



TRACKING MAIN ROTOR BLADES

Date: September 26, 2013

Subject; Tracking the Enstrom Rotor System using the Chadwick 2000 balance system.

Models: All models

Effectively: All Serial Numbers

Experience shows that the procedures previously printed in SIL 0121 and in the various maintenance manuals are not optimum for tracking helicopters using modern tracking equipment including Chadwick 177 and 8350 models and/or on helicopters that have blades with leading edge spars manufactured by Universal.

Universal-spar blades can be identified by the serial number that is stamped on the root of the blade. Main rotor blade serial numbers are a 16- XXXX number that is terminated with a – (M, R, A, or U). "U" blades incorporate Universal spars.

Blades manufactured by Martin, Reynolds, or Alcoa, can be tracked with the following procedures, but the initial hover track segment can be eliminated before working out the cyclic feedback with the out-board tabs.

Blades manufactured by Universal must be hover tracked to .2 IPS or less before any attempt is made to work out the cyclic feedback; otherwise the cyclic feedback will return when the hover is tracked.

A. Main Rotor Blade Tracking using the Chadwick 2000 system.

Note: This procedure should also be followed when using the DSS Microvibe and ACES systems with any modifications required by the individual system used.

General:

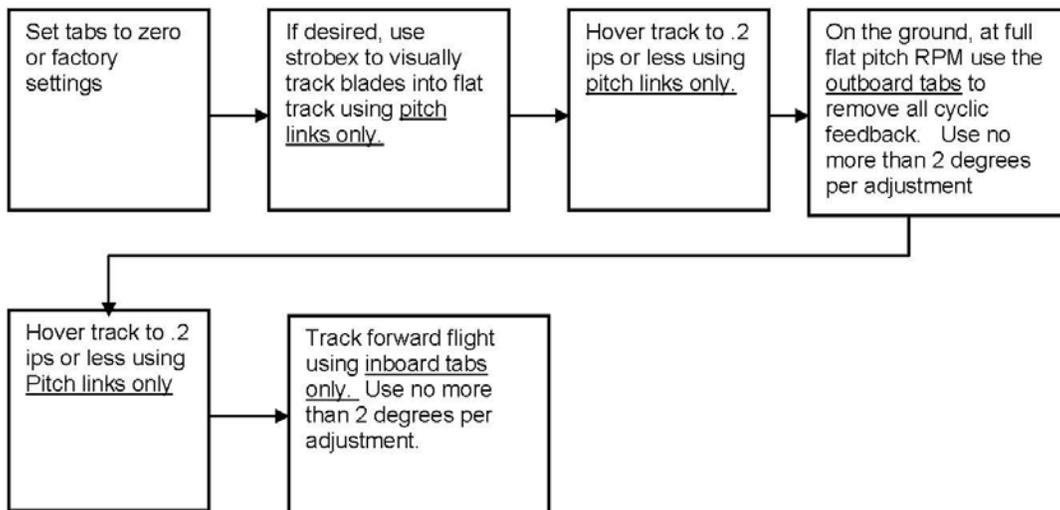
The purpose of tracking the main rotor blades is to obtain a smooth ride. This is accomplished by adjusting the blade track to reduce vibration. An out-of-track condition will produce a vibration, usually a one-per rev which is felt as a vertical vibration. However, for the rotor system to be smooth, it does not necessarily mean that the blades are flying in the same plane.

With the advent of digital tracking equipment it has been found that the best ride is not necessarily a condition of the blades flying in plane, but in a track that gives the least magnitude of vertical vibration.

For this reason, Enstrom recommends that the strobe light only be used on the ground for initial rough track or for initial hover track if the ride is unacceptably rough to begin hover tracking.

Do not change the tip weights in the blades from original factory settings.

Tracking Procedure Flow Chart



Installation of Equipment

1. Install magnetic pick up in the swashplate bracket for the 480, or Install an optical sensor on fuel tank of the piston helicopters.



Magnetic Pick-up installed on 480 Swashplate.



Optical Sensor installed on 280FX air scoop. Mount the bracket under the fuel tank mounting screws on F 28 series helicopters.

2. The number one blade (Target blade) must be at the 12;o'clock position relative to the front of the helicopter when the magnetic pick up is opposite the interrupter on the swashplate, or when the optical sensor is opposite the reflective tape on the mast.
3. Install the velocimeter on the instrument panel.



Velocimeter installed on 480 lower instrument panel.



Velocimeter installed on 280FX lower instrument panel

4. Install strobe light if desired, or if there is reason to believe that the initial hover will be unacceptably rough.

B. Tracking procedure

1. Grease main rotor head.
2. Bleed main rotor dampers
3. Set tabs at recorded angles on the "Blade Information Sheet" or zero all the tabs.
4. Ground run helicopter with rotor engaged at full "flat pitch" rpm.
5. If the strobe light is being used, observe the track of the blades and use pitch links to adjust the track into a reasonable flat track.
6. Hover the helicopter into the wind. (480 Blade RPM 372) (F & C series 350 blade RPM) (A series 332 Blade RPM)

NOTE: The best results are obtained if the helicopter is loaded so that the helicopter is relatively heavy. Normally, adding weight will make the blades fly at a higher angle of attack and will increase the roughness of the ride, where as the helicopter gets lighter from fuel burn, the ride will improve.

7. Record the ips reading and the clock angle. Using the Vertical accelerometer Channel B polar Chart, adjust track for ips readings of less than .2 using pitch links.

C. Tabbing out feedback.

Tabbing out cyclic feed back is the most difficult and the most important procedure in achieving optimum ride in Enstrom helicopters with minimum cyclic vibration. Less than optimum outboard tabbing results in excessive inboard tab to achieve a smooth ride and also excessive cyclic stick vibration.

D. Unfortunately there is no reliable method of determining the correct outboard tab other than trial and error. (known as the Witch Hunt)

1. Create a chart such as the one shown below to record the results of the tabbing runs.

1 up	
1 dn	
2 up	
2 dn	
3 up	
3 dn	

2. Operate the helicopter on the ground at full flat pitch blade RPM
3. Move the cyclic 6 to 8 inches in a forward and aft movement at approximately 1 cycle per second and feel for feed back in the cyclic motion.

NOTE: Feedback will not necessarily be indicated by cyclic stick shake, although stick shake will result from significant feedback.

NOTE: With the piston aircraft, this procedure can be done with the collective in the full down position but the 480s often have some slight mechanical feed back that gives the appearance of blade tab feed back but is not. With the 480s it helps to pull a bit of collective pitch and allow the helicopter to rise slightly to extend the landing gear oleos a bit. This will eliminate the mechanical feed back and allow the pilot or technician to feel the blade feedback.

4. Stop the blades and add 2 degrees up to the # blade outboard tab.

5. Run the helicopter again with the same procedures and check the cyclic for feed back again. The purpose of this procedure is to compare the feed back to the original tabbing, and to the last tab attempt. Normally the severity of the feed back will stay the same, get better or get worse.
 6. If the feedback is eliminated this procedure is finished. If the magnitude of the cyclic feed back either stays the same, or worsens then change the setting on the same outboard tab to 2 degrees down.
 7. Run the helicopter again and using the same procedure, compare the magnitude of the cyclic feedback. Again, it should either be eliminated, stay the same or get worse. If it stays the same or gets worse, then set the #1 blade outboard tab back to zero, and add 2 degrees up to the #2 blade outboard tab.
 8. By following this procedure it should be possible to eliminate the cyclic feed back with one outboard tab adjustment on one blade.
- E. Using pitchlinks, re-track the hover to less than .2 ips. If the above procedure is followed once the hover has been tracked smooth, the cyclic feedback should not reoccur.
- F. Forward flight is tracked using the inboard blade tabs.
1. Fly the helicopter at normal cruse settings, (24 in MP for A models), (28 in MP for C models), (29 in MP for F models), (102 % N2 for 480B Models) and record the ips reading and the clock angle.
 2. Using the same polar chart, adjust the forward flight to less than .2 ips with the inboard tabs.

NOTE: If addition of inboard tab affects the hover, take that tab out again and try opposite tab on the other two blades.

NOTE: When making clock angle corrections, if a tab change does not improve the ips reading, it is advised to take the tab adjustment out again and try adjusting the inboard tab on another blade. Failure to follow this procedure will result in excessive tab amounts on all the blades.

3. Continue this procedure until the forward flight ips reading is .2 or less.

