

WHAT IS 0844 HEAD<sup>?</sup>

## #0840 MINIATURE AIRCRAFT USA XL-PRO II C.N.C. ROTOR SYSTEM

Please read all instructions carefully prior to installation of this rotorhead. Proper installation and operation of this system will require some modification to your mechanics along with precise set-up procedures.

### STEP 1 Washout Assembly Modification

Installation of the XL-Pro II C.N.C. rotorhead requires that the conventional orientation of the washout arms be reversed. Proper identification of your washout hub is important prior to proceeding. The designation is as follows:

- Plastic hub #0219 (standard in kits #1001, 1003 and 1005).
- Aluminum C.N.C. hub #0571 **early** type (tapped pivot bolt holes **are not** fully through the hub and anti-rotation guide pin slots are 2.65mm or .104" wide).
- Aluminum C.N.C. hub #0571 **late** type (tapped holes are "through" holes and slots are 2.75mm or .108" wide).

After identifying your hub, examine the drawing to see the correct arm orientation. In all cases, spacer washers #0562-1 (extras included) will be required to avoid bearing binding after pivot bolts are tight. Follow these guidelines for assembly:

#### A - Model using plastic hub or "Late" aluminum type and plastic or aluminum arms.

No mods are required except to note arm orientation as per the drawing and that spacer washers are required. Trial fit the plastic hub onto the anti-rotation guide pins in the rotorhead to ensure smooth fit. Some plastic hubs might be snug on the pins and will require relief of the holes. A small jewelers file or appropriate drill will easily remedy this situation. "Late" aluminum hubs are already sized to properly fit the pin.

#### B - Model using "Early" aluminum hub and plastic or aluminum arms.

Since these hubs do not have "thru" holes, some modification is required to allow the arms to be reversed. Use a 2.4mm drill (3/32") to drill from the threaded side of each hole through to the opposite side (use a small piece of cellophane tape around the drill to protect the surrounding threads. Now, go to the opposite side and enlarge the pilot hole with a 3.0mm (.116 - .118") drill to a depth of 2.50mm. Do not drill deeper or larger. This will allow the pivot bolts to be installed from the new side.

"Early" hubs may fit too tightly on the guide pins, so check carefully. Use a small file if adjustment is required.

**NOTE:** We cannot guaranty correct fitment of any aftermarket copies of the X-Cell washout assembly. You will find it best to use only genuine X-Cell parts and accessories for this installation.

## **STEP 2      Swashplate Modification**

Install a single #0009 M3 washer behind each of the two #0109 threaded balls on the inner swashplate ring which connect to the Hiller rods going to the bell mixers. This will space each ball outward the required amount. Be sure to use Loctite during re-assembly.

## **STEP 3      Installation of the Rotorhead**

All XL-Pro II main head blocks are 100% C.N.C. milled without secondary operations. The centerline accuracy is without question, however, the same cannot be said for some mainshaft cross holes. This can cause difficulty during initial assembly. The XL-Pro II rotorhead does not utilize the conventional 3.0mm bolt to retain the head upon the shaft. Instead, a 3.0mm hardened precision ground dowel pin is captured with an M4 socket set screw. Since these dowels are a true 3.0mm diameter (M3 bolts are not) and the mainshaft hole may be slightly off-center, you should trial fit the head and dowel. The chamfered end is used for entry. A small access hole on the opposite side of the head will allow a 2.0mm wire or 1.5 Allen driver to be used to push the dowel out after the set screw is removed. If the dowel will not fully insert through the main shaft with only moderate pressure, rotate the head 180 degrees upon the shaft and repeat. If neither position will work the mainshaft cross hole must be enlarged slightly using a 3.0 - 3.1mm drill (.120"). This is easily accomplished since all M.A./USA mainshafts are only heat treated on the "auto-rotation" end. Be sure to deburr the edges. Do not attempt to modify the head block.

The rotorhead is further secured to the shaft by the tightening of each secondary mixer located at the base of the head block. These should be installed with Loctite (in the head block threads and not directly upon the bolt threads to avoid Loctite entering the bearings) and tightened well with a good quality Phillips screw driver of the appropriate size. These special screws are 12.9 hard for this reason. It is advisable to periodically check their tightness.

**IMPORTANT** - While the secondary mixers appear assembled as you receive the rotorhead, they **must** be removed and properly installed with Loctite prior to use.

## **STEP 4      Flybar Installation**

Flybar control arms should be set as per the drawing. This is to say that the bottom surface of each is parallel. This produces a slight downward angle in each (which can be increased for set-ups using extreme swashplate tilt). Three positions are available for

the control ball on each arm. We recommend that you use the outermost hole initially. Testing has shown this to be the best overall position, but your needs may be different. Paddle weight and blade C.G. will have influence here.

Paddle choice is up to the individual. We have found XL-Pro II paddles #0561-5 to be best overall (ideal weight range of 35 - 45grams). Flybar disc diameter should be approximately 39 - 40% of main rotor diameter so choose your flybar accordingly. For example, using M.A./USA Pro graphite blades #3696-1 (690.0mm) and Pro II paddles #0561-5 calls for #0566-1 flybar.

#### **STEP 5      Secondary Mixer Set-Up**

The secondary mixers offer two output positions for the #0115 balls. The inboard position nearest the #0109 ball is recommended for most models. The outboard position significantly increase flybar authority and is more desirable however, lightweight pod and boom models will not typically tolerate this position and may exhibit oscillation about the mainshaft in windy conditions or at very low rotor speeds (somewhat similar to excessively tight dampening). To the contrary, fuselage models will often allow the use of this position. Various blade types can also dictate the position to be utilized. If you are using the in-board position and wish to quickly test the outer, then simply lengthen the #0337 pushrod two turns and move the ball to the outer hole.

#### **STEP 6      Blade Pivot Bolt Tension**

Pivot bolts should be only tight enough so that when the model is tilted the blades do not fold from their own weight. Constant R.P.M. set-ups can be a little tighter while two-stage set-ups must be freer to lead and lag. Always use the correct pivot bolts which are 12.9 hard and have sufficiently long shanks. Replace locknuts as needed to maintain good grip and always use the shim washers whenever possible. Lock washers may be bonded into their positions with "Goop" #0502, if you wish.

#### **STEP 7      Dampening Adjustment and Service**

The dampening system is quite simple and easy to adjust or replace. Dampening is provided by two blocks of special polymer compound and color-code shims. The factory setting is moderately firm and has proven acceptable for many variations in rotor blades, R.P.M. and model type (fuselage, pod and boom, light, heavy, etc.). Dampening rate and static track can be adjusted further by adding or removing shims from either or both sides. Generally, a .11mm (.0045") change of shim on one side only can result in a 2.0 - 3.0mm (3/32 - 1/8") change at the blade tip. This step is not required unless blades are a little irregular.

Due to the design of the dampening in this head, it is quite tolerant of blade irregularity or small static track variations. Color-code shims are included and measure as follows:

Brown = .25mm (.010")  
Blue = .11mm (.0045")  
Red = .04mm (.0015")

In addition to removing shims, dampening can further be softened by trimming the width of the dampeners (at each end where they rest against the side plates) but generally the best set-up is stiffer not softer.

As supplied new, the dampeners will "break-in" slightly for the first 5 or so flights and then remain constant rate for many gallons of fuel. It is recommended that no changes be tested until at least 10 or so flights are completed.

Since dampening is so important to the best operation of the rotorhead and many variables can exist in blade choice, R.P.M. and model configuration, each pilot must determine his best set-up. As a guideline, the following should be considered when testing dampening rates:

**Very-Soft** -- On the plus side, the model will feel very "forgiving" in the hover and accept virtually any R.P.M. range. Cyclic response will be diminished somewhat. On the negative side, the model will react poorly to wind gust and be somewhat fore & aft sensitive in forward flight. This is not considered an acceptable "contest" set-up.

**Very-Tight** -- This is the most desirable for windy conditions. The tendency for the model (especially a fuselage) to "lift" its nose in wind gust is minimized. Forward flight is more precise. The only down side to this set-up is exhibited in the possibility of "mast bumping" or oscillating slowly about the main shaft in a fore and aft or side to side pattern. This tendency is unfortunately enhanced by a high gyro setting. This is considered the stopping point and can be minimized by changing hovering R.P.M. and/or loosening the dampening. Often the condition is only evident in certain cross-wind conditions so it is important to evaluate your set-up in all situations if you intend to stay as close to this "tight" set-up as possible.

### **Dampener Access**

Examine the drawing to familiarize yourself with the basic procedure. The steps to access the dampeners are as follows:

- 1) Remove the head button via the two flat socket head screws.
- 2) Remove the M4x6 socket set screw in the center on the top of the head block.
- 3) Apply downward pressure to the head and use a small tool to push the #0840-4

pivot axle out of the bearing in the side plates. This will release the upper rotorhead assembly and only the pushrods will hinder lifting off the model. The dampener components sit in machined grooves in the head block. Shims are installed beneath each dampener. Re-assembly is similar. Adequate downward pressure (more shims - more pressure) must be utilized to allow insertion of the pivot axle. Be sure the flat is upward and the #0840-5 washers are still in place in the head block. Temporarily Loctite should be used at all positions.

## **STEP 8      Pushrods**

Approximate pushrod settings for initial set-up (as measured on exposed pushrod between ball links).

Hiller rods (swashplate to bell mixers) - 62.5mm long.

Secondary mixer rods (secondary mixer to bell mixers) - 16.0mm.

Short secondary mixer rods (secondary mixer to flybar) - 0 - .5mm.

**All tracking adjustments should be made only to the hiller pushrods.**

## **Repair Service and Parts**

Should you damage or have any problems with the, XL-Pro II rotorhead, return it to Miniature Aircraft USA for servicing. Due to the special fit necessary on many of the components and procedures/tools required for proper assembly, most individual parts will not be sold outright except as used by Miniature Aircraft USA to service your rotorhead. Liability considerations dictate that there be no exceptions to this policy. The following items may be purchased and shipped separately:

#0840-1	Dampeners
#0840-2	Shim Set
#0840-3	Head Button
#0840-4	Pivot Shaft
#0840-5	Steel Washers (2)
#0840-6	Retainer Dowel Pin M3
#0840-7	Spacer Washers (2)
#0840-8	Blade Pivot Bolts (2)

All remaining "0840 series" numbers are factory installed only. Charges will be for parts and shipping only with no labor fee involved. Turn-around should be 1 - 2 days.

MINIATURE AIRCRAFT USA

# XI-prc II

EXPERT ROTORHEAD

0840

