Manual No. 340
Revision 3
December 2022

Propeller Owner's Manual
and Logbook

WING-IN-GROUND-EFFECT CRAFT PROPELLERS

Compact Constant Speed, Non-counterweighted
( )HM-( )( )Y( )-1( )

Compact Constant Speed and Feathering
( )HM-( )( )Y( )-2( )

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WARNING (Rev. 2)

People who operate Wing-In-Ground-effect (WIG) craft should recognize that various types of risks are involved; and they should take all precautions to minimize them, since they cannot be eliminated entirely. The propeller is a vital component of the craft. A mechanical failure of the propeller could create vibrations sufficiently severe to damage the craft, possibly causing it to become uncontrollable.

Propellers are subject to constant vibration stresses from the engine and airstream, which are added to high bending and centrifugal stresses.

Before a propeller is determined to be safe to operate on a craft, an adequate margin of safety must be demonstrated. Even though every precaution is taken in the design and manufacture of a propeller, history has revealed rare instances of failures, particularly of the fatigue type.

It is essential that the propeller is properly maintained according to the recommended service procedures and a close watch is exercised to detect impending problems before they become serious. Any grease or oil leakage, loss of air pressure, unusual vibration, or unusual operation should be investigated and repaired, as it could be a warning that something serious is wrong.

For operators of uncertified or experimental craft an even greater level of vigilance is required in the maintenance and inspection of the propeller. Experimental installations often use propeller-engine combinations that have not been tested and approved. In these cases, the stress on the propeller and, therefore, its safety margin is unknown. Failure could be as severe as loss of propeller or propeller blades and cause loss of propeller control and/or loss of craft control.

Experimental craft may operate with unapproved engines or propellers or engine modifications to increase horsepower, such as unapproved crankshaft damper configurations or high compression pistons. These issues affect the vibration output of the engine and the stress levels on the propeller. Significant propeller life reduction and failure are real possibilities.

Frequent inspections are strongly recommended if operating with a non-certificated installation; however, these inspections may not guarantee propeller reliability, as a failing device may be hidden from the view of the inspector. Propeller overhaul is strongly recommended to accomplish periodic internal inspection.

Inspect the propeller/blades in accordance with the applicable operation/maintenance documents.

REVISION 3 HIGHLIGHTS

Revision 3, dated December 2022, incorporates the following:

Front matter (Cover, Revision Highlights, etc.), has been revised to match this revision.

References to ice protection systems have been removed.

Updated the Hartzell Propeller Inc. logo on the cover and revised the header on all pages.

Minor language/format changes and renumbering are marked with a revision bar but not listed in this section.

DESCRIPTION AND OPERATION

- Revised the section, “Propeller Model Designation”
- Added the section, “Propeller Blades”
- Revised the section, “Governor Model Designation”

INSTALLATION AND REMOVAL

- Revised the section, “Pre-Installation”
- Revised Table 3-2, “Torque Table”
- Added the section, “Propeller Mounting Hardware and Torque Information”
- Added the section, “Bulkhead Installation” and the applicable Figure(s)
- Revised the section, “Propeller Installation” and added the applicable Figure(s)
- Added the section, “One-Piece Spinner Dome Installation” and the applicable Table and Figure(s)
- Added the section, “Two-Piece Spinner Dome Installation” and the applicable Figure(s)
- Added the section, “Spinner Assembly Clearance Checks” and the applicable Figure(s)
- Added the section, “Metal Bulkhead Spacing Adjustments” and the applicable Figure(s)
- Added the section, “Composite Bulkhead Spacing Adjustments” and the applicable Figure(s)

TESTING AND TROUBLESHOOTING

- Revised the section, “Operational Checks”
- Revised the section, “Troubleshooting”

REVISION 3 HIGHLIGHTS

INSPECTION AND CHECK
- Revised the section, “Pre-Operation Checks”
- Revised the section, “Operational Checks”
- Revised the section, “Required Periodic Inspections and Maintenance”
- Revised the section, “Inspection Procedures”
- Revised the section, “Special Inspections”
- Revised the section, “Long Term Storage”

MAINTENANCE PRACTICES
- Revised the section, “Cleaning”
- Revised the section, “Lubrication” and the applicable Figure(s)
- Added the section, “Corrosion Inhibitor” and the applicable Figure(s)
- Revised the section, “Composite Blades”
- Added the section, “Aluminum Blades” and the applicable Figure(s)
- Added the section, “Blade Paint Touch-Up” and revised Table 6-2
- Revised the section, “Propeller High Pitch Settings”
- Added the section, “Feathering Pitch Stop Settings”
- Added the section, “Reverse Pitch Stop Settings”
- Revised the section, “Start Lock Settings”
- Added the section, “Erosion Tape on Composite Blades”

ANTI-ICE AND DE-ICE SYSTEMS
- Removed this chapter

RECORDS
- Revised the section, “Record Keeping”

REVISION 3 HIGHLIGHTS

1. Introduction

   A. General

      This is a list of current revisions that have been issued against this manual. Please compare it to the RECORD OF REVISIONS page to ensure that all revisions have been added to the manual.

   B. Components

      (1) Revision No. indicates the revisions incorporated in this manual.

      (2) Issue Date is the date of the revision.

      (3) Comments indicates the level of the revision.

         (a) New Issue is a new manual distribution. The manual is distributed in its entirety. All the page revision dates are the same and no change bars are used.

         (b) Reissue is a revision to an existing manual that includes major content and/or major format changes. The manual is distributed in its entirety. All the page revision dates are the same and no change bars are used.

         (c) Major Revision is a revision to an existing manual that includes major content or minor content changes over a large portion of the manual. The manual is distributed in its entirety. All the page revision dates are the same, but change bars are used to indicate the changes incorporated in the latest revision of the manual.

         (d) Minor Revision is a revision to an existing manual that includes minor content changes to the manual. Only the revised pages of the manual are distributed. Each page retains the date and the change bars associated with the last revision to that page.

Revision No.	Issue Date	Comments
Original	Aug/13	New Issue
Rev. 1	Aug/14	Minor Revision
Rev. 2	Jul/17	Minor Revision
Rev. 3	Dec/22	Major Revision

RECORD OF REVISIONS

Rev. No.	Issue Date	Date Inserted	Inserted By
Original	Aug/13	Aug/13	HPI
1	Aug/14	Aug/14	HPI
2	Jul/17	Jul/17	HPI
3	Dec/22	Dec/22	HPI

RECORD OF REVISIONS

Rev. No.	Issue Date	Date Inserted	Inserted By

RECORD OF TEMPORARY REVISIONS

TR No.	Issue Date	Date Inserted	Inserted By	Date Removed	Removed By

RECORD OF TEMPORARY REVISIONS

TR No.	Issue Date	Date Inserted	Inserted By	Date Removed	Removed By

SERVICE DOCUMENTS LIST

CAUTION 1: DO NOT USE OBSOLETE OR OUTDATED INFORMATION. PERFORM ALL INSPECTIONS OR WORK IN ACCORDANCE WITH THE MOST RECENT REVISION OF THE SERVICE DOCUMENT. INFORMATION CONTAINED IN A SERVICE DOCUMENT MAY BE SIGNIFICANTLY CHANGED FROM EARLIER REVISIONS. FAILURE TO COMPLY WITH INFORMATION CONTAINED IN A SERVICE DOCUMENT OR THE USE OF OBSOLETE INFORMATION MAY CREATE AN UNSAFE CONDITION THAT MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE.

CAUTION 2: THE INFORMATION FOR THE DOCUMENTS LISTED INDICATES THE REVISION LEVEL AND DATE AT THE TIME THAT THE DOCUMENT WAS INITIALLY INCORPORATED INTO THIS MANUAL. INFORMATION CONTAINED IN A SERVICE DOCUMENT MAY BE SIGNIFICANTLY CHANGED FROM EARLIER REVISIONS. REFER TO THE APPLICABLE SERVICE DOCUMENT INDEX FOR THE MOST RECENT REVISION LEVEL OF THE SERVICE DOCUMENT.

Service Document Number	Incorporation Rev/Date
HM-SL-003	Rev. 2, Jul/17

SERVICE DOCUMENTS LIST

Service Document Number	Incorporation Rev/Date

OPERATIONAL LIMITATIONS

1. The applicable certification agency may establish specific life limits for certain component parts, as well as the entire propeller. Such limits require replacement of the identified parts after a specified number of hours of use.
2. The following data summarizes all current information concerning Hartzell Propeller Inc. life limited parts as related to propeller models affected by this manual. These parts are not life limited on other installations; however, time accumulated toward life limit accrues when first operated on craft/engine/propeller combinations listed, and continues regardless of subsequent installations (which may or may not be life limited).

   (a) Propeller models affected by this manual currently do not have any life limited parts.

Rev. No.	Description of Revision

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LIST OF EFFECTIVE PAGES

Chapter	Page	Revision	Date
Cover/Inside Cover	Cover/Inside Cover	Rev. 3	Dec/22
Message	1 thru 2	Rev. 3	Dec/22
Revision Highlights	1 thru 4	Rev. 3	Dec/22
Record of Revisions	1 thru 2	Rev. 3	Dec/22
Record of Temporary Revisions	1 thru 2	Rev. 3	Dec/22
Service Documents List	1 thru 2	Rev. 3	Dec/22
Operational Limitations	1 thru 2	Rev. 3	Dec/22
List of Effective Pages	1 thru 2	Rev. 3	Dec/22
Table of Contents	1 thru 2	Rev. 3	Dec/22
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Description and Operation	2-1 thru 2-16	Rev. 3	Dec/22
Installation and Removal	3-1 thru 3-2	Rev. 3	Dec/22
	3-2.1 thru 3-2.2	Rev. 3	Dec/22
	3-3 thru 3-62	Rev. 3	Dec/22
Testing and Troubleshooting	4-1 thru 4-12	Rev. 3	Dec/22
Inspection and Check	5-1 thru 5-28	Rev. 3	Dec/22
Maintenance Practices	6-1 thru 6-42	Rev. 3	Dec/22
Records	7-1 thru 7-8	Rev. 3	Dec/22

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1. General

A. Statement of Purpose

CAUTION: KEEP THIS MANUAL WITH THE PROPELLER OR THE CRAFT UPON WHICH IT IS INSTALLED AT ALL TIMES. THE LOGBOOK RECORD WITHIN THIS MANUAL MUST BE MAINTAINED, RETAINED CONCURRENTLY, AND BECOME A PART OF THE CRAFT AND ENGINE SERVICE RECORDS.

(1) The information in this manual can be used by qualified personnel to install, operate, and maintain the applicable Hartzell propeller assemblies.

(a) Additional manuals are available that include overhaul procedures and specifications for the propeller.

(2) This manual may include multiple design types.

(a) Parentheses shown in the propeller model designations in this or other Hartzell Propeller Inc. publications indicate letter(s) and/or number(s) that may or may not be present because of different configurations permitted on the various aircraft installations.

1 Refer to the Description and Operation chapter of this manual for propeller and blade model designation information.

(3) Where possible, this manual is written in the format specified by ATA iSpec 2200.

B. Maintenance Practices

(1) The propeller and its components are highly vulnerable to damage while they are removed from the engine. Properly protect all components until they are reinstalled on the engine.

(2) Never attempt to move the craft by pulling on the propeller.

(3) Avoid the use of blade paddles. If blade paddles must be used, use at least two paddles. Do not put the blade paddle in the area of the de-ice or anti-icing boot when applying torque to a blade assembly. Put the blade paddle in the thickest area of the blade, just outside of the de-ice or anti-icing boot. Use one blade paddle per blade.

(4) Use only the approved consumables, e.g., cleaning agents, lubricants, etc.

(5) Observe applicable torque values during maintenance.

(6) Before installing the propeller on the engine, the propeller must be static balanced. New propellers are statically balanced at Hartzell Propeller Inc. Overhauled propellers must be statically balanced by the overhaul facility before return to service.

(a) Dynamic balance is recommended, but may be accomplished at the discretion of the operator, unless specifically required by the craft or engine manufacturer.

1 Perform dynamic balancing in accordance with the Maintenance Practices chapter of this manual.

2 Additional procedures may be found in the applicable maintenance manual.

(7) As necessary, use a soft, non-graphite pencil or crayon to make identifying marks on components.

(8) As applicable, follow military standard NASM33540 for safety-wire, safety cable, and cotter pin general practices. Use 0.032 (0.81 mm) diameter stainless steel safety wire unless otherwise indicated.

(9) The information in this manual revision supersedes data in all previously published revisions of this manual.

(10) The craft manufacturer's manuals should be used in addition to the information in this manual due to possible special requirements for specific craft applications.

(11) Approved corrosion protection followed by approved paint must be applied to all aluminum blades.

(a) For information about the application of corrosion protection and paint, refer to the Maintenance Practices chapter of this manual. Operation of blades without the specified coatings and finishes, i.e., "polished blades", is not permitted.

2. Craft or Engine Modifications

A. Propeller Stress Levels

(1) Propellers are approved vibrationwise on craft and engine combinations based on tests or analysis of similar installations. This data has demonstrated that propeller stress levels are affected by craft configuration, airspeed, weight, power, engine configuration and approved maneuvers. Craft modifications that can affect propeller stress include, but are not limited to: aerodynamic changes ahead of or behind the propeller, realignment of the thrust axis, increasing or decreasing airspeed limits, and increasing or decreasing weight limits (less significant on piston engines).

B. Engine Modifications

(1) Engine modifications can affect the propeller. The two primary categories of engine modifications are those that affect structure and those that affect power. An example of a structural engine modification is the alteration of the crankshaft or damper of a piston engine. Any change to the weight, stiffness or tuning of rotating components could result in a potentially dangerous resonant condition that is not detectable by the pilot. Most common engine modifications affect the power during some phase of operation. Some modifications increase the maximum power output, while others improve the power available during hot and high operation (flat rating) or at off-peak conditions.

(a) Examples of turbine engine modifications include, but are not limited to: changes to the compressor, power turbine or hot section of a turboprop engine.

(b) Examples of reciprocating engine modifications include, but are not limited to: the addition or alteration of a turbocharger or turbonormalizer, increased compression ratio, increased RPM, altered ignition timing, electronic ignition, full authority digital electronic controls (FADEC), or tuned induction or exhaust.

(2) All such modifications must be reviewed and approved by the propeller manufacturer prior to obtaining approval on the craft.

3. Restrictions and Placards (Rev. 1)
   A. Important Information
      (1) The propellers covered by this manual may have a restricted operating range that requires a cockpit placard.
         (a) The restrictions, if present, will vary depending on the propeller, blade, engine, and/or craft model.
         (b) Review the applicable certification agency information and operating handbook for specific information.

4. Reference Publications
   A. Hartzell Propeller Inc. Publications
      (1) Information published in Service Bulletins, Service Letters, Service Advisories, and Service Instructions may supersede information published in this manual. The reader must consult active Service Bulletins, Service Letters, Service Advisories, and Service Instructions for information that may have not yet been incorporated into the latest revision of this manual.
      (2) In addition to this manual, one or more of the following publications are required for information regarding specific recommendations and procedures to maintain propeller assemblies that are included in this manual.

Manual No. (ATA No.)	Available at www.hartzellprop.com	Hartzell Propeller Inc. Manual Title
n/a	Yes	Active Hartzell Propeller Inc. Service Bulletins, Service Letters, Service Instructions, and Service Advisories
Manual 127 (61-16-27)	Yes	Metal Spinner Maintenance Manual

Manual No. (ATA No.)	Available at www.hartzellprop.com	Hartzell Propeller Inc. Manual Title
Manual 130B (61-23-30)	-	Mechanically Actuated Governors and Accessories Maintenance Manual
Manual 133C (61-13-33)	-	Aluminum Blade Overhaul Manual
Manual 135F (61-13-35)	-	Composite Propeller Blade Maintenance Manual
Manual 148 (61-16-48)	Yes	Composite Spinner Maintenance Manual
Manual 165A (61-00-65)	Yes	Illustrated Tool and Equipment Manual
Manual 170 (61-13-70)	Yes	Composite Propeller Blade Field Maintenance and Minor Repair Manual
Manual 180 (30-61-80)	Yes	Propeller Ice Protection System Manual
Manual 202A (61-01-02)	Vol. 7, Yes	Standard Practices Manual, Volumes 1 through 11

B. Vendor Publications

(1) None

5. Personnel Requirements (Rev. 1)

   A. Service and Maintenance Procedures in this Manual

      (1) Personnel performing the service and maintenance procedures in this manual are expected to have the required equipment/tooling, training, and certifications (when required by the applicable certification agency) to accomplish the work in a safe manner.

      (2) Compliance to the applicable regulatory requirements established by the applicable certification agency is mandatory for anyone performing or accepting responsibility for the inspection and/or repair of any Hartzell Propeller Inc. product.

         (a) Maintenance records must be kept in accordance with the requirements established by the applicable certification agency.

6. Special Tooling and Consumable Materials (Rev. 1)

   A. Special Tooling

      (1) Special tooling may be required for procedures in this manual. For further tooling information, refer to Hartzell Propeller Inc. Illustrated Tool and Equipment Manual 165A (61-00-65).

         (a) Tooling reference numbers appear with the prefix “TE” directly following the tool name to which they apply. For example, a template that is reference number 133 will appear as: template TE133.

   B. Consumable Materials

      (1) Consumable materials are referenced in certain sections throughout this manual. Specific approved materials are listed in the Consumable Materials chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

         (a) Consumable material reference numbers appear with the prefix “CM” directly following the material to which they apply. For example, an adhesive that is reference number 16 will appear as: adhesive CM16. Only the material(s) specified can be used.

7. Safe Handling of Paints and Chemicals (Rev.1)

   A. Instructions for Use

      (1) Always use caution when handling or being exposed to paints and/or chemicals during propeller overhaul and maintenance procedures.

      (2) Before using paint or chemicals, always read the manufacturer's label on the container(s) and follow specified instructions and procedures for storage, preparation, mixing, and/or application.

      (3) Refer to the product's Material Safety Data Sheet (MSDS) for detailed information about physical properties, health, and physical hazards of any paint or chemical.

8. Calendar Limits and Long Term Storage (Rev. 2)

   A. Calendar Limits

      (1) The effects of exposure to the environment over a period of time create a need for propeller overhaul regardless of flight time.

      (2) A calendar limit between overhauls is specified in Hartzell Propeller Inc. Service Letter HM-SL-001.

      (3) Experience has shown that special care, such as keeping a craft in a hangar, is not sufficient to permit extension of the calendar limit.

      (4) The start date for the calendar limit is when the propeller is first installed on an engine.

      (5) The calendar limit is not interrupted by subsequent removal and/or storage.

      (6) The start date for the calendar limit must not be confused with the warranty start date, that is with certain exceptions, the date of installation by the first retail customer.

   B. Long Term Storage

      (1) Propellers that have been in storage have additional inspection requirements before installation. Refer to the Packaging and Storage chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

9. Component Life and Overhaul (Rev. 2)

WARNING: CERTAIN PROPELLER COMPONENTS USED IN NON-AVIATION APPLICATIONS ARE MARKED WITH DIFFERENT PART NUMBERS TO DISTINGUISH THEM FROM COMPONENTS USED IN AVIATION APPLICATIONS. DO NOT ALTER THE PART NUMBERS SHOWN ON PARTS DESIGNATED FOR NON-AVIATION APPLICATIONS OR OTHERWISE APPLY THOSE PARTS FOR USE ON AVIATION APPLICATIONS.

A. Component Life

(1) Component life is expressed in terms of hours of service (Time Since New, TSN) and in terms of hours of service since overhaul (Time Since Overhaul, TSO).

NOTE: TSN/TSO is considered as the time accumulated between rotation and landing, i.e., flight time.

(2) Time Since New (TSN) and Time Since Overhaul (TSO) records for the propeller hub and blades must be maintained in the propeller logbook.

(3) Both TSN and TSO are necessary for defining the life of the component. Certain components, or in some cases an entire propeller, may be “life limited”, which means that they must be replaced after a specified period of use (TSN).

(a) It is a regulatory requirement that a record of the Time Since New (TSN) be maintained for all life limited parts.

(b) Refer to the Operational Limitations chapter in the applicable Hartzell Propeller Inc. Owner’s Manual for a list of life limited components.

(4) When a component or assembly undergoes an overhaul, the TSO is returned to zero hours.

(a) Time Since New (TSN) can never be returned to zero.

(b) Repair without overhaul does not affect TSO or TSN.

(5) Blades and hubs are sometimes replaced while in service or at overhaul.

(a) Maintaining separate TSN and TSO histories for a replacement hub or blade is required.

(b) Hub replacement

1 If the hub is replaced, the replacement hub serial number must be recorded (the entry signed and dated) in the propeller logbook.

2 The propeller will be identified with the serial number of the replacement hub.

NOTE: Propeller assembly serial numbers are impression stamped on the hub. For stamping information, refer to the Parts Identification and Marking chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

3 The TSN and TSO of the replacement hub must be recorded and maintained in the propeller logbook.

4 If tracking any component(s) other than the hub/blades, maintain these TSN/TSO records separately in the propeller logbook.

NOTE: Hub replacement does not affect the TSN/TSO of any other propeller components.

B. Overhaul

(1) Overhaul is the periodic disassembly, cleaning, inspecting, repairing as necessary, reassembling, and testing in accordance with approved standards and technical data approved by Hartzell Propeller Inc.

(2) The overhaul interval is based on hours of service, i.e., operation time, or on calendar time.

(a) Overhaul intervals are specified in Hartzell Propeller Inc. Service Letter HM-SL-001.

(b) At such specified periods, the propeller hub assembly and the blade assemblies must be completely disassembled and inspected for cracks, wear, corrosion, and other unusual or abnormal conditions.

(3) Overhaul must be completed in accordance with the latest revision of the applicable component maintenance manual and other publications applicable to, or referenced in, the component maintenance manual.

(a) Parts that are not replaced at overhaul must be inspected in accordance with the check criteria in the applicable Hartzell Propeller Inc. component maintenance manual.

(b) Parts that must be replaced at overhaul are identified by a “Y” in the O/H column of the Illustrated Parts List in the applicable Hartzell Propeller Inc. component maintenance manual.

(4) The information in this manual supersedes data in all previously published revisions of this manual.

10. Damage/Repair Types (Rev. 1)
    A. Operable/Inoperable Damage
        (1) Operable damage is a specific condition to a propeller component that is within the servicable damage limits specified in the applicable Hartzell Propeller Inc. component maintenance manual.
            (a) Operable damage does not affect the safety or operational characteristics of the propeller and conforms to its type design.
            (b) Operable damage does not require repair before further operation, but should be repaired as soon as possible to prevent degradation of the damage.
        (2) Inoperable damage is a specific condition to a propeller component that exceeds the serviceable damage limits specified in the applicable Hartzell Propeller Inc. component maintenance manual.
            (a) Inoperable damage can affect the safety or operational characteristics of the propeller and does not conform to its type design.
            (b) Inoperable damage must be repaired before the propeller is returned to service.
    B. Minor/Major Repair
        (1) Minor Repair
            (a) Minor repair is that which may be done safely in the field by a certified mechanic.
                1 For serviceable limits and repair criteria for Hartzell propeller components, refer to the applicable Hartzell Propeller Inc. component maintenance manual.

(2) Major Repair

(a) Major repair cannot be done by elementary operations.

(b) Major repair work must be accepted by an individual that is certified by the applicable agency.

1 Hartzell recommends that individuals performing major repairs also have a Factory Training Certificate from Hartzell Propeller Inc.

2 The repair station must meet facility, tooling, and personnel requirements and is required to participate in Hartzell Propeller Inc. Sample Programs as defined in the Approved Facilities chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

11. Propeller Critical Parts (Rev. 1)

A. Propeller Critical Parts

(1) Procedures in this manual may involve Propeller Critical Parts (PCP).

(a) These procedures have been substantiated based on Engineering analysis that expects this product will be operated and maintained using the procedures and inspections provided in the Instructions for Continued Airworthiness (ICA) for this product.

(b) Refer to the Illustrated Parts List chapter in the applicable Hartzell Propeller Inc. maintenance manual to identify the Propeller Critical Parts.

(2) Numerous propeller system parts can produce a propeller Major or Hazardous effect, even though those parts may not be considered as Propeller Critical Parts.

(a) The operating and maintenance procedures and inspections provided in the ICA for this product are, therefore, expected to be accomplished for all propeller system parts.

12. Warranty Service (Rev. 1)
    A. Warranty Claims
        (1) If you believe you have a warranty claim, contact the Hartzell Propeller Inc. Product Support Department to request a *Warranty Application* form. Complete this form and return it to Hartzell Product Support for evaluation **before proceeding with repair or inspection work**. Upon receipt of this form, the Hartzell Product Support Department will provide instructions on how to proceed.
            (a) For Hartzell Propeller Inc. Product Support Department contact information, refer to the "Contact Information" section in this chapter.

13. Hartzell Propeller Inc. Contact Information (Rev. 2)
    A. Product Support Department
        (1) Contact the Product Support Department of Hartzell Propeller Inc. about any maintenance problems or to request information not included in this publication.

            NOTE: When calling from outside the United States, dial (001) before dialing the telephone numbers below.

            (a) Hartzell Propeller Inc. Product Support may be reached during business hours (8:00 a.m. through 5:00 p.m., United States Eastern Time) at (937) 778-4379 or at (800) 942-7767, toll free from the United States and Canada.
            (b) Hartzell Propeller Inc. Product Support can also be reached by fax at (937) 778-4215, and by e-mail at techsupport@hartzellprop.com.

(c) After business hours, you may leave a message on our 24 hour product support line at (937) 778-4376 or at (800) 942-7767, toll free from the United States and Canada.

1 A technical representative will contact you during normal business hours.

2 Urgent AOG support is also available 24 hours per day, seven days per week via this message service.

(d) Additional information is available on the Hartzell Propeller Inc. website at www.hartzellprop.com.

B. Technical Publications Department

(1) For Hartzell Propeller Inc. service literature and revisions, contact:

Hartzell Propeller Inc.
Telephone: 937.778.4200
Attn: Technical Publications Department
Fax: 937.778.4215
One Propeller Place
E-mail: manuals@hartzellprop.com
Piqua, Ohio 45356-2634 U.S.A.

C. Recommended Facilities

(1) Hartzell Propeller Inc. recommends using Hartzell-approved distributors and repair facilities for the purchase, repair, and overhaul of Hartzell propeller assemblies or components.

(2) Information about the Hartzell Propeller Inc. worldwide network of aftermarket distributors and approved repair facilities is available on the Hartzell website at www.hartzellprop.com.

14. Definitions (Rev. 4)

A basic understanding of the following terms will assist in maintaining and operating Hartzell Propeller Inc. propeller systems.

Term	Definition
Annealed	Softening of material due to overexposure to heat
Aviation Certified	Intended for FAA or international equivalent type certificated aircraft applications. A TC and PC number must be stamped on the hub, and a PC number must be stamped on blades.
Aviation Experimental	Intended for aircraft/propeller applications not certified by the FAA or international equivalent. Products marked with an “X” at or near the end of the model number or part number are not certified by the FAA or international equivalent and are not intended to use on certificated aircraft.
Beta Operation	A mode of pitch control that is directed by the pilot rather than by the propeller governor
Beta Range	Blade angles between low pitch and maximum reverse blade angle
Beta System	Parts and/or equipment related to operation (manual control) of propeller blade angle between low pitch blade angle and full reverse blade angle
Blade Angle	Measurement of blade airfoil location described as the angle between the blade airfoil and the surface described by propeller rotation

Term	Definition
Blade Centerline	An imaginary reference line through the length of a blade around which the blade rotates
Blade Station	Refers to a location on an individual blade for blade inspection purposes. It is a measurement from the blade “zero” station to a location on a blade, used to apply blade specification data in blade overhaul manuals. Note: Do not confuse *blade station* with *reference blade radius*; they may not originate at the same location.
Blemish	An imperfection with visible attributes, but having no impact on safety or utility
Brinelling	A depression caused by failure of the material in compression
Bulge	An outward curve or bend
Camber	The surface of the blade that is directed toward the front of the aircraft. It is the low pressure, or suction, side of the blade. The camber side is convex in shape over the entire length of the blade.
Chord	A straight line distance between the leading and trailing edges of an airfoil
Chordwise	A direction that is generally from the leading edge to the trailing edge of an airfoil
Co-bonded	The act of bonding a composite laminate and simultaneously curing it to some other prepared surface

Term	Definition
Composite Material	Kevlar®, carbon, or fiberglass fibers bound together with, or encapsulated within an epoxy resin
Compression Rolling	A process that provides improved strength and resistance to fatigue
Constant Force	A force that is always present in some degree when the propeller is operating
Constant Speed	A propeller system that employs a governing device to maintain a selected engine RPM
Corrosion (Aluminum)	The chemical or electrochemical attack by an acid or alkaline that reacts with the protective oxide layer and results in damage of the base aluminum. Part failure can occur from corrosion due to loss of structural aluminum converted to corrosion product, pitting, a rough etched surface finish, and other strength reduction damage caused by corrosion.
Corrosion (Steel)	Typically, an electrochemical process that requires the simultaneous presence of iron (component of steel), moisture and oxygen. The iron is the reducing agent (gives up electrons) while the oxygen is the oxidizing agent (gains electrons). Iron or an iron alloy such as steel is oxidized in the presence of moisture and oxygen to produce rust. Corrosion is accelerated in the presence of salty water or acid rain. Part failure can occur from corrosion due to loss of structural steel converted to corrosion product, pitting, a rough etched surface finish and other strength reduction damage caused by corrosion.

Term	Definition
Corrosion Product (Aluminum)	A white or dull gray powdery material that has an increased volume appearance (compared to non-corroded aluminum). Corrosion product is not to be confused with damage left in the base aluminum such as pits, worm holes, and etched surface finish.
Corrosion Product (Steel)	When iron or an iron alloy such as steel corrodes, a corrosion product known as rust is formed. Rust is an iron oxide which is reddish in appearance and occupies approximately six times the volume of the original material. Rust is flakey and crumbly and has no structural integrity. Rust is permeable to air and water, therefore the interior metallic iron (steel) beneath a rust layer continues to corrode. Corrosion product is not to be confused with damage left in the base steel such as pits and etched surface finish.
Crack	Irregularly shaped separation within a material, sometimes visible as a narrow opening at the surface
Debond	Separation of two materials that were originally bonded together in a separate operation
Defect	An imperfection that affects safety or utility
Delamination	Internal separation of the layers of composite material

Term	Definition
Dent	The permanent deflection of the cross section that is visible on both sides with no visible change in cross sectional thickness
Depression	Surface area where the material has been compressed but not removed
Distortion	Alteration of the original shape or size of a component
Edge Alignment	Distance from the blade centerline to the leading edge of the blade
Erosion	Gradual wearing away or deterioration due to action of the elements
Exposure	Leaving material open to action of the elements
Face	The surface of the blade that is directed toward the rear of the aircraft. The face side is the high pressure, or thrusting, side of the blade. The blade airfoil sections are normally cambered or curved such that the face side of the blade may be flat or even concave in the midblade and tip region.
Face Alignment	Distance from the blade centerline to the highest point on the face side perpendicular to the chord line
Feathering	The capability of blades to be rotated parallel to the relative wind, thus reducing aerodynamic drag
Fraying	A raveling or shredding of material

Term	Definition
Fretting	Damage that develops when relative motion of small displacement takes place between contacting parts, wearing away the surface
Galling	To fret or wear away by friction
Gouge	Surface area where material has been removed
Hazardous Propeller Effect	The hazardous propeller effects are defined in Title 14 CFRsection 35.15(g)(1)
Horizontal Balance	Balance between the blade tip and the center of the hub
Impact Damage	Damage that occurs when the propeller blade or hub assembly strikes, or is struck by, an object while in flight or on the ground
Inboard	Toward the butt of the blade
Intergranular Corrosion	Corrosion that attacks along the grain boundaries of metal alloys
Jog	A term used to describe movement up/down, left/right, or on/off in short incremental motions
Laminate	To unite composite material by using a bonding material, usually with pressure and heat
Lengthwise	A direction that is generally parallel to the pitch axis
Loose Material	Material that is no longer fixed or fully attached

Term	Definition
Low Pitch	The lowest blade angle attainable by the governor for constant speed operation
Major Propeller Effect	The major propeller effects are defined in Title 14 CFR section 35.15(g)(2)
Minor Deformation	Deformed material not associated with a crack or missing material
Monocoque	A type of construction in which the outer skin carries all or a major part of the load
Nick	Removal of paint and possibly a small amount of material
Non-Aviation Certified	Intended for non-aircraft application, such as Hovercraft or Wing-in-Ground effect (WIG) applications. These products are certificated by an authority other than FAA. The hub and blades will be stamped with an identification that is different from, but comparable to TC and PC.
Non-Aviation Experimental	Intended for non-aircraft application, such as Hovercraft or Wing-In-Ground effect (WIG) applications. Products marked with an “X” at or near the end of the model number or part number are not certified by any authority and are not intended for use on certificated craft.
Onspeed	Condition in which the RPM selected by the pilot through the propeller control/condition lever and the actual engine (propeller) RPM are equal
Open Circuit	Connection of high or infinite resistance between points in a circuit which are normally lower

Term	Definition
Outboard	Toward the tip of the blade
Overhaul	The periodic disassembly, inspection, repair, refinish, and reassembly of a propeller assembly to maintain airworthiness
Overspeed	Condition in which the RPM of the propeller or engine exceeds predetermined maximum limits; the condition in which the engine (propeller) RPM is higher than the RPM selected by the pilot through the propeller control/condition lever
Pitch	Same as “Blade Angle”
Pitting	Formation of a number of small, irregularly shaped cavities in surface material caused by corrosion or wear
Pitting (Linear)	The configuration of the majority of pits forming a pattern in the shape of a line
Porosity	An aggregation of microvoids. See “voids”.
Propeller Critical Parts	A part on the propeller whose primary failure can result in a hazardous propeller effect, as determined by the safety analysis required by Title 14 CFR section 35.15

Term	Definition
Reference Blade Radius	Refers to the propeller reference blade radius in an assembled propeller, e.g., 30-inch radius. A measurement from the propeller hub centerline to a point on a blade, used for blade angle measurement in an assembled propeller. An adhesive stripe (blade angle reference tape CM160) is usually located at the reference blade radius location. Note: Do not confuse *reference blade radius* with *blade station*; they may not originate at the same point.
Reversing	The capability of rotating blades to a position to generate reverse thrust to slow the aircraft or back up
Scratch	Same as “Nick”
Short Circuit	Connection of low resistance between points on a circuit between which the resistance is normally much greater
Shot Peening	Process where steel shot is impinged on a surface to create compressive surface stress, that provides improved strength and resistance to fatigue
Single Acting	Hydraulically actuated propeller that utilizes a single oil supply for pitch control
Split	Delamination of blade extending to the blade surface, normally found near the trailing edge or tip
Station Line	See "Blade Station"
Synchronizing	Adjusting the RPM of all the propellers of a multi-engine aircraft to the same RPM

Term	Definition
Synchrophasing	A form of propeller sychronization in which not only the RPM of the engines (propellers) are held constant, but also the position of the propellers in relation to each other
Ticking	A series of parallel marks or scratches running circumferentially around the diameter of the blade
Track	In an assembled propeller, a measurement of the location of the blade tip with respect to the plane of rotation, used to verify face alignment and to compare blade tip location with respect to the locations of the other blades in the assembly
Trailing Edge	The aft edge of an airfoil over which the air passes last
Trimline	Factory terminology referring to where the part was trimmed to length
Underspeed	The condition in which the actual engine (propeller) RPM is lower than the RPM selected by the pilot through the propeller control/condition lever
Unidirectional Material	A composite material in which the fibers are substantially oriented in the same direction
Variable Force	A force that may be applied or removed during propeller operation
Vertical Balance	Balance between the leading and trailing edges of a two-blade propeller with the blades positioned vertically

Term	Definition
Voids	Air or gas that has been trapped and cured into a laminate
Windmilling	The rotation of an aircraft propeller caused by air flowing through it while the engine is not producing power
Woven Fabric	A material constructed by interlacing fiber to form a fabric pattern
Wrinkle (aluminum blade)	A wavy appearance caused by high and low material displacement
Wrinkle (composite blade)	Overlap or fold within the material

15. Abbreviations (Rev. 2)

Abbreviation	Term
AD	Airworthiness Directives
AMM	Aircraft Maintenance Manual
AOG	Aircraft on Ground
AR	As Required
ATA	Air Transport Association
CSU	Constant Speed Unit
FAA	Federal Aviation Administration
FH	Flight Hour
FM	Flight Manual
FMS	Flight Manual Supplement
Ft-Lb	Foot-Pound
HMI	Human Machine Interface
ICA	Instructions for Continued Airworthiness
ID	Inside Diameter
In-Lb	Inch-Pound
IPL	Illustrated Parts List
IPS	Inches Per Second
kPa	Kilopascals
Lb(s)	Pound(s)
Max.	Maximum

Abbreviation	Term
Min.	Minimum
MIL-X-XXX	Military Specification
MPI	Major Periodic Inspection (Overhaul)
MS	Military Standard
MSDS	Material Safety Data Sheet
N	Newtons
N/A	Not Applicable
NAS	National Aerospace Standards
NASM	National Aerospace Standards, Military
NDT	Nondestructive Testing
NIST	National Institute of Standards and Technology
N•m	Newton-Meters
OD	Outside Diameter
OPT	Optional
PC	Production Certificate
PCP	Propeller Critical Part
PLC	Programmable Logic Controller
PMB	Plastic Media Blasting (Cleaning)
POH	Pilot’s Operating Handbook
PSI	Pounds per Square Inch

Abbreviation	Term
RF	Reference
RPM	Revolutions per Minute
SAE	Society of Automotive Engineers
STC	Supplemental Type Certificate
TBO	Time Between Overhaul
TC	Type Certificate
TSI	Time Since Inspection
TSN	Time Since New
TSO	Time Since Overhaul
UID	Unique Identification
WIG	Wing-In-Ground-Effect

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1. Description of Propeller and Systems

   A. System Overview

      The propellers included in this manual are constant speed, single-acting, hydraulically actuated propellers. These propellers are designed for use with reciprocating engines.

      A constant speed propeller system is controlled by an engine speed sensing device (governor) to maintain a constant engine/propeller RPM by changing blade angle.

      The governor uses an internal pump that is driven by the engine. This pump increases engine oil pressure for supply to the propeller. Engine speed sensing hardware within the governor controls the supply of oil to the propeller, supplying or draining oil as appropriate to maintain constant engine speed.

      Propeller blade angle change is actuated by a hydraulic piston/cylinder combination mounted on the forward end of the propeller hub. The linear motion of the hydraulic piston is transmitted to each blade through a pitch change rod and a fork. A pitch change knob, located at the base of the blade, connects the blade to the fork. Each blade root is supported in the hub by a retention bearing. The retention bearing holds the blade firmly in the hub, but also allows the blade angle to change.

      Propeller forces, consisting of: 1) mechanical spring action, 2) counterweight centrifugal twisting moment, 3) centrifugal and aerodynamic twisting moment of the blades, and 4) an air charge on some propellers, in various combinations, are constantly present while the propeller is operating. The summation of these forces is opposed by a variable hydraulic force (oil pressure from the engine driven governor). Oil pressure is metered by the governor to oppose these constant forces and maintain a constant engine RPM.

Oil under pressure from the engine-driven governor is supplied to the hydraulic cylinder through the pitch change rod. Increasing or decreasing the oil volume within the hydraulic cylinder either increases blade angle to reduce engine RPM, or reduces blade angle to increase engine RPM. By changing the blade angle, the governor maintains constant engine RPM (within limits), independent of the throttle setting.

If oil pressure is lost at any time, the summation of propeller forces, which is in direct opposition to the lost variable hydraulic force, either increases or reduces blade angle, depending upon propeller model.

B. Constant Speed Propellers ( )HM-( )( )Y( )( )-1( )

The -1 Series propeller models are constant speed, non-counterweighted propellers. The propellers are capable of blade angles between a low positive pitch (low pitch) and high positive pitch (high pitch).

Centrifugal twisting moment acting on the blades moves the blades to a low blade angle (low pitch) to increase RPM. Since the centrifugal twisting moment is only present when the propeller is rotating, a mechanical spring is installed within the propeller to assist movement of the blades to a lower pitch position as RPM decays, and to reduce the propeller pitch to the low pitch stop when the propeller is static. With the blades at low pitch, the load on the starter when starting the engine is reduced significantly.

Oil pressure opposes the spring and centrifugal twisting moment to move the blades to a high blade angle (high pitch), reducing engine RPM.

If oil pressure is lost at any time, the propeller will move to low pitch. This occurs because the spring and blade centrifugal twisting moment are no longer opposed by hydraulic oil pressure. The propeller will then reduce blade pitch to the low pitch stop.

C. Constant Speed, Feathering Propellers ( )HM-( )( )Y( )( )-2( )

The -2 Series propellers are constant speed propellers that use an air charge, spring, and counterweights (if installed) to move the blades to high pitch/feather position. Blade centrifugal twisting moment acts to move the blades to low pitch, but the air charge, spring, and counterweights overcome this force. Oil pressure against a propeller mounted hydraulic piston opposes the counterweight, spring, and air charge forces to move the blades to low blade angle (low pitch).

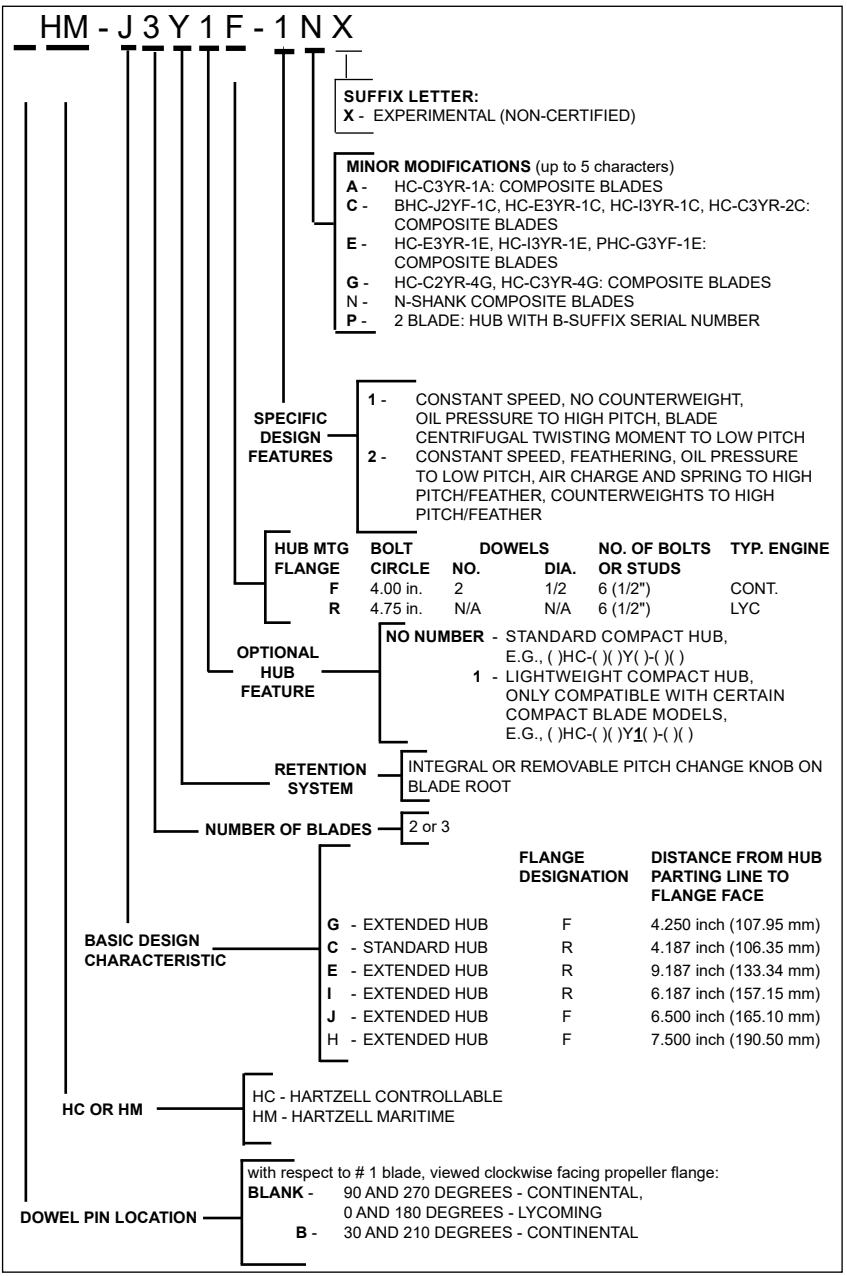
The action of the air charge, spring, and counterweights tends to move the blades to a higher blade angle (high pitch), reducing engine RPM. Oil pressure toward low pitch increases engine RPM.

If oil pressure is lost during operation, the propeller will feather. Feathering occurs because the air charge, spring, and blade counterweights are no longer opposed by hydraulic oil pressure. The air charge, spring and blade counterweights are then free to increase blade pitch to the feathering (high pitch) stop.

Normal in-flight feathering of these propellers is accomplished when the pilot retards the propeller pitch control past the feather detent. This allows control oil to drain from the cylinder and return to the engine sump. The engine can then be shut down.

Normal in-flight unfeathering is accomplished when the pilot positions the propeller pitch control into the normal flight (governing) range and an engine restart is attempted.

When the engine is stopped on the ground, it is undesirable to feather the propeller, as the high blade angle prevents the engine from starting. To prevent feathering during normal engine shutdown on the ground, the propeller incorporates spring energized latches. If propeller rotation is approximately 800 RPM or above, the latches are disengaged by centrifugal force acting on the latches to compress the springs. When RPM drops below 800 RPM (and blade angle is typically within 7 degrees of the low pitch stop), the springs overcome the latch weight centrifugal force and move the latches to engage the high pitch stops, preventing blade angle movement to feather during normal engine shutdown.



Propeller Model Designation
Table 2-1

D. Propeller Model Designation

(1) Hartzell Propeller Inc. uses a model designation system to identify specific propeller and blade assemblies. The propeller model number and blade model number are separated by a slash (/).

(a) Example: *propeller model number / blade model number*

(2) The propeller model number is impression stamped on the propeller hub.

(3) Refer to Table 2-1 for a description of the characters used in the propeller model number.

2. Propeller Blades

A. Description of Aluminum Blades

(1) Aluminum propeller blades are manufactured from one solid piece of aluminum that has been forged and heat-treated prior to manufacture.

(2) Aluminum blades are identified by shank design, propeller diameter, tip configurations, and other blade characteristics.

(a) Refer to the section, "Blade Model Designation" in this chapter.

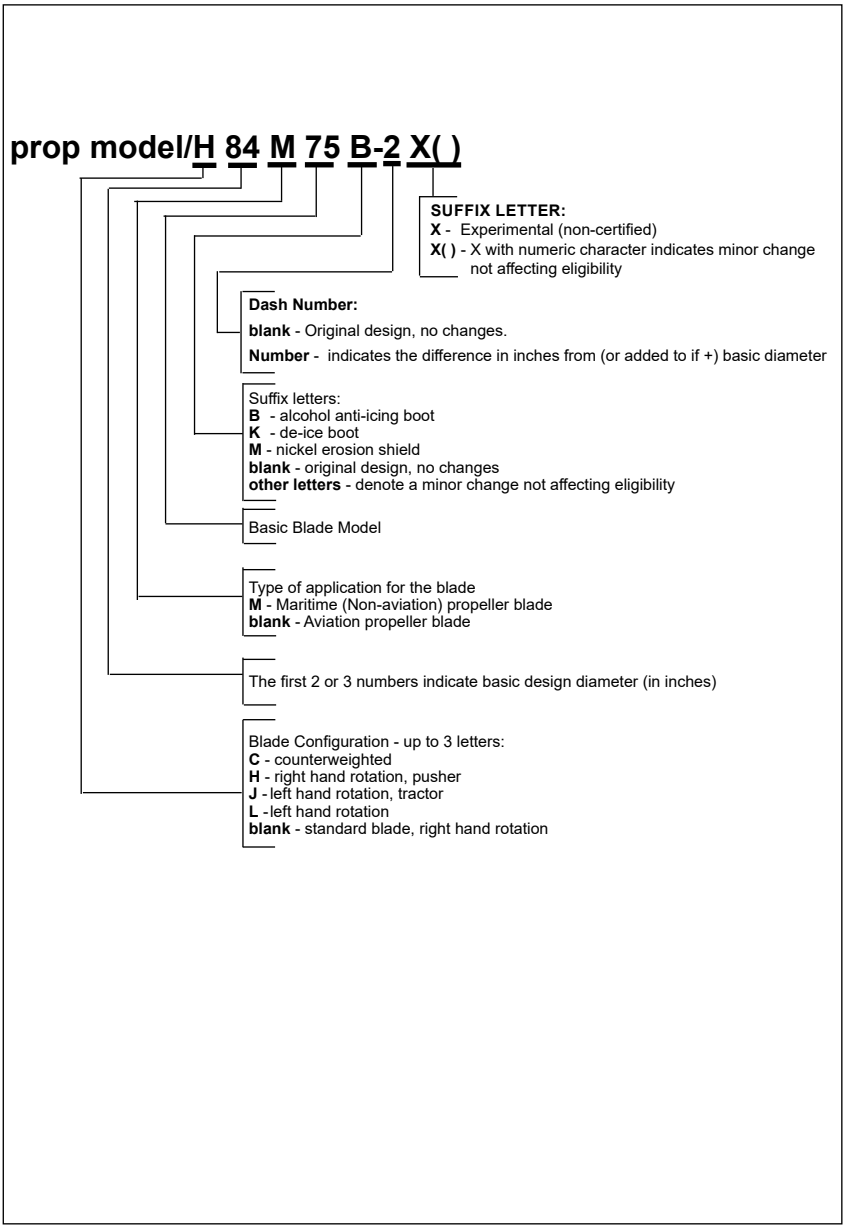
B. Description of Composite Blades

(1) Hartzell Propeller Inc. composite blades are constructed by layering composite material over a foam core and a metal blade shank.

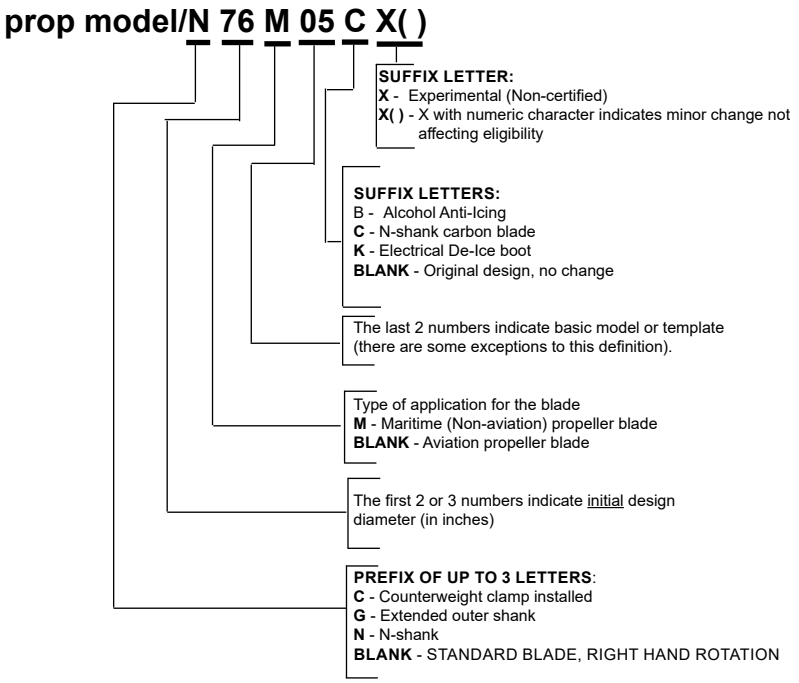
(2) A metal erosion shield is bonded to the leading edge of the blade to provide protection from impact and erosion.

(3) Composite blades are identified by direction of rotation, shank design, propeller diameter, and other blade characteristics.

(a) Refer to the section, "Blade Model Designation" in this chapter.



Aluminum Blade Model Designation
Table 2-2



BLADE TYPE	BLADE MODEL DESIGNATION
N-shank Carbon	N76M05C( )
	NC83M04-5( )

Composite Blade Model Designation
Table 2-3

C. Blade Model Designation

(1) Hartzell Propeller Inc. uses a model number designation system to identify specific propeller and blade assemblies. The propeller model number and blade model number are separated by a slash (/).

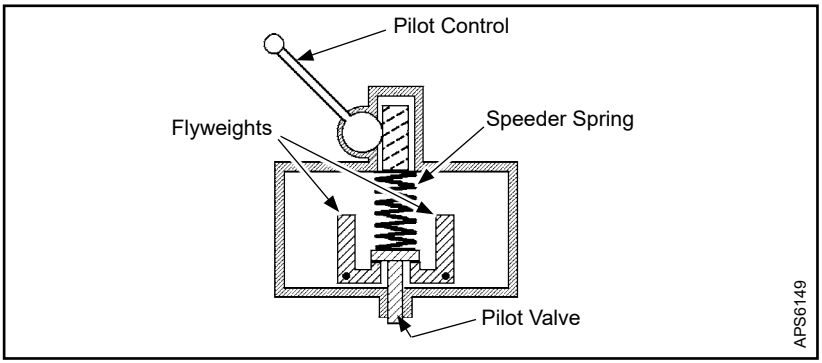
(a) Example: *propeller model number / blade model number*

(2) The blade model number is impression stamped on the butt end of the blade, and also identified by a label on the cylinder.

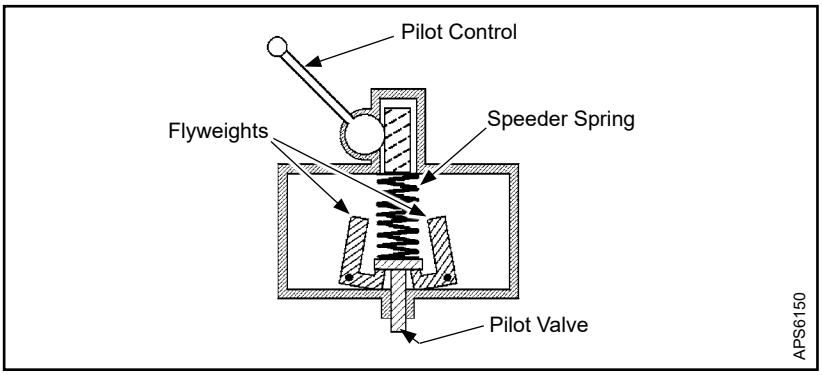
(3) Refer to the applicable table for a description of the characters used in the blade model number:

(a) Aluminum blades: Refer to Table 2-2

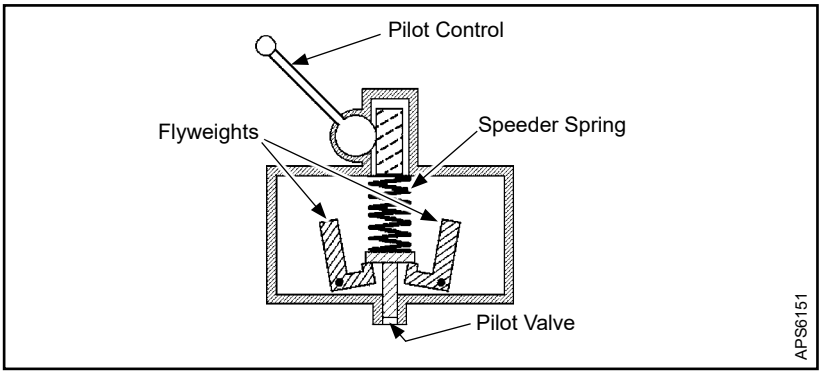
(b) Composite blades: Refer to table 2-3



Governor in Onspeed Condition
Figure 2-1



Governor in Underspeed Condition
Figure 2-2



Governor in Overspeed Condition
Figure 2-3

3. Governors (Rev. 2)

A. Theory of Operation

(1) A governor is an engine RPM sensing device and high pressure oil pump. In a constant speed propeller system, the governor responds to a change in engine RPM by directing oil under pressure to the propeller hydraulic cylinder or by releasing oil from the hydraulic cylinder. The change in oil volume in the hydraulic cylinder changes the blade angle and maintains the propeller system RPM to the set value. The governor is set for a specific RPM via the cockpit propeller control, that compresses or releases the governor speeder spring.

(2) When the engine is operating at the RPM set by the pilot using the cockpit control, the governor is operating **onspeed**. Refer to Figure 2-1. In an onspeed condition, the centrifugal force acting on the flyweights is balanced by the speeder spring, and the pilot valve is neither directing oil to nor from the propeller hydraulic cylinder.

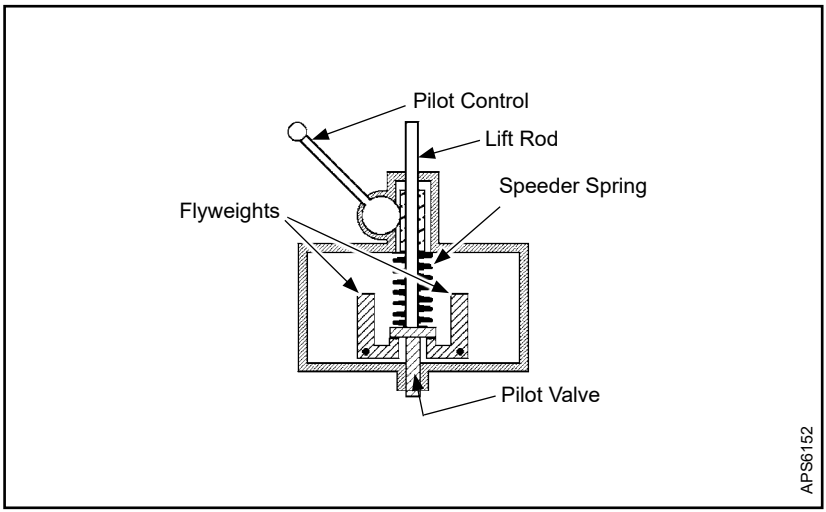
(3) When the engine is operating below the RPM set by the pilot using the cockpit control, the governor is operating **underspeed**. Refer to Figure 2-2. In an underspeed condition, the flyweights tilt inward because there is not enough centrifugal force on the flyweights to overcome the force of the speeder spring. The pilot valve, forced down by the speeder spring, meters oil flow to decrease propeller pitch and raise engine RPM.

(4) When the engine is operating above the RPM set by the pilot using the cockpit control, the governor is operating **overspeed**. Refer to Figure 2-3. In an overspeed condition, the centrifugal force acting on the flyweights is greater than the speeder spring force. The flyweights tilt outward, and raise the pilot valve. The pilot valve then meters oil flow to increase propeller pitch and lower engine RPM.

(5) Feathering governors allow oil to be pushed from the propeller to the engine drain to increase propeller pitch to feather.

(a) Some governors will move the propeller to feather by electrically or mechanically actuating a valve that opens to drain the oil supply between the propeller and governor to increase propeller pitch and allow the propeller to feather.

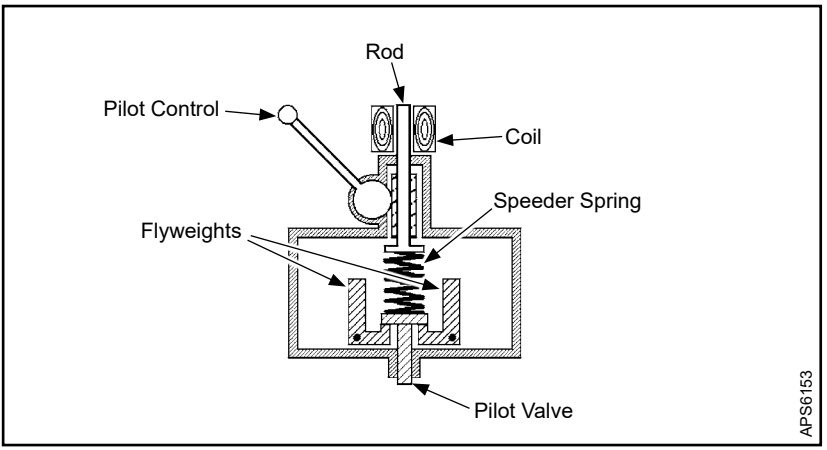
(b) Figure 2-4 illustrates another feathering propeller governor system. When it is desired to feather the propeller, the lift rod may be moved by the cockpit control to mechanically engage the valve. The lifted valve dumps oil to increase propeller pitch until the propeller feathers.



Feathering Governor
Figure 2-4

(6) A synchronizing system can be employed in a multi-engine aircraft to keep the engines operating at the same RPM. A synchrophasing system not only keeps the RPM of the engines consistent, but also keeps the propeller blades in phase with each other. Both synchronizing and synchrophasing systems serve to reduce noise and vibration. Figure 2-5 illustrates a governor as a component of a synchronizing or synchrophasing system.

(a) Hartzell Propeller Inc. synchronizing or synchrophasing systems use one engine (the master engine) as an RPM and phase reference and adjust the RPM of the remaining engine(s) [slave engine(s)] to match it. The RPM of the master engine is monitored electronically, and this information is used to adjust the voltage applied to the electrical coil on the slave governor(s). The voltage to the coil either raises or lowers a rod which changes the force of the speeder spring. In this manner, engine RPM and phase of the propellers is synchronized or synchrophased.



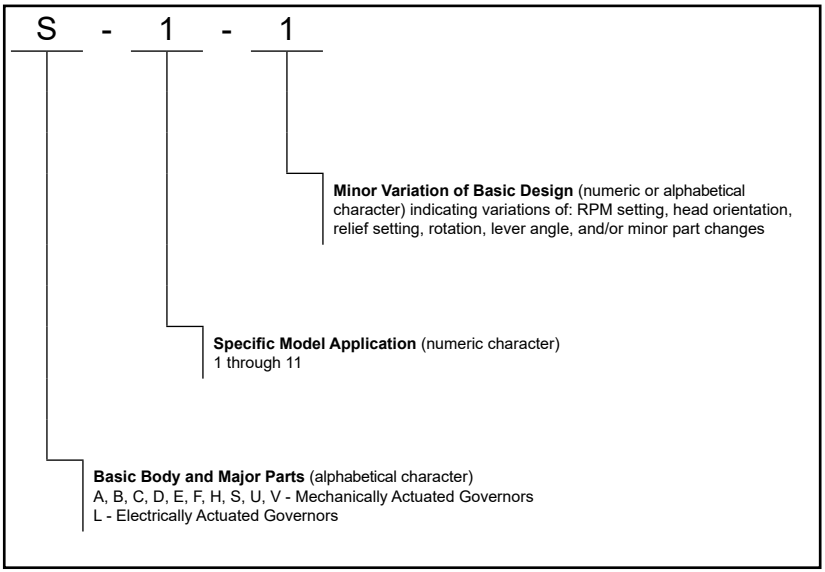
Synchronizer/Synchrophaser Governor
Figure 2-5

B. Governor Model Designation

(1) Hartzell Propeller Inc. uses a model number designation system to identify specific governor models.

(2) The governor model number is stamped on the base and/or body of the governor assembly.

(3) Refer to Table 2-4 for a description of the characters used in the governor model number.



Governor Model Designation
Table 2-4

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1. Tools, Consumables, and Expendables

The following tools, consumables, and expendables will be required for propeller removal or installation:

NOTE: Compact propellers are manufactured with six basic hub mounting flange designs. The flange types are D, F, K, L, N, and R. The flange type is indicated in the propeller model number stamped on the hub. For example, PHM-J3Y**F**-1N indicates an “F” flange. Refer to the Model Designation section in the Description and Operation chapter of this manual for a description of each flange.

A. Tooling

D and F Flange

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench (1/2 inch drive)
- Torque wrench adapter (Hartzell Propeller Inc. P/N BST-2860 or 101939)
- 3/4 inch open end wrench

L Flange

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench (1/2 inch drive)
- Torque wrench adapter (Hartzell Propeller Inc. P/N BST-2860 or 101939)
- 5/8 inch open end wrench

N Flange

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench (1/2 inch drive)
- Torque wrench adapter (Hartzell Propeller Inc. P/N 101939)
- 7/8 inch open end wrench
- 7/8 inch crowfoot wrench

K and R Flange

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench (1/4 inch drive)
- Torque wrench adapter (Hartzell Propeller Inc. P/N BST-2860 or 101939)
- 3/4 inch open end wrench

B. Consumables

• Quick Dry Stoddard Solvent or Methyl-Ethyl-Ketone (MEK)

C. Expendables

• 0.032 (0.81 mm) stainless steel aircraft safety wire (Alternate: 0.032 inch [0.81 mm] aircraft safety cable, and associated hardware)
• O-ring - propeller to engine seal (see Table 3-1)

2. Pre-Installation

A. Inspection of Shipping Package

(1) Examine the exterior of the shipping container, especially the box ends around each blade, for signs of shipping damage.

(a) If the box is damaged, contact the freight company for a freight claim.

(b) A hole, or tear, or crushed appearance at the end of the box (blade tips) may indicate that the propeller was dropped during shipment, possibly damaging the blades.

1 If the propeller is damaged, contact Hartzell Propeller Inc. Refer to the section, “Hartzell Propeller Inc. Contact Information” in the Introduction chapter of this manual.

Flange	O-ring	Stud/Bolt	Nut	Washer/ Spacer	Spring Pin
“F”	C-3317-228	n/a	A-2044	A-1381*	n/a
“R”	C-3317-228	A-2067	A-2069	A-1381	B-3842-0625
* NOTE: Do not install the A-1381 washer on installations that use Goodrich Corp. P/N 4E1881 or 4E2058 split mounting plate.					

Propeller/Engine Flange O-rings and Hardware
Table 3-1

B. Uncrating

(1) Put the propeller on a firm support.

(2) Remove the banding and any external wood bracing from the cardboard shipping container.

(3) Remove the cardboard from the hub and blades.

CAUTION: DO NOT STAND THE PROPELLER ON A BLADE TIP.

(4) Put the propeller on a padded surface that supports the entire length of the propeller.

(5) Remove the plastic dust cover cup from the propeller mounting flange, if installed.

C. Inspection after Shipment

(1) After removing the propeller from the shipping container, examine the propeller components for shipping damage.

D. Reassembly of a Propeller Disassembled for Shipment

(1) If a propeller was received disassembled for shipment, it must be reassembled by trained personnel in accordance with the applicable propeller maintenance manual.

E. Air Charge Pressure Check (-2 Propellers)

(1) Perform an air charge pressure check before propeller installation. Refer to the section, “Air Charge” in the Maintenance Practices chapter of this manual.

(a) If the air pressure loss is not within the specified limits, refer to the section, “Failure to Feather” in the Testing and Troubleshooting chapter of this manual.

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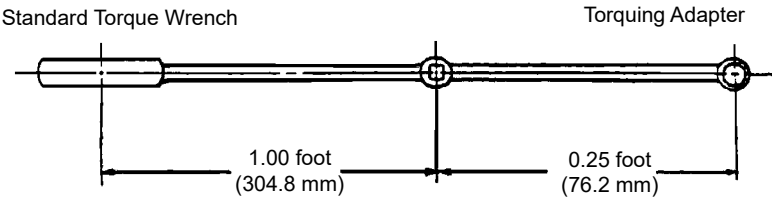


$$\frac{\text{(actual torque required) X (torque wrench length)}}{\text{(torque wrench length) + (length of adapter)}} = \text{Torque wrench reading to achieve required actual torque}$$

EXAMPLE:

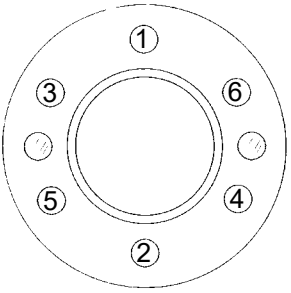
$$\frac{\text{100 Ft-Lb (136 N•m) x 1.00 ft (304.8 mm)}}{\text{1.00 ft (304.8 mm) + 0.25 ft (76.2 mm)}} = \text{80 Ft-Lb (108 N•m)} < \text{reading on torque wrench with 3-inch (76.2 mm) adapter for actual torque of 100 Ft-Lb (136 N•m)}$$

The correction shown is for an adapter that is aligned with the centerline of the torque wrench. If the adapter is angled 90 degrees relative to the torque wrench centerline, the torque wrench reading and actual torque applied will be equal.

Calculating Torque When Using a Torque Wrench Adapter
Figure 3-1

Installation Torques	
CAUTION 1: MOUNTING HARDWARE MUST BE CLEAN AND DRY TO PREVENT EXCESSIVE PRELOAD OF THE MOUNTING FLANGE. CAUTION 2: ALL TORQUES LISTED ARE DRY TORQUE. CAUTION 3: REFER TO FIGURE 3-1 FOR TORQUE READING WHEN USING A TORQUE WRENCH ADAPTER.	
Hub clamping bolts/spinner mounting nuts	20-22 ft-lbs (28-29 N•m)
D flange propeller mounting nuts	75-80 ft-lbs (102-108 N•m)
F flange propeller mounting nuts	70-80 ft-lbs (95-108 N•m)
N flange propeller mounting nuts	90-100 ft-lbs (123-136 N•m)
L flange propeller mounting nuts	45-55 ft-lbs (62-74.5 N•m)
K and R flange propeller mounting studs	60-70 ft-lbs (81.4-95 N•m)
Damper assembly mtg. nuts	28-30 ft-lbs (38-40 N•m)
Low pitch stop jam nut -1 Application (See Figure 6-7)	14-16 ft-lbs (19-21.6 N•m)
Low pitch stop jam nut P/N A-2043-1 -1 Application (Refer to Figure 6-7)	14-16 ft-lbs (19-21 N•m)
Low pitch stop jam nut P/N B-3359 -1 Application (Refer to Figure 6-7)	14-16 ft-lbs (19-21 N•m)
Low pitch stop jam nut P/N B-3599 -1 Application (Refer to Figure 6-7)	14-16 ft-lbs (19-21 N•m)
Low pitch stop jam nut P/N A-2405-2 -2 Application (Refer to Figure 6-8)	25-30 ft-lbs (34-40 N•m)
Low pitch stop jam nut P/N A-2405-4 -2 Application (Refer to Figure 6-8)	25-30 ft-lbs (34-40 N•m)

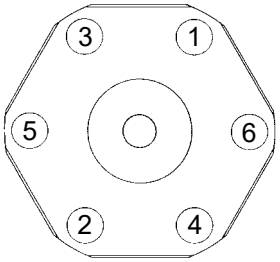
Torque Table
Table 3-2



F Flange

Step 1 - Torque all mounting nuts to 40 Ft-Lbs (54 N•m) in the sequence shown

Step 2 - Torque all mounting nuts in accordance with Table 3-2 and Figure 3-1 in the sequence shown



R Flange

Step 1 - Torque all mounting studs to 40 Ft-Lbs (54 N•m) in the sequence shown

Step 2 - Torque all mounting studs in accordance with Table 3-2 and Figure 3-1 in the sequence shown

Torquing Sequence for Propeller Mounting Bolts/Nuts
Figure 3-2

3. Propeller Mounting Hardware and Torque Information (Rev. 1)
   A. Propeller Mounting Hardware
      (1) Refer to Table 3-1 for part numbers of the propeller mounting hardware and O-rings.
   B. Torque Information
      (1) The structural integrity of joints in the propeller that are held together with threaded fasteners is dependent upon proper torque application.
         (a) Vibration can cause an incorrectly tightened fastener to fail in a matter of minutes.
         (b) Correct tension in a fastener depends on a variety of known load factors and can influence fastener service life.
         (c) Correct tension is achieved by application of measured torque.
      (2) Use accurate wrenches and professional procedures to make sure of correct tensioning.
      (3) Refer to Table 3-2 for the torque values to use when installing a Hartzell propeller.
      (4) When an adapter is used with a torque wrench, use the equation in Figure 3-1 to determine the correct torque value.
      (5) Refer to Figure 3-2 for the proper torquing sequence of the propeller mounting bolts/nuts.

4. Bulkhead Installation (Rev. 3)

A. General

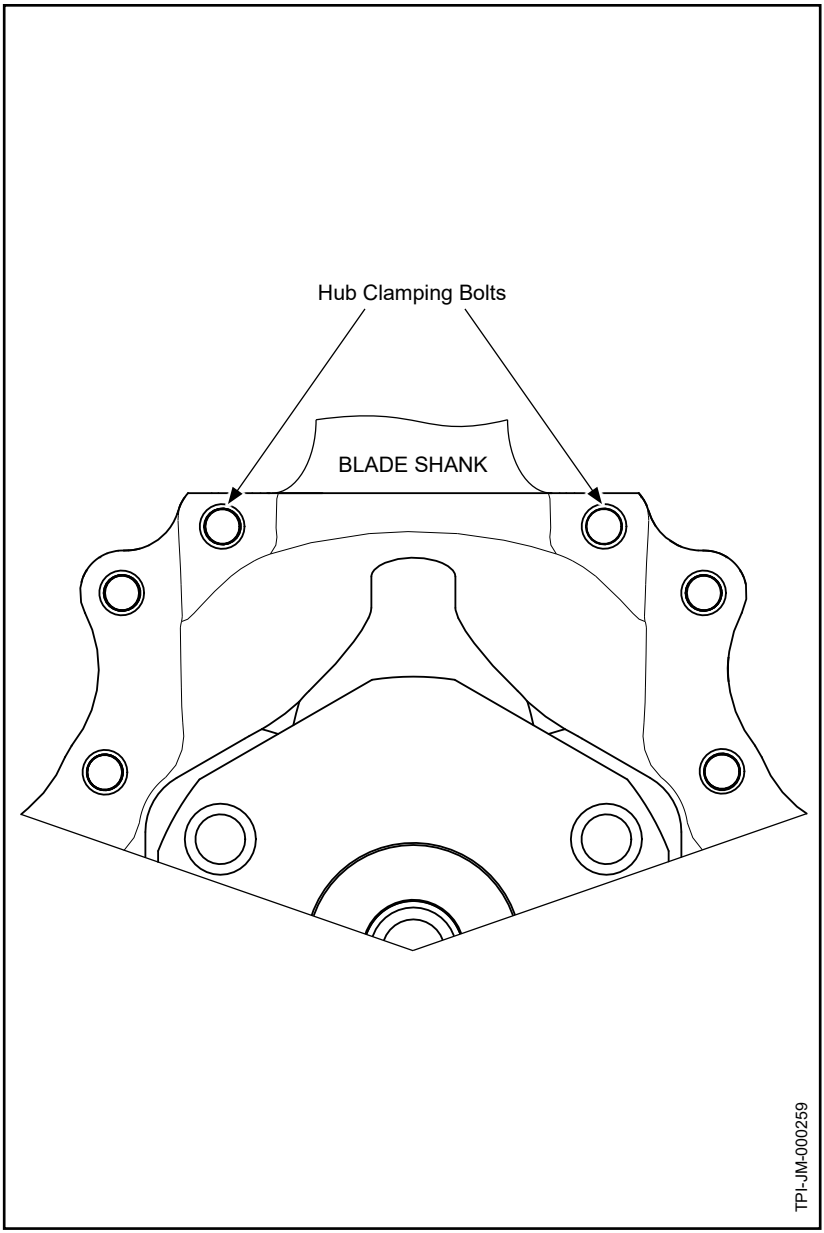
(1) The spinner support must be mounted to the hub before the propeller can be installed.

(2) The spinner assembly may be supplied with spinner mounting hardware, including long hub clamping bolts, washers, and nuts.

(a) If the propeller is shipped with longer hub clamping bolts, spinner mounting hardware will not be supplied with the spinner assembly. Refer to Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59) for the applicable installation.

(b) On some installations, it may be necessary to install spacers and/or washers under the head of the hub clamping bolt to avoid interference with the aircraft cowling.

1 If the installation of the spinner mounting kit requires removal of hub clamping bolts, the propeller must be sent to certified propeller repair station with the appropriate rating.



Hub Clamping Bolt Location
Figure 3-3

B. Installation of a Metal Bulkhead

CAUTION: REMOVE THE NUTS AND WASHERS FROM THE HUB CLAMPING BOLTS ON THE LEFT/RIGHT SIDE OF THE BLADE SHANK ONLY. DO NOT REMOVE THE HUB CLAMPING BOLTS.

(1) Remove the nuts and washers from the hub clamping bolts located on the left/right side of the blade shank. Refer to Figure 3-3.

NOTE: Additional washers/spacers may have been used during assembly of the propeller for hub clamping purposes. These additional washers/spacers may not be components of the applicable spinner mounting kit.

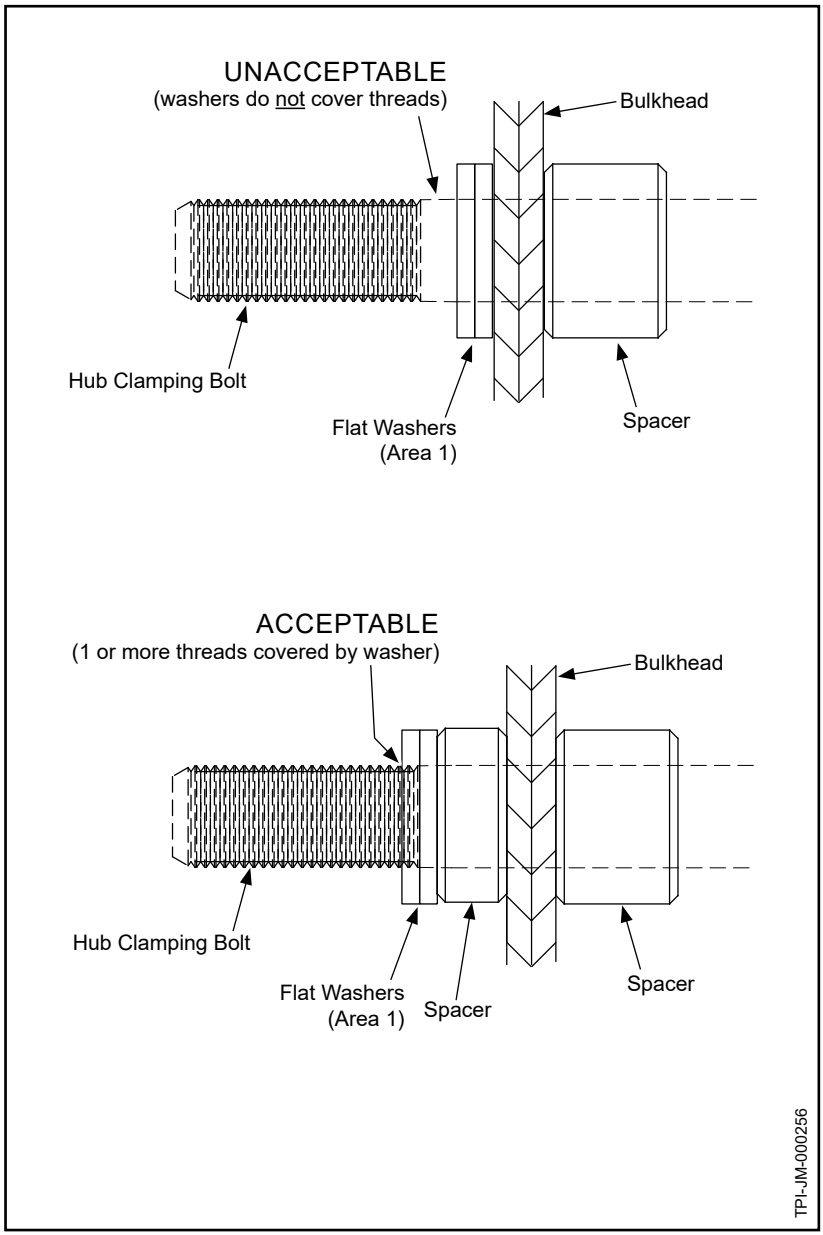
CAUTION 1: USE ONLY WASHERS/SPACERS FROM THE APPLICABLE SPINNER MOUNTING KIT TO INSTALL THE SPINNER BULKHEAD.

CAUTION 2: THE STACK-UP SEQUENCE FOR EACH HUB CLAMPING BOLT MUST BE THE SAME. VARIANCES BETWEEN STACK-UPS CAN CAUSE CRACKING OF THE SPINNER BULKHEAD. EXCEPTIONS MAY BE REQUIRED

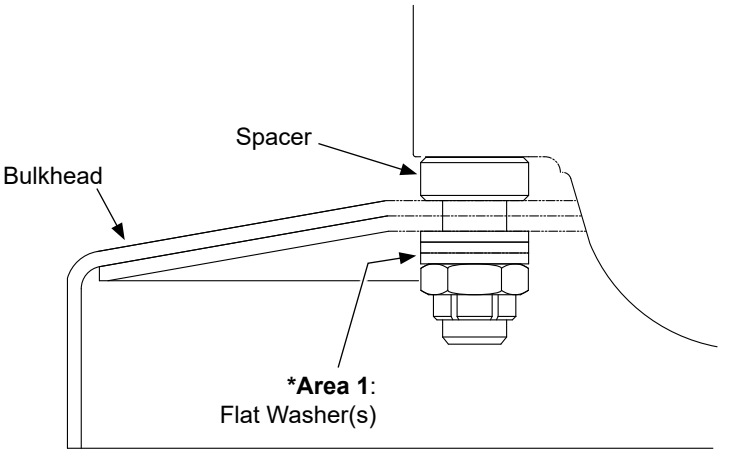
CAUTION 3: DO NOT LET THE SPINNER BULKHEAD TOUCH THE HUB. TO MAINTAIN BULKEAD TO HUB CLEARANCE, ADDITIONAL FLAT WASHER(S) OR SPACER(S) MAY BE REQUIRED.

(2) If applicable, install the spacer(s) onto the hub clamping bolts, then install the spinner bulkhead onto the hub clamping bolts.

(a) For applications that do not use spacers, install a minimum of two flat washers between the spinner bulkhead and the propeller hub.



Thread Coverage: Metal Bulkhead
Figure 3-4



* Up to three flat washers can be installed in **Area 1** to get proper thread engagement.

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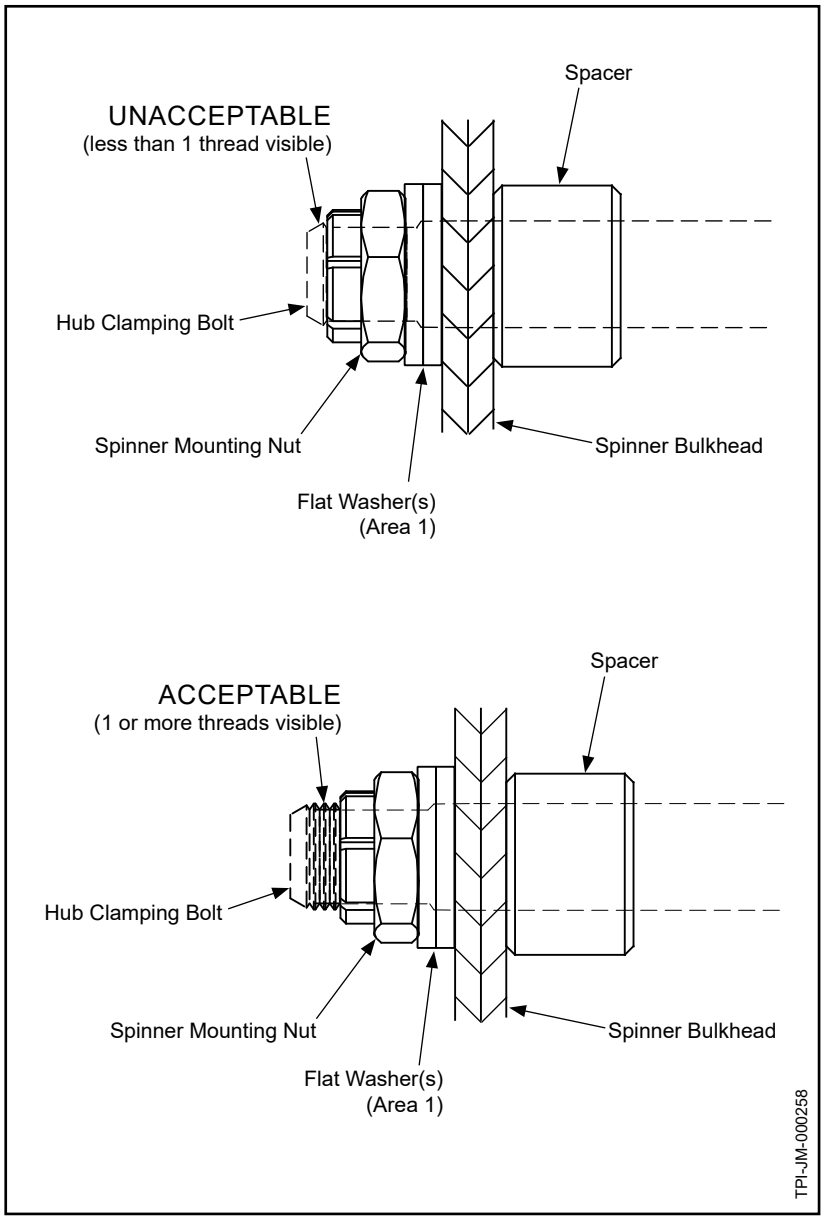
Metal Bulkhead Mounting
Figure 3-5



Thread Exposure: Metal Bulkhead
Figure 3-6

(b) Refer to Hartzell Propeller Inc. Application Guide 159 (61-02-59) for the applicable spinner mounting kit.

(c) Refer to Hartzell Propeller Inc. Metal Spinner Maintenance Manual 127 (61-27-16) for the parts list of the spinner mounting kit.

CAUTION: A MINIMUM OF ONE THREAD MUST BE COVERED BY FLAT WASHER(S) TO MAKE SURE THE SPINNER MOUNTING NUT WILL NOT BOTTOM OUT ON THE NON-THREADED AREA OF THE HUB CLAMPING BOLT. REFER TO FIGURE 3-4 FOR ILLUSTRATIONS OF ACCEPTABLE/UNACCEPTABLE THREAD COVERAGE.

(3) Install one flat washer and/or spacer (if applicable) onto the hub clamping bolts, then check the thread coverage on the hub clamping bolts in accordance with Figure 3-4.

(a) If the washer/spacer covers a minimum of one thread on the hub clamping bolt, go to step (4) of this procedure.

(b) If the washer/spacer does not cover at least one thread on the hub clamping bolt, install additional flat washer(s) from the spinner mounting kit in accordance with Figure 3-5.

1 Up to three flat washers can be installed in Area 1 to get proper thread coverage. Refer to Figure 3-4 and Figure 3-5.

CAUTION: AT LEAST ONE THREAD OF THE HUB CLAMPING BOLT MUST BE VISIBLE BELOW THE SPINNER MOUNTING NUT. REFER TO FIGURE 3-6 FOR ILLUSTRATIONS OF ACCEPTABLE AND UNACCEPTABLE THREAD EXPOSURE.

(4) Install a spinner mounting nut on each of the hub clamping bolts used to mount the spinner bulkhead.

(a) Torque each spinner mounting nut in accordance with the section, “Propeller Mounting Hardware and Torque Information” in this chapter.

(b) If there is less than one hub clamping bolt thread visible below the spinner mounting nut, remove one of the additional washers added in Area 1, then reinstall/torque the spinner mounting nut and check the thread exposure.

1 A minimum of one washer is required in Area 1.

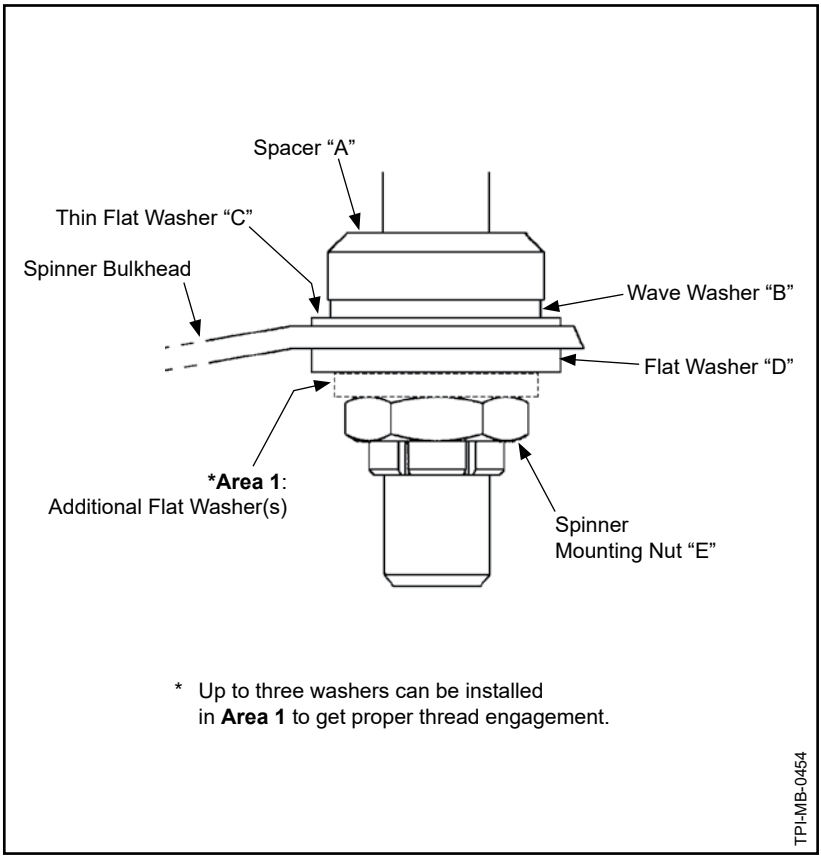
(5) Refer to the section, “Spinner Assembly Clearance Checks” in this chapter.

(6) To adjust the position/spacing of the spinner bulkhead, refer to the section, “Metal Bulkhead Spacing Adjustments” in this chapter.

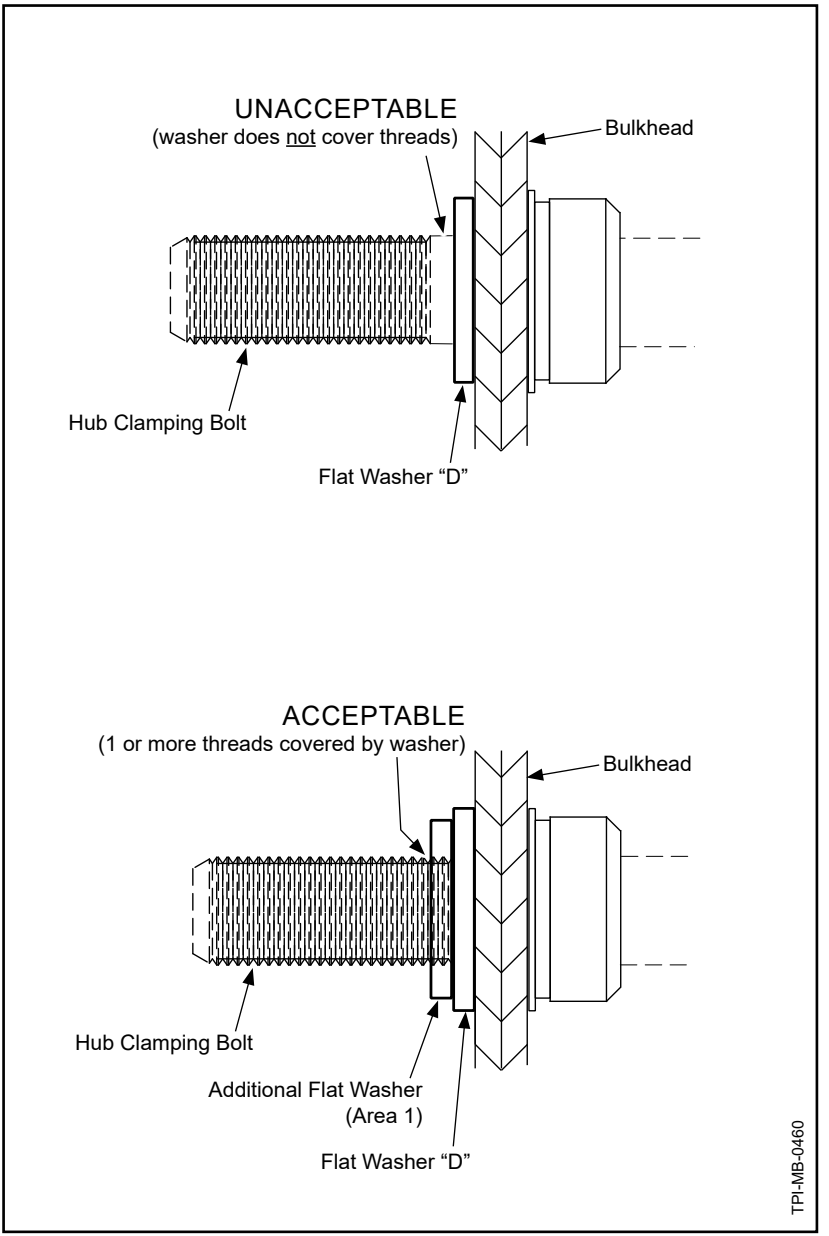
C. Installation of a Composite Bulkhead

CAUTION: REMOVE THE NUTS AND WASHERS FROM THE HUB CLAMPING BOLTS ON THE LEFT/RIGHT SIDE OF THE BLADE SHANK ONLY. DO NOT REMOVE THE HUB CLAMPING BOLTS.

(1) Remove spinner mounting nuts “E” and flat washers “D” from the hub clamping bolts located on the left/right side of the blade shank. Refer to Figure 3-2 and Figure 3-7.



Composite Bulkhead Mounting
Figure 3-7



Thread Coverage: Composite Bulkhead
Figure 3-8

CAUTION 1: THE STACK-UP SEQUENCE FOR EACH HUB CLAMPING BOLT MUST BE THE SAME. VARIANCES BETWEEN STACK-UPS CAN CAUSE CRACKING OF THE SPINNER BULKHEAD. EXCEPTIONS MAY BE REQUIRED

CAUTION 2: DO NOT LET THE SPINNER BULKHEAD TOUCH THE HUB. TO MAINTAIN BULKHEAD TO HUB CLEARANCE, ADDITIONAL FLAT WASHER(S) OR SPACER(S) MAY BE REQUIRED.

(2) Install spacer “A”, wave washer “B”, and thin flat washer “C” onto the hub clamping bolts in accordance with Figure 3-7, then install the spinner bulkhead onto the hub clamping bolts.

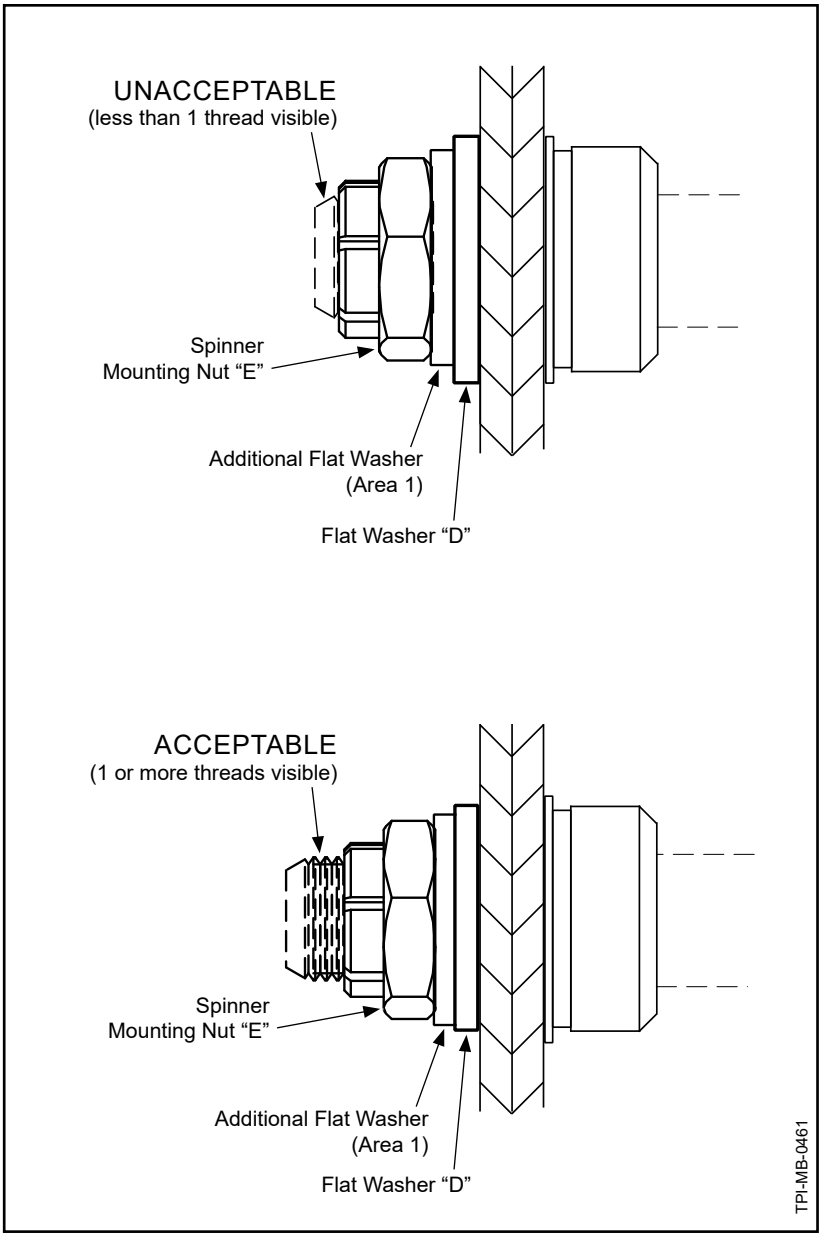
(a) Refer to Hartzell Propeller Inc. Application Guide 159 (61-02-59) for the applicable spinner mounting kit.

(b) Refer to Hartzell Propeller Inc. Composite Spinner Maintenance Manual 148 (61-16-48) for the parts list of the spinner mounting kit.

CAUTION: A MINIMUM OF ONE THREAD MUST BE COVERED BY FLAT WASHER “D” AND/OR ADDITIONAL FLAT WASHER(S) TO MAKE SURE THE SPINNER MOUNTING NUT “E” DOES NOT BOTTOM OUT ON THE NON-THREADED AREA OF THE HUB CLAMPING BOLT. REFER TO FIGURE 3-8 FOR ILLUSTRATIONS OF ACCEPTABLE/ UNACCEPTABLE THREAD COVERAGE.

(3) Install one flat washer “D” onto the hub clamping bolts, then check the thread coverage on the hub clamping bolts in accordance with Figure 3-8.

(a) If washer “D” covers a minimum of one thread on the hub clamping bolt, go to step (4) of this procedure.



Thread Exposure: Composite Bulkhead
Figure 3-9

(b) If washer “D” does not cover at least one thread on the hub clamping bolt, install additional flat washer(s) in accordance with Figure 3-7.

1 Up to three flat washers may be installed in Area 1 to get proper thread coverage Refer to Figure 3-7 and Figure 3-8.

CAUTION: AT LEAST ONE THREAD OF THE HUB CLAMPING BOLT MUST BE VISIBLE BELOW THE SPINNER MOUNTING NUT. REFER TO FIGURE 3-9 FOR ILLUSTRATIONS OF ACCEPTABLE AND UNACCEPTABLE THREAD EXPOSURE.

(4) Install a spinner mounting nut “E” on each of the hub clamping bolts used to mount the spinner bulkhead.

(a) Torque each spinner mounting nut in accordance with the section, “Propeller Mounting Hardware and Torque Information” in this chapter.

(b) If there is less than one hub clamping bolt thread visible below the spinner mounting nut “E”, remove one of the additional washers added in Area 1, then reinstall/torque the spinner mounting nut and check the thread exposure. Refer to Figure 3-9.

1 Flat washer “D” is required in Area 1.

(5) Refer to the section, “Spinner Assembly Clearance Checks” in this chapter.

(6) To adjust the position/spacing of the spinner bulkhead, refer to the section, “Composite Bulkhead Spacing Adjustments” in this chapter.

5. Spinner Adapter Ring Installation (if applicable)

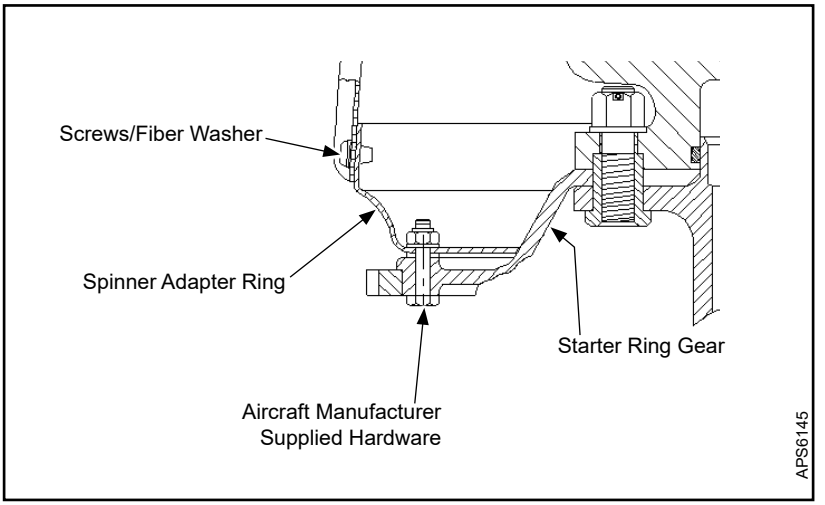
A. Installation

(1) Install the spinner adapter ring to the starter ring gear using hardware supplied by the airframe manufacturer. Refer to Figure 3-10.

CAUTION: BOLTS INSTALLED INCORRECTLY CAN DAMAGE ENGINE COMPONENTS.

(a) Install spinner adapter bolts so that the bolt heads are at the rear of the starter ring gear. Refer to Figure 3-10.

(2) Torque the bolts as specified by the airframe manufacturer.



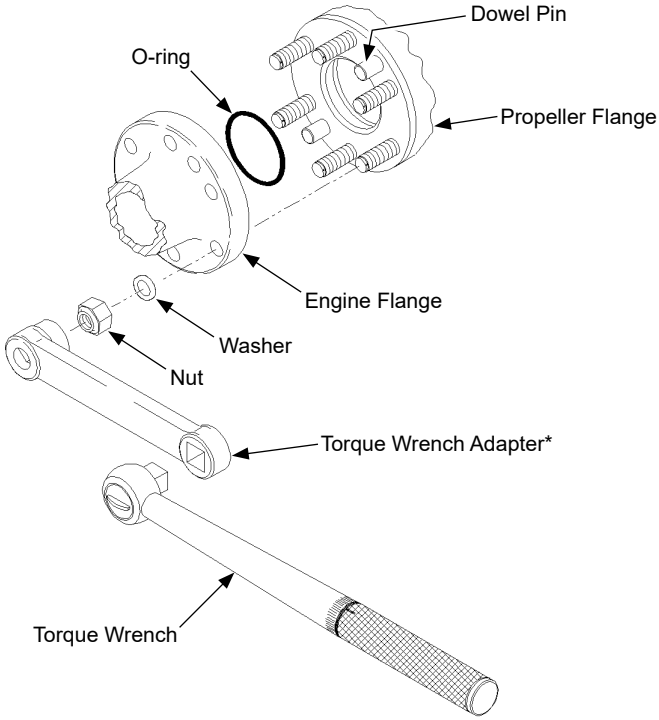
Spinner Adapter Ring
Figure 3-10

WARNING: FAILURE TO FOLLOW THESE INSTALLATION INSTRUCTIONS MAY LEAD TO PROPELLER DAMAGE, ENGINE DAMAGE, OR PROPELLER FAILURE, WHICH MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE. UNUSUAL OR ABNORMAL VIBRATION DEMANDS IMMEDIATE INSPECTION FOR IMPROPER PROPELLER INSTALLATION. PROPELLER SEPARATION MAY OR MAY NOT BE PROCEEDED BY VIBRATION.

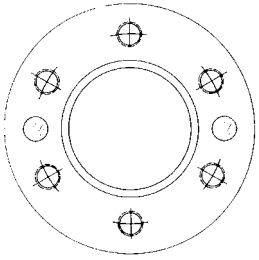
6. Propeller Installation

WARNING: ANY PART IDENTIFIED IN THIS MANUAL AS AN EXPERIMENTAL OR NON-AVIATION PART MUST NOT BE USED IN AN FAA OR INTERNATIONAL EQUIVALENT TYPE CERTIFICATED PROPELLER. A PART IDENTIFIED AS EXPERIMENTAL OR NON-AVIATION DOES NOT HAVE FAA OR INTERNATIONAL EQUIVALENT APPROVAL. USE ONLY THE APPROVED ILLUSTRATED PARTS LIST PROVIDED IN THE APPLICABLE OVERHAUL MANUAL OR ADDITIONAL PARTS APPROVED BY AN FAA ACCEPTED DOCUMENT FOR ASSEMBLY OF A PROPELLER. THE OPERATOR ASSUMES ALL RISK ASSOCIATED WITH THE USE OF EXPERIMENTAL PARTS. USE OF EXPERIMENTAL PARTS ON A CRAFT MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE.

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS.



*NOTE: If a torque wrench adapter is used, use the calculation in Figure 3-4 to determine correct torque wrench setting.



F Flange

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F Flange Propeller Mounting
Figure 3-11

A. Flange Description

CAUTION: THE ALUMINUM HUB PROPELLER MOUNTING O-RING IS LOCATED ON THE INSIDE DIAMETER OF THE PROPELLER HUB. THERE SHOULD NOT BE AN O-RING ON THE ENGINE FLANGE WHEN INSTALLING AN ALUMINUM HUB PROPELLER.

(1) Hartzell Propeller Inc. Wing-In-Ground effect propellers are manufactured with two basic hub mounting flange designs.

(2) The flange type designators are “F” and “R”. The flange type is indicated in the propeller model stamped on the hub. For example, PHM-J3YF-1N indicates an “F” flange.

(3) Refer to the section, “Model Designation” in the Description and Operation chapter of this manual for description of each flange type. Sample flanges are also shown in Figure 3-11 and Figure 3-13.

B. Installation of “F” Flange Propellers

(1) General

(a) An “F” flange propeller has six 1/2 inch diameter studs configured in a four inch circle.

(b) Two dowel pins are also supplied to transfer torque and index the propeller with respect to the engine crankshaft. See Figure 3-11.

(c) The dowel pin locations used on a particular propeller installation are indicated in the propeller model stamped on the hub. Refer to the section, “Model Designation” in the Description and Operation chapter of this manual.

(2) Perform the applicable steps in the section, “Bulkhead Installation” in this chapter.

WARNING: CLEANING AGENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION IS REQUIRED. AVOID PROLONGED CONTACT. USE IN WELL VENTILATED AREA.

(3) Clean the engine flange and propeller flange with Quick Dry Stoddard Solvent or MEK.

(4) Lubricate the mounting flange O-ring with engine oil. Refer to Figure 3-11.

(a) Install the O-ring in the O-ring groove in the hub bore. Refer to Table 3-1 for the applicable O-ring and mounting hardware.

NOTE: When the propeller is received from the factory, the O-ring has been installed.

WARNING: MAKE SURE THAT ANY EQUIPMENT USED TO INSTALL THE PROPELLER IS RATED UP TO 800 LBS. (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION. ONE PERSON MUST NEVER ATTEMPT TO INSTALL AN UNSUPPORTED PROPELLER BY HIMSELF, REGARDLESS OF THE SIZE OR WEIGHT OF THE PROPELLER. MANUALLY LIFTING THE PROPELLER ONTO THE ENGINE CAN RESULT IN PERSONAL INJURY.

CAUTION 1: A PROPELLER MUST BE CORRECTLY SUPPORTED DURING INSTALLATION ON THE ENGINE. AVOID ANY ROCKING OR SHIFTING OF THE PROPELLER WHEN IT IS PARTIALLY ENGAGED WITH THE ENGINE. ROCKING OF THE PROPELLER DURING PROPELLER INSTALLATION CAN DAMAGE THE PROPELLER HUB MOUNTING FACE, CAUSING ACTUATION OIL LEAKAGE OR DAMAGE THAT MAY SCRAP THE HUB. HUB DAMAGE CAN ALSO INTRODUCE METAL INTO THE PROPELLER OIL ACTUATION SYSTEM, WHICH COULD POSSIBLY DAMAGE THE ENGINE.

CAUTION 2: WHEN INSTALLING THE PROPELLER ON THE CRAFT, DO NOT DAMAGE THE ICE PROTECTION SYSTEM COMPONENTS, IF APPLICABLE.

(5) With a suitable support, such as a crane hoist or similar equipment, carefully move the propeller assembly to the craft engine mounting flange in preparation for installation.

(6) Install the propeller on the engine flange. Make sure to align the dowel pins in the propeller flange with the corresponding holes in the engine mounting flange.

  (a) The propeller may be installed on the engine flange in a given position, or 180 degrees from that position. Check the engine and craft manuals to determine if either manual specifies a propeller mounting position.

CAUTION 1: MOUNTING HARDWARE MUST BE CLEAN AND DRY TO PREVENT EXCESSIVE PRELOAD OF THE MOUNTING FLANGE.

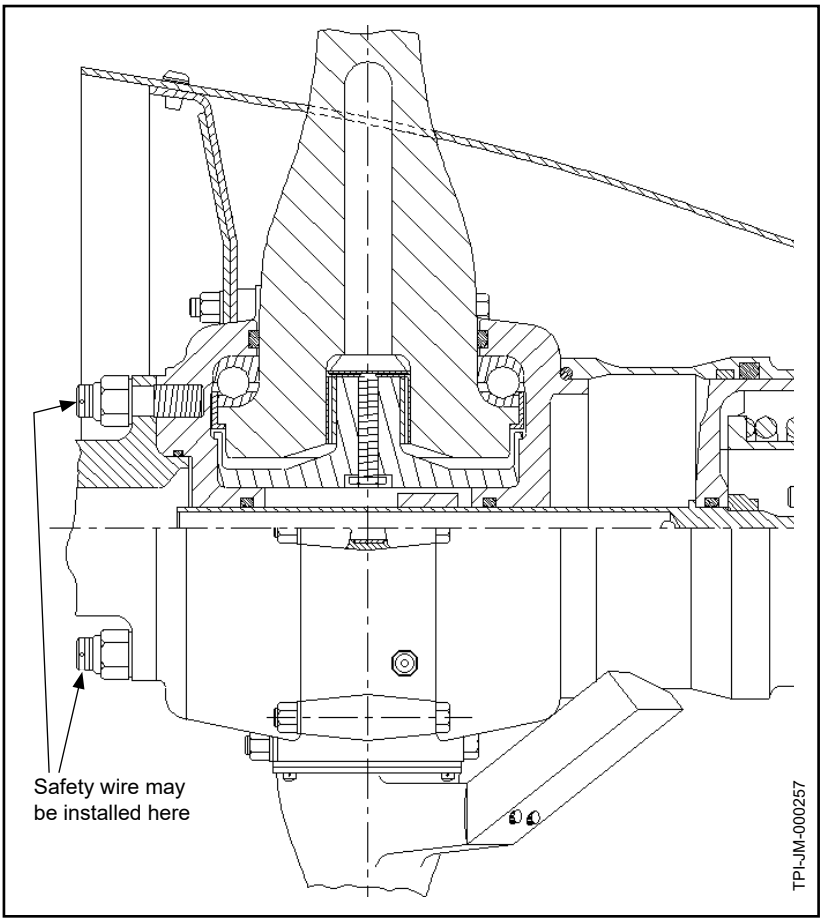
CAUTION 2: TIGHTEN NUTS EVENLY TO AVOID HUB DAMAGE.

(7) Install the 1/2 inch propeller mounting nuts (dry) with spacers. Refer to Table 3-1.

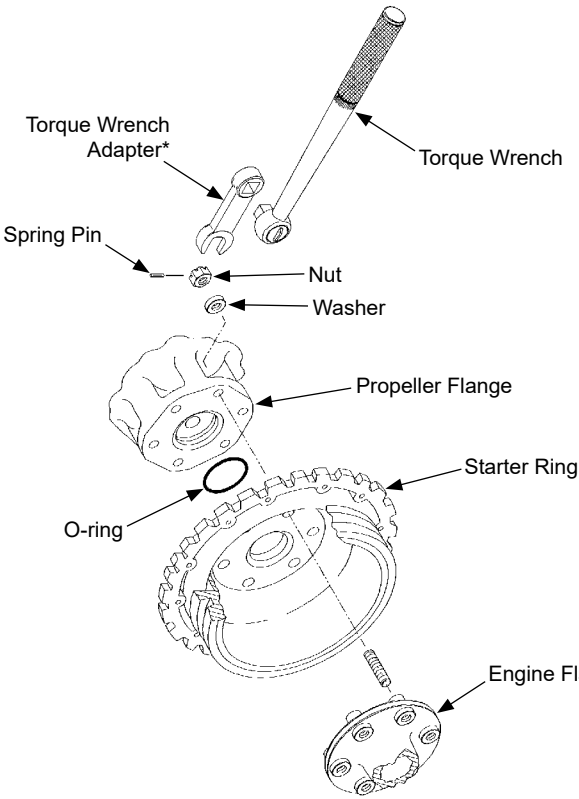
(8) Torque the 1/2 inch propeller mounting nuts (dry) in accordance with Table 3-2, Figure 3-1, and Figure 3-2.

(9) If required by the craft maintenance manual, safety the mounting studs in pairs at the rear of the propeller mounting flange using 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware. Refer to Figure 3-12.

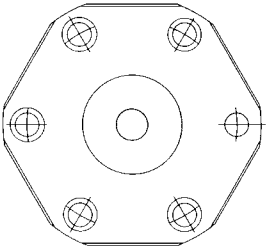
(10) Install the propeller spinner dome in accordance with the section “Spinner Installation” in this chapter.



Safety Wire Installation
Figure 3-12



*NOTE: If a torque wrench adapter is used, use the calculation in Figure 3-1 to determine correct torque wrench setting



R Flange

APS6172

APS6160D
APS6172

R Flange Propeller Mounting
Figure 3-13

C. Installation of “R” Flange Propellers

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS.

(1) General

(a) An “R” flange is an SAE No. 2 flange that has six 1/2 inch diameter studs configured in a 4.75 inch circle.

(b) Five drive bushings transfer torque and index the propeller with respect to the engine crankshaft. The bushings are located on the engine flange and fit into counter bored holes on the propeller flange. Refer to Figure 3-13.

(c) The bushing locations used on a particular propeller installation are indicated in the propeller model stamped on the hub. Refer to the Model Designation section in the Description and Operation chapter of this manual.

(2) Perform the applicable steps under Spinner Pre-Installation within this chapter.

WARNING: CLEANING AGENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION IS REQUIRED. AVOID PROLONGED CONTACT. USE IN WELL VENTILATED AREA.

(3) Clean the engine flange and propeller flange with Quick Dry Stoddard Solvent or MEK.

(4) Install the O-ring in the O-ring groove in the rear of the hub as shown in Figure 3-13. Refer to Table 3-1 for the applicable O-ring and mounting hardware.

NOTE: When the propeller is received from the factory, the O-ring has been installed.

WARNING: MAKE SURE THAT ANY EQUIPMENT USED TO INSTALL THE PROPELLER IS RATED UP TO 800 LBS. (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION. ONE PERSON MUST NEVER ATTEMPT TO INSTALL AN UNSUPPORTED PROPELLER BY HIMSELF, REGARDLESS OF THE SIZE OR WEIGHT OF THE PROPELLER. MANUALLY LIFTING THE PROPELLER ONTO THE ENGINE CAN RESULT IN PERSONAL INJURY.

CAUTION 1: A PROPELLER MUST BE CORRECTLY SUPPORTED DURING INSTALLATION ON THE ENGINE. AVOID ANY ROCKING OR SHIFTING OF THE PROPELLER WHEN IT IS PARTIALLY ENGAGED WITH THE ENGINE. ROCKING OF THE PROPELLER DURING PROPELLER INSTALLATION CAN DAMAGE THE PROPELLER HUB MOUNTING FACE, CAUSING ACTUATION OIL LEAKAGE OR DAMAGE THAT MAY SCRAP THE HUB. HUB DAMAGE CAN ALSO INTRODUCE METAL INTO THE PROPELLER OIL ACTUATION SYSTEM, WHICH COULD POSSIBLY DAMAGE THE ENGINE.

CAUTION 2: WHEN INSTALLING THE PROPELLER ON THE CRAFT, DO NOT DAMAGE THE ICE PROTECTION SYSTEM COMPONENTS, IF APPLICABLE.

(5) With a suitable support, such as a crane hoist or similar equipment, carefully move the propeller assembly to the craft engine mounting flange in preparation for installation.

(6) Install the propeller on the engine flange. Align the engine flange bushings with the corresponding holes in the propeller flange.

CAUTION 1: MOUNTING HARDWARE MUST BE CLEAN AND DRY TO PREVENT EXCESSIVE PRELOAD OF THE MOUNTING FLANGE.

CAUTION 2: TIGHTEN NUTS EVENLY TO AVOID HUB DAMAGE

(7) Torque the 1/2 inch diameter propeller mounting studs (dry) in accordance with Table 3-2, Figure 3-1, and Figure 3-2.

(8) If required by the craft maintenance manual, safety the mounting studs at the rear of the propeller mounting flange with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware. Refer to Figure 3-12.

(9) Install the propeller spinner dome in accordance with the section “Spinner Installation” in this chapter.

7. One-Piece Spinner Dome Installation (Rev. 1)

CAUTION 1: TO PREVENT DAMAGE TO THE BLADE AND BLADE PAINT, WRAP THE BLADE SHANKS IN SEVERAL LAYERS OF MASKING OR DUCT TAPE BEFORE INSTALLING THE SPINNER DOME. REMOVE THE TAPE AFTER THE SPINNER IS INSTALLED.

CAUTION 2: THE SPINNER DOME WILL WOBBLE IF NOT ALIGNED PROPERLY. THIS MAY AFFECT THE DYNAMIC BALANCE OF THE PROPELLER.

NOTE 1: The following instructions relate to Hartzell Propeller Inc. spinners only. In some cases, the airframe manufacturer produced the spinner assembly. If so, refer to the airframe manufacturer's manual for spinner installation instructions.

NOTE 2: There are three types of one-piece spinner domes used on Hartzell Propeller Inc. Compact-series propellers:

- Spinner Dome without a Forward Bulkhead
- Spinner Dome with a Bonded Forward Bulkhead
- Spinner Dome with a Removable Forward Bulkhead

NOTE 3: A forward bulkhead is an internal support that encircles the propeller cylinder.

NOTE 4: Refer to the applicable installation instructions for the type of dome/forward bulkhead being installed.

NOTE 5: The B-3845-8 screws supplied with metal spinner assemblies are 0.500 inch (12.70 mm) in length. If correct thread engagement cannot be achieved when installing the spinner dome, B-3845-9 screws may be used. The B-3845-9 screws are 0.562 inch (14.27 mm) in length.

A. Installation of a One-Piece Spinner Dome without a Forward Bulkhead

(1) Examine the low pitch stop hardware configuration.

(a) If the visual examination shows that the hardware configuration is one hex nut safety wired to a set screw, no further action is required.

(b) If the visual examination shows that the hardware configuration is not one hex nut safety wired to a set screw, modify the propeller assembly to the hardware configuration of one hex nut safety wired to a set screw in accordance with the section “Modification of the Low Pitch Stop Hardware” in the Maintenance Practices chapter of this manual.

(2) Install the spinner dome.

(a) If anti-ice travel tubes are installed:

CAUTION: THE TRAVEL TUBES MUST NOT TOUCH THE SPINNER DOME BLADE CUTOUT.

1 Make sure there is clearance between the travel tubes and the spinner dome blade cutouts.

2 Make adjustments to the position of the travel tubes in accordance to Hartzell Propeller Inc. Manual 180 (30-61-80).

Spinner Dome/Cap	Washer	Screw
Metal Dome	A-1020 Washer, Fiber	B-3845-8 10-32, Truss Head
Metal Cap	n/a	B-3866-50 8-32, 100° Head, Cres.
Composite Dome	B-3860-10L Dimpled, 100°, Cres.	B-3867-272 10-32, 100° Head, Cres.

Spinner Dome and Spinner Cap Mounting Hardware
Table 3-3

CAUTION: MAKE SURE OF PROPER THREAD ENGAGEMENT FOR THE SCREWS IN THE NUTPLATES. APPROXIMATELY 1 TO 1 1/2 THREADS MUST EXTEND PAST THE BULKHEAD NUTPLATES. TO AVOID DAMAGING THE AIRCRAFT COWLING, THE SCREWS MUST NOT EXTEND MORE THAN THREE THREADS PAST THE BULKHEAD NUTPLATES.

(3) Attach the spinner dome to the spinner bulkhead with the supplied screws and washers. Refer to Table 3-3.

(a) Install a screw in the hole(s) centered between each two adjacent blade cutouts.

1 If the centerline between the adjacent blade cutouts does not align with a mounting hole, install screws in the two holes closest to the centerline.

CAUTION: BE SURE THE SCREWS DRAW THE SPINNER DOME TIGHT TO THE BULKHEAD.

(b) Tighten the screws until snug, then turn an additional 1/8 rotation to achieve an approximate torque value of 20-30 In-Lbs. (2.3-3.3 N•m).

CAUTION: IN THE FOLLOWING STEP, TIGHTEN EACH SCREW BEFORE INSTALLING THE NEXT SCREW.

(c) Working from the screw(s) previously installed at the centerline toward the blade cutouts, install the remaining screws.

1 Tighten each screw until snug, then turn an additional 1/8 rotation to achieve an approximate torque value of 20-30 In-Lbs. (2.3-3.3 N•m) before installing the next screw.

B. Installation of a One-Piece Spinner Dome with a Bonded Forward Bulkhead

(1) Examine the low pitch stop hardware configuration.

(a) If the visual examination shows that the hardware configuration is one hex nut safety wired to a set screw, no further action is required.

(b) If the visual examination shows that the hardware configuration is not one hex nut safety wired to a set screw, modify the propeller assembly to the hardware configuration of one hex nut safety wired to a set screw in accordance with the section “Modification of the Low Pitch Stop Hardware” in the Maintenance Practices chapter of this manual.

(2) Install the spinner dome.

CAUTION: THE FORWARD BULKHEAD MUST FIT SNUGLY ON THE CYLINDER. AN IMPROPERLY SUPPORTED DOME COULD CAUSE CYLINDER DAMAGE OR A CRACK IN THE DOME OR BULKHEAD.

(3) Using both hands, grasp the spinner dome in the approximate location of the forward bulkhead and apply lateral force (side-to-side).

(a) If there is no lateral movement: Go to step (4) of this procedure.

(b) If there is lateral movement: Apply UHMW tape CM137 in accordance with the following steps.

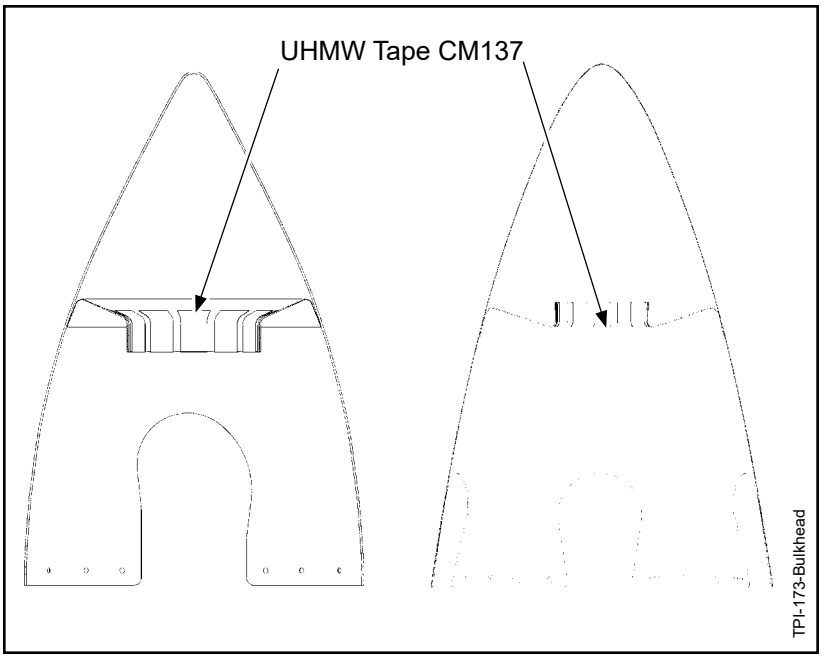
1 Option 1: Apply UHMW tape CM137 around the cylinder.

a Wrap one or more layers of UHMW tape CM137 around the cylinder until the forward bulkhead fits snugly on the cylinder.

2 Option 2: Apply UHMW tape CM137 to the forward bulkhead.

a Install 2.5 inch (63 mm) strips of UHMW tape CM137 in equally spaced locations around the ID of the forward bulkhead as shown in Figure 3-14.

b If necessary, install additional layers of UHMW tape CM137 until the forward bulkhead fits snugly on the cylinder.



UHMW Tape Location - For Bonded Forward Bulkhead
Figure 3-14

CAUTION: MAKE SURE OF PROPER THREAD ENGAGEMENT FOR THE SCREWS IN THE NUTPLATES. APPROXIMATELY 1 TO 1 1/2 THREADS MUST EXTEND PAST THE BULKHEAD NUTPLATES. TO AVOID DAMAGING THE AIRCRAFT COWLING, THE SCREWS MUST NOT EXTEND MORE THAN THREE THREADS PAST THE BULKHEAD NUTPLATES.

(4) Attach the spinner dome to the spinner bulkhead with the supplied screws and washers. Refer to Table 3-3.

(a) Install a screw in the hole(s) centered between each two adjacent blade cutouts.

1 If the centerline between the adjacent blade cutouts does not align with a mounting hole, install screws in the two holes closest to the centerline.

CAUTION: BE SURE THE SCREWS DRAW THE SPINNER DOME TIGHT TO THE BULKHEAD.

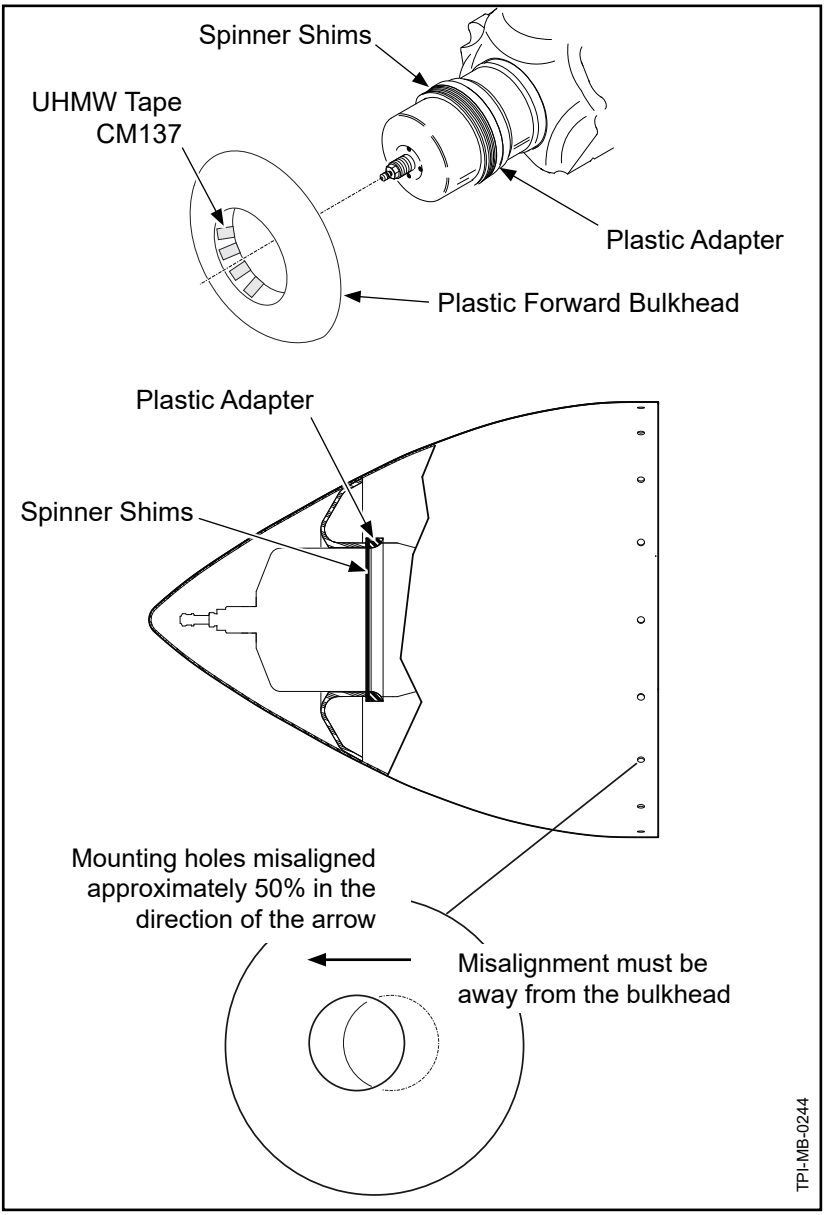
(b) Tighten the screws until snug, then turn an additional 1/8 rotation to achieve an approximate torque value of 20-30 In-Lbs. (2.3-3.3 N•m).

CAUTION: IN THE FOLLOWING STEP, TIGHTEN EACH SCREW BEFORE INSTALLING THE NEXT SCREW.

(c) Working from the screw(s) previously installed at the centerline toward the blade cutouts, install the remaining screws.

1 Tighten each screw until snug, then turn an additional 1/8 rotation to achieve an approximate torque value of 20-30 In-Lbs. (2.3-3.3 N•m) before installing the next screw.

(5) If the spinner loosens in service, add one or more layers of UHMW tape to the cylinder until the spinner fits snugly.



One-Piece Spinner Dome Installation with Removable Forward Bulkhead
Figure 3-15

C. Installation of a One-Piece Spinner Dome with a Removable Plastic Forward Bulkhead

(1) Put the plastic adapter on the cylinder with the radiused side of the adapter against the raised surface on the cylinder as shown in Figure 3-15.

(2) Put ten spinner shims on top of the plastic adapter.

NOTE: The spinner shims are used to adjust the spinner dome preload. Shims can be added or removed after pre-fitting the spinner dome later in this procedure.

(3) Put the forward bulkhead over the cylinder on top of the spinner shims.

CAUTION: THE FORWARD BULKHEAD MUST FIT SNUGLY ON THE CYLINDER. AN IMPROPERLY SUPPORTED DOME COULD CAUSE CYLINDER DAMAGE OR A CRACK IN THE DOME OR BULKHEAD.

(4) Using both hands, grasp the forward bulkhead and apply lateral force (side-to-side).

(a) If there is no lateral movement: Go to step (5) of this procedure.

(b) If there is lateral movement: Apply UHMW tape CM137 in accordance with the following steps.

1 Option 1: Apply UHMW tape CM137 around the ID of the forward bulkhead that fits over the cylinder.

a Install 2.5 inch (63 mm) strips of UHMW tape CM137 in equally spaced locations around the ID of the forward bulkhead as shown in Figure 3-15.

b If necessary, install additional layers of UHMW tape CM137 until the forward bulkhead fits snugly on the cylinder.

2 Option 2: Apply UHMW tape CM137 around the cylinder.

a Wrap one or more layers of UHMW tape CM137 around the cylinder until the forward bulkhead fits snugly on the cylinder.

(5) Install the spinner dome and gently push the dome as far as it will go onto the bulkhead.

(6) Examine the alignment of the mounting holes in the spinner dome and the bulkhead.

(a) Approximately 50% of the diameter of each bulkhead mounting hole must be visible through the spinner dome mounting holes.

NOTE: The temporary misalignment of the mounting holes is necessary to get the proper preload of the spinner dome.

(b) If the mounting hole position is correct, go to step (7) of this procedure.

(c) If the mounting hole position is incorrect, add/remove spinner shims to get proper alignment.

CAUTION: MAKE SURE OF PROPER THREAD ENGAGEMENT FOR THE SCREWS IN THE NUTPLATES. APPROXIMATELY 1 TO 1 1/2 THREADS MUST EXTEND PAST THE BULKHEAD NUTPLATES. TO AVOID DAMAGING THE AIRCRAFT COWLING, THE SCREWS MUST NOT EXTEND MORE THAN THREE THREADS PAST THE BULKHEAD NUTPLATES.

(7) Attach the spinner dome to the spinner bulkhead with the supplied screws and washers. Refer to Table 3-3.

(a) Install a screw in the hole(s) centered between each two adjacent blade cutouts.

1 If the centerline between the adjacent blade cutouts does not align with a mounting hole, install screws in the two holes closest to the centerline.

CAUTION: BE SURE THE SCREWS DRAW THE SPINNER DOME TIGHT TO THE BULKHEAD.

(b) Tighten the screws until snug, then turn an additional 1/8 rotation to achieve an approximate torque value of 20-30 In-Lbs. (2.3-3.3 N•m).

CAUTION: IN THE FOLLOWING STEP, TIGHTEN EACH SCREW BEFORE INSTALLING THE NEXT SCREW.

(c) Working from the screw(s) previously installed at the centerline toward the blade cutouts, install the remaining screws.

1 Tighten each screw until snug, then turn an additional 1/8 rotation to achieve an approximate torque value of 20-30 In-Lbs. (2.3-3.3 N•m) before installing the next screw.

(8) If the spinner loosens in service, add one or more layers of UHMW tape to the forward bulkhead or cylinder until the spinner fits snugly.

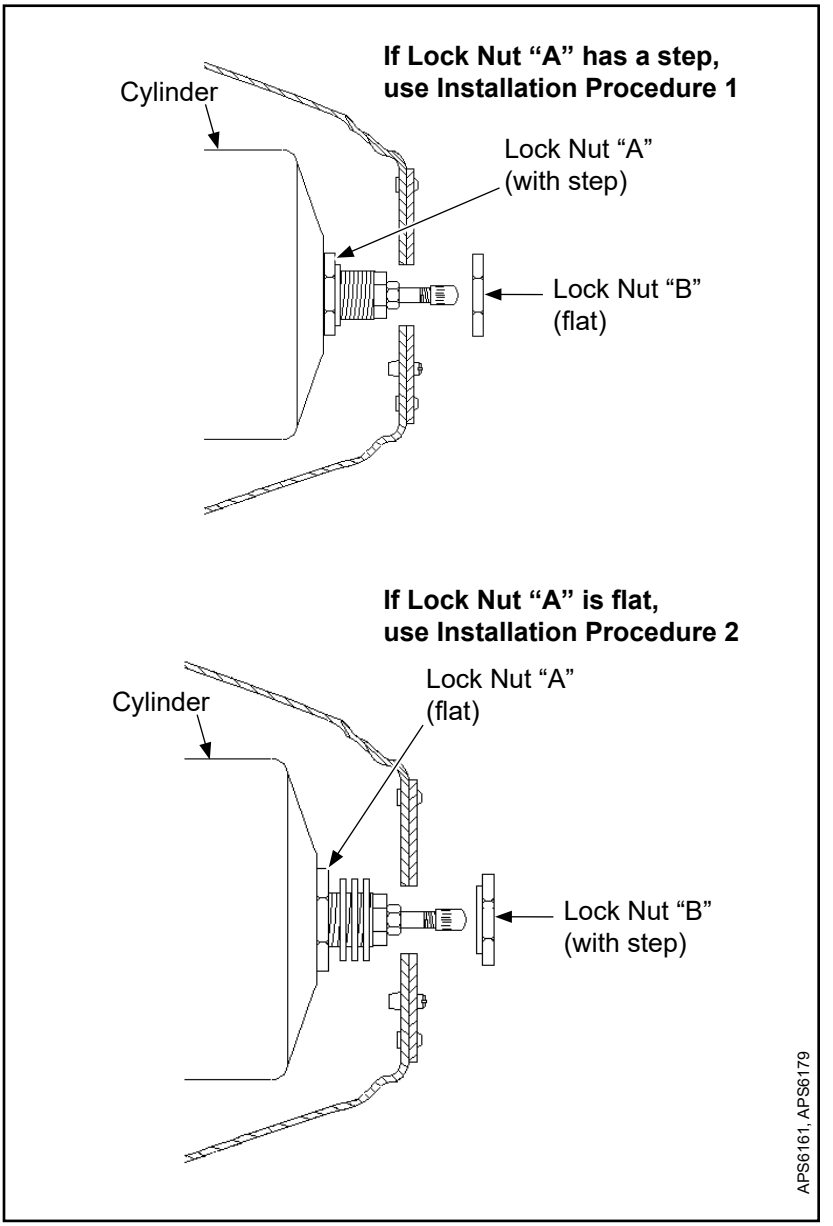
8. Two-Piece Spinner Dome Installation

CAUTION 1: TO PREVENT DAMAGE TO THE BLADE AND BLADE PAINT, WRAP THE BLADE SHANKS IN SEVERAL LAYERS OF MASKING OR DUCT TAPE BEFORE INSTALLING THE SPINNER DOME. REMOVE THE TAPE AFTER THE SPINNER IS INSTALLED.

CAUTION 2: THE SPINNER DOME WILL WOBBLE IF NOT ALIGNED PROPERLY. THIS MAY AFFECT THE DYNAMIC BALANCE OF THE PROPELLER.

NOTE 1: The following instructions relate to Hartzell Propeller Inc. spinners only. In some cases, the airframe manufacturer produced the spinner assembly. If so, refer to the airframe manufacturer's manual for spinner installation instructions.

NOTE 2: There are two different prodedures for installing two-piece spinner domes. Examine the lock nut "A" at the top of the cylinder, then refer to Figure 3-16 to determine the applicable installation procedure for the two-piece spinner dome.



Lock Nut “A” Identification
Figure 3-16

NOTE 3: The B-3845-8 screws supplied with metal spinner assemblies are 0.500 inch (12.70 mm) in length. If correct thread engagement cannot be achieved when installing the spinner dome, B-3845-9 screws may be used. The B-3845-9 screws are 0.562 inch (14.27 mm) in length.

A. Installation Procedure 1

(1) General

(a) A spinner dome that is installed using Procedure 1 can be identified by the lock nut “A” at the top of the cylinder. The lock nut “A” will have a “step” facing away from the cylinder as shown in Figure 3-16.

1 Lock nut “A” may have drilled holes for safety wire, but safety wire is not required in this location.

(2) Install the spinner dome.

(a) Push the spinner dome toward the bulkhead to align the spinner mounting holes with those of the bulkhead.

CAUTION: MAKE SURE OF PROPER THREAD ENGAGEMENT FOR THE SCREWS IN THE NUTPLATES. APPROXIMATELY 1 TO 1 1/2 THREADS MUST EXTEND PAST THE BULKHEAD NUTPLATES. TO AVOID DAMAGING THE AIRCRAFT COWLING, THE SCREWS MUST NOT EXTEND MORE THAN THREE THREADS PAST THE BULKHEAD NUTPLATES.

(3) Attach the spinner dome to the spinner bulkhead with the supplied screws and washers. Refer to Table 3-3.

(a) Install a screw in the hole(s) centered between each two adjacent blade cutouts.

1 If the centerline between the adjacent blade cutouts does not align with a mounting hole, install screws in the two holes closest to the centerline.

CAUTION: BE SURE THE SCREWS DRAW THE SPINNER DOME TIGHT TO THE BULKHEAD.

(b) Tighten the screws until snug, then turn an additional 1/8 rotation to achieve an approximate torque value of 20-30 In-Lbs. (2.3-3.3 N•m).

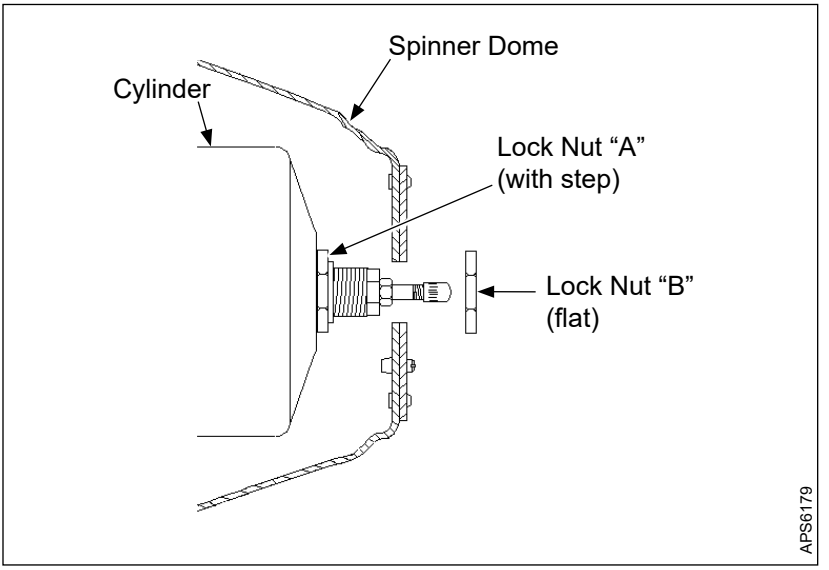
CAUTION: IN THE FOLLOWING STEP, TIGHTEN EACH SCREW BEFORE INSTALLING THE NEXT SCREW.

(c) Working from the screw(s) previously installed at the centerline toward the blade cutouts, install the remaining screws.

1 Tighten each screw until snug, then turn an additional 1/8 rotation to achieve an approximate torque value of 20-30 In-Lbs. (2.3-3.3 N•m) before installing the next screw.

(4) Install the lock nut “B” on the low pitch stop in accordance with Figure 3-17.

(a) Torque lock nut “B” in accordance with Table 3-1 and Figure 3-1.

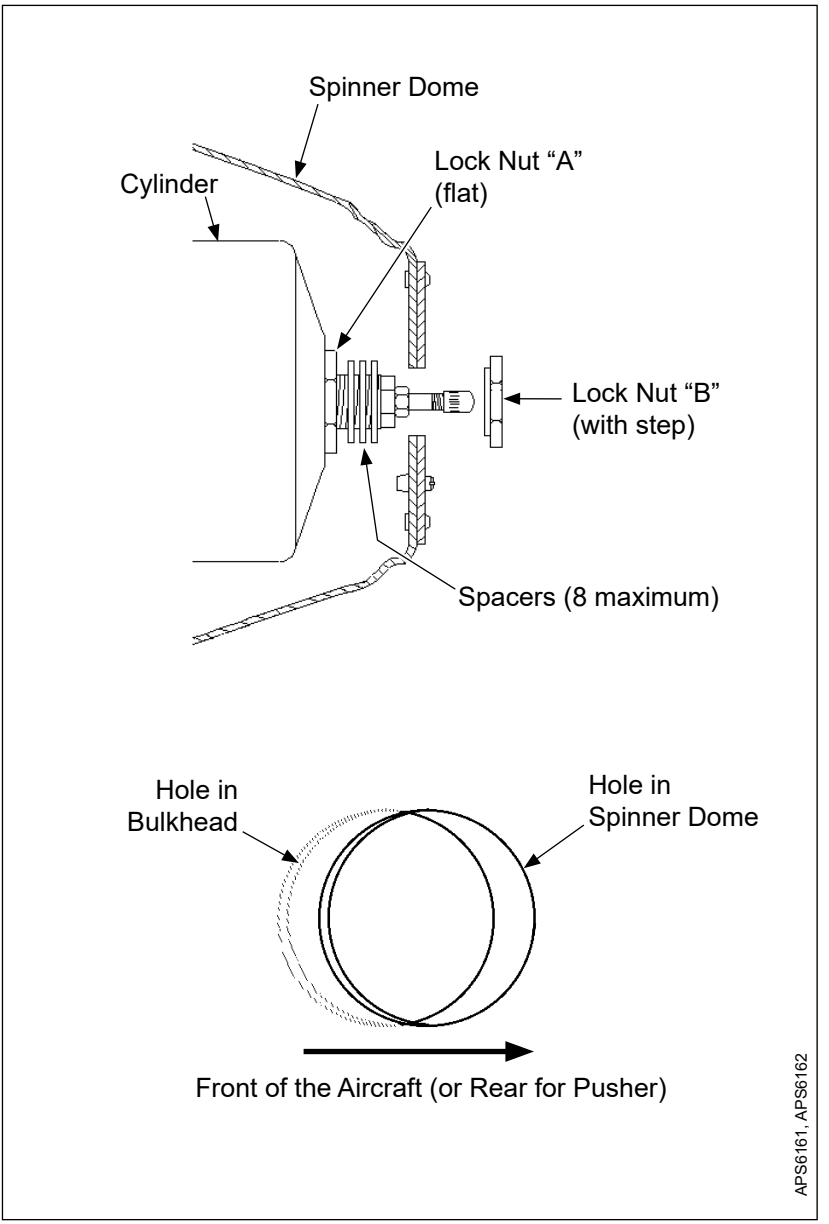


Two-Piece Spinner Dome Installation - Procedure 1
Figure 3-17

(5) Safety wire the lock nut “B” to each of the two screws on the flat face of the spinner dome surrounding the lock nut “B”.

CAUTION: MAKE SURE THAT THE SCREWS DO NOT EXTEND MORE THAN THREE THREADS PAST THE BULKHEAD NUTPLATES. IF THE SCREWS EXTEND MORE THAN THREE THREADS, THIS CAN CAUSE DAMAGE TO THE AIRCRAFT COWLING.

(6) Using flat head screws, attach the spinner dome cap to the spinner dome. Refer to Table 3-3.



Two-Piece Spinner Dome Installation - Procedure 2
Figure 3-18

B. Installation Procedure 2

(1) General

(a) A spinner dome that is installed using Procedure 2 can identified by the lock nut “A” at the top of the cylinder. The lock nut “A” will be flat as shown in Figure 3-18.

1 Lock nut “A” may have drilled holes for safety wire, but safety wire is not required in this location.

(2) Put spacers on the low pitch stop lock nut ”A” in accordance with Figure 3-18.

(a) Up to eight spacers may be used.

(3) Install spacers, then examine the spinner fit. The spinner is correctly spaced when the holes in the spinner dome are misaligned 1/4 -1/3 of their diameter toward the front of the aircraft, or rear in a pusher installation. Refer to Figure 3-18.

(a) Add or remove spacers to achieve this alignment.

(4) Install spinner dome.

(5) Push the spinner dome aft to align the spinner mounting holes with those of the bulkhead or adapter ring.

CAUTION: MAKE SURE OF PROPER THREAD ENGAGEMENT FOR THE SCREWS IN THE NUTPLATES. APPROXIMATELY 1 TO 1 1/2 THREADS MUST EXTEND PAST THE BULKHEAD NUTPLATES. TO AVOID DAMAGING THE AIRCRAFT COWLING, THE SCREWS MUST NOT EXTEND MORE THAN THREE THREADS PAST THE BULKHEAD NUTPLATES.

(6) Attach the spinner dome to the spinner bulkhead with the supplied screws and washers. Refer to Table 3-3.

(a) Install a screw in the hole(s) centered between each two adjacent blade cutouts.

1 If the centerline between the adjacent blade cutouts does not align with a mounting hole, install screws in the two holes closest to the centerline.

CAUTION: BE SURE THE SCREWS DRAW THE SPINNER DOME TIGHT TO THE BULKHEAD.

(b) Tighten the screws until snug, then turn an additional 1/8 rotation to achieve an approximate torque value of 20-30 In-Lbs. (2.3-3.3 N•m).

CAUTION: IN THE FOLLOWING STEP, TIGHTEN EACH SCREW BEFORE INSTALLING THE NEXT SCREW.

(c) Working from the screw(s) previously installed at the centerline toward the blade cutouts, install the remaining screws.

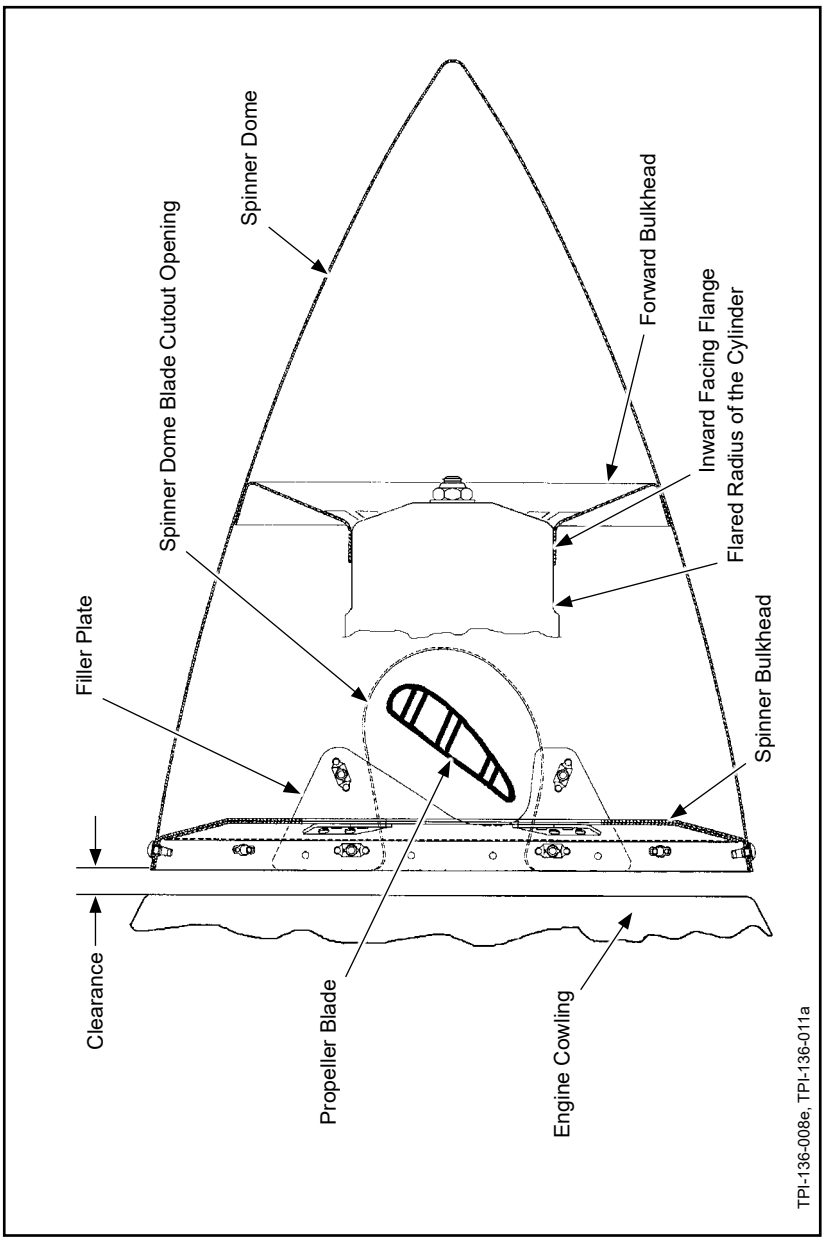
1 Tighten each screw until snug, then turn an additional 1/8 rotation to achieve an approximate torque value of 20-30 In-Lbs. (2.3-3.3 N•m) before installing the next screw.

(7) Install the lock nut “B” on the low pitch stop with the step facing the cylinder as shown in Figure 3-18.

(a) Torque lock nut “B” in accordance with Table 3-2 and Figure 3-1.

(8) Safety wire the lock nut to each of the two screws on the flat face of the spinner dome surrounding the lock nut “B”.

(9) Using flat head screws, attach the spinner dome cap to the spinner dome.



Spinner Assembly Clearance
Figure 3-19

9. Spinner Assembly Clearance Checks (Rev. 2)

CAUTION: CLEARANCE BETWEEN THE BULKHEAD AND THE ENGINE COWLING MAY CHANGE DURING AIRCRAFT OPERATION

A. Clearance Checks - Refer to Figure 3-19

(1) The spinner bulkhead must be spaced between the propeller hub and the engine cowling to prevent contact between the spinner assembly and the propeller blades throughout the full range of blade travel.

(2) The spinner assembly and the hub clamping bolts must not touch any of the following components/areas or cause interference during propeller/engine operation:

(a) Engine cowling

(b) Any non-rotating part of the aircraft

(c) Ice protection system components (wire harnesses, anti-ice tubes, etc.)

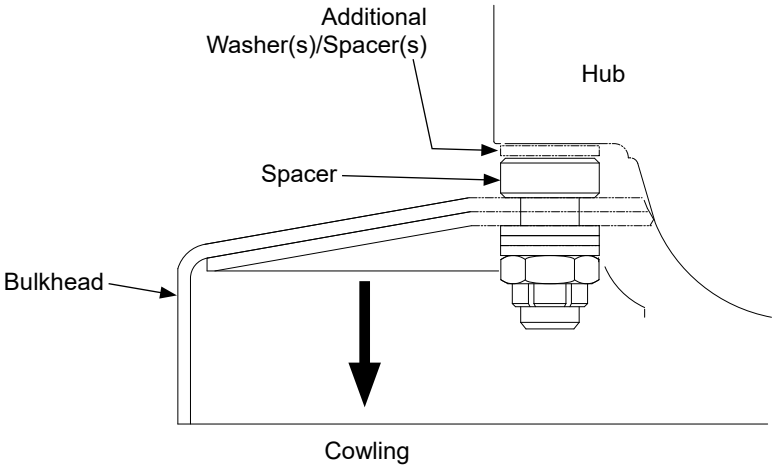
(d) Counterweights/mounting hardware

(3) For spinner domes with a bonded forward bulkhead, make sure the flange on the forward bulkhead does not bottom out on the flared radius of the cylinder.

(a) Using both hands, grasp the spinner dome in the approximate location of the forward bulkhead and apply lateral force (side-to-side).

1 If there is lateral movement: Refer to the applicable Spinner Dome Installation section in this chapter.

(4) If there is any spinner asssembly interference, refer to the applicable section, “Metal/Composite Bulkhead Spacing Adjustment” in this chapter.



Metal Bulkhead Toward the Cowling
Figure 3-20

10. Metal Bulkhead Spacing Adjustments (Rev. 1)

A. To Move the Bulkhead Toward the Cowling

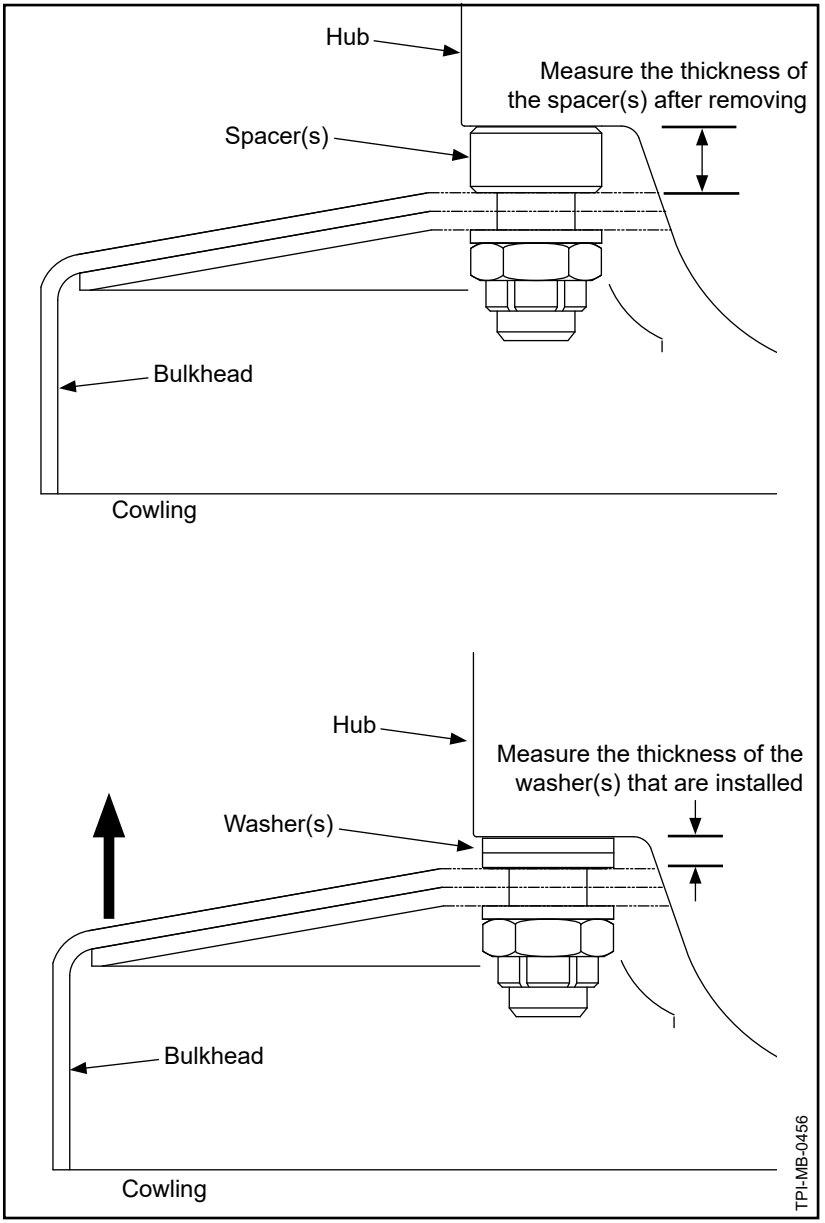
CAUTION 1: THE STACK-UP SEQUENCE FOR EACH HUB CLAMPING BOLT MUST BE THE SAME. VARIANCES BETWEEN STACK-UPS CAN CAUSE CRACKING OF THE SPINNER BULKHEAD. EXCEPTIONS MAY BE REQUIRED IF PROPELLER APPLICATIONS HAVE DE-ICE OR ANTI-ICE APPLICATIONS. REFER TO HARTZELL PROPELLER INC. ICE PROTECTION SYSTEM MANUAL 180 (30-61-80) FOR INSTALLATION INSTRUCTIONS.

CAUTION 2: THE COMBINED THICKNESS OF ADDITIONAL WASHERS/SPACERS MUST BE LESS THAN OR EQUAL TO 0.125 INCH (3.17 MM). IF MORE ADJUSTMENT IS NEEDED, CONTACT THE HARTZELL PRODUCT SUPPORT DEPARTMENT.

(1) Put additional washer(s)/spacer(s) between the spacer and the hub as shown in Figure 3-20 to get the desired bulkhead spacing.

CAUTION: THREAD COVERAGE/ENGAGEMENT REQUIREMENTS SPECIFIED IN THE “BULKHEAD INSTALLATION” SECTION MUST BE MET.

(2) Complete the spinner bulkhead/dome installation in accordance with the applicable sections in this chapter.



Metal Bulkhead Away From the Cowling
Figure 3-21

B. To Move the Bulkhead Away From the Cowling

CAUTION 1: THE STACK-UP SEQUENCE FOR EACH HUB CLAMPING BOLT MUST BE THE SAME. VARIANCES BETWEEN STACK-UPS CAN CAUSE CRACKING OF THE SPINNER BULKHEAD. EXCEPTIONS MAY BE REQUIRED IF PROPELLER APPLICATIONS HAVE DE-ICE OR ANTI-ICE APPLICATIONS. REFER TO HARTZELL PROPELLER INC. ICE PROTECTION SYSTEM MANUAL 180 (30-61-80) FOR INSTALLATION INSTRUCTIONS.

CAUTION 2: THE MAXIMUM PERMITTED BULKHEAD ADJUSTMENT AWAY FROM THE COWLING IS 0.125 INCH (3.17 MM). IF MORE ADJUSTMENT IS NEEDED, CONTACT THE HARTZELL PRODUCT SUPPORT DEPARTMENT.

(1) Remove the spacer(s)/washer(s) between the bulkhead and the hub. Refer to Figure 3-21.

(a) Measure the combined thickness of the spacer(s)/washer(s) that were removed.

(2) Install washer(s) and/or spacer(s) between the bulkhead and the hub to get the desired bulkhead spacing.

(a) Measure the combined thickness of the washer(s)/spacers that were installed.

(b) The difference between the thickness of the washer(s)/spacer(s) that were removed, and the thickness of the washer(s)/spacer(s) that were installed must be 0.125 inch (3.17 mm) or less.

CAUTION: THREAD COVERAGE/ENGAGEMENT REQUIREMENTS SPECIFIED IN THE “BULKHEAD INSTALLATION” SECTION MUST BE MET.

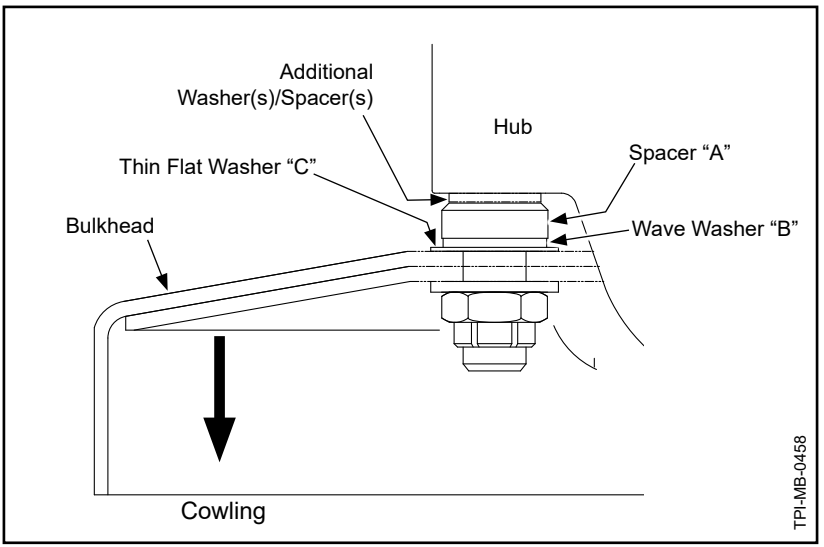
(3) Complete the spinner bulkhead/dome installation in accordance with the applicable sections in this chapter.

11. Composite Bulkhead Spacing Adjustments (Rev. 1)

A. To Move the Bulkhead Toward the Cowling

CAUTION 1: THE STACK-UP SEQUENCE FOR EACH HUB CLAMPING BOLT MUST BE THE SAME. VARIANCES BETWEEN STACK-UPS CAN CAUSE CRACKING OF THE SPINNER BULKHEAD. EXCEPTIONS MAY BE REQUIRED IF PROPELLER APPLICATIONS HAVE DE-ICE OR ANTI-ICE APPLICATIONS. REFER TO HARTZELL PROPELLER INC. ICE PROTECTION SYSTEM MANUAL 180 (30-61-80) FOR INSTALLATION INSTRUCTIONS.

CAUTION 2: THE COMBINED THICKNESS OF ADDITIONAL WASHERS/SPACERS MUST BE LESS THAN OR EQUAL TO 0.125 INCH (3.17 MM). IF MORE ADJUSTMENT IS NEEDED, CONTACT THE HARTZELL PRODUCT SUPPORT DEPARTMENT.



Composite Bulkhead Toward the Cowling
Figure 3-22

(1) Put additional washer(s)/spacer(s) between the spacer “A” and the hub as shown in Figure 3-22 to get the desired bulkhead spacing.

CAUTION: THREAD COVERAGE/ENGAGEMENT REQUIREMENTS SPECIFIED IN THE “BULKHEAD INSTALLATION” SECTION MUST BE MET.

(2) Complete the spinner bulkhead/dome installation in accordance with the applicable sections in this chapter.

B. To Move the Bulkhead Away From the Cowling

(1) If the bulkhead is too close to the cowling, contact Hartzell Propeller Inc.

(a) Refer to the section, “Hartzell Propeller Inc. Contact Information” in the Introduction chapter of this manual.

12. Post-Installation Checks

A. Important Information

(1) Refer to the craft manufacturer’s instructions for post-installation checks.

(2) Perform the “Static RPM Check” in accordance with the Maintenance Practices chapter in this manual.

13. Spinner Removal

CAUTION: WRAP THE BLADE SHANKS IN SEVERAL LAYERS OF MASKING OR DUCT TAPE BEFORE REMOVING THE SPINNER DOME, TO PREVENT DAMAGING THE BLADE AND BLADE SURFACE.

A. Removal of Single Piece Spinner Dome

(1) Remove the screws and washers that attach the spinner dome to the spinner bulkhead or adapter ring.

(2) Remove the spinner dome.

B. Removal of Two-Piece Spinner Dome

(1) Remove the flat head screws that attach the spinner dome cap to the spinner dome.

(2) Cut and remove the lock nut safety wire.

(3) Remove the lock nut.

(4) Remove the screws and washers that attach the spinner dome to the spinner bulkhead.

(5) Remove the spinner dome.

C. Hub Mounted Spinner Bulkhead Removal

(1) Remove the propeller in accordance with the section, “Propeller Removal” in this chapter.

(2) Remove the flat washers and self-locking nuts that attach the spinner bulkhead to the propeller hub. Remove the spinner bulkhead.

(3) Reinstall the flat washers and self-locking nuts that were removed during the removal of the spinner bulkhead.

D. Starter Ring Gear Spinner Adapter Removal

(1) Remove the propeller in accordance with the section, “Propeller Removal” in this chapter.

(2) Remove the spinner adapter by removing the hardware that attaches the spinner adapter to the starter ring gear.

14. Propeller Removal

A. Removal of “F” Flange Propellers

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS.

(1) Remove the spinner dome in accordance with the section “Spinner Removal” in this chapter.

(2) Cut and remove the safety wire (if installed) on the propeller mounting studs.

WARNING: MAKE SURE THE SLING IS RATED UP TO 800 POUNDS (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING REMOVAL.

(3) Support the propeller assembly with a sling.

NOTE: Supporting the propeller with the sling may be delayed until all but two mounting nuts and spacers have been removed.

(4) If the propeller will be reinstalled and it has been dynamically balanced, make an identifying mark (with a felt-tipped pen only) on the propeller hub and a matching mark on the engine flange to make sure of correct positioning of the propeller during re-installation. This will prevent dynamic imbalance.

CAUTION: DISCARD THE PROPELLER MOUNTING NUTS AND SPACERS IF THEY ARE DAMAGED OR CORRODED, OR WHEN THE PROPELLER IS REMOVED FOR OVERHAUL.

(5) Remove the six 1/2 inch diameter mounting nuts.

(a) If the propeller is removed between overhaul intervals, mounting studs, nuts, and spacers may be reused if they are not damaged or corroded.

CAUTION: REMOVE THE PROPELLER FROM THE MOUNTING FLANGE WITH CARE TO PREVENT DAMAGING THE PROPELLER MOUNTING STUDS.

(6) Using the support sling, remove the propeller from the mounting flange.

(7) Put the propeller on a cart for transport.

B. Removal of “R” Flange Propellers

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS.

(1) Remove the spinner dome in accordance with the section “Spinner Removal” in this chapter.

(2) Cut and remove the safety wire (if installed) on the propeller mounting stud nuts.

WARNING: MAKE SURE THE SLING IS RATED UP TO 800 POUNDS TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING REMOVAL.

(3) Support the propeller assembly with a sling.

(4) If the propeller will be reinstalled and it has been dynamically balanced, make an identifying mark (with a felt-tipped pen only) on the propeller hub and a matching mark on the engine flange to make sure of correct positioning of the propeller during re-installation. This will prevent dynamic imbalance.

CAUTION: DISCARD THE PROPELLER MOUNTING NUTS AND SPACERS IF THEY ARE DAMAGED OR CORRODED, OR WHEN THE PROPELLER IS REMOVED FOR OVERHAUL.

(5) Unscrew the six 1/2 inch diameter mounting studs from the engine bushings.

(a) If the propeller is removed between overhaul intervals, mounting studs, nuts, and spacers may be reused if they are not damaged or corroded.

CAUTION: REMOVE THE PROPELLER FROM THE MOUNTING FLANGE WITH CARE TO PREVENT DAMAGING THE PROPELLER MOUNTING STUDS.

(6) Using the support sling, remove the propeller from the mounting flange.

(7) Put the propeller on a cart for transport.

TESTING AND TROUBLESHOOTING - CONTENTS

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1. Operational Checks (Rev. 1)
   A. Operational Checks
      (1) Refer to the Inspection and Check chapter of this manual for operational checks including pre-flight, initial run-up, and post-run checks.
2. Troubleshooting

   CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

   A. Hunting and Surging (Rev. 2)
      (1) General
         (a) Hunting is characterized by a cyclic variation in engine speed above and below desired speed. Surging is characterized by a large increase/decrease in engine speed, followed by a return to set speed after one or two occurrences.
         (b) If the propeller is hunting, an appropriately certified propeller repair station should check:
            1 Governor
            2 Fuel control
            3 Synchrophaser or synchronizer (if applicable)

(2) If the propeller is surging:

(a) Perform the “Initial Run-Up” in accordance with the Inspection and Check chapter of this manual to release trapped air from the propeller.

1 If surging reoccurs it is most likely due to a faulty governor.

a Have the governor tested by an appropriately certified propeller repair station.

(b) Hunting and/or surging may also be caused by friction or binding within the governor control, or by internal propeller corrosion, which causes the propeller to react slower to governor commands.

1 To isolate these faults, the propeller must be tested on a test bench at an appropriately certified propeller repair station.

B. Engine Speed Varies with Airspeed

(1) Small variances in engine speed are normal and are no cause for concern.

(2) Increase in engine speed while increasing airspeed:

(a) Non-feathering (-1) propeller:

1 Governor is not increasing oil volume in the propeller.

2 Engine transfer bearing leaking excessively.

3 Excessive friction in the blade bearings or pitch changing mechanism.

(b) Feathering (-2):

1 Governor is not reducing oil volume in the propeller.

2 Air charge (-2 propeller only) is too low. Refer to the Maintenance Practices chapter for air recharge procedure.

3 Excessive friction in the blade bearings or pitch changing mechanism.

(3) Decrease in engine speed while increasing airspeed:
   (a) Non-feathering (-1) propeller:
      1 Governor pilot valve is stuck and is excessively increasing oil volume.
   (b) Feathering (-2):
      1 Governor pilot valve is stuck and is excessively decreasing oil volume.
      2 Feathering command engaged on propeller pitch control (-2 propeller only).

(4) Increase in engine speed while decreasing airspeed:
   (a) Non-feathering (-1) propeller:
      1 Governor pilot valve is stuck and is excessively decreasing oil volume.
   (b) Feathering (-2):
      1 Governor pilot valve is stuck and is excessively increasing oil volume.

(5) Decrease in engine speed while decreasing airspeed:
   (a) Non-feathering (-1) propeller:
      1 Governor is not reducing oil volume in propeller.
      2 Excessive friction in blade bearings or pitch changing mechanism.
   (b) Feathering (-2):
      1 Governor is not increasing oil volume in the propeller.
      2 Air charge (-2 propeller only) is too high. Refer to the section, "Air Charge" in the Maintenance Practices chapter of this manual.
      3 Engine transfer bearing leaking excessively.
      4 Excessive friction in the blade bearings or pitch changing mechanism.

C. Loss of Propeller Control (-1 propellers only)
   (1) Propeller goes to uncommanded low pitch (high RPM)
      (a) Loss of propeller oil pressure - check:
         1 Governor pressure relief valve for proper operation.
         2 Governor drive for damage.
         3 Adequate engine oil supply.
         4 Engine transfer bearing leaking excessively.
      (b) Internal oil leakage to opposite side of piston and into hub.
   (2) Propeller goes to uncommanded high pitch (low RPM)
      (a) Governor pilot valve sticking.
   (3) RPM increases with power and airspeed, propeller RPM control has little or no effect.
      (a) Excessive friction in the blade bearings or pitch changing mechanism.
      (b) Internal oil leakage to opposite side of piston and into hub.

D. Loss of Propeller Control (-2 propellers)
   (1) Propeller goes to uncommanded high pitch (or feather)
      (a) Loss of propeller oil pressure - check:
         1 Governor pressure relief valve for proper operation.
         2 Governor drive for damage.
         3 Adequate engine oil supply.
         4 Engine transfer bearing leaking excessively.
      (b) Start locks not engaging (-2 propellers only)
      (c) Air charge pressure too high (-2 propellers only). Refer to the section, "Air Charge" in the Maintenance Practices chapter of this manual.
   (2) Propeller goes to uncommanded low pitch (high RPM)
      (a) Governor pilot valve sticking.

(3) RPM increases with power and airspeed, propeller RPM control has little or no effect.

(a) Excessive friction in blade bearings or pitch changing mechanism.

(b) Air charge lost or low. (-2 propellers only). Refer to the section, "Air Charge" in the in the Maintenance Practices chapter of this manual.

(c) Broken feathering spring (-2 propellers only).

(4) RPM Control Sluggish

(a) Air charge lost or low (-2 propellers only). Refer to the section, "Air Charge" in the in the Maintenance Practices chapter of this manual.

E. Failure to Feather or Feathers Slowly (-2 propellers only)

(1) Air charge lost or low. If applicable, refer to the section, "Air Charge" in the Maintenance Practices chapter of this manual.

(2) Broken feathering spring (if applicable).

(3) Check for proper function and rigging of propeller/governor control linkage.

(4) Check governor function.

(5) The propeller must be inspected for misadjustment or internal corrosion (usually in blade bearings or pitch change mechanism) that results in excessive friction.

(a) This inspection must be performed by an appropriately certified propeller repair station.

F. Failure to Unfeather (-2 propellers only)

(1) Check for proper function and rigging of propeller control linkage.

(2) Check of the governor function.

(3) Check for excessive oil leakage at the engine transfer bearing.

(4) The propeller must be inspected for misadjustment or internal corrosion (usually in blade bearings or pitch change mechanism) that results in excessive friction.

(a) This inspection must be performed by an appropriately certified propeller repair station.

G. Start Locks (Anti-feather Latches) Fail to Latch on Shutdown (-2 propellers only)

(1) Propeller was feathered before shutdown.

(2) Shutdown occurred at high RPM with prop control off the low pitch stop.

(3) Air charge is too high. Refer to the Maintenance Practices chapter for this procedure.

(4) Excessive engine transfer bearing oil leakage.

(5) Excessive governor pump leakage.

(6) Broken start locks.

NOTE 1: Problems G.(1) and G.(2) above can be resolved by restarting the engine, putting the propeller control in the proper shutdown position, then shutting down the engine.

NOTE 3: Problems G.(4), G.(5), and G.(6) must be referred to an appropriately certified propeller repair station.

H. Vibration

CAUTION 1: ANY VIBRATION THAT OCCURS SUDDENLY, OR IS ACCOMPANIED BY UNEXPLAINED GREASE LEAKAGE SHOULD BE INVESTIGATED IMMEDIATELY BEFORE FURTHER OPERATION.

CAUTION 2: VIBRATION PROBLEMS BECAUSE OF PROPELLER SYSTEM IMBALANCE ARE NORMALLY FELT THROUGHOUT THE RPM RANGE, WITH THE INTENSITY OF VIBRATION INCREASING WITH RPM. VIBRATION PROBLEMS THAT OCCUR IN A NARROW RPM RANGE ARE A SYMPTOM OF RESONANCE, THAT IS POTENTIALLY HARMFUL TO THE PROPELLER. AVOID OPERATION UNTIL THE PROPELLER CAN BE CHECKED AT AN APPROPRIATELY CERTIFIED REPAIR STATION.

(1) Check:
   (a) Control surfaces, cowl flaps, exhaust system, landing gear doors, etc. for excessive play that may be causing vibration that is unrelated to the propeller
   (b) Isolation of engine controls and lines
   (c) Engine mount wear
   (d) Uneven or over-lubrication of propeller
   (e) Proper engine/propeller flange mating
   (f) Blade track:
      1 Refer to the section, "Blade Track" in the Inspection and Check chapter of this manual.
   (g) Blade angles:
      1 Blade angles must be within specified tolerance between blades.
         a Refer to an appropriately certified propeller repair station to check/adjust blade angles.

(h) Spinner for cracks, improper installation, or "wobble" during operation

(i) Static balance

(j) Propeller installation:

1 Remove and reinstall the propeller 180 degrees from the original installation position.

a "R" flange propellers installed on an engine that has an "R" flange cannot be reinstalled 180 degrees from original installation position.

(k) Hub damage or cracking

(l) Grease or oil leakage

(m) Blade deformation

(2) Dynamic Balance

(a) Dynamic balancing is recommended after installing or performing maintenance on a propeller. While this is normally an optional task, it may be required by the engine or craft manufacturer to make certain the propeller/engine combination is balanced correctly before operation.

1 Refer to the engine or craft manuals, and the Maintenance Practices chapter of this manual.

I. Propeller Overspeed

(1) Check:

(a) Tachometer error

(b) Low pitch stop adjustment

(c) Governor Maximum RPM set too high

(d) Loss of oil pressure (-1 propellers only)

1 Oil starvation

2 Governor failure

(e) Loss or lowered air charge (-2 propellers only- results in momentary overspeed). Refer to the section, "Air Charge" in the Maintenance Practices chapter of this manual.

(f) Governor pilot valve jammed to supply high pressure only (-2 propellers only)

(g) Oil leaking past piston causing the hydraulic lock of piston in the cylinder (-1 propellers only)

J. Overspeed Avoidance (Operational) for Propeller Models ( )HM-( )(2,3)Y( )( )-1( )

(1) Hartzell ( )HM-( )(2,3)Y( )( )-1( ) propellers are designed to reduce blade angle in the event of a loss of oil pressure. This reduction in blade angle allows all available engine power to be utilized in the event of an oil system failure. This reduction in blade angle also can allow the engine to overspeed.

(2) If there is an engine overspeed, refer to the Inspection and Check chapter of this manual for corrective action following a propeller overspeed. Additional inspections may be required by the engine and/craft manufacturer.

K. Propeller Underspeed

(1) Check:

(a) Tachometer error

(b) Excessive transfer bearing oil leakage

(c) Governor oil pressure low

(d) Governor oil passage clogged

(e) Oil leaking past piston causing hydraulic lock in the cylinder (-2 Propellers only)

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1. Pre-Operation Checks (Rev. 2)

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. Important Information

(1) Follow propeller pre-flight inspection procedures specified in the Pilot Operating Handbook (POH) in addition to the inspections specified in this section.

(2) Defects or damage found during the pre-flight inspection must be evaluated in accordance with the applicable section in the Testing and Troubleshooting chapter and/or the Maintenance Practices chapter of this manual.

B. Propeller Blades

(1) Visually examine the entire blade (leading edge, trailing edge, face, and camber sides) for nicks, gouges, erosion, cracks, and debonds (composite blades only).

(a) Normal erosion (sand-blasted appearance) on the leading edge of the blade is permitted and does not require removal before further flight.

(2) Visually examine the blades for lightning strike indications in accordance with the section, “Lightning Strike” in this chapter.

(3) Check the blades for radial play or movement of the blade tip (in-and-out, fore-and-aft, and end play).

(a) Refer to the section, “Loose Blades” in this chapter for blade play limits.

(4) Composite Blades Only:

(a) Composite blades that do not have an anti-icing or de-ice boot installed require erosion tape on the leading edge of the blade.

1 Refer to the section, “Erosion Tape Installation” in the Maintenance Practices chapter of this manual for requirements and instructions.

C. Spinner Assembly and Blade Retention Components

(1) Inspect the spinner and the visible blade retention components for damage and/or cracks.

(a) Repair or replace components as required before further operation.

D. Hardware

(1) Check for loose or missing hardware.

(a) Retighten or reinstall as necessary.

WARNING: ABNORMAL GREASE/OIL LEAKAGE CAN BE AN INDICATION OF A FAILING PROPELLER BLADE OR BLADE RETENTION COMPONENT. A BLADE SEPARATION CAN RESULT IN A CATASTROPHIC CRAFT ACCIDENT.

E. Grease/Oil Leakage

(1) Examine the face and camber-sides of the blades for evidence of grease/oil leakage.

(2) Using an appropriate light source, examine the propeller through the blade cut-outs in the spinner for signs of grease/oil leakage.

(a) Spinner removal is not required for this inspection.

(b) If grease/oil leakage is found, refer to the section, “Inspection Procedures” in this chapter.

F. Initial Run-Up

(1) Perform the Initial Run-Up procedure in accordance with the section, “Operational Checks” in this chapter.

G. Additional Information

(1) Refer to the craft manufacturer’s manual for additional pre-flight checks.

(2) Refer to the section, “Inspection Procedures” in this chapter for additional inspection/repair information.

2. Operational Checks (Rev. 2)

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. Initial Run-Up

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

WARNING: REFER TO THE CRAFT 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 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 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. 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 operation.

1 Refer to the section, “Vibration” in the Testing and Troubleshooting chapter of this manual to determine the cause/correction for the vibration.

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

(7) For additional inspection information (including possible corrections), refer to the section, “Inspection Procedures” in this chapter, and/or the Testing and Troubleshooting chapter of this manual.

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

B. Static RPM Check

NOTE: This operational check should be performed after installation, maintenance, or propeller adjustment.

CAUTION: A CALIBRATED TACHOMETER MUST BE USED TO MAKE SURE OF THE ACCURACY OF THE RPM CHECK.

(1) Set the brakes and chock the craft or tie craft down.

(2) Back the Maximum RPM Stop on the governor out one turn.

(3) Start the engine.

(4) Advance the propeller control lever to MAX (max RPM), then retard the control lever one inch (25.4 mm).

(5) SLOWLY advance the throttle to the maximum manifold pressure.

(6) Slowly advance the propeller control lever until the engine speed stabilizes.

(a) If engine speed stabilizes at the maximum power static RPM specified by the propeller's Installation Data Sheet (IDS), then the low pitch stop is set correctly.

(b) If engine speed stabilizes above or below the rated RPM, the low pitch stop may require adjustment. Refer to the Maintenance Practices chapter of this manual.

(7) Stop the engine.

(8) Return the Maximum RPM Stop on the governor to the original position.

(9) Operate the craft to confirm the maximum rated RPM specified in the Installation Data Sheet (IDS) is achieved.

(a) Adjust the governor to the rated RPM with the Maximum RPM Stop screw.

1 If the governor is adjusted to the rated RPM with the maximum RPM stop screw, hold the maximum RPM stop screw in place and torque the maximum RPM stop locking nut in accordance with Table 3-1, Torque Table.

(10) Refer to the craft's maintenance manual for additional procedures that may be required after propeller installation.

C. Post-Run Check

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

3. Required Periodic Inspections and Maintenance (Rev. 2)

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. Periodic Inspection

(1) Perform the following inspection procedures at 100 hour intervals, not to exceed six (6) calendar months. Procedures involved in these inspections are detailed below.

(a) Inspection and maintenance specified by a craft manufacturer's maintenance program and approved by the applicable certification agency may not coincide with the inspection time intervals specified.

1 In this situation, the craft manufacturer's schedule may be applied as long as the calendar limit for the inspection interval does not exceed six (6) months.

(b) For additional inspection information (including possible corrections), refer to the section, "Inspection Procedures" in this chapter, and/or the Testing and Troubleshooting chapter of this manual.

(2) Remove the spinner dome.

(3) Visually examine the propeller blades (lead edge, trail edge, face, and camber sides) for nicks, gouges, erosion, cracks, etc.

(a) Refer to the applicable section ("Aluminum Blades" or "Composite Blades") in the Maintenance Practices chapter of this manual for damage evaluation and repair information.

(4) Examine the propeller for grease/oil leakage in accordance with the section, "Grease/Oil Leakage" in this chapter.

(5) Visually examine all propeller parts for cracks, wear or unsafe conditions.

(6) If a blade track problem is suspected, check the blade track in accordance with the section, "Blade Track" in this chapter.

(7) For (-2) feathering propellers that incorporate an air charge in the cylinder, check pressure every 100 hours or once a month, whichever comes first.

(a) Refer to the Maintenance Practices chapter of this manual for procedures.

1 If the propeller air pressure is routinely low, or there is engine oil leaking from the air valve, the cause may be a faulty seal in the propeller.

a An inspection to verify the condition of the seal should be performed by qualified personnel at an appropriately certified propeller repair station.

(8) Make an entry in the propeller logbook about completion of these inspections.

B. Periodic Maintenance

(1) Lubricate the propeller assembly.

(a) Refer to the section, "Lubrication" in the Maintenance Practices chapter of this manual for intervals and procedures.

C. Periodic Coin-Tap Inspections for Composite Blades

(1) Perform a coin-tap inspection of the exposed section of the blade at intervals not to exceed 1200 flight hours.

(2) Perform a coin-tap inspection of the erosion shield surface at 600 hour intervals, not to exceed 12 months.

(3) Refer to Hartzell Propeller Inc. Composite Blade Field Maintenance and Minor Repair Manual 170 (61-13-70) for the coin-tap inspection procedure.

D. Operational Limitations

(1) Certain components, as well as the entire propeller may have specific life limits established as part of the certification. Such limits require mandatory replacement of specified parts after a defined number of hours and/or cycles of use.

(2) Life limited component times may exist for the propeller models included in this manual. Refer to the Operational Limitations chapter of this manual.

(3) Operators are urged to keep informed of additional operational information via Hartzell Propeller Inc. Service Bulletins and Service Letters, which are available from Hartzell distrbutors or from Hartzell by subscription. Selected information is also available on the Hartzell Propeller Inc. website at www.hartzellprop.com.

E. Overhaul Periods

(1) During operation, the propeller is constantly subjected to vibration from the engine and the airstream, as well as high centrifugal forces.

(2) The propeller is also subject to corrosion, wear, and general deterioration due to aging. Under these conditions, metal fatigue or mechanical failures can occur.

(3) To protect your safety, your investment, and to maximize the safe operating lifetime of your propeller, it is essential that a propeller be properly maintained and overhauled according to the recommended service procedures.

(a) For Hartzell Propeller Inc. propeller overhaul periods, refer to Hartzell Propeller Inc. Service Letter HM-SL-001.

4. Inspection Procedures

A. Blade Damage (Rev. 1)

(1) Refer to the applicable section, Aluminum/Composite Blades in the Maintenance Practices chapter of this manual for damage evaluation and repair information.

B. Grease/Oil Leakage (Rev. 1)

WARNING: UNUSUAL OR ABNORMAL GREASE LEAKAGE OR VIBRATION, WHERE THE CONDITION STARTED SUDDENLY, CAN BE AN INDICATION OF A FAILING PROPELLER BLADE OR BLADE RETENTION COMPONENT. AN INSERVICE BLADE SEPARATION MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE. UNUSUAL OR ABNORMAL GREASE LEAKAGE OR VIBRATION DEMANDS IMMEDIATE INSPECTION.

(1) Important Information

(a) A new or newly overhauled propeller may leak slightly during the first several hours of operation. This leakage may be caused by the seating of seals and O-rings, and the slinging of lubricants used during assembly. Leakage should cease within the first ten hours of operation.

(b) Leakage that persists beyond the first ten hours of operation on a new or newly overhauled propeller, or occurs on a propeller that has been in service for some time will require repair.

1 A determination should be made as to the source of the leak. If the source of the leak is the O-ring seal between the engine and propeller flange, or a lubrication fitting, field repair is permitted.

2 All other leakage repairs should be referred to an appropriately certified propeller repair station.

3 If abnormal leakage is detected, inspect the propeller assembly using the Inspection Procedure steps in this section.

(c) Grease Leakage - Probable Cause:

1 Loose/defective lubrication fitting

2 Damaged blade shank to hub O-ring seal

3 Damaged hub seal (at hub parting line)

4 Damaged hub/engine flange interface O-ring

5 Cracked hub

(2) Inspection Procedure

(a) Remove the spinner dome.

CAUTION: PERFORM A VISUAL INSPECTION WITHOUT CLEANING THE PARTS. A TIGHT CRACK IS OFTEN EVIDENT DUE TO TRACES OF GREASE COMING FROM THE CRACK. CLEANING CAN REMOVE SUCH EVIDENCE AND MAKE A CRACK VIRTUALLY IMPOSSIBLE TO SEE.

(b) Perform a visual inspection of the hub, blades, and blade retention areas to locate the source of the grease leak.

1 If the source of the grease leak is a lubrication fitting, blade O-ring, or the hub parting line, repairs can be accomplished during scheduled maintenance as long as operational safety is not compromised.

a To repair a grease leak from a lubrication fitting, blade O-ring, or hub parting line, the propeller must be disassembled and inspected at an appropriately certified propeller repair station.

2 If the source of the grease leak is a component or location other than a lubrication fitting, blade O-ring, or the hub parting line, the propeller must be disassembled and inspected at a certified propeller repair station with the appropriate rating before further operation.

(c) Perform a visual inspection for cracks in the hub.

1 Extra attention should be given to the blade retention area of the hub.

2 A crack may be visible or may be indicated by grease leaking from a seemingly solid surface.

(d) If cracks are suspected, additional inspections to verify the condition must be performed before further operation.

1 Inspections typically include disassembly of the propeller followed by inspection of parts, using nondestructive methods in accordance with published procedures.

a These inspections must be performed by qualified personnel at an appropriately certified propeller repair station to verify the condition.

(e) If cracks or failing components are found, these parts must be replaced before further operation.

1 Report such occurrences to the appropriate applicable authorities and to Hartzell Propeller Inc. Product Support.

C. Vibration (Rev. 1)

NOTE: Vibration may originate in the engine, propeller, or airframe. Troubleshooting procedures typically begin with an investigation of the engine. Airframe components, such as engine mounts or loose landing gear doors, can also be the source of vibration. When investigating an abnormal vibration, the blades and the blade retention components should be considered as potential sources of the vibration.

(1) Important Information

(a) Instances of abnormal vibration should be investigated immediately. If the cause of the vibration is not readily apparent, examine the propeller in accordance with the instructions in this section.

(b) Perform troubleshooting and evaluation of possible sources of vibration in accordance with engine or craft manufacturer's instructions.

(c) Refer to the section, "Vibration" in the Testing and Troubleshooting chapter of this manual.

1 Perform the checks to determine the possible cause of the vibration.

a If no cause is found, the propeller could be the source of the vibration. Examine the propeller in accordance with the Inspection steps in this section.

(2) Inspection

(a) Remove the spinner dome.

(b) Visually examine the hub and blades for cracks.

1 Pay particular attention to the blade retention areas of the hub.

2 A crack may be readily visible, or may be indicated by grease leaking from a seemingly solid surface.

(c) If cracks are suspected, additional inspections must be performed to evaluate the condition before further operation.

1 These inspections typically include disassembly of the propeller, followed by inspection of parts, using nondestructive methods in accordance with published procedures.

2 These inspections must be performed by qualified personnel at an appropriately certified propeller repair station.

(d) Inspect the movement of the propeller blades in accordance with the section, “Loose Blades” in this chapter.

(e) Inspect blade track in accordance with the section, “Blade Track” in this chapter.

CAUTION: DO NOT USE BLADE PADDLES TO TURN THE BLADES.

1 Manually (by hand) attempt to turn the blades (change pitch).

2 Visually check for damaged blades.

(f) If abnormal blade conditions or damage are found, additional inspections must be performed to evaluate the condition before further operation.

1 These inspections mut be performed by an appropriately certified propeller repair station.

(g) If cracks or failing components are found, these parts must be replaced before further operation.

1 Report such occurances to applicable authorities and to Hartzell Propeller Inc. Product Support.

D. Blade Track

(1) Check blade track as follows:

WARNING: SAFELY SECURE THE CRAFT AND MAKE SURE OF THE SAFETY OF ANYONE NEAR THE CRAFT BEFORE PERFORMING A CHECK FOR BLADE TRACK.

(a) Secure the craft or tie the craft down to prevent movement.

(b) Refer to Figure 5-1. Place a fixed reference point beneath the propeller, within 0.25 inch (6.3 mm) of the lowest point of the propeller arc.

NOTE: This reference point may be a flat board with a sheet of paper attached to it. The board may then be blocked up to within 0.25 inch (6.3 mm) of the propeller arc.

TI-401-0019

Checking Blade Track
Figure 5-1

WARNING: MAKE SURE THAT THE ENGINE MAGNETO IS GROUNDED (OFF) BEFORE ROTATING THE PROPELLER.

(c) Rotate the propeller by hand (opposite the direction of normal rotation) until a blade points directly at the paper. Mark the position of the blade tip in relation to the paper.

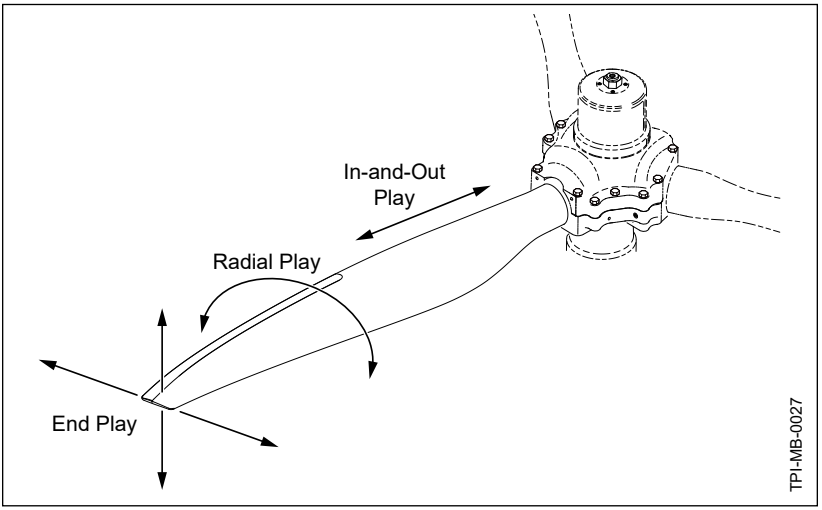
(d) Repeat this procedure with the remaining blades.

(e) Tracking tolerance is ± 0.125 inch (±3.18 mm) or 0.250 inch (6.35 mm) total.

(2) Possible Correction

(a) Remove foreign matter from the propeller mounting flange.

(b) If no foreign matter is present, refer to an appropriately certified propeller repair station.



Blade Play
Figure 5-2

E. Loose Blades (Rev. 2)

(1) Limits for blade play are specified below. Refer to Figure 5-2.

(a)	End Play:	
	Leading Edge to Trailing Edge	See Note below
	Fore-and-Aft (face to camber)	See Note below
(b)	In-and-Out Play	None
(c)	Radial Play (pitch change)	±0.5 degree (1 degree total) measured at reference station

NOTE: Blades should be tight in the propeller; however, play that is within the allowable limits is acceptable if the blade returns to its original position when released. If blade play is greater than the allowable limits, or if the blade(s) do not return to their original position when released, there may be internal wear or damage that should be referred to an appropriately certified propeller repair station.

F. Corrosion

WARNING: REPAIR THAT INVOLVES COLD WORKING THE METAL, RESULTING IN CONCEALMENT OF A DAMAGED AREA, IS NOT PERMITTED.

(1) Corrosion of any type on the hub or heavy corrosion on other parts that results in severe pitting must be referred to an appropriately certified propeller repair station.

G. Spinner Damage (Rev. 2)

(1) Inspect the spinner for cracks, missing hardware, or other damage.

(a) Metal Spinners

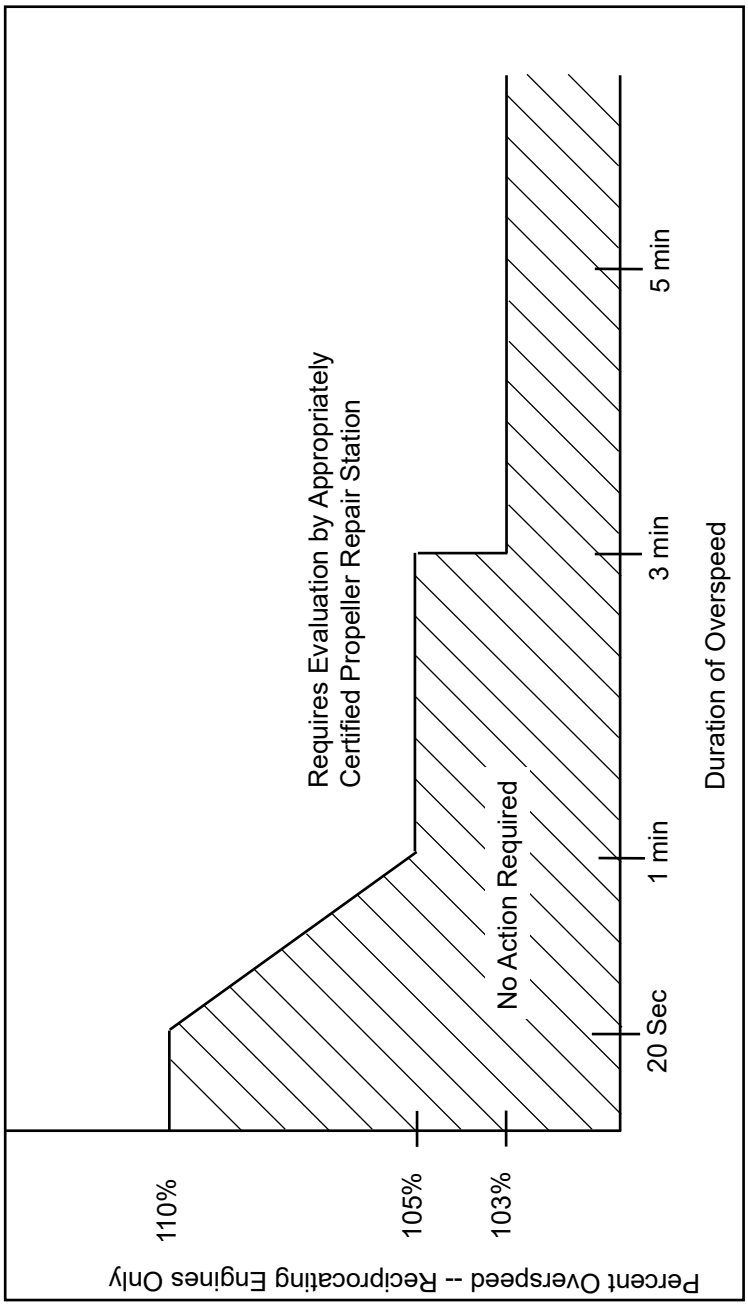
1 For damage evaluation and repair information, refer to Hartzell Propeller Inc. Manual 127 (61-16-27) or a certified propeller repair station with the appropriate rating.

2 Contact the applicable local authority for repair approval.

(b) Composite Spinners

1 For damage evaluation and repair information, refer to Hartzell Propeller Inc. Composite Spinner Maintenance Manual 148 (61-16-48) or a certified propeller repair station with the appropriate rating.

2 Contact the local airworthiness authority for repair approval.



Reciprocating Engine Overspeed Limits
Figure 5-3

5. Special Inspections (Rev. 1)

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. Overspeed

(1) An overspeed occurs when the propeller RPM exceeds the maximum RPM stated in the applicable Aircraft Type Certificate Data Sheet. The duration of time and magnitude of overspeed for a single event determines the corrective action that must be taken to make sure no damage to the propeller has occurred.

(2) The criteria for determining the required action after an overspeed are based on many factors. The additional centrifugal forces that occur during overspeed are not the only concern. Some applications have sharp increases in vibratory stresses at RPMs above the maximum rated for the craft/engine/propeller combination.

(a) When a propeller installed on a reciprocating engine has an overspeed event, refer to the Reciprocating Engine Overspeed Limits (Figure 5-3) to determine the corrective action to be taken.

(b) If an overspeed requiring propeller evaluation occurs on an aircraft using a Hartzell Propeller Inc. governor, the governor must be evaluated by a certified propeller repair station with the appropriate rating.

(c) Make a record of the overspeed event in the propeller logbook, indicating any corrective action(s) taken.

B. Lightning Strike - Composite Blades (Rev. 1)

CAUTION 1: REFER TO THE ENGINE AND CRAFT MANUFACTURER'S MANUALS FOR ADDITIONAL INSPECTIONS TO PERFORM AFTER A PROPELLER LIGHTNING STRIKE.

CAUTION 2: A COMPOSITE BLADE SUSPECTED OF LIGHTNING STRIKE MUST BE INSPECTED AND MAY REQUIRE OVERHAUL.

NOTE: Lightning usually enters the propeller through the metal erosion shield or the stainless steel mesh (if applicable) of a blade. The charge typically enters at the tip of the blade and travels through the erosion shield toward the hub. The charge exits the erosion shield at the inboard end and enters the next conductive element in the path.

(1) General

(a) In the event of a propeller lightning strike, an inspection is required before further operation.

(b) If the propeller meets the requirements of the "Temporary Operation Inspection" in this section, 10 hours of operation is permitted before propeller disassembly/inspection must be performed.

(2) Temporary Operation Inspection

(a) Remove the spinner dome and perform a visual inspection of the propeller, blades, and spinner for evidence of damage that would require repair before operation (such as arcing damage to propeller hub).

1 A lightning strike indication may appear as a darkened area in proximity of the tip and at the most inboard end of the metal erosion shield.

2 Other indications include: debonding, lifting or buckling of the erosion shield, and splitting or delamination of the composite material.

(b) Perform visual and coin-tap inspections of the blades that have lightning strike indications in accordance with Hartzell Propeller Inc. Composite Blade Field Maintenance and Minor Repair Manual 170 (61-13-70).

1 If the damage is within the airworthy damage limits specified in Manual 170, temporary operation for up to 10 flight hours is permitted before propeller disassembly and inspection.

2 If the damage is not within the airworthy damage limits specified in Manual 170, temporary operation is not permitted. The propeller must be removed from the aircraft, disassembled, evaluated, and/or repaired by a certified propeller repair station with the appropriate rating before further flight.

(c) Make a record of the lightning strike in the propeller logbook, indicating any corrective action(s) taken.

(3) For flight beyond the 10-hour temporary operation limit:

(a) The propeller must be removed from the aircraft, disassembled, evaluated, and/or repaired by an appropriately certified propeller repair station.

C. Lightning Strike - Aluminum Blades (Rev. 1)

CAUTION: REFER TO THE ENGINE AND CRAFT MANUFACTURER'S MANUALS FOR ADDITIONAL INSPECTIONS TO PERFORM AFTER A PROPELLER LIGHTNING STRIKE.

(1) General

(a) In the event of a propeller lightning strike, an inspection is required before further operation.

(b) If the propeller meets the requirements of the "Temporary Operation Inspection" in this section, 10 hours of operation is permitted before propeller disassembly/inspection must be performed.

(2) Temporary Operation Inspection

(a) Remove the spinner dome and perform a visual inspection of the propeller, blades, and spinner for evidence of damage that would require repair before operation (such arcing damage to propeller hub).

CAUTION: IF THE PROPELLER EXPERIENCES A LIGHTNING STRIKE, REFER TO THE "ALUMINUM BLADES" SECTION IN THE MAINTENANCE PRACTICES CHAPTER OF THIS MANUAL TO EVALUATE THE DAMAGE BEFORE FURTHER OPERATION.

1 If the only evident damage is minor arcing burns to the blades, temporary operation for up to 10 flight hours is permitted before propeller disassembly and inspection.

2 If there is evidence of additional damage, beyond minor arcing burns to the blades, temporary operation is not permitted. The propeller must be removed from the craft, disassembled, evaluated, and/or repaired by an appropriately certified propeller repair station.

(b) Make a record of the lightning strike in the propeller logbook, indicating any corrective action(s) taken.

(3) For flight beyond the 10-hour temporary operation limit:

(a) The propeller must be removed from the craft, disassembled, evaluated, and/or repaired by an appropriately certified propeller repair station.

D. Foreign Object Strike/Ground Strike (Rev. 1)

(1) General

(a) A foreign object/ground strike can include a broad spectrum of damage, from a minor stone nick to severe ground impact damage.

1 A conservative approach in evaluating the damage is required because there may be hidden damage that is not readily apparent during an on-wing, visual inspection.

(b) A foreign object/ground strike is defined as:

1 Any incident, whether or not the engine is operating, that requires repair to the propeller other than minor dressing of the blades.

a Examples of foreign object/ground strike include situations where a craft is stationary and the landing gear collapses causing one or more blades to be significantly damaged, or where a hangar door (or other object) strikes the propeller blade(s).

b These cases should be handled as foreign object/ground strikes because of potentially severe side loading on the propeller hub, blades, and retention bearings.

2 Any incident during engine operation in which the propeller impacts a solid object that causes a drop in revolutions per minute (RPM) and also requires structural repair of the propeller (incidents requiring only paint touch-up are not included). This is not restricted to propeller strikes against the ground.

3 A sudden RPM drop while impacting water, tall grass, or similar yielding medium, where propeller blade damage is not normally incurred.

(c) In the event of a foreign object/ground strike, an inspection is required before further operation.

(2) Inspection Procedure

(a) Examine the propeller assembly for damage related to the foreign object/ground strike.

(b) If any of the following indications are found, the propeller must be removed from the craft, disassembled, and overhauled by an appropriately certified propeller repair station.

1 Blade(s) damaged, bent, or out of track/angle

2 Blade(s) loose in the hub

a Refer to the section, “Loose Blades” in this chapter for the permitted limits of blade movement.

3 Any noticeable or **suspected** damage to the pitch change mechanism

4 Any blade diameter reduction

5 Bent, cracked, or failed engine shaft

6 Vibration during operation (that was not present before the event)

(c) Aluminum Blades: Nicks, gouges, and scratches on blade surfaces or the leading and trailing edges must be removed before operation.

1 Refer to the section, “Aluminum Blades” in the Maintenance Practices chapter of this manual (if applicable) for damage evaluation and repair information.

(d) Composite Blades: Perform a thorough visual inspection and a coin-tap inspection of each blade (including the metal erosion shield) in accordance with Hartzell Propeller Inc. Composite Blade Field Maintenance and Minor Repair Manual 170 (61-13-70).

1 If the blade damage is not within the serviceable damage limits, the blade(s) must be repaired before further operation.

(e) Engine mounted components - such as governors, pumps, etc. may be damaged by a foreign object strike, especially if the strike resulted in a sudden stoppage of the engine.

1 These components must be inspected and repaired in accordance with the applicable component maintenance manual.

(f) Make a record of the foreign object/ground strike event in the propeller logbook, indicating any corrective action(s) taken.

E. Fire/Heat Damage (Rev. 1)

WARNING: HIGH TEMPERATURES CAN CAUSE SERIOUS DAMAGE TO PROPELLER HUBS, CLAMPS, AND BLADES (ALUMINUM AND COMPOSITE). THIS DAMAGE CAN RESULT IN CATASTROPHIC FAILURE CAUSING DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE.

(1) A propeller that has been exposed to fire or high temperatures, such as an engine or hangar fire, must be inspected by an appropriately certified propeller repair station is required before further operation.

F. Sudden Stoppage (Rev. 1)

(1) When there is a propeller sudden stoppage because of catastrophic engine failure or seizure, the propeller and any engine driven/powered accessory must be inspected and repaired in accordance with the applicable component maintenance manual.

(2) If the sudden stoppage was caused by a foreign object strike, refer to the section, “Foreign Object/Ground Strike” in this chapter.

6. Long Term Storage

A. Important Information

(1) Parts shipped from Hartzell Propeller Inc. are not shipped or packaged in a container that is designed for long term storage.

(2) Long term storage procedures are detailed in Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(3) Information regarding the return of a propeller assembly to service after long term storage is detailed in Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

B. Composite Blades

(1) In addition to the long term storage requirements specified in Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02), the maximum permitted storage temperature for Hartzell Propeller Inc. composite blades is 180°F (82°C).

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1. Cleaning (Rev. 2)

CAUTION 1: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

CAUTION 2: BEFORE CLEANING THE PROPELLER, BE SURE THE PROPELLER HAS BEEN INSPECTED IN ACCORDANCE WITH THE REQUIRED PERIODIC INSPECTIONS SPECIFIED IN THIS MANUAL. CLEANING THE PROPELLER PRIOR TO INSPECTION MAY REMOVE EVIDENCE OF A CONDITION THAT REQUIRES CORRECTIVE ACTION.

CAUTION 3: DO NOT USE PRESSURE WASHING EQUIPMENT TO CLEAN THE PROPELLER OR CONTROL COMPONENTS. PRESSURE WASHING CAN FORCE WATER AND/OR CLEANING SOLVENTS PAST SEALS, AND CAN LEAD TO INTERNAL CORROSION OF PROPELLER COMPONENTS.

A. General Cleaning

CAUTION 1: WHEN CLEANING THE PROPELLER, DO NOT ALLOW SOAP OR SOLVENT SOLUTIONS TO RUN OR SPLASH INTO THE HUB AREA.

CAUTION 2: DO NOT CLEAN THE PROPELLER WITH CAUSTIC OR ACIDIC SOAP SOLUTIONS. IRREPARABLE CORROSION OF PROPELLER COMPONENTS MAY OCCUR.

(1) Remove the spinner dome in accordance with the Installation and Removal chapter in this manual.

WARNING: ADHESIVES AND SOLVENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT. USE IN WELL VENTILATED AREA.

CAUTION: DO NOT USE ANY SOLVENT DURING CLEANING THAT COULD SOFTEN OR DESTROY THE BOND BETWEEN CHEMICALLY ATTACHED PARTS.

(2) Using a clean cloth dampened with Stoddard solvent CM23 or equivalent, wipe the inside of the spinner dome to remove grease, oil, and other residue.

   (a) Immediately dry the inside of the spinner dome using a clean dry cloth.

(3) Using a clean cloth dampened with Stoddard solvent CM23 or equivalent, wipe the accessible surfaces of the hub, counterweight clamps, slip ring, and bulkhead to remove grease, oil, and other residue.

(4) Fill a tank sprayer with a non-caustic/non-acidic soap solution.

IMPORTANT: WHEN PERFORMING STEPS 5 THRU 7, THE BLADE(S) TO BE CLEANED MUST POINT DOWNWARD. THIS WILL PREVENT THE SOAP SOLUTION AND/OR CONTAMINANTS FROM FLOWING INTO THE HUB/BLADE SEAL AREA.

CAUTION: DO NOT LET THE SOAP SOLUTION DRY ON THE SURFACES OF THE HUB, BULKHEAD, OR SLIP RING.

(5) Using the tank sprayer, apply a fine mist of the soap solution to the surfaces of the downward facing blades, and the hub, bulkhead, and slip ring around the downward facing blades.

   (a) Use a cloth or soft nylon brush to loosen dirt and unwanted material on the surfaces where the soap solution was applied, particularly on the inboard surface of the counterweight clamp.

(6) Using clean potable water at low pressure, rinse the surfaces where the soap solution was applied to remove dirt, unwanted material, and soap residue.

(7) Use a clean dry cloth to dry the surfaces cleaned in the previous steps.

(8) Rotate the propeller so that the next blade(s) to be cleaned are pointing downward, then repeat steps 5 thru 7.

(a) Repeat steps 5 thru 8 until all blades have been cleaned and dried.

(9) Let the propeller dry.

(10) Install the spinner dome in accordance with the Installation and Removal chapter in this manual.

B. Spinner Cleaning and Polishing

(1) Clean the spinner using the General Cleaning procedures in this section.

(2) If an aluminum spinner dome is installed, polish the dome (if required) with an automotive-type aluminum polish.

2. Lubrication (Rev. 6)

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. Lubrication Intervals

(1) The propeller must be lubricated at intervals not to exceed 400 hours or 12 calendar months, whichever occurs first.

(a) Inspection and maintenance specified by an airframe manufacturer's maintenance program and approved by the applicable airworthiness agency may not coincide with the lubrication interval specified.

1 In this situation, the airframe manufacturer's schedule may be applied as long as the calendar limit for the lubrication interval does not exceed twelve (12) months.

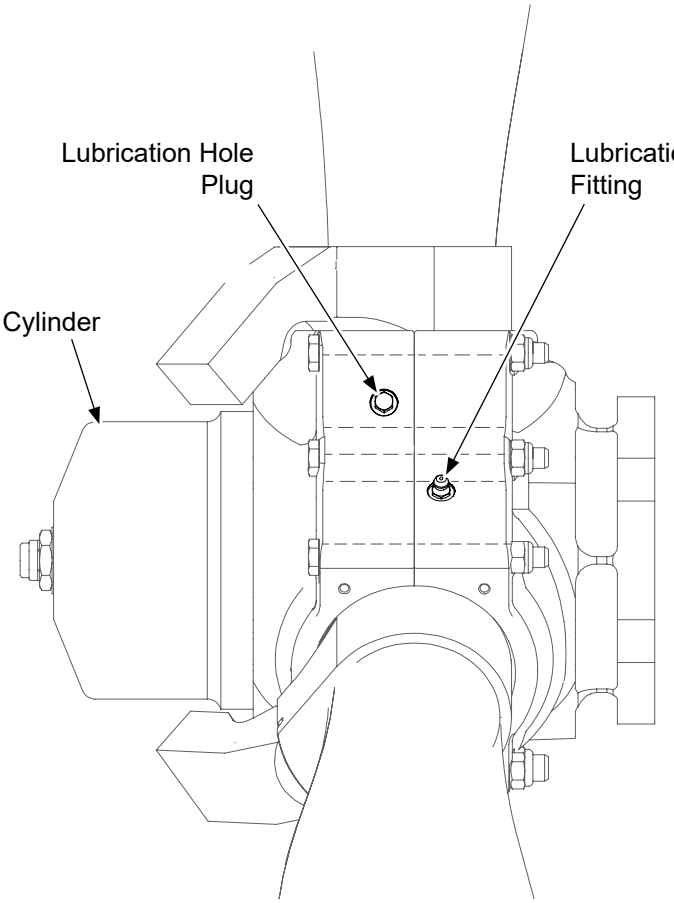
(b) If the craft is operated or stored under adverse atmospheric conditions, e.g., high humidity, salt air, calendar lubrication intervals should be reduced to six months.

(c) If the propeller is leaking grease, the lubrication interval should be reduced to 100 hours until the grease leak issue is resolved.

(2) Owners of a high use craft may wish to extend their lubrication interval. The lubrication interval may be gradually extended after evaluating bearing wear and internal corrosion when the propeller is overhauled.

(3) Hartzell Propeller Inc. recommends that new or newly overhauled propellers be lubricated after approximately the first ten hours of operation because centrifugal loads will pack and redistribute grease which can result in a propeller imbalance. Redistribution of grease may also result in voids in the blade bearing area where moisture can collect.

(a) Purchasers of a new craft should check the propeller logbook to verify whether the propeller was lubricated by the manufacturer during testing. If it was not lubricated, the propeller should be serviced at the earliest convenience.



NOTE: A tractor/pusher propeller with clockwise (standard) rotation is shown in this illustration.

TPI-MB-0335

Lubrication Fittings/Hole Plugs
Figure 6-1

B. Lubrication Procedure

WARNING 1: FOLLOW LUBRICATION PROCEDURES CORRECTLY TO MAINTAIN ACCURATE BALANCE OF THE PROPELLER ASSEMBLY.

WARNING 2: PITCH CONTROL DIFFICULTY COULD RESULT IF THE PROPELLER IS NOT CORRECTLY LUBRICATED.

(1) Remove the propeller spinner.

(2) Each blade socket has two lubrication fittings or one lubrication fitting and one lubrication hole plug. Refer to Figure 6-1.

(3) Remove the caps from the lubrication fittings.

(4) Remove the lubrication fittings or hole plugs as applicable.

(a) For all tractor or pusher propellers with clockwise (standard) rotation when viewed from BEHIND the aircraft, remove the lubrication fittings (p/n A-279 or C-6349) or lubrication hole plugs (p/n 106545) from the CYLINDER-SIDE hub half.

(b) For all tractor or pusher propellers with counter-clockwise (backward) rotation when viewed from BEHIND the aircraft, remove the lubrication fittings (p/n A-279 or C-6349) or lubrication hole plugs (p/n 106545) from the ENGINE-SIDE hub half.

CAUTION: USE CARE NOT TO DAMAGE THE THREADED HOLE WHEN REMOVING A BLOCKAGE.

(5) If there is a blockage in the threaded hole where the lubrication plug was removed (ex. hardened grease), bend a piece of safety wire and use the bent end to loosen the blockage.

CAUTION: USE ONLY HARTZELL PROPELLER INC. APPROVED GREASE. DO NOT MIX DIFFERENT SPECIFICATIONS AND/ OR BRANDS OF GREASE EXCEPT AS NOTED IN THIS SECTION.

(6) A label is normally applied to the propeller to indicate the type of grease previously used. Refer to Figure 6-2.

(a) The same grease type should be used during re-lubrication unless the propeller has been disassembled and the old grease removed.

1 It is not possible to purge old grease through lubrication fittings.

2 To completely replace one grease with another, the propeller must be disassembled and cleaned in accordance with the applicable overhaul manual.

Lubrication Label
Figure 6-2

(7) If different grease types are accidentally mixed, the propeller must be disassembled and cleaned in accordance with the applicable overhaul/maintenance manual within three months or 30 operation cycles whichever occurs first.

(a) EXCEPTION: Aeroshell 5 and Aeroshell 6 greases both have a mineral oil base and the same thickening agent; therefore, mixing of these two greases is permitted in Hartzell propellers.

WARNING: WHEN MIXING AEROSHELL 5 AND AEROSHELL 6 GREASES, THE AIRCRAFT MUST BE PLACARDED TO INDICATE THAT FLIGHT IS PROHIBITED IF THE OUTSIDE AIR TEMPERATURE IS LESS THAN -40° F (-40° C). AEROSHELL 5 GREASE MUST BE INDICATED ON THE LABEL.

CAUTION 1: IF A PNEUMATIC GREASE GUN IS USED, EXTRA CARE MUST BE TAKEN TO AVOID EXCESSIVE PRESSURE BUILDUP.

CAUTION 2: GREASE MUST BE APPLIED TO ALL BLADES OF A PROPELLER ASSEMBLY AT THE TIME OF LUBRICATION.

CAUTION 3: DO NOT ATTEMPT TO PUMP MORE THAN 1 FL. OZ. (30 ML) OF GREASE INTO THE LUBRICATION FITTING. USING MORE THAN 1 FL. OZ. (30 ML) OF GREASE COULD RESULT IN OVER SERVICING OF THE PROPELLER. VERIFY THE OUTPUT OF THE GREASE GUN BEFORE SERVICING THE PROPELLER.

CAUTION 4: OVER-LUBRICATING AN ALUMINUM HUB PROPELLER MAY CAUSE THE GREASE TO ENTER THE HUB CAVITY, LEADING TO EXCESSIVE VIBRATION AND/OR SLUGGISH OPERATION. THE PROPELLER MUST THEN BE DISASSEMBLED TO REMOVE THIS GREASE.

(8) Pump a maximum of 1 fl. oz. (30 ml) grease into the lubrication fitting, or until grease emerges from the hole where the lubrication fitting or hole plug was removed - whichever occurs first.

NOTE: It may be necessary to use a right angle coupler such as TE559 or equivalent, on the grease gun to access the lubrication fittings. Refer to Figure 6-3.

(a) For all tractor or pusher propellers with clockwise (standard) rotation when viewed from BEHIND the aircraft, the lubrication fitting is in the ENGINE-SIDE hub half.

(b) For all tractor or pusher propellers with counter-clockwise (backward) rotation when viewed from BEHIND the aircraft, the lubrication fitting is in the CYLINDER-SIDE hub half.

Right Angle Coupler for Grease Gun
Figure 6-3

(9) If a lubrication fitting (p/n A-279 or C-6349) was removed at the beginning of this procedure, it may be reinstalled or replaced with a lubrication hole plug (p/n 106545).

(a) Reinstall the lubrication fitting or hole plug that was removed at the beginning of this procedure.

(b) Tighten until finger-tight, then tighten one additional 360 degree turn.

(10) Make sure that the ball of each lubrication fitting is correctly seated.

(11) Reinstall a lubrication fitting cap on each lubrication fitting.

C. Approved Lubricants

(1) For a list of lubricants approved for use in Hartzell propellers, refer to the Consumable Materials chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

3. Corrosion Inhibitor (Rev. 1)

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

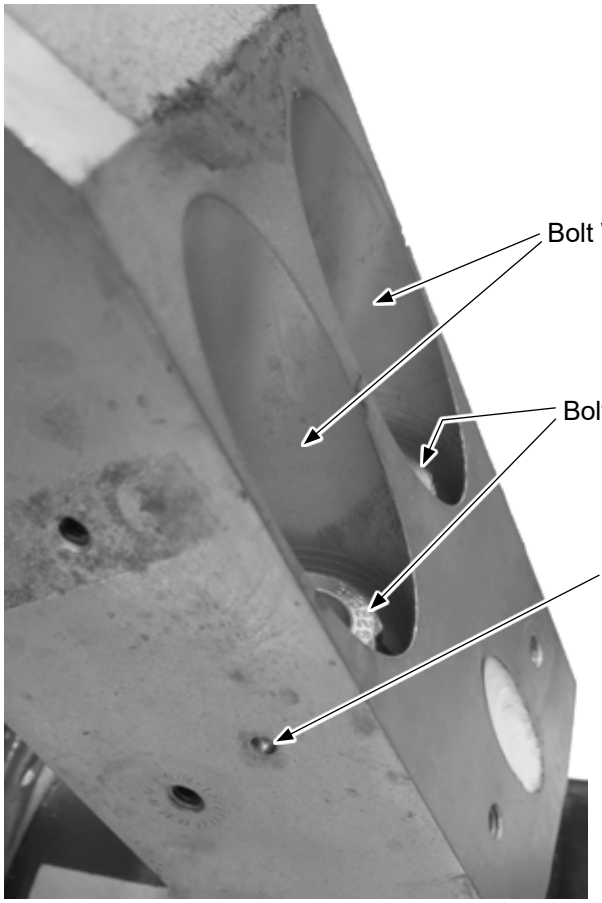
A. Application Intervals

(1) The bolt-on, steel counterweights on propellers manufactured after the release date of Service Letter HC-SL-61-364 dated April, 3, 2020 will be coated with corrosion inhibitor CM352 by Hartzell Propeller Inc. during the assembly process.

(a) Corrosion inhibitor CM352 is applied to prevent corrosion on the counterweight.

(b) Periodic re-application of the corrosion inhibitor CM352 will provide extended protection from corrosion.

1 Hartzell Propeller Inc. recommends re-application of the corrosion inhibitor CM352 at regularly scheduled intervals, similar to the lubrication interval specified in this propeller owner’s manual.



Applying Corrosion Inhibitor CM352
Figure 6-4

B. Application Procedure

(1) Remove the spinner dome in accordance with the Installation and Removal chapter of this manual.

CAUTION: DO NOT APPLY CORROSION INHIBITOR CM352 ONTO ICE PROTECTION SYSTEM COMPONENTS (TERMINAL STRIPS, BOOTS, HARNESSES, ETC.).

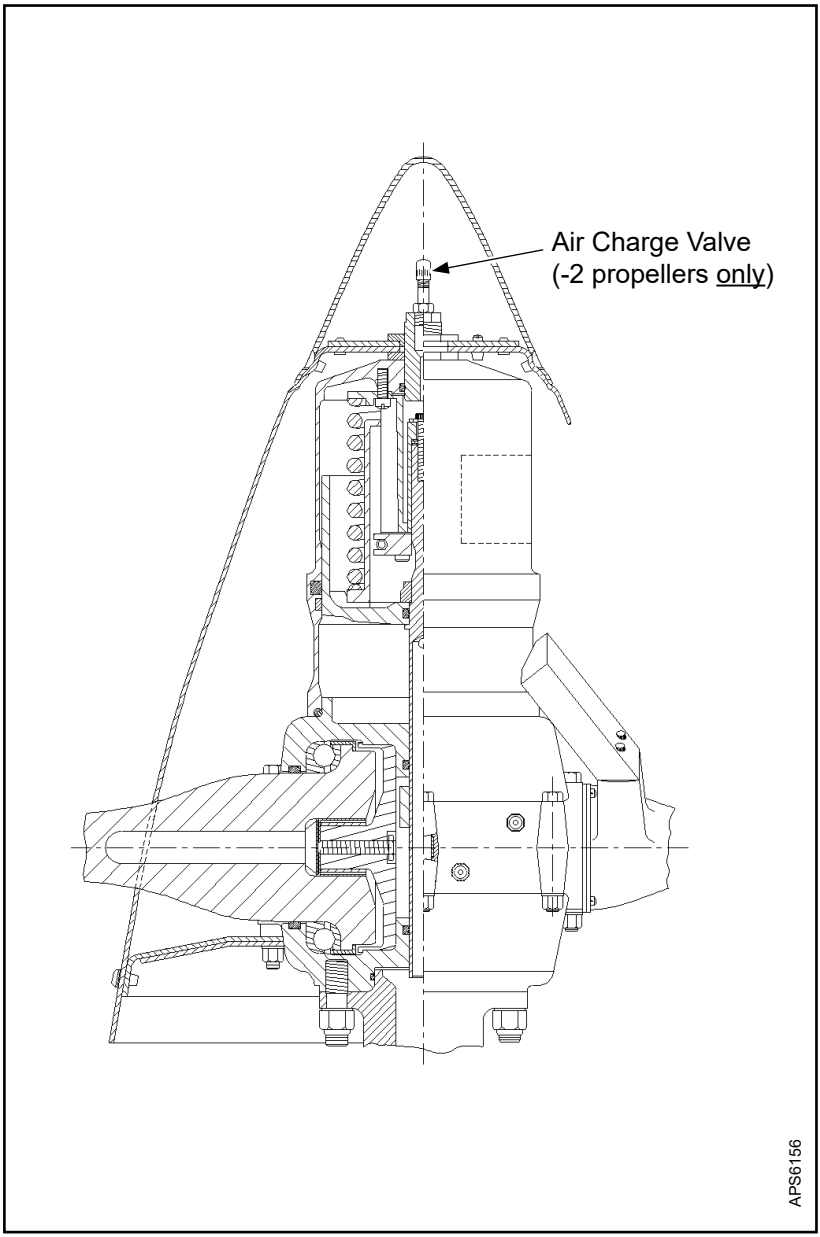
(2) Spray the corrosion inhibitor CM352 into a cup or container, then use a soft bristled brush to apply the corrosion inhibitor CM352 to the bolt heads, spring pins, and bolt wells of the counterweight. Refer to Figure 6-4.

(a) Use caution when applying the corrosion inhibitor CM352 around ice protection system components (terminal strips, boots, harnesses, etc.).

(b) Make sure the bolt heads, spring pins, and bolt wells are completely covered by the corrosion inhibitor CM352.

(c) Optionally, corrosion inhibitor CM352 can be applied to all exposed surfaces of the counterweight.

(3) Let the corrosion inhibitor CM352 cure for a minimum of three hours before flight.



Air Charge Valve Location
Figure 6-5

4. Air Charge (-2 Propellers)

A. Charging the Propeller

WARNING: DO NOT CHARGE THE CYLINDER OR MEASURE THE AIR CHARGE ON A PROPELLER THAT IS IN FEATHER POSITION.

(1) Examine the propeller to make sure that it is positioned on the start locks.

(2) Using proper control, charge the cylinder with dry air or nitrogen.

(a) The air charge valve is located on the cylinder as indicated in Figure 6-5.

(b) Nitrogen is the preferred charging medium.

(c) The proper charge pressure is identified in Table 6-1 in this chapter.

°F	°C	P.S.I.	Bar
100 to 70	38 to 21	41	2.9
40 to 70	4 to 21	38	2.6
0 to 40	-18 to 4	36	2.5
-30 to 0	-34 to -18	33	2.3

Air Charge Pressure
Table 6-1

5. Composite Blades (Rev. 1)
   A. Inspection Requirements
      (1) Perform inspections (pre-flight, periodic, lightning strike, etc.) in accordance with the Inspection and Check chapter of this manual.
   B. Damage Evaluation and Repair Limits
      (1) Any defects or damage to a composite blade must be evaluated in accordance with Hartzell Propeller Inc. Composite Propeller Blade Field Maintenance and Minor Repair Manual 170 (61-13-70) to determine if repairs are required before further flight.
         (a) Airworthy damage does not require repair before further flight, but should be repaired as soon as possible to prevent degradation of the damage.
         (b) Unairworthy damage must be repaired before further flight.
   C. Blade Repairs
      (1) For personnel requirements and procedures for composite blade repairs, refer to Hartzell Propeller Inc. Composite Propeller Blade Field Maintenance and Minor Repair Manual 170 (61-13-70).

6. Aluminum Blades (Rev. 2)

WARNING: NICKS, GOUGES, OR SCRATCHES OF ANY SIZE CAN CREATE A STRESS RISER THAT COULD POTENTIALLY LEAD TO BLADE CRACKING. ALL DAMAGE SHOULD BE VISUALLY EXAMINED CAREFULLY BEFORE OPERATION FOR THE PRESENCE OF CRACKS OR OTHER ABNORMALITIES.

CAUTION 1: BLADES THAT HAVE BEEN PREVIOUSLY REPAIRED OR OVERHAULED MAY HAVE BEEN DIMENSIONALLY REDUCED. BEFORE REPAIRING SIGNIFICANT DAMAGE OR MAKING REPAIRS ON BLADES THAT ARE APPROACHING SERVICEABLE LIMITS, CONTACT A CERTIFIED PROPELLER REPAIR STATION WITH THE APPROPRIATE RATING OR THE HARTZELL PRODUCT SUPPORT DEPARTMENT FOR BLADE DIMENSIONAL LIMITS.

CAUTION 2: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. Important Information

(1) Nicks, gouges, and scratches on blade surfaces or on the leading or trailing edges of the blade, that are greater than 0.031 inch (0.79 mm) wide or deep, must be removed before operation.

(2) Field repair of small nicks and scratches may be performed by qualified personnel in accordance with FAA Advisory Circular 43.13-1B, and the procedures specified in this section.

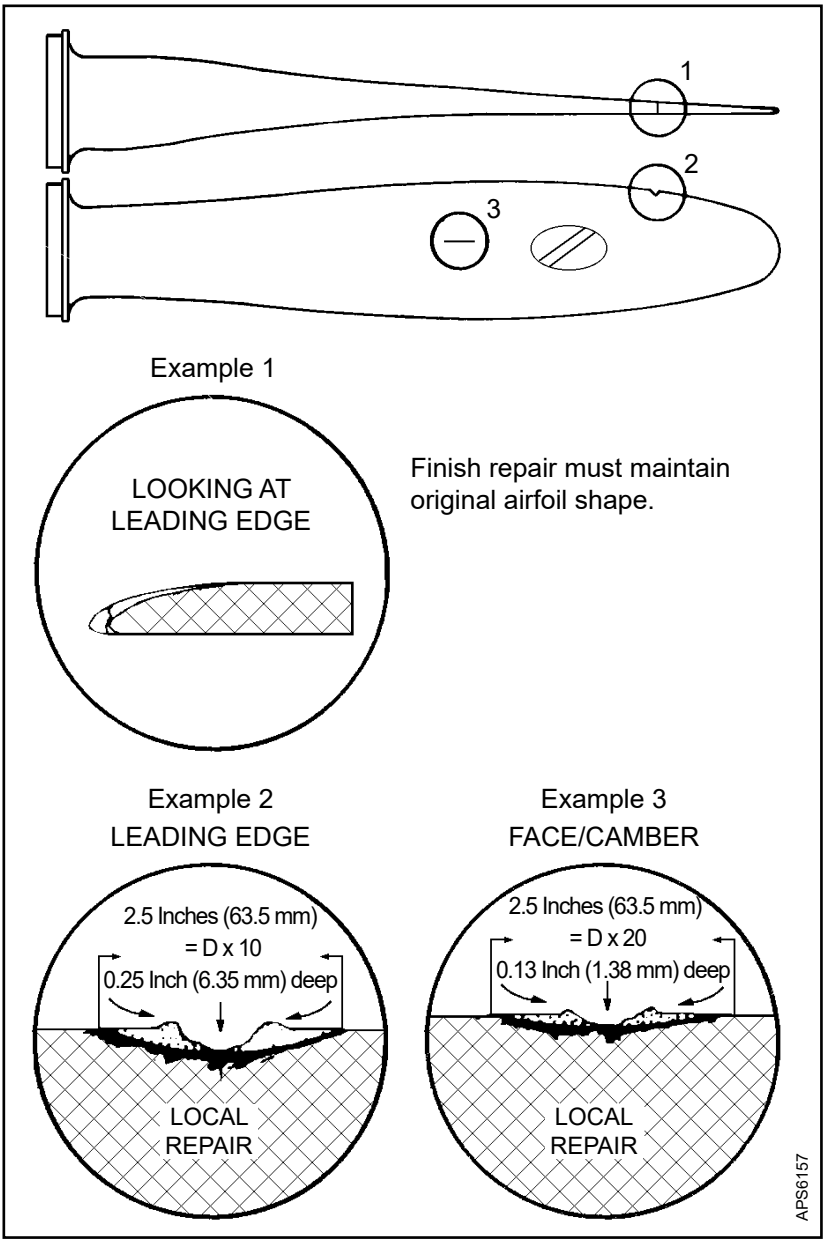
(3) Normal erosion (sand-blasted appearance) on the leading edge of the blade is acceptable, and does not require removal before further operation.

B. Repair of Nicks and Gouges

(1) Local repairs may be made using files, electrical or air powered equipment. Use emery cloth, scotch brite, and crocus cloth for final finishing.

CAUTION 1: ANY REPAIR THAT INVOLVES COLD WORKING THE METAL, RESULTING IN CONCEALMENT OF A DAMAGED AREA, IS NOT PERMITTED. A STRESS CONCENTRATION MAY EXIST THAT CAN RESULT IN A BLADE FAILURE.

CAUTION 2: SHOT PEENED BLADES ARE IDENTIFIED WITH AN “S” IMMEDIATELY FOLLOWING THE BLADE MODEL NUMBER, AS DESCRIBED IN THE DESCRIPTION AND OPERATION CHAPTER OF THIS MANUAL. BLADES THAT HAVE DAMAGE IN SHOT PEENED AREAS IN EXCESS OF 0.015 INCH (0.38 mm) DEEP ON THE FACE OR CAMBER OR 0.250 INCH (6.35 mm) ON THE LEADING OR TRAILING EDGES MUST BE REMOVED FROM SERVICE, AND THE REWORKED AREA SHOT PEENED BEFORE FURTHER FLIGHT. SHOT PEENING OF AN ALUMINUM BLADE MUST BE ACCOMPLISHED BY A CERTIFIED PROPELLER REPAIR STATION WITH THE APPROPRIATE RATING IN ACCORDANCE WITH HARTZELL ALUMINUM BLADE OVERHAUL MANUAL 133C (61-13-33).



Aluminum Blade Repair Limits
Figure 6-6

(2) Calculate the area of repair using Figure 6-6 and the following formulas:

(a) For leading and trailing edge damage:
Depth of the damage x 10. Refer to Example 2.

NOTE: The leading edge includes the first 10% of chord from the leading edge. The trailing edge consists of the last 20% of chord adjacent to the trailing edge.

(b) For face and camber side damage:
Depth of damage x 20. Refer to Example 3.

(3) Repair damage to the leading or trailing edge of the blade by removing material from the bottom of the damaged area.

(a) Remove material from this point out to both sides of the damage to form a smooth, blended depression that maintains the original shape of the blade airfoil.

(4) Repair damage to the blade face or camber side by removing material from the bottom of the damaged area.

(a) Remove material from this point out to both sides of the damage to form a smooth, blended depression that maintains the original shape of the blade airfoil.

(b) Repairs that form a continuous line across the blade section (chordwise) are not permitted.

(5) After filing or sanding the damaged area, use emery cloth to polish the area, then remove any file marks using crocus cloth.

(6) Inspect the repaired area with a 10X magnifying glass.

(a) Be sure that no indication of the damage, file marks, or coarse surface finish remain.

(7) If inspections show any remaining blade damage, repeat steps (5) and (6) of this procedure until no damage remains.

(8) After repair, Hartzell Propeller Inc. recommends penetrant inspection of the blade in accordance with Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(9) Treat the repaired area to prevent corrosion. Properly apply chemical conversion coating and approved paint to the repaired area before returning the blade to service.

(a) Refer to the section, “Blade Paint Touch-Up” in this chapter.

C. Repair of Bent Blades

CAUTION: DO NOT ATTEMPT TO “PRE-STRAIGHTEN” A BLADE BEFORE DELIVERY TO AN APPROPRIATELY CERTIFIED PROPELLER REPAIR STATION. THIS WILL CAUSE THE BLADE TO BE REPLACED BY THE REPAIR FACILITY.

(1) Repair of a bent blade or blades is considered a major repair. This type of repair must be accomplished by an appropriately certified propeller repair station, and only within approved guidelines.

7. Blade Paint Touch-Up (Rev. 2)

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. Important Information

(1) Blade paint touch-up on Hartzell propeller blades may be permitted when performed in accordance with the instructions in this section.

(a) Composite Blades Only:

1 If the area to be painted is less than 10 sq.inches (6451.6 sq. mm), blade paint touch-up is permitted.

2 If the area to be painted is greater than 10 sq. inches (6451.6 sq. mm), blade paint touch-up is not permitted.

a Areas greater than 10 sq. inches (6451.6 sq. mm) require the entire blade to be repainted by a certified propeller repair station with the appropriate rating.

(b) Aluminum Blades Only:

1 Blade paint touch-up is permitted for any size area on an aluminum blade.

B. Paint

(1) The paints listed in Table 6-2 have been tested by Hartzell Propeller Inc. and are recommended for blade touch-up.

(a) Alternate paints may be used for blade touch-up, but Hartzell Propeller Inc. accepts no responsibility for wear or adhesion-related issues.

(2) Touch-up paint manufacturer's contact information:

(a) **Tempo Products Company**
A Plasti-kote Company
1000 Lake Road
Medina, OH 44256
Tel: 800.321.6300
Fax: 216.349.4241
Cage Code: 07708

(b) **Sherwin-Williams Company**
Refer to the Sherwin-Williams
Product Finishes Global Finishes Group website at:
http://oem.sherwin-williams.com

Vendor	Color/Type	Vendor P/N	Hartzell Propeller Inc. P/N
Tempo	Epoxy Black	A-150	A-6741-145-2
Tempo	Epoxy Gray	A-151	A-6741-146-2
Tempo	Epoxy White (tip stripe)	A-152	A-6741-147-2
Tempo	Epoxy Red (tip stripe)	A-153	A-6741-149-2
Tempo	Epoxy Yellow (tip stripe)	A-154	A-6741-150-2
Sherwin-Williams	Black	F75KXB9958-4311	A-6741-145-1
Sherwin-Williams	Gray	F75KXA10445-4311	A-6741-146-1
Sherwin-Williams	Gray Metallic	F75KXM9754-4311	A-6741-148-1
Sherwin-Williams	White (tip stripe)	F75KXW10309-4311	A-6741-147-1
Sherwin-Williams	Red (tip stripe)	F75KXR12320-4311	A-6741-149-1
Sherwin-Williams	Yellow (tip stripe)	F75KXY11841-4311	A-6741-150-1
Sherwin-Williams	Silver Metallic	F63TXS30880-4311	A-6741-163-1
Sherwin-Williams	Silver	F75KXS13564-4311	A-6741-190-1
Sherwin-Williams	Bright Red	1326305 or F63TXR16285-4311	A-6741-200-5
Sherwin-Williams	Bright Yellow	1326313 or F63TXY16286-4311	A-6741-201-5
Sherwin-Williams	Bright Silver	1334259	A-6741-203-5
Sherwin-Williams	Prop Gold	F63TXS17221-4311	A-6741-204-5

Touch-up Paints
Table 6-2

C. Procedure

WARNING: CLEANING AGENTS (ACETONE, #700 LACQUER THINNER, AND MEK), ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT. USE IN WELL VENTILATED AREA.

CAUTION: ANY REFINISHING PROCEDURE CAN ALTER PROPELLER BALANCE. PROPELLERS THAT ARE OUT OF BALANCE MAY EXPERIENCE EXCESSIVE VIBRATIONS WHILE IN OPERATION.

(1) Using a clean cloth moistened with acetone, #700 lacquer thinner, or MEK, wipe the surface of the blade to remove any contaminants.

(2) Permit the solvent to evaporate.

CAUTION 1: EXCESSIVE SANDING ON COMPOSITE BLADES WILL CAUSE "FUZZING" OF THE KEVLAR® MATERIAL. THIS CAN RESULT IN A ROUGH FINISH AND/OR DAMAGE TO THE BLADE.

CAUTION 2: BE SURE TO SAND/FEATHER THE EXISTING COATINGS TO PREVENT EXCESSIVE PAINT BUILDUP.

(3) Using 120 to 180 grit sandpaper, sand to feather the existing coatings away from the eroded or repaired area.

(a) Erosion damage is typically very similar on all blades in a propeller assembly. If one blade has more extensive damage, e.g. in the tip area, sand all the blades in the tip area to replicate the repair of the most severely damaged blade tip. This practice is essential in maintaining balance after refinishing.

(4) Using acetone, #700 lacquer thinner, or MEK, wipe the surface of the blade.

(5) Permit the solvent to evaporate.

(6) Aluminum Blades Only:

(a) Apply an approved corrosion preventative coating to the bare aluminum surface of the blade in accordance with the manufacturer's instructions.

1 Oakite 31, Chromicote L-25, or Alodine 1201 are approved chemical conversion coatings.

(7) Apply masking material to the erosion shield and tip stripes, as needed.

WARNING: FINISH COATINGS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT. USE IN A WELL VENTILATED AREA.

CAUTION: APPLY FINISH COATING TO UNIFORMLY COVER THE REPAIR/ EROSION. AVOID EXCESSIVE PAINT BUILDUP ALONG THE TRAILING EDGE TO AVOID CHANGING THE BLADE PROFILE AND/OR P-STATIC CHARACTERISTICS.

(8) Apply a sufficient amount of finish coating to achieve 2 to 4 mils thickness when dry.

(a) Re-coat before 30 minutes, or after 48 hours.

(b) If the paint is permitted to dry longer than four hours, it must be lightly sanded before another coat is applied.

(9) Remove masking material from the tip stripes and re-apply masking material for the tip stripe refinishing if required.

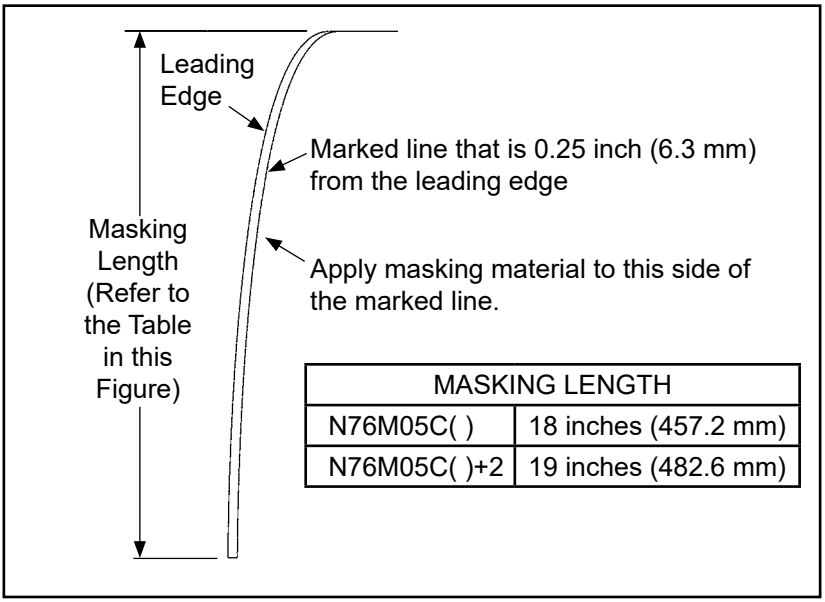
(10) Apply sufficient tip stripe coating to achieve 2 to 4 mils thickness when dry.

(a) Re-coat before 30 minutes, or after 48 hours.

(b) If the paint is permitted to dry longer than four hours, it must be lightly sanded before another coat is applied.

(11) Remove the masking material immediately from the tip stripes, if applicable.

(12) Optionally, perform dynamic balancing in accordance with the procedures and limitations specified in the Dynamic Balance section of this chapter.



MASKING LENGTH	
N76M05C( )	18 inches (457.2 mm)
N76M05C( )+2	19 inches (482.6 mm)

Removal of the Leading Edge Paint
Figure 6-7

D. Optional Removal of Leading Edge Paint for N76M05C( ) Blades

(1) Measure from the tip of the blade as shown in Figure 6-6.

(2) Make a marked line that is 0.25 inch (6.3 mm) from the leading edge along the area as shown in Figure 6-7.

(3) Apply masking material (electrical tape) along the marked line as shown in Figure 6-7.

(4) Using 240 grit or finer sandpaper, remove the paint and primer from the area between the leading edge and the masking material.

(5) Using 400 or finer grit sandpaper, sand the area between the leading edge and the masking material.

(6) Using a medium or fine abrasive pad, for example Scotchbrite®, finish the sanded area.

(7) Remove the masking material from the blade.

WARNING: CLEANING AGENTS (ACETONE, #700 LACQUER THINNER, AND MEK), ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION IS REQUIRED. AVOID PROLONGED CONTACT. USE IN WELL VENTILATED AREA.

(8) Using a clean cloth moistened with acetone, #700 lacquer thinner, or MEK, wipe the blade clean.

8. Dynamic Balance

A. Overview

CAUTION: IF REFLECTIVE TAPE IS USED FOR DYNAMIC BALANCING, REMOVE THE TAPE IMMEDIATELY AFTER BALANCING IS COMPLETED.

NOTE: Dynamic balance is recommended to reduce vibrations that may be caused by a rotating system (propeller and engine) imbalance. Dynamic balancing can help prolong the life of the propeller, engine, craft, and avionics.

(1) Dynamic balance is accomplished by using an accurate means of measuring the amount and location of the dynamic imbalance.

(2) The number of balance weights installed must not exceed the limits specified in this chapter.

(3) Follow the dynamic balance equipment manufacturer’s instructions for dynamic balance in addition to the specifications in this chapter.

NOTE: Some engine manufacturers' instructions also contain information about dynamic balance limits.

B. Inspection Procedures Before Balancing

(1) Visually inspect the propeller assembly before dynamic balancing.

NOTE: The first run-up of a new or overhauled propeller assembly may leave a small amount of grease on the blades and inner surface of the spinner dome.

(a) Using Stoddard solvent (or equivalent), completely remove any grease on the blades or inner surface of the spinner dome.

(b) Visually examine each propeller blade assembly for evidence of grease leakage.

(c) Visually examine the inner surface of the spinner dome for evidence of grease leakage.

(2) If there is no evidence of grease leakage, lubricate the propeller in accordance with the Maintenance Practices chapter in this manual. If grease leakage is evident, determine the location of the leak and correct before re-lubricating the propeller.

(3) Before dynamic balancing, record the number and location of all balance weights.

(4) Static balance is accomplished at a propeller overhaul facility when an overhaul or major repair is performed.

NOTE: If static balancing is not accomplished before dynamic balancing, the propeller may be so severely unbalanced that dynamic balance may be unachievable because of measurement equipment limitations.

C. Modifying Spinner Bulkhead to Accommodate Dynamic Balance Weights

CAUTION: ALL HOLE/BALANCE WEIGHT LOCATIONS MUST TAKE INTO CONSIDERATION, AND MUST AVOID, ANY POSSIBILITY OF INTERFERING WITH THE ADJACENT CRAFT, PROPELLER ICE PROTECTION SYSTEM, AND ENGINE COMPONENTS.

(1) It is recommended that balance weights be placed in a radial location on aluminum spinner bulkheads that have not been previously drilled.

(2) The radial location should be outboard of the de-ice slip ring or bulkhead doubler and inboard of the bend where the bulkhead creates the flange surface to attach the spinner dome.

(3) Twelve equally spaced locations are recommended for weight attachment.

(4) Installing nut plates (10-32 thread) of the type used to attach the spinner dome will permit convenient balance weight attachment on the engine side of the bulkhead.

(5) Alternatively, drilling holes for use with the AN3-( ) type bolts with self-locking nuts is permitted.

(6) Chadwick-Helmuth Manual AW-9611-2, “The Smooth Propeller”, specifies several generic bulkhead rework procedures. These are permitted if they comply with the conditions specified herein.

D. Placement of Balance Weights for Dynamic Balance

(1) The preferred method of attachment of dynamic balance weights is to add the weights to the spinner bulkhead.

NOTE: Many spinner bulkheads have factory installed self-locking nut plates provided for this purpose.

(2) If the location of static balance weights has not been altered, subsequent removal of the dynamic balance weights will return the propeller to its original static balance condition.

(3) Use only stainless or plated steel washers as dynamic balance weights on the spinner bulkhead.

(4) Do not exceed a maximum weight per location of 0.9 oz. (25.5 g).

NOTE: This is approximately equal to six AN970 style washers (0.188 inch ID, 0.875 inch OD, 0.063 inch thickness) (4.78 mm ID, 22.23 mm OD, 1.60 mm thickness).

(5) Install weights using craft quality #10-32 or AN-3( ) type screws or bolts.

(6) Balance weight screws attached to the spinner bulkhead must protrude through the self-locking nuts or nut plates a minimum of one thread and a maximum of four threads.

(a) It may be necessary to alter the number and\ or location of static balance weights to achieve dynamic balance.

(7) Unless otherwise specified by the engine or craft manufacturer, Hartzell Propeller Inc. recommends that the propeller be dynamically balanced to a reading of 0.2 IPS, or less.

(8) If reflective tape is used for dynamic balancing, remove the tape immediately after balancing is completed.

(9) Make a record in the propeller logbook of the number and location of dynamic balance weights, and static balance weights if they have been reconfigured.

9. Propeller Low Pitch Setting

WARNING 1: RPM ADJUSTMENTS MUST BE MADE WITH REFERENCE TO A CALIBRATED TACHOMETER. CRAFT MECHANICAL TACHOMETERS DEVELOP ERRORS OVER TIME, AND SHOULD BE PERIODICALLY RECALIBRATED TO MAKE SURE THE PROPER RPM IS DISPLAYED.

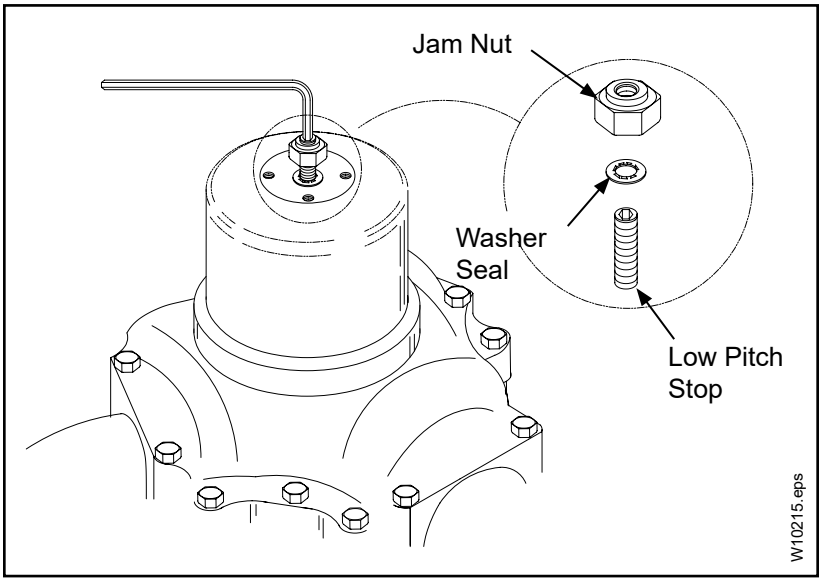
WARNING 2: LOW PITCH BLADE ANGLE ADJUSTMENTS MUST BE MADE IN ACCORDANCE WITH THE APPLICABLE TYPE CERTIFICATE OR SUPPLEMENTAL TYPE CERTIFICATE HOLDER'S MAINTENANCE DATA.

A. Low Pitch Stop - All Propeller Models

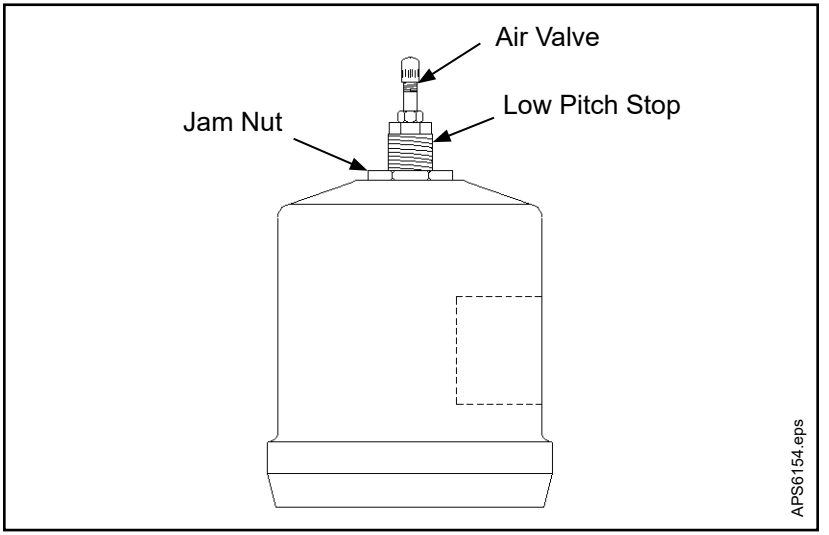
(1) The propeller low pitch stop is set at the factory and should not require any additional adjustment. The required low pitch stop blade angle is listed on the propeller's Installation Data Sheet (IDS) and may also provide the acceptable RPM range for a maximum power static condition. Be aware that the static RPM may be specified to be less than the RPM to which the engine is rated.

(2) An overspeed at the maximum power static condition may indicate that the propeller low-pitch blade angle is set too low and that the governor is improperly adjusted.

(3) An underspeed during the maximum power static condition may be caused by any one or a combination of the following: The propeller low pitch blade angle is too high; the governor is improperly adjusted; the engine is not producing rated power.



Low Pitch Stop Adjustment (-1)
Figure 6-8



Low Pitch Stop Adjustment (-2)
Figure 6-9

B. Max. RPM (Static) Low Pitch Stop Adjustment

WARNING: SIGNIFICANT ADJUSTMENT OF THE LOW PITCH STOP TO ACHIEVE THE SPECIFIED STATIC RPM MAY MASK AN ENGINE POWER PROBLEM.

Refer to the following applicable procedure for accomplishing an adjustment to the low pitch angle:

(1) Non-Feathering (-1) Low Pitch Stop Adjustment

(a) Refer to Figure 6-8. Loosen the jam nut while holding the low pitch stop with an allen wrench to prevent the low pitch stop from turning as the jam nut is loosened. Turning the low pitch stop in will increase blade pitch to reduce RPM, and turning the low pitch stop out will lower blade pitch and increase RPM. The low pitch stop has 24 threads per inch.

1 Turning the stop 3/4 of a turn (0.030 inch [0.76 mm] of linear travel) will change the blade pitch by approximately one degree. One degree of blade pitch will change engine RPM by approximately 140-150 RPM.

2 Turning the low pitch stop screw one revolution equals 0.042 inch (1.06 mm) of linear travel, and results in approximately 1.4 degree blade angle change. This blade angle change results in an RPM increase/decrease of approximately 200 RPM.

WARNING: A MINIMUM OF FIVE THREADS IN THE CYLINDER MUST ENGAGE THE LOW PITCH STOP AFTER ADJUSTMENT IS COMPLETED.

(b) When the low pitch stop is adjusted, torque the low pitch stop jam nut in accordance with Torque Table 3-2.

(c) Repeat the Static RPM Check in the Testing and Troubleshooting chapter of this manual.

(2) Feathering (-2,) Low Pitch Stop Adjustment

WARNING: AIR PRESSURE (-2 PROPELLERS) MUST BE REDUCED TO 0 PSI BEFORE ANY LOW PITCH ADJUSTMENT MAY BE MADE.

(a) Refer to Figure 6-9. Loosen the jam nut while holding the low pitch stop with a second wrench to prevent the low pitch stop from turning as the jam nut is loosened. Turning the low pitch stop into the cylinder will increase blade pitch and reduce RPM, and turning the low pitch stop out of the cylinder will lower blade pitch and increase RPM. The low pitch stop has 20 threads per inch.

1 Turning the low pitch stop 2/3 of a turn (0.030 inch [0.762 mm] of linear travel) will change the blade pitch by approximately one degree. This blade angle change results in an RPM increase/decrease of approximately 140-150 RPM.

2 Turning the low pitch stop screw one full turn (0.050 inch [1.27 mm] of linear travel) will change the blade pitch approximately 1.7 degree. This blade angle change results in an RPM increase/decrease of approximately 250 RPM.

WARNING: A MINIMUM OF FIVE THREADS IN THE CYLINDER MUST ENGAGE THE LOW PITCH STOP AFTER ADJUSTMENT IS COMPLETED.

(b) When the low pitch stop is adjusted, torque the low pitch stop jam nut in accordance with the Torque Table.

(c) Repeat the Static RPM Check in the Testing and Troubleshooting chapter of this manual.

10. Propeller High Pitch Settings
    A. High Pitch (Minimum RPM) Stop Adjustment
        (1) The high pitch stop is set by Hartzell Propeller Inc. in accordance with the craft manufacturer's recommendations.
        (2) The high pitch stops can only be adjusted by Hartzell or by an appropriately certified propeller repair station.
11. Feathering Pitch Stop Settings (Rev. 1)
    A. Feathering Pitch Stop Adjustment
        (1) The feathering pitch stop is set by Hartzell Propeller Inc. in accordance with the aircraft manufacturer’s recommendations.
        (2) The feathering pitch stop can only be adjusted by Hartzell or by a certified propeller repair station with the appropriate rating.
12. Reverse Pitch Stop Settings (Rev. 1)
    A. Reverse Pitch Stop Adjustment
        (1) The reverse pitch stop is set by Hartzell Propeller Inc. in accordance with the aircraft manufacturer’s recommendations.
        (2) The reverse pitch stop can only be adjusted by Hartzell or by a certified propeller repair station with the appropriate rating.
13. Start Lock Settings (Rev. 1)
    A. Start Lock Adjustment
        (1) The start locks are set by Hartzell Propeller Inc. in accordance with the craft manufacturer’s recommendations.
        (2) The start locks can only be adjusted by Hartzell or by an appropriately certified propeller repair station.

14. Erosion Tape on Composite Blades (Rev. 1)
    A. General
        (1) Some composite blades require erosion tape on the leading edge if there is no de-ice/anti-ice boot installed.
        (2) Refer to the Minor Repair chapter of Hartzell Propeller Inc. Composite Blade Field Maintenance and Minor Repair Manual 170 (61-13-70) for the following information:
            (a) Composite blade models that require erosion tape if no de-ice/anti-ice boot is installed
            (b) Erosion tape installation instructions

15. Tachometer Calibration (Rev. 1)

    WARNING: OPERATION WITH AN INACCURATE TACHOMETER CAN CAUSE RESTRICTED RPM OPERATION AND DAMAGING HIGH STRESSES. PROPELLER LIFE WILL BE SHORTENED AND COULD CAUSE CATASTROPHIC FAILURE.

    A. Important Information
        (1) All engine/propeller combinations have operating conditions at which the propeller blade stresses begin to reach design limits.
            (a) In most cases, these conditions occur above the maximum rated RPM of the engine.
            (b) Some engine/propeller combinations have certain ranges of RPM that are less than maximum engine speed, where stresses are at a level considered too high for continuous operation. This results in a restricted operating range where continuous operation is not permitted. A placard on the instrument panel or yellow arc on the tachometer will inform the pilot to avoid operation in this range.
            (c) In other cases, the limiting condition occurs at an RPM only slightly above the maximum engine RPM.
            (d) For these reasons, it is very important to accurately monitor engine speed.

(2) The accuracy of the tachometer is critical to the safe operation of the craft.

(a) Some tachometers have been found to be in error by as much as 200 RPM.

(b) Operating the craft with an inaccurate tachometer could cause continued operation at unacceptably high stresses, including repeatedly exceeding the maximum engine RPM.

(c) Continuous operation in a restricted RPM range subjects the propeller to stresses that are higher than the design limits.

(d) Stresses that are higher than the design limits will shorten the life of the propeller and could cause a catastrophic failure.

B. Tachometer Calibration

(1) 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).

(2) Contact Hartzell Propeller Inc. if the propeller was operated in a restricted RPM range because of a tachometer error.

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RECORDS - CONTENTS

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1. Record Keeping (Rev. 1)

   A. General

      (1) It is important to keep all records of repairs, adjustments, maintenance, or required inspections performed on a propeller or propeller system.

   B. Information to be Recorded

      (1) Refer to the applicable certification agency's regulations for a list of information that must be recorded.

      (2) The logbook may also be used to record:

         (a) Propeller position (on craft)

         (b) Propeller model

         (c) Propeller serial number

         (d) Blade design number

         (e) Blade serial numbers

         (f) Spinner assembly part number

         (g) Propeller pitch range

         (h) Craft information (craft type, model, serial number and registration number).

   C. Blade Damage Repair Sheets

      NOTE: The use of the Blade Damage Repair Sheets in this chapter is at the discretion of the user.

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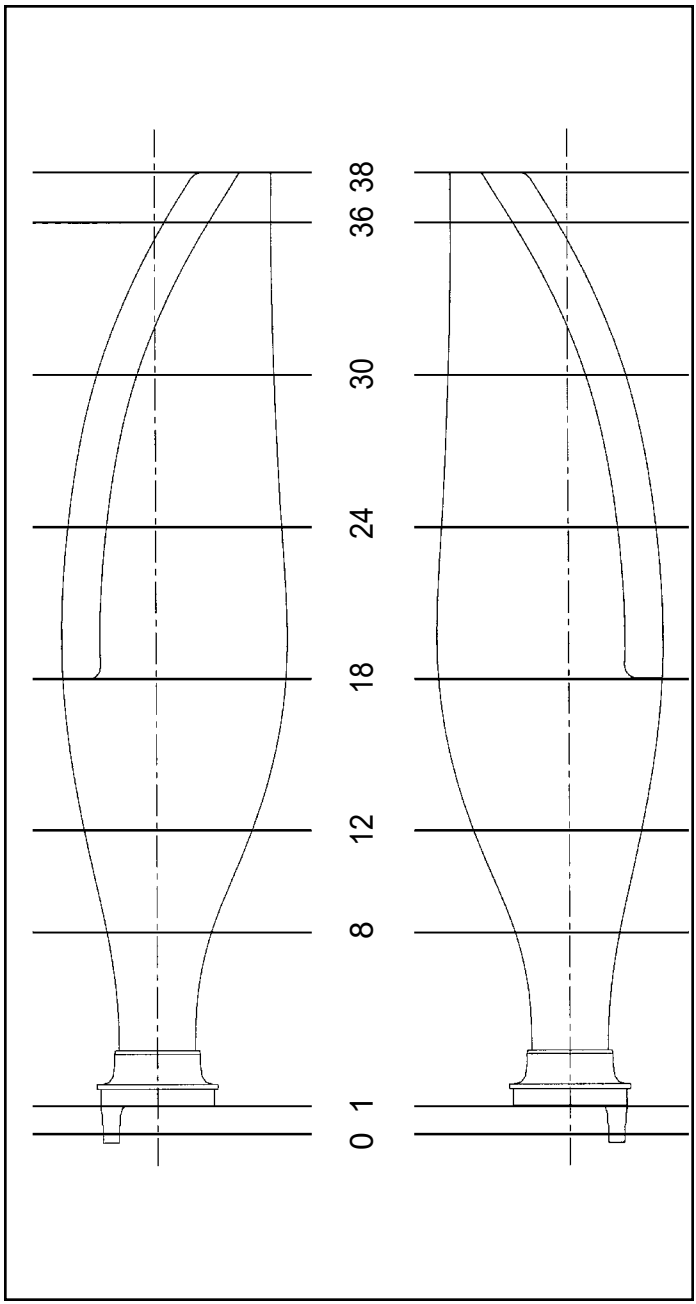
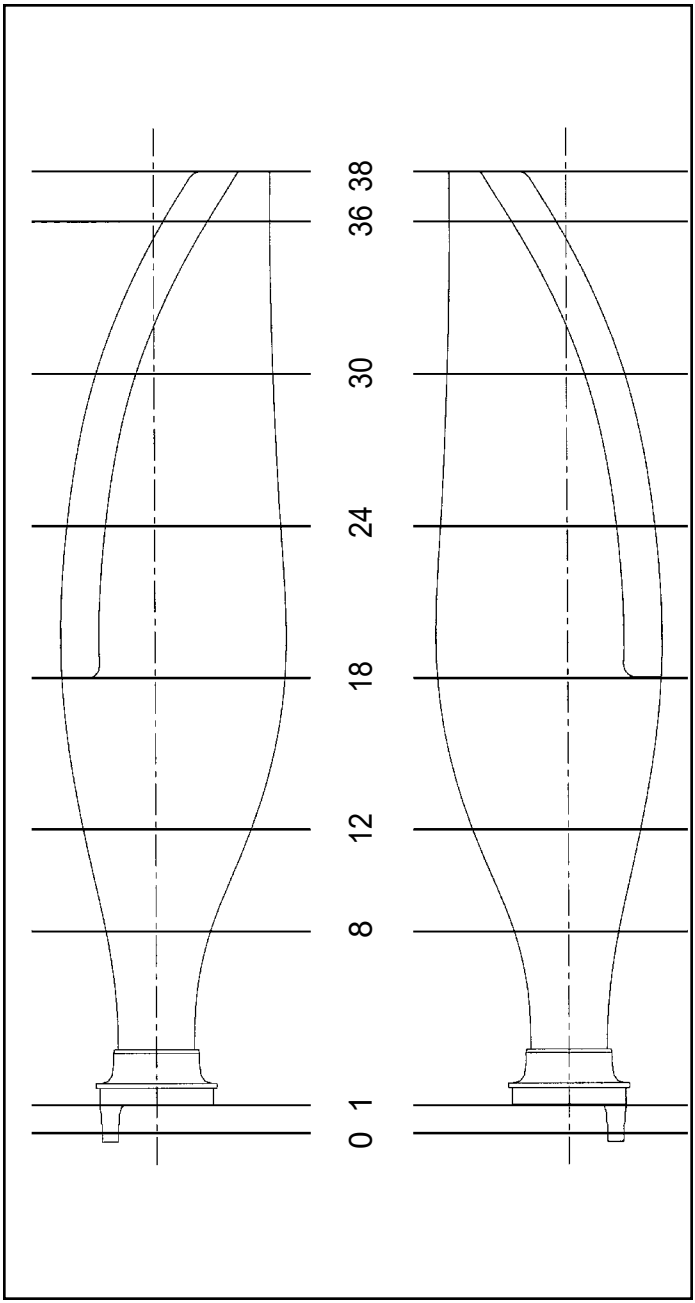
Record of N76M05C( ) Composite Blade Damage Repair

Blade Serial No. _____



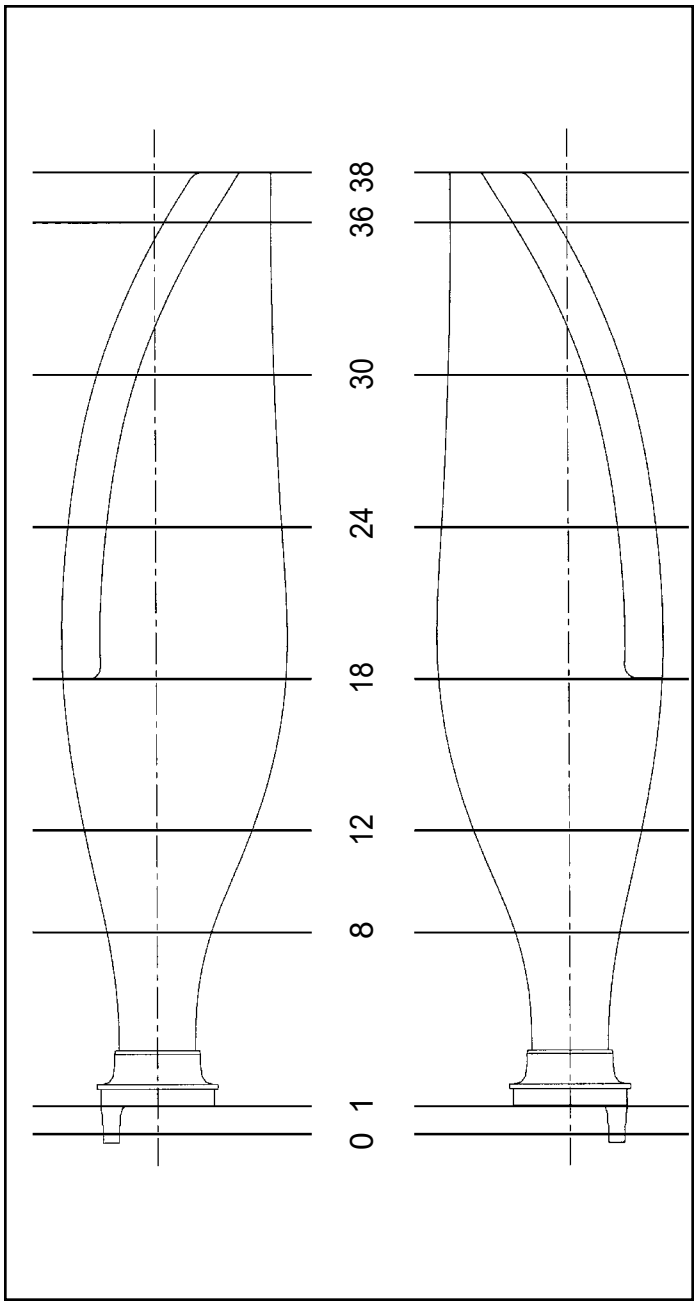
Record of N760M5C( ) Composite Blade Damage Repair

Blade Serial No. _____



Record of N76M05C( ) Composite Blade Damage Repair

Blade Serial No. _____



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