

## 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.

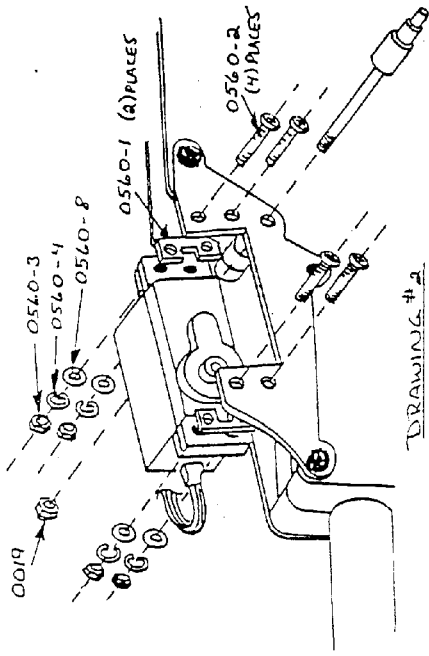
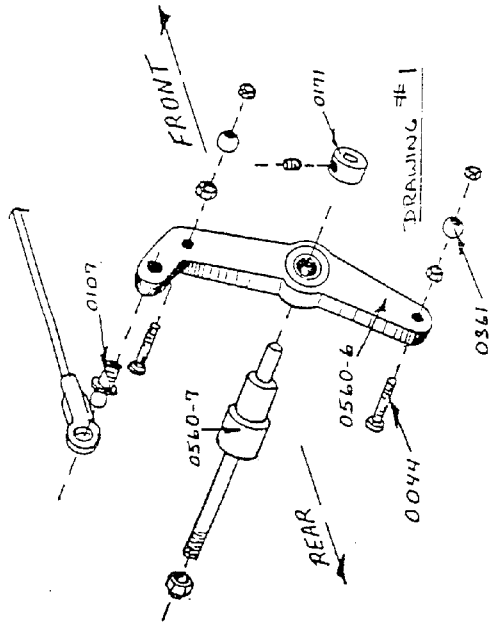
Drawings 3A, B indicate the correct hole positions to achieve the desired differential. This is important to understand and execute accurately to avoid servo binding at full A.T.V. Once you've drilled the correct holes (a #53 - .059" drill or 2.0mm works best), install (2) #0361 steel balls using (2) 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.

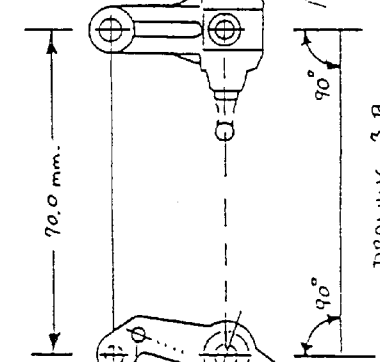
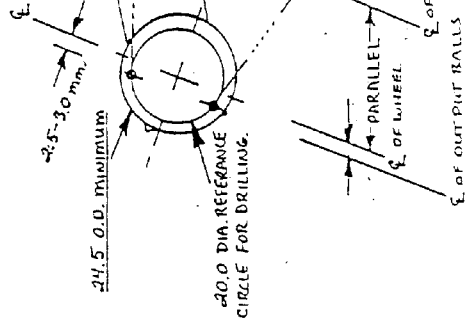
Check your A.T.V. and adjust for maximum useable travel. Usually about 100-110% is possible.

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!



# SUPPLEMENT DRAWINGS TO INSTRUCTIONS FOR #0560 & 0560-1



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

INDICATING CORRECT GEOMETRY  
 STUDY CAREFULLY. NO ALTERATIONS  
 ARE POSSIBLE.