



Service Bulletin

LIGHTWEIGHT, HIGH-SPEED, VERTICAL VIBRATION RECOVERY AND MITIGATION

PURPOSE: To inform pilots of the appropriate recovery method from vertical vibrations in the 206L LongRanger which can occur in high speed, forward flight at low gross weight and provide maintenance personnel with corrective actions to reduce the likelihood and severity of occurrences.

BACKGROUND: Operators have reported experiencing moderate-to-severe vertical vibrations on Bell 206L LongRanger helicopters equipped with Van Horn Aviation (VHA) p/n 20633000-101 main rotor blades. This phenomenon is characterized as a low-frequency, vertical vibration that develops in level flight or upon the initiation of a descent at 85+ KIAS and quickly increases in intensity. The vibration does not consistently recur but is readily recoverable and has been demonstrated to cease immediately when the appropriate recovery is performed as described in Section A.

As of the date of publication, this phenomenon has been reported on only 15 aircraft since 2019. All have landed safely. One instance resulted in damage to the aircraft due to the pilot being unaware of the proper recovery resulting in prolonged vibration. All reported instances have been less than 3,400 lbs gross weight, typically with a single pilot and low fuel (see Figure 1). Of the nearly 300 aircraft in service with 20633000-101 main rotor blades, the vast majority (~95%) have never experienced this issue.

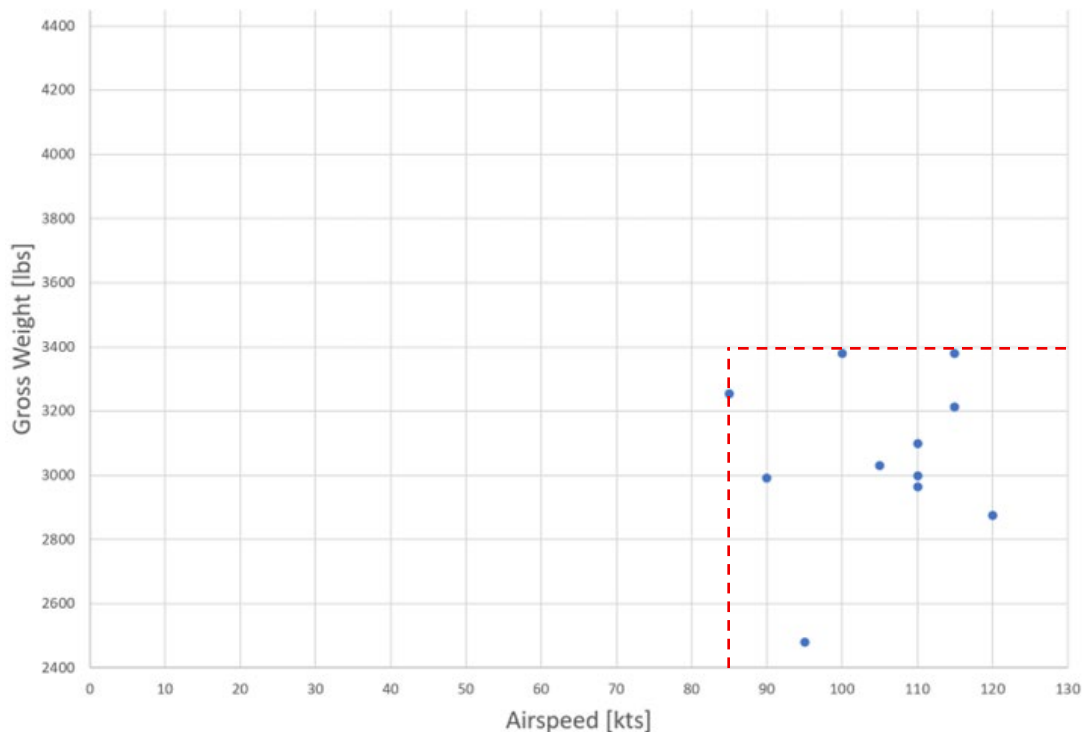


Figure 1. Vertical Hop Flight Envelope



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66 flights and 35 hours of company testing have been performed on 4 aircraft to investigate this issue. The vibration occurs at approximately 5Hz, which is slightly less than once per revolution (1P), and consistent with a tailboom natural frequency. Several aircraft configuration and maintenance items have been identified as potential contributors, presented in Section B. In some cases, the correction of one or more of these conditions has been sufficient to eliminate the vibration entirely. In all cases, a significant reduction in severity and increase in speed at onset has been achieved.

PART NUMBERS AND SERIAL NUMBERS AFFECTED: 20633000-101 blade assemblies (FAA STC No: SR 02684LA, Transport Canada STC SH18-69, Brazil ANAC Supplemental Type Certificate STC 2018S11-11, India Validation DGCA-27014/36/2020-AED, Indonesia Validation SR029).

HELICOPTER MODELS AFFECTED: Bell Models 206L, 206L-1, 206L-3, & 206L-4.

PROCEDURES:

NOTE

If any aspect of this service bulletin is unclear, or if difficulties arise while implementing any of the instructions, contact VHA for additional support before proceeding any further.

All pilots should be aware of the potential for a vibration to occur and the appropriate recovery method when operating in lightweight configurations. However, the data in this Service Bulletin should not be construed as operating limitations or a certainty that a vibration will occur. Multiple aircraft are known to operate in this regime without ever experiencing abnormal vibrations.

A. RECOVERY METHOD

If a vertical vibration develops in forward in-flight, immediately reduce speed and load the rotor by increasing collective.

CAUTION

DO NOT lower collective or enter an autorotation. The vibration will only continue throughout the descent and can potentially result in damage to the aircraft.

Note the intensity, air speed, and fuel level at the time of occurrence. Continue flight at reduced speed. Approximately 5-10 KIAS below the speed at the onset of the vibration is typically sufficient to avoid recurrence.

Report all occurrences to Van Horn Aviation using the form at the back of this Service Bulletin. Refer to corrective actions in Section B.

B. CORRECTIVE ACTIONS

- (1) All aircraft that have experienced the vibration described in this Service Bulletin shall have corrective actions (2)-(7) performed as soon as practical. Until corrective actions are performed, limit airspeed to 5-10 KIAS below the speed at which vibrations were encountered when operating below 3,400 lbs. It is also recommended that aircraft which have not



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experienced the vibration have corrective actions (2)-(7) performed as a preventative measure, especially if operations at less than 3,400 lbs are anticipated.

- (2) **CRITICAL:** Perform and confirm blade alignment IAW the Bell Component Repair and Overhaul Manual, BHT-206L-CR&O-3, section 62-6 Scope Method or section 62-7 String Method. Incorrect blade sweep has initially been identified as the most likely cause of the vertical vibration. Correcting blade sweep has been demonstrated to significantly reduce the vertical vibration.

NOTE

The location of the sweep pin on VHA blades is not the same as the OEM blades. Blade alignment must be performed carefully & accurately when installing VHA blades. Using the same latch bolt setting as the OEM blades will result in significant forward sweep.

NOTE

When using the string method for blade alignment, the alignment point is the **TOP** edge of the blade bolt chamfer. See Figure 62-6 of the Component Repair and Overhaul Manual.

- (3) Center main rotor trunnion IAW the Bell Component Repair and Overhaul Manual, BHT-206L-CR&O-3, section 62-35 paragraph 4 and Figure 62-46.

NOTE

The stated requirement is “dimensions A and B must equal within 0.003 in”, however care should be taken to be within less than 0.001 in., if possible.

CAUTION

measuring the centering of the trunnion relative to the sides of pillow block or similar methods should only be considered a rough check and are not accurate enough to ensure the trunnion is adequately centered within tolerance.

- (4) Set collective minimum friction IAW with the applicable Bell Maintenance Manual (BHT-206L-MM-1 section 27-14, BHT-206L1-MM-1 section 27-14, 206L3-MM-8 section 67-25, 206L4-MM-8 section 67-25).

NOTE

Adjustment for collective minimum friction must be accomplished on the ground by qualified maintenance personnel and is not to be confused with the pilot’s adjustable collective friction knob in the cockpit.

- (5) Set swashplate tilt friction IAW with the applicable Bell Maintenance Manual (BHT-206L-MM-1 section 65-35, BHT-206L1-MM-1 section 65-32, 206L3-MM-8 section 62-33, 206L4-MM-8 section 62-29).



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- (6) Inspect collective lever and idler link bushings for excessive play and proper torque IAW with the applicable Bell Maintenance Manual (BHT-206L-MM-1 section 65-39, BHT-206L1-MM-1 section 65-36, 206L3-MM-8 section 62-33, 206L4-MM-8 section 62-33).
- (7) Perform a test flight(s) in a representative lightweight configuration to determine if a vertical vibration will still develop. Be prepared to execute the recovery procedure. If a vertical vibration does occur, note the intensity, air speed, and fuel level at the time of occurrence. Report all occurrences to VHA using the form at the back of this Service Bulletin.
- (8) **OPTIONAL:** At the operator's discretion, it is acceptable to continue lightweight operations by limiting air speed to 5-10 KIAS below the onset of vibration.
- (9) **OPTIONAL:** Perform track & balance at speeds greater than 105 KIAS (up to V_H). Tracking the rotor system at higher speeds has been shown to reduce the severity of vibrations.
- (10) **OPTIONAL:** If after performing the above actions, the vibration intensity is still objectionable and/or the speed at onset is too limiting to support operations, contact VHA for special instructions on the installation of tracking wedges. Tracking wedges have been found to greatly reduce severity and increase the speed at which vibrations onset.

C. POINTS OF CONTACT

- (1) For further information or assistance, contact Van Horn Aviation at +1 (480) 483-4202, FAX +1 (480) 483-4204 or email info@vanhornaviation.com.
- (2) This current revision of this service bulletin can be accessed on the VHA website: <https://www.vanhornaviation.com/technical-publications#Documents>.



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Vertical Hop Occurrence Report

REPORT ANY OCCURRENCE OF VERTICAL HOP TO VAN HORN AVIATION

FAX or email this record to +1 (480) 483-4204 or info@vanhornaviation.com

Owner/Operator: _____	
Address: _____	Blade Serial Numbers: _____
_____	Tail Number: _____
_____	Gross Weight: _____
_____	Airspeed: _____
Phone: _____	Date of Occurrence: _____
Email: _____	

This report completed by: _____
(Print Name)

(Signature)

(Title)