HUGHES/MD MODELS 369/A/H, OH-6/A HELICOPTER TRACK AND BALANCE

Dynamic Solutions Systems, Inc. (760) 598-4000 - sales@dssmicro.com
Applications Support (714) 898-7087 - applications@dssmicro.com
Product Support (760) 598-4000 - support@dssmicro.com
Training Support (715) 233-9838 - training@dssmicro.com

Track and Balance Equipment Requirements

MFR	P/N	DESCRIPTION	QUANTITY	
			M/R	T/R
DSS	1300	MicroVib II Aircraft Analyzer	1	1
DSS	1014 or 1460 or 1880	Accelerometer, 20mv/g	2	1
DSS	1008-X	Accelerometer Bracket	2	1
DSS	1096-X	Accelerometer Cable	2	1
DSS	1097-X	Photo Tach Cable	0	1
DSS	1170-X	Magnetic Pickup Cable	1	0
DSS	1015	Photo Tach	1	1
DSS	1520	Photo Tach Bracket	1	1
DSS	1254	Reflective Tape (roll)	1	1
DSS	1010	Rotor Protractor	1	1
DSS	1377	Electronic Scale	1	1
DSS	1428	Tab Tool Set, Universal	1	0
MicroTracker Tracking Equipment				
DSS	1145-5	MicroTrack Optical Tracker	1	0
DSS	1450-x	4x4 Signal Mux w/ Optical Adaptor	1	1
Strobe Tracking Equipment				
DSS	1115-x or 1680	4x4 Signal Mux w/ Strobe Adaptor	1	1
DSS	1123-X	Strobe Power Cable	1	0
C-H	135M-10,11 or 12	Strobe Tracker	1	0
C-H	3387	Tip Targets	1	0
Vibration Analysis / Vibration Database Software				
DSS	1600	MicroBase Professional Software	1	
DSS	1311	Serial Cable, MicroVib II to PC	1	

I. Main Rotor Track And Balance

Main Rotor Track And Balance Equipment Installation

NOTE: When mounting vibration sensors, make sure that the vibration sensor's sensitive axis is aligned with the intended measurement direction. The sensitive axis always parallels the sensor mounting bolt axis. In some sensors, the electrical connector exits in-line with the sensitive axis, while in others, the connector exits at a right angle to the sensitive axis. Do not assume that the sensor's electrical connector orientation relates to its sensitive axis.

A. **Vertical Sensor:** Attach the vertical vibration sensor to the standard MDH location in the right side of the instrument cluster using bracket **1008**. The sensitive axis should be pointed **down** as shown in **Fig. 1**. Connect and route cable **1096** to signal mux unit **CH:2**.

B. **Lateral Sensor:** Attach the lateral vibration sensor to the standard MDH location above the left door near the left front corner of the "dog house" using bracket **1008**. The sensitive axis should be pointed **left** as shown in **Fig. 2**. Connect and route cable **1096** to signal mux unit **CH:1**.

C. **Photo Tach:** Attach the photo tach **1015** to the **left** side of the "dog house" behind and to the left of the main rotor hub using bracket **1520**. Carefully align the photo tach so that the light beam strikes the reflective tape when the rotor is positioned as shown in **Fig. 3**.

Figure 1

D. **Reflective Tape:** Attach a **1" x 3"** (25.4mm x 76.2mm) piece of reflective tape lengthwise to the **underside** of one of the the main rotor blades about 6 inches inboard of the blade grip.

E. **Photo Tach Alignment:** Check the beam and tape alignment by powering up the **MicroVib II** Analyzer and turning the rotor until the reflective tape passes through the photo tach's light beam. When the tape passes through the light beam, the photo tach "pilot" light will illuminate to indicate a valid reflection**.** The "pilot" light will also "blink". The higher the rate the greater the strength of the reflection.

Figure 2

F. **Strobe Tracker:** If using a Strobe Tracker, install tip targets on all **four** blades. When installing tip targets, use care to insure that an equal amount of weight (i.e. tip targets, mounting hardware, etc.) is added to each blade.

G. **MicroTracker:** Attach the MicroTracker to the Signal Mux unit. Tip targets are not required when using the MicroTracker.

Main Rotor Track And Balance Equipment Setup

A. **Download Latest Group File:** For the best results, visit **www.dssmicro.com**, then download and install the latest **H369A** group file into your MicroVib II Aircraft Analyzer.

B. **Create New History File:** Press **MODE** then **CONTROL PANEL** then **NEW HISTORY FILE**. If you have a previously saved **H369A** group file, select it and then press **SELECT GROUP FILE**. Otherwise, press **H500C TEMPLATE**.

C. **Modify History Filename:** When you are prompted to modify the History Filename you must choose to either use the suggested filename or enter one which is easier to remember (such as the aircraft registration or serial number). When satisfied with the History Filename, press **OK**. The new History File will be automatically loaded into the Analyzer's memory.

D. **Verify Tasks:** Select **PROP/ROTOR BALANCE** and press **START ANALYSIS**. Press **TASK** and verify the appropriate tasks are available as shown in **Table 1**.

Task	Conditions	Collect Data	Typical Data Use
GND	Idle RPM	Track Pattern	Correct with PC Link Adjustment
	Flight RPM	Track Pattern	Correct with Tab Adjustment
		Lateral Vibration	Correct with Mass Adjustment (see note below)
HOV VT	Hover IGE	Track Pattern	Correct with PC Link Adjustment
		Vertical Vibration	Save for reference only
HOV LTS	Hover IGE	Lateral Vibration	Correct with Blade Sweep
HOV LTW	Hover IGE	Lateral Vibration	Correct with Mass Adjustment
60KT VT	60Kt Level Flight	Track Pattern	Save for reference only
		Vertical Vibration	Correct with Tab Adjustment
90KT VT	90Kt Level Flight	Track Pattern	Save for reference only
		Vertical Vibration	Correct with Tab Adjustment
110KT VT	110Kt Level Flight	Track Pattern	Save for reference only
		Vertical Vibration	Correct with Tab Adjustment

Table 1 - H369A/OH-6A M/R Data Collection Tasks

NOTE: Ground Lateral balancing may be worked with either weight or sweep at users discretion. To set up the GND task for Lateral Balancing, use the Copy Task function to copy HOV LTS or HOV LTW task contents to the GND task. Be sure to rename the task once you have copied it.

E. **Main Rotor Definition:** Refer to the main rotor depiction in **Fig. 3** for blade locations and angles.

F. **Strobe Tracking:** When checking blade track using a signal mux which supports strobe tracking, press **TRACK OPTS** and select **FOUR BLADE ROTOR** followed by **START ANALYSIS**.

G. **MicroTracker Tracking:** When checking blade track using a signal mux which supports the **MicroTracker** press **TRACK OPTS** and select **FOUR BLADE ROTOR**.

If desired, measure the distance from the MicroTracker operator to the rotor blade tips. Enter the measured value in inches (nominally 120 in.) under **SET TRACK DISTANCE** then press **START ANALYSIS**.

Refer to the blade order depiction in **Fig. 3** for blade order.

Main Rotor Track & Balance Procedure

NOTE: The H369A/OH-6A main rotor can be balanced with either blade sweep or weight changes. If using blade sweep, select task HOV LTS for hover balance. If using weight changes, select task HOV LTW.

A. **Ground (Idle RPM)**

1. Select task **GND LT**. Run up the aircraft to **Idle RPM** (64-65%) on the ground and check track.

2. Adjust track using pitch link adjustment for the best ground track possible. Continue adjusting the ground track until blade spread is less than **.5 in.** (12.7mm).

B. **Ground (Flight RPM)**

1. Run the aircraft up to **Flight RPM** (100-103%) on the ground and check track.

2. Adjust track using tab adjustment **Zone A** for the best ground track possible. Continue adjusting the ground track until blade spread is less than **.5 in.** (12.7mm).

3. If desired, collect lateral vibration (minimum 5 avgs) and correct ground balance using **mass**.

C. **Hover Track Verification**

1. Select task **HOV VT**. Hover the aircraft and check track for reference only.

D. **Preliminary Hover Balance**

1. Select task **HOV LTS** or **HOV LTW**. Hover the aircraft and collect lateral vibration (minimum 5 avgs). If the lateral vibration is above .2 in/s correct the balance using **sweep** and/or **weight**. Continue correcting lateral balance until the vibration level is below .2 in/s.

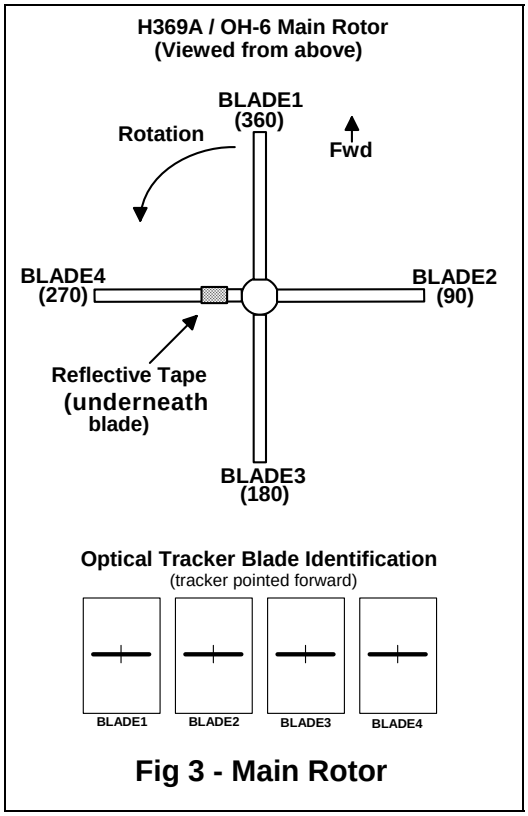

Fig 3 - Main Rotor

2. Select task **HOV VT**. Collect a vertical vibration reading for reference only.

E. **In-Flight Track**

1. Select task **60KT VT**. Fly at **60kts straight and level**. Check track and collect 60kt vertical vibration (minimum 5 avgs).

2. Select task **90KT VT**. Fly at **90kts straight and level**. Check track and collect 90kt vertical vibration (minimum 5 avgs).

3. Select task **110KT VT**. Fly at **110kts straight and level**. Check track and collect 110kt vertical vibration (minimum 5 avgs).

4. On the first vertical correction, you should make a trim tab correction based on the track picture. Enter the trim tab adjustment into **60KT VT**, **90KT VT** and **110KT VT** tasks.

Example: If **BLADE1** (360) is low in the track picture and you bend the tab on **BLADE1** up 1.0 degree - then on tasks **60KT VT**, **90KT VT** and **110KT VT** you will enter a +1.0 for **BLADE1**. Thereafter, the solution displayed will be in degrees of tab adjustment

5. On subsequent vertical corrections, you can utilize the solution displayed to adjust tabs directly. The solution will be computed for and ideal blade and should be split between 90, 180, 270 and 360 based on the track picture.

6. Repeat track and vibration readings at **60kt**, **90kts** and **110kts**. Continue correcting track until vertical vibration is below .2in/s.

F. **Final Hover Balance**

1. Select task **HOV LTS** or **HOV LTW**. Hover aircraft and collect lateral vibration (min 5 avgs).
2. If the hover lateral is above .2 in/s correct the balance using the appropriate adjustment. Continue correcting lateral balance until the vibration level is below .2 in/s.

II. Main Rotor Hub Balancing

Main Rotor Hub Balancing Equipment Installation

NOTE: Balancing of the main rotor hub is performed with main rotor blades and dampers removed.

A. **Lateral Sensor:** Attach the lateral vibration sensor to the standard MDH location above the left door near the left front corner of the "doghouse" using bracket **1008**. The sensitive axis should be pointed **left** as shown in **Figure 2**. Connect and route cable **1096** to signal mux unit **CH:1**.

B. **Magnetic Pickup:** If the aircraft is equipped with a magnetic pickup and interrupter, connect and route cable **1170** to signal mux **CH:A**.

C. **Photo-Tach And Reflective Tape:** If using a photo-tach, attach a **1" x 3"** (25.4mm x 76.2mm) piece of reflective tape lengthwise to the **underside** of the main rotor about 6 inches inboard of the blade grip. Attach the photo-tach **1015** to the **left** side of the aircraft several inches above and slightly forward of the left rear door using bracket **1520**. Carefully align the Photo Tach so that the light beam strikes the reflective tape when the rotor is positioned as shown in Figure 1.

D. **Photo-Tach Alignment:** If using a photo-tach, check the beam and tape alignment by powering up the **MicroVib II** Analyzer and turning the rotor until the reflective tape passes through the photo sensor's light beam. When the tape passes through the light beam, the photo sensor "pilot" light will illuminate to indicate a valid reflection**.** The "pilot" light will also "blink". The higher the rate the greater the strength of the reflection.

Main Rotor Hub Balancing Equipment Setup

A. **Create New History File:** If needed, create a new history file using the procedure from the **Main Rotor Track and Balance** section.

B. **Verify Task:** Select **PROP/ROTOR BALANCE** and press **START ANALYSIS**. Press **TASK** and verify the appropriate task is available as shown in **Table 2**.

Task	CH	Conditions	Collect Data	Typical Data Use
HUB BAL	1A	Gnd 100-103%	Vertical Vibration	Correct with mass adjustment

Table 2 - H369A/OH-6A M/R Hub Balance Task

NOTE: If your current group file does not contain this task, you can download an updated group file from www.dssmicro.com.

Main Rotor Hub Balancing Procedure

A. **Ground Balancing**

1. **Balance At Flight RPM:** Select task **HUB BAL**. Run the aircraft at **Flight RPM** (100-103%) and stabilize before each vibration measurement.
2. **Collect Vibration:** Collect Hub vibration (minimum 5 avgs).
3. **Adjust Weights:** Adjust the rotor using the solution displayed in the Solution Calculator.
4. **Enter Changes:** Enter actual weight changes into the Solution Calculator.
5. **Repeat:** Continue correcting the balance until the vibration is below .15 in/s.

III. Tail Rotor Balancing

Tail Rotor Balance Equipment Installation

A. **Vibration Sensor and Photo Tach:** Attach the Vibration Sensor and photo-tach to the bracket as shown in **Fig. 4**.

B. **Align:** Align the Photo Tach so that the light beam is parallel with the tail rotor output shaft and strikes the tail rotor when the blade passes through the **11:00** portion of its rotation.

C. **Reflective Tape:** Attach a **1" x 1"** (25.4mm x 25.4mm) piece of reflective tape behind one of the tail rotor blades as shown in **Fig. 5**. Choose the location carefully so as to insure that the tape passes through the Photo Tach light as it rotates.

D. **Check Alignment:** Verify the PhotoTach to tape alignment by powering up the **MicroVib II** unit and turning the rotor until the reflective tape passes through the photo sensor's light beam. When the tape passes through the light beam, the photo sensor "pilot" light will illuminate to indicate a valid reflection.

Fig 4 - Accel and Photo-Tach

Fig 5 - Photo-Tach and Tape

Tail Rotor Balance Equipment Setup

A. **Create New History File:** If needed, create a new history file using the procedure from the **Main Rotor Track and Balance** section.

B. **Verify Task:** Select **PROP/ROTOR BALANCE** and press **START ANALYSIS**. Press **TASK** and verify the appropriate task is available as shown in **Table 3**.

Task	CH	Conditions	Collect Data	Typical Data Use
T/R BAL	4D	Gnd 100-103%	Vertical Vibration	Correct with weight adjustment

Table 3 - H369A/OH-6A T/R Balance Task

C. **Tail Rotor Definition:** Refer to the tail rotor depiction in **Fig. 6** for locations and angles.

Tail Rotor Balance Procedure

NOTE: When using the rotor protractor to verify weight locations, the rotation arrows must be observed. The H369A tail rotor turns Counter-Clockwise so the protractor's blue side must be used.

A. **Ground Balancing**

1. **Balance At Flight RPM:** Select task **T/R BAL**. Operate the aircraft at **Flight RPM** (100-103%) and stabilize.
2. **Collect Vibration:** Collect Tail Rotor vibration (minimum 10 avgs).
3. **Adjust Weights:** Adjust the rotor using the solution displayed in the Solution Calculator.
4. **Enter Changes:** Enter actual weight changes into the Solution Calculator.
5. **Repeat:** Continue correcting the balance until the vibration is below .2 in/s.

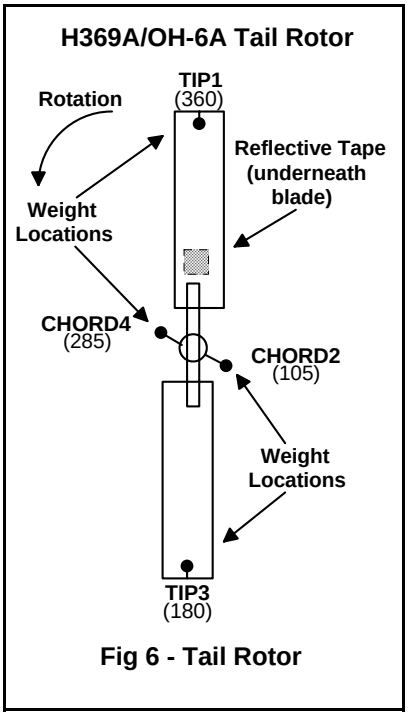

Fig 6 - Tail Rotor