INSTRUCTION MANUAL

BEECHCRAFT STARSHIP

AMTN.NL

INTRODUCTION

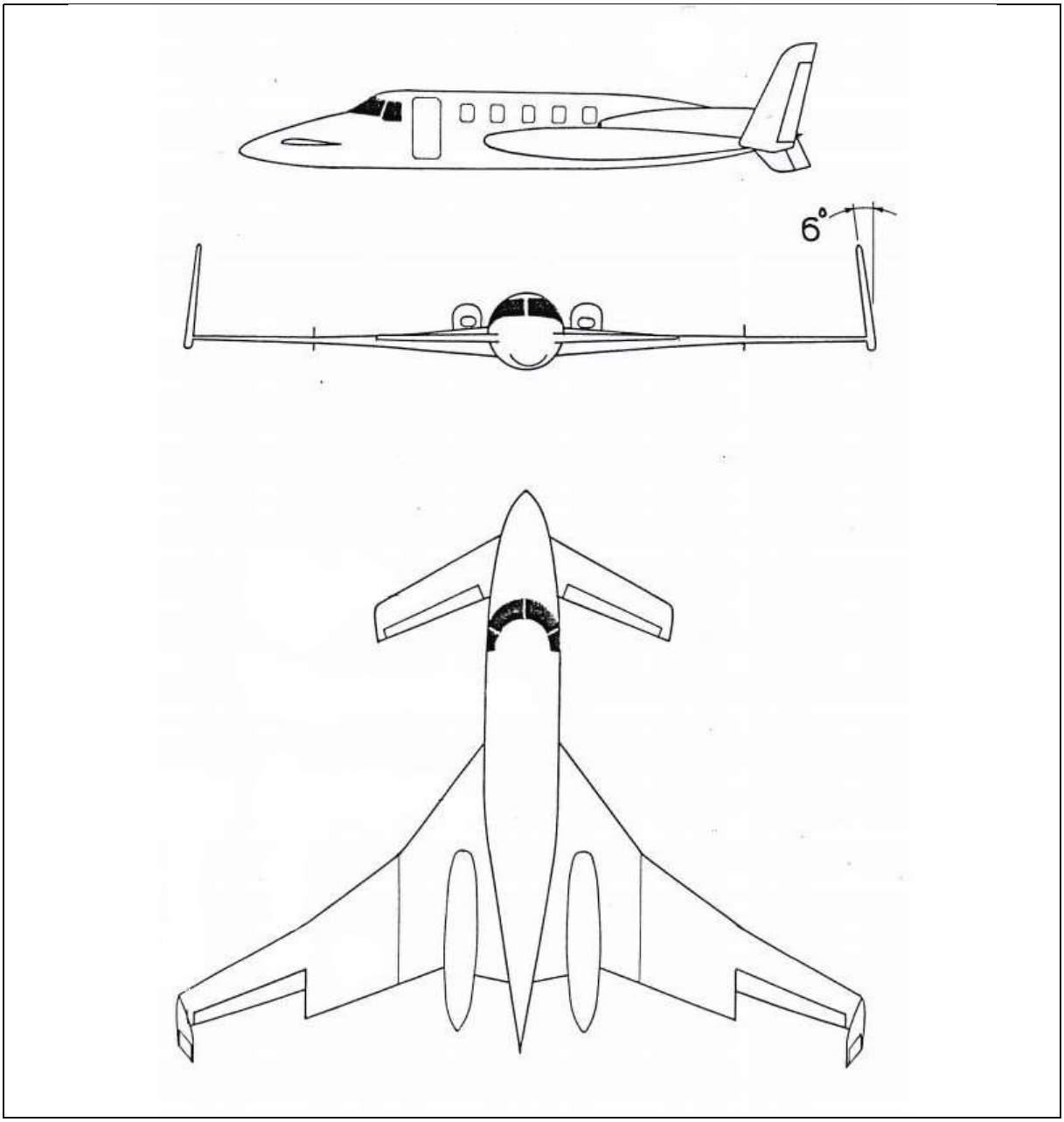
Thank you for purchasing the AMTN Beechcraft Starship (1:8,5). The builder of this model should be experienced in scale model building. If you are not experienced please seek the advice of a qualified builder. The materials and techniques explained in this instruction manual has been flight tested thoroughly.

Please read through the instruction manual before starting construction so you can get an idea of how the airframe is constructed and the construction sequence.

Before starting construction it is a good idea to figure out what equipment you intend to use. It is important to keep the tail as light as possible.

Specification Beechcraft Starship 1:8,5

Wingspan:	2.000mm		
Length:	1.600mm		
Fly weight:	5.000 – 5.250gr.		
	80gr/dm2		
Power:	**3S** 1100KV / 910W Outrunner	or:	**4S** 820KV / 750W Outrunner
	Propeller: 2 blade 10x7		2 blade 10x8 or 3 blade 9x8
	60A Esc		60A Esc
	3S 2.700mAh Lipo Battery		4S 2.700mAh Lipo Battery
Radio:	7 Channel		
Scale:	1 : 8,5		

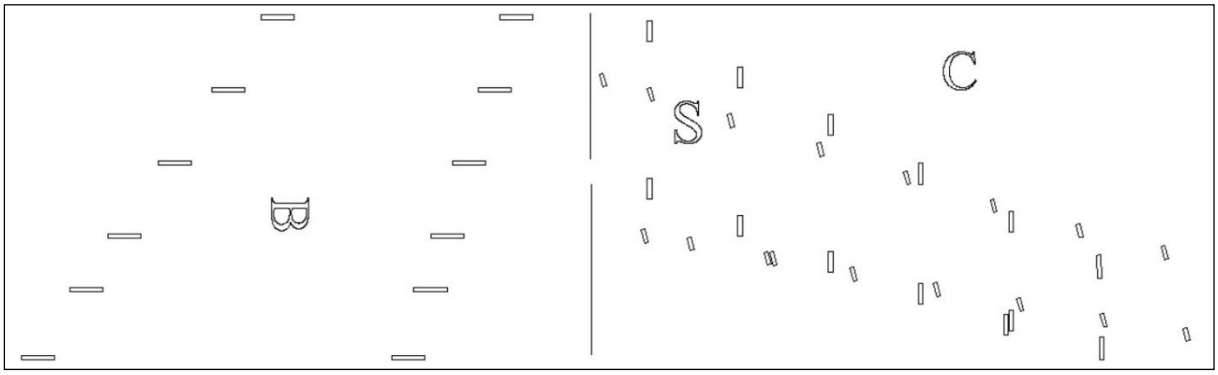


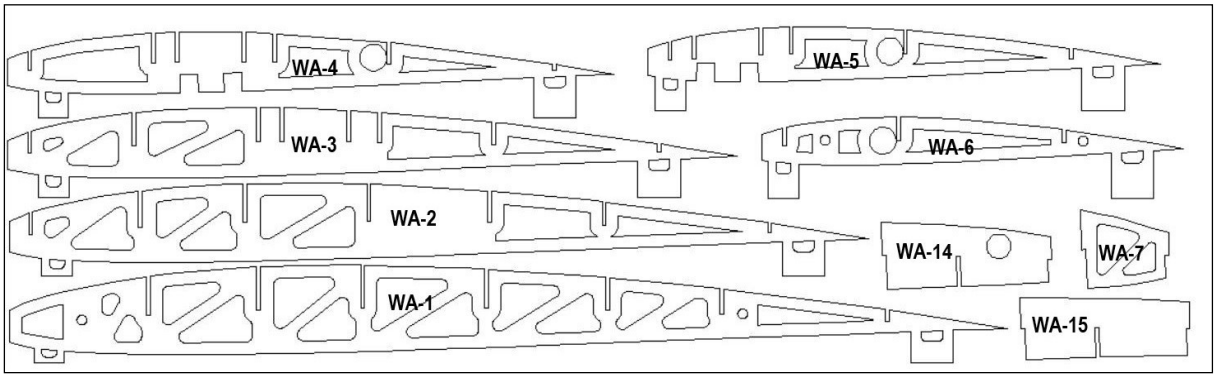
The kit contains:

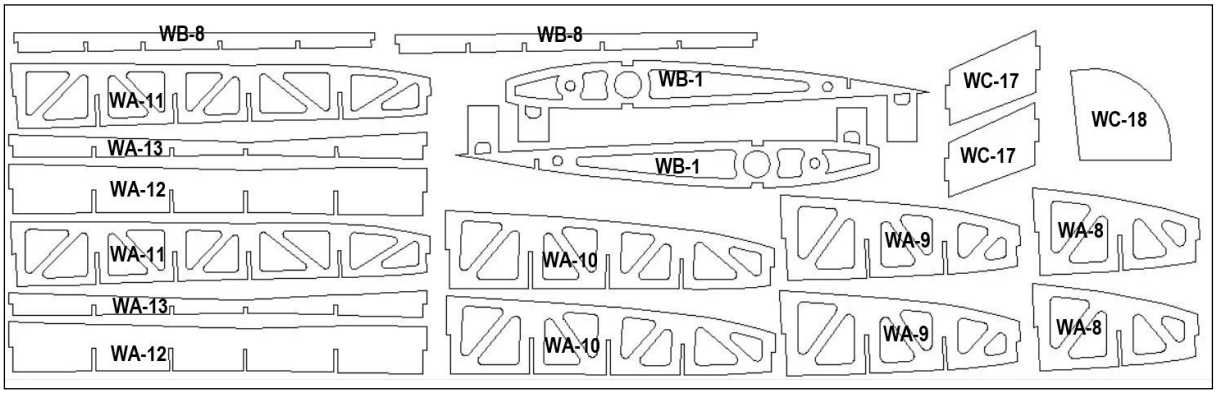
	1,5 mm balsa	2 mm balsa	10 mm balsa	6x6 mm balsa	4x8 mm pinewood
Front wing	4	1	0	0	2
Main wing	24	0	1	0	4
Fuselage	12	0	0	27	1
Total	**40**	**1**	**1**	**27**	**7**

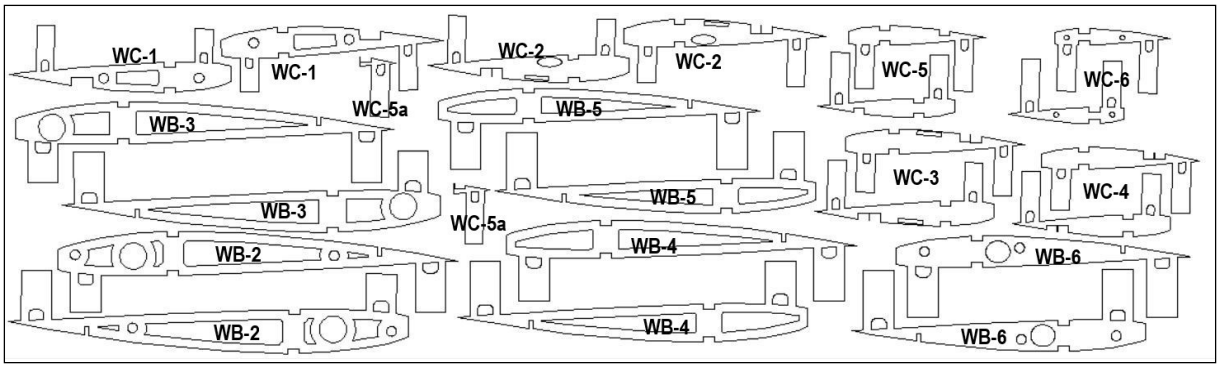
PRE-CUT PARTS

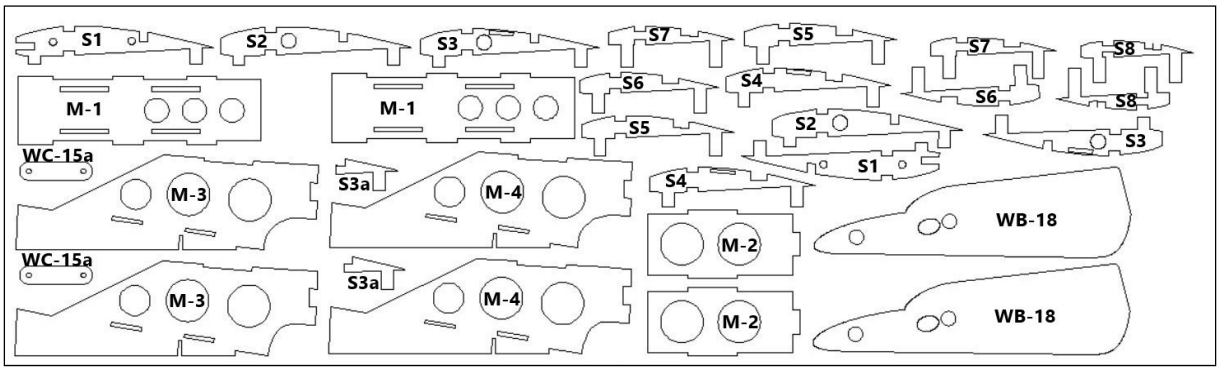
3mm Plywood:

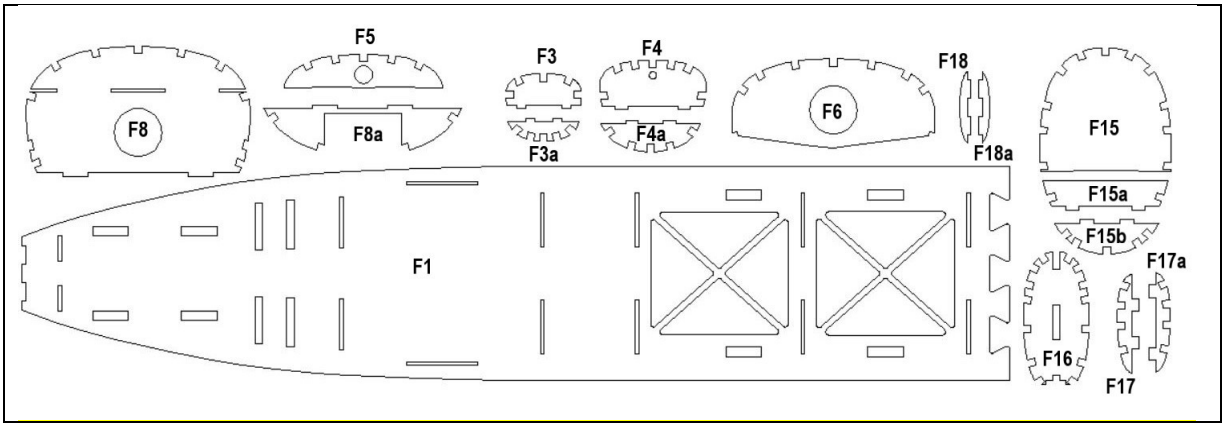


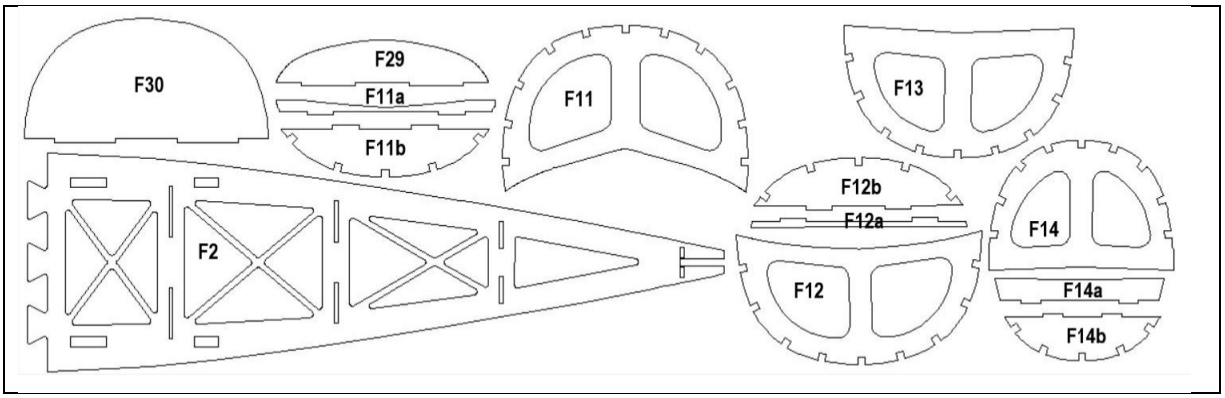


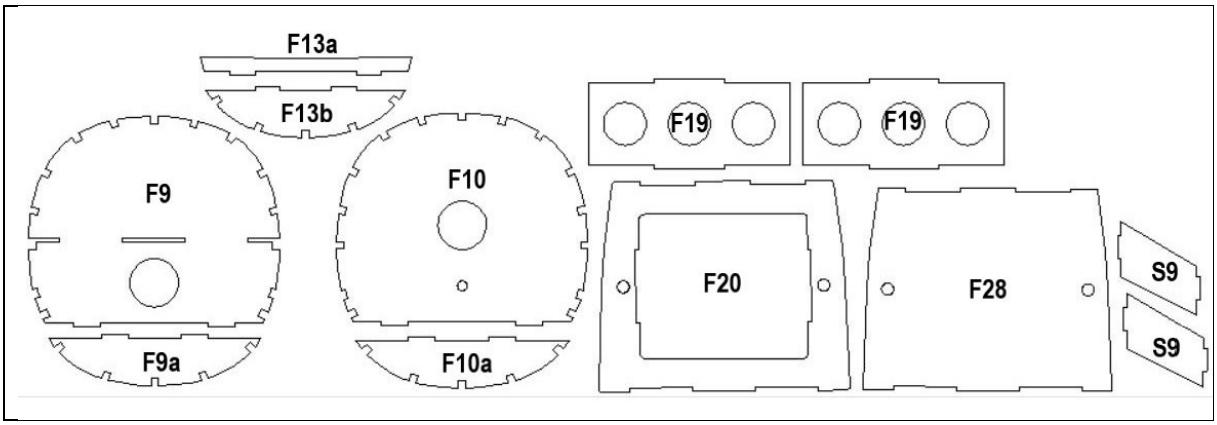



WC-1
WC-1
WC-2
WC-2
WC-5
WC-6
WC-5a
WB-5
WB-3
WB-3
WB-5
WC-3
WC-4
WC-5a
WB-4
WB-2
WB-6
WB-2
WB-4
WB-6

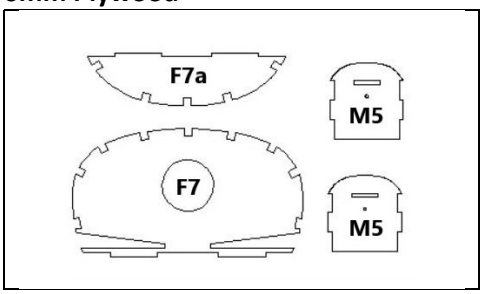

S1
S2
S3
S7
S5
S7
S8
M-1
M-1
S6
S4
S6
S8
S5
S2
S3
WC-15a
S1
S3a
M-3
M-4
S4
WB-18
M-2
WC-15a
S3a
M-3
M-4
M-2
WB-18


F5
F3
F4
F18
F8
F8a
F6
F15
F3a
F4a
F18a
F15a
F15b
F1
F17a
F16
F17

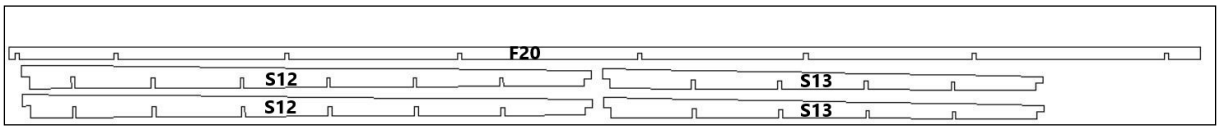

F30
F29
F11
F13
F11a
F11b
F12b
F12a
F14
F2
F12
F14a
F14b

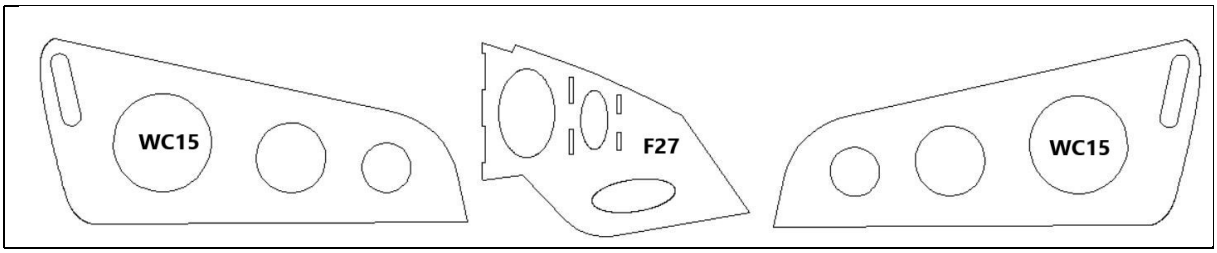


6mm Plywood

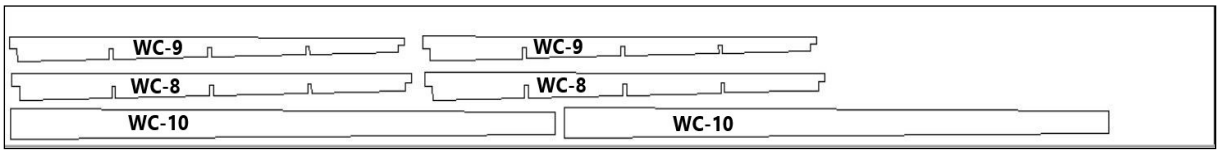


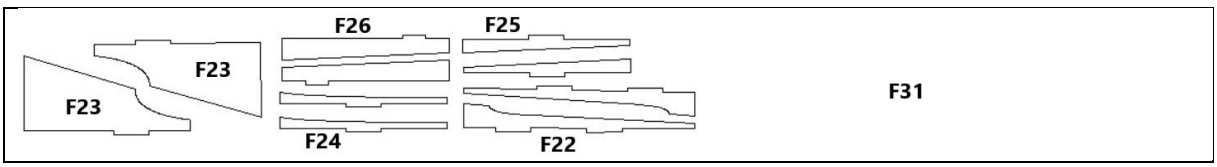
6mm Balsa





8mm Balsa





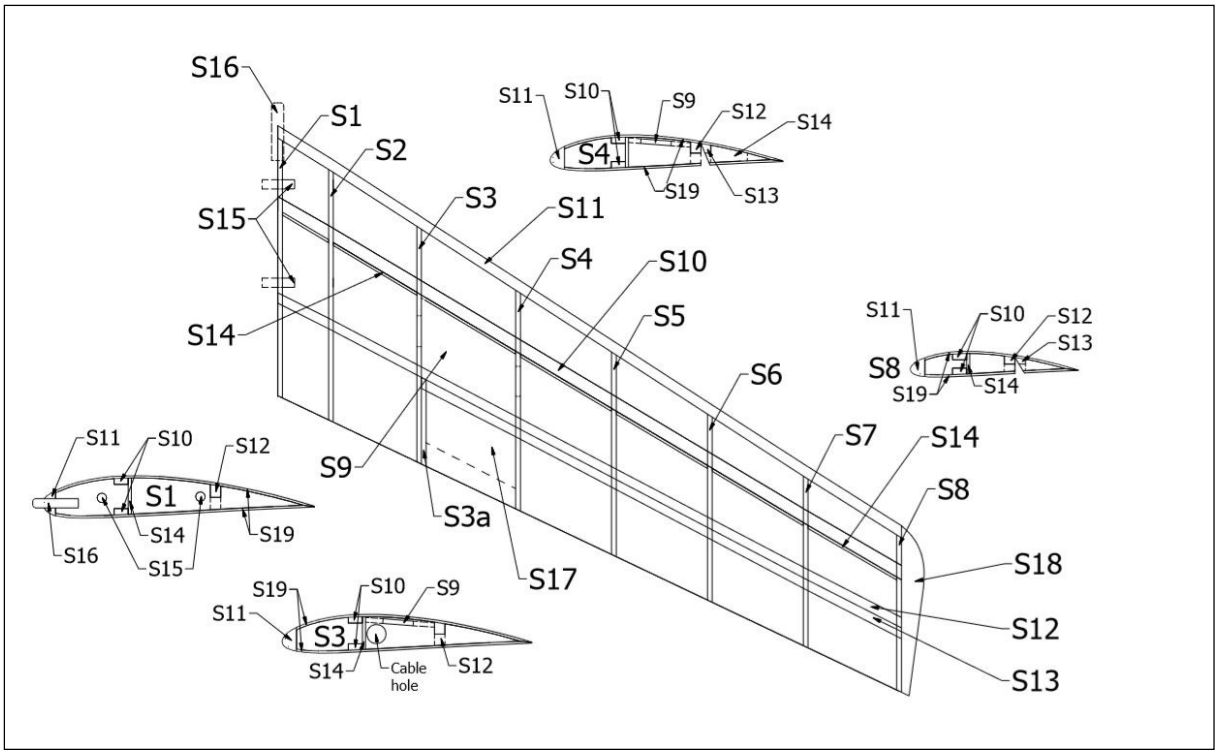
Additional Parts:

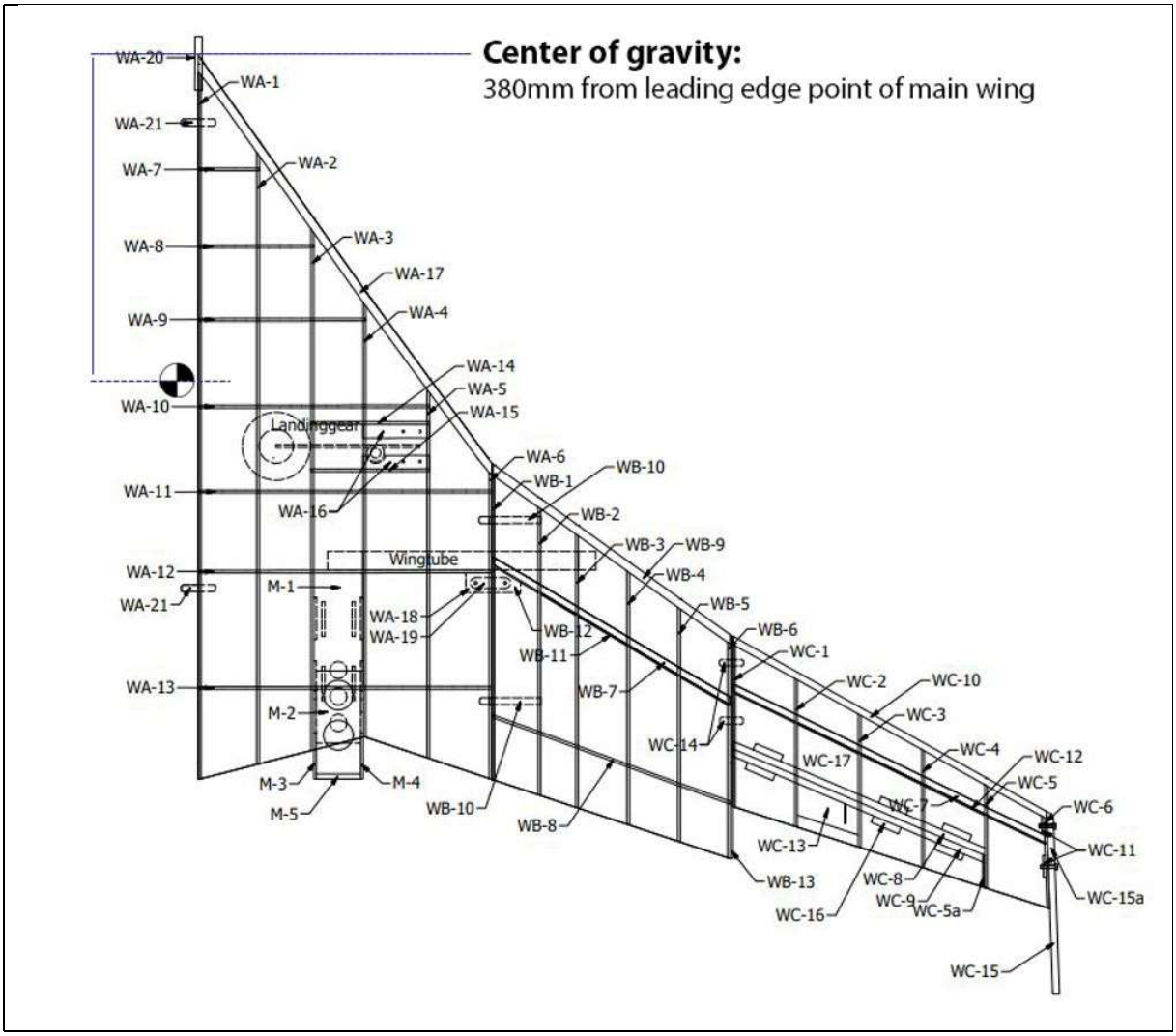
S11 (8mm balsa strip)
S15 (6mm hardwood round)
S16 (6mm hardwood round)
S18 (4 x 10mm balsa)
WA-16 (4 x 15x15mm hardwood)
WA-18 (2 x 10mm plywood)
WA-19 (2 x 1,5mm GFK)
WA-20 (8mm hardwood round)
WA-21 (8mm hardwood round)
WB-10 (8mm hardwood round)
WB-12 (2 x 10mm plywood)
WC-14 (8mm hardwood round)
WC-15 Winglet (2x6mm balsa)
M-5 (2 x 6mm plywood)
F7 en F7a (6mm plywood)
F27 (6mm balsa)

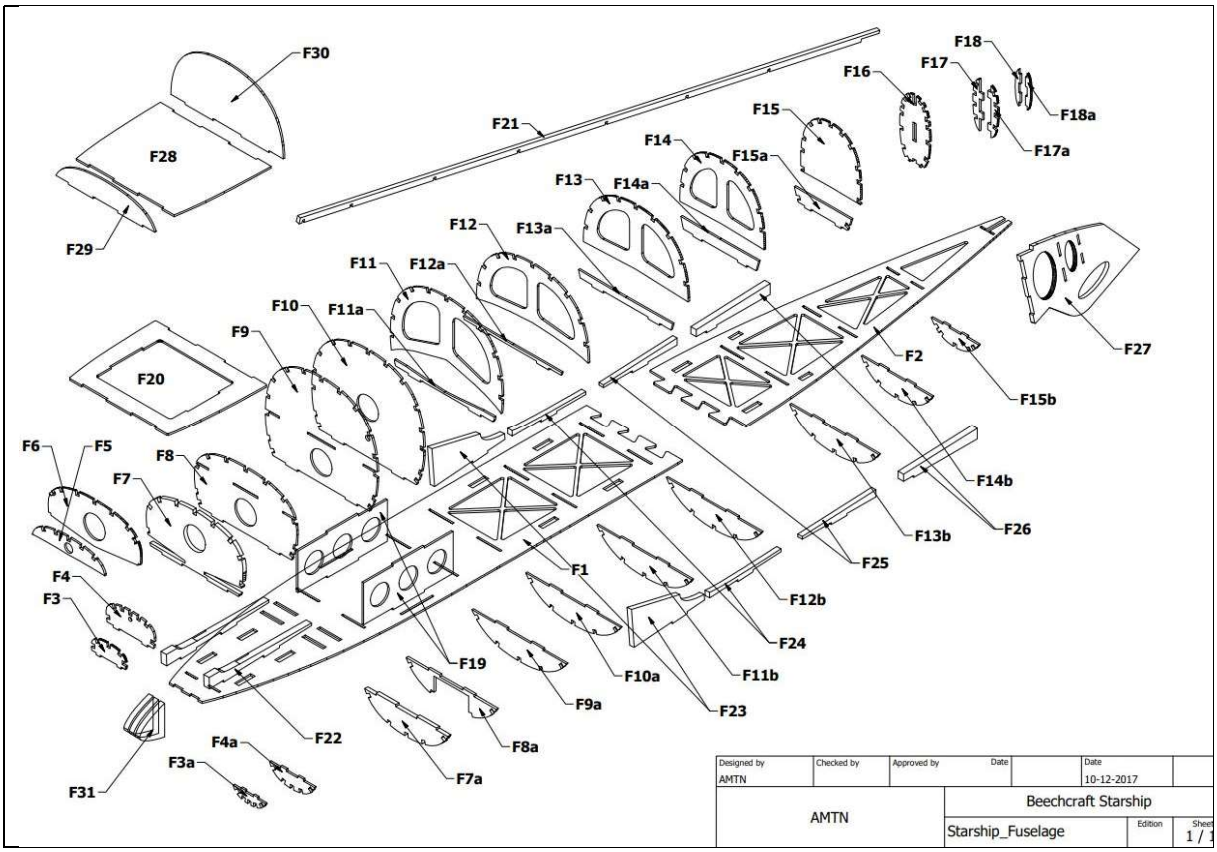
Ruder horn (4 x GFK)
Wing tube 2 x 330mm aluminium
2 x 350mm GFK
2 x GFK-Bonnet
Pet-G Cabin hood

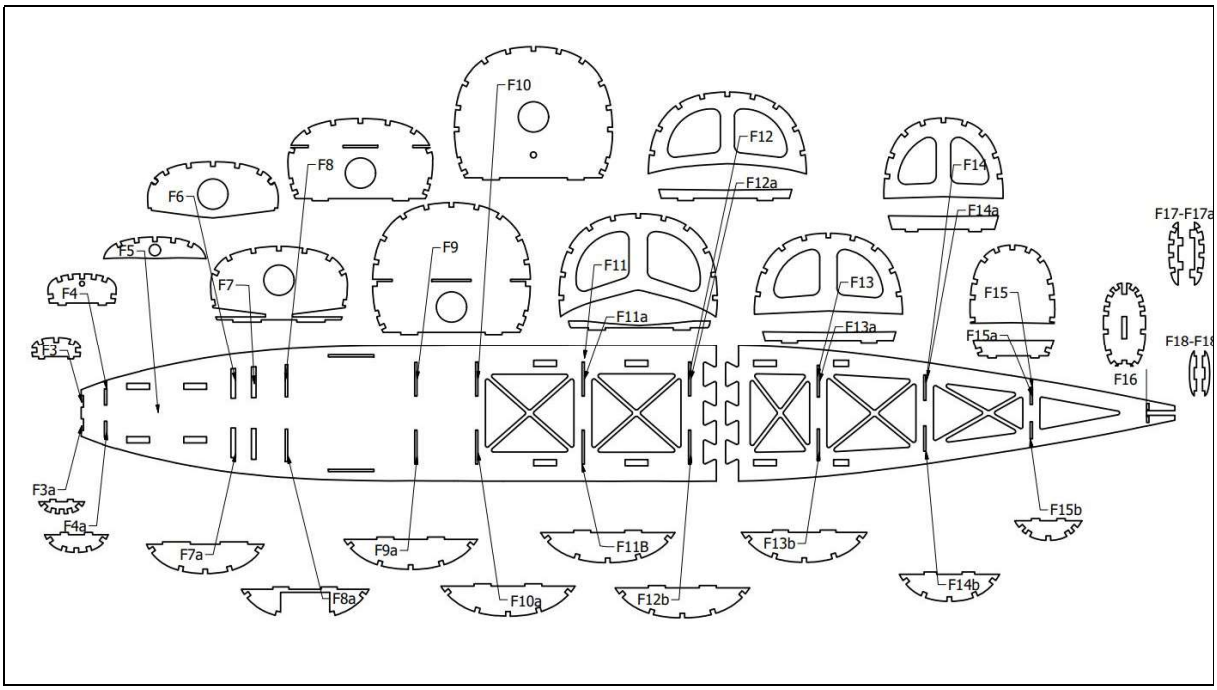
To purchase yourself:

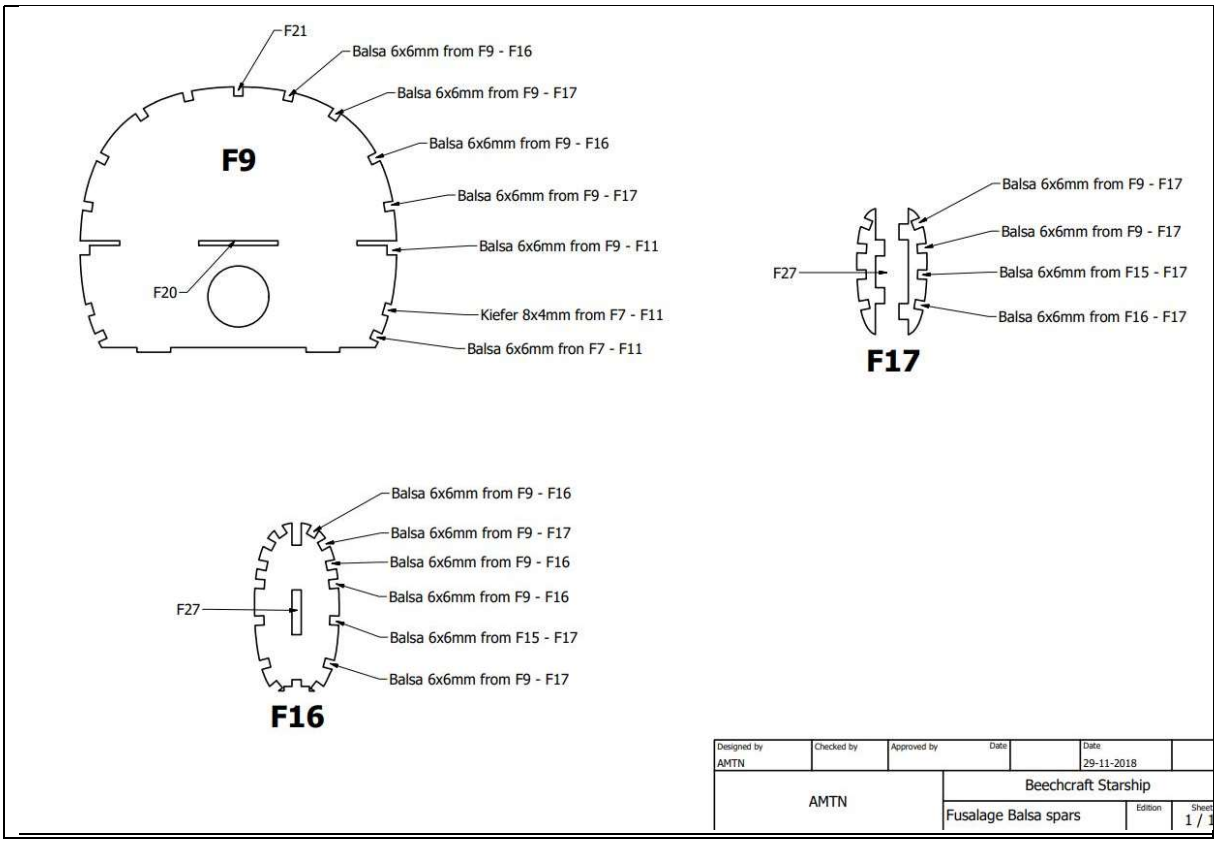
Retracts	E-flite or Electron
Wheels	2 x 74mm and 1 x 60mm
Power	3S 1100KV / 910W outrunner
	4S 820KV / 750 W outrunner


S16
S1
S2
S3
S11
S4
S10
S5
S6
S7
S14
S8
S18
S12
S13
S15
S14
S9
S3a
S17
S11
S10
S9
S12
S14
S19
S13
S11
S10
S12
S13
S8
S19
S14
S11
S10
S12
S1
S14
S19
S16
S15
S19
S10
S9
S11
S3
S14
Cable hole
S12


Center of gravity:
380mm from leading edge point of main wing
WA-20
WA-1
WA-21
WA-7
WA-2
WA-8
WA-3
WA-17
WA-9
WA-4
WA-14
WA-5
WA-10
WA-15
Landinggear
WA-6
WB-10
WB-1
WA-11
WA-16
WB-2
WB-3
WB-9
Wingtube
WA-12
WB-4
M-1
WB-5
WA-21
WA-18
WA-19
WB-12
WB-6
WB-11
WC-1
WA-13
WB-7
WC-2
WC-10
M-2
WC-3
WC-14
WC-4
WC-12
WC-17
M-3
M-4
WC-5
WC-7
WC-6
M-5
WB-10
WB-8
WC-13
WC-11
WB-13
WC-8
WC-15a
WC-16
WC-9
WC-5a
WC-15


F30
F28
F29
F21
F18
F16
F17
F18a
F15
F17a
F14
F15a
F13
F14a
F12
F13a
F11
F12a
F10
F11a
F9
F20
F2
F27
F15b
F6
F5
F8
F7
F14b
F13b
F26
F25
F4
F3
F1
F12b
F24
F19
F10a
F11b
F9a
F23
F22
F8a
F4a
F3a
F7a
F31
Designed by
AMTN
Checked by
Approved by
Date
Date
10-12-2017
AMTN
Beechcraft Starship
Starship_Fuselage
Edition
Sheet
1 / 1


F10
F12
F8
F12a
F14
F6
F14a
F17-F17a
F5
F9
F11
F4
F7
F13
F15
F11a
F3
F13a
F15a
F18-F18
F16
F3a
F15b
F4a
F7a
F9a
F11B
F13b
F14b
F8a
F10a
F12b


F21
Balsa 6x6mm from F9 - F16
Balsa 6x6mm from F9 - F17
F9
Balsa 6x6mm from F9 - F16
Balsa 6x6mm from F9 - F17
Balsa 6x6mm from F9 - F11
F20
Kiefer 8x4mm from F7 - F11
Balsa 6x6mm fron F7 - F11
Balsa 6x6mm from F9 - F17
Balsa 6x6mm from F9 - F17
F27
Balsa 6x6mm from F15 - F17
Balsa 6x6mm from F16 - F17
F17
Balsa 6x6mm from F9 - F16
Balsa 6x6mm from F9 - F17
Balsa 6x6mm from F9 - F16
F27
Balsa 6x6mm from F9 - F16
Balsa 6x6mm from F15 - F17
Balsa 6x6mm from F9 - F17
F16
Designed by
AMTN
Checked by
Approved by
Date
Date
29-11-2018
AMTN
Beechcraft Starship
Fusalage Balsa spars
Edition
Sheet
1 / 1

BUILDING NOTES BEECHCRAFT STARSHIP

In order to achieve a good end result, it is important to adhere to the correct construction sequence. You have to start with the construction of the front wing, followed by the main wing and finally the fuselage.

Front wing
Template “S” is included for the construction of the front wing. All ribs fit in cut-outs of the template, enabling a straight construction of both wing halves.

Main wing
The main wing consists of 3 parts (A, B and C). Templates B and C are included for ribs B and C. All ribs fit here for a straight construction of the wings. No template is supplied for part A because this part is easy to build straight.

Both parts A have a negative angle of 2°. Part B is attached to part A at a 1° angle. Part C is attached to part B at a negative angle of 1,5°.

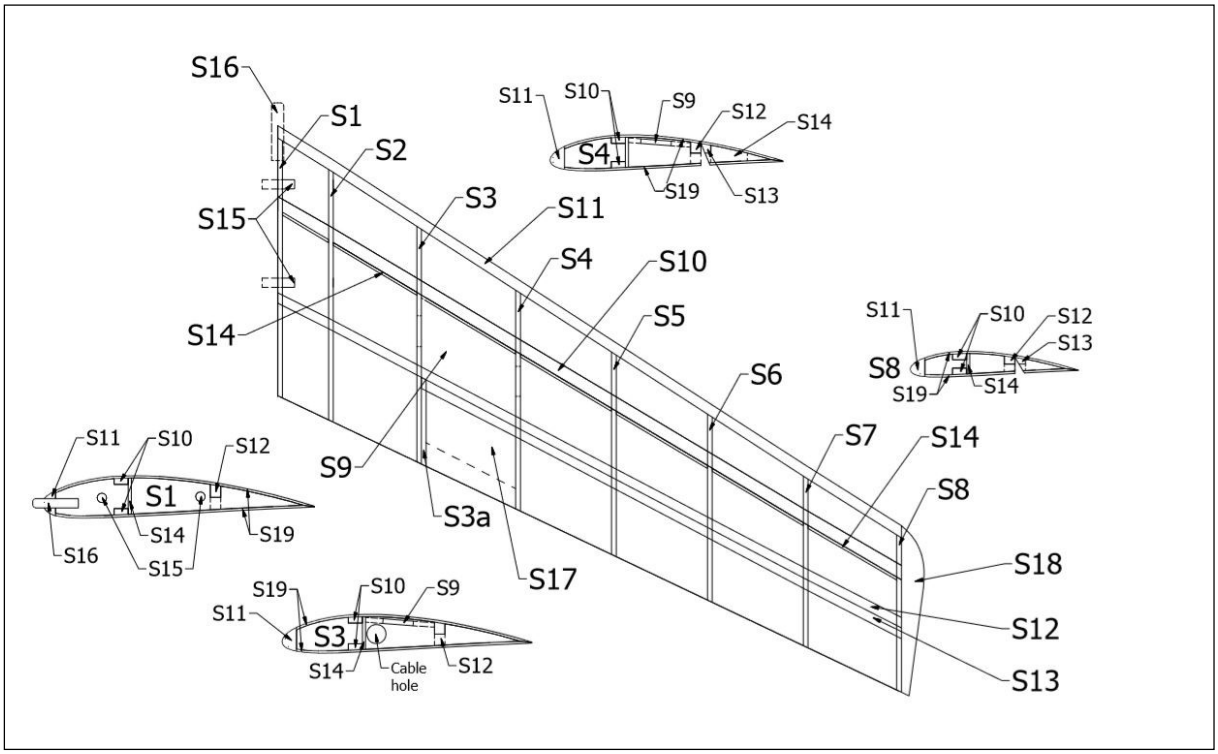
Part B and C are glued together with connectors. Parts B and C are attached to part A with a wing tube.

Frame WC-6 is at an angle of 2° to frame WC-5. This causes the winglets to face inwards. This improves the stability of the aircraft during flight.

Part C has a washout of 1.5° negative to part B. This makes the trailing edge of part C equal to part B. This is necessary to give the aircraft sufficient “lift” during flight. If not, the fuselage will immediately point the nose downwards in normal flight.

Fuselage
The fuselage is built on a building board. Both building boards (F1 and F2) are glued together, after which all formers can be glued on. This always results in a straight and solid building construction. Once the top of the fuselage has been built , the fuselage must be turned over. It is recommended to make a small mould of Styrofoam in which the top of the hull will lie. This is also easy for covering and installation of the retractable landing gear.

FRONT WING

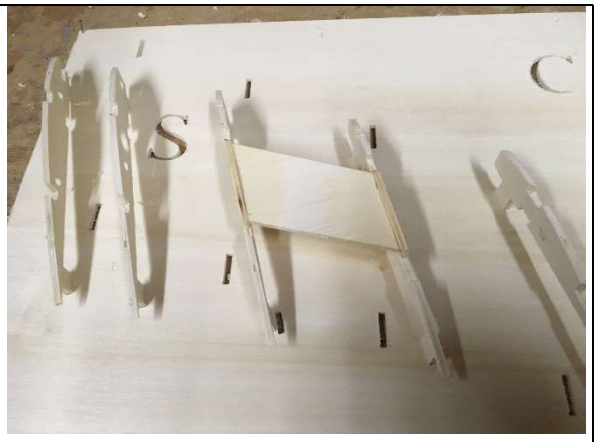
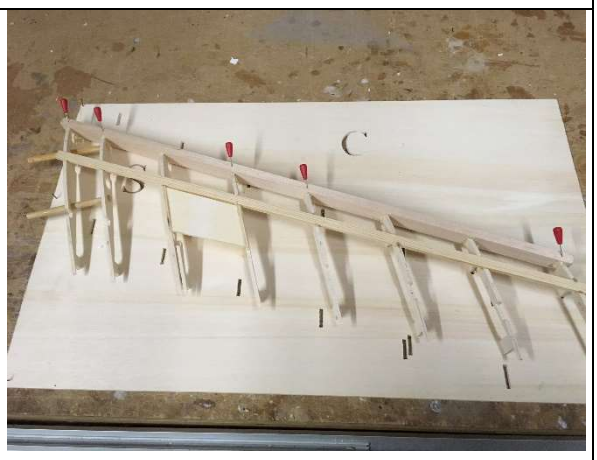


In general:
The front wing will be built by using template “S”. In this template there have been made cut-outs for placement of the ribs, there for the correct angle of attack of the front wing can be guaranteed. Because the front wing has to be built in an angle of attack it is important to prepare the leading edge, main ribs and back list in an angle. They must be reworked slightly.

To correctly assure everything is nicely glued together and filled in the gaps it is advised to work with a good quality PU-glue.

Both front wing halves will be attached together by using part “S15”. To assure the correct V-angle (2 degrees), it is important to leave the build supports attached to the spars until after the wings have been sheeted with wood on the topside.

S0	Template “S”	3mm plywood	Finished part	1
S1 t/m S8	Ribs	3mm plywood	Finished part	16
S3a	Ribs	3mm plywood	Finished part	2
S9	Servodeck	3mm plywood	Finished part	2
S10	Spar	8x4mm pinewood	Pinewood strip	2
S11	Leading edge	8mm balsa		
S12	Spar	6mm balsa	Finished part	2
S13	Spar aileron	6mm balsa	Finished part	2
S14	Strips	2mm balsa		
S15	Panel joiner	6mm hardwood round	Finished part	2
S16	Wing joiner	6mm hardwood round	Finished part	1
S17	Mounting control horns	6mm balsa	Leftover balsa	2
S18	Wingtip	10 mm balsa	Finished part	4
S19	Sheeting	1,5mm balsa		

To help building the front wing, template “S” has been created. **Important:** Part “C” will also be built on this template. Use the correct cut-outs as shown on the photo. Firmly attach template “S” to your building table. Glue part “S9” between parts “S3” and “S4”. After they have been glued, place them on the template. Place ribs “S1” to “S8” on the template. Glue panel joiner “S15” on to ribs “S1” and “S2”.	
The front wing has to be built with an angle of attack. Because of this it is necessary to prepare ribs “S1” till “S8” with a slight angle. This is also necessary for the opening in the main rib (S10) and the back ribs (S12 and S13). Glue “S11” against ribs “S1” till “S8”. After that, glue “S10” in the topside of ribs “S1” to “S8”. “S10” will be cut from a leftover piece 8mm balsa (WC8 to WC10). It is advised to use a good quality PU-glue to ensure a good connection between the ribs. This glue will fill up the openings between the wood.	
Position “S3a” op the correct place on the template. Cut “S12” and “S13” to the correct size. The cut-outs, as shown on the photo, have to be made to ensure a good fit on ribs “S1” till “S8”.	
Glue part “S12” onto ribs “S1” to “S8”. Glue part “S13” onto ribs “S3a” to “S8”. Attention: be sure that part “S12” and “S13” are not glued together. These have to be cut free from each other in a later stage. Use a bit of plastic foil in between these ribs.	

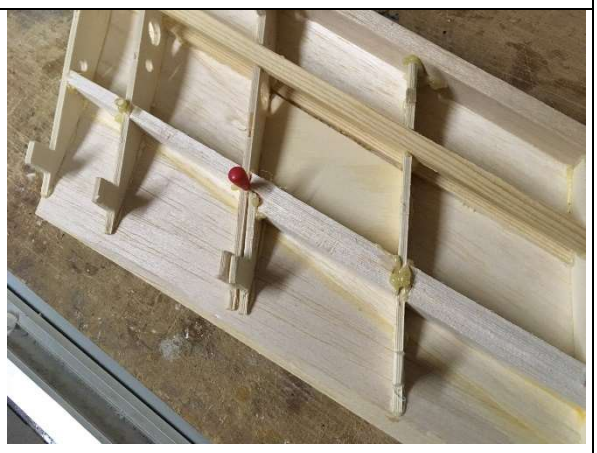
Before sheeting the front wing with wood the parts “S11, S12 and S13” have to be scuffed to fit the correct size.

Cut the sheeting (1,5mm balsa) to the correct size and glue the planks together in one piece.

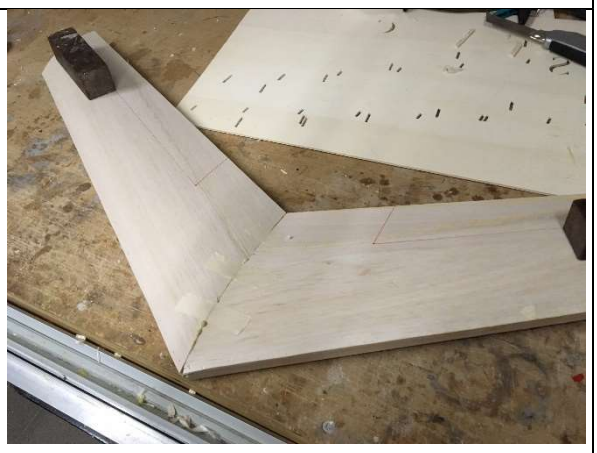
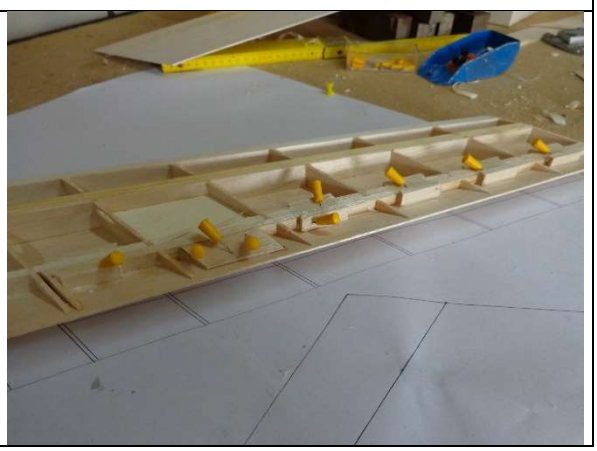
Glue the top size of the sheeting (S19) to fit the correct size. Ensure that the backside of the sheeting has an overlap of 5mm.
Glue S19 on the topside of the wings.

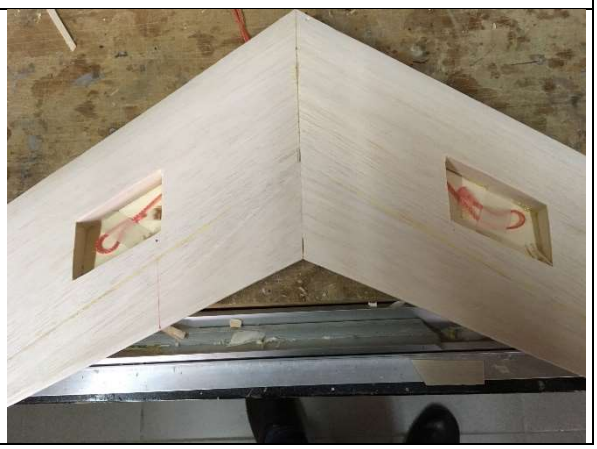
Take the front wing out of the template and put pencil marks on the topside for the control surfaces. To show the contours of the control surfaces, push a long needle through the sheeting between “S12 and S13”. The needle has to go from the underside of the wing through the sheeting of the topside.

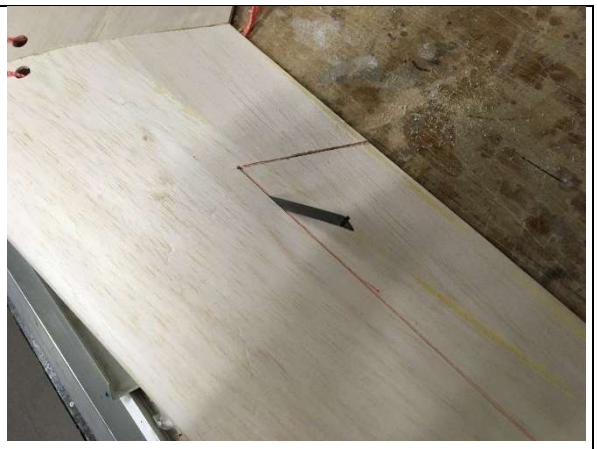
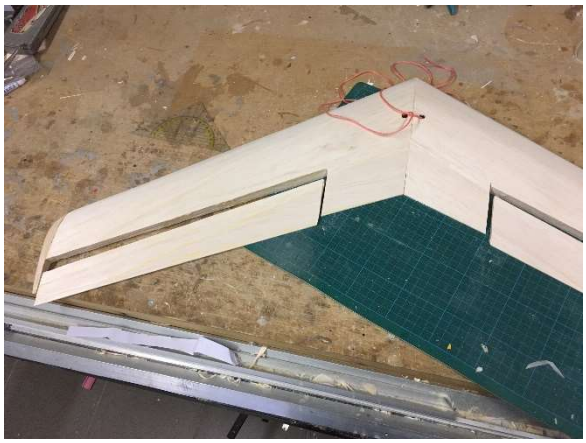
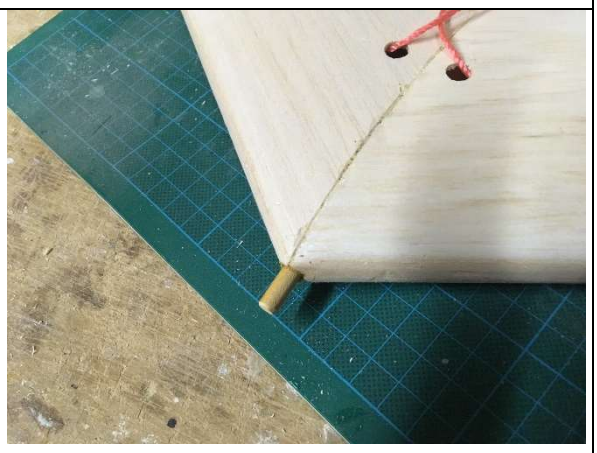
When the needles are in place, mark the contour of the control surfaces with a pencil on the sheeting.



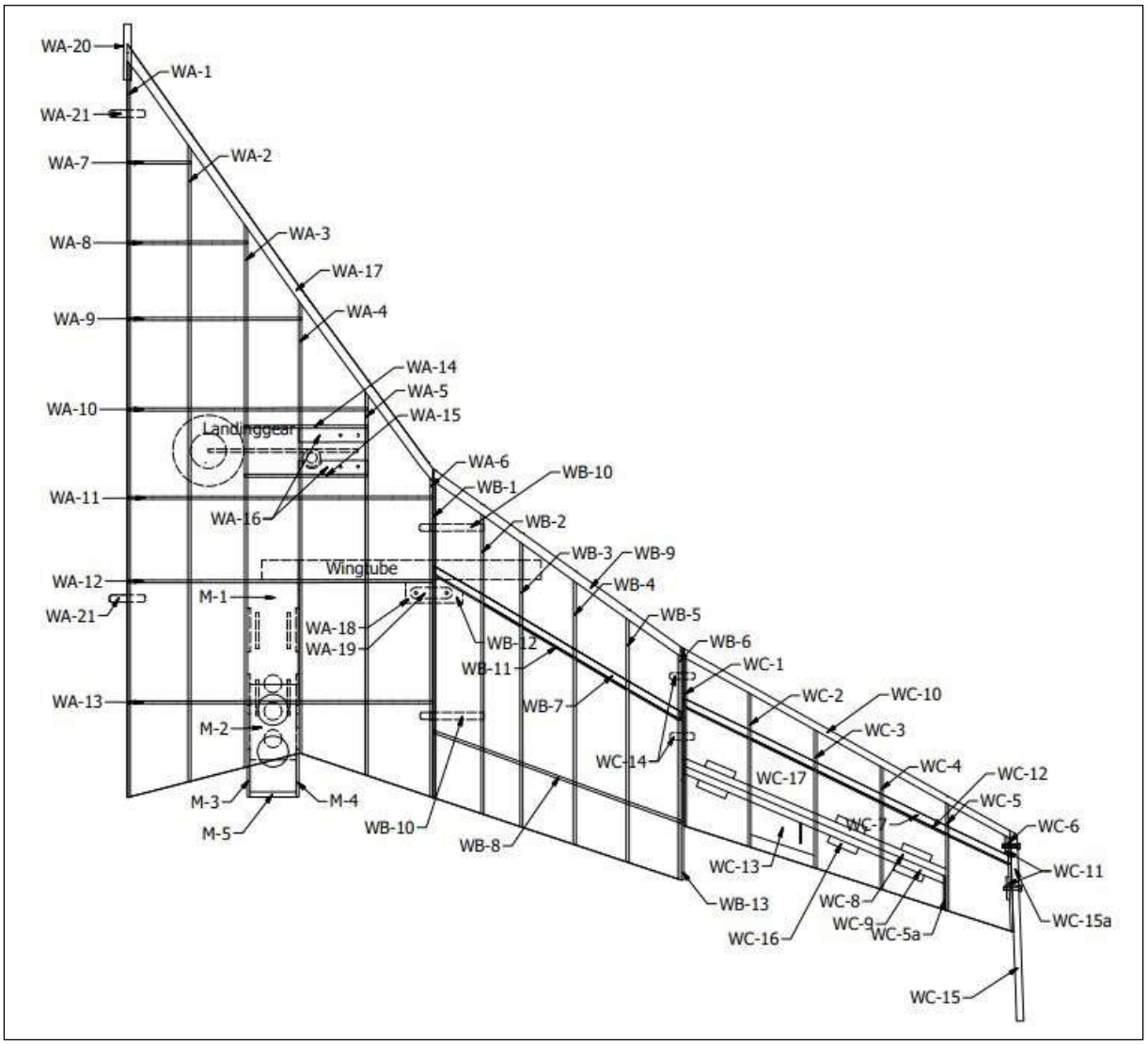
Repeat the previous steps to finish the other side of the front wing.

The next step is to finish the downside of the front wings. Just like in the previous step, cut parts S1 till S8 so that they fit on the main rib S10. Glue S10 on top of ribs S1 till S8.	
Cut part S14 from 2mm balsa. Make sure to cut it in the correct size to fit between the ribs. Glue S14 on to both main ribs and between ribs S1 till S8.	
In this stage of the building process, it is important to glue both wing halves to each other. This to guarantee ***the correct angle and tip twist.*** Remove the supports on the downside of ribs S1 till S8. Scuff ribs S10, S12 and S13 to the correct size.	
Use the leftover pieces of 6mm balsa to make the mounting for the control horns (S17). Glue S17 between ribs S3a and S4.	

Cut out an opening on the top side of the front wing for the servo wire. **<u>Be aware:</u>** be sure to make the opening big enough to fit the servo plug through the opening. Pull a thin piece of rope through the ribs S2 and S3 as a guidance for the servo wire later.	
Trim the leading edge to the correct size. Cut sheeting S19 (1,5mm thick balsa) to the correct size and glue it to the bottom side of the front wing. Cover up the bottom side of the front wing with the balsa-sheeting.	
Apply part S18 with glue to the wingtips of the front wing. When dry, plane the wingtips so they fit perfectly.	
Cut out the opening for the servo's as shown in the picture. Be sure to cut to the correct size.	

Cut out the elevators from both front wing halves. The best result is achieved by doing this with a thin sawblade to cut through the plywood ribs. Cut the front of the elevator in a V-shape of around 5mm. The elevator deflection should be around 10mm.	 
Apply pin S16 with glue in the opening of S1. Construction of the front wing has now been finished.	

MAIN WING.



In general:
The main wing consists of 3 parts: A, B and C.
Part A will be glued in the fuselage. Part B and C will be glued together. Note that part B/C will be connected to part A with a wingtube.

To assist in the build of part B and C there is a template supplied in the kit. The ribs for part A are constructed in a way there will be no need for a template.

Part C has a negative angle of 1,5° relative to part B. Because of this negative angle the topside of the wing will be aligned with the topside of part B. This is needed to provide enough lift to the airplane during flight. If not, the airplane will not have enough lift and will dive to the ground. To increase the stability, part C has a washout of 1,5° negative to part B. It is also to be noted that the most outer rib of the wing is placed under an angle of 2° to the inside. It is also placed that the tip has a angle of 6°.

To build the main wing correctly it is advised to build it in the following order:

- Construction of part A and B, without applying the sheeting.
- Finetuning and aligning part A and B on each other.
- Finish part A completely.
- Apply sheeting to part B, but on only the topside.
- Construction of part C and apply the sheeting to the topside.
- Glue part B on part C.
- Finish the sheeting of part B and C (downside).

Like stated before, the outer rib from part C (WC-6) is applied with an angle of 2° towards the fuselage. This angle has been integrated in the template used to build the main wing. There is also a template supplied to place this rib under an angle of 6°.

MAIN WING PART A

WA-1 t/m WA-6	Rib	3mm plywood	Finished part	12
WA-7 t/m WA-15	Spar	3mm plywood	Finished part	18
WA-16	Landing gear	15x15mm hardwood	Finished part	4
WA-17	Leading edge	10mm balsa		
WA-18	Wing joiner	8mm plywood	Finished part	2
WA-19	Wing joiner	1,5mm GFK	Finished part	2
WA-20 (optional)	Wing joiner	8mm hardwood round		1
WA-21	Panel joiner	8mm hardwood round		2
WA-22	Sheeting	1,5mm balsa		
Wing tube		20mm aluminium		2
Wing tube		GFK		2

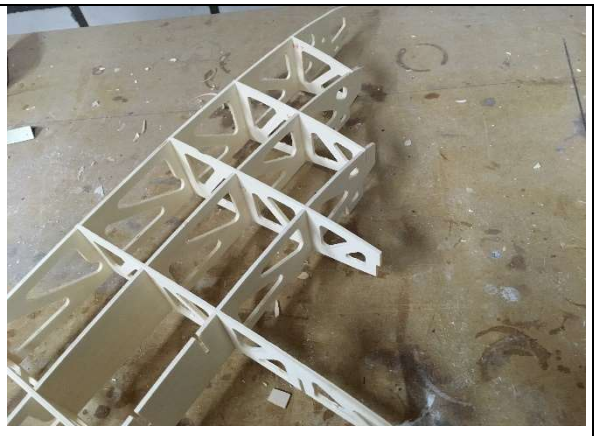
MAIN WING PART B

WB-0	Template “B”	3mm plywood	Finished part	1
WB-1 t/m WB-6	Rib	3mm plywood	Finished part	12
WB-7	Spar	8x4mm pinewood	Pinewood strip	2
WB-8	Spar	3mm plywood	Finished part	2
WB-9	Leading edge	10mm balsa		
WB-10	Panel joiner	8mm hardwood round		2
WB-11	Strips	2mm balsa		
WB-12	Wing joiner	8mm plywood	Finished part	2
WB-13	Winglet	3mm plywood	Finished part	2
WB-14	Sheeting	1,5mm balsa		

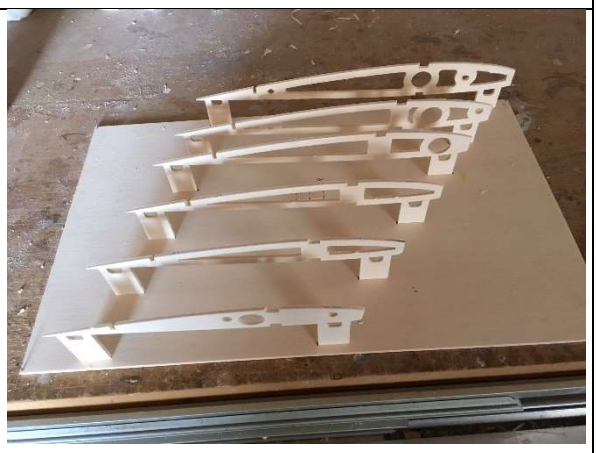
MAIN WING PART C

WC-0	Template “C”	3mm plywood	Finished part	1
WC-1 t/m WC-6	Rib	3mm plywood	Finished part	14
WC-7	Spar	8x4mm pinewood		2
WC-8	Spar	8mm balsa	Finished part	2
WC-9	Spar aileron	8mm balsa	Finished part	2
WC-10	Leading edge	8mm balsa	Finished part	2
WC-11	Reinforcement winglet	3mm plywood	Leftover	
WC-12	Strips	2mm balsa		
WC-13	Mounting control horns	8mm balsa	Leftover	
WC-14	Panel joiner	8mm hardwood round		
WC-15	Winglet	6mm balsa	Finished part	2
WC-15a	Mounting winglet	3mm plywood	Finished part	2
WC-16 (optional)	Mounting hinges	8mm balsa	Leftover	
WC-17	Servo deck	3mm plywood	Finished part	2
WC-18	Template 6° WC-6	3mm plywood	Finished part	2
WC-19	Sheeting	1,5mm balsa		

Supplied in the kit are template B and C to assist in building main wing parts B and C. In the template there have been made cut-outs to place the ribs to assure that they will be placed under the correct angle. For the construction of main wing part A, this is not necessary. The ribs (WA-1 till WA-6) and the main spars (WA-7 till WA-15) must be placed through each other. This can only be done one way. You must be sure that they are placed exactly under a 90° angle.
It is possible that you have to make the openings of the ribs slightly bigger, that it is easier to attach the parts to each other.

Start building part A from the main wing by using ribs WA-1 till WA-3. Slide the main spars WA-7 till WA-13 in each other in the opening of ribs WA-1 and WA-2.	

	
Now slide the ribs WA-4 till WA-6 in the main spar WA-9 till WA-13. This can easily be done by flipping the wing over and carefully sliding the ribs into each other. Be sure to divide the force when sliding the ribs into each other. If you press to hard, it is possible that the wood will break.	 
Finally slide ribs WA-14 and WA-15 in the correct place. In this step it is important to check if the wing is level on the building platform (table) and all the ribs are placed in a 90° angle. Glue the structure together with a thin CA-glue.	

	
Cut out the leading edge of the wing (WA-17) from 10mm balsa. Glue the leading edge to ribs WA-1 till WA-6. Be sure to grind a bit of an angle to the leading edge to improve the glue joint to the ribs. This concludes the first half of building Part A. Repeat the previous steps to glue together the other half of Part A. **Be aware: Don't glue both wing halfs together yet. It is important to build part B first to make a correct fit to Part A.**	
The next step is to start building Part B. Included in the kit is template "B". Firmly attach this template to your building platform. Ribs WB-1 till WB-6 must be reworked slightly. On the leading edge they must have a slight angle sanded to them. Also, the openings for WB-7 and WB-8 must be made. When finished, place the ribs WB-1 till WB-6 in the provided cut-outs in the template.	
Glue together WB-7 on top of ribs WB-1 till WB-6. Cut out the leading edge (WB-9) from 10mm balsa. Attach the leading edge (WB-9) to the ribs WB-1 till WB-6 with glue. Glue WB-8 inside of ribs WB-1 till WB-6. The wing is now stable and strong enough to remove from the building template.	

It is very important to make the correct fit between Part A and Part B.

Connect Part A and B together by using WB-10 and slide it in the openings in WA-6, WB-1 and WB-2. These parts have to fit perfectly in each other. Glue WB-10 in ribs WB-1 and WB-2.

Now slide the wing tube (with the sleeve around it) into ribs WA-4 till WA-6 and WB-1 till WB-3. Be sure to check if ribs WA-6 and WB-1 fit perfectly to each other. Attach the sleeve to both wing parts with glue. Be sure to check that the sleeve is also glued to WA-12.

When both wing parts have a good fit to each other, they can be build separated from each other.

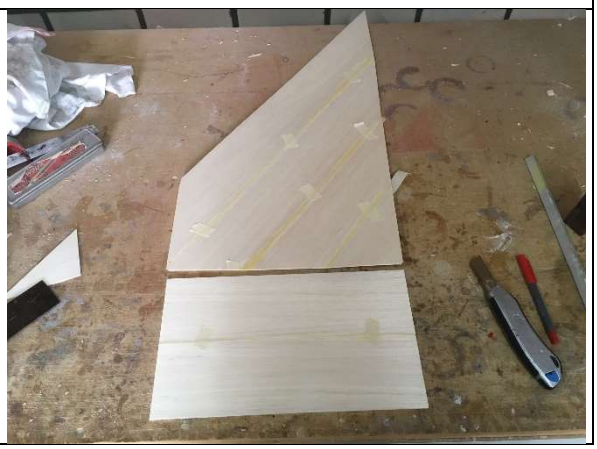
First finish building Part A.

Sand the leading-edge WA-17 into the same shape as the ribs. The sheeting will cover the leading edge of the wing and will be sanded in the correct shape later.

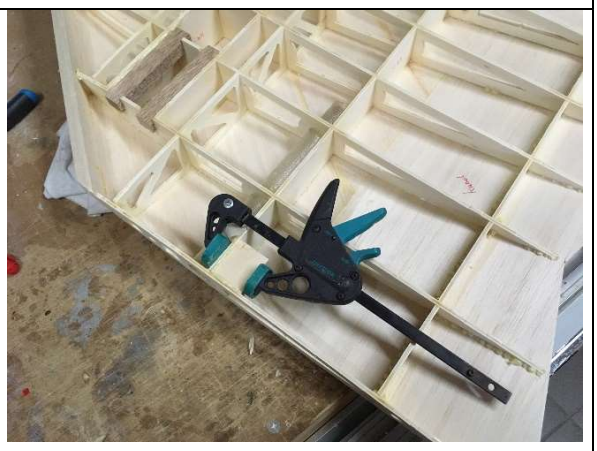
Glue part WA-21 inside of WA-1.

Before both wing halve are glued together, each wing half must be sheeted separately.

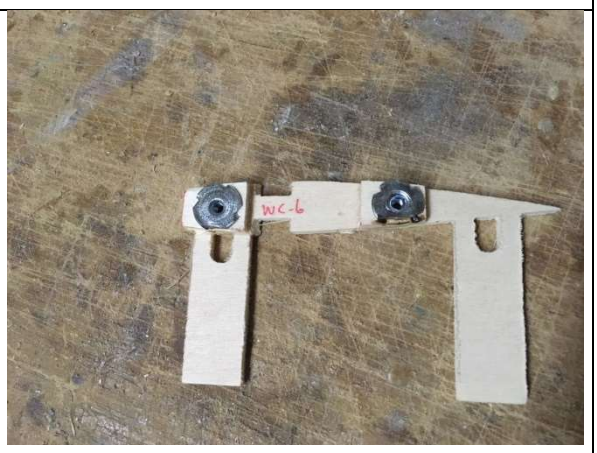
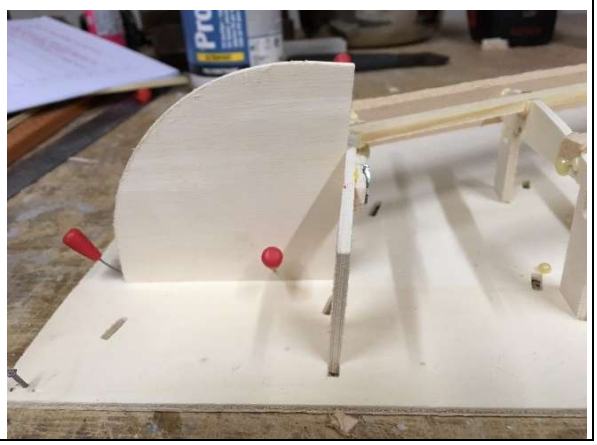
Apply the 1,5mm balsa sheeting to the topsite of Part A.



Do not glue the wing halve together yet! Sheet the top side of each wing half separately first. Cut out the shape of the backside of the wing. Leave a 5mm overlap of sheeting to make a strong connection to the sheeting of the downside of the wing with glue.	
After the top side of both wing halves are sheeted, they can be turned over. Remove the building supports.	
Glue both wing halves together. Use glue calmps for this to secure everything tightly.	
	

Attach part WA-16 (mounting support for the retractable gear) into ribs WA-14 and WA-15 with a good amount of glue.	
Glue the wing mounting (WA-18) against rib WA-6. Glue the wing mounting (WB-12) against rib WB-1. Now place both wing halves to each other. This is needed to drill the screw hole (WB-12) in the correct place. Screw WA-19 in WA-18. Now drill a M3-hole in the opening of WA-19, which is attach to WB-12. Place a M3 impact nut in this hole. As seen on the photo on the next page.	 
Cut out an extra reinforcement piece from some 1,5mm leftover balsa. This reinforcement has to be placed between ribs WA-3, WA-4 and side-ribs WA-11, WA-12. Glue to the top-side of the sheeting. This reinforcement is needed for the mounting of the motor mounts. If not done, it is possible that the sheeting will not be strong enough to support the motor mounts on this point.	

Apply the servo wires for the retractable gear, engine (ESC) and aileron servos through the opening in the ribs. **This must be done now! It cannot be done after applying the sheeting on the downside of the wing.**	 
Apply the sheeting to the downside of Part A in the same way you did as for the topside. Part A is now finished. The opening for the retractable gear will be made later, when part A is glued to the fuselage.	
Before finishing part B it is important to start on part C first. Both wing halves must be glued together. Supplied in the kit is template C to assist in building part C. **Be aware that this is the same template used to build the front wing (S).** Attach the building template firmly to your building surface.	

The leading-edge side of ribs WC-1 till WC-6 have to be sanded in a bit of an angle. This also must be done for the cut-outs in WC-7 till WC-10.	
Attached with M3 screws will be winglets WC-15 to rib WC-6. From a bit of leftover plywood, glue together a reinforcement for rib WC-6. Also glue 2x M3 impact nuts on the inside by the openings in the rib.	
Glue servo mount WC-17 between ribs WC-2 and WC-3. Place the remaining ribs WC-1 till WC-6 in the cut-outs of the template. **Be aware:** The front of rib WC-6 is placed under a 2° angle to the inside. It is also placed with a 6° angle sideways. Template WC-18 is supplied in the kit to assist with this, as shown in the photo.	 

Glue WC-7 on top of ribs WC-1 till WC-6. Glue leading-edge WC-10 on the front side of ribs WC-1 till WC-6.

Because of the arrow-shaped wing it is necessary to adjust WC-8 and WC-9 slightly to make them fit. Slightly chamfer the cut-outs in WC-8 and WC-9. When done, glue WC-8 on top of ribs WC-1 till WC-5. After this, glue WC-9 to ribs WC-1 till WC-5a. Because of the chamfered cut-outs it is advised to use PU glue. By using this kind of glue, the openings will be filled up with glue.

Be aware: make sure that WC-8 and WC-9 are not glued to each other. It can be difficult to get these off each other when the aileron has to be cut out of the wing.

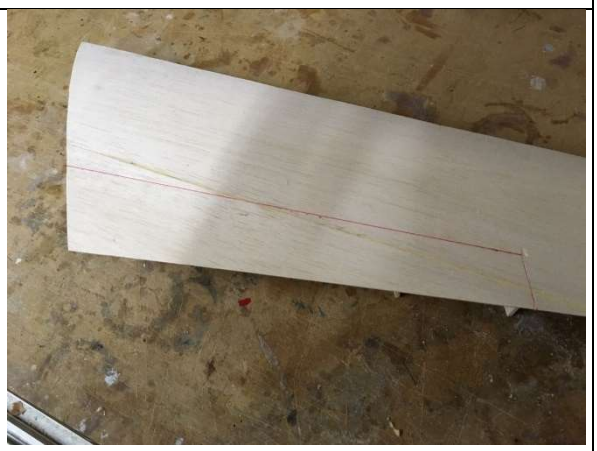
Glue the reinforcements WC-12 behind the main-rib WC-7 between ribs WC-1 till WC-6. Cut these reinforcements in the correct size from 2mm balsa.

Sand WC-8, WC-9 and WC-10 in the correct shape of the wing.

Sheet the topside of part C with 1,5mm balsa.

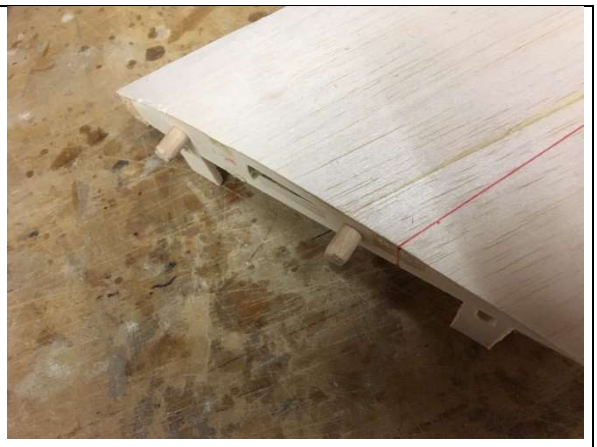
Make sure that the sheeting has a overlap of 5mm on the backside of the wing.

WIth a pencil, draw the shape of the aileron on the topside of part C.



Glue parts WC-14 in the provided openings in rib WC-1.

WC-14 makes sure that part C is placed under the correct angle compared to part B. This gives the aircraft the necessary lift while flying.



Now continue the build of part B.

Sheet part B with the provided 1,5mm balsa.

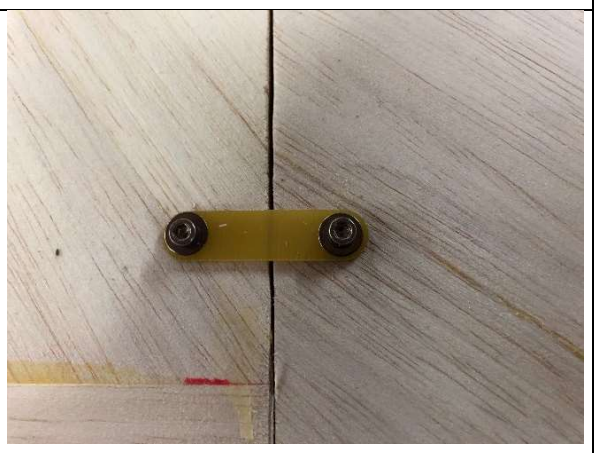
Make sure that the sheeting has a overlap of 5mm on the backside of the wing.

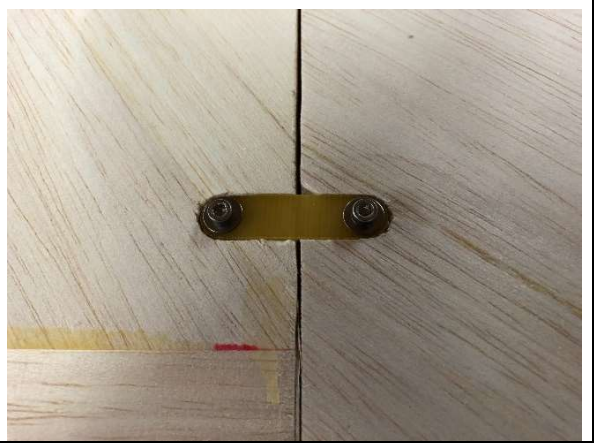
Glue reinforcements WB-11 behind main-rib WB-7 between the ribs WB-1 till WB-6. Cut these in the correct size from 2mm balsa.

Place WB-13 between both wing halves. The topside of both wings must be level between part B and C. If these are not level, make sure to adjust them that they are level. When level, glue part B together with part C.

For gluing part B and C together, use some glue clamps. Be sure to check that the leading edge of part B and part C are straight and level. When doing this, it is possible that the topside of part C is a bit (max. 1mm) underneath the topside of part B.

Remove the support struts that are placed underneath the ribs of part B and part C. Place the servo wire for the aileron through the ribs.	
Sheet the downside of part B with 1,5mm balsa.	
Glue the reinforcements for the control horns WC-13 between ribs WC-2 and WC-3. After this sand them in the correct size. When using pin hinges, it is optional to glue WC-16 again WC-8 and WC-9. Now sheet the downside of part C with 1,5mm balsa. Cut out the opening for the aileron servo.	 

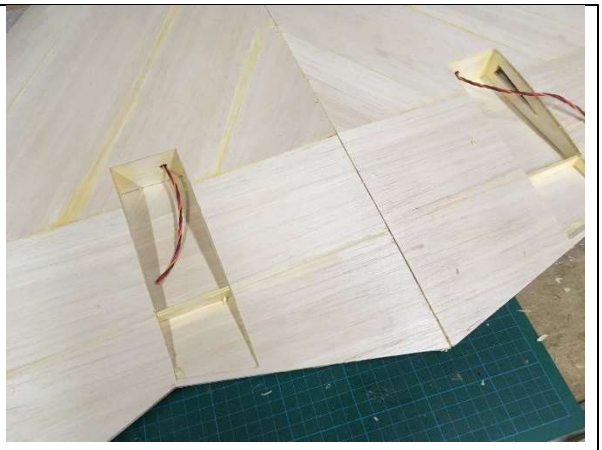
Cut out the aileron from part C.	
Glue parts WC-15a inside of the winglets WC-15.	
Wing parts B and C are now finished.	
To make the wing mounts nice and flush to the sheeting, slide part A and B/C together. Place the connection piece and screw together. Now cut out the shape of the connection piece away from the sheeting.	

ENGINE MOUNTS

M-1	Bottom-rib engine mount	3mm plywood	Finished part	2x
M-2	Top-rib engine mount	3mm plywood	Finished part	2x
M-3	Inner-rib engine mount	3mm plywood	Finished part	2x
M-4	Outer-rib engine mount	3mm plywood	Finished part	2x
M-5	Firewall	6mm plywood	Finished part	2x
M-6	Engine cowl	GFK		2x

On the top side of “Part A”, cut away the sheeting between the ribs WA-3 and WA-4 all the way to rib WA-12. By doing this there will be created an opening to glue the engine mounts on to the wing.

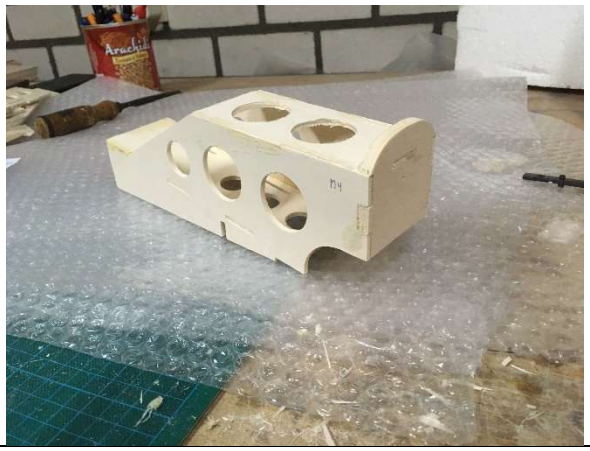


Glue together the engine mounts by using ribs M1 till M5.

The center of the engine is marked on M5.

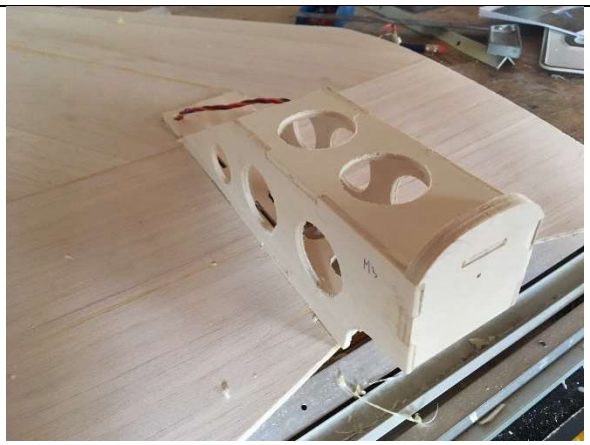
It is advised to drill the 4 holes for the mounting of the electric motor in M5, and to attach impact nuts before gluing M1 till M5 together.

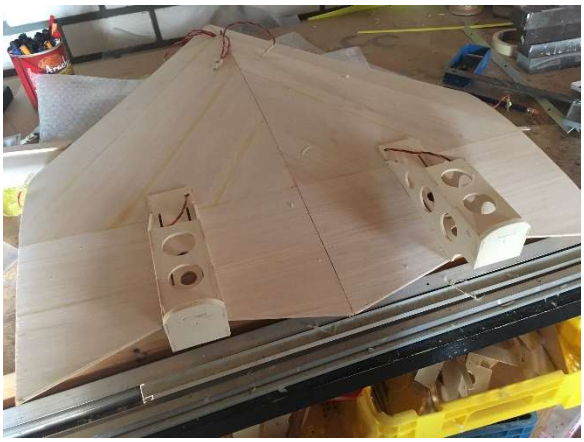
Pay attention: there is a difference between ribs M3 and M4. Rib M4 must be placed on the outer side of the wing.



Attach the engine mounts in the created opening between ribs WA-3 and WA-4 with glue.

Make sure to pull the servo wire for the ESC through the wing and to the topside of the engine mount.





FUSELAGE

F1	Construction template fuselage front	3mm plywood	Finished part	1
F2	Construction template fuselage rear	3mm plywood	Finished part	1
F3	Fuselage former - upper	3mm plywood	Finished part	1
F3a	Fuselage former - under	3mm plywood	Finished part	1
F4	Fuselage former - upper	3mm plywood	Finished part	1
F4a	Fuselage former - under	3mm plywood	Finished part	1
F5	Fuselage former - upper	3mm plywood	Finished part	1
F6	Fuselage former - upper	3mm plywood	Finished part	1
F7	Fuselage former - upper	6mm plywood	Finished part	1
F7a	Fuselage former - under	6mm plywood	Finished part	1
F8	Fuselage former - upper	3mm plywood	Finished part	1
F8a	Fuselage former - under	3mm plywood	Finished part	1
F9	Fuselage former - upper	3mm plywood	Finished part	1
F9a	Fuselage former - under	3mm plywood	Finished part	1
F10	Fuselage former - upper	3mm plywood	Finished part	1
F10a	Fuselage former - under	3mm plywood	Finished part	1
F11	Fuselage former - upper	3mm plywood	Finished part	1
F11a	Fuselage former - middle	3mm plywood	Finished part	1
F11b	Fuselage former - under	3mm plywood	Finished part	1
F12	Fuselage former - upper	3mm plywood	Finished part	1
F12a	Fuselage former - middle	3mm plywood	Finished part	1
F12b	Fuselage former - under	3mm plywood	Finished part	1
F13	Fuselage former - upper	3mm plywood	Finished part	1
F13a	Fuselage former - middle	3mm plywood	Finished part	1
F13b	Fuselage former - under	3mm plywood	Finished part	1
F14	Fuselage former - upper	3mm plywood	Finished part	1
F14a	Fuselage former - middle	3mm plywood	Finished part	1
F14b	Fuselage former - under	3mm plywood	Finished part	1
F15	Fuselage former - upper	3mm plywood	Finished part	1
F15a	Fuselage former - middle	3mm plywood	Finished part	1
F15b	Fuselage former - under	3mm plywood	Finished part	1
F16	Fuselage former	3mm plywood	Finished part	1
F17	Fuselage former - left	3mm plywood	Finished part	1
F17a	Fuselage former - right	3mm plywood	Finished part	1
F18	Fuselage former - left	3mm plywood	Finished part	1
F18a	Fuselage former - right	3mm plywood	Finished part	1
F19	Side RC-box	3mm plywood	Finished part	2
F20	Top RC-Box	3mm plywood	Finished part	1
F21	Spar F9-F15	8mm balsa	Finished part	1
F22	Spar front wing	8mm balsa	Finished part	2
F23	Spar main wing	8mm balsa	Finished part	2
F24	Support main wing	8mm balsa	Finished part	2
F25	Support main wing	8mm balsa	Finished part	2
F26	Support main wing	8mm balsa	Finished part	2
F27	Vertical tail	6mm balsa	Finished part	1
F28	Bottom bonnet	3mm plywood	Finished part	1
F29	Front bonnet	3mm plywood	Finished part	1

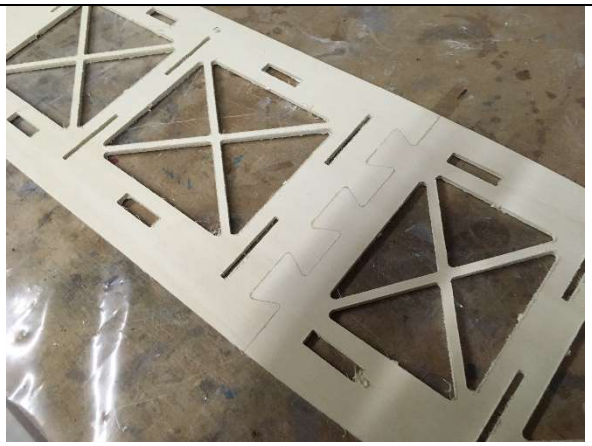
F30	Rear bonnet	3mm plywood	Finished part	1
F31	Nose	8mm balsa	Leftover balsa	
F32	Sheeting	1,5mm balsa		

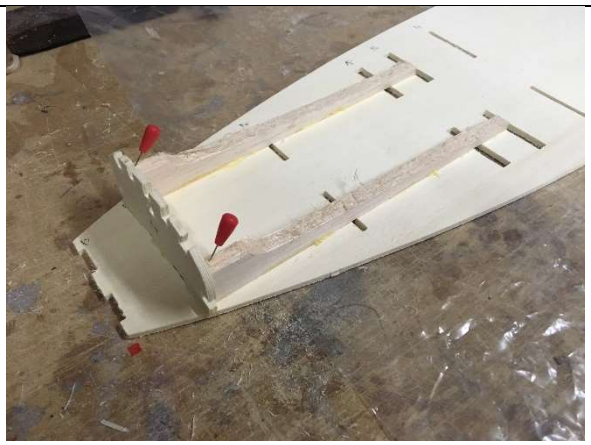
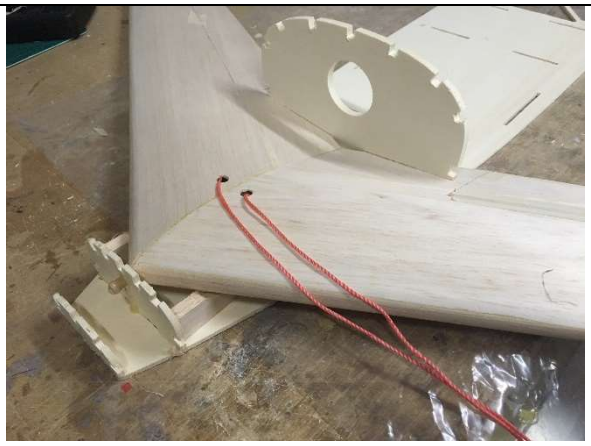
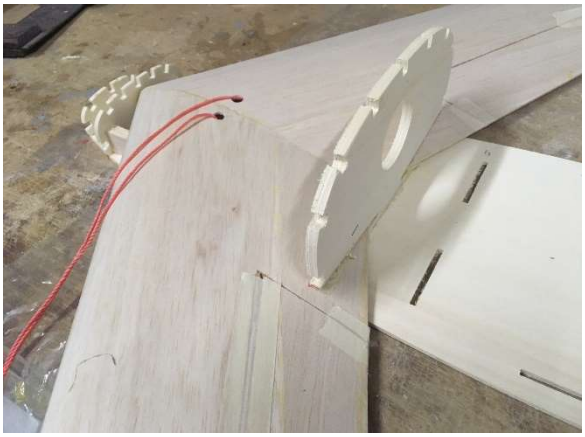
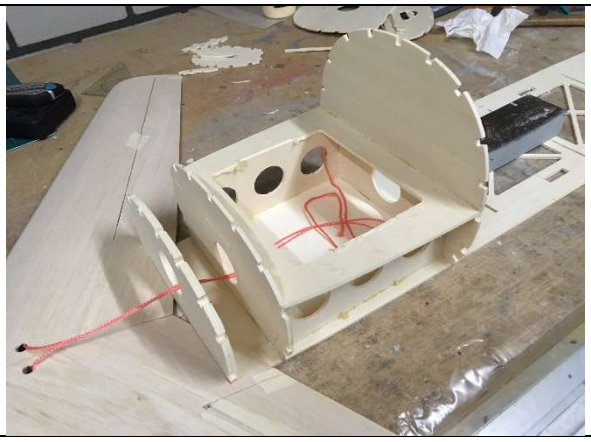
FUSELAGE CONSTRUCTION

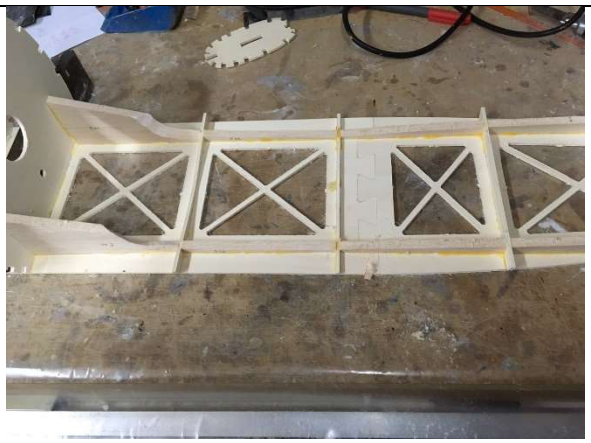
Supplied in the kit are 2 building templates F1 and F2. In these templates there have been made cut-outs for the ribs of the fuselage. By using this method, the fuselage will be sturdy and free of any torsion.

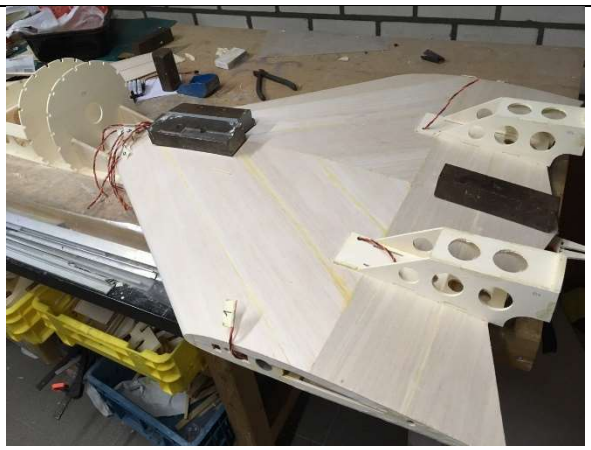
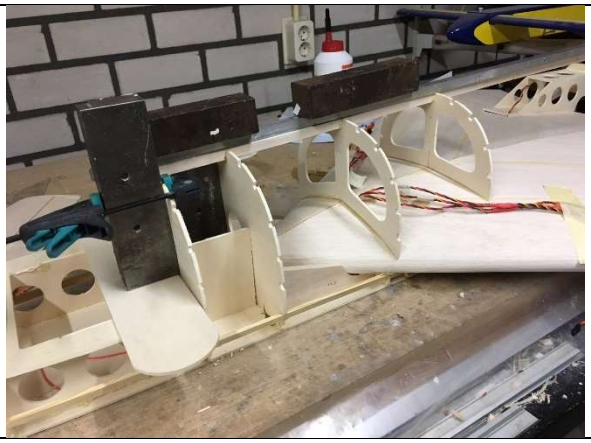
The front wing has to be placed under a 6° angle inside of the fuselage. The main wing will be placed under a 0° angle.

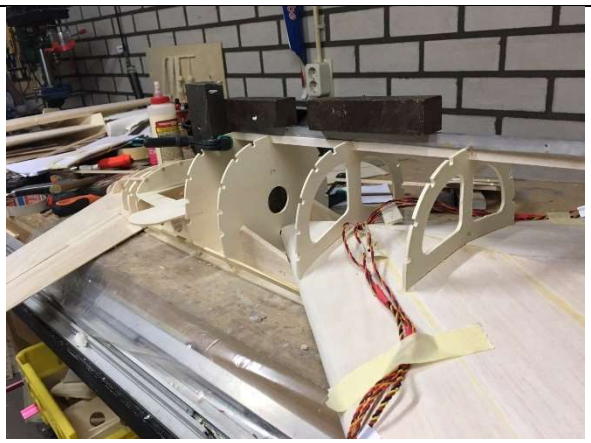
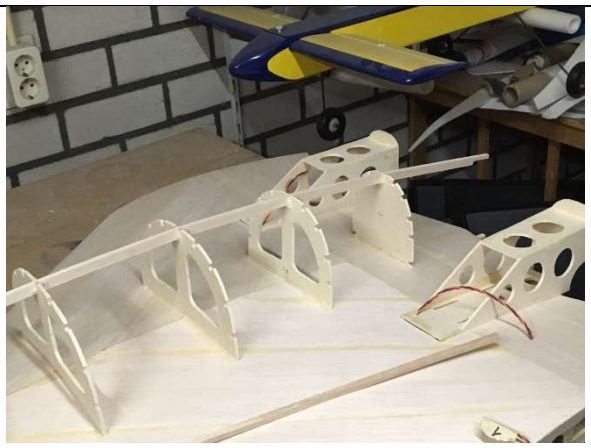
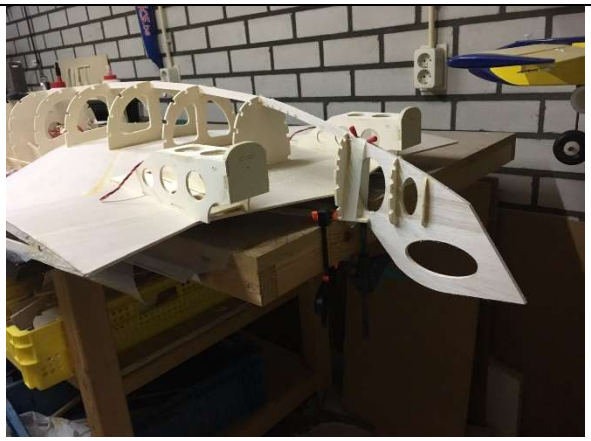
The fuselage will be sheeted with 1,5mm balsa. Because of the elliptical shape of the fuselage, it is not possible to sheet with wood of 100mm width. The sheeting has to be done with balsa planks of max 50mm width.

Glue together template F1 and F2. This way the template will be in one piece so the fuselage can be built easily on top.	 

Glue rib F4 and spars F22 on top of template F1.	
Glue part F3 on top of template F1. Attach both the previously made front wing and rib F7 on top of spars F22 and F2 with glue. The angle which the front wing must be glued on top of the spars has to be 6°.	 
Glue F8, F9, F19 and F20 together and on top of F1.	

Glue rib F10 and the wing bearers F11a, F12a, F13a, F14a, F15a, F23, F24, F25 and F26 in the provided cut outs of template F1 and F2. **Be aware:** F23 has to be modified to fit correctly to the leading edge of main wing part A.	 
Glue, with help of the top main spar (6x6mm), the ribs F5 and F6 on top of the front wing. The balsa main spar will be inserted from F3 till F8. The distance between ribs F4 and F5 is 80mm. The distance between ribs F5 and F6 is 85mm.	
Glue the other spars (6x6mm) in place in ribs F3 till F8 to finish the shape of the nose.	

Attach the main wing part A, with glue, on top of the wing bearers F11a, F12a, F13a, F14a, F15a, F23, F24, F25 and F26. The angle of which the main wing has to be attached to the fuselage is 0°.	
To reinforce the structure between the front wing and main wing part A it is necessary to glue the pine wood spar (8x4mm) on the ribs F7 and F11a.	
Glue parts F17, F17a, F18 and F18a in the cut-outs of vertical tail F27. The vertical tail will be attached to the fuselage with glue in a later stage.	
The topside of the fuselage will be made with balsa spar F21. In this spar there have been made cut outs to glue the ribs F9 till F16. This is to make sure that there is a correct spacing between the ribs and towards main wing part A. Attach the spar F21 to the ribs F9 till F12 with glue. Glue ribs F11 and F12 on top of main wing part A. Be sure to check that F21 is placed in a straight line. From rib F12 towards the back is	

where the curve will start in the top of the fuselage. **Be aware:** • The ribs must be glued exactly in the middle of the wing. To check this, use F21. Be sure that it runs in a straight line. • It depends on how you've built main wing part A. But it is possible that rib F11 has to be slightly modified.	
Glue the ribs F13 till F15 on to spar F21. This creates the curvature in the topside of the fuselage.	
Glue vertical tail F27 in F16. After this has be done F16 can be glued on top of F1 and F21.	 

The next step is to glue the balsa spars (6x6mm) into the ribs F6 till F12. By doing this there will be a strong connection between the front and back of the fuselage.

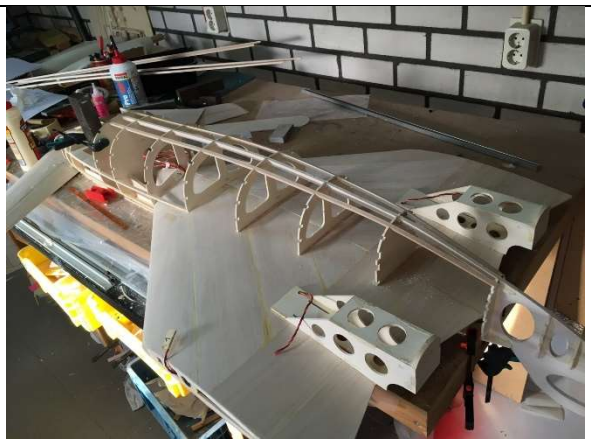
Be aware, the spars have to be glued in simultaneously in the front and in the back of the fuselage.

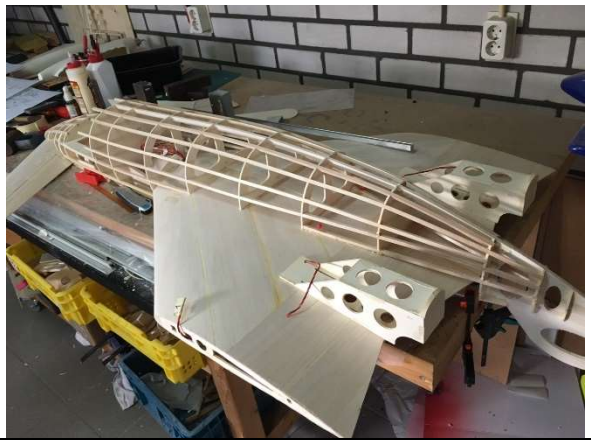
Now the remaining balsa spars (6x6mm) have to be glued in the ribs F9 till F17. Not all the balsa spars will reach F17, some will only run to F16.

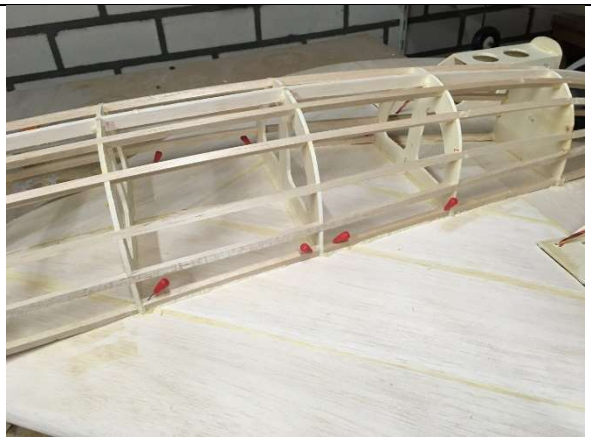
To prevent the fuselage from twisting, be sure to mount the remaining spars with glue on both sides of the fuselage simultaneously.

Start with the spar on top of the ribs and work all the way down.

The 4 spars that run from F9 till F17 have to be extended by 80mm.





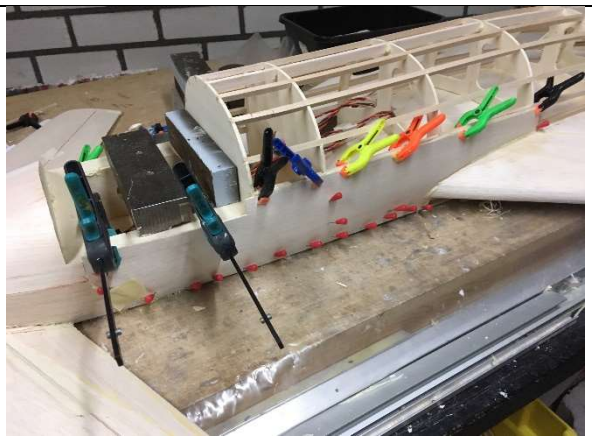
	
Glue a balsa spar (6x6mm) on top of wing part A between ribs F12-F13 and F13-F14. The sheeting will be glued on top of these spars.	
Glue a balsa spar (6x6mm) between ribs F8 and F11.	
Glue a balsa spar (6x6mm) in the opening of ribs F3 and F4 until the downside of the front wing. Because of the strong curve of the fuselage the outer side of the spar has to be made wet. It also helps to make a few small cut-outs in the spar. By doing this it will be easier to curve the spar in the shape of the fuselage.	

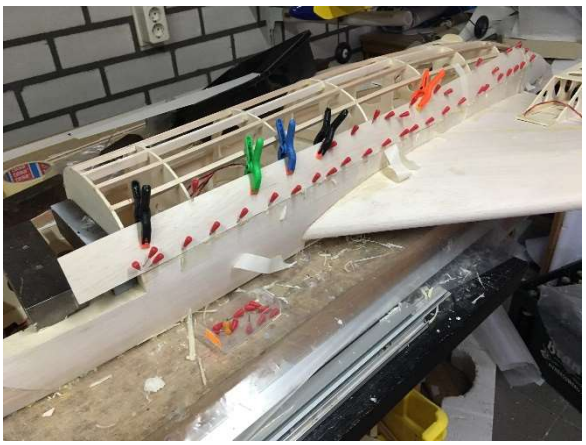
To make sure that the sheeting of the fuselage will connect perfectly to the top of the front wing. It is advised to glue a balsa spare spar on top of the front wing as shown in the photo.

All balsa spars are now glued between the ribs. The next step is to sheet the top of the fuselage with the balsa sheeting. Start on the front end of the fuselage. It is very important that, during the sheeting, F1 and F2 stay perfectly flat on the building platform.
Because of the elliptical shape of the fuselage, it is not possible to sheet the fuselage with the normal width of 100mm. The sheeting will have to be down with balsa planks from 1,5mm thickness with a width of 50mm. Be sure to make the outside of the sheeting wet, to make it easier to bend.

Start on the front end of the front wing. Here is an considerable curve present. To shape the sheeting into this curve, it is advised to use soft and flexible balsa from 1,5mm thickness. To make sure that the sheeting won't break, it is important to make the outside of the wood a bit wet with water. It is also possible to place a bit of tape on the outside of the sheeting before gluing it on top of the ribs.
We advise you to use a good quality PU-glue for the sheeting of the fuselage. This glue will fill in the gaps between the sheeting and the ribs. By using PU-glue in combination with wood glue, the PU-glue will rise even more to fill in these gaps.

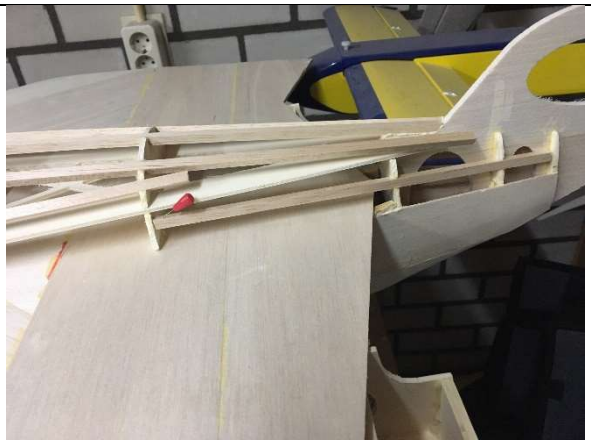
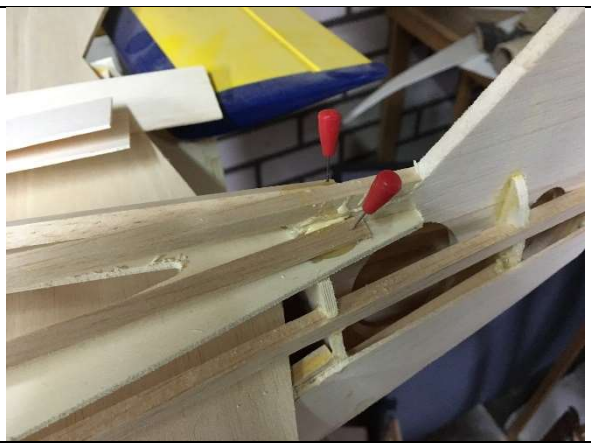
Sheet the fuselage with a maximal width of 50mm.





It is advised to glue short strips of balsa wood on the backside of the sheeting. This will assist in attach the sheeting nicely to each other without any gaps.

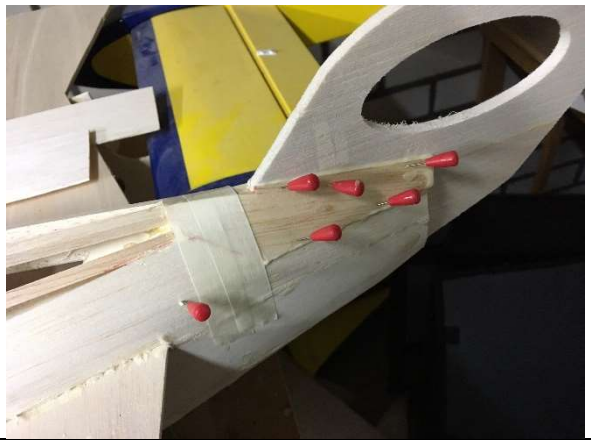
	 
The top side of the fuselage has now been sheeted. Sheeting the downside of the fuselage will be done in the same way as the top side. Remove the fuselage from the building platform. Cut out 2 pieces of Styrofoam and shape them roughly like the top side of the fuselage. This has to be done so the fuselage can lay on the top side comfortably and stable.	
Glue the ribs F3a till F15b in the cut outs on the downside of the fuselage. This will finish the shape of the fuselage.	

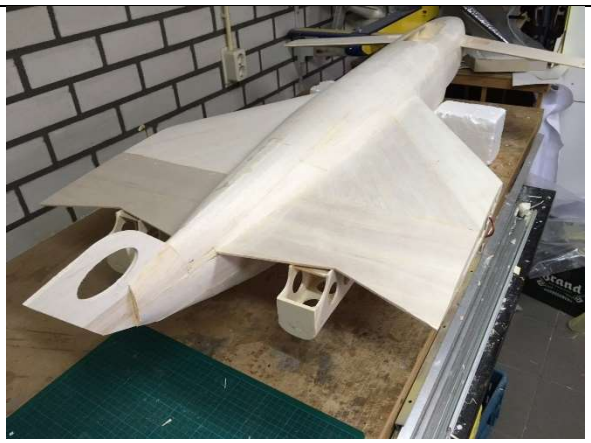
Glue the balsa spars (6x6mm) in the premade cut outs. Start with the main spar between ribs F3a till F7a. Because of the nose wheel from the retractable gear there will be an opening between F7a and F9a. After this has been done, glue the balsa spar between ribs F9a till F27.	
Now glue the remaining balsa spars in the premade cut outs.	
Glue a balsa spar (6x6mm) between ribs F15a till F18a.	
On the back side of the fuselage, cut the balsa spars to the correct length. Just in front of the small rudder.	

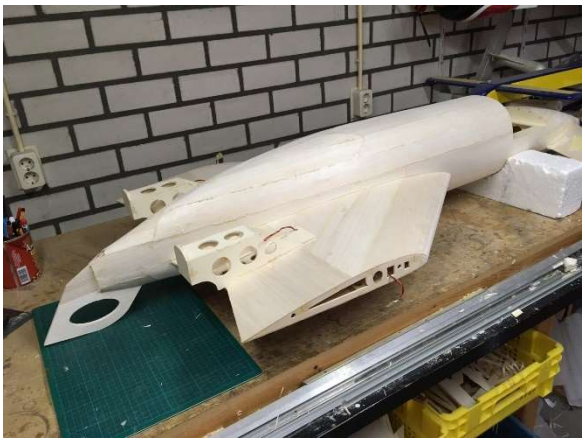
Start sheeting the downside of the fuselage with the 1,5mm balsa. Just like the top side of the fuselage, because of the elliptical shape the sheeting can only be done with planks of a maximal width of 50mm.

Start on the front end of the fuselage. To prevent the sheeting from cracking/breaking, it is important to make the outside of the balsa sheeting a bit wet with water.

Just like the top side of the fuselage, it is also advised to use a good quality PU-glue to apply the sheeting.



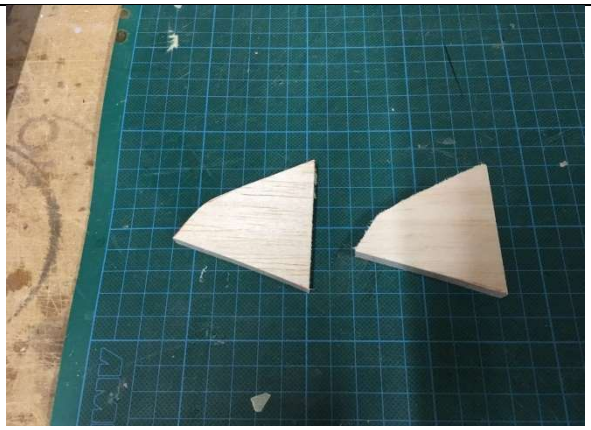




Sheeting of the fuselage has now been finished.

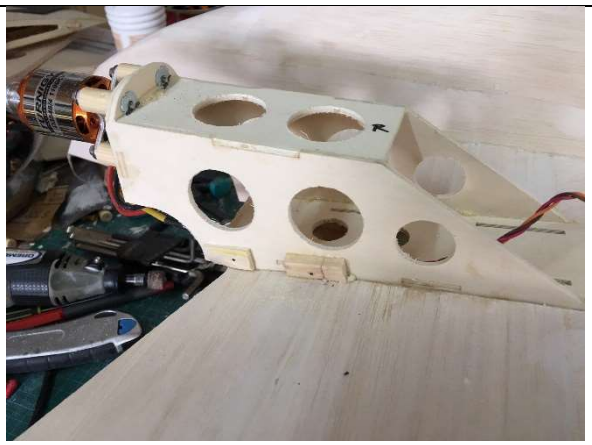
In the next steps you will be finishing the front- and back end of the fuselage.

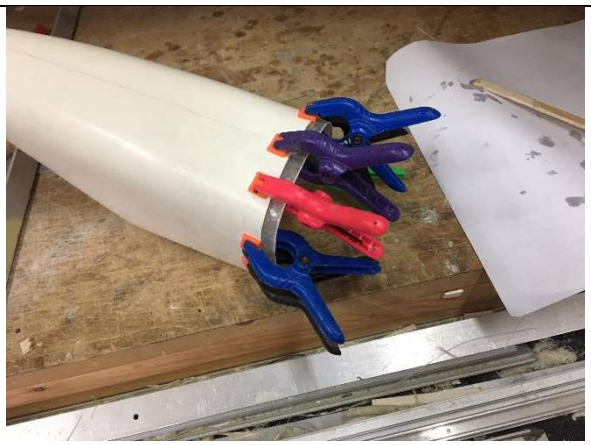
On the back end of the fuselage, near the small rudder, attach a piece of 8mm balsa from F31 with glue. When dried, cut the wood into the correct shape of the fuselage so it perfectly fits.



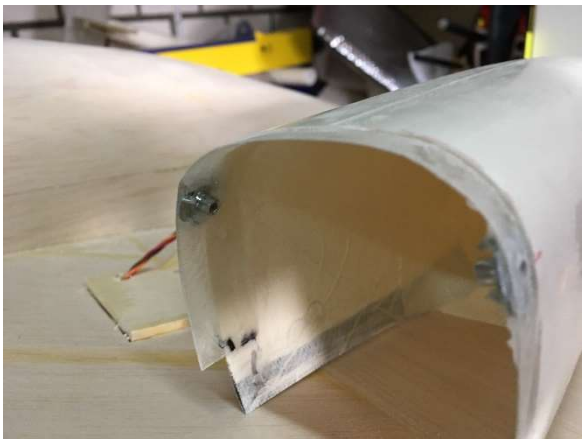
	
Glue 5 blocks from F31 on top of each other. When dried, glue this complete block on the nose of the fuselage. The length of the blocks should be 50mm. Model and shape this block to a nice and round nose for the airplane.	  

	
The base of the cockpit has to be made from F28 (bottom plate), F29 (front side) and F30 (back side). Place all these parts in the space provided on top of the fuselage. Now glue the base parts of the cockpit together. Be sure to not glue them on to the fuselage. It is possible to glue magnets into the provided openings in F28 to make a easy mount for the cockpit on top of the fuselage.	
Provided in the kit is a clear cockpit made from PETG. To complete the cockpit, this has to be glued on top of the base made from F28, F29 and F30. A template for painting the cockpit is included.	
The engine cowls are provided in GFK. Adjust and cut them so they fit perfectly on the main wing. Mount the electric engine on the correct distance and position so it fits the engine cowl. Cut the engine cowl vertically in half on 270mm from the front side. The back side is secured on the main wing and the front part is made removable for the batteries. Prepare and glue 4 pine wood blocks on top of the main wing where the engine cowl will be secured to.	

The engine cowls will be cut in half on 270mm from the front side. The backside will be secured to the motor mount. The front side will be made removable to allow easy access to the lipo batteries.	   



Glue 2 M3 impact nuts in the engine cowl for fixing the front and back of the engine cowls together.



Glue a piece of wood with a notch on wing part A. The front of the engine cowl will be clamped under this.

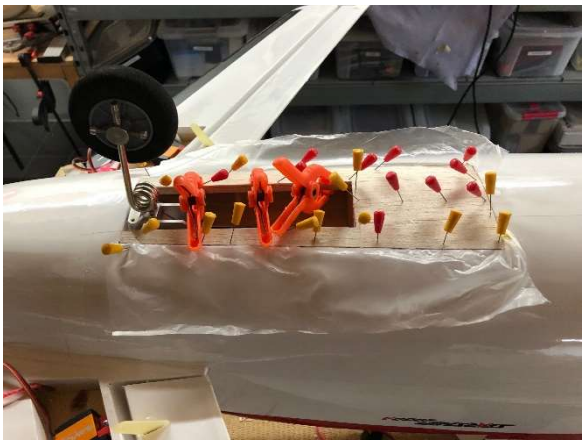
The block should have a length of about 40mm. The distance between the back of the block and M1 is approximately 50mm.

	
To fix the landing gear, 2 wooden spars (WA-46) are glued into the wing. Cut out the outline of the main landing gear.	
Remove the excess plywood from the ribs and then reinforce the wheel arches from 1.5mm balsa (residual wood).	
Install the retractable landing gear.	

Finishing up the nose landing gear.

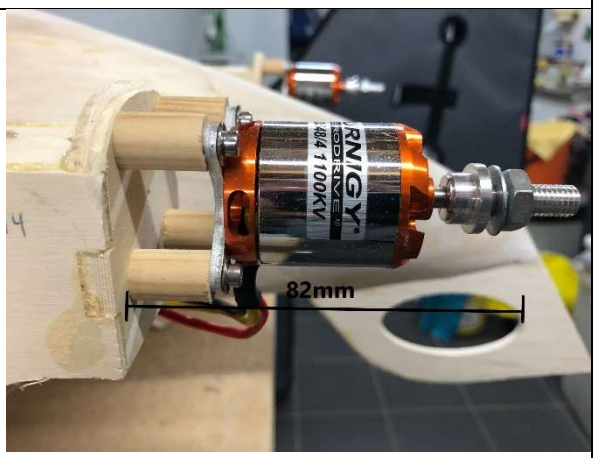
No special ribs or attachments have been made for the retractable nose gear. This all depends on the choice of brand of retractable gear which has been used.

After the landing gear has been fitted and the aircraft has been covered, the opening of the nose wheel can be closed with an additional cap. Excess wood from the kit can be used for this.



The Starship is now ready to finish.

Motor mounting.
For a good fit of the spinner to the engine cowl, the distance between engine mount and spinner should be approximately 82mm.



Cockpit mounting.

It has been decided to fixate the cockpit with 2 magnets. This is strong enough. The cut outs for these magnets have already been made in F20 and F28.

Mounting of the servos

The provided ruder horns are glued in the front- and main wing with a good quality 2 component glue. After this the servos can be mounted.

In the front wing there is just enough space for the positioning of a micro-servo (Savox SH-0255MG in the prototype airplane).

A mini servo (HS-5085MG in the prototype airplane) can be placed in the main wing.

Radio

The cockpit has enough space for a receiver and ESC + receiver lipo.

Center of gravity (CG).

At the start of construction, it was advised to keep the rear of the aircraft as light as possible. Nevertheless, extra weight will still have to be added to the nose.

870mm from leading edge point of front wing (rib F4)
380mm from leading edge point of main wing (rib F10)

The easiest way to do this is to make a small opening at the bottom of the nose in which the weight (preferably lead) can be glued. The lead can be easily attached to the wood you use to make the hatch.

After applying the necessary lead, the hatch can be closed.

READY FOR TAKEOFF.


N8730L

Media:

https://www.youtube.com/watch?v=XRJSm6s6wCY

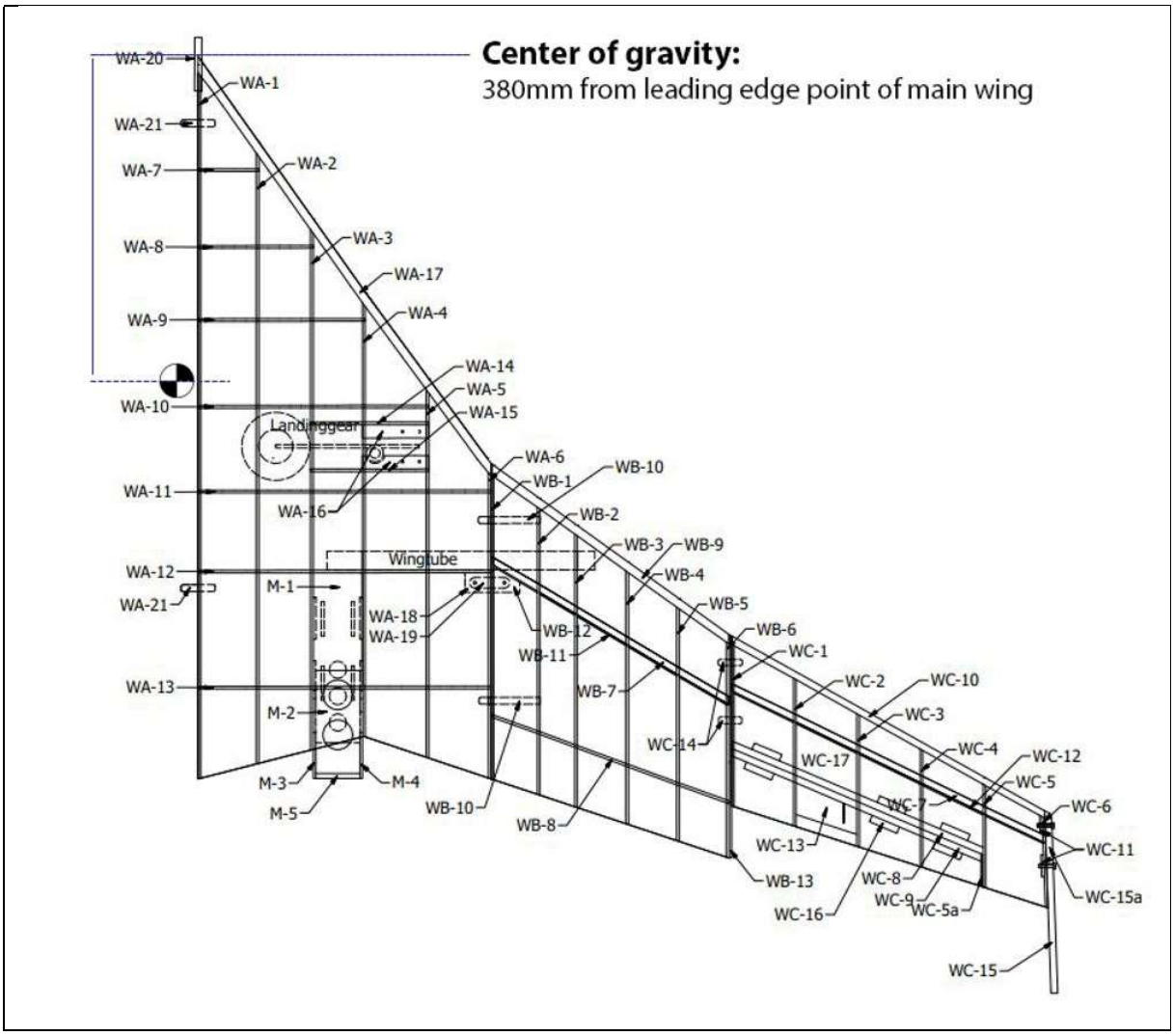
https://www.youtube.com/watch?v=nzSdo-MYR6A

https://www.rcgroups.com/forums/showthread.php?4148453-AMTN-Burt-Rutan-Beechcraft-Starship

https://www.youtube.com/watch?v=PqfCQA9Pqo8

SETUP OF THE STARSHIP.

Center of gravity (CG):
870mm from leading edge point of front wing (rib F4)
380mm from leading edge point of main wing (rib F10)



Electric engine:
3S 2.700 mAh
Turnigy D3548/4 (1100Kv, 910W)
Propeller: 10x7
Joker 3548-3,5
Propeller: 10x7

4S 2.700 mAh
Torque 2814T/820
Propeller: 10x8 (2-blade) 9x8 (3-blade)

Side- and Downthrust:
0° both in side- and downthrust.

Angle of incidence.
Angle of incidence front wing: 6°
Angle of incidence main wing: 0°

Front wing (elevator)
Micro-servo (22.8 x 12.0 x 29.4 mm) with 3,5kg force
(Example: Savox SH-0255MG)
Elevator throw: 10mm

Main wing (aileron)
Mini-servo (29 x 13 x 30 mm) with 4 kg force
(Example: Hitec HS-5085MG/HS-5087MH/HS-D85MG)
Aileron throw: 13mm

These settings are guidelines. Depending on the motorization these may differ.

FIRST FLIGHT WITH THE STARSHIP.

The Beechcraft Starship is a so-called Canard. An airplane that has the elevator at the front. Because the elevator is controlled at the front, it flies very safely. The aircraft cannot crash due to STALL. If you pull too much on the elevator, the front wing will lose LIFT and the nose will drop back down. The large wing provides the carrying capacity of the entire aircraft and it always continues to deliver LIFT. So, the plane can't crash if you give too much elevator.

IMPORTANT:

The front wing acts as an elevator. This means that the elevators go down in the up position and go up in the down position. They work reversed as on a normal airplane. The main wing acts as an aileron. When steering left, the left aileron goes up and the right aileron goes down. When steering right vice versa. **To get enough lift at the start, the elevator must be 70% mixed with the ailerons (mix elevator to aileron 70%)**. This way the airplane gets enough lift to get loose from the ground. When steering up, the elevators of the front wing go down and the ailerons of the main wing go up.

Take-off.

When taking off, it is important that sufficient speed is made without the aircraft developing lift too quickly. You must start while pushing full down. When reached sufficient speed, the down-push will have to be reduced after about 30 meters. At the end of the runway, sufficient upward steering will be required for the main wing to make lift.

Landing.

On landing, the aircraft has a tendency to re-enter the airspace due to speed. It is therefore important that, as soon as the aircraft has landed, it is carefully steered down until the speed has decreased sufficiently.

BEECHCRAFT STARSHIP

In the late 70s, the Beech Aircraft Company was on top of the small business aircraft market. The company's King Air twin had achieved about a 50 per cent market share. The remainder of the business turboprop market was divided among Cessna, Piper, Mitsubishi, Swearingen and Rockwell. Unfortunately, the company's best-selling King Air design was about 15 years old. With such a large market share, Beech executives reasoned that they could only lose market share in the future unless they took a dramatic leap forward. So in 1979, Beech decided to begin work on a new pressurized, all-composite twin-engine business turboprop, a brand new generation of aircraft based on latest building materials technology and a bold new, innovative design. Thus began the most ambitious new development project in the history of general aviation, what would become the Beechcraft 'Starship'.

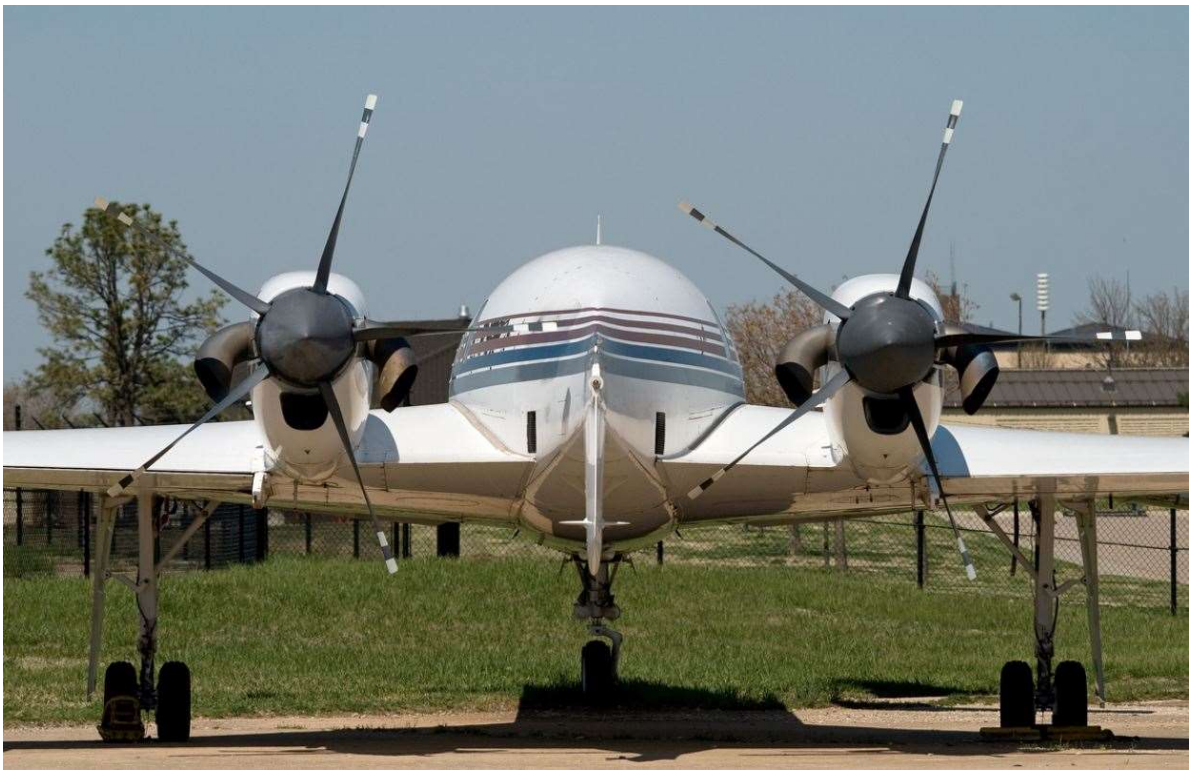
The leading design had its engines mounted in the rear to reduce cabin noise. It had an aft-positioned main wing on which to mount the engines and balance lifting forces. A conventional rudder would have made a huge sounding board for the propellers, so instead, control of the yaw axis and vertical stabilizer function was assigned to tip-sails on each wingtip. The King Air's large cabin had always been a major selling point, and the new Beech design had an even larger one, approaching the size of a medium jet's. Increased size brought increased weight, and the decision was made early on to build it using innovative new composites for its favourable strength-to-weight ratio.

Full development began in 1982, when Beechcraft approached Burt Rutan and his company, Scaled Composites, in Mojave, California, to participate in the final configuration study. The world's acknowledged expert in tandem wing, all-composite pusher aircraft at that time was Burt Rutan. The result was the design for 'Starship', with its variable sweep forward wing, all composite construction and rear-mounted Pratt & Whitney turboprops. While Beech began preliminary design of the full-size prototypes, Scaled Composites was engaged to build an 85 percent scale proof of-concept prototype to flight-test the configuration.

While in development at Scaled, the 85% scale prototype was known as the ***Model 115-6.85*** *or* ***SCAT-1****, and Beechcraft referred to the production version as the* ***Model 2000****. Interestingly, although Beechcraft's name is forever associated with the lines of the handsome and futuristic 'Starship', Rutan apparently input quite enough of his own design for him to hold no less than two patents: one for a variable geometry high lift system incorporated in the Beech Starship (U.S. Patent Number 4,641,800,*

foreign patents also held), and above all one for the very Rutan Model 115 Starship configuration (U.S. Patent Number Des. 292,393, foreign patents also held — see artwork below*).*

The proof of concept was completed in record time, and made its first flight in late August of 1983. A little over a month later, the new aircraft, then dubbed the ***Starship****, was introduced at the National Business Aircraft Association Convention in Dallas, Texas. When the proof of concept Starship made its first appearance, it seemed to many people like a very real aircraft. It was as large as a 90-series King Air, looked good in the air and clearly performed well. To the uneducated observer, it appeared one could put an interior in it, tweak the design here and there and begin a certification program. Sadly, this wasn't the case. The proof of concept aircraft had no certifiable systems and no pressurization. It was not even built out of the intended materials. It was essentially a large flying wind tunnel model designed for a program of 100 test flight hours or less, although it flew five times that long.*



The SCAT-1 was scrapped circa 1992, but even this sad destiny allowed Beechcraft technicians to learn one more useful lesson. Indeed, a major problem with composite aircraft is lightning, as no one knew initially what it would do to a composite airplane. So when the Model 115 was chopped up by Beech, they mounted pieces of the wings vertically on top of a hangar. Sometime later a huge night-time thunderstorm came through and the next morning the ramp area was covered with what appeared to be cotton. No one knew what it was, until someone noticed one of the wings on top of the hangar was gone; it had been hit by lightning and became fluffs of fiber glass blowing in the wind...

The proof of concept Starship's appearance at the Dallas convention gave the impression Beech was much further along than it was, and gave credence to an optimistic schedule the company had announced for certification: the end of 1985. However, by early 1984, many subcontractors still had not come close to delivering their components on time, and there was concern some might not be able to deliver at all. If there was to be a 'Starship', Beech realized it would have to develop it by itself. This resulted in substantial delays while Beech gained experience with the properties and manufacturing techniques required of resins, fibers, adhesives, composite honeycombs and sealants unique to composite aircraft.