HARTZELL PROPELLER INC.

SERVICE LETTER

TRANSMITTAL SHEET

HC-SL-61-254

Propeller - Propeller Operating Restrictions

March 09, 2022

This page transmits a revision to Service Letter HC-SL-61-254.

- Original Issue, dated Feb 24/06
- Revision 1, dated Mar 09/21

Propeller assemblies that have previously complied with an earlier version of this Service Letter are affected.

Changes are shown by a change bar in the left margin of the revised pages.

Revision 1 is issued to change the following in the Service Letter:

- Revise the "Effectivity" section
- Revise the "Compliance" section
- Revise the "References" section
- Revise the "Accomplishment Instructions" section
- Other minor language/format changes

This Service Letter is reissued in its entirety.

HARTZELL PROPELLER INC.

SERVICE LETTER

TRANSMITTAL SHEET

HC-SL-61-254

Propeller - Propeller Operating Restrictions

(Blank Page)

HARTZELL PROPELLER INC.

SERVICE LETTER

HC-SL-61-254

Propeller - Propeller Operating Restrictions

1. Planning Information

A. Effectivity

(1) Hartzell Propeller Inc. 6-blade lightweight turbine HC-A6( )-3( ) propellers are affected by this Service Letter.

WARNING: DO NOT USE OBSOLETE OR OUTDATED INFORMATION. PERFORM ALL INSPECTIONS OR WORK IN ACCORDANCE WITH THE MOST RECENT REVISION OF THIS SERVICE LETTER. INFORMATION CONTAINED IN THIS SERVICE LETTER MAY BE SIGNIFICANTLY CHANGED FROM EARLIER REVISIONS. FAILURE TO COMPLY WITH THIS SERVICE LETTER OR THE USE OF OBSOLETE INFORMATION MAY CREATE AN UNSAFE CONDITION THAT MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE. REFER TO THE SERVICE LETTER INDEX FOR THE MOST RECENT REVISION LEVEL OF THIS SERVICE LETTER.

B. Concurrent Requirements

(1) Additional service documents may apply to the components/propellers affected by this Service Letter. Compliance with additional service documents may be necessary in conjunction with the completion of the Accomplishment Instructions in this Service Letter. Refer to the Hartzell Propeller Inc. website at www.hartzellprop.com for a cross-reference of service documents.

C. Reason

(1) Hartzell has become aware of a potential safety of flight issue that could exist on numerous turboprop aircraft with propellers of four or more blades. These propellers are installed on a wide variety of aircraft and the propeller installations are controlled by the various airframe manufacturer's Type Certificate (TC) or by Supplemental Type Certificate (STC) holders.

(2) The specific issue that prompted this Service Letter results from ground operation of propellers below the minimum specified propeller RPM.

(a) The minimum propeller idle RPM operating restriction is the result of a specific vibratory resonant condition known as a “reactionless mode”. During operation in these conditions the flight crew cannot feel the resulting high propeller vibration. Ground operation at or near an RPM that can cause a reactionless mode vibratory resonance can cause very high stresses in the propeller blades, blade clamps (if applicable), and hubs. These high stresses are more severe when operating in a tailing wind condition.

(b) If the propeller is operating within a restricted RPM range or below a minimum idle RPM restriction for an extended period of time, the propeller blades, blade clamps (if applicable), and hub can become unairworthy due to fatigue. A failed blade, blade clamp (if applicable), or hub has the potential of causing a catastrophic event because of blade separation.

(3) In addition to RPM restrictions below the idle RPM, there are propeller RPM restrictions above the propeller idle RPM range that are of equal importance. The RPM restrictions can vary with different airframe/engine/propeller applications.

(4) The propeller operating restrictions or limitations are found in the Airplane Flight Manual (AFM) or Airplane Flight Manual Supplement (AFMS). It is possible that the propeller RPM restrictions or limitations are not marked on the instrumentation and/or placarded when proper rigging of the engine and propeller prevents the propeller from operating in a restricted region; therefore, it is not always evident, without checking the AFM or AFMS, that the propeller is operating below the minimum specified propeller RPM in a restricted region if the RPM has not been rigged correctly.

(5) Make sure that the propeller is rigged in accordance with the applicable Type Certificate (TC) holder's or Supplemental Type Certificate (STC) holder's propeller installation and rigging instructions, and set proper minimum propeller idle RPM, engine idle speed and engine torque settings. Depending on the application, it is possible that the mechanic could improperly rig the ground RPM or the pilot could manually control the engine such that the propeller is operating at a restricted RPM.

(6) Since either the mechanic or pilot could cause improper operation, and since they can be unaware of the serious effects of such operation, FAA includes in their published SAIB NE-06-13 dated December 12, 2005, a request that the AFM, AFMS, and Aircraft Maintenance Manual (AMM) be amended to contain a clear statement of the propeller operating restriction and an informative warning.

(a) The following is the SAIB suggested warning for the AFM or AFMS:

WARNING: STABILIZED GROUND OPERATION WITHIN THE PROPELLER RESTRICTED RPM RANGE CAN GENERATE HIGH PROPELLER STRESSES AND RESULT IN PROPELLER FAILURE, AND LOSS OF CONTROL OF THE AIRCRAFT.

(b) The following is the SAIB suggested warning for the AMM:

WARNING: STABILIZED GROUND OPERATION WITHIN THE PROPELLER RESTRICTED RPM RANGE CAN GENERATE HIGH PROPELLER STRESSES AND RESULT IN FATIGUE DAMAGE TO THE PROPELLER. THIS DAMAGE CAN LEAD TO A REDUCED PROPELLER FATIGUE LIFE, PROPELLER FAILURE, AND LOSS OF CONTROL OF THE AIRCRAFT. THE PROPELLER RESTRICTED RPM RANGE IS DEFINED IN THE AIRPLANE FLIGHT MANUAL. CONTACT THE AIRCRAFT OR PROPELLER MANUFACTURER FOR CORRECTIVE ACTIONS IF A PROPELLER RESTRICTION OR LIMITATION IS VIOLATED.

(7) This Service Letter alerts owners, operators, pilots, and technicians of all turboprop airplanes with Hartzell propellers with four or more blades, to check their propeller idle RPM settings and any propeller RPM restrictions or limitations, and to adhere to the propeller RPM restrictions or limitations.

D. Description

(1) This Service Letter provides Instructions for Continued Airworthiness (ICA).

(2) This Service Letter may be used by an owner/operator to determine the appropriate corrective action if or when a propeller is identified as having operated below the minimum idle RPM in the propeller RPM restricted region.

(3) The corrective action will be based on the amount the RPM is below the minimum specified propeller RPM in the restricted RPM region and the total hours of operation of the propeller on an engine with improper RPM settings. The greater the amount of the RPM deviation and the longer it is permitted to exist, the more severe the corrective action required. The corrective actions may vary from no action required to scrapping of the blades, blade clamps (if applicable), and hub. Refer to Figure 1 for the required corrective action. Contact Hartzell if further clarification is required. Contact Hartzell when violating a propeller restriction that is other than what is described by Figure 1.

NOTE: A turboprop propeller having four or more blades may have a variety of operating restrictions and these different restrictions may have different operating margins. The chart in Figure 1 applies only when the minimum idle RPM for the propeller is placed just above the top-end of the propeller restriction. This chart does not apply to other propeller restrictions that are above the minimum idle RPM. Contact Hartzell if further clarification is required and for corrective action when violating other propeller RPM restrictions.

E. Compliance

(1) Before further flight, perform the Initial Run-Up and Propeller Ground Idle RPM Check in accordance with the Accomplishment Instructions in this Service Letter.

F. Approval

(1) FAA acceptance has been obtained on technical data in this publication that affects type design.

G. Manpower

(1) Manpower requirements will be determined by installation and operating conditions. Refer to Figure 1 for Corrective Actions.

H. References

(1) Hartzell Propeller Inc. 6-blade Lightweight Turbine Propeller Overhual Manual 144 (61-10-44)

(2) Hartzell Propeller Inc. Propeller Owner's Manual 154 (61-00-54)

(3) Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02)

(4) Airplane Flight Manual (AFM)

(5) Airplane Flight Manual Supplement (AFMS)

(6) Aircraft Maintenance Manual (AMM)

I. Other Publications Affected

(1) Hartzell Propeller Inc. Propeller Owner's Manual 154 (61-00-54)

2. Accomplishment Instructions

A. Initial Run-Up

(1) Following propeller installation and before flight, perform the Initial Run-Up procedure in accordance with the instructions in this section.

WARNING: REFER TO THE AIRCRAFT MAINTENANCE MANUAL FOR ADDITIONAL PROCEDURES THAT MAY BE REQUIRED AFTER PROPELLER INSTALLATION.

(2) Perform engine start and warm-up in accordance with the Pilot’s Operating Handbook (POH).

CAUTION: AIR TRAPPED IN THE PROPELLER HYDRAULIC CYLINDER WILL CAUSE PITCH CONTROL TO BE IMPRECISE AND CAN CAUSE PROPELLER SURGING.

(3) Cycle the propeller control through the operating blade range from low pitch (or reverse), to high pitch (or as specified in the POH).

(a) Repeat this step at least three times.

NOTE: Cycling the propeller control purges air from the propeller hydraulic system and introduces warm oil to the cylinder.

(4) Check the propeller speed control and operation from low pitch (or reverse) to high pitch using the procedure specified in the POH.

(a) Perform all ground functional, feathering, and cycling checks with the minimum propeller RPM drop required to demonstrate the function.

WARNING: ABNORMAL VIBRATION CAN BE AN INDICATION OF A FAILING PROPELLER BLADE OR BLADE RETENTION COMPONENT. AN IN-FLIGHT BLADE SEPARATION CAN RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE.

(5) Check for any abnormal vibration during this run-up.

(a) If vibration occurs, shut the engine down, determine the cause, and correct it before further flight.

(6) Shut down the engine in accordance with the POH.

(7) Refer to the POH and the airframe manufacturer’s manual for additional operational checks.

B. Propeller Ground Idle RPM Check

WARNING: STABILIZED GROUND OPERATION WITHIN THE PROPELLER RESTRICTED RPM RANGE CAN GENERATE HIGH PROPELLER STRESSES AND RESULT IN FATIGUE DAMAGE TO THE PROPELLER. THIS DAMAGE CAN LEAD TO A REDUCED PROPELLER FATIGUE LIFE, PROPELLER FAILURE, AND LOSS OF CONTROL OF THE AIRCRAFT. THE PROPELLER RESTRICTED RPM RANGE IS DEFINED IN THE AIRPLANE FLIGHT MANUAL.

(1) General

(a) Propellers with four or more blades operating on turbine engines can be sensitive to operation within restricted RPM ranges. These restricted ranges are usually in the lower RPM ranges, requiring that ground idle RPM be set above a critical minimum value.

(b) This minimum propeller idle RPM operating restriction is the result of a specific vibratory resonant condition known as “reactionless mode”. During operation in these conditions the flight crew cannot feel the resulting high propeller vibration. Ground operation at or near an RPM that can create a reactionless mode vibratory resonance can cause very high stresses in the propeller blades and the hub. These high stresses are more severe when operating in a quartering tail wind condition.

(c) If the propeller is operated within a restricted RPM range or below a minimum idle RPM restriction for an extended period of time, the propeller blades and hub can become unairworthy because of fatigue. A failed blade or hub has the potential to cause a catastrophic blade separation.

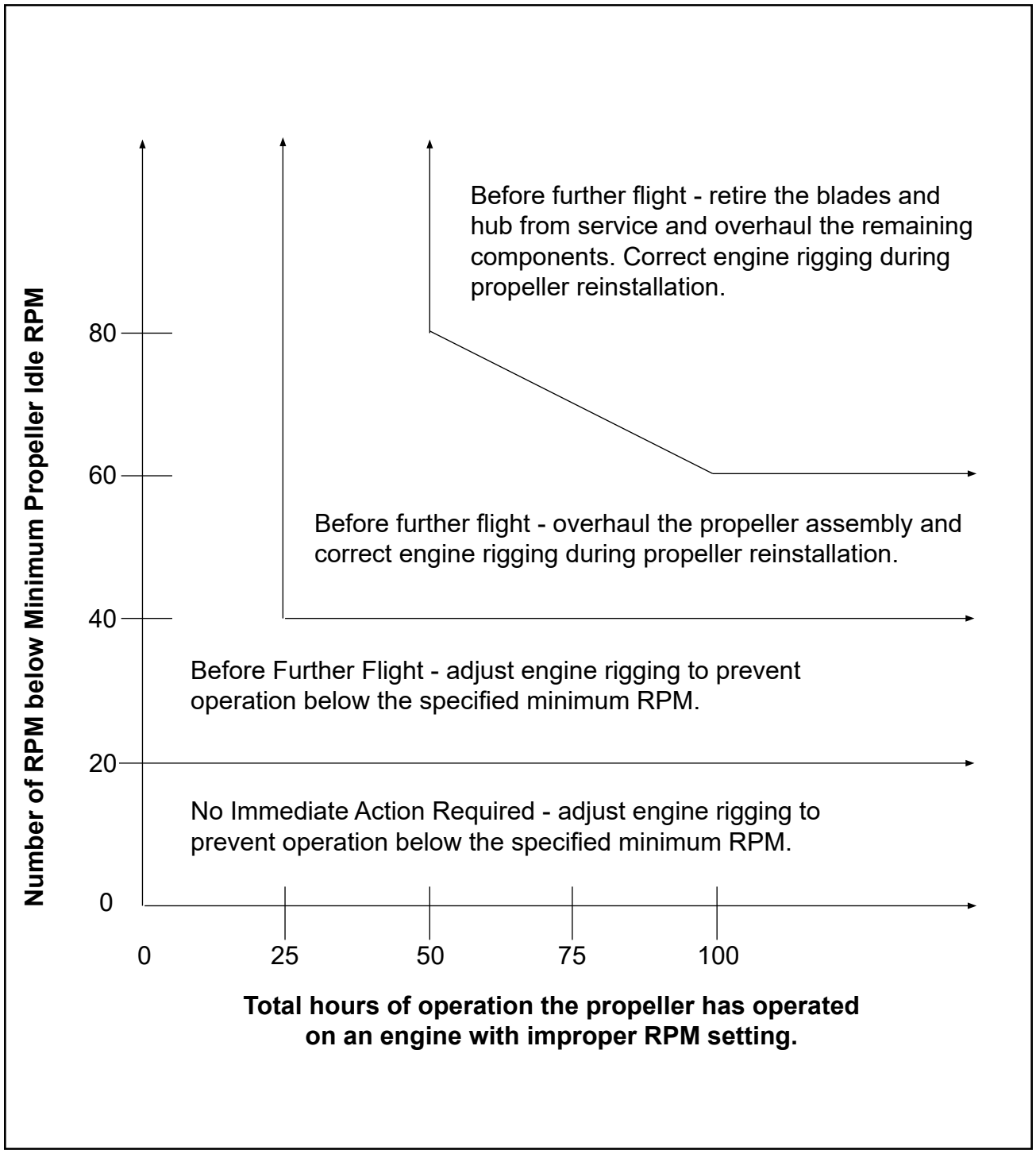
(d) Use the “Periodic Ground Idle RPM Check” steps in this section to determine if the propeller is operating within the specified RPM limits.

(e) Refer to the “Corrective Action” steps in this section for maintenance information about propellers operating outside of the specified RPM range.

SERVICE LETTER

HC-SL-61-254

Propeller - Propeller Operating Restrictions



Corrective Action Required
Figure 1

(2) Periodic Ground Idle RPM Check

NOTE: The accuracy of the tachometer is critical to the safe operation of the aircraft. Hartzell Propeller Inc. recommends that propeller owners/operators calibrate the engine tachometer in accordance with the National Institute of Standards and Technology (NIST) or similar national standard (traceable).

(a) Perform the RPM check in accordance with the Airplane Flight Manual or Airplane Flight Manual Supplement.

1 Refer to the Airplane Flight Manual or Airplane Flight Manual Supplement to determine if there are any propeller RPM restrictions or limitations.

(b) Perform an engine run up and determine if the engine and/or propeller rigging permits operation of the propeller below the minimum specified propeller idle RPM.

(c) If the propeller cannot be operated below the minimum specified propeller idle RPM, no further action is required.

Example:

Minimum propeller idle RPM listed in the AMM is 1180 RPM

Propeller idle is set at 1120 RPM

Propeller has operated with a RPM deviation of **60 RPM**

Engine was rigged 2 months ago and has operated **75 hours** since it was rigged

Figure 1 shows that with an RPM deviation of 60 RPM for 75 hours - the propeller assembly must be overhauled and engine rigging corrected before further flight.

Example of a Ground Idle RPM Check Evaluation
Figure 2

(d) If the propeller can be operated below the minimum specified propeller idle RPM:

1 Refer to Figure 1 for corrective action requirements, and Figure 2 for an example of a ground idle RPM check evaluation.

2 The corrective action is based on the amount the RPM is below the minimum propeller idle RPM and the total hours of operation the propeller has accumulated.

a Figure 1 applies to an aircraft that is operated in conventional service. “Hours of Operation” refers to the total number of hours the propeller is operated on an engine that has an improper RPM setting. It is not the number of hours the propeller is operated in a restricted range, which will be less than the total hours of operation.

(3) Corrective Action

(a) The required corrective action is determined by both the amount and duration of RPM deviation.

1 A turboprop propeller with four or more blades may have a variety of operating restrictions and these different restrictions may have different operating margins.

2 The greater the amount of the RPM deviation and the longer it is permitted to exist, the more severe the required corrective action.

3 The corrective action may vary from no action required, to retirement of the blades and the hub.

4 The chart in Figure 1 specifies the required corrective action for operation below the minimum idle RPM.

a The chart in Figure 1 does not apply to other propeller restrictions that are above the minimum idle RPM.

5 If the corrective action requires a propeller overhaul, overhaul the propeller in accordance with the applicable propeller overhaul manuals.

6 If the corrective action requires that the blades and the hub be retired from service, retire these components in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) before further flight.

a A propeller hub or blade that has been retired from service because of a violation of the operating restrictions as specified in this section must not be reused on another aircraft application.

7 If the corrective action requires the correction of the propeller RPM setting, refer to the applicable installation and rigging instructions for the adjustment of engine torque, engine idle speed, and propeller RPM setting.

(b) Contact Hartzell Propeller Inc. Product Support Department to report the findings, or if a propeller restriction other than those described in Figure 1 has been violated.

(4) Post-Run Check

(a) After engine shutdown, check propeller for signs of grease/oil leakage.

C. Recommended Service Facilities

(1) Hartzell Propeller Inc. has a worldwide network of Recommended Service Facilities for overhaul and repair of our products.

(2) Each service facility must meet standard FAA requirements and additional Hartzell Propeller requirements before being recommended by Hartzell Propeller Inc. Each service facility is audited by Hartzell Propeller Inc. to verify the continuation of the standards.

(3) Hartzell Propeller Inc. recommends that you use one of these service facilities when having your propeller overhauled or repaired.

(4) For a current list of Hartzell Propeller Inc. Recommended Service Facilities, contact Hartzell Propeller Inc. Product Support or refer to the Hartzell Propeller Inc. website at www.hartzellprop.com.

D. Contact Information

Hartzell Propeller Inc.
Attn.: Hartzell Propeller Inc. Product Support
One Propeller Place
Piqua, Ohio 45356-2634 USA
Phone: (001) 937.778.4379
Fax: (001) 937.778.4215
E-mail: techsupport@hartzellprop.com