



# Application Note

Application Note Number	A-ECSA315-316-2020E-MR
Revision	0
Function	Main Rotor Track and Balance
Airframe	SA315 Lama and SA316 Alouette
Engine	N/A
E-Setup Number	A-ECSA315-316-2020E-MR.asf
ACES Systems Analyzer	Model 2020 w/Main Rotor Enhanced
Firmware Version	2.00 or greater
Procedure	N/A

## Introduction

This outline covers the required equipment, equipment installation, analyzer setup, data acquisition, and solution process for using the ACES' 2020 ProBalancer to perform main rotor track and balance on the Eurocopter SA315/316 helicopters. General instructions for the use of the Model 2020 ProBalancer can be found in user manual #2020OM-01. All adjustments to the aircraft are to be performed IAW the Eurocopter Maintenance Manual.

## A. Required Equipment

The following ACES Systems' equipment is required.

Item	Quantity	Description	Part Number
1.	1	Model 2020 ProBalancer	10-100-2020
2.	1	Optical Tracker Model 540-2	75-900-0542
3.	2	Sensor, Vibration, 991D-1	69-100-0075
4.	1	Cable, Sensor, 991D-1, 50'	10-320-0163
5.	1	Cable, Sensor, 991D-1, 25'	10-320-0162
6.	1	Interrupter, SA315/316	22-430-0141
7.	1	Cable, Magnetic Pickup 25'	10-320-0052
8.	1	Magnetic Pickup Bracket, SA315/316	22-430-0140
9.	1	Mount, Sensor, 1/4	22-430-0035
10.	1	Mount, Sensor, 5/16	22-430-0036

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11.	1	Magnetic Pickup	75-900-0187
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### Miscellaneous Equipment

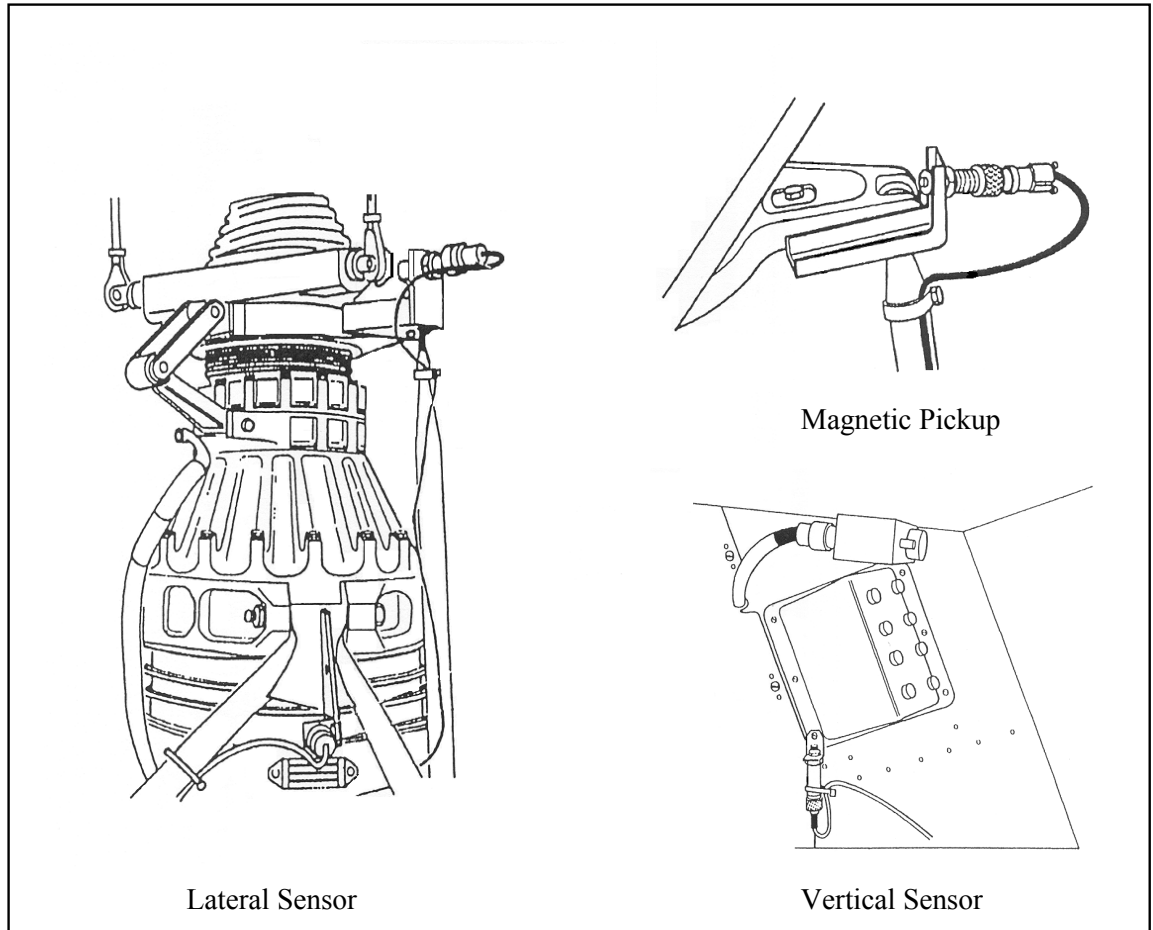
Tape or tie wraps to secure cables to airframe.

## B. Equipment Installation

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1. Position the Blue blade over the nose of the aircraft. Remove nut and install interrupter (P/N 22-430-0141) against the trunnion yoke, facing outwards. Re-install the nut, tighten and insert the pin.
2. Install the magnetic pickup mount (P/N 22-430-0140) on the non rotating star right hand servo control yoke and secure with clamp. Take care not to damage the star. Remove upper jam nut from magnetic pickup (P/N 75-900-0187) and install pickup into pickup bracket. Install the jam nut onto the magnetic pickup.
3. Check that the interrupter and magnetic pickup align. Adjust the clearance between the interrupter and pickup to .060 +/- .010 in. Tighten upper jam nut and safety wire.
4. Connect magnetic pickup cable (P/N 10-320-0052) to pickup and route into cabin area. Secure cable with tape or adel clamps. Connect cable to Tach Channel 1 on analyzer.
5. On the main gear box "A" frame upper section yoke, right hand side, install sensor mount (P/N 22-430-0036). Install 991D-1 sensor (P/N 69-100-0075) into mount and tighten. Sensor connector should face towards the 3:00 position. Connect sensor cable (P/N 10-320-0163) to the sensor and route to the analyzer. Connect the cable to channel B of the 2020 analyzer.
6. Install sensor mount (P/N 22-430-0035) on the left hand side of the center console. Install 991D-1 sensor into mount. Connector of sensor should point down. Connect sensor cable (P/N 10-320-0162) to the sensor and route to the analyzer. Connect the cable to channel A of the 2020 analyzer.
7. Connect the Optical Tracker (P/N 75-900-0542) to the Aux./Comm port on the 2020 analyzer.

**Equipment Installation Diagram**



## C. Analyzer Set Up

1. Turn the analyzer “ON”
2. Enter a new setup as follows; from the “Main Menu” select “Main Rotor Track and Balance” and press **[Enter]**. From the “Main Rotor Tack and Balance” menu, select **[Manage Setups]** and press **[Enter]**. From the ‘Manage Setups’ menu, select **[Edit]** and press **[Enter]**. From the “Edit Screen” press the **[New]** button.
3. The “Main Rotor Setup” screen now appears. Enter the main rotor job setup as shown. For the Alouette, enter RPM of 358 or 353 for the Lama. When completed press **[Enter]**.

**Model 2020 ProBalancer**  
Main Rotor Setup

Name: SA315/316  
 Vertical Chan: (A)  
 Lateral Chan: (E)  
 Sensor: 8810-1  
 Tach Type: (Mag(Hi))  
 Tach Chan: (1) WtPos: (3)  
 Blades: (3) Relative to: (2)  
 RPM: 353 Trk Units: (in)  
 << Conditions >>  
 Ground: (Both) Hover: (Both)  
 MCP: (Both) MCP/45: (Both)  
 (Both) (Both)

4. The “Main Rotor Conditions” screen will determine the charts to be used when calculating corrections for a given measurement. Chart “ID’s” of similar measurements with the same number will average the readings together for use in solutions. The “limit” field under each measurement type will set the point at which the analyzer will determine whether corrections are needed. Enter the information exactly as it appears in the appropriate fields. When completed, press **[Enter]**.

**Model 2020 ProBalancer**  
Main Rotor Conds. Setup

Conds.	Vert Chart ID	Lat Chart ID	Track Adj. ID
Ground	0	1	1
Hover	0	1	1
MCP	1	0	0
MCP/45	1	0	0
Limit	0.30	0.30	0.25

Enter ID=0 if no adjustment.  
Diff charts use diff IDs.

- The “M/R Adjustment Symbol Setup” screen is displayed next. The function of this screen is to determine the direction of movement for a + adjustment. Enter the values as shown. When complete press **[Enter]**.

Model 2020 ProBalancer		
M/R Adj Symbol Setup		
Adjustment Positive Value Meaning		
Weight:	[ADD]	
Sweep:	[FWD]	
Blade:	[UP]	
TAB:	[DOWN]	

- The first main rotor chart to define will be the “Vertical”: MCP-MCP 45 Degree Turn chart. This chart will determine the Tab adjustments to perform for vertical vibration reduction. The unit of adjustment is DEG, “Degrees”. Enter the information exactly as it appears in the appropriate fields. When completed press **[Enter]**.

Model 2020 ProBalancer		
Main Rotor Chart Setup		
Name:	[Vert: MCP-MCP/45]	
Chart Type:	[Regular]	
Sweep Only:	[No]	
Adj. Unit:	[DEG]	
Adj./IPS:	[8.00]	
Bld/Pos	Adj @	Bld/Pos
-----		
[BLUE]	[1]	[0]
[RED]	[8]	[0]
[YELLOW]		
Bld/Pos: in CW or CCW order +Adj = WtAdd/SwFwd/BldUp/TabDn		
Help		

- “Lateral”: Ground-Hover chart. This chart will determine the Weight adjustments to perform for lateral vibration reduction. Enter the information exactly as it appears in the appropriate fields. When completed press **[Enter]**.

Model 2020 ProBalancer		
Main Rotor Chart Setup		
Name:	[Lat: Ground-Hover]	
Chart Type:	[Regular]	
Sweep Only:	[No]	
Adj. Unit:	[GMS]	
Adj./IPS:	[5/1.00]	
Bld/Pos	Adj @	Bld/Pos
-----		
[BLUE]	[5]	[45]
[RED]	[1]	[45]
[YELLOW]		
Bld/Pos: in CW or CCW order +Adj = WtAdd/SwFwd/BldUp/TabDn		
Help		

- Next, the “Tracking Influence Setup” screen for Hover will appear. This chart will determine the amount of pitch change adjustment required to improve track splits at ground and hover. The “Adj./in.” sensitivity tells the balancer the amount of PCL adjustment required to equal one inch of movement at the blade tip. Enter the information exactly as it appears in the appropriate fields. When complete, press **[Enter]**

Model 2020 ProBalancer			
Tracking Influence Setup			
Conds	AdjName	Unit	Adj/in
Ground-Hover	PCL	Fit	4.00
+Adj = WtAdd/SuFwd/BlUp/TabDn			

- Setup complete, press **[Backup]**, select “Start Job”, press **[Enter]** and then select the SA315/316 Main Rotor Setup that was just created.

## D. Data Acquisition

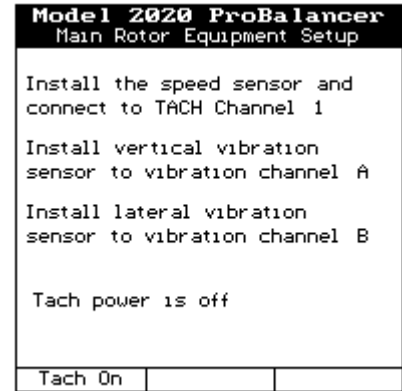
- “Customer Information” screen. It is recommended to complete this screen so that customer information will appear on printout assisting in identification of the job when it is stored in the analyzer memory. When finished press **[Enter]**.

Model 2020 ProBalancer	
Customer Information	
Enter the following optional Customer Information.	
Name:	CUSTOMER NAME
A/C Registrations:	N12345
A/C Total Time:	1200
Press ENTER to continue.	
Names	

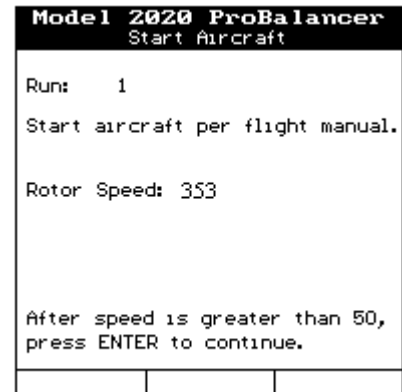
- “Tracking Selections” screen. Allows the user to select tracking device for this particular job. Select Tracker or Strobe and press **[Enter]**.

Model 2020 ProBalancer	
Tracking Selections	
Track Device:	Tracker
- For Optical Tracking Only	
Number of Rotations:	50
Inches To Blade Tip:	120

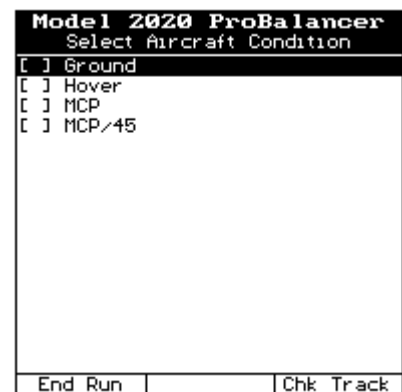
3. “Main Rotor Equipment Setup”. Information screen that prompts the user to verify equipment installation has been performed in accordance with channel selections that were specified when building the setup. Press **[Enter]**.



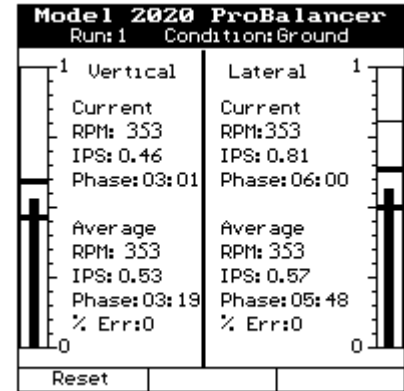
4. “Start Aircraft” screen. This screen allows the user to view the current main rotor rpm. When the aircraft has been started press **[Enter]**.



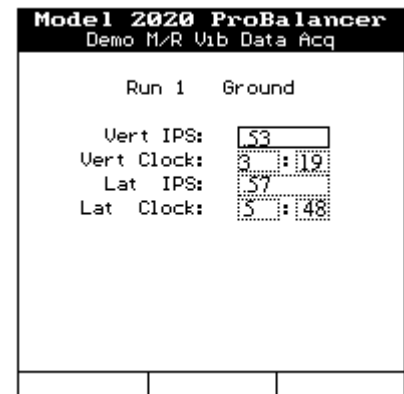
5. “Select Aircraft Condition” screen. Displays the ground and flight regimes that are specified in the setup. Select Ground and press **[Enter]**.



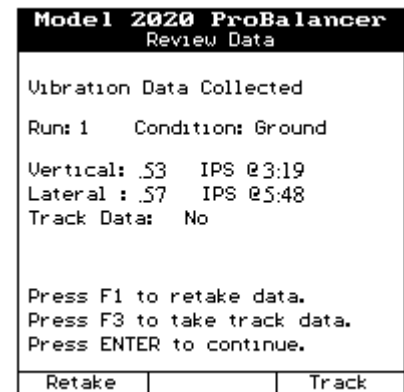
6. “Acquiring Vibration Data”. This screen is displayed during the vibration acquisition. When stable vibration readings are observed, press **[Enter]**.



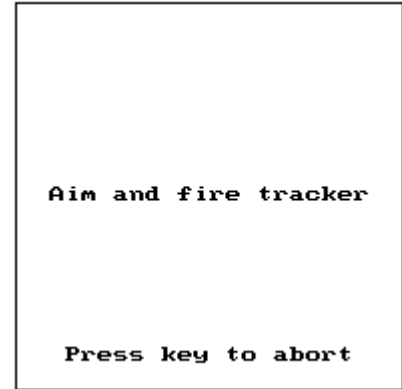
7. “Review Data”. This screen allows the user to view the vibration readings that were acquired during the regime. Press **[Enter]** to continue.



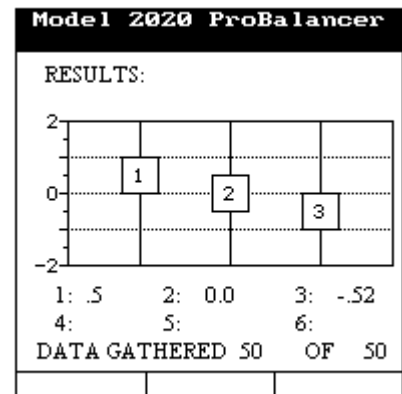
8. “Review Data”. This screen allows the user to view the vibration readings that were acquired during the regime. Press **[Enter]** to continue or **[F-3]** to acquire Track data.



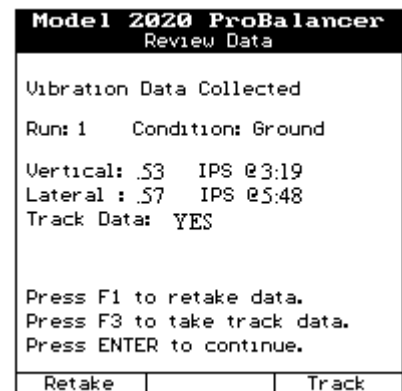
9. The “Track Screen” will appear prompting you to aim and fire the tracker. Aim the tracker at the tip of the rotor disk at the 12:00 position. Move tracker up and down until green LED’s are illuminated. Press trigger one time and release, continue to hold tracker with green LED’s illuminated. The amber LED will pulsate during the acquisition. When tracker acquisition is complete the amber LED will extinguish.



10. The track data will now appear on the screen. The track split will be shown. If the number of packets recorded is less than 75% of the total, press [Enter] and then [F-1] to retake the track reading. After review press [Enter] to continue.



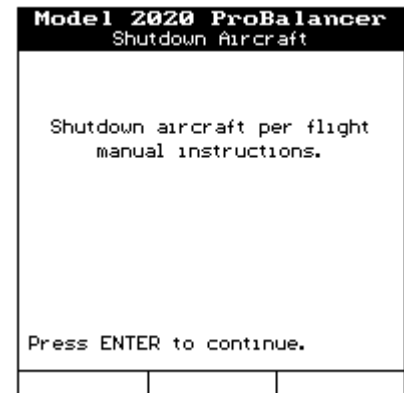
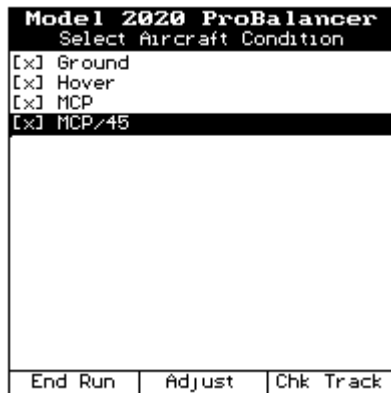
11. The “Review Data” screen will reappear, press [Enter] to continue.



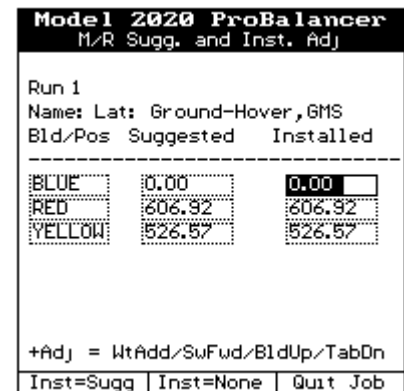
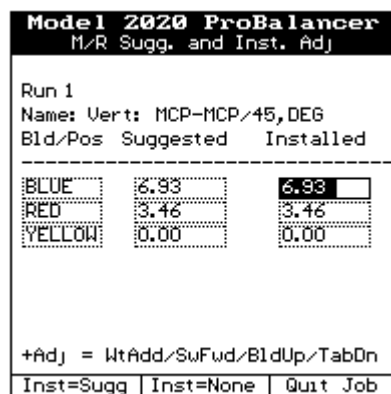
**Note**

**At any time during a flight if the vibration levels are found to be too severe to continue, the user has the option to end run and solve for the vibration data acquired to that point.**

- Repeat sequence through all flight regimes. After all data is acquired press the “Adjust” [F-2] button, shut down the aircraft and review solution options.

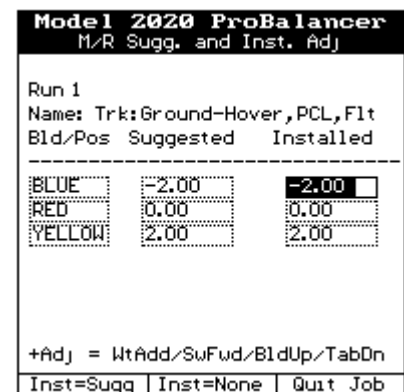


- The analyzer will present all of the solutions possible from the data gathered. It is possible for the analyzer to give two adjustments that would adversely affect the other. The user is ultimately responsible for determining which adjustments to implement and which to discard. Make the desired adjustments to the rotor system as called for by analyzer and press [Enter]. The user will now be prompted to start the engine and continue with run #2.



**Note**

It is important to remember that when installing or removing weights and recording their positions that the influence used for the next run will be updated by the result from the previous run’s solution, therefore be as accurate as possible when recording adjustments made regardless whether the recommended solution is implemented. The only entries on this screen should reflect the actual solution implemented.





# Application Note

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## **Eurocopter SA315/316**

### **Main Rotor Track and Balance**

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Part Number: a-ecsa315-316-2020e-mr

AppNote Number: 11-200-0100

This Application Note is provided for information only and does not supercede the requirements or guidelines set forth in the applicable engine or airframe maintenance manual. Technology for Energy Corporation assumes no obligation or liability, either express or implied, to the Purchaser arising out of the use of this procedure.

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