Building instructions

SCOUT 60

Building instructions and plan Order No. 3809

Robbe Modellsport GmbH

Werk Schlueter Modellbau

Model helicopters - the safety aspect

Radio-controlled model helicopters are fascinating machines, but they are not easy to handle, nor are they toys. An RC helicopter is an aircraft which demands very high levels of technical and piloting skills, and you should not consider building one unless you are a responsible, circumspect modeller, preferably with considerable knowledge and experience.

One way of absorbing knowledge is to read the specialist books and articles in the modelling magazines. The manufacturers of model helicopters also produce useful literature, and the kits include detailed instructions.

You can also attend seminars, all kinds of helicopter events and displays, and of course competitions. Please refer to the modelling press for details of events. Your national body will also be able to offer advice. It is always useful to go along to displays and contests, to ask advice and to watch how the others do it. One word of warning here: steer clear of those modellers who always seem to know better than the manufacturers; they will try and convince you that such and such a model will only fly if you carry out some "improvement" or other. Generally speaking, such alterations are likely to have drawbacks as well as advantages. At best modifications destroy the mix of characteristics which the designer and manufacturer has built into the model, and thus render worthless the detailed instructions, specifications, adjustment values and so on stated in the building instructions. This is not in your interests at all. For this reason, please bear the following in mind:

Construction

Please follow the instructions to the letter. Work carefully and logically, using only the original parts, and modify nothing. This applies right down to individual screws. Lock all screwed joints to prevent them shaking loose. Install the radio control system carefully, mounting the servos in their rubber grommets, with no part of the casing in contact with the chassis. Balance all rotating parts carefully to avoid vibration problems. Always remember: a minor error or carelessness in assembly can result in an extremely dangerous model.

Flying

Fly only at recognised flying sites, using properly licensed radio equipment (where appropriate) and with adequate insurance. Check that nobody is flying on your frequency. Please note the following vital warning: The rotating rotor blades are extremely dangerous, and can cause serious damage and personal injury. Always keep the model a safe distance from onlookers. Never fly towards spectators, far less fly over them. Remember this: a helicopter is capable of flying in any direction without warning. This is the source of its fascination, but also its principal danger.

If you encounter problems, do not fly again until you have found the cause and eliminated it. Sudden changes in flight characteristics are a reliable indicator of a problem.

Repairs

Examine all parts with great care. If anything is defective, use original replacement parts only. Carry out repair work with the same fastidious care that you exercised during initial assembly. It is essential to locate the cause of the damage or the crash, and eliminate it. Faulty repairs result in further damage!

Always remember: a botched repair makes a helicopter extremely dangerous to everybody.

If you stick to these guidelines in a responsible way, you are on the right track for safe, reliable operation.

W A R N I N G

A radio-controlled model helicopter is no toy; it is a complex mechanical device which should not even be considered by other than experienced, responsible and circumspect modellers. Errors or carelessness in construction and in the installation of the radio system inevitably result in an uncontrollable model, which is extremely dangerous.

The rotating rotor blades are a constant source of danger, and can cause severe injury to the pilot, onlookers and others, as well as serious damage to property.

As the manufacturer and dealer have no control over assembly and operation of these products, we can do no more than point out the dangers expressly; we deny any liability.

Dear customer,

The "SCOUT '60" is a member of the newly developed "Schlueter System '88". Compared with earlier designs, this system offers one completely new feature: the main rotor control system. Collective pitch control is achieved by raising and lowering the swashplate, while cyclic pitch is controlled by a system of links offset by 45 Grad>. The control system is complemented by a newly developed two-bladed main rotor with stabiliser bar (fly bar), itself actuated by a system of links offset by 45 Grad>, with pitch compensation and Bell/Hiller mixers.

Cyclic pitch variation of the main rotor blades and stabiliser bar paddles must occur at 90 Grad> to the direction of flight, for technical reasons. In this case, however, these control movements are transferred via the swashplate with all the transmission elements offset by 45 Grad>. If the main rotor rotates to the right, forward flight is no longer achieved by tilting the swashplate forward, but by 45 Grad> to the left and forward. A roll to the right is not achieved by tilting the swashplate to the right by 90 Grad>, but by 45 Grad> to the right and forward. All control movements are thus shifted forward by 45 Grad> in opposition to the direction of rotor rotation.

This kit does not include radio control system, motor and silencer. Please refer to the Schlueter catalogue for recommended radio equipment and motors. We recommend the silencer Order No. S0924 for this model. You will also need a separate adaptor to match the motor you intend using. The Schlueter catalogue includes tables of matching accessories, plus useful helicopter tools, which are available individually and as a complete set in a tool case (Order No. S1370). The rotor blade balance, Order No. S1367, is highly recommended. The following items should be considered essential:

Helicopter adjustment gauge	Order No. S1366
Main rotor adjustment jig	Order No. S1345
Tail rotor balance shaft	Order No. S1346
Ball-link pliers	Order No. S1360

An ideal introduction to the world of model helicopters is "Schlueter's radio-controlled helicopter manual" (Argus Books), written by Ing. Dieter Schlueter. It contains everything worth knowing about model helicopters, and should be considered essential reading by every would-be pilot. The book is available in German under Order No. S9954, and in English under Order No. S9956.

Replacement parts

It is vital that you use original replacement parts exclusively. The part numbers are printed next to the illustration of the part on the plan. When ordering spare parts, this number must be preceded with an "S"; the prefix is not shown on the plan, to avoid confusion.

Bag 17 includes a number of replacement screws and nuts which are often required.

The building instructions often refer to "LOP" and "instant glue". The symbol "L" on the plan indicates where "LOP" is to be used. "LOP" is the fluid supplied in the kit for locking screws and nuts, and also for fixing ballraces on shafts. "Instant glue" is the generic term for the cyano-acrylate adhesives which are produced by many manufacturers. This material sets very quickly, is very versatile, and offers very high strength.

Stage 1 (bag 1) Assembling the side panels

As shown in detail 1 on plan 1, the first step is to screw the threaded bolts (S3111) and (S3134) and the spacers (S3126) to the side panels (S3120), to form the pivot for the bellcranks, which are installed later. Use the M3 locknuts (S0012).

Join the side panels (S3120) to the chassis floor (S3104),using the M3 x 8 socket cap screws (S0030) and M3 locknuts (S0012). Align the side panels on a flat surface before tightening the screws.

Fit the channel-section piece (S3109), and secure it with the M3 x 8 socket cap screws (S0030), the M3 locknuts (S0012) and the tank holder (S3112).

Stage 2 (bag 2) Assembling the skid landing gear

The undercarriage is assembled as shown in detail 2 on plan 1.

The rear skid bar (S3121) requires two extra 3 mm holes at its ends. Use the tank holder (S3101) as a marking-out template.

First plug the skid legs (S3121) into the skid tubes (S3124). Press an M3 locknut (S0012) into each skid connector (S3122) (plastic nut insert on the outside). As an aid to assembly, press a long 2 mm pushrod into the groove in the skid connector, and with its help push the skid connector into the skid tube, until the threads in the hole in the skid leg are visible. Screw in the M3 x 18 socket cap screws (S0088). Relieve the inside of the skid tubes slightly to ease the fitting of the end pads. Press the end pads (S3123) into the skid tubes.

Place the front support (S3105) in the chassis floor. Now screw the complete skid landing gear to the underside of the chassis floor. The M4 x 20 socket cap screw (S0049) is fitted at the front, the M4 x 16 socket cap screw (S0034) at the rear, plus the 4 mm washer (S0066) and the M4 locknut (S0015). The fueltank holder is fixed on the outside together with the skid legs, using the M3 x 16 socket cap screws (S0031), the 3 mm washers (S0007) and M3 locknuts (S0012).

Stage 3 (fueltank) Fueltank installation

Detail 3 on plan 1 shows the assembly of the fueltank (S1119) in detail.

First place the edge guard strip (S3113) on the inside of the tank holder, mark the correct length, cut the strip to length, and install it. Screw the retaining bracket (S3115) to the side plate (S3120) using the spacer sleeve (S0297), the M3 x 30 socket cap screw (S0038) and the M3 locknut (S0012). Fit the rubber sleeve (S3116). Slide the fueltank into the tank holder, leaving a gap about 3 mm wide between the tank front and the side panels (S3120). As shown on the plan, mark the holes for the tank connections and the fixing hole for the retaining bracket (S3115), then withdraw the fueltank from the tank holder and drill the holes. The holes for the tank connections are 5 mm ⌀, that for fixing the retaining bracket 3 mm.

Fit the fueltank back into the tank holder and press the M3 x 12 socket cap screw (S0073) and the 3 mm washer (S0007) through the tank from the inside. Fit the washer (S0007) and the locknut (S0012) on the outside and tighten the nut. Do not over-tighten the nut; the tension is correct when the M3 locknut (S0012) finishes flush with the end of the screw.

Fit an O-ring onto each tank connector, fit them through the holes from the inside, and secure them with a washer and nut each. Cut the silicone tubing to length, and attach the clunk weight. Take care that the feed pipe is not overlength, otherwise the clunk weight may get stuck in the rear rounded part of the fueltank. Clean the fueltank carefully, and seal with the tank lid.

The fueltank covers the screw (S0034) which secures the rear skid leg. However, the tank can be pressed upwards and squashed at the point marked (3a), and the screw is thus accessible or replaceable at any time.

Stage 4 (bag 4) The main rotor shaft assembly

Please refer to detail 4a on plan 1. Place the 10 mm I.D. ballrace in one bearing shell (S3427), and add the second shell. Fit the threaded sleeves (S3133) into the assembled bearing shells. Slide the bearing shells between the side panels (S3120) and fix them in place with the M3 x 10 socket cap screws (S0039). See overall view A.

Now screw the freewheel outer ring (S3432) to the main gear (S1269), using eight M3 x 10 socket cap screws (S0039) and M3 locknuts (S0012). The holes for the pins (S0246) must face away from the gear. See detail 4b on plan 1.

The main rotor shaft (S3430) can now be pushed into the ballrace already fitted in the chassis, with the short hole spacing at the bottom. The mechanics must now be laid on one side, to allow installation of the collet (S1275) and the main gear (S1269) with freewheel outer ring (S3432) attached. Apply a little grease to the holes in the freewheel outer ring (S3432) and press in the compression springs (S0247) and the pins (S0246). Place the freewheel ratchet (S3431) on the main rotor shaft and push the transverse pin (S0249) into the cross hole in the rotor shaft.

Push the top collet (S1275) onto the main rotor shaft, and pull the main rotor shaft up until there is a gap of about 2/10 mm between the freewheel outer ring and the freewheel ratchet. Check that the transverse pin (S0249) engages correctly in the groove in the freewheel ratchet (S3431); see detail 4c. Tighten the top collet (S1275). Slide the bottom collet (S1275) up by the stated 2/10 mm and tighten it. The main rotor shaft must not exhibit any axial play between the bearings. Check once more that there is about 2/10 mm axial play between the main gear and the freewheel outer ring.

Stage 5 (bag 5) Assembling the tail rotor power take-off system

The power take-off for the tail rotor is assembled as shown in detail 5 on plan 1. Please note that the shaft (S3306) must be flush with the slot in the tail rotor connector (S3300). This assembly is fixed between the side panels (S3120) using the M3 x 10 socket cap screws (S0039).

Caution: The shaft (S3306) and bevel gear (S0262) must be exactly at 90 Grad> to the main rotor shaft. The two bevel gears must be adjusted so that they rotate freely, but without slop.

Stage 6 (bag 6) Installing the cooling fan

The cooling fan (S1239) is screwed to the motor, as shown in detail 6a on plan 1. Depending on the motor and carburettor in use, it may be necessary to fit the spacer washer (S0150) supplied.

Caution: Do not forget the washer (S0005). Tighten the motor crankshaft nut very securely, using the retaining spanner (S1344).

Important: The fan (S1239) is bored 6.35 mm ¼, and fits most 10 cc model motors in current use. For motors with different shaft diameters the fan will need to be drilled out. Many motors have considerable tolerances in the crankshaft nose and threaded section, and you may find that the fan does not run true. Other rotating parts will amplify the problem leading to serious vibration. For this reason it is essential to check that the fan runs true at this early stage, and adjust it if necessary.

Checking true running: The easiest method of checking is to use a dial gauge. The maximum permissible tolerance is 5/100 mm at the point marked X1. Clamp the motor lightly in a vice and remove the glowplug. See detail 6b on plan 1.

If you do not have access to a dial gauge, true running can be checked using the rod supplied. Set the rod close to the point to be measured, and adjust it until you see a gap about 0.2 mm wide. Rotate the fan and watch the gap; if it does not alter visibly, the fan is running sufficiently true.

Correcting out of true running: Undo the crankshaft nut on the fan, rotate the fan to a new position and tighten the nut again. Mark the crankshaft (hub) and fan, so that you can try a series of positions. If that is not sufficient, the fan will have to be bored out (about 0.2 to 0.3 mm larger than the crankshaft diameter). Tighten the crankshaft nut only lightly, push the fan to one side, and check true running again. Keep shifting the fan until correct running is achieved. Tighten the nut with greater force, check that the setting is still correct, then tighten the nut fully. If you are unlucky, this may be a frustrating task, but it is absolutely essential.

When - and not before - the fan is running perfectly true, mount the clutch (S3128) and check its running at point X2. If there is a difference, rotate the clutch by 180 Grad>. The measuring point X3 is relatively non-critical and can be corrected by pressing lightly on one side of the starter shaft.

Stage 7 (bag 7) Installing the motor

Referring to detail 7a on plan 1, place the ballraces (S0270) and (S1277) in the bearing shells (S3132) and (S3131), and push the threaded sleeves (S3133) into the assembled shells.

Referring to detail 7b, mount the motor brackets (S0143) on the motor, using the M3 x 16 socket cap screws (S0031), the washers (S0007) and the M3 locknuts (S0012), but do not tighten them. Slip the central bracket (S3107) between the side panels (S3120). Mount the spacer washer (S0269) and the assembled clutch bell (S3129) on the starter shaft.

The motor is now installed as shown, using the M3 x 35 socket cap screws (S0035), the washers (S0007) and M3 locknuts (S0012), but do not tighten them yet. Fit the assembled bearing brackets (S3131) and (S3132), the washer (S0005) and the starter cone (S3106) on the starter shaft from the top, as shown in the overall view A on plan 1.

Check the alignment of the entire assembly; it must be straight between the side panels, and the drive gear (S3200) must mesh accurately with the main gear (S1269), i.e. it rotates freely, but without slop. Carefully tighten all the screws.

Caution: It is important to check that the drive assembly lines up accurately. The chassis must not be under tension. Check gear mesh; it must still be correct when all the screws are tight. Check for freedom of movement and lack of backlash. Tighten securely the socket-head grubscrews (S0041) in the starter cone (S3106). Compare the slots in the motor mount to check that the power unit has been installed true.

Stage 8 (bag 8) Installing the tail boom

The tail boom installation is shown in detail 8 on plan 1. Fit the sliding sleeve (S3301) on the drive shaft (S3314) and thread this assembly into the tail boom (S3313) from the front. The guide sleeves for the drive shaft are already pressed into the tail boom. Grease the sliding sleeve and push it into the tail shaft connector as shown. Now insert the tail boom (S3313) between the side panels (S3120) until it strikes the bearing bracket (S3316). Insert the clamp pieces (S0389) and the M3 x 30 socket cap screws (S0038), but do not tighten the screws yet.

Instant glue the fixing eyes (S3337) into the strut tubes (S3336). It is essential that the flat sections on the eyes are parallel to each other, as shown in detail 8a on plan 2. Screw the strut tubes 3336 to the side panels, together with the spacer pieces (S1294), the threaded sleeve (S3133) and the M3 x 20 socket cap screws (S0036), as shown on the plan.

Screw the horizontal stabilisers (S3538) to the tail mount (S3334) using the threaded piece (S3335), with a shake-proof washer on one end. Slide the assembled mount (S3334) onto the tail boom, and fix the strut tube (S3336) in place, using the M3 x 30 socket cap screw (S0038) and the M3 locknut (S0012). Do not tighten the nut yet.

Stage 9 (bag 9) Fitting the fan housing

Detail 9 on plan 2 shows this area. Drill 3.5 mm ⌇ holes where marked on the inside of the fan housing (S0296), and cut it down by 9 mm at the front. Cut away the housing to clear the carburettor if necessary. Cut the fan housing extension (S0298) to match your motor and instant glue it to the right-hand (wider) half of the fan housing, as seen from the rear, looking forward. Do not glue the left-hand part of the fan housing to the extension. Assemble the fan housing loosely, not forgetting the rear spacer tube (S0297). Do not tighten the screws at the front yet.

Note: Because of the differences in size of the various motors the fan housing extension (S0298) needs to be trimmed individually. It should end about 5 mm short of the motor. Cut the opening for the glowplug and leave space for the plug clip, which is attached from the underside. The material supplied is enough for two extensions.

The M3 x 30 socket cap screws and M3 locknuts which are left over from this bag are used to secure the front structure, and are not needed until later.

Stage 10 (bag 10) The tail rotor gearbox

The tail rotor gearbox housing is assembled next, as shown in detail 10a on plan 2.

Caution: When assembling the tail rotor gearbox please note that the small 17-tooth bevel gear (S0347) must be fitted on the shaft which protrudes from the front (S0346). The socket-head grubscrew (S0046) projects into the cross-hole in the shaft (S0346) and later clamps the drive shaft (S3314). The larger 22-tooth bevel gear (S0348) is fitted on the tubular shaft (S3319) which comes out of the side. If you mix up the bevel gears, tail rotor speed will be extremely high, and eventually the gearbox will be damaged and fail.

The first step is to push the small 17-tooth bevel gear (S0347) onto the tail rotor shaft (S0346), and screw the M3 x 5 socket-head grubscrew (S0046) into the bevel gear (S0347) until the 2mm hole in the tail rotor shaft (S0346) is just clear. Fit the open ballrace (S3317) onto the tail rotor shaft, followed by the single-shield ballrace (S3320), shield on the outside. This assembly is now placed in the right-hand gearbox shell. Push it forward until the bevel gear (S0347) butts up against the ballrace (S3317).

Fit the large bevel gear (S0348) and the spacer tube (S3321) onto the tubular shaft (S3319). The single-shield ballrace (S3320) is now slipped onto the tubular shaft, shield outside. The assembly of these three parts is now pushed back on the tubular shaft (S3319) until the ballrace is flush with the shaft on the right-hand side. Tighten the M3 x 3 socket-head grubscrew (S0041) to secure the bevel gear (S0348). Push the ballrace (S3320), shield outside, against the bevel gear (S0348) on the tubular shaft. Apply a little LOP in the gap between ballrace and tail rotor shafts, to avoid the inner ring rotating on the tail rotor shaft. Take care here; no LOP must get into the ballrace. Now place the assembly in the left-hand gearbox housing shell, join the two gearbox shells and secure with two M3 x 16 socket cap screws (S0031), M3 locknuts (S0012), two M2 x 8 machine screws (S0029) and two M2 locknuts (S0090).

Seal the bottom of the assembled gearbox housing with one M3.5 x 3 grubscrew (S0017) and two more at the sides. Do not screw in the sealing screws too far, otherwise you may jam up the gears.

As shown in detail 10b, screw the threaded bolts (S0228) into the underside of the fixing tongue on the right-hand gearbox housing shell, and secure with an M3 locknut (S0012). Oil the pushrod (S0349) and slide it into the tubular shaft. Fit the bellcrank (S0384) on the short end of the pushrod and the threaded bolt (S0228), and secure it with the collet (S0057) and M3 x 3 socket-head grubscrew (S0041).

Referring to detail 10c, fix the tailskid (S3333) to the fin (S3332), using the M3 x 8 socket cap screws (S0030), washers (S0007) and M3 locknuts (S0012). The fin (S3332) is fixed to the assembled gearbox housing with the four M3 x 30 socket cap screws (S0038) and M3 locknuts (S0012). Do not tighten the screws yet.

The assembled gearbox housing can now be fitted onto the tail boom from the rear, at the same time fitting the drive shaft (S3314) into the tail rotor shaft (S0346). Please note that the socket-head grubscrew (S0046) should not be screwed too far into the tail rotor shaft (S0346).

Tighten the M3 x 30 socket cap screws (S0038) which secure the fin and the tail rotor gearbox, checking that the tail rotor is horizontal and the fin vertical. Do not tighten the socket cap screws too firmly, otherwise you may distort the gearbox.

Caution: The socket-head grubscrew (S0046) which secures the drive shaft (S3314) must be tightened firmly, and the screw must engage squarely on the machined flat on the drive shaft. To ensure that this is so, rotate the tail rotor slowly, with the clamping screw slightly loosened. Tighten the screw slowly, and you will feel when the screw meets the flat. At this point it should be possible to tighten the screw by about one further turn.

Fill the gearbox housing about half-full with grease. Over-filling does no harm, but the excess will ooze out of the upper hole.

Withdraw the tail boom (S3313) between the side panels by about 1 mm. Tighten the four socket cap screws on the side panels, the socket cap screw on the tail mount and the two socket cap screws at the front of the strut tubes. See detail 8a on plan 2.

To prevent the tail boom and tail rotor gearbox from rotating, two 2.2 x 6.5 self-tapping screws (S0042) and two shake-proof washers (S0091) are screwed into the tail rotor gearbox housing and the front tail boom fixing. See details 8a and 11b. Pilot-drill 1.5 mm ! holes, and do not over-tighten the screws!

Stage 11 (bag 11) Assembling the tail rotor pitch control system

The tail rotor hub and blade holders are assembled as shown in detail 11a on plan 1.

I = Screw the ballrace (S0316) and locking washer (S0369) to the tail rotor hub (S0277) (use LOP). The free flange on the locking washer (S0369) must face the ballrace, otherwise the bearing will jam up.

11 = Assemble the tail rotor blade holders (S0317). Lock the screws with LOP. The tail rotor blades (S0394) are fixed using the M3 x 16 socket cap screws (S0031) and M3 locknuts (S0012).

Recommendation: We strongly advise balancing the tail rotor / tail rotor blades assembly at this stage, using the tail rotor balance shaft (Order No. S1346). Do not mount the tail rotor on the tail rotor gearbox tubular shaft until it is balanced.

Assemble the parts of the tail rotor pitch control system as shown in details 11a and 11b, and fix the assembly to the pushrod (S0349) using the collets (S0292). The exact position of these parts is determined later during the basic setting-up operation.

Stage 12 (bag 12) Assembling the swashplate / collective pitch compensator

Referring to detail 12a on plan 2, equip the bellcranks (S3127) with the sleeves (S3532), and screw the brass balls (S3150) to the cranks, using the M2 x 10 machine screws (S0020) and M2 hexagon nuts (S0010). Lock the nuts with LOP. The bellcranks are now mounted on the threaded bolts which are already in place on the chassis, as shown, and secured with the collet (S0057) and socket-head grubscrew (S0041). Check that each bellcrank rotates freely, but without slop.

Referring to detail 12b on plan 2, screw the brass balls (S3150) and the spacer tube (S3439) to the outer ring of the already assembled swashplate, using the M2 x 8 machine screws (S0029), the M2 x 14 socket cap screw (S0074) and M2 hexagon nuts (S0010). Lock the nuts with LOP.

Fix the brass balls (S3150) to the inner ring of the swashplate using the M2 x 10 machine screws (S0020) and the M2 hexagon nuts (S0010). Lock the nuts with LOP.

Apply a little grease to the swashplate ball (S3453) and place it in the swashplate inner ring. Place the steel slide ring (S3441) on top and tighten the three 2.2 x 8 self-tapping screws (S0099) to the point where it is free-moving but devoid of slop.

The collective pitch compensator is now built; see detail 12c on plan 2.

Fit the sleeves (S3532) to the collective pitch compensator levers (S3423), using the M2 x 8 machine screws (S0029) and M2 hexagon nuts (S0010). Secure the nuts with LOP. The prepared compensator levers are now screwed to the pre-assembled collective pitch compensator hub (S3460), using the screws (S3529). Fix the swashplate drivers to the compensator levers using the screws (S3529).

CAUTION: Take particular care that the screws (S3529) are driven in straight. Check that the parts remain free to move, but devoid of slop, when you tighten the screws.

The prepared swashplate and collective pitch compensator assembly are now slid onto the main rotor shaft. The next step is to make up the pushrod connections beween the bellcranks and the swashplate, as shown in detail 12a. To ensure equal pushrod lengths, fit the spacer sleeves (S3428) between the links. Press the swashplate drivers (S3426) on the brass balls already mounted on the swashplate inner ring. Push the threaded sleeve (S3133) into the hole in the swashplate holder (S3429), and fix it between the side panels using the M3 x 10 socket cap screws (S0039). See view A on plan 1.

Stage 13 (bag 13) Assembling the main rotor head

As can be seen from detail 13a on plan 3, the blade support shaft (S3523) is passed through the pre-assembled main rotor hub, and the O-rings (S3506) pushed into their recesses in the main rotor hub.

Fit the spacer washer (S1585), ballrace (S1552), axial bearing (S1551), spacer ring (S3524), ballrace (S1552) and buffer washer (S3525) onto both sides of the blade support shaft, and screw the M5 x 16 socket cap screws (S0081) temporarily (no LOP at this stage) into the blade support shaft leaving a gap of 2 mm. Do not apply LOP at this stage, and do not tighten the screws.

CAUTION: The axial bearing ring whose inside and outside diameter are larger must be fitted on the blade support shaft first, otherwise the blade holders will jam under load.

As shown in detail 13b, fit the blade holder shells (S3527) onto the bearing assembly and place the threaded plates (S3526) in them. Fit the second blade holder shell to seal the unit, and secure with the M3 x 25 socket cap screws (S0037) and M3 locknuts (S0012).

IMPORTANT: Check the axial play of the blade pivot units. Eliminate any play by fitting 0.1 mm thick shim washers (supplied) on both sides.

When both blade holders are complete, remove the two socket cap screws (S0081), apply LOP, and tighten them firmly.

Referring to detail 13c, apply a little LOP to the M3 x 10 socket cap screws (S0039), and screw the blade pitch levers (S3528) loosely to the blade holders. Pull the blade holders (S3527) outward, so that the bearings seat correctly, then tighten the blade holder socket cap screws (S0037) and at the same time the blade pitch lever socket cap screws (S0039).

Fix the brass balls (S3150) to the mixer levers (S3531) using the M2 x 12 machine screws (S0028) and M2 hexagon nuts (S0010). Secure the nuts with LOP. Mount the prepared mixer levers and bushes (S3532) on the blade pitch levers (S3528) using the screws (S3529) and 3 mm washers (S0007).

The transverse shaft (S1576) is already in place in the main rotor hub. Grease the shaft and slide the stabiliser bar (S1570) through. Press the ball link (S3536) onto the brass ball (S3535), as shown in detail 13c. Slide the washer (S0066), the control arm (S3533), the sleeve (S3534) and the ball (S3535) onto both sides of the stabiliser bar. Set the stabiliser bar roughly central and secure the aforementioned parts using the collets (S0559) and the M3 x 3 socket-head grubscrews (S0041), tightening the screws only lightly.

Screw the M3 x 3 socket-head grubscrews (S0041) into the stabiliser weights, and slip them onto the stabiliser bar. Screw the control paddles (S1588) to the stabiliser bar. The paddles (S1588) must be set exactly parallel to each other. The paddles must be set the correct way round relative to the direction of rotor rotation. Undo the collet (S0559), and balance the stabiliser bar precisely by sliding it one way or the other. Tighten the socket-head grubscrews (S0041) in the collets (S0559), align the control arms (S3533) exactly parallel to the control paddles (S1588), and tighten the M3 x 3 socket-head grubscrews (S0041). Any fine correction of balance can be achieved by moving the stabiliser weights (S1587).

Note:

No two pilots agree on the "correct" control response in a model helicopter. To allow for variations, the rotor head can be modified by shifting the stabiliser weights (S1587) or reducing the size of the control paddles (S1588). The effects are as follows:

1. Control paddles (S1588) standard size, inertia weights (S1587) as far outboard as possible. Very good control response, relatively good inherent stability and outstanding aerobatic characteristics. Recommended for experienced and expert pilots.

2. Control paddles (S1588) standard size, inertia weights (S1587) shifted inboard towards the rotor hub. The model becomes extremely sensitive, stability is greatly reduced, flight handling is unbalanced. Only recommended where extreme flight characteristics are required. The model may tend to balloon up at high flight speeds.

3. Control paddles (S1588) shortened by about 20 mm, otherwise the same settings as 1. Slightly more gentle control response, with no tendency to balloon up at high speed. Recommended for slightly calmer flying.

4. Fitting an extra set of inertia weights, Order No. S0755, (not included in the kit) increases the model's inherent stability further. Recommended for beginners and very calm pilots.

Whenever you make a change to the inertia weights, it is absolutely essential to re-balance the stabiliser bar.

Referring to detail 13c, place the driver (S3424) on the assembled main rotor hub (S3520). Press the spacer washers (S1572) into the corresponding holes in the driver. The driver is secured permanently with the M3 x 23 screw (S3522) when the head is assembled.

Stage 14 (bag 14) Assembling the front cabin structure

Please see detail 15a on plan 3 for details of assembling the central section of the front servo structure. Sand the edges of the wooden parts carefully. Round off the edges of the cabin bulkhead thoroughly. Use instant glue for all joints, and drill 3 mm ⅛ holes where marked. When the structure is complete, screw the central section temporarily between the chassis side panels at the front, and check correct alignment.

The longitudinal beams which take the servo mount are glued in place next, but before this the holes for the beams must be sawn out in the cabin rear wall and in the front bulkhead. Before cutting the holes, check the spacing between the beams, which will vary according to the servos you intend using, as shown in detail 15 b on plan 3: the dimension is marked X.

Please note:

The centrepoint of the output shafts of the servos 1, 2 and 3 must be exactly on the centreline of the model, as shown in overall view B on plan 4. As the servo output shafts are usually to one end of the case, the servos must be installed offset to one side. This is the reason for the differences in dimensions A and B, as stated also in the detail drawing 14b.

A full-size drawing is supplied for "Robbe RS 700" servos, which shows the correct beam hole spacing, the position for servos 1, 2 and 3, and the apertures and positions of the servos for tail rotor and throttle. All you need to do is transfer the dimensions to the wood parts.

If you are using other types of servo, you will need to mark out the beam spacings A and B and the other servo apertures yourself. The crucial point is that the servo output shaft centres must be located where shown. If in doubt, you can make up the servo assembly described in Stage 15 beforehand.

As shown in detail 15 on plan 3, slide the rear cabin wall onto the central section (mounted on the chassis) until it rests against the chassis side panels. Fit the 8 x 8 mm servo beams, add the front bulkhead and join the wooden parts using instant glue. In the same way glue in place the base plate (with aperture for throttle servo), the top plates (with aperture for tail rotor servo and optional gyro switch), the right-hand switch plate (with aperture for RC system switch) and the gyro mounting plate.

Apply a fillet of Stabilit Express along all the glued joints for extra rigidity.

Remove the completed front structure and fuel-proof it thoroughly. The front structure can now be fixed permanently between the side panels using the M3 x 30 socket cap screws. Secure the fan housing using the M3 x 35 socket cap screws, but do not overtighten them, as this would damage the wooden parts.

Stage 15 (bag 15) Assembling the mixer

Referring to detail 14a on plan 4, screw the servo holder under the mounts for servos 1, 2 and 3. Drill the holes to match the spacing of the servo mounts. If you re using "Robbe RS 700" servos, pilot drill the holes 1.8 mm ! and secure with self-tapping screws.

It is essential to check that the servos cannot be pulled up and out of the rubber grommets, as this would render the model uncontrollable. See detail 14 on plan 4. If necessary, use the washers (S0065) supplied.

Drill the beams 2.5 mm ⌀. Fix the servos on the beams, and screw the beams to the front structure using the 2.2 x 9.5 self-tapping screws (S0075). Please observe the 19 mm dimension as shown in overall drawing B, and the position of the servo output shafts.

Screw the balls and the reinforcements with the short extension (S3150) to the output levers of servos 2 and 3, as shown in detail 14c on plan 4, using the M2 x 16 machine screws (S0068). For Robbe RS 700 servos dimension "Y" should be 27 mm.

Screw the balls and the reinforcements with the longer extension (S3150) to the output arm of the collective pitch servo 1, using the M2 x 18 machine screws (S0098). Dimension "Y" should be 32 mm for Robbe RS 700 servos.

If you are using servos of a different type, dimensions "Y" may not be as stated above. The dimensions will vary according to the position of the holes in the servo output arms, the servo output arc and the control throws in general (corresponding to the control response you require).

The lever reinforcements are slotted, to allow for differences in the "Y" dimension. The important point is that the reinforcements must be mounted symmetrically on the servo output arms, and the central ball must be exactly above the servo output shaft centrepoint. The ball is fixed using the M2 x 8 machine screw (S0029).

The pushrod connections are shown in detail 12a on plan 2, and the overall drawing B on plan 4. Please follow this procedure:

1. Connect servos 1, 2 and 3 to the receiver. (Do not install the RC system yet, as the correct position can only be determined later when balancing the model. See "Centre of Gravity".)

2. Set all transmitter sticks and trims to neutral.

3. With the transmitter and receiver switched on, all the servo output arms should now be positioned parallel to the long axis of the servos. For servo 1 this applies when the collective pitch stick is central.

4. Adjust the 145 mm pushrod (S3445) until all three servos are exactly vertical.

All the stated pushrod settings should be measured with the servos vertical.

To set up the pushrods for servos 2 and 3 accurately, first slide the channel section jig between the top edge of the side panels and the bottom edge of the swashplate, as shown in overall drawing C on plan 4.

Press the swashplate onto the jig, and the correct thread lengths for the roll servo 2 and pitch-axis servo 3 will be obvious.

Note: Do not bend the threaded section of the pushrods, or they may break.

Secure the main rotor head to the main rotor shaft using the M3 x 23 socket cap screw (S3522) and the M3 locknut (S0012). Make up the pushrod connetions from the swashplate to the rotor head and between collective pitch compensator and rotor head as shown. The exact basic adjustment is shown in the overall drawing C on plan 4. See also the sketch at the end of the building instructions.

The following general rules should be observed:

A. Servos 1, 2 and 3 vertical
B. Bellcranks vertical/horizontal
C. Swashplate to side panel dimension 16 mm (jig)
D. Collective pitch compensator horizontal (offset in direction of rotation by 45 Grad>)
E. Mixer lever on blade pitch lever horizontal
F. Stabiliser bar horizontal

The blade pitch levers should now be angled upward slightly, and the forks of the blade holders should be at an angle of + 2.5 Grad>. The collective pitch range is now - 4 to + 9 Grad>.

The tail rotor control system comprises the pushrods (S0356) and (S3448). The pushrod (S0356) must be fitted with an extra bush on the right-hand side panel, as shown in the detail drawing on plan 2. This bush consists of a spacer tube (S3428) and pushrod guide (S1243), which is fixed in place with an M2 x 18 machine screw (S0098) and an M2 hexagon nut (S0010). Lock the nut with LOP. The four guides (S1241) serve as further bushes. They are fixed to the tail boom (S3313) with the M2 x 10 machine screws (S0020) and M2 hexagon nuts (S0010), as shown at the same point. Lock these screws also with LOP. To prevent the guides (S1241) rotating, they are secured with one 2.2 x 6.5 self-tapping screws each. Drill a 1.5 mm pilot hole in the tail boom at the appropriate points before fitting the screws.

It is vital that the 6 mm long threaded portions of the two tail pushrods are screwed completely into the pushrod connector (S1242).

When setting up the tail rotor pushrods, please check that the control arm (S0384) is at right-angles to the tail boom when the servo is at neutral (centre).

The pitch angle of the tail rotor blades is adjusted by shifting the collets (S0292). The overall range is between about - 10 Grad> and + 25 Grad>, frome one end-point of the tail rotor servo to the other.

You should aim to achieve the following travels, in relation to the main rotor:

Main rotor 0 Grad>	=	Tail rotor 0 Grad>*
Main rotor 2.5 Grad>	=	Tail rotor + 5 Grad>
Main rotor 6.5 Grad>	=	Tail rotor + 10 Grad>

* If you are using the Eppler section tail rotor blades Order No. S0394, measure with the helicopter adjustment gauge, Order No. S1366 parallel to the tail boom.

Stage 16 (bag 16) Completing the main rotor blades

Rub down the main rotor blades (S1272) and trim the doublers if necessary. It is important that the total thickness of the blades including doublers is 14 mm, and that the faces of the doublers are parallel. Seal both ends of the rotor blades with paint, to protect against damp and oil absorption. Cover the main rotor blades with the film supplied, as shown in detail 16 on plan 3.

Balance the rotor blades using the pieces of film supplied, and mark one tip red, one tip black, using the film supplied, to aid blade tracking adjustments.

We strongly recommend the rotor blade balance, Order No. S1367.

If you have to balance the blades without the blade balance, please follow this procedure:

Mount the rotor blades on the rotor head, tighten the setscrews somewhat tighter than normal, and set the blades exactly in line with each other and the rotor head. Turn the assembly over, i.e. in the "inverted flight" position, and support the stabiliser bar. The main rotor blades will now hang below the stabiliser bar. Add film to the lighter blade until the rotor head balances absolutely horizontal.

Cabin

Cut out the cabin mouldings leaving a 5 mm wide flange on one side, and a 10 mm flange on the other, as shown in the drawing. Clamp the two mouldings together with clothes pegs, check that they are correctly aligned, and allow instant glue to run along the joint thus formed. The instant glue will automatically run right into the joint. This is a quick, reliable method of joining the cabin. If you do not have any instant glue, use PVC adhesive in the normal way.

Cut down the central flange of the two cabin mouldings to an even thickness, and trim the cabin to fit snugly on the model. As shown on plan 4 (dotted line), glue a strip of the cabin material over the upper joint area on the inside to reinforce the seam. Cut an access opening for the RC system switch and the gyro switch (if fitted); they are mounted on the right-hand side of the switch plate. As indicated on plan 4, slit the bottom part of the cabin moulding (the projecting part), to allow the cabin to be spread and fitted onto the cabin rear wall.

Paint the cabin in the scheme of your choice, but be sure to rub down the areas to be painted with fine glasspaper beforehand.

Centre of Gravity

With the complete radio system installed, half-fill the fueltank and raise the model by the stabiliser bar. The helicopter should balance with the nose inclined down by about 2 - 3 Grad>.

The position of the battery has a considerable influence on the Centre of Gravity, and moving it is the main means of correcting the balance point. The rest of the radio control system is installed in the remaining space on the lower servo plate. Wrap the battery in a thin layer of foam, and secure it with strong rubber bands. The receiver must be wrapped in vibration-absorbing material. Make sure that no leads are dangling loose. Route the aerial as directly as possible down and out through the cabin bulkhead, and tension it lightly to the skid and the horizontal stabiliser with thin rubber bands. The tail rotor gyro is mounted in an aperture in the central front structure, following the manufacturer's recommendations.

Maintenance

After every two or three hours' operation, the following points on the helicopter should be lubricated:

1. Swashplate ball on the main rotor shaft
2. Sliding sleeve on the collective pitch compensator hub
3. Tail rotor drive shaft in the tail boom sleeves
4. Pushrod in the tubular shaft of the tail rotor gearbox housing

We reserve the right to amend technical specifications. 2/88

Parts List SCOUT 60

Art. No.	Description	No. off
S0000	Washer, 2 mm	6
S0002	Washer, 4.3 mm	2
S0005	Washer, 6.4 mm	2
S0007	Washer, 3.2 mm	45
S0010	Hexagon nut, M2	46
S0011	Hexagon nut, M3	1
S0012	Locknut, M3	74
S0016	Weld nut, M3	1
S0017	Grubscrew, 3.5 x 3	3
S0019	Machine screw, M3 x 5	2
S0020	Machine screw, M2 x 10	23
S0028	Machine screw, M2 x 12	4
S0029	Machine screw, M2 x 8	12
S0030	Socket cap screw, M3 x 8	17
S0031	Socket cap screw,, M3 x 16	12
S0034	Socket cap screw, M4 x 16	1
S0035	Socket cap screw, M3 x 35	7
S0036	Socket cap screw, M3 x 20	2
S0037	Socket cap screw, M3 x 25	9
S0038	Socket cap screw, M3 x 30	13
S0039	Socket cap screw, M3 x 10	37
S0041	Socket grubscrew, M3 x 3	32
S0042	Self-tapping screw, 2.2 x 6.5	10
S0046	Socket grubscrew, 3 x 5	1
S0049	Socket cap screw, M4 x 20	1
S0050	Ball link with ball	1
S0057	Collet, 3 mm	5
S0058	Ball link without ball	18
S0059	Clevis, M2	7
S0060	Allen key, 1.5	1
S0061	Allen key, 2.5	1
S0062	Allen key, 3.0	1
S0064	Allen key, 4.0	2
S0065	Washer, 2 mm	12
S0066	Washer, 4.3	5
S0068	Machine screw, M2 x 16	4
S0072	Pin, 3 x 8	2
S0075	Self-tapping screw, 2.2 x 9.5	14
S0079	Socket cap screw, M3 x 5	1
S0081	Socket cap screw, M5 x 16	2
S0088	Socket cap screw, M3 x 18	4
S0089	Socket cap screw, M4 x 14	2
S0090	Locknut, M2	2
S0092	Machine screw, M2 x 14	1
S0098	Machine screw, M2 x 18	3
S0099	Self-tapping screw, 2.2 x 8	3
S0143	Formed motor bracket	2
S0150	Spacer washer	1
S0162	Impeller	1
S0197	Transverse pin, 2 x 11.8	6
S0218	Clutch lining	1
S0228	Pivot pin	1
S0247	Spring	2
S0249	Pin, 3 x 13.8	1
S0261	Collet, 5 mm	1
S0262	15-tooth bevel gear	1
S0269	Shim washer, 6 x 0.2	1

S0270	Ballrace, 6 x 19 ZZ	3
S0277	Tail rotor hub	1
S0281	Bush	1
S0282	Miniature ballrace	2
S0283	Tail rotor control bar	2
S0284	Ball link and thrust bearing	2
S0285	Transverse pin, 2 x 7.8	2
S0292	Collet 2 mm, M3 thread	2
S0296	Fan housing	1
S0297	Spacer tube, 20 long	2
S0298	Fan housing extension	1
S0316	Ballrace, 3 x 10	2
S0317	Tail rotor blade holder	4
S0346	Tail rotor shaft	1
S0347	17-tooth bevel gear	1
S0348	22-tooth bevel gear	1
S0349	Pushrod	1
S0356	Pushrod, M2 x 6 / M2 x 10 x 760	1
S0364	Ballrace, 3 x 10 ZZ	2
S0369	Circlip	2
S0384	Bellcrank	1
S0389	Tail rotor clamp	4
S0394	Tail rotor blade	2
S0434	Ball-head, 6 mm	1
S0542	Transverse bearing	1
S0804	Film, 165 x 570	2
S1119	Fueltank, 500 cc	1
S1239	Fan hub	1
S1241	Tail rotor clamp clip	4
S1242	Pushrod connector	1
S1243	Pushrod guide	2
S1269	100-tooth gear	1
S1272	Main rotor blade set	1
S1275	Collet, 10 mm	2
S1277	Ballrace, 10 x 19 ZZ	3
S1293	Ball link, short	5
S1294	Spacer	2
S1302	Key, 11 x 30	1
S1314	Grease	1
S1344	Key	1
S1551	Thrust bearing, 8 mm	2
S1552	Ballrace, 8 x 16 ZZ	4
S1556	Sleeve for rotor blade	2
S1570	Stabiliser bar	1
S1572	Spacer ring	3
S1576	Transverse shaft	1
S1585	Washer, 8 x 13 x 0.5	2
S1587	Stabiliser weight	2
S3101	Fueltank holder	1
S3104	Chassis floor	1
S3105	Skid supports	1
S3106	Starter cone	1
S3107	Motor spacer bracket	1
S3109	Channel section, 10 mm, eloxided	2
S3111	Stud	2
S3113	Single-sided fueltank holder	1
S3113	Edge guard, 250 mm	1
S3115	Aluminium retaining bracket	1

S3116	Rubber sleeve	1
S3120	Side panel, Scout	2
S3121	Plastic skid leg	2
S3122	Skid connector, 12 mm	4
S3123	Skid plug, 12 mm	4
S3124	Skid tubing, 12 mm	2
S3126	Spacer piece	2
S3127	Bellcrank	4
S3128	Centrifugal clutch	1
S3129	Clutch bell	1
S3131	Double bearing shell	2
S3132	Bearing shell	2
S3133	Threaded coupler	12
S3134	Stud	2
S3150	Ball	28
S3200	11-tooth spur gear	1
S3300	Tail rotor connector	1
S3301	Slider	1
S3306	Shaft, 5 mm	1
S3313	Tail boom, 725 mm long	1
S3314	Drive shaft, 736 mm long	1
S3315	Ballrace, 5 x 19 ZZ	2
S3316	Double bearing shell	2
S3317	Ballrace, 5 x 13	1
S3318	Tail rotor gear housing, L + R	1
S3319	Tubular shaft	1
S3320	Ballrace, 5 x 13 Z	3
S3321	Spacer tube, 6 x 0.45	1
S3332	Fin	1
S3333	Tailskid	1
S3334	Tail mount	1
S3335	Stud, M4 x 50	1
S3336	Aluminium tube	2
S3337	Retaining eye	4
S3339	Shakeproof washer, 4 mm	1
S3414	Swashplate ballrace	1
S3422	Collective pitch compensator hub	1
S3423	Collective pitch compensator arm	2
S3424	Compensator driver	1
S3425	Pin, 2 x 32 mm	2
S3427	Bearing shell	4
S3428	Spacer tube, plastic, 8 mm	5
S3429	Swashplate holder	1
S3430	Main rotor shaft	1
S3431	Freewheel ratchet	1
S3432	Freewheel outer ring	1
S3433	Bearing, 14 x 2 x 13	1
S3434	Swashplate outer ring	1
S3436	Ball for swashplate	1
S3437	Slide ring	1
S3438	Tube, 40 x 1 x 6	1
S3439	Spacer tube	1
S3440	Mixer, 18-part	1
S3441	Steel slide ring	1
S3442	Spacer tube, plastic, 5 mm	2
S3443	Pushrod, M2 x 25	6
S3444	Pushrod, 2 x M2 x 8 x 138	1
S3445	Pushrod, 2 x M2 x 8 x 145	2

S3446	Pushrod, 2 x M2 x 8 x 105	1
S3447	Pushrod, 2 x M2 x 8 x 185	1
S3448	Pushrod, M2 x 6 / M2 x 10 x 220	1
S3453	Ball-link	1
S3460	Coll. pitch compensator / sleeve	1
S3461	Freewheel spring	2
S3459	Sleeve for compensator hub	1
S3506	O-ring, 7 x 3	2
S3507	Shim washer, 8 x 13 x 0.1	4
S3510	Pushrod, M2 x 10	2
S3521	Main rotor hub, plastic	1
S3522	Special screw, M3 x 23	1
S3523	Blade pivot shaft	1
S3524	Spacer ring	2
S3525	Thrust washer	2
S3526	Threaded plate, M3	4
S3527	Blade holder shell	4
S3528	Blade pitch lever	2
S3529	Special screw, M3 x 27.5	6
S3530	Setscrew, 37 mm long	2
S3531	Mixer lever	2
S3532	Bush	22
S3533	Lever with ball	2
S3534	Sleeve	2
S3535	Ball, 8 mm	2
S3536	Ball link	2
S3537	Special screw, M3 x 26, socket	1
S3538	Control paddle, 70 long	2
S3540	Pushrod, M2 x 5 / M2 x 10 x 75	2
S3542	HR hub, plastic	1
S3807	Front wooden structure set	1
S3809	Plan and instructions	1
S3811	Trim film	1
S3814	Canopy, Scout	1

Robbe Modellsport GmbH

Werk Schlueter Modellbau

Schlueter Modellbau . Dieselstrasse 5 . 6052 Muehlheim am Main . West Germany

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