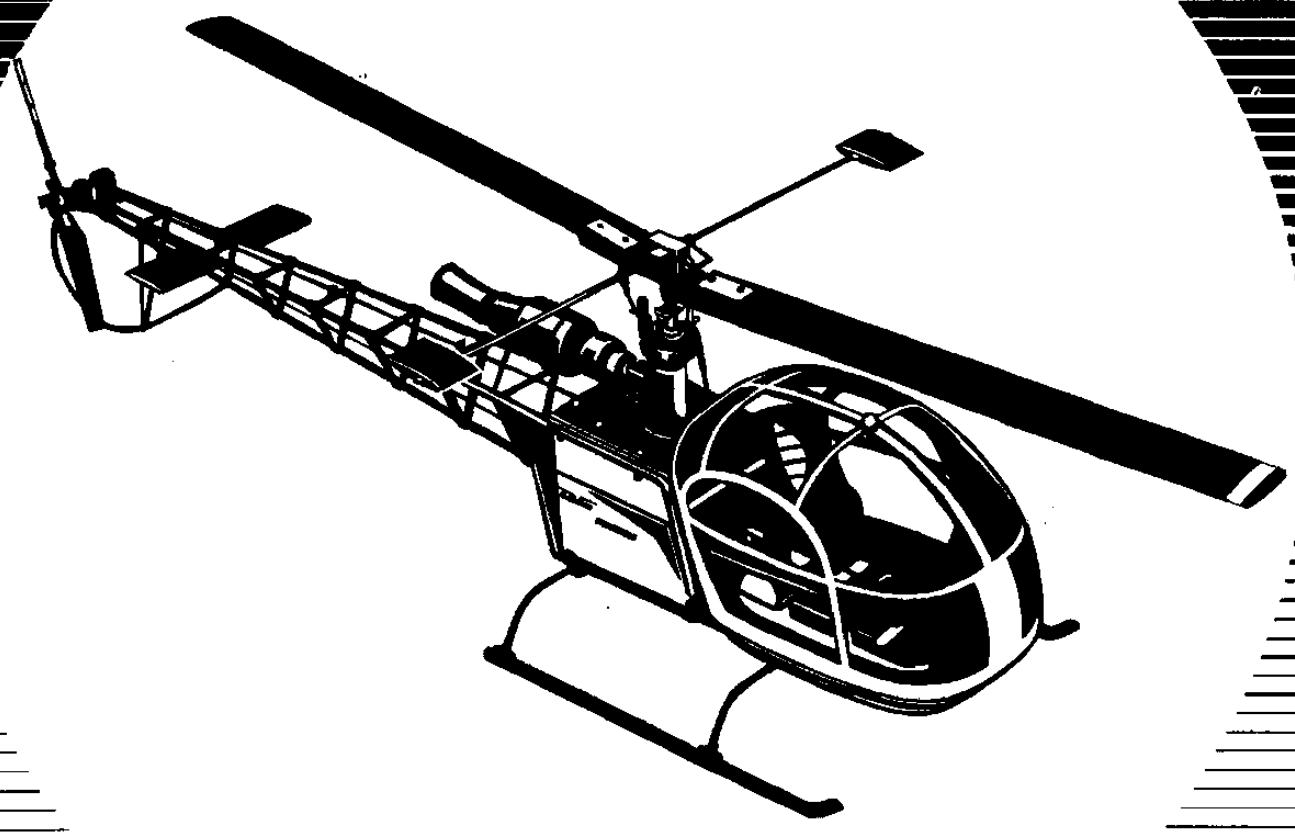
KAVAN alouette 2

WITH KAVAN CONTROL SYSTEM



Assembly and flying instructions

Dear Modeler,

Even today, flying radio controlled helicopters is for most of the modelers a complete mystery. The somewhat more complicated construction as well as the flying technique which has to be relearned, has given rise to the opinion that the normal RC modeler is not able to fulfill these higher requirements. It might be stated that not all model flyers, who have built and flown helicopters during the past years, could achieve the expected success. There may have been different reasons for this lack of success. It is a fact that in the beginning, the helicopter was exactly like RC airplanes and had to overcome some basic problems. Many models that were presented to the market did not comply with the expectations of the modeler.

The KAVAN Bell Jet Ranger opens new dimensions which cannot be excelled within the next few years. This well-balanced scale model, with the finest of details is the first RC helicopter with collective pitch which allows all full size helicopter maneuvers to be performed by the RC model. The worldwide success the KAVAN Jet Ranger has achieved, during helicopter competitions, has proven that we have gone in the right direction. In spite of this success we have continued testing our model in the wind-tunnel in co-operation with the Bell Company, Institutes of Flying Research and RC experts. Mr Kavan wanted to know more about the reaction of the model when it is exposed to different wind forces, how it reacts with more or less weight, etc. The cost of the wind-tunnel test was rather high, but valuable experience was gained from it. Not only the company, but also the model flyer will profit even more from these tests, with the helicopter pilot knowing that in the KAVAN Jet Ranger and the Alouette 2 he has safe, fully tested models.

With the Alouette 2, we are presenting another outstanding KAVAN helicopter. Again, it is a scale model of the famous French helicopter used by customs officers, military and police personell throughout Europe. First of all we wished to create a reasonably priced and luggage compartment sized model, which opens the way to the beginning helicopter pilot, and is still an ideal second model for the experienced owner of the KAVAN Jet Ranger. The Alouette 2 will sell for approximately half the price of the Jet Ranger and, therefore, will be desirable for a lot more model flyers than the large Bell Jet Ranger type. The Alouette 2 is a model that will not scare off the newcomer to model helicopter flying, but will still be interesting and exciting enough for the expert. This new helicopter from Franz Kavan is manufactured to the same exacting quality standards as the KAVAN Bell Jet Ranger and is equipped with the same patented "Kavan control system". This system operates with a four-channel, four servo radio control unit, and the model will perform all the maneuvers of the full-scale helicopter, plus loops and rolls.

The epoxy cabin top is supplied. The model may be equipped with floats, which we highly recommend for the first test flights. We have devoted special care in designing a simple construction to hold down the building time, and many prefinished building elements, including the mounted tail rotor boom, will reduce the building time to the absolute minimum. The idea to present the Alouette 2 as a small helicopter was originated by Mr. Kavan some time ago. However, before work on the proto-type was started the wind-tunnel test had to be examined and analysed for use in the new model. Extensive testing of the first model was necessary and many changes were made before the new model was considered satisfactory. Now we are able to present you with the KAVAN Alouette 2, a fully developed model helicopter.

We congratulate you on your choice and trust you will have much fun in building and flying your Alouette 2.

K A V A N C O M P A N Y

BUILDING INSTRUCTIONS

PRELIMINARY

We assume that for many model builders the KAVAN Alouette 2 will be the first introduction into the new and exciting world of rotary wing aircraft. We have therefore tried to make the building instructions as detailed as possible.

The building procedure has been divided into a series of steps and we suggest that you follow the prescribed method exactly in order to quickly complete a reliable model. We have selected only materials of the highest quality so that they will withstand the enormous stresses of a rotary wing model in flight.

Please read the respective paragraphs carefully before entering a new phase in building and at the same time check the plan and the photos to determine the respective placement or position of those parts.

Use only those glues suggested in the instructions. Many areas are highly stressed and the glues suggested have been proven by tests to provide the required strength.

The individual parts are numbered in close sequence to the building procedure. You will find these numbers listed in the replacement parts list which is included in the kit. Any conventional radio equipment may be used in the KAVAN Alouette 2, as well as any .40 cu. inch engine.

FUSELAGE

Start by drilling the marked holes on both plywood pieces no. 2003/4 with a drill size 3.1 mm (1/8 inch or no. 30 drill). Carefully trim both side pieces, as well as the plywood base plate no. 2002. Into the base plate no. 2002 you must make the cut outs for the receiver and the battery as marked. Before cutting the other half of the plate be sure to place the servos into the right position and mark the correct size as necessary. The two front servos should be installed togather in one large hole (the servo cables are to be put into the space between the servos) while the two rear servos should be mounted in individual holes, photo 1 and 2.Finally the cut outs for attaching the canopy and for the on-off switch should be made. In case you are using a Webra 40 engine, you may drill the cut out (marked by shading) for the muffler and the needle valve. If you are using another engine we will describe the mounting procedure in a later phase. The plywood base plate should be slightly chamfered to fit the curve of the plastic body shell no. 2002. Carefully sand a chamfer according to the shaded area marked. A final sanding of the entire base plate may be accomplished now.

Now cement the front body no. 2001 and the plywood base plate no. 2002 together with PVC-glue enclosed in the kit. Take the prefinished tail boom no. 2007 and push it into the brackets in the rear bulkhead no. 2006. We now suggest that you stand the tail boom upright and clamp it on your table or work bench for ease of gluing the plastic triangles, photo 3 and 4. At this point the three aluminum longerons should be secured by closing the clamps (rear bulkhead no. 2006) with six M3x12 mm screws and stop lock nuts. Now you can start fitting the 2 mm truss-struts no. 2008 to the plastic triangles and cementing them in place. The truss-struts are supplied in six different lengths. Be sure that none of those struts will be stretched, for that will

warp the fuselage boom. All struts should be cemented with epoxy glue or a similar two component glue. Then glue in the pre-shaped tail skid no. 2009, one side being glued into the end of the lower tube while the other side has to be glued into the most rearward of the three rudder fin clamps. Finally install the plastic rudder (fin) no. 2010 into the three clamps on the lower longeron and drill through the rudder (fin) using the existing holes in the clamps as a guide. The rudder (fin) should be fastened with M2x8 mm screws. With a small aluminum strip fasten the clamp which will secure the rudder (fin) to the tail skid. While the assembly is drying check the completed assembly from all angles to make sure that everything is in proper alignment. The 4 mm aluminum tube no. 2011 which attaches the plastic horizontal stabilizers should be glued on the third hole from the end triangular former (holes provided). Take care that the tube is properly centered so that both ends project equally on each side of the boom (see assembly plan). Now glue on both plastic horizontal stabilizers no. 2011a so that they will have an angle of incidence of 0 degrees (parallel to the top longerons of the tail boom). Allow the complete assembly to dry for 24 hours, under normal room temperature, prior to painting. It is up to you whether you paint or spray. Make your colors in compliance with our suggestions shown on the box.

The next step will be to join the front body no. 2001 with the front engine box bulkhead. Before joining however, the two bell crank levers no. 2001b must be installed between the two projections (attach brackets) in the rear portion of the front body no. 2001 with the pin supplied. The front bulkhead no. 2005 locks the pin of the two bell crank levers no. 2001b, photo 5. The balance of the fuselage assembly will be done with M3x10 mm pan head screws and stop nuts.

Note: At all times during assembly of the main transmission unit, each machine screw should be secured by using a lock type washer next to the head, followed with a plain washer directly below the lock washer.

Now in one operation, both side pieces no. 2003 and 2004, the front bulkhead no. 2005 with front body no. 2001 and the rear bulkhead no. 2006 should be joined together with pan head screws and stop nuts. Before installing the 6 rearmost pan head screws, both side aluminum sheets no. 2012 must be sandwiched between the rear bulkhead no. 2006 and the plywood pieces no. 2003 and 2004. Thightening the screws will secure the aluminum sheets. There are two tabs on the rear edge of each aluminum sheet which should be bent around its adjacent triangular truss.

LANDING GEAR SKIDS, no. 2015, complete

Take the 8 mm beechwood-rod out of the material package and cut it into 4 equal pieces. These pieces will be pushed individually into the hollow landing gear skids to where the landing bear brackets will be attached. Now install the four landing gear brackets to the skids with 2.2x9.5 mm sheet metal screws. Glue both of the preshaped struts made from 4 mm steel-wire, into the four landing gear brackets. Use epoxy or similar cement, taking care that the struts will be glued at right angles to the skids. After drying the landing gear can be installed with four M3x 15 mm pan head screws with stop lock nuts to the fuselage bottom. In order to prevent the landing gear clamping brackets from breaking off at the fuselage bottom, due to excessive tightening of the screws, you will find 4 plastic spacers no. 2001a in the kit, which should be installed between the bracket lugs in the front only, photo 6. Now the fuselage construction is completed.

MAIN TRANSMISSION

Set the big plastic spur gear no. 2102 on the main rotor shaft (8mm Ø) no. 2101 and fasten it so that the flange side of the gear will be down and is flush with the end of the rotor shaft. Screw both parts together with a M3x18 mm socket head screw and stop nut. Then insert the main rotor shaft from below into the transmission base plate no. 2100 of the main transmission. Install the cone shaped aluminum part no. 2200 to the main rotor shaft with a M3x8 mm socket head screw so that it will be secured without end-play. The aluminum mounting plate no. 2103 should be next attached with four M3x6 mm cylinder head screws, to the two large plastic flanges on the bottom of the transmission base plate no. 2100. See photo 7 for exact positioning.

Now place the premounted clutch no.2107 into the clutch bell no. 2106a and secure the assembly to the intermediate shaft with a M3x6 mm screw and a big washer. From below insert the premounted clutch no. 2107 and intermediate shaft into the transmission base plate no. 2100 and fasten the plastic bearing block no. 2106b with two M3x10 mm pan head screws onto the aluminum mounting plate no. 2103, photo 8. Take the tail drive shaft unit no. 2114 consisting of bevel gear, 2 ball bearings and brass spacer and insert them from behind into the plastic bearing block which is a part of the transmission base plate no. 2100. Then, two M3x6 mm pan head screws with washers will be installed as indicated to prevent the assembly from backing out, photo 8. The bevel gear may be meshed too tightly against its mating gear on the clutch shaft; prevent this by pushing the tail drive unit rearward with a beechwood stick so that the rear ball bearing is snug against the washers of the pan head screws. Now assemble both engine-mount castings no. 2104 on the front side of the aluminum mounting plate no. 2103, photo 9. Do not tighten the M3x10 mm pan head screws yet, because the engine must be fitted exactly. The already predrilled holes for the engine mounts on the other side of the engine mount castings no. 2104 should fit most engine sizes. Should your engine not fit correctly simply enlarge the holes on the engine slightly so that the mounting screws will be located properly. Do not drill the holes in the engine-mount castings no. 2104 as they are threaded. Prior to installing the engine, take the propeller washers off and install the appropriate tapered split cone on the engine crank shaft. Next install the small timing belt gear/cooling fan no. 2110 over the tapered split cone no. 2110a. It is important that the small timing belt disc is exactly flush with the big timing belt disc on the clutch. This can be obtained by turning down the tapered split cone to the appropriate thickness or fitting one or two washers no. 2109 on the engine crank shaft. Now attach the timing belt no. 2108 onto the timing belt gear. Finally the prop unit should be securly fastened to lock the assembly in place. This prop can be taken off by using the hup puller no. 2112 in case the engine has to be changed.

The engine mount castings are additionally secured to the upper transmission base plate with four M3x10 mm screws. Possibly, during mounting your engine, an air space is found between the transmission base plate and engine mount castings. In this case the engine blocks could not be secured tightly against the transmission base plate unless spacers were added. Therefore, we have included in the kit four distance metal spacers no. 2105. Now check whether you need one or two of these metal spacers for good support and install them in the gap. Now all screws for mounting the engine blocks can be tightened securely, photo 10.

Finally the timing belt must first be pushed over the cooling propeller to the timing belt disc, and then over the large timing belt disc below the clutch. It may be necessary to loosen the four engine mount screws in order to provide clearance for installing the belt.Be sure to tighten the engine down again after belt installation.

Now install the muffler. You possibly, as stated before, may now have to cut out the slot on the right side plate to match the dimensions of your muffler. On the other side plate there must also be a hole drilled to accomodate the needle valve extension. Now secure the muffler tightly and that completes the main transmission assembly.

MAIN ROTOR HEAD AND SWASH PLATE

On one of the lugs of the outer ring of the swash plate no. 2203 the stub shaft and a washer should be installed. Screw in the stub shaft from outside and secure an M2 nut to the shaft from the inside (the nut must fit flush inside the mounting flange), photo 11. One each brass ball will be fitted to 2 other lugs on the outer ring of the swash plate using M2x8 mm screws and nuts. Under no circumstances forget the washers between the balls and outer ring lugs. In the same manner mount three brass balls at 3 positions on the inner ring. The nuts for these screws will be located in the rectangular holes of the inner ring. Attach a brass ball and the two bended (90 degrees)control arms no. 2203a for the swash plate to the inner ring of the swash plate, photo 11.

Refer to photo 12 for the following sequence of assembly:
On the main rotor shaft install the following parts in the order given: Aluminum bushing no. 2201, swash plate no. 2203, additional aluminum bushing no. 2201 and finally the plastic swash plate driver no. 2204. All of the previous pieces should be pushed downward to lock the swash plate in place. Then the swash plate driver no. 2204 should be rotated until its pivit pin is perpendicular to the hole bored in the main rotor shaft. Screw the driver to the main rotor shaft and secure it with a M3 nut. In the bag of the main rotor bearing parts you will find the swash plate entie rotate bracket no. 2212 with a long slot which is used to engage the short stub shaft and prevents rotation of the swash plate outer ring. This bracket should be installed with a M3x6 mm pan head screw with washer. Be sure to insert the short stub shaft into the slot before tightening down.

SERVO INSTALLATION (see assembly plan)

Now install your four servos into the wood servo base plate and secure them tightly. The servos should now be adjusted in such a manner that the push rod connector will be about the height as the top hole in the bell crank levers no. 2001b. Both of the 85 mm push rods (from package no. 2076) are provided with clips, however, only on one side should lock nuts be used so that the other side (at the servo position) may be adjusted. Adjust the length of the push rods so that the servo will not be obstructed throughout its full movement. On both of the 135 mm long push rods install a clip and a lock nut on one end and a ball joint on the other end. The clip has to be tightened to the rod with a stop nut. Later you will set the total length of these rods so that a neutral position of the servos will result in the swash plate being exactly at a right angle to the main rotor shaft. Install the long push rods in the bell cranks which are located on the front body bulkhead. The ends with the clips are attached to the bell cranks and the ball joints should come out the top to be later attached to the swash plate. Now take the complete transmission assembly and set it into the fuselage for a trial fit. Both long push rods should go through the rectangular cut out in the transmission base plate. The outside push rod will be installed on the right side of the swash plate. The inboard push rod, however, will have to be angled slightly (beginning about 20 mm above the transmission base plate) so that it will lead, without binding, to the front ball of the

swash plate. Then close the rectangle in the transmission base plate with part no. 2115 and tighten it with two 2.2x6.5 mm screws. The complete transmission can now be secured with four M3x10 mm screws (one each on the fuselage side plates and two on the rear bulkhead).

Take the partly finished main rotor head no. 2205 and push the 4 mm stabilizer rod no. 2206 through the aluminum seesaw. The rod should be fitted exactly in the center of the seesaw so that both sides measure an equal distance. On one side of the rod and against the center-piece, secure a setting ring no. 2208, photo 13. On the other side, install the right angled lever no. 2207. Take care that the stabilizer rod is perfectly free to rotate but is free of all endplay. Afterwards the two alu-damping paddles no. 2209 should be screwed onto the stabilizer rod and secured with each other in the same plane as the right angled lever. That is both paddles and the 90 degree lever must be in a horizontal position.

For those of you who are experienced model helicopter flyers we recommend the use of our wooden aerodynamic damping blades no. 3318a for higher flying performance.

After completing the stabilizer assembly the unit should be balanced so that both paddles remain in horizontal position. If necessary you should loosen the setting ring and 90 degree lever slightly and slide the rod back and forth until balance is achieved. If it is only slightly out of balance, screwing the damping blades in or out might accomplish the same result, without having to loosen the rod.

MAIN ROTOR BLADES no. 2220

Now the main rotor blades will be covered. Before covering the blades you should sand the surface with fine sand paper (240-320). The blades must be free of dust otherwise the paper will not stick. Also take care, that your work place will be absolutely clean. Now put the foil with the safety cover upwards on your work table, and very carefully peel off the protective cover. The rotor blade trailing edge should be pressed onto the sticky surface so that approximately a 5 mm strip of paper will extend toward the bottom side of the blade. Gently rotate the blade so that the upper surface (camber) will press down on the sticky surface. Then lift the blade and covering material from the table and carefully smooth all wrinkles with light hand pressure. It is best to begin at the middle and work to the outside of the blades. Next, bend the outstanding 5 mm edge backwards and stick it on the bottom side of the blade. Afterwards the remaining foil can be rolled around the leading edge and onto the bottom surface of the rotor blade. This rolling operation can best be performed by rolling the rotor blade leading edge against the table top. Any amount of foil left on the end of the blade should be cut off with a razor blade.

Press a sharp tool in the position of the pre-drilled holes, through the foil, so that the rotor blades may be assembled. On the main rotor blade plastic holder you will find recesses for M3 nuts. In these recesses set 4 nuts and install M3x8 mm socket head screws from below so that the end of the screws will be flush with the upper edge of the recessed nuts. Then lay both angled metal sheets no. 2210 on the plastic blade holder so that the angle will be toward the leading edge of the blade in the direction of rotation, photo 14.Direction of rotation as seen from above is counter-clockwise. Now sandwich the main rotor blades between the angled metal sheets and the slightly arched blade adjustment plates no. 2211 and secure the assembly togehter with M3x20 mm socket head screws and lock nuts. Put a washer between socket head screw and lock nut. The blades now have an angle of incidence of approximately 4 degrees, however, can be increased to 7 degrees by adjusting the 4 socket head screws. This way the angle can be adjusted to match engine power or

as desired.

The main rotor hub has an opening which is 2 mm larger than the diameter of the main rotor shaft. When mounting the main rotor hub this difference in size is compensated for by a rubber bushing no. 2205a. Now push the main rotor head onto the shaft and secure it with a M3x22 mm socket head screw with lock nut. Two push rods are provided to connect the rotor head mechanism with the swash plate. The shorter (45 mm) push rod is provided on both sides with ball joints whereas the longer push rod (55 mm) has a ball socket on one end and a normal clip with a 2 mm lock nut on the other. The short push rod connects to the right angled lever and controls the rotation of the stabilizer paddles, whereas the longer push rod connects the swash plate to the plastic mixing lever on the rotor head; photo 14 illustrates that the long push rod is slightly angled in the middle so as not to interfere with any other parts. The connection of the short rod must be exactly in the middle of the hole in the plastic hold of the main rotor blades through which the short rod is angled so that the portion connected to the mixing lever is parallel to the main rotor shaft. The stabilizer rod must always be maintained at a right angle (90 degrees) to the centerline of the main rotor blades. All of these settings are initial adjustments, however, minor correction may be necessary during final adjustments for flight.

TAIL ROTOR no. 2300

The tail rotor as included in the kit is completely assembled. Only the plastic tail rotor blades no. 2301 must be installed. Secure them with M3x12 mm pan head screws with lock nuts. See plan for direction of rotation. The screws should be tightened only so much that the tail rotor blades may be moved with moderate finger pressure in the blade holder. Take the 2 mm tail rotor drive shaft no. 2302 which is flattened on both ends and push one end into the tail rotor connection which stands about 12 mm out of the transmission housing. Then insert the tail rotor drive shaft and tail rotor assembly through the tail boom guides until the other end of the drive shaft engages its respective connector extending out of the main transmission box. Finally the tail rotor transmission should be clamped with a M3x22 mm socket head screw and lock nut inserted into the clamp lugs on the rearmost tail boom former.

On the 0.8 mm steel tail rotor "control" rod, solder a threaded coupler; install a ball joint on the threaded coupler after it cools. The other end of the control rod should be pushed through the holes which are located along the right side of the fuselage on each triangular truss, through the transmission housing and the front plate and into the servo compartment. All holes have been provided for in the fuselage.Where the mixing lever no. 2508 attaches to the engine/throttle servo a brass ball should be mounted topside. Now the mixing lever can be connected to the two servos. The point at which the mixing lever (bar) is attached to the two servos must be at a distance of 48 mm. You can accomplish this with the use of M2 screws, bushings and washers. The servos may require slight relocation to provide the 48 mm distance. Should you have servos with linear output you should make two small brackets to which the mixing lever may be attached at the required 48 mm spacing. The tail rotor blades have to be in 0 position, that is parallel to the drive shaft. As soon as this has been achieved hold the pitch arm and then you can cut the tail rotor drive shaft to its correct length. After installing the mixing lever you can measure and cut the exact length of the 0.8 mm tail rotor control rod. Cut it and solder on a threaded coupler with snap link and lock nut, so that the snap link can be connected to the mixing lever while the tail rotor

pitch control arm is in the neutral position of its total range (see assembly plan).

Connect the snap link to the approximate middle of the mixing lever for now. By reference to the side view a push rod must be built in such a fashion as to connect the carburetor arm with the brass ball on the mixing lever. On one end of the throttle push rod you should mount a ball socket. The other end should be pushed through the hole in the front bulkhead no. 2005 and angled directly to the carburetor lever. Install a Kavan plastic snap link. Now the throttle push rod can be connected. Now plug in your radio and by operating the throttle stick from closed to fully open, you can determine if the carburetor is properly functioning throughout its full range of operation from fully open to idle. Be sure the push rod moves freely without binding. You may adjust the linkage to achieve the proper carburetor movement.

FUEL TANK INSTALLATION

The fuel tank (250 cc, 8 oz) no. 29/A provided with the kit should be assembled prior to installing it in the cabin, photo 2. The tank fill and vent tubes should be installed in the rubber stopper so as to extend outside the fuselage 1/4 inch through the holes provided for that purpose. Always use the Kavan fuel filter no. 19 to make sure that only absolutely clean fuel will enter the fuel tank. The fuel pick-up tubing should be bent at right angle so that the fuel tubing line will lead directly through the front bulk head and to the carburetor. Attach the tank to the bottom of the cabin with double stick mounting tape.

COLLING FAN SHROUD no. 2113

The bottom plate for the engine transmission box (cooling fan shroud) must be cut out on the marked lines. Push the rear end of the shroud through the opening provided in the rear bulk head of the transmission housing (directly above the landing gear attaching points). Now it has to be centered so that the cooling fan is free to rotate without touching the shroud. Under no circumstances should the cooling fan make contact with this shroud. The exact position of the plate should be found prior to drilling two 1.7 mm holes into the flat end of the front body no. 2001 for securing the shroud to the transmission box. 2.2x6.5 mm sheet metal screws should be used for the purpose of attachment, photo 16

CANOPY no. 2014

Now take the two parts of the canopy and cut out the excess material at the bottom and back wall according to the markings. In addition you must cut two rectangular openings at the back of the canopy which will serve to anchor the canopy to the front bulk head. The two halves of the canopy are next joined together with the use of the plastic channel supplied. The edge of one side of the canopy should be carefully cemented,by applying the enclosed special glue to the channel first. For applying the glue use the needles attached to the package of glue.The other half of the canopy should then be coated with the special glue and cemented into the other side of the channel in the same manner. Before attaching the PVC mounting channel no. 2014a it would help to bevel the edges of the canopy with sandpaper so that the resulting sharp edge will slide more easily into the channel. Be very careful when working

with the cement as it will attack the plastic canopy and spoil its looks if not applied properly. The shaped metal fastener no. 2014b should be installed at the bottom front glue joint with M2x8 mm screws and nuts. This fastener will be used to hold the canopy in place in conjunction with the rectangular openings of the back wall. A slight push on the front end and the fastener will snap into the opening provided in the fuselage. If desired you may paint the cabin outlines or stripe them with commercial striping tape.

SCALE TURBO ENGINE no. 2016

The two halves of the KAVAN Scale Turbe Engine are attached together with three M2x25 mm counterboard head screws. Then cement the exhaust on the rear end with glue. A 6x45 mm aluminum tube no. 2016a will be inserted between the opening in the front of the engine and the hole in the main rotor tower. The Jet Engine must be fastened in the rear with the aluminum strips no. 2016b enclosed in the kit and M2x8 mm screws by anchoring to the tail boom longerons. The aluminum metal sheet no. 2016c contained in the kit is finally glued onto the top of the turbo engine.

ADDITIONAL NOTES:

1. Do not use LOP to secure nuts as this type of glue would damage the plastic material. All nuts, with the exception of nylon stop nuts can be secured by applying a drop of paint.

2. In the kit you will find a gilded plastic tube, length approximately 15 cm (= 6"), which is used for the steel wire, diameter 0,8 mm in the servo section. See photo no. 2. After the gilded plastic tube has been pushed over the steel wire, diam. 0,8 mm, it has to be glued to the front bulkhead no. 2005 on one end. About in the center of this plastic tube the wire strap which is enclosed in the kit and supports the plastic tube, is fastened onto the servo.

T R I M M I N G A N D F L Y I N G

THE ALOUETTE 2

FUELS

There are no special requirements as to the type of glow-fuel required, however, the recommendations of the engine manufacturers should be followed for best results. After much experimentation, we have found that glow-fuels of low nitro content (2% to 5%) work best for RC helicopter flying. It is imperative that the entire fuel system (from tank to engine) be spotlessly clean at all times and that only filtered fuel (Kavan Fuel Filter no. 19) be used when filling the tank.

STARTING

After your model has been fueled, turn on the radio system and perform the normal ground range-check. If all controls respond in a satisfactory manner, set the (transmitter) throttle control stick to the low position, and the throttle trim lever to the idle position for starting. Under no circumstances should you start the engine with a throttle setting above idle since to do so would engage the clutch and cause immediate blade rotation. Next connect the battery-lead to the glow-plug-jack.

Holding the model by the main rotor head assembly (not the blades or stabilizer rods) tilt the model to one side and engage the Kavan electric starter onto the cooling fan/starter-hub. After the engine is running, return the model to a level position and remove the battery-lead from the glow-plug-jack. After checking to see that your starting accessories are not in the path of blade rotation, you may release the rotor head. At the correct idle-setting, the rotor should not revolve. If it does rotate, this indicates that the engine must be adjusted for a lower idle setting. Stop the rotorblades from rotating before making this adjustment. A short acceleration while the rotor is still being held will do no harm, however unnecessary or longer run-ups will subject the clutch to severe strain and possible damage.

ENGINE TESTING AND ADJUSTING

New engines may be installed directly into helicopters without being broken-in. Subsequent testing and adjusting should be accomplished after installation so that you can get the "feel" of how the engine will react under actual conditions. Of equal importance as the right engine is the use of a good carburetor. We recommend the use of a Kavan carburetor no. 40 for optimum power output. Different fuels and weather conditions will require a different needle valve setting for optimum performance, therefore, you should become familiar with the proper method of adjusting the mixture control. As mentioned before, the idle setting should provide a smooth running engine without causing blade rotation and should be accomplished in accordance with the engine manufacturers instructions. The final high-speed needle valve setting will be achieved only after the engine has been sufficiently broken-in, usually just prior to your first flight.

The best needle valve setting for flight is where the engine accelerates smoothly and without hesitation, to full power and continues to run without a decrease in RPM. Because of cooling requirements and reliability the needle valve must be set to a slightly rich mixture. This is accomplished by obtaining peak RPM. Then turning the needle valve about 1/4 to 1/2 turn counterclockwise until the RPM drops off very slightly. A too rich setting is definitely better than a too lean setting.

CAUTION
It is important to recognize that the main rotor blades, when turning at high speed develop potentially dangerous forces and every precaution should be taken to prevent injury.

BLADE BALANCING

Prior to installing the main rotor assembly onto your helicopter it is necessary that the blades be properly balanced. In the above building procedures we have already balanced the stabilizer bar so that it remains perfectly horizontal and in balance. Now we must balance the main rotor blades in the same manner. This balance may be accomplished by placing the stabilizer paddle rod across the jaws of an open vise or other parallel plates, to determine which blade is heavier. You will probably find that due to the precise construction of the kit blades will be almost balanced. If one blade does appear to be heavier then that lighter blade can be brought back to level by applying plastic coated covering material to the underside of the lighter blade. It is also recommended that a contrasting color band be applied to one blade tip so that blade tracking (as described later) will be easy. This contrasting color band should be applied to the lighter blade in order to help bring that blade back to its proper balanced condition.

ROTOR BLADE ALIGNMENT (Blade Tracking)

With the model facing down wind (to prevent wind gust tip up) position yourself directly behind and to the right of the tail boom. Slowly advance the throttle control stick on the transmitter. At approximately half-pover, the model should begin to lift off the ground. The engine should run rich (in 4-cycle) right up to the point of lift-off, and then break into its normal 2-cycle operation as it becomes airborne. While your helicopter is still being restrained as it hovers near the ground, the rotor disc should be observed from the side. You will probably notice that one blade appears to be rotating higher than the other. As the blade tips are of different contrasting colors, this can be easily checked. Both blade tips should track together in a common horizontal plan of rotation. Any out-of-track condition greater than 1/8 inch will cause extreme vibration, loss of lift and control command. If one blade appears to be tracking higher than the other, note the color and return the engine to the idle position. After the blades stop rotating, decrease the pitch of the blade which ran higher and slightly increase the pitch of the lower running blade as follows:

The manner in which the pitch of the blades is changed is very simple. To increase the pitch on one blade, slightly loosen the two main screws which go through the curved upper plate. Then screw in the two bottom socket head screws until the proper angle has been achieved. After making the adjustment be sure to retighten the main mounting screws.

Important Note: When making blade pitch adjustments it is very important that each of the two adjusting main screws be turned in the same direction and in equal amounts. We suggest that each screw be turned only half a revolution at a time. The blade adjustment range is from 4 degrees to a maximum of 7 degrees, however one degree of change is usually more than enough to accomplish perfect blade tracking. Repeat this blade tracking procedure as often as necessary to insure both blades track together.

For most engine installations a starting point of 4 degrees blade pitch is sufficient for satisfactory flight, however, different engines with different power outputs may require different blade pitch settings. This must be done at your discretion by experimenting with the blade pitch adjustment. For flying sites that are located at the higher elevations it might also be advantageous to experiment with blade setting to achieve optimum performance.

INITIAL TRIMMING FOR FLIGHT

Before proceeding to actual flight practice it is necessary to adjust it for longitudinal,lateral and rotational trim. These adjustments may be made while the model is restrained on the ground, but are best accomplished by permitting it to move about (unrestrained) while watching it closely. With the model facing into the wind "S L O W L Y" advance the throttle until the model becomes buoyant just before lift-off and "swims" around on the ground. Do not move any other transmitter controls while determining the trim characteristics of your model during this procedure.

The first thing you will probably notice upon applying throttle, will be a tendency for it to rotate (yaw) either to the left or right. This yaw condition should be corrected by adjusting the control rod linkage to the tail rotor assembly in such a fashion as to oppose the action. Do not use the transmitter trim control for this initial adjustment. All trim controls should be set in the neutral position (except throttle) and kept there for minor inflight adjustments. When making these adjustments, the entire fuselage of the model should be watched rather than the tail boom since the nose moves in a direction opposite to that of the tail boom, and confusion will result if you learn to correct the tail rather than the nose. It will be necessary to alter your connection point at the mixing lever between engine and tail servo. Each engine is producing another torque, in order to compensate you have to shift the rudder connection to the tail rotor at the mixing lever. If your model turns right side with cabine and leftside with tail, it means a larger turning moment. The connection point has to be placed nearer to the engine servo. Fly it just like an airplane; that is, left rudder for left turn, right rudder for right turn etc.

After the yaw has been corrected to the extent that the model shows little tendency to turn around its vertical axis during slow and smooth throttle application, you may then proceed to the lateral (aileron) and longitudinal (elevator) trim procedure. These are both accomplished in the same manner and consist of watching the model (while swimming) for tendencies to drift forward, backwards or sideways. If the model drifts in any direction, adjust the trim parts on the transmitter to oppose the direction of the drift. If the drift cannot be corrected by adjusting the transmitter trims, then it will be necessary to adjust the control linkage to the swash-plate to oppose the direction of movement. For example: if the model drifts forward on the ground, the swash-plate must be adjusted slightly upward in the front (same direction as though you applied "back" elevator). In case the helicopter leans over to the right, or drifts to the right, then the swash-plate must be adjusted to have a slightly greater tilt to the left (same direction as left aileron movements). Repeat the trim procedure as often as necessary to minimize any tendency to drift.

Now, assuming that you have trimmed the model correctly, you should be able to apply throttle smoothly and without other control movements, the helicopter will gently lift off the ground without excessive drift in any direction. Only after achieving this trimmed condition should you attempt to fly your model.

GYROSCOPE no. 3901

The KAVAN Alouette 2 is constructed for optimum flying abilities. With the proper trimming it is possible to perform free-flights. Until the modeler is able to perfectly control his helicopter, we recommend the use of the electric KAVAN gyroscopic stabilizer. The gyroscope dampens the movement around the yaw axis by opposing unwanted or sudden turns of the fuselage. This movement creates the greatest difficulty for the beginner as it is a movement unknown with fixed wing models.

The gyroscope is connected to the tail rotor servo. When the helicopter moves around its yaw axis the gyroscope compensates by directing this servo. Thus the helicopter remains in its position which makes the KAVAN gyroscope nearly indispensable for the first training with any RC helicopter.

FLYING

Now a few basic rules that should be followed prior to any model helicopter flight. These rules have been formulated for safety reasons and to insure a trouble-free learning process.

1. Area Selection
   Be sure to select a level hard-surfaced area for your first flights. Parking lots are excellent if there are no obstructions in the immediate vicinity since your first flights will be restricted to 100 feet to 200 feet radius hovering practice. As proficiency increases, you will want more room to fly and it may be necessary to operate from grass fields. Lift-off from grass should present no problem if a quick (jump) take-off is executed. Remember, any dirt on your practice area will be picked up by the rotor blades and circulated through your engine and cabin interior, and will cause rapid wear on all moving parts and bearings. Avoid dirt fields at all costs.

2. Training Aids
   Do not tether your new model with strings or other so-called training devices. The model must move freely in all directions without being restrained. Tethering prevents this natural movement and can result in dynamic unbalance and difficulty in the learning process. Of course, the floats no. 2914 are highly recommended to prevent inadvertant tip-over.

3. Positioning
   In the beginning it is extremely important that the model always points directly into the wind. Helicopters exhibit a powerful weathervaning tendency so it is best to start with it pointing in the right direction on each and every take-off and landing. Position yourself in the same relative location (about 5 to 10 feet behind and to one side) for each lift-off, and walk with the model as it moves around. Try to maintain the same distance between you and the model at all times during hover practice.

4. Control Movements

Always operate the transmitter controls in a smooth, deliberate manner, especially the engine throttle. Sudden or fast acceleration of the throttle control will result in unwanted torque being transmitted to the fuselage and tail rotor compensations must be very fast and sure to correct for this condition. On the other hand, smooth changes in the throttle will give the tail rotor time to keep up with the changes in torque and the necessary corrections are relatively smaller.

5. Safety

As mentioned previously the rotating blades create potentially dangerous forces so that every precaution must be taken to avoid inadvertant contact with them while operating. Be especially careful when making adjustments while the blades are turning and keep your test area free of unnecessary items such as fuel cans, tool boxes etc. It should be standard practice to exercise a good measure of spectator/crowd control when either testing or flying your model. Never permit spectators to crowd around when starting, running-up or hovering. When you fly be certain to maneuver the model so as to keep from flying over or near any assembly of persons or property.

Now that you have observed all the safety rules, let's begin the flight training.

FLIGHT TRAINING

Move your model to an open, turf field (for training purposes). Advance the throttle slowly until the model becomes slightly buoyant, operate the longitudinal control-stick and notice how the helicopter begins to tilt forward and rearwards; also check the lateral control actions. Avoid applying too much control or the model may be tipped too far, thereby causing damage. You should spend some time becoming accustomed to control functions before lifting the model into flight.

At first, only apply enough throttle so that the model lifts off only a few inches above the ground, then reduce the throttle slowly allowing the model to settle again. If properly adjusted the model should rise straight up without any undue tendencies to move about or rotate (yaw). Make any necessary adjustments before proceeding.

For those modelers not familiar with flying a helicopter, we would like to pass on some advice before proceeding. It's a known fact that to hover a helicopter is one of the more difficult maneuvers to learn and perform. Also, trying to operate a helicopter just several inches above the ground (in ground effect) takes a great deal of practice and skill. As helicopters have more stability in forward flight, this can be an asset for the novice, so we base the training sequences upon this fact. We do not recommend the tethered method for training purposes.

With the model facing into the wind and a very slight amount of forward cyclic-trim applied, increase the throttle to lift off. The model should be liftet off some one or two feet and flown slowly forward a short distance (some 6 to 10 feet), then slowly reduce the throttle allowing the model to settle. Position yourself some five to ten feet behind and to one side of the model and follow it along as you make these short flights across your flying site. Continue these short flights to the limit of the flying site. After stopping the rotors, carry your helicopter to the original down-wind position and resume the short flights again. As you become more

confident and proficient rather than extending the distance of each hop, begin to lengthen the time intervals between lift-offs and landings as an approach to learning to hover the model. This is one of the most successful training exercises found to date.

Always face the model into the wind for lift-offs and avoid operating with the model's skids just a few inches above the ground in the turbulent ground-effect. Practice the slow forward flights, slowing the flights until you can keep the model over a fixed spot (hovering). Practice hovering at various altitudes learning how to return the model to the ground from the slow forward flights and the hover positions.

Don't become impatient! Learning to fly a helicopter takes time and deep concentration. Take a break periodically. Avoid an audience if you can. Practice as often as you can. Become proficient in hovering your model.

It has been proven that the RC helicopter pilot can save his model from some critical flight-positions if he is well versed in hovering his model. Do not allow others to induce you into premature flights around the field. You will have ample opportunity to demonstrate your new-learned skills in due time. Each flight must begin with a lift-off to hovering and finishes with a hovering just before touchdown. The importance of hover practice cannot be overlooked.

Learn to fly your Alouette 2 in a constant heading square pattern. Lift off some three to five feet and into the wind, fly forward approximately 10 feet, pause, and hover for a moment, then fly the model laterally to the left 10 feet keeping the model facing into the wind. Pause and hover for a moment then fly the model 10 feet rearward, again keeping it facing into the wind. Pause, and hover a moment, then fly the model sideways 10 feet to the right. Stop and hover over the original lift-off point. This is an extremely good coordination maneuver/exercise. On each leg of the maneuver attempt to maintain a constant altitude and rate of speed.

There are many close-in exercises which can be practiced before beginning the higher altitude and speed flights around the flying site such as:Slow circular or square pattern flights around yourself, small figure eights out in front of yourself and rectangles, only to name a few. Any and all exercise build confidence and improve co-ordination.

When you feel you can control your model with reasonable confidence, the next step is learning to fly around the field. The Alouette 2 behaves much like a conventional RC airplane in forward flight. Lift-off into the wind and hover at an altitude of four to six feet. Check the control functions. By giving a small amount of forward cyclic (down elevator) the model will begin to pick up forward speed and gain altitude. Do not panic if the model climbs to 20 or 30 feet of altitude, just do not allow the model to keep accelerating. Reduce the throttle, and forward cyclic to maintain a moderate speed. When the model is 75 to 100 feet away, start a left turn by introducing a bit of left-cyclic along with a small amount of left yaw-control. As the turn begins, the nose of the helicopter will tend to drop much like an airplane. To prevent the model from losing altitude, begin to apply reverse-cyclic (up elevator) to maintain the established altitude.

After circling the field once or twice, you can begin the landing descent. Reduce the throttle and apply a bit of reverse-cyclic slowing the model and losing altitude at the same time. For the first landings from these forward flights rather than slowing the model to almost a hover condition at a high altitude, make the descent at an angle of approximately 30 degrees until the model is some six to eight feet above the ground. Add more throttle to stop the descent and hover a moment above the intended landing spot before landing.

An important aspect in making flights around the field is that the helicopter while flying down-wind should not be flown slower than the speed at which the wind is moving. The moving wind, acting against the helicopter's tail boom and vertical stabilizer can cause the model to weather-vane, when least expected! Pay strict attention to the attitude of the helicopter while flying at a 90 degree angle to your line of sight. Helicopters in general offer a poor visual silhouette at a distance and it takes only a moment to become disorientated.

As your confidence builds and skill improves, begin working on: fast starts, pinwheels (yaw turns), stall turns, high speed Yo-Yos, spot landings and all the maneuvers possible within the flight-envelops of helicopters, and you also then join the ranks as an accomplished RC helicopter pilot.

With the Alouette 2 it is possible to fly loops and rolls. To be able to perform these maneuvers you need a lot of training and confidence. The model should not master you, but you should master the model.

In closing, we wish you many enjoyable hours of flying and much success. One last reminder: It is the successful flyer who thoroughly "pre-flights" his model before each and every flight.

NOTE

The world wide service that Kavan is providing for the Jet Ranger owners will also be available for the Alouette 2 owners. Make sure that you will return the white service card, as otherwise you cannot be added to the mailing list.

P R E - F L I G H T C H E C K L I S T

Before starting the engine

MAIN ROTOR ASSEMBLY

1. Damping blades secure? There should be a 90 degree angle between the damping blades and the main rotor blades.
2. Stabilizer-rods secured, not nicked or bent.
3. Bearing-pins and bearings secure.
4. Seesaw and mixing levers move freely.
5. Plastic ball-joints properly engaged and sound, no signs of wear.
6. Main rotor blade secured and aligned.
7. Main rotor hub-bolt secure, no vertical motion of main rotor shaft.
8. All bolts and ball-joints secure at swash-plate. Guide hub secured to shaft. Swash-plate lubricated.

TAIL ROTOR ASSEMBLY

1. No excessive movement of blade retainers.
2. Blades and retainers secure and sound.
3. Hub secure
4. Ball joints engaged and sound.
5. Control plate secure and bushing lubricated.
6. Lubricate both tail rotor shafts and lubricating hole in tail transmission.
7. No end-play on drive shaft or back-lash.
8. Tail rotor rotates freely when main rotor is hand-turned.

GENERAL

1. Inspect servo/control assembly for loose components.
   All ball joints and links connected.
2. Mixing lever secure. Servos secure and no wires interfering with control functions, batteries charged.

3. Test all control functions at normal ground-check distance.

4. Radio, battery and servo plugs secured.

5. Transmission bolts secured.

6. Fuel tank and system operative. No kinks in lines.

7. Receiver and battery-pack secured.

8. Landing gear bolts secured.

9. Cooling fan secure and free of nicks, rotates without touching cooling-shroud.

10. Test continuity of glow-plug.

11. Proper center of gravity with tank filled.

12. Transmitter trimlevers in proper positions.
Throttle stick in low position.

13. Radio system turned on.

14. Glow-plug connected to starting battery.

15. Ensure that electric starter rotates in proper direction (clockwise when viewed from starting-con end)

16. Grasp main rotor assembly, tilt model, engage statter. Start engine.

17. Have assistant remove starting equipment to safe distance.
Allow engine to idle for a few moments before disconnecting battery frin glow plug.

Carefully release main rotor assembly; stand clear of model and advance throttle to one-third open position allowing engine to warm. Recheck control functions.

Check rotor blade tracking before any attempt to lift-off model, also trim levers as required. Be sure spectators remain at a safe distance. Avoid flying near or over spectators.

PARTS LIST

MISCELLANEOUS

2001	Front Body
2001a	Plastic Spacers
2001b	Bell Crank Levers with Pin
2002/4	Sheet of Plywood
2005	Front Bulkhead
2006	Rear Bulkhead
2007	Tail Boom
2008	Truss-Struts (set)
2009	Tail Skid
2010	Plastic Rudder (fin)
2011	Alu-Tube
2011a	Horizontal Stabilizers
2012	Side Alu-Sheets (set)
2014	Canopy
2014a	PVC-Canopy Mounting Channel
2014b	Metal Fastener
2015	Landing Gear Skids, compl.
2016	Scale Turbo Engine
2016a	Alu-Tube
2016b	Alu-Metal Sheet
2016c	Alu-Sheet for Turbo Engine
2041	Allen Wrench (set)
2044	PVC-Glue
2053	Decals
2057	Assembly- and Flying Instructions
2058	Main Plan
2070	Washers, assorted
2071	Nuts, assorted
2072	Pan Head Screws (M3)
2072a	Pan Head Screws (M2)
2073	Socket Head Screws
2074	Ball Joints / Snap Links / Couplers 1,2 mm (set)
2076	Push Rod (set)
2508	Mixing Lever

MAIN TRANSMISSION

2100	Transmission Base Plate
2101	Main Rotor Shaft
2102	Plastic Spur Gear
2103	Alu-Mounting Plate
2104	Engine Mount Castings
2105	Metal Spacers
2106	Clutch Bell compl. as provided in the kit
2106a	Clutch Bell
2106b	Plastic Bearing Block with Ball Bearing
2106c	Bevel Gear
2106d	Metal Spur Gear
2106e	Distance Bushing
2107	Clutch, compl.
2108	Timing Belt
2109	Washers for Engine (set)
2110	Timing Gear/Cooling Fan
2110a	Split Cone (set)
2112	Hub Puller
2113	Cooling Fan Shroud
2114	Tail Drive Shaft Unit
2115	Small Plastic Plate

MAIN ROTOR HEAD

2200	Alu-Part, cone shaped
2201	Alu-Bushing
2203	Swash Plate, compl.
2203a	Control Arms for Swash Plate with Stub Shaft
2204	Plastic Swash Plate Driver, compl.
2205	Main Rotor Head, compl.
2205a	Rubber Bushing
2206	Stabilizer Rod
2207	Right Angled Lever
2208	Setting Ring
2209	Alu Damping Paddles (set)
2210	Angled Metal Sheets (set)
2211	Arched Blade Adjustment Plates
2212	Swash Plate Entie Rotate Bracket
2220	Main Rotor Blades (set)

TAIL ROTOR

2300	Tail Rotor, compl.
2301	Tail Rotor Blades (set)
2302	Flexible Tail Rotor Drive Shaft Ø 2 mm

ACCESSORIES

3901	Gyroscope
3902	Mitsumi-Micromotor
3903	Gyroscope-Potentiometer
3903a	Gyroscope-Tension Spring
3903b	Gyroscope-Trim Pot
3904	Position Blinking Lights
3905	Extra Set of Bulbs
3905a	Extra Set of Lenses and Brackets
3906	Electronic Fuel Control
3907	Extra Set of Bulbs
3907a	Extra Set of Lenses and Brackets
4	Snap Links
13	Threaded Couplers (1,2 mm)
29a	Fuel Tank
2914	Floaters
3016	Pen Lubricator
3037	Silencer
3318a	Aerodynamic Damping Blades (Wood)
3324a	Ball Joint, Plastic, with Brass Ball

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	x	Miss Blum	c/o Kavan Model Aircraft Inc., 1424 E. Borchard Ave, Santa Ana, Cal. Tel(714)835-7788

Our above listed service-agents will be ready to give you any support in technical problems!
Please note, service centers marked with "x" have spare parts on stock.