#0832 HEAVY DUTY FRONT T/ROTOR TRANSMISSION TUNE-UP KIT.

APPLICATION - Fits X-Cell kits #1003, 1004, 1005, 1006, 1010 and other X-Cells with the optional Miniature Aircraft USA graphite torque tube T/Rotor Drive System.

NOTE - Compatible with the following M.A./USA accessories: #0551 and 0552 "Slipper Type"constant tail drive.
#0534 Autorotation Thrust Bearing

(Not compatible with #0550 "Split Gear" type constant T/Rotor drive without extensive modifications).

PURPOSE - This group of parts and special instructions will yield the best possible service from the main gear/front transmission assembly for use with the latest ultra fast gyros and servos (such as the Futaba FP-G501 system).

Please follow the instructions carefully. Only steps which are unique to these new parts will be described. It is assumed that normal kit instructions will be followed where they apply.

BACKGROUND - The approach M.A./USA has taken to address the problems created by the special high speed gyro systems has been fully tested by the nations top pilots.

You will note that (contrary to the opinions of some modelers) this modification kit does not utilize a metal replacement for the #0233 nylon/glass fiber transmission housing. There are specific reasons for this. Testing of a metal block resulted in only a small improvement in gear life over stock parts, and at the normal RPM (7800 - 8400) on the shaft created considerable R.F. noise for the radio in certain conditions. This was obviously the incorrect approach. Since the #0233 block assembly has been proven by a major radio manufacturer to be the quietest possible set-up, we chose to retain it in conjunction with other changes. By incorporating an additional support bearing ahead of the bevel gear we were able to achieve 100% gear integrity in even the most severe use and very little R.F. noise increase. Successful testing was even executed with a "loose" gear mesh, 100% gyro setting and high throttle - All conditions usually not encountered.

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1	0183	M10x19x5 Bearing (installed in 0832-1)
1	0832-2	Auxillary Front Transmission Bearing Block
1	0425	M5x13x4 Bearing (installed in 0832-2)
1	0832-3	Front Transmission Shaft with Delrin Female Universal
2	0240	Threaded Sleeves
4	0002	M3 Lock Washer
4	0003	M3 Large Flat Washers
4	0063	M3x10 Socket Head Bolts
6	0840-31	M3x16 Button Socket Head Bolts
1	0619	Shim Washer M10.1x15.8x.5

"Tear Down" Procedures

Initially the following must be removed from the model:

- Tailboom assembly at main frames
- Main shaft assembly from mainframes
- Lower main shaft bearing block #0182

- Main gear/autorotation assembly
- Front transmission assembly

After these steps, do the following:

- Completely disassemble front transmission
- Remove main gear from autorotation hub

ASSEMBLIES TO BE MODIFIED

Main Gear/Autorotation

Re-assemble the maingear/autorotation unit using (6) M3x16 #0840-31 Button Socket Head Bolts replacing original #0069 bolts. Set unit aside.

FRONT TRANSMISSION

With the transmission previously disassembled, examine the drawing to determine the amount of plastic to be removed on each side of the bearing block #0233. This is not a critical procedure but rather simply intended to concentrate side frame contact at each threaded brass sleeve and away from the radius of each bearing. The easiest method is to us a small sanding drum on a Dremel Tool.

Install the #0240 Threaded Sleeves as shown and make a note as to which side contains the knurled half. ON **THIS SIDE ONLY** the #0063 socket head bolts should be **FULLY** tightened after installation. The #0063 bolts on the opposite side should be tightened only enough to compress the lock washers and no more (this is only moderately tight).

As always, it is recommended that each bearing within the transmission be "mounted" with RED Loctite (permanent) for best results. Use of a heat gun later will simplify bearing removal. The new #0425 Front Bearing can be also treated with Loctite but later disassembly will require removal of the #0832-2 block along with the front transmission. This is a minor inconvenience considering the improved integrity of the assembly. Set the unit aside or loosely position it within the frame for a moment.

The #0507 Alignment Tool is helpful in overall assembly and is recommended (standard equipment in kits #1004, 1006 and 1010).

INSTALLATION STEPS

Mainshaft Components

Examine the drawing to see the position of the bearing blocks #0832-1 and 0832-2. Install these parts as shown and tightened only the forward #0077 socket head bolt (using the mainshaft for alignment and leaving the rearward #0077 bolt loose to allow later vertical adjustment of the #0832-2 block).

NOTE: Remember that at this point, the front transmission should either be not installed or shifted upward so that the bevel gear will not contact the main gear.

STEP 1 - Prepare set screw from the two #0205 mainshaft collars with Loctite. Slide the mainshaft into position capturing the collar between the bearing blocks. If you are using a 16 tooth bevel gear, a shim washer #0619 is included (if needed) to be installed above the autorotation hub. You may wish to trial fit everything without the washer. It is only added if available up/down adjustment of the #0832-2 bearing block does not yield the desired gear mesh. Most models will not need the shim washer.

STEP 2 - If collar #0215, threaded types #0551-3 and 0552-3, or a through bolt #0067 exist at the base of the mainshaft. Be sure it is fully tightened. Pull upward on the mainshaft while pushing downward on the #0205 collar just above the lower mainshaft bearing block #0832-1 and #0832-2. **Lightly** tighten one set screw. At this time, neither the mainshaft nor the maingear/autorotation assembly will move up or down.

STEP 3 - Lightly tap on the top of the mainshaft (or rotorhead) with a wooden block (or similar device) until a very slight amount of up/down play is evident in the main gear/autorotation assembly. The play should be as little as you can feel for certain (.010 - .030" or .25 - .75mm). NOTE - If you've added #0534 to your kit disregard this free play.

STEP 4 - Fully tighten both set screws in the lower #0205 collar (same collar as in step 3). Apply light pressure downward on the mainshaft while simultaneously pulling upward on the upper #0205 collar. Tighten it's set screw fully. At this stage, the mainshaft will not move up/down and the maingear/autorotation assembly will have very slight up/down play. This free play will be discussed in a later step.

STEP 5 - Slide the bevel gear/front transmission assembly downward into contact with the main gear (and into the bearing of the #0832-2 if not already done so). Looking from the side, be sure a very small gap exists between the back side of the bevel gear teeth and the rib surrounding the teeth on the main gear. If such a gap doesn't exist adjust the bevel gear as required. Set the gear mesh approaching zero free play. If a high spot or two exist (and you've followed normal kit instructions from trueing the maingear/autorotation assembly) mesh top the high spots. This is the opposite of the mesh technique used when this modification kit was not used. Check for up/down play in the main gear/autorotation assembly. When the mesh is correct, the up/down play previously established in step 3 will no longer be evident. The free play was only in existence to eliminate pre-load on the #0211 plastic spacer or the bearings within the autorotation.

NOTE -Again, as stated in step 3, if you've added accessory #0534 disregard the "FEE-PLAY" in the autorotation and follow specific instructions supplied with #0534 for this step.

IMPORTANT - If your model is equipped with #0551 or #0552 "Slipper" constant tail drive (standard in kits 1004, 1006 and 1010). Be sure all gears, mainshaft and front tail drive adjustment are performed with the #0551-2 or #0552-2 clamping ring and their O-rings backed-off out of contact with the autorotation hub. These should always be adjusted last.

FRONT TRANSMISSION ASSEMBLY FINAL STEP

Referring back to earlier notes relating to the front transmission modification, tighten each #0063 bolt as indicated after all adjustments are set.

FINAL ASSEMBLY

Reinstall the tailboom assembly taking note of it's correct depth within the boom clamps as stressed in normal assembly instructions. It is suggested that you contact M.A./USA for specific mixing set-ups to maximize the operation of either the Futaba G501 or J.R. Piezo technology gyros. Programmable mixing is generally considered the best method to operate this type of gyro. If you are using standard type gyros no further changes are required.

If you have any question feel free to contact Tech Support with Miniature Aircraft USA at (407) 292-4267.

Set Up Instructions for Futaba G-501 Gyro
By Cliff Hiatt 1/25/96

A. Switched Sensitivity (adjustable from gyro control box):

1. Set rudder ATV to +\-45%. (For each flight condition on the 9ZHP, also set the rudder AFR to +\-100%.) This gyro increases the output throw on the channel in use. 45% ATV will give the same throws and mixer outputs (such as t/r compensation) as before.
2. Set gyro ATV to +\- 100%. (for each flight condition and set function switch location on 9ZHP.) Set desired high and low sensitivity pot designations with transmitter reversing function for the gyro channel.
3. Set correct gyro direction with switch located on amplifier.
4. Adjust gyro gain from control box. Use @90% for hover and 50% for aerobatics as a starting point.
5. Spin rate can be adjusted by either changing gyro gain or rudder ATV (use AFR on the 9ZHP so that mixed rudder throws are not affected and adjust as desired for each flight condition). In this mode the gyro gain remains constant. The tail rotor must have sufficient power to override the gyro gain or the gain must be reduced to increase spin rate.
6. Use mechanical linkage throws as before. If tail rotor oscillates while in a hover with gyro set @90%, reduce mechanical throw or tail rotor diameter.

B. Switched Sensitivity (adjustable from transmitter gyro ATV):

1. Same as A1 Above.
2. Adjust gyro gain with ATV so that the high rate position is @ 90% and low rate is @ 50%. Set the switch direction with the transmitter reversing function for the gyro channel. (The 9ZHP allows for different rate settings for each flight condition. Set the desired ATV or AFR amounts while the condition is activated.)
3. Same as A3 above.
4. Adjust gyro gain pots so that the "0" is full low and "1" is full high.
5. Same as A5 above except gyro gain is adjusted with gyro ATV (or AFR on the 9ZHP).
6. Same as A6 above.

C. Stick Priority Sensitivity (reduced as rudder stick is deflected):

NOTE: **These instructions are tailored for the Futaba 9ZHP transmitter**. The same principles apply with other transmitters that have programmable mix functions but exact settings must be developed by the user.

1. Same as 1A above.
2. Set gyro ATV +\- 100% for all flight conditions and select "NUL" for the gyro channel control on the "FNC"select menu. Reverse the gyro channel in the reversing menu. (Other transmitter brands: deselect the gyro channel switch if possible.)
3. Same as A3 above.
4. Same as B4 above.
5. Activate a program mix as shown: RUD is master, Gyro is slave, CRV mix type, UNMIX mode, INH trim and NUL switch select (so that mix is continuous). Do this for all flight conditions.
6. Same as A6 above.
7. Gyro gain reduction is adjustable using the PMIX curve points where +100% mix is equal to 100% gyro and -100% mix is equal to 0% gyro. (Each 10% of mixer adjustment equates to a 5% change in gyro gain) **NOTE: The following mixer values are examples. It is recommended that the lower values are used for initial settings. Optimize for your machine by trial and error. This gyro is very powerful!**

- Set the hover mixer up as follows: point #1 = -10%, #2 = 23%, #3 = +56%, #4 = +90%, #5 = +56%,

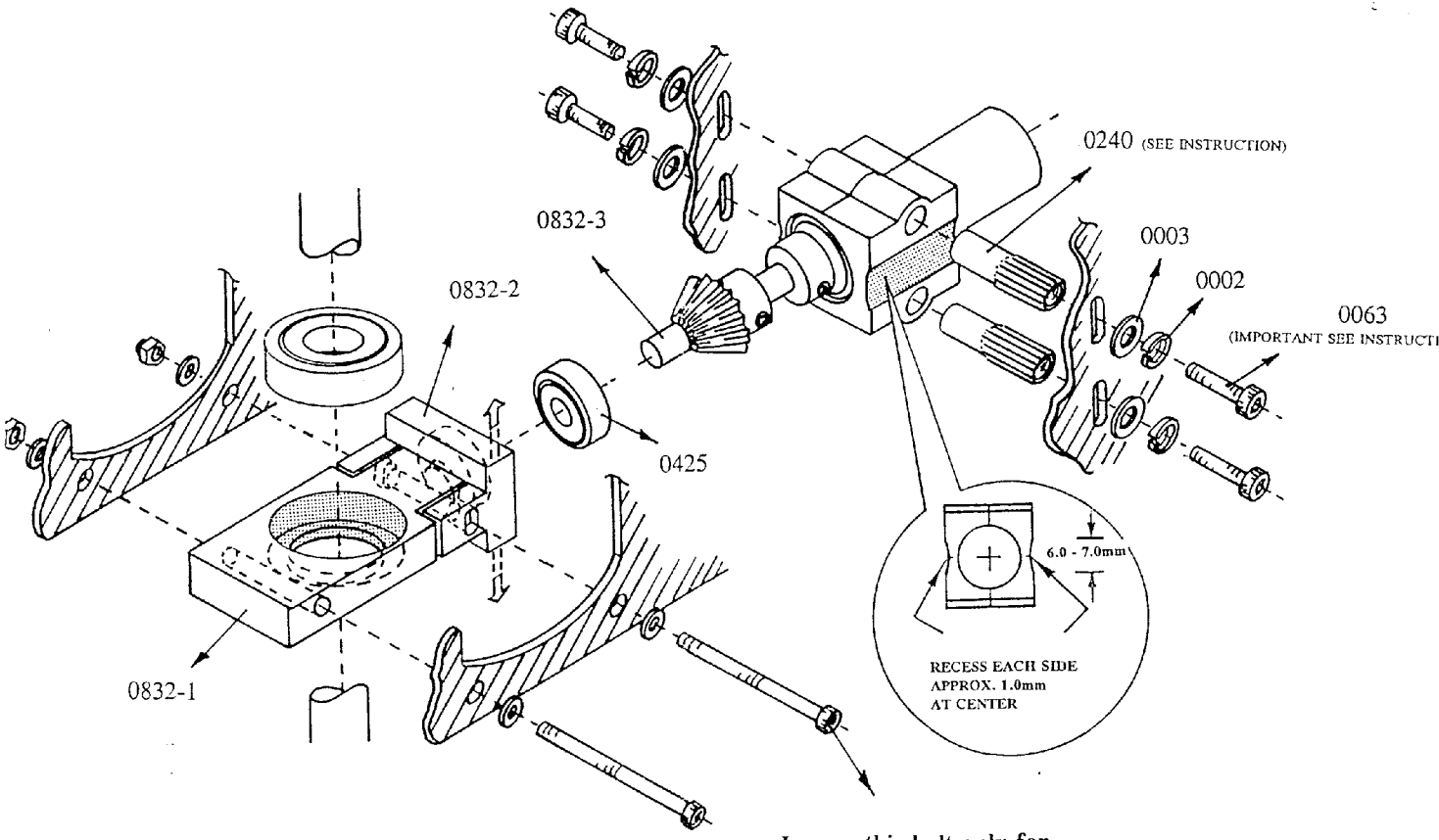
#6 = +23% and #7 = -10%. (This equates to : 95% gyro at center stick with a linear reduction to 45% gyro at full stick.) The curve will look like a "V".

- Set the forward flight condition mixers up as follows: point #1 = -80%, #2 = -40%, #3 = 0%, #4 = +40%, #5 = 0%, #6 = -40%, #7 = -80%. (This equates to 65% gyro at center stick with a linear reduction to 10% gyro at full stick.) The curve will look like a "V".

Options: Point #2 and #3 can be placed above or below the "V" line to affect positive or negative exponential reduction of gyro gain as the stick is deflected. Spin rate is adjusted with a combination of AFR and mixer point values.

HEAVY DUTY FRONT T/ROTOR TRANSMISSION TUNE UP KIT

#0832



Loosen this bolt only for vertical adjustment of 0832-2.