

ASSEMBLY AND FLIGHT INSTRUCTION

"KALT HELICOPTER -- HUEY COBRA 450"

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## KALT "BELL HUEY COBRA 450"

This model is based mechanically upon the German model "BELL AH-IG HUEY COBRA" made by Mr. Dieter Schluter for the first time in the world as a controllable model helicopter. With his consent the "Kalt Helicopter" has been redesigned and produced for more ease of control.

This model is designed to be controlled in all the ways of the real helicopter movements by installing a 4 channel proportional radio. Mr. Schluter has the patent to all the mechanics of the helicopter, and Kalt Sangyo Co., Ltd. of Japan is licensed to produce this reduced size scale model. The model, which is made fundamentally same as "AH-IG Huey Cobra" of Bell Helicopter, U.S.A. for its contour and structure, has been under strict and repeated tests for durability and flight; therefore, there is no need to modify the structure and type adopted by this reproduction.

### A. How to Make Fuselage

The following instruction presupposes that you have some knowledge and experience of building conventional model airplanes. Fuselage is formed with Gel-Coated F.R.P. You are required to make some cutting and perforation on Longerons, Frames, and Hull; and to finish some parts for yourself, like stabilizer, the opening of vertical fin.

Glue to use Glue for assembling the kit must be either one of Epoxy or Polyester. Some fast drying glue are poor in adhesive strength and in resistance to vibration.

1. Clean the fuselage both inside and outside with lacquer thinner or acetone.
2. Glue F-10 to the lowest part of fuselage. Be sure that it is down flush to the edge of the fuselage. (See Drawing)
3. Glue F-2 to F-10 at right angle as illustrated. All the frames have holes for pitch control wire, align these holes at right side.
4. Glue F-1 as illustrated.
5. Bend the tip of F-9 to the curve of fuselage, glue it down through F-1 and F-2.
6. Glue F-3 (the rear part of canopy.)
7. Glue F-4 to F-10 and F-9.
8. Glue F-7 which comes to the bottom of canopy through F-1, F-3, and F-4.
9. Glue F-8 (the upper cover of the engine) between F-2 and F-3.
10. Make necessary holes on SM-1, and SM-2 (mounting plywood board for servos.) Glue down SM-1 bridging F-9s of both sides, and SM-2 to F-7 and F-9.
11. Insert F-6 toward the foot of the vertical fin and feed glue through the rear opening.
12. Make an outlet hole on the right side of the vertical fin for pitch control cable tube (confirm holes on frames before installation.) Decide the location of outlet with consideration so that cable should move smoothly. (The location on the drawing can be used most of cases as it is.)
13. Let the outer tube of pitch control cable go through F-2, SM-2, F-4, F-6 and glue each place. Around the outside and inside of the vertical fin, use ample glue.
14. Glue brass pipe for flexible shaft to F-5 and F-6, after bolting down main gear box to mounting plate tentatively and jointing with flexible shaft so you can be sure about alignment.
15. Glue F-11, and F-12 as illustrated. Use sufficient glue around the contour, otherwise they may come off later with vibration.
16. Make tail skid as drawing and glue it down.
17. After these steps completed, glue block V to vertical fin after having correcting the shape of the fin.

18. Now you come to the step of assembling. Glue together C-1, C-2, and C-3 according to the shape of the counter portion of fuselage. Then glue FRP canopy shaping it to fit the assembled frames of C-1, C-2, and C-3. To hold Canopy in the position, a rubber band may be used to pull it down as illustrated. Also you can attach a pin on the rear part, and latch the front.
19. Perforate the following holes on Fuselage as illustrated;
  - a. Access for Fuel Tank.
  - b. Inlet for Fuel Pipe.
  - c. Holes for the bolts of muffler.
  - d. Access for Muffler.
  - e. Access for Needle Valve.
  - f. Access to Mast Joint Bolt.
  - g. Outlet for Aileron, Elevator Rods.
  - h. Outlet for Mast.
  - i. Access to Tail Gear Box.

## B. Finishing of Fuselage

Generally you can do the same procedures of finishing as you do to model airplanes. It is recommendable to put fuelproof clear finishings on the inside of frames and longerons, for the outside of fuselage it is good enough to spray a thin layer of clear as the final touch. But around the muffler, fuel tank, and engine, it should be a little thicker.

## C. Assembly of Engine Cooling Fan, Clutch and Gear Box

It is almost self-explanatory how to assemble these parts. The Gear Box is already assembled, to which the clutch bell is attached. Cooling Fan, Pulley and Clutch Shoe are mono-cock structure. What has left for you to do is connecting Gear Box to Engine, which you are supposed to do very carefully.

1. Take out Engine Crank Shaft with Housing, putting Taper Spacer on Shaft, and then Cooling Fan Assembly having Fan side toward Engine. Tighten Pilot Nut firmly (a long hexagonal nut, thread side to Engine Shaft.) Handle Nut with care as it is equipped with Needle Bearing on the other side. Put back Engine Shaft into Engine Crank Shaft Case.
2. Insert Pilot Nut with Needle Bearing side into Shaft Clutch Bell of Gear Box which was mounted onto Mounting Plate before, make sure to put Starting Belt to Pulley and a little amount of grease to needle Bearing prior to connection.
3. Be sure about the side of Mounting Plate as it's not symmetrical.
4. Use 3mm thick Spacer between Engine and Mounting Plate so as to align the center of Shafts.
5. Before installing Engine Cover, make perforations on it for Engine Exhaust, Needle Valve, Fuel Tubing and access for Engine Plug.
6. Make holes on Lower Cooling Fan Cover for installing bolts and oil drain. You should also do some trimming for Nuts of Upper Fan Cover. This Lower Fan Cover will be attached lastly to F-10 through Mounting Plate with wood screws.
7. Installing Position of Mechanism Assembly. After assembling all mechanism onto Mounting Plate, place it underneath of Fuselage and see if it's right or not considering the location of holes for Muffler, Needle Valve and Engine, insert Mast into Mast Joint then examine if Mast is not touching upper opening of fuselage. If right bore holes for installing bolts. You should also consider the alignment with Flexible Shaft.

#### D. Assembly of Center Parts of Main Rotor

1. After installing mechanism and Mast properly, fix Mast Housing to position with four bolts.
2. Insert Swash Plate as illustrated.
3. Then fix Swash Plate Stopper with care about right direction as illustrated.
4. Insert Gimbal Ring to Mast.
5. Stabilizer Bar should go through Bearings on Yoke Hangers (tri-angle shaped metal,) fix it in the position with Control Lever and Stopper as illustrated.
6. You can lock Stabilizer Blades by tightening Lock Nuts at both ends. It is recommended to smooth Stabilizer Blades before assembling. It is mandatory to align the angle of Stabilizer Blades and Control Lever before locking.
7. Be sure that Stabilizer Blades are fixed for clockwise rotation (when looking at it from the above.)
8. Attach Main Rotor Blades to Blade Holders which are bolted to Yoke. Dihedral angle is  $3^{\circ}$  at one side, and angle of attack is  $4^{\circ}$  at the lower surface of Blade against Stabilizer Bar. Balance right and left blades by adding weight of such as wood screws or tape. Measure pitch of Blades with a gauge which you can make from the drawing. For correcting pitch use 2 crescent wrenches and twist Blade Holders.
9. Completing all the procedures above stated, take away main rotor section from Mast.

#### E. Connection of Flexible Shaft

1. Grease Flexible Shaft and insert it into Brass Pipe from Tail Opening. At the end it will be connected to Drive Shaft of Main Gear Box with Joint.
2. Then Joint to Tail Gear Box.
3. After Connecting Flexible Shaft, rotate Clutch Bell and see everything moves smoothly.

#### F. Assembling Tail Rotor Section

1. Put a cover of plastic or metal sheet or plywood over Opening of Tail Gear Box which has no threaded holes. Over the other opening, place Back Plate on Fuselage after reinforcing the area with plywood where Tail Box is to be attached. Make holes on reinforcing plywood for installing bolts, house gear box with Pitch Control Guide (triangle metal with diagonal slit) outside of fuselage and with Tail Rotor Pitch Control Arm (2mm L shaped rod) through the axis.
2. Tighten Tail Rotor Blade Nylon Pitch Housing sandwiching Bearings. Direction of Arm is out of question, just don't make both arms opposite way.
3. Insert Tail Rotor Pitch Control Nylon Plate ( ) into Pitch Control Arm with 2 stoppers on both sides so that Nylon Plate moves when Control Arm is moved along diagonal slit of Guide. A little slackness should be given in order to rotate Rotors smoothly.
4. Attach Nylon Joint to Nylon Plate as illustrated. Connect it by bolting down Joint Ball to the hole on Arms which situated on one side of Nylon Pitching Housing.
5. Trim Tail Rotor as shown on the drawing. Harden around installing holes by dropping some instant glue.
6. Range of pitch should be so adjusted that, when you tilt Rudder Stick of your radio all the way leftward, the pitch is nil or a little minus; when to the far right the pitch should be  $25^{\circ}$  -  $30^{\circ}$ .
7. To Tail Rotor Pitch Control Wire should be soldered at both ends with proper length of 2mm threaded piano wires using brass tubes as joints.

#### G. Connection of Aileron and Elevator Servo to Main Rotor

1. Installing location of Aileron and Elevator servos should be decided as shown on the drawing. Use a servo with a longer arm as the stroke of an ordinary one may inadequate.
2. Adjust Aileron (for conveniency we adopt the same way of calling it as is the case of airplane) and Swashplate to tilt rightward when the aileron stick of radio is tilted rightward.
3. For elevator, adjust Sashplate to tilt backward when elevator stick is pulled up-position.
4. Of two long arms with balls on lower Plate of Swashplate, one on the right side is for Aileron; and the other on front is for Elevator. On left of Swashplate only a ball is attached which should be connected to the rear of the Pylon with a longer rod(Radius Arm) in order to lock the lower Swashplate.
5. Adjust Swashplate to be right angle to Mast and Elevator Arm facing forward exactly when servos are in neutral position (refer drawing).
6. Link Arm on the upper Swashplate to the ball of Stabilizer Control Lever using Nylon Link Joint. (refer drawing)
7. This section can be taken off during transportation.
8. Range of working angle for Elevator and Aileron is  $10^{\circ}$  -  $15^{\circ}$ . They should be set for smooth movement.

#### H. Engine Control

Engine is controlled same way as model airplanes. But after covered by Cooling Fan Cover, movement of the carb will be concealed, so you haveto be sure to adjust it right prior to installation.

#### I. Landing Skid

4.5 mm Hi Carbon Steel Wire is furnished in the kit for Skid which can be bent at right angle more easily by knealing it. Ample solder must be used for joints. (refer to drawing).

#### J. Balancing Center of Gravity

You are required to be more careful about CG of the helicopter model than of model airplanes. After completing the kit pick it up holding Gimbal Ring Section. Adjust the balance by putting some weight at the nose, if necessary, so that the nose slightly is downward.

#### K. Final Check and Adjustment

1. Check all nuts and bolts. It is recommendable to apply rubber adherent to all the nuts except Nylon Nuts.
2. Switch on your radio and see every steering system moves properly.
3. Check outport on Fuselage for Control Rods is big enough when you work both Aileron and Elevator at a time.
4. Ascertain Pitch Control Arm for Tail Rotor slides smoothly along Guide slit. Put a little amount of grease in sliding parts.

## FLIGHT PRACTICE

### A. Warning to Flying Helicopter

Only when you have flying technics of conventional airplanes, you can start the practice of flying helicopter. It is needless to mention difficulty of flying model helicopters as they are less efficient and with a lot of limitation in steering systems. This is easily proved by telling a fact that only several years ago a large amount of money was offered to the first success of R/C model helicopter. You must be very careful when you fly it as it has a big rotor running exposed. There ought to be ample distance between the helicopter and people watching. Getting it insured is most recommendable. Though this model helicopter presents you excellent flight performance, stability, ample power; you ought to have, at least, thorough command of technics of taking off and landing R/C planes.

### B. Starting Engine and Adjustment

A motor driven starter is a must to start the engine. You may have to modify you starter to fit the belt. It is recommendable to put the copter on a stand to start it, otherwise you must lie down on the ground. Be alert always to the rother which is whirling upon your head.

After fixing the belt on starter, blow up fuel tank through Air Outlet of tank and get the starter working 4 or 5 rounds. Connect booster cord to Plug, keeping Throttle Lever a little higher than the lowest, otherwise the rotor will suddenly begin to whirl.

After engine started hold skid firmly and open throttle valve fully, closing needle valve gradually till you find out the point of the highest speed. Then twist needle valve back 1/2 - 1/3 turns for safety. Engine sounds much quieter than conventional model airplanes, so you are required to get accustomed to it. Repeat Hi and Low engine adjustment several times to assure engine is thoroughly in good condition. Breaking-in of engine before installation is not in need. Clutch begins to engage at 3,500 R.P.M., so set the engine idling quite high up to just before the engaging point.

### C. Primary Practice of Flight

Relation between Stick Work and Coptor movement is as follows;

Elevator	-----down	- - - - -	Forward, Speed up, Downward
"	up	- - - - -	Speed down, Backward
Aileron	-----left	- - - - -	Banking to Left
"	right	- - - - -	" Right
Rudder	-----left	- - - - -	Turning to Left
"	right	- - - - -	" Right
Engine	-----Hi	- - - - -	Upward
"	-----Low	- - - - -	Downward

Combining above listed manipulation, you can do all the flight movement. For the stable flight you are required to controll it freely anytime.

For practice flight, put the copter on the ground against the wind, tie the strut of the skid with 10 foot strings four directions, give them such slackness that the copter can leave the ground for about 8 inches high, and can move 8 to 12 inches 4 ways. When the copter tilted, the tip of the rotor will not touch the ground. Now before you really fly it, check the following points;

1. Rev up engine gradually, see if there is any unnatural vibration in the main rotor and tail rotor.
2. If you don't hear any strange sound.
3. If the steering system move properly; when everything is perfect up to this point, accelerate the engine more and check the following points further more;
  - a. Rev it up till the copter is just about to take off, and see if the tail moves around either way.
  - b. If it doesn't roll either way.
  - c. If it doesn't tilt forward or backward.

If you see any strange behavior, correct by working corresponding trim lever of your radio.

When you cannot make correction unless you have to move trim lever too much, adjust by turning Adjuster Screw, keeping trim lever in neutral position. After finishing adjustment, try to acquire the feeling of engine controlling, lifting, and steering rudder. When it is just about to leave the ground, down the elevator, then the copter starts forwards. Thus you can learn the feeling of taking off while moving forwards.

Warning: After 5 to 10 minutes practice, tighten set screws of joints of main and tail gear boxes.

#### D. Steering for Take-Off, Cruising and Landing

1. Taking-off: Be sure about surrounding safety and put the copter on the ground against the wind. Rev up the engine gradually and when it is about to leave the ground, down Elevator slowly, it will glide forwards and upwards keeping its nose down. About this stage, the copter may tilt, because of ground effect, you can compensate it by aileron manipulation.

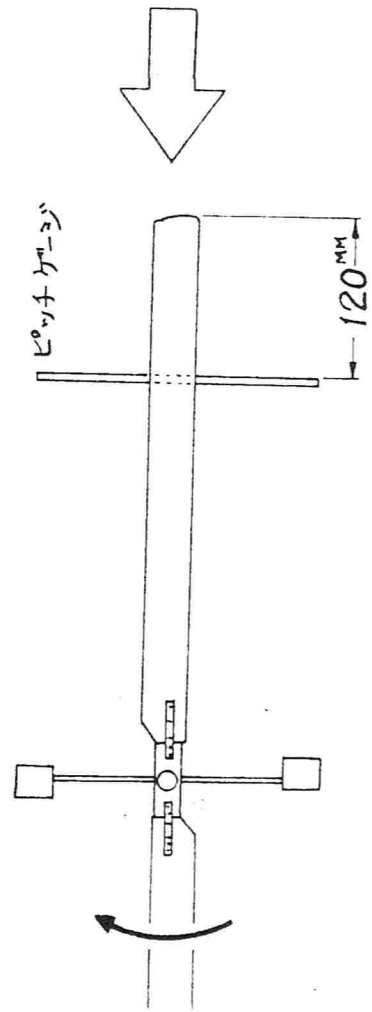
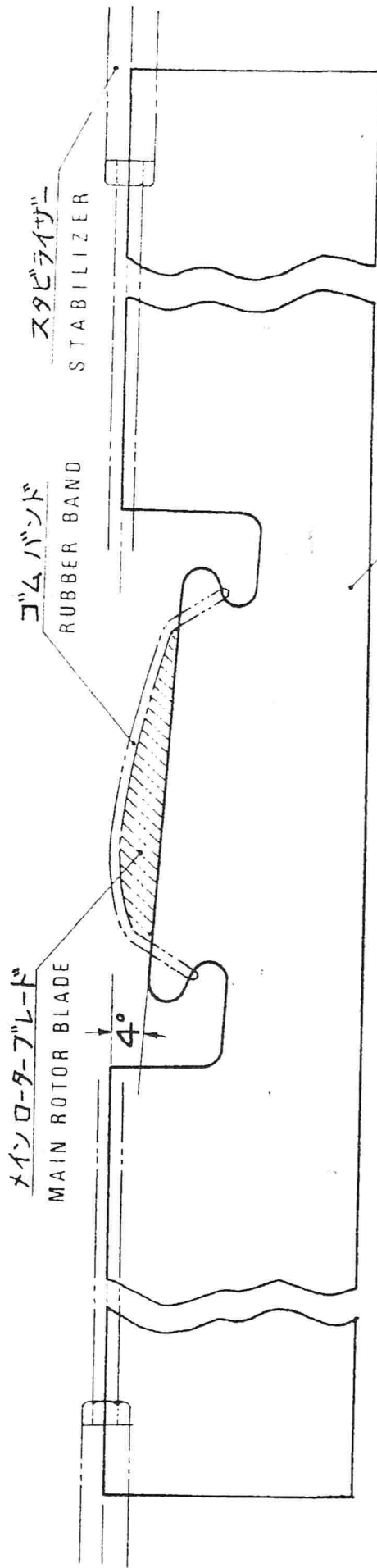
2. Level Flight and Turning: After forwarding against wind for a while and gained some altitude, steer Aileron with Rudder same way, it will start turning. Because of direction of rotor whirling, it is easier to turn right, more movement of rudder is required for turning left. Getting into level flight rev down to proper degree, 1/2 opening of throttle is supposed to be right.

3. Landing: Decelerate when it approaches 30 feet away from the landing point. When it gets down 15 - 20 feet high, rev up engine slightly so as to cope with the down inertia and get it back to the level flight once, and then make it downwards again. At the moment of touching down the ground, cut off throttle to the lowest. This is the decisive moment calling for your most attention. If you are late, it will be toppled over.

Your KALT helicopter is a precision flying machine manufactured to exact tolerances with great care and thorough flight tested by our staff of flight experts. We wish you every success in this thrilling new hobby sport. Please read these instructions carefully and thoroughly before starting construction of your helicopter kit.

# メインローターブレード用 ピッチゲージ

## GAUGE FOR ANGLE OF ATTACK



スタビライザーバーとピッチゲージ上面とを  
 見くらべ、スタビライザーバーを基準にメインロー  
 ターブレードのピッチを調整して下さい。

YOU CAN ADJUST THE ANGLE OF ATTACK  
 BY ALIGNING THE UPPER EDGE OF THE GAUGE  
 WITH THE STABILIZERS.