

Nederlandsche Vliegtuig Industrie FK.31 Omega Modelsⁱ resin kit

Monoplane fighter

Scale 1:72

Koolhoven designed the FK.31, when he had established his own aircraft factory, the “Nederlandsche Vliegtuig Industrie” N.V.I. in the Netherlands. A mock-up of the aircraft appeared on the Salon Aéronautique in Paris in November 1922. The aircraft was the first airplane designed from the beginning with a air-cooled radial engine. It made its maiden flight in the summer of 1923. The Bristol Jupiter powered aircraft was a two-seat monoplane for reconnaissance, fighter and advanced training duties. It was sold in small quantities to the KNIL LA (Dutch East-Indies Army Air Department, four aircraft) and the Finnish Air Force (eight aircraft). License production by De Monge in France was planned; one aircraft was sold to De Monge as an example and one was built in France. Series production did not materialize. In January 1925 the aircraft held for a while three world speed records.



The kit comes in a sturdy carton box and contains the resin parts, two lengths of metal wire for bracing struts and engine details, and two rubber tires. Decals for the Finnish aircraft are included.



The model represents an FK.31 built under license in Finland, and no other version can be built from it, as the cowling and wing (without circular cut-out) are typical for this particular versionⁱⁱ.

The instruction sheet is rather extensive for an Omega Models kit and contains a short description and two photographs of the aircraft and lists its performance. Summary painting instructions are included. Parts are identified and their location is shown in an exploded view. A three-view drawing shows the finished plane and indicates the location of the decals.



Hooftman (ref.1), Wesselink (ref. 2 and 3), Top (ref. 4) and Casius (ref. 5) give the dimensions of the FK 31. Ref. 13 contains an extensive article on the FK.31 by Wesselink with many photographs and data. It includes also a three-view drawing of the aircraft.

	<i>Ref.</i>	<i>1:72</i>	<i>model</i>
<i>Span</i>	13.70	190.3 mm	188.0 mm
<i>Length</i>	7.80	108.3 mm	110.0 mm
<i>Height</i>	3.40	47.2 mm	45.5 mm

	<i>Ref.</i>
<i>Engine</i>	Bristol Jupiter 450 hp
<i>Crew</i>	2
<i>Armament</i>	2 MG 7.7, 1 movable MG 7.7

As can be seen from the table, the model is quite well to scale.

It took quite some time to remove the parts from the sprues and to clean them. Most parts were of good quality, except fuselage and wing. There was a shallow hollow in the wing just right of the center, clearly visible, but repairable. The panel engravings are fine, but rather shallow (that's why I have accentuated them on the picture), and need to be redone, if they should be visible after painting. Also, the wing tips are hanging down. I will correct that in a bath of hot water. That should work, as the wing is rather thin.

The underside of the fuselage shows quite some large irregularities, which need to be repaired with putty, and here also the panel engraving need to be enforced.

The two engine exhausts are too crude and very short, while the attempt to make them hollow has been only partially successful. Probably I will replace them by exhausts scratched from plastic rod. The cylinders of the Jupiter engine have been cast as separate units, and are quite well detailed. The instruction sheet contains guidelines how to detail them further in addition. The cockpit interior is not very detailed, and some parts are too crude (e.g. the control stick). All other parts are quite alright. Almost all struts have a streamlined profile and I have found hardly any air bubbles.

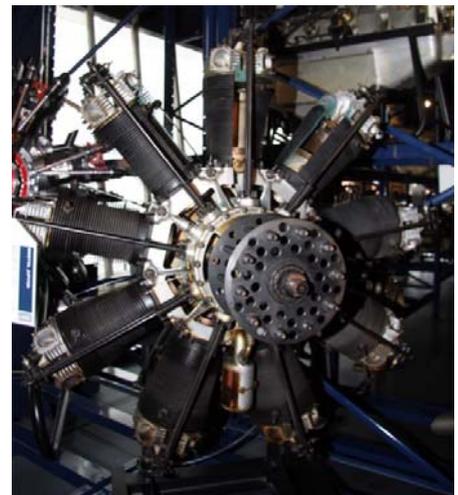
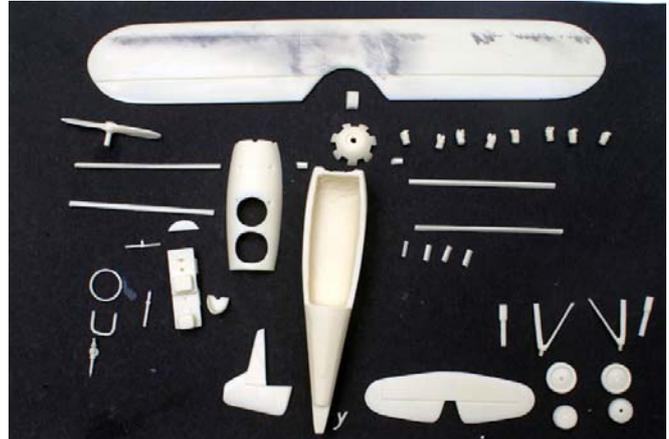
The largest problem is the engine. According to all references, the Jupiter engine has nine cylinders (see the picture of a 1923 Jupiter engine to the right, the version most probably flown on the FK.31). In the fuselage and the cowling only seven cavities are present and the kit provides eight cylinders, so probably one spare. Bristol has only developed a seven-cylinder radial engine in 1930, so too late for this aircraft of the first half of the twenties. Changing the kit to a nine-cylinder version is probably too difficult, so unless Omega Models provides an upgrade of the kit, I will built a seven cylinder Jupiter version.

To handle the individual cylinders easier I have glued them to a piece of 0.4 mm wire before painting and detailing them. I have painted the cylinder body gun metal and the casings for the valve mechanism at the top silver. Only the top of the cylinders needs to be accurately modeled, as the cylindrical part is covered almost completely by the engine cowling.



At the rear side I have constructed the exhausts from small pieces of 0.4 mm brass wire, carefully cut to avoid burrs. It was quite difficult to fit these, and to make that a bit easier I have drilled 0.4 mm holes in the cylinder top casing. I have left the brass wire also unpainted. As can be seen on the picture, each cylinder has two valve rods placed one behind the other. I have simulated that by gluing two ends of 0.25 mm wire together and have painted them black.

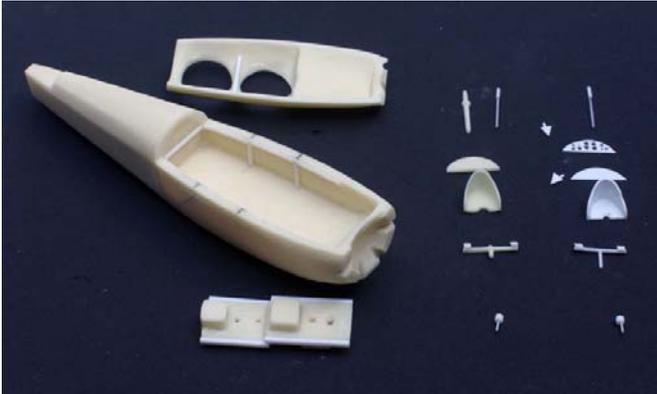
When fitting one of the cylinders in the cut-outs in the front of the fuselage and the cowling, the cut-outs appeared to be too small. So I have made them quite a bit larger with a diamond cutter, which is less easy clogged by resin dust than a grinder. Fine adjustment will be done, when the fuselage has been assembled.



Fuselage and cockpit

The surface irregularities in the fuselage have been repaired with putty and the fuselage has been sanded and I have engraved slightly deeper panel lines. I have suppressed the door at the right side of the fuselage and engraved a second door for the pilot's cockpit at the left side.

The four FK.31's built under license by the Finns, among which the FO-66, appear to have been used as trainers only, so they were equipped with dual controls, and carried no machine gun. The kit does not contain the parts to build the training version, so I have made the necessary parts from scratch, as shown on the picture to the left (whitish parts): pedals for the foot control, a second foot control, control sticks, replacing also the crude original one, two compasses, two throttle handles, a



second seat made of 0.5 mm plastic sheet and a second instrument panel. The original panel carries positive-relief dials, which I will have to detail with dry brushing techniques, the copy has a 0.25 mm thick cover, which reproduces the dials by drilled holes, and which will be mounted on a 0.25 mm thick black painted surface, in which the dial details will be scratched such that the white plastic reappears. All details have been produced from various bits of profile and sheet material.



rial.

The cockpit floor has been made larger; otherwise the foot control would stick out at the sides. The fuselage has ample room to do so. To achieve the correct height for the seats, the floor support needed to be adjusted. I have simulated the tube fuselage frame by half round rod from Evergreen, glued against the visible part of the fuselage. I have also glued a plastic profile in the fuselage decking to support the instrument panel for the second cockpit and to attach the shoulder straps of the front cockpit seatbelts to.



I have painted the cockpit and assembled the parts in it. As the cockpit is rather wide I have mounted the compasses next to the seats. The inside of the fuselage has been painted



light grey, the frame tubes dark grey. The picture at the left shows the two instrument panel; at the right the original one, as supplied in the kit, to the left the one I have scratched from 0.25 mm plastic sheet.



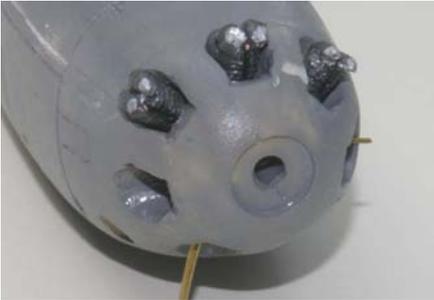
The cockpit floor has been glued in the fuselage and the seats have been provided with belts made of painted Tamyia tape. At the left on the fuselage frame tubes the throttles made from scraps 0.25 mm strip. Now the fuse-



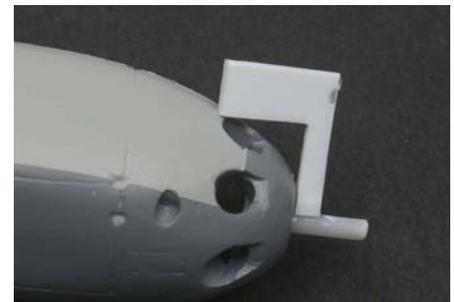
lage can be closed and the nose cap can be fitted.

As usual, now that the fuselage has been closed, hardly anything is visible any more of the detailed cockpit interior.

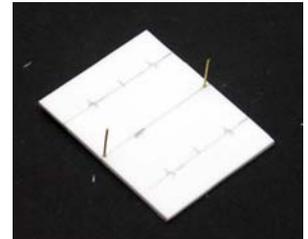
I have finished the fuselage joints with putty and then fitted the cylinders in the holes, which needed still some correction. The fitting exercise also showed that care should be taken to put the cylinders at the correct distance from the engine axis and to place them at the right angles. To place them on the correct diameter, I have made a small tool; fitting the rod in the propeller hole the flag should just pass over the cylinder head.



After having mounted the vertical and horizontal tail planes and having given the fuselage its final coat of paint (top Humbrol 125 and bottom Humbrol 129), I have glued the cylinders in their final position.



I have made a small jig to place the cabane struts in the correct position, copying the hole pattern in the underside of the wing. There is a conflict between the three-view drawing included in the kit on the location of the cabane struts of the model. According to the drawing the struts should lean backwards a bit, but that is hardly possible if the cabane struts should be in the same plane as the wing struts (something that is also confirmed by photographs of the original). So the end will probably be an historic compromise.



I have mounted the cabane struts with the help of the jig. As they all had the same length this would have resulted in a negative angle of incidence of the wing. So I have glued a small slice of 1.0 mm plastic rod to the two forward struts (the small white bits that have been painted grey afterwards). Also the 0.3 mm holes for the elevator and rudder have been drilled in the fuselage at this moment.



The fuselage has been coated with gloss varnish and the decals have been applied with ample Microscale Set and Sol to fit the double curvature well. I have adjusted the length of the cabane struts, so the wing is positioned well. One of the mounting holes in the wing needed to be moved a bit to achieve a correct positioning in the horizontal plane.



When I wanted to seal the decals with satin varnish (this time a 50/50 Revell gloss and matt varnish mixture with a couple of drops of white spirit), they dissolved spontaneously. This was the first time I have experienced that with Omega Models decals; normally they support enamel varnish quite well. Apparently this time ALPS decals had been included in the kit and as there were no "spares" on the decal sheet I could not test them. So there was no other solution than to produce new ones, for which I have used the RAF

KO-66 KO-66 KO-66 KO-66

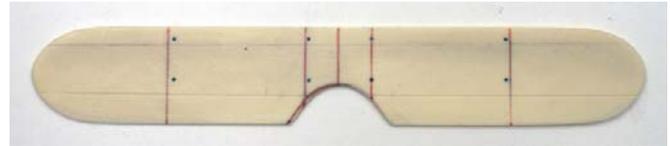
WW2 851 ATH font. That font is also a bit less skinny than the original registration in the kit.

For the Finnish insignia I still had some left over from a Fokker D.XXI decal set, which had the same size as the original decals.

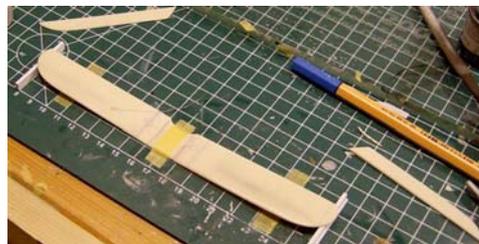
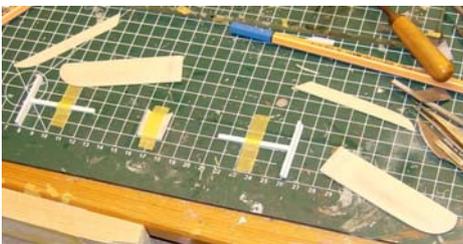
To avoid any risk of spoiling the decals again, I have sealed them with Revell Aqua Color acrylic gloss varnish on water basis before finishing the fuselage with the satin varnish mixture.

Wing and tail planes

I have checked the location of the wing struts, and they appeared incorrect, as often is the case, and not only with resin kits. The 1:72 scale three-view drawing supplied with the kit is a good help for that. The wing is rather asymmetric, not only the strut locations, but also the large cut-out (left side on the picture). The red lines in the picture indicate the correct locations and outline, and I have accentuated the locations according to the kit with blue. So some correction is needed here. Also, the wing should have a dihedral of 5.5 mm relative to the 18 mm wide flat center section of the wing. I have engraved the center section panel lines a bit deeper to force the wing to bend there after the hot water bath. The 18 mm center section must also be reflected on the wing upper surface, implying that all panel lines have to be modified. To give the wing the correct dihedral I have constructed to jigs with 5 mm height to support the tips. The picture shows the wing after the hot water bath.



However, the dihedral disappeared more and more over the days, until only 1 mm was left after a week. Apparently the resin material has quite some memory. So I decided to take some drastic measures and have cut the wing at the location of the inner wing struts, at



the same time removing the ailerons/flaps from the wing. I have glued the wing halves together with thick cyano, protecting the cutting mat with cellotape against the glue and using the same tip supports and I have filled up



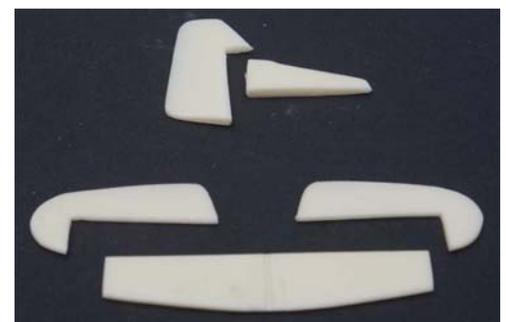
the gaps in the joints by dripping thin cyano in them. When the joints were dry I have sanded the surface, applied putty,

sanded again and redone the panel lines. At the same time the incorrectly engraved hinge line for one of the ailerons has also been corrected.

I have also removed the rudder and elevator from the tail planes. They have been painted and rudder and elevator have been provided with PE control horns. To establish a solid connection I have first



glued a 0.45 mm hole on the attachment location on rudder and elevator and then glued them with thin cyano. The long ailerons/flaps have no control horns; the transmission is internal to the wing. I still should make some mechanism between wing and control

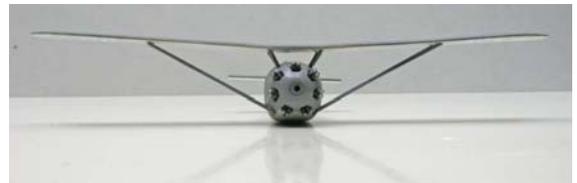
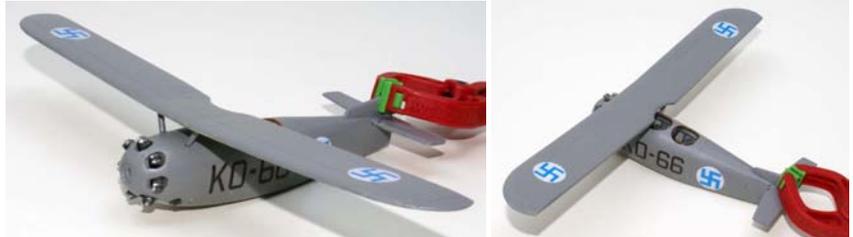


surface, but I could not find any details on the (scarce) pictures of the FK.31.

I have made two guidance rollers for the control cables to the upper side of the elevator from 0.75 mm plastic rod as can be seen on the rear view picture of the KO-31ⁱⁱⁱ. Also the two exhaust tubes, in which I had drilled a 1 mm hole, have been glued in the holes in the nose.

After applying the decals on the wing, it has been sealed with Revell Aqua Color acrylic gloss varnish on water basis and finished with the satin varnish mixture. When dry, I have aligned the wing on the cabane struts and glued it with thick cyanoacrylate glue.

Next I have adjusted the wing struts, which had been painted beforehand, to the correct length (they were some 3 mm too long), adjusted the chamfer of the strut ends to get a snug fitting with



wing and fuselage and glued them with thin cyano.

The cross bracing struts for the N-struts have been made of 0.9 mm plastic rod and the four bracing struts of the tail plane of 0.65 mm plastic rod. I have preferred to use that material instead of the very hard metal wire included in the kit. I have also glued the tailskid in place.

Another detail that has been added is the small tube at the left side of the nose (0.9 mm rod with a hole of 0.7 mm drilled in it). I have no idea what its function was, but it is clearly visible on the photograph of the KO-66.



I have mounted the two aileron control rods, made of 0.25 mm metal wire and glued in the 0.4 mm holes, which I had drilled beforehand in wing and fuselage.

All holes for the control cables had to be opened up again, as the many coats of varnish filled them up almost completely.



Undercarriage

I have deepened the holes for the landing gear in the fuselage a bit with drills of several sizes and adjusted the fitting of the V-styles in these. One of the holes was at least 2 mm in the wrong location, probably the result of torsion of the fuselage during the moulding of the resin. I had corrected the overall shape already by sanding, but the holes stay of course in their original place. Luckily the holes in the fuselage were not deep, so the "dent" is not very well visible. The undercarriage legs have been positioned with the correct 37 mm spread with the help of an



end of plastic of that size.



The supporting struts with the rubber spring packages were a couple of millimeters too short, so I have used only the damper package en brought the struts on the correct length with a piece of streamlined

profile. Fitting them exactly without any pretension has been done trial and error and they have been fixed with thin cyano.

I have made the struts between the spring package and the top of the forward cabane struts from streamline profile in my scrap box, and not from the metal wire in the kit. According to the pictures of the original they were indeed streamlined. And it makes the model more authentic, "lighter" in front and rear view, and still quite sturdy.

The wheels have real rubber tires. When placing them on the axle stubs on the V-struts they have slightly too much an "in-flight" attitude. This could not be corrected without rebuilding the V-struts.



Windshields

Although the photographs of the FK.31 in my possession are rather vague and do not show windshields for the crew, I cannot imagine they were sitting unprotected in more than 200 km/hr wind. So I have cut two windshields from 0.12 mm clear plastic sheet, bent them in shape and glued them with white glue to the fuselage. To make it easier to cut the flimsy plastic, I have glued it to a piece of Tamiya tape.



Control surfaces

I have mounted the rudder a bit deflected to the left according to the rudder bar position and the elevator deflected downwards, its normal rest position. The hinges have been simulated by tiny drops of thick cyano glue. I have used pieces of tape to keep the elevator in position until the glue was dry.

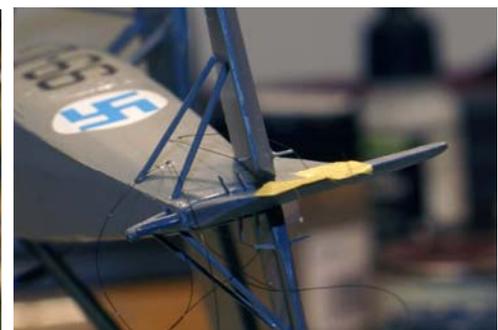


The control cables have been made from 0,06 mm black painted fishing line, glued into 0.3 mm holes drilled beforehand, and fixed with a tiny drop of thin cyano. I have first mounted the left side. After some fifteen minutes the glue is sufficiently dry to start the other side.



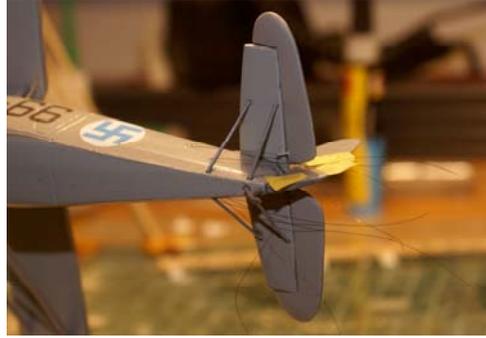
Giving the glue ample time to set, the control cables can be mounted, one side at a time. The order I have followed is:

- Guide the elevator top control cable over the guidance roller on top of the horizontal tail plane to the top elevator control horn, bring it under tension and fix it temporarily with a small piece of tape. Apply a small drop of



thin cyano to the cable both at the roller and the control horn.

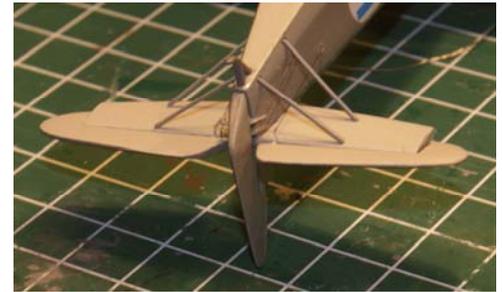
- Apply the cable to the lower elevator control horn.
- Apply the two cables to the rudder.
- When dry, remove the tape and cut the excess wire with a very sharp knife.
- Repeat the procedure for the other side of the tail planes.



The picture at the right shows the rear fuselage at the end of this procedure.



Next I have glued the ailerons in place, right one down and left one up, again corresponding to the control stick position. I have only given them a small deflection, as that seems logical taking into account their large span. I have simulated the hinges again with a small drop of thick cyano, four of them this time, and again tape has been used to keep them in place until the glue was dry. No control cable have been mounted, as there is no sign of control horns on



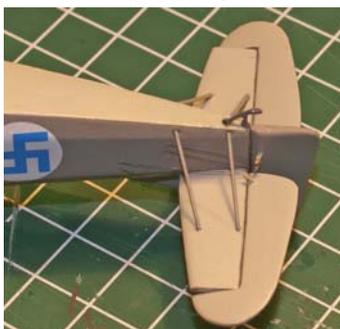
any FK.31 photograph and there are strong indications that the actuation of the ailerons is done internally by directly driving the aileron hinge structure.

Last minute modifications

When comparing the model with the (one and only) photograph I have of the license produced Finnish FK.31, the KO-66, some discrepancies become apparent.

- The tailskid is too crude and too big.
- The reinforcement stringers on the nose are missing^{iv}.
- Reinforcement ribs on the lower mid wing surface are missing⁴.
- The exhaust is faired to the cowling.
- The wing of the model is rather thin.
- The wheel attitude is not the same.

The last discrepancy I will not correct, as this means revision of the complete landing gear V-styles to get a sufficiently strong construction. Wing correction at



this phase is not possible any more, and would anyhow boil down to constructing an almost completely new wing. It is also too late for the fairing the exhaust.

The former three discrepancies I have attempted to correct. I have constructed a new tailskid from 0.6 mm soft metal wire, as I feared that one made from plastic rod would not be strong enough.



The reinforcements have been made from 0.25 mm pre-painted metal wire, rolled on a flat surface to straighten it. For the rib reinforcements I have cut 15 mm long ends of light grey painted wire and glued them between the wing forward and rear spars. Dipping one end of the piece of wire in thin cyano, they can be fixed in the right location, and adjusted during just a few seconds. The remaining length has been fixed by applying a bit of thin cyano along the wire.

I have made the cowling reinforcements from 9 mm long pieces of mid grey pre-painted wire, bend by hand in the approximately correct shape. One end has been dipped in thin cyano and has been fixed in the middle between two cylinders closest to the propeller hub, as illustrated in the picture above. The wire has then been glued bit by bit with small amount of thin cyano, keeping it down until the wire stuck. This has been repeated six times.

Two small pieces of 0.25 mm metal wire have been fitted in 0.3 mm holes drilled in the forward undercarriage V-strut. I have touched up all wires with the respective shades of grey, as the copper core always shines through after cutting.

Finally I have touched up the glue spots with satin varnish to illuminate the shiny reflections and acetuated the panel lines of the wing and on some locations of the fuselage with soft black pencil.

Summary

The Omega Models 1:72 kit for the NVI FK.31 as built under license in Finland is a nice and rather unique kit to build, but needs quite some corrections to represent the original correctly. Wing and fuselage needed to be corrected quite a bit to eliminate asymmetry of these parts, and the wing is thinner than that of the original. Also, the holes for the wing struts are not in the correct place. Major flaw is that the Jupiter engine is modeled as a seven cylinder, while it was in reality a nine-cylinder engine. The wing has a flat underside, while the aircraft's wing had quite some dihedral.

The kit contains parts to furnish the second cockpit with a machine gun. Historically the Finnish aircraft were equipped with dual controls, and have never been equipped with a machine gun. Parts to equip the second cockpit with seat, stick, rudder bar and instrument panel are not included in the kit and must be scratch built or taken from the scrap box. Other, minor flaws are the undercarriage damper struts, that are too short, the engravings of the access doors and the tailskid that is too big. The decals are not resistant to enamel varnish; this should have been explicitly mentioned in the instruction sheet, as the kit contains no spare decals to test this.

All corrections, except for a nine-cylinder engine and a thicker wing, are relatively easy to make, and refining the model by adding detail to engine and control surfaces is rather straight forward, although they take more effort than usual for a resin kit. The kit would also gain in value by a more extensive instruction sheet, really adapted to the version of the aircraft modeled.

Nevertheless, the finished NVI FK.31 shows a good resemblance with the original. Below some pictures of the model are shown.











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Appendix Photographs of Finnish NVI FK.31 aircraft



The four pictures above are photographs of the Finnish FK.31's produced by Koolhoven in the Netherlands. The picture at the right is of one of the four aircraft produced in Finland and the subject of this building report.

The two pictures below are Koolhoven produced FK.31's, which have the same rear fuselage as the Finnish, but carry a Dutch registration. The H-NACG is also equipped with an observer's machine gun, which certainly was not the Finnish aircraft standard; these were exclusively used as unarmed trainers. According to Wesselink (ref. 14) the aircraft has, however been delivered to Finland and served there as KO-33. The same source reports that the H-NACF, which also has a different engine cowling, has never been delivered to Finland.



ⁱ www.omega-models.com

ⁱⁱ The FK.31's for Finland constructed by Koolhoven in the Netherlands had also no circular cut-out, but the cut-out in the wing trailing edge was more rectangular and much smaller.

ⁱⁱⁱ www.militaryimages.net

^{iv} As the picture of the KO-66 in my references did not have a large contrast, I did not notice these discrepancies, until they were pointed out to me by a fellow modeller.