Building Instructions
Morane Saulnier MS505, scale 1 : 4

Dear customer, many thanks for purchasing my kit, and for the trust you have shown in me.

The development of this model took around four years, during which time I encountered and solved many initial problems before the design was finalised for series production. During this period I have learned a great deal, and incorporated many ideas into the final version. However, I never lost sight of my original aim, which was to remain as close to the original machine as possible, including detail features wherever possible.

I never allow compromises in terms of quality - neither in the materials nor the manufacture of the various sub-assemblies - I use the best materials and the finest suppliers exclusively, because:

You have paid your own good money for this model, and are justified in expecting top quality - and that is what I aim to provide. I constantly check the plans and documentation, but if you notice that an error that has crept in, or have an improvement of any kind to offer, I am always open to your suggestions.

My philosophy:

My aim is to provide you, my customer, with an exclusive model which is to your entire satisfaction, and I work very hard at achieving that aim - satis-fied customers are my greatest asset in this era of ARF models and 'Made in China' - two developments which I, as an old model "builder", view with a healthy level of scepticism.

You can rest assured that my Storch - just like the full-size machine - is definitely "Made in Germany".

Overview

I spent a long time thinking about the numbering of the many kit components, with the result that the parts are now sub-divided into the groups listed below:

Parts	1 – 72	Wings
Parts	80 – 92	Struts (wing and tailplane)
Parts	100 – 144	Tailplane and elevators
Parts	150 – 168	Fin and rudder
Parts	200 – 236	Fuselage
Parts	250 – 268	Undercarriage

The machining process leaves small connecting lugs in the wooden sheets, but most of them are positioned where they cause no problems (exception: wing webbing). Most of the lugs are removed during construction in any case, e.g. when sanding a structure prior to sheeting, or during the “final” light sanding.

The first stage is to build the wooden structures (wing and tail panels). Next comes the fit between the wings and the fuselage, and the installation of the joiner system. The next stage - bonding the formers in the fuselage - is carried out using jigs supplied in the kit: the formers are tacked in position, and then bonded permanently in place in a single process.

These building instructions are comprehensive, and my aims in producing them were as follows:

To pass on my experience, solutions to problems and helpful information in the form of tips, all of which helped me make progress during development – these are all printed green.

I also wanted to point out potential stumbling blocks - printed red - which I hope will help you avoid mistakes and therefore make swift progress. I blundered into some of these blocks myself …

Please don’t be put off by the extent of the building instructions. The text covers all the model’s sub-assemblies in detail, but the experienced modeller (or those of you who just prefer building to reading) will find it possible to build the model just by referring to the plans, the parts list and the photos. If you fall into that category, please keep an eye on the red and green passages in the instructions, which are sufficient on their own to keep you moving forward. In general terms I tend to view instructions more as a reference work for those times when you run out of ideas when building …

And finally: we all know that a picture says more than a thousand words, and the CD contains a truly comprehensive series of pictures which depict every sin-gle stage of construction, arranged by sub-assembly. It also includes all the other documents and any number of pictures of the full-size machine. You will find that you can answer many a little query more quickly by studying a photo-graph than by reading the text.

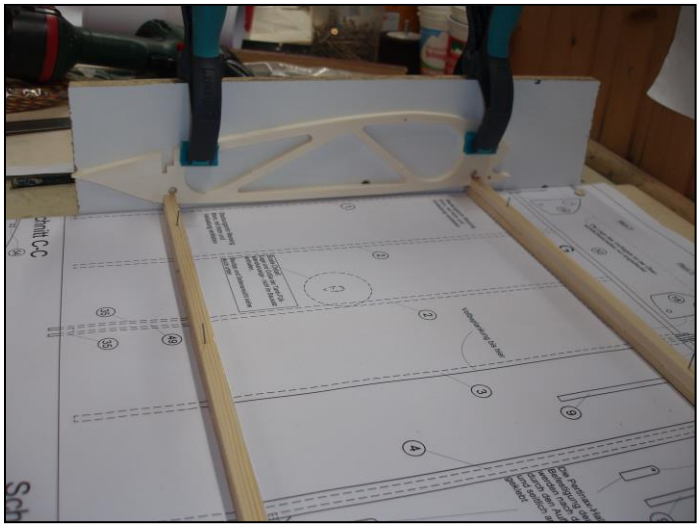
Contents

1. Preparation

The first step is to write the part numbers on the machine-cut parts in all the pre-cut sheets, referring to the print-outs supplied, and cut them out. A wood-carving knife is ideal for this, but a stout craft knife (carpet knife) or a small hacksaw blade also does the job. The wooden parts can then be sorted into groups according to the individual sub-assemblies.

To build the model you will need a flat sheet of hardwood (blockboard) about 1600 x 700 mm in size. Tape down the full-size plan, keeping the edges square to the panel; the root ribs should end exactly flush with the edge of the building board. When everything is positioned accurately, fix the bottom jig strips in place using fine steel nails. Apply a single strip of adhesive tape over the full length of each strip, to prevent the ribs sticking to the jig.

Screw a scrap piece of laminated chipboard to the edge of the building board as shown in Fig. 1 - the root rib can now be clamped to this.



White glue is used for (almost) all the glued joints on the model. It is best to use slow-setting epoxy for the wing joiner system, and the GRP and Pertinax parts, and should be thickened in some instances.

Fig. 1

The spars can now be fixed to the jig strips using modelling pins (between the ribs, of course …).

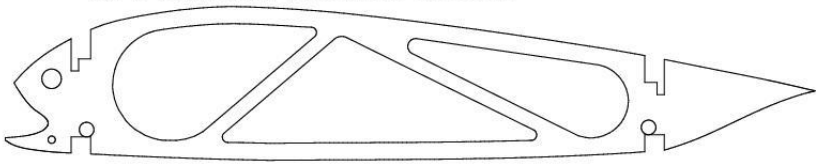
Before you fit the ribs, please study the plan for a while to establish which ribs belong where. At the top of the plan the ribs are sequentially numbered 1 to 22, i.e. every rib has a “name”. There are eight different rib types per wing panel, and for this reason the parts list only shows them as Nos. 1 to 8. This is quite difficult to describe in words, but a glance at the parts list and the plan will clarify things …

It is therefore important to note that the rib numbers as stated in the parts list do not coincide with the sequential numbering of the ribs (from 1 - 22) on the plan!

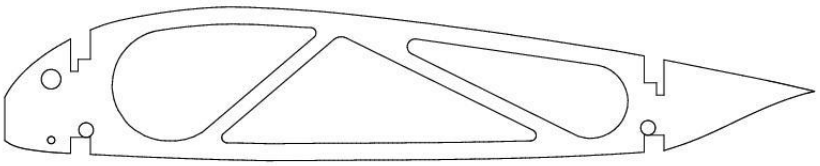
Write the numbers on the ribs as shown in the parts list - but for safety’s sake please refer to the sketch on the next page to check that all are present and correctly numbered:

1.1

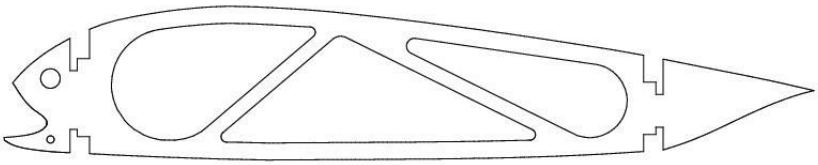
Rib 1 / Poplar 6mm / Parts List Nr. 1 / 2 Pieces



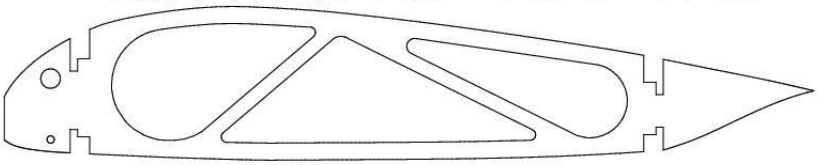
Rib 2;3 / Poplar 4mm / Parts List Nr. 2 / 4 Pieces



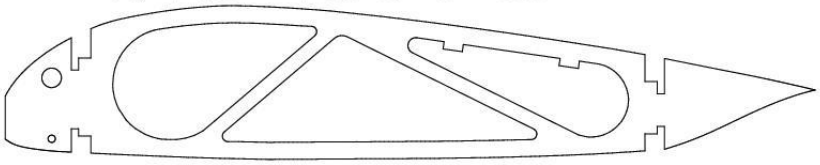
Rib 4;13;19 / Poplar 4mm / Parts List Nr. 3 / 6 Pieces



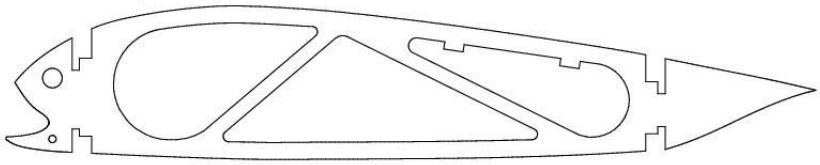
Rib 5;8;9;11;12;14;15;18;20;21 / Poplar 4mm / Parts List Nr. 4 / 20 Pieces



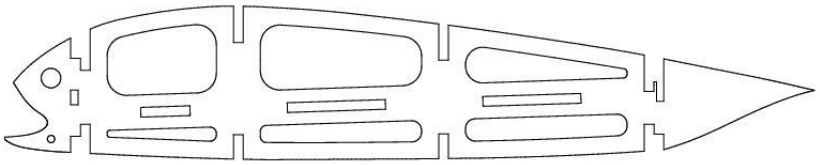
Rib 6;17 / Poplar 4mm / Parts List Nr. 5 / 4 Pieces



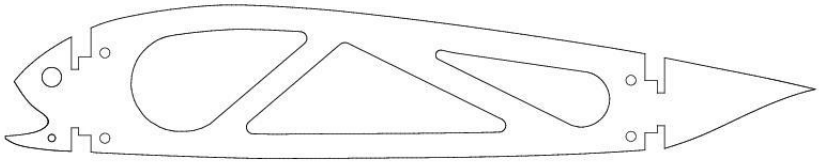
Rib 7;16 / Poplar 4mm / Parts List Nr. 6 / 4 Pieces



Rib 22 / Poplar 4mm / Parts List Nr. 7 / 2 Pieces



Rib 10 / Aircraft Plywood 4mm / Parts List Nr. 8 / 2 Pieces



2. Building the wing panels

2.1. Fitting the spars, ribs and webbing

At this early point I would like to pass on a very useful tip which an "old hand" told me: any relatively large parts - such as wing ribs - which exhibit unwanted curvature can easily be straightened using a film iron: just apply the iron to the convex face. Wood is a "living" material, and we have to cope with a little distortion here and there.

Once you are sure all the ribs are present and correctly numbered, you can make a start.

The correct rib positions and spacings are automatically defined by the notches in the webbing.

Watch out for the remnants of the machine-cut lugs in the upper tabs and notches in the webbing. Be sure to remove them if they are still present, otherwise they will prevent the joints fitting closely at the gluing stage.

The spar webs in the area of the joiner sleeves (10, 11, also 14, 15) are different: the tabs and notches are not present on the underside, as the joiner sleeves take up the space required. The kit also contains special spar webs (13, 17) for the bays adjacent to the tip ribs.

All the ribs and webs can now be glued to the lower spar in turn. The kit includes overlapping plastic combs (slotted templates) which are slipped onto the ribs from the trailing edge (see Fig. 2); they ensure that the rib spacing is as accurate as possible at the trailing edge while the glue is drying. The rear webs feature slots for the control surface hinge lugs (35) - see section A-A or B-B; take care not to allow glue to obstruct these notches.

Please note that the rib spacing may not be exactly as shown on the plan, as an inaccuracy of 1/10 mm per rib bay makes a difference of more than 2 mm over the full span! This level of inaccuracy is within the manufacturing tolerance of the wing ribs, which are intended to be exactly 4 mm thick. A scale is included on each sheet which helps to show up inaccuracies in the drawing. The inaccuracy may amount to plus or minus 2 - 3 mm, depending on the plotting service employed. The discrepancy is not significant, except that it can affect the alignment of the control surface ribs which support the hinges - but more on this later.

Fig. 2

Allow all the glued joints to set hard before gluing the upper spars to the structure - but please trial-fit them ("dry run") before reaching for the glue.

Once the spars are in place, the doublers (18) (which support the slat brackets) can be glued to the front part of ribs 1, 4, 7, 10, 13, 16, 19 and 22. Note that ribs 1 and 22 only feature one doubler, glued on the inboard face – see plan. The doublers and ribs have identical holes; temporarily fit 8 and 3 mm Ø steel dowels (e.g. old drill bits) through the holes to maintain correct alignment when gluing them.

Caution: when gluing the doublers in place ensure that no excess glue is allowed to harden in the slots for the slat brackets between the doublers and ribs.

Attach M4 captive nuts to the servo plates (19), then glue the plates to the servo frames (20) before fixing them to the rib framework in the positions shown on the plan. The servo frames are designed to suit standard-size servos. Check that the servos are a snug fit, and adjust the openings if necessary before gluing the parts together. The servos are installed inverted, and are secured later using the plywood plates (21) and M4 screws.

The captive nuts retain the servos; don't trust friction to keep them in place; secure them with 5-minute epoxy.

Glue the leading edge (32) to the structure, and sand it to follow the airfoil section prior to attaching the leading edge sheeting (Figs. 3 and 4). Mark the slat bracket locations on the leading edge with a felt-tip pen, or drill pilot-holes at the bracket positions, to enable you to find the openings again once the wing is sheeted.

The next step is to sheet the top surface of the wing, but not before deploying the servo leads through the upper holes in the front part of the ribs (Fig. 4).

Tip: fix the servo leads to each rib with a little hot-melt adhesive, otherwise they will rattle about when the engine is running.

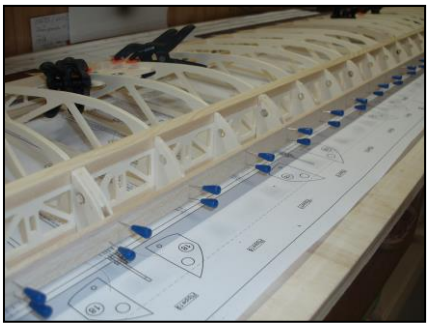


Fig. 3

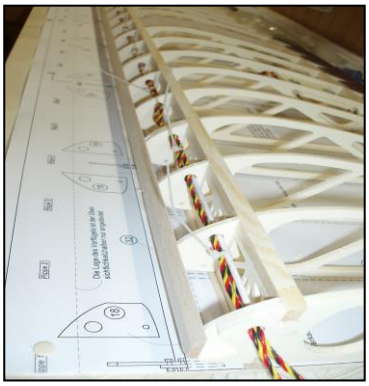


Fig. 4

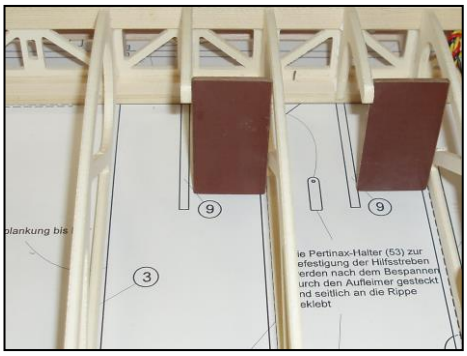


Fig. 4a

The riblets can now be glued in place starting at rib 4 (!).

When I built the wing shown, I installed the riblets after sheeting the leading edge, but if you install them beforehand, they act as stop-pieces for the sheeting.

2.2. Upper wing sheeting

All the sheeting on the model takes the form of 2 mm balsa. The kit includes sheet panels 1700 mm long (51) for the wing; those for the control surfaces (48, 50) are 1000 mm long.

The sheeting panels are deliberately supplied with excess width to avoid possible distortion in storage, as some of the pieces are quite narrow.

You can now cut the sheeting to width using a long straight edge (steel ruler) and a craft knife. A width of about 55 mm is sufficient for the leading edge sheeting, while the panels for the trailing edge should be 80 mm wide.

Glue the leading edge and trailing edge sheeting in place, using modelling pins and hardwood strips to clamp them in place.

Tip: you may need to moisten the sheet panel if the wood is reluctant to take up the curvature, or looks likely to split. If you do this, pin the panel in place on the wing while it dries. Don't glue it in place when still damp, as this is likely to produce a warped wing.

Fig. 5

Three inboard rib bays starting from the wing root are fully sheeted (see Fig. 7). Some versions of the full-size aeroplane were fitted with an enlarged fueltank, and these had seven sheeted rib bays. The struts provide ample torsional rigidity to the wings despite the relative paucity of wing sheeting. A further advantage of the abbreviated sheeting is that it does not conceal the landing flap servos, so they remain accessible right to the finishing stage.

The plastic comb templates (70) at the trailing edge should be left in place between the ribs until the glue has set hard, to ensure that the ribs remain straight.

Cut 10 mm wide cap strips using a balsa stripper, and glue them to the top of the ribs. Don't forget to remove the pins holding the bottom spar to the jig over the three inboard rib bays before sheeting in this area. Attaching the sheet to the three root bays completes the work on the top of the wing.

Fig. 6

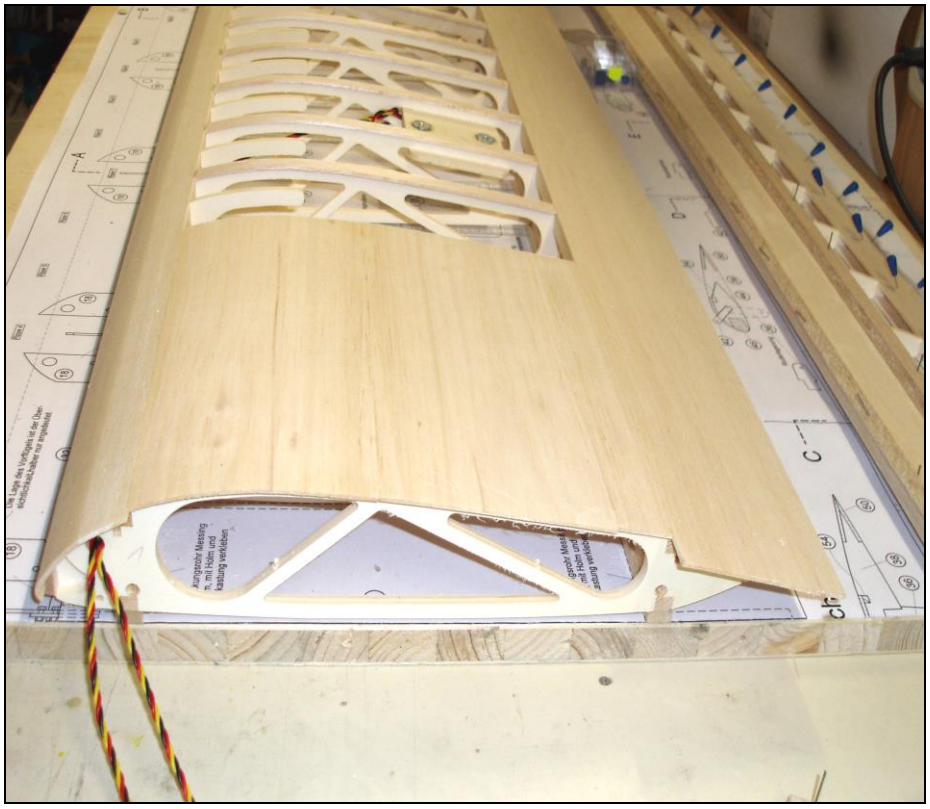


Fig. 7

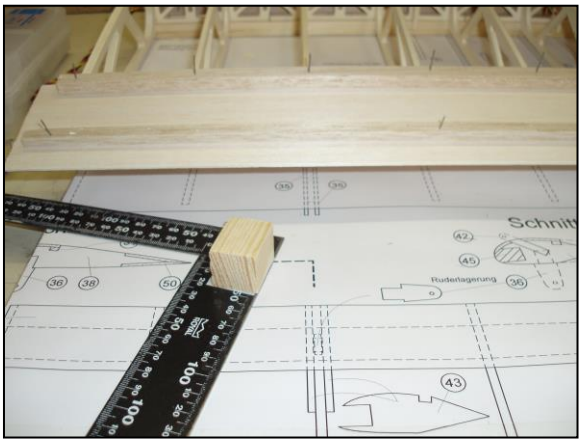
2.3. Ailerons and landing flaps

The next step is to assemble the ailerons and flaps before turning the wing panel over. I have drawn these parts separately on the plan, so there is space to construct them at the same time as the wing panels.

At Point 2.1. I have already mentioned the problem of dimensional inaccuracy over the wingspan. By now you have presumably discovered that the wing has turned out a few mm longer or shorter than the plan. If the wing matches the plan perfectly, then your luck's in - consider buying a lottery ticket this week … ☺

Any discrepancy is only significant because those flap and aileron ribs which support the hinge brackets must line up exactly with the wing ribs, i.e. you may need to make slight adjustments to the spanwise position of the aileron and flap ribs (39) and (41).

You can check this by laying a square against the jig strip and the spar, and marking on the plan the rear extension of ribs 3, 7, 11, 12, 17 and 22, so that the lines cross the control surfaces. The ailerons and flaps are of identical construction.



The rear sheeting (50) can now be prepared for both control surfaces as shown on the plan; pin the panels down on the building board. All the aileron and flap ribs *fitted with tabs (no load-bearing function) (38), (40) and (40a)* can now be fitted and glued to the sheeting at the rear. At the same time engage the front of the ribs at the leading edge, and glue them in place. Use pins to secure the ribs.

Allow these glued joints to set hard, then glue the hinge lug ribs (39) and (41) in place, exactly at the positions you previously marked on the plan.

The next step is to glue the doublers (43) and (43a) to the hinge lug ribs you have just fitted (Fig. 9). Each of the aileron and flap ribs 7 and 17 which support the two Pertinax horns (42) should be fitted with two doublers (44) and (43) - see plan. The servo output shafts should now line up exactly with the horns. The thick doublers (43a) only need to be fitted to the ailerons, where an opening has to be cut on the underside as shown in Fig. 24; without the thick doubler there would be insufficient material to support the covering film.

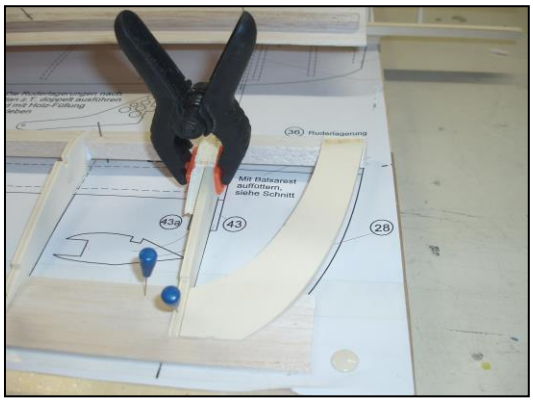
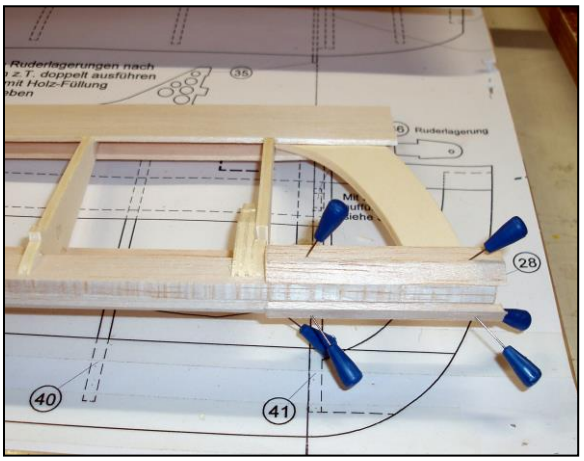


Fig. 9

Sand the aileron tip (28) to a fine taper at the trailing edge, and glue it to the projecting sheeting, as shown on the plan. At the front it should be trimmed to fit *on top of* the leading edge (Fig. 9).

The balsa spars (54) can now be glued in place, after sanding the leading edge flush with the ribs. Once again, you may need to moisten the balsa beforehand. Complete the trailing edge sheeting of the control surfaces.



Figs. 10 + 10a

Allow the glued joints to set hard, then remove the ailerons and flaps from the building board.

Fit scrap balsa in-fill pieces at the leading edge at the tip, top and bottom, as shown on the plan, and sand them to the profile in section F-F. Sand the leading edge to the section shown on the plan, and remove the tabs with a saw.

The wing panel can now also be removed from the building board. Cut off the excess spar material flush with the root and tip ribs.

2.4. Bottom wing sheeting, wing joiner system

You do not need to place the wing over the plan for this stage; to sheet the underside it is sufficient to screw the jig strips (used for the initial stage) to the building board.

Fix the wing to the jig again using modelling pins. Sand the leading edge to profile, and cut the sheet panels to width: about 45 mm is adequate for the leading edge, about 85 mm for the trailing edge. Sheet the leading and trailing edges of the wing using the procedure described for the top of the wing.

Do not sheet the three inboard rib bays until you have installed the wing joiner / retainer clamp system:

The wing retainer clamps consist of a large machined component (58) for the front joiner system and a small machined part (59) for the rear joiner. These parts are supplied already bonded to the brass sleeves which accept the steel wing joiners. The steel joiners are clamped in the machined components by means of grubscrews; access to the grubscrews is via 2 mm Ø holes in the GRP wing fairings, which are drilled later. The joiner assemblies are supplied ready to install.

Initially I was not sure whether the clamping system would work in practice, but in the meantime the model has had to cope with two very abrupt emergency landings in long grass (due to engine cuts), which have shown that the clamp does "give" under stress, and absorbs a great deal of energy - good insurance for the airframe.

The screw clamp is superior to any rigid wing retainer system!

Installation:

Apply a light coating of thickened epoxy to the spars and webbing where they make contact with the joiner system. Seal the outboard end of the sleeves with plasticene to prevent resin getting inside them.

Lightly sand the brass sleeves, and simply "twist" the whole assembly into the wing to the point where the machined aluminium parts rest against the root rib. Glue the machined parts to the root rib with a little epoxy, and check that they are aligned at right-angles to the building board.

When you are satisfied that all is well, bond the brass sleeves to the spars and the root rib using plenty of thickened epoxy.

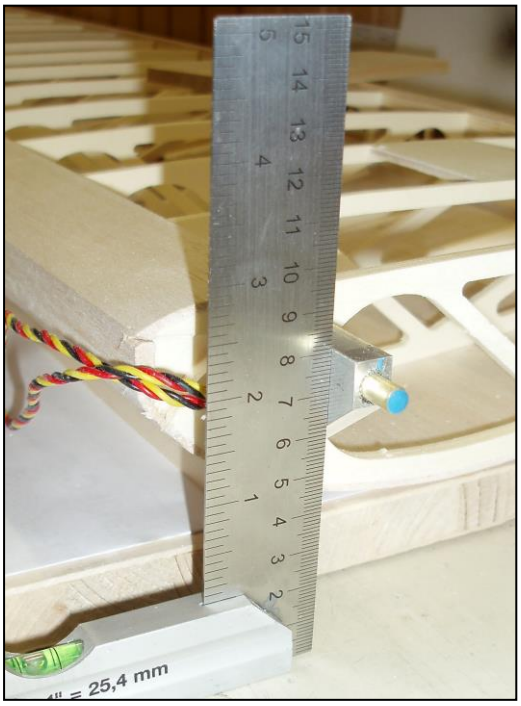


Fig. 11

The GRP wing root fairing (62) can now be prepared as shown in Fig. 12, and then glued to the root rib. You will need to drill holes in the fairing for the servo leads and the wing joiner components (see drilling template on the plan). There is ample space for the servo leads in the wing root fairing, between the machined aluminium part and the GRP skin.

The end of the brass tubes must be glued securely to the GRP fairing; sand back the brass sleeves flush with the moulding, and temporarily seal the open ends with plasticene.

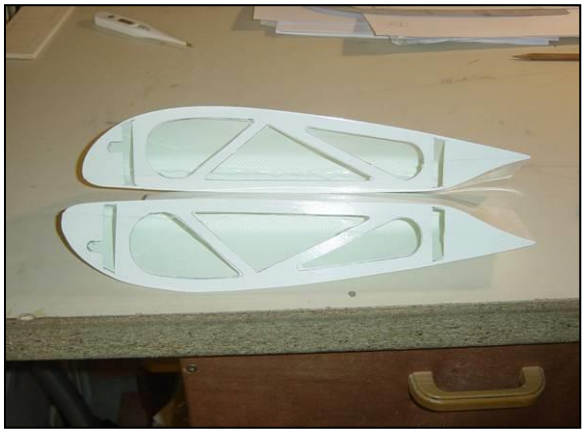


Fig. 12

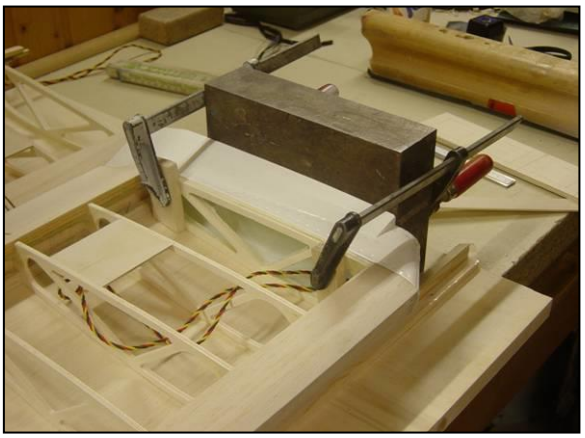


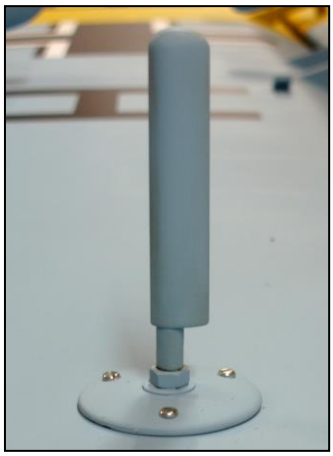
Fig. 13

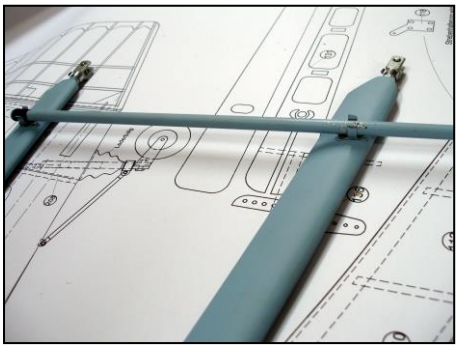
Scale tip: Fig. 13 clearly shows a reinforcing plate fitted between ribs 2 and 3: this supports the "fuel level indicator" (Fig. 14) which the scale modeller will want to fit; see plan sheet 2 for more information on this.

This is also a good time to incorporate another plate in the left-hand wing panel to support the landing light (Fig. 15), as shown on plan sheet 1.

A third scale detail fitting is the pitot tube (Fig. 16), which is a characteristic feature of the Storch. It is 600 mm long, and is mounted on top of the left-hand wing strut.

These scale fittings are not included in the kit, but can easily be made by the modeller.





Figs. 14 - 16

2.5. Aileron / flap hinges

The slots in the wing sheeting for the 2 mm Pertinax hinge lugs (35) now have to be cut out. Some of the hinge lugs are double, some single, as shown on the plan. Where double lugs are specified, in-fill pieces (49) have to be glued between the two parts. The hinge lugs engage in slots in the rear webbing, so their position is pre-defined.

Fig. 17

The position of the ribs can be transferred onto the sheeting using a ruler; the plan shows the length of the slots. Use a craft knife to cut them out, and a needle file to clean up the edges.

All the hinge lugs - in the wing and the control surfaces - are not glued in place until later, i.e. when the wings have been covered. However, it is important to check at this stage that all the hinge lugs line up correctly:

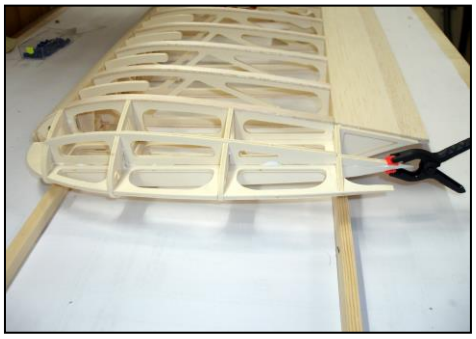
This is accomplished by clamping the hinge lugs to the control surfaces with scrap balsa packing pieces, and inserting the lugs in the slots in the wing. Carefully offer up each control surface to the wing in turn, and check that they line up correctly.

Tip: the 3 mm lugs fit into 4 mm slots in the control surface ribs. The oversize slots allow you to compensate for any minor spanwise tolerances.

The three rib bays at the root can now be sheeted in, and the bottom cap strips glued to the ribs. At this stage you should also fit the balsa gussets in *those* areas where the brackets for the main and secondary struts have to pass through the sheeting (ribs 5 and 10; see plan).

2.6. Wingtip

Now we come to the interesting little puzzle which is the wingtip: the plan shows the parts and how they fit together. Part (27) is required to thicken rib 22, to provide a support for the sheeting. Sand the wingtip outline (22) to a taper at the trailing edge before gluing it in place, to avoid a step in the sheeting at this point.



Thicken the outboard end of the wingtip by adding the machine-cut 8 mm balsa parts (31), and fit the rear 2 mm balsa sheeting. Complete the leading edge with the balsa blocks supplied.

The wing structure can now be sanded smooth overall.

Fig. 18

2.7. Leading edge slat

When you have cut the slots in the leading edge for the slat brackets, it is possible to trial-fit the brackets.

Each slat bracket consists of the bracket itself (33) and a doubler (34). The two parts are fixed together using M2 x 8 mm socket-head screws (72), and glued with cyano-acrylate adhesive (“cyano”) at the same time. Now check that the brackets are an easy sliding fit in all the slots, and temporarily insert them.

Unfortunately I have been unable to obtain Pertinax in the correct thickness, so these parts are all about 1/10 mm thicker than the rib material, and are therefore a little too thick for the slots. I recommend that you use a band sander to reduce the thickness of the doublers a little before fitting, as the brackets will then fit neatly into the slots.

Fig. 19

The position of the slat brackets can now be marked on the slat itself using a spirit pen, as shown in Fig. 19.

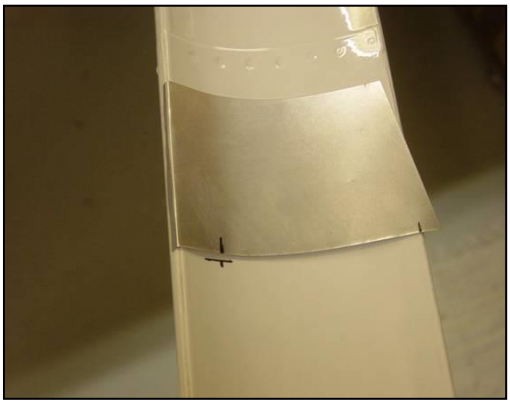


Fig. 20

Make a card or sheet aluminium template for marking the position of the holes on the slat: the distance from the leading edge is 15 mm. Drill the holes 2.5 mm Ø.

Fig. 21

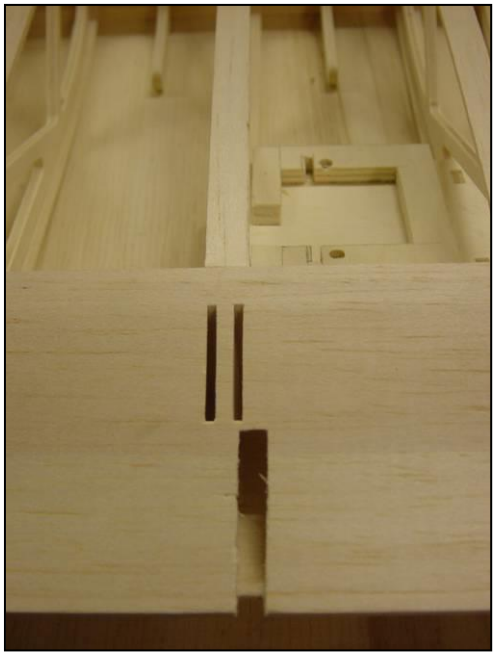
Once the holes have been drilled, the slat can be fitted onto the spigots from underneath, and then folded up and over.

The slat brackets are not glued in the wing until the panel has been covered. When painting is complete, the slat brackets - complete with slat - can be glued in place using a little UHU-Endfest (slow epoxy). This produces a virtually invisible joint which still has ample strength.

2.8. Remaining work

Minor jobs now await, which you may already have completed in the meantime:

Trial-fitting and installing the servos, control surfaces and horns:



Cut clearance slots about 5 mm wide in the bottom wing sheeting for the servo pushrods, as shown in the drawing.

A small (scale-size) notch is also required at the trailing edge of the wing to provide clearance for the aileron and landing flap horns (see Fig. 22).

You may need to trim the webbing slightly to ensure that the pushrods do not foul the structure at any point.

Fig. 22

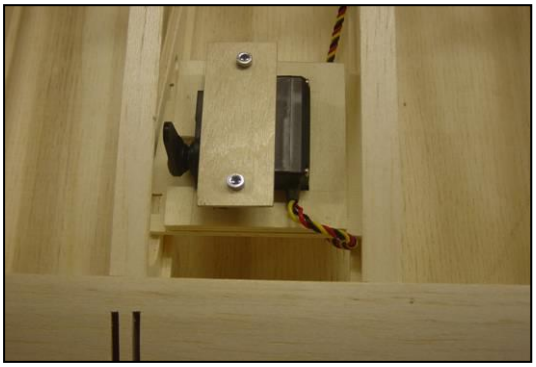
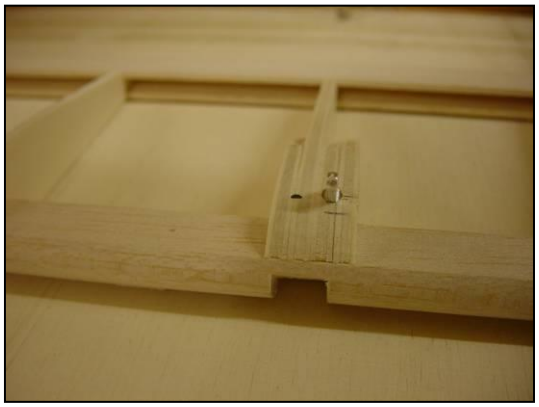


Fig. 23 shows one wing-mounted servo installed, and secured with the retaining plate (21).

Fig. 23



Since ailerons need to deflect up as well as down, slots are also required in the aileron to clear the hinge lugs, as shown in the photo; see also section B-B on the plan.

Cut the slot for the Pertinax horn in the aileron sheeting.
The photo shows one aileron on the prototype model before the leading edge sheeting was added.

Fig. 24

The aluminium brackets (66) and (67) which form the strut attachment points should now be trial-fitted; they pass through the cap strips at wing rib 10, as shown on the plan. The Pertinax brackets (53) for the secondary struts (82) also pass through the cap strips.

The aluminium brackets are eventually screwed permanently to the wing, but only after the underside (and before the top) has been covered.

Fig. 25

The GRP “teardrops” (64) can now be glued to the long supports on the control surfaces (37) – the “bananas” – and sanded smooth.

If there are any wooden parts which you have not yet finish-sanded, this is the time to finish the job. Fig. 25 gives a good idea of how the whole structure should now look …

The two holes for the wing retainer clamp screws can now be drilled in the GRP wing root fairing.

Assemble the second wing panel in exactly the same manner as the first.

3. Struts
3.1. Wing struts

The wing struts are fabricated from profiled spruce strip; the front strut is slightly larger than the rear one, as on the full-size machine. The two struts are glued together, with a metal connecting plate (83) as reinforcement. The stainless steel secondary struts (82) are supplied with the joints already soldered; they are screwed to the main struts when complete.

But first things first …

Drill a 4 mm Ø hole in the bottom end of the front strut to accommodate the threaded rod attached to the metal connecting plate; the hole should be slightly off-centre, so that the metal plate ends up in the centre of the strut. Both struts can now be cut slightly overlength, as shown on the plan; the extra length is to allow adjustment of the struts when they are fitted to the model.

Now make a saw-cut in the profiled strips to accept the metal plate. Weight down the rear end of the struts over the plan, so that the metal plate can be trial-fitted. When everything fits thus far, glue the metal plate in the front strut, using only slightly thickened epoxy (Fig. 26). The next step is to weight the rear strut down over the plan, and glue it to the front strut and the metal plate, taking care to produce a strong joint. The result should look as shown in Fig. 28, although the joint line of the struts is different from that shown on the plan.

Fig. 26

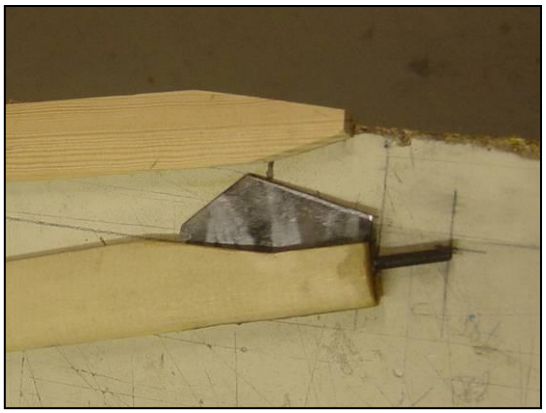


Fig. 27

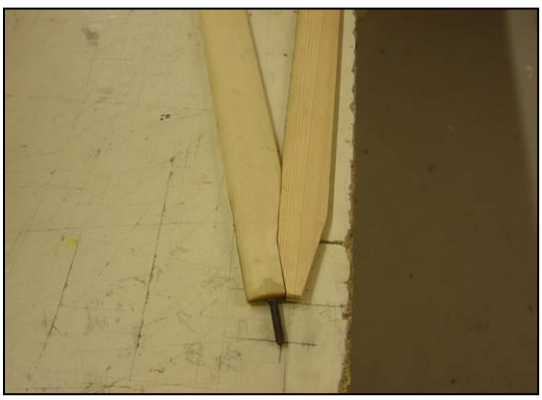


Fig. 28

Fig. 29

Fig. 29 shows the strut components already screwed to the metal plate using M2 x 18 socket-head screws (86) – the other metal fitting is only a self-indulgence for scale appearance.

Both ends of the strut can now be cut to length. The dimensions shown on the plan are correct, but for safety's sake please leave them 5 mm longer than stated; they are cut to exact length and the ends bevelled - as shown in Fig. 30 - when the model is first assembled.

Drill a 3 mm Ø hole in both end-faces of the struts at the thickest point, to a depth of about 70 mm, and cut an M4 thread in the holes using a long tap.

Fig. 30

The 4 mm studding is now screwed into the holes: simply lock two nuts against each other at the end of the rod, and use a spanner to drive in the studding.

The studding should be glued in place using slow epoxy before the finish is applied. M4 clevises with snap-fit spring retainers are used to connect the struts to the wings and fuselage (Fig. 32).

To obtain a good base for painting the struts, all you need is one or two coats of normal spray-can primer. There is no need to tissue-cover the struts, as the primer hides the wood grain almost completely.

The secondary struts are now assembled as shown on the plan (Fig. 31).

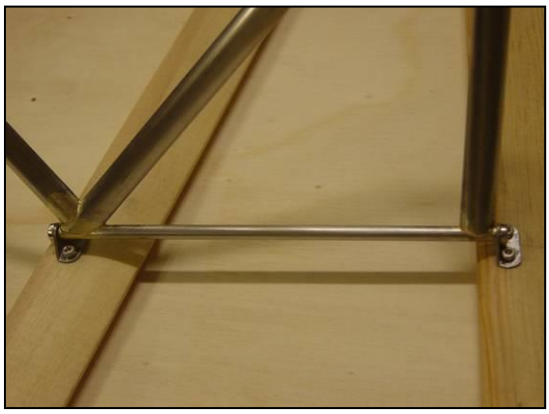


Fig. 31

Fig. 32

3.2. Tailplane struts

Cut the profiled spruce strips to length to form the tailplane struts (90) as shown on the plan. Drill holes in the end-faces, tap the holes M3, and install M3 clevises.

4. Tailplane and elevators
4.1. Tailplane

The tailplane takes the form of two plug-in panels.

Please note right now: like the wing struts, the Storch's tailplane struts are load-bearing parts, and must be constructed with this in mind!

Background: since the Storch has a long tail moment, it has a natural tendency to be tail-heavy, so weight should be saved wherever possible at the tail end. I believe I have come up with an excellent compromise between strength and weight in the whole tail area. The lightweight sandwich-laminate construction of the fuselage also makes an important contribution to this. An over-engineered tailplane joiner system would invariably add a lot of unnecessary weight.

If you intend to power your model with an engine / silencer weighing around 2.5 - 3 kg, it should be possible to achieve the correct Centre of Gravity without adding nose ballast. If your engine is lighter, lead will undoubtedly be required. If you are fitting an in-line twin, you don't need to worry about every last gramme at the tail.

The tailplane panels are of conventional construction. The kit includes the jig plate featuring machined slots for the ribs.

I have designed ribs (102) to act as mounts for the elevator servos. The kit contains two ribs with apertures for two different sizes of servo; both variants allow the servos to be installed and removed through the root ribs:

Rib 2 / part 102 to accommodate a standard servo, size 39 x 19 mm
Rib 2 / part 102a to accommodate a lighter servo, size 33 x 15 mm

Construction:

Align the rear edge of the two jig plates accurately, and screw them to a flat building board, spaced slightly further apart than the fuselage width. Insert the rib tabs in the slots in the jig. Sand the joiner sleeves (140 + 142), but do not cut them in half. Check that they fit in the holes in the ribs, and insert them in the structure. Seal the outboard end of the joiner sleeves with balsa caps to prevent the joiner tubes slipping right through them.

The trailing edge (111), leading edge (109) and spar (110) can now be glued to each tailplane panel. Epoxy the joiner sleeves to the ribs, using the glue sparingly. (Fig. 33)

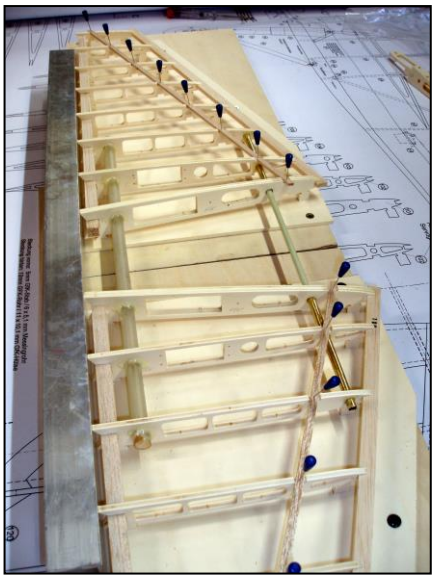


Fig. 33

Allow the glued joints to set hard before separating the panels.

The trailing edge (111) consists of a 10 x 10 mm balsa strip. To ensure that the trailing edge sheeting makes good contact over the whole span, the trailing edge needs to be packed up with scrap 4 mm balsa between the ribs, and sanded smooth.
Install scrap 10 mm balsa in-fill pieces between ribs (106) and (107), to provide better support for the strut bracket and spreader plate (118), which are fitted later.

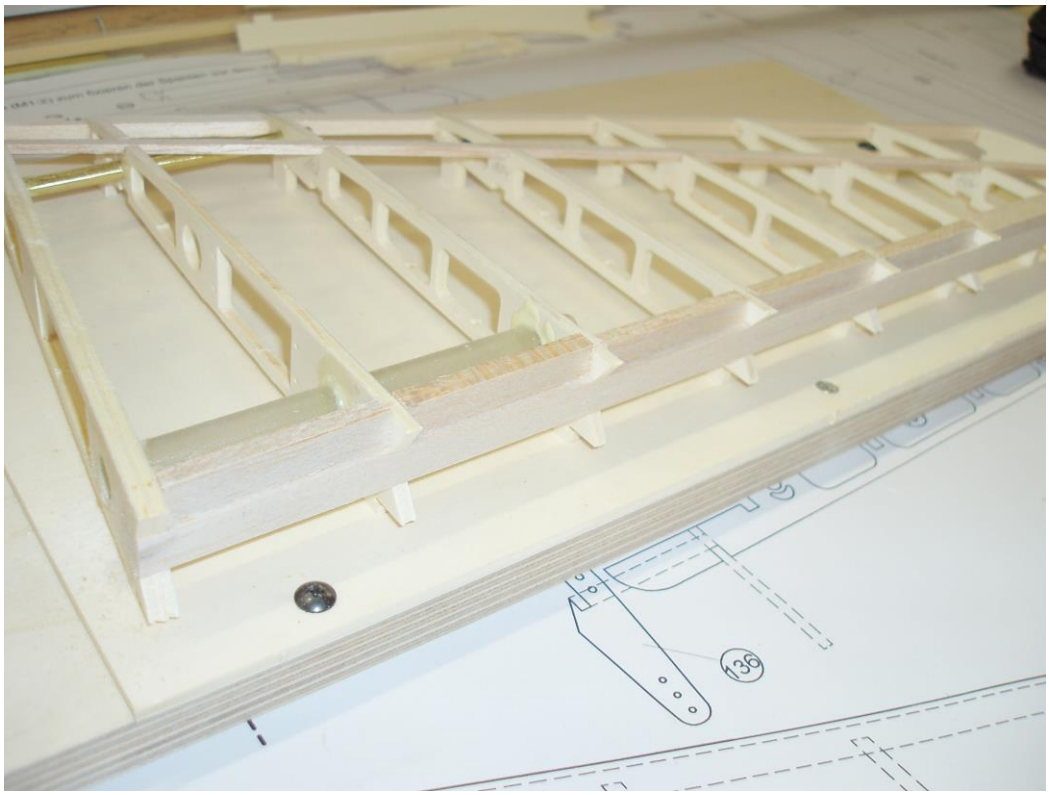


Fig. 34

Carefully sand the leading edge of the tailplane panels to follow the airfoil section before adding the top sheeting.
The top surfaces can now be completed by adding the sheeting and rib cap strips.

Remove the panels from the jig, and insert the negative ribs (also included) in the slots in their place. The tailplane panels can now be pinned down to the negative ribs in order to complete the underside, i.e. fitting the spars, sheeting panels and rib cap strips; of course, the tabs must first be removed from the ribs. The remainder of this stage is completed in the conventional manner.

Allow the tailplane panels to dry out thoroughly, then sand the leading edges to the correct profile, and cut off the excess sheeting material. Cut away the top sheeting as far as the trailing edge to accommodate the Pertinax strut bracket (118). When the tailplane has been covered, the strut brackets are glued to the trailing edge and screwed to the spreader plate - see plan.

4.2. Elevators

Please note: the kit contains full-size construction plans for all control surfaces; the panels should be built directly over the plan.

The kit includes a GRP tube and spruce strips (138) which are designed to help you produce warp-free control surfaces. The GRP tube is supported on the front spruce strip, and the trailing edge (120 / 121) on the rear spruce strip. The GRP tubes only act as construction aids; they are used again later to build the rudder.

Note that the spruce strips must be packed up by 1 mm at the trailing edge, in order to keep the centreline of the control surface horizontal when the panel is being assembled - see plan sheet 3, sections A-A, B-B.
Hammer nails into the ends of the spruce strips, but leave enough shank projecting to accept rubber bands - the bands are used to hold the rib framework down on the building jig (Fig. 35).

Construction:

The first step is to glue together the two trailing edge pieces (120 / 121) over the plan; lay plastic film under the joint to prevent the parts sticking to the paper.

Screw the jig components to the building board in the position shown on the plan, i.e. the elevators are assembled directly over the drawing. Sort the ribs (122 - 130) in numerical order, and slip them onto the GRP tube. When all the ribs are more or less in position, thread them onto the trailing edge. This procedure is similar to a puzzle, but sooner or later every rib will be where it should be.

The framework can now be laid down on the jig components, and fixed in place with rubber bands between the nails. Trim the false leading edge (131) to fit, and glue it to the ribs; the small slot for the horn should be on the underside. Check that the rib (128) is at right-angles to the leading edge, and that all the ribs are correctly located. At this stage you can confidently glue all the parts together.

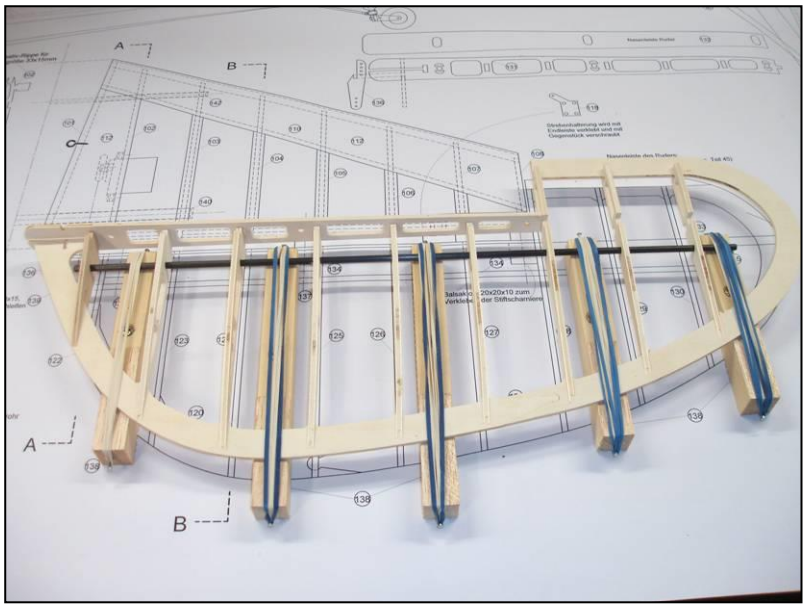
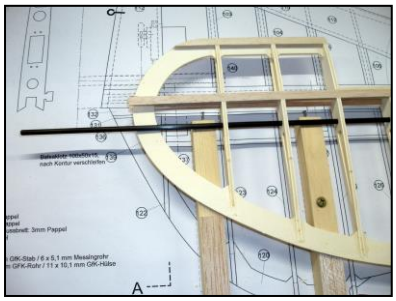


Fig. 35

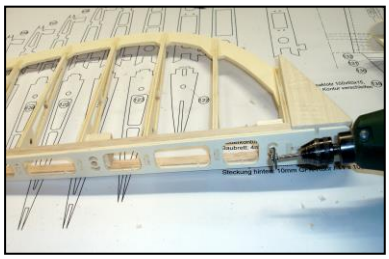
The method of construction makes it extremely difficult to apply white glue to the joints, so for this stage only all the joints are glued using low-viscosity cyano-acrylate ("thin cyano").

Allow everything to set hard, then glue the spars (133), outboard leading edges, balsa blocks (139) and reinforcements (134) to the structure – this time reverting to white glue.



Note that the ends of the spars should not be glued to the tip (121) until the panel has been removed from the jig and the GRP tube withdrawn.

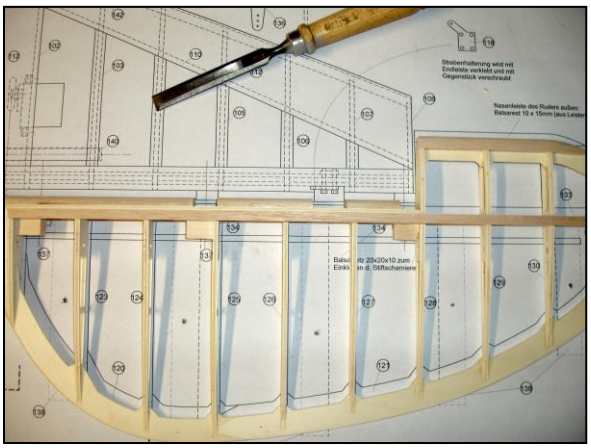
When the glue has set hard, drill 5 mm Ø holes for the point-hinges in the reinforcements (134). The slots in the leading edge can now be cut using a craft knife or disc cutter. The hinge pivot axis needs to be just behind the false leading edge (131) to ensure that the recessed “knuckle” hinge works properly. The point-hinges are eventually glued in the elevators and tailplane, but not until the finish has been applied, as the elevators cannot be removed subsequently.



The leading edge (132) can now be glued to the elevator, and the panel sanded smooth overall.

Please ensure that the hinge has sufficient angular travel; you may need to file out the slots slightly to achieve this. The elevators and rudder should have as much travel as you can arrange.

Final sprint: a slot has to be sawn in the leading edge of the elevator to accept the Pertinax horn. This is also the time to cut the three notches in the leading edge of the elevator in the scale positions; they are drawn in on the plan (see Figs. 36 + 37). Mark the position of the point-hinges on the tailplane.



Figs. 36 + 37

The second elevator can now be assembled in the same manner using the same jig - but please note that the false leading edge (131) must be installed as a mirror-image of the first panel - i.e. the machined slot for the horn in the false leading edge must be on top.

5. Rudder

In terms of design the rudder is similar to the elevators – the method of construction is almost the same. There are two main differences: the rudder is detachable, and two GRP tubes (168) are used as temporary jig components, i.e. they are also withdrawn again after construction.

Construction:

The rudder is again built directly over the drawing. Hammer nails into the ends of the spruce jig rails as before.

Screw the jig components to the building board in the positions shown on the plan, and sort the ribs in numerical order (151 - 158). Cut the GRP tubes to length, and slip the ribs onto them. Once all the ribs are more or less in position, thread them onto the trailing edge (150) as previously described.

Lay the framework down on the jig, and fit rubber bands as shown to hold it firmly in place. Trim the false leading edge (159) to fit, and glue it to the ribs. Check that rib (157) is at right-angles to the leading edge, and all the ribs are correctly positioned, then glue them all the joints using thin cyano, as described for the elevators.

When the joints have set hard, glue the spars (162) to the structure.

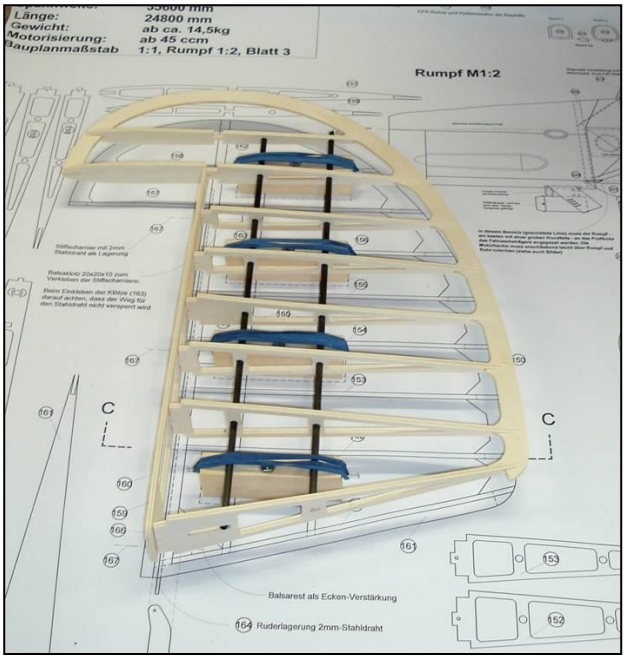
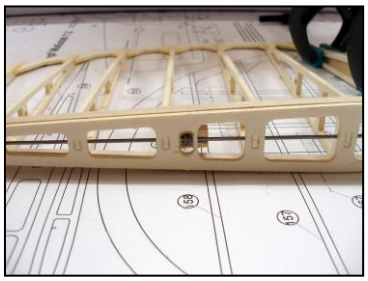


Fig. 38

The ribs feature 2.2 mm Ø holes for the 2 mm Ø hinge pivot rod, which allows the rudder to be removed from the fuselage. Point-hinges are again used:

Tip: my standard method of producing detachable control surfaces - as here - is to remove the rivets from the point-hinges, drill out the pivot holes to 2 mm Ø, and use a 2 mm Ø steel rod as pivot. Taper the leading end of the rod, and ensure that it is an easy sliding fit through all the hinges.

When the glued joints are hard, slide the steel pivot rod through the holes. Cut guide notches in the reinforcements (163) using a triangular file, and glue them to the false leading edge (159) in the positions shown on the plan; the purpose of the reinforcements is to guide the steel rod. Please take care not to glue the steel pivot rod in place at the same time.

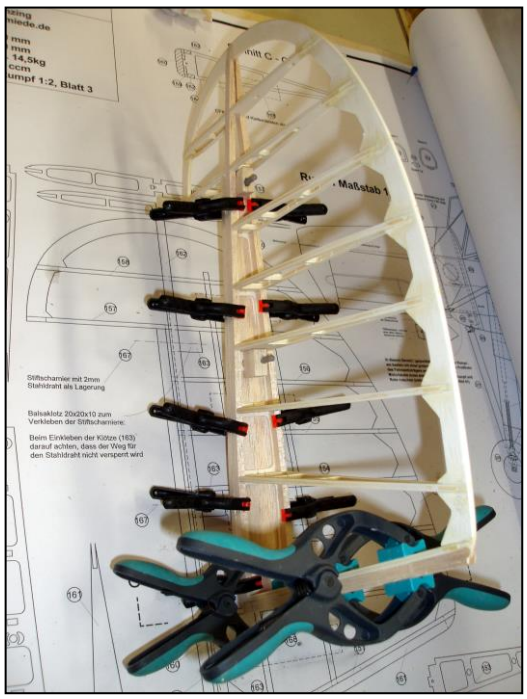


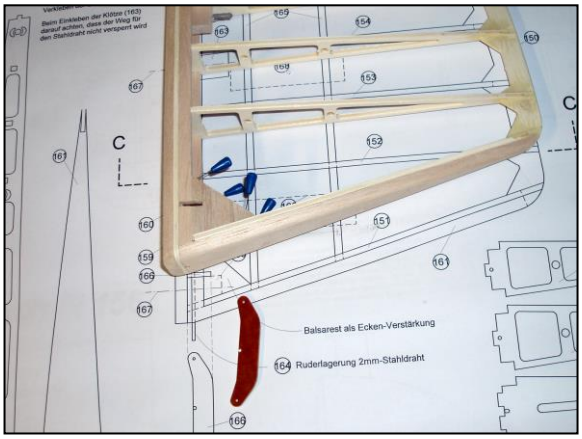
Allow the glue to set hard, then check that the steel pivot rod can easily be slid through the rudder. Drill the 5 mm Ø holes for the point-hinges in the reinforcements. Cut slots in the false leading edge (159) using a cutting disc, as described for the elevators.

Fig. 39

The point-hinges can now be fitted “dry” (no glue), and the pivot rod threaded through from the bottom: ensure that the rod is still an easy fit when slid through all the hinges. When you are satisfied, glue the point-hinges in place using 5-minute epoxy. The only point to watch is that no glue gets into the hinge pivots.

At this point the leading edge (160) and the scrap balsa gussets can be glued to the structure. Remove the rudder from the jig, and withdraw the GRP tubes from the ribs before gluing the bottom strip (161) to the structure. The rudder can now be sanded smooth overall. Work on the rudder is completed by cutting the slot for the horn (166), although the horn itself is not glued in place until the rudder has been covered.





Figs. 40 + 41

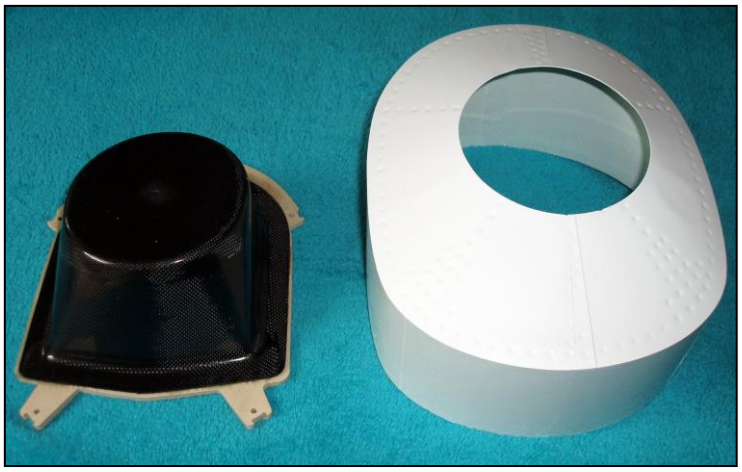
6. General work on fuselage, engine installation

As already mentioned in the section on the tailplane, it is important to keep an eye on weight at the tail, depending on the type of engine you intend to install.

From the point of view of performance and size I recommend the Moki S180 for this model. **The dome what you can order optional is prepared for this engine**.

You can adjust the position of center of gravity with the batteries when you install them behind the cabin – you´ll won´t need additional weight.

With this engine the MS505 is indeed overpowered, but you can need the power for towing big sailplanes.



The setup is as follows:

You will drill the motor mount holes to the firewall as well as the center hole (70mm).

The hole is marked on the dome.

The motor mount bolts will be fastened using M5 blind nuts.

You still want to fasten and secure the motormount to the fuselage using three 5mm bolts each at the side decks of the fuselage.
The dome is tablocked to round firewall former, the bolts only handle the pull, not the rotational force.

The aluminium brackets you use to mount the cowl and fairings to the dome will be aligned, then predrilled using a 3.3mm drill, the you cut a M4 thread (or alternatively for a standard bolt of comparable size and quality should you not have metric tools). The holes at the dome will be M4, the aluminium bracket will be mounted to the fairings from the rear.

You will glue reinforcement parts (252) to the Fiberglas fairings where the side covers are located.

Once the motor mount is mounted to the fuselage you can fit the fairings and glue the aluminium brackets in place. The fairing overlaps the fuselage by around 10mm.

Since the whole setup can be removed (the motor cannot be removed on it's own) you need to place the fastening bolts for the motor mount right around the access hatches in order to be accessible.

The hatches will be removed and mounted using the included hingetape. See the photos on the CD.

The ignition will be placed on the bottom of the board inside the fairing (248), I mounted the ignition battery and switch on the right side – hence you can remove the ignition battery should you prefer to do so while you charge it.

The two servos for throttle and choke as well as the fuel tank will be mounted inside the motor mount on the included board (246), again see CD.

The fuel tank will be mounted on the board (246) as well and will look thereby into the fuselage. This parts are all building a unit which you can easy disassemble from the fuselage if needed.

6.1. Wing joiner system, fuselage formers and aero-tow mechanism

The first step here is to trial-fit the engine bulkhead (200), and glue it in the fuselage using thickened epoxy and a little glass cloth. The two holes in the bulkhead indicate its front face; at a later stage these are the points at which the holes are drilled for the diagonal reinforcements which extend to the spar bridge. This bulkhead should be fitted flush with the fuselage at the front; its position dictates the correct location of the remaining fuselage formers.

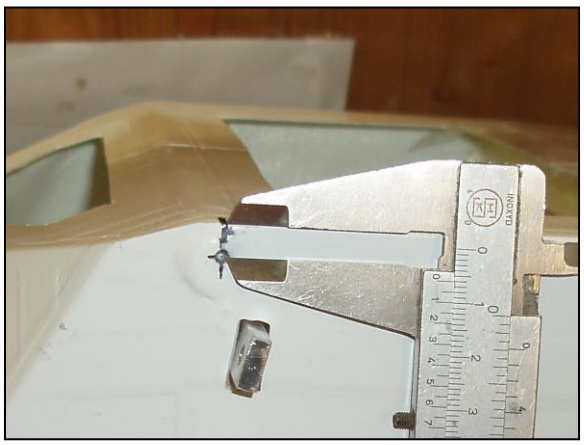
The side and top window openings can now be cut to approximate size:

Don't cut the openings to final size yet - it is essential to leave about 10 - 15 mm excess all round! If you were to remove the whole opening, the narrow glazing bars would be render the fuselage too unstable for subsequent work, and it would not be possible to glue the bars accurately to the formers.

The best tool for cutting out the window openings is a Proxxon (small hand-held electric drill) with cut-off disc.

Before the formers are installed, the wings should be offered up to the fuselage and the joiner sleeves glued in place. Start by drilling the front holes for the joiner system, as shown in the photo; the rear holes should be located 230 mm aft of the front ones. These locations ensure that the joiner sleeves are located exactly over formers (3) and (5). The wings must be fitted to the fuselage in order to check the position and alignment of the wings and joiner system: clear plenty of space, lay the assembled model down inverted, and then measure everything to check that the airframe is symmetrical.

Once you are confident that the joiner sleeves fit accurately, and the wings line up correctly, glue them to the holes in the fuselage using 5-minute epoxy.



Figs. 45 + 46

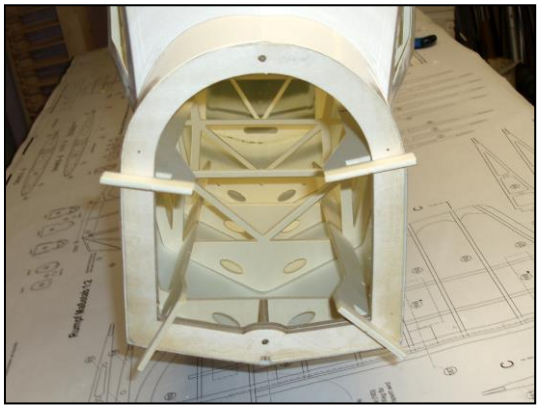
The joiner sleeves are glued permanently to the fuselage roof as part of the next stage of construction when you:

Install the formers

Note that the inside of the fuselage must be sanded thoroughly at every joint position to provide a mechanical "key" for the adhesive.

Fit the formers into the fuselage through one of the rear window openings (see pictures on the CD)

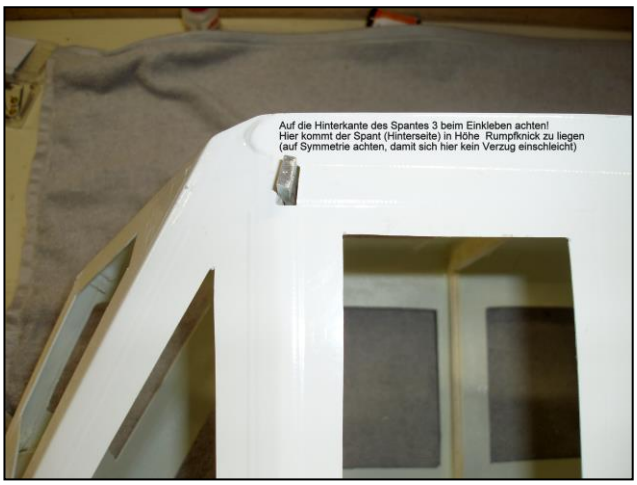
Figs. 47 + 48



Check that formers 1a, 2, 3, 4 and 5 are a snug fit at the appropriate points in the fuselage, then clamp them in place using the jig components (232 + 233). Press captive nuts into the front face of former 3 to accept the upper undercarriage bridge (219).

The jig components hold the formers securely in the correct position in the lower half of the fuselage, relative to the engine bulkhead. The formers can now be aligned in the upper cabin area, so that they coincide with the wing joiner sleeves.

The reference point here is the change in the fuselage angle at former 3: The rear edge of the former should be located very close to this point (see Fig. 49 on the right; the undercarriage bridge is already in place).

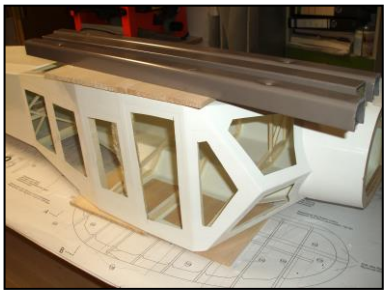


When you are confident that all the parts fit together correctly, tack the formers to the fuselage at a few points, and leave the adhesive to set hard overnight. The jig components can now be removed again.

At this stage the tacked parts can be permanently bonded to the fuselage in a single process. The fuselage should be weighted down while the epoxy is curing, to ensure that the glazing bars of the GRP fuselage make good contact with all the formers, and to obtain perfectly flat fuselage sides; however, don't apply too much weight in the area of the glazing bars (Fig. 52).

Leave the minimum of excess epoxy along the joints between the glazing bars and the formers, as space must be left for the glazing panels. It is a good idea to glue glass or carbon fibre rovings along the joints between formers and fuselage; this involves a little extra effort, but does add greatly to the strength of the fuselage. Thickened epoxy applied using a syringe is a simpler alternative (Fig. 51).



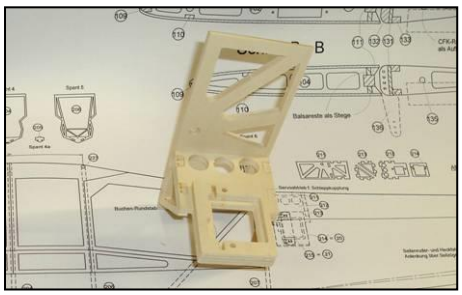


Figs. 50 - 52

On the following day the remaining formers 4a, 6, the servo plate (210) and - if required - the aero-tow mechanism (parts 211 – 214) can be trimmed to fit and epoxied in place one by one.

The method of servo mounting works just as well as it does in the wings. I prefer to use the old, proven Rödel aero-tow mechanism, even though it was originally intended for gliders.





Figs. 53 – 55

Hammer M4 captive nuts into the underside of the rear undercarriage mount / former 4a before gluing it in the fuselage. Use a band sander to taper the side surfaces towards the fuselage sides. Reinforce the joints between the top of former 4a and the fuselage with glass cloth and epoxy.

All the window openings can now be trimmed to final size. File the holes for the upper undercarriage bridge piece (219) to final size, and screw the bridge piece in place.

Trim the two diagonal 2 mm CFRP reinforcements (217) to fit between the engine bulkhead and the top of former 2, and glue them to the structure. The two small holes at the sides of the engine bulkhead are the starting point: drill holes from these points upwards diagonally towards the fuselage roof.

These braces are only for appearance; they have no load-bearing function.



Figs. 56 - 58

Trim the three beech dowel reinforcements (216) to fit as shown on the plan, and epoxy them in place.

6.2. Strut bridge

Mark the position of the slots for the strut bridge in the fuselage, and cut them out neatly. Place the bridge against the front of former 5, fit M4 x 14 socket-head screws from the rear, and fit self-locking nuts at the front to secure it.

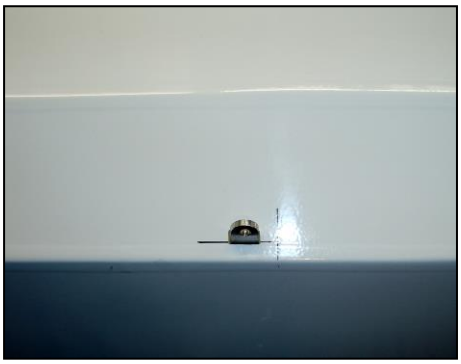


Fig. 59

6.3. Tailwheel unit

Mark the position of the tailwheel support former (208) and the front aluminium tailwheel bracket in the fuselage. File out the slots for the ends of the front aluminium bracket, epoxy the bracket in the fuselage, and laminate several layers of glass cloth over it for additional strength. If the sandwich (thicker) area of the fuselage extends this far, relieve it at this point, and also where the former fits. Cut a slot about 15 x 35 mm in size aft of the former to clear the tailwheel leg (Fig. 61).

Press two M4 captive nuts into the former to secure the tailwheel unit, and apply a drop of cyano to each. A rubber block acts as a shock absorber at the top, while the M4 thread in the block allows it to swivel.

Brass tubes are used to brace the tailwheel unit to the fuselage; squeeze both ends flat in a vice, bend the tubes slightly as shown, and drill the holes for the screws. The tailwheel former can be bonded into the fuselage once the long aluminium bracket has been screwed to the former, and the rubber shock absorber mounted at the top of the bracket.

Fig. 60

The steerable tailwheel and rudder are actuated by means of pull-cables. The (scale) openings at the tail through which the rudder control cables pass should now be cut out as shown on the plan.

You may wish to ask your wife or girlfriend for a little help in making the scale leather bellows ….

Fig. 61

Maintenance: the lower tailwheel bush takes the form of a machined aluminium part mounted between two O-rings. Please check the condition of the O-rings at regular intervals, and replace them when required; re-grease the bush at the same time.

6.4. Tailplane joiner system, tail post

The datum line is marked on the fuselage at the tailplane position. Cut 11 mm Ø holes for the GRP joiner sleeve, positioned 55 mm from the rear edge of the fuselage. The front 6 mm Ø holes are measured from these. This procedure produces a longitudinal dihedral of 2.5°. The tailplane joiner sleeves can now be trial-fitted.

Before the joiner sleeves are installed permanently, the model should be assembled completely - for the first time. This is also a good time to determine the final length of the wing struts; temporarily screw the strut brackets to ribs 10 to make this possible. You will probably need to shorten the struts by the 5 mm safety margin which we previously added. Set the dihedral to 0°, or a small positive amount; when correctly adjusted, the struts should be exactly the same length.

Once you are sure that the wings fit properly against the fuselage, and that the wing struts are the correct length and properly installed, you can trial-fit the tailplane panels: measure everything carefully, then tack the joiner sleeves to the fuselage using 5-minute epoxy. The two tailplane panels are held against the fuselage sides using rubber bands stretched between the screw-hooks (144) fitted to the root ribs. I also use this form of retainer when flying the model, as the rubber bands prevent the tailplane rattling against the fuselage.

Glue the strut bracket (218) in the fin, and add a balsa block for reinforcement. This produces a one-piece bridge between the tailplane panels passing through the fin, which cannot oscillate. Ensure that the lengths of studding are glued really securely to the tailplane struts, as the strut system forms a load-bearing part of the model.

This whole procedure is a little time-consuming, but when it is finished, several important stages in setting up the model are completed in a single process.

Dismantle the model again, and bond the tailplane joiner sleeves to the fuselage permanently using thickened epoxy.

Finally trim the tail post (209), complete with rudder, to fit in the fuselage, and glue it in place.

6.5. Undercarriage mounting

The main stainless steel undercarriage supports (250) are supplied with the joints already soldered; they are attached to the model at three points on each side:

1. Locate the clevis on the undercarriage support and attach it to the undercarriage bridge (219) at the top.

2. The second point is the front bottom corner of the fuselage: use a large round file to trim the fuselage to clear the tear-drop section tubes, as shown in the photo.

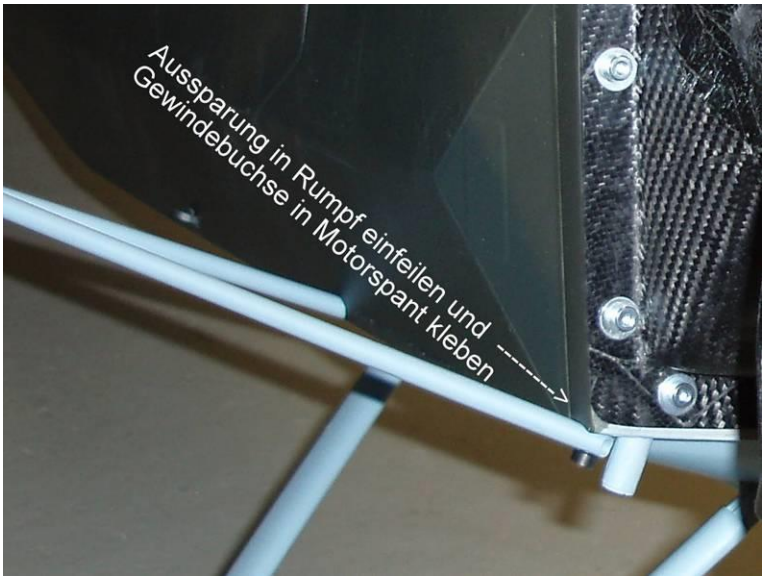


Fig. 62

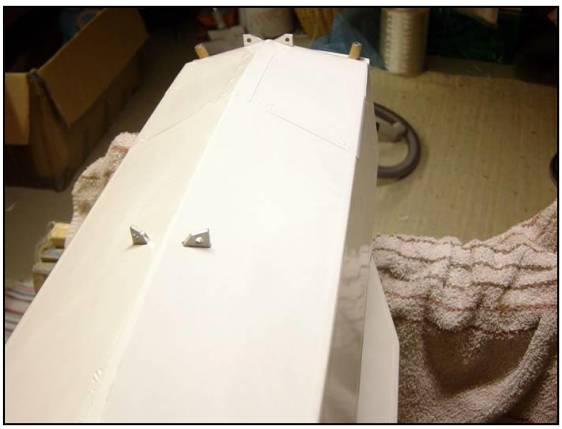
3. The rear undercarriage member is fixed to the fuselage a few millimetres aft of former 3. Drill holes in the fuselage at this point, a little way from the former, and glue the brass sleeves (227) to the former to accept the ends.

Screw the undercarriage supports to something using the screws (222), working from the inside of the fuselage. Drill holes for the M4 threaded sleeves (224) in the centre of the engine bulkhead; once the undercarriage has been trial-fitted, the sleeves are glued permanently in these holes (see also Fig. 62).

Check that it is possible to attach the undercarriage supports without placing anything under stress, and that the cowl fits over the undercarriage support tubes and into its proper position.

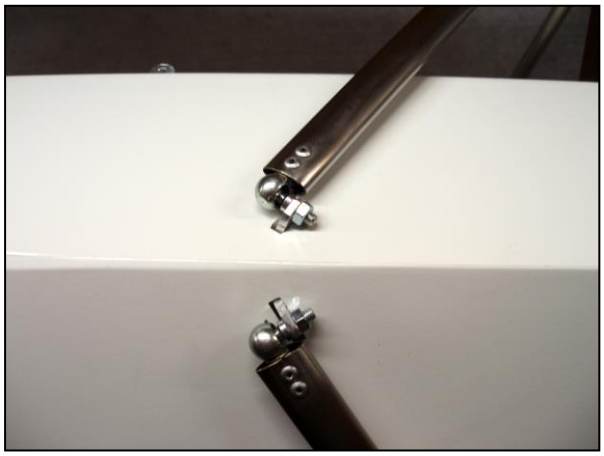
The front and rear brackets for the undercarriage struts are attached to formers 1a and 4a. Carefully cut slots for them in the fuselage, working from the inside.

Figs. 63 + 64



6.6. Undercarriage – assembly, maintenance

The undercarriage struts terminating in the ball-end bolts are screwed to the undercarriage fittings, with the rivets on the underside. Attach the top loop of the gas strut to the undercarriage support using a bolt and self-locking nut. Screw the struts together and to the bottom axle bracket using the ring-screw (Fig. 68).



Figs. 65 + 66

Figs. 67 + 68

At the final assembly stage please ensure that the connection between the various undercarriage components - as shown in Fig. 68 - is as secure as possible; I recommend fitting a shakeproof washer between each pair of components. Tighten everything as firmly as possible using the M6 x 22 screw and self-locking nut.

The correct toe-in angle is pre-defined by the ready-made components.

Screw the upper GRP fairing between the top loop and the gas strut cylinder. Align the fairings carefully fore-and-aft, cut a slot about 15 mm long at the ring-screw position, and fix them to the axle bracket using an M3 x 10 mm socket-head screw. The two fairing components should slide easily inside each other; the lower fairing is supplied slightly overlength, and can be shortened by a few centimetres at the top if necessary.

A supplementary compression spring and a rubber buffer are fitted over the piston rod.
This combination of /coil spring + gas strut provides the “characteristic Storch” undercarriage effect; the rubber buffer acts as a stop damper to cope with particularly adventurous landings - insofar as they are possible at all with a model of this type …


Fig. 69

7. Finishing, control surface travels, Centre of Gravity, Flying

My model is painted overall, using Profi-Cover (from Toni Clark - Practical Scale: www.toni-clark.com) as the basis. The servos are concealed un-der the covering. In the interests of scale appearance I have not fitted servo access hatches to my models for many years, and have never had cause to regret it.

If you opt for a camouflage scheme, no primer is required; primer only increases the model's weight unnecessarily, and in any case dark colours have excellent covering power. The only areas which require an even coat of primer (ideally white) are the wingtips and the fuselage band, both of which are signal yellow.

Coloured paints matching those used by the German RLM (Reichsluftfahrt-Minis-terium) can be obtained from www.tailormadedecals.com, who also supply clear lacquer. The paints are easy to apply, and the finishing lacquer, which is thinned 1 : 1 and light in weight, reliably produces an even matt finish over the whole model.

In terms of control surface travels I would recommend as much as possible on ele-vator, as this occasionally makes it possible to achieve the Storch's characteristic stalled descent in calm conditions. However, this travel is far too great for normal flying, so it should be tamed by applying around 30 - 40% Exponential.

I set up the ailerons for about 20° travel with around 50% differential, although this is not the maximum possible throw. The landing flaps work well when deployed to around 60 - 65° - a small amount of down-elevator needs to be mixed in.

Fig. 73 - First flight of the prototype (Fieseler Storch) on 08.04.2010

Centre of Gravity

Flight testing has shown the ideal Centre of Gravity to be around 41% (!) of the wing chord - 195 mm from the leading edge of the slat on former 4. This sounds too far aft, but is actually on the safe side! The machine should balance level with the fueltank empty. Since the slats have a more pronounced effect at high angles of attack, the model becomes less stable at extremely low speed if the CG is too far forward!

Flying

Please be aware, that the MS505 with the Moki 180 is very overpowered!
When I fly solo with the model, I reduce throttle to about 50%. Also for towing sailplanes with a weight of 10 to12 kg.
For towing sailplanes up to 25kg, it is sufficient to limit throttle to 80%.

Slow flying with less speed seems really scale with the MS505. For full speed flights it´s better to use a Bearcat or similar…☺

6.8. Glazing

With the finish applied, the RC system installed and the interior fittings completed, the final step is to fit the glazing panels using silicone adhesive. I used Wacker Elastosil E43, and obtained excellent, durable joints without sanding the glazing.

The arrangement of the glazing panels on the machine-cut sheet corresponds to the plan-view of the model; mark the panels before separating them from the sheet.

The glazing panels can now be trimmed to fit individually, and fixed around with magnets.

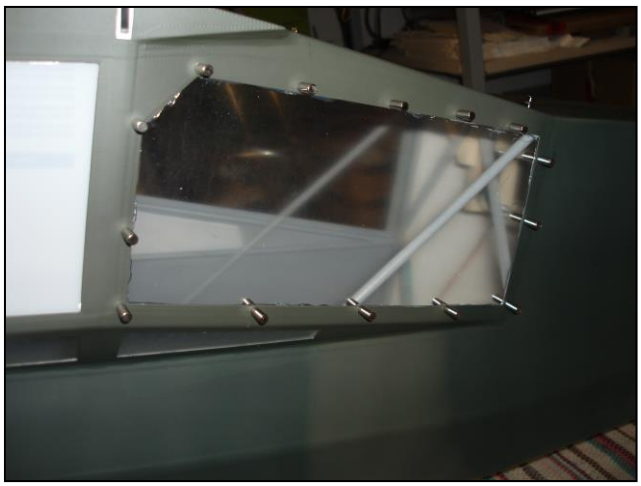


Fig. 74

The top two rear panels of my model are clamped in place by the dowel reinforcement (216), and can therefore be removed for access to the fuselage.

Please pay an occasional visit to www.storchschmiede.de, and check for updates to the building instructions in the Download area, where I will regularly include new information.

9. Specification - MS 505

Scale	1 : 4
Wingspan	356 cm
Fuselage length	348 cm
Wing chord	47.5 cm
Weight	min. 16 kg
Wing loading	approx. 95 g / dm^2
Engine	min. 100 cc radial
Long. dihedral	2.5°
C.G.	41% of wing chord, 195 mm aft of slat leading edge
Design	Alfred Brenzing
Internet	www.storchschmiede.de