INSTRUCTION COMMON UPGRADES

1001 X-Cell Unit

miniature aircraft usa

X-CELL FRONT TRANSMISSION ALIGNMENT TOOL
#0507

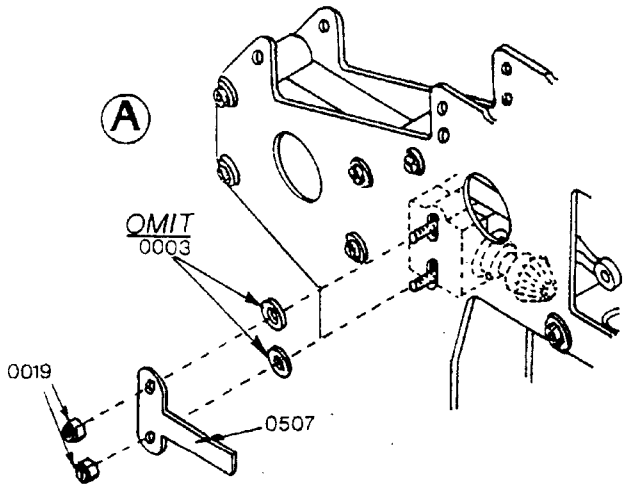
This tool ensures that the front transmission of any X-Cell Helicopter is level to the main gear (critical to proper gear mesh and longevity). The tool can be used during building or simply left permanently in place. If the later is chosen, you can be assured that hard landings or abusive flying has not compromised gear mesh by simply visually comparing the bottom straight edge of the tool with the edge of the mainframe just above the main gear.

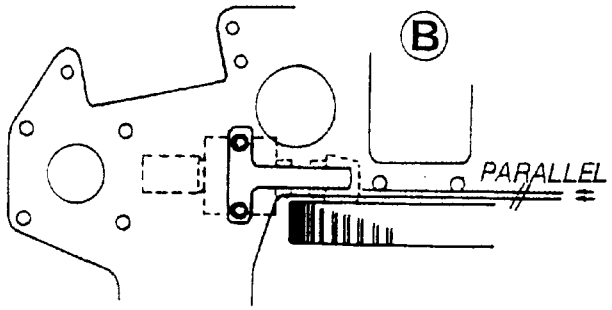
Installation Method:

Temporary (during the build-up) - in the normal transmission installation, the socket head bolts install from the left side of the model. To aid in alignment, simply press the tool onto the exposed threaded ends of the M3 socket head bolts on the right side of the model. See drawing (B) for tool positioning.

Permanent:

Substitute the #0507 tool for the (2) #0003 flat washers, align as necessary and tighten the (2) M3 locknuts.





#0507.DOC
February 11, 1994

IMPORTANT NOTICE - Extended .30, .40, .50, .60 Mainshafts

Instructions for .50/.60 Extended Main Shaft Kit #0530
.30/.40 Extended Main Shaft #0614

Kit #0530 includes 1 #0614, 1 #0019, 1 #0619, 1 #0067.

Part #0614 supercedes #0203 and #0613. #0614 is 10.0mm longer than #0203 and #0613. A number of reasons have made this change desireable.

SPECIAL NOTE: **The solid end of the main shaft must be installed (downward) in the autorotation gear with the drilled end installed in the rotor head block facing upwards.**

A. If the optional #0540 mainshaft thrust bearing kit is utilized, additional swashplate-to-frame clearance is helpful.

B. If the hi-tilt flybar system #0565 is installed, it is beneficial to have more flybar clearance during hard flying.

C. Some extra hovering stability is gained by the longer mainshaft.

D. Additional boom clearance is possible during poorly executed autorotations or hard landings.

NOTE: As per drawing - when using shaft #0614 in place of the original shaft #0203 for the X-Cell .50 or .60, part #0215 collar and #0213 washer will be substituted by 1 #0619 washer, 1 #0067 (3x14mm) bolt and 1 #0019 (3mm) locknut.

Some important steps are necessary when installing this unit. It is your option as to whether or not you elect to utilize its full length or portions of it. By using plastic spacers #0210 (5.0mm tall) under the autorotation assembly (and above #0619 washer), you can use it in one of three ways (each has corresponding special instructions).

MODE 1 - Using the shaft in its full length (**without any** #0210 spacers). Readjust all four #0227 swashplate support pushrods so that the gap between the back surface of each ball link is 29.5mm. The flybar control rods should be readjusted so that the gap from link to link is 8.5mm ("gap" meaning the amount of pushrod exposed -- be sure equal amounts of threads are showing on the swashplate rods). The hiller rods should have a gap of 58.0mm.

MODE 2 - Using the #0614 shaft with (1) #0210 5.0mm spacer. Readjust the four #0227 swashplate support pushrods to a "gap" of 27.0mm. The flybar pushrods should again be adjusted to a "gap" of 6.5mm. The hiller pushrods should have a "gap" of 56.0mm. Install (1) #0210 plastic spacer between the auto unit and the #0619 washer.

MODE 3 - Using the #0614 shaft with (2) #0210 5.0mm spacers (or the same as original stock length #0203 or #0613 mainshaft). Follow all original pushrod length adjustments and install (2) #0210 5.0mm thick plastic spacers below the autorotation assembly and above washer #0619 and the lower autorotation collar. In this mode, clearance must be cut into the fan shroud -- a 20.0mm diameter hole is suitable.

In each case be sure to apply a drop of oil or light grease to the #0619 washer and any #0210 spacers used.

Order #0614 for replacement shafts.

If Mode 1 or 2 are used, perform the following procedure:

Drill a new hole 15.5mm from the bottom of support #0247 (directly between the existing holes) with a #32 drill (.116" or 3.0mm) completely through. Make a countersink hole at half depth using a #3 drill (.213" or 5.5mm) and light pressure.

Drill a new hole in the left main frame directly between the two existing support mounting holes (16.0mm from the top or bottom edge) with a #32 drill (.116" or 3.0mm)

Install anti-rotation support #0247 using the upper two holes in the frame and the lower two holes in the support. This will raise the support by about 9.0mm (thereby accommodating any additional main shaft length).

WARNING: **It is most important that you follow these directions closely to avoid any possible disengagement of the #0219 washout hub from its guide pins #0297 in the lower head block during extreme negative pitch ranges. The steps outlined will prevent this situation.**

Instructions for #0614

Part #0614 supercedes #0613. #0614 is 10.0mm longer than #0613. A number of reasons have made this change desireable.

A. Additional swashplate-to-frame clearance at full negative pitch is helpful.

B. If the hi-tilt flybar system #0565 is installed, it is beneficial to have more flybar clearance during hard flying.

C. Some extra hovering stability is gained by the longer mainshaft.

D. Additional boom clearance is possible during poorly executed autorotations or hard landings.

Some **important** steps are necessary when installing this unit. It is your option as to whether or not you elect to utilize its full length or portions of it. By using plastic spacers #0210 (5.0mm tall) under the autorotation assembly (and above the #0619 lower washer and retaining bout), you can use it in one of three ways (each has corresponding special instructions).

MODE 1 - Using the shaft in its full length (**without any** #0210 spacers). Readjust all four #0227 swashplate support pushrods so that the "gap" between the back surface of each ball link is 29.5mm. The flybar control rods should be readjusted so that the "gap" from link to link is 8.0mm ("gap" meaning the amount of pushrod exposed -- be sure equal amounts of threads are showing on the swashplate rods). The hiller rods should have a gap of 60.0mm.

MODE 2 - Using the #0614 shaft with (1) #0210 5.0mm spacer. Readjust the four #0227 swashplate support pushrods to a "gap" of 27.0mm. The flybar pushrods should again be adjusted to a "gap" of 8.0mm. The hiller pushrods should have a "gap" of 59.0mm. Install (1) #0210 plastic spacer between the auto unit and the #0619 washer.

MODE 3 - Using the #0614 shaft with (2) #0210 5.0mm spacers (or the same as original stock length #0613 mainshaft). Follow all original pushrod length adjustments and install (2) #0210 5.0mm thick plastic spacers below the autorotation assembly and above washer #0619. In this mode, clearance must be cut into the fan shroud -- a 20.0mm diameter hole is suitable.

In each case be sure to apply a drop of oil or light grease to the #0619 washer and any #0210 spacers used.

If Mode 1 or 2 are used, perform the following procedure:

Drill a new hole 15.5mm from the bottom of support #0247 (directly between the existing holes) with a #32 drill (.116" or 3.0mm) completely through. Make a countersink hole at half depth using a #3 drill (.213" or 5.5mm) and light pressure.

Drill a new hole in the left main frame directly between the two existing support mounting holes (16.0mm from the top or bottom edge) with a #32 drill (.116" or 3.0mm)

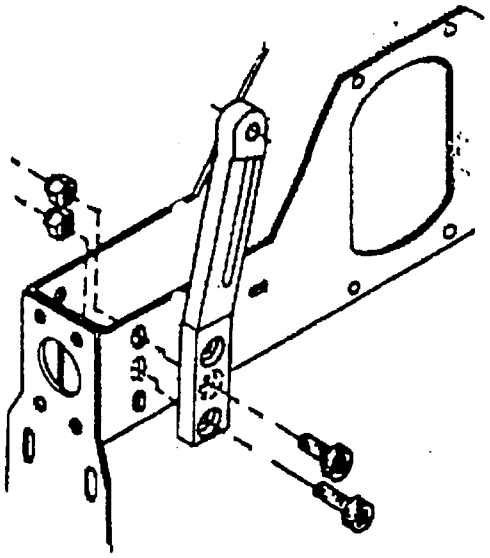
Install anti-rotation support #0247 using the upper two holes in the frame and the lower two holes in the support. This will raise the support by about 9.0mm (thereby accommodating any additional main shaft length).

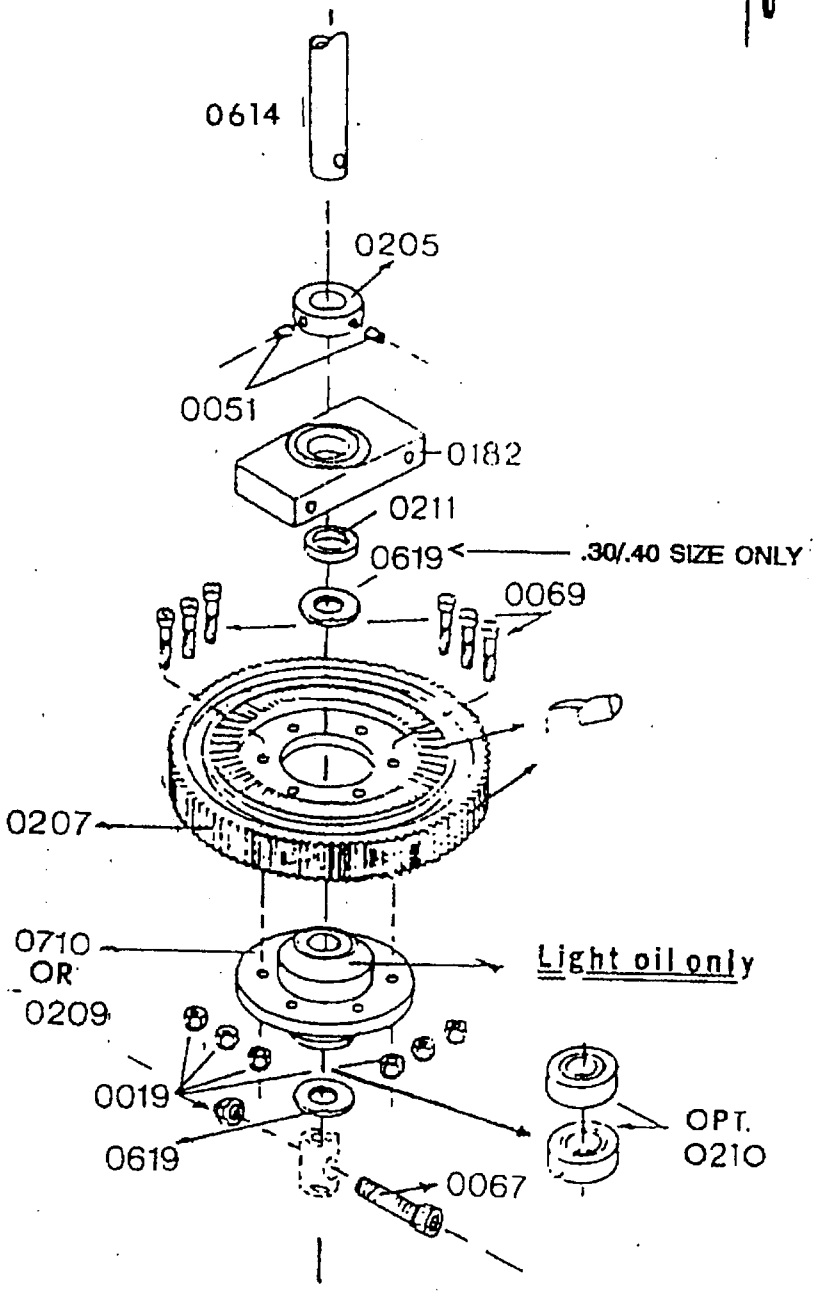
WARNING: It is most important that you follow these directions closely to avoid any possible disengagement of the #0219 washout hub from its guide pins #0297 in the lower head block during extreme negative pitch ranges. The steps outlined will prevent this situation.

NOTE: Some shafts will be of two-piece construction. Use the solid end within the autorotation unit.

LONG SHAFT #0614

Rod #	No Spcrs	One Spcr
0337	8.5mm	6.5mm
0227	29.5mm	27mm
0335	58mm	56mm



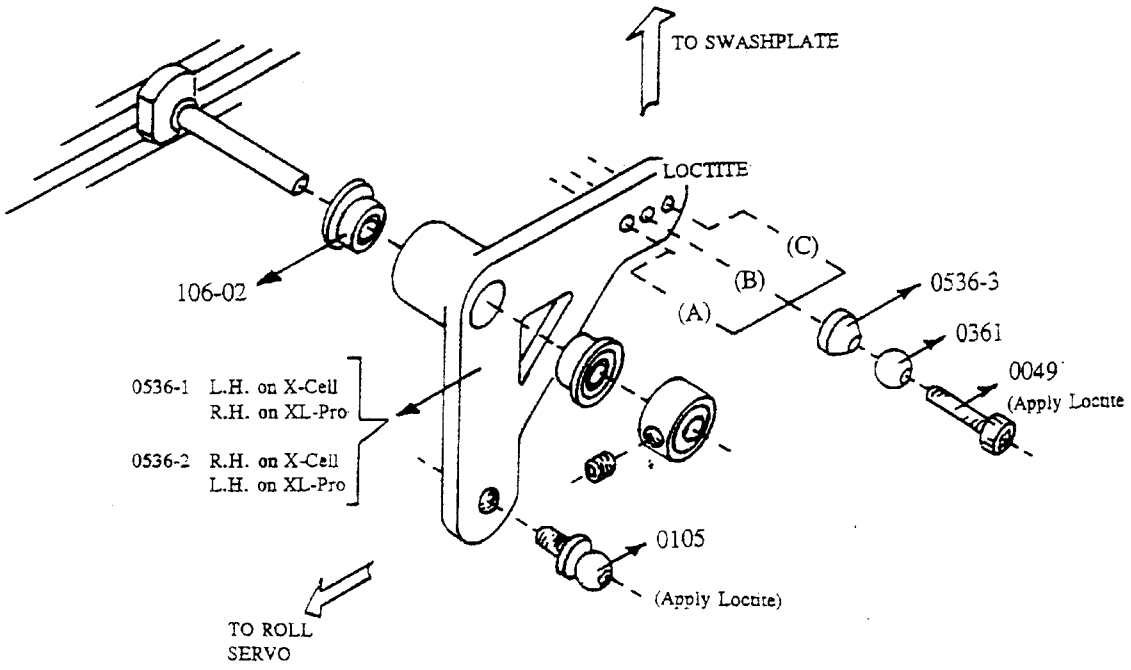


#0536 ADJUSTABLE ROLL BELLCRANKS
(Replace #0167)

Allows up to +/- 10% variation on swashplate deflection or ATV. Plus increased rigidity over plastic unit. Precision C.N.C. machined and gold anodized 6061-T6 aluminum.

CONTENTS:

1	#0536-1	Bellcrank
1	#0536-2	Bellcrank
4	#106-02	M3 Ball Bearings (installed)
2	#0536-3	M2 Conical Spacers
2	#0361	Steel Balls
2	#0049	M2x10 Socket Head 12.9 Hard Screws
2	#0105	Threaded Steel Balls M3x4.5



POSITION (A) - Up to 10% less swashplate deflection or
Up to 10% greater A.T.V.

POSITION (B) - Up to 5 % less swashplate deflection or
Up to 5 % greater A.T.V.

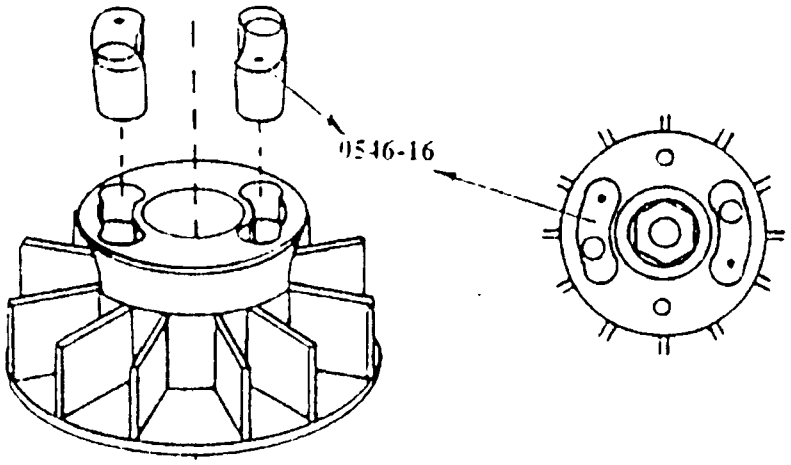
POSITION (C) - Original position as in #0167

0546-16A
MOULDED CLUTCH DAMPENER

CONTENTS:

2 #0546-16 Dampeners

Examine the drawing for the correct orientation of each damper within the fan hub. In each case, the side with the small 1.0 mm diameter "dimple" (adjacent to the large through hole is to be upward facing away from the engine. Apply talcum powder or a little soapy water (do not use oil, grease, or silicone) to the dampener and push it fully into the slot provided until even with the top surface. Repeat with the second dampener. When completed, add a little talcum powder to the hole in each dampener to make clutch insertion easier



#0549
ADAPTER KIT FOR OPTIONAL GEAR RATIOS IN X-CELL .60 (#1001, #1003)

Purpose

To modify existing components to accept optional main-gear ratios.
9.3 to 1 Gear #0549-93 (93 tooth).
9.4 to 1 Gear #0549-94 (94 tooth).
9.5 to 1 Gear #0549-95 (95 tooth).
9.6 to 1 Gear #0549-96 (96 tooth).
(Each gear choice is available separately and not contained in adapter kit #0549.)

Contents

1	#0029	M2.2x13 Phillips tapping screw
2	#0063	M3x10 Socket head bolts
2	#0009	M3 Small flat washers
4	#0067	M3x14 Socket head bolts
2	#0003	M3 Large flat washers
4	#0080	M4x14 Socket head bolts
6	#0549-4	Motor shims
1	#0549-3	Motor mount (recognized by an index mark on motor surface)
2	#0549-5	Cooling shroud assembly (1 each, left & right)
1	#0549-6	Cooling shroud brace (right)
1	#0549-7	Cooling shroud brace (left)

Instructions

NOTE: The following instructions will assume that the engine/clutch assembly, upper bearing block, fan shroud and motor mount are removed from the model.

Step #1 - Frame Modification:

(Does not apply to X-Cell kits or frames manufactured after 1/1/92.) It is necessary to elongate the slots in the frame that hold the clutch bearing block #0198, bolt #0077. Each slot should be elongated forward a total of 3.0mm. This is simply accomplished by using a center punch to mark the frames 1.5mm ahead of each slot. Drill each mark with an M3 drill (.118") and use a small file to even out the slot. The following will explain the use of the above slots, the motor shims #0549-4 and motor mount 0549-3.

Ratio	Motor Shims	Resultant Engine Shift (forward)
9.3 to 1	3 each side	1.37mm (.054")
9.4 to 1	2 each side	1.835mm (0722")
9.5 to 1	1 each side	2.315mm (.0911")
9.6 to 1	None	2.710mm (.1067")

Step #2 - Main Gear:

Select the main gear best suited for your application. The following are general guidelines and are not to be considered the only choices.

9.3, 9.4 to 1: Good for overall use with a wide variety of engines (particularly O.S. .61 SFN-FSR, Enya XF IV, Webra .61 and Super Tiger) with moderate rpm ranges. This ratio will allow hovering rpm down to about 1,300 with engine/carburetor difficulties. Top rotor speed usually at about 1,700 maximum. A good "hotdog" type ratio where engine loading is a little greater but top rotor speed is still desirable. Miniature Aircraft USA modified engines (O.S. or Enya short stroke responds well with this ratio and up to 680.0mm blades) - 9.3 - 9.4 to 1 may still be used for constant rotor speed type setups, if desired (1,600 - 1,700 rpms).

9.5 to 1: Similar to 9.4 to 1 in general characteristic - except that hovering rpm can be further reduced by 50 to 75 rpm without difficulty. A constant type rpm setup or 1,600 to 1,700 can still be utilized, if desired, with this ratio. Top rpm will drop by 50 rpm as compared to 9.4 to 1. Some long-stroke engines respond well to 9.5 to 1.

9.6 to 1: The preferred ratio for longstroke (O.S. series or Y.S. long stroke) and higher rpm motors (Rossi, OPS, and Pico). Allow a very low hover rpm (if desired) and good top end, while avoiding the typical "long-stroke hump" in the mid-range . 9.6 to 1 is particularly popular with European and Japanese pilots. Depending on the particular motor chosen, top rpm may be slightly lower than with other ratios.

Install the main gear as per original instructions.

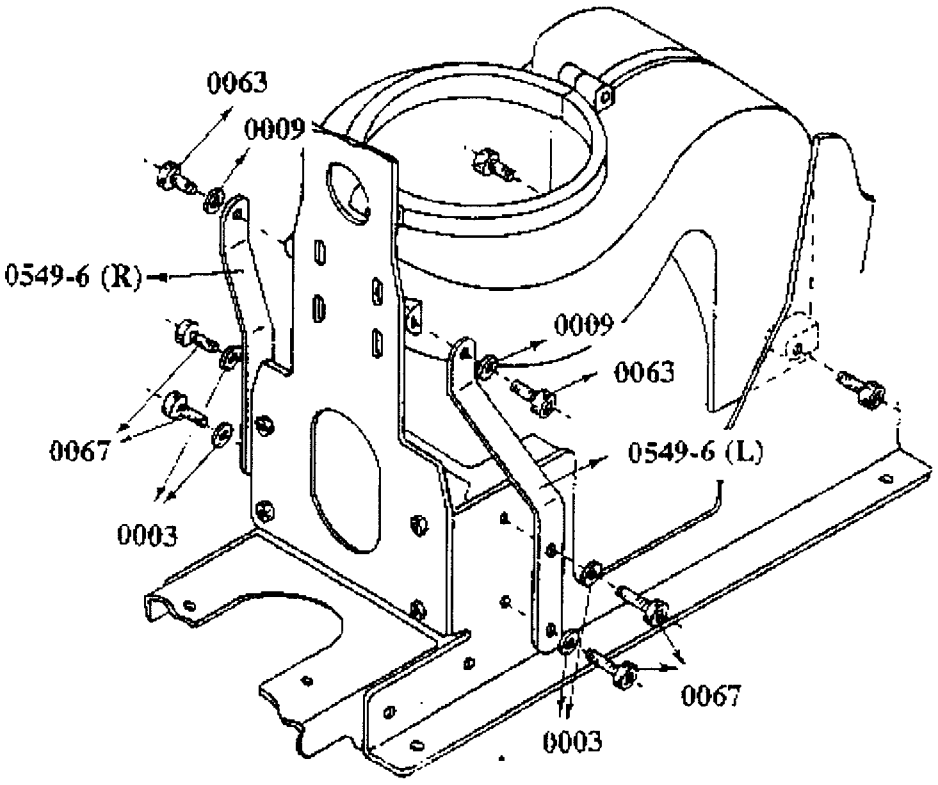
Step #3 - Motor and Fan Shroud

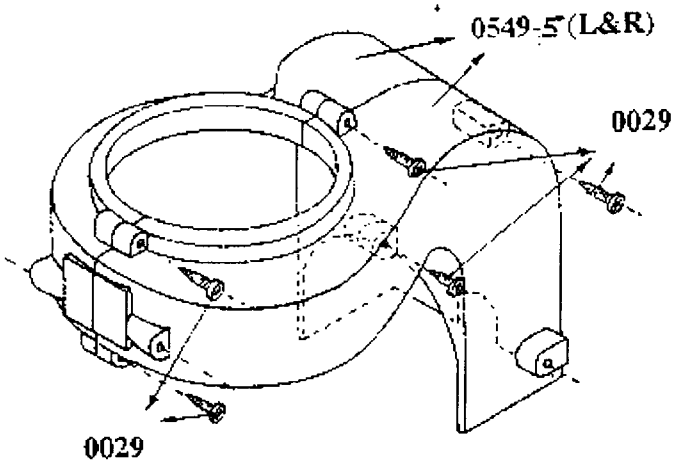
Replace the original motor mount #0191 with mount #0549-3. The three holes on each side have been shifted 2.71mm to reposition the motor. Remember to use the correct shims that apply to your choice of main-gear ratio. Once again: For 9.3 to 1 use three per side, for 9.4 to 1 use two per side, for 9.5 to 1, use one per side, and 9.6 to 1, use none. Use four M4x14 socket head bolts #0067 to secure the motor (and shims) to motor.

Position the assembly within the frames and temporarily secure with one original socket bolt #0063 and washer #0003 in the further most rear hole of the motor mount on each side. Select both pieces of fan shroud brace #0549-6. The left-hand version mount via the uppermost and lowermost motor mount through the 4.75 and 3.0mm holes in the braces. When installed, the left-hand version sweeps forward and inward at the top. The 4.75mm hole at the bottom allows fore and aft adjustment, while the slot at the top allows up/down fan shroud adjustment. The right-hand version is the opposite. Use one M3x10 socket head bolt #0063 on each side into the fan shroud along with the M3 small flat washers #0009. Use two M3x14 socket head bolts #0067 with the M3 large flat washers #0003 at the lower end of the brace (into the motor mount). It is best to use the rearmost motor mount bolt on each side to hold the motor and the gear mesh, while adjusting the fan shroud braces for proper fan clearance. Now you may tighten each bolt.

Generally the rear fan shroud mounting boss will tolerate any re-positioning of the fan shroud to accommodate the various gear ratios. If, for some reason, you would like to move the rear or the shroud also, there is extra plastic molded behind the bolt holes on each side to allow for the drilling of new holes. However, this is usually not necessary.

NOTE: One additional M2.2x13 Phillips tapping screw #0029 is provided for the new position under the front of the shroud. Any other assembly procedures will be the same as in the original assembly manual.


0063
0009
0549-6 (R)
0009
0063
0067
0549-6 (L)
0003
0067
0003


0549-5 (L&R)
0029
0029

PART #0550

CONSTANT TAIL ROTOR DRIVE AUTOROTATION UNIT

ASSEMBLY INSTRUCTIONS

IMPORTANT:

The Constant Tail Rotor Drive Autorotation Unit uses a split main gear, enabling the tail rotor system to remain engaged during autorotation maneuvers, therefore allowing complete tail rotor control. Since the tail rotor system is constantly spinning during the auto maneuver it is important that when the throttle hold switch on the transmitter is activated, the tail rotor pitch will go to 0-degrees and the tail rotor compensation is deactivated. This will eliminate any loss of main rotor blade speed due to undesired tail rotor pitch during the autorotation maneuver. Many of the new computer PCM radio systems incorporate this feature in the throttle hold circuitry.

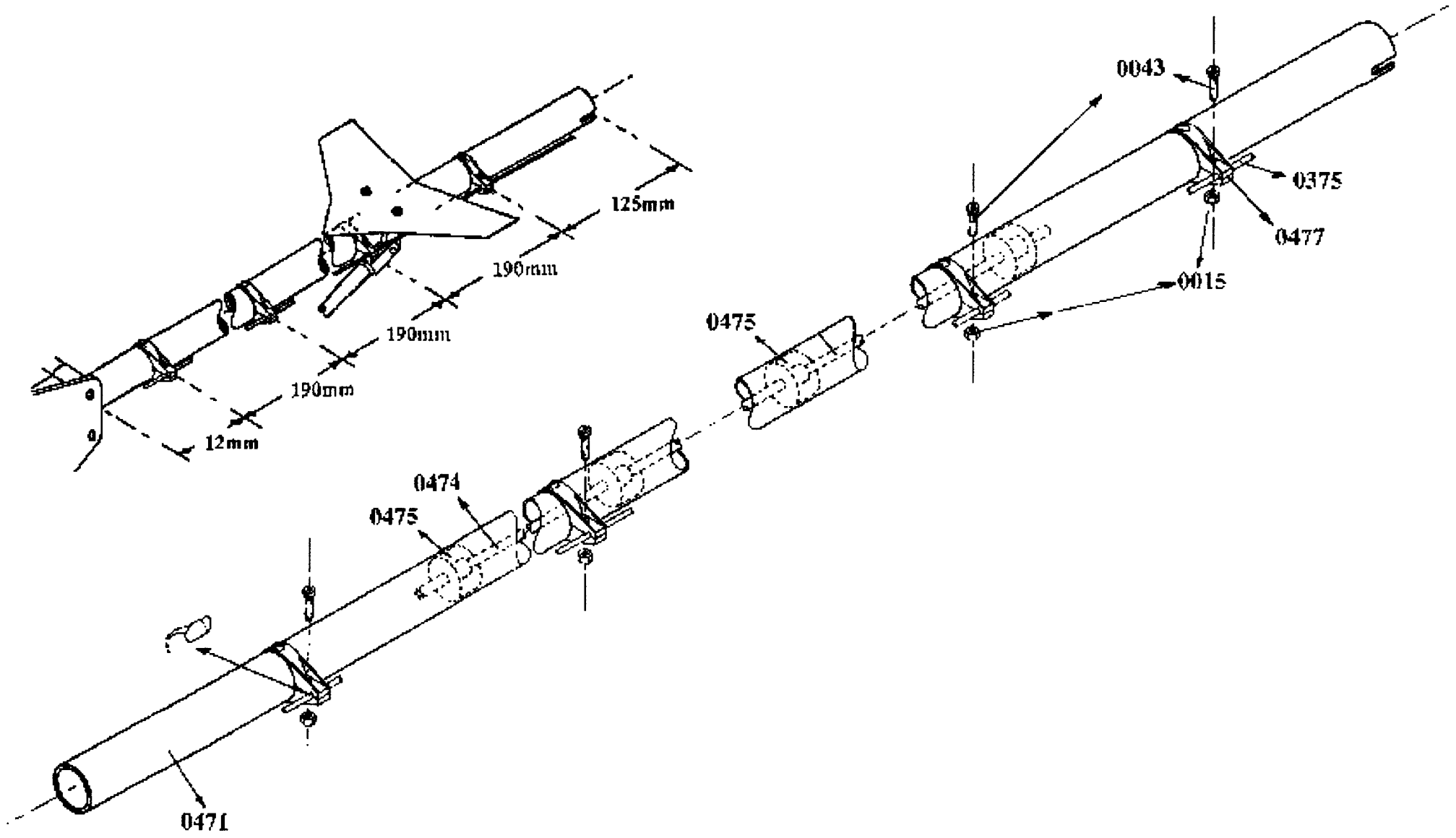
ASSEMBLY:

First remove the standard #0207, 0209, 0211 autorotation unit. The #0211 spacer will no longer be used. As before, oil (do not grease) the one-way autorotation bearings. With the main rotor shaft #0203 still raised up, slide the new pre-assembled driven autorotation unit into place. Be certain that the shim provided #0550-7 remains centered in between the upper and lower sections of the auto unit. Push the main rotor shaft threw the unit until it extends below the lower section. Reassemble the washer #0213 and collar #0215 (use locktite) on the bottom of the main rotor shaft. Tighten securely.

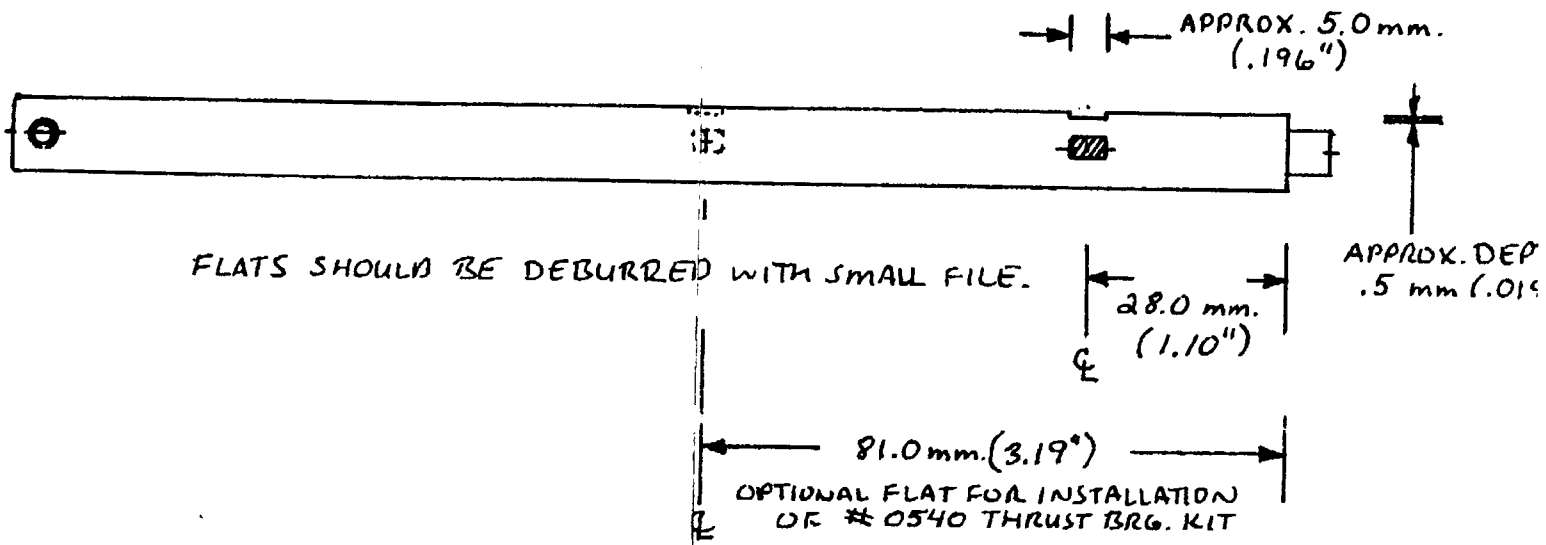
Apply locktite on the two set screws in the upper aluminum section #0550-4 of the driven auto unit. Adjust the upper section in relationship to the lower section until there is approximately .5mm of up and down play in the lower gear section on the main rotor shaft. Tighten the two set screws securely on the main rotor shaft.

Now pull up on the main rotor shaft and tighten the two collars #0205 (use locktite). There should be no end play in the main rotor shaft, but still retaining the .5mm play in the lower autorotation gear section.

Now that the unit is securely in place, recheck the clutch bell and tail rotor gear mesh in relation to the driven tail autorotation unit. Adjust as needed. Slightly oil the upper and lower plastic main gears before flying. If you have any questions, please feel free to call.


125mm
190mm
190mm
12mm
0043
0375
0477
0015
0475
0474
0475
0471

RECOMMENDED MAINSHAFT "FLATS" WHEN INSTALLING #0550 AUTOROTATION



PART #0553
ALUMINUM ELEVATOR SWING ARM

PURPOSE

Replace #0155 (plastic swing arm) with formed #6061-T6 aluminum arms and ball bearings. Increases swashplate stability at high speed. Fits X-Cell .30 through .60 series helicopters.

CONTENTS

(2)	#0553-8	#0553-1 Swing-Arm Halves w/#0553-2 Bearing Installed
(1)	#0553-3	Hex Spacer
(1)	#0553-4	Bearing Spacer
(2)	#0009	Flat Washers
(2)	#0553-6	Phillips Flat Head Screws
(2)	#0553-7	Pivot Studs
(2)	#0019	M3 Locknuts

INSTRUCTIONS

Step 1. Remove the original swing arm (#0155) and the elevator yoke (#0157). Remove the yoke, leaving the ball bearings (#0159) in place in the yoke.

Step 2. Examine each aluminum swing arm to determine the inside and outer surface. Comparing them to the plastic part #0155, will show that the flanged bearing is installed from what we will call the outer surface (also identified by the counter-sunk hole midway down the arm.)

Select each of the short pivot studs (#0553-7). Insert the threaded portion (from the inside surface) through the 3.0mm hole at the bent end of one of the swing-arm halves. Secure on the outside with a M3 locknut (#0019). Repeat on the other swing arm.

Step 3. Snap each previously installed pivot stud into the ballbearings (#0159) contained in the elevator yoke (#0157). Select the bearing spacer (#0553-4) (identified by the step on each end) and press one end into the inside surface of each bearing. Install the hex spacer (#0553-3), using Loctite and two Phillips screws (#0553-6).

Step 4. Install the assembly into the side frames--making sure to capture one flat space washer (#0009) on each side between the flanged bearing and the inside surface of each side frame.

Re-install all other assemblies according to the kit instructions.

Note: With the system, it is possible to tighten the swing-arm pivot bolt (#0009) or pivot stud (0560-7), if you have push pull elevator. No binding should occur; however, **only moderate tightening** is suggested.

December 26, 1993
0553.INS

PART #0560 PUSH-PULL ELEVATOR CONVERSION
INSTALLATION INSTRUCTIONS

Explanation of Operation:

1. This system eliminates (when properly adjusted) any flybar interaction (fore and aft) during collective pitch operation. Adjustments must be made **exactly** as per instructions to maintain the correct geometry between the swing-arm and control arms/pushrods.

2. The elevator servo is now able to function with the A.T.V. set at 100%. Previously, only 70-80% was useable without binding. Servo centering and travel duration are improved.

3. Additionally, "useable" servo power is increased due to the "push-pull" operation. All servo loads are equalized.

Contents:

2	#0560-1	Metal Servo Spacers
4	#0560-2	M2.5x14 Phillips Machine Screws
4	#0560-3	M2.5 Brass Hex Nuts
4	#0560-4	M2.5 Lockwashers
2	#0560-5	4x9x2.5 Ball Bearings (installed)
1	#0560-6	Control Arm
1	#0560-7	Special Pivot/Stud
4	#0560-8	M2.5 Flat Washers
4	#0361	Steel Balls
1	#0105	Threaded Hex Steel Ball M3x4.5
8	#0015	M2 Hex Nuts
2	#0043	M2x10 - 8.8 Hard Slotted Screws
2	#0044	M2x12 - 8.8 Hard Slotted Screws
1	#0171	Collar
1	#0051	M3x3 Socket Set Screw
3	#0133	Long Ball Links
2	#0135	Short Ball Links
2	#0313	2.0mmx12.0mm Pushrods

Note: When installing on X-CELL .30/.40 helicopters, an additional threaded steel ball #0107 must be purchased.

STEP 1

Install (1) long ball link #0133 and (1) short ball link #0135 on each pushrod #0313. Leave a gap between the links of approximately 2.5-3.5mm and set aside. Following Drawing #1, install(2) M2x12 #0044 screws, M2 nuts #0015, and #0361 steel balls into control arm #0560-6 as illustrated. Loctite each outer M2 nut. **Do not deviate from the installation direction shown.** Remove the original #0107 threaded steel hex ball from the input arm of the #0157 elevator bellcrank. It will be replaced later with a different size ball. As per Drawing #1, install the previously removed #0107 threaded ball on the control arm #0560-6. Be certain it is installed on the opposite side of the (2) #0361 balls as shown. Set the assembly aside.

Install (1) #0560-7 special pivot/stud in place of the original swing arm pivot screw #0099. The M3 nut will be on the same side as before. Tighten this nut so as to restrict spinning of the pivot/stud #0560-7 but not enough to compress the side frames enough to bind the swing arm function.

STEP 2

Remove the original #0317 clevis from the original elevator pushrod. Install (1) #0133 long ball link in its place. IMPORTANT: **You must adjust this pushrod to a total length of 70.0mm from ball link hole centerline to centerline.** Any

deviation of this measurement will now or later disrupt proper function of this modification kit. (This means no trim adjustments to this pushrod at any time.) It will be difficult to bring the links to this measurement, but they will go this far, even though final turns will be quite tight.

STEP 3

Snap (1) link from this pushrod onto the #0105 threaded steel ball and install into the position on the #0157 elevator bellcrank previously used by the #0107 ball. Use slow cyano as usual. Slide the #0560-6 control arm into place on the #0560-7 pivot/stud with the pushrod on the side facing the right main frame. Snap the remaining ball link onto the elevator bellcrank. Install (1) #0171 aluminum collar with (1) #0051 M3x3 set screw (with Loctite) onto the exposed part of the #0560-7 pivot/stud. Adjust so no lateral "play" exists in the control arm. NOTE: This condition should be checked from time-to-time in use to allow the best positive elevator control.

You will now see that a vertical line drawn through the control arm pivot point and its #0107 steel hex ball will always be exactly parallel to a vertical line drawn through the elevator bellcrank hex ball #0105 and its pivot point at pin #0161. This parallelogram is vital to the proper function of this system.

STEP 4

Place (2) equal height blocks under the swashplate and adjust (2) swashplate pushrods #0227 to be absolutely sure that the #0157 elevator bellcrank arm is exactly vertical when the swashplate is level with the frames. Any future trim adjustment for elevator must now be made to only these (2) #0227 pushrods.

STEP 5

Flip your elevator servo over so that its output wheel is now towards the rear of the model. Install the servo from behind the #0365 aluminum plate with (4) each M2.5x14 screws, alum. spacers, washers, lock washers and brass nuts. Refer to Drawing #2. You will probably need to drill out the holes originally fitted to self-tapping servo screws.

Select a Servo wheel with a minimum O.D. of 24.5mm. (A standard J.R. wheel or a large Futaba accessory wheel are satisfactory.) Study Drawing #3 to see how the holes must be arranged (the standard J.R. wheel already has suitable holes) for the desired "differential." The "differential" throw is essential to smooth operation.

Electronically neutralize your servo (being sure no "trim" exists on the transmitter). If you've chosen an un-drilled wheel, then it can be installed now in any position. If you are using a stock J.R. wheel, then the process is more complex. Drawing #3B shows how to determine correct positioning. Your goal is that a line drawn through the servo wheel control balls be exactly parallel with a line drawn through the control arm input balls. Drawing #4 will further clarify this situation. If, by trying different wheel positions, you cannot achieve this, it is recommended that you obtain an un-drilled accessory wheel to work with.

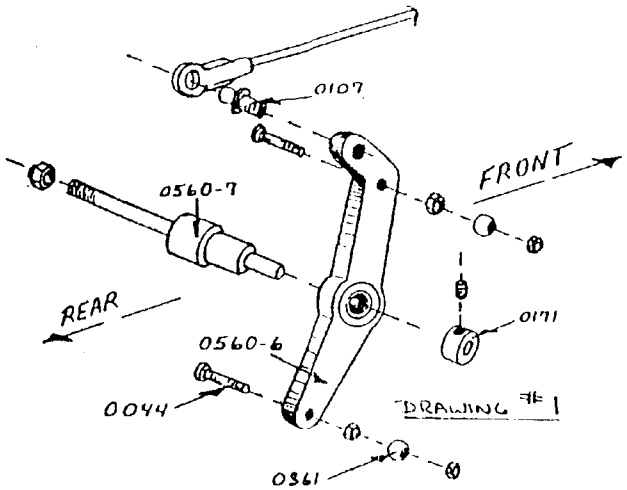
Drawings 3A, B indicate the correct hole positions to achieve the desired differential. This is important to understand and execute accurately to avoid servo binding at full A.T.V. Once you've drilled the correct holes (a #53 - .059" drill or 2.0mm works best), install (2) #0361 steel balls using (2) M2x10 #0042 screws with M2 nuts as spacers and retainers. This is to say that the screws are installed from the outside with a nut next to each surface of the plastic wheel. If this is not adhered to, it is possible interference could result during operation.

Check each previously assembled #0313 pushrod for fit. Due to variations for each type of servo, you will need to adjust their length accordingly. You should attempt to keep each as equal in length as possible and adjusted so each can be freely "rocked" on its respective ball without undue load at neutral. Only very minor deviations in one rod length to another is allowable. Keep in mind that maximum efficiency is obtained by equality and accuracy in such a set-up.

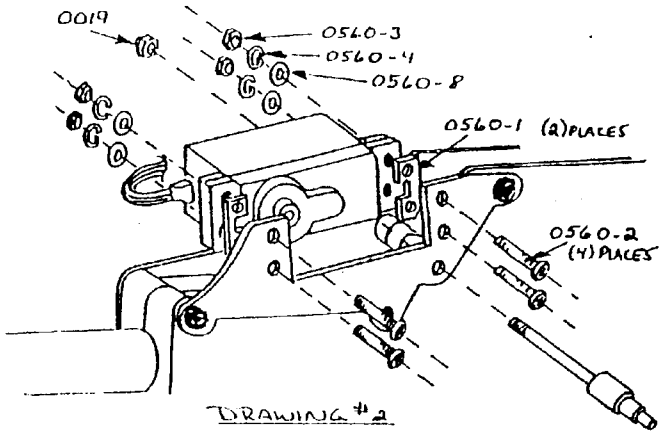
Check your A.T.V. and adjust for maximum useable travel. Usually about 100-110% is possible.

You should experience more axial rolls, rolling stall turns, and improved inverted or low pitch situations with this system.

If you have any questions or difficulty, ask for technical assistance at Miniature Aircraft USA at (407) 422-1531. Good luck with your push-pull conversion!

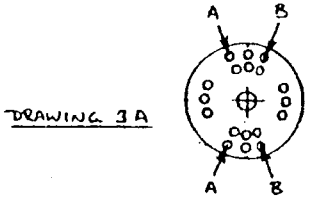


DRAWING #1



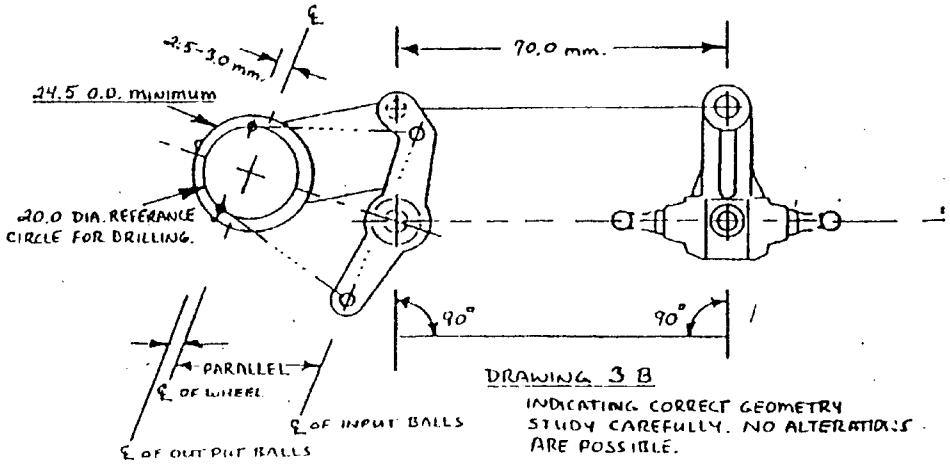
DRAWING #2

SUPPLEMENT DRAWINGS TO INSTRUCTIONS FOR #0560 & 0560-1



DRAWING 3A

TYPICAL J.R. WHEEL
USEABLE POSITIONS = A-A OR B-B
(NOT A-B OR B-A)



DRAWING 3B

INDICATING CORRECT GEOMETRY
STUDY CAREFULLY. NO ALTERATIONS
ARE POSSIBLE.

0586-0

CARBON GRAPHITE FRAME SET

Parts Inventory List:

20	#0003	3mm Flat Washers (Large)
46	#0009	3mm Flat Washers (Small)
15	#0019	3mm Hex Locknut
30	#0063	M3x10 Socket Head Screws
3	#0067	m3x14 Socket Head Bolts
4	#0077	M3x30 Socket Head Screws
2	#0575-1	Servo Blocks
1	#0586-5	Graphite Elevator Plate (Fits .30 thru .60)
2	#0586-20	Graphite Lower Main Frame Sides
1	#0586-21	Aluminum Lower Frame Channel (Right)
1	#0586-22	Aluminum Lower Frame Channel (Left)
1	#0586-23	Graphite Vertical Front Plate
2	#0586-24	Top Main Frame Sides (Graphite)
1	#0586-25	Graphite Gyro Plate
1	#0595-1	Left Rear Gyro Mounting Plate
1	#0595-2	Right Rear Gyro Mounting Plate
3	#106-22	Rubber Grommet Isolators
3	#106-24	Dampening Sleeves
2	#106-66	Graphite Landing Gear Brace
4	#106-72	Frame Plate Corner Blocks
2	#106-76	"Threaded" Spacers
4	#106-78	"Un-Threaded" Spacers

.60 Size Assembly Notes:

1) Disassemble your existing frame set.

2) Assemble entire frame set before re- assembling original components. Align entire frame set on a flat surface.

3) Loctite all screws (not using #0019 locknuts).

4) Install the three rubber grommets (#106-22) into the graphite elevator plate (#0586-24). Squeeze grommets together & push in as far as possible. Use a small straight screwdriver and work around the grommets, pushing one side all the way thru. Center the three dampening sleeves (#106-24) in the grommets.

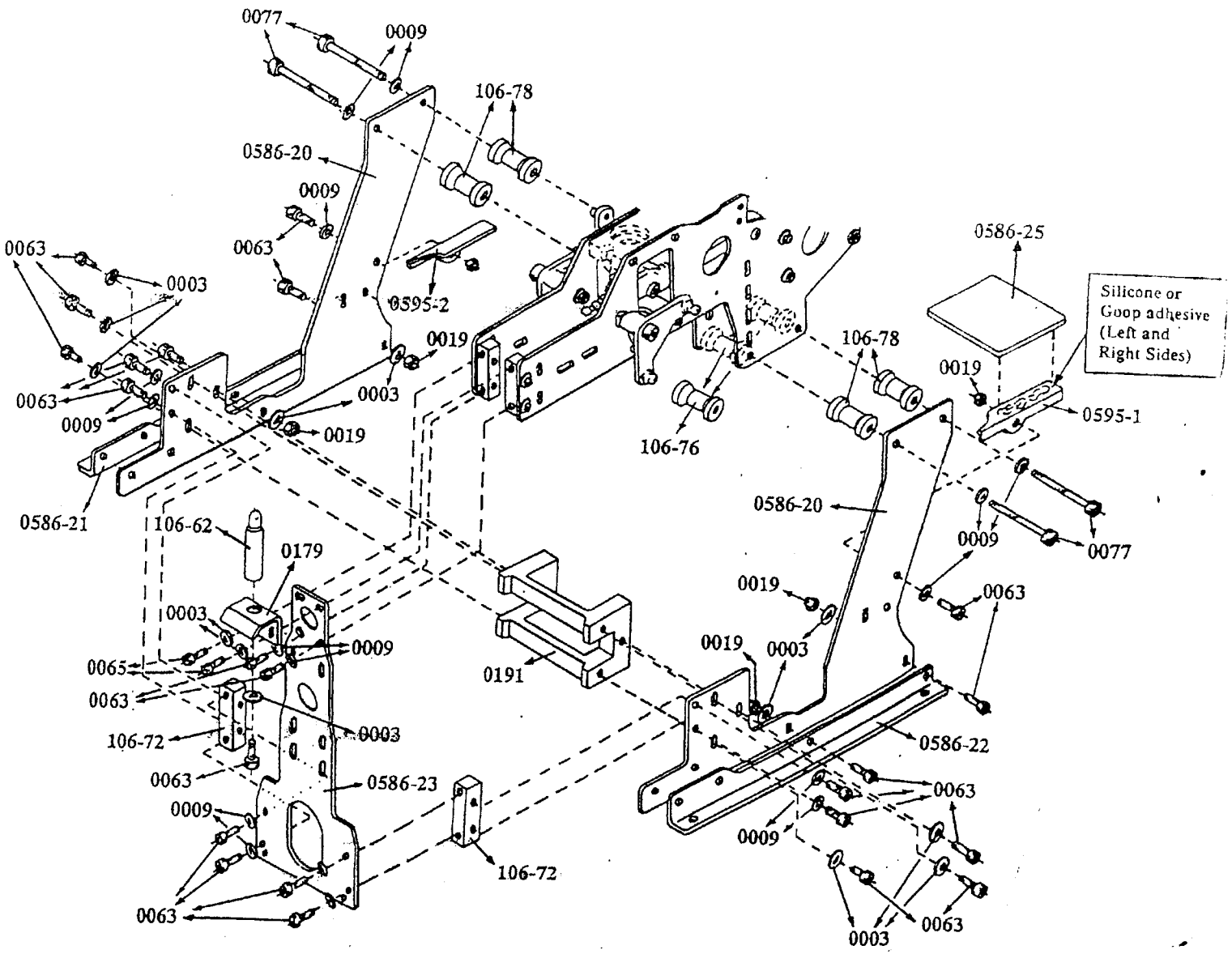
5) Install the elevator servo plate by bolting the elevator plate to the inside of the right upper frame plate (#0827-5) using the following hardware: 3) #0067 M3x14 socket bolts, 3) #0003 M3 washers (large), 3) #0019 locknuts.

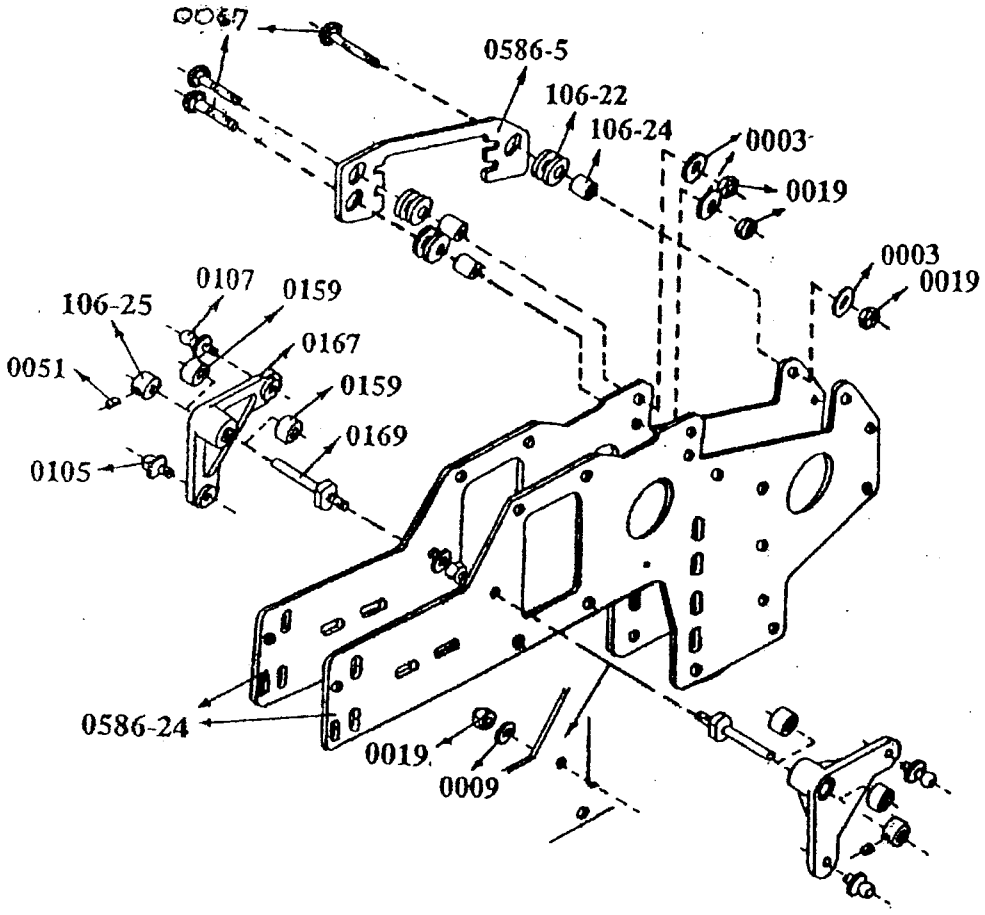
6) Reinstall all of the original equipment: bellcranks, mainshaft components, tail drive, etc. Note that many of the bolts which are going into graphite will use M3 washers under the bolt heads.

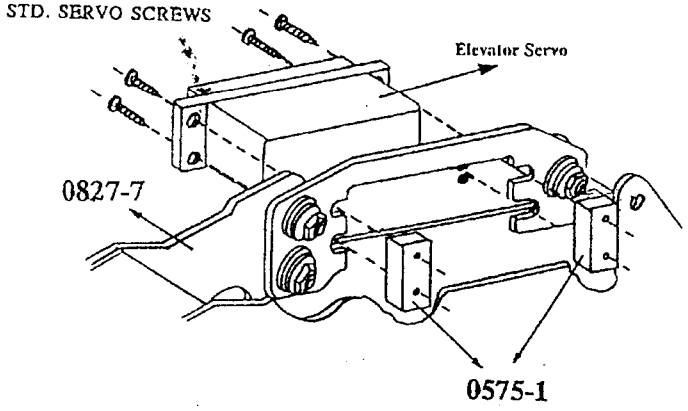
7) Mount the servo from the right side in the following order using four of the servo screws provided with your radio equipment and two (#0575-1) servo doublers on the inside. Snugly tighten, but do not crush the servo rubber grommets.

8) Route all wires as neatly as possible, making sure that the wires do not rub any graphite edges.

9) Reinstall the upper canopy latch (#0179) noting that it may need the two holes widened outwards 1.5mm.


0077
0009
106-78
0586-20
0009
0063
0063
0003
0595-2
0019
0003
0063
0009
0019
0586-21
106-62
0179
0003
0009
0065
0063
0003
106-72
0063
0586-23
0009
106-72
0063
0586-25
Silicone or Goop adhesive (Left and Right Sides)
106-78
0019
0595-1
106-76
0586-20
0009
0077
0019
0063
0019
0003
0191
0586-22
0063
0009
0003
0063


0057
0586-5
106-22
106-24
0003
0019
0003
0019
0107
0159
106-25
0167
0051
0159
0169
0105
0586-24
0019
0009


STD. SERVO SCREWS
Elevator Servo
0827-7
0575-1

ASSEMBLY INSTRUCTIONS FOR INJECTION MOLDED FAI PADDLES #0561-5

Parts Supplied:

4	#0051 M3x3 Set Screws
2	#0561-6 Flybar Paddles Main Section
2	#0561-7 Flybar Paddle End Caps
2	#0561-8 Flybar Paddle Plastic Inserts
2	#0561-9 Flybar Paddle Aluminum Safety Locks
2	#0561-10 Flybar Paddle Lead Weight Thick, 44mm (5.8 grams)
2	#0561-11 Flybar Paddle Lead Weight Thick, 65mm (8.6 grams)
2	#0561-12 Flybar Paddle Lead Weight Thin, 65mm (5.7 grams)

Additional Requirements:

80 grit Sand Paper
Thick Cyano Glue
Thin Cyano Glue
Gram Scale (Optional)

A. NOTE: Before assembling the paddles it will be necessary to choose the over-all paddle weight desired by the number of lead strips used to achieve a desired flying characteristics.

The following characteristic may be expected with the installation of the lead strips:

- With no lead (total weight approximately 24.0 grams) - Crisp control with fast cyclic authority.
- With single strip of large lead mounted in insert (total weight approximately 32.0 grams) - Crisp control will remain with increased stability.
- With two strips of large lead , one mounted in the insert and the other mounted on the leading edge of the insert. (total weight approximately 40.0 grams) - Excellent hovering control with increased forward flight stability. Enhancing smooth and precise FAI type aerobatics.
- With three lead strips (total weight approximately 45.0 grams) - Extreme hovering stability. Slow and precise aerobatic maneuvers.

: **Assemble both paddles simultaneously.**

B. Remove all the sections of lead #0561-10, 0561-11, 0561-12. Roll the lead under a sanding block using 80 grit sandpaper until they are flat and thoroughly roughened. Select the shortest piece of lead #0561-10 (44mm) and press it completely into the slot in the plastic insert #0561-8, thin cyano in place.
Using 80 grit sand paper roughen the entire surfaces of the plastic inner insert 0561-8. Slow cyano glue the desired amount of lead #0561-11 and #0561-12 onto the leading edge of the plastic insert. If both pieces of the lead are used glue the thick section of lead #0561-11 on first. Carefully line up the lead pieces with the plastic insert and allow to dry. Slightly shape sand the leading edge of lead and any excess glue until the assembled plastic paddle insert will slide inside the paddle main section, #0561-6.

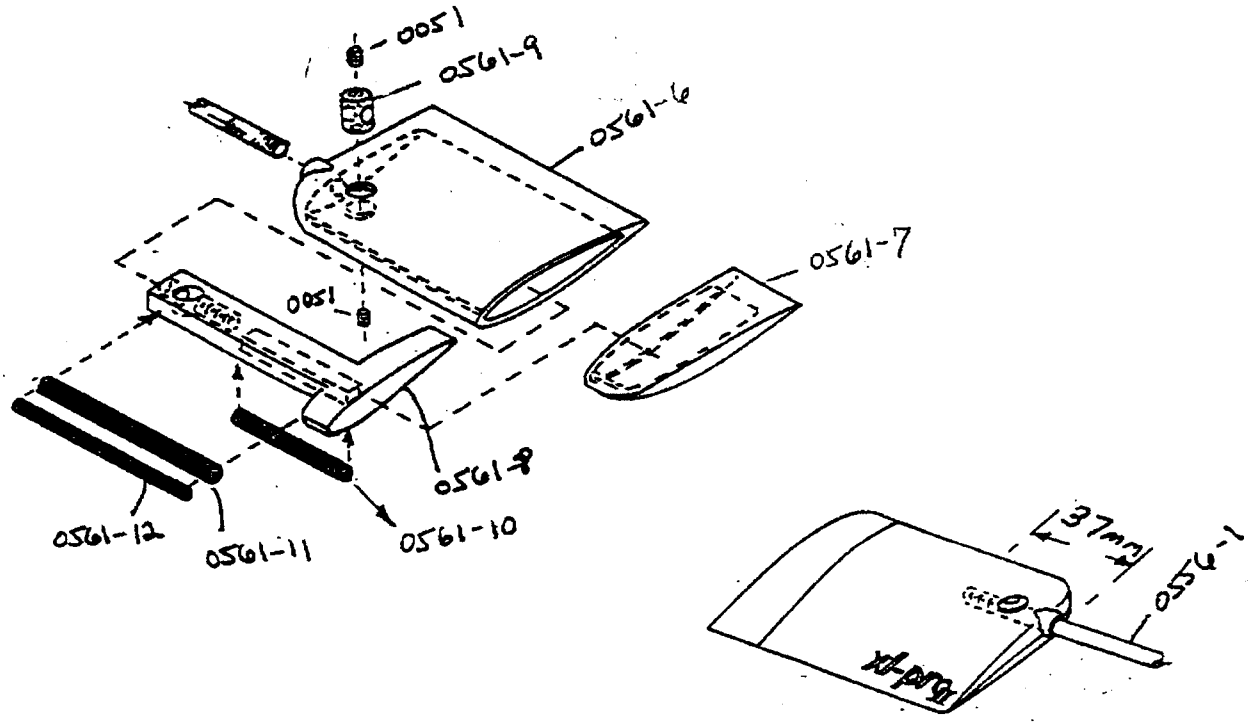
C. With 80 grit roughen up the internal surfaces (as best you can) of the paddle main section #0561-6 and the paddle end cap #0561-7. Slide the assembled insert #0561-8 into the main paddle section until the hole in the insert and the paddle for the aluminum safety lock aligns. If this does not align, sand the lead until alignment is achieved. Re-install the plastic insert.

Align the un-threaded hole in the aluminum safety lock #0561-9 in-line with the Fly-Bar insertion hole in the plastic paddle. Press and center the safety lock into the paddle. Wick thin zap around the protruding end of the plastic inner sleeve #0561-8. Wipe away any excess glue.

NOTE: If a gram scale is available weigh both paddles including the end caps #0561-7, to determine if they are matching in weight. If correction is needed, drill small holes in the end of the plastic insert or add weight to the inside of the end caps. (Glue the end caps in place, only if a gram scale was used. If a gram scale is not available, proceed with the next step).

D. From each end of the flybar measure in 37mm and place a mark (masking tape works very well). Thread each flybar paddle up to the marks. Study drawings for correct paddle orientation.
NOTE: If a gram scale is not available, the flybar system will need to be checked for balance. Temporarily snap the end caps in place. Un-snap any ball links connected to the flybar system and check the flybar for a level balance. If incorrect alter paddles as described in section ("D-NOTE"). After all corrections above have been made the end caps may be glued in place. Final balance of completed paddle may be achieved by using a small piece of black tape on the paddles leading edge.

E. Thread two #0051 M3x3 set screws into each aluminum safety lock. Align each flybar paddle as necessary. Loctite and secure each of the M3x3 set screws.



#0575 PLASTIC SERVO TRAY INSTRUCTIONS

The following will outline assembly of the plastic servo tray for installation on the X-Cell .50 and .60 series. Special notes will be included where applicable for fitting to X-Cell .30 and .40 series.

NOTE: While the standard arrangement is for conventional single throw collective this tray has special provisions for conversion to push/pull collective. Should you desire this arrangement, it is necessary to purchase (separately) the #0576 push/pull conversion package containing the bell crank and hardware along with special supplemental instructions.

0575 CONTENTS

Quantity	Description
2	#0353 Roll Servo Female Pivots
4	#0575 Servo Screw Doublers for Throttle Servo (and collective in standard mode). Size: 20.0x8.0x5.0mm block with 2 small holes.
1	#0575 Adapter Block for X-Cell .30/.40 Only. Size: 20.0x8.0x9.0mm with 2 small holes, 1 large hole and 1 radiused edge.
2	#0575-3 Rudder Servo Spacer Blocks. Size: 20.0x8.0x9.0mm block with 3 small holes.
1	#0575-4 Upper Servo Tray
1	#0575-5 Lower Tray
1	#0575-6 Main Vertical Support and Throttle Mount
1	#0575-7 Secondary Vertical Brace
1	#0575-8 Switch Plate
17	#0027 M2.2x9.5 Phillips Tapping Screws for us as follows: 4) for Roll Servo Pivots 2) for Rudder Spacer Blocks 2) for .30/.40 adapter 9) for joint connections
4	#0035 M2.2x16 Phillips Tapping Screws for Throttle Servo
4	#0001 M2 Flat Washers for Throttle Servo
2	#0029 M2.2x13 Phillips Tapping Screws for #0575-7 Brace

A. ASSEMBLY FOR .30/.46 OR .60

Generally, the tray is very similar to the wooden version previously offered with some important key assembly differences that cannot be overlooked.

Examine the #0575-5 lower tray. You will see that long, thin slots are molded in the front and rear of this part. If you are going to install the tray on an X-Cell .60, it is necessary to cut through the slots at the rear of the lower tray thus removing the last

20.0mm from the narrow end. This is only for .60 X-Cells and provides the necessary clearance for the #0349 lower support brackets.

Special Note for X-Cell .30/.46 - Do not cut as shown above. Instead, it will be necessary to only cut across the front of the tray (wide end) in the (3) grooves provided next to the slots. This will provide suitable canopy clearance and shorten the tray by 28.5mm.

B. SERVO INSTALLATION

The order of assembly of the various plastic parts is not critical; however, experience has shown that it is more convenient to initially fit the servos prior to overall assembly. The reason for this is due to the adjustable nature of servo openings. Obviously this tray must accept all popular servo sizes, so the following will outline each servo installation.

1. **Rudder Servo** - The output position is to the rear of the tray. The servo is supported by (2) #0575-3 spacer blocks. Using original servo hardware, mount the blocks to the servo allowing at least 1.0mm case clearance. Apply a thin coat of cyano (Flex, Poly, Slow, or Gap filler type) to the underside of each block and set the assembly into position on the tray. Install a #0027 M2.2x9.5 Phillips screw through the tray from below up into each block in the center hole provided. Center the servo within the opening and tighten the screws. After curing, the servo can be removed if you wish, although it is not necessary.

2. **Collective Servo** - If you are not opting for the push/pull conversion, the collective servo will be installed directly on top of the upper tray without any spacers, but with the #0575-1 doubler blocks. If you are converting to push/pull follow the special instruction provided with the conversion kit. In this installation, the servo output will again be to the rear of the tray. Using original servo hardware, position the servo in the opening flush on the top surface followed by the #0575-1 doubler block from beneath the top tray with cyano as above. Again, adjust for case clearance before tightening the servo screws and letting the cyano cure. As with the rudder servo, the collective servo can be removed without losing its' position if you like.

3. **Throttle Servo** - Same as collective with the #0575-1 doublers coming from the opposite side with cyano. Instead of using the original servo screws, it is necessary to use the #0035 M2.2x16 Phillips tapping screws and #0001 M2 provided.

4. **Roll Servo** - Follow same procedures as with the wooden tray. Simply pre-assemble the male pivots #0351 as per section 7 of the kit plan sheet #0503. Install the female pivots and center the assembly in the upper tray. Add cyano prior to final tightening of the #0027 M2.2x9.5 Phillips tapping screws through the upper tray in each pivot. Allow no side play in the servo and center output splines with the true center of the tray (the rear hole for the screw to the vertical support is true center).

C. OVERALL ASSEMBLY

It is best if a thin line of cyano is put on the mating surface prior to installation of the screws. All screws are #0027 M2.2x9.5 Phillips tapping screws with the exception of the two upper screws holding the top tray to the secondary vertical support into the lower tray upright. These should be #0029 M2.2x13 Phillips tapping screws.

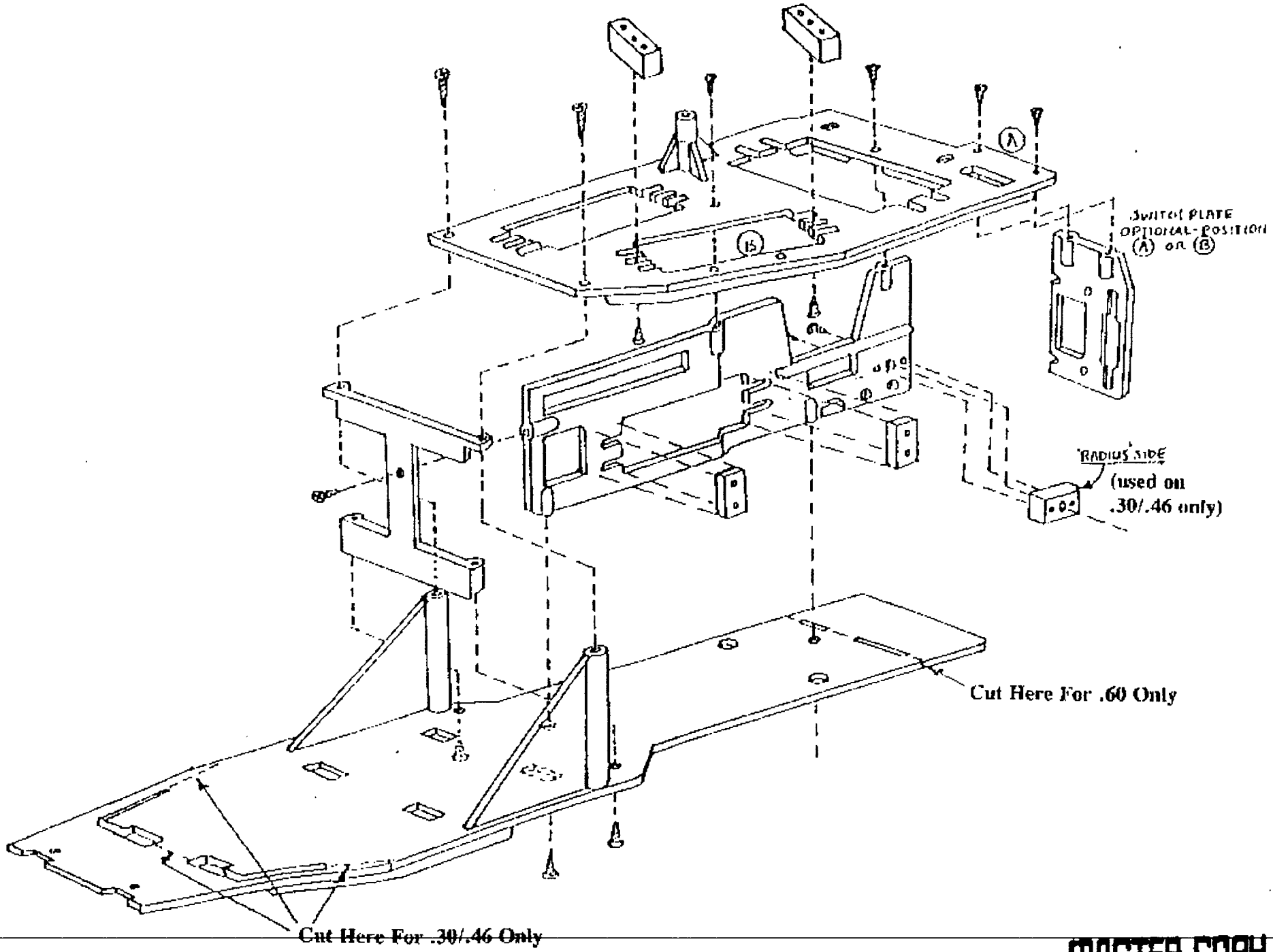
The switch plate can go in either of two positions. One will place it to the left rear of the tray allowing switch access from behind the canopy near the main gear area. The other position will place it alongside the rudder servo. This position is good for some fuselages or when you choose to have a small access hole in the canopy side window area.

D. INSTALLATION

Note that the upper tray mounting holes for attachment to the front frame plate are slightly elongated. This allows proper fitting to both .30/.46 and .60 X-Cells In either case, push the tray up against the frame vertical front plate during the bolt installation.

As previously mentioned for .60 installation, the lower tray was trimmed for clearance of the lower metal brackets #0349. In the installation, utilize the (2) 3.0mm holes lowermost in the tray.

Special Note for X-Cell .30/.46 - Note that (1) special plastic block #0575-2 is provided for fitting to .30/.46 models. Apply cyano and install this block on the left side of the main vertical support of the servo tray in the position having (3) holes about 11.0mm up from the bottom edge. Install (2) #0027 M2.2x9.5 Phillips screws from the right side through the vertical support into the smaller (2) holes of the #0575-2 block. Be sure to have the radiused edge on the outside and to the rear. This radius matches the radius of the 90 degree mounting tab stamped into the .30/.46 front frame support. Use the original #0073 socket bolt and M3 locknut in this position.


A
B
SWITCH PLATE
OPTIONAL - POSITION
(A) OR (B)
RADIUS SIDE
(used on
.30/.46 only)
Cut Here For .60 Only
Cut Here For .30/.46 Only

#0576 PUSH/PULL CONVERSION FOR PLASTIC SERVO TRAY #0575

#0576 CONTENTS

Quantity	Description
2	#0575-3 Servo spacer blocks with (3) small holes. Size 20.0 x 8.0 x 9.0mm
1	#0560-6 Control Arm w/2 #0560-5 Ball Bearings Installed
1	#0560-7 Pivot Stud
1	#0107 Hex Ball
4	#0361 Balls
1	#0019 M3 Locknut
1	#0171 Collar
1	#0051 M3 x 3 Socket Set Screw
2	#0133 Long Ball Links
4	#0135 Short Ball Links
3	#0313 Short Pushrods
2	#0044 M2 x 12 Grade 8.8 Slotted Machine Screws
8	#0015 M2 Nuts
2	#0027 M2.2 x 9.5 Phillips Tapping Screws
2	#0043 M2 x 10 Slotted Machine Screws

INSTALLATION

Insert (1) #0560-7 pivot stud down through the reinforced hole provided on the upper servo tray between the collective and roll servo positions. Secure below with (1) M3 Locknut.

Install the collective servo using (2) #0575-3 spacer blocks onto the servo using original servo hardware. Allow proper case clearance. Position the servo into the opening with the output spline to the rear. Apply cyano to the block mating surfaces and secure from below with (2) #0027 M2.2 x 9.5 Phillips Screws.

Examine the drawing to determine which side of the #0560-6 control arm is the top side. Select (1) #0107 hex ball and install it with Loctite up into the underside of the control arm in the M3 threaded outermost hole provided. Install (1) #0361 ball onto (1) #0044 M2x12 slotted screw followed by (1) M2 nut. Install this from above into the top of the control arm followed by Loctite and an M2 nut below. Repeat for the other hole. Follow this with (1) #0171 collar and set screw.

SET UP

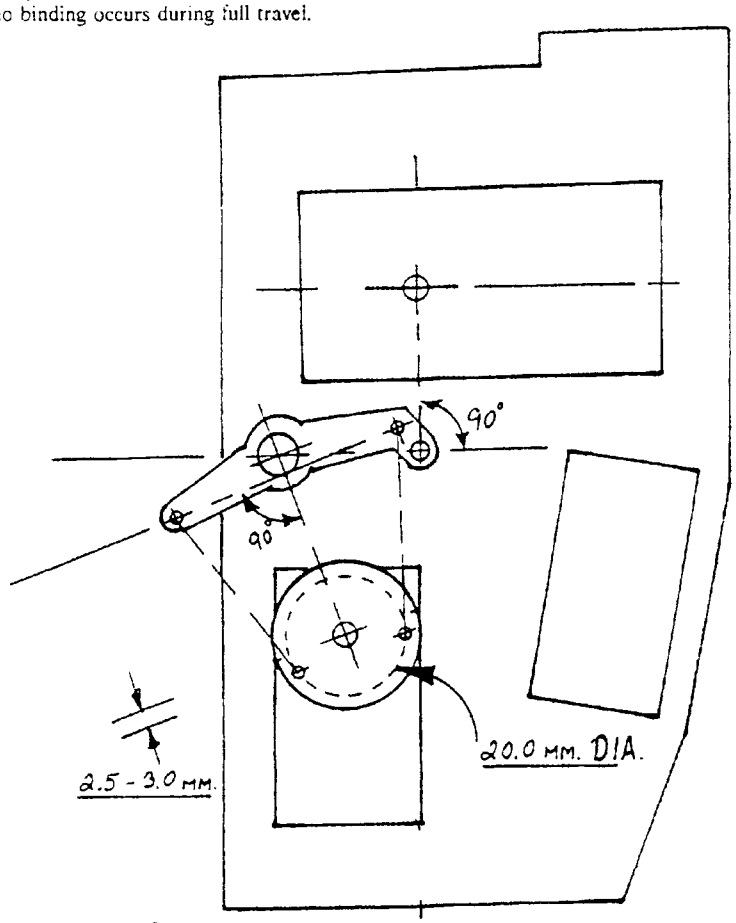
Study the drawing to understand the proper servo set up. This is most important to insure against any binding or interferance during operation.

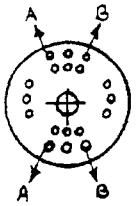
Basically, the following relationship is required:

1). Roll servo exactly vertical
2). A line drawn from the pivot stud center point through the #0107 hex ball is exactly parallel with the lengthwise centerline of the roll servo and the roll servo cut out.
3). A line drawn through each #0361 ball atop the bellcrank is exactly perpendicular top a line drawn from the pivot stud center to the servo spline center.
4). At your option, the servo wheel is installed so that a line 2.5mm behind the servo spline center drawn through (2) 2.0mm holes (drilled on a 20.0mm diameter circle) is exactly parallel with a line drawn through the #0361 balls atop the control arm, at hover point or zero pitch. Study

the drawing to further clarify this relationship.

Connections between the servo and the control arm are made using (1) #0133 long link and (1) #0135 short link on each side. Use (1) #0043 M2x10 slotted screw with #0361 balls and M2 nut atop each side of the servo wheel with (1) M2 nut below. The connection from control arm to roll servo is made using (2) #0135 short links an a short pushrod. The exposed threaded rod between each link will be about 2.0mm. Adjust each servo rod so that no binding occurs during full travel.





Typical J.R. Wheel
Usable Positions = A-A or B-B
(not A-B or B-A)

Instructions For Carbon Fiber Tail
Booms #0587-1 thru 0587-6

#0587-1,-2,-3 Installation of Pod and Boom type Booms.

Step I. - Remove the entire tail boom section from the main mechanics, including the front tail boom supports #0185. Disassemble all boom support components, push-rod guides, fin components, Tail Transmission, and drive shaft components from the tail boom.

Step II. - Before reassembling the removed components from Step I, trail fit the following parts onto the carbon fiber tail boom; #0447 plastic T/R control rod guides, #0479 plastic mount for horizontal fin, #0487 vertical fin mounts, and #0683 rear fin and transmission mount (X-Cell 30/40). It is possible that over time these parts may have expanded. If a tighter fit is necessary it is easily accomplished by first marking the correct position of each component on the tail boom. Then wrap the marked area with one layer of normal sewing thread and glue with cyano. Trail fit and repeat with thread if necessary. Complete reassembly of entire tail boom section.

Step III. - Trail fit and align the completed tail boom section into the main frames. Tighten until Snug the front tail boom clamp bolts and mark the tail boom at the back edge of the boom clamps #0185. Remove the tail boom and apply slow cyano on the tail boom ahead of the mark just applied. A small amount of glue around boom will be all that is necessary. Quickly reinstall the boom into the front plastic boom clamps #0185 and align to the mark as necessary. Securely tighten and wipe away any excess glue.

Step IV. - Re-check for tightness of boom and all components. At this time it will be necessary to change the C.G. of the helicopter due to a lighter tail boom.

#0587-4,-5,-6 Installation of Fuselage Tail Booms

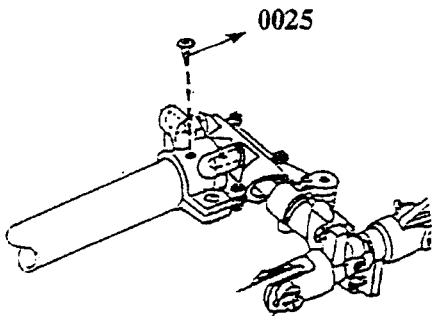
NOTE: ALIGN ALL COMPONENTS INTO FUSELAGE BEFORE ANY GLUING.

Step I. - Due to the reduced O.D. size of the three ply carbon fiber booms it will be necessary to enlarge the area's under all the components mounted onto the outside of the tail boom. Provided with the tail boom is shrink wrap. Cut appropriate sides to fit under the front tail boom clamp #0185, tail rotor push rod guides #0477 and the rear transmission mount #0683 (optional recommended mount). Cyano glue in position and shrink with a heat gun.

Step II. - The use of the optional tail transmission mount #0683 is recommended. Mount the tail transmission wood bulkhead between the tail rotor transmission and the opt. mount #0683.

Step III. - As described in the Pod and Boom style carbon fiber boom instructions. Cyano glue the front tail boom into the #0185 boom clamps.

Special note for all installations.
As added security it is suggested that a #0025 (M2.2x6.5) self tapping screw be installed through the #0683 mount, the boom, and into the transmission. The hole should be a diameter of 1.6 - 1.9mm (.062 - .074") and located 7.0 - 8.0mm from the front edge of #0683 (on the mold seam line) anywhere around it's diameter. Do not use any screw longer than 6.5mm.



#0596 ADJUSTABLE ROLL SERVO CONTROL ARM FOR ALL X-CELL 30, 40, 50 AND 60 SERIES

This unit provides the following advantages:

- 3 output positions, each with correct differential to minimize collective/roll interaction.
- All collective load is direct to servo spline, instead through a "Bridge" set-up.
- Simplified ball link removal.
- Fit J.R., Futaba and Sanwa(Airtronics).

NOTE: This unit works especially well when used with #0536 adjustable roll bellcranks.

NOTE: ***(*) Denotes either part #0596-4 or #0596-5 will be in the contents list depending on radio gear used***

CONTENTS:

	1	0596-1	Upper Plate (with small center hole)
	1	0596-2	Lower Plate (with large hex hole)
	1	0567-3	M3 Conical Spacer
*	1	0596-4	J.R., Sanwa(Airtronic) Hex Output Wheel
*	1	0596-5	Futaba Hex Output Wheel
	1	0596-6	M2.9x16 Phillips Oval Head Self-Tapping Screw
	4	0536-3	M2 Conical Spacers
	1	0555-1	M3 Ball
	2	0361	M2 Balls
	3	0133	Ball Links
	2	0047	M2x16 Slotted Machine Screws (12.9 Hard)
	2	0018	M2 Locknuts

INSTALLATION:

STEP 1 Select the appropriate hex output wheel (#0596-4 for Airtronics(Sanwa) and J.R. radios and white in color or #0596-5 for Futaba and black in color) and the #0596-2 Lower Plate (with large hex center hole). Neutralize your radio roll trims and position the hex output wheel so that test fitting the lower plate will indicate that it is exactly neutral on the servo. You have two areas of adjustment here, the spline on the servo and the hex. Utilize both should make this step easy.

STEP 2 At this stage you must determine which output position you wish to use. Carefully study the positions on the drawing and note this in any of the three positions, the output points will always be ahead (nearer the collective servo) of the centerline. This is accomplished by using parts #0596-1 and -2 upright or inverted.

Position A:
- 24.0mm ball-to-ball
- Output similar to original #0359 but with differential.

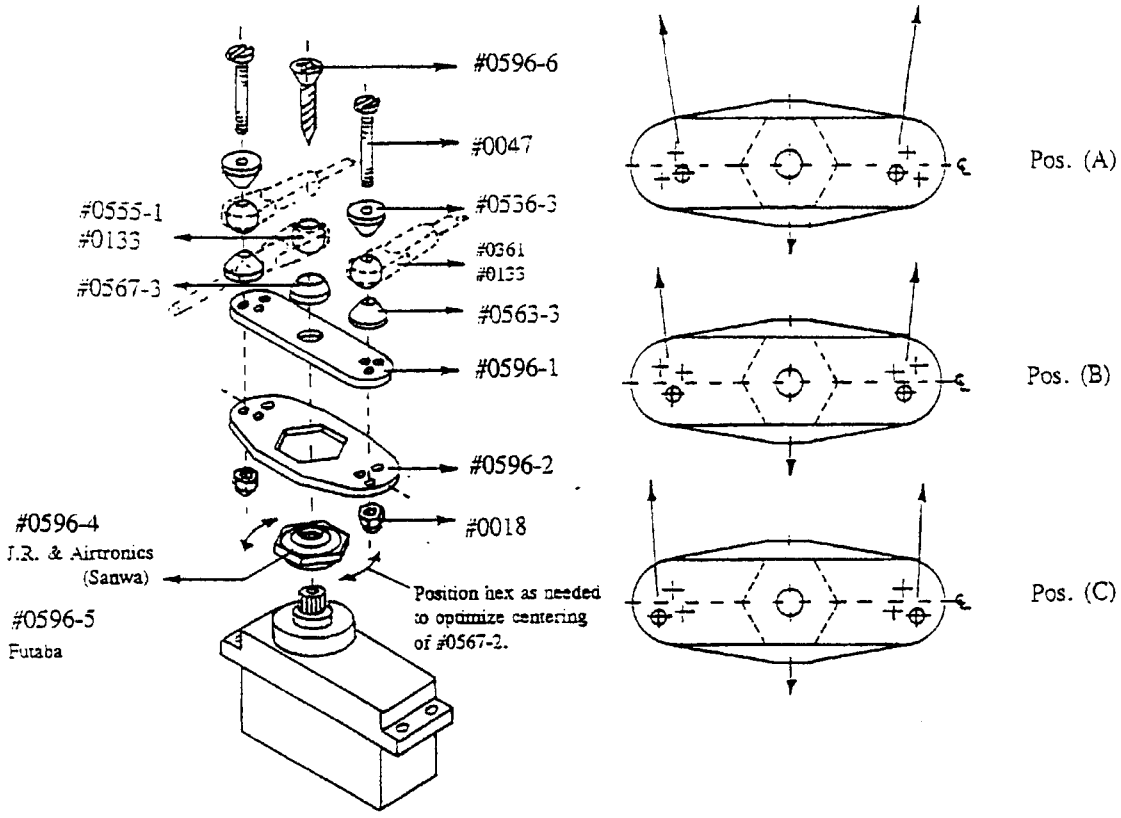
Position B:
- 26.0mm ball-to-ball
- Greater output with differential suitable for hot-dog flying.
- Pushrods can be used without bends in some cases.

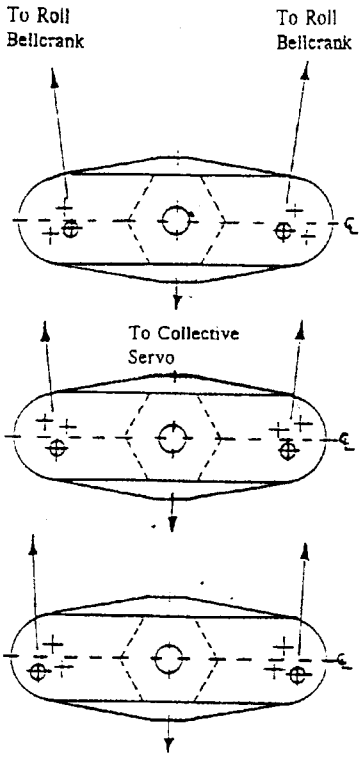
Position C:
- 29.0mm ball-to-ball
- Output for use with adjustable bellcranks and straight pushrods #106-34 (optional parts) not included.

STEP 3 Install the #0555-1 M3 ball into a #0133 ball link and replace the existing link on your collective servo pushrod. Select (1) #0596-6 M2.9x16 Phillips oval head screw, (1) #0567-3 M3 conical spacer, (1) #0596-1 Upper plate and the previously selected hex output wheel and lower plate. Assemble these components in order (as per Drawing and your position choice) making sure that all holes are aligned prior to tightening. Tighten this screw as you would any servo wheel screw.

STEP 4 Install (2) #0361 M2 balls into (2) #0133 links and screw then onto your roll pushrods. Select (2) #0047 M2x16 Slotted screws, (4) #0536-3 M2 conical spacers and (2) #0018 M2 locknuts. Install these in correct order as per the drawing into your chosen output holes. Be sure you have oriented the plates so your chosen output holes are ahead of the centerline.

After installation, you will see that each link is captured by conical spacers and change in output positions will require disassembly to enable inverting of the plates.


#0596-6
#0047
#0555-1
#0133
#0536-3
#0361
#0133
#0567-3
#0563-3
#0596-1
#0596-2
#0596-4
J.R. & Airtronics
(Sanwa)
#0018
Position hex as needed
to optimize centering
of #0567-2.
#0596-5
Futaba
Pos. (A)
Pos. (B)
Pos. (C)



Pos. (A)
24.0mm Output Spacing
(As on original X-Cell Parts)
with Differential

Pos. (B)
26.0mm Output Spacing
(2.0mm over original)
with Differential

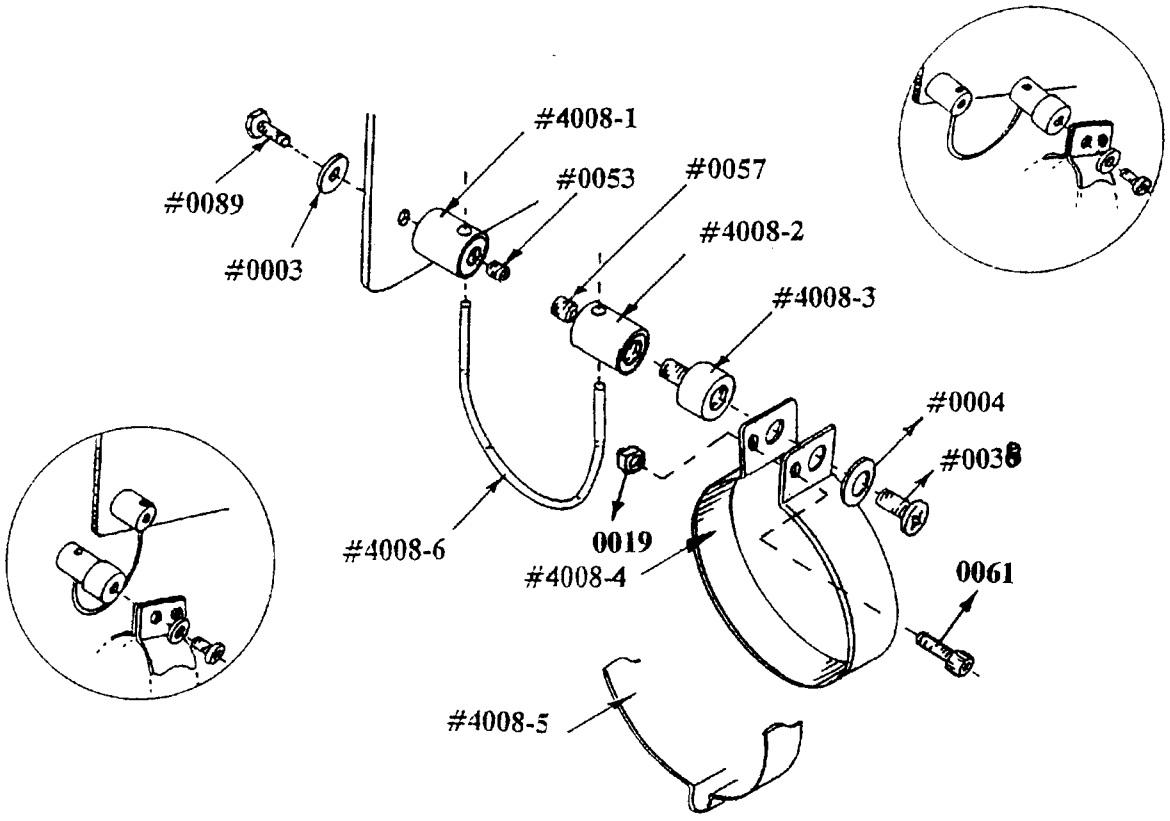
Pos. (C)
29.0mm Output Spacing
(5.0mm over original)
with Differential

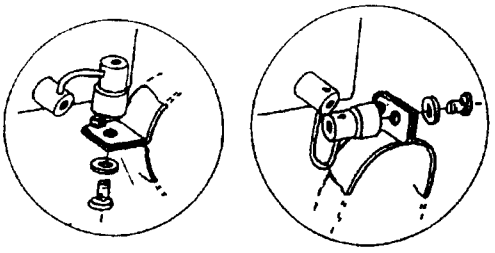
NOTE: Always orientate so output holes in use are ahead of centerline towards collective servo.

#4008 UNIVERSAL EXHAUST SYSTEM SHOCK MOUNT KIT

A must accessory for isolating your exhaust system from hi-frequency vibration and minimizing damage from impact. Use this kit to mount most tuned mufflers (such as Magna-Nitro pipes #3961, 3961-1, 3980 and Hattori 666, 669, 672, 650 and other 40.0mm O.D. pipes) and tuned pipes (such as Magna-Pipe #3651 and Hattori #638 "U" shaped pipes). [SPECIAL NOTE: Of the V-Tech series of tuned pipes, only the .20 size can utilized the strap provided, installation of .40 or .60 V-Tech pipes require that a longer strap be fabricated from strap metal or soft wire such as coat hangar wire.]

Study the drawing for the basic installation. It is recommended that you form the 2.0mm wire in a smooth 180 degree arc allowing at least 8.0mm or straight wire at each end for insertion into each stand-off. However, the actual shape of the wire can be more or less of an arc depending on your requirements. Each stand-off can be rotated to suit your installation. Loctite all mounting points except either ends of the rubber shock mount and the M4x6 Phillips screws holding the strap (Loctite would render them difficult to disassemble later for service and is not required).





4008EXHT.DOC
February 27, 1994