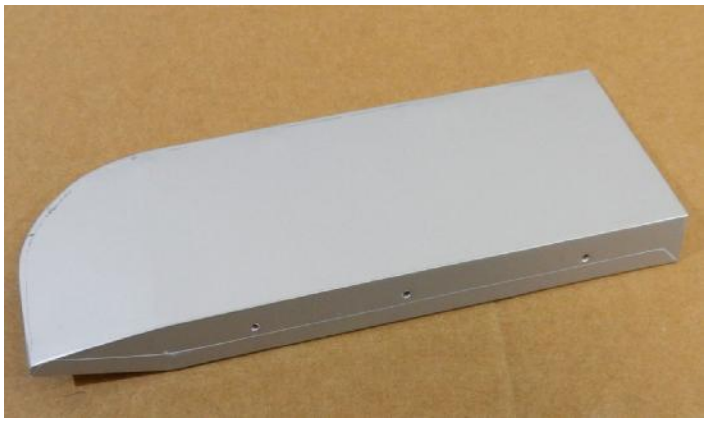
❑ **33.** Iron the covering on aileron L.E. and side rib.

❑ **34.** Cut the covering along the T.E. and wing tip with an overlap of approx. 6mm. You can use rest of spar 3x6mm as a spacer.

❑ **35.** Iron the covering to the T.E. and the wing tip.

❑ **36.** Iron the covering to the outer edges of the aileron.

❑ **37.** Cut the covering along the L.E. with an overlap of approx. 6mm. You can use rest of spar 3x6mm as a spacer.



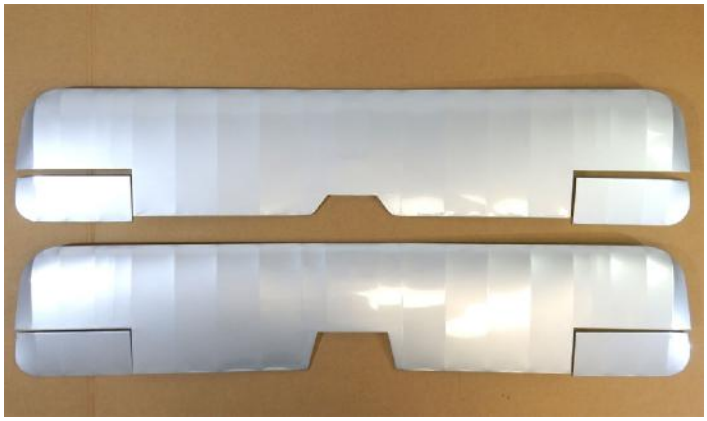
❑ **38.** Cut the covering around the edges with an overlap of 5mm.

❑ **39.** Iron the covering to the outer edges of the aileron.

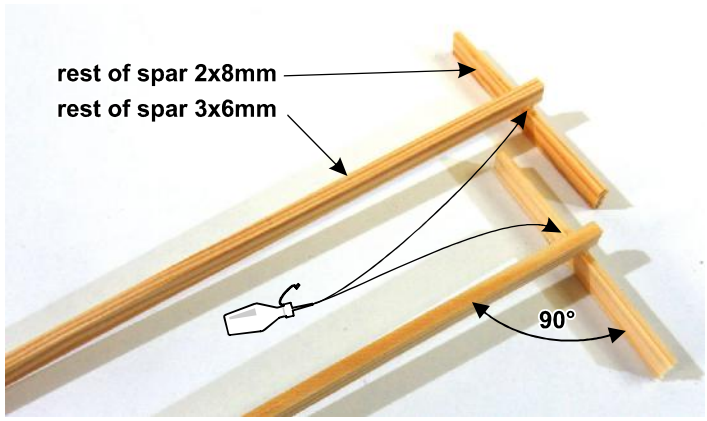
❑ **40.** Pierce the aileron L.E. to free heated air.

❑ **41.** Set the iron to a higher temperature, shrink the covering thoroughly and iron it on the ribs.

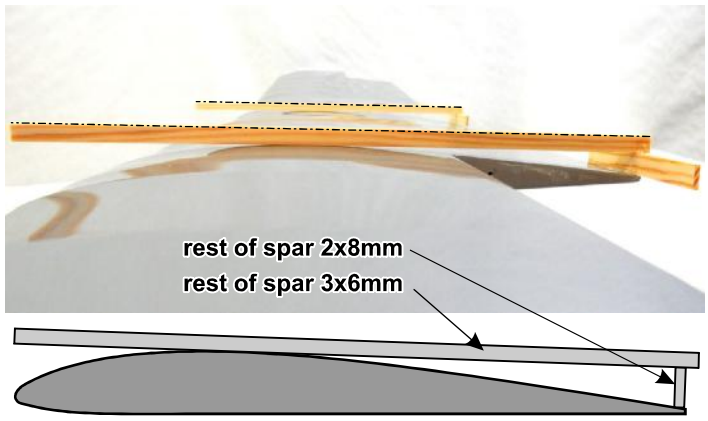
❑ **42.** Cover the remaining ailerons in the same way.



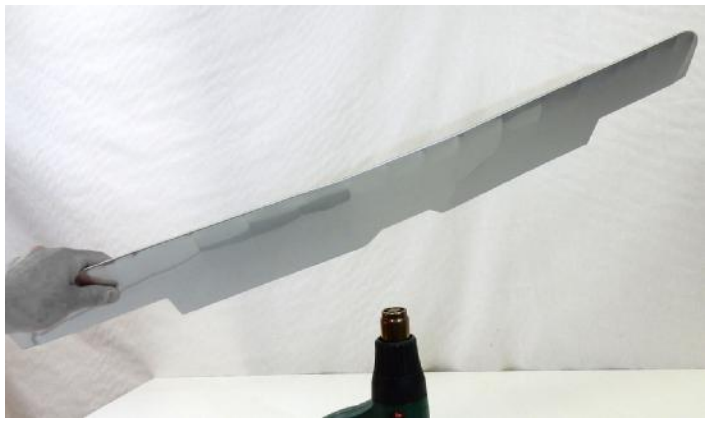
❑ **43.** The wings are covered. However, it is necessary to check that they are straight and untwisted.



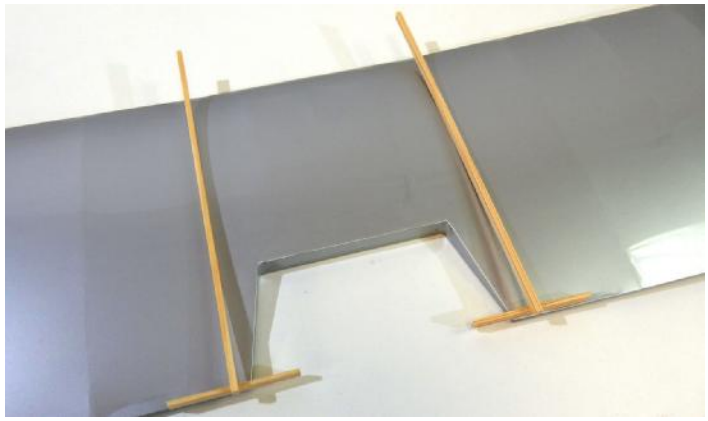
❑ **44.** Glue the aids (gauges) from the rests of the 3x6 and 2x8 spars according to the picture. Keep angle 90° between the spars.



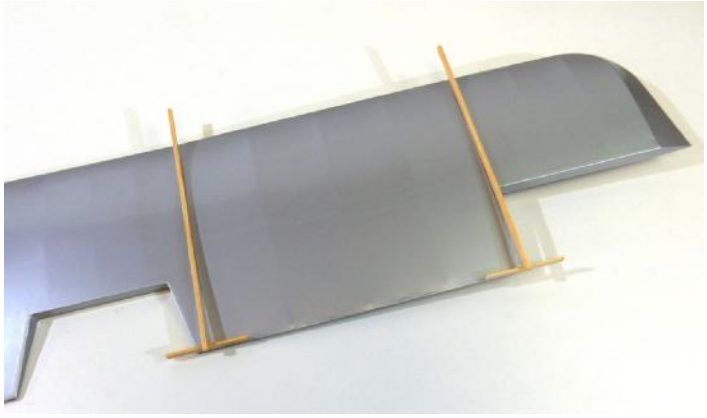
❑ **45.** Place the gauges on the wing and check from the side whether the spars are parallel. If they are not, heat the covering and twist the wing. Repeat until the wing is perfectly straight.



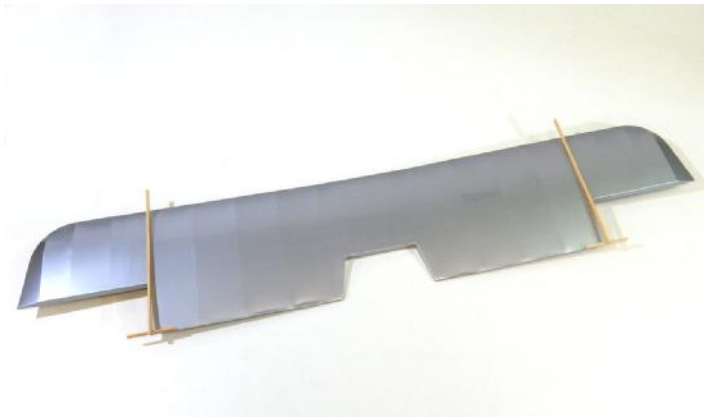
❑ **46.** Carefully heat the wing over the heat gun.



❑ **47.** Check the center wing section.



❑ **48.** Check both sides of the wing.

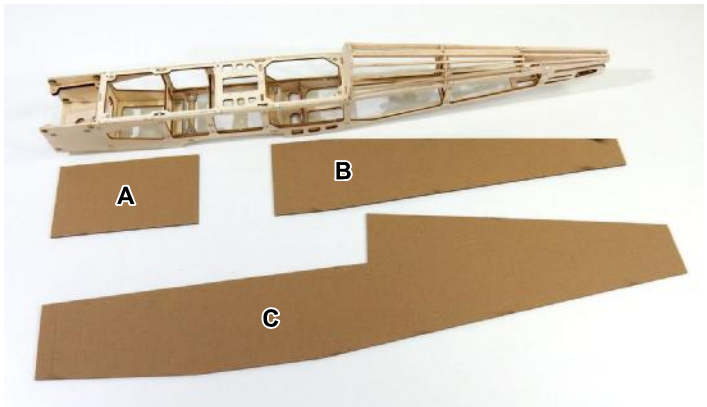


❑ **49.** Finally, check the ends of the wings.

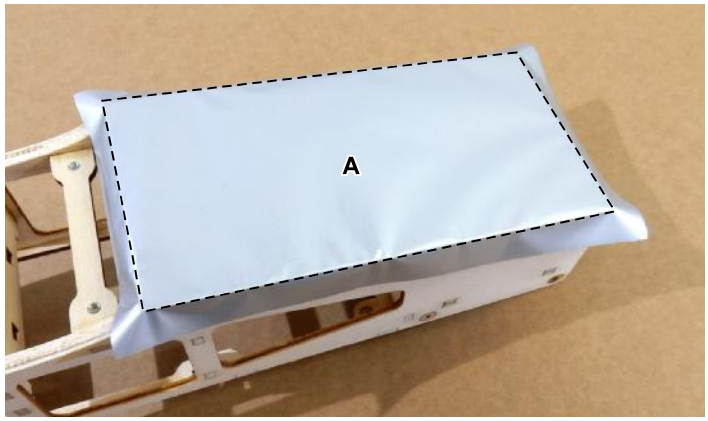
❑ **50.** Check the second wing in the same.

Note: This checking is very important to ensure excellent flight characteristics of the model. Never miss it!

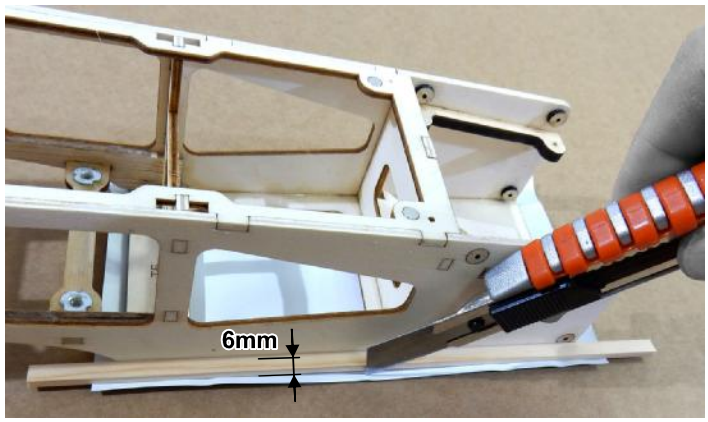
❑ **51.** Like the wing, check all the ailerons. Their underside must be flat. Be careful not to burn the covering.



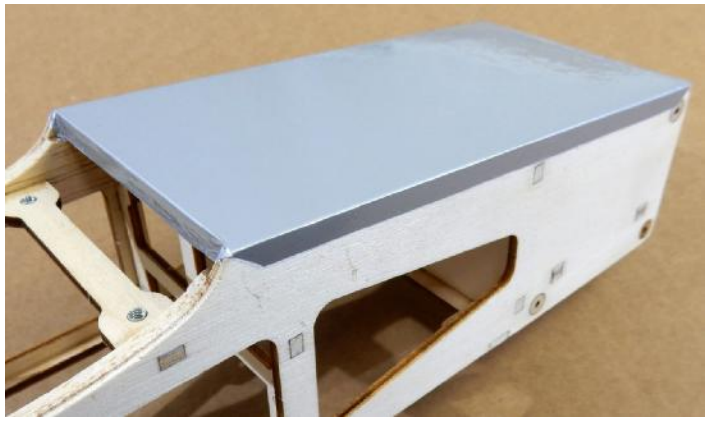
❑ **52.** Continue by covering the fuse. We recommend making paper templates. When redrawing on the cover, be careful to make the covering pieces for both sides of the fuselage (L / R).



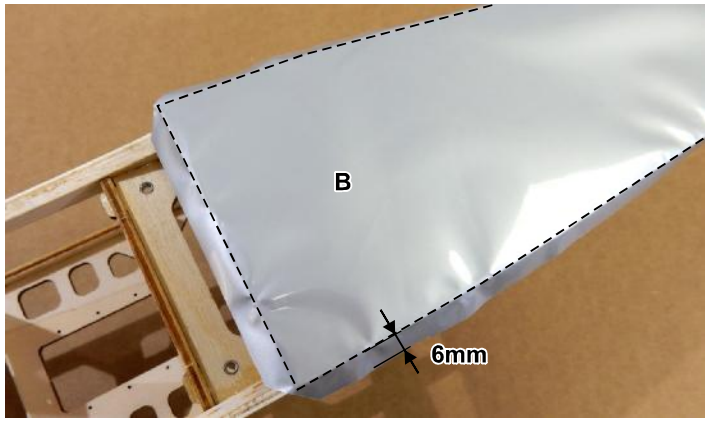
❑ **53.** Start by covering the bottom front of the fuselage. Iron the covering only to the edges.



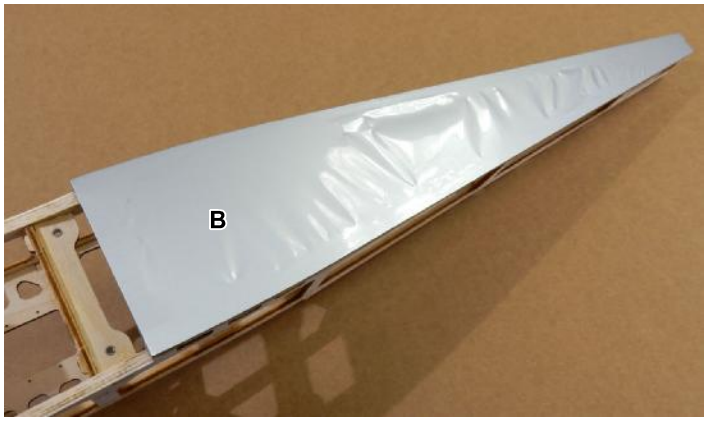
❑ **54.** Cut the covering around the edges with an overlap of approx. 6 mm. You can use rest of spar 3x6mm as a spacer.



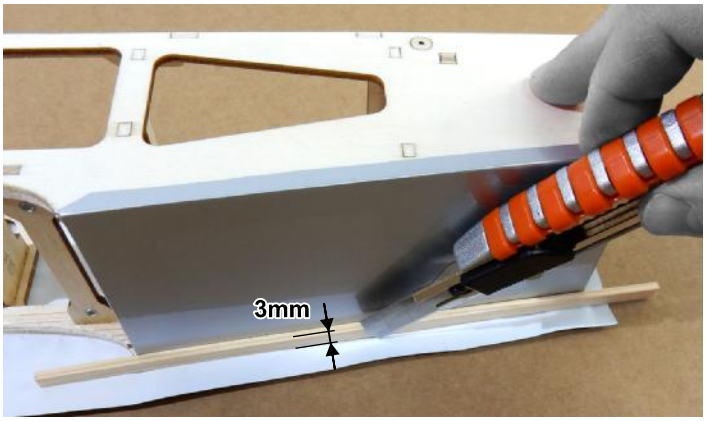
❑ **55.** Iron the overlaps thoroughly. You can iron this covering in the whole surface.



❑ **56.** Continue by covering the rear bottom fuselage. Again, first iron the covering only to the edges and then cut around the edges with an overlap of approx. 6mm.



❑ **57.** Iron the covering overlaps thoroughly. Do not shrink this covering yet!



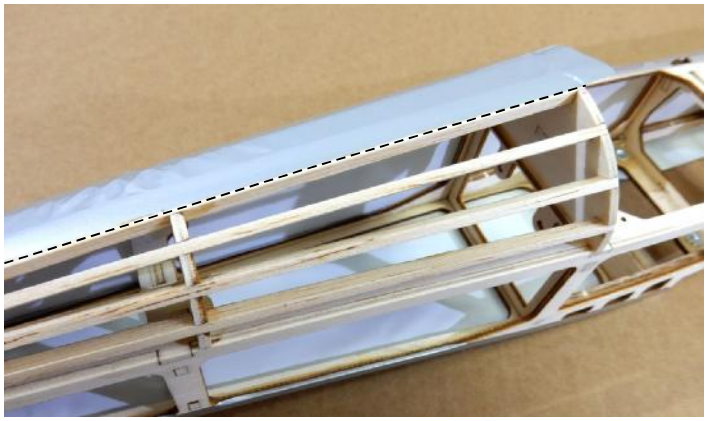
❑ **61.** Cut the foil around the edges. Where it is connected to the already made covering with an overlap of approx. 3mm. Where it is connected to an uncoated structure with an overlap of approx. 6mm. You can use rest of spar 3x6mm as a spacer.

❑ **58.** Continue by covering the left side of the fuselage. Again, iron on the edges first. Do not iron the covering on the upper rear part of the fuselage!

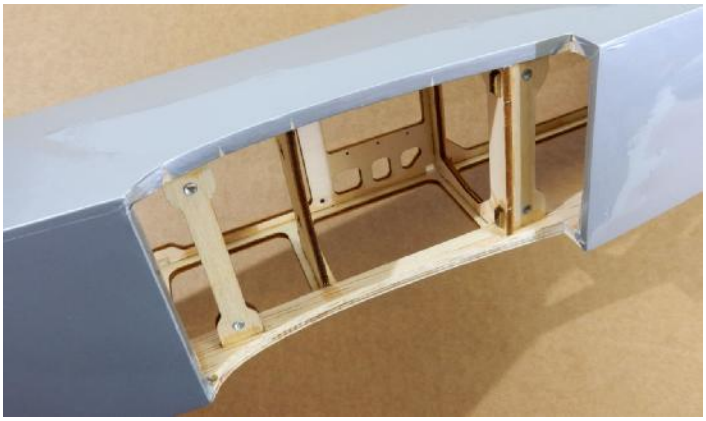
❑ **62.** Cut the covering in the bottom wing saddle before ironing.

❑ **59.** Trim the covering for the upper part of the fuselage according to the ruler so that edge of the covering ends at the balsa spar edge on the top (see the next picture).

❑ **63.** Iron the covering overlaps thoroughly. You can shrink the covering on the front of the fuselage, but do not shrink it on the back of fuselage now!



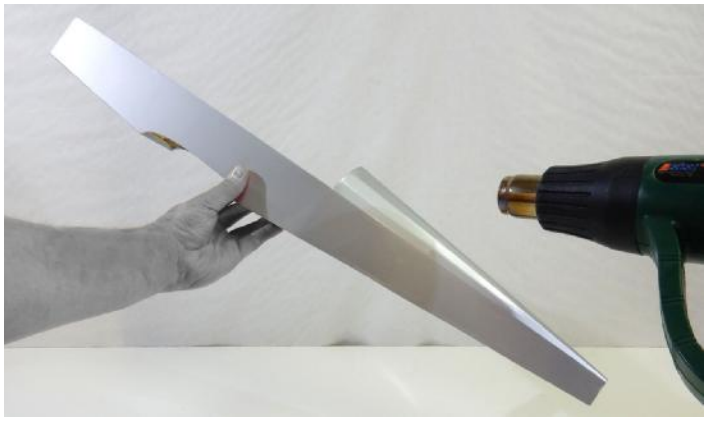
❑ **60.** Iron the covering to the edge of top balsa spar.



❑ **64.** Iron the covering over the edges of the lower wing saddle and trim the overlaps.

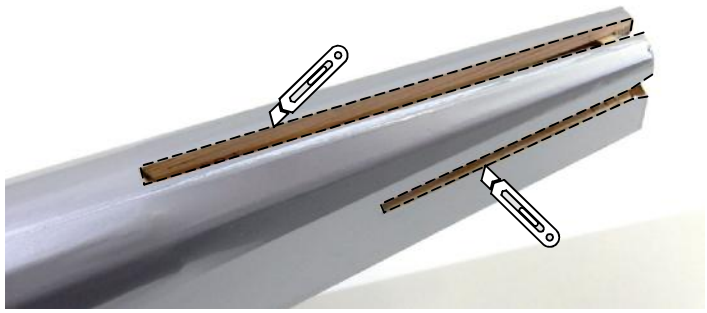
❑ **65.** Like the left side, cover the right side of the fuselage. Again, iron on the edges first. Do not iron the covering on the upper rear part of the fuselage!

❑ **66.** Trim the covering for the upper part of the fuselage according to the ruler so that edge of the covering ends at the balsa spar edge on the top.

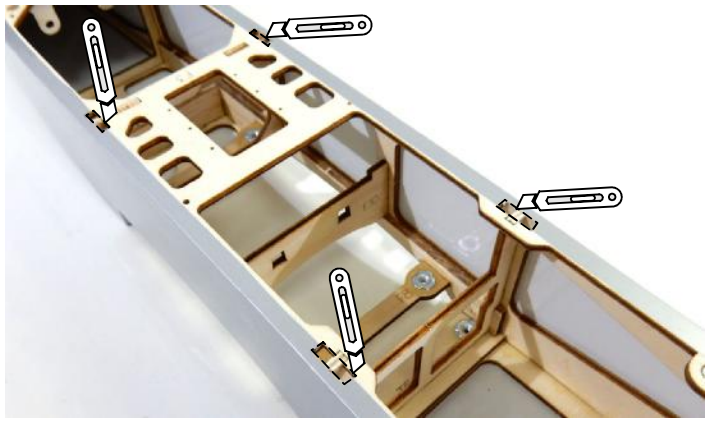


❑ **67.** Heat the covering with heat gun to shrink it. Be careful not to burn it. When shrinking, make sure that the covering does not start to come loose (slip) at the edges.

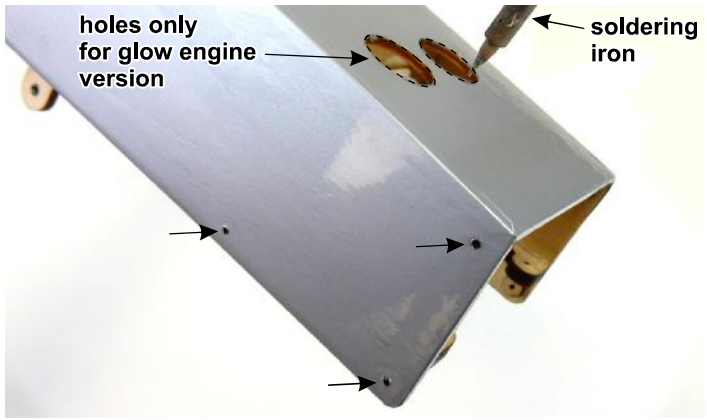
❑ **68.** Thoroughly iron the shrinked covering to the fuselage structure.



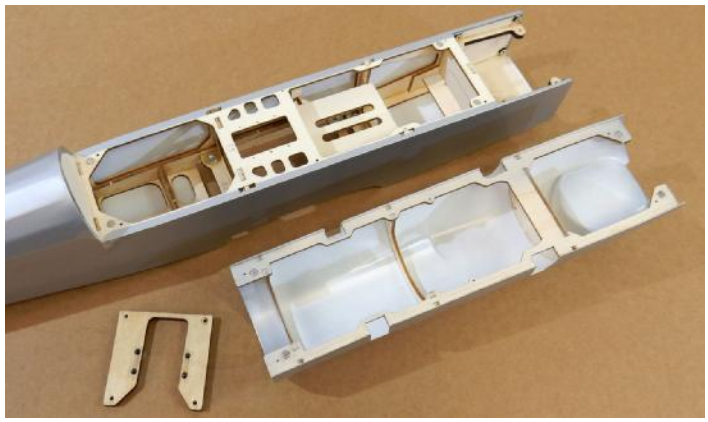
❑ **69.** Cut and remove the covering from the slots for the horizontal and vertical stabilizers.



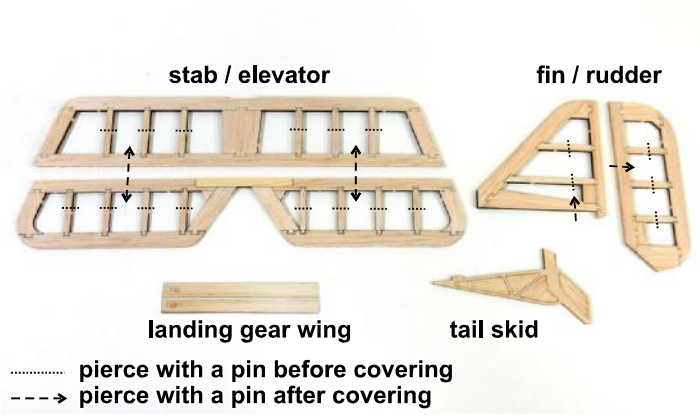
❑ **70.** Cut and remove the covering from the four holes for the upper wing saddle holders.



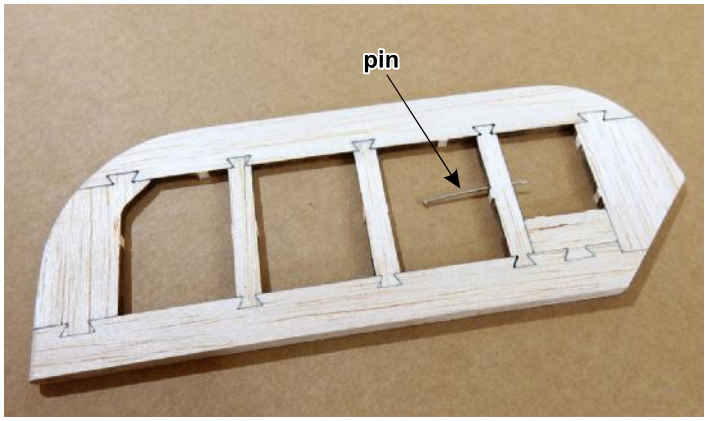
❑ **71.** On the front of the fuselage, remove the covering over the screw holes for motor cowl screws and for landing gear screws. For the glow engine version, remove the covering above the two large circular holes on the lower front of the fuselage - it serves to drain spilled fuel and drain oil from the engine case. To create nice holes, we recommend using a soldering iron with a conical point tip.



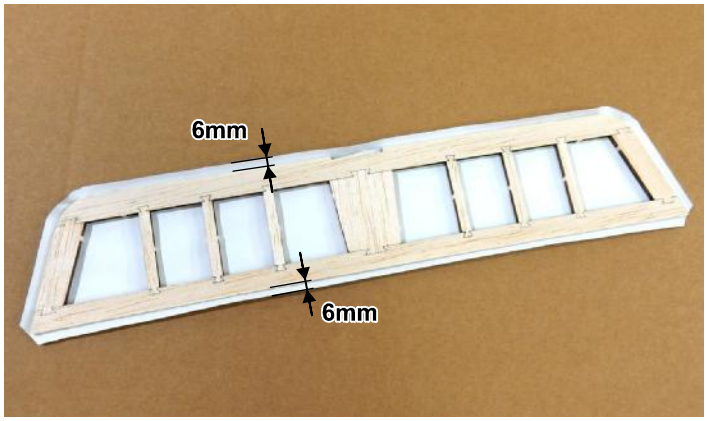
❑ **72.** In the glow engine version you need to proof the wooden parts against the glow fuel. Proof the inside of the front fuselage, the engine mount and the wooden structure of the front fuselage cover. You can use a two-component varnish. We recommend to use 2 part epoxy resin with a couple of drops of meths (or alcohol) as a thinner.



❑ **73.** Prepare the remaining parts of the model for covering - stab / elevator, fin / rudder, tail skid and landing gear wing.
Note: In order for air to escape from inside the parts, all the ribs on the tail surfaces must be pierced with a pin.

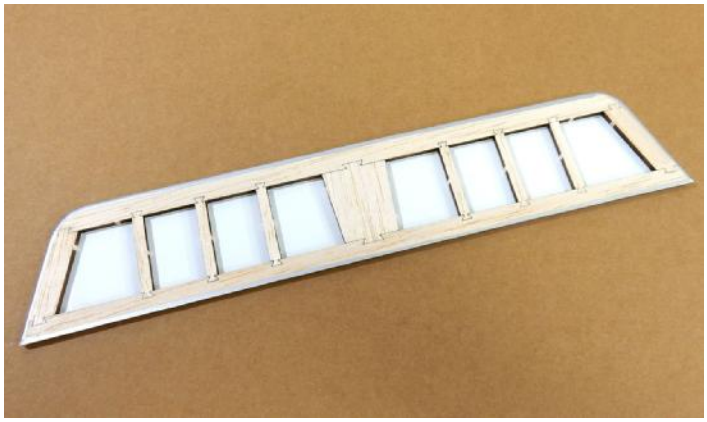


❑ **74.** Pierce all ribs of the tails. After covering, you will pierce the outer edge.



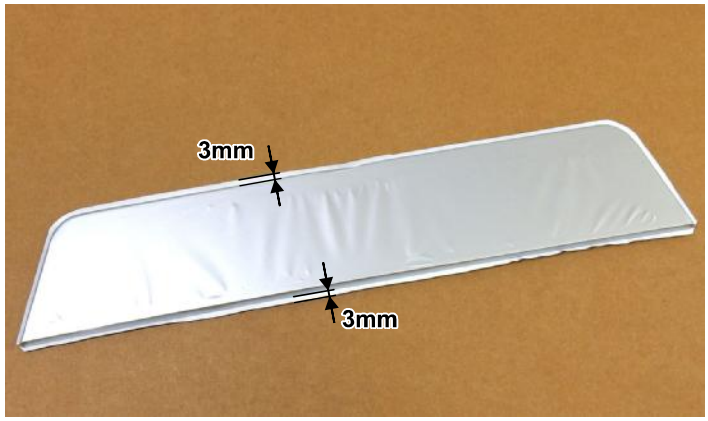
❑ **75.** Iron the covering onto bottom outer edges.

❑ **76.** Cut the covering around the edges with an overlap of approx. 6 mm. You can use rest of spar 3x6mm as a spacer.



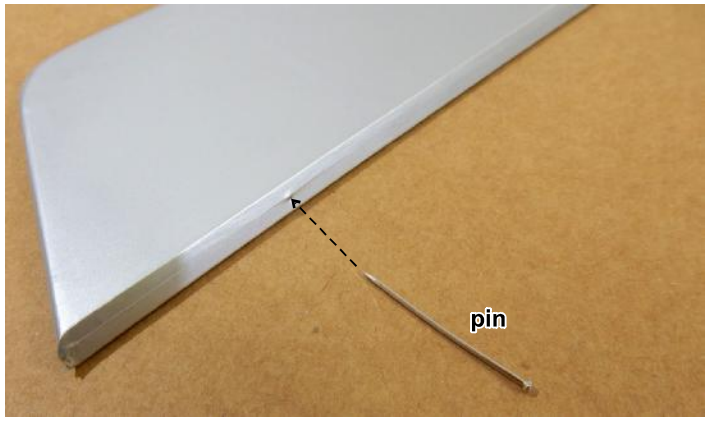
❑ **77.** Iron the covering over the edges on the top surface.

❑ **78.** Do not shrink the covering now!



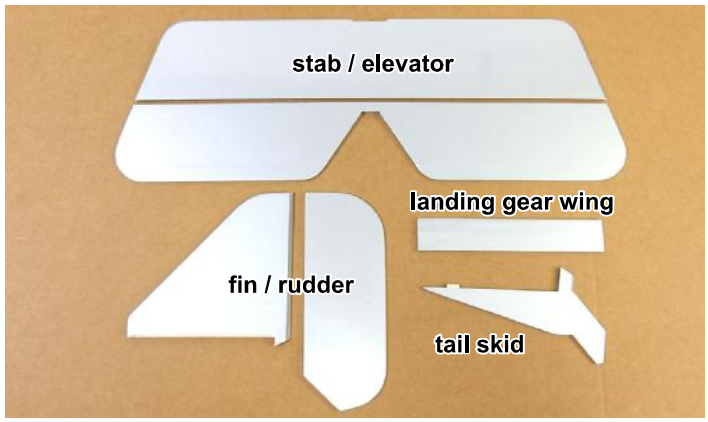
❑ **79.** Iron the covering onto upper outer edges.

❑ **80.** Cut the covering around the edges with an overlap of approx. 3 mm. You can use rest of spar 3x6mm as a spacer.



❑ **81.** Pierce the T.E. with an pin to free hot air when shrinking.

❑ **82.** Shrink the covering and iron it thoroughly on the structure.



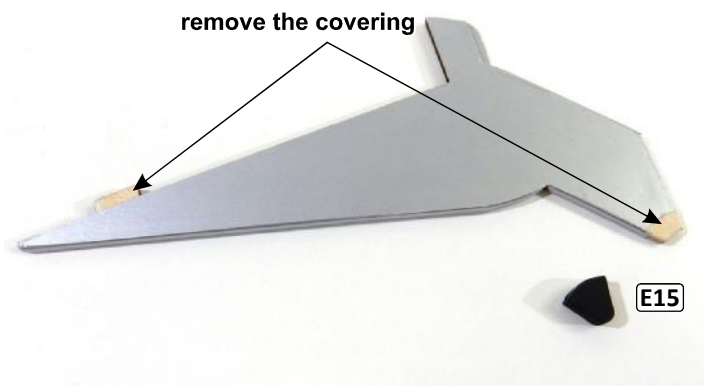
❑ **83.** Cover the elevator in the same way.

❑ **84.** Cover the fin and rudder in the same way.

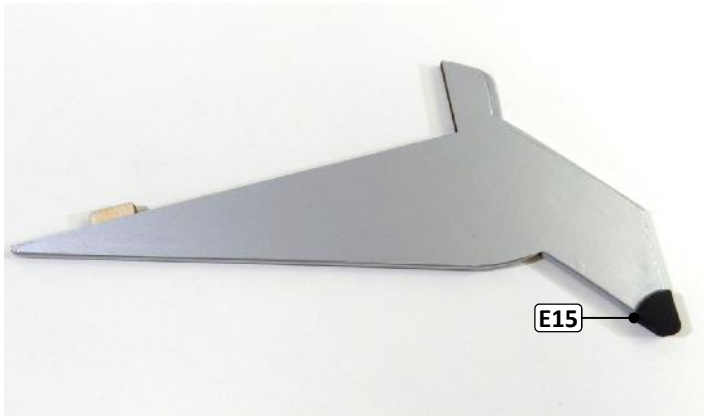
❑ **85.** Cover the landing gear wing in the same way.

❑ **86.** Cover the tail skid in the same way.

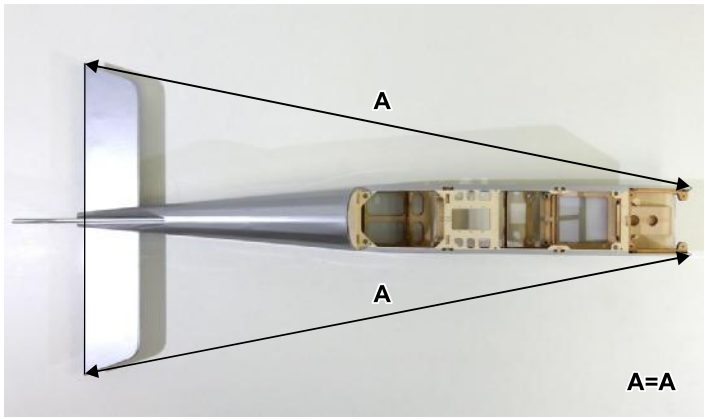
Covering - assembly



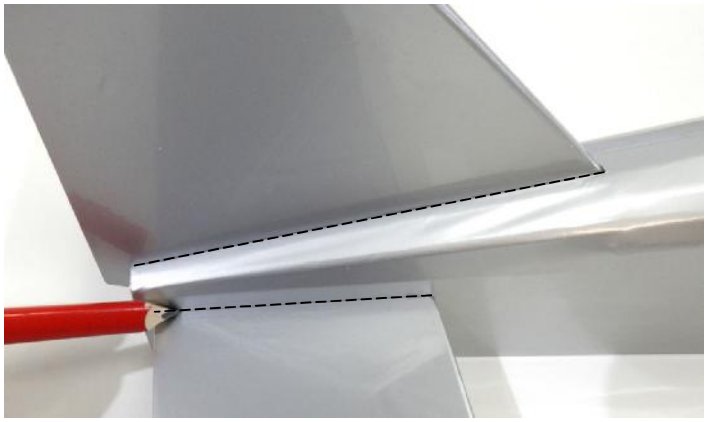
❑ **1.** Remove the covering on tail skid.



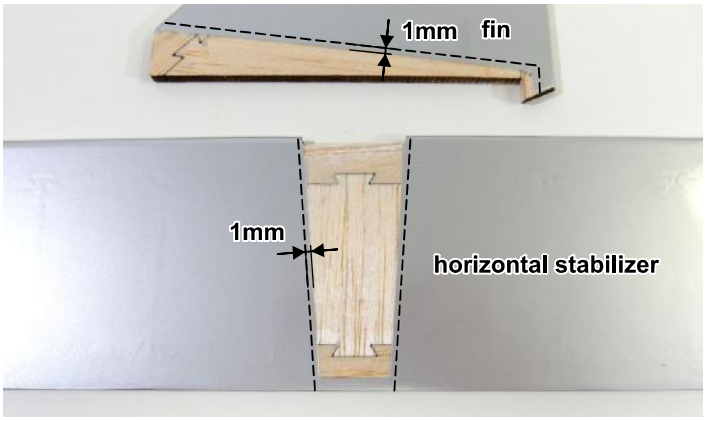
❑ **2.** Glue the slider **E15** on the tail skid.



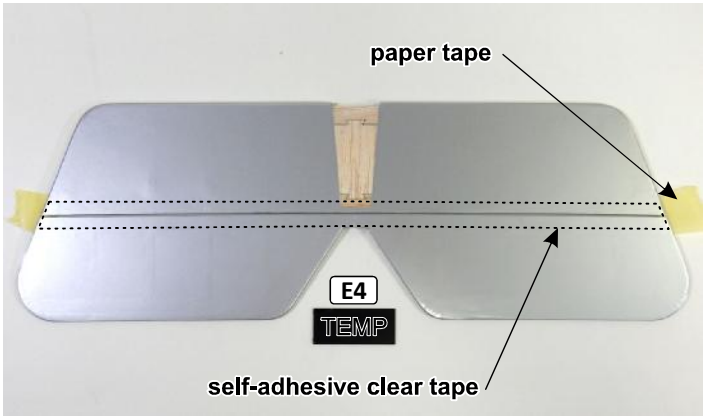
❑ **3.** Insert horizontal and vertical stabilizers onto the fuselage and check the geometry. Don't glue!



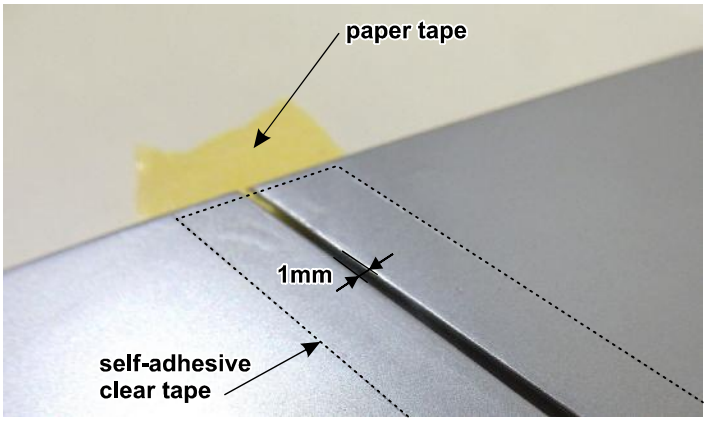
❑ **4.** Mark the position of the fuselage on all sides with a pencil on the stabilizers.



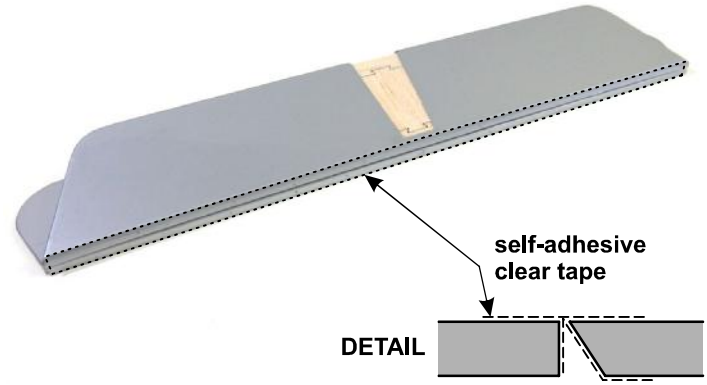
❑ **5.** Carefully cut the covering on both sides approx. 1mm from the marked lines and remove. **Be careful not to cut the L.E. and T.E.!**



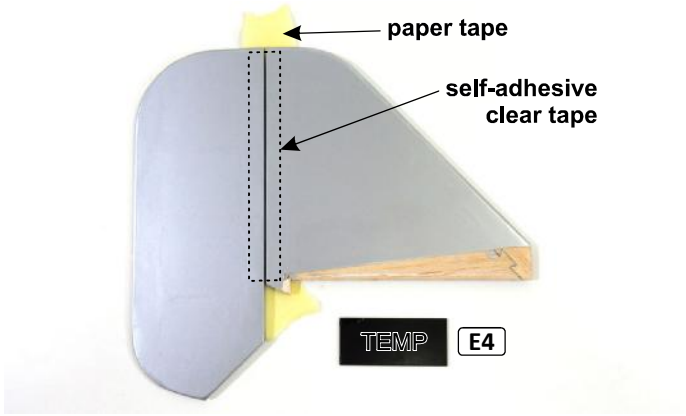
❑ **6.** Glue the elevator to the stabilizer with a temporary paper tape so that there is a gap of 1mm between the parts. You can use the “TEMP” spacer **E4** to keep the distance.



❑ **7.** Make hinge using high-quality self-adhesive clear tape 10-15mm wide. Remove the paper tape.

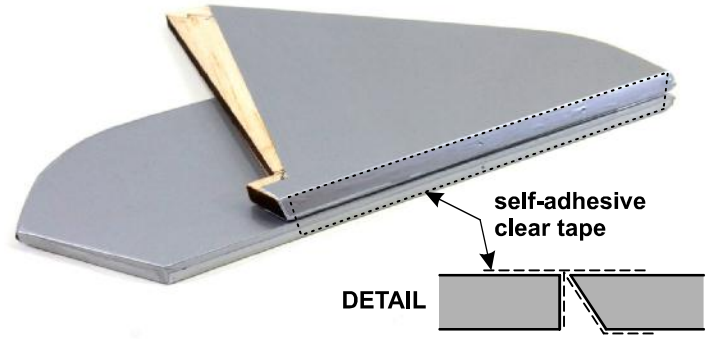


❑ **8.** Bend the stabilizer and apply high-quality self-adhesive clear tape 10-15mm wide on the other side as well.

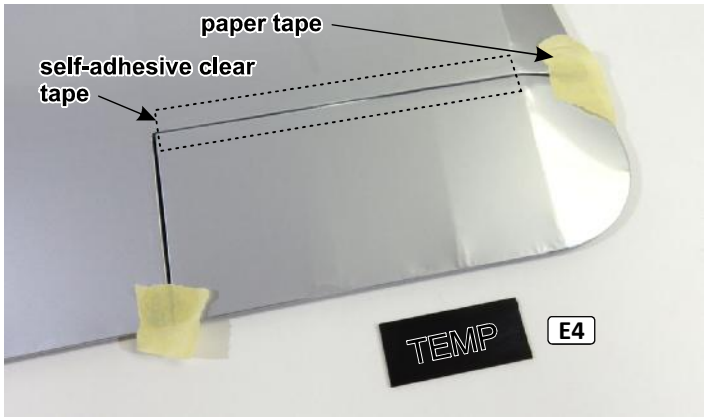


❑ **9.** Glue the rudder to the fin with a temporary paper tape so that there is a gap of 1mm between the parts. You can use the "TEMP" spacer **E4** to keep the distance.

❑ **10.** Make hinge using high-quality self-adhesive clear tape 10-15mm wide. Remove the paper tape.



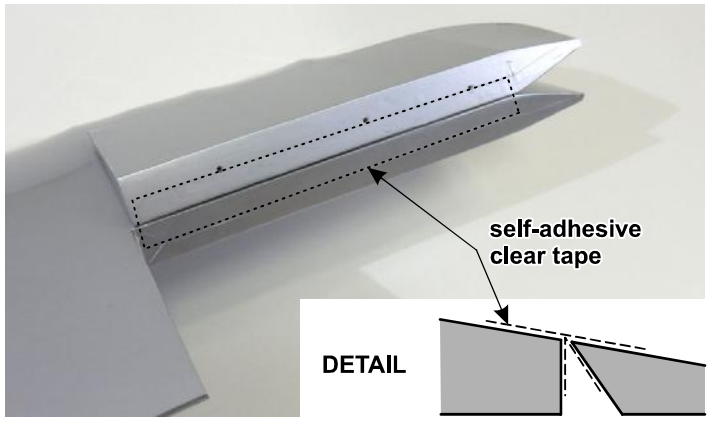
❑ **11.** Bend the fin and apply high-quality self-adhesive clear tape 10-15mm wide on the other side as well.



❑ **12.** Glue the aileron to the wing with a temporary paper tape so that there is a gap of 1mm between the parts. You can use the "TEMP" spacer **E4** to keep the distance.

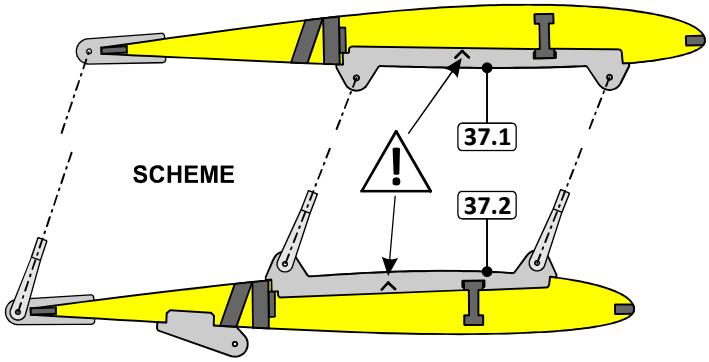
Warning! Choose the right ailerons for the wings. The bottom wing includes ailerons that have a reinforced rib for gluing the control horn.

❑ **13.** Make hinge using high-quality self-adhesive clear tape 10-15mm wide. Remove the paper tape.



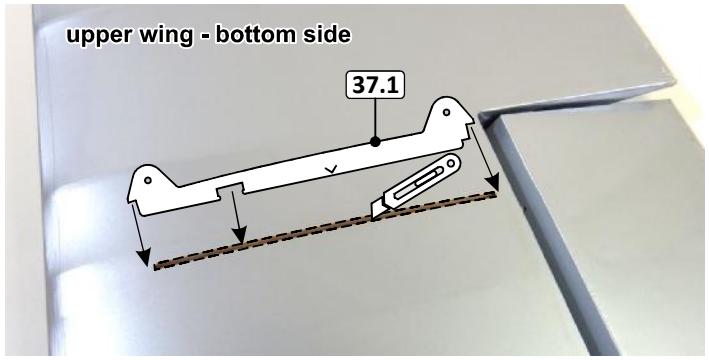
❑ **14.** Bend the aileron and apply high-quality self-adhesive clear tape 10-15mm wide on the other side as well.

❑ **15.** Attach the remaining ailerons in the same way.

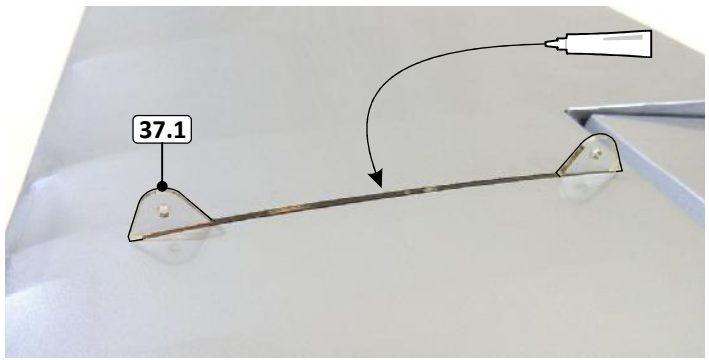


❑ **16.** Prepare the wing strut holders from **plate 37**. For upper wing **37.1**, for bottom wing **37.2.** Orient yourself according to the small arrows on the parts - they must point upwards on the finished wings.

Note: The scheme shows how the holders are fitted to the wings. They are mounted on the front spar and lie on the false T.E. in front of the aileron.



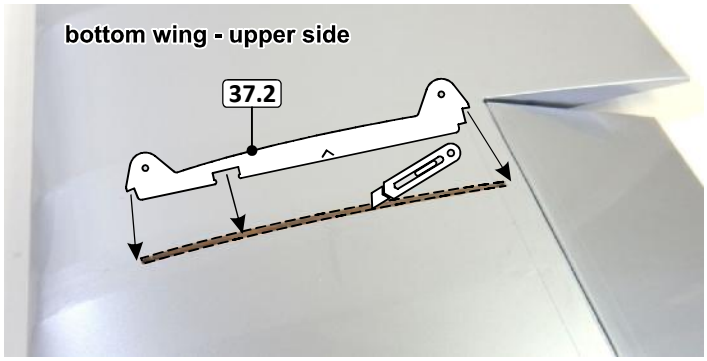
❑ **17.** On the bottom side of the upper wing, cut a gap between the ribs **5.5** and **5.6** to a distance of 94mm from the false T.E.



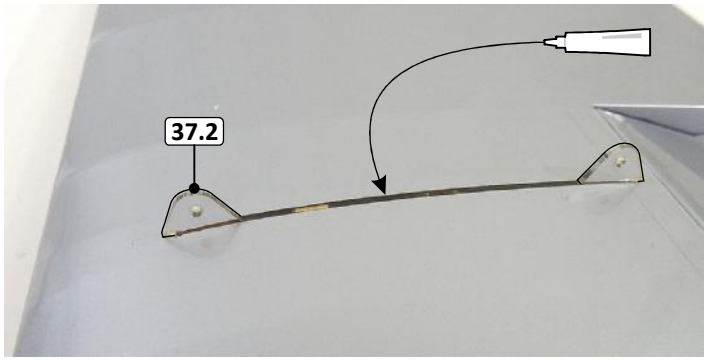
❑ **18.** Try to put the holder **37.1** into the gap. It must be aligned with wing surface. If not, you have probably used a lot of glue to glue the wing structure and it will interfere - adjust the shape of the holder.

❑ **19.** Use **UHU POR** to glue holer **37.1** into the slot.

❑ **20.** Glue the second holder to the wing in the same way.



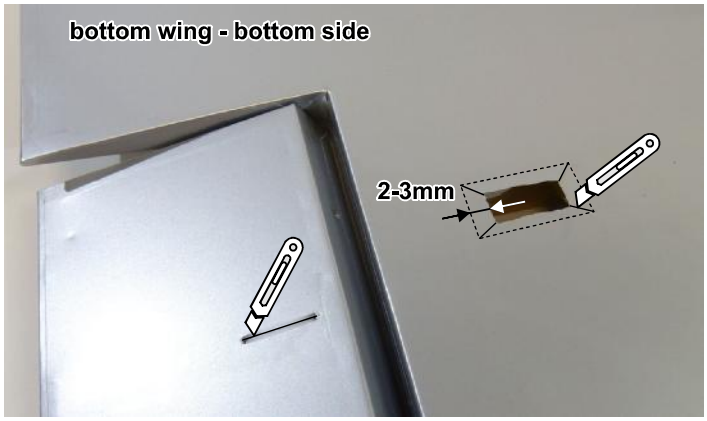
❑ **21.** On the upper side of the bottom wing, cut a gap between the ribs **5.1** and **5.2** to a distance of 94mm from the false T.E.



❑ **22.** Try to put the holder **37.2** into the gap. It must be aligned with wing surface. If not, you have probably used a lot of glue to glue the wing structure and it will interfere - adjust the shape of the holder.

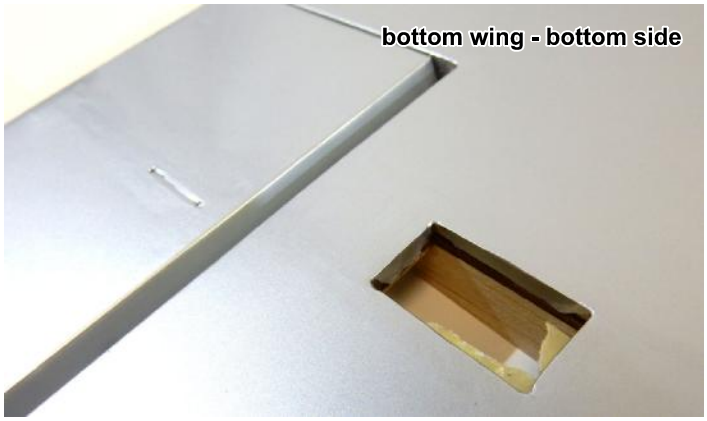
❑ **23.** Use **UHU POR** to glue holder **37.2** into the slot.

❑ **24.** Glue the second holder to the wing in the same way.



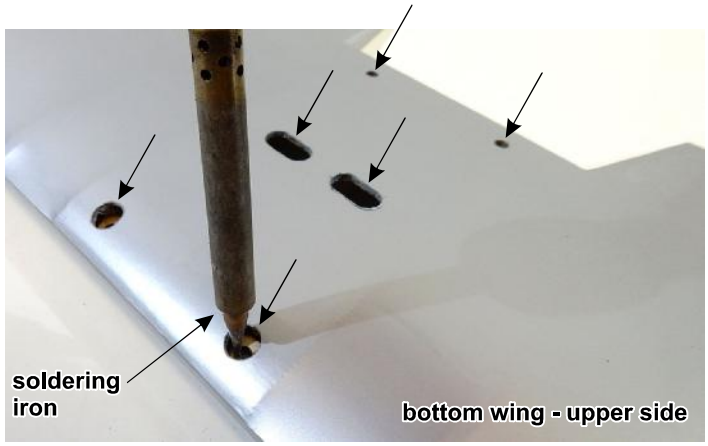
❑ **25.** On the bottom side of the bottom wing, cut the covering in place of the aileron horn.

❑ **26.** Cut the covering in the servo hole so that there are approx. 2-3mm wide overlaps.

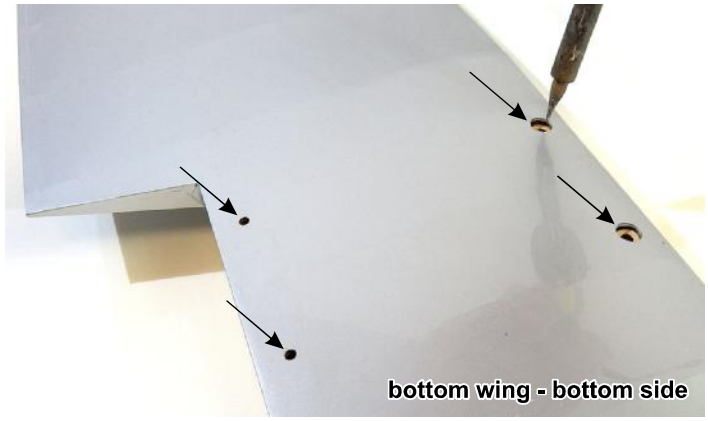


❑ **27.** Iron the overlaps around the servo hole over the edges.

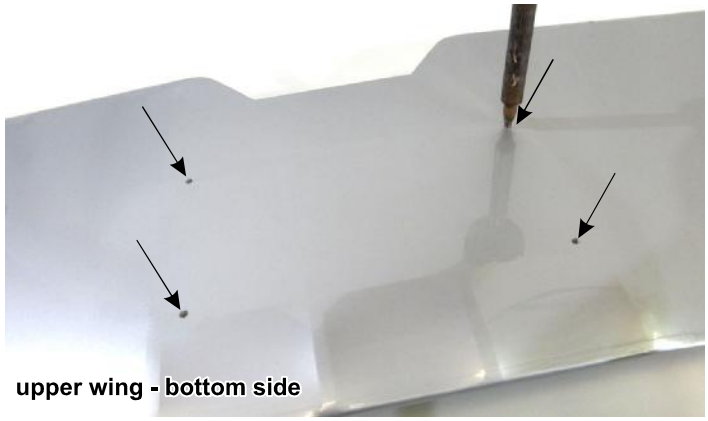
❑ **28.** Repeat steps *25 - 27* on the other side of the wing.



❑ **29.** On the top of the bottom wing, remove the covering over the screw and servo cable holes. To create nice holes, we recommend using a soldering iron with a conical point tip.



❑ **30.** On the bottom side of the bottom wing, remove the covering over the screw holes. To create nice holes, we recommend using a soldering iron with a conical point tip.



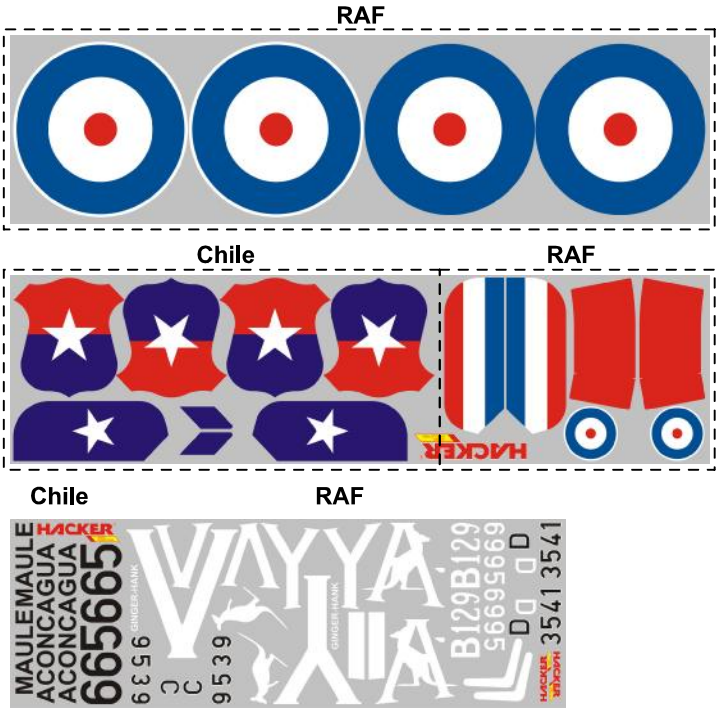
❑ **31.** On the bottom side of the upper wing, remove the covering over the T-nuts. To create nice holes, we recommend using a soldering iron with a conical point tip.

Notes:

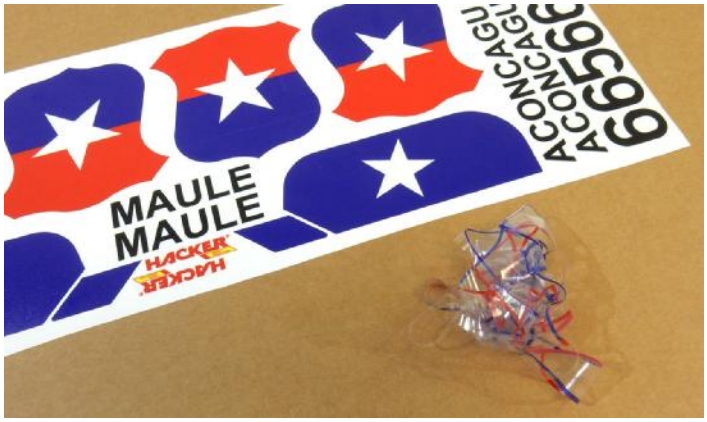
Stickers - wings, rudder

Introduction:
- Although stickers are usually applied to the finished model, it is suitable to apply them to some parts of the model now because they would be harder to apply to the fully assembled model.
- We now recommend to apply the stickers only on the wings and the rudder.
- Stickers for fuselage will be applied to the finished model, because it may still be necessary to heat the fuselage covering to make the correct geometry of the model (to level stab with respect to the wings).
- When applying stickers, we recommend proceeding by cutting out the sticker with a small addition around the outer edges. Bend or cut a small piece of the backing paper. Place the sticker to the correct place and press the sticky part without paper to the covering. Then remove the rest of the backing paper and gradually smooth the sticker to the covering. Careful work should not create air bubbles between the sticker and the covering.

Note: The following steps may differ slightly depending on your version of the color scheme.

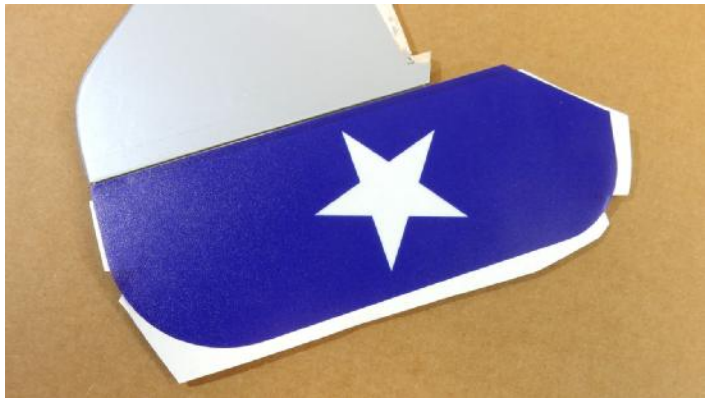


Stickers for the "**RAF**" version for four color variants.
Stickers for the "**Chile**" version for two color variants.

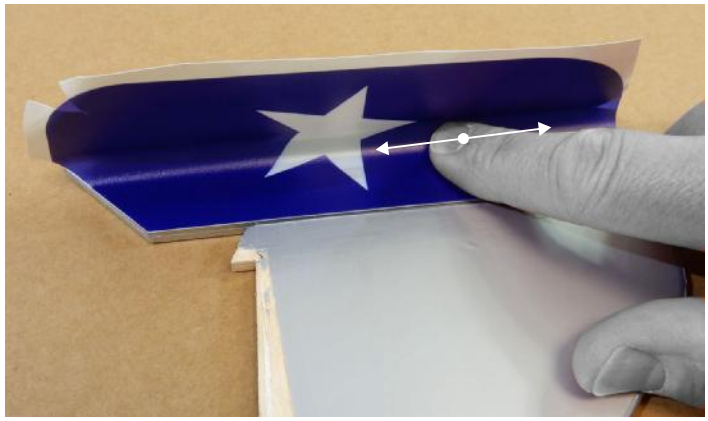


❑ **1.** Remove unnecessary film from the sticker sheet.

❑ **2.** Before applying the stickers, clean the parts with a suitable cleaner, eg acetone or alcohol.
Warning! Pre-test your cleaner on the rest of the material to prevent damage to the covering.



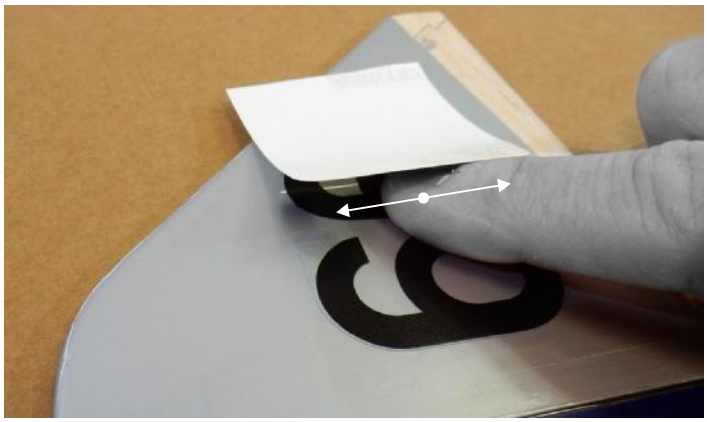
❑ **3.** Partially remove the backing paper and place the sticker on the rudder along with the L.E. Make sure the sticker aligns with the other outer edges.



❑ **4.** Apply the sticker to the covering with your finger. Move your finger from right to left and back.

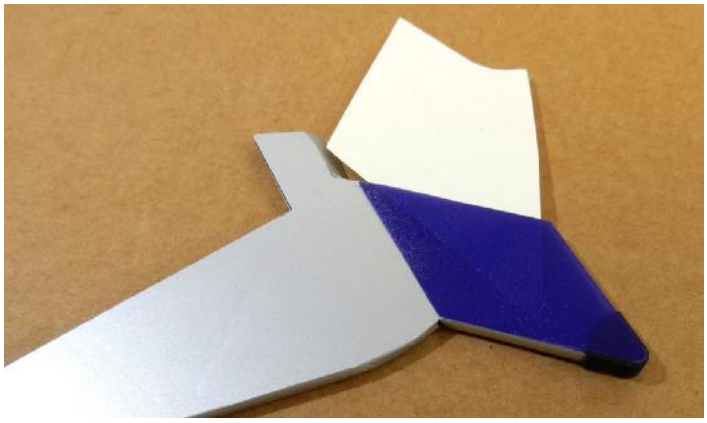
❑ **5.** Carefully apply the sticker on the edges as well.

❑ **6.** Partially remove the backing paper and place the sticker on the fin.

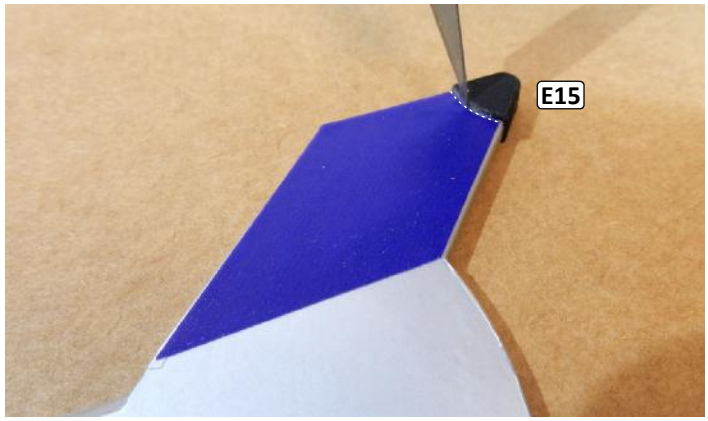


❑ **7.** Apply the sticker to the covering with your finger. Move your finger from right to left and back.

❑ **8.** Repeat steps *3* - *7* on the other side of the fin / rudder.

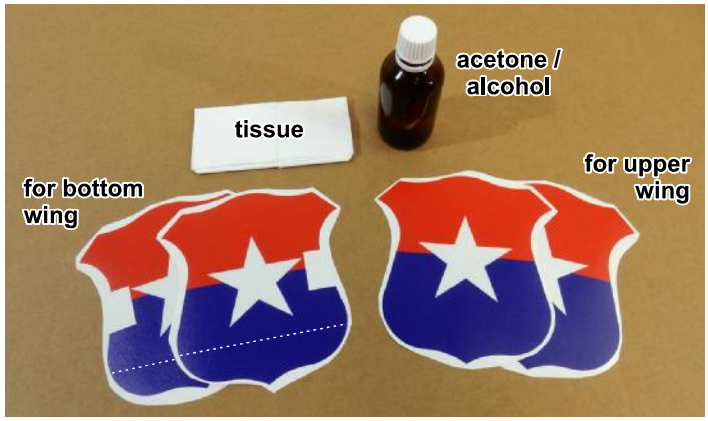


❑ **9.** Apply stickers on both sides on the tail skid (Chile version only).



❑ **10.** Cut and remove piece of the stickers on both sides along the edge of the **E15** slider.

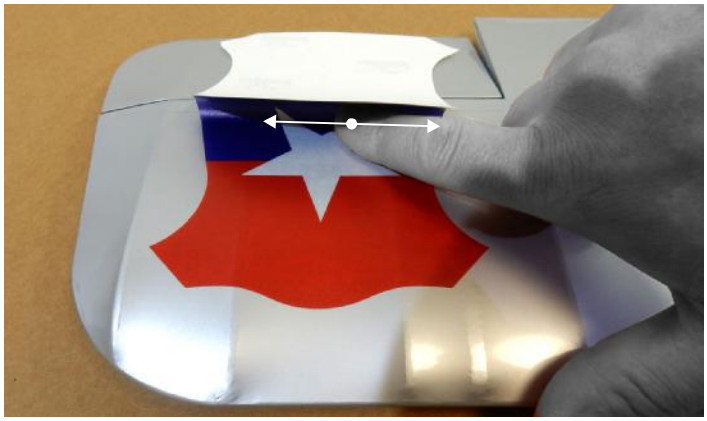
❑ **11.** The fin / rudder and tail skid are ready for final assembly.



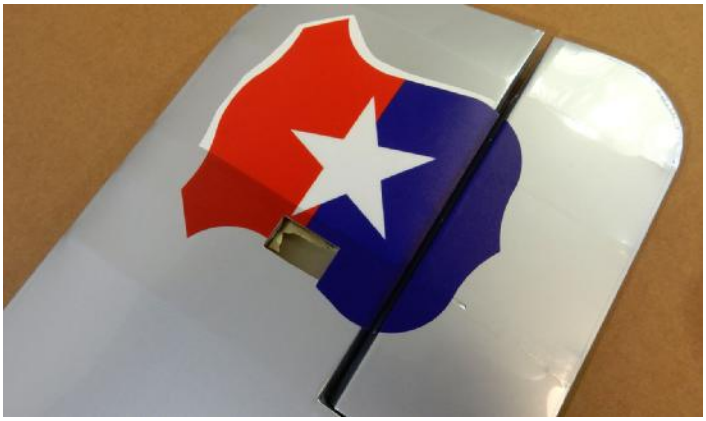
❑ **12.** Prepare wing stickers and clean the surface of the wings.
Warning! The stickers for the bottom wing have cutouts for servos and are divided in the place of the aileron hinge.

❑ **13.** Remove piece of the backing paper from the sticker.

❑ **14.** Place the sticker on the correct position and stick it on the edge.

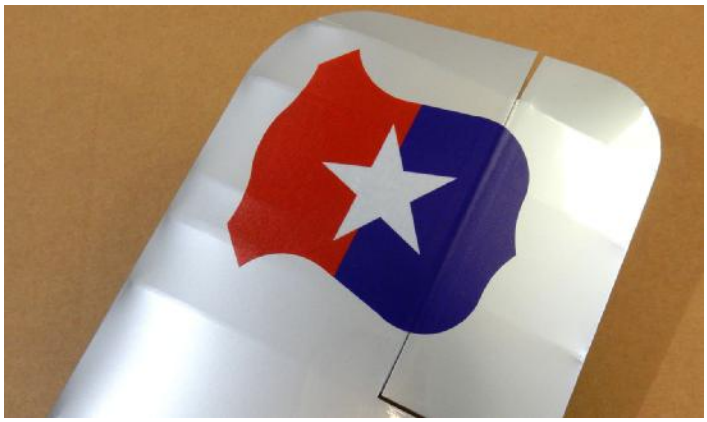


❑ **15.** Apply the sticker to the covering with your finger. Move your finger from right to left and back.

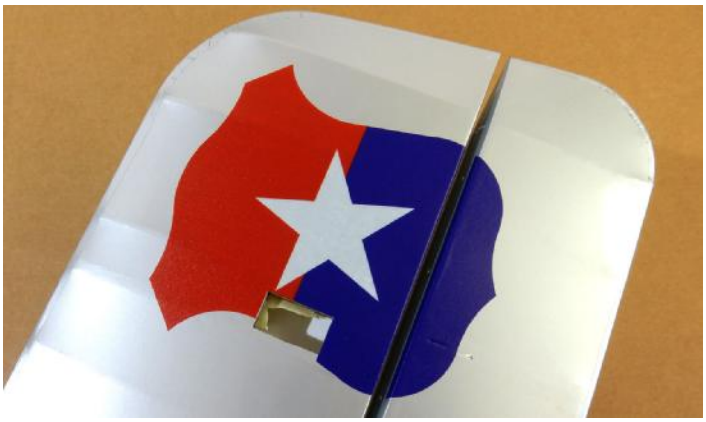


❑ **19.** Stick the sticker on the aileron and bend over the L.E.

❑ **20.** Partially stick the sticker on the wing.



❑ **16.** Repeat steps *13 - 15* on the other side of the upper wing.
Note: If there are other stickers on the wing (depending on the version), proceed in the same way when applying.



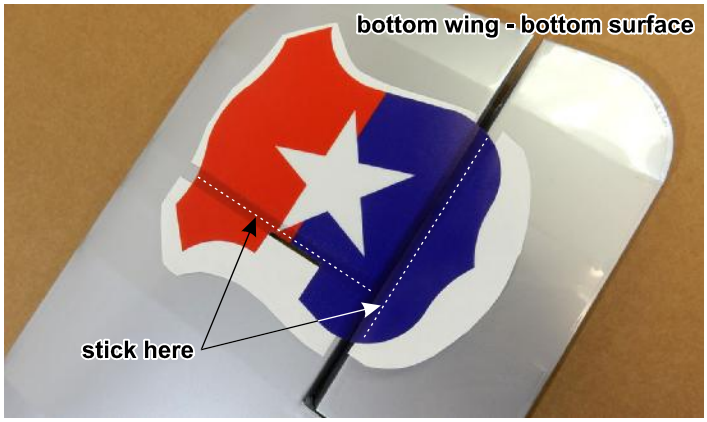
❑ **21.** Stick the rest of the sticker on the wing and bend over the false T.E.

❑ **22.** Cut the sticker for the aileron horn.

❑ **23.** Repeat steps *17 - 22* on the other side of the bottom wing.

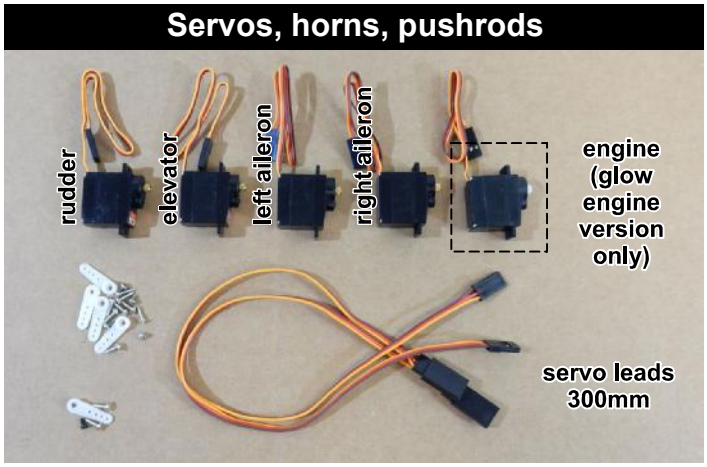
❑ **17.** Partially remove the backing paper, separate the piece for the aileron from the sticker.

❑ **24.** The wings are ready for final assembly.

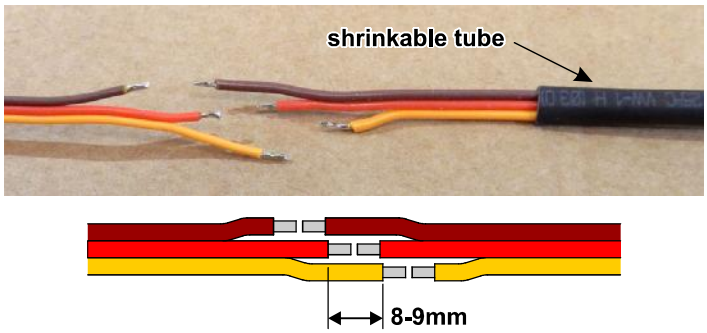


❑ **18.** Place the stickers in the correct position and stick them in the marked places.

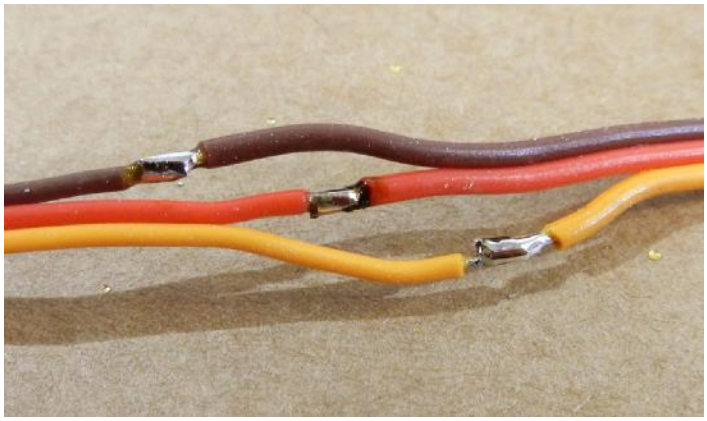
Notes:



❑ **1.** Prepare servos. For the electro version, we recommend four servos with a metal gears (MG) with weight 9-15g. For the glow engine version, one more servo 9-15g (plastic gears are enough).

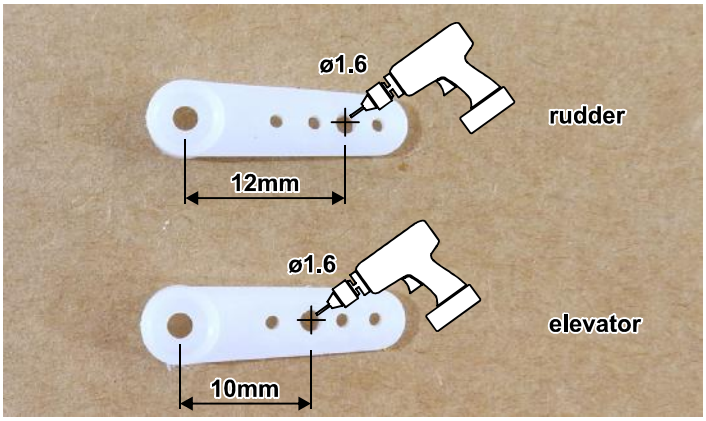


❑ **2.** Aileron servo cables need to be adjusted. The joint must be soldered. Trim the servo and lead cables as shown. Be sure to attach a heat shrink tubing to one of the cables before soldering.

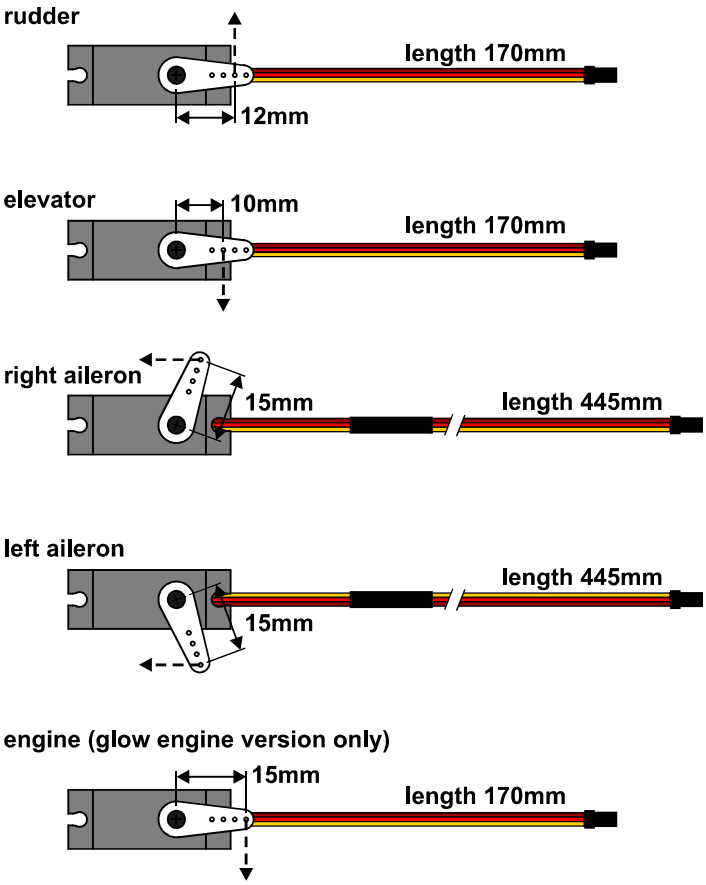


❑ **3.** Solder the cables.

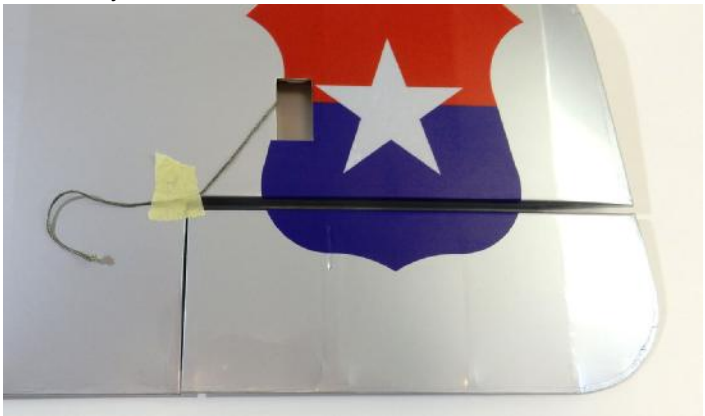
❑ **4.** Place the shrinkable tube over soldered joints and shrink it with heat gun.



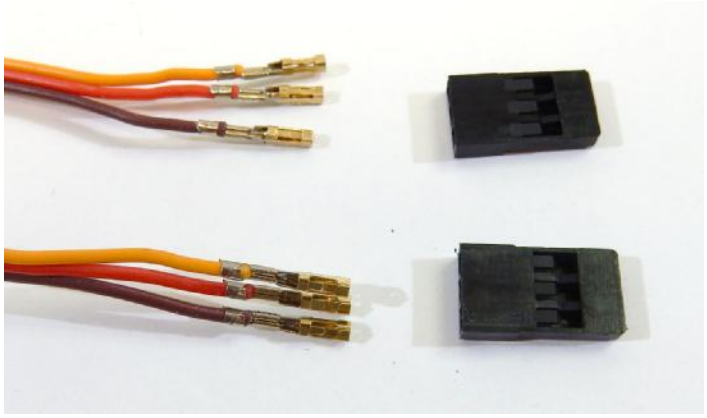
❑ **5.** Resize the holes in the rudder and elevator servo arms by drilling to a diameter of 1.6mm.



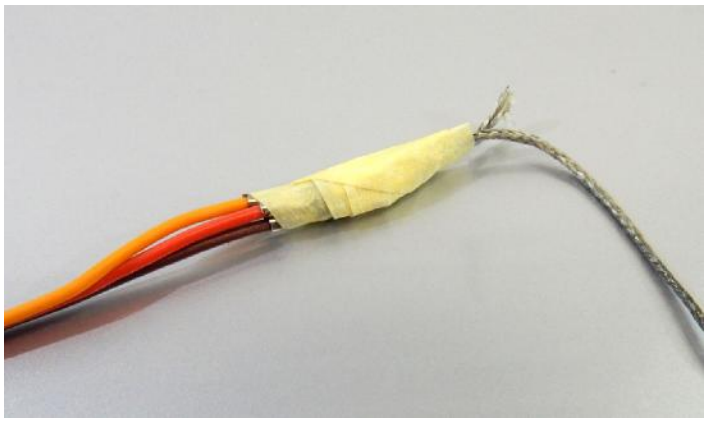
❑ **6.** Set the servos to neutral and adjust the horns as shown. The picture also shows the pushrods position on the horn - you will use this pic later when installing the pushrods. Do not screw the horns yet.



❑ **7.** Pull out the threads from the servo mount and fix them with paper tape.

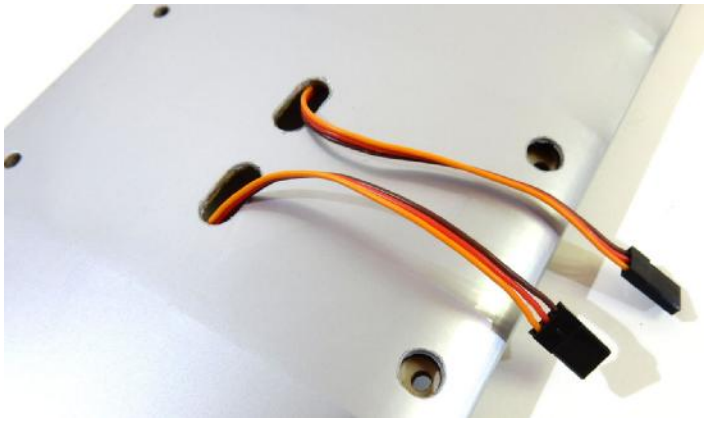


❑ **8.** Remove the plastic connector caps from the aileron servo cables.



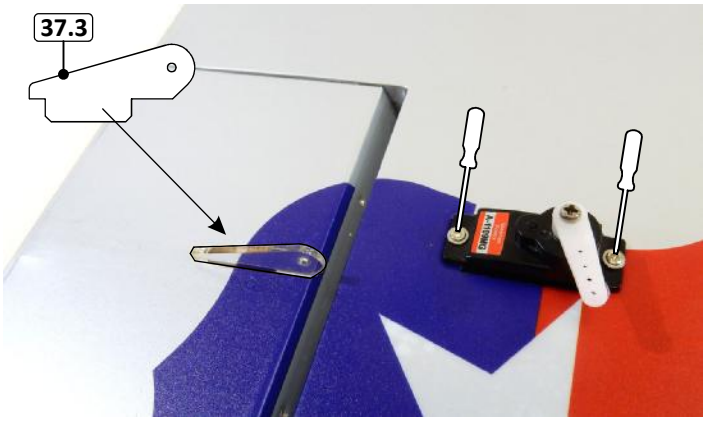
❑ **9.** Using paper tape fix the end of the cable thoroughly to the thread.

❑ **10.** Pull-through the servo cable through the wing.



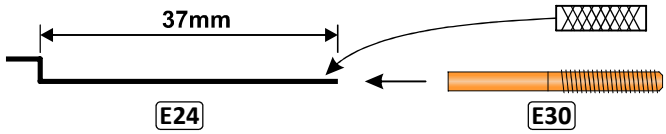
❑ **11.** Pull-through the second servo cable through the wing.

❑ **12.** Place the plastic caps on the pins.



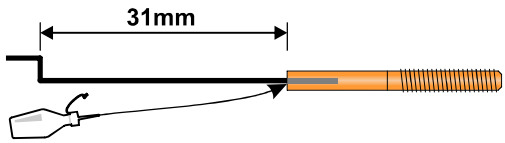
❑ **13.** Screw the aileron servos into the wing.

❑ **14.** Glue the aileron horns **37.3** into the slots in the ailerons.

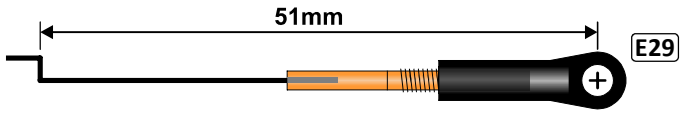


❑ **15.** Trim two pushrods **E24** to 37mm length.

❑ **16.** Sand lightly pushrod ends for better glue adherence.

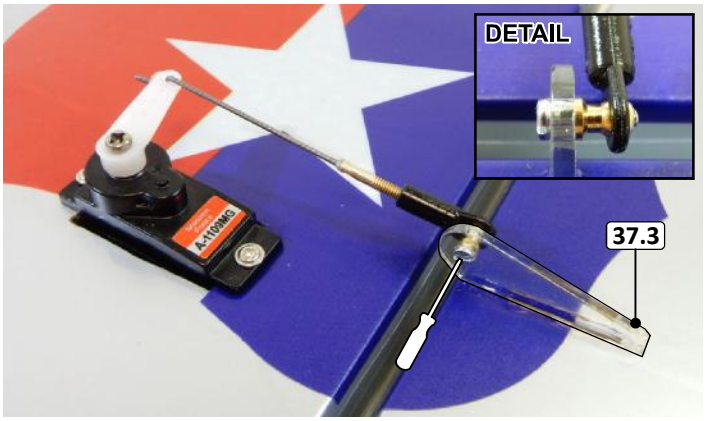


❑ **17.** Glue both pushrods **E24** into the threaded couplers **E30**.



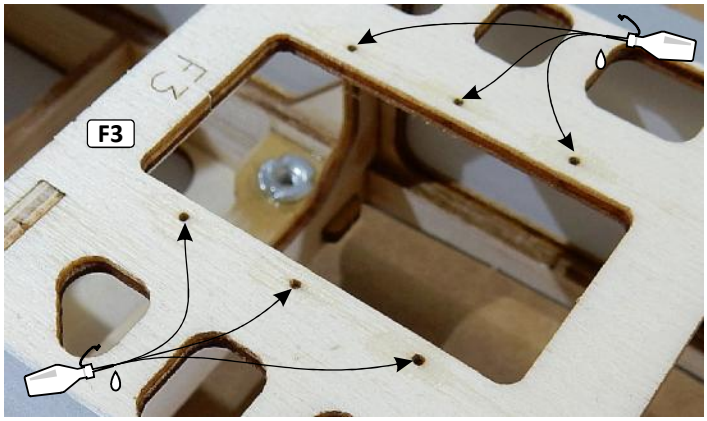
❑ **18.** Screw the ball links **E29** onto both threaded couplers **E30**. Set the pushrod length to 51mm by screwing.

❑ **19.** Insert the balls into the ball links. Aileron rods are ready.

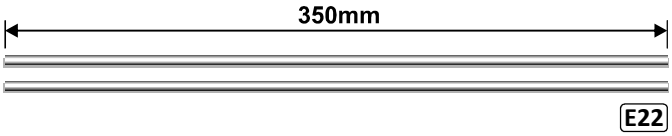


❑ **20.** Attach the pushrod into the servo arm and screw the ball to the aileron horn.

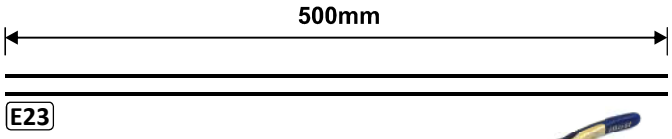
❑ **21.** Also install the pushrod on the second aileron servo.



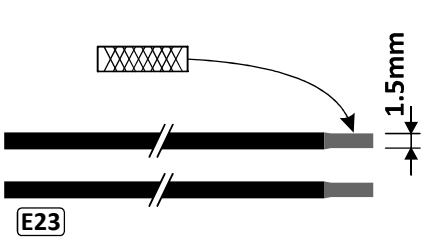
❑ **22.** Apply drops of CA around holes for servo screws. The glue will reinforce the plywood and the screws will hold better.

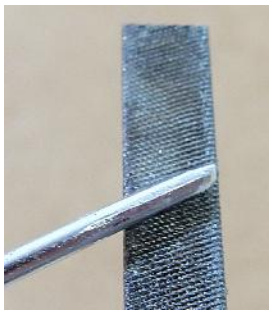


❑ **23.** Cut two 350mm long pieces from the plastic tube **E22**.



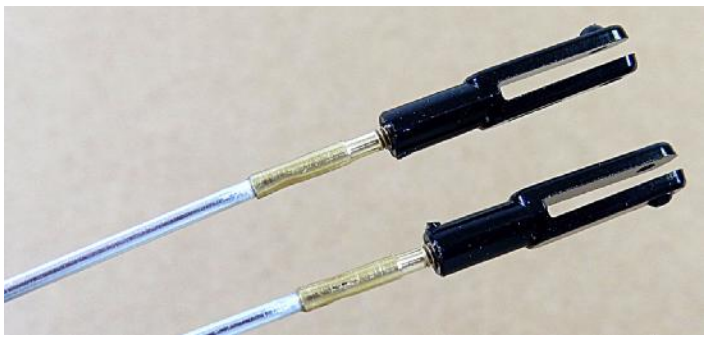
❑ **24.** Cut two 500mm long pieces of **E23** aluminum wire. Use diagonal pliers.

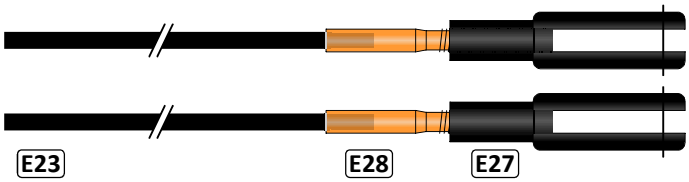




❑ **25.** Sand both wires **E23** at one end to a diameter of 1.5mm.

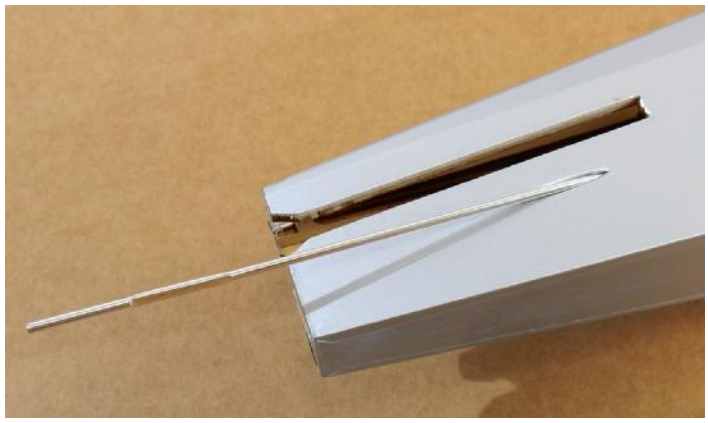
❑ **26.** Glue the threaded couplers **E28** to the ends of both wires **E23**.



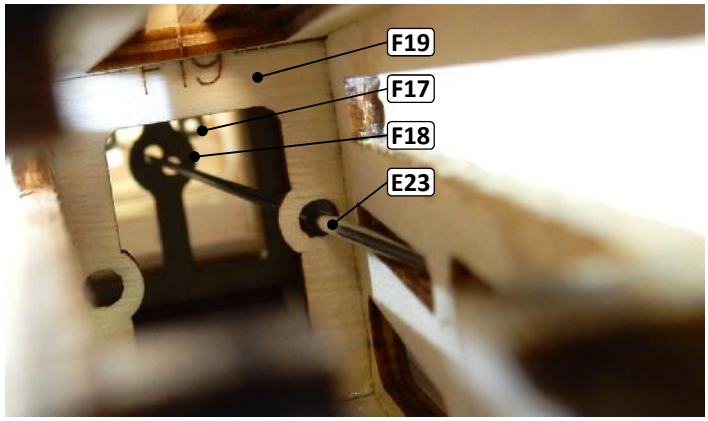


❑ **27.** Screw the clevises **E27** onto both threaded couplers **E28**.

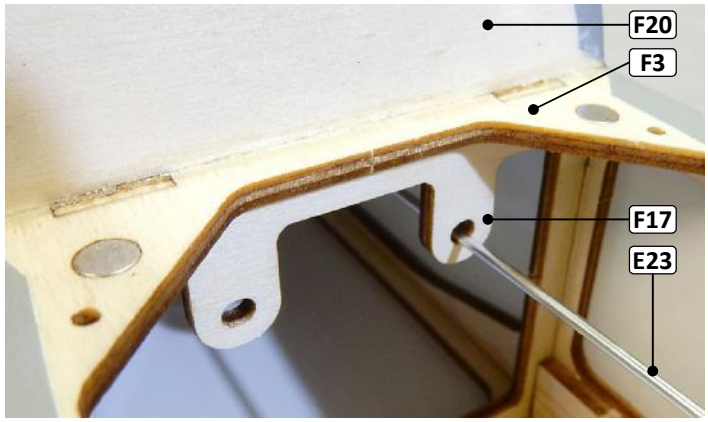
❑ **28.** Cut the covering at the pushrod place at the end of the fuselage.
Warning! Cut only a part, see picture.



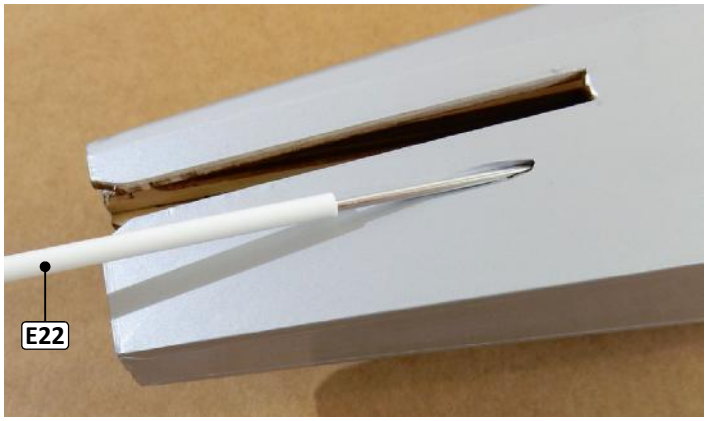
❑ **29.** Insert the rest of the wire **E23** through the cut covering.



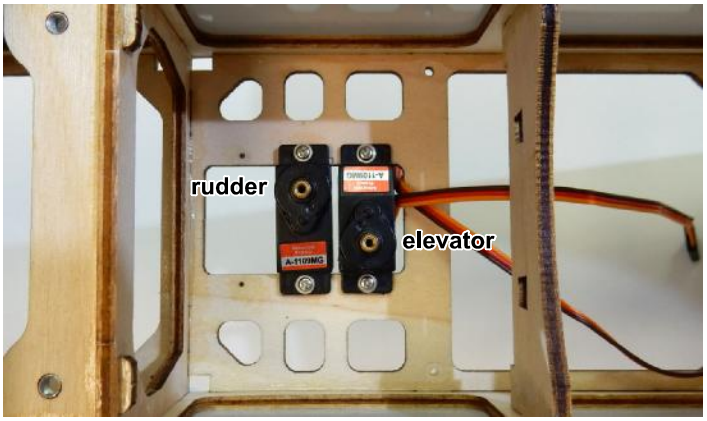
❑ **30.** Pass the wire **E23** so that it passes through the holes in the formers **F19**, **F18** and **F17**.



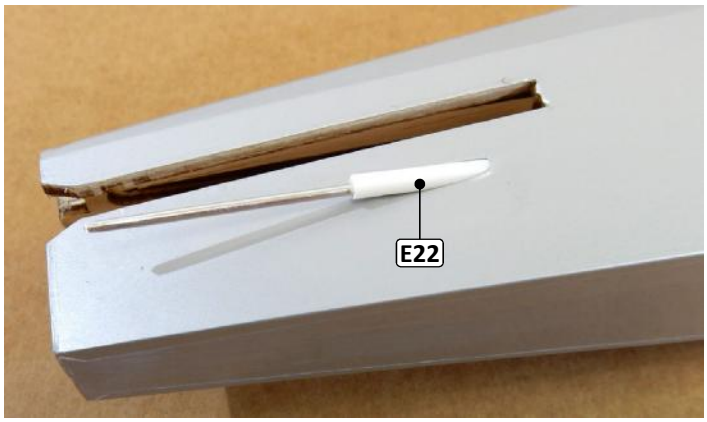
❑ **31.** The wire **E23** will protrude from the fuselage on one side and from the former **F17** on the other. The wire will make a guide for passing the plastic tube **E22**.



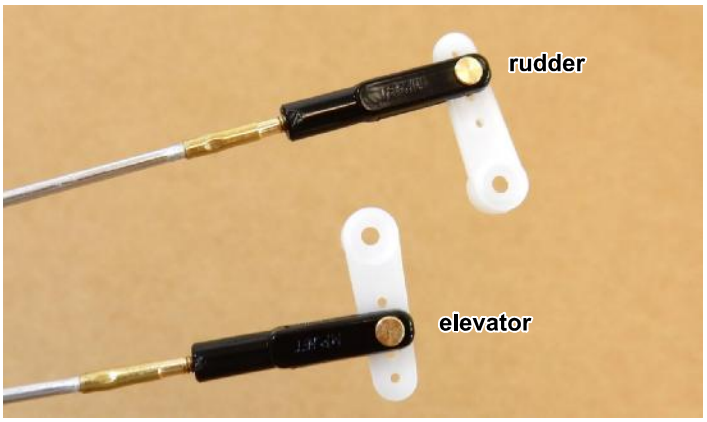
❑ **32.** Slide the tube **E22** (length 350mm) onto the wire.



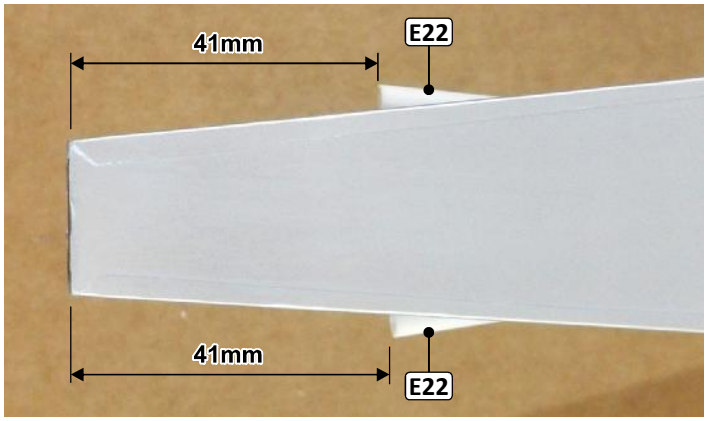
❑ **37.** Screw the elevator and rudder servos to the fuselage.



❑ **33.** Push the tube **E22** (length 350mm) into the fuselage. After this step you can remove the pushrod.

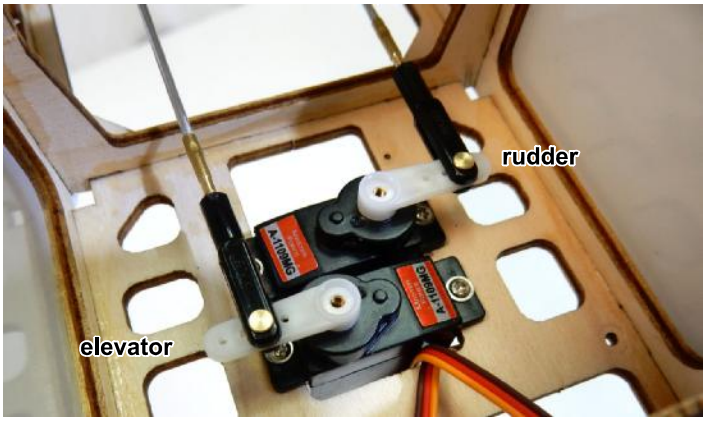


❑ **38.** Attach the pushrods to servo arms.



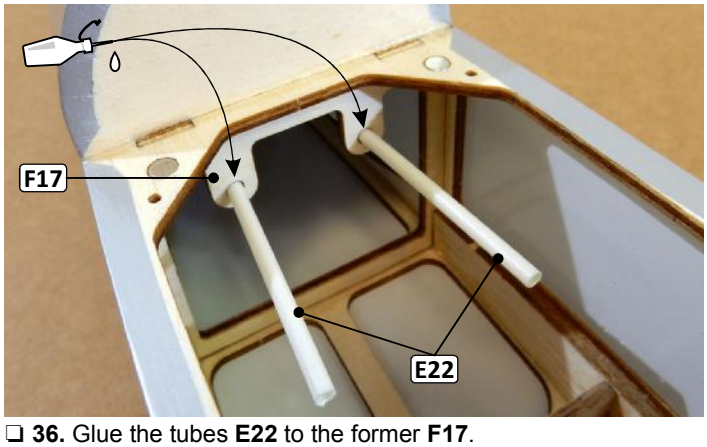
❑ **34.** Repeat steps *28-33* and install the second tube **E22** (length 350mm) in the same way.

❑ **35.** Push both tubes so that the distance between the rear of the fuselage and the beginning of the tubes is 41mm.

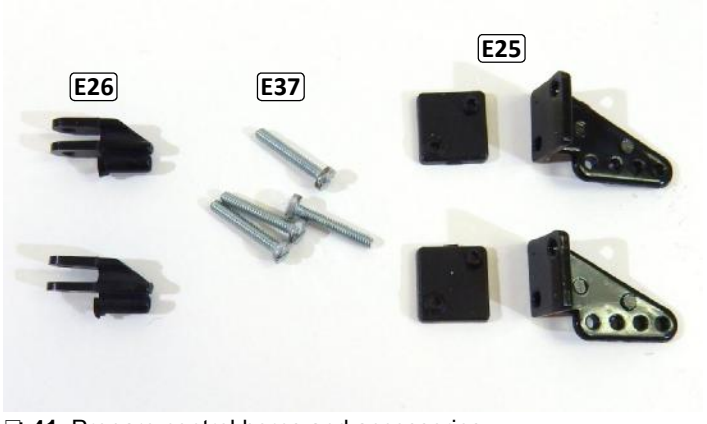


❑ **39.** Insert the pushrods into the tubes in the fuselage.

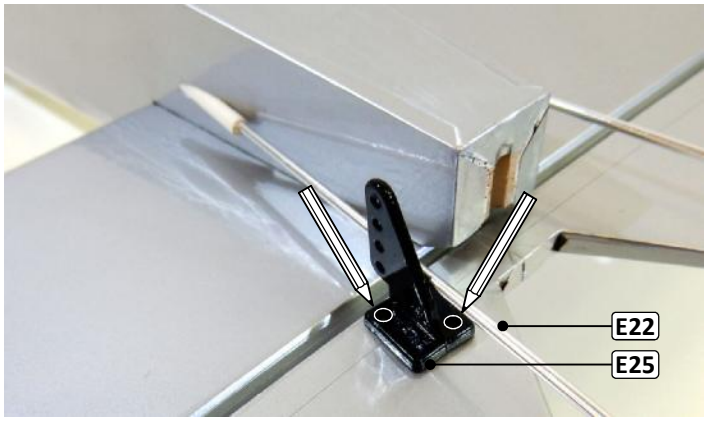
❑ **40.** Attach the servo arms on the servos, do not screw them.



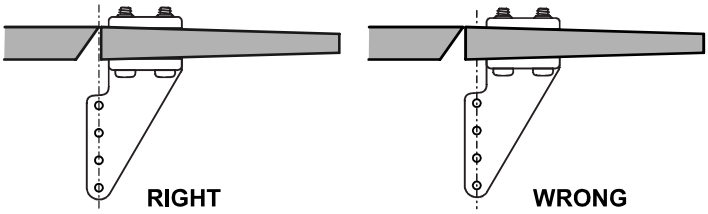
❑ **36.** Glue the tubes **E22** to the former **F17**.



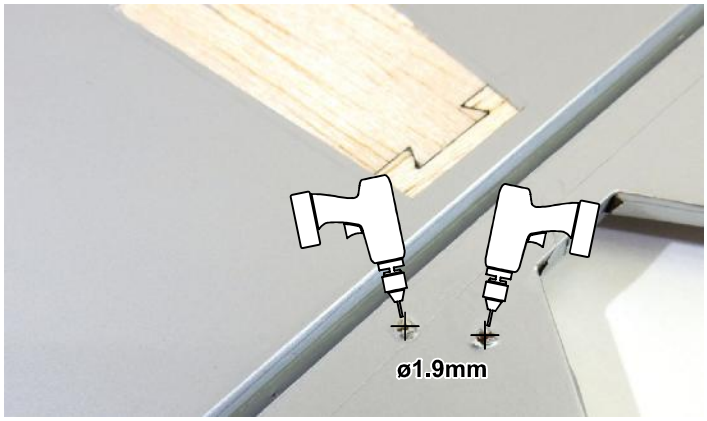
❑ **41.** Prepare control horns and accessories.



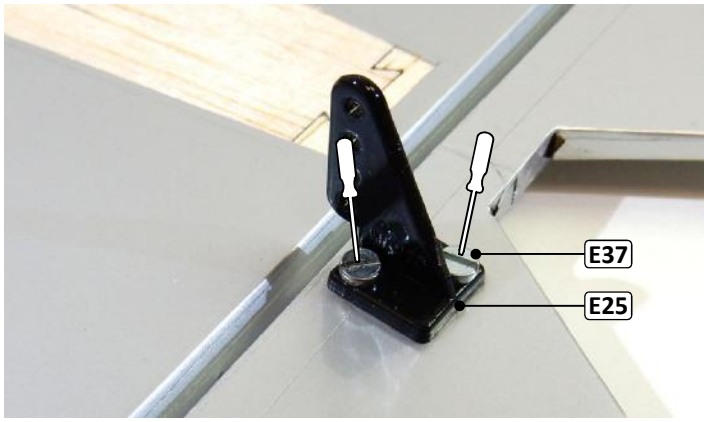
❑ **41.** Insert the horizontal stabilizer into the fuselage and fix the elevator in the neutral position (eg with a peg, etc.). Don't glue.
❑ **42.** Place the control horn on the elevator, align it with the pushrod and mark the position of the screw holes.



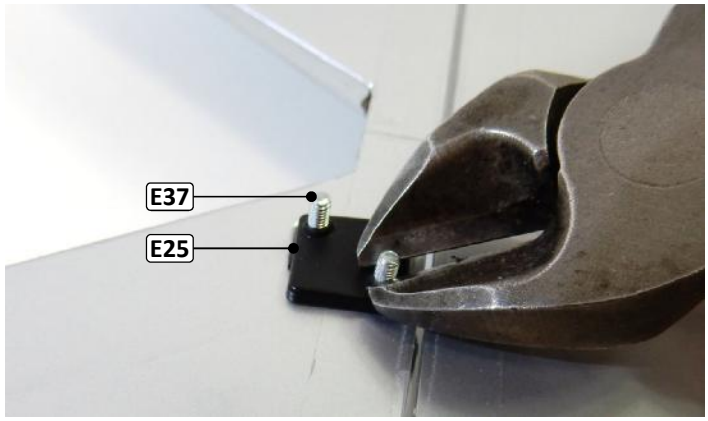
❑ **43.** The control horn must be in the correct position with respect to the axis of rotation of the rudder, see picture.



❑ **44.** Drill the holes for screwing the control horn **E25** with a ø1.9mm drill bit.

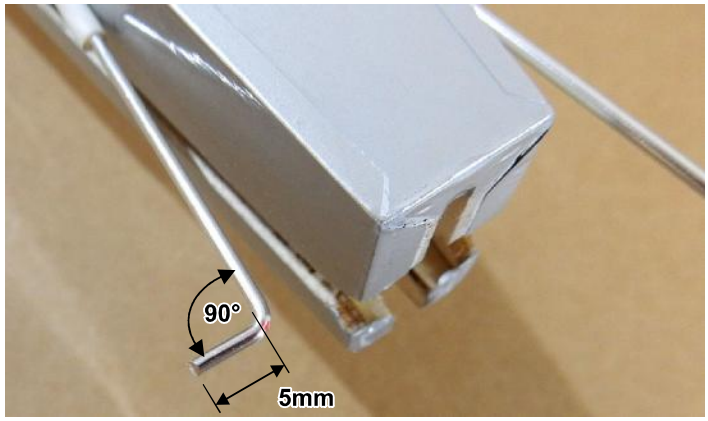


❑ **45.** Screw on the control horn **E25** with two screws **E37** (M2) to the elevator.

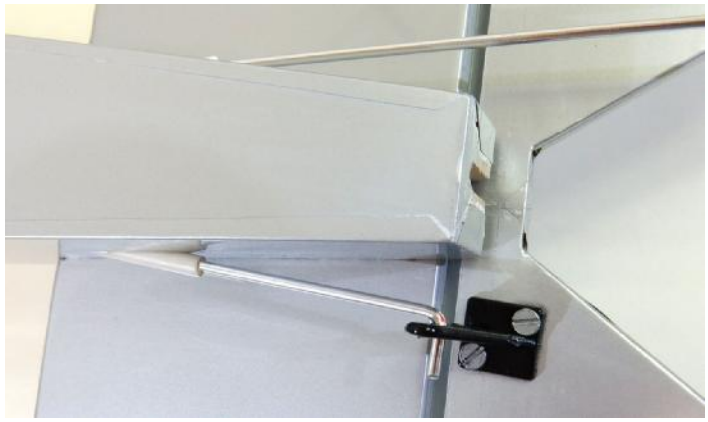


❑ **46.** Trim off the excess screw threads with cable splitter.

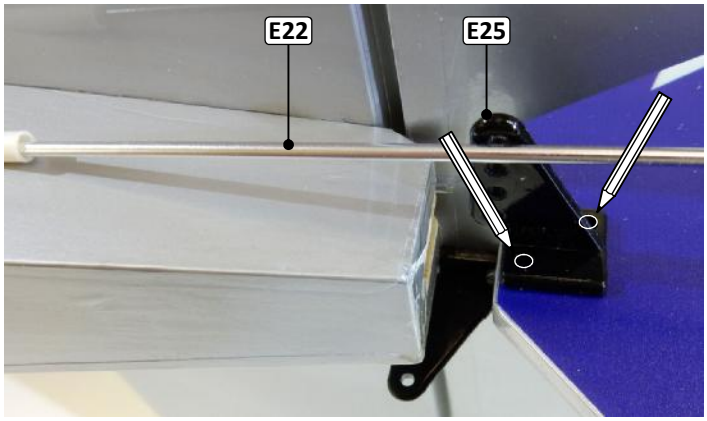
❑ **47.** Mark the position of the holes in the control horn with a marker on the pushrod.



❑ **48.** Use pliers to bend the rod by 90°.
❑ **49.** Shorten the bent end to approx. 5mm.

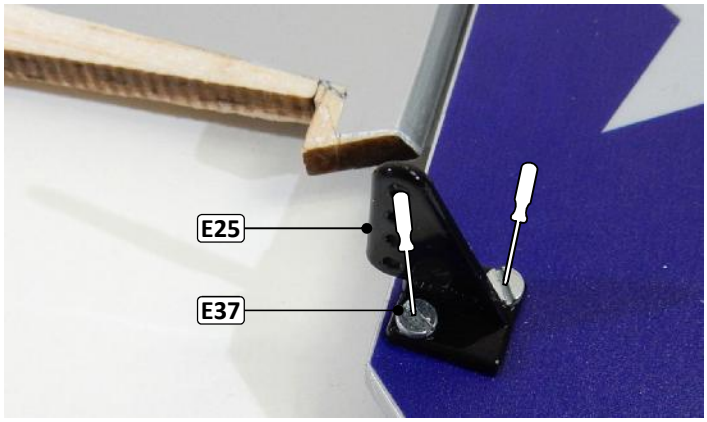


❑ **50.** Try to put the pushrod in the control horn. Do not use the FasLink **E26** now.

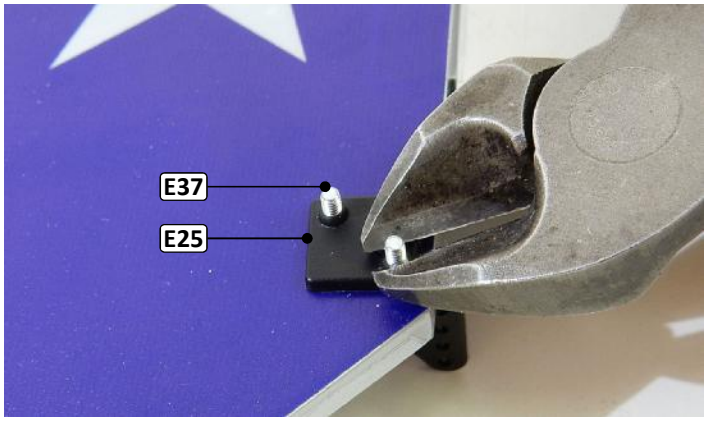


❑ **51.** Insert the vertical stabilizer into the fuselage and fix the rudder in the neutral position (eg with a peg, etc.). Don't glue.
❑ **52.** Place the control horn on the rudder, align it with the pushrod and mark the position of the screw holes.

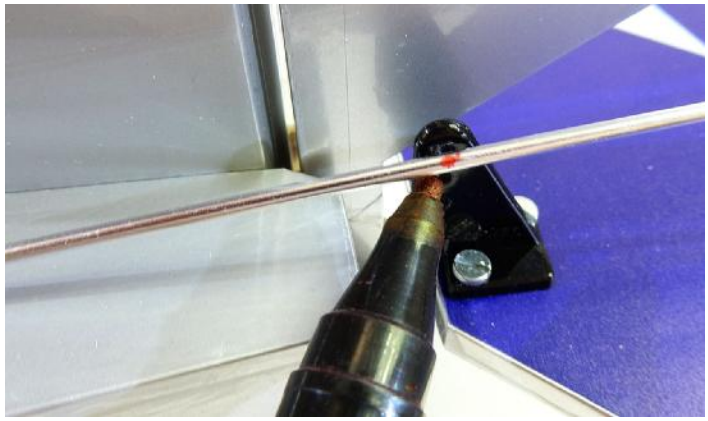
❑ **53.** Drill the holes for screwing the control horn **E25** with a ø1.9mm drill bit.



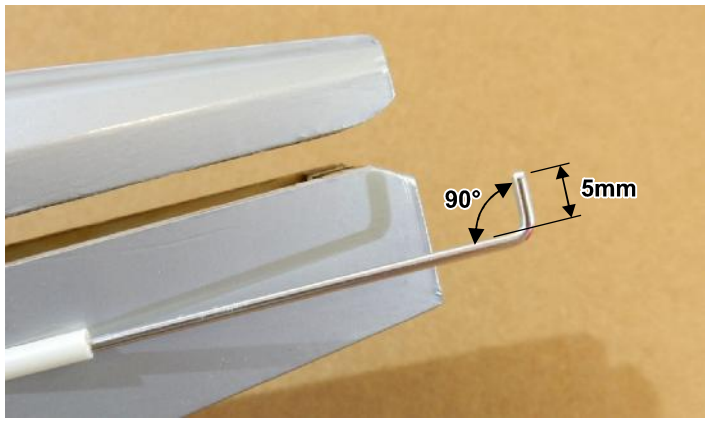
❑ **54.** Screw on the control horn **E25** with two screws **E37** (M2) to the rudder.



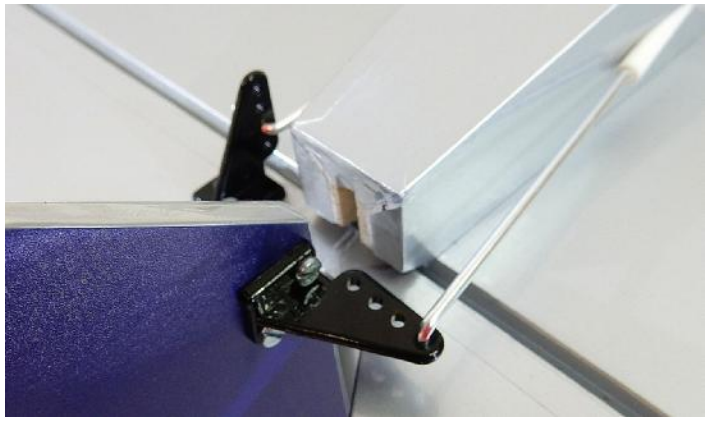
❑ **55.** Trim off the excess screw threads with cable splitter.



❑ **56.** Mark the position of the holes in the control horn with a marker on the pushrod.



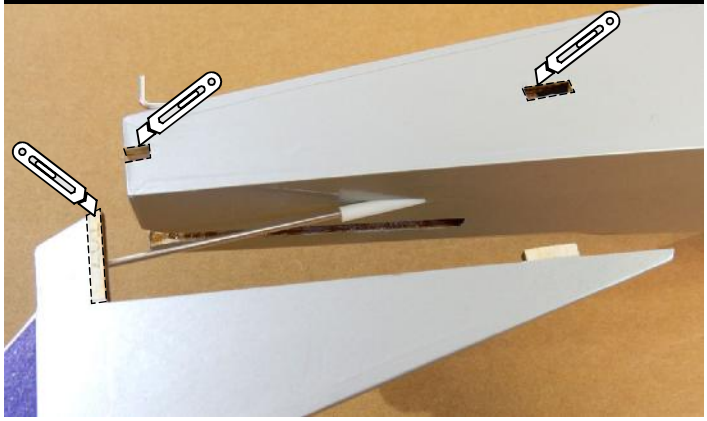
❑ **57.** Use pliers to bend the rod by 90°.
❑ **58.** Shorten the bent end to approx. 5mm.



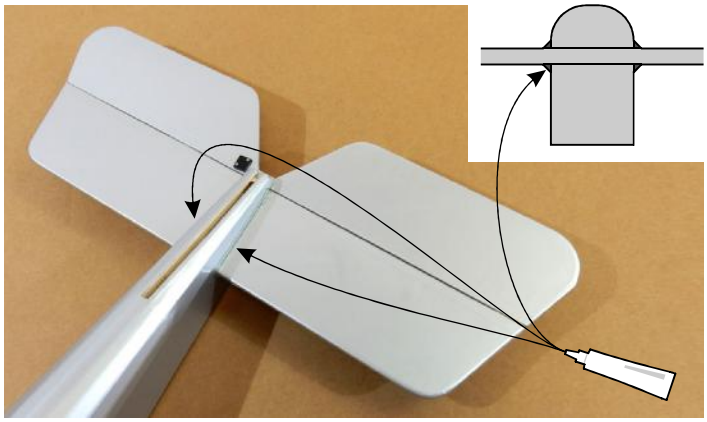
❑ **59.** Try to put the pushrods in the control horns. Do not use the FasLinks **E26** now. The pushrods will be fitted to the control horns as you can see in the picture.

Notes:

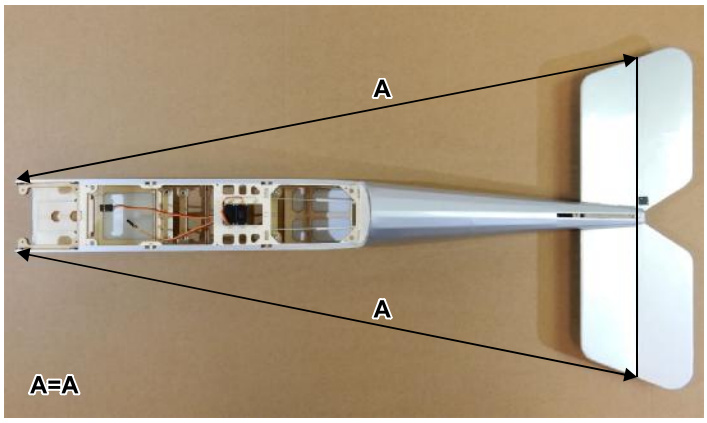
Assembly - tails



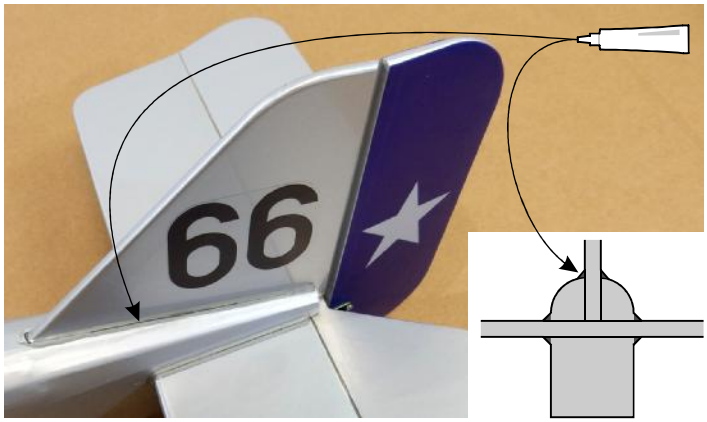
❑ **1.** Remove the covering from fuselage and from the tail skid.



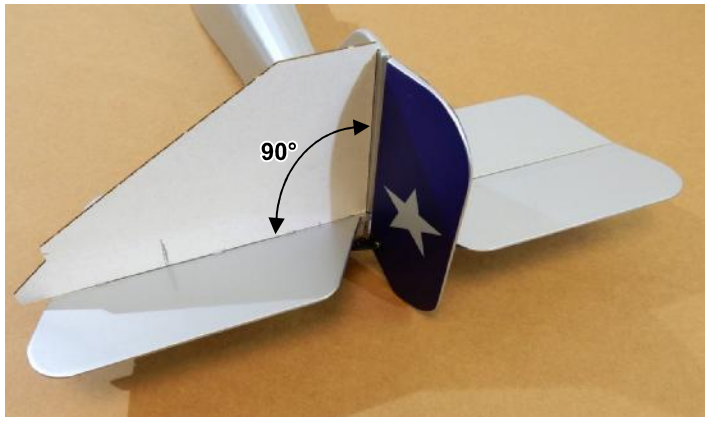
❑ **2.** Glue the stab to the fuse. We recommend gluing with **UHU POR**. In case of repair or replacement of the stab, the joint can be disassembled easily. Fill the corners between the fuselage and the stab with **UHU POR**.



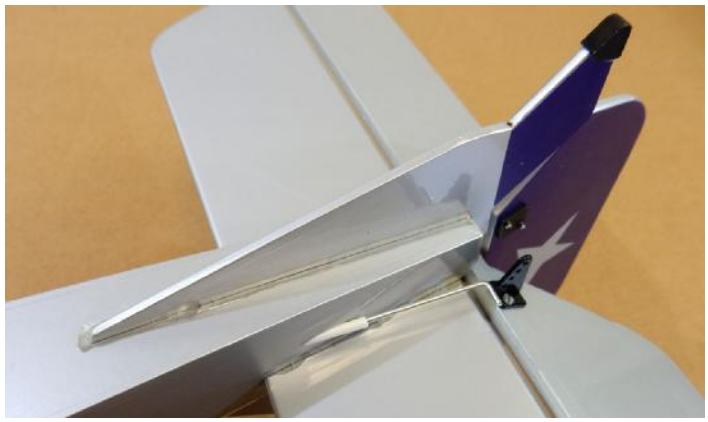
❑ **3.** Measure from the stab tips to the fuse front, to make sure the stab / elevator is square with the fuse.



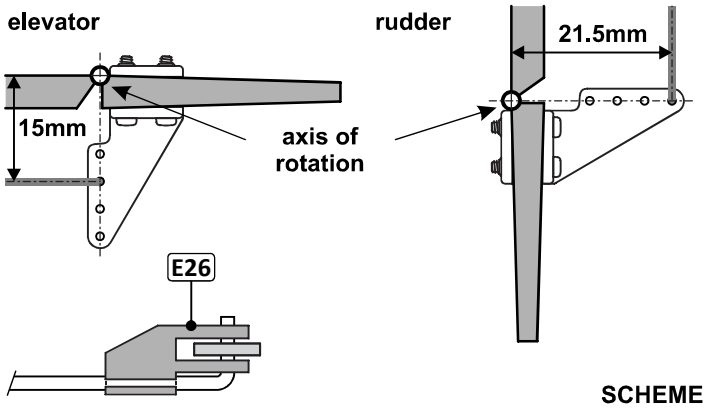
❑ **4.** Glue the fin to the fuselage. Glue in the same way as in the stab / elevator.



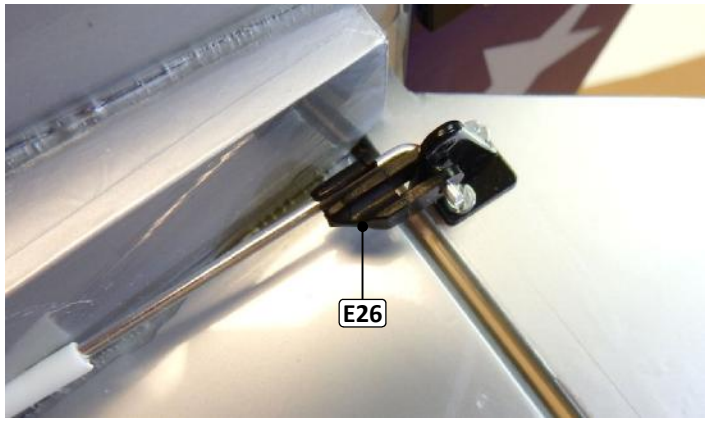
❑ **5.** Use a paper template to make sure the fin is perpendicular to the stab.



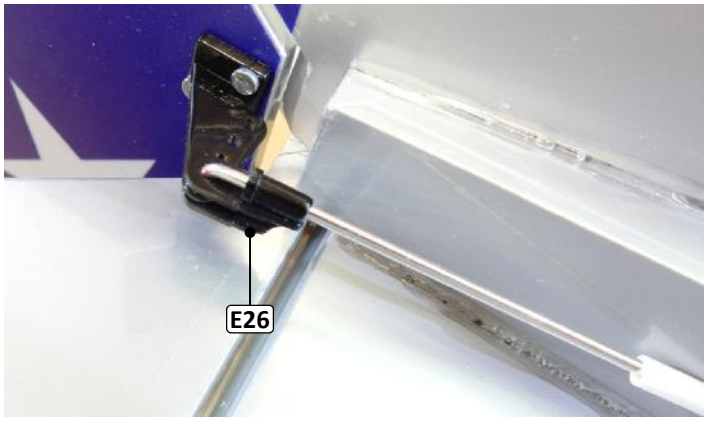
❑ **6.** Glue the tail skid. Use **UHU POR** again. Fill the corners between the fuselage and the tail skid with **UHU POR**.



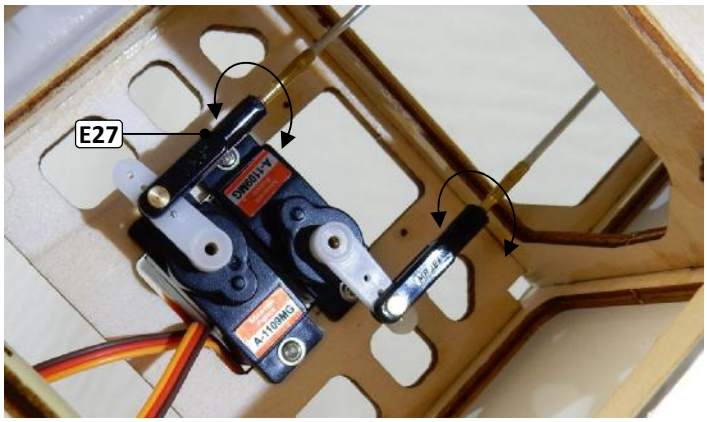
❑ **7.** Prepare FasLinks **E26**. In the picture you can see how they will be mounted on the pushrod. The picture also shows how the pushrods will be fitted to the control horns.



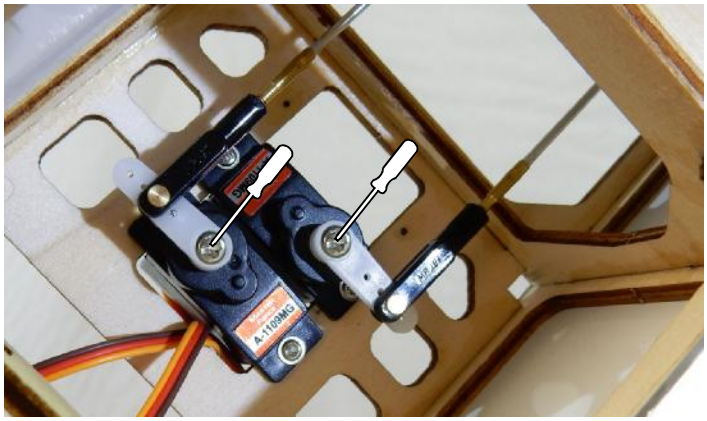
❑ **8.** Connect the elevator pushrod to the elevator control horn and secure with the FasLink **E26**.



❑ **9.** Connect the rudder pushrod to the rudder control horn and secure with the FasLink **E26**.



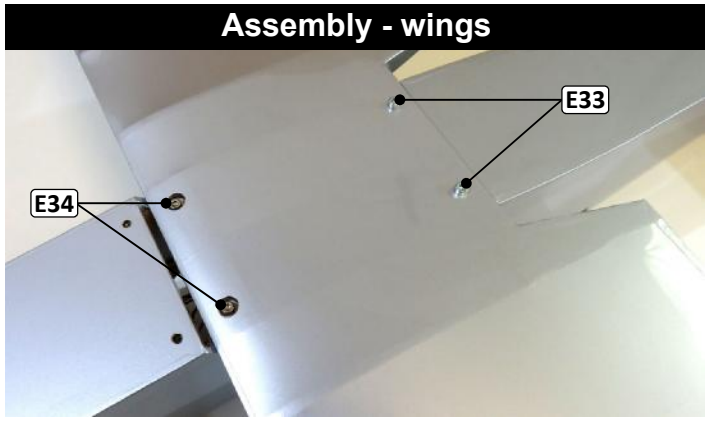
❑ **10.** Adjust the length of the pushrods by screwing in / out the clevises **E27** so that the servo horn and tail horns are in the neutral position.



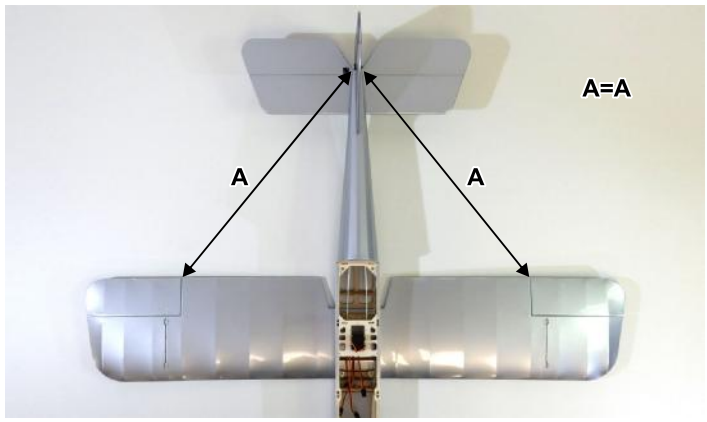
❑ **11.** Screw the servo horns.

Notes:

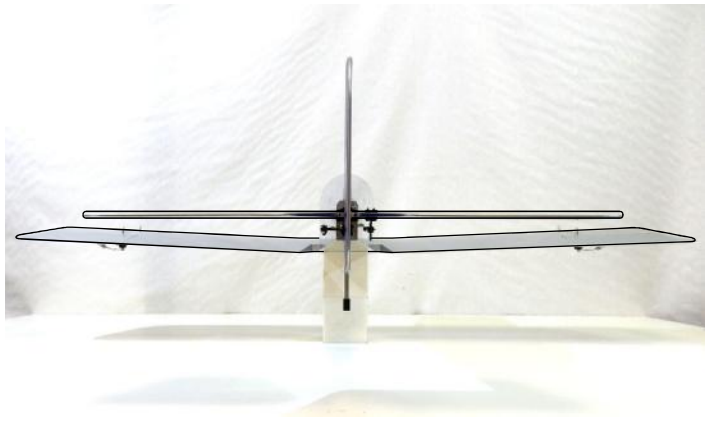
Assembly - wings



❑ **1.** Attach bottom wing to the fuselage with screws **E33** (M3x30) and **E34** (M3x20).

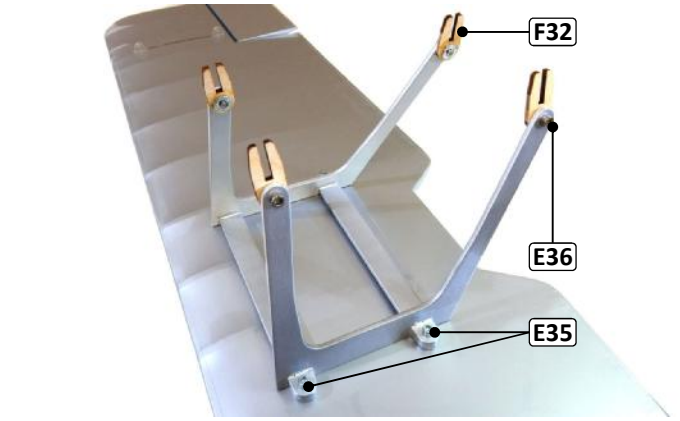


❑ **2.** Measure from the fuse end to the aileron T.E. edge, to make sure the wing is square with the fuse.

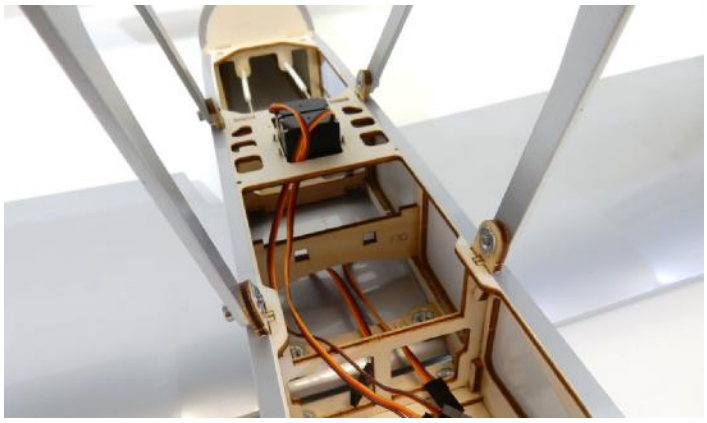


❑ **3.** Viewed from behind check if the stab is in level with respect to the wing. Stab and wing must be parallel!

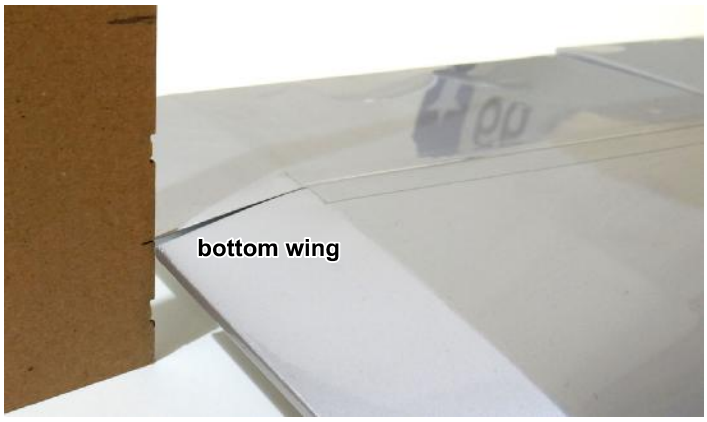
❑ **4.** You can easily correct a slight twist of the fuselage by heating the covering and twisting the fuselage to the correct position. Because of this step, you have not previously applied stickers to the fuselage.



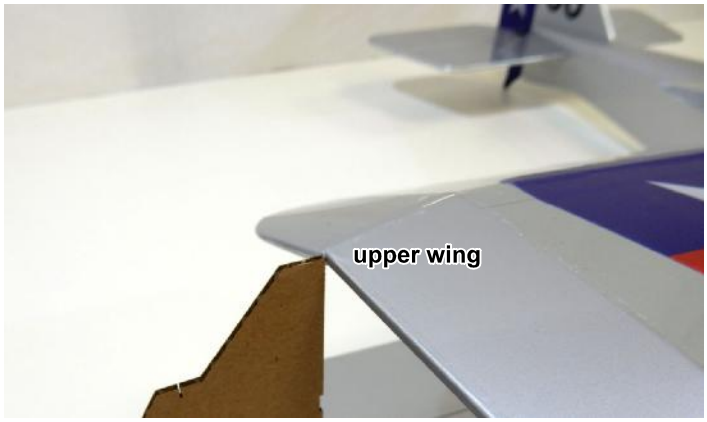
❑ **5.** Install upper wing saddle to the upper wing with 4pcs screws **E35** (M3x10). Screw on the holders **F32** with screws **E36** (M3x8) to the upper wing saddle.



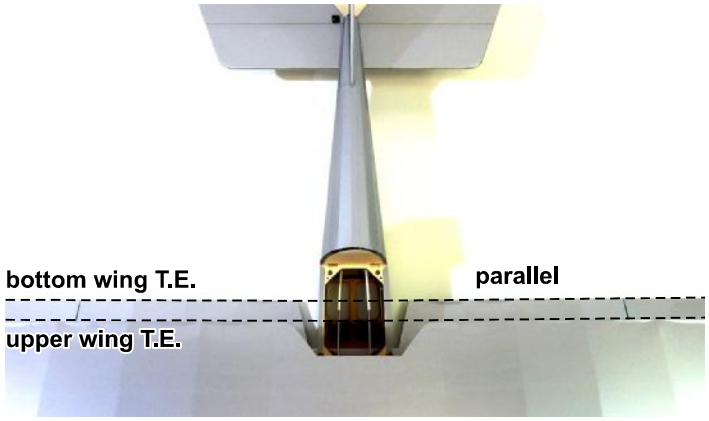
❑ **6.** Insert the holders **F32** into the fuselage. Don't glue!



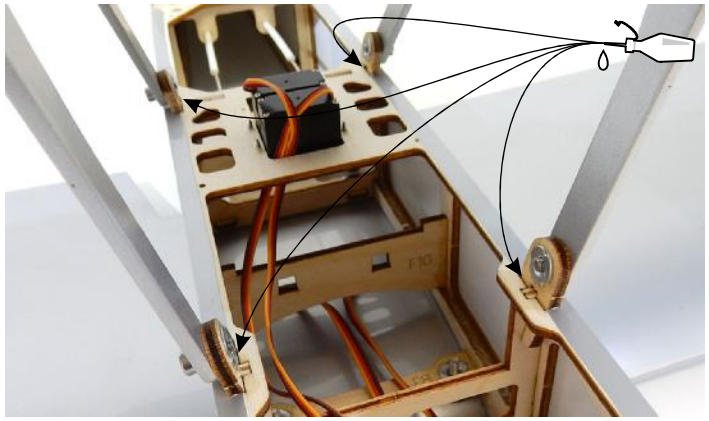
❑ **7.** Check the distance of the bottom wing tips from the table. Use a template. The ends do not have to be at the height of the mark on the template, but they must both be at the same height!



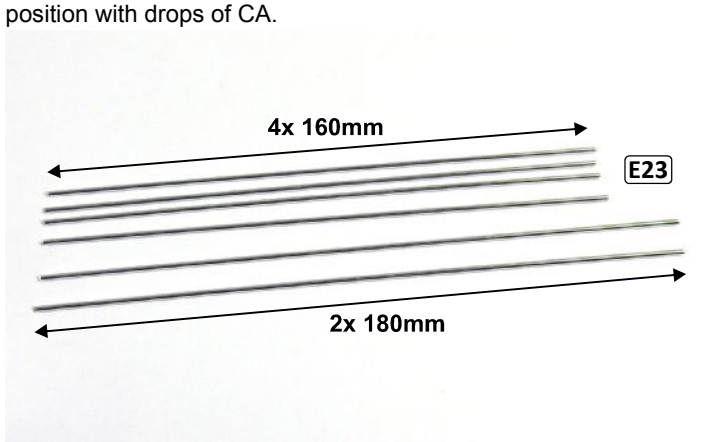
❑ **8.** Check the distance of the upper wing tips from the table. Use a template. The ends do not have to be at the height of the mark on the template, but they must both be at the same height!



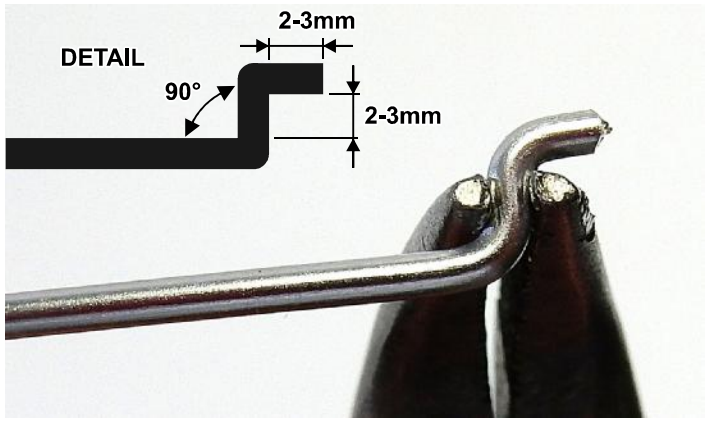
❑ **9.** When viewed from above, check that the trailing edges of both wings are parallel. You change the setting of the upper wing by moving the holders **F32** in the fuselage. If you cannot achieve the correct geometry of both wings, check again that the wings are not twisted.



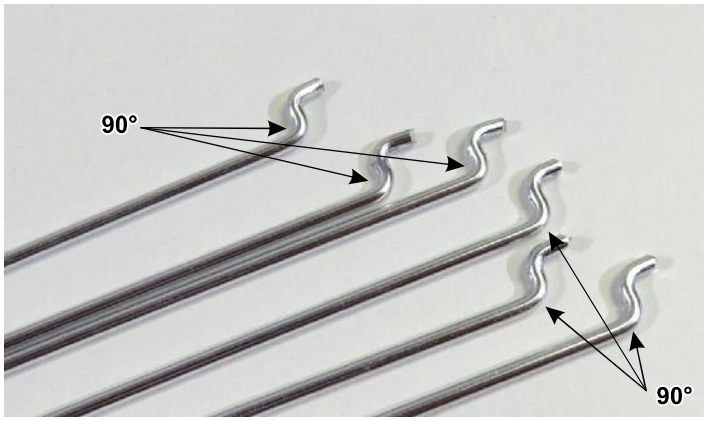
❑ **10.** Fix the upper wing saddle holders **F32** in the correct position with drops of CA.



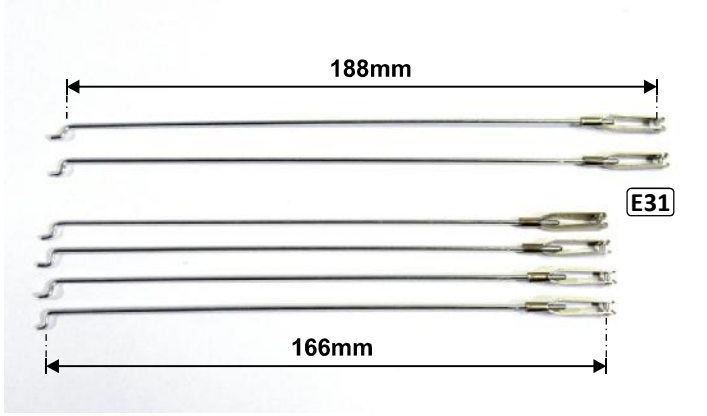
❑ **11.** Cut 4pcs of length 160mm and 2pcs of length 180mm from **E23** wire.



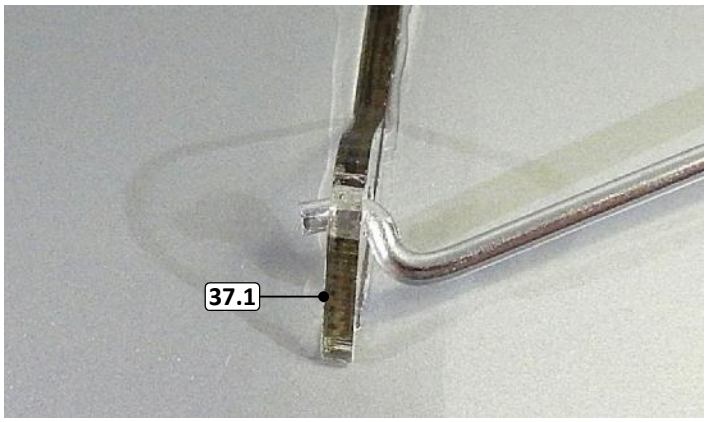
❑ **12.** Make a Z-bend at one end of all the wires with small pliers.



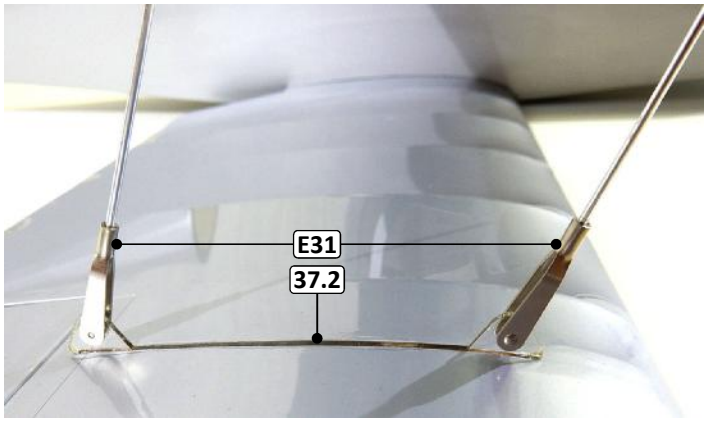
❑ **13.** Keep a 90° bend in the marked places. The second bend does not have to be 90°.



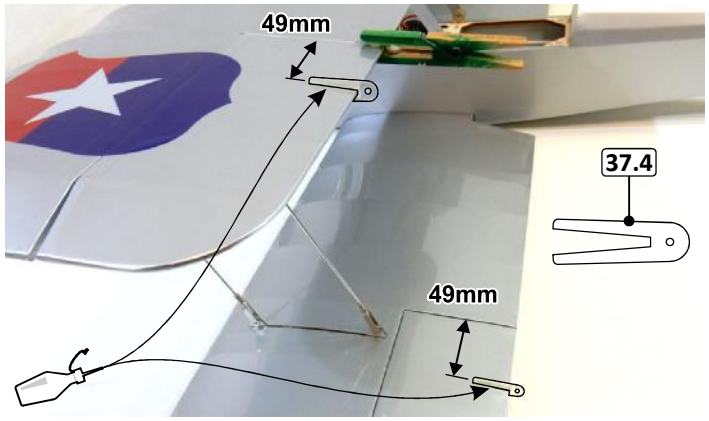
❑ **14.** Screw in the clevises **E31** so that the length of the rods is 166mm (wing struts) and 188mm (aileron connection rods).



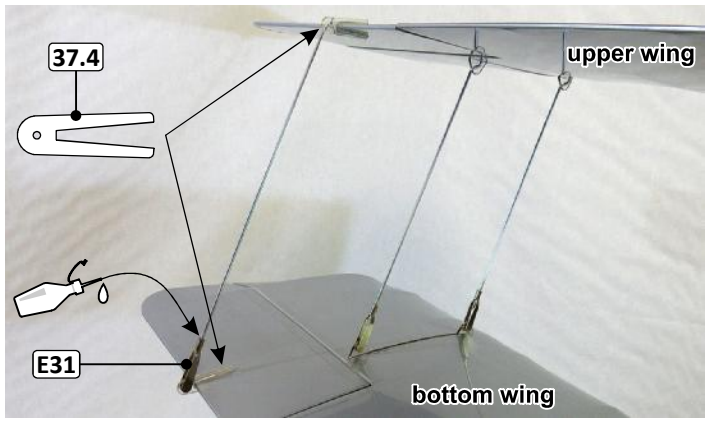
❑ **15.** Insert the four struts (length 166mm) by Z-bend into the holders **37.1** in the upper wing.



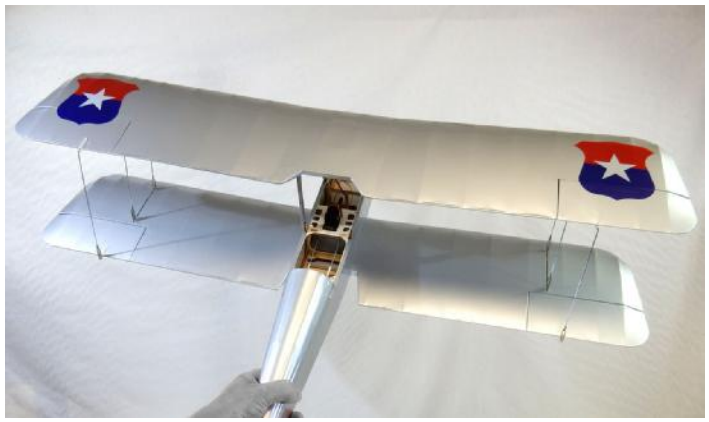
❑ **16.** Snap the clevises **E31** on the struts onto the holders **37.2** on both sides of the bottom wing.



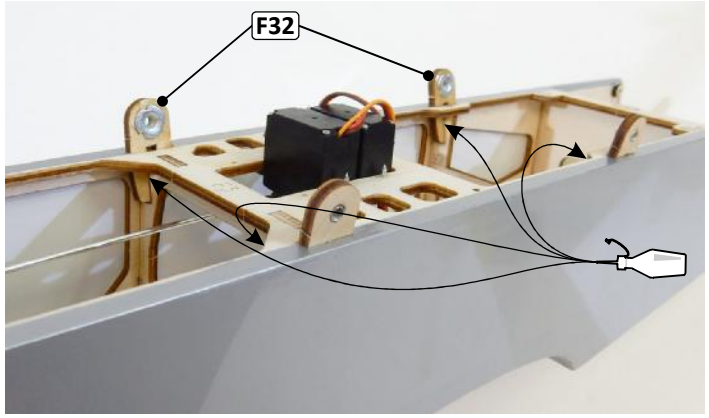
❑ **17.** Fix the ailerons in the neutral position and glue the horns **37.4** in the place of the rib (approx. 49mm from the aileron edge.
❑ **18.** Also glue the horns on the other side of the wings.



❑ **19.** Set the exact lengths of the connection rods screwing the clevises **E31** so that both ailerons are in neutral when connected.
❑ **20.** Connect the ailerons on both sides of the wing with the rods. Secure the clevises with a drop of CA.

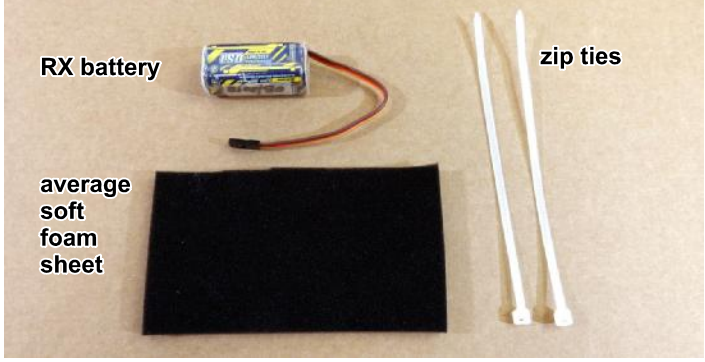


❑ **21.** The wing struts and aileron rods are assembled.
❑ **22.** Remove wings and upper wing saddle.

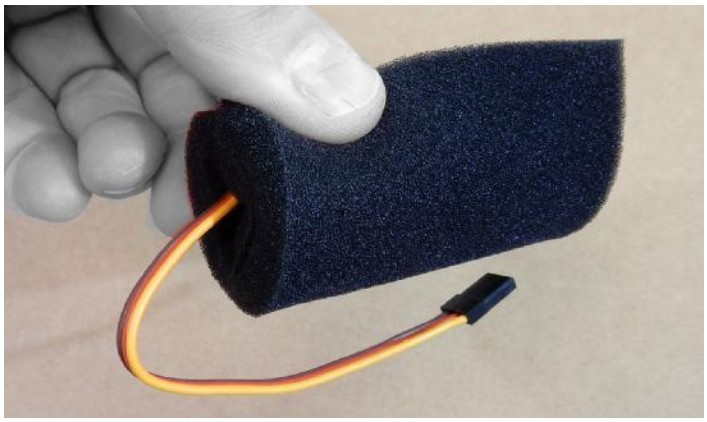


❑ **23.** Thoroughly glue all four holders **F32** to the fuselage.

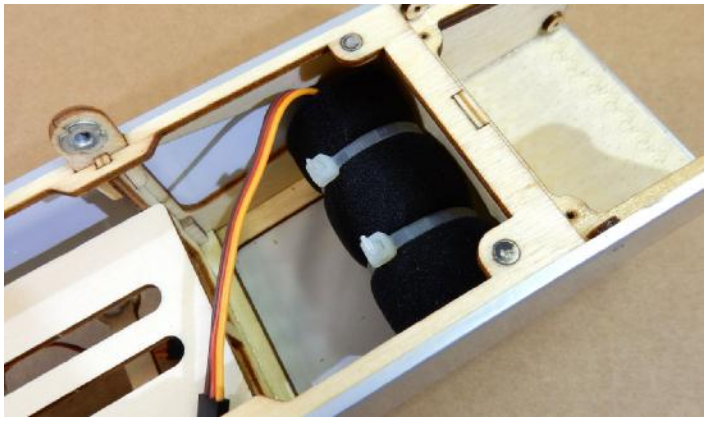
Glow engine installation



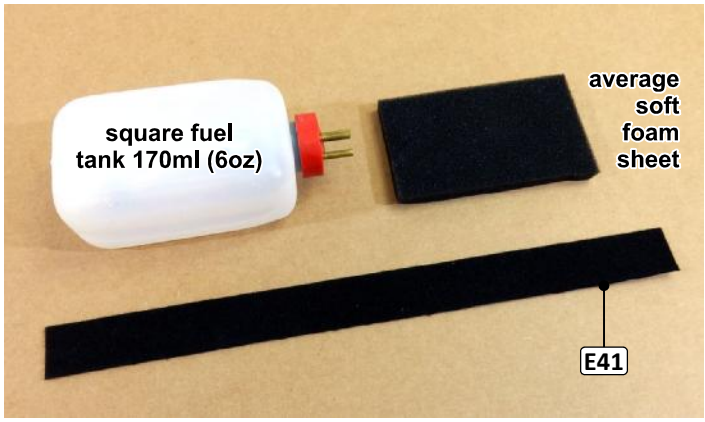
❑ **1.** Prepare the receiver battery, a piece of average soft foam and a cable ZIP ties. The kit doesn´t include this equipment!



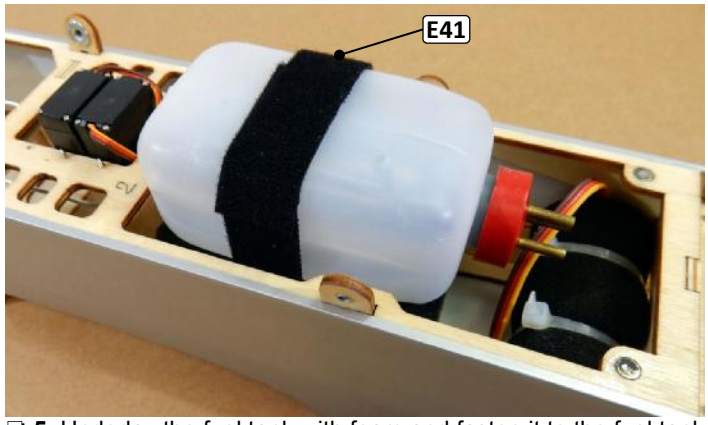
❑ **2.** Wrap the battery in foam.



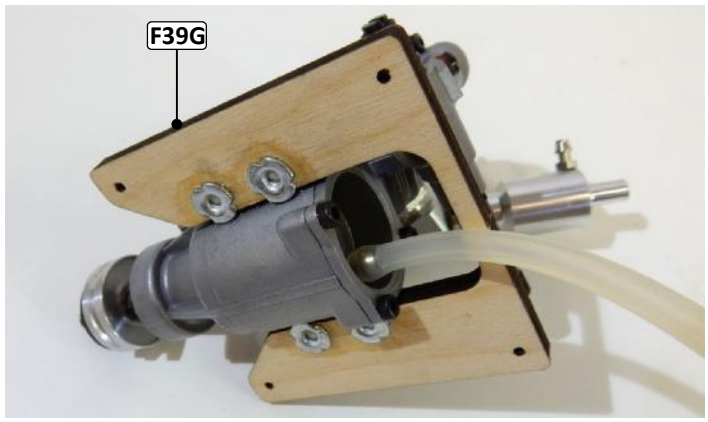
❑ **3.** Attach the battery to the battery mount platform **F37G** using two ZIP straps.



❑ **4.** Prepare a fuel tank (square, 170ml / 6oz), a piece of average soft foam and velcro **E41**. The kit doesn´t include the fuel tank and foam!

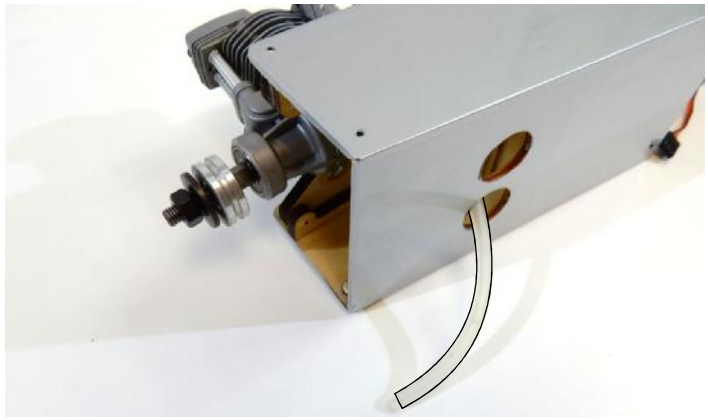


❑ **5.** Underlay the fuel tank with foam and fasten it to the fuel tank platform **F38G** with velcro **E41**.

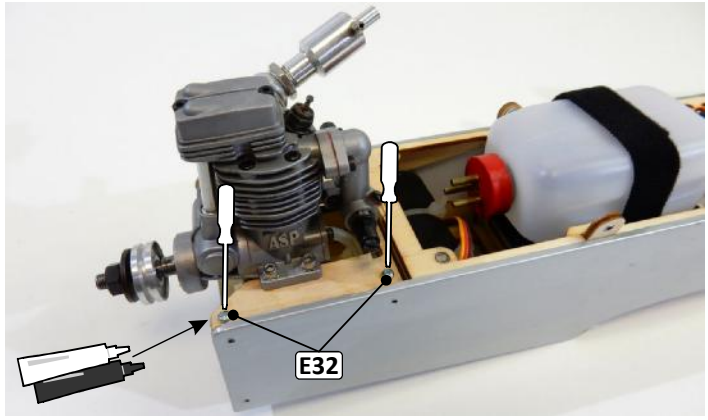


❑ **6.** Attach silicon tube to the crankcase.

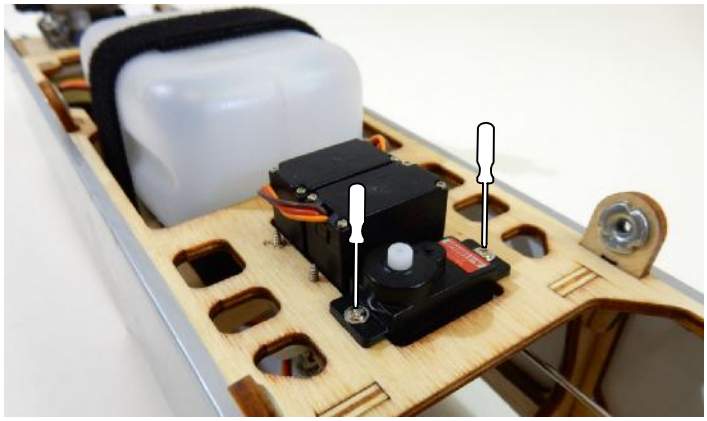
Note: When using a new engine, we recommend to make first run tests outside the model. After the test install the engine to the model. When installing the engine follow the engine manufacturer's instructions.



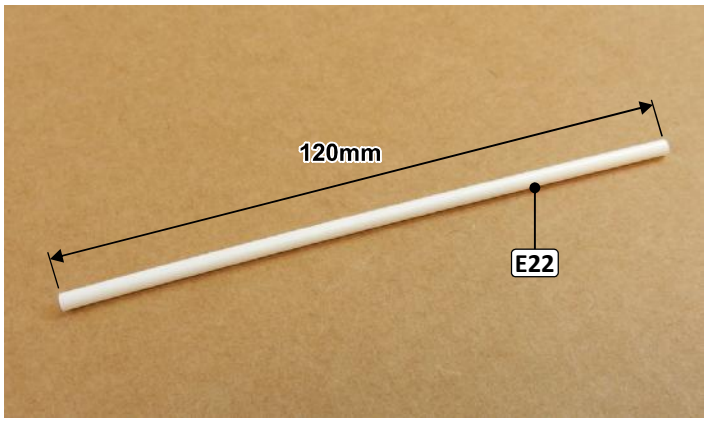
❑ **7.** Install engine with engine mount **F39G** into the fuselage. Pass the tube through the hole in the bottom front of the fuselage.



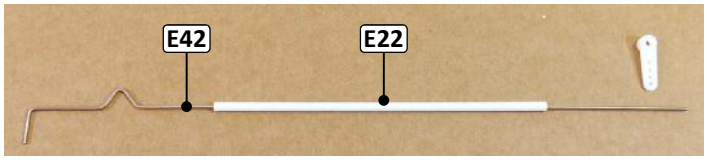
❑ **8.** Glue the engine mount with two-component glue (epoxy) and screw it into the fuselage with four screws **E32**.

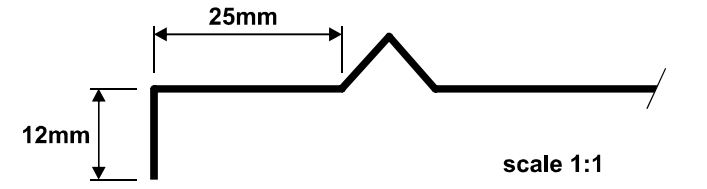


❑ **9.** Screw the throttle servo into the fuselage.



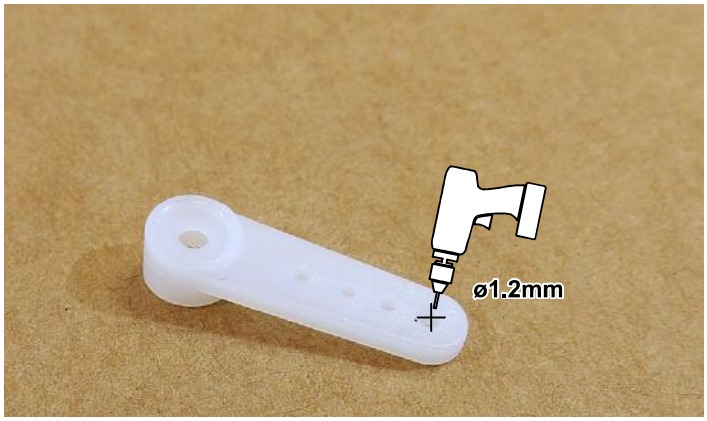
❑ **10.** Cut a 120mm long piece from the plastic tube **E22**.



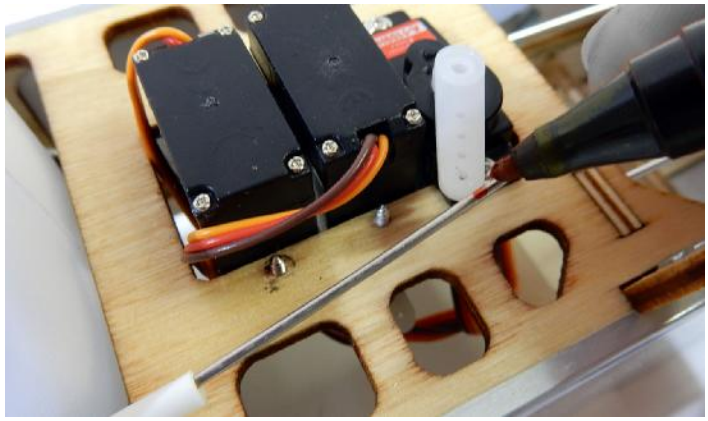


❑ **11.** Bend the throttle pushrod **E42** following the picture.

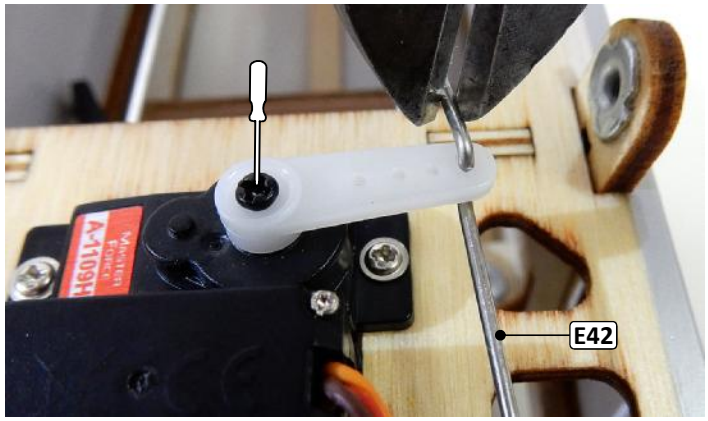
❑ **12.** Insert the throttle pushrod **E42** into the tube **E22** (length 120mm).



❑ **13.** Enlarge the hole in the throttle servo arm to a diameter of 1.2mm.



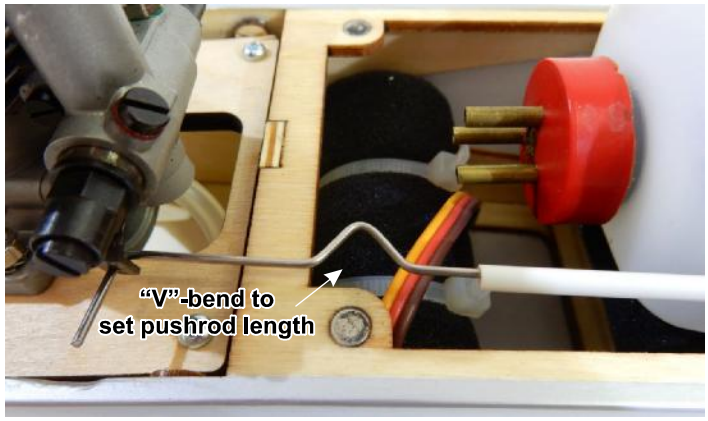
❑ **14.** Connect the throttle pushrod to the RC carburetor horn. Set the throttle servo and RC carburetor to the "off" position. Mark the position of the hole in the servo arm on the pushrod **E42**.



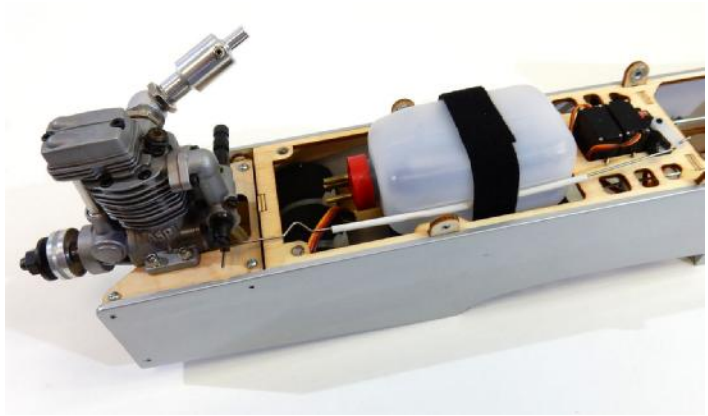
❑ **15.** Make a Z-bend at the marked point of the **E42** pushrod.

❑ **16.** Attach the servo arm on the pushrod and screw it to the servo.

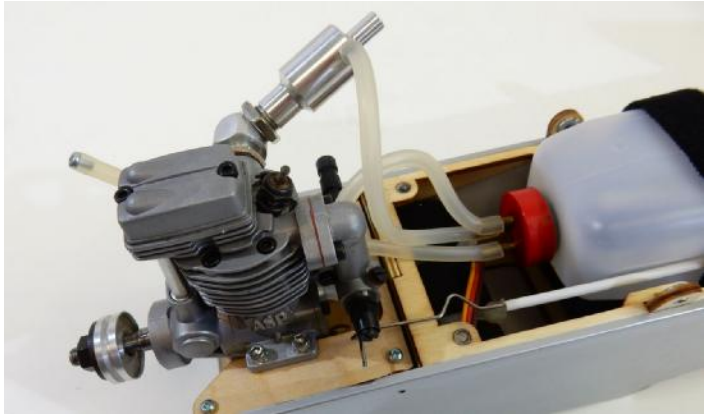
❑ **17.** Trim off the excess pushrod with cable splitter.



❑ **18.** You can adjust the pushrod length by bending the V-bend.



❑ **19.** Check the free movement of the throttle pushrod over the entire engine speed control range.



❑ **20.** Connect the fuel tank to the engine with suitable tubes (silicone).

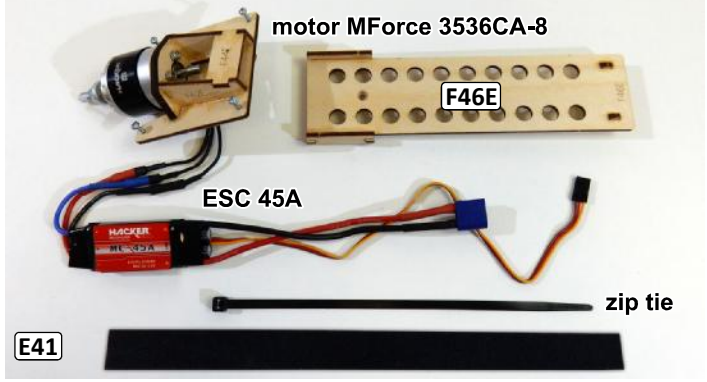
❑ **21.** Attach the fuselage cover and test for collisions with the engine throttle pushrod or fuel tubes.

❑ **22.** Screw on the engine cowl.

Note: For the maiden flights with the model, we recommend removing the cowl for easier access and engine adjustment.

Notes:

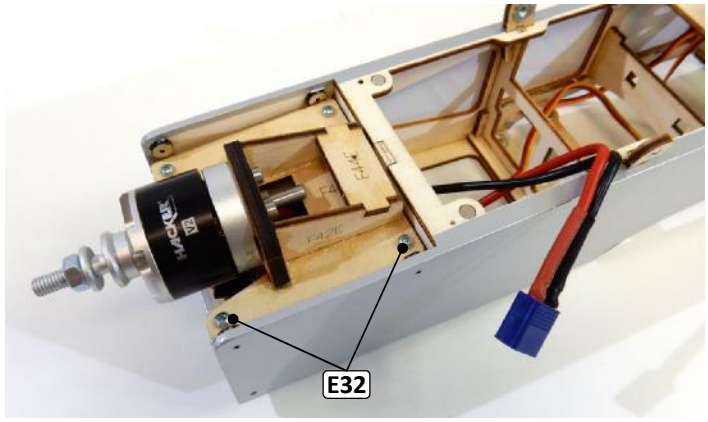
Electro motor installation



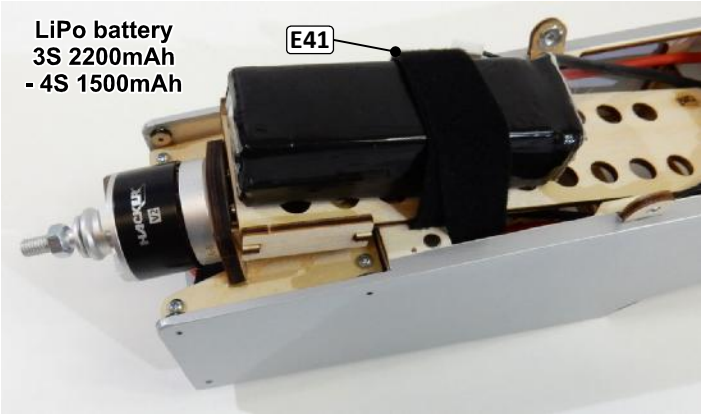
❑ **1.** Prepare parts for assembling the electro version. The kit doesn´t include the cable ZIP tie!

❑ **2.** Connect the motor to the ESC. Connect the receiver or servo tester, the battery and check that the motor is spinning in the right direction.

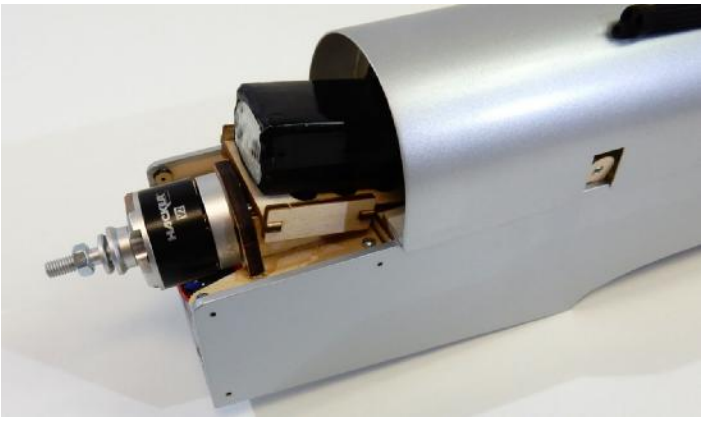
❑ **3.** Fix the ESC with cables to the ESC platform **F45E** with a cable ZIP tie.



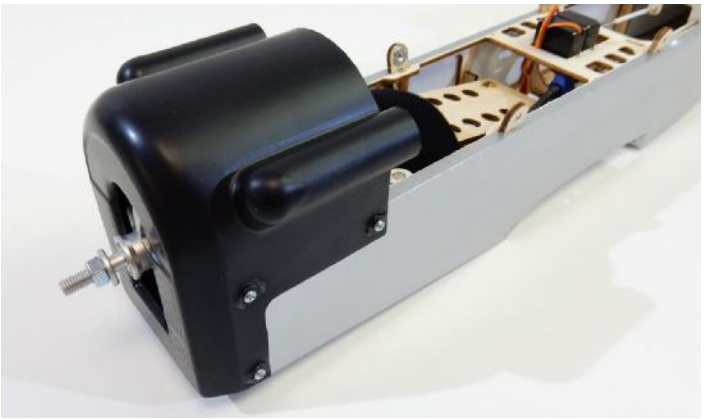
❑ **4.** Screw the motor mount with the motor to the fuselage with four screws **E32**.



❑ **5.** Attach the battery platform to the fuselage using screw **E32**.
❑ **6.** Try to attach your battery with velcro **E41**. Don´t care about battery position considering to the C.G. now.



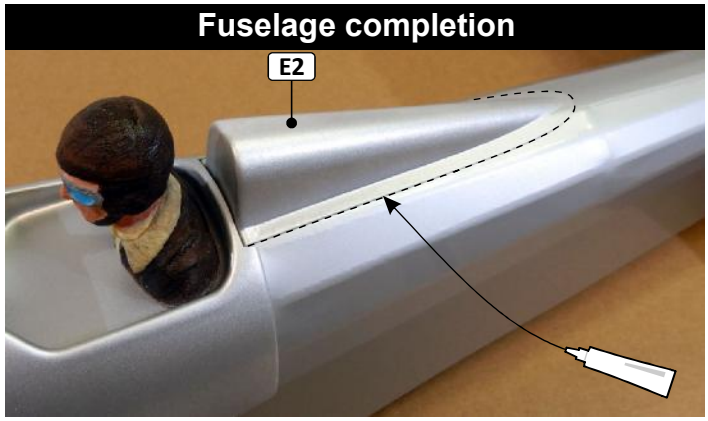
❑ **7.** Attach the fuselage cover and make sure that the batteries or the velcro **E41** do not interfere with the cover.



❑ **8.** When satisfied with the fitting, use 6pcs screws **E32** to attach motor cowl. Remove the battery from the fuselage.

Notes:

Fuselage completion



❑ **1.** Glue the vac-formed part **E2** to the fuselage using the **UHU POR**.

❑ **2.** Prepare the remaining stickers for the fuselage and clean the surface of the fuselage before applying the stickers using alcohol or acetone.

❑ **3.** Remove piece of the backing paper, place the sticker in place, and press the sticky area of the sticker to the covering.

❑ **4.** Thoroughly apply the sticker to the covering with your finger.

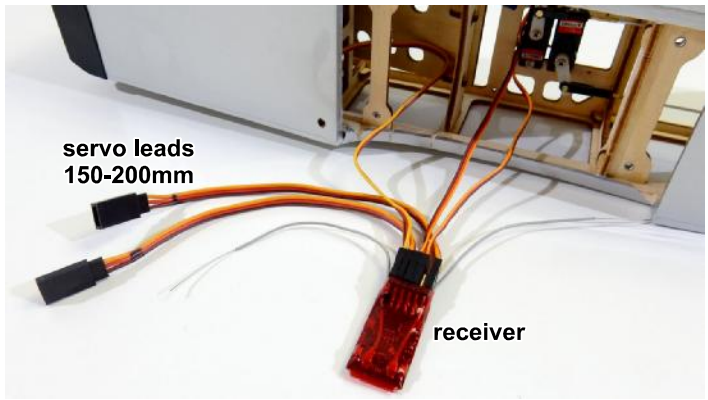
❑ **5.** Apply the sticker on the other side of the fuselage in the same way.

❑ **6.** You will make us happy if you apply our HACKER logo stickers on both sides of the fuselage :). When gluing, proceed in the same way as for other stickers.

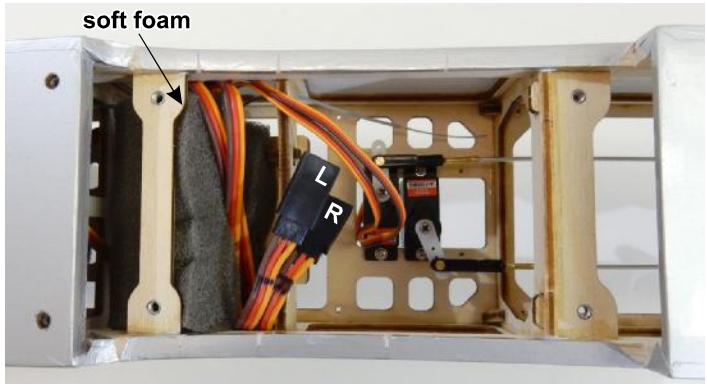
Notes:

Final assembly

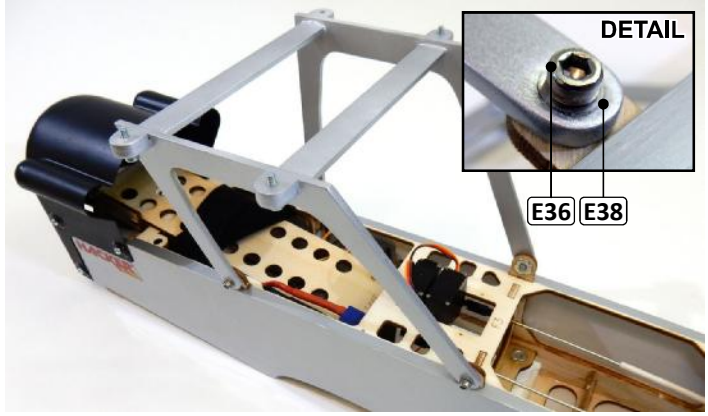
Introduction:
- The final assembly is similar for the electric version and the glow engine version. The next procedure describes the electrical version (electric version is on the pics).
- Tighten the screws thoroughly but gently.
- When installing the receiver, follow the receiver manufacturer's instructions (eg antennas position, etc.).
- Fasten the propeller to the motor thoroughly. A loose propeller can really hurt you (the author's own experience).
- Place the plane battery (electric version) to balance the model. The position of the center of gravity is shown on page no.4. If the battery cannot be placed to balance the model, you must use an additional load. Thoroughly attach the additional load to the model.
- For the glow engine version balance the model with a full fuel tank.
- Never try to fly with an unbalanced model!



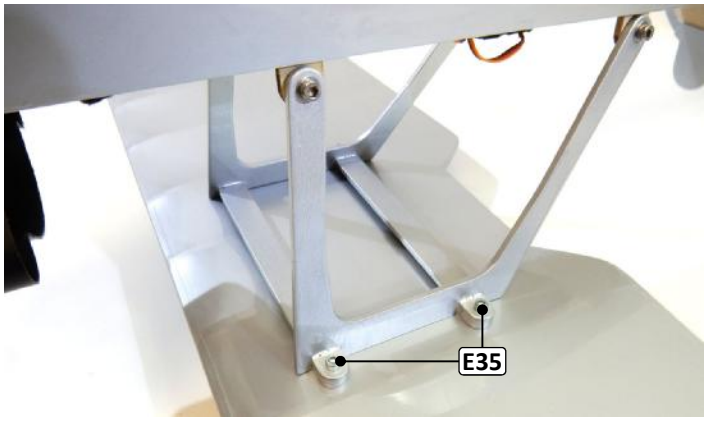
❑ **1.** Connect servo leads for aileron servos (length approx. 150-200mm) to the receiver. Connect the tail servos and ESC (throttle servo) to the receiver.



❑ **2.** Wrap the receiver in foam and insert it into the fuselage.
Note: We recommend marking extension cables for easier connection of aileron servos (left / right).

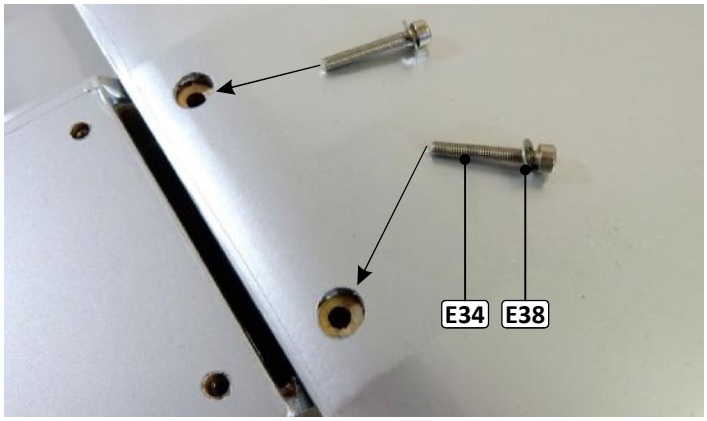


❑ **3.** Screw the upper wing saddle to the fuselage. Use 4pcs screws **E36** (M3x8) with washers **E38**.



❑ **4.** Screw the upper wing to the upper wing saddle using 4pcs screws **E35** (M3x10).

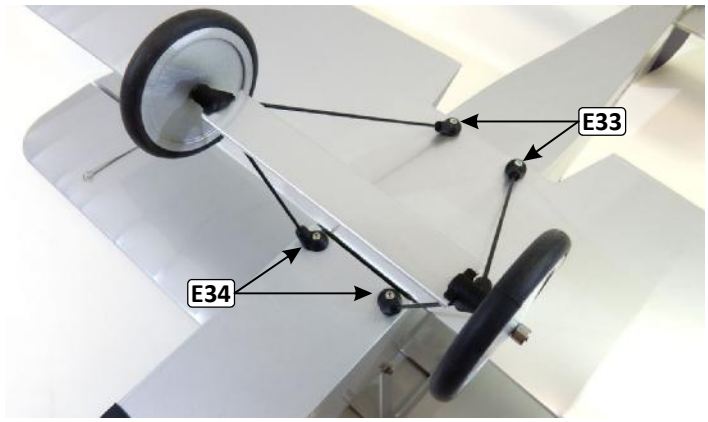
❑ **5.** Connect the aileron servo cables with servo leads from the receiver.



❑ **6.** Use screws **E34** (M3x20) with washers **E38** for the bottom wing L.E. place.

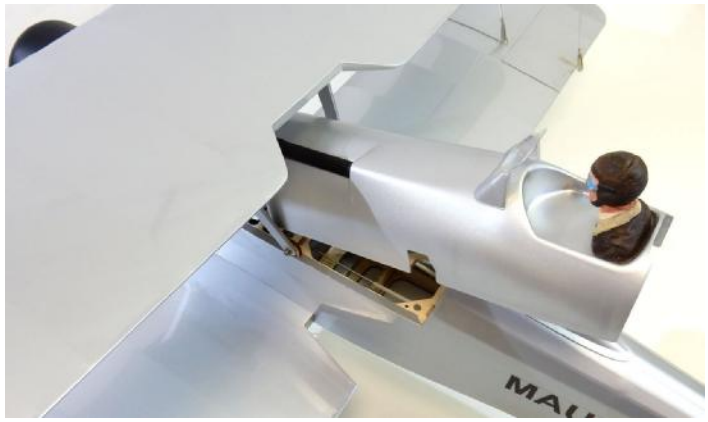
❑ **7.** Screw the bottom to the fuselage.

❑ **8.** Assemble the landing gear. Tighten the screws in the wheel stoppers **E20** thoroughly.



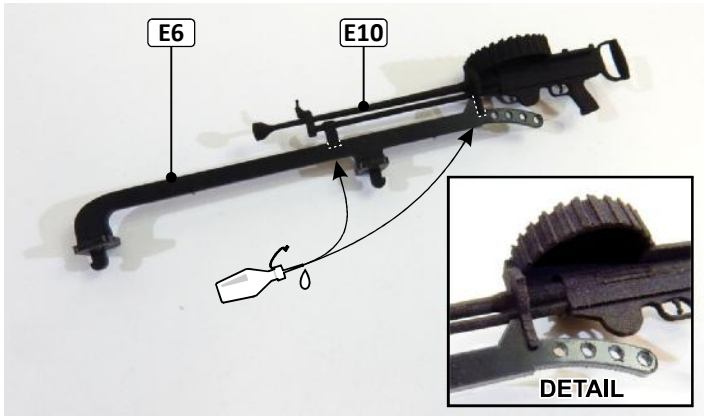
❑ **9.** Screw the landing gear to the fuselage using 2pcs screws **E34** (M3x20) at the front and 2pcs screws **E33** (M3x30) at the rear.

❑ **10.** Connect the wings with struts and ailerons with rods.

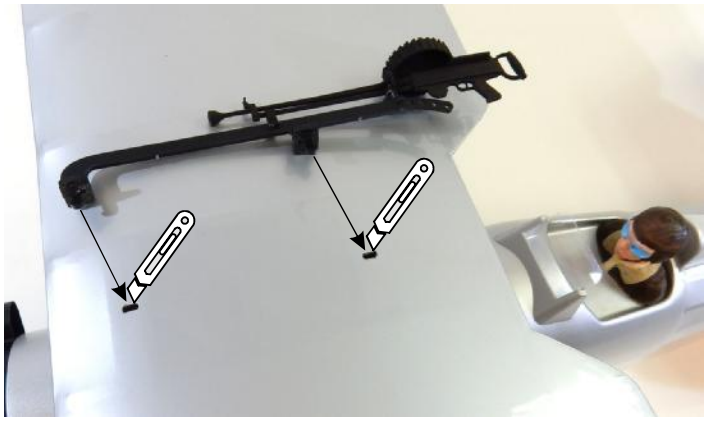


❑ **11.** Attach the fuselage cover. Start to insert it from the back.

❑ **12.** Make sure that the fuselage cover fits on the fuselage and does not collide with the upper wing saddle.



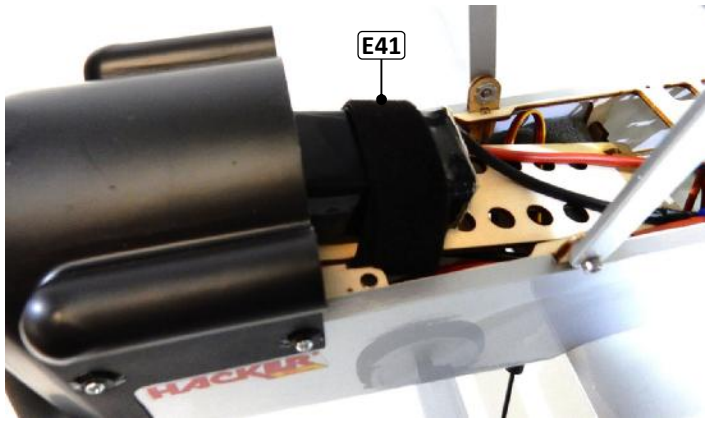
❑ **13.** Glue the upper wing machine gun **E10** to the holder **E6**.



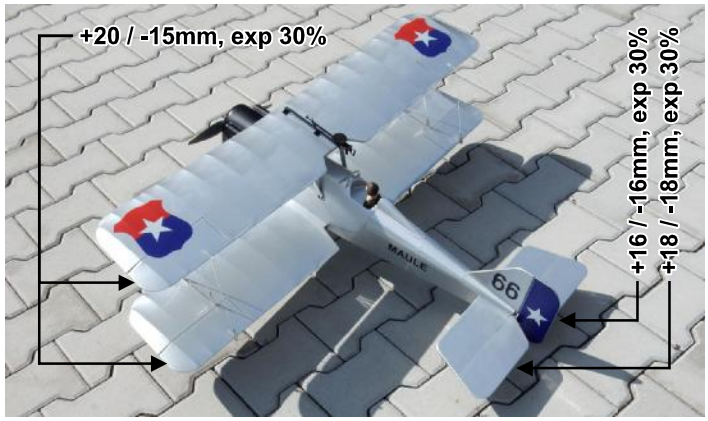
❑ **14.** Cut (or better use soldering iron tip) the slots for the **E2** machine gun holder in the upper wing.

❑ **15.** Insert the holder **E2** with the machine gun **E10** into the slots in the upper wing. Do not glue - the machine gun is demountable. This can be useful, for example, when transporting the model.

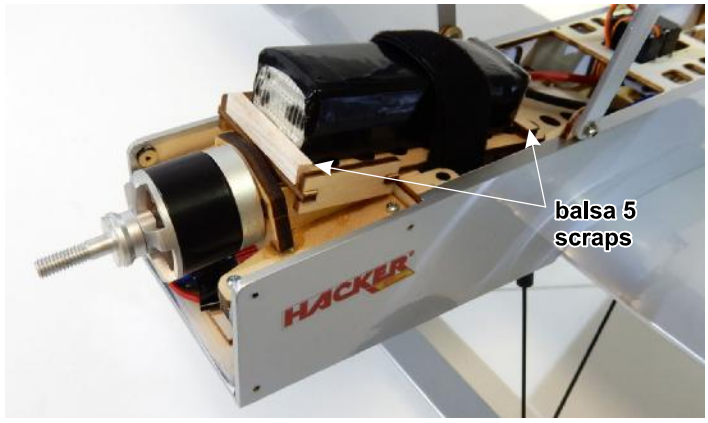
❑ **16.** Install a suitable propeller on the motor, depending on the battery used (3 or 4-cells). **Use a propeller suitable for IC engines on your glow engine!**



❑ **17.** Attach the plane battery to the battery platform with velcro **E41** to balance the model. Adjust velcro length if needed. See page no.4 for C.G. position.



❑ **18.** Set the rates as recommended. **Beware of mechanical restrictions on the movement of the moving surfaces and servos!**



❑ **19.** After maiden flight and finding the battery right place, glue the stoppers made from the remains of balsa 5 to the battery platform to prevent accidental battery movement.

Set the right orientation and size of movements.
Right setting is individual, set it during the first flights.
Set C.G. position according to the manual.

We wish you a lot of fun and many happy landings.
Your Hacker Model Production crew!

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