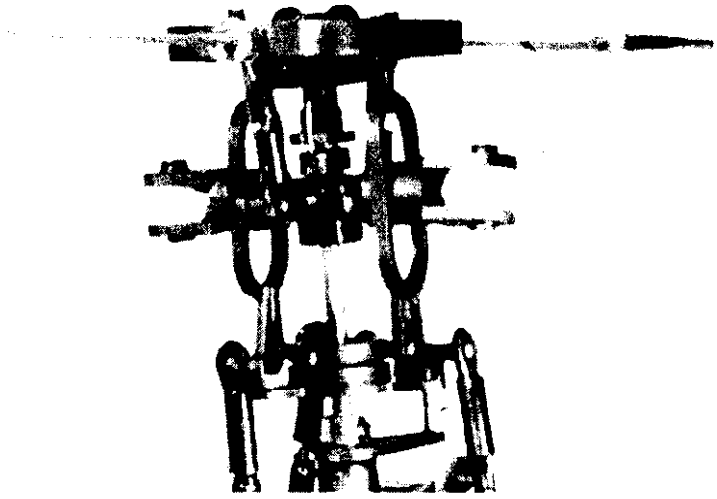
MS - HORNET CP

UPGRADE KIT



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ASEMBLY INSTRUCTIONS

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HORNET CP UPGRADE KIT - ASSEMBLY INSTRUCTIONS

Dear Customer,

Thank you for purchasing HORNET CP Upgrade kit – a genuine product of MS Composit Co.!

Warning!
RC model helicopter is not a toy. The rotating model elements represent an instant source of danger. Never use broken parts, replace even if you only suspect the part might be not in a perfect condition. Use the model only in places suitable for such activities.

The HORNET CP Upgrade kit is designed for turning your HORNET series helicopter into a pitch-controlled model for better performance, aerobatic capabilities and higher comfort.
Modern CCPM control system uses three-points cyclic control, eliminating need for complex mechanic mixing solutions. The CCPM system requires RC transmitter, which is equipped with this type (CCPM) of RC heli mix program.

Further information can be found on http://www.mscomposit.com

HORNET CP is designed for whole range of RC pilots – from beginners to experts. It is capable of indoor and outdoor flying.

HORNET CP is a quite complex electro – mechanical device. Proper functionality can be achieved only if the assembly instructions are carefully followed, and necessary care and attention is paid to the whole assembly process.

DISASSEMBLY OF THE BASE SYSTEM – Pic.1

1. Disconnect the E020 rods from the swashplate.
2. Disengage the E015 joint from the main gear.
3. Pull out the main shaft with the rotor head out of the heli frame.
4. Disassemble both servos and the receiver.
5. Using a de-bonder, disassemble E008 from the E001 frame.

CP ROTOR HEAD ASSEMBLY – Pic.2

E055 Bolt M2x8	2x	E074 Stabilizer Drifter	1x
E075 Rotor Head CP	1x	E076 Blade Grip	2x
E077 Threaded Inlay M2	2x	E066 Main Shaft CP	1x
E082 Elastic Member	3x	E115 Needle 1x10 hardened	3x
L0265 Bearing 2x6x2.5	4x		

1. Insert needles E115 into the drifter E074, so their ends line up with the bottom E074 surface. The needles can be glued in proper position (not mandatory).
2. Insert metal inlays E077 into the rotor head E075 openings from inside.
3. Put the complete stabilizer drifter E074 onto the main shaft E066 in such manner, that the openings for the pin E115 are aligned – check by putting E115 in and out. The holder fits onto the shaft tightly. We recommend to round very slightly the low outer edge of the cylindrical part of E074 for easier insertion of the elastic member E082 – see further steps.
4. Insert the rotor head E075 from bottom onto the main shaft E066 so the pin E115 can fix all three parts (E075, E066 and E074) together. This enables the rotor head to swing. The joint E115 must be inserted with its whole length, and should not extend beyond E075 rims.
5. Push the elastic members E082 (O rings) into the free space between the rotor head E075 and stabilizer holder E074. For easier assembly wet the O rings with soap water. Use rounded tools to prevent the ring damage. Swing the rotor head around the E115 joint several times to position the ring properly.
6. Insert two pairs of L0265 bearings into the blade grips E076.
7. Fix the completed blade grips E076 onto the rotor head E075 by bolts E055. Tighten the bolts very carefully using hex wrench E063. Use Loctite or similar to fix the E055 bolts. **ATTENTION!** Preserve the bearings from the fixing liquid!
8. The blade grips must move absolutely freely.

STABILIZER ASSEMBLY – Pic.3

E047 Flybar	1x	E071 Collective horn	1x
E049 Bolt M1. 6x5	2x	E050 Nut M1. 6	2x
E072 Stabilizer dome	1x	E073 Stabilizer bed	1x
E083 Grub screw M3x4	2x	L0260 Bearing 2x6x2	2x
E048 Paddle	1set	E052 Grub Screw M3x3	2x

1. Insert the L0260 bearings into the stabilizer dome E072.
2. Insert the dome assembly into the stabilizer holder E073 and tighten the grub screws E083 so the dome is fixed in the holder, and can swing freely without a play.
3. Insert the collective horn E071 onto the outer edges of the stabilizer dome E072,

and join both parts by inserting the stabilizer rod E047. The stabilizer dome must be right in the middle of the stabilizer rod!

4. Mount the grub screws E052 into the metallic rings of collective horn E071, verify the stabilizer symmetry and carefully tighten the E052 grub screws using hex wrench E063.
5. Mount the stabilizer paddles E048 onto the flybar. Fix the paddles slightly in horizontal position using bolts E049 and nuts E050. The paddles MUST be parallel to the collective horn E071, and they must be also parallel one to each other.
6. Check the symmetric mount of the stabilizer paddles – it's distance from the rotor axis must be equal.

CP ROTOR HEAD ASSEMBLY - Pic.4

E021 Ball link	2x	E052 Grub Screw M3x3	1x
E058 Bolt M2x8	2x	E067 Stopper ring	1x
E070 Connecting rod	2x	E079 Ball link Short	2x
E092 Swashplate CP	1x		

1. Assemble the connecting rods using the ball links E021, E079 and the rods E058 (M2x8). Adjust the connecting rods length to 20 mm – see Pic.4. The correct rod length is very important for proper range of angle of attack.
2. Put the complete stabilizer assembly onto the main shaft E066 so the stabilizer socket E073 links with the needles E115.
3. Put the connecting rods E070 on the ball joints of the stabilizer horn E071. Pay attention to the proper orientation of the rods – follow the picture.
4. Insert (from bottom) the complete swashplate E092 onto the main shaft and fix the opposite ball joints on the upper swashplate to the connecting rods E070.
5. Using the connecting rods, assembled in Step 1., connect the ball joints on the stabilizer dome E072 to the joints on the blade grips E076.
6. Insert the stopper ring E067 with grub screw E052 so the rim for the bearing faces down.

HELICOPTER COMPLETION Pic.5

E008 Anti Rotation Support	1x	E009 Anti rotation Pin (20mm)	1x
E020 Servo Link	3x	E021 Ball link	3x
E063 Hex hey	1x	E058 Bolt M2x8	3x
E078 Bolt M2x12	2x	E084 Pinion gear 11 teeth	1x
E085 Pinion gear 12 teeth	1x	E086 Pinion Gear 13 teeth	1x
E088 Main Rotor Blades CP	1set	E115 Needle 1x10 hardened	1x
E093 Tail Pitch Slider CP	1x	E024 Servo mount	3x

1. Glue the Anti rotation support E008 with the Anti rotation pin onto the Main body E001. The Anti rotation pin must be parallel to the lengthwise heli axis and

is facing back.

2. Put the main shaft E066 with complete rotor head assembly into the bearings in the Main body E001.
3. Fix the Main gear E002 to the main shaft using the Needle E115.
4. Adjust the play in the transmission for the tail drive (the E002 crown wheel and the pinion E018). If needed, use suitable washer and after adjustment fix the main shaft in proper position by the grub screw in the stopper ring E067. Don't apply too much power - avoid excessive load and tension on and in the ball bearings.
5. Complete the connecting rods using E021, E020 and E058 - the length will depend on used servos type.
6. Using CA glue, fix the Servo Mounts E024 for the swashplate control servos. Try to position the plates so the servo connecting rods are as parallel to the main shaft as possible. In other case the differentiation of the swashplate control movements would lead to worser flight capabilities.
7. Fix the servos to the servo plates using quality double-faced self adhesive tape, with no foam for higher control stiffness. You can glue (CA) the servos directly to the heli main body without the Servo Mounts as well.
8. There are several different ways how to place the servos on the frame. System described here is standard for three-points control in the lengthwise model axis, where two servos control the roll and all three servos control the nick – system called HR3 or SR3. If needed, you can use also system HN3 or SN3. Before fixing the servos, think about the accessibility of different construction elements for maintenance and repairs. **All rotor head control servos MUST be of the same type as equal servo speed and deflection range is crucial for proper control functionality.**
9. After setting up the RC equipment (see section SETUP and ADJUSTMENT), put the servos into neutral positions and install the servo horns. **In neutral servo positions the horns must be horizontal.** Fix the horns with the corresponding bolts.
10. Adjust the length of the connecting rods so, that the swashplate is perpendicular in all directions to the main shaft when the servos are in neutral position. Furthermore, the blades pitch angle should be at 0° if servos are in neutral positions. After adjusting the lengths install the connecting rods. The distance of the connecting rod joint on the servo horn should be 8 - 10 mm from the horn bolt axis. **ATTENTION – this distance must be equal on all three servos.**

HORNET CP SETUP AND ADJUSTMENT

1. Set on the transmitter the corresponding heli mix program - HR3 or SR3 (for Futaba transmitters), or equivalent for other transmitter types.
2. Set up the servo reversing, so the swashplate movements correspond to the sticks movements.
3. Set up the swashplate servos deflection. If the recommended horn length is kept,

for MS-15 and MS-10 servos is the value 60% for nick and roll and 30% for pitch. Attention – when increasing the positive angle, the swashplate moves down.

4. Check again the connecting rod length. In neutral servo position (don't forget to reset the trimming) the swashplate must be perpendicular to the main rotor shaft, the main blades pitch must be 0° and the stabilizer paddles pitch is 0° as well. The throttle stick is at 50% (central stick position) during this check. Furthermore, check the servo horns, which must be horizontal.
5. To check the blade pitch, use the included pitch gauge.
6. The pitch gauge usage. Cut off and bend both halves of the device as shown on the picture. Pay attention to cut as precisely, as you can - resulting setting accuracy depends on the metering device accuracy. Put both gauge parts on the square part of the blade grips, keeping the gap between scales as small as possible. The angle of attack can be read on the scale.
7. The tail rotor setup is same as for standard Hornet without Cyclic Pitch control. Only set up the REVO mix corresponding to your needs and convenience. REVO mix must be set up to compensate the influence of changing torque when changing the main blades pitch. Use the new modified tail pitch slider E090, which utilizes two bearings for higher stiffness.
8. The maximal possible angle of attack depends on the transmission rate chosen, the motor and accu used. If the standard motor and accu pack is used, and the medium transmission, i.e. pinion with 12 cogs, maximum angle can be set to 10°. The exact setup can be done only by flight tests. Too high angle will cause significant shortening of flight time, and can lead to the propulsive system overload. This situation can result in no power reserve for critical situation handling. We recommend to perform the flight tests and pitch setup with accu loaded to 50% only, what will ensure the attack angle will be big enough to fly, but not too big when the accu is partially discharged.
9. The maximal positive pitch angle is limited to +15°.
10. The minimal pitch angle is limited by length of the E015 joints. For inverted flight is the setup –10%.
11. For normal flight modes we recommend lower negative angle setup, at level of –2° to –3°, what will allow safe and stable descend flight. For autorotation the angle can be increased to –5°.
12. The rotor blades are fixed to the blade grips by bolts E078, which should be not over tightened.
13. The blades tracking must be performed in hover flight as a part of initial heli setup. Check if the main rotor blades follow one track. If not, correct it by changing the length of the pitch connecting rod. For the low running blade, the rod must be extended (and vice versa). As far as you hardly will be able to recognize which blade is lower, just try and extend one of the rods. Make the correction slowly - by a half turn only. If it gets worse, extend the other blade. Try it until the blades track

properly.

POSSIBLE PROBLEMS

Symptom	Reason	Solution
Main rotor vibrates	Rotor blades not tracked Blade bolts too tight Bent main shaft Stabilizer not symmetric Bent flybar Damaged main rotor blades	Adjust Loosen the bolts a bit Replace the shaft Check the stabilizer setup and symmetry and adjust if needed Replace flybar Replace the main blades
Tail rotor vibrates	Too tight bolts The tail rotor head bowed The tail blade grips bowed The grips distance from the rotor axis not equal	Loosen the bolts Glue the rotor head correctly Replace the grips Adjust
Improper swashplate control	Wrong transmitter mix setup Too tight ball links and movable system elements Bent E015 joints	Correct transmitter setup Loosen the ball links carefully Replace
Improper tail blades control	Gyro not setup properly Too tight movement of the movable system parts Some of pinion gears damaged or not engaged properly	Check and correct Loosen the system Replace and/or adjust

In case you experience tail control problems, too tight system is the reason. The tail blade system must move absolutely freely, without play. Check even the tail pitch slider holes for the tail pitch pins, and free it if needed.

We wish you fun and success with MS Composit products

MS Composit Team