Application Note

MD Helicopters, Inc.

4 Blade Tail Rotor Balance

Part Number: 11-200-0184

AppNote Number: A-MD500-4040-TR4blade (Rev. 1.1, Dec 2004)

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Application Note

Application Note Number	A-MD500-4040-TR4blade
Revision	1.1 (From Aircraft data Revision 36)
Function	4 Blade Tail Rotor Balance
Airframe	MD Helicopters, Inc. MD500 Series
Engine	N/A
E-Setup Number	a-md500-4040-tr4blade.asf
ACES Systems Analyzer	Model 4040 Viper
Firmware Version	1.0 or greater
Procedure	Short Method Tail Rotor Balance

Introduction

This Application Note covers the required equipment, equipment installation, analyzer setup, data acquisition and solution process for using the ACES Systems Model 4040 with the Main and Tail Rotor Performance Option to perform the "Short Method" tail rotor balance on the airframe listed above. If a satisfactory balance cannot be obtained using the "Short Method", the "Long Method" must be used in accordance with the Airframe Maintenance Manual. General instructions for the use of the Model 4040 can be found in the Model 4040 User Manual #4040OM-01 (P/N 75-900-4040). All procedures for track and balance and all adjustments should be made in accordance with the applicable Maintenance Manual.

A. Required Equipment

The following equipment is found in a standard 4040 Helicopter kit:

Item	Quantity	Description	Part Number
1.	1	Analyzer, Model 4040	10-100-4040
2.	1	Option, 4040 Main & Tail Rotor	11-900-0005
3.	1	Tachometer, Optical, Phototach (New)	10-100-1773*
4.	1	Cable, Tach, Generic, 50'	10-320-0126*
5.	1	Sensor, Vibe, Accel, 991D-1	69-100-0075
6.	1	Cable, Sensor 991D-1, 50'	10-320-0163
7.	1	Tape, Reflective, Roll, 10'	10-400-0176

*This listing shows the latest design parts. It is acceptable to perform this task using previous designs with the appropriate accessories. For compatibility issues, contact ACES Systems.

Additional Required Equipment

The following equipment is NOT found in a standard 4040 Helicopter Kit:

Item	Quantity	Description	Part Number
1.	1	Mount, Phototach, General Purpose	22-430-0066

Miscellaneous Equipment

Tape or tie wraps to secure cables to airframe.

B. Equipment Installation

1. Position the helicopter on a flat surface with the nose facing into the wind.
2. Insert 991D-1 Vibration Sensor (P/N 69-100-0075) through ¼" hole in Phototach Mount (P/N 22-430-0066) and thread Sensor into the breather plug on the tail gearbox. Install Phototach (P/N 10-100-1773) into ¾" hole in Mount facing tail rotor assembly. Secure with nylon nut or sunshield. (Figure 1)
3. Connect Vibration Sensor Cable (P/N 10-320-0163) to Sensor and secure along tailboom.
4. Connect Phototach Cable (P/N 10-320-0126) to Phototach and secure along tailboom.

WARNING

When routing cables, use caution to avoid rotating components, engine exhaust system, or aircraft controls.

5. Attach Phototach Cable to Tach 1 of the ACES Model 4040 Analyzer. Attach the Vibration Sensor Cable to Channel A of the ACES Model 4040 Analyzer.
6. Apply a piece of Reflective Tape (P/N 10-400-0176) to the aft side of the hub on one of the outboard tail rotor blades. (Figure 2) See paragraph D.3 below for additional instructions for placing reflective tape.

Equipment Installation Diagram

FIGURE 1

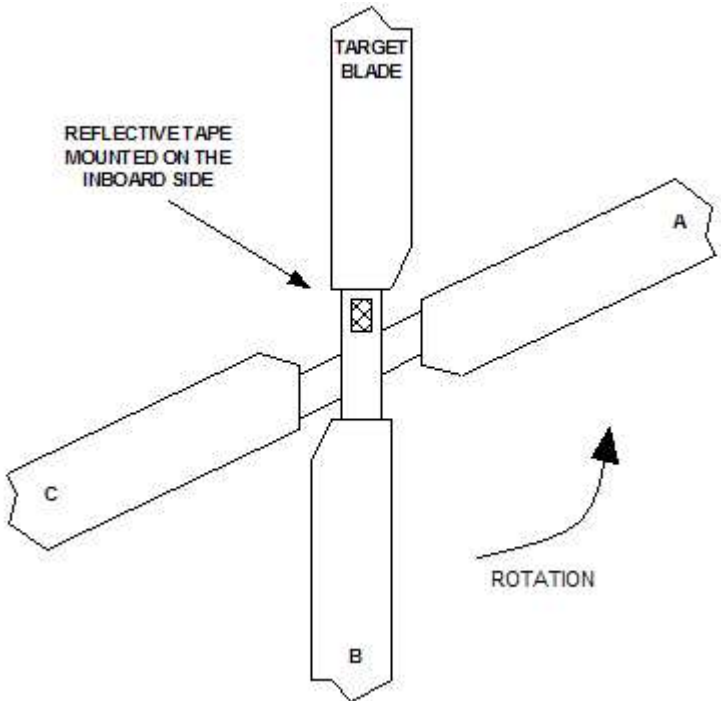
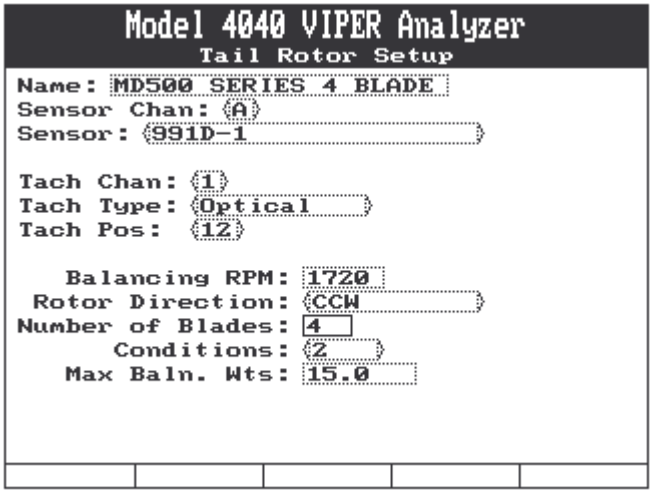


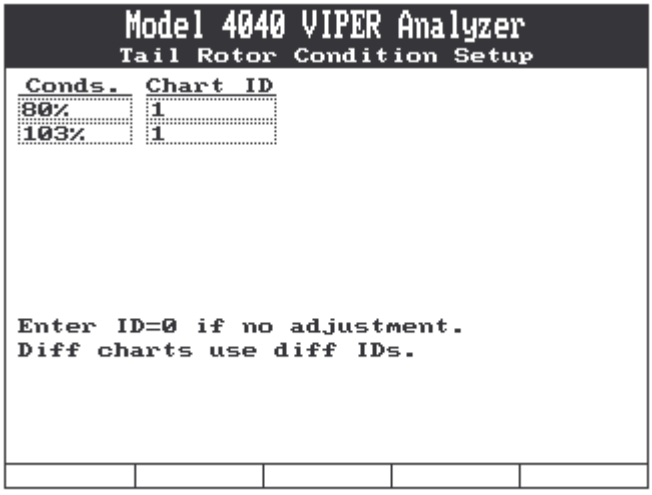
FIGURE 2

C. Analyzer Set Up

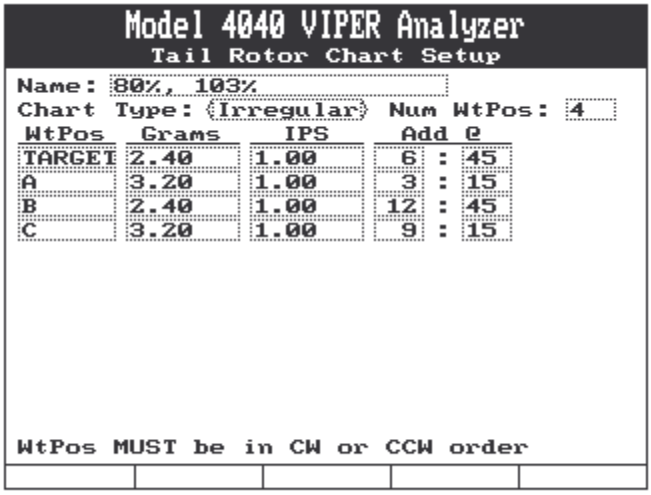
1. Turn the analyzer **[ON].**
2. Enter a new setup as follows; from the "Main Menu" select "Tail Rotor Balance" and press **[ENTER].** From the "Tail Rotor Balance" menu, select "Manage Setups" and press **[ENTER].** From the "Manage Setups" menu, select "New" and press **[ENTER].**
3. The "Tail Rotor Setup" screen now appears. Enter the tail rotor setup as shown below. When completed press **[ENTER].**



4. The "Tail Rotor Condition Setup" screen will now appear. You can define up to three different conditions in which to acquire vibration data.



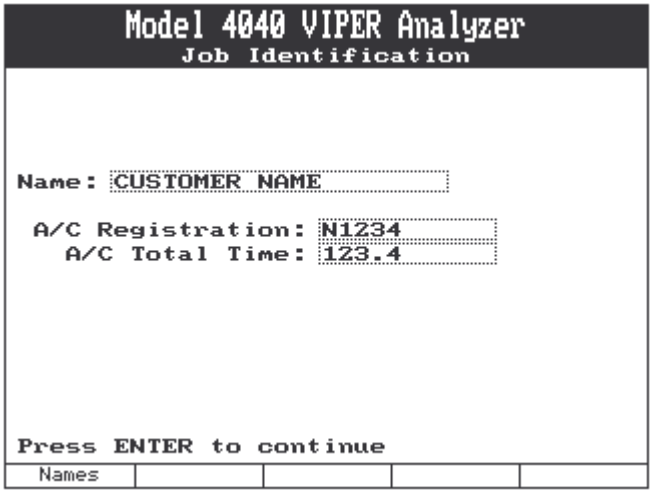
5. The "Tail Rotor Chart Setup" screen will define the chart to be used when calculating corrections for a given measurement. Enter the information exactly as it appears in the appropriate fields. When completed, press **[ENTER].**



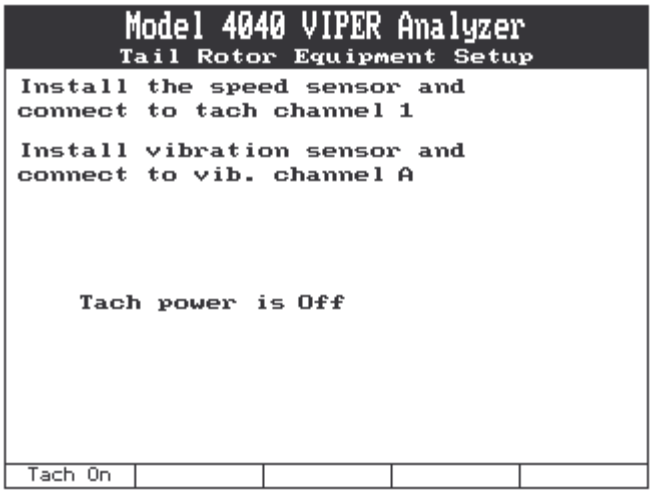
6. The setup is now complete, press **[BACKUP],** select "Start Job", press **[ENTER]** and then select the "Tail Rotor Setup" that was just created.

D. Data Acquisition

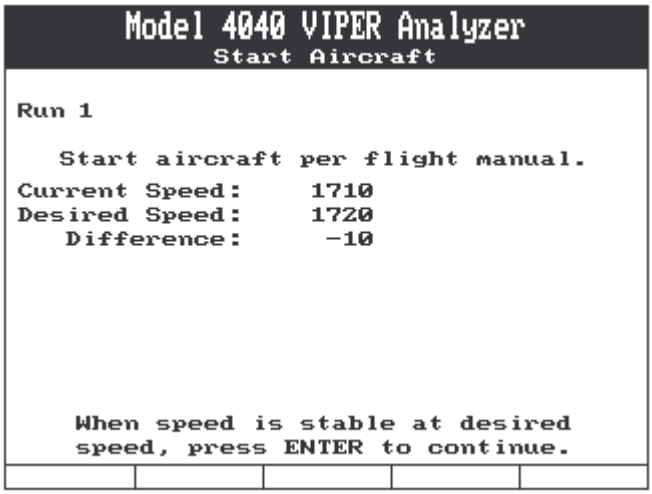
1. "Customer Information" screen. To assist with the identification of the job when it is printed and/or stored in the analyzer, it is recommended that this screen be completed. When finished press **[ENTER].**



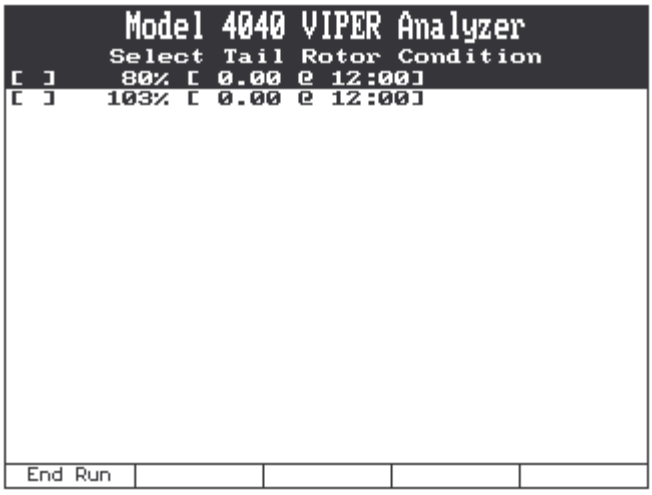
2. "Tail Rotor Equipment Setup". Information screen that prompts the user to verify equipment installation has been performed in accordance with channel selections that were specified when building the setup.



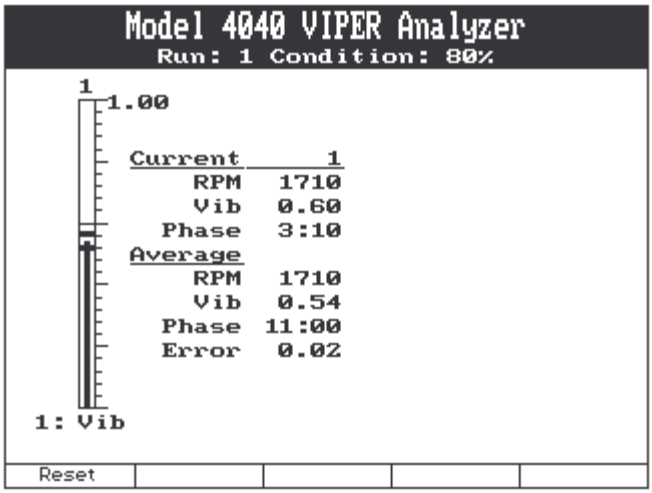
3. Install and align reflective tape with Phototach as follows:
   a. Press **[F1]** "Tach On". Align one blade with the phototach. (See Section B Figure 2)
   b. Hold a 2-inch piece of reflective tape, reflective surface facing the Phototach, against the backside of the blade. Do not remove backing at this point.
   c. The red "Gate" light on the back of the Phototach should illuminate as the reflective tape is properly aligned in front of the LED. Clean an area of the blade or grip in preparation for mounting the reflective tape.
   d. Remove the backing and install the reflective tape on the clean blade or grip surface.
   e. When tape installation is complete, press **[ENTER]** to continue.
4. "Start Aircraft" screen. This screen allows the user to view the current tail rotor RPM. When the aircraft has been started press **[ENTER].**



5. The "Select Tail Rotor Condition" screen will appear. Highlight the 80% line and press **[ENTER]** to begin data acquisition.

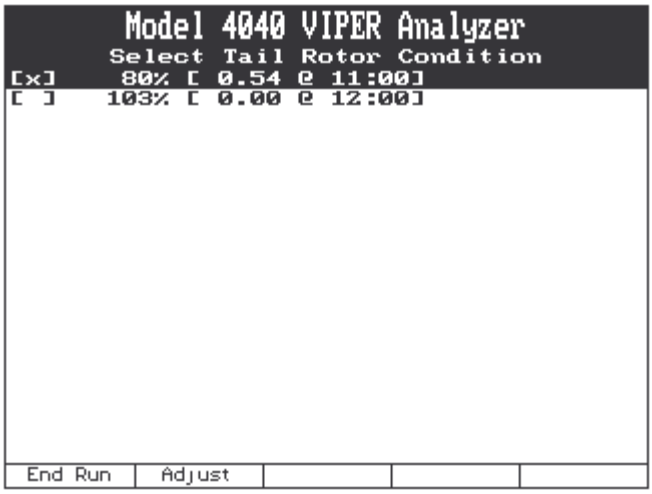


6. The analyzer will present the data acquisition screen as shown. This screen allows you to monitor both the current and averaged vibration readings. While monitoring the measurement, you may press the **[F1]** "Reset" key to restart the averaging process. Use this feature as a way to validate the quality of the measurement. If the averaged readings return to a value similar to that prior to being "Reset", the measurement can be considered good. If the measurement is not similar, you may choose to "Reset" the average again.

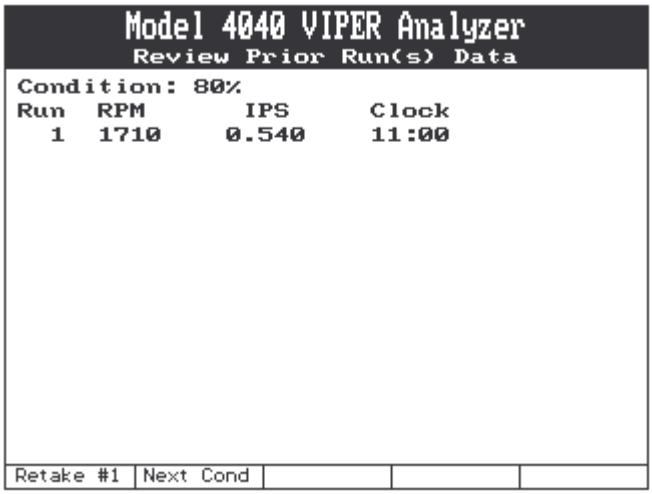


See the Model 4040 User Manual #4040OM-01 (P/N 75-900-4040) Chapter 20 for detailed instructions on how to read the "Converging Vibration Indicator and Scale."

7. You will be prompted to “Shut Down Aircraft”. Press **[F5]** to proceed to the “Select Tail Rotor Condition” screen. This screen allows the user to view the vibration readings that were acquired during the regime. Press **[ENTER]** to “Retake” the data for the highlighted condition. Press **[F1]** “End Run” or **[F2]** “Adjust” to continue. It is not necessary to take balance readings at the 103 % condition until the 80% condition vibration level is below 0.1 IPS.



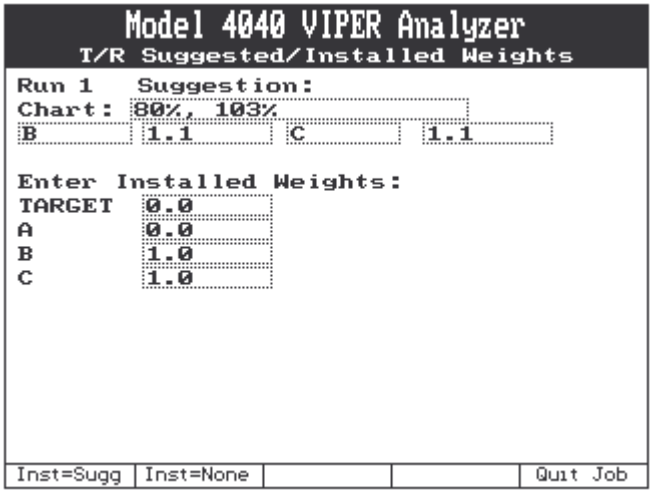
8. The “Review Prior Run(s) Data” screen will be displayed. This screen lets you review the cumulative readings from all 80% runs previously taken. If you wish to “Retake” the current reading, press **[F1]** “Retake (Run #)”. Pressing **[F2]** “Next Cond”, if present, will display the readings for 103%.



9. The “T/R Sugg. & Inst. Wts” screen will present a suggested solution based on the chart created in the original setup and the vibration IPS and clock reading. You have the opportunity to install the suggested weight corrections or decide on a different corrective action. It is important that the entry under the “Enter Installed Wts” reflect the actual weight amounts and locations used.

   Using the keypad, record the actual weight(s) installed between runs and their location. If you choose to remove weight from an opposite or alternate position, enter the negative

adjustment. Do this by moving the highlight to the appropriate field, press the **[SPACE+/-]** key to produce a (-).



To remove all suggested values use the **[F2]** "Inst=None" key. If you decide you would like to revert back to the suggested weights use **[F1]** "Inst=Sugg" key.

The **[F5]** "Quit Job" exits the balance job with no provisions to resume the job at a later point in time. If you wish to leave the job and be able to resume it later, press the **[MAIN MENU]** key.

10. When you have finished with the solution process, press **[ENTER]** and you will be taken to the "Start Aircraft" screen as shown in paragraph 4 of this section to continue the balance process.

NOTE

The above instructions are for balancing the Tail Rotor using the "Short Method" only. If a satisfactory balance cannot be achieved using the "Short Method" the "Long Method" from the applicable Airframe Maintenance Manual must be used. Contact ACES Systems for additional help in performing the "Long Method" balance with ACES Systems equipment.