Koolhoven F.K.49 and F.K.49A HA Models resin masters

Cartography and ambulance plane

Scale 1:72

This building report is slightly different from the usual ones; it addresses primarily the development of a master for a resin kit. The actual building report will be a separate document, addressing the building of the first (pre)production kit of the model.

Koolhoven F.K.49

First a bit of history of the original aircraft is presented. The Koolhoven F.K.49 has been developed on request of the Dutch Ordnance Survey (Topographische Dienst, TD) and the Air Service of the Dutch Army (Luchtvaartafdeling, LVA) and was operated by the LVA. The cooperation between the TD and the LVA existed already longer and for cartography and aerial photography a Fokker F.VIIa/3m or a Fokker C.IV of the LVA was used, for which only the direct operational cost was charged. The last one was not really fit for the task, the observer/photographer was sitting in open air and the available equipment was limited. The LVA used the first aircraft for other missions too -training, transport, bombing flights- so was badly available. The three-engine plane was also relatively expensive in operating. The Royal Dutch Airlines (KLM) had also an aircraft specifically equipped for cartography/aerial photography, the Fokker F.VIII PH-OTO, but this plane was commercially exploited, so even more expensive.

So an alternative was sought, which was less expensive to operate than these aircraft. When the Koolhoven F.K.48 appeared in 1934, a passenger aircraft accommodating six people and motorized by two De Havilland Gipsy Major engines of 135 horsepower, such an alternative seemed available. From the F.K.48 Koolhoven developed in 1934-1935 the F.K.49 equipped with an on-board dark room. The aircraft had dual controls, so it could also be used for training. It accommodated a crew of four, a pilot, a navigator or second pilot, a photographer and an assistant photographer. The aircraft with a very characteristic angular forward fuselage was bought by the LVA, made its first flight on September 22, 1935 and was registered as 950. It was used for reconnaissance and photography missions by the LVA and was operated against direct operational cost by the LVA for the Ordnance Survey for cartography missions. It has been scrapped after the German occupation of the Netherlands in 1940.

Koolhoven F.K.49A

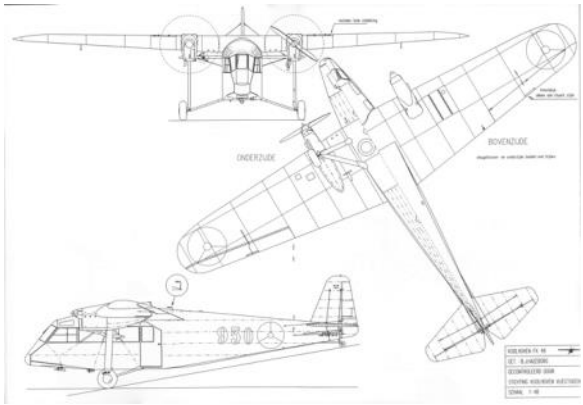
The F.K.49 has been developed in three versions with more powerful engines, which were assigned the designation F.K.49A. The first one was an aircraft for cartography and aerial photography for the Turkish Air Force with Ranger V-770 B-4 engines of 305 hp, the second one an ambulance aircraft for the Finnish Coast Guard with Hirth 508C engines of 285 hp, which could be equipped with a wheel or (EDO) float landing gear.

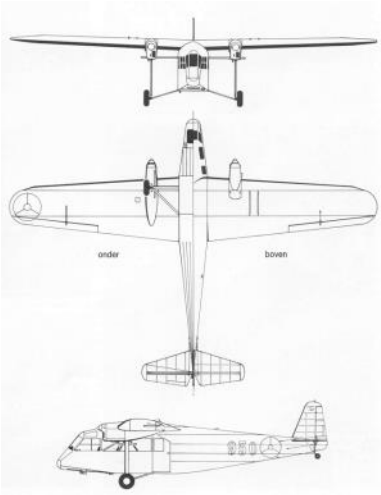
The third F.K.49A version, two aircraft with Argus AS-10-C engines of 200 hp, has been ordered by Rumania. They were. The first two F.K.49A's have been delivered to the customers, the last two, built according to the specification for the Turkish aircraft, were under construction, when the Koolhoven factory was destroyed during the German bombing in 1940 of the Waalhaven airport in Rotterdam. The Finnish aircraft made its first flight on November 3, 1939 and has

flown for some time in the Netherlands with floats and orange triangles under the military registration 1001 before it has been delivered to Finland in January 1940. Here a short movie of the F.K.49A can be found.

Drawings

Reference 5, written by Harry van der Meer and published by the now defunct Stichting Koolhoven Vliegtuigen (Foundation Koolhoven Aircraft), contains very good drawings of the F.K.49.





The book about Koolhoven written by Wesselink en Postma (ref. 6) also contains a three view drawing of the LVA F.K.49, which shows only minor differences with the drawings in ref. 5.

The main dimensions of the F.K.49A are the same as those of the F.K.49. However, there are a number of important differences between the two F.K.49A aircraft and the F.K.49 of the LVA. The facsimile edition of the Koolhoven Brochure of 1940, also published by the same Stichting Koolhoven Vliegtuigen, contains a small three view drawing of the F.K.49A. The drawing had insufficient detail to be used as a reference, but indicates the great differences between the two versions clearly.

From the Aviodrome Museum in Lelystad I have obtained with the help of Harry van der Meer two drawings, one with two options for the cabin arrangement dated April 1, 1939 and one undated three view drawing) of the Finnish aircraft, of which it is, however, not certain in how far they represent the actual realized configuration. A copy of the airworthiness certificate (CoA), dated December 20, 1939, confirms that the wheel version of the F.K.49A aircraft has been certified for a maximum occupation of five persons, a pilot, navigator/radio operator, a cabin attendant/nurse and two patients on stretchers[1]. I have reproduced all drawings on a 1:72 scale.

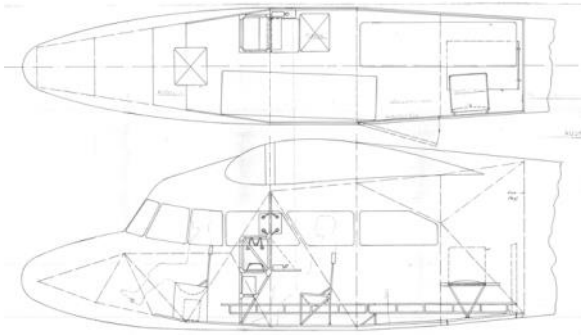
Differences between the versions

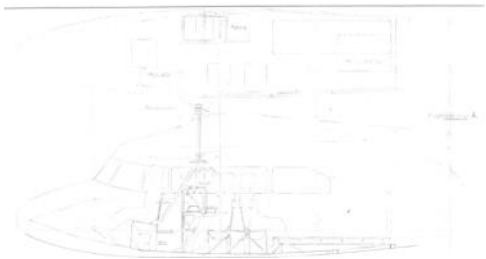
The F.K.49A versions, next to different engines, propellers, hence also nacelles and exhausts, a streamlined forward fuselage and a curved cockpit window frame, so the fairing between forward fuselage and wing is also different. The door of the Turkish aircraft has a wider window, the Finnish aircraft has two doors opposite to each other, which are hinged at the bottom and not at the side. Both doors have no windows, they serve as walkway. The Turkish plane has a large window in the underside of the nose for the pilot and a small, glazed nose, while the nose of the Finnish aircraft is closed and has a smaller window under the nose. The Finnish aircraft is reported to have had a large hatch in the underside of the aft fuselage to enable easy loading of stretchers[2]. The tail surfaces, rudder and elevator are larger than those of the F.K.49.

Also the cabin arrangement is different. The F.K.49A had a single pilot position and the pilot had a rather standard control column and a more usual instrument panel. As there was no second pilot position, the cabin could be arranged more efficiently. The Turkish aircraft had an on-board dark room as had the F.K.49 and accommodated a standard crew of four persons and the large cartography camera. Alternatively it could accommodate in addition to the pilot up to seven persons using folding seats[3].

In the Finnish aircraft (see the drawing of this “Configuration B” below, which I have inked anew) the radio operator/navigator was positioned at the right behind the pilot, so approximately at the same place where the second pilot/navigator was seated in the F.K.49. To the left of the radio operator there was room for a stretcher, as well as behind him.

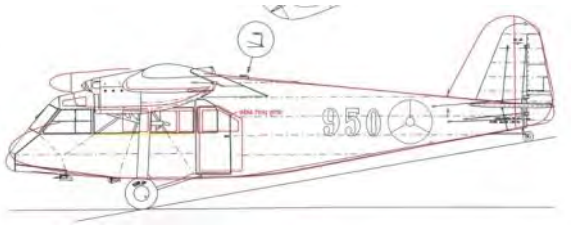
The text in ref. 5 mentions that in both cases a second stretcher could be accommodate above the first one, but this is not shown on the drawing, and the CoA would imply that in this case only the pilot would be present with the patients in the aircraft. In the appendix an analysis to establish the most likely configuration. The dark room has been deleted; part of the room has been used to provide space for the second stretcher and the cabin attendant.





"Configuration A" in this same drawing shows a cabin arrangement for pilot, navigator/radio operator and two other crew members plus one stretcher. A ring antenna is shown on the wing leading edge and the position of the navigator has been moved forward, leaving hardly room for the navigator to do his work. As there are no pictures of the Finnish plane with such an antenna, this probably is not the actually realized configuration.

One of the photographs shows an almost perfect side view of the Finnish F.K.49A. I have aligned this picture horizontally, enlarged it to 1/72 scale and drawn the outline of fuselage, fin, engine nacelle, door and windows in CorelDraw. Projecting this (red-lined) drawing on the side view of the F.K.49 shows that the aft fuselage of both versions is indeed identical, except may be the part at the tail surfaces, which seems to be shortened to accommodate the larger rudder.

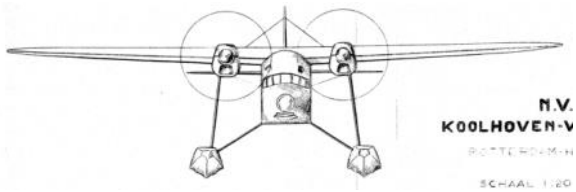


Although the cockpit windows are not visible on the photograph, they are probably located higher than at the LVA aircraft, while the cabin windows are less high. The doors of the Finnish aircraft are wider. I have reconstructed the "nominal" nacelle dimensions by taking the average of the left and right nacelle, as seen on the photograph.

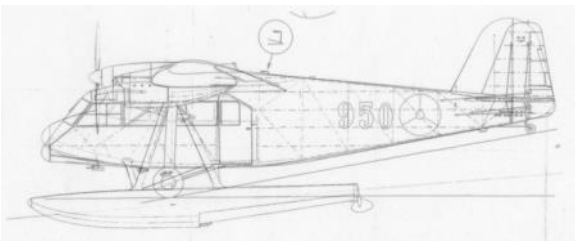
Projection of the outline on the side view of the Koolhoven drawing of the F.K.49A shows an almost perfect fit, with the exception of the window arrangement, the height of the windows and the propeller spinner. For these aspects I have considered the photographs as leading.

Also the coverage on the side view of the cabin arrangement is almost perfect, in this case also the cabin window arrangement.

The book *Van Brik tot Starfighter*, by Hugo Hooftman (ref. 2) contains a front view photograph of the float plane. I have enlarged this rather poor quality picture to 1/72 scale and have again produced an outline in CorelDraw, but the picture is not good enough to draw conclusions. The front view in the F.K.49A drawing is, however, very useful.



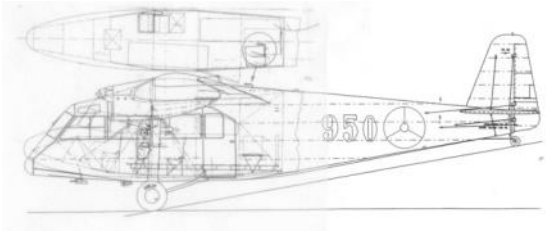
A last check is the fit between the different views of the F.K.49 and the F.K.49A, where I have printed these last ones on transparent paper. All views have been normalized to within 1% of the span.



Side view

Both side views have been aligned on the forward wing spar (the attachment point of the main undercarriage strut) and the height of the aft fuselage. The aft fuselage of the

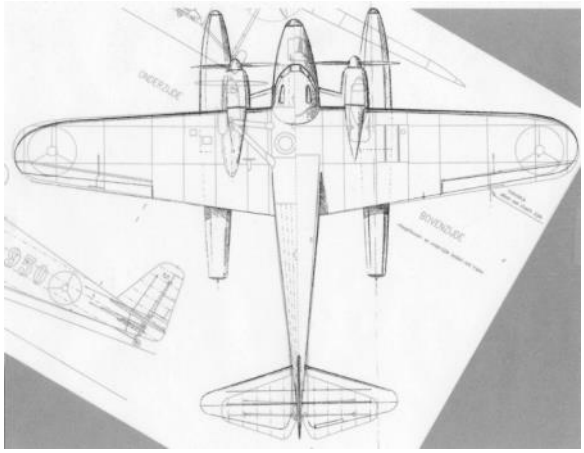
F.K.49A has been shortened relative to the F.K.49 to accommodate the larger rudder. The nose has been kept on the same length, the engines of the 49A are positioned farther before the wing leading edge and the wing chord seems a bit smaller. The door is wider and joins the first frame tube of the aft fuselage. Height of the cabin windows is smaller, height of the fuselage agrees well.



The match with the side view of the cabin arrangement shows a slightly less high fuselage under the wing. The wing chord agrees well. The folding seat for the medical assistant is located in the F.K.49 dark room.

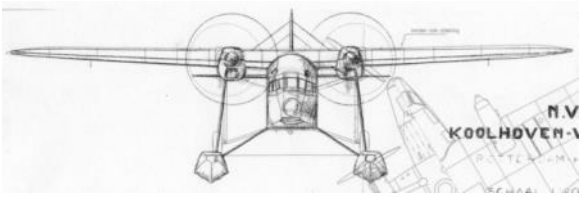
Top view

These views are aligned along the axial line of symmetry and the root wing chords. The first thing that can be noticed is the rotation of the wing. Careful measurements showed that this was a slight inaccuracy in the F.K.49 drawing, amplified by a small difference of the vertical and horizontal scale factors of the reduction from 1/48 to 1/72 scale. The tail surfaces of the F.K.49A are a quite a bit larger and have a differnet shape as those reproduced in the facsimile publication of the Koolhoven brochure (ref. 1). The engines of the 49A are located more in board than those of the 49. This seems unlikely, because it would have led to a new wing design, while in all references it is stated that the wings of all versions were identical. A comparison with the front view of the F.K.49A in ref. 2 indicates an identical engine position for both versions. Other dimensions of the two versions are rather consistent.

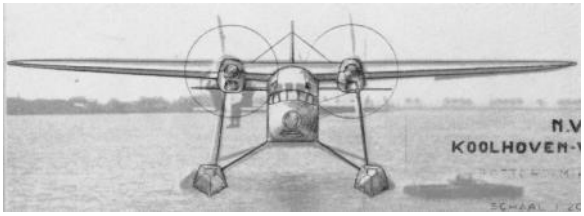


Front view

The front views have been aligned on the centre lines of the vertical and horizontal tail planes. Shape and width of the (maximum) fuselage cross section agree well; the fuselage height seems a bit smaller. Also the wing is slightly thinner. The engine location shows the same difference as in the top view. The larger propellers due to the more powerfull engines show up clearly.



A comparison with the photograph in the book of Hooftman (ref. 2) indicates that the location of the engines in the drawing is not correct.



Based on the advice of Harry van de Meer I have used the two original drawings as baseline for the F.K.49A with exception of the engine location. The cabin arrangement is that of the ambulance aircraft with pilot, navigator/radio operator, medical assistant and two stretchers. Where differences between F.K.49 and F.K.49A for parts that should be identical are significant, for example the engine location, shape and dimensions of the aft fuselage (with exception of the shortening for the F.K.49A) and the height of the fuselage, I have taken the F.K.49 drawing as baseline.

Consequences for resin kit

In principle the decision has been taken to produce a kit of the Dutch and Finnish version; it is not expected that there will be much demand for the Turkish version, which can anyhow be adapted rather easily from the Finnish version by the builder.

A number of parts is common to both versions: the aft fuselage (with exception of the rear wall with the dark room sliding door and the hatch in the floor of the ambulance plane) the wing, the wheel undercarriage, although there is some doubt about the tail wheel and possible a number of parts of the interior.

For the forward fuselage, the cabin walls, the engine nacelles and exhausts, the propellers and tail surfaces two different versions must be made. The most important difference is the forward fuselage, immediately followed by engine nacelles and propellers. A number of interior parts is also different, for example the control sticks, the instrument panel and (of course) the stretchers for the Finnish version.

The Dutch and Finnish version will be separate kits, with each between 50 and 60 parts. The floats will be a modification set for the Finnish kit with wheel undercarriage and is composed of 8 parts, but pending the additional cost they probably will be combined in one kit for the Finnish version

We are aiming for the production of 50 kits in total. The Dutch version will be issued first (target date first quarter of 2019), the Finnish will follow three months later. Distribution over the two versions will depend on demand. Estimated is that 30 kits will be made for the Dutch version and 20 for the Finnish version. Price is estimated to be in the range of 60 to 80 euro.

F.K.49 (LVA version, c/n 4901) main characteristics are:

	Ref.	*1:72*
Span	16.00 m	222.2 mm
Length	11.60 m	161.1 mm
Height	3.12 m	43.3 mm
Engine	Two De Havilland Gipsy Major I, 130 hp	
Crew/passengers	4	

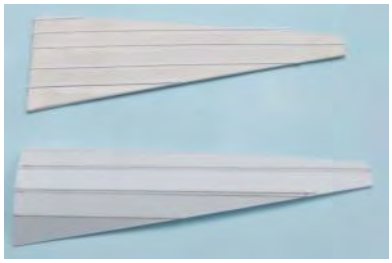
F.K.49A (Finnish version, c/n 4903) main characteristics are:

	Ref.	*1:72*
Span	16.00 m	222.2 mm
Length	11.80 m	163.9 mm
Height	3.18 m	44.2 mm
Engine	Two Hirth HM 508 inverted V8, 285 hp	
Crew/passengers	5	

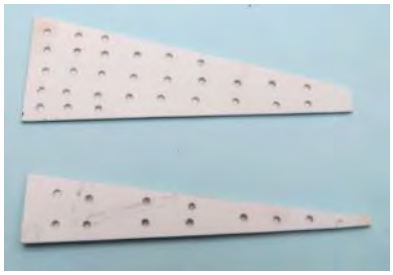
Note that the fuselage of the Finnish aircraft is 0.20 m (2.8 mm in 1/72 scale) longer.

Aft fuselage and fuselage bottom

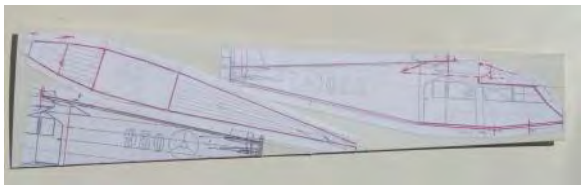
Several tests have been performed to produce the linen-over-stringers appearance of fuselage parts, where the objective was to find an acceptable compromise between likeliness and manufacturability. To simulate the tight linen on the side walls I have made a sidewall the same way I usually do for my scratch models. On a base of 1 mm styrene I have glued 0.3 x 0.5 mm strips on the place of the frame tubes and attached a skin made from 0.25 mm sheet, in which the “stringers” have been carved with a knife. This skin has been lightly bent to form the surface.



Normally I glue the skin to the base, but then air pockets would be formed, making the master incompatible with the vacuum during the mould production. To solve this problem I have drilled 2 mm holes in the substrate. The bottom surface of the rear fuselage I have made the same way. The surface had the right appearance, but the casting expert rejected this solution. In his opinion there still would be air pockets with risk on explosion, while the thin skin could be compressed during casting. Worst of all, the silicone material would run in the holes, making it impossible to remove the master without damaging the mould.



So I had to devise another method of modeling the outside surfaces. I have produced a second copy of bottom and wall and have at the same time made a rig, shown at the right of the picture, to assemble the floor panels under the right angles. I have cut out the lower surface panels and have reinforced the aft panel with a 2 x 4 mm strip, as it was rather

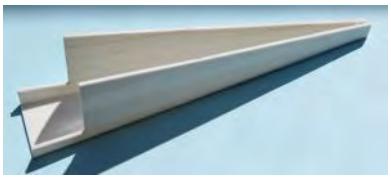


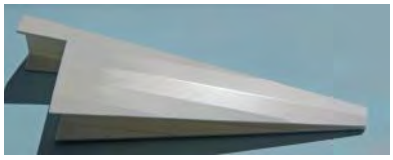
flexible and would not have kept has shape when used as a master.

Next I have tried a side wall where I glued 0.3 x 0.5 mm strips in engraved “stringers”, sanding them down by hand, hoping that this would give the desired effect, but the result was disappointing. I noticed, however, that it was possible to bend the wall towards the side where the engraved lines were, such that at the opposite side panels appeared between each fold.

The bottom panel I have modeled the same way I had done for my Fokker F.XX model: gluing strips of 0.5 x 1 mm on the surface and sanding these in a rounded shape at both sides, the front and the rear. Then the room between the strips has been filled with putty and sanded smooth, but preserving the stringer pattern. Finishing has been done with a couple of curved and round files to emphasize the taught linen surface. This worked reasonably well.

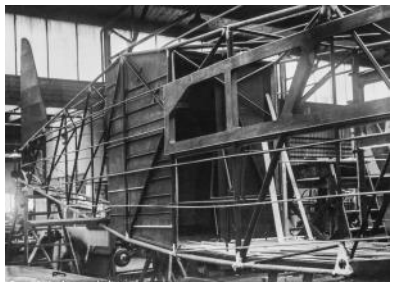
I have produced the two aft fuselage side walls and a top side from 1 mm plastic sheet. I have decided to let the aft fuselage into the wing behind the rear spar, so part of the wing has to be removed. Walls and top side have been glued together, and the facets of the sides showed up well. The engraved lines are clearly visible on the inside of the walls. I have also marked the location of the rear fuselage wall on sides and top.





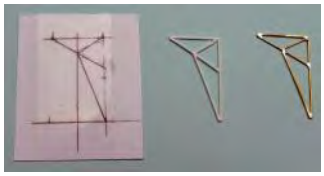
I have made the rear cabin wall from 1 mm thick styrene sheet and have made it fitting to the curved sidewalls. The curvature of the aft fuselage sidewalls is such that they are in the middle two millimeter wider than at top and bottom. As they will have to be joined to almost completely flat cabin sidewalls the width in the middle will have to be adjusted by sanding, which would remove possible all material. So I have added a strip at the front end fitting the wall curvature at one side and being straight at the other side. This way sanding the surface flush should be possible without compromising the structural integrity.

Via Harry van der Meer I have received a picture of the dark room of the F.K.49 from the Aviodrome museum. This shows clearly the ceiling of the room sloping down and the tubes surrounding it. Based on this picture I have shaped the clean room sliding door (clearly at the left) and luggage room above it. Remarkable is also, that the (wooden) window frame shows rather wide separations between the individual rear windows; only the forward tubes have no such cover.



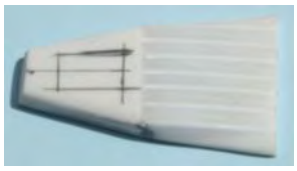
I have modelled the luggage hold above the dark room from 1 mm thick plastic. The shape follows the fuselage tube frame supporting the part of the wing behind the rear spar.

I have made the wall and the sliding door of the dark room from 0.5 mm sheet and have made them fitting between the two vertical posts against the aft fuselage walls. In front of the wall there run a number of fuselage frame tubes. I have taken the measures of the wall opening from the model, made a drawing, covered that with sellotape and built the frame over it from 0.5 mm styrene rod. However, I found the result not very sturdy and possibly too weak to serve as a master. So I have repeated the exercise with soldered brass rod of 0.5 mm diameter. I have also glued a handle and red light on the door.



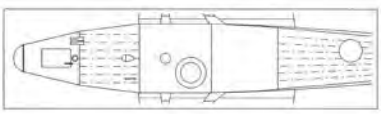
The bottom of the fuselage has been built up as one piece. To make the sturdy connection between the three parts I have made a doubler from 0.5 mm plastic, bent at the rear and front section, which will be glued on top of the bottom parts. The doubler is on both sides 0.5 mm smaller than

the bottom itself at the location of the cabin, 1.0 mm at the location of the aft fuselage. This way it provides a fitting surface for the cabin walls, which will be made from 0.5 mm plastic sheet, and the aft fuselage walls, which have been made from 1 mm sheet.



The nose section of the fuselage bottom has been doubled by a piece of 2 mm thick plastic, rounded at the sides. Again, this has to be faired to the plat fuselage bottom, and is covered the same way as the rear fuselage bottom. I have used the same technique here: making stringers from strip (this time 0.5 mm wide and 2 mm high), sanding them in the correct shape and filling the space between the stringers, this time with many layers of white glue. The white glue shrinks when drying, this way simulating the tight linen between the stringers. I have also drawn the window in the floor, drilled several holes in it and connected them with a knife.

Next I have glued the doubler to the three parts of the fuselage underside, using the jig produced from the side view to achieve the right angles and carefully aligning them. I have reinforced the joints between the three parts with thick cyanoacrylate glue. After a dry fit I have still made some minor adjustments to the areas where cabin walls and aft fuselage should be mounted.

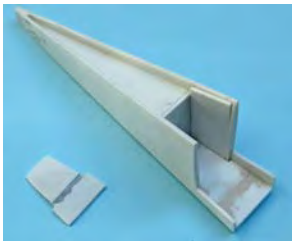


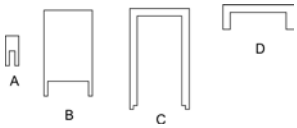
In the floor of the cabin there are two more windows, a small one for the drift measurement instrument and a large one for the bulky camera. I have measured their position from the drawing and drilled the holes in the floor. These windows will have to be closed, when using the part in the F.K.49A kit. Also the from part will have to be removed then, as well as the last 5 mm of the fuselage.

Finally I have dry fitted the four part together. After some small adjustments the parts fitted well, and these first four masters for the kit were finished.

There were still some details to be added to the aft fuselage and the fuselage bottom. On the top surface two small brackets are visible, both on the drawings and on the photographs. Their purpose is not clear, but I have nevertheless modeled them from 0.5 mm plastic sheet. On the forward bottom surface is a navigation light located, which I have made from a small piece of 1.5 mm thick sheet material. A small, circular 1.6 mm disc has been punched from 0.25 mm plastic and glued behind the rectangular window. Again its purpose is not clear.

When the tail surfaces had been finished, I have drilled 0.5 mm holes in the aft fuselage at the place where the pins of elevator halves and fin had to be placed. I have also drilled slanted holes for the control cables as indicated in the drawing. As the same aft fuselage will be used for F.K.49 and F.K.49A this means that six holes have been drilled. The left and right tail surfaces are not exchangeable, as the pins are in different locations.





The fuselage gave some production problems. The large triangular shaped inner part of the mould would move during casting and cause air bubbles and thin spots in the 1 mm thick walls. Hence the master has been modified by gluing a piece of plastic 4 millimetres from the lower edge until the aft cabin wall and filling the cavity with plaster, yielding cross sections from tail to front as drawn at the right.

The cavity has been closed with an adjusted rear cabin wall at cross section B. The walls of the dark room have been doubled with a piece of 1mm thick styrene bent in

the same shape as the original walls and the ceiling has been doubled as well. I have adapted the dimensions of the bottom of the luggage hold of the F.K.49 to the new dimensions. The master in this configuration functioned well in casting.

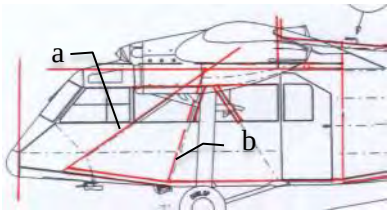
Cockpit and cabin

F.K.49

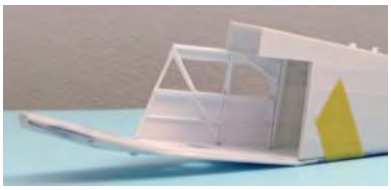
The F.K.49 cabin walls followed the steel tube fuselage frame rather strictly, showing up as sharp “bends” on the outside. This makes it a bit difficult to model them from one flat piece of sheet material and dictated the way the walls have been split up in parts. Also, it is not very clear were separations between the windows were present.

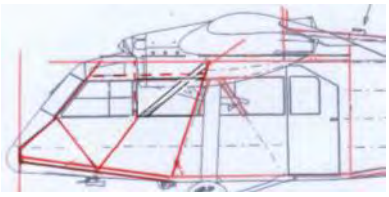
The picture of the dark room gives some information about the design of the rear part of the wall. The vertical and forward downward sloping tube are not covered by a wooden window separation. On the picture at the right there seems to be a separation between the widows above and below the frame tube running from top left to bottom right, but it is less wide than the separation in the rear part. The wall shows a sharp bend at the place close to the forward vertical window separation, which is confirmed by the floor plan, as reflected in the fuselage bottom part.

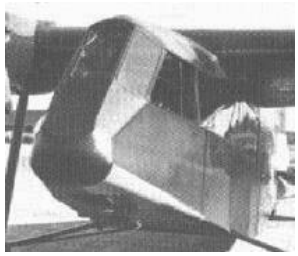
The weak bend along the vertical in the aft part of the cabin wall can be accommodated in a slight bend of that styrene part of wall. It hardly shows up in the pictures, anyhow. Another weak bend follows the tube running from top left to bottom right as shown in the photograph at the right. This bend may be accommodated in the forward part of the side wall. This is the red line **a** in the drawing below.



So I have decided to build up the side wall in two parts, separated along the line **b**, as indicated in red on the picture. I have glued a copy of this drawing and of its mirror image on 0.5 mm styrene sheet and cut both cabin walls out. After a dry fit on fuselage bottom and aft part I have adjusted the dimensions. The bends in the walls I have made by carving the back side lightly with a panel line scriber at the place of the tubes. That way they can be easily bent. I have detailed the inner side of the cabin walls with some strips and with 0.5 and 0.7 mm rod, representing the fuselage frame tubes and I have doubled the door to make it a bit more stiff. On the forward side of the wall I have glued the rod only half on this part of the side wall; this way it can serve as gluing surface for the forward cabin side wall. Under the windows I have glued a 1 x 1 mm strip, representing the window sill and the cables and rods running under it. The wall is fitting well to the rear fuselage part.

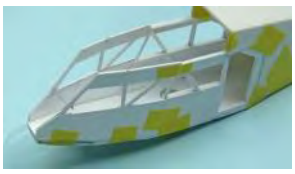




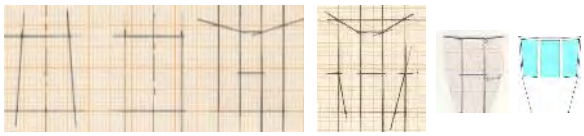


I have modified the configuration of the fuselage tubes in the forward part of the cabin a bit. This seemed to me to reflect the actual configuration better and, may be more important, made the modelling also simpler. Again, I have carved the back side of the wall at the place of the tubing to bend the wall panel. I had to find the correct fitting to fuselage bottom and aft cabin wall trial and error; the drawing was not accurate enough.

When the walls were fitting well I have cut out the windows. Also here I had to correct the configuration a bit to ensure that all windows were well aligned. I did not finalize the top of the walls, I want to do that only when the wing is available. Most likely the top will be cut off at the dotted line at the underside of the windows in the cockpit roof.

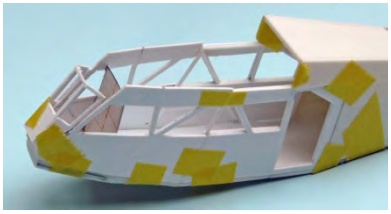


On first view the nose section seemed rather complicated, but after detailed examination of photographs and drawing it appeared to be made up by three flat panels, assembled under an angle to each other. This could be reproduced, but the exact configuration had to be determined trial-and-error. I have first measured from the drawing and the model the width of the fuselage at the location of the first bend in the forward fuselage, as this determines width and fit of the windshield and nose section and has to be kept in the correct configuration when fitting the windshield. And I have measured the windshield/nose dimensions from the drawing and have converted these in a flat drawing. I was not sure of the width at the top width, so I made two templates, one tapered at the top, the other one rectangular. Templates and first version of the windshield are shown at the left of the picture. I have printed these shapes on carton and have cut them out.

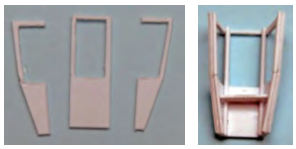


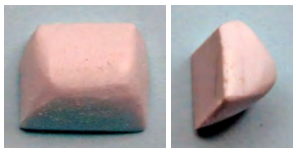
When fitting the templates in the fuselage, the tapered one resulted in the right fuselage shape. To keep it in place I had to temporarily fix the template with Kristal Klear. Fitting the windshield led to some modifications, which I have drawn again, printed on carton and fitted on the fuselage. Again some modification was needed, before a satisfactory fit could be achieved.

Next I have copied that last version of the front panel on graph paper in CorelDRAW, redrawn it and placed the windows in it, checking carefully for symmetry, and have glued a print on paper on 0.25 and 0.5 mm thich styrene sheet. For a last check on the size and fitting I have cut out the 0.25 mm copy, bent it and fitted it on the fuselage.



Feasibility being shown, I have cut the 0.5 mm thick copy, which is the thinnest material fit to serve as a master. However, as it is impossible to bend the 0.5 mm wide window styles, which are 0.5 mm thick, I have built the front panel up from three parts. After gluing the three parts together and dry fitting it to the fuselage to determine the correct angles, I have glued 0.5 mm rods and a small shelf to the inner side. The final product fits sufficiently well on the fuselage. The small nose I have made from three pieces of 1.5 mm thick styrene glued on each other. It has been sanded to the final shape by trial and error. I have made a small jig to keep the forward sidewalls on the correct distance, when gluing the front panel in place.

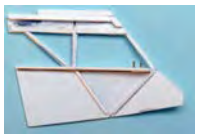




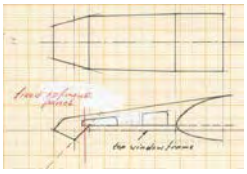
As the cabin roof of the F.K.49 was streamlined and contained four windows, that part could not be made from resin (transparent resin is anyhow notoriously crude and badly transparent), so it has been made in vacform. For this a master has been produced. The lower edge of the roof under the windows is part of the cabin side walls. Final fit of walls and cockpit roof could only be made when the wing was ready.

Fitting the wing still made some minor adjustment of the top of the forward sidewall necessary. A dry fit of the front panel showed that the model got the right appearance. It also showed that the sloped surface of the nose was slightly too far forward; this had to be corrected. Placing the small jig for the fuselage width gave the reference for the production of the master for the cockpit.

As the cockpit roof starts immediately at the upper edge of the windows, I have glued pieces of 1 x 1 mm strip at the top of the forward fuselage walls, so I can round the edges to form the lower edge of the roof. I have also mounted some pieces of 0.2 mm brass wire on the left window sill to model the throttle handles.

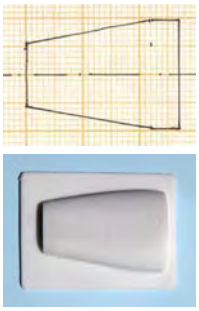


I have measured the model and have drawn the scale 2:1 a “plan” for the cockpit roof. This has been reduced 50% to serve as a template for the master for the mould for the vacform cockpit roof. I have glued two pieces of 2 mm and one each of 1.5 and 1.0 mm thick styrene sheet on each other and have glued the template on top. I have first cut and sanded it from this piece according to the top view. I have decided to separate the forward part from the aft part and glue that directly to the front panel; this makes both the interface and the transparent roof simpler. I have neglected the cut out for the wing leading edge; I will indicate that on the resin master with pieces of thin plastic sheet to guide the modeller, when cutting the roof from the clear plastic vacform part.

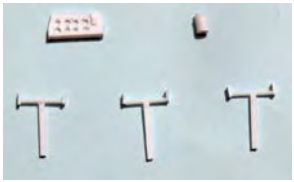


I have separated the front part, sanded it roughly in the correct thickness and shape and have glued it to the front panel. After reworking it a bit it fitted well to the forward side walls. I have also produced from a piece of 0.5 mm sheet material the overhead instrument panel and have mounted it in a recess in the front part of the cockpit roof. As can be seen from the photograph there were two instrument dials and a number of switches or valves located on it.

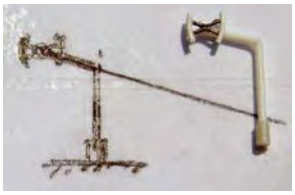
When I had sanded the aft part of the cockpit roof, I noticed I had made a big error in its dimensions; I should have had at least some kind of black out. The forward part was correct, but the rear part should have a width of 19 mm, the same as the fuselage. So I have drawn a new template, made a new pile of plastic sheet and have redone the sawing and sanding. Fitting the new part on the F.K.49 fuselage gave the right appearance. I have glued the roof on a piece of 1 mm plastic sheet, the master for a couple of resin copies which will serve as mould for the vacform cockpit roof.



For the controls I have taken the measures from the drawings in ref. 5. I have produced the rudder bars from pieces of 0.5 mm rod, 0.25 mm sheet and some strip. The instrument panel has been made from a piece of 0.5 mm sheet in which I have drilled holes to represent the instrument dials. This has been bent along a horizontal cut and backed with a piece of 0.25 mm sheet. The compass is made from pieces of 2 and 1.2 mm rod glued on each other.



I found a couple of nice picture of the control column, even one in which Frits Koolhoven is inspecting that piece of equipment. I have made a drawing of the control column based on the dimensions measured from the drawing in ref. 5. The steering wheel is very narrow (3.5 mm). I have produced the spokes from 0.4 mm brass wire, bent and soldered together. The xxx has been made form 0.5 mm plastic bent around a tube and cut into the required length. The column itself is made of 0.8 mm rod, the bottom is a 0.8 x 1.2 mm piece of tube. It was quite a job to assemble it, and I hope it will pass the check for manufacturability.



The equipment for cartography in the cabin comprises a drift meter, drawn as a simple cylinder without a description of details, a console, also without details and description and a camera. This last one is drawn in detail and in ref. 5 a good photograph is included.

It was clear that the camera could not be modelled as one part; it would have been impossible to make a resin copy of it. So I have modelled it in three parts. The base is made up from three parts of 0.5 mm sheet and some pieces of 0.8 mm rod and the mechanism is made from 0,5 mm sheet and 1 mm square strip. The camera has been cut from a solid piece of styrene, the optics a piece of RC Bowden cable and the rotation axle from 1.5 mm rod. I have made a decal for the top surface. In a second attempt I have attached thinner legs to the supporting frame, allowing the builder to vary the angle under which the camera is placed.

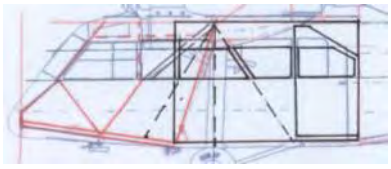
Also the folding seats could not be made from one piece, so I have made the V-shaped legs from 0.5 mm rod. The seats themselves are made of 1 mm styrene sheet, decorated with grooves.

The pilot seat had a tube frame to support it according to the drawing in ref. 5, so the master could not be made in one piece. I have made the seat bottom again from 1 mm plastic, the back from 0.5 mm sheet. The legs are made from pieces of 0.5 mm rod.

The seat of the navigator/second pilot is placed on a cabinet, probably accommodating the battery. I have made the cabinet from pieces of styrene sheet glued on top of each other.

To place the elements on cockpit and cabin floor I have glued squares of 0.25 mm plastic on the locations of the seats and the camera base and have made superficial holes for rudder bar and control column. I have glued small notches on the inside of the aft side walls at the intended location of the folding seats, which have to be mounted on top of the horizontal stringer.

F.K.49A



The cabin side walls of the Finnish F.K.49A have been constructed the same way as those for the F.K.49, but according to the drawings the configuration of the fuselage tubes, the windows and the doors is slightly different. I have drawn them in a copy of the F.K.49 drawing, as the walls have to fit on the same bottom and aft fuselage.

The original drawings show windows in the doors. However, these are missing in the photographs. The doors on both sides were hinged at the bottom, serving at a gangway to enter the plane. On two photographs there is evidence of horizontal enforcements on the outside and steps on the inside. This is clearly illustrated in the photographs of the aircraft. So I have modified the doors accordingly by carving horizontal lines on the interior, bending the doors slightly and gluing steps made from a tapered strip on the inside.

I have cut the cabin wall to size and fitting to the aft fuselage. The inside of the wall has been finished the same way as for the F.K.49

with rods of 0.8 and 0.5 mm and strip of 1 x 0.5 mm. Again, the lower edge of the wall has been kept free to provide a gluing surface to the bottom.

The forward part of the bottom must be cut off when building a F.K.49A, as well as 5 mm of the rear fuselage end and the holes in the bottom must be closed. The commonality between the two models could ensure a lower cost, but this also depends of the number of kits produced[4].

In its current state the master has been used as an interface template for the F.K.49A forward fuselage. To model this part I have first printed copies of the top, side and front view drawings on carton. I have cut out the side view and top views on the nose level and the level under and above the cockpit windows. I have cut the top views on the line of symmetry and glued them on the side view. The assembly has been completed with the from view and fitted to the aft fuselage, F.K.49A side walls and fuselage bottom. This showed a good correspondence in length and cabin and cockpit window alignment.

I have repeated the process with paper copies of the drawings glued on 1 mm (side view and top and bottom top view) and 0.5 mm (top view under the cockpit windows) plastic sheet, taking into account the thickness of the material. The 0.5 mm copies have been produced twice; the forward fuselage master will be cut in two on this level, the lower part to serve as a basis for the resin nose section, the upper part as a mould for the vacform cockpit windshield and roof. The pieces have been cut out and glued on the side view, and the connections reinforced with pieces of strip.

I have filled the room between the plastic parts with Milliput putty, a rather dirty job. After the material had hardened, I have cut and sanded the nose section in the correct shape and have fitted it to a side wall. The top forward corner of the side wall had to be bent a little bit more inwards to get a good fit; the remainder can be sanded off when assembling the model.

I have also engraved lines in the nose where the steel tube “stiffeners” are located, four in each quarter circle as far as I could derive from the photographs (they are not indicated in the drawings).

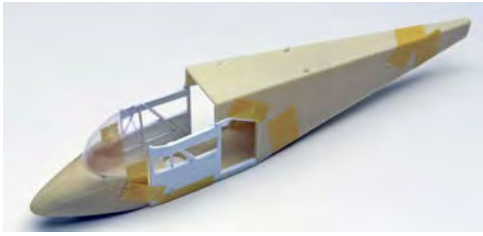
The next job was to separate the windshield-cockpit roof part from the nose section. I have marked a beginning of the exterior of the cut between the two layers of 0.5 mm styrene sheet with a razor blade saw and have completed the separation with the good old jigsaw. This worked reasonably well; only on the forward part of the top section I missed the separation plane, but the damage to the Milliput filling was only marginal.

I have removed the plastic sheeting from both parts. That was relatively easy, because Milliput hardly adheres to a smooth styrene surface. After cleaning and sanding the surfaces I have covered them again with 0.5 mm sheet to arrive at the correct height of both parts. The excess plastic at the edges has been removed and were finished with putty.

After making it fit on the fuselage and against the wing leading edge, I have glued the cockpit part to a piece of plastic sheet to serve as master for the resin copies I will use to produce the clear plastic vacform parts.

Also for the F.K.49A walls a last fit with the wing has been made. After a minor correction of the height and front end of the sidewalls, a satisfactory fit was achieved. The top of the sidewalls has been reinforced with a piece of

0.5 mm styrene rod. Of course the forward part of the fuselage bottom should be ignored; one of the first production copies of that component will be used to produce a custom made master for the F.K.49A.



On receiving the first resin copies of the F.K.49 fuselage bottom part I have removed the forward part of one of them and dry-fitted it with the side walls, nose, canopy and wing of the F.K.49A. Only two minor adjustments were necessary: the upper forward corners of the side walls needed to be bent a bit more inwards to fit the cockpit roof well and the interface of the cockpit roof itself with the wing needed to be adjusted to fit the wing leading edge. The adjustment of the walls was simple; the thin styrene let itself form quite easily.

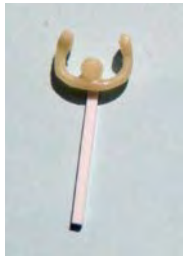
When the F.K.49A wing-engine assembly in its final configuration became available, a dry fit showed that the wing angle of incidence was too small, almost negative, and that the upper wing surface was slightly lower than the top surface of the rear fuselage. I have corrected that by gluing a strip to the top edge of the cabin walls, 0.5 mm high at the rear and 1 mm high at the front.

I have filled the big hole in the shortened F.K.49 fuselage floor with a styrene plug cut according to the template for the camera window, also a test whether this template had the correct size (it had). The small hole for the drift meter has been closed with pieces of tube and rod.

Next I have removed the original markings for seats and camera mount on the floor, repaired damage with putty and sanded everything well. I have cut two 5 x 5 mm squares from 0.13 mm sheet and glued them on the location of pilot and radio operator seats according to the detailed cabin drawing. I have also drilled two 0.5 mm holes on the place where the radio rack frame must be attached to the floor. Although it is doubtful, that the access hatch actually was present in the Finnish F.K.49A, I have engraved its limits on both sides of the floor.

On the port wall of the aft fuselage I have glued two pieces of 1 x 1 mm strip to represent the hinges for the folding seat of the nurse.

The rudder bar of the F.K.49A is the same as that of the F.K.49 but the control column is quite different; it has a more modern form. I have constructed it from a resin part in my spare box and a piece of strip. The picture also shows that in the floor in front of the rudder bar a window was present.



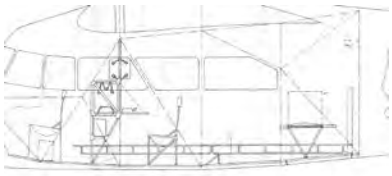
Two individually suspended engine instruments were present between the two parts of the instrument panel. Ref. 19 also contains a more detailed picture of the panel itself. The instrument panel has to fit in the nose behind the middle window and the two windows next to it. The nose is there 9.5 mm wide. I have scaled both pictures of the instrument panel to this width and have assembled them to one picture in CorelDraw.

I have glued a printed copy of the drawing on a piece of 0.4 mm plastic and transferred the place of the dials on the print with a sharp pin to the plastic. Next I have cut the instrument panel out; the picture illustrates its small

size relative to a coin of 10 eurocent.

I have drilled holes at the place of the pin pricks. First I have used a 0.6 mm drill, but that deformed the panel too much, so I have switched to a 0.5 mm drill. Gluing a piece of 0.22 mm styrene sheet to the back completed the instrument panel master. In ref. 19 mentions in the text an additional instrument panel is mentioned, mounted to the cockpit ceiling and carrying mainly engine instruments, but it is not visible on any picture. I have made a small panel in the same way as the big one.

Although none of the pictures shows a compass, it is unlikely that the aircraft was not equipped with it, so I have made one with a piece of 1.0 mm rod glued on a larger piece of 1.2 mm rod, placed on a small square piece of 0.5 mm sheet material.

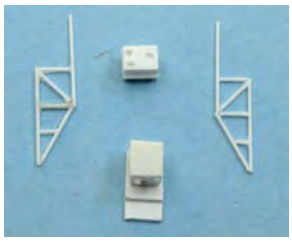


I have constructed the seats for the F.K.49A the same way as for the F.K.49, but the actual configuration is slightly different. In this case the battery is placed in a cabinet under the seat of the pilot and the seat of the radio operator is mounted on a steel tube frame. Also the dimensions of the seats themselves are different; I have copied them from the cabin drawing. The seat bottom is again made from 1 mm styrene, the backrest from 0.5 mm sheet and the frame, constructed over the side view of the drawing, is made from 0.5 mm rod. The folding seat and its legs for the nurse has been made the same way as that for the F.K.49.

I have made the stretchers from 0.5 mm sheet material and two frames of 0.5 mm rod. The frames have again been constructed over a plasticised copy of the side view cabin drawing. On advice of the moulding company the top surface has been doubled with a piece of 0.25 mm sheet material.

However, the masters were difficult to reproduce; many air bubbles were present, and the masters did not survive the production of the moulds. So I have made new masters, separating the bed section and the support frames. The bed section has been made from 1 mm styrene sheet. I have made two versions for the frames, one made from 0.64 mm styrene rod, the other made from 0.5 mm brass rod. Also, the two frames have been joined together forming a more solid assembly. The modeller can easily cut the resin part to obtain the two frames. It was the choice of the moulding company which master to use.

The two side frames of the radio rack have been constructed over a copy of the cabin arrangement drawing from 0.5 mm plastic rod. The radio operator desk has been made from 0.5 mm plastic sheet, the radio equipment components from pieces of plastic sheet glued together and sawed and sanded to the required size. Dials and knobs have been improvised and modelled by drilled holes and slices of plastic rod. I have not modelled the suspension cords on the master. This completed the cabin and cockpit interior.



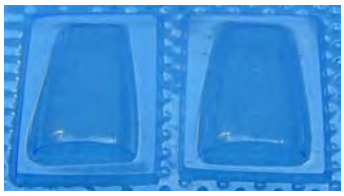
Vacform cockpit/cabin roof

I have drilled 0.6 mm holes in the masters for the vacform cockpit/cabin roofs to allow the air to escape easier, of course only in those parts of the roof, where no windows would be present. I have performed a test with several materials: from left to right 0.2 mm thick plastic document cover, taken from old reports, 0.3 mm newly bought document cover material and 0.5 mm thick Vivak, a heat-deformable polyester. The first and the last I have tried once already in producing the observer “bathtub” for the Fokker G.IA. Vivak has the tendency to form air or water vapour bells in the material and resulted in a rather stiff product, difficult to adapt in shape.

The vacform machine handles pieces of plastic of 125 x 125 mm. They are clamped in a frame by means of the brass button. The master form is put on the perforated platform and the frame is brought up under the heating

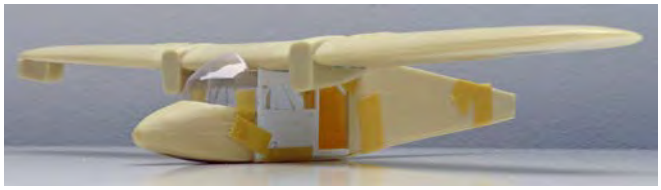
element in the rounded top part by means of the handle with the red end. When the plastic is starting to hang down a bit, the vacuum engine is switched on, followed by immediate lowering of the frame and switching off the heater. When the shape has formed, the vacuum engine is switched off, and after a cooling period the plastic is removed from the frame and the master form is removed from the plastic.

I have first tried to form a F.K.49 cockpit roof in the 0.2 mm thick plastic. This did not work; the plastic was too thin to clamp in the frame of the vacform machine. A second try with the 0.3 mm document cover sheet was successful; it was even possible to form two roofs at the same time. Also the F.K.49A roof could be formed successfully from this plastic. No air bubbles were present, as happened during earlier tests. I did not try to use the 0.5 mm Vivak material for this model[5], as the roofs probably need some flexibility to fit them nicely on the fuselages.

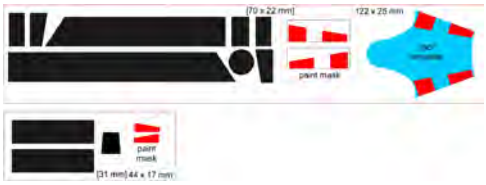


I have removed the cockpit roofs from the plastic sheet and have cut them to the correct size. This worked well for the roof of the F.K.49; first taking the base of and then freeing the two ends. The thickness of the plastic was 0.2 mm and the stiffness was just right. A full dry fit can only be done, when I have received the prototype kit. The roof of the F.K.49A was very flexible after removing the base and appeared to be only 0.1 mm thick, as the extension of the plastic sheet for this configuration is quite large. This was too thin to handle it easy; it is probably better to use the 0.5 mm Vivak for this canopy. The fit to the nose section was quite all right. So for the series production of the F.K.49 I will use the 0.3 mm plastic and for the F.K.49A the 0.5 mm Vivak will be selected and sets of three copies of the F.K.49A canopies will be produced in one run.

Production of the F.K.49A canopies did not pose any problems. However, production of the F.K.49 canopies yielded many malformed items; the vacform machine did not clamp 0.25 millimetre thick plastic well. Also, the angles were not very sharp, so after a while I decided to use also the 0.5 mm Vivak for it. P:roduction continued until the Vival was finished and new material had to be ordered.



A dry fit of the fuselage, canopy and a wing of the F.K.49 showed that the interface of the canopy with the wing still had to be adjusted, which corresponds to the overlap between the canopy and the wing as shown in the drawings.

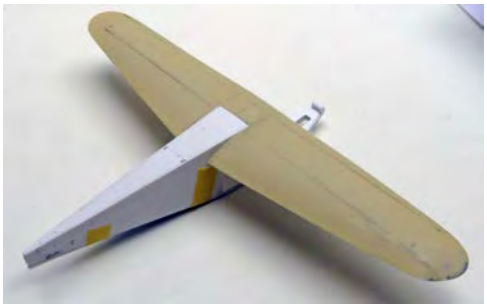


I have produced templates in CorelDraw for the cabin windows for both versions and for the cockpit roof of the F.K.49 and paint masks for the roof windows of both versions. The roof template is drawn from a scan of the carton trial-and-error template I had used to engrave the boundaries on the F.K.49 vacform master.

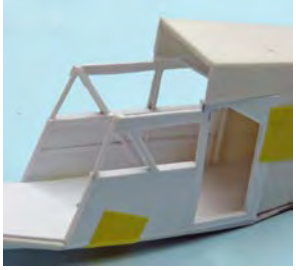
Wing

A wooden model of the wing has been made by JohnH as master for six copies, of which two have been detailed to serve as final masters. The first copy has been used for the F.K.49 master production, the second has served as a template to produce the engine nacelles of the F.K.49A.

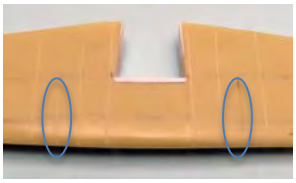
I have cleaned the wing and have copied the interface with the aft fuselage as shown in the drawing on it. I have also drawn the position of the front and rear spar on it.



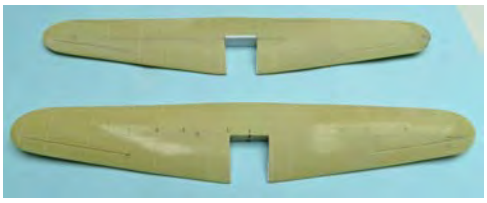
With saw, knife, file and sanding tools I have made the cut-out, trial and error fitting wing and fuselage together. A dry fit showed that the cut-out was quite correct; it reflected the drawing well. The luggage compartment ended up on the right spot. To align the frame tubes of the sidewalls well with the spars I had to glue a piece of 1.5 mm thick plastic in the bottom of the cut-out. Another thing to be corrected was a small gap between the wing trailing edge and the aft fuselage. I achieved that by gluing pieces of thin sheet material to the wing and sanding these until fitting well.



The forward part of the side wall s had to be lowered to fit the wing well on the fuselage. This could be done without compromising the integrety of the walls. The height of the forward fuselage side panels had to be corrected also and had to be matched to the wing leading edge. I have reinforced the top of the sidewalls by gluing 0.5 mm frame tubes along the edges.



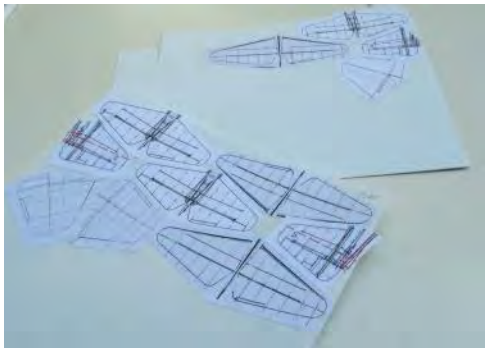
I have again measured the position of the panel lines along the wing spars and have engraved them in the wing surface. I have also measured the location of the cross span panel lines and have indicated them on the upper and lower wing surface, making sure that they aligned well. I have also indicated the engine nacelle centre lines.



The wing of the F.K.49A has the same dimensions as that of the F.K.49, so I have made a second copy. I have engraved the aileron outlines in the wing, deeper than the panel lines. Not separating them from the wing reduces the cost of moulds and parts. The damage to the wing tips caused by air bubble and the engraving has been repaired later.

Fuselage frame tubes in the cabin between forward and rear wing spar have been modelled on the wing lower surface with 0.65 mm styrene rod. This was not only for aesthetics, but also has a functional use: It kept the aft side walls on the right distance from each other, possibly eliminating the need to use the jig to keep the forward fuselage walls on the correct distance, when assembling the front wall.

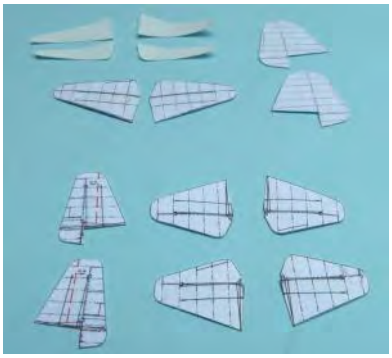
Tail surfaces



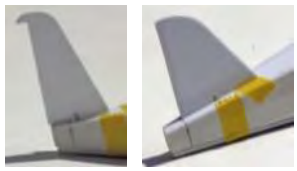
To build the tail surfaces I have used the same method as I had done for the fin of the Koolhoven F.K.43 and the Fokker D.XIII and F.XX: a core of (this time) 0.5 mm thick and face sheets of 0.25 mm thick.

The face sheets have been superficially carved at the location of the ribs with the knife. After cutting out the parts, I have redone the cuts with three passes of a panel scriber, have separated rudder and eleva-

tor halve and have bent the face sheets on the carved lines, as shown in the picture top left.



I have inserted a 0.5 mm brass pin in the core of the fin and the stabilizer halves and for the fin I have drilled a hole on the corresponding place on the fuselage top surface. As the fin for the F.K.49A is on a different position, there is a different holes for each version. The picture shows clearly the different configuration. The holes will be reproduced as a small dimple in the resin copy; the pin will indicate the place where a new metal pin should be mounted in the fin.

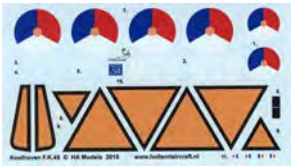


Next came the most tedious job: gluing pieces of 0.2 metal wire in each of the engraved “rib” locations of the skins. The wire serves to prevent the skins to glue to the core, creating this way the effect of linen tight over the metal tube frame. As there are 24 of them this takes some time. Next the skins have been glued to the core, starting with the leading edge and using Revell Contacta sparingly. When that had set, I have glued the remainder of the skin to the core by applying Tamiya Ultra Thin Cement between the skin and the core, pressing the skin firmly to the core to eliminate as much as possible air enclosures.

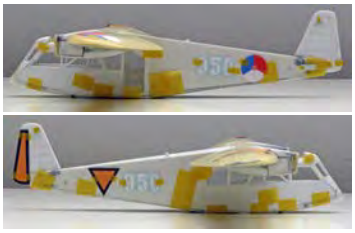
When the glue had dried well, I have performed a last check on the adherence of the face sheets and have sanded the edges of the surfaces round, except for the trailing edge of elevator and rudder, which have been sanded as thin as possible. I have then used them to locate the fixation holes for the pins in the fuselage. I have also drilled holes in the fin and stabilizer halves of each of the two versions to accommodate the rigging wires.

As the cost of the moulds and parts -next to the volume of the part- is determined also by the number of parts, I have glued elevator halves and rudder to fin and stabilizer halves. This will save approximately 5% on the cost of the resin parts.

Decals



The Koolhoven F.K.49 as has flown with the LVA registered as “950” with the standard Dutch roundels and with the black edged orange triangles and rudder shortly before the Second World War. I have copied the “950” in a CorelDraw sheet and redrawn the numbers. I have also redrawn the rudder outline and modified it in the orange rudder. Small print on fin and aft fuselage has also been produced, as well as the text “DUNLOP” on the tyres. Size of the roundels I have copied from the drawing in ref. 5. The size of the triangles has been deduced from the photographs of F.K.49 and F.K.49A and with a description of the regulatory required dimensions. The triangles have been provided with the regulation 10 cm wide black edge, scaled down to 1/72. The decal sheet includes also a scaled copy of the photograph of the instrument panel, a decal for the top of the camera. A dry fit of the cut-out copy of the shapes on fuselage and wing confirmed the correct dimensions of the decals[6].



The F.K.49A has flown with the registration 1001 and black edged orange triangles and rudder in the Netherlands. The triangles were identical to those of the F.K.49, but the rudder was of course different. When it was transferred to Finland it carried the registration OH-MVE. With the coast guard in Finland it had the same registration and carried a red cross on the fin. As there are only the triangles common to F.K.49 and F.K.49A I have drawn a separate set of decals. I have not identified any small print on the pictures of the F.K.49A. Size of the registrations has been derived from the photographs. There are some pictures of the aircraft, taken after the 18th of June

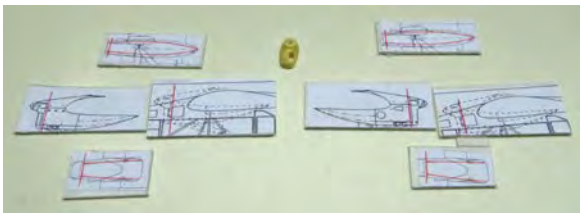
1941 with a yellow (German RLM 04, or British/US insignia yellow) band (7 mm wide in 1/72) around the aft fuselage and yellow painted lower side of the wing tips with a width of 1/6 of the span (37 mm in 1/72). I have made no decals for this, as it is easy to paint. The metallic and white decals are ALPS printed, the pure black & white ones laser printed and the coloured decals have been printed with an UV laser printer.

Propellers, nacelles and exhausts

F.K.49

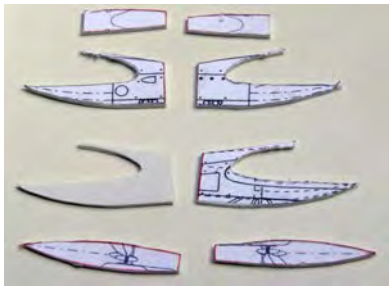
As the F.K.49 and the F.K.49A had different engines, propellers, nacelles and exhausts were also different. I have used as masters for the F.K.49 a cowling front[7] and propeller by Aeroclub Models, that I still had in a collection of Aeroclub white metal parts I had once bought. I have first ordered six resin copies of them, as I will need two to incorporate in the final nacelle masters, and some spares are always welcome.

Ref. 5 contains a drawing of the inboard side of each nacelle, clearly showing the cut out for the wing. It also contains a drawing of the side view of the fuselage, where the outboard side of the engine is shown in dotted lines. To check whether this drawing was usable I have printed it on transparent paper and compared the wing cutout with that in the inboard view, which should be larger. There was a good correspondence, so I have decided to use the dotted line drawing as a template also.



The top and bottom of the nacelles I have taken from the top/bottom view in ref. 5. As I will build the nacelles from 1mm styrene sheet I have decreased the contour with 1 mm at all sides. I have also checked whether the dimensions on the drawings fitted with the engine front. I have glued copies of the drawing on the styrene sheet and have started to cut out the space for the wing.

The resin wing appeared about a millimeter thicker than the wing cut out on the drawing. Trial and error the top of the cut out has been widened until it fitted well on the wing.



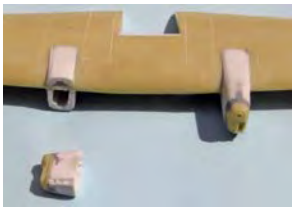
Next I have cut out all shapes and I have marked the inboard part with a superficial hole on the inner side. I have bent all sides to fit well together and have glued the side to the top and bottom. A dry fit of the nacelle on the wing showed it fitted well. However, the nacelle was 0.5 millimeter narrower than the engine front. I have corrected that by gluing a piece of 0.25 mm styrene to each side of the nacelle. I have also glue a front wall in the nacelle to provide a proper gluing surface for the engine front.

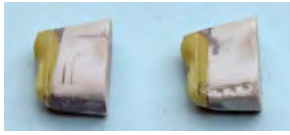
I have glued the engine front to the nacelle, have sanded the corners of the nacelle round and the sides in the shape of the engine front contour. A dry fit on the wing completed the work.

The remaining irregularities I have filled with putty. The second nacelle has been built the same way, but mirrored. A dry fit showed that they would have to be rotated slightly about the longitudinal axis to position them purely vertical. I have glued the nacelles on the wing with thick cyanoacrylate glue and have filled the gaps with putty. After several iterations with sanding and putty the result was satisfactory.

Next I have drawn the panel lines on the engine and have indicated the place of the three dials of engine instruments that are on the inboard side of each nacelle. I have engraved

the panel lines with razor saw and scriber and I have removed some material at the place of the dials to form a kind of instrument panel. I have modeled the dials by drilling superficial, 0.7 mm holes in the panel.





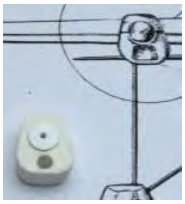
I have removed the part of the nacelles in front of the wing leading edge with the saw and I have filled the exposed cavities in wing and nacelles with low crimp plaster.

The panel lines around the (metal) tank cover have been engraved a bit deeper and the stringers, made from 0.4 x 0.5 mm strip, glued in place. The tank cap has been made from a thin slice of 1.5 mm rod.

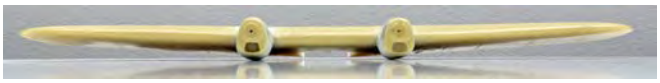
On the wing underside I have engraved a couple of access hatches under the tank compartments. Both upper and lower side of the wing have been provided with slanted holes at the control cable exits and superficial holes on places where control horns should be glued. I have drilled a 1 mm hole in the nacelle at the location of the forward wing spar and have widened the lower part to a rectangle of 4 x 1 mm. This is a bit smaller than the cross section of the landing gear leg, but as that has to be constructed by the modeler, it is better to adapt the size to the actual part than assuming now a standard fitting dimension. After some minor repairs the masters for wing and nacelles were finished.

I have made the exhausts from 0.8 mm plastic rod, cut to the correct size and shape over a copy of the drawing of the exhausts in ref. 5. The heat exchanger for the cabin heating is a tube of 1.5 mm diameter.

F.K.49A



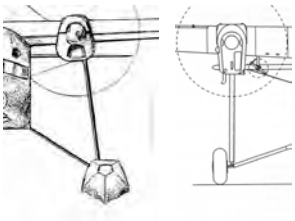
The cowlings for the Hirth engines of the F.K.49A are quite different. Searching the internet for donor kits did not yield a result, the cowling of the Messerschmitt Bf 109 Taifun does not have the same form. So I had to make a cowling from scratch. I have glued three pieces of 2 mm plastic sheet on top of each other and have left them to dry 24 hours. I have glued a copy of the cowling front view on it, indicated the place of the propeller shaft and the center of the air inlet and have sawn and sanded the front outline. I have drilled a 1.2 mm hole for the shaft and a 3 mm hole in the inlet. I have glued a 0.5 mm disc with a diameter of 6 mm, the diameter of the propeller spinner, on the front. Next I have spent an hour or so in sanding the shape of the cowling and the air inlet according to top, side and front view from the drawing and the panel lines have been engraved in it. This cowling has served as a master for six resin copies.



The nacelles have been produced by Hans Berfelo, a colleague modeler, using the cowlings. The wing models quite well the different appearance of the F.K.49A, as shown in the picture below.

However, the wing incidence angle was too small, almost negative, and the wing top surface was slightly lower than the aft fuselage top, when the wing was resting on the side walls. So I have corrected this by gluing a strip on the top of the side walls, 0.5 mm thick at the back and 1.0 mm thick at the front.

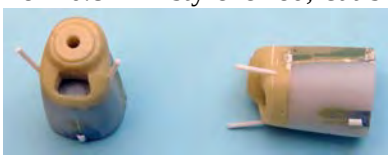
As for F.K.49 also for this model the front part of the nacelles has been separated from the wing to allow easy production of the wing.



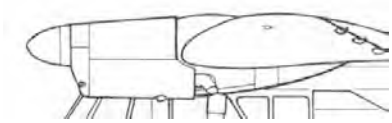
The wheel undercarriage main strut is connected to the same point at the wing spar as the float main strut, but as the float strut is spread sideways the interface to the lower part of the nacelle is different. As a consequence I have drilled two 1 mm holes in each nacelle to accommodate the brass rod incorporated in each main strut.

I have marked the edges of the cabin walls on the lower surface of the wing and have glued 0.4 x 0.5 mm strips on it simulating the fuselage frame tubes. As with the F.K.49 I have engrave some access hatches below the tank compartments. On the wing upper surface the enforcement profiles for the fuel tank covers and the tank lids have been glued.

The panel lines have been engraved in the nacelles according to the drawing, as well as a small access hatches on the top surface. The front of the nacelles had two small air intakes at the side of the big central one and under the nacelles a small streamlined body was visible. I have made the former ones from 0.8 mm styrene rod, cut skewed, have cut it off and drilled a 0.3 mm hole in it. The streamlined body I have made from small pieces of half round strip of 1 mm wide, shaped with a knife and sanding.

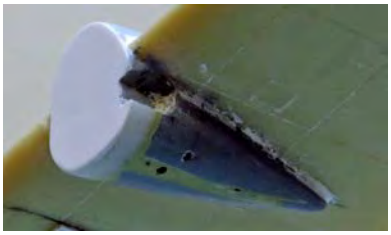


The engines have a single exhaust just under and behind the wing leading edge. From the Finnish side view drawing I have measured the dimensions of the exhaust. They have a diameter of 2 mm and extend 5 mm behind the wing leading edge. I have modeled them from 2 mm solder, which I have first rolled straight with a steel ruler. Initially I have tried to bend the end part with a pair of plyers. Bending went all right, but the solder flattened under the pressure. To prevent this happening I have made a small tool (nothing more than a 2 mm hole drilled in a thick piece of styrene), inserted the piece of solder in it, and bent the solder sharply. This worked well. I have drilled a 1.2 mm hole in the end piece and have finished it by filing.



The exhausts will be separate parts; as the wing is probably being cast the same way as for the F.K.49 (span vertical), making the exhaust an integral part of the wing would risk that the lower exhaust would be a favorite meeting place for air bubbles.

The exhausts will be mounted in a 5 mm long slot with a 2 x 2 mm cross section milled in the nacelle.

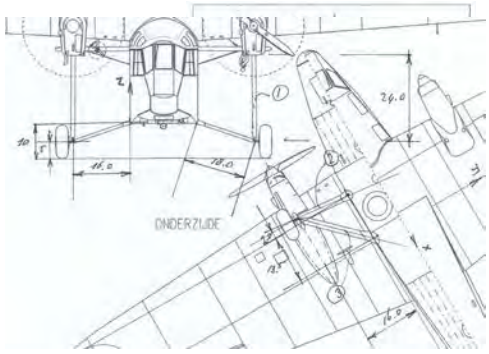


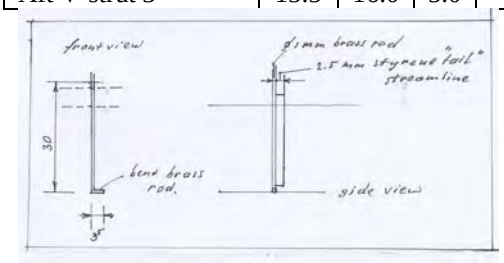
Wheel undercarriage, both versions

A master for the main wheels has been made from a modified 1:100 scale Fokker Friendship model main wheel and six resin copies have been ordered. Two main wheel copies and one tail wheel copy will be used as masters for each of the F.K.49 versions.

From details of the F.K.49 drawing in ref. 5 I have taken the relevant measures to calculate the dimensions of the undercarrige struts, given in the table below in millimeters.

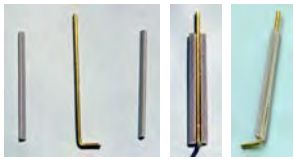
Strut	*X*	*Y*	*Z*	*Length*	*Thickness*	*Width*
Main landing gear leg strut 1 minimum	2.0	24.0	0.0	24.1	1.5	3.5
Main landing gear leg strut 1 maximum	2.0	28.0	0.0	28.1	1.5	3.5
Forward V-strut 2	2.0	16.0	5.0	16.9	1.2	2.0
Aft V-strut 3	15.5	16.0	5.0	22.8	1.2	2.0



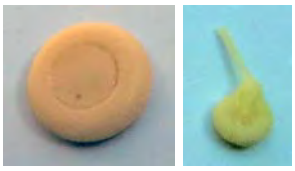


In principle all struts can be made from styrene streamline profile, which is available in sizes 1.4 x 3.1 mm for the main landing gear leg and 1 x 2 mm for the V-strut. But the resin copies of these struts probably would not be capable to carry the weight of the rather heavy resin wing for a long time, so I have opted for another solution for the main landing gear leg.

To test out a solution, I have first made it the strut from a 45 mm long piece of 1.0 mm brass rod, bent at 5 mm from the end to serve at axle for the wheel and have glued a "tail" of 2.5 mm wide to it, cut from 1.25 x 3.2 mm streamline profile.

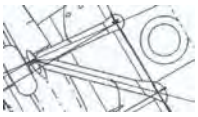


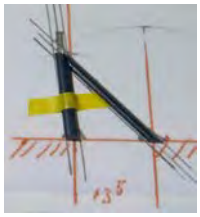
However, this did not look right when comparing it to the side view in the drawing, which shows that the axle is placed on the center line of the strut. So in a second attempt I have cut the 3.2 mm wide streamline profile in half lengthwise and have glued the two halves to the brass rod, taking care that the brass piece was well in the middle and that the stub axle was normal to the plane of the strut. Next I have covered it well with putty, using Revell Plasto for its good adherence to brass and styrene, and have sanded the excess away, at the same time reducing the chord to 3.5 mm. This was judged to be the best solution.



The main wheels are a copy of the wheel of a 1/100 scale Fokker F.27 Friendship, of which the hub has been modified to resemble a thirties wheel with a low pressure tire. The tail wheel is a copy of a tail wheel with the right size from my spare box.

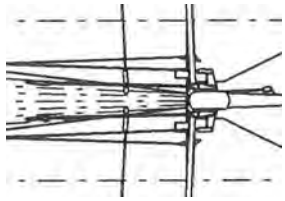
When fitting the wheel to the brass axle, it appeared that the hole in the wheel was far too large. I have corrected that by gluing a piece of 1.0 x 1.8 mm styrene tube in the hole. I have also sanded the tires to get rid of the threads of the modern F.27 wheel.





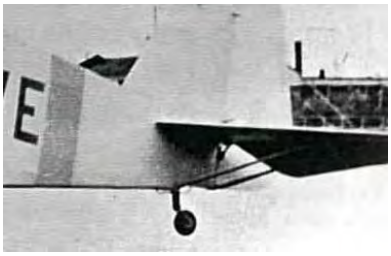
I have also drawn a template to assemble the V-struts. I have covered the template with clear Sellotape, cut some the two xx mm black styrene streamline struts (real droplet-shape streamline) to the required length and have glued them together.

The attachment of the struts to the fuselage on the drawing shows some mini-fairings. I have made these by gluing strips of 0.25 mm thick sheet material to the end of the struts, cutting them into the required and sanding them until they resembled the drawing sufficiently. I have filed a groove in the top of the fairing to make it fit better on the right angle between fuselage side wall and bottom. As I wanted to avoid another loop via the production firm to get the required four copies, I have repeated this process three times (both for the F.K.49 and the wheel version of the F.K.49A).



Investigating the drawing of the F.K.49 aft fuselage in detail, I found that the actual tail wheel configuration of the F.K.49 was a bit different. There was a circular frame around the tail wheel, to which the control cables for the tail wheel were attached. I have modeled this by means of a piece of 0.4 mm brass wire, hoping that this can be reproduced in

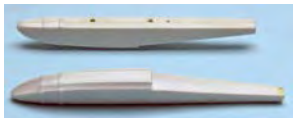
resin.



The tail wheel of the F.K.49A and its accommodation is not the same. Literature mentions that a tail wheel of the F.K.58 was mounted. In any case, the configuration is clearly different from that of the F.K.49, as the picture at the right shows. Also it seems a bit larger, although the difference is marginal (comparing it to height of the rudder in the picture it measures 4.2 mm in 1/72 scale, while the F.K.49 tail wheel has a diameter of 3.9 mm). In my spare parts collection I have found a tail wheel of the correct configuration, but with a diameter of 4.9 mm, so too big. So I have modified a F.K.49 tail wheel to the F.K.49A configuration by gluing a piece of styrene tube around the shaft.

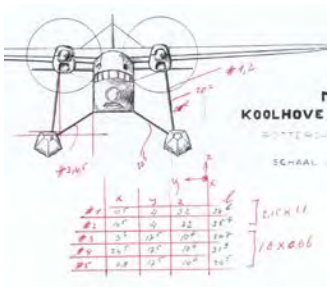
Floats, F.K.49A

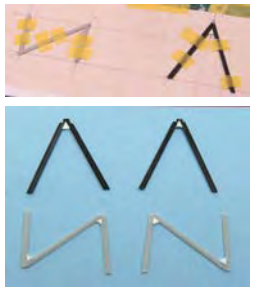
A search for existing Edo float models did not deliver the 120 mm long versions that were needed for the F.K.49A. However, two models were identified that had the right shape and the correct 12 mm width. Both could possibly be modified to come to the right length.



The first one came from a DHC-2 Beaver kit. Besides having to be lengthened, these also had to be filled to get a solid master for producing a mould under vacuum.

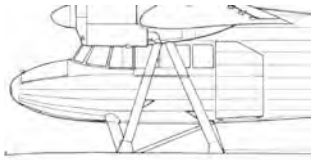
The second candidate was a EDO 39-4000 resin model of Khee Kha Models. This last one has been selected as the basis for the masters.



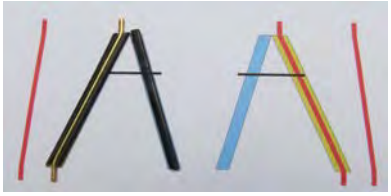


I have measured the float struts in the three view drawing and have calculated their dimensions in the flat plane. Based on those I have made a template over which I have constructed the N- and V-struts for the floats. I have produced the inverted V-struts from 2.15 x 1.1 mm streamline profile, the N-struts from 1.8 x 0.85 mm streamline profile. The top of the V-struts has been shaped to fit in the cavity for the (wheel) landing gear struts and the corners both N- and V-struts have been strengthened with small triangles of 0.4 mm styrene sheet.

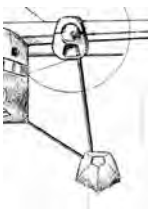
Ref. 8 contains some better quality pictures and drawings of the F.K.49A, based on which a side view scale drawing has been produced. The float struts had a horizontal connection, which I have modeled from 0.5 mm rod. The drawing also shows the climbing aids on the struts. The forward N-strut to the fuselage, however, seems rather over dimensioned in comparison to the original Koolhoven drawing.



However, the weight that will be resting on the inverted V-struts is quite heavy, and there is a good chance the resin struts will deform over time. So I have redesigned the struts analogous to the main landing gear strut: a rear strut with a core of 1 mm brass wire with a pinhole connection to nacelle and float and a half strip of streamline profile glued in front and behind it. The remainder of the inverted V-strut is then just glued between this strut and the float. I have made a sample to evaluate this solution.



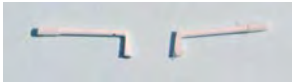
The master for the floats has been produced by Hans Berfelo, a colleague modeler. As the floats of the F.K.49A were larger, longer and thicker, it was quite a job to get a good copy, so one of the floats was lost in the attempt. The second float was of the correct appearance and dimensions. This copy has been modified such that it can serve as a master for both the port and the starboard float with minimum work for the modeler afterwards.



As I had only a single master for both floats and as the strut connections to the floats are mirrored, I have made holes for the strut connections for both configurations; 1.0 mm diameter for the messing core of the aft main strut and 0.5 mm diameter for the other strut connections. This master will be used to produce two moulds and the modeler will have to close the holes that are not used.

The float rudders have been scratched from 0.5 mm styrene sheet and 0.8 mm rod. At the top I have drilled a 0.4 mm hole, in which I have inserted a piece of 0.4 mm wire that will serve as control horn.

Other parts



I have produced the aileron balance weights for both versions from 0.5 and 0.8 mm plastic rod and a piece of 0.4 mm sheet.

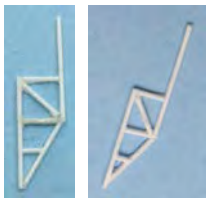
The masters for the three Venturi tubes under the fuselage have been taken from a set by Croco Model Company. I have used the medium and large size of that set; the small version was too small to serve as master, and most of them were damaged. The drawing of the F.K.49 shows two large copies and one medium size. The F.K.49A does not show any Venturi tubes, but it is likely that they had at least two large ones.

The air flow driven generator/air pump has been made from a piece of 1.5 mm rod some slivers of 0.5 mm sheet. The suspensions has been made from a piece of streamline profile.

Resin casting limitations

I have brought the masters to the company which will do the casting to have them examined for producibility. There were some worries for the parts using 0.5 mm thick sheet, that the mould would close during casting. For the cabin walls the risk is limited, as they have quite some reinforcements, but the dark room wall and door of the F.K.49 and the stretchers of the F.K.49A were serious cases. I have added an extra layer of 0.13 sheet to the stretchers. For the dark room wall first an attempt will be made to cast them; if that does not work, a template and sufficient 0.5 mm sheet will be added, so the modeler can scratch the wall him (or her) self.

There was also some doubt on the resistance to ageing of the complex framework parts, especially the supports of the radio rack of the F.K.49A, which were made from 0.5 mm diameter rod. They could be cast, but resin tends to become brittle when ageing, so modelers keeping the kit (too) long in their stash would run the risk of finding these parts in assorted pieces. It was decided to rebuild these masters from 0.65 mm rod.



The tail wheel of the F.K.49 with the brass “control horn” assembly was rejected as unfeasible. The brass part will be deleted and the building instructions will contain a description of the steps needed to construct it.

As a precaution I have modified the masters for the cabin walls of the F.K.49A; the large door opening and the weak attachment of the top and bottom part to the forward part of the wall would lead to casting problems. The strip of 1 mm thick material along the aft side will have to be removed by the modeler. All other masters were considered to be fit for producing the moulds.

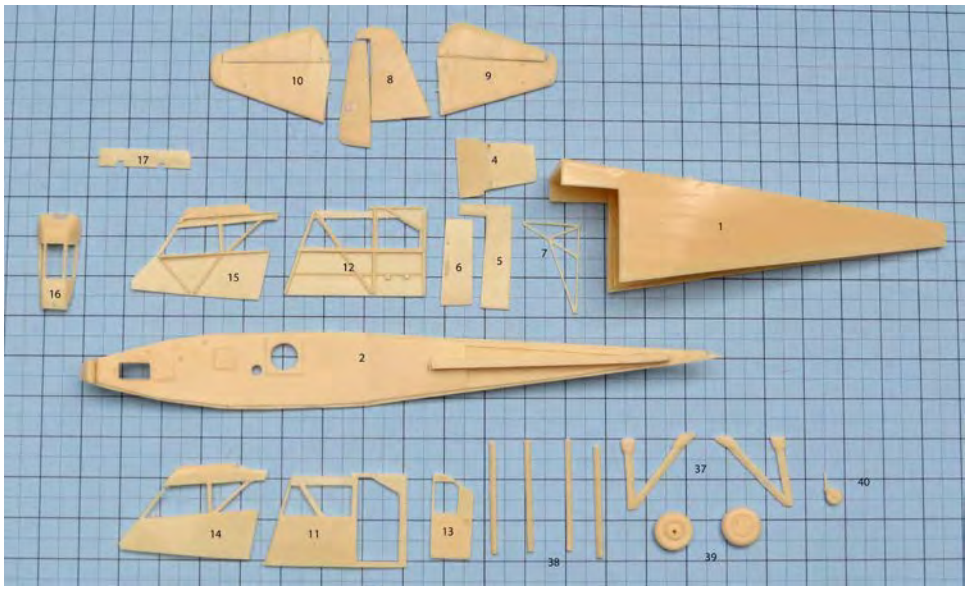
Pre-production kits

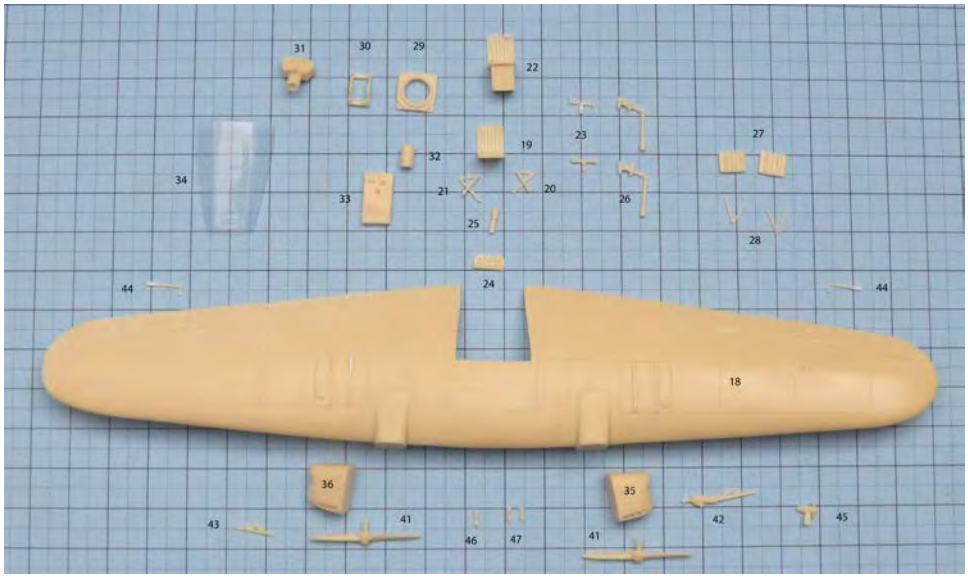
F.K.49

On receiving the first two (pre-) production kits I have made a list of “defects” and discussed them with the producer and a solution for most of them has been found avoiding the need to make new masters and moulds. A general phenomenon is that the first copies from new moulds show more defects than the later ones, of course also because of the corrective measures taken.

I have selected the worst copy of each part to perform the dry fit of fuselage and wing and to evaluate the feasibility of repairs to be done by the modelers procuring the kit. I have separated the parts from the casting provisions with a razor saw, which minimizes the risk to damage the parts. Only minor corrections of the parts were necessary to obtain a good fit, mainly related to the fitting of the side wall to the ridge along the fuselage floor and minor adjustments of the dimensions of the parts by slight sanding. So the go ahead for production has been given. Detailed information of the building of the prototype will be given in a separate building report.

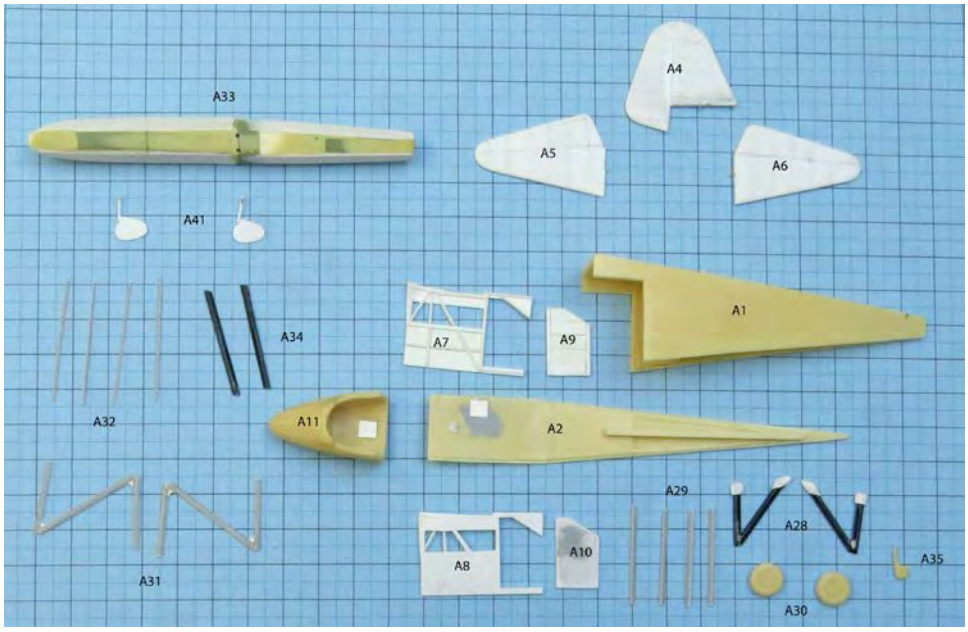
Below pictures of the parts of the kit are shown.

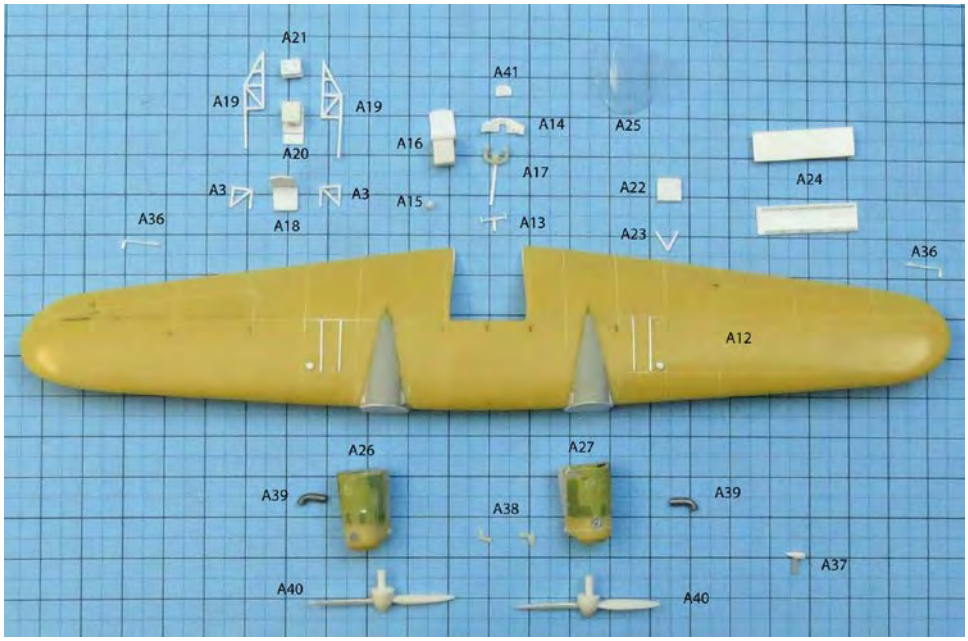




F.K.49A

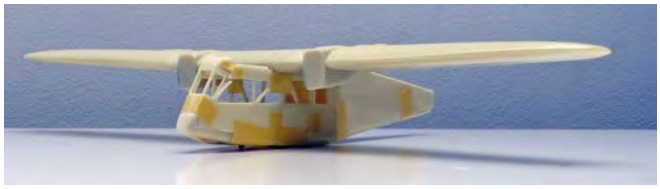
Below pictures of the parts of the kit are shown.





Add picture wings, engines & floats and replace by picture of actual parts

To conclude this building report a picture of the dry fit of the two models. At the right the pre-production model of the F.K.49, at the left that of the F.K.49A.



The actual building of the prototype resin kits of F.K.49 and F.K.49A is covered in separate building reports.

References

1. Anon., *Koolhoven Vliegtuigen, 1910-1940*, Facsimile uitgave, 1940
2. H. Hooftman, *Van Brik tot Starfighter, Deel I: Met stofbril en leren vliegkap*, La Rivière & Voorhoeve, Zwolle, 1962
3. Koolhoven, *Tekening no. 1103 S, Type F.K.49, No. 4903, Ausstattung der Kabine*, N.V. Koolhoven-Vliegtuigen, 1939
4. Koolhoven, *FK-49*, N.V. Koolhoven-Vliegtuigen
5. H. Van der Meer, *F.K.49*, Stichting Koolhoven Vliegtuigen, 1999

6. T. Wesselink & T. Postma, *Koolhoven, Nederlands vliegtuigbouwer in de schaduw van Fokker*, ISBN 90 228 3890 0, 1981
7. H. van der Meer/Aviodrome, *Personal communication, Drawings of F.K.49A*, 2018
8. J. Raunio, *Taattua laatua, Merivartiolaitoksen Koolhoven F.K.49A*[8], 1999?
9. Koolhoven F.K.49, Cartography plane, Building report, http://www.hollandaircraft.nl/K15b%20FK%2049.pdf
10. Koolhoven F.K.49A, Ambulance plane, Building report,

Appendix F.K.49 and F.K.49A documentation

Photographs

If no reference is given, the pictures have been taken from the Internet/Wikipedia.

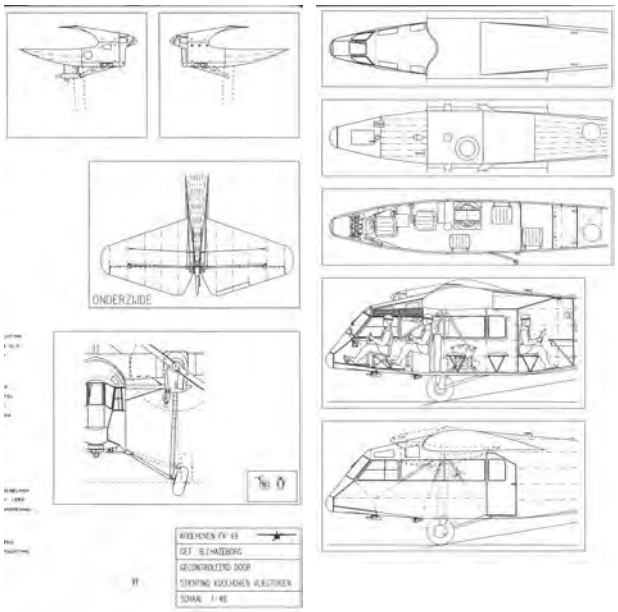
[Source: ref. 5]

[Source: ref. 5]

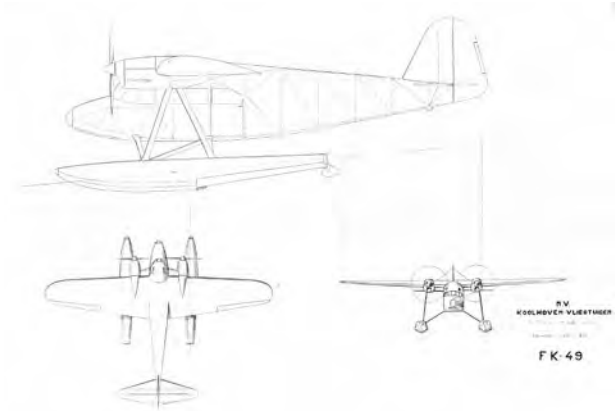
[Source: ref. 8]

[Source: ref. 8]

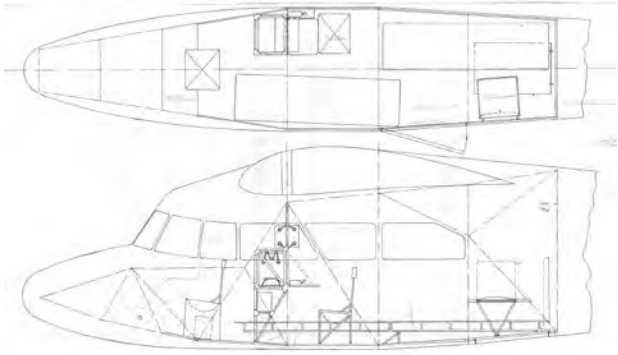
Drawings



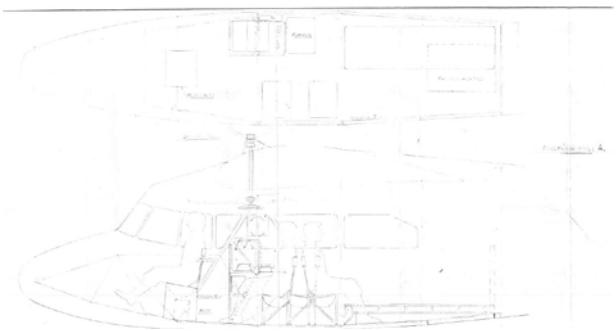
[Source: ref. 5]



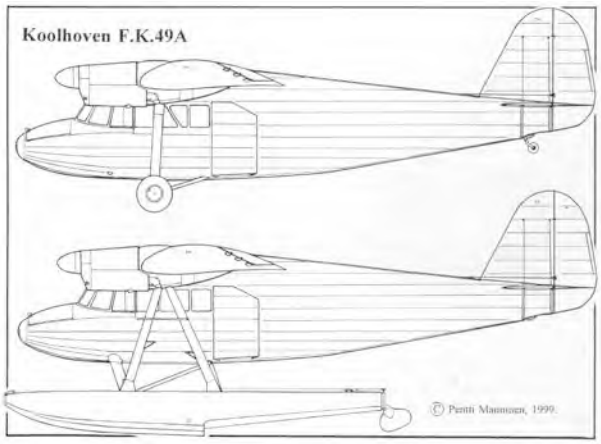
[Source: ref. 7]



[Source: ref. 7]



[Source: ref. 7]



[Source: ref. 8]

Certificate of Airworthiness (CoA) of the Finnish F.K.49A (courtesy Harry van der Meer/ Aviodrome)

NEDERLAND.
MINISTERIE VAN WATERSTAAT.
LUCHTVAARTDIENST.

FOTO VAN HET VLIEGTUIG (van ter zijde)
9 bij 12 cm.

BEWIJS VAN LUCHTWAARDIGHEID (vervanger dan bedr.).
CERTIFICAT DE NAVIGABILITE (plus lourds que Pair).
N°. 369

EERSTE DEEL.

Naam, voornamen, woonplaats en nationaliteit van den eigenaar of houder.

1. Naam: N.V.Koolhoven Vliegtuigen
2. Voornamen: -----
3. Woonplaats: Rotterdam, Vliegveld Zuidhaven
4. Nationaliteit: Nederlandsch

Naam van den fabrikant.

5. Naam: N.V.Koolhoven Vliegtuigen

Nationaliteits- en inschrijvingskenmerk.

6. -------

Beschrijving van het vliegtuig

7. Type FK 49 ; serie FK 49 , fabrieksnummer 4903
8. Plaats en jaar van den bouw van het vliegtuig: Rotterdam, 1939

Aard van het vliegtuig:
9. Landvliegtuig, watervliegtuig of amphibie: landvliegtuig
10. Aantal vleugels: een
11. Aantal motoren: twee
12. Grootste aantal personen, dat vervoerd mag worden (bemanning inbegrepen): vijf

Indeeling van het vliegtuig | 13. Categorie: I (normaal)
14. Klasse: niet-verkeersvluchtvaartuigen

15. Grootste breedte (of vleugelwijd): 16.00 m.
16. Grootste hoogte (of vliegstand): 11.40 m.
17. Totale hoogte (voor watervliegtuigen met inbegrip van en onder [illegible]): 1.00 m.

Motoren:
18. Aantal: twee
19. Merken: Hirth
20. Type: H M 508 a-C
21. Internationaal vermogen op 0 m hoogte (per motor): 285 PK 5000 omwentelingen per minuut (international normal).
Vermogen per uur op 0 m hoogte met het Hirthsysteem aan-gebouwde vermogen (per motor): [illegible]
22. Benzine: 67 kg/h
23. Olie: 0.09 kg/h
24. Schroeven: Aantal: twee Type: 2 bl. linde lucht. Electr.verstelb. Fabrieksnummer: -----
Merk: F.D.M. Speed/Hamboot 7 . 88 Middellijn: 2.70 m

25. Gewicht, indig met alle ingebouwde deelen en met kerkwater, [illegible] Bedrijfsmatig: [illegible] kg
Gewicht van de bedrijfsmatige (26. Brandstof: 190 kg 2000
(volle tanks) 27. Olie: 45 kg
28. Toelaatbaar gewicht voor bemanning: [illegible] kg
29. Toelaatbaar gewicht voor uitrusting (zonder radio): --- kg
30. Gewicht van de radio-installatie: --- kg
31. Maximum toelaatbaar gewicht voor de lading (passagiers-goederen), inclusief de tanks vol zijn: --- kg 740
[illegible] kg
32. Maximum toelaatbaar gewicht van het volbladen vliegtuig: 2740 kg

Na te komen voorwaarden.

33. Maximum toelaatbaar gewicht (volbel geschreven):
zeven en twintig honderd en veertig kilogram
34. Verplichte minimum aantal leden van de bemanning: een
35. Verplichtet uitrusting: ---
36. Stowing van de lading
37. Verplaatsing van het gewicht | Ladingsvoorschriften: Het vliegtuig moet altijd voldoende blijven worden, dat de projectie van het zwaartepunt op de gemiddelde aerodynamische koorde (G.A.K.) op een afstand van [illegible] rand van die koorde ligt van tenminste 26.8 % en ten hoogste 32.8 %.
De ligging van de neus van de G.A.K. ten opzichte van het roepkoeppunt-v. 1a 425 mm naar voren, resp. 325 mm naar boven, terwijl de hoek van de G.A.K. met de horizontaal (loodrechte op de verticale roepbuis) -2° bedraagt.
38. Maximum toelaatbare snelheid in duikvlucht: 300 km/h
Maximum toelaatbare snelheid in horizontale: 230 km/h in bulle weer 200 km
39. De benzine moet een octaanwaarde hebben van 87

Gravenhage, 20 December 1939
De Directeur,

Most probable cabin arrangement of the Finnish F.K.49A.

The cabin drawing and ref. 5 are contradicting the photographs and the CoA of the Finnish F.K.49A on three points:

1. The maximum number of persons accommodated (ref. 5 states seven, of which 4 stretchers for patients, the CoA five and the cabin drawing shows only two stretchers),
2. The number of doors (ref. 5 and the cabin drawing shows only one, the photographs show two) and the door hinge line,
3. The presence of a hatch in the cabin floor before the rear cabin wall (ref. 5 states it and the cabin drawing shows it; photographs do not present any evidence of it).

Ad 1:

It is unlikely that seven people could be accommodated on board; in that case less than half the full tank fuel load could be accommodated, reducing the endurance to 3 hours. Most important: the drawing does only show two stretchers. So the capacity of the aircraft should be five persons.

Ad 2:

The photographs show clear evidence that two, wide doors, hinged at the bottom side, opposite to each other were present.

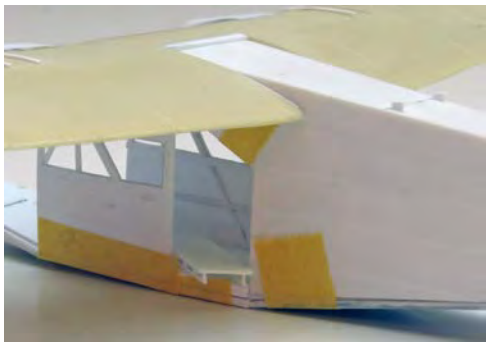
Ad 3:

To decide on this issue some more work is needed. When I had made the masters, I could test, whether a

hatch was needed to get the stretchers in the cabin, or that the doors would suffice.

From the starboard side:

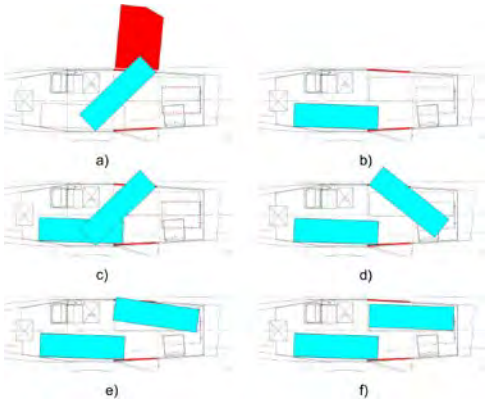
The stretcher passes, but comes possibly too close to the radio-operator seat.



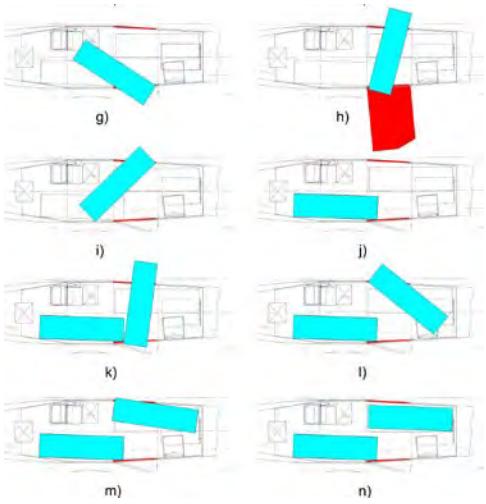
From the port side again the stretcher comes close to or in contact with the radio-operator seat.

When turning right from the port side, the stretcher jams, but that may be caused by the large thichness of the model's cabin walls and tube frame. So the "real scaled world" test does not give a reliable result.

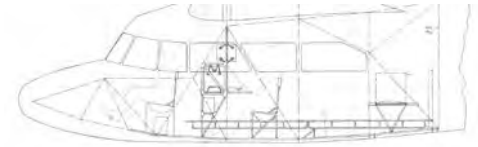
To further investigate I have made a drawing in CorelDraw of the cabin floor plan and the stretchers. The door openings and the opened doors, copied from the drawing, are marked in red, the stretchers are the turquoise rectangles. The floor hatch is indicated with a dotted red outline in some of the drawings.



This gives some more reliable evidence. Steps a) through f) show that the stretchers can pass from the starboard side, step d) even avoids passing one stretcher over the other, as in step c). This step also shows the need to have a folding seat for the nurse instead of a fixed seat. Step e) illustrates that there is enough room to turn the stretcher without hitting the cabin real wall.



Step g) shows that loading the stretcher from the port side is not possible, if a direct turn to the left is made; it collides with the radio-operator seat. Lifting it over the seat makes the operation very awkward. However, when the stretcher is first partly passed through the opposite door, step h), we arrive next at the same position as step a), and the loading can continue as described in steps i) through n), with a preference for avoiding step c), as sliding over the floor is easier than lifting a stretcher over another one. The only limitation in this procedure is the order the stretchers must be loaded: first the port stretcher, then the starboard one. And of course unloading in the reversed order.



The configuration with a hatch is also constrained by the impossibility to open or close the hatch, if the starboard stretcher is in its place, as the hatch rotates upwards.

So the conclusion is, that a hatch is not necessary and even undesired to load or unload the stretchers. As a consequence I have not modelled a hatch in the cabin floor. Of course individual modellers can always deviate.

[1] The text of ref. 5 mentions capacity for four stretchers. According to the certificate of airworthiness this would not be allowed (unless only the pilot is accommodated next to the four patients). Also, the drawing shows only two.

[2] The door at the starboard side is not present on the F.K.49A drawing; presence of both the hatch and two doors seems a bit overdone (see the analysis in the appendix).

[3] No proof could be found that the aircraft was certified for this capacity.

[4] After discussion with the retailer it has been decided to produce 50 kits for the F.K.49 and 30 kits for the F.K.49A. As only 30 to 50 copies can be produced from a mould, the commonality issue disappeared, and both versions will have their own set of moulds.

[5] I have used that material to form the observers tub for the Fokker G.IA.

[6] The print of the orange triangle wing decal in the picture is not on the correct place; according to the regulations it should be in the middle of the wing and measure 90% of the wing chord at that place.

[7] The De Havilland Gipsy Major cowling front had first been used in the master for the Koolhoven F.K.43, but could easily be removed from the (wooden) master, which anyhow had been replaced by a resin master and was not needed any more.

[8] Guaranteed quality, the F.K.49A of the Coast Guard