

BUILDING INSTRUCTION

for

"MINI BOY"

Congratulations on your purchase of the "Mini-Boy"!

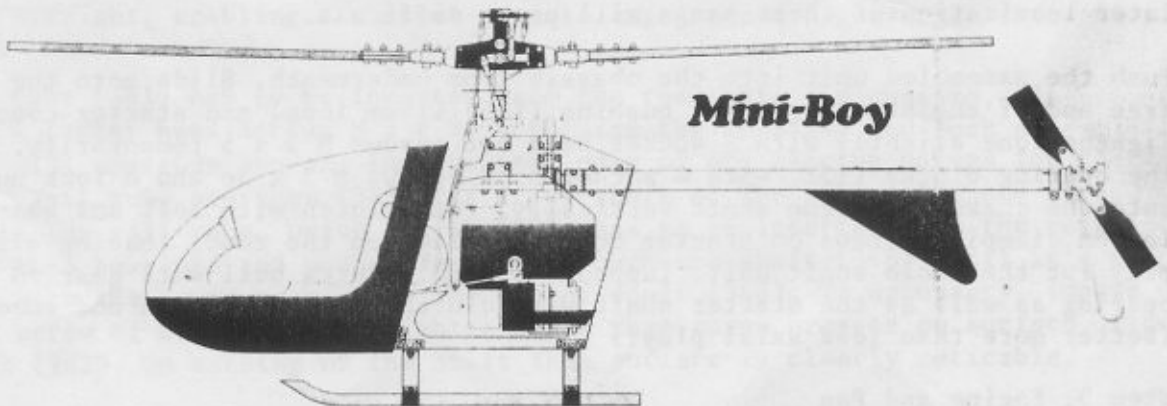
You have chosen a model based on the evaluation of 15 years experience in Helicopter techniques and the production of several ten thousand kits. Thus you can be sure that all components have been very carefully selected for their task and will coincide perfectly, to assure a successful and safe flight performance.

On assembly of your model, adhere exactly to the building instruction, pay attention to the detailed hints. Always read one chapter thoroughly before starting with the assembly. Look for possible enclosures with special instructions or additional recommendations.

Important:

A model helicopter is not a toy and only belongs in the hands of responsible persons. This applies to the assembly and the operation. The rotating blades exert a considerable energy! Assemble very carefully and check your model before each start, for the function of all parts. Fly only on permitted fields. Keep away from spectators. Keep yourself in an adequate safety distance to the model. Pay attention to the instructions of the radio-control-unit manufacturers.

With proper care, you certainly will have a lot of fun with your "Mini-Boy"!



HUBSCHRAUBER

Schlüter

MODELLBAU

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To simplify construction, all building components are packed in bags numbered in a sequence corresponding to their appropriate assembly stage. It is therefore recommended that you keep to the number sequence given in instruction stage and on the corresponding bag, so to keep your working place always tidy, open up only the bag required for a particular stage on which you are presently working.

Step 1, Chassis and Skids

Screw together with 12 iron screw M 3 x 8 and hexagon nuts (nuts to the inside) the two sideplates (190), using the 2 bottom-U-Profiles (189) and the 2 short U-Profiles (141). It's important to line up the side plates parallel to each other and tighten the screws at once. Secure screws by a drop of "Loctite", (Order No 1341). Screw struts (195) with 2 socket head screws M 3 x 10 and lock nut underneath the bottom U- Profiles.

Screw the skids (196) with the clamp (125) and the 8 screws M 3 x 10 with hexagon nuts on the struts (195). Skids have to protrude at the rear approx. 55 mm. Tighten screws finally, nuts facing downward. Secure nuts with Lotite.

In addition screw U-Profil (141) with 2 iron screws M 3 x 8 and nuts M 3 between the chassis walls, above the engine mount, i.e. underneath the two drilled holes for the rear fan mounting. U-Profil serves as reinforcement for the chassis, on assembly take care that the fastening plates for the engine (187) do not distort the chassis.

Step 2, Clutch and Starting Shaft

The clutch (182) is already pre-assembled with the starting shaft (183) and the cross pin (197). Slide onto the starting shaft as follows:

- 1 bushing (184) (4mm long)
- 1 disc (199)
- 1 needle bearing (198)
- 1 clutch bell (180) with gear (181) mounted
- 1 disc (199)
- 1 bushing (185)(14mm long)
- 1 bearing support (131) with bearing (130) with ball bearing for clutch
- 1 bearing support, as above, but with the ball bearing facing away from the clutch.

Grease has to be applied on mounting of the bushings, discs and needle bearings, later lubrication of these parts will prove difficult.

Push the assembled unit into the chassis from underneath. Slide onto the upper, free end of the starting shaft bushing (185) (14mm long) and starter cone (186). Tighten cone slightly with 2 socket head set screws M 3 x 5 temporarily. Screw the bearing blocks (131) with 4 socket head screws M 3 x 30 and 4 lock nuts M 3 into the chassis. Align shaft vertically. Push clutch with bell and gear upward, loosen clamping screws on starter cone and slide on the cone, leaving slight axial play for the whole shaft unit. (approx. 0,2mm). Clutch bell with gear on the needle bearing as well as the starter shaft with clutch must move clean and smoothly. (Better more than less axial play!)

Step 3, Engine and Fan

The flywheel (179) has already been assembled with the fan (162) and the carrier pins (160) for the clutch. The flywheel has a drilled hole of 1/4" i.e. 6,35 mm and fits the nowadays common engine types of 6,5 ccm. Instead of the propeller, the flywheel will be mounted on to the engine crank shaft. Use holder (Order No 1344) for the clutch, when tightening crankshaft nut firmly!

Eventually apply washer (150) to obtain sufficient clearance to the carburetor. Screw engine supporting plates (187) with spacer disc (188) against left and right side of chassis, using 4 socket head screws M 3 x 15, large washers 3 mm dia. and lock nuts (screws from the outside, washers and nuts from the inside). Don't tighten screws yet. Screw the engine with 4 socket head screws m 3 x 10 and lock nuts M 3 onto the engine supporting plates (187). Push the whole unit upward, so carrier pins of flywheel engage into the drilled hole of the clutch. Protruding center part of the clutch has to be pressed into the opening of the flywheel, providing adequate fixing of the flywheel. Occasionally, depending on engine type, the holes have to be enlarged. On this inserting procedure, care has to be taken that a straight alignment between starting shaft with clutch and flywheel with engine is provided. Don't push the engine too far upward, otherwise the axial play in the clutch shaft gets lost. After exact mounting, clutch bell with drive gear will turn smoothly. As well starting shaft with the clutch must be easily movable, with an audible slight tone, caused by the play between the carrier pins and the holes of the clutch.

Cut out the cooling fan housing (119) according to markings and adapt to the openings provided for the carburetor operation. Procedures will be eased by the transparent material of the housing. Hold halves of housing against engine and mark the adequate openings and holes for drilling. Fasten halves of cooling fan housing, facing in flight direction, onto the right side plate with iron screw M 2 x 10, using on both sides washers and hexagon nuts M 2. Fan wheel must move free, without touching housing. Pay attention that cooling air is let to cylinder of the engine.

Step 4, Tail rotor drive

Put the crown gear (191) onto the shaft (346), socket set screw M 3 x 5 must intrude into cross drilling of shaft (346). Slide the two ball bearings (352) onto the shaft, press bearings into bearing halves (339). Push this unit from the rear into the chassis plates, fasten bearing halves with 2 socket head screws M 3 x 30 with large washer on both sides and lock nuts. Pay attention to the exact setting of the crown gear for the tail rotor drive to the drive gear of the clutch bell. Crown gear has to be aligned in a right angle to the drive gear. Both gears should have 1/10 mm play to each other. On tightening the fastening screws for the bearing supports, take care that the bearing supports are not pressed too tight. Unit must run smoothly.

On adjusting play of the crown gear (191) care has to be taken that the entire bearing block is moved, not only the gear with the shaft. Bearing block must be kept straight, enabling the crown gear to engage in a right*angle into the clutch gear.

Tail tube (381) has to be inserted from the rear into the chassis, clamped between 4 socket head screws M 3 x 30 (crossing the chassis) and lock nuts. Tail tube will protrude approx. 1mm the rear edge of the bearing halves for the crown gear. Tail tube bearings (343) for drive shaft of the tail rotor are already mounted in the tail tube. Drive shaft (382) has to be inserted from the rear into the tail tube bearings and pushed forward through the shaft (346) until it's in one line with the crown gear, i.e. the end of shaft (346). If necessary, loosen clamping screw of crown gear, retighten again that screw presses on surface of drive shaft (382). On turning of the shaft this surface is clearly noticeable.

Cut out side fin and stabilizer according to drawing and fasten with self tapping screws 2,2 x 6,5 and large washers onto the tail tube.

Step 5, Tail gear

Slide onto hollow shaft (380) bevel gear (348) (22teeth), and tighten well with socket set screw M 3x3. Put on one ball bearing (352) (open) and one ball bearing

(363) (closed with disc).

Screw on bevel gear (347) (17 teeth) with socket head screw M 3 x 5 onto the tail rotor shaft (346). Don't tighten socket set screw, enabling later insertion of shaft. Slide on ball bearing (352) (open) and (363) (closed with disc) Insert both gears with ball bearings into the tail rotor gear box. (Long shaft (380) into the square part, short shaft (346) into round part). On mounting the gears, take care that the small gear is driven by the shaft coming from the front and the big gear is located on the actual tail rotor axis, leading to a reduction. Mixing up of the two gears will cause an extreme high rotation of the tail rotor with resulting danger of destruction.

Grease gears well, fill up gear box before assembly, with grease. Drilled holes on the gear box underneath the bevel gears have to be closed with 1 each screw M 3,5 x 3, preventing that warm grease leaks out. Screw the tail rotor gear box together according to picture, using M 3 x 25 screws and lock nuts. Apply guide bushing (379). The tail rotor, opposed to earlier models viewed in flight direction, is located on the right side. Screws for the tail rotor gear will be inserted from above, nuts from underneath. Tail wire will be mounted with washer to the forward left screw, thus screw is provided in a length of 30 mm.

Slide clamp (354) onto the tail tube, feed in tail rotor gear, align horizontal with shaft facing to the right, tighten clamp. On this procedure, drive shaft has to be threaded into the hollow shaft on the tail rotor. If necessary, clamping screw for the small gear has to be loosened, operated from above by a wrench 1,5 mm, inserted through the drilled hole of the box. After fastening the clamp, tighten clamping screw for the drive shaft, moving the tail rotor shaft for and after, until you clearly notice the surface of the drive shaft. Tighten clamping screw well onto surface. Feed into hollow shaft (380) from the left (with grease) the pre-assembled bearing support (341) with control lever (342) and control rod (349). Fasten laterally to box with 4 iron screws M 3 x 8. Control lever upward. Clamping discs of control rod (349) have to be adjusted, if necessary, enabling free movement of the rod with the lever (342) in the tail rotor shaft.

Step 6, Tail Rotor

Slide onto tail rotor-hollow shaft (380) spacer tube (359) and tail rotor hub (327). Tighten well with wrench 1,5 mm and 2 socket set screws M 3x3 through the lateral, threaded holes. Insert into the Plastic halves of the blade mounts (317) two ball bearings (316) with 1 each safety washer (369) and socket head screw M 3 x 8 (small ring of safety washer facing ball bearing). Screw together halves with 2 screws M 2x10 and hexagon nuts. Fasten to each arm of the blade mounts (317) from the outside, one ball bearing with screws M 2 x 10 and hexagon nuts. Insert washer 2mm between ball and arm. Then screw the now completed blade mounts, with the socket head screw M 3 x 8 inside, using 2,5 mm wrench, on the tail rotor hub, tighten well. Slide onto the control rod, protruding the hollow shaft:

1. Collar (314)
2. Safety Washer 2 mm - important!
3. Control plate (315)
4. Safety Washer 2 mm - important!
5. Collar (314)

Fasten collar temporary with set screws M 2,6 x 4. Screw ball bearing with 2 screws M 2 x 10 on control plate (315). Attention: Viewed from the left, tail rotor rotates to the right. (Upper rotor blade of tail rotor moves to the rear).

Arms of blade mounts (317) with the mounted ball bearings are routed behind the blade mounts (viewed in rotation direction). This is important for the correct control movement of the tail rotor relative to the collective pitch (view detail picture).

Tail rotor blades (383) will be screwed with screws M 3 x 15 and locknuts between the arms of the blade mounts (317), tighten slightly, so rotor blades will pivot away on light finger pressure.

Setting of the collars (314) i.e. of the tail rotor blades, will be executed after mounting of the servos and control linkage.

Step 7, Main rotor and Drive

Screw loosely between side plates the two bearing supports (152) with the already inserted ball bearings, using 4 socket head screws M 3 x 30 and lock nuts. On the lower support, bearing faces downward, on upper support, bearing faces upward.

Insert into the slot of the main rotor shaft (480) pitch linkage (479), use grease. Short angled part of the pitch linkage has to be located at the end of the rotor shaft, which has been provided with 2 grooves. From this side, slide onto the shaft with the pitch linkage as follows:

- 1 Carrier (484) with forkend first (upward)
2. Bevel spring (487) narrow part first
3. Swash plate (482/483/464) with small inner ring first
4. Swash plate ball (481) ball first

Insert rotor shaft (480) with the mounted parts from above into the bearing supports, until securing ring (490) can be pressed into the second, i.e. upper groove of the bearing support. Then push shaft upward, until securing ring touches ball bearing. Press swash plate ball from above, downward and tighten with 2 socket set screws M 3 x 3 onto the shaft. Take care that none of the damping screws does block the pitch linkage. Slide onto lower, protruding end of main rotor shaft (480) as follows:

- 1 disc (489)
- 2 gear hub (193) with free wheel (autorotation clutch) (488) longer end upward
- 3 disc (489)
- 4 securing ring (490)

Securing ring has to be inserted from the side and must engage completely into the groove of the main rotor shaft. Autorotation clutch and disc have to be greased.

Gear (192) with deeper side upward, will be screwed under the gear hub (193), using 6 iron screws M 3 x 10 from above and large washers with lock nuts from underneath. At the same time, gear (192) has to engage into drive gear. Now the whole main rotor unit has to be aligned. Tighten screws for the bearing supports. If necessary, axial play of the main rotor shaft has to be corrected again by moving the swash plate ball.

Bevel spring will press swash plate onto the ball. Grease ball. Clamp carrier (484) with socket head screw M 3 x 20 and washers on both sides and lock nut onto the shaft. Press carrier downward, so bevel spring is pre-bent. Distance between upper edge of inner swash plate ring and lower edge of the carrier forkend will be 22 mm.

Screw into lower, outer ring of swash plate, 3 ball fittings (434) and into upper, inner ring 1 ball fitting (496). Linkage (486) for the swash plate will be mounted to the right side (viewed in flight direction). Apply ball joint (058) without ball at the front, screw into lateral hole of the chassis, one ball joint (050) with ball rearward, with iron screw M 2 x 12, washer and nut. Linkage length has to be aligned that ball fitting of swash plate is exactly in right angle to the chassis. The two remaining ball fittings face to the front and left.

Step 8, Toggle lever (collective Yoke)

Screw into forkend of toggle lever (491), bearing (472) with 2 collar bearings (535) using 2 iron screws M 3 x 5 (steel bearing from the outside).

Parts must run smoothly and must be greased.

Screw eyebolt (447) into ball bearing of toggle joint with lock nut M 3.

Screw angle (492) with 2 iron screws M 3 x 5 and nuts M 3 on top of toggle lever (491). Slotted part of angle (492) has to be parallel to the operation arm of the toggle lever.

Slide onto side plates, from the inside, toggle lever with 2 collar bearings. Angled part of the pitch linkage, which protrudes the main rotor shaft, has to be hooked into eyebolt. Screw toggle lever with steel bearing washer (570) from the outside with 2 screws M 3 x 10 and hexagon nuts into the chassis. (Nuts to the inside). Toggle lever must operate smoothly.

Mount the mixing lever (344) for the tail rotor laterally into slot of angle (492) Sequence from the outside:

Iron screw M 3 x 15
large washer
bushing (161)
trim lever (344)
large washer
angle (492)
large washer
nut M 3.

Screw will be temporarily tightened in middle position of slot and can be moved for appropriate tail rotor mixing at later stage. Lever (344) must move smoothly but without play. Use grease.

Step 9, Main Rotor

The already assembled blade shaft holders with blade shaft and lever (572) are loosely fastened between the side plates (587) with two M 3 x 30 socket head screws and lock nuts M 3. Control arms are inserted in the slots of the side plates. Shock absorber rubber sleeves (588) and spacer bushing (568) are inserted into the aluminum housing (567). Now fit the complete aluminum housing loosely between the side plates, using two M 3 x 30 socket screws and lock nuts. Do not tighten. Sequence of the rubber sleeves may be seen on the drawing. Rubber sleeves consist of 5 single rubber rings, which have to be cut out of the provided hose material and are pushed onto the spacer bushings (568). Sequence: Center: 1 rubber small, 6 mm long. Side, next: one each rubber large, 3 mm long. Outside: One each rubber small, 4 mm long.

Fit the black steel bearings (586), longer end first, into the center top hole of the pre-assembled rotor hub. (560). The side plates are loose, so they can be spread a little and can be fitted onto the steel bearings (586). Tighten all six screws of the side plates. Align side plates exactly parallel and adjust blade connecting shafts to V-shape. Side plates have to move readily on the bearings, use grease.

The aluminum adapter (575) is fitted onto the blade shaft (572) with a little bit Loctite and fastened on the inside with M 3 x 15 socket head screw and lock nut. The flat blade holders (584) are fastened onto the adapters, on the outside, using

M 4 x 20 socket screws and lock nut. Do not tighten yet. When using Loctite, pay attention that screw doesn't get stuck. Rotor blades will be fastened with socket screws M 3 x 15 and lock nuts later on.

Step 10, Main rotor control

Fit into mixing lever (591) laterally provided with 3 holes, from the outside two steel ball fittings (434). You have the choice between three drilled holes. Inner hole (facing to the head) corresponds to normal collective pitch, right for the beginner. The center hole (increased pitch) more suited for the trained flyer and for autorotation. Outer hole for extreme pitch, for the expert. (Extreme autorotation, eventually negativ pitch on inverted flights).

A third steel ball fitting (434) has to be inserted in the center of lever, from the inside to outside. Slide one bushing each (589) lateral onto cross shaft (558) and allow mixing lever (spread a little) to snap onto the hollow steel shaft. Stabilizer bar (545) is inserted through this hollow shaft. (grease) Fit washers on both sides and steel collar (559) on one side and fasten with socket set screws M 3 x 2 temporarily in middle position of stabilizer bar. On other side, fit control lever (562). As well, fasten temporarily with socket screw M 3 x 3. Ball joint with ball of control lever (562) will face to the inside, toward rotor hub.

As far as no extreme aerobatic capability is required, slide on both sides of the stabilizer bar weights (1211), using 2 each socket set screws M 3 x 5 for temporary fastening.

Fasten plastic paddles (749), with epoxy resin or semilar glue, paddles must be aligned parallel. The thread is self-tapping. Take care that the thread is not overturned. Slide weights (1211) onto the control paddles and fasten.

Move stabilizer bar for and after until balanced. This has to be executed very carefully. Smooth operation of the rotor depends on this balancing. After exact fixing of the center position, tighten collar (559) and control lever (562) on stabilizer bar. Bar should have slight axial play of approx. 1/10 mm. On tightening of control lever (562), take care that lever is in line with the control paddles.

Weights (1211) fastened to the outside, provide a high stability. Control reaction increases, the more weights are moved to the inside. On each change, take care for exact balancing of the stabilizer bar.

Slide the pre-assembled unit with the rotor hub onto the main rotor shaft. Push socket screw M 3 x 30 with black bearing washers (570) through bearing (586) and cross hole of main rotor shaft, tighten with locknut M 3.

Screw one ball joint without ball on top of protruding pitch linkage and press on middle ball of mixing lever. Adjust ball joint that mixing lever is exactly horizontal, when arm of toggle lever faces exactly vertical downward. (Both levers are in middle position). Fit two ball joints on control rod (590) (75mm long) and press on ball of upper swash plate ring, i.e. on ball of control lever (562). Adjust length of linkage, so control lever (562) together with the control paddles is exactly horizontal, when swash plate is horizontal. Lead control rod through fork end of carrier, Carrier on the rotor shaft has to be positioned in rotation direction, so that the control linkage (590) is aligned exactly parallel to the main rotor, 90° to the stabilizer bar. Watch the space of 22 mm between carrier and upper edge of swash plate for correct pre-bending of the bevel spring. Don't jam carrier by overtightening with screw.

Screw on outer side of blade control lever, the small mixing levers (566) with the ball heads to the outside, with one each collar bearing (535) and steel bearing washer (570) with socket screw 3 x 8 and hexagon nut M 3. Sequence from the outside to the inside should be:

Socket head screw M 3 x 8
steel bearing washer (570)
mixing lever (566)
collar bearing (535)
blade control lever and nut M 3

On mounting of the parts, take care that mixing levers (566) run absolutely free and without play. Grease bearing before assembly.

Screw in upper ring of swash plate two steel ball fittings (496). Connect these ball heads, using linkage (436) - 40 mm long - and two each ball joints (058), without ball, with the balls of the longer arms of the mixing lever (566). Connect balls of the shorter arms of mixing lever (566) with the balls on upper lever (561), using two control rods (433) (20 mm long) and two each ball joints (058) without ball.

On determining the exact length of the mentioned linkages proceede as follows:

Position swash plate in all directions exactly horizontal, i.e. right angle to the main rotor shaft. Stabilizer bar must be exactly horizontal, mixing lever (591) as well (middle position of collective pitch). Now adjust linkages that the small mixing levers (566) are as well exactly horizontal. Small linkages are routed nearly vertical, longer linkages slightly slanty, but parallel to each other and to the same side.

Step 11, Servo Carrier and Control

Cut out of the 2 mm plywood the rear cabin section, forward section for pilot seating, servo carrier, receiver and accumulator. Before gluing these parts, the exact position and cut outs for the servos have to be determined. Four servos are sufficient for "normal" flight performance, mounting of servos should be as follows: If you intend to install more than four servos or your transmitter is provided with an electronic mixer, please apply to the explanations of "Special advices". This applies also for the installation of a relativ light radio unit, which should be located as far as possible to the front, to prevent the model from getting tail-heavy. A good middle position for the servos is marked on the parts. Servos for the operation of the swash plate have to be located from the rear to the right and left of the middle, screwed into the rear section of the cabin, (above the tank). Servos for the operation of the engine throttle and the collective pitch are screwed from the side into the pilot seat. On collective pitch control, the servos for the operation of the tail rotor will be installed from the right side (opposed side) into the pilot seat. Cut outs for the last mentioned servos are identical and can be executed at the same time. This applies as well for an eventual extension according to the explanations of the "Special advices" for different positions for the servos or the installation of an additional tank.

The complete unit and prepared parts for the installation of servos have to be glued together with special wood glue (as shown). The rounding for the tank cut out in the wood section, will be reinforced with plywood 0,6 mm. Before gluing, adjust the tank and if necessary, clear plywood rounding.

As well, forward rounding for the instrument panel should be reinforced with 0,6 mm plywood. Upper contour of PVC molded part serves as imitation for the instrument panel.

Special tank versions are available for aerobatic flights (with additional tank), refer for closer description to "Special advices".

For standard equipment on "normal" flight performance tank should be provided, as shown, with tank nipples and hose. Tank should be pressed in the rounding on rear cabin section. The entire cabin assembly will be screwed with 2 iron screws and M 3 x 10 large washers and lock nuts onto the forward angled arms of the chassis. On this procedure, tank should be fitted tightly. To avoid distortion of tank, foam rubber may be applied. Connection of fuel tubing may be seen on the picture.

Cut out canopy, leaving an edge of 5 mm, separate in the middle of the form and glue on the edges together with glue. Cabin halves may be painted along the marked line, so the actual clear canopy remains. Cabin will be installed from the front over the entire assembly, spread slightly at the rear and will snap over the rear cabin section. Apply rubber band to the lateral protruding studs and tighten cabin firmly.

Main rotor blades

Main rotor blades (1217) are completed and provided with drilled holes for the blade mounts. It's recommendable to sand trailing edge and surface slightly before covering blades with self-adhesive foil, outer ends and screw area should be painted. Then cover blades with pre-cut, self-adhesive foil, take care that area of blade mounts remains uncovered. In no case blade mounts should be fastened on the foil.

Procedure for Covering

Remove pre-cut foil from backing paper and place foil on a smooth and even surface, with self-adhesive side up. Place the rotor blade on foil, foil must overlap the trailing blade edge by about 2 cm. Press blade onto foil. Lift the blade (with the foil), now rub the foil carefully from the rear to the front onto the blade. Try to avoid air bubbles forming under the foil. Fold overlapping foil edge around the trailing edge of the blade with as sharp a crease as possible onto the free surface. Now fold the broader part of the foil clean and without air bubbles around the leading edge, press onto second side of rotor blade. At the trailing edge, foil will overlap the already 2 cm covered edge.

Press foil down thoroughly, to prevent it's peeling off during later use.

Fasten main rotor blades to blade mounts with the screws provided there. (looking down from above, rotor rotates to the right). Mount 3 screws each that rotor blades are in a straight line with blade mounts, blade pitch lever at zero position has to coincide with zero line of the fully symmetrical rotor blade profile.

Balancing of the Main Rotor

Position the main rotor (removed from the main rotor shaft) with the stabilizer bar between two supports in a way, that main rotor hub faces downward. Remove ball joints from blade pitch levers, so that rotor blades with the middle part of rotor head swing up and down, absolutely free. Align rotor blades straight. More weight has to be applied to the lighter weight blade (shown by an upward motion) by adding additional self-adhesive foil along the blade length until counterbalance is achieved, starting at the blade tip (avoid air bubbles) and keep the trailing edges with as sharp a crease as possible. These balancing procedures are important for a smooth running rotor system and should be executed very carefully. For later checking of blade tracking, apply different colored black and red tape on outer blade tips (width 3-5cm).

Installation of Radio-control Unit for "normal" sequence of 4 servos

Receiver and accumulator have to be located forward in the cabin, under the instrument panel. Accumulator forward. Parts should be laid into rubber foam and fastened with rubber band. Antenna will be routed out of lower, right corner of cabin and fastened to side fin. Take care that antenna doesn't touch metallic parts. Install switch on right or left side of rear cabin section.

Linkage installation

Length of linkages depend on the servo employed. For this reason linkages are provided on one end with lengthened thread M 2, which can be shortened to length required. All ball heads and links for the connection of the servos are provided in the kit.

Engine and Pitch control

Sequence of linkages can be seen on the three pictures, position "Idle", "half throttle" and "full throttle". (Upper to lower picture). Engine and pitch are operated by the same servo, but are mounted at an angle of about 90° to each other on the servo disc. Extension sleeve for the pitch ball link (included in the kit) provides clearance, so link is positioned above engine linkage. On operation, at first full throttle and less pitch is applied, later, on full throttle position, only pitch. This provides a nearly constant rotor rotation by different pitch settings. Lift of pitch linkage should be approx. 8 to maximum 10 mm. Linkages and levers must run smoothly and should (in no position) touch each other or get jammed in the opening of the rear cabin section.

Operation of Swash plate

Sequence of servos and linkages for the rolling movements (swash plate across to the left or right) may be seen on the pictures. Linkage is slightly bent at threadless end! thus on maximum operation no interference with the gear will occur. Tilting movements of the swash plate (fore and aft) will be operated by the servo (seen on next page on upper right side). Here as well, linkage should not touch the gear. Travel of linkage approx. 8- 10 mm to both sides.

Tail rotor and compensation

Servo for the tail rotor - next page, upper right side - operates equalizing lever, fastened to the toggle lever for pitch control. Linkage is routed from here to the tail rotor. Guide tube has to be inserted at the tail rotor between side fin and stabilizer and fastened with adhesive band. Travel of tail rotor linkage approx. 12-16 mm. Utmost care has to be taken that linkage runs smoothly, doesn't get jammed or touches other parts. Equalizing lever on toggle lever can be moved up and down in the slot, when screw is loosened. Upward: less tail rotor compensation, downward: more tail rotor compensation.

Special advices

Radio control unit

Additional servo trays provided for the installation of more than four servos and application of electronic mixing by transmitter.

Assemble plywood support according to instruction, i.e. if already completed, plywood support may be utilized. In addition, cut out of the plywood part (1218) a horizontal servo tray, which fits evenly into the front openings of the support wall and touches the rear cabin wall. (Only glue in place after completing the cut outs for the servos). Important: the additional plywood trays have to be glued to the rear wall of the plywood support from the front, in the area of the fastening screws for the support. Reinforcement plates have to be glued, from the front, onto the rear wall and tightened with the screws of the support.

Now the plywood support consist of two "floors". Push the receiver in the lower compartment, in the upper install the accumulator, right to the front. Tendency: position all weights as far as possible to the front, servos as well.

Sequence of Servos

The two servos in the rear plywood support wall (determined for the operation of the swash plate) remain in the shown position.

Install the servo for the tail rotor (with mechanical tail rotor compensation on toggle lever) to the right side of the new servo tray from underneath to the top Connection will be executed by the rod (468) on which a coupler piece will be soldered. (1146).

On employing an electronical tail rotor mixing, lever on toggle lever will be omitted and tail rotor will be controlled directly. The long rod leading to the rear, will be routed straight to the front, extended by sleeve (378) and rod (377). Servo for the tail rotor has to be mounted in the center of tray A.

Servos for pitch and engine have to be installed from (left) underneath to the top on to the horizontal servo tray, one after the other, or you may position one servo from the side onto the left vertical wall. The best sequence has to be determined by the model builder himself, according to size and moving direction of the servos. Connections will be executed by the rods (468) and soldered-on coupler pieces (1146).

Additional tank for aerobatic flight

For aerobatic flights the "normal" sequence of the tank is not sufficient secured, since the engine sucks air on some flight positions. Therefore, a "Special tank" is recommended.

Tank should be located between the side walls of plywood support, right in front of the rear cabin wall, apply foam rubber and secure with rubber band. Tank opening to the front. System of tank sequence may be seen on the drawing, installation of nipples and tubing will be according to the pictures. General advice for the additional tank: Re-fueling will be executed through hose leading to the engine. (eventually apply filter or nipple). On re-fueling, additional tank should be filled first, thus air will exit of tank on upper nipple into the main tank. Nipple has to be located right on top, enabling the exit of the entire air. Main tank will be filled by additional tank. Here, air will exit on the crosswise located openings for the normal- and inverted flight position. In this position, main tank can be completely emptied, intake nipple of additional tank is always positioned in tank center and provides on all flight positions, airfree fuel.

As additional tank, we recommend the 100 ccm tank, Order No 1117, which is provided with tank pendant, 1 bent nipple and 2 straight nipples (tank fittings). In addition, hose No 730 (1m) is required.

Basic setting

Main rotor blades collective pitch:	3° to 8°
Hovering flight setting, approx.	6° to 7°
Tail rotor on hovering flight approx.	8°
Tail rotor mixing on pitch operation approx.	3° to 6°
Swash plate operation, cyclic, approx. (to all sides)	10° to 12°
On hovering flight, swashplate inclination to the front	1° to 1,5°
swashplate inclination to the right, approx.	0,5° to 1°

Center of gravity is exactly underneath of main rotor axis, with full tank, model is slightly nose-heavy.

The final adjustments of the main rotor blades and the tail rotor blades should be executed with the gauge, Order No 1366.

You may prepare a simple gauge on your own. Sample can be seen by the pictures. Scales have to be copied onto 5 mm thick plywood or cut and glued than. Take care that the length is 320mm, only than the degrees are correct. In the drilled holes you may install round wooden sticks. Attach gauge underneath rotor blade, fasten with rubber band. View scale of gauge over stabilizer bar and read off. All mentioned angle of incidences relate always to the stabilizer bar! Bar must be on all measurings exactly horizontal, i.e. in a right angle to the main rotor shaft.

Further informations on breaking-in of the model, settings flight training, tools, as well as maintenance and accessories, can be read in my book, "RC-Helicopter Manual", Order No 9956. Book can be obtained at your dealer or directly by Schlüter Modellbau.

The standard engine muffler may be used, as far as it is not too long and get's too near to the ground. The special muffler, order No 927 is recommended. An additional adapter for this muffler is obtainable for the corresponding engine type, Order No 933, with identification letter for the motor type. Refer to main catalog for adapter types.

At the end one advice:

A model helicopter is a facinating flying machine, which requires exact technical application and a lot of care. On operation, caution has to be taken, since the rotor blades, rotating with high speed, are quite dangerous. Therefore, pay attention to the advices given at the begin of this building instructions and act accordingly.

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