HOW TO USE THE P-TPE-1 TAPERED PIN EXTRACTOR

A) Please refer to the three color pictures of the Extractor being used on an actual airplane. The 3 pictures are numbered: Page 1, Page 2, and Page 3: Please do each step in this order.

B) Remove the nut and any washers that now exist on the end of the Universal Joint Tapered Pin that is to be removed. DISCARD the Nut and SAVE any remaining parts and/or Washers in a Ziploc bag or other safe container. Label the container Pilot's Side or Co-Pilot's Side, whichever it is you're working on.

C) Procure from your aviation parts supplier three MS21042-L3 Nuts: This part is essential for successful extraction because the tool is designed for this type nut. This type nut requires a ¼" size, six-sided socket. One of the new nuts will be used for the extraction operations; the other two nuts will be used during final installation of the tapered pins (After inspection of the Shaft hole placement has been accomplished).

B) Take the Extractor and turn either one of the two capscrews until the end of the screw is flush with the Plate in which it is screwed into. Then, unscrew and remove the other capscrew entirely.

C) Notice that the two Plates that make-up the Extractor, have their holes drilled closer to one edge than the other. (In other words, in your mind, if you drew a line through each of the three holes, that line, is closer to one edge of the Plates than the other). Take the plate that has a center hole drilled all the way through it, and position it around the aircraft's Universal Joint so that the edge that is closest to the imaginary line is near the Bronze (colored) Bushing: See photos. Position the Plate so that the end of the Tapered Pin enters the Plate's center hole and is now seated fully against the universal joint's side. See Photo Page 1.

D) Holding the Plate in place, swing the remaining Plate, 180 degrees, so that the two Plates now are positioned around the Universal Joint, like a saddle on a horse. Now take the remaining cap screw and start screwing the two plates together, slowly and gradually. Make sure that the MS21042-L3 Nut becomes seated in the depression in the Plate that is designed to receive and stabilize the Nut during the extraction operation. At the same time, check that the tapered pin has fully entered the through-hole (in the other Plate) and that each Plate is seated on the universal joint's outer surface or diameter. Adjust each of the screws, by hand until you achieve the following conditions:

a) The Tapered Pin is fully seated in the Plate such that the plate is in full contact with the U-Joint's outer diameter.

b) The Nut (Tapered Pin Nut) is seated in the dimple on the other Plate.

c) Check that both Plates are parallel with each other and that the entire Extractor is square with respect to the Universal Joint. If it isn't, loosen the capscrews slightly, reposition the Extractor as necessary, and hand-tighten the screws: See Photo 2.

E) Take a 5/32" Hex Key ("Allen" wrench) and start tightening each capscrew, a little at a time: First one; then the other. Alternate back and forth between each capscrew, turning clockwise, about a ¼ to ½ turn at a time (or less if the screws get very hard to turn).

F) Suddenly the Extractor will become loose in your hands: This means that the Pin has been separated from the Tapered Hole in the U-Joint. Inspect the Nut-end of the Tapered Pin to ascertain that separation has occurred: The Nut should now be touching the U-Joint outside diameter: See Photo 3.

G) Unscrew either one of the capscrews until it is flush with the Plate. Unscrew the remaining capscrew enough so that one of the plates can be rotated 180 degrees, allowing the extractor to be removed. Re-align the two plates so that the previously removed screw can be re-installed. Re-install that screw. Put the Extractor aside, for now.

H) Now, remove the Nut on the end of the Tapered Pin. Your Tapered Pin Extractor is designed to do minimal, or no, damage to the Tapered Pin. In most instances you will be able to unscrew the nut with the fingers of one hand, which exerting some small pressure on the head of the tapered pin (to prevent the Pin from rotating while you are removing the Nut).

a) If the Nut doesn't want to come off using finger pressure, use a ¼" socket.

b) If the nut still won't come off, because the Pin is turning, LIGHTLY tap the head of the pin with a small hammer to slightly seat it, and then use the socket wrench to remove the Nut.

c) With your fingers, push the Pin out of the Hole in the Universal Joint.

I) Have your helper sit in the seat with the controls that <u>aren't</u> being presently worked on. You need to sit in the seat that has the Controls that are being worked on. Have your helper hold his/her Control from turning. Now carefully try turning "your" control wheel. If it turns easily, then exert a moderate aft force while rotating the wheel slowly back and forth. If there is binding, try spraying the universal joint/tapered hole/shaft area with a good penetrating oil such as "Kroil", "Triflo", or "WD-40". If this doesn't work,

it may be necessary (AFTER REMOVING ALL TRACES OF LUBRICANT WITH ALCOHOL THAT HAS THEN BEEN ALLOWED TO EVAPORATE), to Heat the U-Joint with a "Heat-Gun" to expand the I.D. of the Joint relative to the Shaft. (Be careful to direct the heat in such a way as to not set the airplane on fire).

J) Measure from the center of the Sprocket Shaft hole to the end of the Shaft. Make sure that the measured distance is 0.190" or GREATER. If the measured value is smaller than 0.190", the Sprocket Shaft must be replaced. For details, print-out the Two Piper service bulletins and the Airworthiness-Directive. These are easily available on our website: www.tuotiaviation.com

K) Check the play in the Universal Joint. If you can notice it while flying, it definitely is excessive. We are available for fee-based consultation on the details of machining operations when the U-Joint and/or the Sprocket Shaft require replacing. This work is quite specialized and, in our opinion, does not easily fall within "normal" machining operations or practices.

L) When all has been checked and meets the requirements of the SB's and the AD: Examine the old Tapered Pin. Check that its tapered diameter is not nicked or gouged. (A smooth, polished look is OK). Check that the NEW nut can be hand started and turned 2 or 3 turns by hand. If any of these conditions are not correct: Replace the pin! See the previously mentioned Service Bulletins for the proper Piper Part Number.

M) Before installing the new MS21042-L3 Nut, first, install the Washers you removed and saved. You should have either an AN960-10 Flat Washer or an AN975-3 Taper Pin Washer. Be sure to first install the Washer and then the Nut. If your installation uses a Taper Pin Washer, be sure that is installed so that the flat surface is toward the nut and the concave surface is against the Universal Joint. Torque the Nut to between 35 and 40 inch pounds, using a calibrated torque wrench.

O) I have made every effort has been made to be accurate and helpful. In the event that you notice any contradiction between my instructions and the instructions contained within Piper SB1197A and/or SB1197B: The practices and procedures specified in the Service Bulletin shall prevail.

P) I hope that this tool has saved you as much time and frustration as it has saved me. If your experience has been good, please tell others! If you have experienced difficulty, please contact me at thomasttuoti@tuotiaviation.com or telephone (602) 315-1973. Thank you!