HOVERSTAR™

INSTRUCTION MANUAL

REVOLUTION™


mm
1cm
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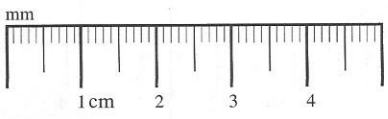


INTRODUCTION

Congratulations on your purchase of the Revolution HoverStar, the first complete entry level R/C helicopter system. Designed for use with a standard 4-channel FM radio system and .40-.46 ball bearing R/C aircraft engine, the HoverStar is an ideal way for the entry level sport aircraft pilot to economically and successfully make the transition to helicopter flying.

To further insure the pilot's success, the HoverStar kit also includes the HoverStar Flight Training Course, as well as a set of HoverGuard flight training gear. Designed and manufactured in the USA, the Revolution HoverStar provides the entry level helicopter pilot with a total training package, making it easier than ever before to enjoy R/C helicopter flying.

Warning

The radio controlled model helicopter contained in this kit is not a toy, but a sophisticated piece of equipment. This product is not recommended for use by children. Radio controlled models such as this are capable of causing property damage and/or bodily harm to both the operator/assembler and/or spectators if not properly assembled and operated. Horizon Hobby Distributors assumes no liability for damages that occur from incorrect assembly and/or use/misuse of this product.

AMA Information

We strongly encourage all prospective and current R/C aircraft pilots to join the Academy of Model Aeronautics. The AMA is a non-profit organization which provides services to model aircraft pilots. As an AMA member you will receive a monthly magazine entitled Model Aviation, as well as a liability insurance plan to cover against possible accident or injury. All AMA charter aircraft clubs require individuals to hold a current AMA sporting license prior to operation of their models. For further information you can contact the AMA at:

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302
(317) 287-1256

Design and Construction

The HoverStar has been engineered and constructed from the ground up to be the ideal training helicopter for the entry level pilot. You will find that when compared to other beginner helicopters, your HoverStar has an extremely low parts count, making assembly and adjustment quick and easy to do and maintain. Utilizing a fixed pitch rotor head design, the HoverStar 's control system is very simple and easy for the entry level modeler to understand. The HoverStar's fixed pitch rotor head design also allows the helicopter to be flown using a conventional 4-channel FM radio system (gyro recommended), eliminating the need to purchase and program a high tech helicopter radio system. All this, combined with the HoverStar's straight-forward design, provide the entry level modeler with an easily adjustable, low maintenance training helicopter with outstanding hovering stability.

HoverStar Design Features

Fixed Pitch Main Rotor System

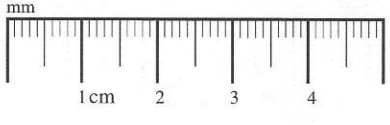
One of the unique features of the HoverStar is its high tech composite rotor system. This rotor system consists of a one-piece nylon composite center body with a dual ball bearing supported main rotor hub. The composite center body provides the correct amount of flex dampening during all rotor speeds. This, combined with the HoverStar's paddle design and adjustable flybar weights, is the key to the HoverStar's rock-solid hovering characteristics. The main rotor blade holders included with the HoverStar come directly from the factory with the approximate amount of blade pitch angle. This takes the guesswork out of choosing the correct blade pitch, eliminating the need for expensive blade pitch gauges.

A Special Note on Fixed Pitch Helicopters

As with any fixed pitch helicopter design, the rise and descent of the helicopter is controlled by the increase and decrease of the main rotor head RPM. This is controlled by the throttle of the engine. This method varies from collective pitch, which requires the main rotor blades to change pitch angle while maintaining a constant RPM. The collective pitch system requires many more linkages to achieve the similar results found with the fixed pitch rotor systems. The fixed pitch rotor head design of the HoverStar has been developed to reduce the overall linkage/parts count of the rotor system, making the HoverStar main rotor head/control assembly extremely easy to assemble and understand.

Main Rotor Blades

The main rotor blades included with your HoverStar have been specifically engineered to maximize the flight performance when combined with the HoverStar 's fixed pitch rotor head system. A combination of a unique airfoil and blade dimensions have produced a flight response that provides a stable, accurate control response never before associated with fixed pitch control. Cyclic inputs (fore/aft, left/right) are smooth, yet responsive. Altitude control, normally less precise in earlier fixed pitch models, is dramatically improved as the HoverStar climbs and descends easily and predictably. This precise attitude control is a direct result of extensive research and testing, which has lead to a simple and effective rotor blade design.



NOTE: Do not attempt to operate your HOVERSTAR *with other than factory replacement main rotor blades as the altitude performance and stability will be affected dramatically.*

Main Frame Design

Your HOVERSTAR utilizes a unique, single-piece mainframe. Constructed of 1/8" composite G-10 material, the HOVERSTAR'S mainframe plate provides a durable platform for the mechanics that is resistant to bending, breakage or fatigue. This composite G-10 material also reduces the possibility of radio RF noise, a common problem found in some metal-framed helicopters.

The HOVERSTAR's single-piece mainframe also doubles as a servo tray, with all four servos attaching to the mainframe plate through universal servo cutouts. This makes the HOVERSTAR 's radio installation both simple and accurate with no finishing, drilling, or painting required.

Clutch Assembly

The HOVERSTAR features a one-piece clutch that is machined from high grade steel. This design provides superior reliability and performance and is the same style clutch commonly found on high tech competition helicopters. The HOVERSTAR clutch is also factory fitted to the aluminum clutch bell to insure correct engagement and reliable operation.

Engine Assembly

The completed engine assembly mounts to the mainframe of the HOVERSTAR via a separate engine mounting plate, utilizing only 3 mounting bolts. This makes the installation/removal of the HOVERSTAR 's engine quick and easy. Since the engine mounts to the side of the HOVERSTAR mainframe, the glow plug and carburetor needle valves are easily accessible. This unique installation also allows the modeler to use a standard aircraft muffler, eliminating the need for costly specialty helicopter mufflers.

Drive System

To insure accuracy and reliability, the drive system of the HOVERSTAR is fully supported by ball bearings located inside machined aluminum bearing blocks. The main rotor shaft and intermediate shaft assemblies are pre-assembled at the factory for quick assembly. The ribbed belt drive system of the HOVERSTAR eliminates the need to set and adjust an exacting gear mesh, while aiding in the reduction of vibration.

Tail Drive System

Your HOVERSTAR kit is equipped with a factory-assembled tail rotor gear box assembly. This gear box utilizes a composite nylon case and steel bevel gears, and is full ball bearing supported and pre-greased for precision and reliability. Ball bearing tail blade holders complete the assembly, producing a tail rotor system that provides very smooth control response and, with regular lubrication, virtually unlimited use. Mating your HOVERSTAR tail gear box to the drive system is a dual supported tail drive shaft which provides positive, accurate response.

Total Training Package

Flight Training Course

Your HOVERSTAR kit comes to you complete with the HOVERSTAR Flight Training Course. This video serves as an invaluable learning aid and has been developed to help the entry-level helicopter pilot understand, through sight and sound, the fine engine adjustments, flight trimming, and training procedures necessary to succeed in learning to fly the HOVERSTAR. Although entertaining, it is not necessary to view the HOVERSTAR Flight Training Course prior to the assembly of your kit.

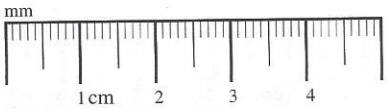
During the assembly process, it is important to read and closely follow the procedures in the instruction manual. Your HOVERSTAR 's instruction manual contains many important building tips and set-up procedures that take place during construction that cannot be overlooked. These tips are not included in the HOVERSTAR Flight Training Course as the video takes over where the manual ends. After your HOVERSTAR is constructed per the instruction manual, the HOVERSTAR Flight Training Course will be your Instructor, providing you with the balance of the information necessary to successfully fly your HOVERSTAR.

On the fun side, the Flight Training Course puts the HOVERSTAR through its paces to show you what the HOVERSTAR is really capable of. Remember, when learning to fly your HOVERSTAR, please follow the instruction procedures exactly, and when you have a question, your Flight Training Course is waiting to help.

HoverStar HoverGuard Training Gear

Your HOVERSTAR kit is equipped with HoverGuard training gear. This training system is designed specifically for the HOVERSTAR and completes the total training package. When used in conjunction with the Flight Training Course, your HoverGuard training gear will significantly reduce the risk of damage to your helicopter while training.

The spring action-design of the HoverGuard is designed to reduce impact when the helicopter comes in contact with the landing surface during a hard set down (a common occurrence when first learning). This will greatly reduce the risk of damage of boom strike to the HOVERSTAR. (Boom strike is when the main blade contacts the tail boom during a very hard set down). In addition, the wide stance of the HoverGuard will give a larger landing platform, making set downs much easier while reducing the risk of tip-overs. As mentioned in the Flight Training Course, the HoverGuard provides the best protection when used on a flat, level surface such as blacktop, concrete, etc. Assembly instructions for the HoverGuard are located in Section 12 of this manual.



Pre-Assembly Information

The HOVERSTAR can be assembled very quickly by an entry-level modeler, usually within a weekend. However, we strongly recommend thoroughly reading the building instructions at least one time prior to beginning assembly. It is extremely important that all of the assembly requirements included in this manual are followed exactly per the instructions.

Incorrect assembly and any errors in control linkage set-up will adversely affect flight characteristics of an R/C helicopter, significantly more than with a conventional sport airplane. Be sure to review the building sequences slowly and begin assembly only after you have thoroughly read and understood the section you are about to complete. A little extra time and patience during the assembly of your HOVERSTAR will greatly reduce your set-up time at the flying site and make final trimming for flight training much quicker and easier.

One important factor in assembling your HOVERSTAR that cannot be stressed enough is that all nuts and threaded components (other than lock nuts) should be assembled using Locktite #242 or equivalent. This will make the loosening of these parts due to vibration highly improbable.

Please note that when applying Locktite, it is recommended that for best results you use it sparingly.

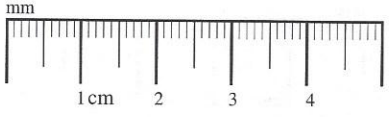
CAUTION: Do not use Locktite #242 on plastic parts. The solvents used in this product could soften or fatigue some plastics.

To help in the selection and identification of hardware (nuts, bolts, washers, etc.), we have provided illustrations (actual size) of the specific nuts, bolts, washers etc., that are to be used in this particular assembly. These illustrations can be found at the bottom of each section's assembly diagram. There is also a metric scale located at the bottom of each page for further verification.

When first opening your HOVERSTAR kit, you will notice that all of the parts in the main mechanics parts bag are also packaged individually and numbered from 1-10 to coordinate with sections 1-10 of this instruction manual.

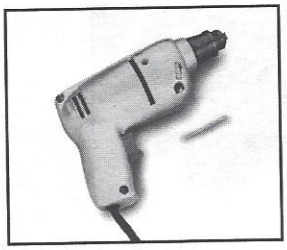
All small hardware (nuts, bolts, washers, etc.) for each step are separated and packaged separately within bags 1-10. When beginning a section, you will need to open only the bag with the corresponding number to that section. It is suggested that you place all of the hardware in an open container (e.g., coffee can) during assembly so no small parts are lost. It may also be helpful to familiarize yourself with the various sizes of screws, bolts, nuts, etc., as illustrated in the appropriate assembly section before you begin assembly. At the end of each section, there should be no parts remaining.

Great care has been taken in filling the bags with the correct quantity of parts and hardware for each section. However, occasionally mistakes do happen. In the event that you do find a parts shortage, please contact your local HOVERSTAR dealer, or contact the HoverStar Helpline at (217) 355-9511.

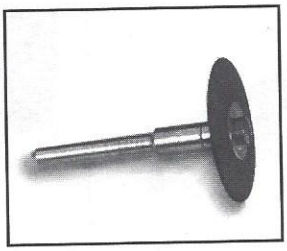


Tools *(not included in kit):*

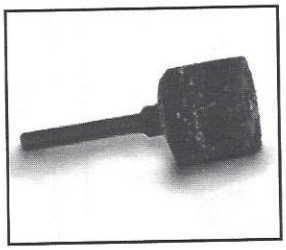
You will need the following common tools for assembly of your HOVERSTAR™:



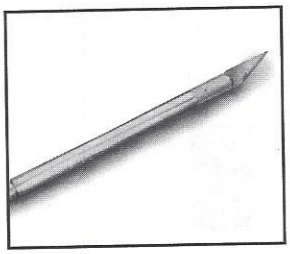
Drill or Moto-Tool



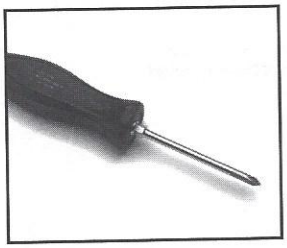
Moto-Tool Cut-Off Wheel



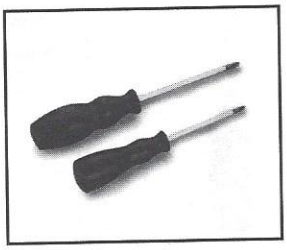
Moto-Tool Drum Sander



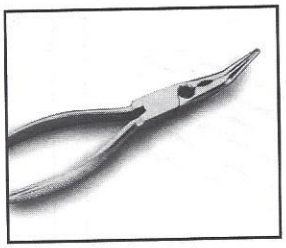
#1 Hobby Knife



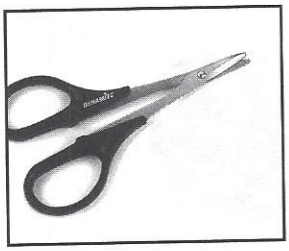
Small Phillips Screwdriver



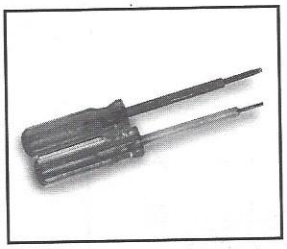
Medium Straight Screwdriver



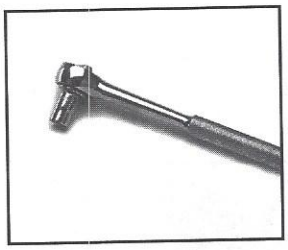
Needle Nose Pliers



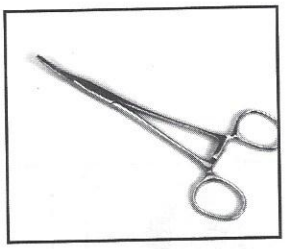
Lexan Scissors



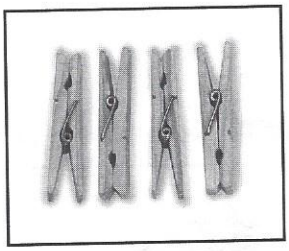
5.5 & 7.0mm Hex Wrenches



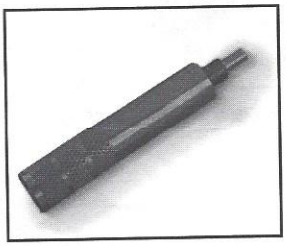
1/4" Drive Socket Wrench Set



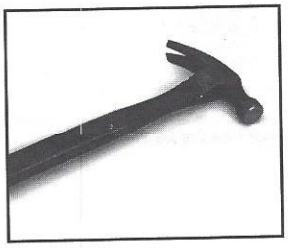
Medium Size Hemostat



Wooden Clothes Pins (15-20 pieces)

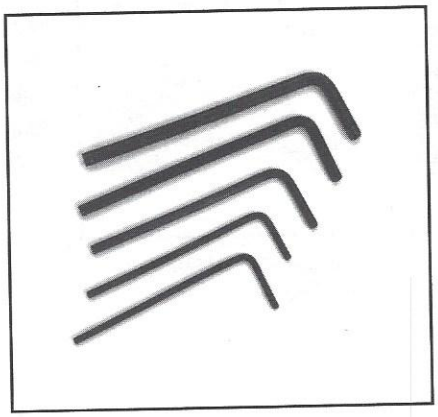


Revolution Piston Locking Tool



Small Hammer

Tools (included in kit)



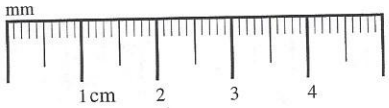
1/16mm L Wrench

1.5mm L Wrench

2.0mm L Wrench

2.5mm L Wrench

3.0mm L Wrench

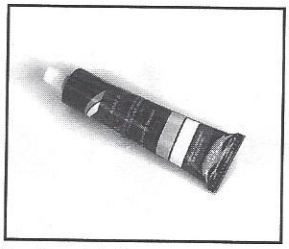


Supplies *(not included in kit):*

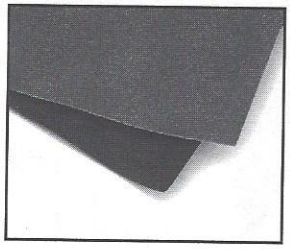
You will need the following items for assembly of your HoverStar™:

Locktite #242 or equivalent

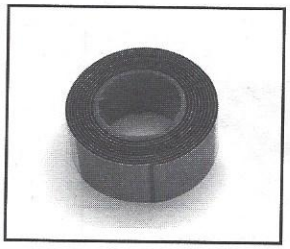
CA Adhesive



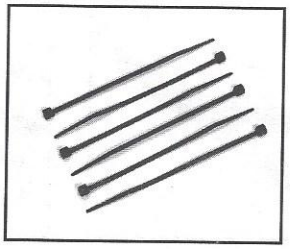
Goop Canopy Adhesive



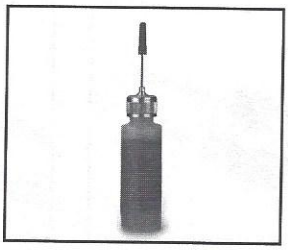
1 Sheet 120 & 320 Sandpaper



1/8" Double Sided Servo Tape (1 Roll)



Nylon Wire Ties (4-6 Pieces)

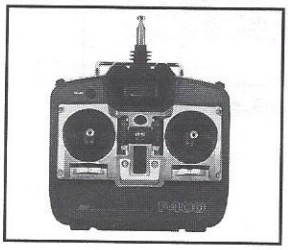


Pin Point Oiler

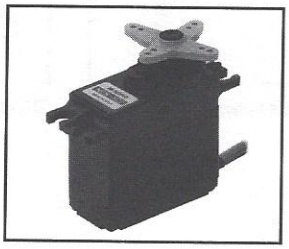
Optional:

Pactra Racing Finish Lexan Paint
Pactra Formula U Clear Polyurethane

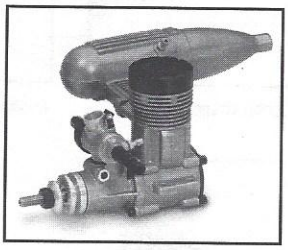
Equipment *(not included in kit):*



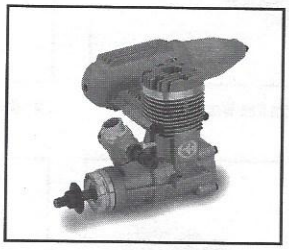
Radio System: 4-Channel (minimum) FM Radio System



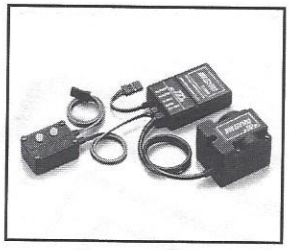
4 Standard Servos



Engine: .40-.46 Cubic Inch Ball Bearing R/C Aircraft Engine with Muffler. ASP .46 FSR and the Thunder Tiger Pro .46 engines shown.

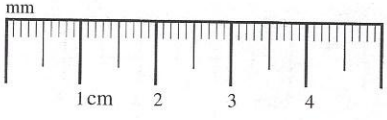


RX Battery: 1000mAh or larger



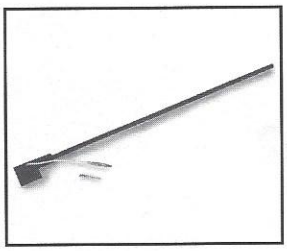
Gyro: Single Rate Ball Bearing Gyro System

We highly recommend the JR F400 radio system, the JR 130 single rate ball bearing and gyro system for yaw control of your HoverStar. We also recommend using either the ASP .46 FSR or the Thunder Tiger Pro .46 engine.

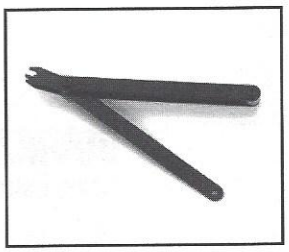


Optional Equipment

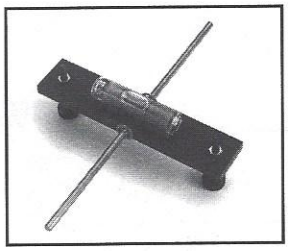
We recommend the following optional equipment for use with HOVERSTAR :



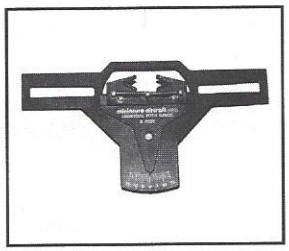
Revolution Base Loaded Whip Antenna



Revolution Ball Link Pliers



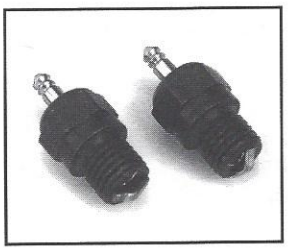
Revolution Blade Balancer



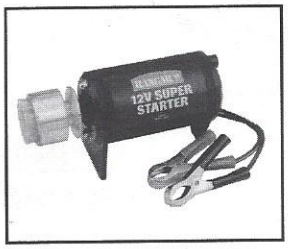
Pitch Gauge

Field Equipment

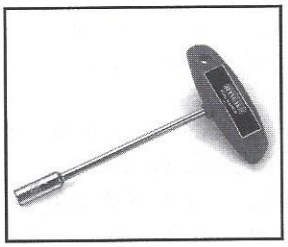
From 10% Aircraft to 30% Helicopter Fuel (15%-30% Heli Fuel Recommended)



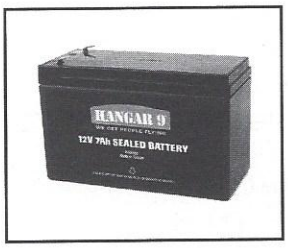
Glow Plugs (R/C long)



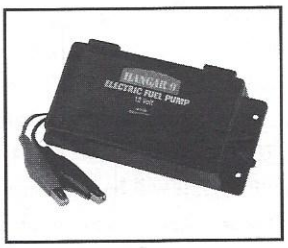
Hangar 9 or Equivalent 12V Electric Starter



Hangar 9 or Equivalent Glow Plug Wrench

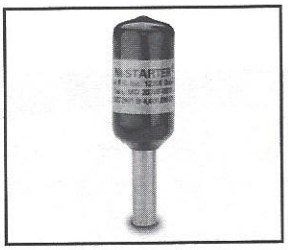


Hangar 9 or Equivalent 12V Sealed Battery

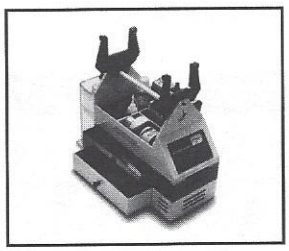


Hangar 9 or Equivalent Manual or Electric Fuel Pump

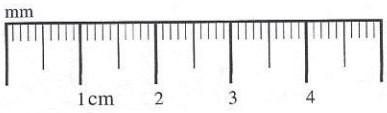
Hangar 9 or Equivalent Power Panel w/Cord



Ni-Cad Glow Battery



Field Support Box



CONSTRUCTION

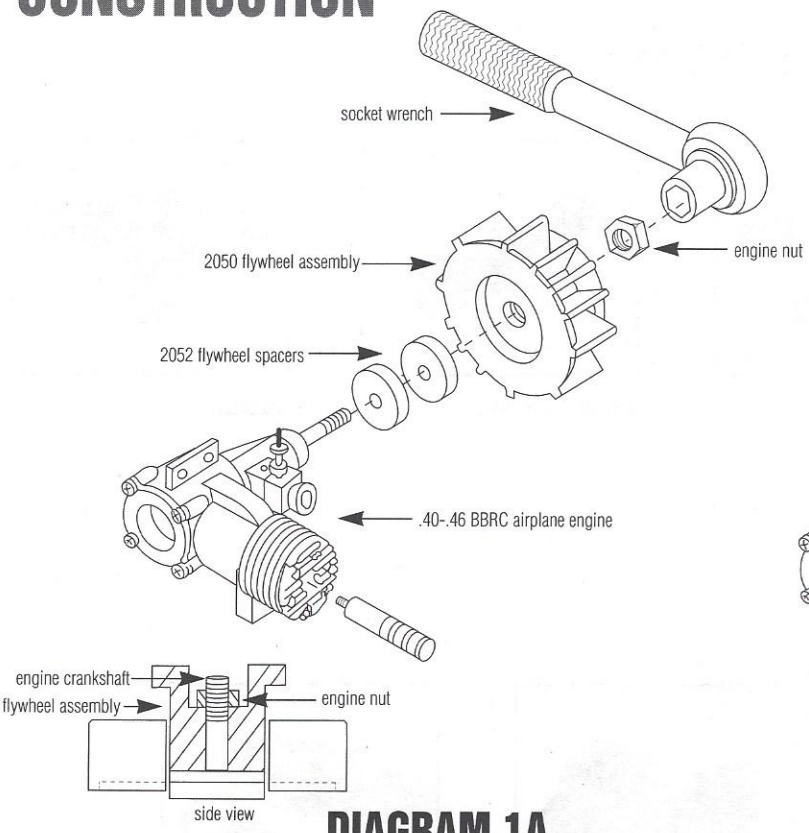


DIAGRAM 1A
Flywheel Attachment

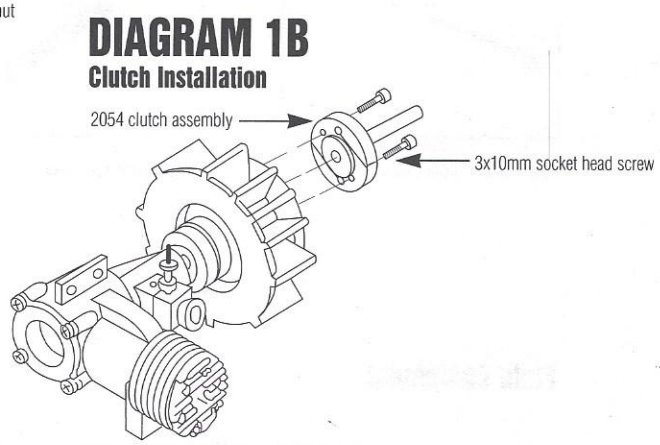


DIAGRAM 1B
Clutch Installation

SECTION ONE

STEP 1 Engine Preparation and Assembly

A. Remove the engine nut and prop washer from the engine, leaving the knurled prop back plate in place. Place the two flywheel spacers (2052) on the engine crankshaft, followed by the flywheel assembly (2050). Check to be sure that the crankshaft of the engine is at least 1/16" below the face of the flywheel. If the crankshaft protrudes, it will be necessary to cut the tip off to allow clearance using a moto-tool with a cut-off wheel.

Using the appropriate socket wrench and socket for your particular engine nut, thread the nut hand-tight onto the crankshaft through the center of the flywheel assembly. (Diagram 1A)

B. Temporarily attach the clutched assembly (2054) to the flywheel using the two 3x10mm socket screws supplied. (Diagram 1B)

Set the engine on its back plate and slowly rotate the flywheel assembly, making sure that the crankshaft of the engine is also turning. While rotating the flywheel, look at the tip of the clutch shaft. The shaft should rotate true without side-to-side movement. If the clutch shaft wobbles at the tip, remove the clutch assembly and rotate 180° and reattach and test. If the shaft still wobbles noticeably, it is possible that the prop back plate is not seated correctly on your engine. To correct this, lightly tap the face of the flywheel on the portion that appears to be high until the clutch shaft rotates true. A little time spent on this procedure will greatly reduce the potential for vibration. Mark the clutch shaft and flywheel with a pencil and remove the clutch assembly.

Screw Bag One:			
5	3mm Lock Nut	2	3x10mm Socket Head Screw
6	3mm Large Washer	2	3x5mm Set Screw
4	3x16mm Socket Head Screw		

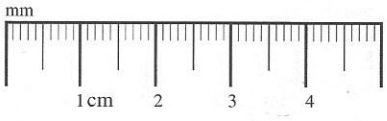


DIAGRAM 1C
Clutch Bell/Start Cone Attachment

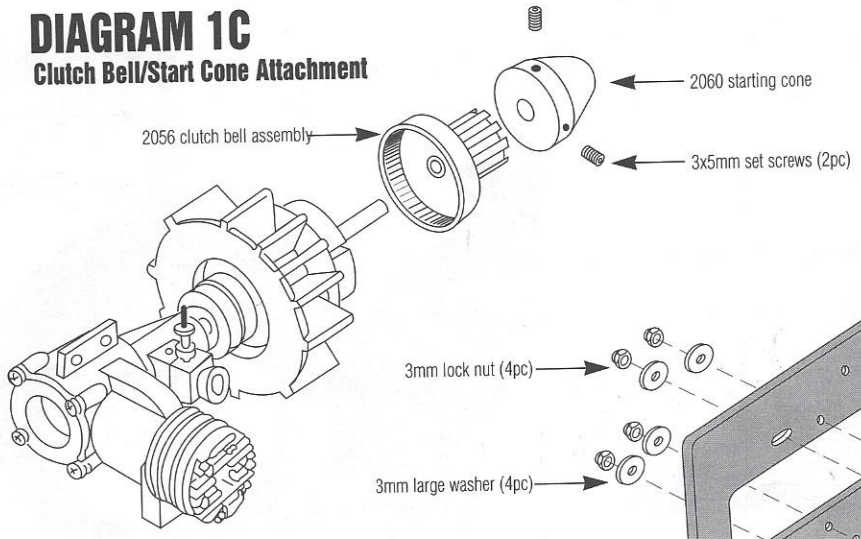
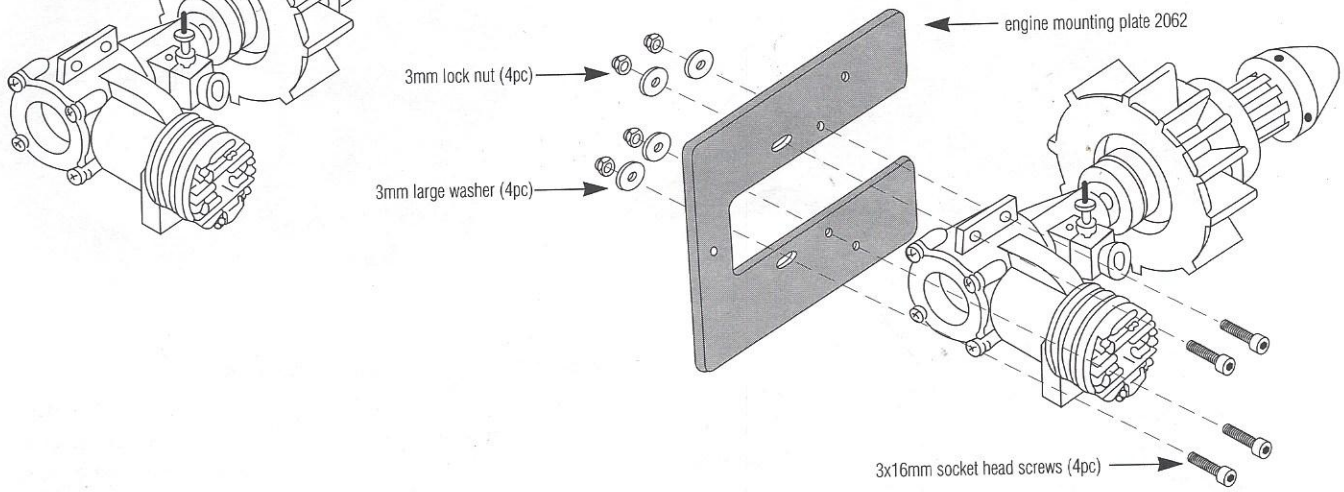


DIAGRAM 1D
Engine Mounting Plate Attachment



C. It is now time to fully tighten the flywheel assembly to the engine. For this procedure, it is recommended that you use a Revolution Piston Locking Tool.

Thread the piston locking tool into the glow plug hole in the cylinder head. Next, while holding the fan assembly with a shop rag, tighten the flywheel to the engine. It is important that the nut is very snug to prevent the flywheel assembly from loosening during operation. Take care not to apply full pressure to the piston locking tool as this could damage the piston of the engine. (Diagram 1A)

Apply Locktite to the exposed threads of the crankshaft. Be sure to remove the piston locking tool. Reinstall the clutch assembly onto the flywheel, making sure it is in the same position as previously marked. Secure the clutch assembly to the flywheel using the two 3x10mm socket head screws and Locktite. (Diagram 1B)

D. Apply a generous coating of oil to the clutch shaft and install the clutch bell assembly (2056). Next, position the starting cone (2060) onto the clutch shaft so there is approximately 1/32" clearance between the back of the assembly. Secure the starting cone using two 3x5mm set screws and Locktite. Spin the clutch bell assembly making sure that it rotates freely on the clutch shaft. If this is not done correctly, the engine will not idle freely. (Diagram 1C)

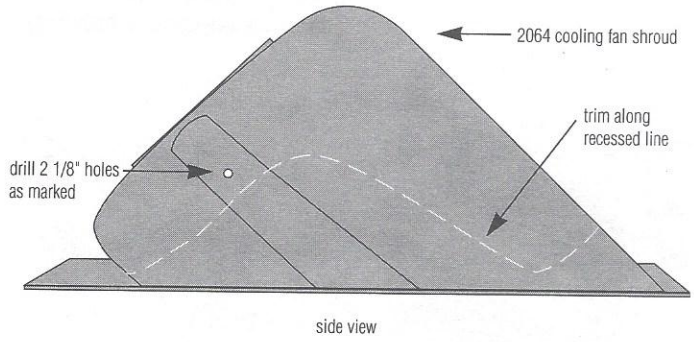
E. Attach the completed engine assembly to the engine mounting plate (2062) using the four 3x16mm socket head screws, four 3mm washers and four 3mm lock nuts. The bolts should be placed so that the head of the bolt is in contact with the engine mounting lugs, and the 3mm washers and nuts secure as the engine mounting to the engine. (Diagram 1D) If your particular engine does not appear to fit the engine mounting plate correctly, please contact either your local dealer or the Horizon Service Center for further information.

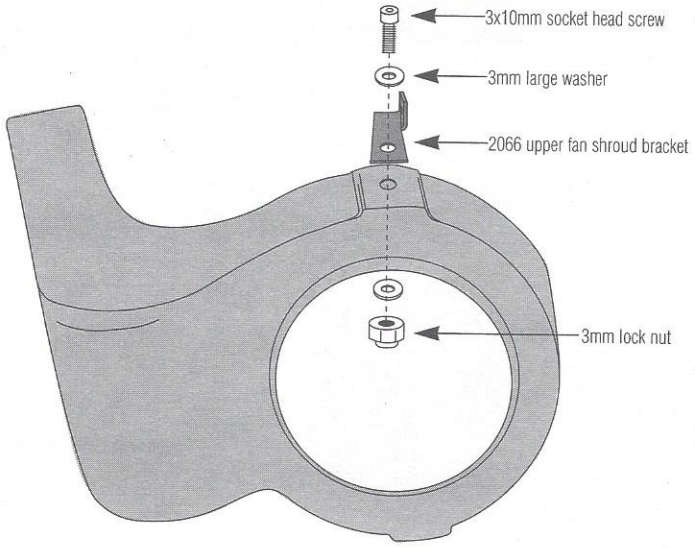
STEP 2 Carburetor Preparation and Adjustment

It is very important that your engine's carburetor assembly is prepared and adjusted properly before installation into your HOVERSTAR. Take extra care in following these steps to insure proper operation.

DIAGRAM 1E

Cooling Shroud Preparation/Assembly





A. Barrel Travel Adjustment

Adjust the barrel travel of your carburetor so that at low throttle the carburetor barrel is completely closed. Accomplish this by adjusting the carburetor barrel stop screw. Please refer to your engine's instructions for location and further information. Once this adjustment has been made it is a good idea to apply a small amount of Locktite to the threads of the stop screw to guard against it vibrating out of adjustment during operation.

B. Barrel Retaining Screw

Some engines will use a separate barrel retaining screw to hold the barrel into the carburetor assembly. If this is the case with your engine, it is recommended that you check to make sure this assembly is tightened securely. It is also recommended that you apply Locktite to the threads to prevent possible loosening during operation.

C. Carburetor Throttle Arm Preparation

During the final linkage assembly, you will be required to connect the throttle control rod to the outermost hole of the throttle arm (approximately 9/16" from center). On some engines it may be necessary to enlarge this hole using a 1/16" drill bit. Please also insure that there are no burs or flashing on the throttle arm and that the throttle arm is securely fastened to the carburetor barrel.

NOTE: Do not install a glow plug into your engine at this time as it is necessary to rotate the engine freely during assembly.

STEP 3 Cooling Shroud Preparation

A. The cooling shroud assembly (2064) included with your HOVERSTAR is a one-piece design. Trim the fan shroud along the recessed outline using Lexan scissors. It is suggested, however, that you test fit the fan shroud over the completed engine assembly (carburetor installed), leaving 1/32" gap to insure that there are no areas of the cooling shroud that come in contact with the fan assembly, carburetor, glow plug, etc. If you are using a helicopter engine for your HOVERSTAR, it may be necessary, depending on the engine, to trim the cooling shroud slightly to clear the larger cylinder head included with most helicopter type engines (Diagram 1E).

B. It is necessary to drill two 1/8" mounting holes in the cooling shroud assembly. The correct drilling locations for these two holes are located in the two raised, flat portions of the cooling shroud that would be located directly above and below the engine cooling fan assembly. These holes have been pre-marked from the factory with recessed dimples in the correct location (Diagram 1E).

C. Remove the protective coating from the outside of the cooling shroud and attach the upper fan shroud bracket (2066) to the top of the cooling shroud using one 3x10mm socket head screw, two 3mm large washers a 3mm lock nut. The bolt should be attached so that the head of the bolt is visible, with the 3mm lock nut and washer on the inside of the cooling shroud. Make certain before tightening that the upper fan shroud bracket is placed at exactly 90° to the face of the cooling shroud.

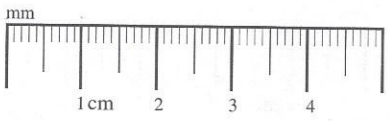
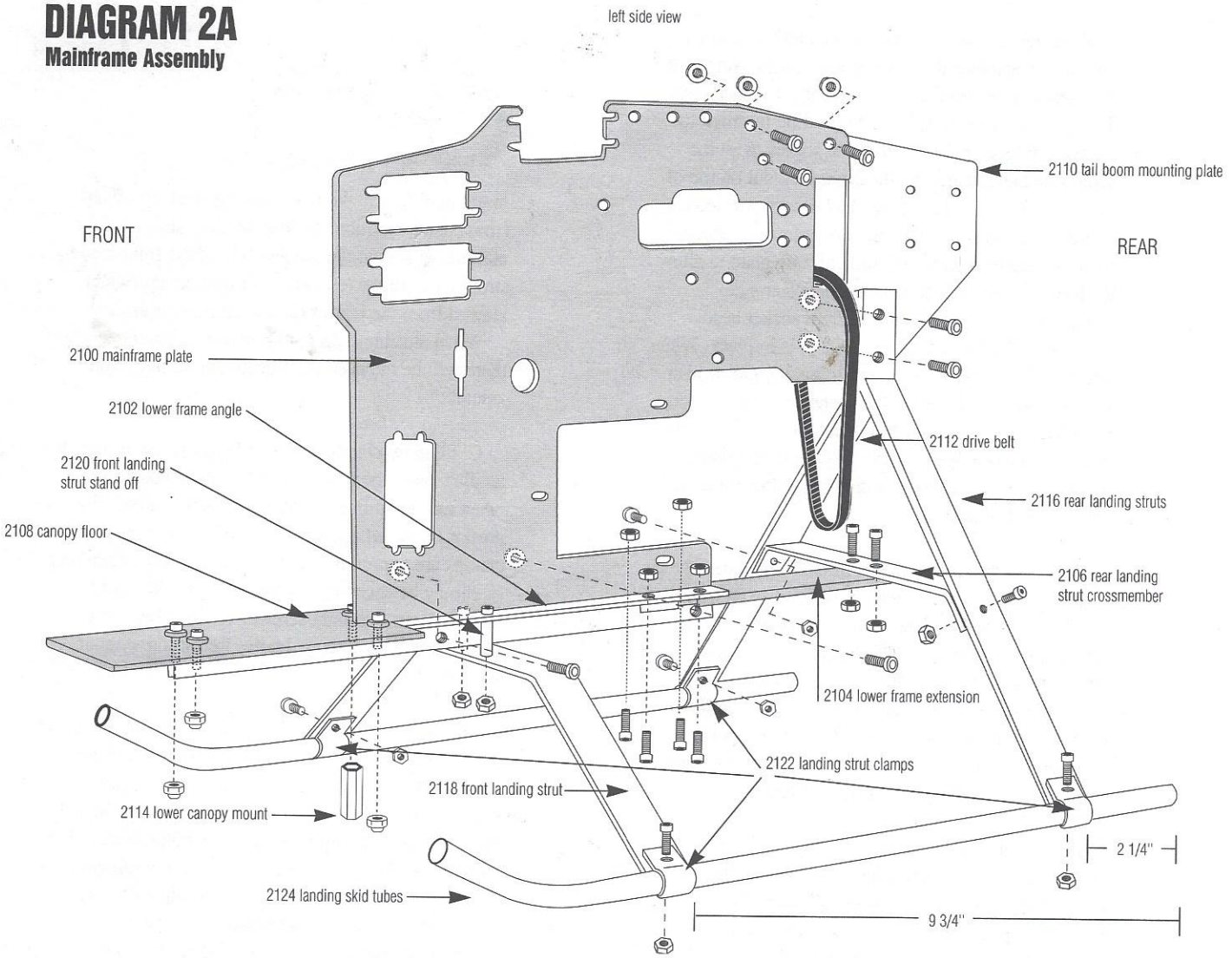


DIAGRAM 2A
Mainframe Assembly



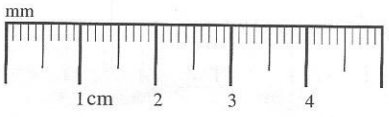
SECTION TWO

STEP 1 Mainframe Assembly

A. Attach the two lower frame angles (2102) to the bottom portion of the mainframe plate (2100) using two 3x12mm socket head screws and two 3mm lock nuts. Make sure that the angles are attached in a T fashion so that the slotted hole in each angle is to the rear of the mainframe, and that the channels extend approximately 3" past the front of the mainframe plate.

B. Install the canopy floor (2108) to the extended portion of the lower frame angles using four 3x12mm socket head screws, four 3mm washers, three 3mm lock nuts and one lower canopy standoff (2114). You will notice that the slot and holes in the rear portion of the canopy floor are offset. Position the canopy floor onto the assembly so that the wider side of the canopy floor faces toward the left side of the helicopter (when viewed from the rear of the frame assembly). Please also note that the lower canopy standoff attaches to the right rear bolt of the canopy floor. All bolts and washers should be installed through the top of the canopy floor with the three 3mm lock nuts and one the lower canopy mount at the bottom. Apply Locktite before attaching the lower canopy standoff. (Diagram 2A)

Screw Bag Two:					
22	3mm Lock Nut		2	3x20mm Socket Head Screw	
4	3mm Washer		10	3x10mm Socket Head Screw	
2	3x25mm Socket Head Screw		11	3x12mm Socket Head Screw	



C. Attach the lower frame extension (2104) to the bottom T portion of the lower frame angles using four 3x10mm socket head screws and four 3mm lock nuts. The lower frame extension plate must be installed to the bottom face of the lower frame angles, with the screws facing upward and the 3mm lock nut on top of the lower frame angles. It may be necessary to loosen the rearward 3x12mm socket head screw that attaches the lower frame angles to the mainframe plate to allow the lower frame extension additional clearance. Remember to re-tighten the 3x12mm socket head screw after the lower frame extension is in place. When attaching the lower frame extension plate, please also note that the offset hole in the center of the extension plate needs to be positioned toward the left side of the helicopter (when viewed from the rear of the mainframe) to provide proper positioning and mounting of the cooling fan shroud.

D. Attach the rear landing strut cross member (2106) to the top of the lower frame extension (2104) using two 3x12mm socket head screws and two 3mm lock nuts. Please note that the two holes in the center of the rear landing strut cross member are located offset from center. Position the rear landing strut cross member on the lower frame extension so that the longer side of the cross member is to the left side of the helicopter (when viewed from the rear of the frame forward).

E. Place the engine drive belt (2112) over the rear portion of the mainframe plate. Next, attach the tail boom mounting plate (2110) to the right side of the mainframe plate when viewed from rear of frame forward, using three 3x12mm socket head screws and three 3mm lock nuts. Do not tighten these screws completely. This will be done in a later step.

STEP 2 Landing Gear Assembly

A. Attach the two rear landing struts (2116) to the left side of the mainframe plate (when viewed from the rear of the frame forward) using two 3x20mm socket head screws and two 3mm lock nuts. Before tightening these completely, connect the two rear landing struts to each side of the rear landing strut cross member using two 3x10mm socket head screws and two 3mm lock nuts. Now tighten the two 3x20mm rear landing strut screws and the three 3x12mm tail boom mounting plate screws left loose from Step 1E.

B. Attach the front landing strut (2118) to the two holes in the lower frame angles located closest to the rear of the canopy floor using two 3x25mm socket head screws, two front landing strut standoffs (2120) and two 3mm lock nuts. Please note that the two

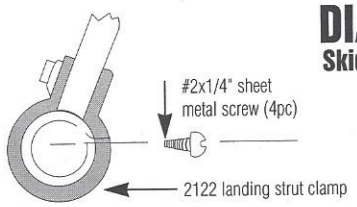


DIAGRAM 2B
Skid Clamp Attachment

mounting holes in the front landing strut are offset from center. Position the front landing strut onto the mainframe so that the longest side of the front landing strut is toward the left side of the helicopter (when viewed from the rear of the mainframe forward).

When attaching, do not tighten bolts completely as there will be the need for adjustment during further assembly.

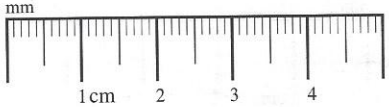
C. Slide two landing strut clamps (2122) over each landing skid tube (2124). Position the clamps so that when measured from the rear of the skid tubes (flat portion) forward, the back edge of the front and rear clamps are approximately 9-3/4" and 2-1/4" respectively. It may be necessary to spread the landing strut clamps using a straight screwdriver to allow them to pass over the landing skid tubes freely and without scratches.

D. Attach the two landing skid tubes to the front and rear landing struts using four 3x10mm socket head screws and four 3mm lock nuts. You may need to squeeze the skid clamp ears closer together using a Hemostat or vise grip to allow proper attachment of the 3x10mm socket head screws. Before final tightening of the four 3x10mm skid clamp screws, align the front of each skid tubes so that the bends at the front of each skid tube are perfectly vertical. Tighten the four 3x10mm skid clamp screws and also the two 3x25mm front landing strut screws from Step 2B.

E. Set your HOVERSTAR on a flat, level surface and check to see that both landing skid tubes are flat and level with the table surface. If there is any unevenness or wobble, hold the two landing skid tubes and twist or tweak the landing gear assembly until it becomes level with the surface.

F. It is suggested that you bond the four landing skid clamps to the landing skid tubes. The most effective way to bond the skid clamps to the tubes is to drill a 1/16" hole through each skid clamp and skid tube and connect using four #2x1/4" (Diagram 2C) sheet metal screws (not included). This method will provide the most positive bonding.

A more simple, but less effective, method of bonding the landing skid clamps to the landing skid tubes would be to apply CA adhesive around the edges of the landing skid clamps.



SECTION THREE

STEP 1 Drive System Assembly

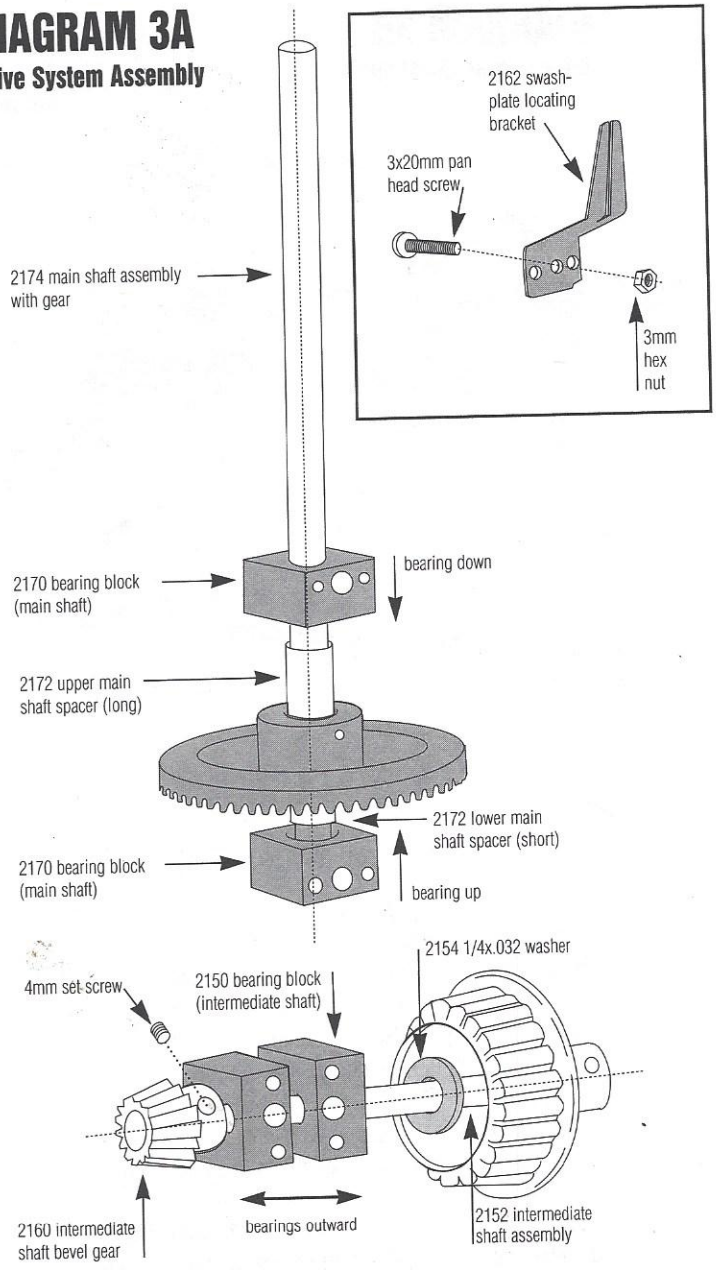
A. Insert one 3x20mm pan head screw through the swashplate locating bracket (2162) with the head of the screw at the backside of the bracket, and secure using one 3mm hex nut (use Locktite). Set this assembly aside. (See Inset).

B. Slide the longer of the two main shaft spacers (2172) over the top (long section) of the main shaft assembly (2174), followed by one main shaft bearing block assembly (2170). Repeat this procedure for the remaining main shaft spacer and bearing block assembly. (Diagram 3A). Be sure that the main shaft bearing block assemblies are installed so that both main shaft bearings are positioned toward, and make contact with, the two main shaft spacers. Lightly oil each bearing.

C. Mount the completed main shaft assembly, frame doubler plate (2164) and swashplate locating bracket assembly (from Step 1A) to the left side of the mainframe plate (when viewed from the rear of the mainframe forward) using four 3x30mm socket head screws, four 3mm washers, three 3mm lock nuts, and one tail control rod clip standoff (2184) as shown in Diagram 3B. When assembling, thread the 3mm nuts onto the 3x30mm socket head screws and hand tighten. These will be tightened in a later step.

D. Slide the 1/4"x.032 washer (2154) over the long end of the intermediate shaft assembly (2152). Next, place the two intermediate shaft bearing block assemblies (2150) onto the long side of the intermediate shaft so that the first bearing faces toward the intermediate shaft pulley, and the second faces toward the long end of the intermediate shaft. (Diagram 3A)

DIAGRAM 3A
Drive System Assembly



Screw Bag Three:

9	3mm Washer	1	2.5mm Hex Nut
6	3mm Large Washer	1	4x4mm Set Screw
2	3x10mm Socket Head Screw	9	3x30mm Socket Head Screw
4	3x12mm Socket Head Screw	10	3mm Lock Nut
1	3x10mm Flat Head Screw	1	1/4" .032 Washer
1	3x20mm Pan Head Screw		

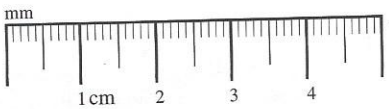
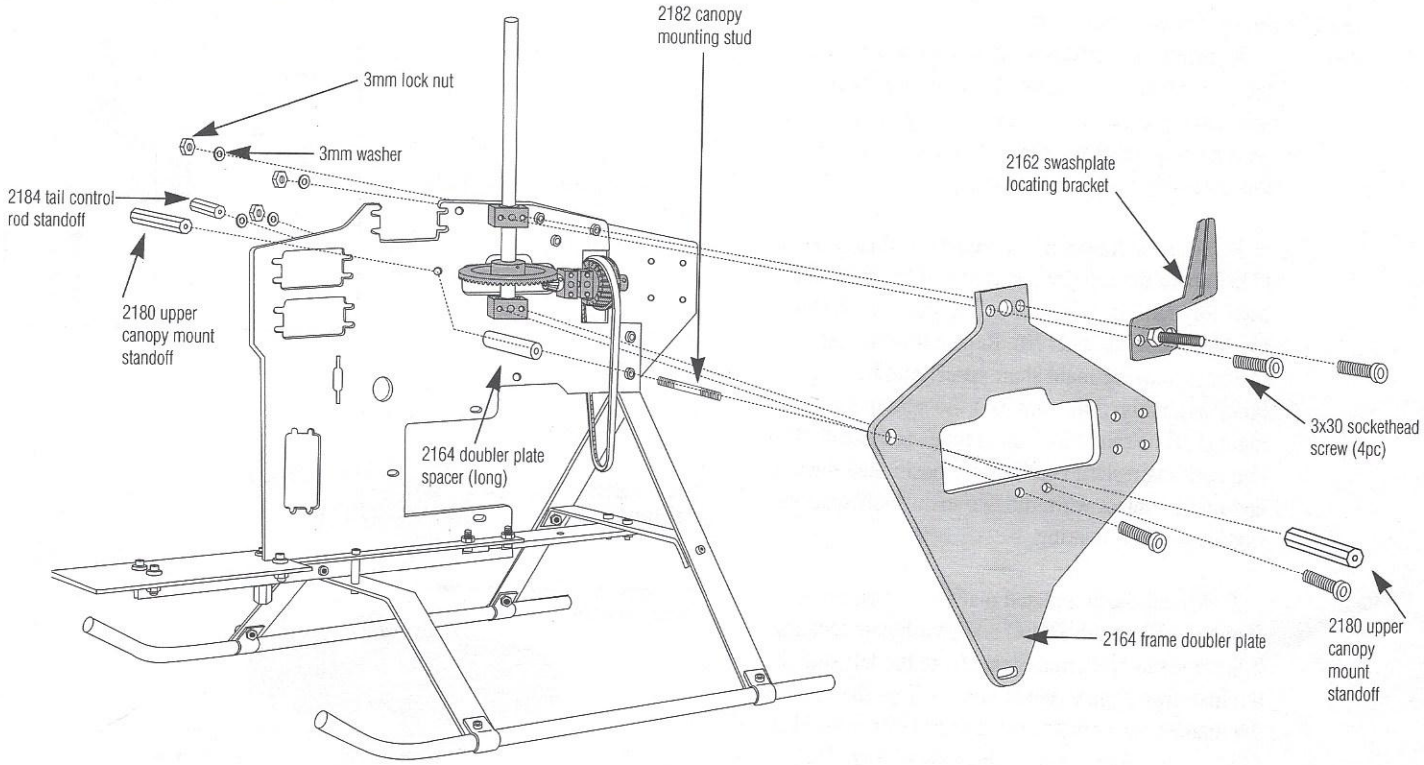


DIAGRAM 3B
Drive System Installation



Slide the intermediate shaft bevel gear (2160) over the long end of the intermediate shaft assembly and temporarily secure using a 4x4mm set screw. The bevel gear will be adjusted and tightened in Step E. Attach the completed intermediate shaft assembly to the left side of the mainframe (between the frame and doubler plate) and secure using four 3x30mm socket head screws, four 3mm washers and four 3mm lock nuts. Remember to engage the engine drive belt over the intermediate shaft assembly pulley. (Diagram 3B) Tighten the four 3x30mm intermediate shaft socket head screws completely.

E. Loosen the intermediate shaft bevel gear slightly and adjust so there is no pressure applied to the intermediate shaft bearing blocks. Re-tighten the bevel gear and check to insure that the assembly rotates freely. Lightly oil each bearing. Tighten the four 3x30mm main rotor shaft bearing block socket head screws completely.

Check the gear mesh between the main drive gear and the intermediate bevel gear. The system should rotate freely, with a slight amount of backlash (play) between the two gears.

F. Install the two upper canopy mount standoffs (2180) to the mainframe assembly using the upper canopy mount stud (2182) and doubler plate spacer (long) (2164) as shown in Diagram 3B. Use Locktite when assembling.

STEP 2 Engine Installation

A. Attach the three fuel tank mounting standoffs (2188) to the fuel tank mounting plate (2186) using two 3x10mm socket head screws and one 3x10mm flat head screw. Use Locktite. Position so the single recessed hole in the front of the fuel tank plate is opposite the three fuel tank standoffs. Set this assembly aside. (Diagram 3C)

B. Attach the lower portion of the cooling fan shroud assembly (completed in Section 1, Step 3) to the lower frame extension plate offset hole using one 3x12mm socket head screw, two 3mm large washers, and one 3mm lock nut. Position the head of the bolt and first washer so they are inside the cooling shroud, with the second washer between the bottom of the shroud and the plate with the 3mm lock nut at the bottom of the lower frame extension plate.

Position the cooling shroud so that the face is exactly 90° to the mainframe plate, then tighten the lower portion of the cooling shroud snugly to the lower frame extension plate.

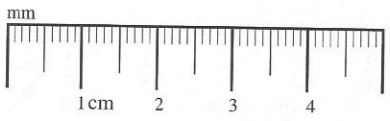
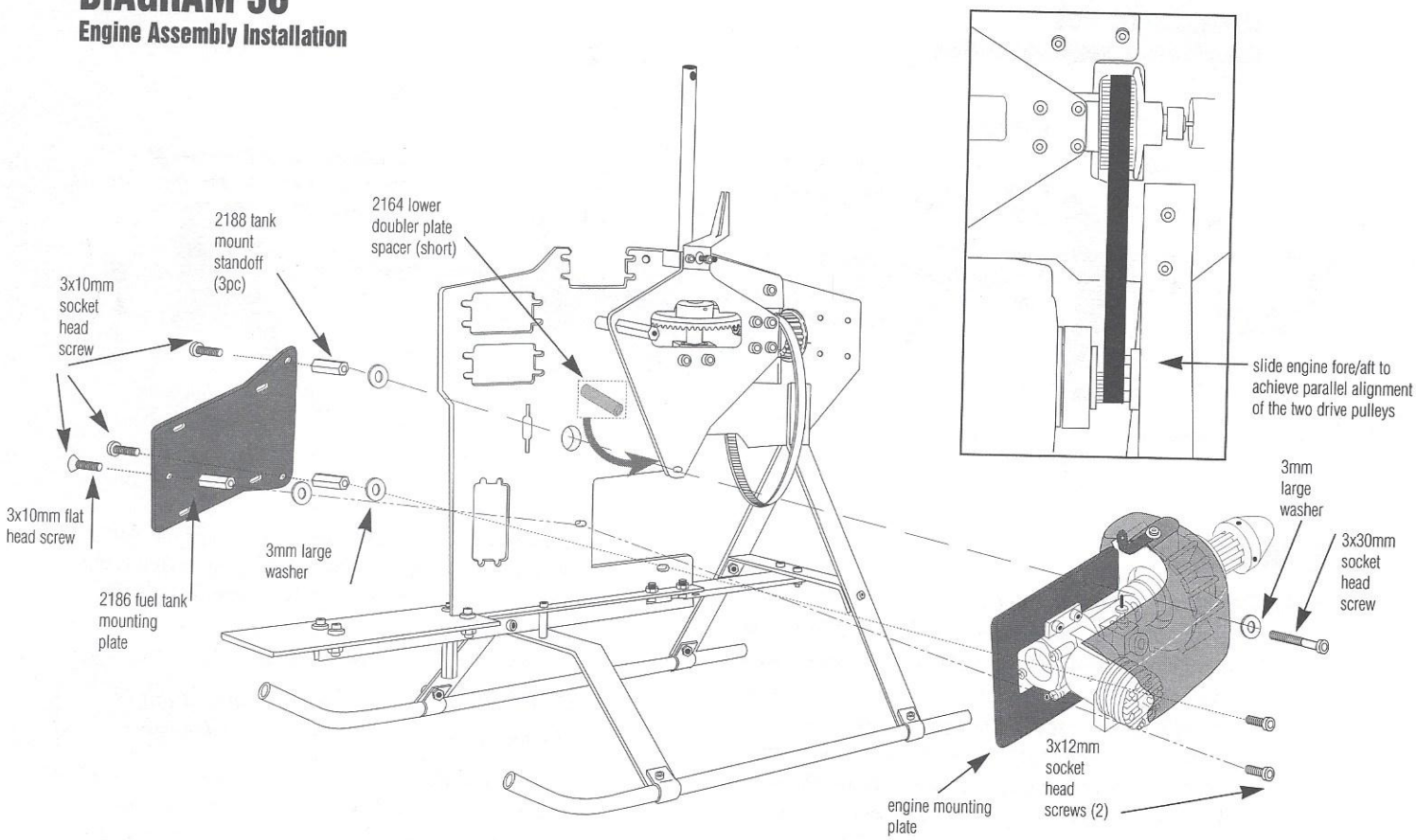


DIAGRAM 3C
Engine Assembly Installation



C. Insert the completed engine assembly (from Section 1) on to the left side of the mainframe when viewed from the rear of the mainframe forward. Hold the engine assembly in place temporarily by inserting the lower doubler plate spacer (short) (2164) between the engine plate and the back side of the frame doubler plate, followed by one 3x30mm socket head screw and one 3mm large washer. Insert the remaining two 3x12mm socket head screws through the engine/mainframe mounting plates. Make sure that you have engaged the main drive belt onto the clutch bell assembly pulley. (Diagram 3C)

D. Slide one 3mm large washer (3 total) over the three protruding engine mounting bolts visible on the right side of the mainframe (when viewed from the rear of the mainframe forward). Apply Locktite to the three protruding engine bolts and install the completed fuel tank mounting plate assembly (from Section 3 Step 2A). Do not tighten completely.

E. View the intermediate shaft drive pulley, main drive belt, and clutch bell drive pulley directly from the left side of the mainframe (when viewed from the rear of the mainframe forward) and check the alignment of the belt and pulleys.

All three should be in line with one another and perfectly vertical. Slide the engine assembly either toward the front or rear (depending upon the length of the particular engine) until this assembly is lined up perfectly. (Diagram 3C) This step is very important for proper operation and belt wear, and reduced vibration. Once this alignment has been achieved apply moderate downward pressure to the engine starter cone and then tighten the 3 engine mounting plate screws. Next, check the belt tension making sure that the belt is snug, but not so tight as to create binding of the clutch bell and or the main drive system.

F. Secure the upper fan shroud mounting bracket to the mainframe plate using one 3x12mm socket head screw, one 3mm washer and one 3mm lock nut.

Before tightening completely, rotate the engine starting cone and listen for any contact or misalignment between the flywheel assembly and the cooling fan shroud. Adjust as necessary until there is no longer any contact, then tighten the cooling fan shroud mounting bolts securely (Diagram 3C). Next, check to insure that there is adequate clearance of the cooling fan shroud for inserting/removing the glow plug. Trim if necessary for clearance.

NOTE: *You may now install a glow plug into your engine. Do not install the engine's muffler at this time. The muffler will be installed after the throttle linkage has been attached and adjusted.*

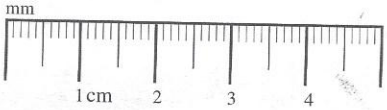
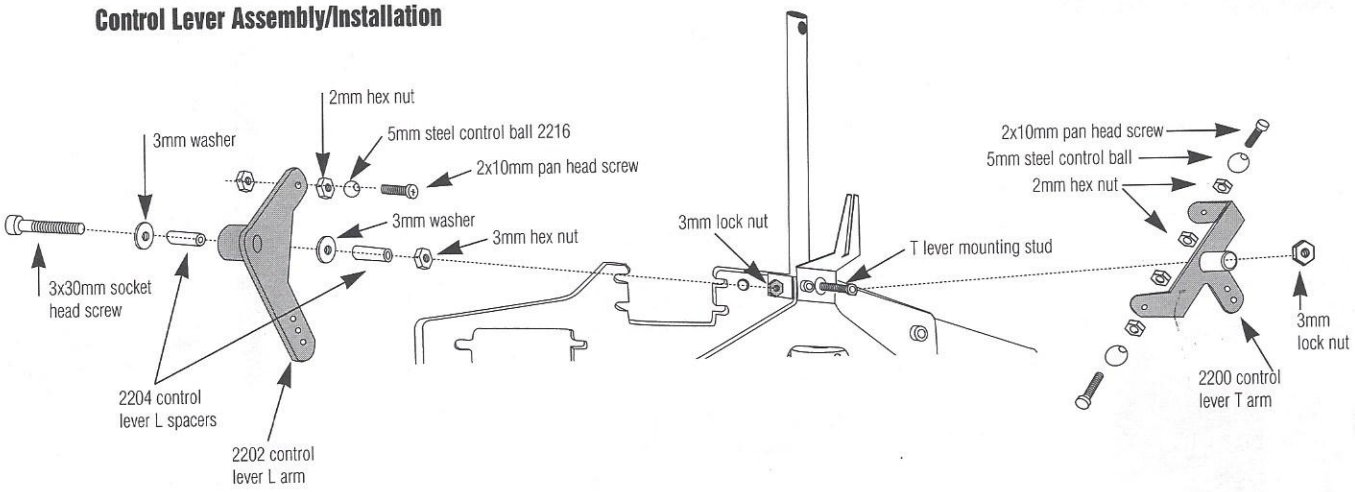


DIAGRAM 4A

Control Lever Assembly/Installation



SECTION FOUR

STEP 1 Control System Assembly

A. Attach two 5mm steel control balls (2216) to the outside of the control lever T arm (2200) fingers using two 2x10mm pan head screws and four 2mm hex nuts. To do this, slide one 5mm control ball over one 2x10mm pan head screw and secure using one 2mm hex nut and repeat. Next, slide this assembly through the outside of the T lever fingers and secure from the rear with a 2mm hex nut. Use Locktite. Repeat this procedure for the other side. Next, install the completed T lever assembly to the protruding mounting stud on the swashplate locating bracket and secure using a 3mm lock nut. Apply oil to the center of the T lever bushing prior to installation.

When tightening the 3mm lock nut, be sure that the T lever can still rotate freely, but without excess play or slop. It is recommended that a small drop of CA adhesive be applied to bond the 3mm lock nut to the mounting stud to prevent loosening during operation (Diagram 4A).

B. Attach one 5mm steel control ball (2216) to the short inside flat portion of the control lever L (2202) using one 2 x 10mm pan head screw and two 2mm hex nuts. To do this, slide one 5mm control ball over the one 2x10mm pan head screw and secure using one 2mm hex nut. Insert this assembly through the short arm of the L lever from the flat side, and secure using the second 2mm hex nut. Apply a small drop of CA adhesive to the end of the nut/screw.

Install the pivot screw assembly to the L lever using one 3x30mm socket head screw, two 3mm washers, two L lever spacers (2204) and one 3mm hex nut. To do this, slide one 3mm washer over the 3x30mm socket head screw, followed by one L lever spacer. Next slide the L lever over the L lever spacer followed by the second 3mm washer and second L lever spacer. Secure this assembly using the 3mm lock nut and Locktite.

CAUTION: Do not use Locktite! Because this is a plastic part, Locktite could cause damage to the L lever.

It is important to oil this assembly lightly prior to assembly. Check to insure that when the 3mm hex nut is tightened, the L lever can still move freely on the bushing. Loosen slightly if necessary until it rotates freely.

Attach the completed L lever assembly to the right side of the mainframe (when viewed from the rear of the helicopter forward) through the hole located just in front of the upper main shaft bearing block and secure using one 3mm lock nut.

Screw Bag Four:					
1	3x5mm Set Screw		6	2x10mm Pan Head Screw	
1	3mm Hex Nut		10	2mm Hex Nut	
2	3mm Lock Nut		1	3x30mm Socket Head Screw	
2	2.5mm Washer		2	2x20mm Pan Head Screw	

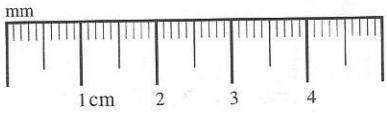
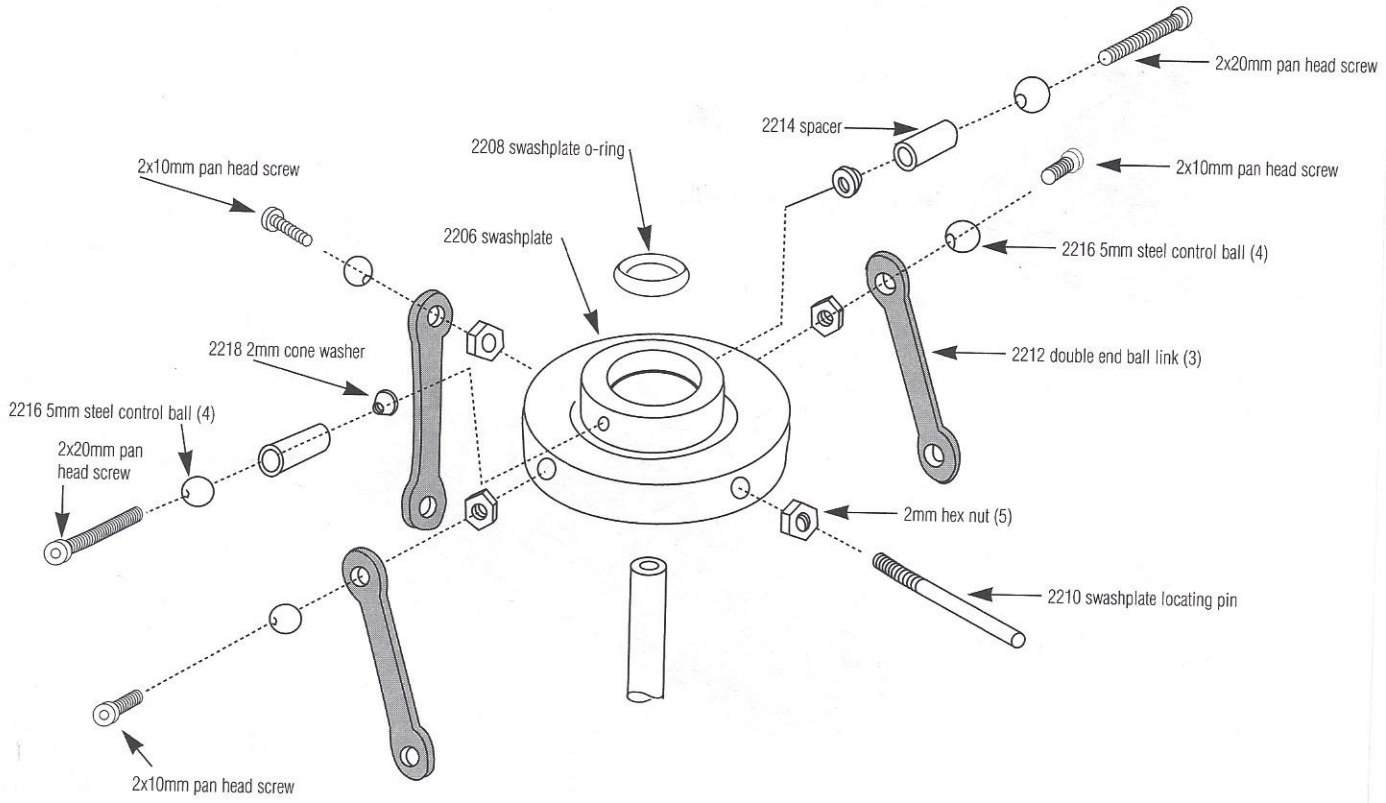


DIAGRAM 4B

Swashplate Assembly



C. Insert the swashplate O-ring (2208) into the center groove of the swashplate assembly (2206) by lightly applying oil to the O-ring and inserting with your fingers. (Diagram 4B)

Do not use a screwdriver or other tools as it is possible to damage the O-ring or the center of the swashplate assembly.

D. Attach the two upper 5mm steel control balls to the upper swashplate ring using two 2x20mm pan head screws, two swashplate ball spacers (2214) and two 2mm cone washers (2218). To do this, slide one 5mm steel control ball over the 2x20mm pan head screw, followed by one swashplate ball spacer, and one 2mm cone washer (small side toward spacer) and repeat. Install the two completed assemblies onto the upper swashplate ring using Locktite.

Repeat this procedure for the three 5mm lower swashplate ring steel control balls using three 2x10mm pan head screws and three 2mm hex nuts. Use Locktite. (Diagram 4B)

Attach the swashplate locating pin (2210) to the final hole in the lower swashplate ring. Thread one 2mm hex nut onto the locating pin. Next, apply Locktite to the pin and thread into the lower swashplate ring until it stops, then tighten the 2mm hex nut against the outside face of the lower swashplate ring.

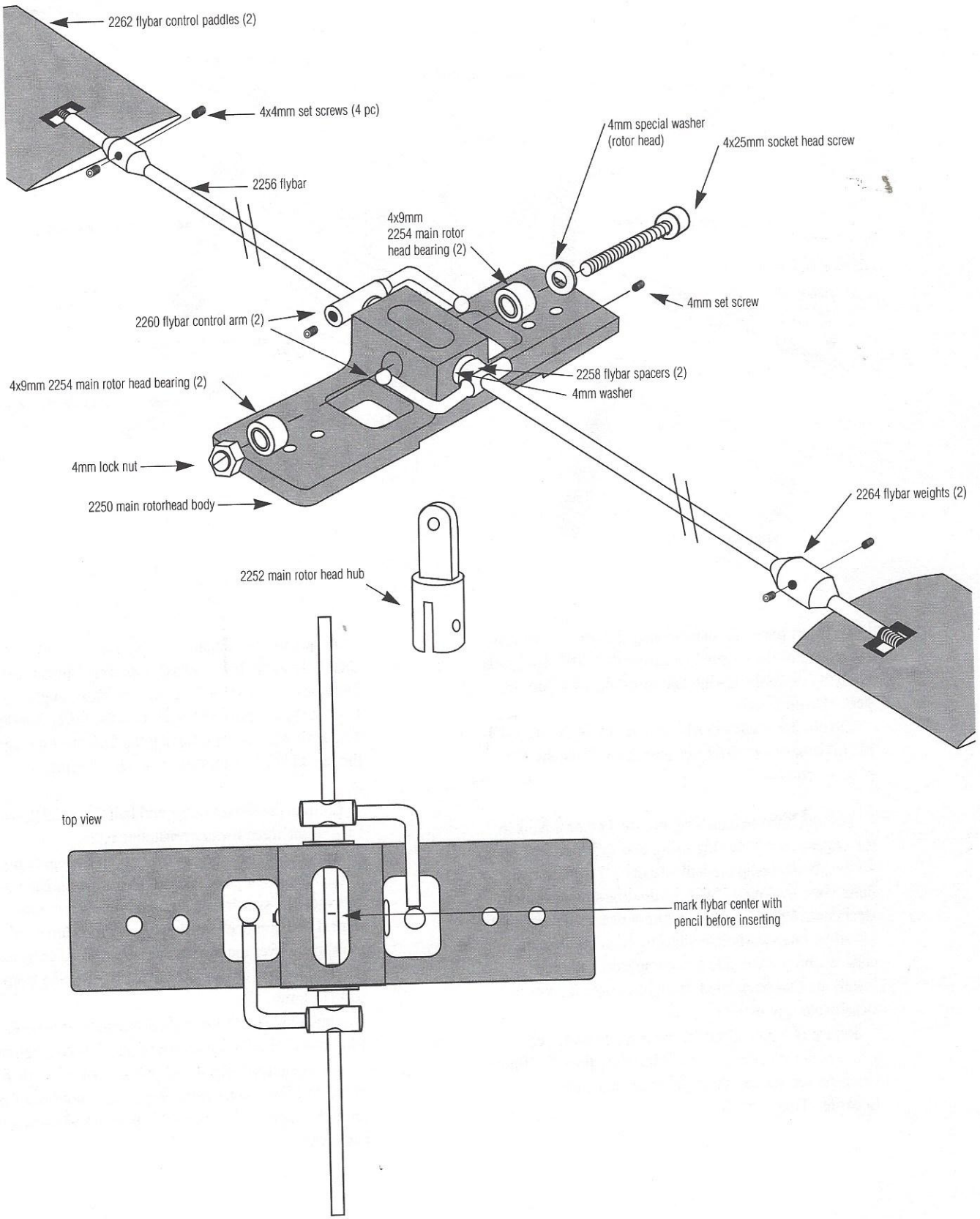
E. Snap the three double end ball links (2212) onto each of the three lower swashplate balls.

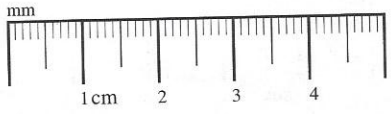
Apply a light coating of oil to both the upper portion of the main rotor shaft, as well as the swashplate O-ring and slide the swashplate down onto the main rotor shaft. Do this procedure slowly — if you force the swashplate over the main rotor shaft too quickly, it's possible for the swashplate O-ring to dislodge from its seat (Diagram 4B).

Attach the remaining ends of the three double end ball links to the L (one location) and T (two locations) levers respectively. Apply a light drop of oil to all six of the ball link connections. Please also note that the L lever should be in an inverted L position when properly connected.

DIAGRAM 5A

Main Rotor Head Assembly





SECTION FIVE

STEP 1 Main Rotor Head Assembly

A. Insert the main rotor head steel hub (2252) into the center of the main rotor head body (2250) so the hole in the main rotor head hub is centered with the large diameter holes in the main rotor head body (Diagram 5A). Attach the main rotor head hub to the main rotor head center body using one 4x25mm socket head screw, two 4x9mm main rotor head bearings (2254) one 4mm rotor head (special) washer and one 4mm lock nut. To do this, slide one 4mm rotor head washer over the 4x25mm socket head screw followed by one 4mm rotor head bearing. Next, slide this assembly through the main rotor head body and hub. Slide the second main rotor head bearing onto the protruding 4x25mm socket head screw. Secure the assembly using the 4mm lock nut. After tightening, make sure that the main rotor head hub can pivot freely inside the rotor head body slot. Adjust (loosen/tighten) if necessary.

B. Mark the center of your flybar with a pencil by measuring the total distance, and then dividing in half (approximately 93/4"). Slide the flybar (2256) through the center block of the main rotor head body so the pencil center mark on the flybar is centered in the slot on the top of the center block. Next, slide one 4mm washer over each side of the flybar, followed by one flybar spacer (2258) for each side. (Diagram 5A) Thread one 4x4mm set screw into each of the two flybar control arms (2260), then slide one control arm onto each side of the flybar, making sure that when installed the ball at the end of each control faces in toward the main rotor head body.

Securely tighten each of the flybar control arms using the two 4x4mm set screws and Locktite so that when viewed from the end of the flybar, they are parallel (level) to one another. At this time, check to make sure that the flybar has remained in the center of the center block slot and that the flybar can pivot freely, but without play (or slop) in the center block.

Re-measure the flybar if necessary to verify that it has remained centered.

WARNING: This procedure is very important because if the flybar is not exactly centered, your rotor head will not be balanced, resulting in excess vibration.

C. Install four 4x4mm set screws loosely into each of the two flybar weights (2264), making sure not to obstruct the 4mm hole that the flybar will pass through. Next, slide one flybar weight over each side of the flybar and secure at a measurement of 1-1/16" from the tip of the flybar to the outside edge of the flybar weight. (Diagram 5A)

D. Thread one flybar paddle (2262) onto each side of the flybar until the tip of the flybar touches the far or outside edge of the square hole in the flybar paddles. Using a ruler, measure from the center of the rotor head to the tip of each flybar control paddle to ensure that the flybar paddles are each the same distance from the rotor head.

View the flybar assembly from each end and adjust each flybar paddle until they are exactly parallel with each other, as well as the two flybar control arms. Set the main rotor head assembly aside as it will need assembly and balancing in a later step.

Once this is complete, apply a drop of CA adhesive to the threads of each end of the flybar where they are visible through the square hole in the flybar paddles.

Screw Bag Five:

1	4x25mm Socket Head Screw	2	4mm Washer
1	4mm Lock Nut	1	4mm Special (rotor head) Washer
6	4x4mm Set Screw		

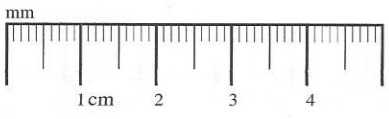
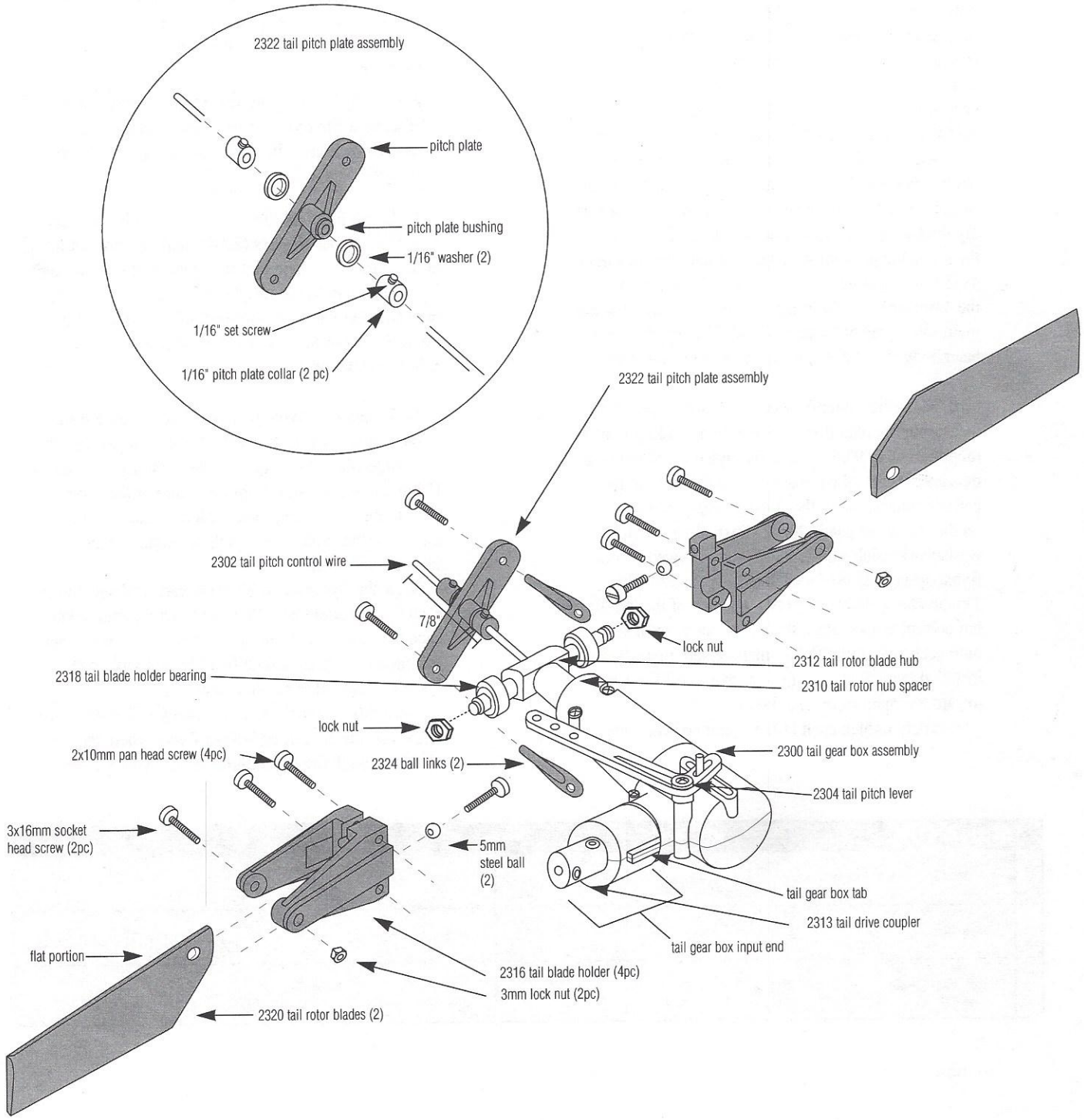
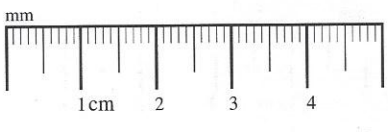


DIAGRAM 6A

Tail Gear Box Assembly





SECTION SIX

STEP 1 *Tail Gear Box Assembly*

A. Locate the pre-assembled tail rotor gear box (2300). This unit has been lubricated at the factory. Slide one tail blade holder bearing (2318) over each side of the tail rotor hub (2312) shafts and secure using two 3mm lock nuts. After tightening, rotate each bearing to insure that they can spin freely, but without movement at the hub. Adjust the two 3mm lock nuts if necessary. (Diagram 6A)

Locate the four tail blade holder halves (2316). Two of the four tail blade holder halves have a control tab attached. Attach a 5mm steel control ball to the bottom portion of each control tab using a 2x10mm pan head screw. Be careful not to over-tighten the 2x10mm pan head screws as it is possible to break the screws head if over-tightened.

Snap the four tail rotor blade halves, paired one with tab/one without, over the two tail rotor blade holder bearings, making sure that the blade holder with tab is positioned to the far side of the tail rotor gear box.

Secure the blade holder halves together using four 2x10mm pan head screws installed with the heads of the screws inserted through the blade holder half with the molded tab first.

B. Attach the two plastic ball links (2324) to the tail rotor pitch plate (2322) using two 2x10mm pan head screws. Do not fully tighten. The two plastic ball links must be able to pivot freely on the tail pitch plate for proper control. Check to make sure there is no excess play or slop between the head of the pan head screw and the pitch plate. Adjust if necessary and apply a drop of oil to each connection.)

Thread the two 1/16" set screws into each of the 1/16" pitch plate collars, making sure not to obstruct the 1/16" hole in the center of the collars.

Slide the first 1/16" pitch plate collar onto the tail pitch control wire (2302). Secure the collar to the tail pitch control wire so that it is of approximately 7/8" when measured from the tip of the wire to the outside edge of the collar.

Slide one 1/16" pitch control plate washer over the tail pitch control wire followed by the 1/16" tail pitch plate bushing. Apply oil liberally to both the pitch wire and the bushing.

Next, slide the pitch plate over the tail pitch control wire and onto the tail pitch plate bushing, making sure that the ball links on the tail pitch plate face inward toward the tail blade holders.

Slide the final 1/16" washer and 1/16" tail pitch plate collar over the tail pitch control wire and secure using the 1/16" set screw (See Inset Diagram). Check to make sure the pitch plate assembly can spin freely on the tail pitch wire and there is a slight, but not excessive, amount of play between the pitch plate and the collars. Snap the two ball links onto the 5mm steel control balls located on the two tail blade holders. Move the tail pitch lever (2304) to insure that the assembly moves freely. Lightly oil the two pitch plate ball links.)

C. Inset the tail rotor blades (2320) into each tail blade holder with the flat portion of the blade facing away from the tail gear box assembly.

Secure the tail rotor blades to the tail blade holders loosely using two 3x16mm socket head screws and two 3mm lock nuts.

Check to make sure the tail blades can pivot, with some resistance, within the tail blade holders. For safety concerns, make sure that the tail blade bolts are installed so the head of the bolt faces outward, away from the tail gear box assembly.

Screw Bag Six:

4	3x35mm Socket Head Screw	4	3mm Washer
2	3x16mm Socket Head Screw	2	3x5mm Set Screw
8	3mm Lock Nut	8	2x10mm Pan Head Screw

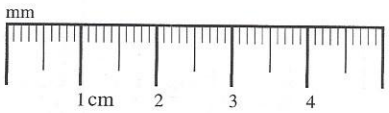
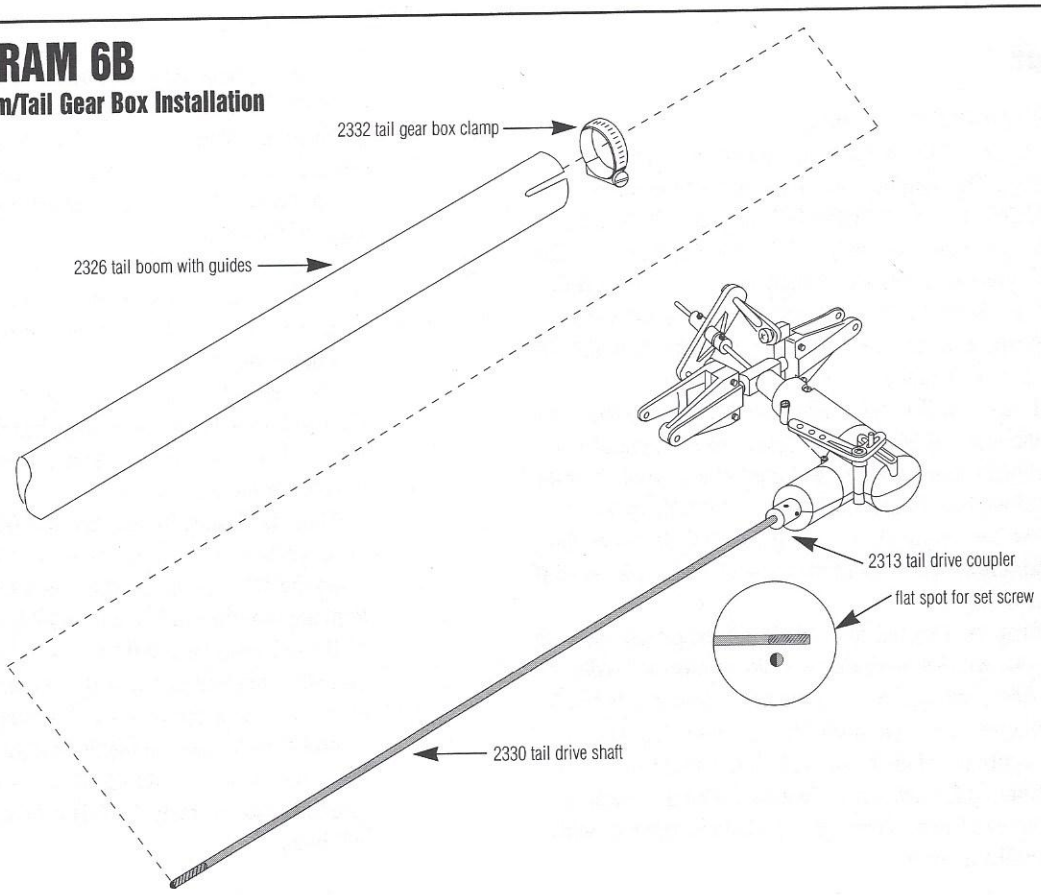


DIAGRAM 6B

Tail Boom/Tail Gear Box Installation



STEP 2 Tail Boom/Tail Gear Box Installation

A. Locate the tail drive shaft (2330) and insert one end into the tail drive shaft coupler located on the input end of the tail gear box assembly. Secure the drive shaft to the drive shaft coupler using the two provided 4x4mm set screws and Locktite. Make sure that one of the two set screws is engaged into the ground flat portion on the end of the tail drive wire. Also be sure to tighten the two set screws equally so that the drive shaft will be centered in the drive coupler (Diagram 6B).

B. Apply a light coating of oil onto the entire length of the tail rotor drive shaft and insert into the tail boom assembly (2326) from the rear (end of the boom with two slots). Make sure that the tail gear box assembly is inserted completely into the end of the tail boom so that the two tabs in the tail gear box casing engage into two of the slots in the tail boom. It is also suggested that the tail gear box be attached to the tail boom so that when the tail pitch bell crank is at the top of the tail gear box, the two tail drive shaft guide screws located on the tail boom assembly are pointing downward. Next, slide the tail gear box clamp (2332) over the length of the tail boom assembly and secure the tail gear box in place. It is important to locate the tail gear box clamp so that the large screw portion is at the bottom to allow adequate clearance for the tail control rod. (Diagram 6B)

C. Loosely attach the two (4 piece) tail boom mounting clamps (2336) to the left side of tail boom mounting plate (when viewed from the rear of frame forward located a the back of the mainframe assembly) using four 3x35mm socket head screws, four 3mm washers, and four 3mm lock nuts. (Diagram 6C)

Insert the completed tail boom/tail gear box assembly into the tail boom mounts so that the front end of the tail boom protrudes approximately 1/16" in front of the front tail boom mounting clamp. Make sure that while doing this, the tail drive shaft has engaged into the intermediate shaft assembly. Rotate the tail boom/tail gear box assembly until the tail gear box assembly is pointing toward the right (when viewed from the rear of the helicopter) and that it is at exactly a 90° angle (output shaft level) from the main rotor shaft. Tighten the four 3x35mm socket head bolts to secure the tail boom/tail gear box assembly in position.

Remove the 4x6mm set screw from the intermediate shaft collar (2158). Next, rotate the tail blades until the flat spot on the forward end of the tail drive shaft becomes visible through the hole in the intermediate shaft collar. Apply Locktite to the 4x6mm set screw, re-install and tighten firmly against the tail rotor drive shaft, making sure that the set screw seats against the flat portion of the tail drive shaft.

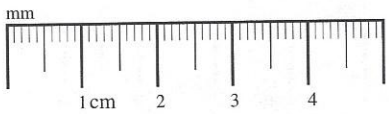
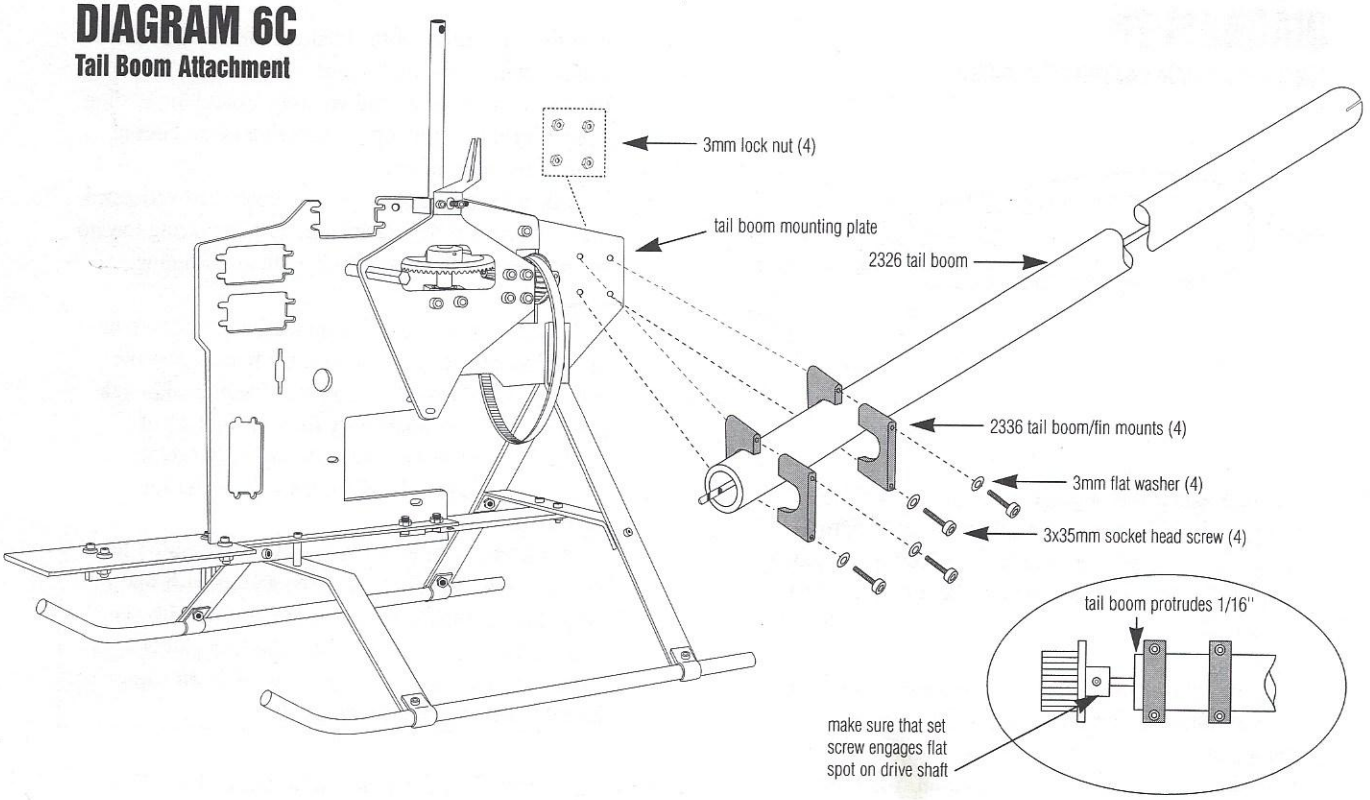


DIAGRAM 6C
Tail Boom Attachment



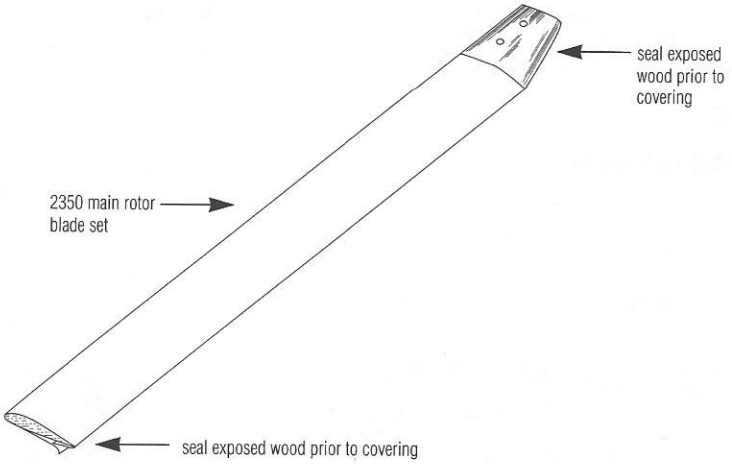
SECTION SEVEN

STEP 1 Rotor Blade Preparations & Assembly

A. Remove the main rotor blade (2350) from the package. It is suggested that the blades be lightly sanded using 120 grit sand paper before final preparation. When sanding be extremely careful not to alter the airfoil of the main rotor blade. It is also important to sand each blade equally or it will have an adverse affect in the final balancing of your rotor blade. Wipe all the sanding dust from the blades completely before moving to the next procedure.

B. We recommend that both the tip and the root of each rotor blade be sealed to strengthen the wood, and more importantly to prevent fuel soaking. (These areas are not covered by the blade covering after assembly). (Diagram 7A) Use either a fuelproof dope or a light coating of CA adhesive for this purpose. When

DIAGRAM 7A
Main Rotor Blade Preparation/Assembly



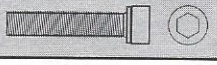
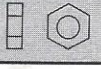
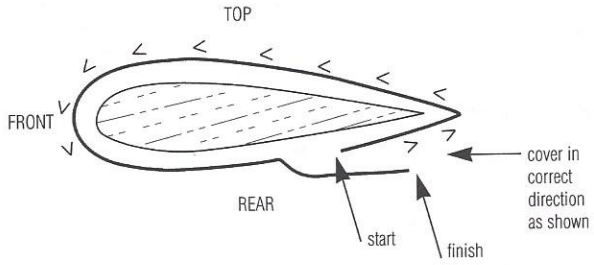
Screw Bag Seven:					
1	3x20mm Socket Head Screw		2	3mm Washer	
9	3x16mm Socket Head Screw		10	3mm Lock Nut	

DIAGRAM 7B

Main Rotor Blade Covering Procedure



applying sealer, it is suggested that you coat at least 2" of the blade at the root (near bolt holes) and approximately 1/2" at the tip of each blade. If you want to also paint these areas, you should do so before proceeding to the next step.

C. The blade covering (2354) included with your kit is a self-adhesive vinyl similar to shelving paper. Before attempting to apply this covering, be sure to view Diagram 7B for proper orientation. You must remove all dust from the main rotor blades for smooth and proper adhesion of the blade covering.

The first step in the application of the blade covering is to carefully remove the paper backing from the covering material. Next, position the covering at the bottom of the rotor blade 1/2" in from the trailing edge of the blade, with the end of the blade covering even with the tip of the rotor blade.

Roll the covering around the trailing edge of the blade being careful that the covering adheres tightly and smoothly over the sharp corners of the trailing edge. Continue to press the covering down, rolling it over the top portion of the blade. Continue around the leading edge of the rotor blade being careful to attach the covering smoothly and securely around the leading edge. Finish by applying the covering to the bottom edge of the rotor blade.

If done properly, the covering should be overlapped on the bottom of the blade with the seam facing toward the rear area of the rotor blade, with no trimming required.

It is best for the covering on the rotor blades to be applied as smoothly and as wrinkle free as possible. Small wrinkles and creases in the covering, although not ideal, will be satisfactory for your first set of blades. If you feel the need to recover your rotor blades, contact your local HOVERSTAR dealer for replacement covering.

WARNING: It is not safe or recommended for you to attempt to fly your HOVERSTAR with main rotor blades that have not been covered with the supplied blade covering. Blade covering adds additional strength and integrity to your main rotor blades and must not be omitted.

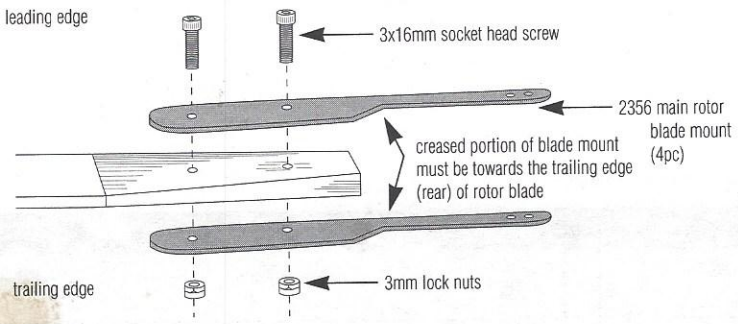
Step 2 Rotor Blade Final Assembly/Installation

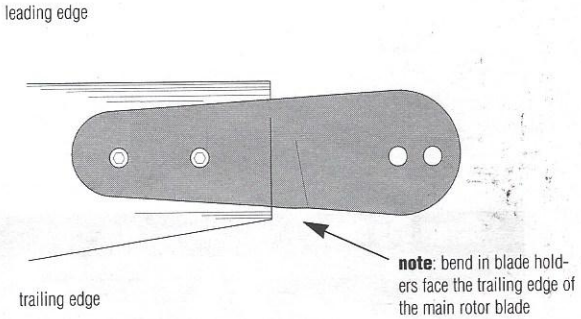
A. Attach the four main rotor blade mounts (2356) to the main rotor blades using four 3x16mm socket head screws and four 3mm lock nuts. When installing, make certain that the creased or bent portion of the blade mount faces toward the trailing edge of the rotor blade.

It is essential to insert the mounting screws into the top portion of the rotor blade so that the nut and exposed threads are at the bottom or flat portion of the blade. This is critical for safety during operation so you do not come in contact with the sharp portion of the screws when stopping the rotor head (Diagram 7C).

DIAGRAM 7C

Main Rotor Blade Mount Attachment





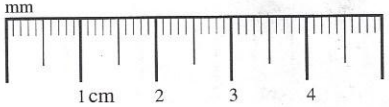
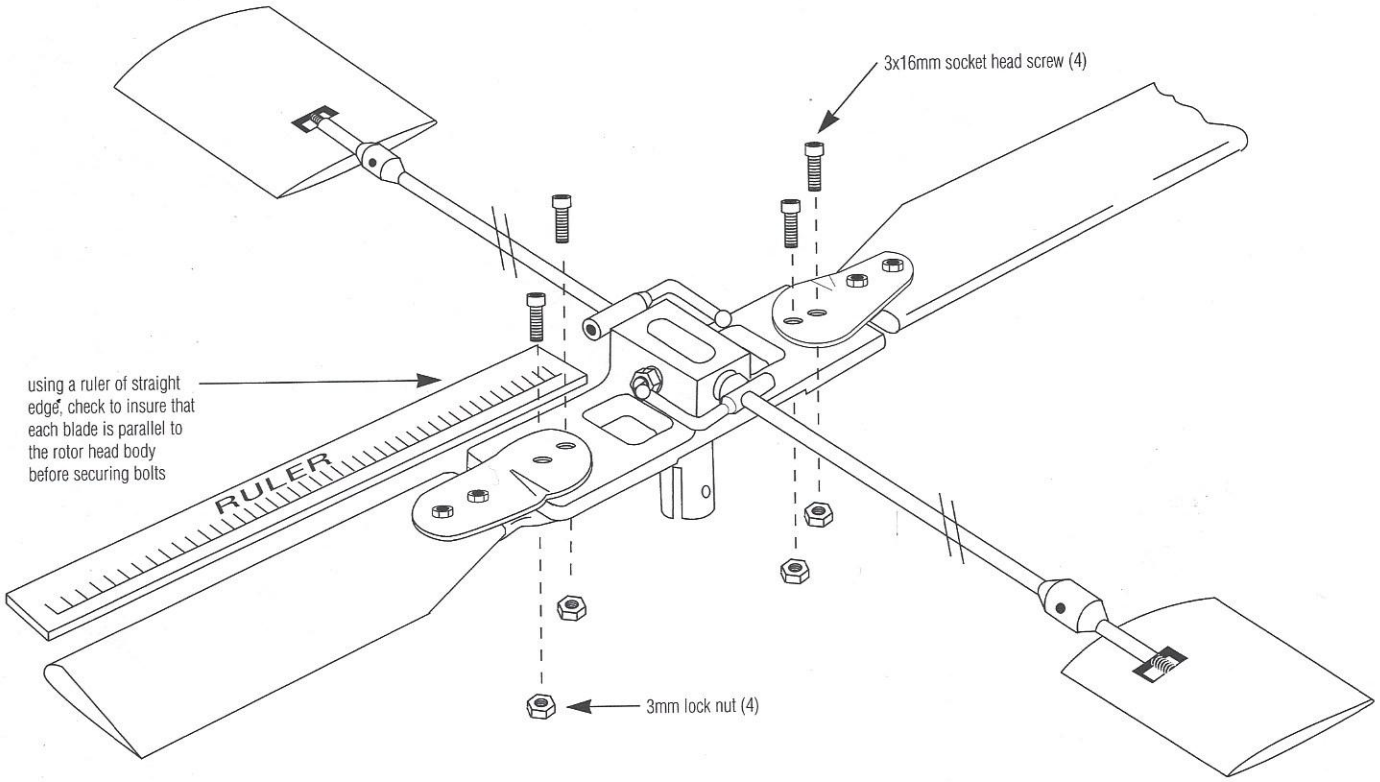


DIAGRAM 7D

Main Rotor Head Final Assembly



B. Install the completed main rotor blades onto the rotor head assembly using four 3x16mm socket head screws and 3mm lock nuts. Be certain, as in the previous step, the heads of the screws are on top, with the nuts to the bottom of the rotor head assembly. Do not completely tighten the four 3x16mm socket head screws as they will be need for adjustment of the main blades (Diagram 7D). When installed correctly, the leading edge of the main rotor blade will be raised or higher than the trailing edge.

C. Before final tightening of the main rotor blade mounts to the main rotor head body, you must make sure that the blades are parallel to the main rotor head body, as well as each other. To do this, simply rest a straight edge or ruler against the flat sides of the main rotor head body so that the straight edge or ruler runs parallel to the leading edge of the main rotor blade. Next, gently position the rotor blade so that the space between the straight edge and the leading edge of the blade (approximately 1/8") is even. Once this has been accomplished, carefully, but firmly tighten the two 3x16mm socket head screws and repeat the process for the next rotor blade.

When finished, look at the rotor blades to see that they are parallel to each other as well as the rotor head center body. This adjustment/alignment is critical to insure proper balancing of the main rotor head as well as to reduce vibration.

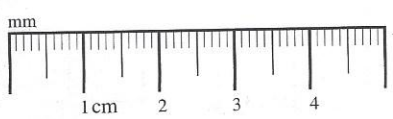
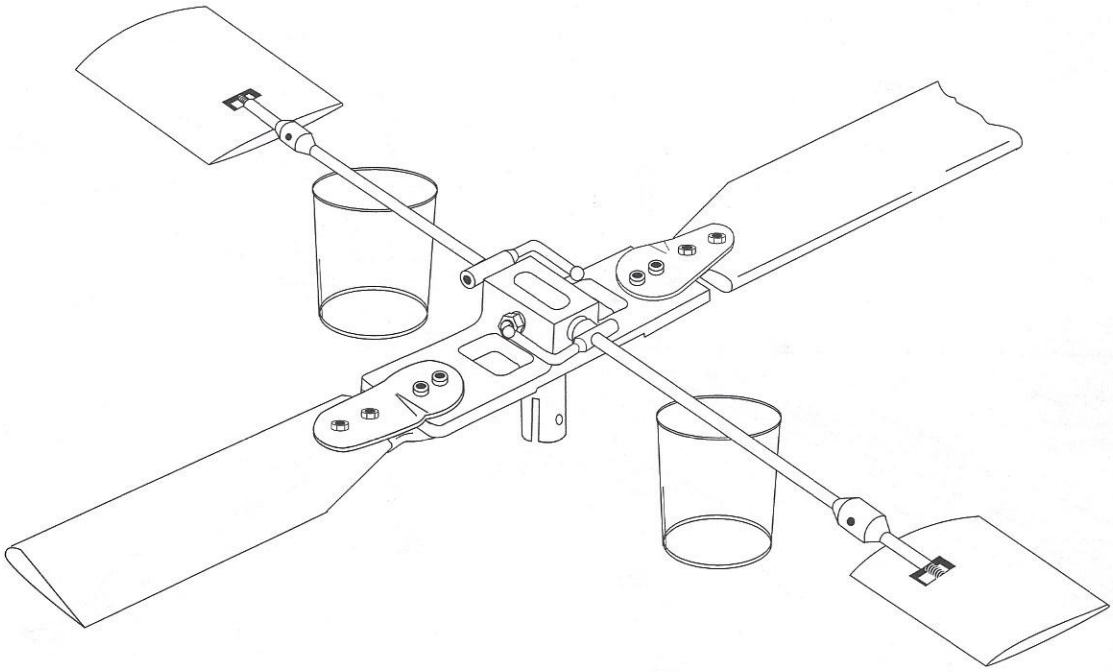


DIAGRAM 7E

Main Rotor Head Balancing



STEP 3 Rotor Head Balancing

Proper balancing of your rotor head is a very critical part of assembly of your HOVERSTAR. The time and effort spent on this process will reflect directly on the proper flying and low vibration of your helicopter. Please follow the instructions below carefully and diligently for best results.

A. Position the rotor head assembly on a flat, level surface so the bottom of the steel rotor head hub rests firmly on the table surface. Pivot the rotor head body left and right on the rotor hub and release. The rotor head assembly, if properly balanced, should return to a level position, paddles level, when viewed from one end of the main rotor blade. If one control paddle appears to be closer to the table surface than the other (measure with a ruler), loosen the flybar weight of the low paddle and slide 1/2" at a time, toward the rotor head main body, and repeat. Once the rotor head returns to a level position, secure the flybar weights tightly to the flybar.

NOTE: If the rotor head assembly does not pivot freely, loosen the 4x25mm head bolt slightly and re-test.

B. Using two equal size drinking glasses (rims up) suspend the rotor head assembly between the two glasses by resting the flybar assembly onto the glasses in a teeter-totter fashion (Diagram 7E).

Level the flybar assembly and view the rotor head assembly from the side (Diagram 7F). More likely than not, one rotor blade tip will be closer to the table surface than the other. This is the heavy side of the rotor head assembly. To correct this out-of-balance situation, locate your HOVERSTAR decal set (2414).

Cut the two different color strips of blade tracking material from the decal sheet. Remove the backing from each piece of tracking tape. Completely adhere one piece of tracking tape to the tip of the light, or high, rotor blade.

Next, rest the second strip of tracking tape on the top of the heavy or low rotor blade temporarily. Trim this piece of tracking tape 1/4" at a time, checking the balance between cuts, until the tip of each blade is an equal distance from the table surface. In some cases, it may be necessary to apply both pieces of blade tracking tape to the same rotor blade to correct a more severe out of balance situation. This can easily be

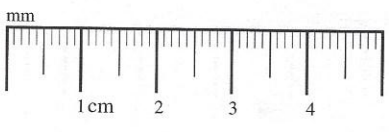
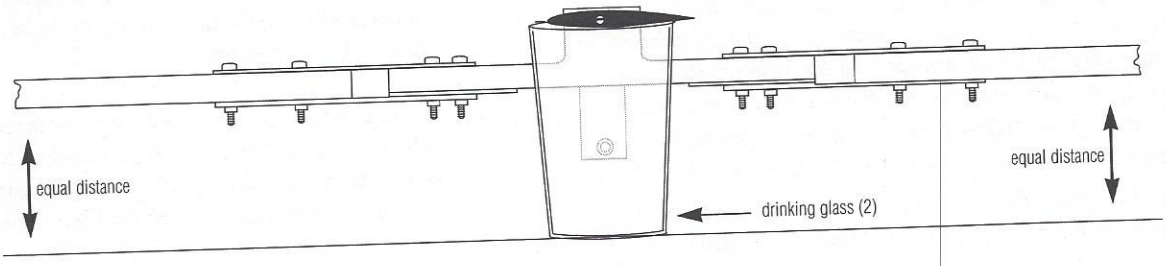


DIAGRAM 7F

Main Rotor Head Balancing



caused by uneven sanding, sealing, painting, etc. If it appears that it will take more than two pieces of blade tracking tape to bring the rotor head into balance, it is suggested that you apply a thin coat of five minute epoxy to the tip of the main rotor blade and rebalance.

When applying the blade tracking tape, make sure that all final seams face toward the rear of the rotor blade. It is not recommended that you apply multiple layers of blade tracking tape to the same area of the blade. This will increase the thickness of the blade airfoil, which could cause blade tracking problems during flight.

Once your rotor head assembly is balanced and level check to make sure the blade tracking tape is securely adhered to the blades.

NOTE: For all balancing, it is important that the area in which you are performing the balancing be free from drafts, running fans, etc., as this could adversely affect the balancing procedures and give false readings during this process.

C. Temporarily install one 3x20mm socket head screw, two 3mm washers and one 3mm lock nut through the lower portion of the main rotor hub. This will be removed in a later step for rotor head attachment.

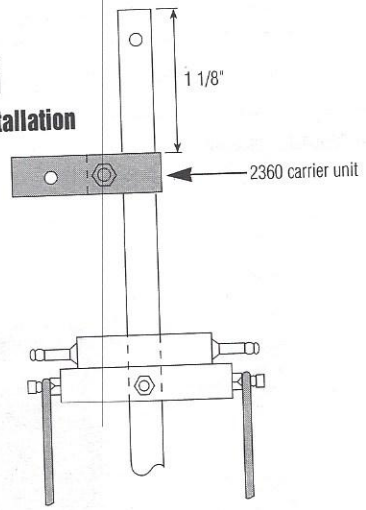
STEP 4 Swashplate Driver Installation

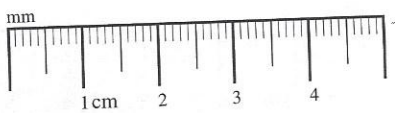
A. Slide the swashplate driver (2360) over the top of the main rotor shaft and position at approximately 1-1/8" from the top of the main rotor shaft (when measured from the top edge of the swashplate driver to the top of the main rotor shaft). Secure the swashplate driver in place using one 3x16mm socket head screw and one 3mm lock nut.

Do not tighten completely as this will need to be rotated into the correct position in a later step (Diagram 7G).

DIAGRAM 7G

Swashplate Driver Installation





SECTION EIGHT

STEP 1 Radio Equipment Installation

The HOVERSTAR has been designed to accept many different radio systems and servos. The universal servo cut outs in the mainframe plate have been designed for use with standard size servos only. It is not recommended that you alter the servo cut-outs to mount your particular servos as proper mounting is extremely critical to the control response of your HOVERSTAR.

For our HOVERSTAR radio, we have chosen to use the JR F400 4-channel FM radio system. We have found this system to display excellent quality and reliability and find it to be an ideal choice for use with the HOVERSTAR. Although these instructions show the specific installation of the JR F400 radio system, these installation procedures are common to most other 4-channel radio systems.

It is necessary for you to charge your radio system prior to installation. During the installation procedure, you will be called on to turn the radio system on periodically for final adjustments. Please refer to your radio system instructions for specific charging procedures.

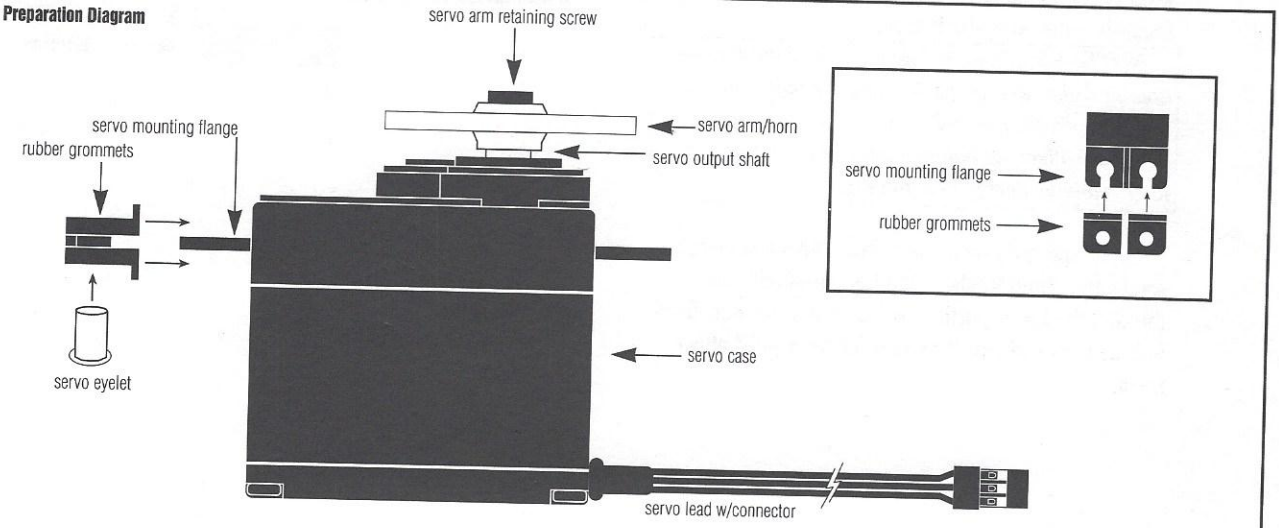
A. The first step in the installation of your radio equipment into your HOVERSTAR is the installation of the four standard size servos.

Start by preparing the servos for installation by first removing the servo arm from each servo and then installing the four rubber grommets and brass eyelets per the manufacturer's instruction onto each servo. As a rule, the brass servo grommets are always installed onto the servo so the flange of the eyelet is at the bottom of the servo flange.

B. It is now time to mount your four servos to the HOVERSTAR mainframe using the sixteen 2.5x15mm pan head screws, sixteen 2.5mm washers and sixteen 2.5mm hex nuts (four of each per servo) provided. It is very important that the servos be installed in the proper position. The location for each servo are as follows (when viewed from the rear of the frame forward):

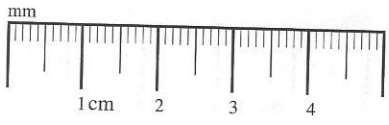
- **Roll/Aileron Servo**
  Right side of frame plate, output shaft toward the front of the helicopter.
- **Pitch/Elevator Servo**
  Left side of frame plate, output shaft toward the rear of the helicopter.
- **Throttle Servo**
  Left side of frame plate, output shaft toward the bottom of the helicopter.
- **Yaw/Rudder Servo**
  Right side of the frame plate, output shaft towards the rear of the helicopter

Servo Preparation Diagram

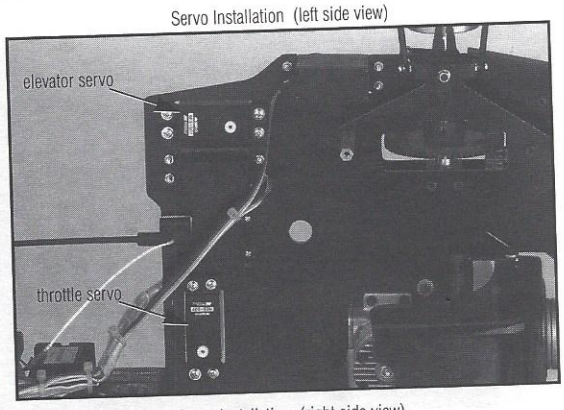


Screw Bag Eight:

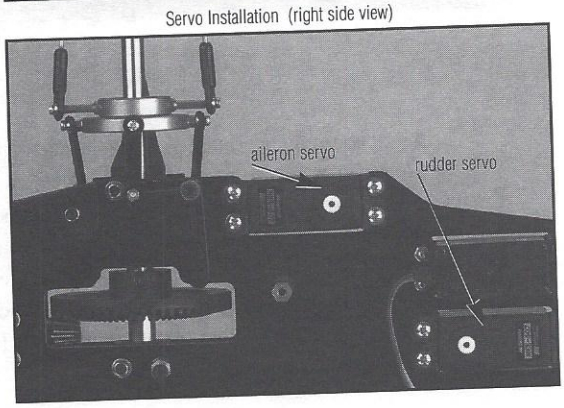
16	2.5x15mm Pan Head Screw		16	2.5mm Hex Nut	
1	3x8mm Socket Head Screw		16	2.5mm Washer	
1	2x8mm Pan Head Screw		2	2x10mm Pan Head Screw	



Servo Installation (left side view)



Servo Installation (right side view)



Install the 2.5x15mm pan head screws onto the servos so the head of the screw, as well as the 2.5mm washer, is on the top of the servo grommets, with the 2.5mm hex nuts contacting the back side of the mainframe plate. Secure each bolt snugly so the servo grommet is compressed until the screw and washer bottom out on the servo eyelet. Use a drop of Locktite on each bolt after tightening.

WARNING: This is very important—if no Locktite is used, the servo mounting bolts could vibrate loose, creating an erratic control response.

Check to be sure the case of the servo does not come into direct contact with the servo cut-outs in the mainframe plate. This direct contact will transmit excess vibration to your servo, and could result in failure.

C. Mount the switch harness to the mainframe through the pre-cut universal switch hole, inserting from the right side of the frame when viewed from the rear of the frame forward. It is very important that the switch harness is installed so when in the down position, the switch is on, and in the up position, the switch is off. The reason for this is that in the event of a hard landing or crash, the force of the impact with the ground will force the on/off switch to remain in the on position, giving you the control to shut the engine off. If reversed, it is possible for the switch to be shut off with a hard impact, causing total loss of control of the model. After installation, slide the switch On and Off to insure that it can move completely in each direction without contact with the switch plate cut-out.

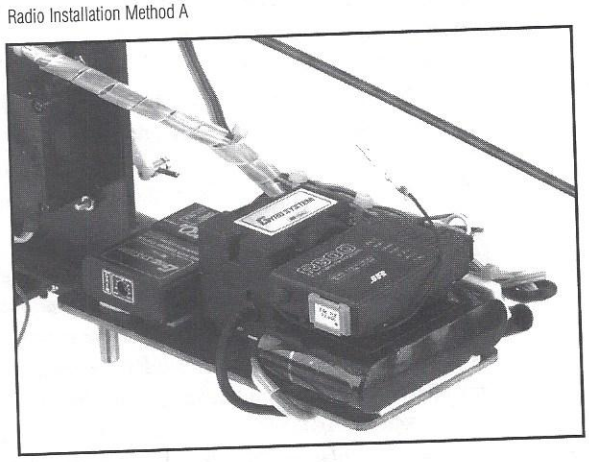
D. Mount the receiver battery pack (1000mAh minimum), receiver, gyro motor and gyro amplifier to the canopy floor using 1/8" double-sided servo tape (not included), making sure to fully isolate each component from contact with the mainframe plate, canopy floor, or each other.

Installation will vary based on the size of your receiver battery pack. If your battery pack measures 2" by 3 1/2" or less, we suggest using installation method A. If your battery pack measures larger than these dimensions, please refer to installation method B.

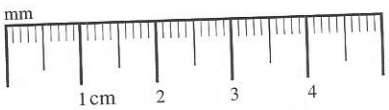
When installing your radio components, please take care to insure that they are firmly secured by the 1/8" servo tape. Also be sure to position the receiver so the antenna exit is furthest away from all other wires and the receiver crystal is easily accessible for frequency identification.

***NOTE:** Do not use Velcro to mount the gyro or receiver battery.*

Radio Installation Method A



Radio Installation Method B



E. Now connect the four servos, switch harness gyro, and receiver battery pack to the receiver in the following manner:

Aileron = Left and right cyclic (swashplate)
Elevator = Fore and aft pitch (swashplate)
Rudder = Left and right tail rotor (tail rotor)
Throttle = Throttle

With regard to your gyro system (JR130 Gyro shown) it is important that the Rx-Rudd lead from the gyro amplifier be connected to the rudder channel of the receiver, with the rudder or tail rotor servo connecting into the Rudd-SX receptacle located on the gyro amplifier. For gyros other than the JR130, please check your gyro's instructions for proper connection.

It may be necessary to use a 3"-6" aileron extension to connect the Rx-Rudd lead from the gyro amplifier to the rudder receptacle on your receiver.

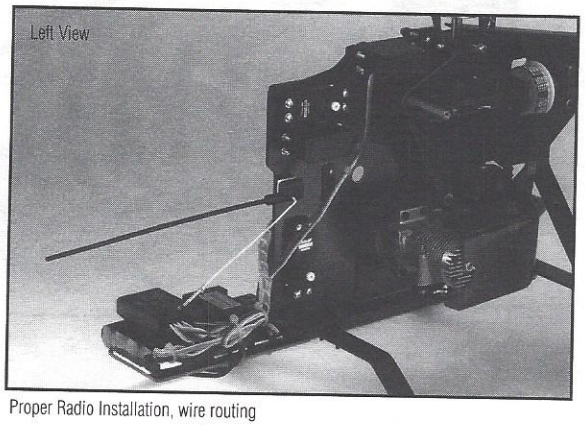
We recommend that you secure your battery/switch harness connection, as well as any other extension lead connections, by applying a piece of Scotch tape (or similar) around the connection.

While making these connections, we suggest that you route all of your leads neatly, making sure they do not come in contact with the mainframe plate front edge or obstruct any areas where the servo control rods will route.

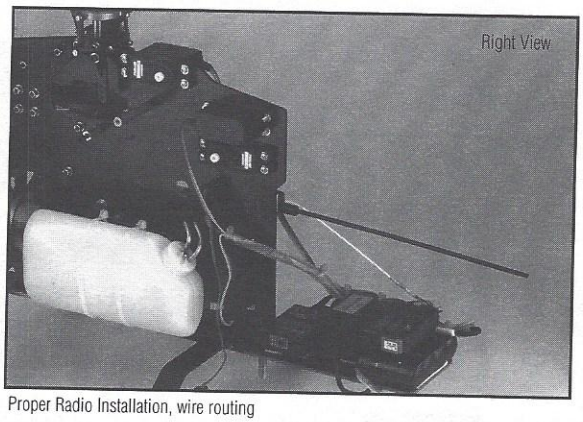
CAUTION: You should slightly sand the front edges of the mainframe plate smooth using 120 grit sandpaper. The composite G-10 material used for the mainframe is very abrasive and could cut through the lead wires during operation if care is not taken to route the radio lead wires properly. Again, it is important to route all lead wires neatly and away from the frame components.

You may secure the lead wires together to form a wire harness using nylon wire tires (not included).

Refer to the radio installation photos for proper lead wire routing.



Proper Radio Installation, wire routing



Proper Radio Installation, wire routing

F. It is recommended that you purchase/install a base loaded receiver whip antenna for added convenience and proper operation of your HOVERSTAR. Our purchase choice is a Revolution base loaded whip antenna (RVO1010) for this purpose. Please refer to your particular whip antenna instructions for proper connection, and to the radio installation photos for proper placement on your HOVERSTAR.

G. Turn on your transmitter and then your receiver switch. Move your two control sticks in all directions while checking to make sure that all four servos are operating properly. With your radio system still on, move your rudder, aileron, and elevator transmitter trims to the center while moving your throttle stick to the center position with the throttle trim to its full low position. Next, turn your receiver switch off, followed by your transmitter switch. Your radio system and servos are now prepared for the next procedure.

STEP 2 Control Rod Assembly/Installation

A. Aileron/Roll Servo/Rod Installation

Thread the black heavy-duty clevis onto the shortest (1-3/8") servo rod and adjust so that from the center of the Z bend in the servo rod to the hole in the center of the clevis there is a distance of approximately 1-3/4" on center.

Install the completed servo rod assembly onto the L lever (roll) through the closest hole to the center of the L level and secure using one 2x8mm pan head screw. Make sure that the clevis can still rotate freely on the L lever. Next, trim a servo arm as shown and install onto the Z bend through a hole that is approximately 3/8" from the center hole of the servo arm making sure that the servo rod is on the inside of the servo arm. It may be necessary to enlarge the hole in the servo wheel using a 1/16" drill bit for proper attachment. Tilt the swashplate approximately 1-2° to the right and install the arm/wheel onto the

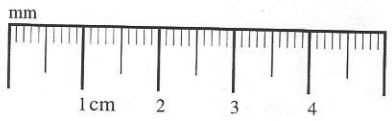
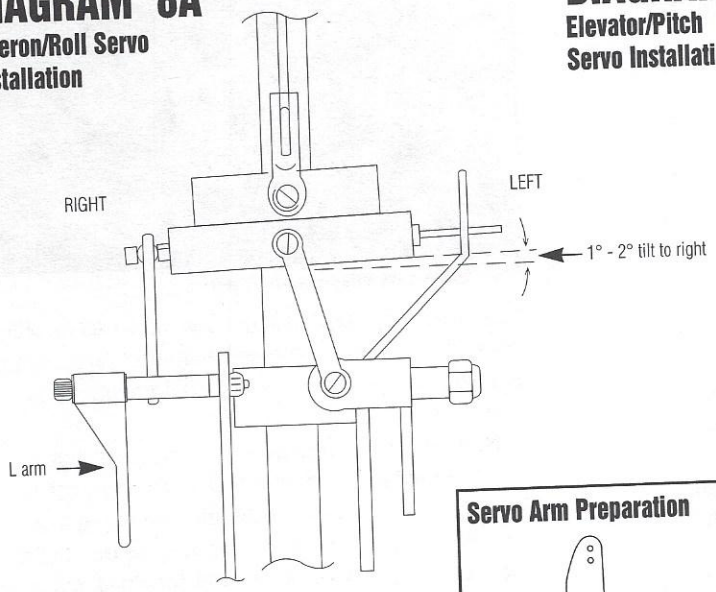
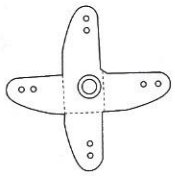


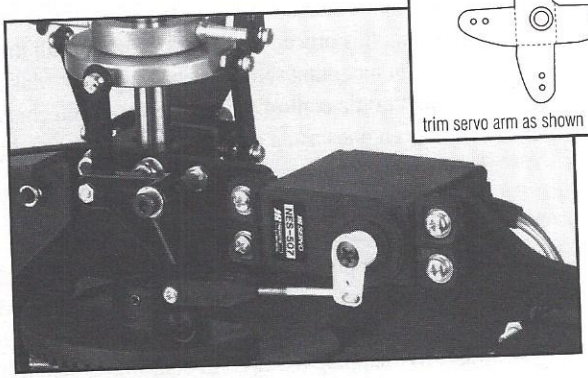
DIAGRAM 8A
Aileron/Roll Servo Installation



Servo Arm Preparation



trim servo arm as shown



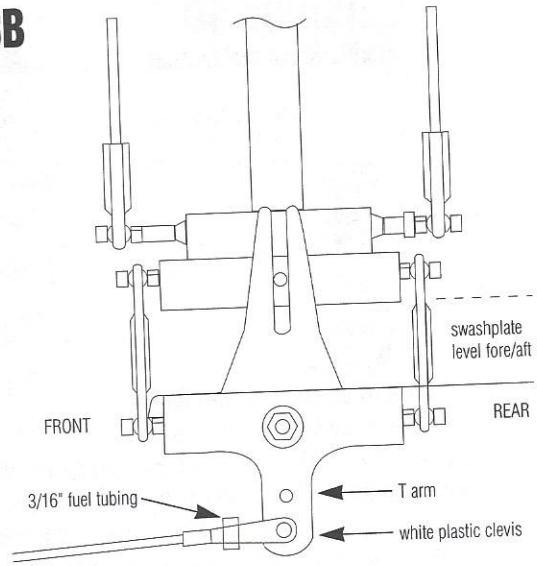
Completed Aileron/Roll Servo Installation

servo so the hole in use is directly below the output shaft of the servo. Adjust the length of the control rod if necessary. Next, turn on your radio system and move the aileron stick to its full left/right travel while checking to insure that the servo/control linkage does not stall or bind. If the system binds, move the control rod in one hole on the servo arms. Check the direction of the servo in relation to the control stick, so that when viewed from the rear of the helicopter, the swashplate moves in the same direction as the transmitters control stick. Reverse the servo if necessary. Remember to install the servo arm retaining screw when completed.

B. Elevator/Pitch Servo/Rod Installation

Thread one white plastic clevis onto the 4-1/8" long servo control rod so that when measured from the center of the Z bend in the control rod to the center pin of the clevis, it measures approximately 4-1/2". Connect the completed control rod assembly to the bottom hole in the T lever making sure the clevis is completely closed (the clevis should make a snapping noise). It is recommended that you install a 3/16" piece of fuel tubing over the clevis to act as a keeper to prevent the

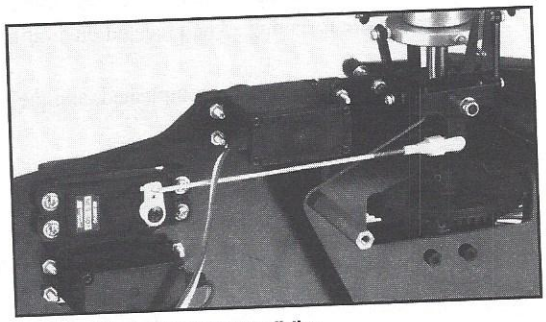
DIAGRAM 8B
Elevator/Pitch Servo Installation



clevis from opening during operation. Also make sure that the control rod assembly is routed to the inside of the roll or aileron servo lead. Next, trim a servo arms shown and install onto the Z bend through a hole that is approximately 3/8" from the center hole of the servo arm. Make sure that the control rod is in the outside of the servo arm. As in the previous step, it may be necessary to enlarge the hole in the servo arm using a 1/16" drill bit. Level the swashplate assembly and install the servo arm/wheel onto the servo so the hole in use is directly above the output shaft of the servo. Adjust the length of the control rod if necessary.

Next, turn on your radio system and move the elevator stick to its full fore/aft travel while checking to be sure that the servo control linkage does not stall or bind. If the system binds, move the control rod in one hole on the servo arm. Check the direction of the servo in relation to the control stick so that when viewed from the rear of the helicopter, the swashplate moves in the same direction as the transmitter control stick. Reverse the servo if necessary.

Remember to install the servo arm retaining screw when complete.



Completed Elevator/Pitch Servo Installation

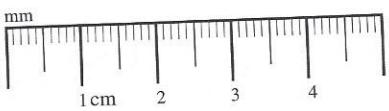
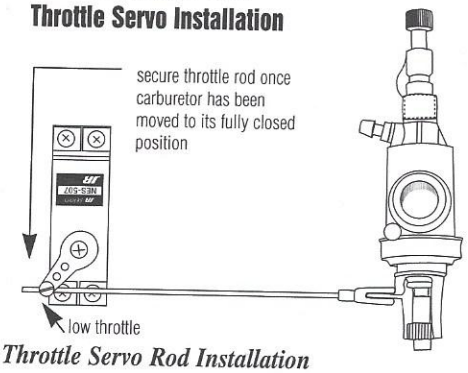


DIAGRAM 8C
Throttle Servo Installation

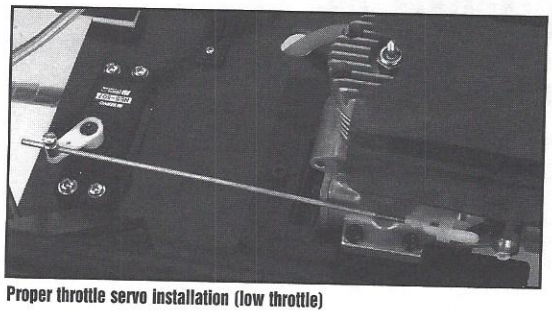


C. Throttle Servo Rod Installation

Thread one white plastic clevis onto the 5-1/2" long servo control rod so that when measured from the end of the control rod assembly to the pin on the clevis, it measures approximately 5-5/8". Connect the completed control rod to the bottom hole in the carburetor throttle arm, making sure that the clevis is completely closed (the clevis should make a snapping noise.) It is recommended that you install a 3/16" piece of fuel tubing over the clevis to act as a keeper to prevent the clevis from opening during operation. Next, install the adjustable servo rod connector to the face of a servo arm through a hole that is approximately 1/2" from the center hole in the servo arm. Trim the servo arm as shown. It is not necessary to enlarge the hole in the servo wheel. Secure the adjustable connector to the servo arm from the rear using the white plastic securing cap. Move the connector to insure that it can rotate on the servo arm. Slide the end of the throttle control rod through the 1/16" hole in the adjustable connector and attach the servo arm/wheel to the servo so the adjustable connector is directly below the output shaft of the servo.

Turn your radio system on and move the throttle stick to the full low position (Diagram 8C). The servo arm should move toward the front of the helicopter (when viewed from rear of frame forward). If your servo moves toward the rear of the helicopter, reverse the throttle reversing switch located on your transmitter.

Once this has been accomplished, and the servo arm/wheel is facing toward the front of the servo, pull the throttle control rod forward until it no longer moves and tighten the screw on the adjustable connector to secure the throttle arm.



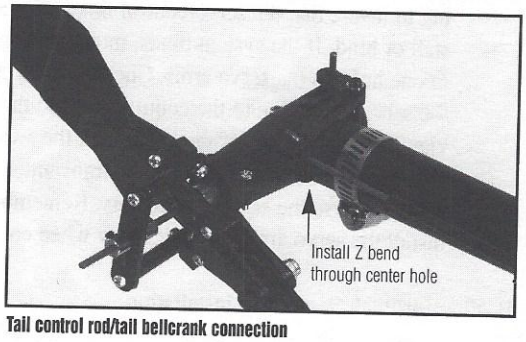
Proper throttle servo installation (low throttle)

Next, move your throttle trim to its full high position, followed by the throttle stick of the transmitter. While doing this, watch the throttle control rod to be sure that it does not bind or go beyond the travel of the carburetor barrel. If the control rod does bind, move the adjustable connector in one hole on the servo arm and repeat this procedure. Remember to install the servo arm mounting screw when completed. Make sure that the throttle control rod does not come in contact with the engine casing during movement; bend slightly for clearance if necessary.

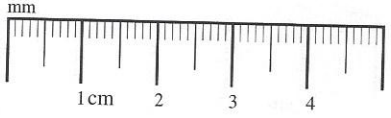
D. Rudder/Tail Rotor Servo/Rod Installation

Locate the pre-assembled tail control rod assembly (2404/2406) and install onto the tail boom on the right side (when viewed from the rear of the helicopter forward) by snapping the two tail control rod clamps over the tail boom. Be sure to position the tail control rod Z bend through the center hole in the tail control bellcrank (located on the tail gear box) before attaching the tail control rod assembly to the tail boom.

Slide the tail control rod clip (2184) over the tail

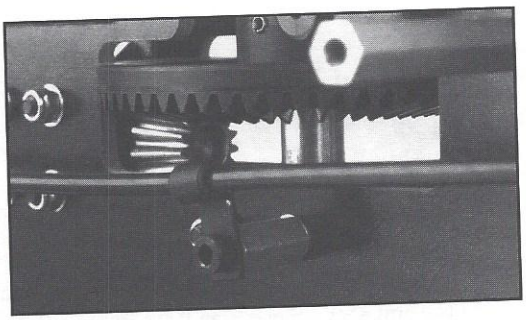


Tail control rod/tail bellcrank connection



control rod wire/tube. (It may be necessary to spread slightly using a screwdriver). Secure to the tail control rod clip to the control rod clip standoff using one 3x8mm socket head screw. Use Locktite when assembling.

Position the tail control rod tube onto the model so there is a space of approximately 1-1/2" between the front edge of the tail gear box assembly and the end of the tail control rod tube.

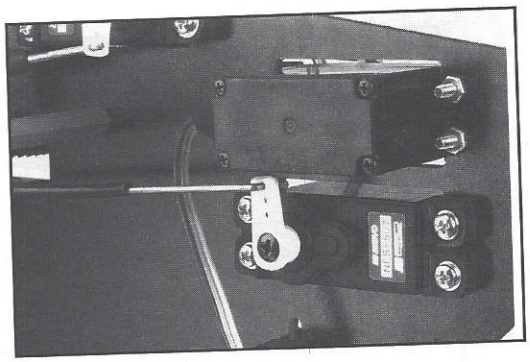


Tail control rod clip attachment

Next, crimp the tail control rod clip to the tail control rod tube slightly, making sure not to obstruct the movement of the tail control rod.

Trim a servo arm as shown and install onto the Z bend on the tail control rod through a hole that is approximately 1/2" from the center hole of the servo arm. As in previous steps, it may be necessary to enlarge the hole in the servo arm slightly using a 1/16" drill bit. Attach the servo arm to the servo so that the hole in use is directly above the servo output shaft of the servo.

Next, turn on your radio system and move the rudder/tail rotor stick to its full left/right travel while checking to be sure that the tail rotor control rod linkage does not stall or bind. If the linkage binds, move the Z bend in one hole on the servo arm and repeat the procedure.

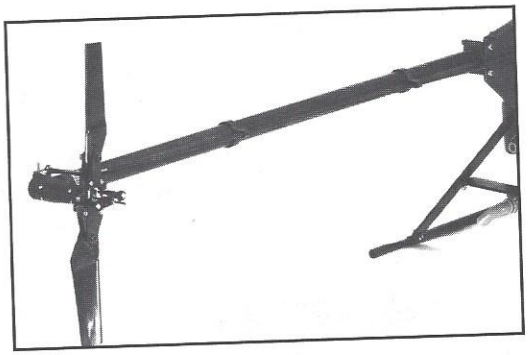


Proper Rudder/Tail Rotor Servo Installation

Check the direction of the servo in relation to the control stick so that when viewed from the rear of the helicopter, the servo arm moves forward when the control stick is moved to the right. Reverse the direction of the servo if necessary. Remember to install the servo arm retaining screw when completed.

Position the tail control rod clamps on the tail boom so they are spaced approximately 4" and 13" from the back edge of the tail boom mounting plate. Rotate the clamps on the tail boom so that the tail control rod is as straight as possible when viewed from the right side of the helicopter. Secure the two tail control rod clamps to the tail boom using two 2x10mm pan head screws.

Apply a small drop of CA adhesive to each tail control rod clamp, and also to the tail control rod clip, to secure the tail control rod tube in place.



Proper positioning of the tail control rod

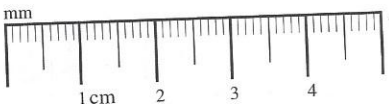
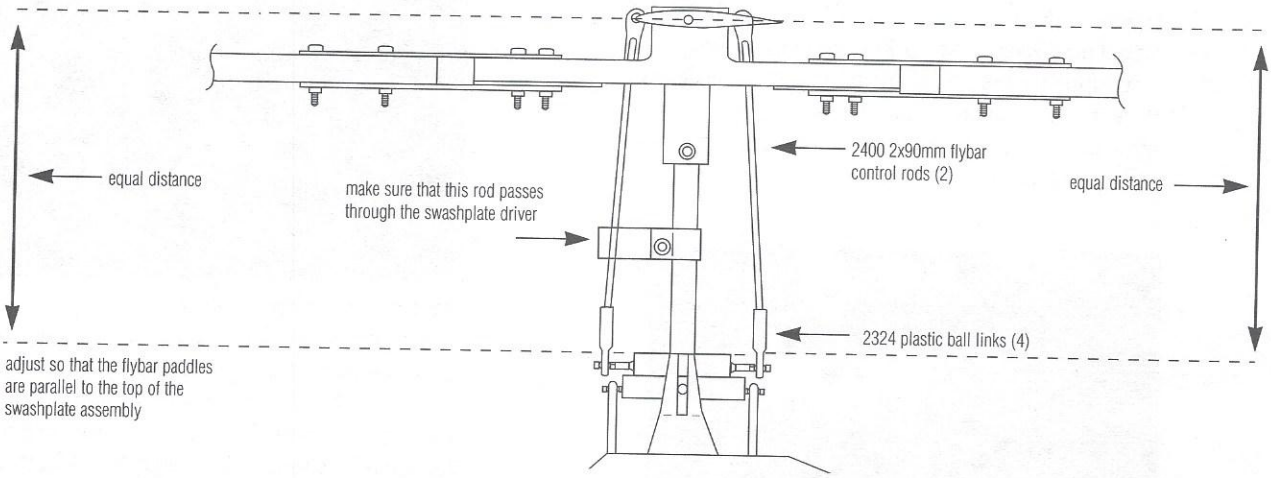


DIAGRAM 8-D

Flybar Control Rod Installation/Adjustment



STEP 5 Flybar Control Rod/Rotor Head Installation

Thread two back plastic ball links (2324) onto each of the two 2x90mm flybar control rods (2400) a distance of approximately 4-5/16" when measured at the center of each ball socket. Rotate the links so that they are at a 90° angle to each other.

Attach the two completed flybar control rods to the upper swashplate balls, making sure that one of the control rods passes through the center of the swashplate driver assembly.

Install the completed rotor head assembly onto the helicopter using the screws, washers and nuts that were temporarily installed in Section 7, Step 3C. When assembling, make sure the two flybar control rods pass through the two square openings in the main rotor head body.

Position the flybar assembly so it is parallel with the swashplate assembly, then connect the remaining two ball links to the two flybar control arms (Diagram 8D).

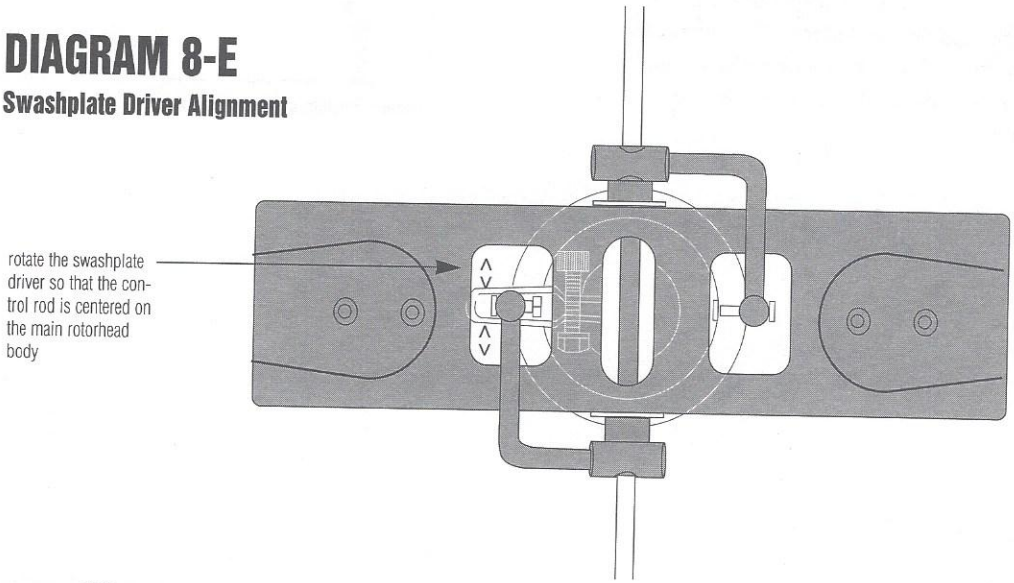
Start by connecting one ball link to one flybar control arm, then check to see if the flybar paddles are parallel with the swashplate. Adjust the control rod if necessary. It is also necessary at this time to rotate the swashplate driver assembly so that when viewed from the top of the rotor head, the swashplate driver aligns directly in the center of the rotor head body square opening, allowing the flybar control rod to be centered as well. Once adjusted, securely tighten the swashplate driver assembly to the main rotor shaft assembly (Diagram 8E).

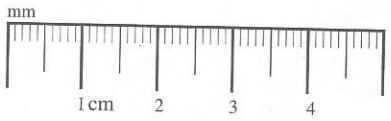
Next, check the length of the remaining flybar control rod and adjust so the ball link lines up with the second flybar control rod.

It is important that the flybar control rods are adjusted properly as any up or down pressure applied to the swashplate assembly by the flybar control rods will have an adverse effect on control response.

DIAGRAM 8-E

Swashplate Driver Alignment



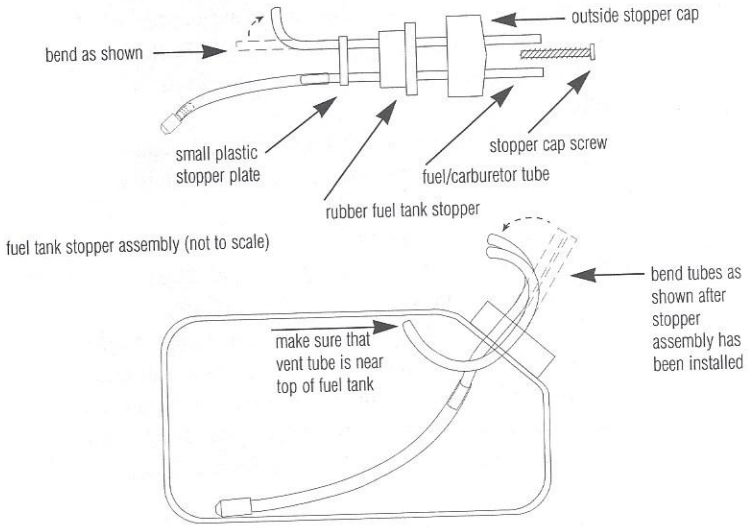


SECTION NINE

STEP 1 Fuel Tank/Muffler Installation

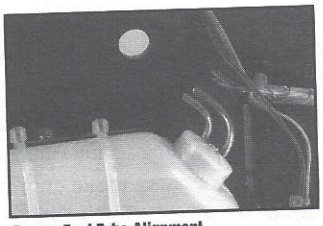
A. Insert the two brass tubes through the two open holes in the rubber fuel tank stopper so that one tube protrudes approximately 1" from the bottom edge of the stopper and the second tube is approximately 1-1/2" from the end of the stopper. Slide the small plastic stopper plate over the two tubes. Next, install the outside stopper cap over the tube and hold together temporarily using the stopper cap screw. Bend the brass tubes to their desired angles as shown in the diagram. The tube with the inside upward bend is the vent/pressure tube and the straight tube is the fuel pickup tube.

Fuel Tank Assembly



Attach the klunk and clear silicone fuel tubing to the inside of the pickup tube. Insert the completed stopper assembly into the tank and check to see that the vent tube travels nearly to the top of the fuel tank and the klunk can move in all positions inside the tank without interference.

It may be necessary to shorten the silicone fuel tubing to allow clearance inside the tank. Secure the completed stopper to the fuel tank making sure that the vent tube is at the top of the tank. Next, bend the outside portion of the two brass tubes so that when the tank is installed onto the helicopter, they will align with the 1/2" fuel line hole in the mainframe plate. Test fit until the tubes are positioned correctly.

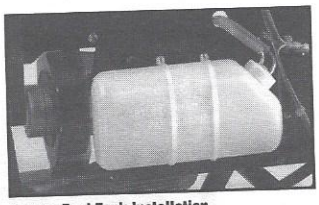


Proper Fuel Tube Alignment

B. Before installing the fuel tank onto the helicopter, it is recommended that you remove the sharp corners around the 1/2" fuel line hole using 120 grit sandpaper. This will prevent the fuel lines from wearing through during operation.

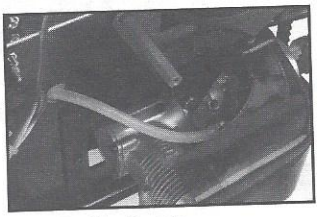
C. Apply two pieces of 1/8"x2" double sided servo tape (not included) horizontally to the face of the fuel tank mounting plate, approximately 3/8" from the outside edge of the plate.

Clean the outside of the fuel tank with rubbing alcohol, or equivalent, and attach the fuel tank to the mounting plate via the double sided servo tape. Make sure to leave at least a 1/16" space between the back of the fuel tank and the cooling shroud.



Proper Fuel Tank Installation

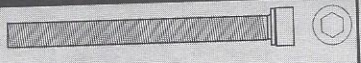
Feed the two 10" nylon tie wraps through the slots in the fuel tank mounting plate and secure around the fuel tank. The tie wraps should hold the fuel tank firmly, but do not compress the backside of the fuel tank.

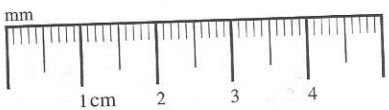


Proper Fuel Line Routing

D. Attach a piece of fuel tubing (not included) to the brass fuel pickup tube on the fuel tank, passing the fuel line through the 1/2" hole in the mainframe plate. Determine the correct length for the tubing and attach to the carburetor fuel nipple. You may at this time elect to insert an in-line fuel filter (not included) onto the carburetor fuel line.

Screw Bag Nine

4	3x35mm Socket Head Screw		4	3mm Washer
4	3mm Lock Nut		3	Canopy Thumb Screw
3	3mm Large Washer			



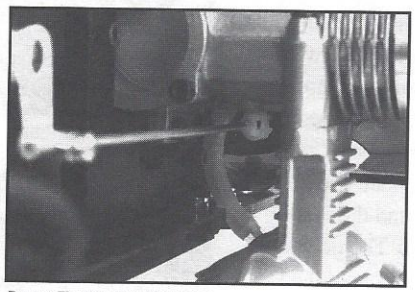
STEP 2 Muffler Installation

Attach a second piece of fuel tubing from the fuel tank to the pressure nipple located on your engine's muffler. Test fit your muffler to your engine while checking the clearance of the pressure nipple to the mainframe assembly. Depending on the engine/muffler combination, it may be necessary to file or grind a portion of the left lower frame angle for proper clearance.

Another option would be to use a Dubro #669 muffler extension between your engine and muffler. This would eliminate the need to file or grind the lower frame angle. However, you will need to check the clearance between the bottom of your muffler and your HoverGuard training gear for clearance as the bottom of the muffler may now interfere, depending on the specific engine/muffler you choose.

Once you have achieved proper clearance for the muffler pressure nipple, securely fasten the muffler to the engine using Locktite. Route the muffler pressure fuel line through the 1/2" hole in the mainframe and connect to the vent/pressure tube on your fuel tank.

Once complete, check to be sure that the muffler pressure fuel line will not interfere with the operation of your throttle control rod/carburetor assembly.



Proper Throttle Rod Clearance

SECTION TEN

Choosing a Finishing Method

Your HOVERSTAR kit has been designed to give the modeler the option of painting the canopy and tail fins, or leaving the pre-colored components as is and applying only the decals for an attractive appearance.

For initial hovering/training purposes, the pre-colored canopy and tail fins provide a striking, yet functional, appearance and require much less time and effort to assemble. If you do not want to paint your model, proceed to Step 1B.

For the modeler wishing to experience the forward flight capabilities of the HOVERSTAR, we suggest that the canopy and tail fins be painted a lighter color before applying your HOVERSTAR decals. The reason for this is simply that a light color model is much more visible at far distances and higher altitudes than a darkly colored model.

This increase in visibility is helpful to keep yourself oriented with your HOVERSTAR when in forward flight. The coloring of your HOVERSTAR is much more critical than with a fixed wing airplane since there is much less area (wing, fuselage, etc.) on a helicopter to orient yourself with during flight. This is the most difficult thing to overcome when transitioning from fixed wing to helicopter flight.

Painting your HOVERSTAR a light color will make orientation much more defined, accelerating your forward flight learning process.

Finishing Procedures

STEP 1 Tail Fin Preparation and Painting

A. Clean both the vertical and horizontal fins with rubbing alcohol to remove any oil, grease or residue. Sand both fins using 320 grit sandpaper or Scotchbrite, making sure to remove the gloss or shine from the entire surface.

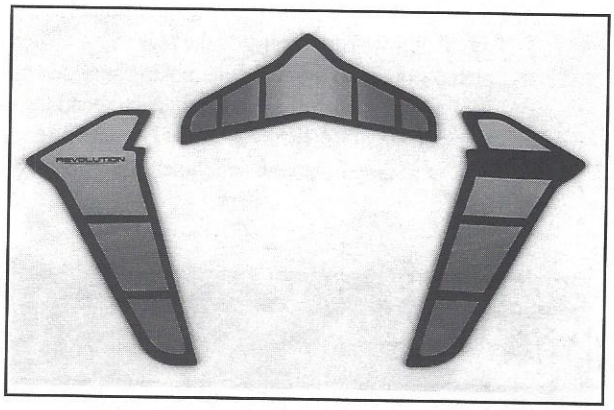
Clean both the vertical and horizontal fins again with rubbing alcohol to remove any and all sanding dust.

For a quick, yet attractive, finish we suggest the use of Pactra Racing Finish car paints with a Pactra Formula U clear finish to provide fuel-proofing.

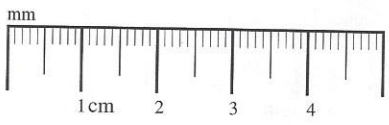
An alternate method providing similar results would be to use Coverite Black Baron paints. Black Baron is already fuel-proof, requiring no additional fuel-proof clear coatings. Once dried completely, you can proceed to the final tail fin assembly/installation procedure.

B. Tail Fin Final Assembly/Installation

Cut and apply the pressure sensitive vertical and horizontal fin decals from your HOVERSTAR decal sheet (2414) to the vertical and horizontal fins as shown in the photos. It will be necessary to open the holes in the decals to match the holes in the fins.



Horizontal/Vertical Fin Decal Attachment



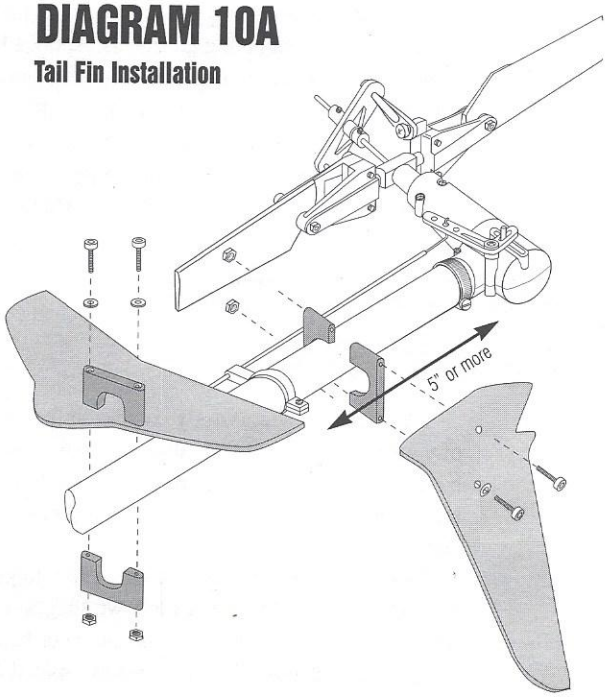
Attach the vertical fin to the tail boom of the helicopter using two tail fins mounts (2336), two 3x35mm socket head screws, two 3mm large washers and two 3mm lock nuts as shown in Diagram 10A, making sure that the fin is completely vertical and parallel to the mainframe when viewed from the rear of the model. Position the fin so the back edge of the fin comes in contact with the front edge of the tail rotor gear box assembly.

Turn your radio system on and move your rudder to its full left/right positions, checking to make sure the tail fin mount does not interfere with the movement of the tail control rod.

Mount the horizontal fin in the same manner as the vertical fin in a position that is approximately 5" or greater from the end of the tail boom. Check that when viewed from the rear of the model the fin is perfectly horizontal and at a 90° angle to the vertical fin (Diagram 10A).

DIAGRAM 10A

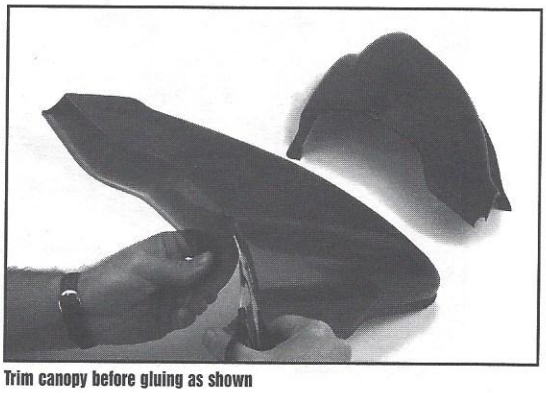
Tail Fin Installation



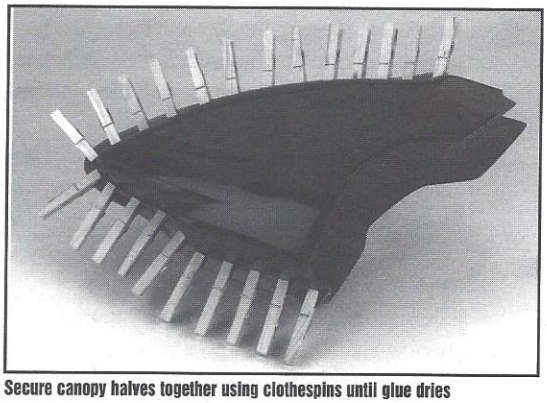
STEP 2 Canopy Assembly

A. Remove the back flanged portion of the two canopy halves using Lexan scissors, leaving a flange approximately 3/16" wide around the back edge of the canopy. Follow the recessed line in the canopy for proper trimming. Then trim the entire outside diameter of each canopy half so that there is a 1/2" flange remaining.

Apply a thin coating of Goop Canopy Adhesive (not included) around the entire inside lip of each canopy half, then fit the two halves together, making sure the



Trim canopy before gluing as shown



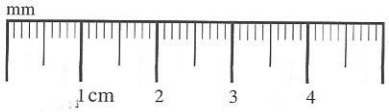
Secure canopy halves together using clothespins until glue dries

two canopy halves join together evenly around the entire perimeter of the canopy. Secure the canopy halves together to dry using approximately 15-20 wooden clothes pins (not included). For best results, let the canopy halves dry overnight before proceeding. For added durability, you can cut two 1"x2" reinforcement strips from scrap canopy material and install to the upper and lower portions of the canopy near the end of the seams using Goop adhesive. This will provide additional strength, and prevent the seam from separating during use and removal.

B. Remove the wooden clothespins, and using a Moto-tool with a cut-off wheel, carefully trim the seam of the canopy around the entire diameter so that it provides approximately a 3/16"-1/4" flange from the surface of the canopy. Smooth the seam using a barrel sanding wheel or 120 grit sandpaper. You should protect the windshield area during this procedure by applying masking tape along the flange area. Remove this tape once the flange is completed, along with the protective film from the entire canopy.

Using a 7/32" drillbit, open the three holes in the canopy for the canopy mounting grommets using the three dimpled areas on the canopy for proper hole location.

Test fit the canopy to the model to make sure that it does not interfere with the frame, control movements, etc. Take extra care to insure the upper left portion of



Proper decal attachment

Completed/Mounted Canopy

the canopy has adequate clearance to the edge of the swashplate locating bracket and that when the swashplate is deflected to the far left, the swashplate locating pin does not come in contact with the canopy. Trim as necessary for proper clearance.

NOTE: If you wish to paint your HoverStar, proceed to Step 2C. If you have elected not to paint your HoverStar, go to Step 2D.

C. Canopy Preparation and Painting

Clean the outside of the canopy thoroughly with rubbing alcohol, to remove any oil, grease, or residue. Make certain that you have removed the protective film from the canopy prior to this procedure. Using masking tape, carefully cover the entire window area using the recessed window outline as a guide.

Lightly sand the outside of the canopy using either 320 grit sandpaper or Scotchbrite, making sure to remove any gloss from the outside of the canopy.

Clean the outside of the canopy again to remove all sanding dust from the surface.

Place three small pieces of masking tape on the inside of the canopy to cover each of the three canopy mounting holes. Next, fill the inside of the canopy assembly with newspaper, covering the inside portion of the windscreen completely to guard against overspray coming in contact with the window area during painting. Insert a 1/2" dowel into the canopy through the newspaper and secure in the middle of the canopy with masking tape. This will allow you to hold the canopy during painting. Your canopy is now ready to paint. For a quick and attractive finish, we suggest the use of Pactra Racing Finish car paints as they provide excellent adhesion to the canopy material. To provide fuel-proofing for the finish, you will want to apply a clear coating of Pactra Formula U clear over the entire surface.

An alternate method providing similar results would be to use the Coverite Black Baron painting system. Black Baron is already fuel-proof, requiring no additional fuel-proof clear coating.

Once dried completely, you can proceed to the canopy decal installation/assembly procedure.

D. Canopy Decal Installation/Assembly

Cut and apply the pressure sensitive HOVERSTAR canopy decals from the decal sheet (2414) as shown in the photos above.

Taking a little extra time and effort during the cutting and attachment of your decals will greatly enhance the final appearance of your HoverStar.

Next, open the holes in the decals to match the holes in the canopy for the canopy mounting screws and insert the canopy mounting grommets. Apply a light drop of CA adhesive to the inside of each grommet after installation to adhere them to the canopy.

Mount your completed canopy onto your HOVERSTAR using the three 3mm canopy mounting screws and three 3mm large washers provided.

FINAL ASSEMBLY COMMENTS

You have now successfully completed the assembly of your HOVERSTAR. If assembled correctly, you should have no parts left over, with the exception of the HoverGuard training gear, which we will cover in a later step.

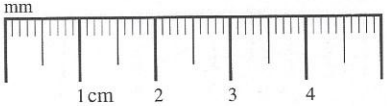
Although we are sure that you are eager to get your HOVERSTAR out to the flying field, we suggest that you first review the instruction manual and your helicopter once more to insure that it has been assembled properly and accurately.

Remove the canopy and verify that all servos are functioning properly, and that they operate in the correct direction in relation to the control stick movement.

Double-check all screws, nuts, bolts, and linkages to see that they are secured properly.

There are several additional procedures that still need to be performed before your HOVERSTAR is ready to make its debut at the local training site/flying field.

Please do not overlook these final steps as they are critical to the performance of your HOVERSTAR.



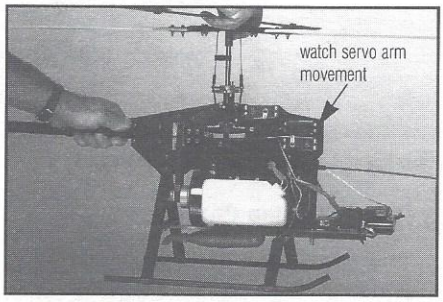
Pre-Flight Adjustments

A. Gyro Direction/Gain Adjustment

It is important to verify that your gyro is compensating in the correct direction before flying. A gyro that compensates in the wrong direction (backwards) is actually worse than no gyro at all.

To verify the direction that the gyro compensates, you will need to remove the canopy of your HOVERSTAR so that the rudder/tail rotor servo arm is visible. Turn your radio system on and verify that your servo moves in the appropriate direction as compared to your rudder control stick. As previously mentioned, moving your rudder stick to the right will cause your rudder servo arm to move forward or toward the front of the helicopter.

To determine the gyro direction, lift your HOVERSTAR by the main rotor head, and rotate the frame of the helicopter on the rotor head, or main shaft, so that the nose of the helicopter moves to the left. A quick action will be necessary while doing this procedure. Watch the tail rotor servo arm.



Gyro Direction Testing

If your gyro moves in the correct direction, the servo arm should move forward when the nose of the helicopter is moved to the left. If the servo arm moves to the rear, the gyro is compensating in the wrong direction. To correct this problem with the JR130 Pro II gyro, reverse the gyro motor plug where it connects to the gyro amplifier and re-test. If you are using a different gyro, refer to your gyro's instructions for the reversing procedure.

Test the gyro compensation direction once more to insure that it is now compensating in the correct direction. Consult your HOVERSTAR Flight Training Course for clarification.

B. Gyro Sensitivity Adjustment

You will also need to set the sensitivity of your gyro prior to flying your HOVERSTAR.

A good starting point for the sensitivity adjustment of the JR 130 Pro II gyro is approximately 75%. The sensitivity adjustment pot is found on the end panel of the gyro amplifier. Adjust the sensitivity using a small, straight screwdriver. Seventy-five percent sensitivity is a good starting point for other gyros as well.

It may be necessary to re-adjust the sensitivity of your gyro at the flying field. It is easy to gauge the sensitivity requirements of your gyro at the field by taking note of its movement or symptoms.

If the tail of your helicopter continuously kicks or hunts from one side to another, it is a sign that your gyro sensitively is too high, making the gyro overcompensate during correction. For this situation, reduce the gyro sensitivity at approximately 10% intervals until the tail holds in a neutral position.

An indication that your gyro sensitivity is too low would be if the tail of the helicopter continues to drift in both directions, never finding neutral or central. For this situation, increase your gyro sensitivity at approximately ten percent intervals until the tail of your helicopter will hold at the neutral position.

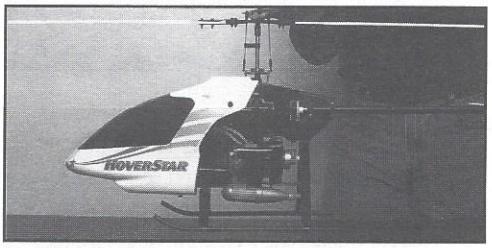
Since there are many variables in determining gyro sensitivity, this is an adjustment that must be fine tuned after flying your HOVERSTAR.

C. Center of Gravity Balancing

Before your first flight with your HOVERSTAR, you need to check that the center of gravity is in the proper location for hovering.

Make sure that your HOVERSTAR is completely assembled and ready to fly, including the canopy, tail fins, etc.

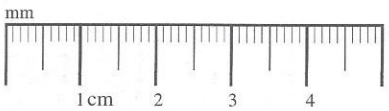
To check the CG balance, lift the HOVERSTAR by the main rotor head flybar assembly while viewing the bottom of the landing skids. Properly balanced, the HOVERSTAR skids should be level with the table surface, with the main fuel tank empty.



Proper C.G. balancing

A neutral balance like this is ideal for hovering, requiring the least amount of cyclic trim. Add a large lead weight or a larger Rx battery if necessary until proper balance is achieved. It is also possible to move the horizontal fin forward to improve the balance if necessary.

When balancing your HOVERSTAR for forward flight, the rear of the skid tubes should lift approximately 1/2" higher from the table surface than the front of the skids. This will help reduce the tendency for lifting, or ballooning, during fast forward flight.



HoverGuard Training Gear Assembly

As part of the total training package, your HOVERSTAR kit has been equipped with the Revolution HoverGuard training system, specifically designed for use in training with your HOVERSTAR.

It is extremely important that you do not attempt to fly your HOVERSTAR without the use of the HoverGuard until you become proficient at the hovering procedures outlined in the Flight Instructor video included with your kit.

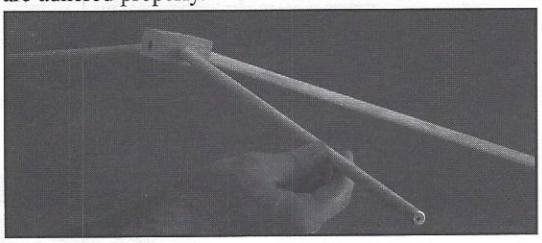
When properly installed and assembled, your HoverGuard will provide the best protection against possible damage or tip over, which can commonly occur when learning to hover.

The built-in spring action of the HOVERSTAR HoverGuard will absorb most of the hard impact which occurs with quick set downs, greatly reducing the fatigue to your model and its components.

A. Assembly of the HoverGuard

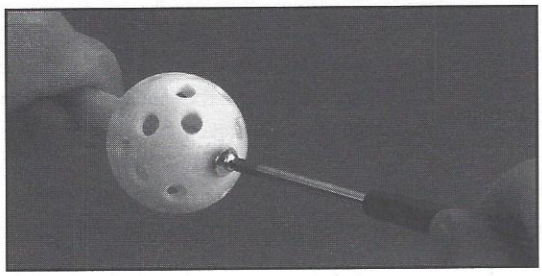
Insert the four 7/16"x22" dowel legs evenly into the center block of the HoverGuard, taking note that one end of each dowel leg has a pre-drilled hole and should be positioned away from the center block.

Remove one dowel leg at a time, apply CA adhesive, and then re-install. Repeat this procedure for the remaining legs. Check to insure that all four dowel legs are adhered properly.



Dowel leg attachment

B. For added durability and to prevent fuel soaking, it is recommended that you seal your HoverGuard training gear before use with clear dope or polyurethane. Seal your HoverGuard and let dry prior to final assembly.



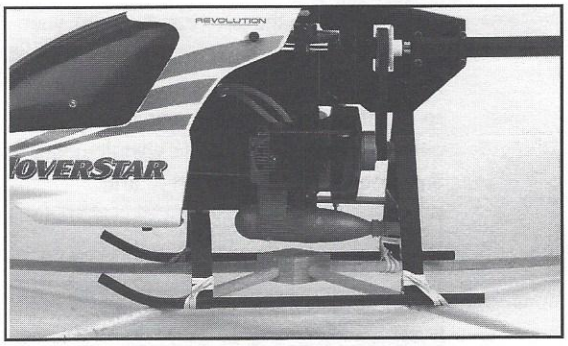
Training ball attachment

C. Install the four HoverGuard training balls to each end of the dowel legs and secure using the four self tapping screws and washers provided.

Make sure that each ball is free to rotate on the dowel leg.

D. Test fit your HoverGuard to your HOVERSTAR using the eight #64 rubber bands, attaching two to each dowel leg. Next, wrap each rubber band once around each landing strut and secure over the end of the landing skid tube. Repeat this procedure for all eight rubber bands.

Check the clearance between the HoverGuard and your muffler for adequate clearance.



Proper HoverGuard attachment (not muffler clearance)

HoverStar Flight Training Course

To complete the total training package, we have included the Flight Training Course to aid the beginning helicopter pilot with sight and sound information. It is an invaluable aid in the quest for knowledge and understanding of your HOVERSTAR.

Before your initial flights, view the video several times to become familiar with the various adjustments necessary to prepare your HOVERSTAR for flight training.

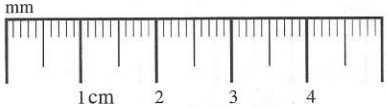
HoverStar Fuel Selection

Selecting the proper fuel for use in your HOVERSTAR could play an important role in the operating characteristics of your engine.

Model Helicopters unlike their airplane counterparts, require a more constant engine power output to maintain flight. These constant power requirements also tend to increase the operating temperature of the engine during use.

Although most helicopters, including the HOVERSTAR are cooled by a special cooling fan, it is sometimes necessary to use specially blended "helicopter" type fuels to reduce and maintain the engines operating temperature for proper operation.

In most cases, blended "helicopter fuel" contains a



higher percentage of oil content than the standard airplane blend fuels.

This additional oil helps to reduce and maintain the operating temperature of the engine during all types of flying, while providing additional engine reliability and extended engine life.

When choosing fuel for your HoverStar, although standard blend 10%-15% "aircraft" fuel is acceptable, in most cases greater reliability and performance will be achieved by using a special blend "helicopter" fuel with a nitromethane content of between 15%-30%.

Initial Flight Adjustments

A. Engine/Carburetor Adjustments

Your first task will be to adjust the low speed needle valve of your engine to achieve a reliable idle during starting. Most carburetors will be pre-set, requiring only minor adjustment for proper idle. Move the low speed needle valve 1/16" of a turn until a smooth, reliable idle is achieved. As a safety measure, it is recommended the engine be stopped before adjusting the low speed needle valve.

The high speed needle valve will need to be set by increasing the RPM of the helicopter until it approaches lift off.

This near lift-off should be achieved at approximately 1/2" to 5/"8 throttle. If you increase the throttle to 3/4" full stick without lift-off, the engine is too rich. Turn the main needle valve in 1/8" of a turn until you achieve the proper setting. This procedure is detailed in the HOVERSTAR Flight Training Course.

B. Main Rotor Blade Tracking

Main rotor blade tracking is a measure of the lift of each blade, which should be equal. If the lift of one rotor blade is greater than the other due to more pitch, warps, etc., then the blades will not travel in the same plane, resulting in excess vibration and reduced control.

The blade tracking tape that you applied to your rotor blade are contrasting colors to help identify each blade during operation.

On the initial run-up of your HOVERSTAR, you will need to view the main rotor blade tracking when the helicopter is light on the HoverGuard.

When viewing the blades at eye level, you will be able to see if both rotor blades are in track, running in the same plane, or out of track, running in two separate planes.

As a rule of thumb, it is best to remember by color which rotor blade is low or rotating in the lower plane. Next, you will stop the rotor head, and with the use of two crescent wrenches, increase the pitch angle of that blade slightly and re-test. Once you have chosen a particular blade or color, you should continue to work with the same rotor blade, adjusting the pitch until both blades are tracking with each other. If you find you have difficulty identifying each blade during flight, it may be necessary to apply additional tracking tape for better visibility. If an equal amount of additional tape is added, rebalancing the rotor head should not be necessary.

The HOVERSTAR Flight Training Course covers this important set-up procedure.

C. Final Flight Trimming

Final flight trimming can be accomplished once you have adjusted the engine and blade tracking. To do this, increase the engine throttle until the helicopter becomes light on the HoverGuard. Do this several times. If the helicopter continues to move or wander in the same direction each time, move the transmitter trim on the corresponding control surface slightly in the opposite direction and re-test. Continue this procedure until the model does not favor any specific direction.

When trimming your model, take into account the wind direction as the wind will play a significant role when trimming.

You will find that each day you return to fly, you might have to spend several minutes re-trimming your HOVERSTAR. This is due, in part, to the change in wind and weather conditions, as well as the installation of your HoverGuard. This trimming procedure is outlined in the HOVERSTAR Flight Training Course for clarification.

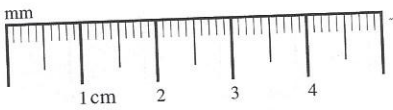
Initial Flight Training Practices

Once your model is properly trimmed and adjusted, you are ready for basic flight training exercises.

One of the first things that you should practice is ground skating or sliding your helicopter on the training gear, without ever lifting the heli off the ground. This procedure allows you to become familiar with the four main controls, with a reduced possibility of damage to your model.

The next procedure is to perform short flights, or hops, lasting only seconds at a time. Make sure that you lift the helicopter no more than one foot from the surface. Once proficient, you can lengthen the flights or hops. You are now on your way to learning how to hover.

It is suggested that for your first several trips to the flying area, you pick a day with very low wind. The stronger the wind, the more difficult it will be to fly your model. Please refer to the Flight Training Course for further information on training procedures.



General Maintenance

Following is a list of maintenance tips and maintenance schedules that will help keep your HoverStar in top operating condition for seasons to come.

Cleaning and inspection

After each flying session it's important to clean and inspect your HoverStar. Furniture polish and a soft cloth works great for removing fuel residue and dirt, plus it leaves a glossy shine on the anodized aluminum parts and canopy. Be sure to remove the canopy exposing the mechanics and radio gear. Check that all screws and nuts are properly tightened, that the radio gear, including the gyro, is securely fastened in place, and that the servo lead wires are neatly bundled and cannot come into contact with the edges of the main frame. Carefully inspect the blades for any nicks or cracks. If a crack in the main rotor blade should develop, **replace the blades IMMEDIATELY.** Never operate your HoverStar with a damaged rotor blade.

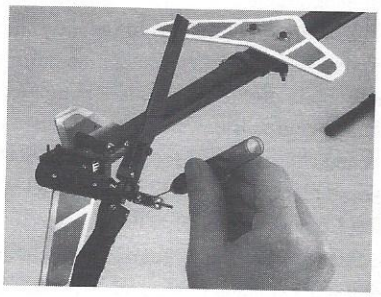
Examine the gear for any excess or unusual wear or missing teeth. Also check the belt condition by examining the teeth on the belt. If the teeth are worn or missing, replace the belt immediately. Also check the belt tension. When a belt is new it's normal for it to stretch slightly over the first several tanks full. Eventually it will stabilize and cease to stretch.

At the end of your flying session, if you don't plan on flying the HoverStar within the next week, it's recommend that the tank be fully drained and the engine run completely out of fuel. Then several drops of after run oil, available at your local Hobby Dealer, should be applied in the carburetor and the engine turned over with the starter for several seconds. This will prevent internal engine corrosion.

Lubrication

An important part of maintaining your HoverStar is proper lubrication. Use a high quality, medium viscosity oil on the following points:

Area	Frequency
Tail Rotor Pitch Plate	Before every flying session
Swashplate O-Ring	Every 2-3 hours
Tail Rotor Drive Shaft (Disassembly Required)	Every 5-6 hours or if a high pitched squealing occurs
Clutch Bushings	Every 2-3 hours
Bell Crank Pivot Points	Every 5-6 hours



Apply a light drop of oil to the tail pitch plate assembly.

Apply a light drop of oil to each ball link and swashplate O-Ring.

In addition, a few drops of oil should be applied to each ball bearing every 8-10 hours of service.

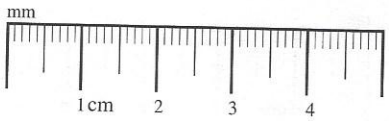
After every 10 hours of operation, it is important to disassemble the tail rotor gear box, clean out the old grease and pack the gear box 1/3 full with a high quality grease.

NOTE: *After a crash, it's important to thoroughly clean and relubricate the above mentioned areas. Also note that if you're flying in a dirty, dusty area, it will be necessary to clean and lubricate these areas more frequently than prescribed.*

Periodically check that your blades track properly. It's normal to have to occasionally adjust the blade tracking slightly to bring them back into perfect alignment.

After every 5-6 hours of use, it's important to check the fit of each ball link on their respective ball. The plastic link should rotate freely on the ball but with very little in/out, up/down for free play. Replace the link when an excessive amount of free play is noticed.

By following these simple maintenance steps, your HoverStar will reward you with many seasons of reliable, enjoyable flying.

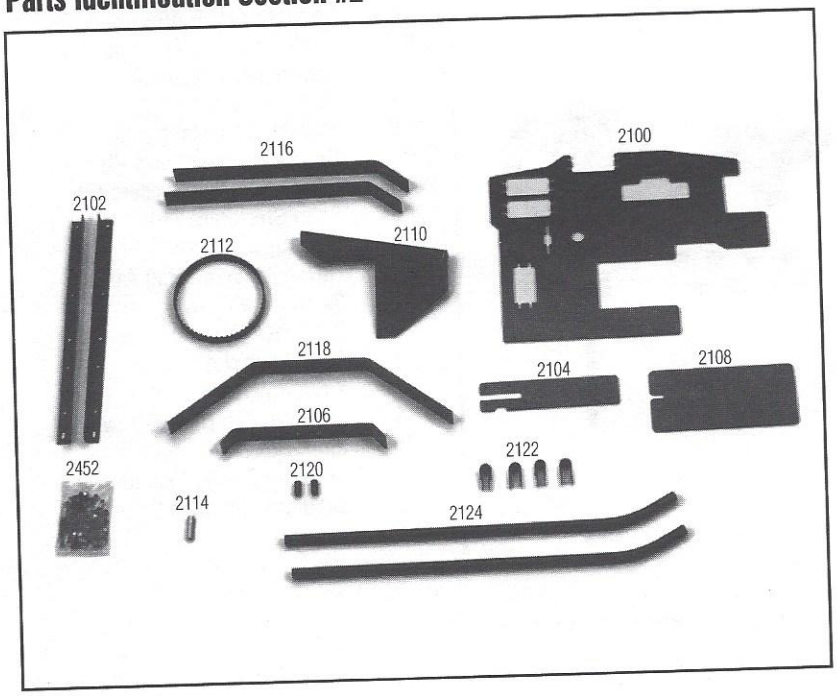


PARTS IDENTIFICATION/ORDERING CHARTS

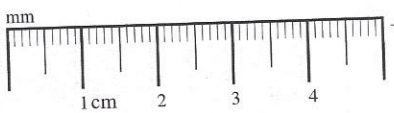
Parts Identification Section #1 — Engine Assembly

2050	Flywheel Assembly
2052	Flywheel Spacers
2054	Clutch Assembly
2056	Clutch Bell Assembly
2060	Starting Cone
2062	Engine Mounting Plate
2064	Cooling Fan Shroud
2066	Upper Fan Shroud Bracket
2451	Hoverstar Screw Bag #1
5	3mm Lock Nut
6	3mm Large Washer
4	3x16mm Socket Head Screw
2	3x10mm Socket Head Screw
2	3x5mm Set Screw

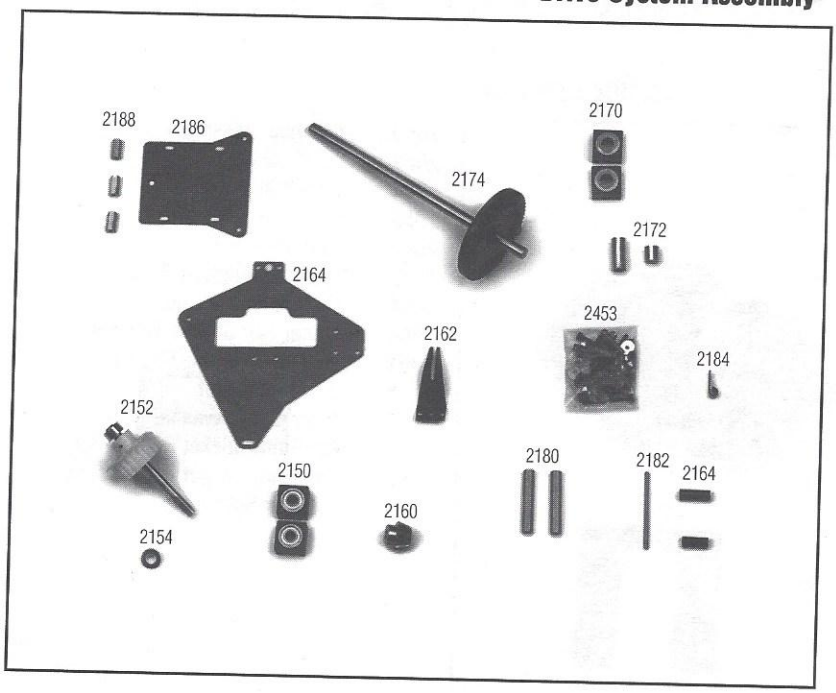
Parts Identification Section #2 — Main Frame Assembly



2100	Main Frame Plate
2102	Lower Frame Angles (L& R)
2104	Lower Frame Extension
2106	Rear Landing Strut Crossmember
2108	Canopy Floor
2112	Drive Belt
2110	Tail Boom Mounting Plate
2114	Lower Canopy Mount
2116	Rear Landing Struts (2)
2118	Front Landing Strut
2120	Front Landing Strut Standoffs (2)
2122	Landing Strut Clamps (4)
2124	Landing Skid Tubes
2452	Hoverstar Screw Bag #2
22	3mm Lock Nut
4	3mm Washer
2	3x25mm Socket Head Screw
2	3x20mm Socket Head Screw
10	3x10mm Socket Head Screw
11	3x12mm Socket Head Screw

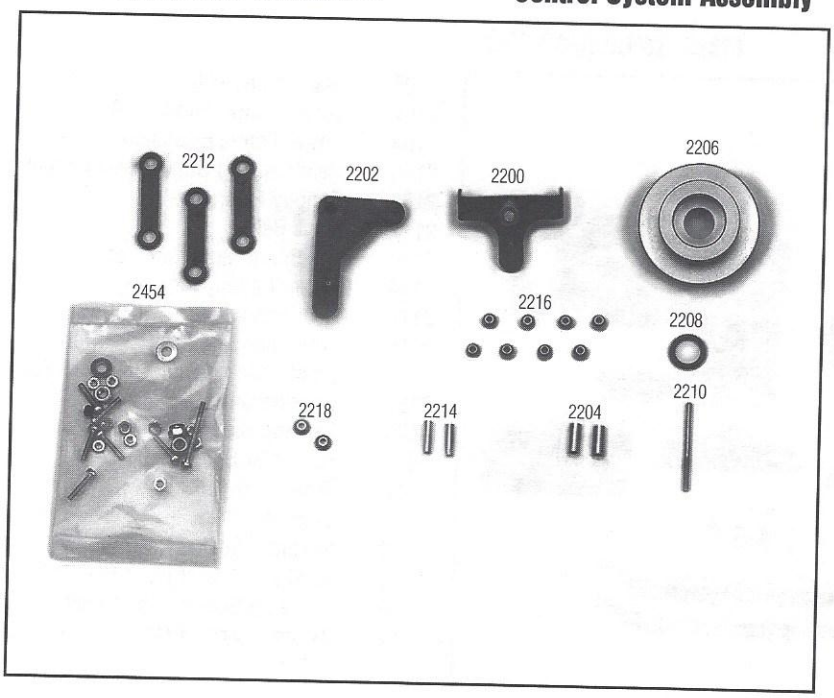


Parts Identification Section #3 — Drive System Assembly



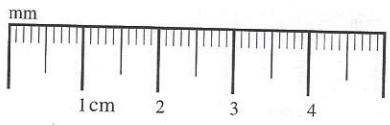
2150*	Bearing Block w/BB (Intermediate Shaft) (1)(2pc Per Kit)
2152	Intermediate Shaft Assembly
2154	1/4"x.032 Washer
2160	Intermediate Shaft Bevel Gear
2162	Swashplate Locating Bracket
2164	Frame Doubler Plate
2170*	Bearing Block w/BB (Mainshaft) (1)(2pc Per Kit)
2172	Main Shaft Spacers (Long & Short)
2174	Main Rotor Shaft Assembly w/ Gear
2180	Upper Canopy Mount Standoff (2)
2182	Upper Canopy Mount Stud
2184	Tail Control Rod Clip w/Standoff
2186	Fuel Tank Mounting Plate
2188	Fuel Tank Mounting Standoffs
2453	Hoverstar Screw Bag #3
9	3mm Washer
6	3mm Large Washer
2	3x10mm Socket Head Screw
4	3x12mm Socket Head Screw
1	3x10mm Flat Head Screw
1	3x20 Pan Head Screw
1	2.5mm Hex Nut
1	4x4mm Set Screw
9	3x30mm Socket Head Screw
10	3mm Lock Nut
1	1/4" .032 Washer

Parts Identification Section #4 — Control System Assembly

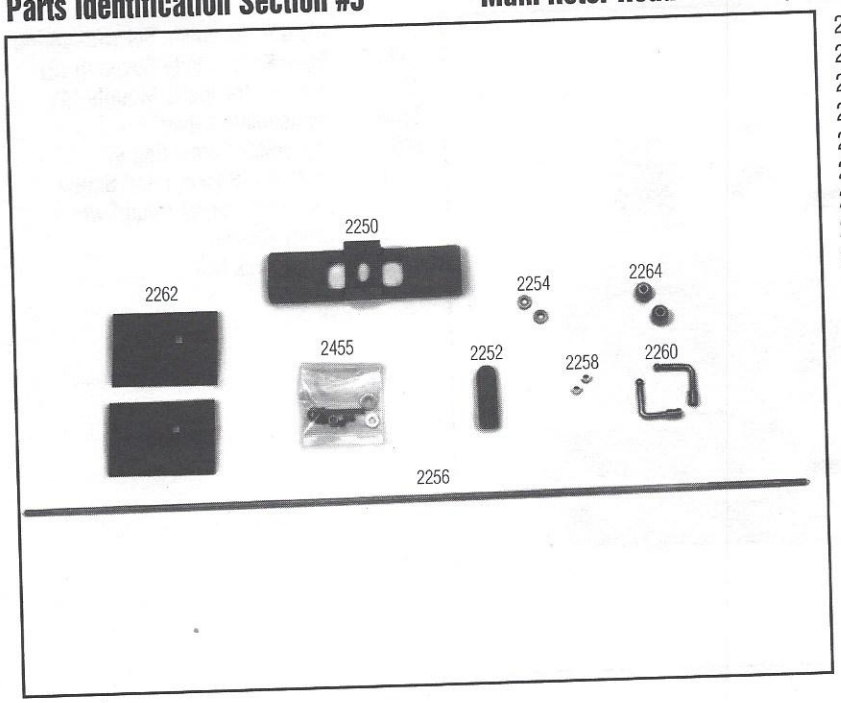


2200	Control Lever T Arm
2202	Control Lever L Arm
2204	Control Lever L Arm Spacers
2206	Swashplate Assembly
2208	Swashplate "O" Ring
2210	Swashplate Locating Pin
2212	Double End Ball Links (3)
2214	Swashplate Ball Spacers (2)
2216*	5mm Steel Balls (10)
2218	Cone Spacers (2)
2454	Hoverstar Screw Bag #4
1	3x5mm Set Screw
1	3mm Hex Nut
2	3mm Lock Nut
2	2.5mm Washer
6	2x10mm Pan Head Screw
10	2mm Hex Nut
1	3x30mm Socket Head Screw
2	2x20mm Pan Head Screw

* Replacement Part Quantity Shown.

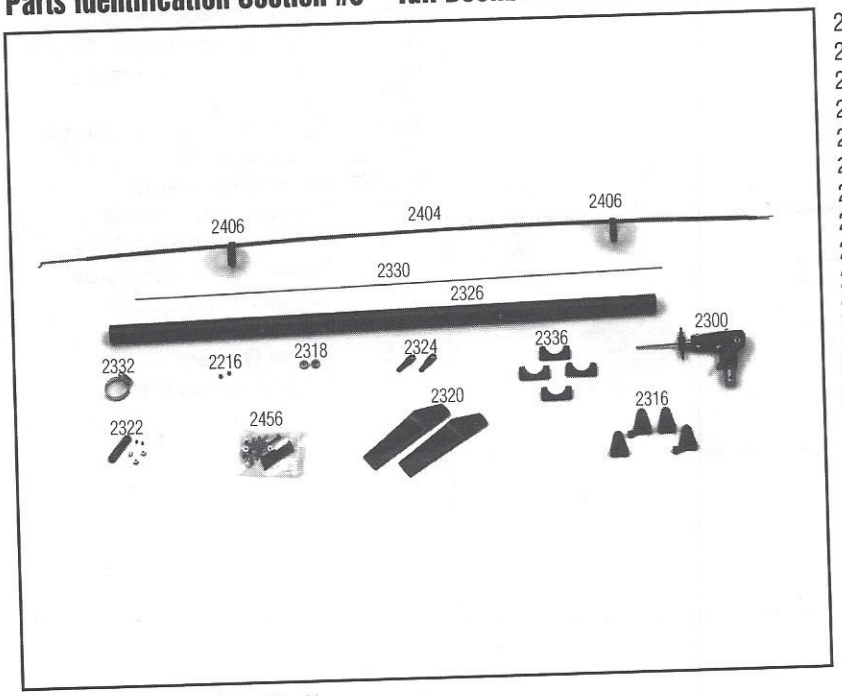


Parts Identification Section #5 Main Rotor Head Assembly



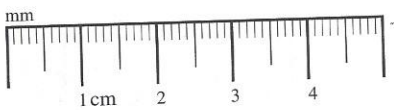
2250	Main Rotor Head Body
2252	Main Rotor Head Hub
2254	Main Rotor Head Bearings (2)
2256	Flybar
2258	Flybar Spacers (2)
2260*	Flybar Control Arm (1)(2pc Per Kit)
2262	Flybar Control Paddles (2)
2264	Flybar Weights (2)
2455	Hoverstar Screw Bag #5
1	4x25mm Socket Head Screw
1	4mm Lock Nut
6	4x4mm Set Screw
2	4mm Washer
1	4mm Special (rotor head) Washers

Parts Identification Section #6 Tail Boom/Tail Gear Box Assembly

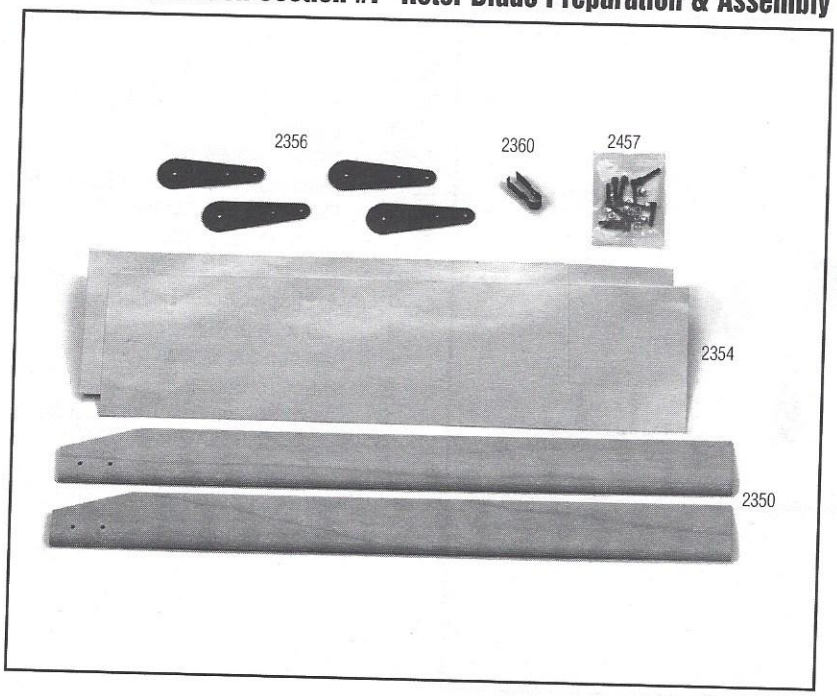


2300	Tail Gear Box Assembly
2316	Tail Blade Holders (4)
2318	Tail Blade Holder Bearing (2)
2320	Tail Rotor Blades (2)
2322	Tail Pitch Plate Assembly
2324*	Ball Links (6)
2216*	5mm Steel Balls (10)
2326	Tail Boom w/Guides
2330	Tail Drive Shaft
2332	Tail Gear Box Clamp
2336	Tail Boom/ Fin Mounts (4pc)
2404	Tail Control Rod Set
2406	Tail Control Rod Guides
2456	Hoverstar Screw Bag #6
4	3x35mm Socket Head Screw
2	3x16mm Socket Head Screw
8	3mm Lock Nut
4	3mm Washer
2	3x5mm Set Screw
8	2x10mm Pan Head Screw

* Replacement Part Quantity Shown.

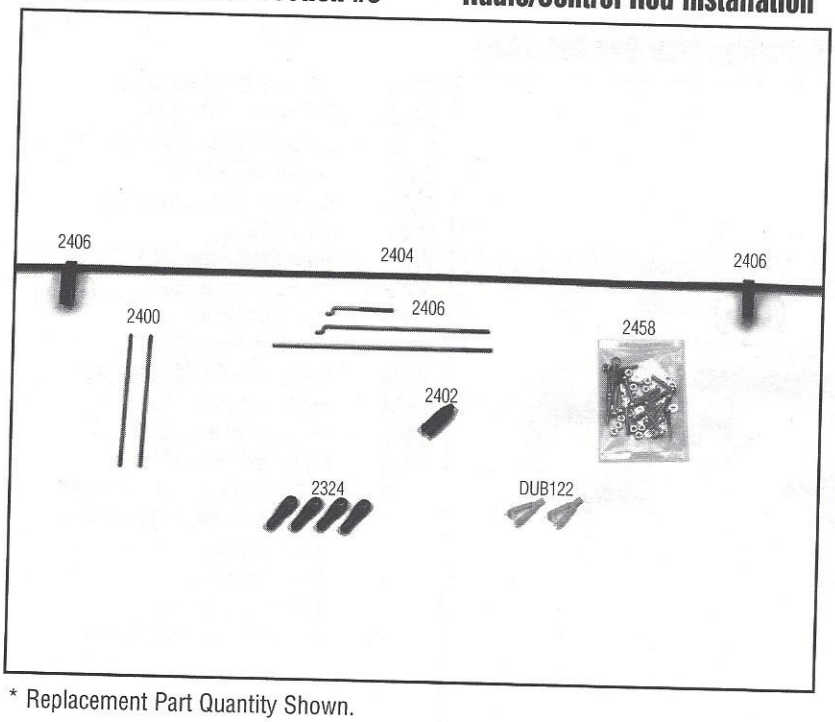


Parts Identification Section #7 Rotor Blade Preparation & Assembly



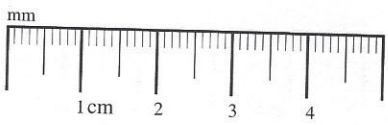
2350	Main Rotor Blade Set w/Covering
2354	Main Rotor Blade Covering (2)
2356	Main Rotor Blade Mounts (4)
2360	Swashplate Driver
2457	Hoverstar Screw Bag #7
1	3x20mm Socket Head Screw
9	3x16mm Socket Head Swrew
2	3mm Washer
10	3mm Lock Nut

Parts Identification Section #8 Radio/Control Rod Installation

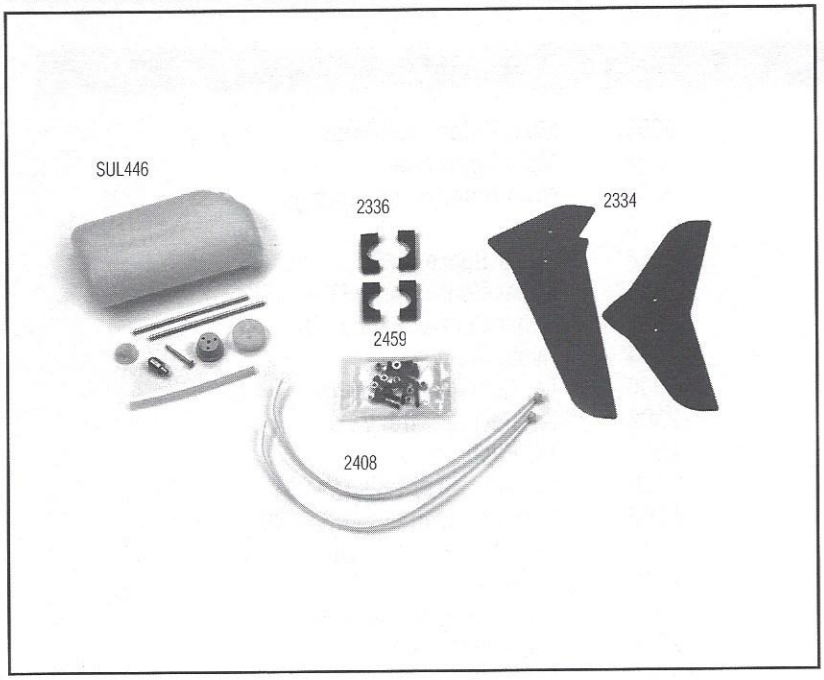


2404	Tail Control Rod Set w/Clamp
2406	Tail Control Rod Clamps (2)
2400	2x90mm Flybar Control Rod (2)
2402	Servo Rod Set w/Z Bends (3)
2324*	Ball Links (6pc)
2184	Tail Control Rod Clip w/Standoff
DUB122	Plastic Clevis (2)
DUB121	Adjustable Connector
2458	Hoverstar Screw Bag #8
16	2.5x15mm Pan Head Screw
1	3x8mm Socket Head Screw
1	2x8mm Pan Head Screw
16	2.5mm Hex Nut
16	2.5mm Washer
2	2x10mm PanHead Screw

* Replacement Part Quantity Shown.

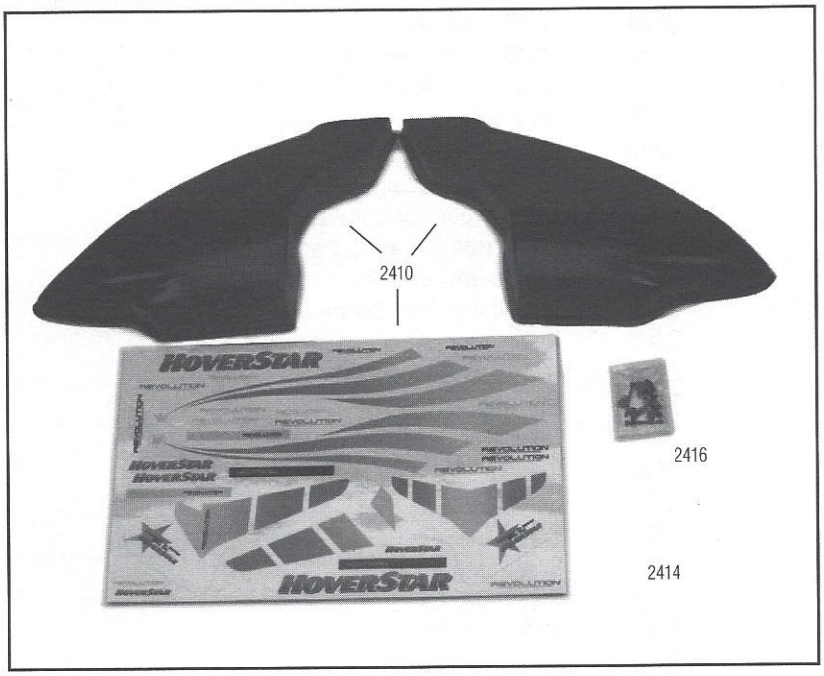


Parts Identification Section #9 — Fuel Tank, Tail Fin Assembly

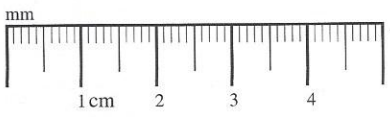


2334	Tail Fin Set (Vertical & Horizontal)
2336	Tail Boom/Fin Mounts (4pc)
SUL446	8oz Fuel Tank Assembly
2408	Nylon Tie Wraps (2)
2459	Hoverstar Screw Bag #9
4	3x35mm Socket Head Screw
4	3mm Lock Nut
3	3mm Large Washer
4	3mm Washer
3	Canopy Thumb Screw

Parts Identification Section #10 — Canopy Assembly



2410	Hoverstar Canopy Set (Canopy, Decal Set, Canopy Mounting Hardware)
2414	Hoverstar Decal Set
2416	Hoverstar Canopy Mounting Hardware (3-Thumb Screws, 3-Canopy Grommets, 3-3mm Large Washers)



HOVERSTAR COMPLETE/NUMERICAL PARTS LIST

PART #	DESCRIPTION
2050	Flywheel Assembly
2052	Flywheel Spacers (2)
2054	Clutch Assembly
2056	Clutch Bell Assembly
2058	Clutch Lining
2060	Starting Cone
2062	Engine Mounting Plate
2064	Cooling Fan Shroud
2066	Upper Fan Shroud Bracket
2100	Main Frame Plate
2102	Lower Frame Angles (2)
2104	Lower Frame Extension
2108	Canopy Floor
2110	Tail Boom Mounting Plate
2106	Rear Landing Strut Crossmember
2112	Drive Belt
2114	Lower Canopy Mount (1)
2116	Rear Landing Struts (2)
2118	Front Landing Strut
2120	Front Landing Strut Standoff (2)
2122	Landing Strut Clamps (4)
2124	Landing Skid Tubes (2)
2150*	Bearing Block w/BB (Int. Shaft)(1)
2152	Intermediate Shaft Assembly
2154	1/4 x .032 Washer
2156	Intermediate Shaft Pulley w/Pin
2158	Intermediate Shaft Collar
2160	Intermediate Shaft Bevel Gear
2162	Swashplate Locating Bracket
2164	Frame Doubler Plate w/Spacers
2170*	Bearing Block w/BB (Main Shaft)(1)
2172	Main Shaft Spacers (2)
2174	Main Shaft Assembly w/Gear
2176	Main Shaft
2178	Main Driver Gear w/Pin
2180	Upper Canopy Mount Standoff (2)
2182	Upper Canopy Mount Stud
2184	Tail Control Rod Clip w/Standoff (2)
2186	Fuel Tank Mounting Plate
2188	Fuel Tank Mount Standoff (3)
2190	Belt Tension Gauge
2200	Control Lever T Arm
2202	Control Lever L Arm
2204	Control Lever L Spacers (2)
2206	Swashplate Assembly
2208	Swashplate O-Ring
2210	Swashplate Locating Pin
2212	Double End Ball Links (3)
2214	Swashplate Ball Spacers (2)
2216	5mm Steel Ball (10)
2218	2mm Cone Washer (2)
2250	Main Rotor Head Body
2252	Main Rotor Head Hub
2254	Main Rotor Head Bearings
2256	Flybar
2258	Flybar Spacers (2)
2260*	Flybar Control Arm(1)
2262	Flybar Control Paddle (2)
2264	Flybar Weights (2)
2300	Tail Gear Box Assembly
2302	Tail Pitch Control Wire
2304	Tail Pitch Lever
2306	Tail Rotor Input Shaft w/BB
2308	Tail Rotor Output Shaft w/BB
2310	Tail Rotor Hub Spacer
2312	Tail Rotor Blade Hub
2313	Tail Rotor Drive Coupler
2314	Tail Gear Box Case
2316	Tail Blade Holders (4)
2318	Tail Blade Holder Bearings (2)
2320	Tail Rotor Blades
2322	Tail Pitch Plate Assembly
2324	Ball Links (6)
2326	Tail Boom w/Guides (2)
2328	Tail Drive Shaft Guides (2)
2330	Tail Drive Shaft
2332	Tail gear Box Clamp
2334	Tail Fin Set (2)
2336	Tail Boom/Fin Mounts (8)
2350	Main Rotor Blade Set
2354	Main Rotor Blade Covering
2356	Main Rotor Blade Mounts (4)
2360	Swashplate Driver
2400	2x90 Flybar Control Rod (2)
2402	Servo Rod Set w/Hardware
2404	Tail Control Rod Set
2406	Tail Control Rod Clamp (3)
2408	Nylon Tie Wraps
2410	Hoverstar Canopy Set
2412	Hoverstar Canopy
2414	Hoverstar Decal Set
2416	Canopy Mounting Hardware
2451	Screw Bag #1
2452	Screw Bag #2
2453	Screw Bag #3
2454	Screw Bag #4
2455	Screw Bag #5
2456	Screw Bag #6
2457	Screw Bag #7
2458	Screw Bag #8
2459	Screw Bag #9

* Replacement Part Quantity Shown.

HOVERSTAR™

TROUBLESHOOTING GUIDE

PROBLEM	CAUSE	CURE
Helicopter Vibrates Excessively	A. Rotor Head out of balance B. Belt tension too tight/loose C. Excessive clutch Run-out D. Engine Running Roughly	A. Re-balance rotor head system and blades B. Readjust belt tension C. Remove/Reinstall clutch assembly align D. Change heat range of glow plug, readjust carburetor
Engine Runs Inconsistent or Overheats	A. Belt tension too tight B. Glow Plug C. Fuel D. Main Blade Pitch	A. Loosen belt tension slightly B. Change glow plug type/heat range C. Change/switch to heli blend fuel.change fuel brand D. Reduce or increase main blade pitch slightly
Helicopter Rotates with Full Tail Rotor Trim	A. Tail pitch incorrect B. Main Rotor Pitch incorrect C. Gyro Gain too low/high D. Tail drive shaft slipping	A. Adjust tail pitch plate in/out with collars, re-center trim B. Increase or reduce main blade pitch slightly C. Increase or decrease gain D. Tighten tail drive shaft set screws
Main Rotor Blades do not "Track"	A. Blades warped or twisted B. Main blade Plates too loose C. Main blade plates misaligned	A. Straighten or replace as necessary B. Tighten blade plate bolts C. Realign blade plates/rotor blades
Clutch "Grabs" or binds at Idle	A. Belt tension too tight B. Drive pulleys misaligned C. Clutch shaft too dry D. Start cone misaligned	A. Loosen tension slightly B. Realign engine and set belt tension C. Remove clutch bell and oil clutch shaft lightly D. Reposition start cone so there is play between cone and clutch bell
Main Rotor RPM too High	A. Main Blade Pitch B. Engine too "Lean"	A. Increase Pitch in both main blades slightly B. Richen Engine slightly
Main Rotor RPM too Low	A. Main Blade Pitch B. Engine too "Rich"	A. Decrease pitch in both main blades slightly B. Lean engine slightly
Helicopter will not Lift off Ground	A. Engine too "Rich" B. Blade Pitch too High/Low C. Belt Tension too Tight	A. Lean engine slightly B. Increase/decrease pitch in both main blades slightly C. Loosen belt tension slightly
Helicopter Constantly "drifts" in same direction	A. Control Linkage out of Adjustment B. Incorrect C.G. Balancing C. Incorrect Positioning of Hoverguard Training Gear	A. Adjust linkage so that no trim is needed B. Re-check C.G. balancing and adjust C. Re-position HoverGuard training gear
Helicopter Rotates Uncontrollably	A. Gyro Direction Reversed B. Gyro Gain Too Low C. Tail Rotor Servo Reversed D. Main Rotor RPM Too Low	A. Re-test Gyro direction and correct B. Increase Gyro gain C. Re-check tail rotor servo direction and correct D. Decrease pitch in both main blades slightly

HOVERSTAR HELPLINE

1-217-355-9511

Even though we've tried to cover every angle, there may still be questions. So we have an answer—the HoverStar Helpline. A special line staffed with some special people familiar with the HoverStar to answer your questions.

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4105 Fieldstone Road
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