Manual No. 167
61-00-67
Revision 4
March 2021

Propeller Owner's Manual
and Logbook

Steel Hub Reciprocating Propellers with Aluminum Blades

Three Blade	Four Blade
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Product Support Fax: 937-778-4215

As a fellow pilot, I urge you to read this Manual thoroughly. It contains a wealth of information about your new propeller.

The propeller is among the most reliable components of your airplane. It is also among the most critical to flight safety. It therefore deserves the care and maintenance called for in this Manual. Please give it your attention, especially the section dealing with Inspections and Checks.

Thank you for choosing a Hartzell propeller. Properly maintained it will give you many years of reliable service.

Jim Brown
Chairman, Hartzell Propeller Inc.

WARNING (Rev. 2)

People who fly 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 aircraft. A mechanical failure of the propeller could cause a forced landing or create vibrations sufficiently severe to damage the aircraft, 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 certified as being safe to operate on an airplane, 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 aircraft 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 aircraft control.

Hartzell Propeller Inc. follows FAA regulations for propeller certification on certificated aircraft. Experimental aircraft 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.

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REVISION 4 HIGHLIGHTS

Revision 4, dated March 2021 is a major revision distributed in its entirety.

REVISIONS 4 HIGHLIGHTS

1. Introduction

   A. General

   (1) This is a list of current revisions that have been issued against this manual. Please compare it to the RECORD OF REVISIONS page to make sure 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	March/00	New Issue
Rev. 1	Apr/06	Minor Revision
Rev. 2	Aug/11	Minor Revision
Rev. 3	Jun/14	Minor Revision
Rev. 4	Mar/21	Major Revision

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RECORD OF REVISIONS

This is a record of revisions inserted into this manual.

Rev. No.	Issue Date	Date Inserted	Inserted By
1	Apr/06	Apr/06	HPI
2	Aug/11	Aug/11	HPI
3	Jun/14	Jun/14	HPI
4	Mar/21	Mar/21	HPI

RECORD OF REVISIONS

This is a record of revisions inserted into this manual.

Rev. No.	Issue Date	Date Inserted	Inserted By

RECORD OF TEMPORARY REVISIONS

TR No.	Issue Date	Date Inserted	Inserted By	Date Removed	Removed By
TR-001	May/02	May/02	HPI	Apr/06	HPI
TR-002	May/02	May/02	HPI	Apr/06	HPI
TR-003	Nov/03	Nov/03	HPI	Apr/06	HPI
TR-004	May/04	May/04	HPI	Apr/06	HPI

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 A 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
Service Letter No. 93	Rev. 1, Apr/06
HC-SL-61-185, Rev. 3	Revision 4, Mar/21
HC-SL-61-364	Revision 4, Mar/21

SERVICE DOCUMENTS LIST

Service Document Number	Incorporation Rev/Date

AIRWORTHINESS LIMITATIONS

The Airworthiness Limitations section is FAA approved and specifies maintenance required under 14 CFR §§ 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

FAA APPROVED

by: ______________________ date: AUG 17 2010

Manager, Chicago Aircraft Certification Office,
ACE-115C
Federal Aviation Administration

Rev. No.	Description of Revision
2	Relocated Airworthiness Limitations pages from Manual 177

AIRWORTHINESS LIMITATIONS

1. The FAA establishes 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 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 aircraft/engine/propeller combinations listed and continues regardless of subsequent installations (that may or may not be life limited).
   A. Propeller models affected by this manual currently do not have any life limited parts.
   B. There are no new (or additional) Airworthiness Limitations associated with this equipment and/or installation.

FAA APPROVED

by: ______________________ date: AUG 1 7 20[illegible]

for Manager, Chicago Aircraft Certification Office,
ACE-115C
Federal Aviation Administration

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INTRODUCTION - CONTENTS

INTRODUCTION - CONTENTS, continued

1. General (Rev. 1)

A. Statement of Purpose

(1) This manual has been reviewed and accepted by the FAA. Additionally, the Airworthiness Limitations section of this manual has been approved by the FAA.

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

(2) 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.

(3) 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.

(4) 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 aircraft 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 statically balanced. New propellers are statically balanced at Hartzell Propeller Inc. Overhauled propellers must be statically balanced by a certified propeller repair station with the appropriate rating before return to service.

(a) Dynamic balance is recommended, but may be accomplished at the discretion of the operator, unless specifically required by the airframe 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 aircraft 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 inch (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 airframe manufacturer's manuals should be used in addition to the information in this manual due to possible special requirements for specific aircraft applications.

(11) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information for the components can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(12) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(13) 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. Airframe or Engine Modifications (Rev. 1)

A. Propeller Stress Levels

(1) Propellers are approved vibrationwise on airframe and engine combinations based on tests or analysis of similar installations. This data has demonstrated that propeller stress levels are affected by airframe configuration, airspeed, weight, power, engine configuration, and approved flight maneuvers. Aircraft modifications that can effect 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, increasing or decreasing weight limits (less significant on piston engines), and the addition of approved flight maneuvers (utility and aerobatic).

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 aircraft.

3. <u>Restrictions and Placards</u> (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 aircraft model.

(b) Review the propeller and aircraft type certificate data sheet (TCDS), Pilot Operating Handbook (POH), and any applicable Airworthiness Directives 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 130B (61-23-30)	-	Mechanically Actuated Governors and Accessories Maintenance Manual
Manual 133C (61-13-33)	-	Aluminum Blade Overhaul Manual
Manual 148 (61-16-48)	-	Composite Spinner Maintenance Manual
Manual 159 (61-02-59)	Yes	Application Guide

Manual No. (ATA No.)	Available at www.hartzellprop.com	Hartzell Propeller Inc. Manual Title
Manual 165A (61-00-65)	Yes	Illustrated Tool and Equipment Manual
Manual 177 (61-10-77)	-	Steel Hub Reciprocating Propeller Overhaul and Maintenance 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

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 Aviation Authority) to accomplish the work in a safe and airworthy manner.

(2) Compliance to the applicable regulatory requirements established by the Federal Aviation Administration (FAA) or international equivalent 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 Federal Aviation Administration (FAA) or international equivalent.

(b) Refer to Federal Aviation Regulation (FAR) Part 43 for additional information about general aviation maintenance requirements.

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/or 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 the 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 HC-SL-61-61Y.

(3) Experience has shown that special care, such as keeping an aircraft 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. 1)

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 Airworthiness 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., flight time, or on calendar time.

(a) Overhaul intervals are specified in the applicable Hartzell Propeller Inc. propeller owner's manual and Hartzell Service Letter HC-SL-61-61Y.

(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. Airworthy/Unairworthy Damage

(1) Airworthy damage is a specific condition to a propeller component that is within the airworthy damage limits specified in the applicable Hartzell Propeller Inc. component maintenance manual.

(a) Airworthy damage does not affect the safety or flight characteristics of the propeller and conforms to its type design.

(b) Airworthy damage does not require repair before further flight, but should be repaired as soon as possible to prevent degradation of the damage.

(2) Unairworthy damage is a specific condition to a propeller component that exceeds the airworthy damage limits specified in the applicable Hartzell Propeller Inc. component maintenance manual.

(a) Unairworthy damage can affect the safety or flight characteristics of the propeller and does not conform to its type design.

(b) Unairworthy 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 aircraft 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 Federal Aviation Administration (FAA) or international equivalent.

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.
Attn: Technical Publications Department
One Propeller Place
Piqua, Ohio 45356-2634 U.S.A.

Telephone: 937.778.4200
Fax: 937.778.4215
E-mail: manuals@hartzellprop.com

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 corrode, 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
Dent	The permanent deflection of the cross section that is visible on both sides with no visible change in cross sectional thickness

Term	Definition
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
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

Term	Definition
Gouge	Surface area where material has been removed
Hazardous Propeller Effect	The hazardous propeller effects are defined in Title 14 CFR section 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
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

Term	Definition
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
Outboard	Toward the tip of the blade
Overhaul	The periodic disassembly, inspection, repair, refinish, and reassembly of a propeller assembly to maintain airworthiness

Term	Definition
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
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.

Term	Definition
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
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

Term	Definition
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 fiber 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
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

Term	Definition
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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DESCRIPTION AND OPERATION - CONTENTS

LIST OF FIGURES

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1. Description of Propeller and Systems

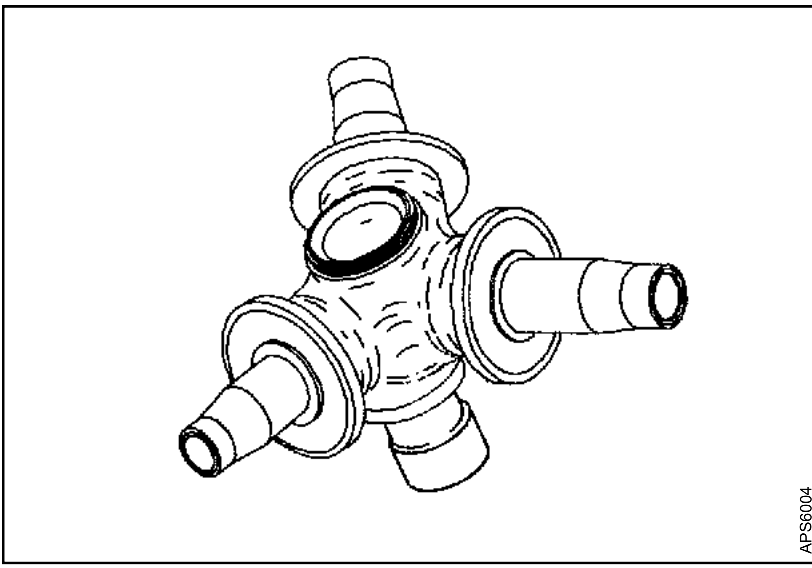
A. System Overview

Hartzell steel hub propellers are either ground adjustable or constant speed assemblies that use a steel hub as a central component (Figure 2-1).

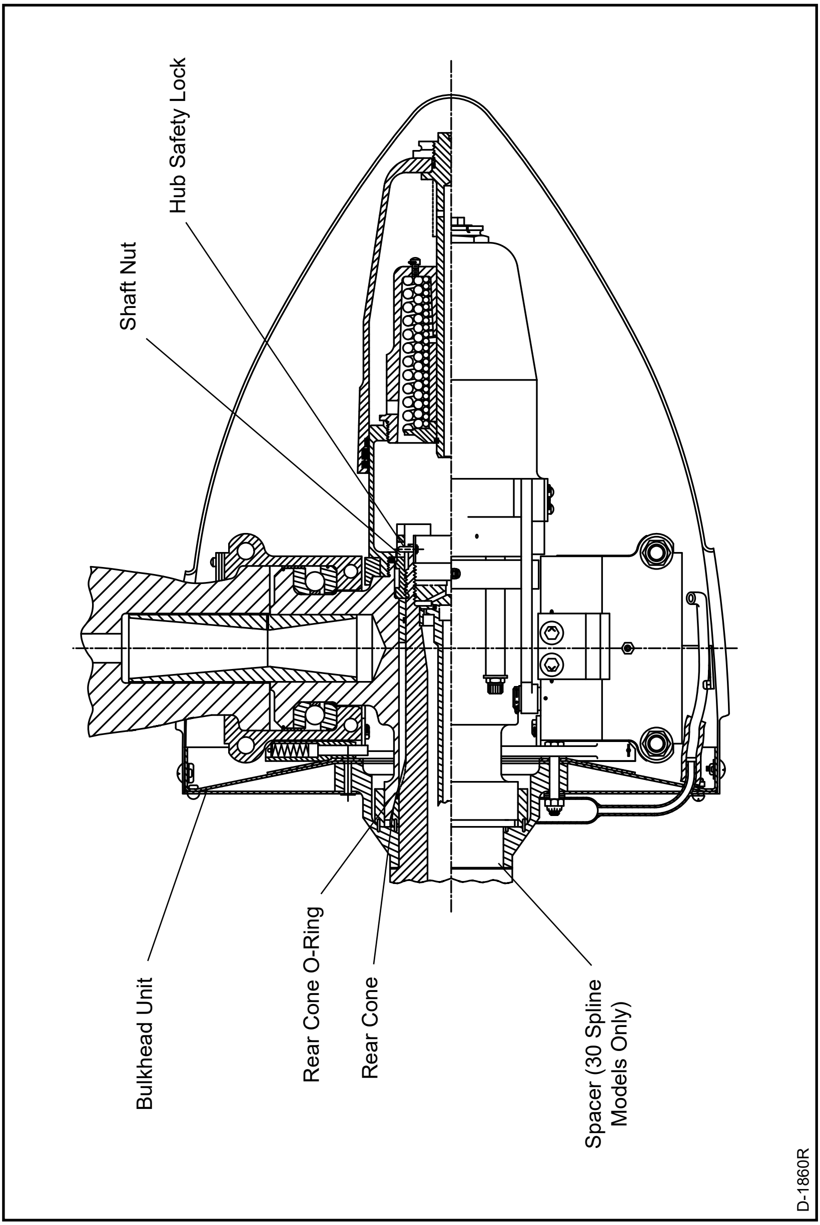
The propellers attach to the engine through either a splined shaft or one of several flanged designs. Spline shaft attachments use either a Society of Automotive Engineers (SAE) Number 20 or Number 30 spline (Figure 2-2).

NOTE: SAE Number 20 and SAE Number 30 spline shaft propellers will be identified simply as "20 spline shaft" and "30 spline shaft" propellers throughout the text of this manual.

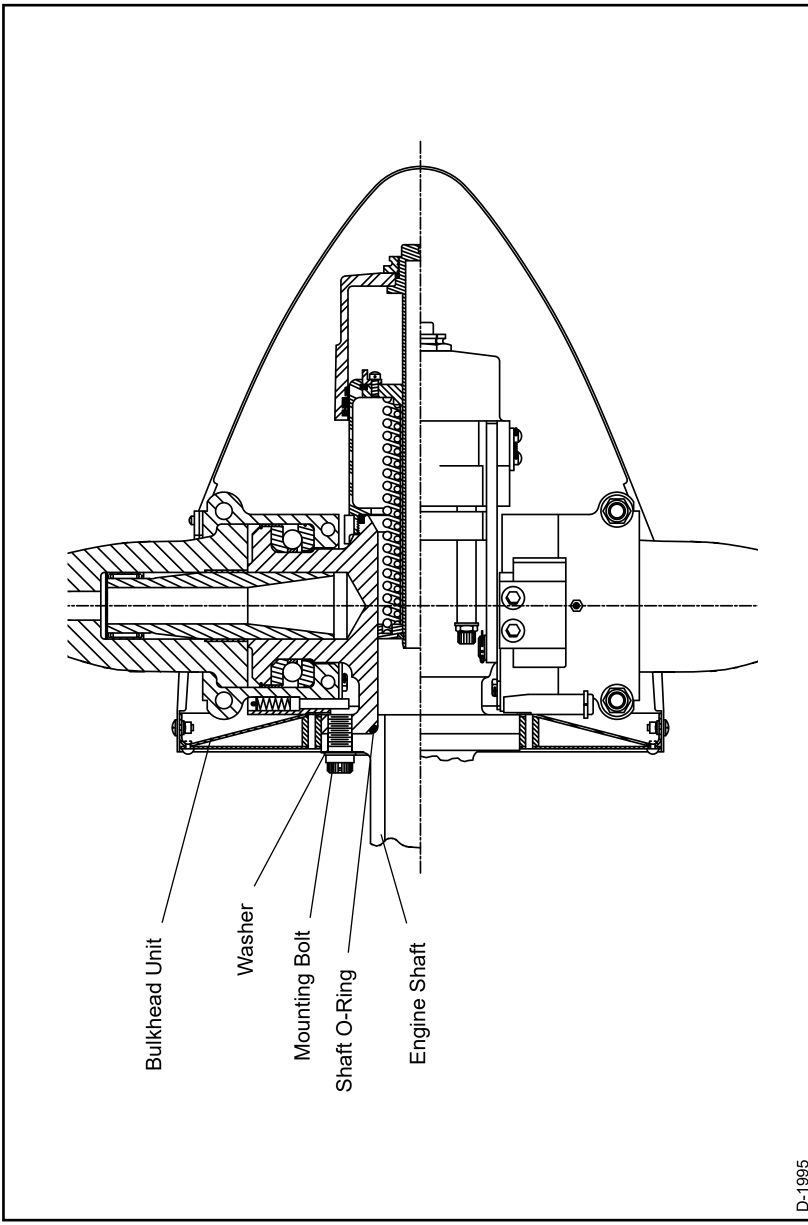
Flanged shaft attachments use a six bolt and two dowel pin interface or an eight bolt and two dowel pin interface between the engine and the propeller flange (Figure 2-3).



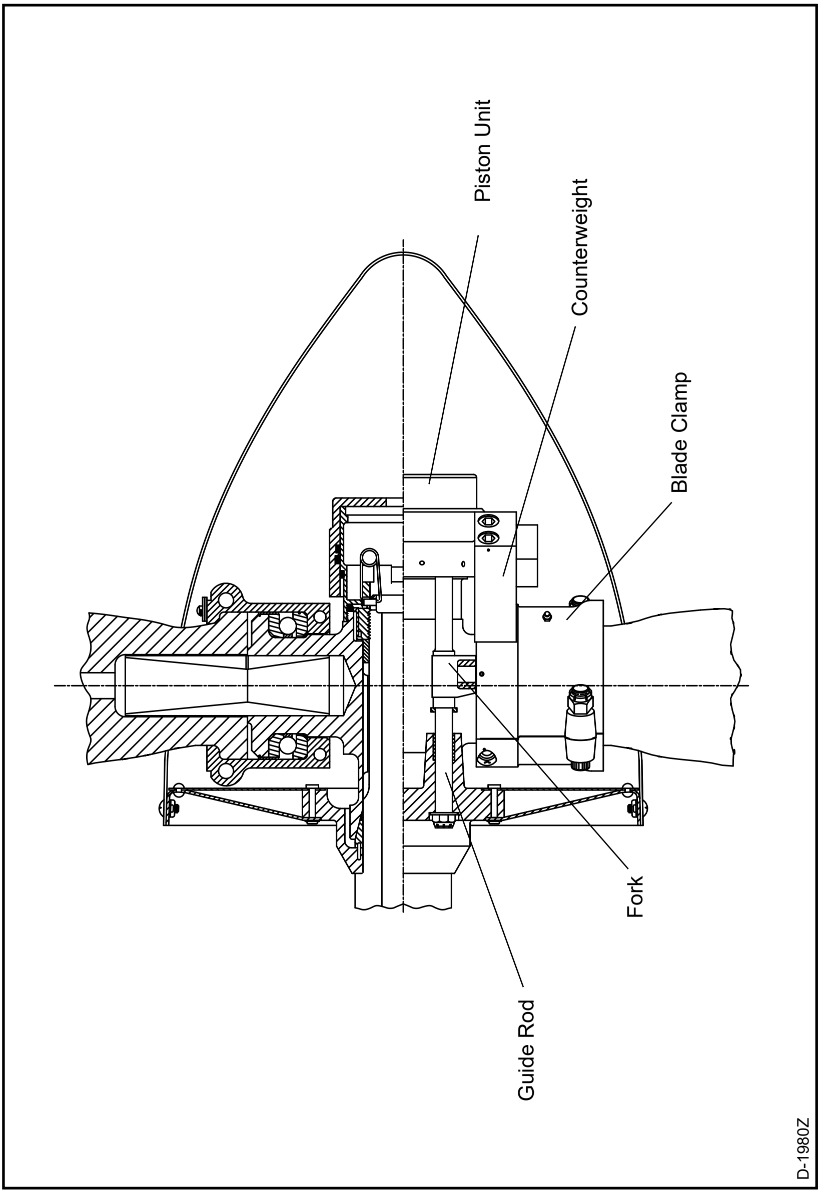
Steel Hub Unit (For Splined Shaft Mounting)
Figure 2-1



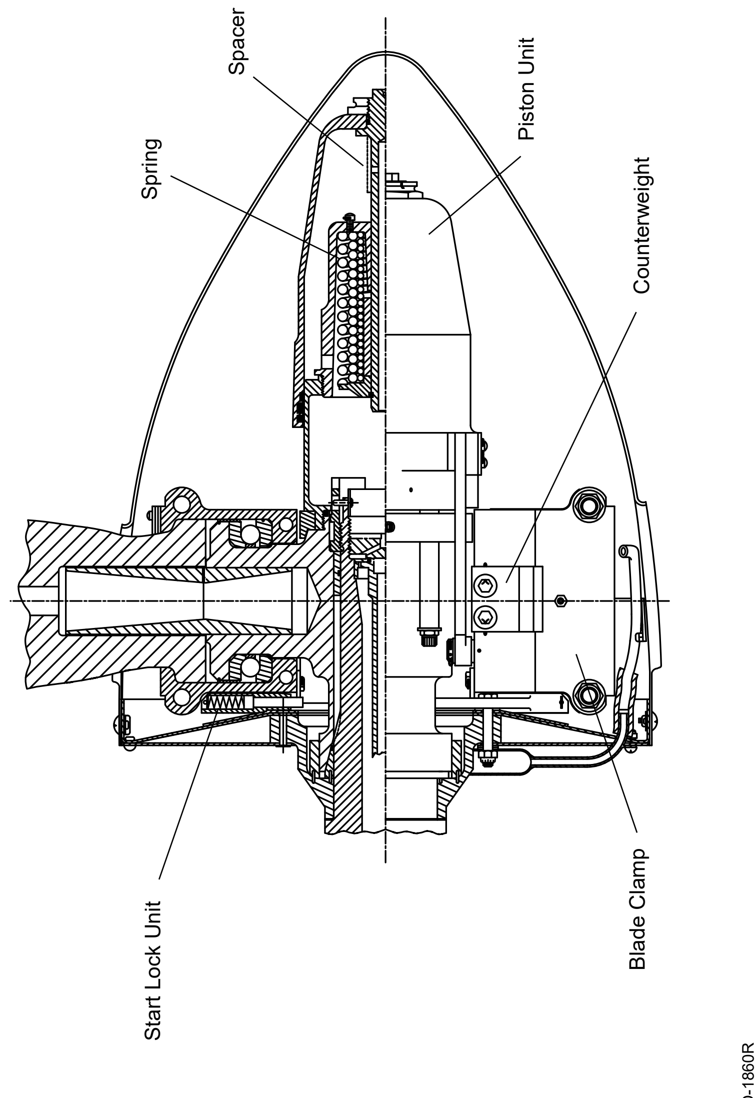
Spline Shaft Attachment
Figure 2-2



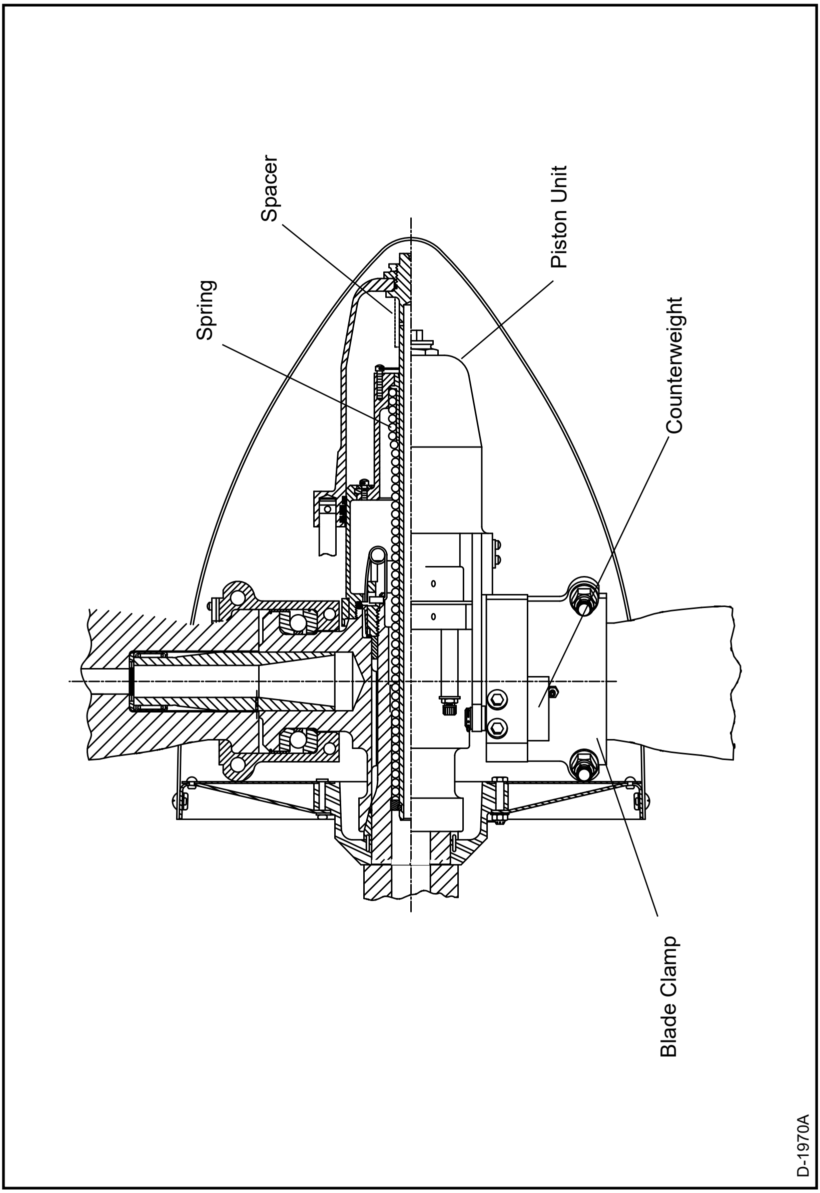
Flanged Shaft Attachment
Figure 2-3



Constant Speed Counterweighted, Non-feathering (HC-B3[W,Z]20-1) Propeller Assembly
Figure 2-4



Constant Speed Counterweighted, Non-feathering (HC-B3[ ]30-1E[ ]) propeller Assembly
Figure 2-5



Constant Speed Counterweighted, Non-feathering (HC-B3Z20-1F) Propeller Assembly
Figure 2-6

B. Constant Speed Counterweighted, Non-feathering Propellers

Propeller models HC-B3( )20-1, HC-B3( )30-1E( ) and HC-B4( )N-1( ). Refer to Figures 2-4 through 2-6.

Constant speed counterweighted, non-feathering propellers are typically used on single engine aircraft.

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 either a link arm system, or a sliding rod and fork system, connected to a blade clamp that rotates with the blade. Each blade is retained on the propeller hub by a blade clamp and thrust bearing. The thrust bearing allows the blade to change angle with the blade under centrifugal load.

Propeller forces consisting of mechanical spring action (HC-B3[W,Z]20-1 models have no spring), blade counterweight twisting moment and centrifugal and aerodynamic twisting moment of the blades in various combinations are constantly present while the propeller is operating. The summation of these forces causes the propeller to rotate to a higher blade angle. A variable hydraulic force (oil under pressure from the engine driven governor) toward a lower blade angle opposes the summation of these forces. Oil is metered by the governor to oppose these constant forces and maintain a constant engine RPM.

A spring is installed in all models except HC-B3(W,Z)20-1. Spring force assists rotation of blade pitch to a higher blade angle.

A counterweight is a weight that is attached to each blade clamp to cause the blade to rotate to a higher blade pitch. Counterweighted propellers require governor supplied oil to decrease blade pitch. If the oil supply is lost, the counterweighted propeller will go to high pitch, or low RPM.

The weight of each propeller blade when spinning, generates centrifugal force and a twisting force that attempts to rotate each blade to a lower blade angle.

Air flow around the blade generates lift and an aerodynamic twisting moment that will attempt to increase or decrease blade angle, depending on flight condition and blade design. This force is generally very small in relation to the other forces.

A governor is an engine speed-sensing device that maintains a constant engine/propeller RPM by changing blade angle and varying load on the engine.

The governor uses an internal pump that is driven by an accessory drive from the engine. This pump uses an engine oil supply and increases the engine oil pressure for supply to the propeller. Engine speed sensing hardware within the governor controls the supply of oil to, or drain of oil from the propeller, resulting in a change of blade pitch to maintain constant engine speed.

Oil pressure from the engine-driven governor is supplied to the propeller mounted hydraulic cylinder through the engine shaft and propeller hub. Increasing the oil volume within the hydraulic cylinder reduces blade angle to increase engine RPM. Decreasing the oil volume will increase blade angle to decrease engine RPM. By changing the blade angle, the governor maintains constant engine RPM (within limits), independent of the throttle setting.

On some models that have a spring (HC-B3[ ]30-1E[ ] only), it is undesirable to allow the propeller to go to high pitch when the engine is stopped after landing. To prevent the propeller from going to high pitch during normal engine shut down, the propeller incorporates spring energized latches (start locks). Refer to Figure 2-5. If the propeller rotation is approximately 800 RPM or above, the latches are disengaged by centrifugal force acting on the latch weights to compress the springs. When the propeller drops below 800 RPM, the springs overcome the centrifugal force acting on the latch weights and move the latches to engage the start locks, preventing blade angle movement to a higher blade angle.

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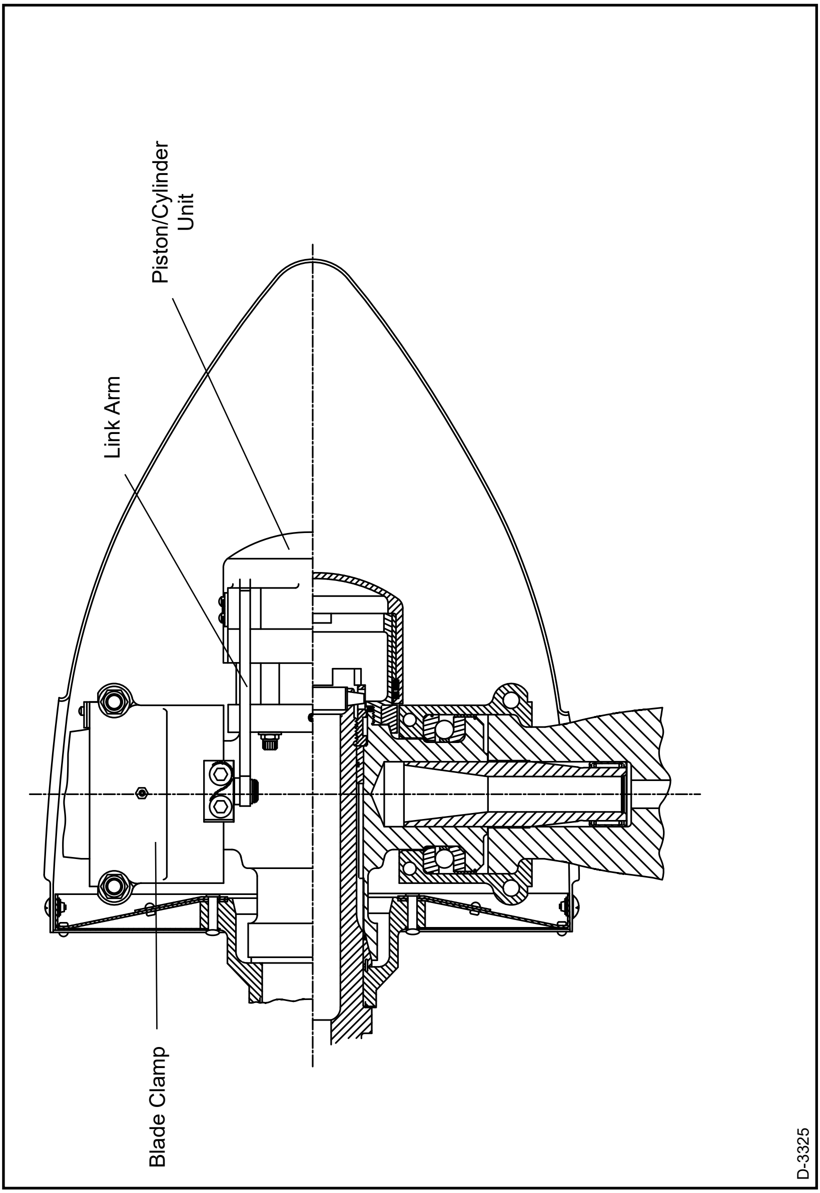

Constant Speed Non-counterweighted, Non-feathering Propeller Assembly
Figure 2-7

C. Constant Speed Non-counterweighted, Non-feathering Propellers

Propeller models HC-B3( )20-4( ),HC-B3( )30-4( ) and HC-B3( )F-4( ). Refer to Figure 2-7.

Constant speed non-counterweighted, non-feathering propellers are typically used on single engine aircraft.

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 either a link arm system, or a sliding rod and fork system, connected to a blade clamp that rotates with the blade. Each blade is retained on the propeller hub by a blade clamp and thrust bearing. The thrust bearing allows the blade to change angle with the blade under centrifugal load.

Propeller forces consisting of mechanical spring action and centrifugal and aerodynamic twisting moment of the blades in various combinations are constantly present while the propeller is operating. The summation of these forces causes the propeller to rotate to a lower blade angle. A variable hydraulic force (oil under pressure from the engine driven governor) toward a higher blade angle opposes the summation of these forces. Oil is metered by the governor to oppose these constant forces and maintain a constant engine RPM.

A spring may be installed in some models. If a spring is installed, its force assists rotation of blade pitch to a higher blade angle. Propeller models HC-B3R30-4A and -4B use spring force to lower blade angle. All other -4 type propeller models covered in this manual use spring force to increase blade angle.

A non-counterweighted propeller requires governor supplied oil to increase blade angle. If the oil supply is lost, the non-counterweighted propeller will go to low pitch, or high RPM.

The weight of each propeller blade when spinning, generates centrifugal force and a twisting force that attempts to rotate each blade to a lower blade angle.

Air flow around the blade generates lift and an aerodynamic twisting moment that will attempt to increase or decrease blade angle, depending on flight condition and blade design. This force is generally very small in relation to the other forces.

A governor is an engine speed-sensing device that maintains a constant engine/propeller RPM by changing blade angle and varying load on the engine.

The governor uses an internal pump that is driven by an accessory drive from the engine. This pump uses an engine oil supply and increases the engine oil pressure for supply to the propeller. Engine speed sensing hardware within the governor controls the supply of oil to, or drain of oil from the propeller, resulting in a change of blade pitch to maintain constant engine speed.

Oil pressure from the engine-driven governor is supplied to the propeller mounted hydraulic cylinder through the engine shaft and propeller hub. Increasing the oil volume within the hydraulic cylinder increases blade angle to decrease engine RPM. Decreasing the oil volume will decrease blade angle to increase engine RPM. By changing the blade angle, the governor maintains constant engine RPM (within limits), independent of the throttle setting.

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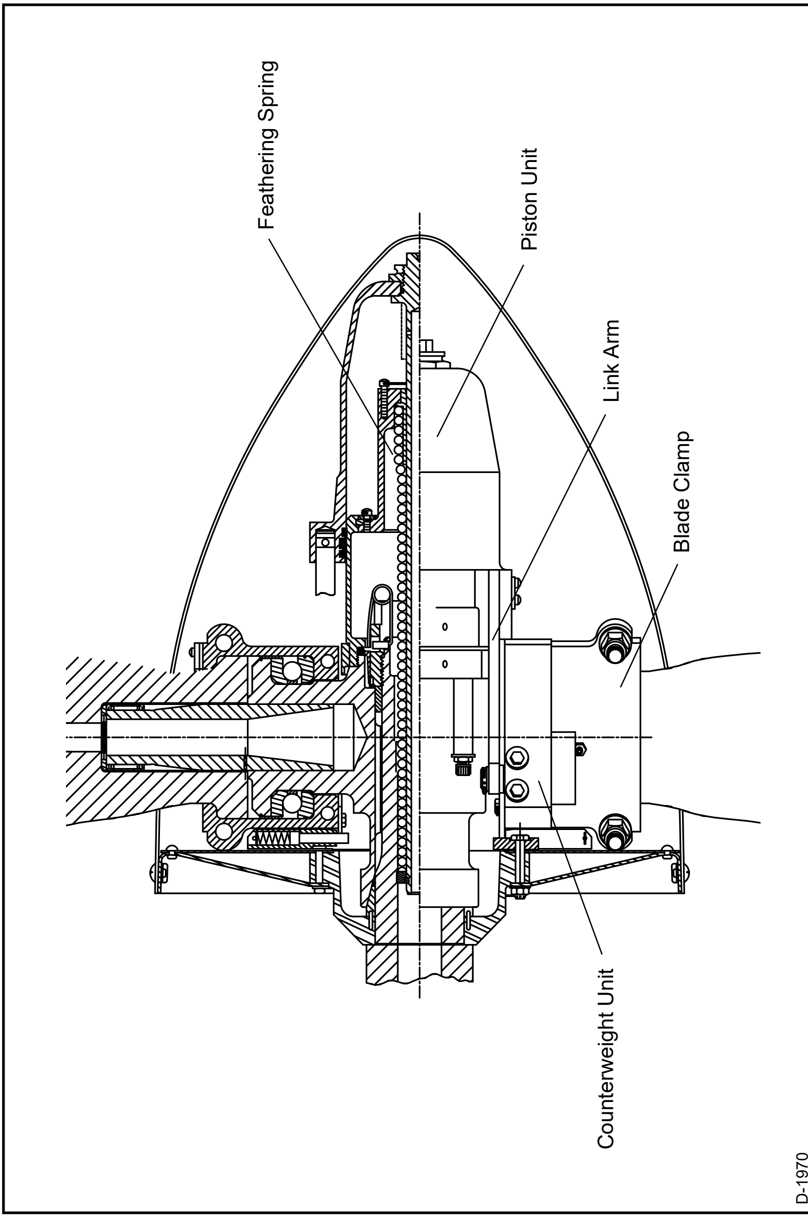


Constant Speed and Feathering Propeller Assembly
Figure 2-8

D. Constant Speed and Feathering Propellers

Propeller models HC-B3( )20-2( ), HC-B3( )30-2( ), HC-B3( )F-2, and HC-B3( )N-2( ). Refer to Figure 2-8.

A constant speed and feathering propeller is typically used on a twin engine aircraft. It is counterweighted, and is controlled by an engine speed-sensing device (governor) to maintain a constant engine/propeller RPM by changing blade angle and varying load on the engine.

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 either a link arm system, or a sliding rod and fork system, connected to a blade clamp that rotates with the blade. Each blade is retained on the propeller hub by a blade clamp and thrust bearing. The thrust bearing allows the blade to change angle.

Propeller forces consisting of mechanical spring action, blade counterweight twisting moment, and centrifugal and aerodynamic twisting moment of the blades in various combinations are constantly present while the propeller is operating. The summation of these forces causes the propeller to rotate to a higher pitch. A variable hydraulic force (oil under pressure from the engine driven governor) toward a lower blade pitch opposes the summation of these forces. Oil is metered by the governor to oppose these constant forces and maintain a constant engine RPM.

The forces of the installed spring assist rotation of blade pitch to a higher blade angle.

The counterweight is a weight that is attached to each blade clamp to cause the blade to rotate to a higher blade pitch. Counterweighted propellers require governor supplied oil to decrease blade pitch. If the oil supply is lost, the counterweighted propeller will go to high pitch, or low RPM.

The weight of each propeller blade when spinning, generates centrifugal force and a twisting force that attempts to rotate each blade to a lower blade angle.

Air flow around the blade generates lift and an aerodynamic twisting moment that attempts to increase or decrease blade angle, depending on flight condition and blade design. This force is generally very small in relation to the other forces.

A governor is an engine speed-sensing device that maintains a constant engine/propeller RPM by changing blade angle and varying load on the engine.

The governor uses an internal pump that is driven by an accessory drive from the engine. This pump uses an engine oil supply and increases the engine oil pressure for supply to the propeller. Engine speed sensing hardware within the governor controls the supply of oil to, or the drain of oil from the propeller, resulting in a change of blade pitch to maintain constant engine speed.

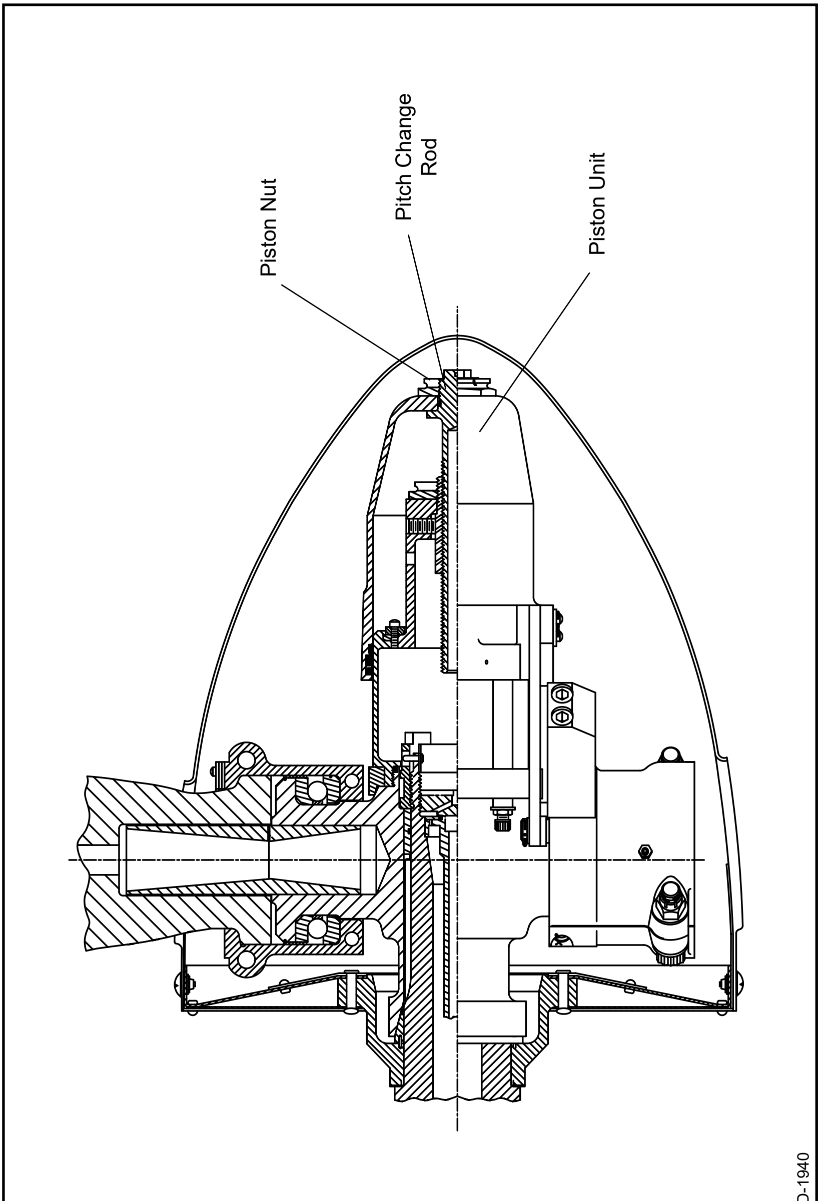
Oil pressure from the engine-driven governor is supplied to the propeller mounted hydraulic cylinder through the engine shaft and propeller hub. Increasing the oil volume within the hydraulic cylinder reduces blade angle to increase engine RPM. Decreasing the oil volume will increase blade angle to decrease engine RPM. By changing the blade angle, the governor maintains constant engine RPM (within limits), independent of the throttle setting.

If oil supply is lost during flight, the propeller will feather. Feathering occurs because the spring and blade clamp mounted counterweight forces are no longer opposed by hydraulic oil pressure and are 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 oil to drain from the propeller and return to the engine sump. Engine shutdown is normally accomplished during the feathering process.

Normal in-flight unfeathering is accomplished when the pilot positions the propeller pitch control into normal flight (governing) range and restarts the engine. As engine speed increases, oil is supplied by the governor to the propeller, and the blade angle decreases.

It is undesirable to feather the propeller when the engine is stopped after landing. To prevent feathering during normal engine shut down, the propeller incorporates spring energized latches (start locks). If the propeller rotation is approximately 800 RPM or above, the latches are disengaged by centrifugal force acting on the latch weights to compress the springs. When the propeller drops below 800 RPM, the springs overcome the centrifugal force acting on the latch weights and move the latches to engage the start locks, preventing blade angle movement to feather.



Ground Adjustable Propeller Assembly
Figure 2-9

E. Ground Adjustable Pitch Propellers

Propeller models HA-B3( )30-1( ). Refer to Figure 2-9.

Ground adjustable pitch propellers are typically used on single engine aircraft equipped with an engine that does not support governing capability nor is able to supply oil through a hollow shaft to the propeller.

Ground adjustable pitch propellers may be set to a desired blade pitch by manually adjusting the propeller when the aircraft is static on the ground. This allows an optimal blade pitch to be selected for different flight conditions, such as climb or cruise. A propeller adjusted for climb will not fly very fast (unless engine RPM's are excessively high). A propeller adjusted for cruise will need more runway for takeoff and will climb more slowly (engine RPM will be less than optimum).

Ground adjustable propellers do not require a governor or any oil supply, as they do not change blade pitch in flight.

HC - B 3 P 30 - 2 EA

EA — MINOR MODIFICATIONS NOT AFFECTING BASIC PROPELLER OPERATION

SPECIFIC DESIGN FEATURES

- **1 -** NONFEATHERING, COUNTERWEIGHTS, OIL TO DECREASE PITCH
- **2 -** FEATHERING, COUNTERWEIGHTS, OIL TO DECREASE PITCH, FEATHERING SPRING
- **4 -** NO COUNTERWEIGHT, OIL TO INCREASE PITCH, EXTENDED LINK SCREW RADIUS, NO SPRING
- **4A , 4B -** NO COUNTERWEIGHT, OIL TO INCREASE PITCH, EXTENDED LINK SCREW RADIUS, SPRING

SHAFT MOUNTING

	BOLT CIRCLE	DOWELS No.	DOWELS DIA.	NO. OF BOLTS OR STUDS
N FLANGE	4.25 inch (10.8 cm)	2	0.50 inch (12.7 mm)	8 (0.56 inch) (14.2 mm)
F FLANGE	4.00 inch (10.2 cm)	2	0.50 inch (12.7 mm)	6 (0.50 inch) (12.7 mm)

- **20** SPLINE, SAE 20, 21 BRITISH
- **30** SPLINE, SAE 30, 31 FRENCH

BASIC SHANK

- **P, R, T, W** - NEEDLE BEARINGS IN BLADE
- **Z** - SINGLE SHOULDER

NO. OF BLADES — **3 or 4**

BASIC DESIGN

- **B** - SINGLE SHOULDER RETENTION

- HA - HARTZELL ADJUSTABLE, GROUND ADJUSTABLE
- HC - HARTZELL CONTROLLABLE

Propeller Model Designations
Table 2-1

<u>NOTE</u>: Parentheses in the model designation system indicates that an option or modification may or may not be included in the blade assembly.

prop model/R10152 -5.5R

Dash Number (or + number), diameter reduction (or increase) from basic design. In this example, the nominal 101 inch diameter has been reduced 5.5 inches = 95.5 inch dia. (with some exceptions) there may be a letter following the dash number:
E - elliptical tip
R - specifically rounded tip
S - square tip (Exception: Blade model 8433NS was manufactured with a square tip; however, the "S" square tip designator in the model number did not follow a dash.)

Suffix letters:
B - anti-ice boot (alcohol) or de-ice boot (wire element)
C - blade dimensional modification from basic design
H - hard alloy (7076)
S - Shot peen (Exception: Blade model M10474 was manufactured with a shot peened surface; however, the "S" shot peen designator was not included in the model number. The "S" designator must be added to M10476 blades at overhaul.)
blank - original design, no changes

Engineering designation for design characteristics

The first 2 or 3 numbers indicate <u>initial</u> design diameter (in inches)
(not necessarily the actual propeller diameter)

Prefix of up to 3 letters:
L - left hand rotation
P,R,T,W,Z - shank design

Aluminum Blade Model Designation
Table 2-2

F. Propeller 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 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. <u>Propeller Blades</u>

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. 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

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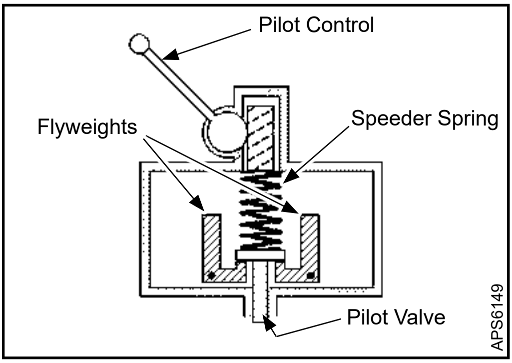
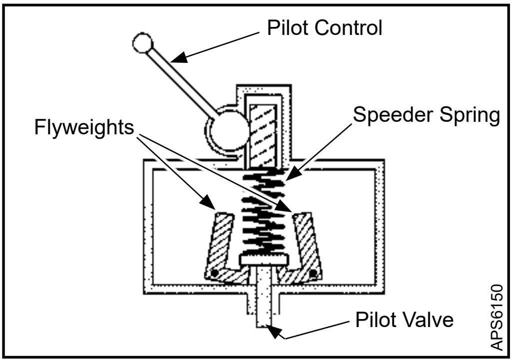
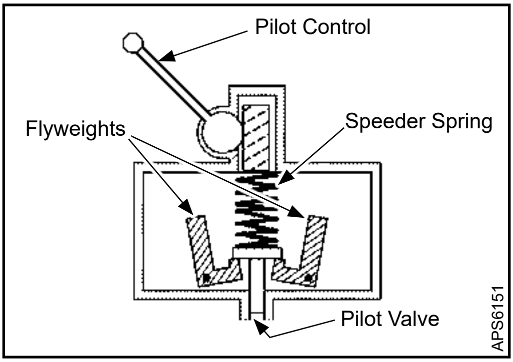


Governor in Onspeed Condition
Figure 2-10



Governor in Underspeed Condition
Figure 2-11



Governor in Overspeed Condition
Figure 2-12

3. Governors (Rev. 1)

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 2-10. 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.

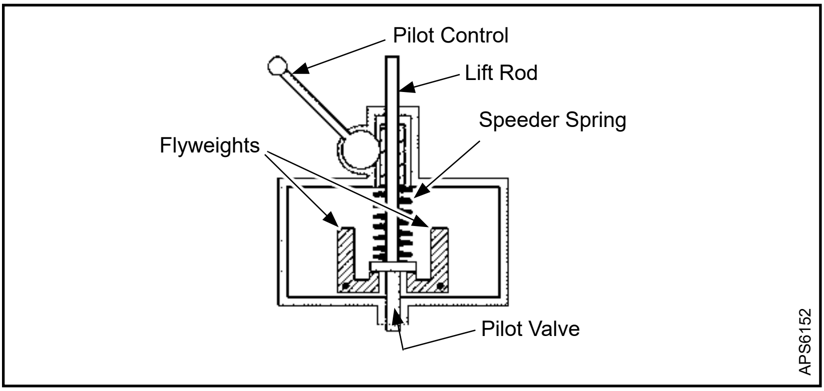
(3) When the engine is operating below the RPM set by the pilot using the cockpit control, the governor is operating **underspeed**. Refer to Figure 2-11. In an underspeed condition, the flyweights tilt inward because there is not enough centrifugal force on the flyweights to overcome the force of the 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 2-12. 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.

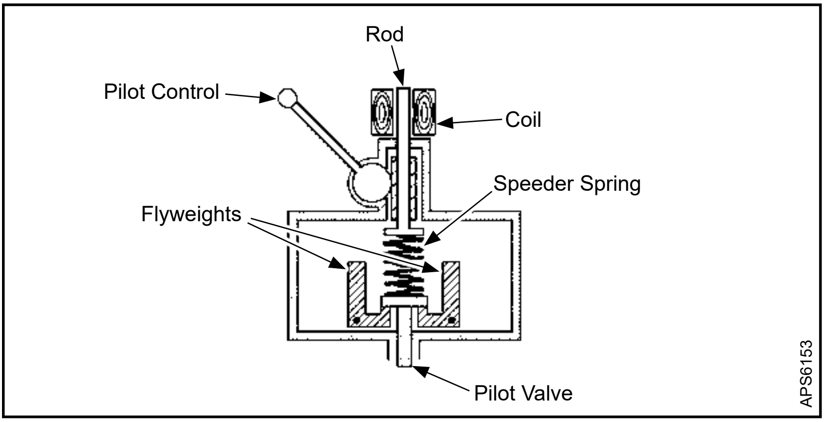
(b) Figure 2-13 illustrates another feathering propeller governor system. When it is desired to feather the propeller, the lift rod may be moved by the cockpit control to mechanically engage the valve. The lifted valve dumps oil to increase propeller pitch until the propeller feathers.



Feathering Governor
Figure 2-13

(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 2-14 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 2-14

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 2-3 for a description of the characters used in the governor model number.

S - 1 - 1

Minor Variation of Basic Design (numeric or alpha character)
indicating variations of: RPM setting, head orientation, relief setting, rotation, lever angle, and/or minor part changes

Specific Model Application (numeric character)
1 through 11

Basic Body and Major Parts (alpha character)
A, B, C, D, E, F, H, S, U, V - Mechanically Actuated Governors
L - Electrically Actuated Governors

Governor Model Designation
Table 2-3

4. Unfeathering Accumulators (Rev. 2)

A. System Overview

(1) An unfeathering accumulator is a device that stores a volume of oil at a pressure and supplies it to the propeller when commanded to. This supplied pressure will lower blade angle which will cause the propeller to windmill and make the engine easier to start.

(2) Hartzell Propeller Inc. manufactures an accumulator that is a cylinder with a moveable internal piston. One end of the cylinder and piston is filled with engine oil, and the other end of the cylinder and piston is filled with air or nitrogen to a designated pressure through an air valve. The accumulator is a self-contained unit and is usually installed at some remote location in the engine compartment. An oil supply hose is connected between the accumulator and the governor.

(3) Hartzell Propeller Inc. manufactures governors that have unfeathering and feathering capability; although some governors are able to feather a propeller they are not automatically capable of unfeathering the propeller.

B. Mechanical Models

(1) The governor has a fitting or threaded hole to attach with an oil supply hose that is connected to the accumulator on the other end. During operation of the engine and propeller, the governor supplies oil to the accumulator and maintains oil in the accumulator during engine operation.

(2) The pilot commands feather of the propeller by moving the RPM control of the governor toward lower RPM to reach the feather command location. The governor disconnects the oil supply to the accumulator and seals a volume of oil under pressure in the accumulator. The governor then connects the oil supply line from the propeller piston and permits the propeller blades to move to a feather stop in the propeller.

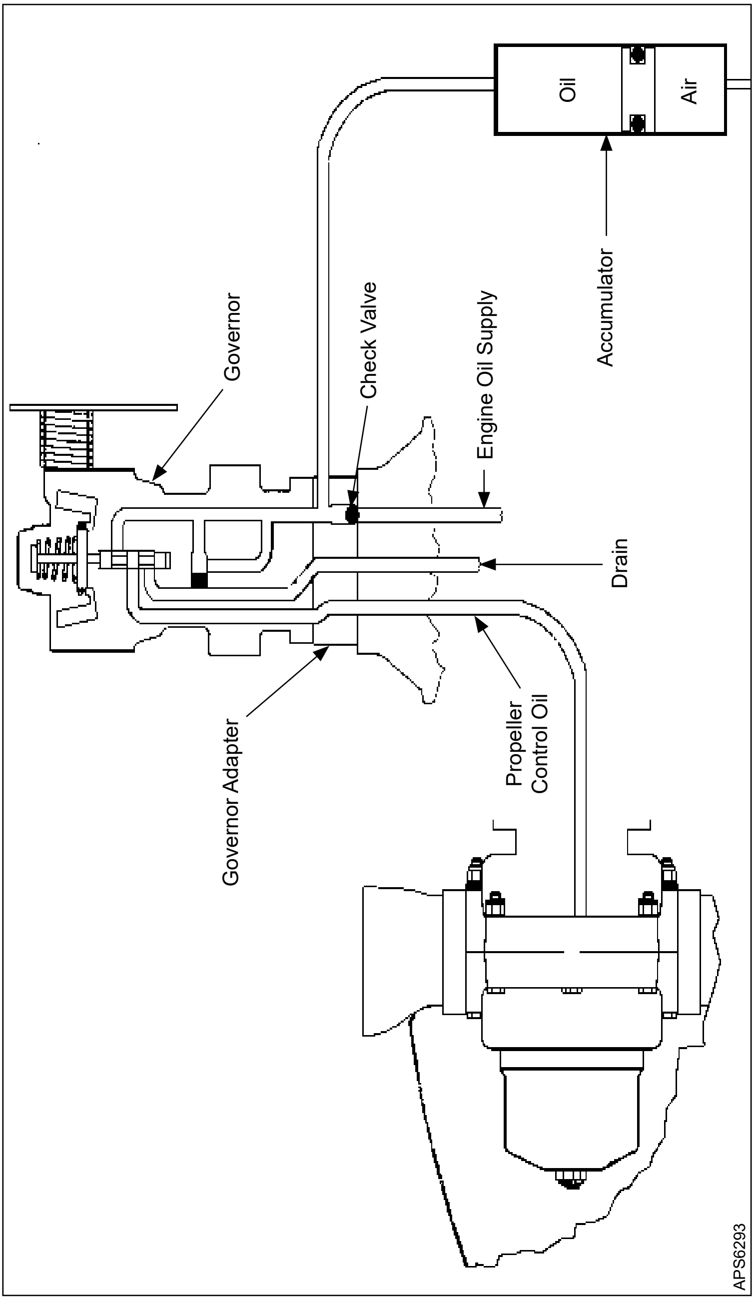
(3) Unfeathering occurs when the governor RPM control is moved by the pilot from the feather location to a higher RPM selection for governing. The governor disconnects the propeller oil supply from the drain and reconnects it to the governor oil supply line from the governor. At that point there is no oil available from the engine oil pump to the governor; therefore, no governed oil is available from the governor for controlling the propeller blade angle and RPM. Further movement of the governor RPM control toward higher RPM will cause the governor to connect the accumulator to the oil supply line from governor to the propeller. The air or nitrogen pressure in one side of the accumulator will push a piston to force oil from the other side of the accumulator through the governor to the propeller piston to move the propeller blades from feather to a lower blade angle. The propeller will then begin to windmill and will permit the engine to start.

C. Electrical Models

(1) In an electrical model a switch activates a solenoid coil allowing oil to reverse out of a valve resulting in a lower blade angle for the purpose of starting the associated engine.

(2) The governor has a fitting or threaded hole to attach with an oil supply hose that is connected on the other side to the accumulator solenoid valve that is connected to the oil side of the accumulator. During operation of the engine and propeller, the governor supplies oil to the accumulator through the solenoid valve's check valve until equal pressure is reached allowing the check valve to then close and maintain oil pressure at engine shutdown.

(3) When the engine has shut down or failed, no oil is available from the engine oil pump to the governor; therefore, no governed oil is available from the governor for controlling the propeller blade angle and RPM. Unfeathering occurs when a switch is activated energizing the coil on the accumulator solenoid valve. The activated coil changes the valve from a one-way valve to an open passage allowing reverse flow back out of the accumulator and to the governor. The air or nitrogen pressure in one side of the accumulator will push a piston to force oil from the other side of the accumulator through the governor to the propeller piston to move the propeller blades from feather to a lower blade angle. The propeller will then begin to windmill and permit the engine to start.



Governor/Accumulator System
Figure 2-15

5. Aerobatic Accumulators (Rev. 1)

CAUTION: THE EFFECTIVENESS OF THE ACCUMULATOR SYSTEM CANNOT BE ACCURATELY SPECIFIED DUE TO VARIABLES IN THE ENGINE AND GOVERNOR INTERNAL LEAKAGE RATES, AS WELL AS THE EXTENT AND DURATION OF OIL STARVATION. THE SYSTEM CANNOT ENSURE 100% PROTECTION FROM OVERSPEED IN ALL OPERATING CONDITIONS.

A. System Overview - Refer to Figure 2-15

(1) The fundamental purpose of the accumulator is to supply oil to the governor during brief circumstances of engine oil starvation, not prolonged periods of this condition. The accumulator's oil supply helps to avoid loss of propeller control and overspeed.

(2) The accumulator has a one (1) quart capacity for the oil and the volume required for an air charge. A piston or diaphragm separates the oil and air.

(3) When the engine is operating, the engine oil system supplies oil to the input side of the governor gear pump. The oil supply also charges the accumulator at any time the engine oil system is developing a pressure greater than the accumulator air charge pressure. The accumulator is filled with oil until the air charge pressure of the compressed air volume is equal to the engine oil pressure.

(4) In the event that the engine oil pressure drops below the accumulator air pressure, the oil in the accumulator is discharged to supply the governor gear pump. A check valve in an adapter located between the engine and governor will prevent the accumulator from discharging oil into the engine. The loss of propeller control and overspeed are avoided while an oil supply to the governor is maintained.

6. Propeller Ice Protection Systems (Rev. 1)

A. System Description

(1) For detailed descriptions of propeller ice protection systems, refer to the Anti-ice and De-ice Systems chapter in this manual.

INSTALLATION AND REMOVAL - CONTENTS

INSTALLATION AND REMOVAL - CONTENTS, CONTINUED

LIST OF FIGURES

LIST OF FIGURES

LIST OF TABLES

1. <u>Tools, Consumables, and Expendables</u>

The steel hub reciprocating propellers covered in this manual are manufactured with either a flange mounting or a spline mounting. The flange type or spline type used on a particular propeller installation is indicated in the propeller model identification number stamped on the hub. For example, HC-B3M**<u>N</u>**-3 indicates an "N" flange. HC-BR**<u>30</u>**-4 indicates a "30" spline. Refer to the Steel Hub Model Identification in the Description and Operation chapter of this manual for a description of each flange type.

The flange mounted propeller is supplied completely assembled. The spline mounted propeller is supplied with the piston removed.

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

A. Tooling

F Flange
- Safety wire pliers (Alternate: Safety cable tool)
- Calibrated torque wrench
- Torque wrench adapter, Hartzell Propeller Inc. P/N AST-2917 or a locally procured torque wrench adapter of the appropriate size

N Flange
- Safety wire pliers (Alternate: Safety cable tool)
- Calibrated torque wrench
- Torque wrench adapter, Hartzell Propeller Inc. P/N BST-2877 or a locally procured torque wrench adapter of the appropriate size

20 Spline
- Safety wire pliers
- Shaft nut wrench Hartzell Propeller Inc. P/N BST-2910, or equivalent

30 Spline
- Safety wire pliers
- Spanner wrench Hartzell Propeller Inc. P/N BT-461, strap wrench Hartzell Propeller Inc. P/N 100923, or equivalent
- Shaft nut wrench, Hartzell Propeller Inc. P/N BST-2910, or equivalent

B. Consumables
- Quick Dry Stoddard Solvent or Methyl-Ethyl-Ketone (MEK)

C. Expendables
- 0.032 inch (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 (Refer to Table 3-1)

Part	Propeller Model	Part No.
Dowel Pin	HC-B3( )F-2( )	B-6138-8-8
	HC-B3WF-4	B-6138-8-8
	HC-B3WN-2L	B-6138-8-8
	HC-B4TN-1	B-6138-8-8
Piston Dust Seal	HC-B3( )20-2( )	B-1843
	HC-B3( )20-1B	B-1843
	HC-B3( )20-4	B-1843
	HC-B3R30-4A,-4B	B-1843
	HC-B3( )30-2( )	B-1843
	HC-B3( )30-1E( )	B-1843
	HC-B3( )30-2E( )	B-1843
	HC-B3( )20-1	B-1843
	HC-B3Z20-1F	B-1843
Hub Lock Safety Pin	HC-B3( )20-2( )	A-847
	HC-B3( )20-1	A-847
	HC-B3Z20-1F	A-847
	HC-B3( )20-4	A-847
Jam Nut (Low pitch stop)	HC-B3( )20-2( )	B-3368
	HC-B3Z20-1F	B-3368
	HC-B3( )20-4	B-3368
	HC-B3( )30-2B( )	B-3368
	HC-B3( )30-1E( )	B-3368
	HC-B3( )30-2E( )	B-3368
	HC-B3R30-4A,-4B	B-3368
Mounting Bolt	HC-B3( )F-2( )	A-1328-1
	HC-B3WF-4	A-1328-2
	HC-B3WN-2L	B-3339
	HC-B4TN-1	B-3339
Nut, Flexlock (on guide rod)	HC-B3( )20-1	A-848-2
Nut, Piston	HC-B3( )30-1E( )	A-880-1
	HC-B3( )30-2B( )	A-880-1
	HC-B3( )30-2E( )	A-880-1
	HC-B3R30-4A,-4B	A-880-1
	HA-B3( )30-1B	A-880-1

Propeller Mounting Hardware
Table 3-1, Page 1 of 3

Part	Propeller Model	Part No.
O-ring, Bushing/Shaft	HC-B3( )F-2( )	C-3317-228
	HC-B3WF-4	C-3317-228
	HC-B3( )30-2( )	C-3317-141
	HA-B3( )30-1B	C-3317-141
	HC-B3R30-4A,-4B	C-3317-141
O-ring, Hub	HC-B4TN-1	C-3317-230
O-ring, Piston	HC-B3( )20-2( )	C-3317-343-1
	HC-B3( )30-2B( )	C-3317-343-1
	HC-B3( )20-1	C-3317-343-1
	HC-B3Z20-1F	C-3317-343-1
	HA-B3( )30-1B	C-3317-343-1
	HC-B3( )30-1E( )	C-3317-347-1
	HC-B3( )30-2E( )	C-3317-347-1
	HC-B3R30-4A,-4B	C-3317-347-1
	HC-B3( )20-4	C-3317-347-1
	HC-B3( )30-4	C-3317-347-1
O-ring, Rear Cone	HC-B3( )20-2( )	C-3317-229
	HC-B3( )20-4	C-3317-229
	HC-B3( )20-1	C-3317-229
	HC-B3Z20-1F	C-3317-229
	HC-B3( )30-2B( )	C-3317-231
	HC-B3( )30-1E( )	C-3317-231
	HC-B3( )30-2E( )	C-3317-231
	HC-B3( )30-4	C-3317-231
	HA-B3( )30-1B	C-3317-231
	HC-B3R30-4A,-4B	C-3317-231
O-ring, Rod	HA-B3( )30-1B	C-3317-020
	HC-B3Z20-1F	C-3317-020
	HC-B3( )20-2( )	C-3317-020
	HC-B3( )30-2B( )	C-3317-020
	HC-B3( )30-1E( )	C-3317-020
	HC-B3( )30-2E( )	C-3317-020
	HC-B3( )20-4	C-3317-235
	HC-B3( )30-4	C-3317-235
	HC-B3R30-4A,-4B	C-3317-020
Spacer	HA-B3( )30-1B	A-1855
	HC-B3R30-4A,-4B	A-1855
	HC-B3( )30-4	A-1855
	HC-B3( )30-2B( )	A-1855
	HC-B3( )30-1E( )	A-1855
	HC-B3( )30-2E( )	A-1855

Propeller Mounting Hardware
Table 3-1, Page 2 of 3

Part	Propeller Model	Part No.
Spacer, High Stop	HC-B3( )20-1	A-970-( )
Shaft/Hub Nut	HC-B3( )20-2( )	A-63B
	HC-B3( )20-4	A-63B
	HC-B3( )20-1	A-63B
	HC-B3Z20-1F	A-63B
	HC-B3( )30-4	B-1894
	HA-B3( )30-1B	B-1894
	HC-B3R30-4A,-4B	B-1894
	HC-B3( )30-2B( )	B-1894
	HC-B3( )30-1E( )	B-1894
	HC-B3( )30-2E( )	B-1894
Shaft Nut Lock	HC-B3( )30-2B( )	A-1848
	HC-B3( )30-1E( )	A-1848
	HC-B3( )30-2E( )	A-1848
	HC-B3( )30-4	A-1848
	HA-B3( )30-1B	A-1848
	HC-B3R30-4A,-4B	A-1848
Socket Head Cap Screw, (Low pitch stop)	HC-B3( )20-2( )	A-2037
	HC-B3Z20-1F	A-2037
	HC-B3( )30-2B( )	A-2037
	HC-B3( )30-1E( )	A-2037
	HC-B3( )30-2E( )	A-2037
	HC-B3R30-4A,-4B	A-2037
Split Ring	HC-B3( )20-2( )	A-859
	HC-B3Z20-1F	A-859
	HC-B3( )30-2B( )	A-859
Washer, (Guide rod)	HC-B3( )20-1	A-965
Washer, (Low pitch stop)	HC-B3( )20-2( )	A-1444
	HC-B3Z20-1F	A-1444
	HC-B3( )20-4	A-1444
	HC-B3( )30-2B( )	A-1444
	HC-B3( )30-1E( )	A-1444
	HC-B3( )30-2E( )	A-1444
	HC-B3R30-4A,-4B	A-1444
Mounting Washer	HC-B3( )F-2( )	A-1381
	HC-B3WN-2L	A-2048-2
	HC-B4TN-1	A-2048-2

Propeller Mounting Hardware
Table 3-1, Page 3 of 3

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.

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

CAUTION: ON STEEL HUB TURBINE PROPELLERS, THE PISTON NUT (A-880-1 OR A-880-2) MAY BE REMOVED TO ALLOW THE BLADES TO ROTATE BEFORE PACKAGING.

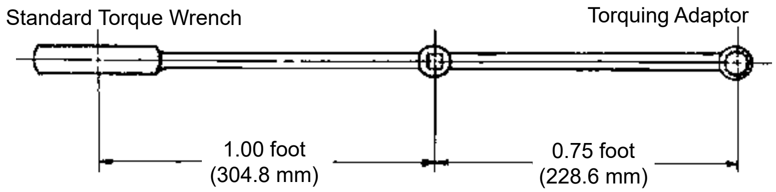
NOTE: The ability to rotate the blades during propeller installation will make it easier to access the propeller mounting bolts on -3 propeller models.

(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.

(2) For installation of ice protection systems manufactured by Hartzell, refer to Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).



(actual torque required) X (torque wrench length) / (torque wrench length) + (length of adapter) = Torque wrench reading to achieve required actual torque

EXAMPLE:

100 Ft-Lb (136 N•m) x 1 ft (308.4 mm) / 1 ft (308.4 mm) + 0.75 ft (228.6 mm) = 57.1 Ft-Lb (77.4 N•m) < reading on torque wrench with 9-inch (228.6 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.

APS212

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

CAUTION 1: FOR A PROPELLER THAT DOES NOT USE A LUBRICATED (WET) TORQUE, THE MOUNTING HARDWARE MUST BE CLEAN AND DRY TO PREVENT EXCESSIVE PRELOAD OF THE MOUNTING FLANGE.

CAUTION 2: TORQUE VALUES WITH "WET" NOTED AFTER THEM ARE BASED ON LUBRICATED THREADS WITH APPROVED ANTI-SEIZE COMPOUND MIL-PRF-83483( ).

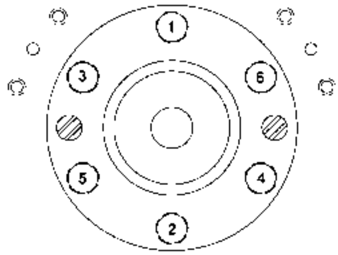
CAUTION 3: REFER TO FIGURE 3-1 FOR TORQUE READING WHEN USING A TORQUE WRENCH ADAPTER.

Hardware	Torque
F-flange propeller mounting bolts A-1328-( )	80-90 ft-lbs (108-122 N•m)
N-flange propeller mounting bolts B-3339 (HC-B4TN-1) B-3339 (HC-B3WN-2L)	100-105 Ft-Lbs (136-142 N•m) Wet
Spinner mounting bolts	30-40 ft-lbs (41-54 N•m)
Shaft nut A-63B B-1894	450 ft-lbs (610 N•m)* 600 ft-lbs (813 N•m)*
Feathering spring assembly	100 ft-lbs (108 N•m)*
Piston nut A-880-1 (HC-B3[ ]20-2[ ]) A-880-1 (HC-B3[ ]30-[ ] [ ])	120 ft-lbs. (162 N•m)* 120 ft-lbs. (162 N•m)*
Pitch adjustment nut A-880-1 (HA-B3[ ]30-[ ] [ ])	75 ft-lbs. (102 N•m)*
Low-pitch stop jam nut B-3368	10 ft-lbs. (14 N•m)*
Flexlock Nut (on guide rod) A-848-2 (HC-B3[ ]20-1)	10 ft-lbs. (14 N•m)*

* Torque tolerance is ± 10 percent unless otherwise noted.

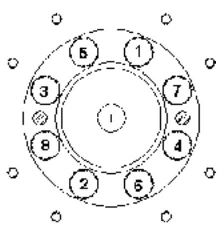
Torque Table
Table 3-2

F Flange

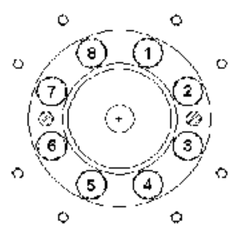


Step 1 - Torque all bolts/nuts to 40 Ft-Lbs (54 N•m).
Step 2 - Torque all bolts/nuts in accordance with Table 3-2.

N Flange



SEQUENCE A
Use Sequence A for steps one and two.



SEQUENCE B
Use Sequence B for step three.

Step 1 - Torque all bolts/nuts to 40 Ft-Lbs (54 N•m).
Step 2 - Torque all bolts/nuts to 80 Ft-Lbs (108 N•m).

Step 3 - Torque all bolts/nuts to Table 3-2.

W10108C, W10109C, W10109B

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. Spinner Adapter Ring Installation (if applicable)

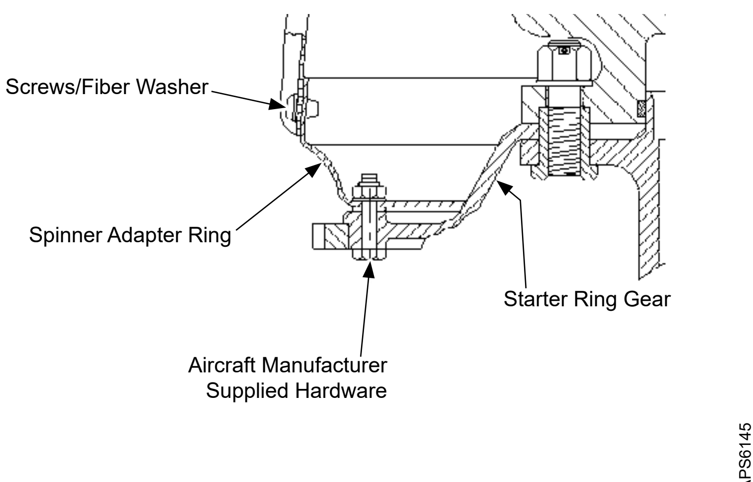
A. Installation

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

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 3-3.

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



Spinner Adapter Ring
Figure 3-3

5. Propeller Installation

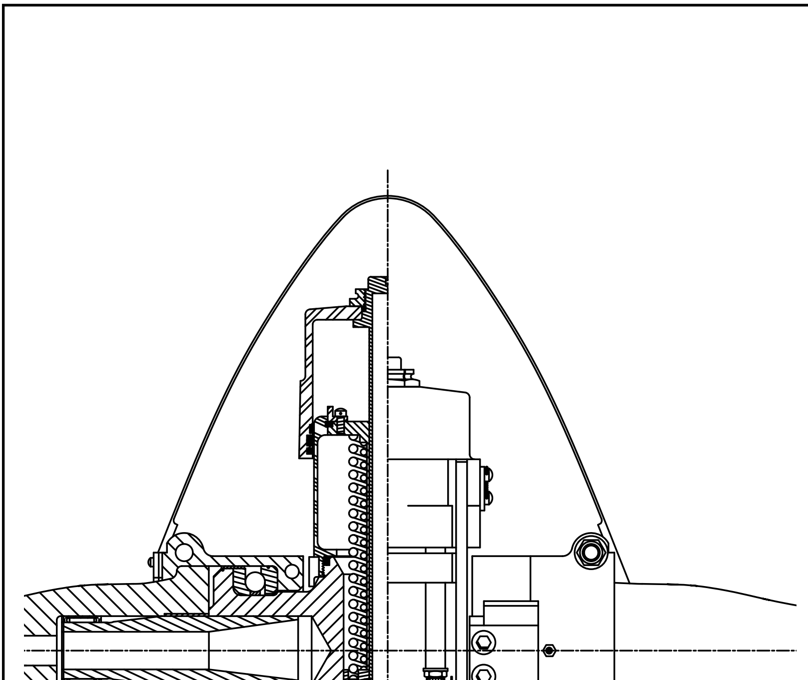
CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS.

A. Important Information

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE. PROPELLER FAILURE CAN RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: WHEN INSTALLING THE PROPELLER, FOLLOW THE AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES, AS THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS OWNER'S MANUAL.

WARNING 3: ADHESIVES AND SOLVENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT AND BREATHING OF VAPORS. USE SOLVENT RESISTANT GLOVES TO MINIMIZE SKIN CONTACT AND WEAR SAFETY GLASSES FOR EYE PROTECTION. USE IN A WELL VENTILATED AREA AWAY FROM SPARKS AND FLAME. READ AND OBSERVE ALL WARNING LABELS.



HC-B3( )F-2( ) Propeller
Figure 3-4

CAUTION 1: WHEN INSTALLING THE PROPELLER ON THE AIRCRAFT, DO NOT DAMAGE THE ICE PROTECTION SYSTEM COMPONENTS, IF APPLICABLE.

CAUTION 2: DO NOT PUT THE BLADE PADDLES IN THE AREA OF THE DE-ICE BOOT WHEN APPLYING TORQUE TO A BLADE ASSEMBLY. PUT THE BLADE PADDLES IN THE THICKEST AREA OF THE BLADE, JUST OUTBOARD OF THE DE-ICE BOOT. USE ONE BLADE PADDLE PER BLADE.

(1) Make sure the propeller is removed before the engine is removed or installed in the airframe.

(2) Follow the airframe manufacturer's instructions for installing the propeller. If such instructions are not in the airframe manufacturer's manual, then follow the instructions in this manual; however, mechanics must consider that this owner's manual does not describe important procedures that are outside its scope. In addition to propeller installation procedures, items such as rigging and preflight testing, installation and adjustment of de-ice equipment, and propeller synchronization devices are normally found in the airframe manufacturer's manuals.

B. O-ring and Propeller Mounting Hardware Identification

(1) Refer to Table 3-1 for specific part numbers of O-rings and propeller mounting hardware, and propeller model effectivity.

C. Installing the HC-B3( )F-2( ) Propeller - Refer to Figure 3-4.

(1) Press two dowel pins (Table 3-1) through the holes in the propeller flange to be flush with the propeller side of the hub flange.

(2) Clean the engine flange and propeller flange with Quick Dry Stoddard Solvent.

WARNING 1: THE PISTON NUT SHOULD HAVE BEEN REMOVED BEFORE SHIPPING TO PERMIT ROTATING OF THE BLADES FOR PACKAGING.

WARNING 2: FOR SAFETY REASONS, IF THE PISTON NUT WAS NOT REMOVED, THE PROPELLER MUST BE PLACED IN FEATHER POSITION BEFORE IT IS INSTALLED ON THE AIRCRAFT.

WARNING 3: MAKE SURE THE SLING IS RATED UP TO 800 POUNDS (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION.

(3) Using a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

(4) If the spinner bulkhead is to be installed and is not already in place, perform the following steps:

(a) Install the spinner bulkhead facing toward the propeller.

(b) From the engine side of the bulkhead, insert the mounting bolts through the bulkhead and into the start lock.

NOTE: Installation of the 835-29 spinner assembly on the HC-B3WF-2 propeller requires that a minimum of one washer be installed under that no more than two threads of the mounting bolt pass through the start lock mounting nut. Additional washers may be used under the mounting bolt head as required.

(c) Install the washers and locking nuts on the propeller side of the start lock to secure the mounting bolts and bulkhead.

(d) Torque the attaching bolts to 8-12 Ft-Lb (11-16 N•m).

(5) Install the shaft O-ring (Table 3-1) on the engine shaft.

CAUTION: USE CARE TO AVOID SCRAPING ALUMINUM FROM THE BORE OF THE SPINNER BULKHEAD. SCRAPINGS COULD BECOME WEDGED BETWEEN THE FLANGES.

(6) Align the threaded holes of the propeller flange with the bolt holes in the engine flange, and align the dowel pins in the propeller flange with the dowel pin holes in the engine flange.

CAUTION: MAKE SURE THAT COMPLETE AND TRUE SURFACE CONTACT IS ESTABLISHED BETWEEN THE PROPELLER HUB FLANGE AND THE ENGINE FLANGE.

(7) Slide the propeller onto the engine flange.

CAUTION: NEW PROPELLER MOUNTING BOLTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

(8) Install mounting bolts (Table 3-1) with washers through the engine flange from the rear and into the tapped holes in the propeller flange.

(a) For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

(9) Using a torque wrench with the appropriate torque wrench adapter, torque all mounting bolts in the sequences and steps shown in Figure 3-2. Refer to Table 3-2 and Figure 3-1 to determine the proper torque value to which the torque wrench must be set.

(10) Safety all mounting bolts with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware (two bolts per safety).

(11) Procedure for reinstallation of the piston nut, if applicable.

(a) Following the installation of the propeller, retract the start lock pins and hold them in place with a heavy wire inserted through the hole of each start lock housing

(b) Carefully push the piston onto the pitch change rod, rotate the blades to feather position, and attach the piston nut to the pitch change rod.

(c) Use a breaker bar and a 5/8 inch deep well socket to hold the pitch change rod.

(d) Using a 1-7/16 inch crowfoot wrench and torque wrench, torque the piston nut. Refer to Table 3-2 and Figure 3-1 for the proper torque value.

NOTE: The removal and subsequent reinstallation of the piston nut does not require that the propeller blade angles be rechecked.

(12) Remove the wires from the start lock brackets.

CAUTION: DO NOT PUT THE BLADE PADDLE IN THE AREA OF THE DE-ICE 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 BOOT. USE ONE BLADE PADDLE PER BLADE.

(13) Position the propeller on the start locks by using the blade paddles to slowly rotate the blades simultaneously toward low pitch until the start lock pins engage the stop plates.

(14) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(15) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(16) Install the propeller spinner dome in accordance with the section, "Spinner Dome Installation" in this chapter.

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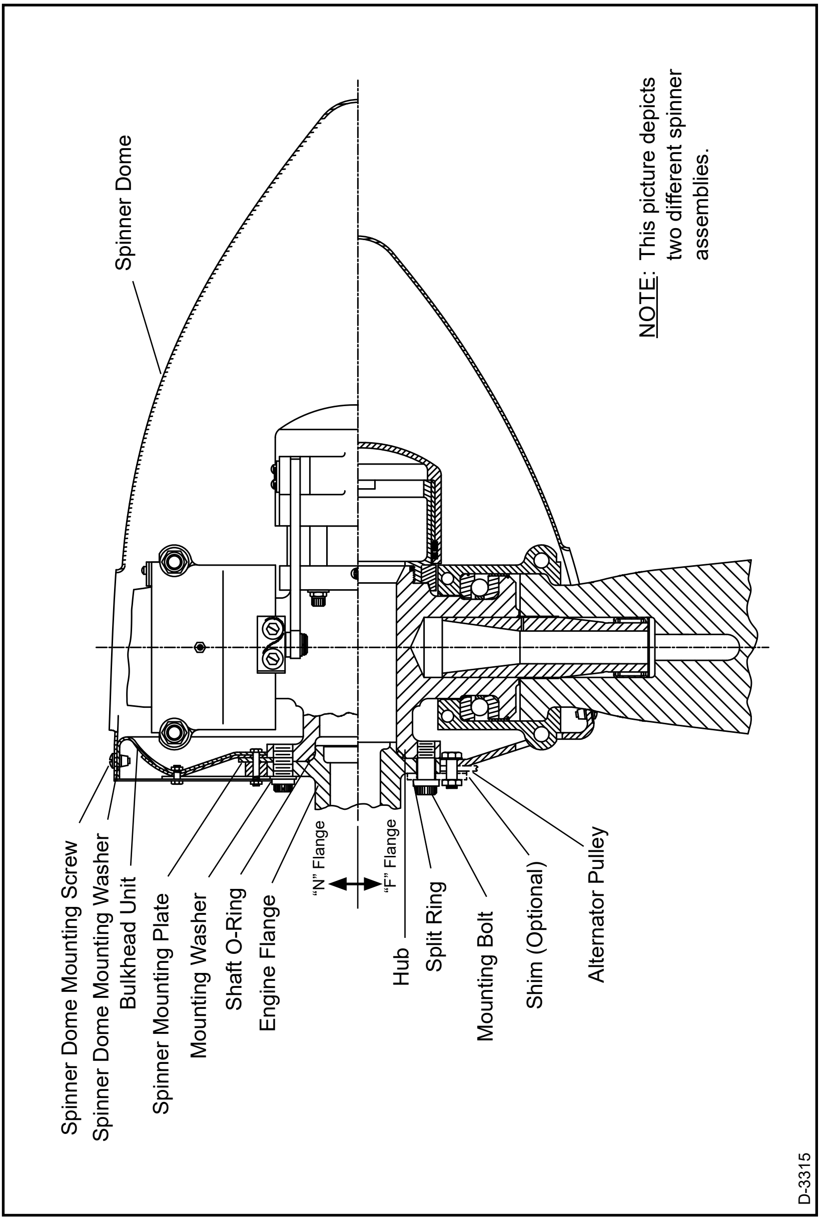


HC-B3WF-4 Propeller
Figure 3-5

D. Installing the HC-B3WF-4 Propeller - Refer to Figure 3-5.

(1) Press two dowel pins (Table 3-1) through the holes in the propeller flange to be flush with the propeller side of the hub flange.

(2) Clean the engine flange and propeller flange with Quick Dry Stoddard Solvent.

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

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

(3) Using a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

(4) Slide the airframe manufacturer supplied shim onto the engine block side of the engine flange.

(5) Slide the airframe manufacturer supplied alternator pulley onto the engine block side of the engine flange, against the shim.

(6) Slide the spinner bulkhead onto the engine flange.

(7) Install the shaft O-ring (Table 3-1) on the engine shaft.

(8) Align the threaded holes of the propeller flange with the bolt holes in the engine flange, and align the dowel pins in the propeller flange with the dowel pin holes in the engine flange.

(9) Pull the bulkhead forward, toward the propeller.

(10) Pull the alternator pulley forward against the bulkhead.

(11) Pull the shim forward against the alternator pulley.

(12)Position the airframe manufacturer supplied split-ring on the back side of the engine flange and on the engine side of the shim.

(a) Align the attachment holes of the ring, alternator pulley, and bulkhead to allow the installation of the manufacturer supplied fasteners.

(b) Secure the ring, shim, alternator pulley, and spinner bulkhead together with the manufacturer supplied fasteners.

(c) Align the ring with the mounting bolt holes in the engine flange.

CAUTION: MAKE SURE THAT COMPLETE AND TRUE SURFACE CONTACT IS ESTABLISHED BETWEEN THE PROPELLER HUB FLANGE AND THE ENGINE FLANGE.

(13)Slide the propeller onto the engine shaft.

CAUTION: NEW PROPELLER MOUNTING BOLTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

(14)Install mounting bolts (Table 3-1) with washers through the ring and the engine flange and into the tapped holes in the propeller flange.

(a) For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

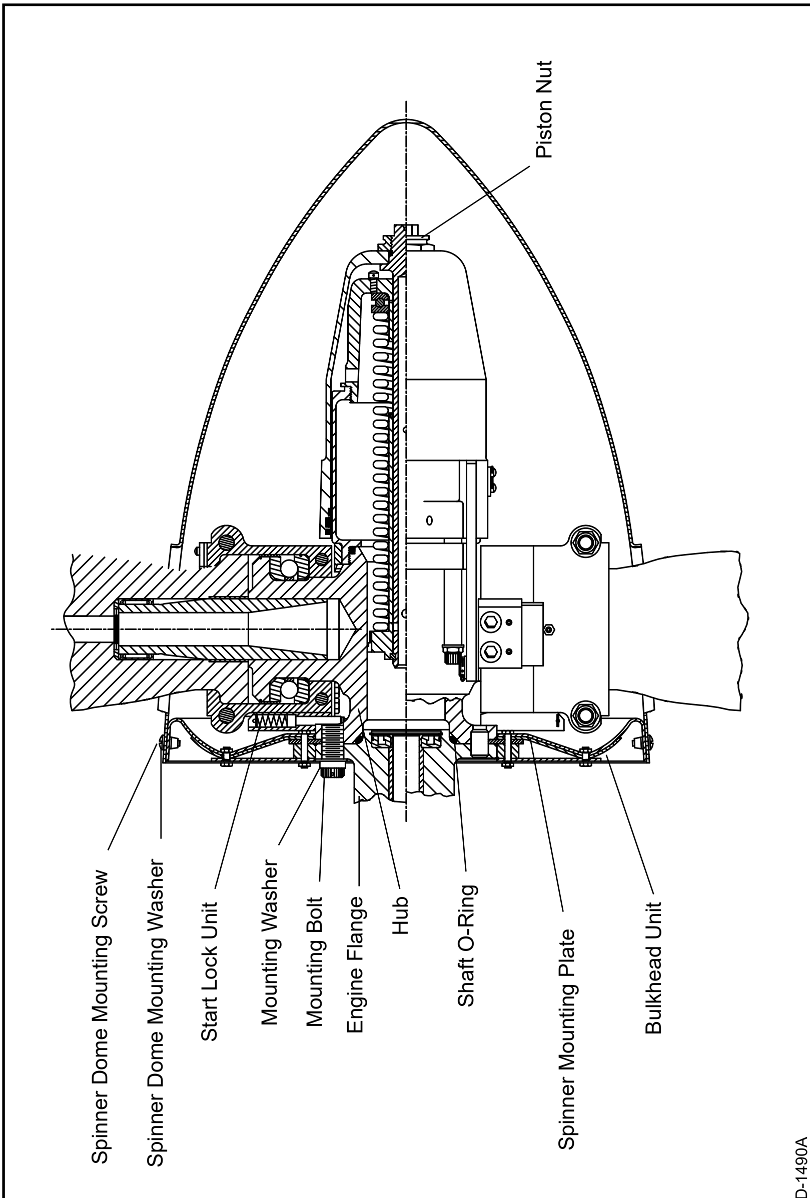
(15)Using a torque wrench with the appropriate torque wrench adapter, torque all mounting bolts in sequences and steps shown in Figure 3-2. Refer to Table 3-2 and Figure 3-1 to determine the proper torque value to which the torque wrench must be set.

(16)Safety all mounting bolts with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware (two bolts per safety).

(17) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(18) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(19) Install the propeller spinner dome in accordance with the section, "Spinner Dome Installation" in this chapter.



HC-B3WN-2L Propeller
Figure 3-6

E. Installing the HC-B3WN-2L Propeller - Refer to Figure 3-6.

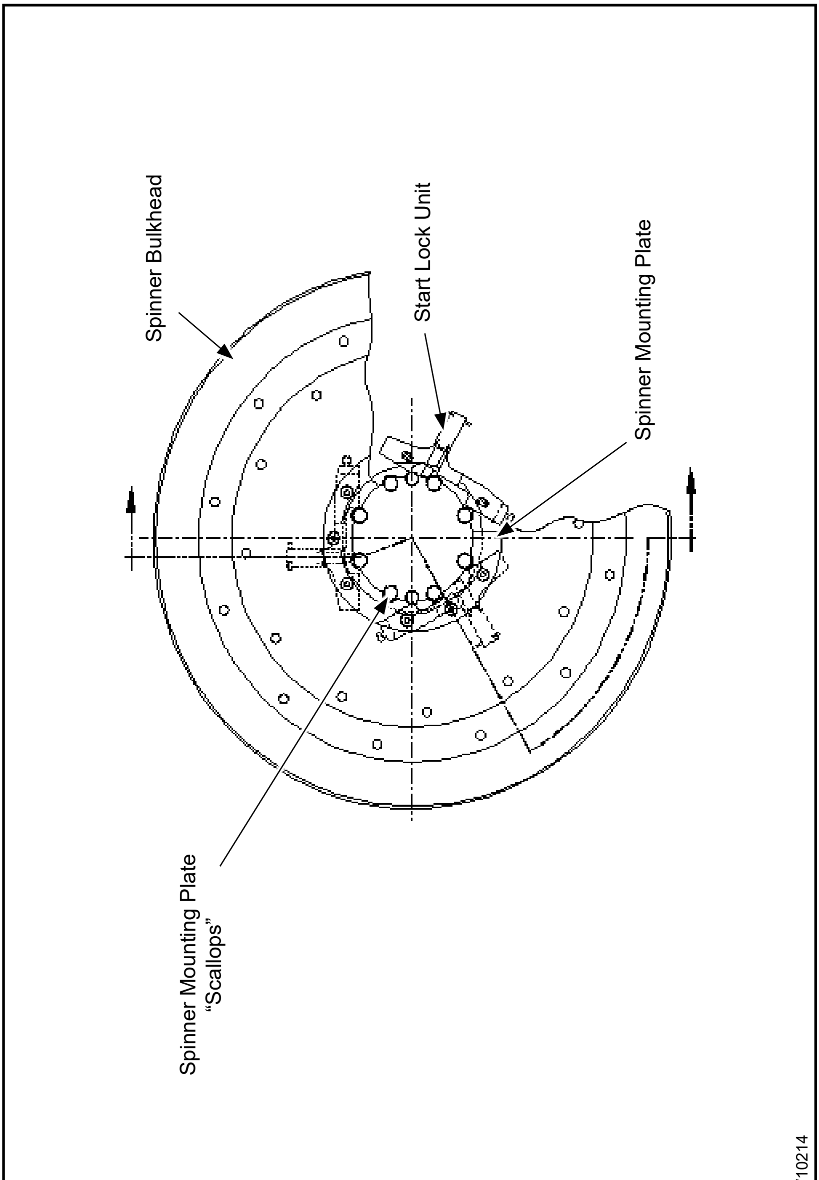
CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS.

NOTE: This propeller is manufactured with a one-piece spinner mounting plate. The spinner bulkhead is attached to the spinner mounting plate. The spinner mounting plate is installed in a cutaway portion of the propeller hub flange and is "pinched" between the propeller hub flange and the engine flange.

(1) Press two dowel pins (Table 3-1) through the holes in the propeller flange to be flush with the propeller side of the hub flange.

WARNING: ADHESIVES AND SOLVENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT AND BREATHING OF VAPORS. USE SOLVENT RESISTANT GLOVES TO MINIMIZE SKIN CONTACT AND WEAR SAFETY GLASSES FOR EYE PROTECTION. USE IN A WELL VENTILATED AREA AWAY FROM SPARKS AND FLAME. READ AND OBSERVE ALL WARNING LABELS.

(2) Clean the engine flange and propeller flange with Quick Dry Stoddard Solvent.



One-piece Spinner Mounting Plate Installation
Figure 3-7

WARNING 1: THE PISTON NUT SHOULD HAVE BEEN REMOVED BEFORE SHIPPING TO ALLOW ROTATING OF THE BLADES FOR PACKAGING.

WARNING 2: FOR SAFETY REASONS, IF THE PISTON NUT WAS NOT REMOVED, THE PROPELLER MUST BE PLACED IN FEATHER POSITION BEFORE IT IS INSTALLED ON THE AIRCRAFT.

WARNING 3: MAKE SURE THE SLING IS RATED UP TO 800 POUNDS (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION.

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

(3) Using a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

(4) Install the specified shaft O-ring (Table 3-1) on the engine shaft.

(5) Retract each start lock pin, holding it in place with a heavy wire inserted through the hole in each start lock housing.

(6) Slide the assembled one-piece spinner mounting plate, spinner bulkhead, and start lock onto the propeller hub flange.

NOTE: The start locks must face toward the propeller.

(7) Align the clearance "scallops" in the spinner mounting plate with the holes in the propeller hub flange. Refer to Figure 3-7.

NOTE: This will make sure that the spinner mounting plate does not interfere with the mounting bolts and dowel pins.

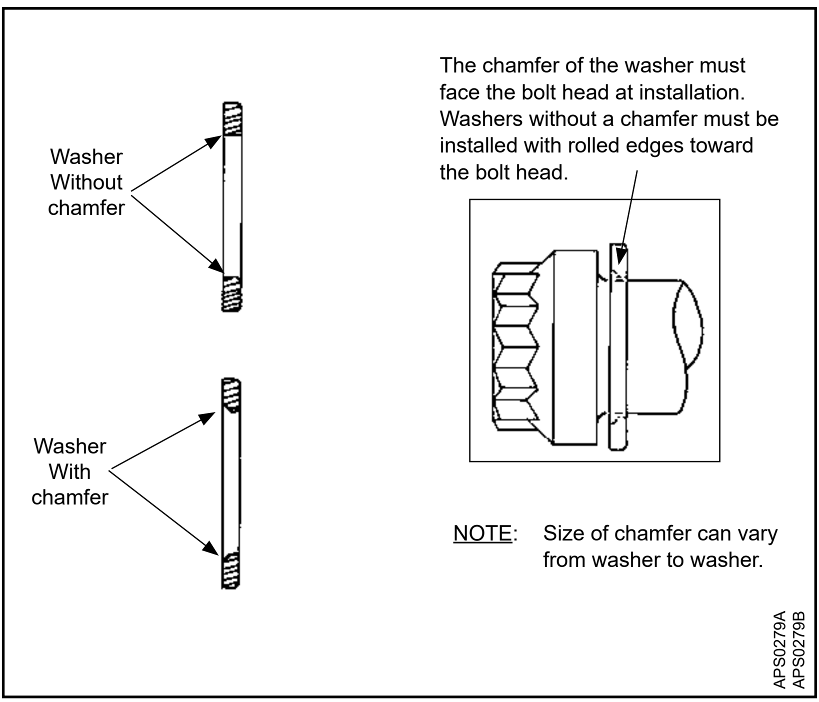
(8) Align the start locks with each blade and clamp mounted stop plate.

NOTE: The start locks are attached to the spinner bulkhead.

(9) Align the mounting and dowel pin holes in the propeller hub flange with the mounting holes and dowel pins in the engine flange.

CAUTION: MAKE SURE THAT COMPLETE AND TRUE SURFACE CONTACT IS ESTABLISHED BETWEEN THE PROPELLER HUB FLANGE AND THE ENGINE FLANGE.

(10) Slide the propeller flange, spinner bulkhead, and spinner mounting plate onto the engine flange.



Mounting Bolt and Washer
Figure 3-8

CAUTION: NEW PROPELLER MOUNTING BOLTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

(11) Apply MIL-PRF-83483 anti-seize compound to the threaded surfaces of the mounting bolts.

NOTE: For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

CAUTION: THE ID CHAMFER OF THE WASHER MUST BE FACING TOWARD THE BOLT HEAD. WASHERS WITHOUT CHAMFER MUST BE INSTALLED WITH ROLLED EDGES TOWARD THE BOLT HEAD. REFER TO FIGURE 3-8.

(12) Install mounting bolts (Table 3-1) with washers through the engine flange from the rear and into the tapped holes in the propeller flange.

(a) For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

(13) Using a torque wrench with the appropriate torque wrench adapter, torque all mounting bolts in sequences and steps shown in Figure 3-2. Refer to Table 3-2 and Figure 3-1 to determine the proper torque value to which the torque wrench must be set.

(14) Safety all mounting bolts with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware (two bolts per safety).

(15) Procedure for reinstallation of piston nut, if applicable.

(a) Carefully push the piston onto the pitch change rod, rotate the blades to feather position, and attach the piston nut to the pitch change rod.

(b) Use a breaker bar and a 5/8 inch deep well socket to hold the pitch change rod.

(c) Using a 1-7/16 inch crowfoot wrench and torque wrench, torque the piston nut. Refer to Table 3-2 and Figure 3-1 for the proper torque value.

NOTE: The removal and subsequent reinstallation of the piston nut does not require that the propeller blade angles be rechecked.

(16) Remove the wires from the start lock brackets.

CAUTION: DO NOT PUT THE BLADE PADDLE IN THE AREA OF THE DE-ICE 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 BOOT. USE ONE BLADE PADDLE PER BLADE.

(17) Position the propeller on the start locks by using the blade paddles to slowly rotate the blades simultaneously toward low pitch until the start lock pins engage the stop plates.

(18) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(19) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(20) Install the propeller spinner dome in accordance with the section, "Spinner Dome Installation" in this chapter.

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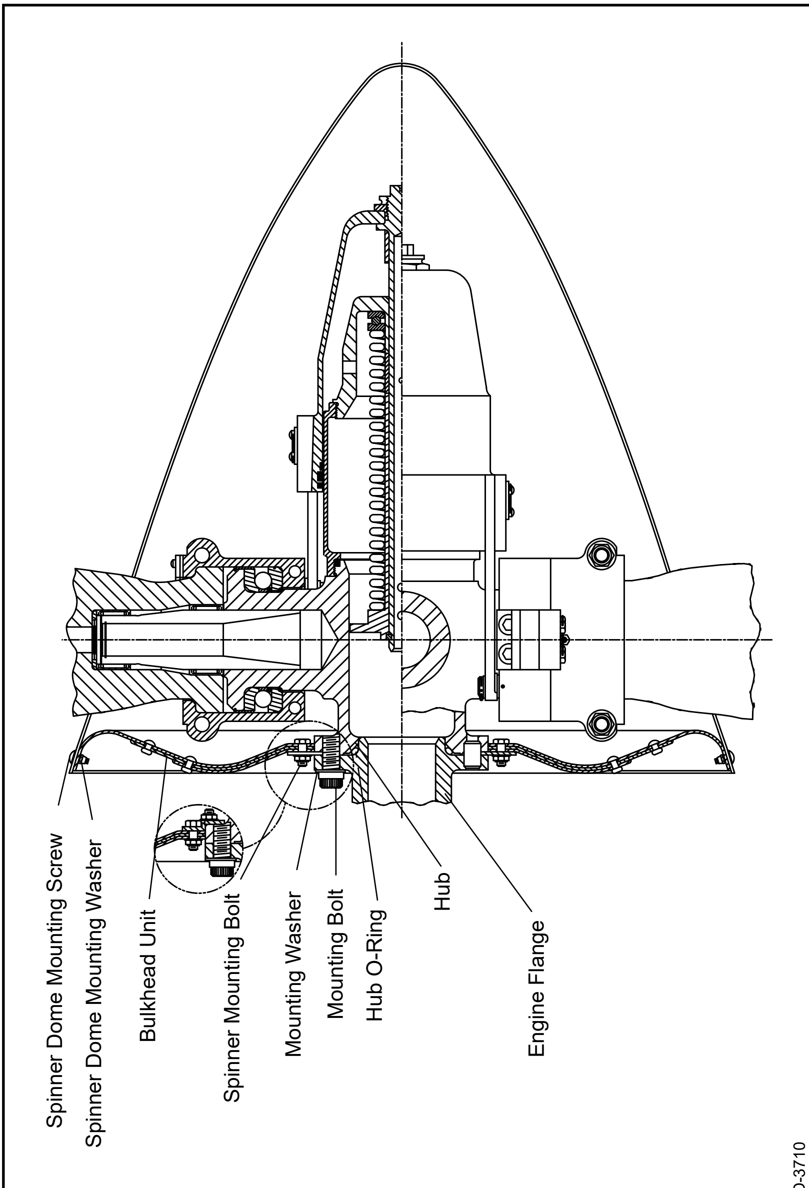


HC-B4TN-1 With One-Piece Spinner Mounting Plate
Figure 3-9

F. Installing the HC-B4TN-1 Propeller With a One-piece Spinner Mounting Plate - Refer to Figure 3-9

WARNING: ADHESIVES AND SOLVENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT AND BREATHING OF VAPORS. USE SOLVENT RESISTANT GLOVES TO MINIMIZE SKIN CONTACT AND WEAR SAFETY GLASSES FOR EYE PROTECTION. USE IN A WELL VENTILATED AREA AWAY FROM SPARKS AND FLAME. READ AND OBSERVE ALL WARNING LABELS.

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: Some HC-B4TN-1 propellers were manufactured with a one-piece spinner mounting plate. The spinner bulkhead is attached to the spinner mounting plate. The spinner mounting plate is installed in a cutaway portion of the propeller hub flange and is "pinched" between the propeller hub flange and the engine flange. Refer to Figure 3-9.

(1) Clean the engine flange and propeller flange with Quick Dry Stoddard Solvent.

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

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

(2) Using a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange.

(3) Install the hub O-ring (Table 3-1) on the engine flange.

(4) Slide the spinner mounting plate and spinner bulkhead onto a shoulder on the propeller hub flange.

(5) Align the clearance "scallops" in the spinner mounting plate with the holes in the propeller hub flange.

NOTE: This will make sure that the spinner mounting plate does not interfere with the mounting bolts and the dowel pins.

(6) Align the threaded holes and dowel pins in the propeller hub flange with the mounting holes and the dowel pin holes in the engine flange.

CAUTION: MAKE SURE THAT COMPLETE AND TRUE SURFACE CONTACT IS ESTABLISHED BETWEEN THE PROPELLER HUB FLANGE AND THE ENGINE FLANGE.

(7) Slide the propeller flange, spinner bulkhead and spinner mounting plate onto the engine flange.

CAUTION: NEW PROPELLER MOUNTING BOLTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

(8) Apply MIL-PRF-83483 anti-seize compound to the threaded surfaces of the mounting bolts.

CAUTION: THE ID CHAMFER OF THE WASHER MUST BE FACING TOWARD THE BOLT HEAD. WASHERS WITHOUT CHAMFER MUST BE INSTALLED WITH ROLLED EDGES TOWARD THE BOLT HEAD. REFER TO FIGURE 3-8.

(9) Install mounting bolts (Table 3-1) with washers through the engine flange from the rear and into the tapped holes in the propeller flange.

(a) For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

(10) Using a torque wrench with the appropriate torque wrench adapter, torque all mounting bolts in sequences and steps shown in Figure 3-2. Refer to Table 3-2 and Figure 3-1 to determine the proper torque value to which the torque wrench must be set.

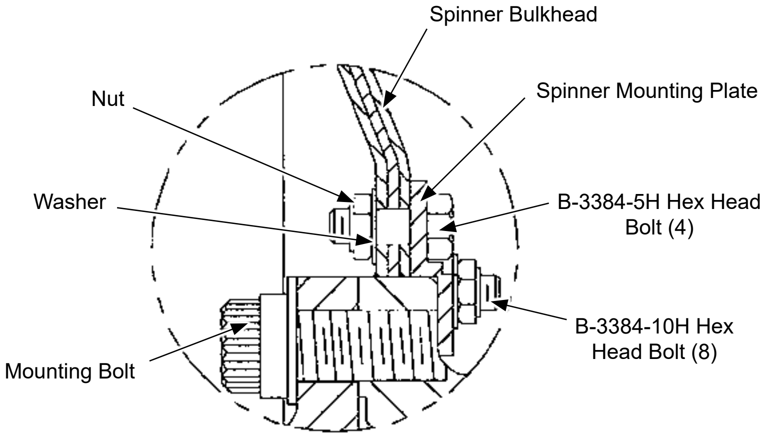
(11) Safety all mounting bolts with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware (two bolts per safety.

(12) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(13) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(14) Install the propeller spinner dome in accordance with the section, "Spinner Dome Installation" in this chapter.

(b) Secure the spinner dome to the spinner bulkhead with the supplied screws and washers.



HC-B4TN-1 Configured With Two-Piece Spinner Mounting Plate
Figure 3-10

G. Installing the HC-B4TN-1 Propeller With a Two-piece Spinner Mounting Plate - Refer to Figure 3-10

WARNING: ADHESIVES AND SOLVENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT AND BREATHING OF VAPORS. USE SOLVENT RESISTANT GLOVES TO MINIMIZE SKIN CONTACT AND WEAR SAFETY GLASSES FOR EYE PROTECTION. USE IN A WELL VENTILATED AREA AWAY FROM SPARKS AND FLAME. READ AND OBSERVE ALL WARNING LABELS.

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: Some HC-B4TN-1 propellers were manufactured with a two-piece spinner mounting plate. The spinner bulkhead is attached to the spinner mounting plate, which is bolted onto the propeller hub flange. Refer to Figure 3-10.

(1) Clean the engine flange and propeller flange with Quick Dry Stoddard Solvent.

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

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

(2) Using a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange.

(3) If the spinner bulkhead is to be installed and is not already in place, perform the following steps:

(a) Slide the spinner bulkhead over the propeller flange, against the spinner mounting plate.

(b) Align the spinner bulkhead attachment holes with the spinner mounting plate attachment holes.

(c) Insert the hex head bolts from the propeller side of the spinner mounting plate.

(d) Install the washer and locking nut on each attachment bolt.

(e) Torque the hex head bolts to 8-12 Ft-Lb (11-16 N•m).

(4) Install the hub O-ring (Table 3-1) on the engine flange.

(5) Align the mounting holes and dowel pins in the propeller hub flange with the mounting holes and dowel pin holes in the engine flange.

CAUTION: MAKE SURE THAT COMPLETE AND TRUE SURFACE CONTACT IS ESTABLISHED BETWEEN THE PROPELLER HUB FLANGE AND THE ENGINE FLANGE.

(6) Slide the propeller flange onto the engine flange.

CAUTION: NEW PROPELLER MOUNTING BOLTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

(7) Apply anti-seize compound MIL-PRF-83483 to the threaded surfaces of the mounting bolts.

CAUTION: THE ID CHAMFER OF THE WASHER MUST BE FACING TOWARD THE BOLT HEAD. WASHERS WITHOUT A CHAMFER MUST BE INSTALLED WITH THE ROLLED EDGES TOWARD THE BOLT HEAD. REFER TO FIGURE 3-8.

(8) Install mounting bolts (Table 3-1) with washers through the engine flange and into the tapped holes in the propeller flange.

(a) For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

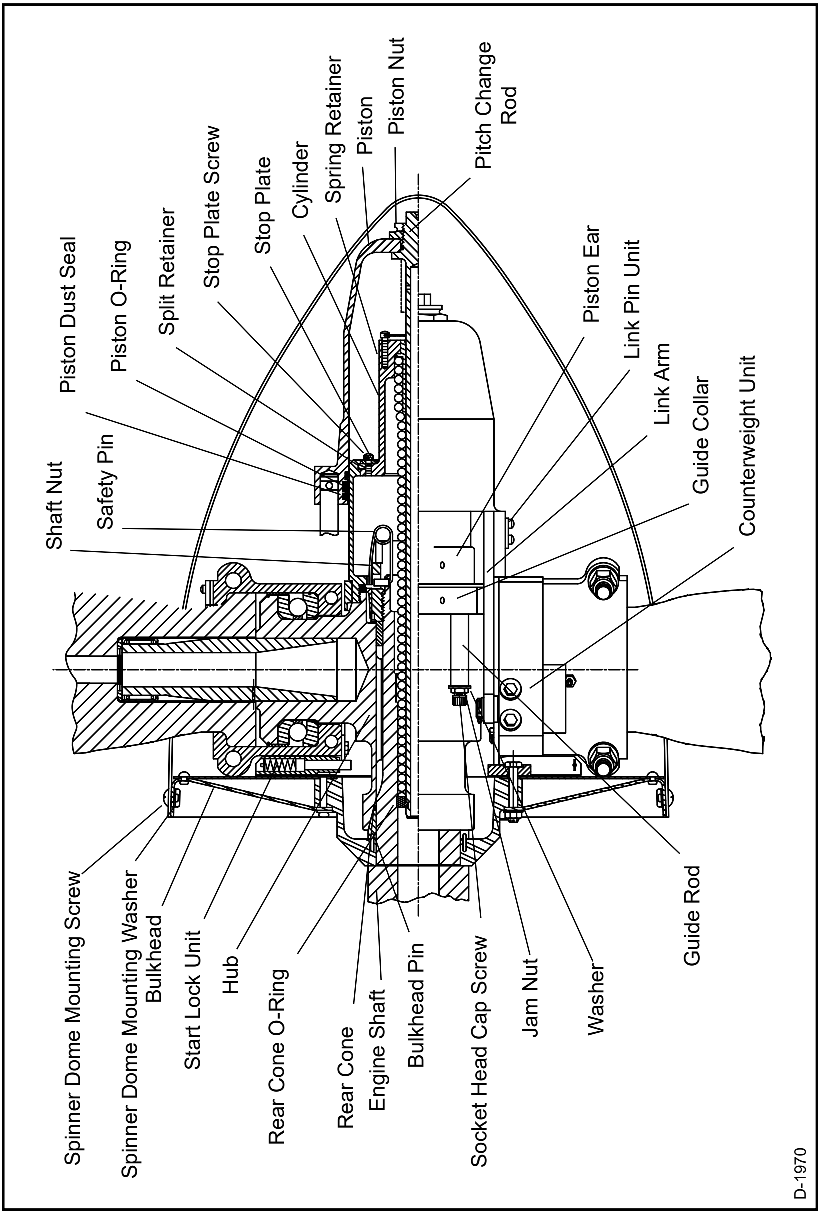
(9) Using a torque wrench with the appropriate torque wrench adapter, torque all mounting bolts in sequences and steps shown in Figure 3-2. Refer to Table 3-2 and Figure 3-1 to determine the proper torque value to which the torque wrench must be set.

(10) Safety all mounting bolts with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware (two bolts per safety).

(11) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80) .

(12) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(13) Install the propeller spinner dome in accordance with the section, "Spinner Dome Installation" in this chapter.



HC-B3( )20-2( ) and HC-B3( )30-2B( ) Propellers
Figure 3-11

H. Installing the HC-B3( )20-2( ) and HC-B3( )30-2B( ) Propellers - Refer to Figure 3-11

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

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.

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

(1) Using a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine shaft.

CAUTION: THE PISTON MUST BE REMOVED BEFORE INSTALLING THE PROPELLER ON THE AIRCRAFT. IF THE PISTON HAS ALREADY BEEN REMOVED, PROCEED TO STEP 4.H.(4).

(2) Piston Removal - Refer to Figures 3-12 and 3-13

(a) Remove the piston nut.

NOTE: The piston nut should have been removed before shipping to allow rotating of the blades for packaging.

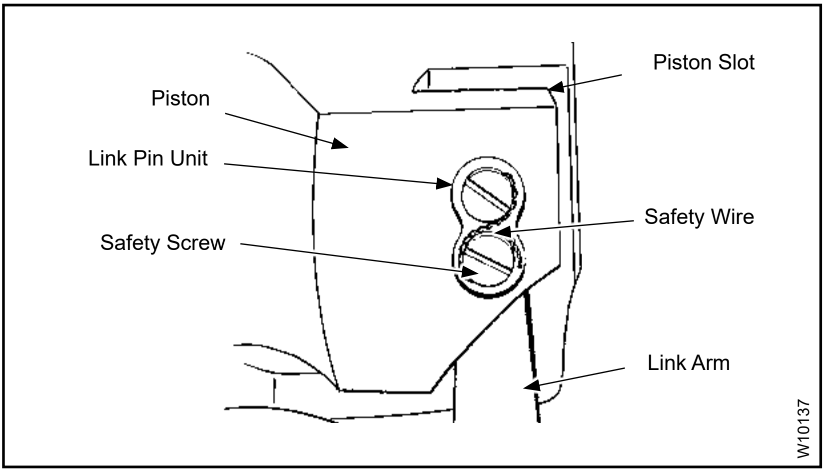
(b) Remove the safety wire (if installed) from the link pin units.

(c) Remove the safety screw from each link pin unit.

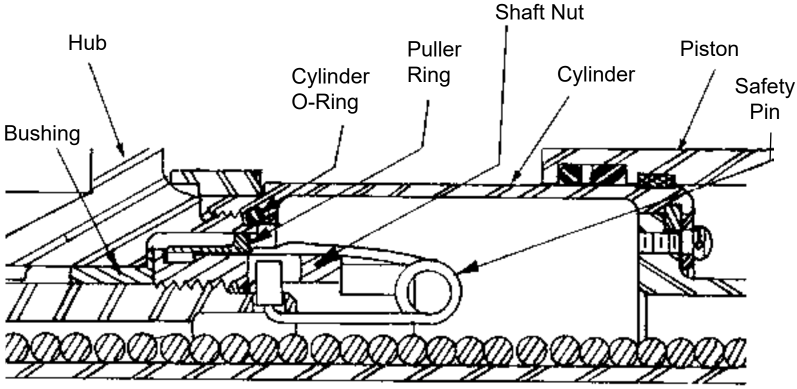
(d) Remove each link pin unit.

(e) The piston ears and guide collar should have corresponding index numbers (1, 2, and 3) impression stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

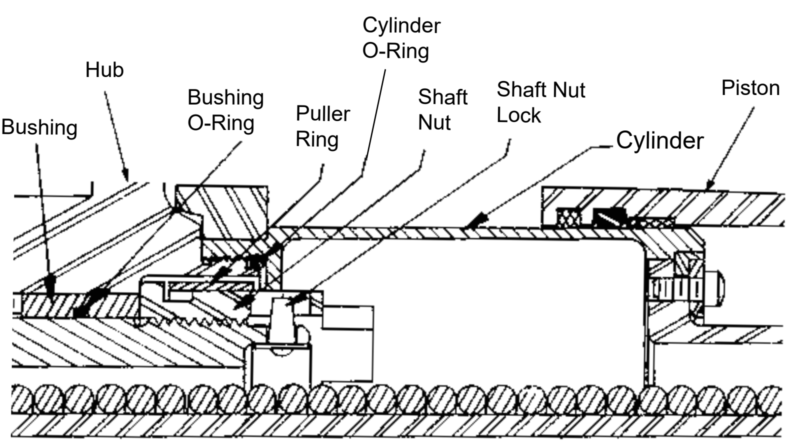
NOTE: This will make sure that the components are reassembled in their original location.



Piston to Link Arm Attachment Details
Figure 3-12



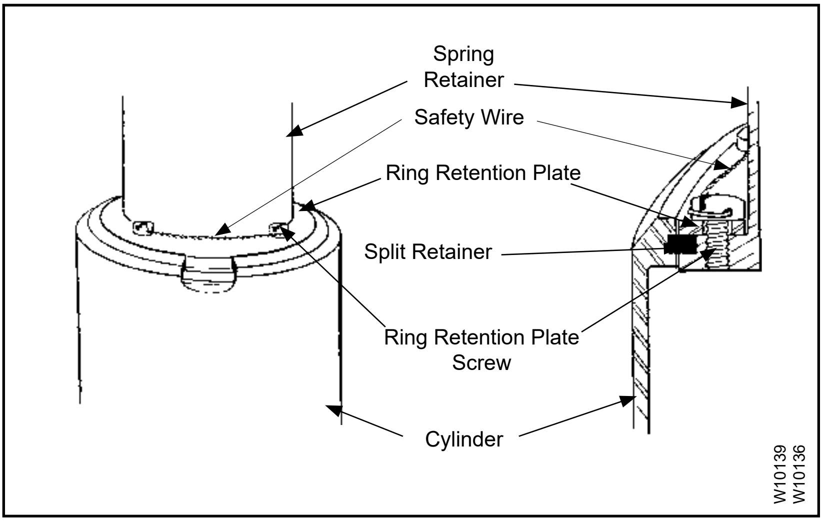
Safety Pin on 20 Spline Shaft Models



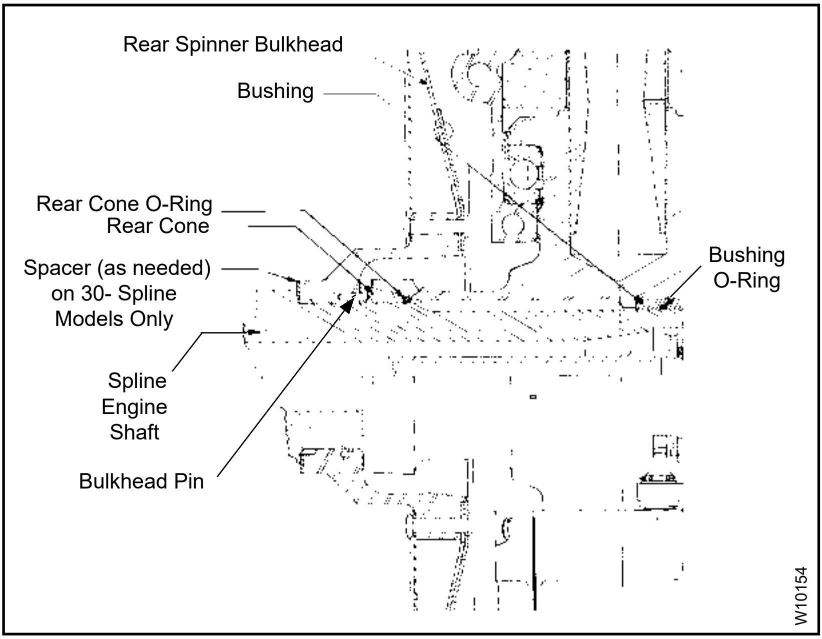
Shaft Nut Lock on 30 Spline Shaft Models

W10135
W10140

Safetying the Shaft Nut on 20 and 30 Spline Shaft Propellers
Figure 3-13



Spring Assembly to Cylinder Attachment Details
Figure 3-14



Rear Hub Mounting Parts on 20 and 30 Spline Shaft Propellers
Figure 3-15

(f) Slide the link arms out of the piston slots.

(g) Remove the socket head cap screw (Table 3-1), jam nut, and washer from each piston guide rod.

(h) Slide the piston off the cylinder.

CAUTION: THE SPRING ASSEMBLY MUST BE REMOVED BEFORE INSTALLING THE PROPELLER ON THE AIRCRAFT. IF THE SPRING ASSEMBLY HAS ALREADY BEEN REMOVED, PROCEED TO STEP 4.H.(5).

(3) Spring assembly removal - Refer to Figure 3-14

(a) Remove the ring retention plate screw safety wire (if installed).

(b) Remove the ring retention plate screws.

(c) Remove the retention plate.

(d) Remove the split retainer.

(e) Remove the spring assembly from the cylinder.

(4) On 30 spline shaft propeller models only, install the bushing O-ring (Table 3-1) in the ID groove of the bushing, located in the hub bore. Refer to Figure 3-13.

NOTE: The shaft bushing is press fit into the hub.

(5) Make sure the propeller hub spline and engine spline surfaces are clean.

(6) On 30 spline shaft models only, slide the spacers (Table 3-1), as required, onto the shaft. Refer to Figure 3-15.

(7) Slide the spinner bulkhead onto the shaft.

(8) Install the rear cone onto the bulkhead, matching the holes in the cone with the pins in the bulkhead. Refer to Figure 3-15.

(9) Install the rear cone O-ring (Table 3-1) over the shaft. Refer to Figure 3-15.

(10) Slide the propeller hub onto the shaft and tighten the shaft nut until the rear bulkhead is snug, but not tight.

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

(11) Carefully slide the spinner dome over the reassembled propeller.

(12) To properly position the rear bulkhead, temporarily install the spinner dome with at least four screws.

(a) Make sure the start lock pins are parallel with the blade axis, but offset to one side.

(13) Adjust the spinner to equalize the clearance between the blades and the blade cutouts in the dome.

(14) Remove the spinner dome.

(15) Torque the propeller shaft nut (Table 3-1) using tool BST-2910. Refer to Table 3-2 and Figure 3-1 to determine the proper torque value to which the torque wrench must be set.

(16) Safety the shaft nut to the engine shaft using a hub lock safety pin (Table 3-1) for 20 spline models, or a shaft nut lock for 30 spline models. Refer to Figure 3-13.

NOTE: The hub lock safety pin or shaft nut lock is normally supplied in a separate package when the propeller is shipped new from the factory.

(17) Install the spring assembly -
Refer to Figures 3-11 and 3-14

(a) Place the feathering spring assembly into the engine shaft, with the front spring retainer inside the cylinder.

(b) Install the split retainer between the cylinder and the front spring retainer, sliding the split retainer into the recess in the cylinder.

(c) Pull the spring retainer tight against the split retainer.

(d) Install the ring retainer plate, which secures the split retainer, into place.

(e) Install the ring retention plate screws and tighten them until they are snug.

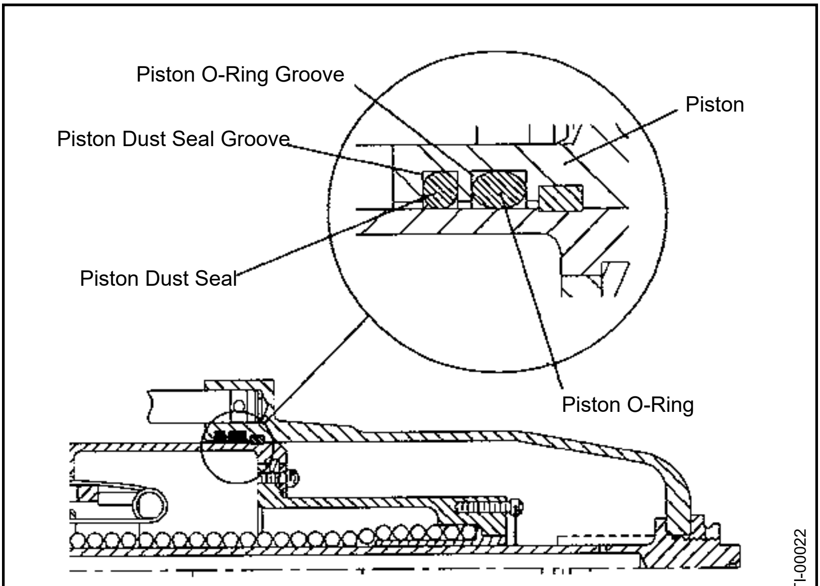
(f) Safety the ring retention plate screws with 0.032 inch (0.81 mm) minimum diameter stainless steel wire (two screws per safety).

(18) If the piston O-ring (Table 3-1) and the piston dust seal are not already installed in the piston, perform the following steps. Refer to Figure 3-16.

(a) Lubricate the piston O-ring and carefully install it in the groove provided for it in the piston.

(b) Cut the necessary length of oiled piston dust seal material.

1 Cut the piston dust seal material on a 30 degree diagonal so there will be an overlap with a smooth surface, free of fuzz.



Installing Piston O-Ring and Piston Dust Seal
Figure 3-16

(c) Apply a layer of aviation grade reciprocating engine oil to the piston dust seal.

CAUTION: MAKE SURE THAT THE PISTON DUST SEAL IS FREE OF FUZZ.

(d) Install the piston dust seal material in the groove provided for it in the piston.

(19) Install the rod O-ring (Table 3-1) in the groove at the end of the threaded portion of the pitch change rod.

CAUTION: TO MAINTAIN PROPER BLADE ANGLES, IT IS IMPORTANT THAT THE PISTON BE REINSTALLED IN THE SAME POSITION AS WHEN IT WAS ORIGINALLY ASSEMBLED. INDEX NUMBERS ON THE PISTON AND THE GUIDE COLLAR ARE PROVIDED TO MAKE SURE OF PROPER POSITIONING.

(20) Locate and match up the index numbers (1, 2, and 3) on the piston ears with the corresponding index numbers on the guide collar.

NOTE: The index marks will be either impression stamped or drawn with a felt-tipped pen.

(21) Oil the surface of the cylinder and install the piston.

(22) Slide the piston onto the cylinder and pass the guide rods through the guide collar bushings.

(23) Install the washer, socket head cap screw, and jam nut (Table 3-1), at the end of each guide rod. Refer to Figure 3-11.

(24) Connect the link arms to the piston. Refer to Figure 3-12.

(25) Install the link pin units.

(26) Install the link pin safety screws.

(27) Safety the link pin screws together with 0.032 inch (0.81 mm) minimum diameter stainless steel wire Refer to Figure 3-12.

(28) Carefully rotate the blades into feather position and fasten the piston to the pitch change rod with the piston nut (Table 3-1).

(29) Torque the piston nut per Table 3-2.

(30) Torque the jam nut against the guide rod. Refer to Table 3-2.

(31) Remove the wires from the start lock brackets.

(32) Position the propeller on the start locks.

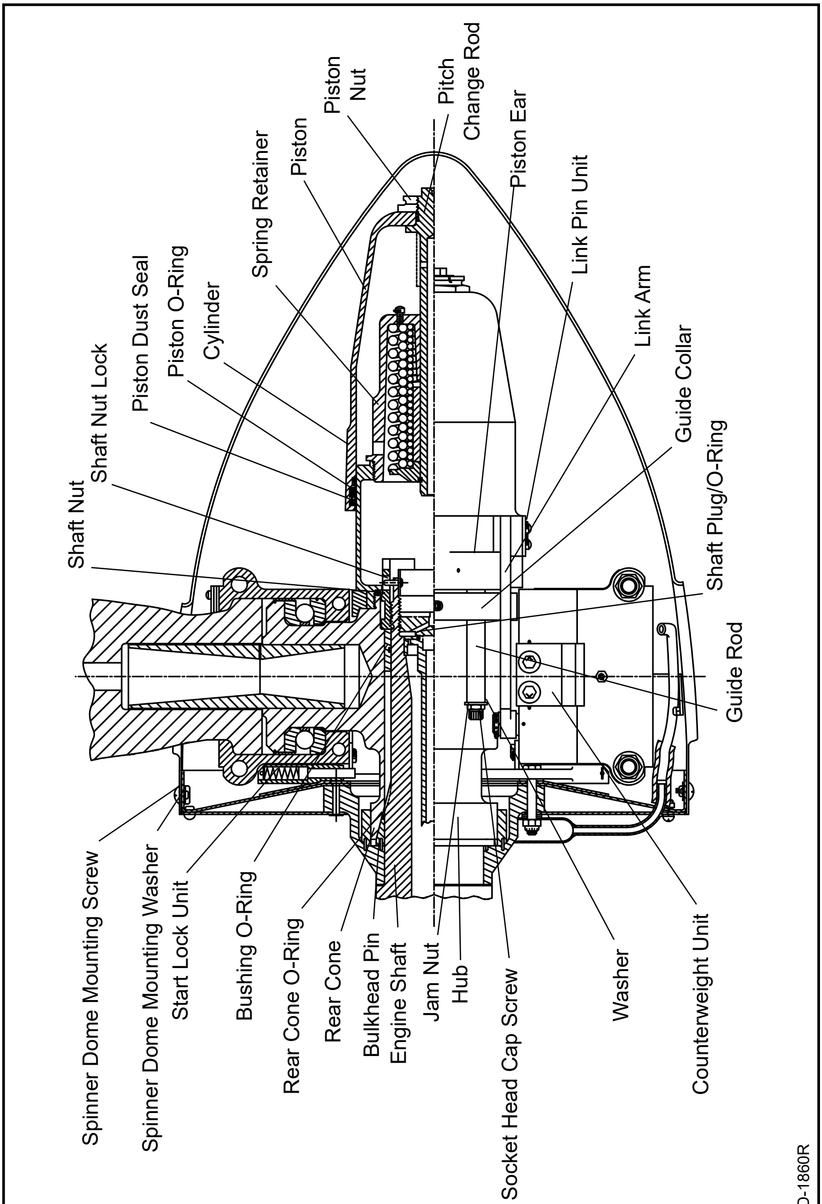
CAUTION: DO NOT PUT THE BLADE PADDLE IN THE AREA OF THE DE-ICE BOOT WHEN APPLYING TORQUE TO A BLADE ASSEMBLY. PUT THE BLADE PADDLE IN THE THICKEST AREA OF THE BLADE, JUST OUTSIDE OF THE DE-ICE BOOT. USE ONE BLADE PADDLE PER BLADE.

(33) Using the blade paddles, simultaneously rotate the blades toward low pitch until the auto high stop pins engage the stop plate.

(34) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(35) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(36) Install the propeller spinner dome in accordance with the section, "Spinner Dome Installation" in this chapter.



HC-B3( )30-1E( ) and HC-B3( )30-2E( ) Propellers
Figure 3-17

I. Installing the HC-B3( )30-1E( ) and HC-B3( )30-2E( ) Propellers - Refer to Figure 3-17

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) This step pertains only to installation on the R985-A14B engine. If installing the propeller on an engine other than the R985-A14B, proceed to step 4.I.(2).

(a) If installing the above propeller models on the R985-A14B engine, modification to the engine is required. On the R985-A14B engine, it is necessary to install a special plug in the front of the shaft, which plugs the central oil passage, but allows oil to flow through the outer passages.

1 Remove the original shaft plug.

2 Install O-ring C-3317- 210-1.

3 Install the new shaft plug A-1834 plug (1-15/16 -16 threads) or A-1834-1 plug (1-3/4 -16 threads).

WARNING 1: THE PISTON NUT SHOULD HAVE BEEN REMOVED BEFORE SHIPPING TO PERMIT ROTATING OF THE BLADES FOR PACKAGING.

FOR SAFETY REASONS, IF THE PISTON NUT WAS NOT REMOVED, THE PROPELLER MUST BE PLACED IN FEATHER POSITION (HC-B3[ ]30-2E[ ] MODELS ONLY) OR IN HIGH PITCH POSITION (HC-B3[ ]30-1E[ ] MODELS ONLY) BEFORE IT IS INSTALLED ON THE AIRCRAFT.

WARNING 2: MAKE SURE THE SLING IS RATED UP TO 800 POUNDS (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION.

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

(2) Using a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine shaft.

CAUTION: THE PISTON MUST BE REMOVED BEFORE INSTALLING THE PROPELLER ON THE AIRCRAFT. IF THE PISTON HAS ALREADY BEEN REMOVED, PROCEED TO STEP 4.I.(5).

(3) Piston removal - Refer to Figures 3-17 and 3-12

(a) Remove the piston nut.

NOTE: The piston nut should have been removed before shipping to allow rotating of the blades for packaging.

(b) Remove the safety wire (if installed) from the link pin units.

(c) Remove the safety screw from each link pin unit.

(d) Remove each link pin unit.

(e) The piston ears and guide collar should have corresponding index numbers (1, 2, and 3) impression stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(f) Slide the link arms out of the piston slots.

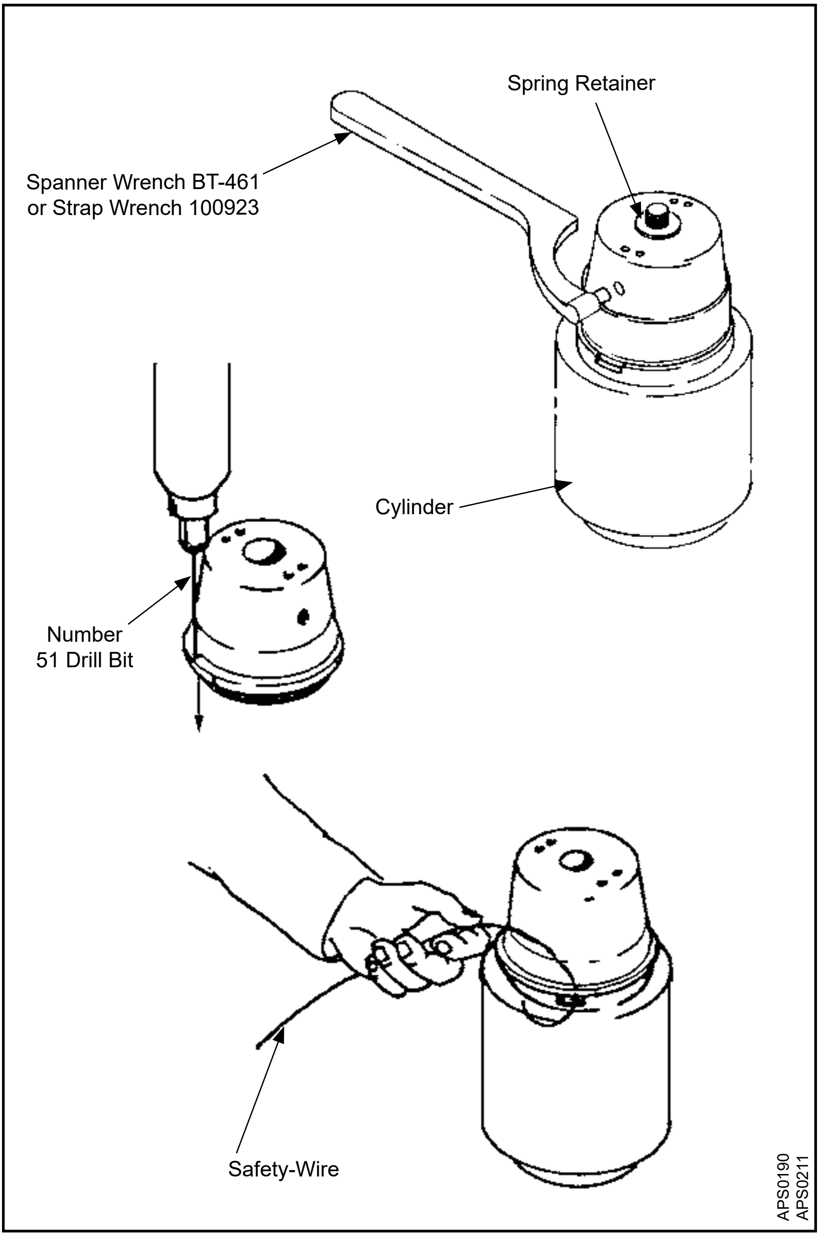
(g) Remove the socket head cap screw, jam nut, and washer from each piston guide rod.

(h) Slide the piston off the cylinder.

CAUTION: THE SPRING ASSEMBLY MUST BE REMOVED BEFORE INSTALLING THE PROPELLER ON THE AIRCRAFT. IF THE ASSEMBLY HAS ALREADY BEEN REMOVED, PROCEED TO STEP 4.I.(6).

(4) Spring assembly removal

(a) Remove the safety wire (if installed).



Feathering Spring Assembly
Figure 3-18

(b) Unthread the spring retainer from the cylinder using spanner wrench BT-461 or strap wrench 100923. Refer to Figure 3-18.

(c) Remove the spring retainer and the attached spring assembly from the cylinder.

(5) Install the bushing O-ring (Table 3-1) into the shaft bushing.

NOTE: The shaft bushing is press fit into the hub.

(6) Make sure the propeller hub spline and engine spline surfaces are clean.

(7) Slide the spacers (as required) onto the engine shaft. Refer to Figure 3-15.

(8) Slide the rear spinner bulkhead onto the engine shaft.

(9) Install the rear cone onto the bulkhead, matching the holes in the cone with the pins in the bulkhead. Refer to Figure 3-15.

(10) Install the rear cone O-ring (Table 3-1) over the shaft. Refer to Figure 3-15.

CAUTION: IF THE START LOCK PINS ARE EXTENDED, THE STOP PLATE WILL BE BENT OR SHEARED OFF.

(11) Retract the start lock pins and hold them in place with a heavy wire inserted through the hole of each start lock housing.

NOTE: The start locks are attached to the spinner bulkhead.

(12) Slide the propeller hub onto the engine shaft, and tighten the shaft nut until the rear bulkhead is snug, but not tight.

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

(13) Carefully slide the spinner dome over the reassembled propeller.

(14) To properly position the rear bulkhead, temporarily install the spinner dome with at least three screws.

NOTE: Make sure the start lock pins are parallel with the blade axis, but offset to one side.

(15) Adjust the spinner to equalize the clearance between the blades and the blade cutouts in the dome.

(16) Remove the spinner dome.

(17) Torque the propeller shaft nut (Table 3-1) using tool BST-2910. Refer to Table 3-2 and Figure 3-1 to determine the proper torque value to which the torque wrench must be set.

(18) Safety the shaft nut to the engine shaft using a shaft nut lock (Table 3-1). Refer to Figure 3-13.

NOTE: The shaft nut lock is normally supplied in a separate package when the propeller is shipped new from the factory.

(19) Insert the feathering spring assembly into the cylinder.

(20) Use the special spanner wrench BT-461 or strap wrench 100923 to thread the feathering spring into place in the cylinder. Refer to Figure 3-18.

(21) Torque the feathering spring assembly. Refer to Table 3-2 and Figure 3-1 to determine the proper torque value to which the torque wrench must be set.

(22) Using a number 51 (0.067 inch) drill bit, drill a hole through the lip on the spring cup to line up with the slot in the cylinder. Refer to Figure 3-18.

(23) Insert 0.032-inch minimum diameter stainless steel wire CM131 through the hole in the spring cup, matching it with the slots in the cylinder. Refer to Figure 3-18.

(a) Use three loops of wire to safety the feathering spring assembly.

(b) Tuck the "pigtail" into the slotted area.

(24) If the piston O-ring (Table 3-1) and the piston dust seal are not already installed in the piston, perform the following steps. Refer to Figure 3-16.

(a) Lubricate the piston O-ring and carefully install it in the groove provided for it in the piston.

(b) Cut the necessary length of oiled piston dust seal material.

1 Cut the piston dust seal material on a 30 degree diagonal so there will be an overlap with a smooth surface, free of fuzz.

(c) Apply a layer of aviation grade reciprocating engine oil to the piston dust seal.

CAUTION: MAKE SURE THAT THE PISTON DUST SEAL IS FREE OF FUZZ.

(d) Install the piston dust seal material in the groove provided for it in the piston.

(e) Install the rod O-ring (Table 3-1) in the groove at the end of the threaded portion of the pitch change rod.

CAUTION: TO MAINTAIN PROPER BLADE ANGLES, IT IS IMPORTANT THAT THE PISTON BE REINSTALLED IN THE SAME POSITION AS WHEN IT WAS ORIGINALLY ASSEMBLED. INDEX NUMBERS ON THE PISTON AND THE GUIDE COLLAR ARE PROVIDED TO MAKE SURE OF PROPER POSITIONING.

(25) Locate and match up the index numbers (1, 2, and 3) on the piston ears with the corresponding index numbers on the guide collar.

NOTE: The index marks will be either impression stamped or drawn with a felt-tipped pen.

(26) Oil the surface of the cylinder and install the piston.

(27) Slide the piston onto the cylinder and pass the guide rods through the guide collar bushings.

(28) Install the low-pitch stop components: washer, socket head cap screw, and jam nut (Table 3-1), at the end of each guide rod. Refer to Figure 3-17.

(29) Connect the link arms to the piston.

(30) Install the link pin units.

(31) Install the link pin safety screws.

(32) Safety the two screws together with 0.032 inch (0.81 mm) minimum diameter stainless steel wire.

(33) Rotate the blades into feather position and fasten the piston to the pitch change rod with the piston nut (Table 3-1).

(34) Torque the piston nut per Table 3-2.

(35) Torque the jam nut against the guide rod per Table 3-2.

(36) Remove the wires from the start lock brackets.

(37) Position the propeller on the start locks.

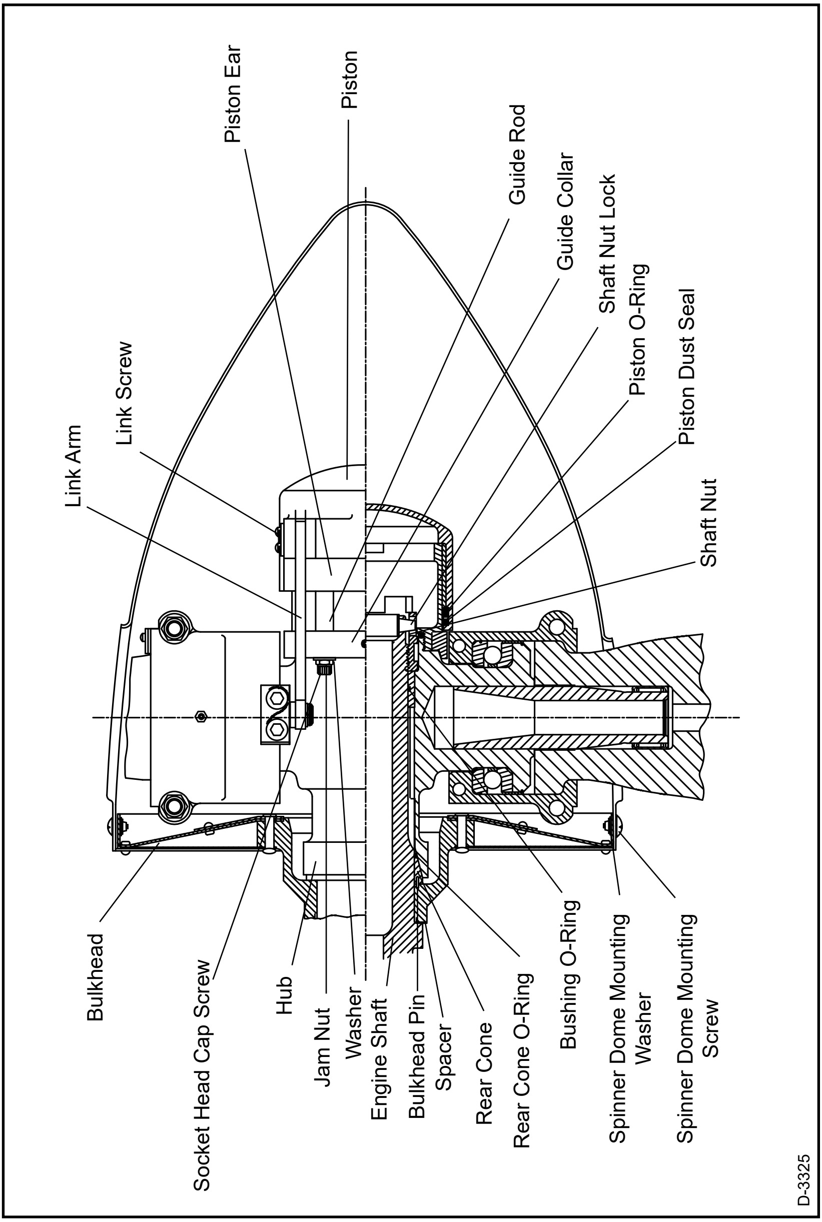
CAUTION: DO NOT PUT THE BLADE PADDLE IN THE AREA OF THE DE-ICE BOOT WHEN APPLYING TORQUE TO A BLADE ASSEMBLY. PUT THE BLADE PADDLE IN THE THICKEST AREA OF THE BLADE, JUST OUTSIDE OF THE DE-ICE BOOT. USE ONE BLADE PADDLE PER BLADE.

(38) Using blade paddles, simultaneously rotate the blades toward low pitch until the start lock pins engage the stop plate.

(39) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(40) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(41) Install the propeller spinner dome in accordance with the section, "Spinner Dome Installation" in this chapter.



HC-B3( )20-4 and HC-B3( )30-4 Propellers
Figure 3-19

J. Installing the HC-B3( )20-4 and HC-B3( )30-4 Propellers - Refer to Figure 3-19

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

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.

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

(1) Using a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange.

CAUTION: THE PISTON MUST BE REMOVED BEFORE INSTALLING THE PROPELLER ON THE AIRCRAFT. IF THE PISTON HAS ALREADY BEEN REMOVED, PROCEED TO STEP 4.J.(3).

(2) Piston Removal - Refer to Figures 3-19 and 3-12

(a) Remove the safety wire (if installed) from the link pin units.

(b) Remove the safety screw from each link pin unit.

(c) Remove each link pin unit.

(d) The piston ears and guide collar should have corresponding index numbers (1, 2, and 3) impression stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(e) Slide the link arms out of the piston slots.

(f) Remove the socket head cap screw, jam nut, and washer from each piston guide rod.

(g) Slide the piston off the cylinder.

(3) On HC-B3( )30-4 propellers only, install the bushing O-ring (Table 3-1) into the shaft bushing.

NOTE: The shaft bushing is press fit into the hub.

(4) Make sure the propeller hub spline and engine spline surfaces are clean.

(5) On 30 spline shaft models only, slide the spacer (Table 3-1), as required, onto the shaft. Refer to Figure 3-15.

(6) Slide the rear spinner bulkhead onto the engine shaft.

(7) Install the rear cone onto the bulkhead, matching the holes in the cone with the pins in the bulkhead.

(8) Install the rear cone O-ring (Table 3-1) over the shaft. Refer to Figure 3-15.

(9) Slide the propeller hub onto the engine shaft and tighten the shaft nut until the rear bulkhead is snug, but not tight.

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

(10) Carefully slide the spinner dome over the reassembled propeller.

(11) To properly position the rear bulkhead, temporarily install the spinner dome with at least four screws.

(12) Adjust the spinner to equalize the clearance between the blades and the blade cutouts in the dome.

(13) Remove the spinner dome.

(14) Torque the propeller shaft nut (Table 3-1) using tool BST-2910. Refer to Table 3-2 and Figure 3-1 to determine the proper torque value to which the torque wrench must be set.

(15) Safety the shaft nut using a safety pin for 20 spline models or a shaft nut lock for 30 spline models. Refer to Figure 3-13.

NOTE: The hub lock safety pin or shaft nut lock is normally supplied in a separate package when the propeller is shipped new from the factory.

(16) If the piston O-ring and the piston dust seal are not already installed in the piston, perform the following steps. Refer to Figure 3-16.

(a) Lubricate the piston O-ring (Table 3-1) and carefully install it in the groove provided for it in the piston.

(b) Cut the necessary length of oiled piston dust seal material.

1 Cut the piston dust seal material on a 30 degree diagonal so there will be an overlap with a smooth surface, free of fuzz.

(c) Apply a layer of aviation grade reciprocating engine oil to the piston dust seal.

CAUTION: MAKE SURE THAT THE PISTON DUST SEAL IS FREE OF FUZZ.

(d) Install the piston dust seal material in the groove provided for it in the piston.

CAUTION: TO MAINTAIN PROPER BLADE ANGLES, IT IS IMPORTANT THAT THE PISTON BE REINSTALLED IN THE SAME POSITION AS WHEN IT WAS ORIGINALLY ASSEMBLED. INDEX NUMBERS ON THE PISTON AND THE GUIDE COLLAR ARE PROVIDED TO MAKE SURE OF PROPER POSITIONING.

(17) Locate and match up the index numbers (1, 2, and 3) on the piston ears with the corresponding index numbers on the guide collar.

NOTE: The index marks will be either impression stamped or drawn with a felt-tipped pen.

(18) Oil the surface of the cylinder and install the piston.

(19) Slide the piston onto the cylinder and pass the guide rods through the guide collar bushings.

(20) Install the washer, socket head cap screw, and jam nut (Table 3-1), at the end of each guide rod.

(21) Connect the link arms to the piston. Refer to Figure 3-12.

(22) Install the link pin units.

(23) Install the link pin safety screws.

(24) Safety the link pin screws together with 0.032 inch (0.81 mm) minimum diameter stainless steel wire. Refer to Figure 3-12.

(25) Torque the jam nut against the guide rod per Table 3-2.

(26) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(27) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(28) Install the propeller spinner dome in accordance with the section, "Spinner Dome Installation" in this chapter.

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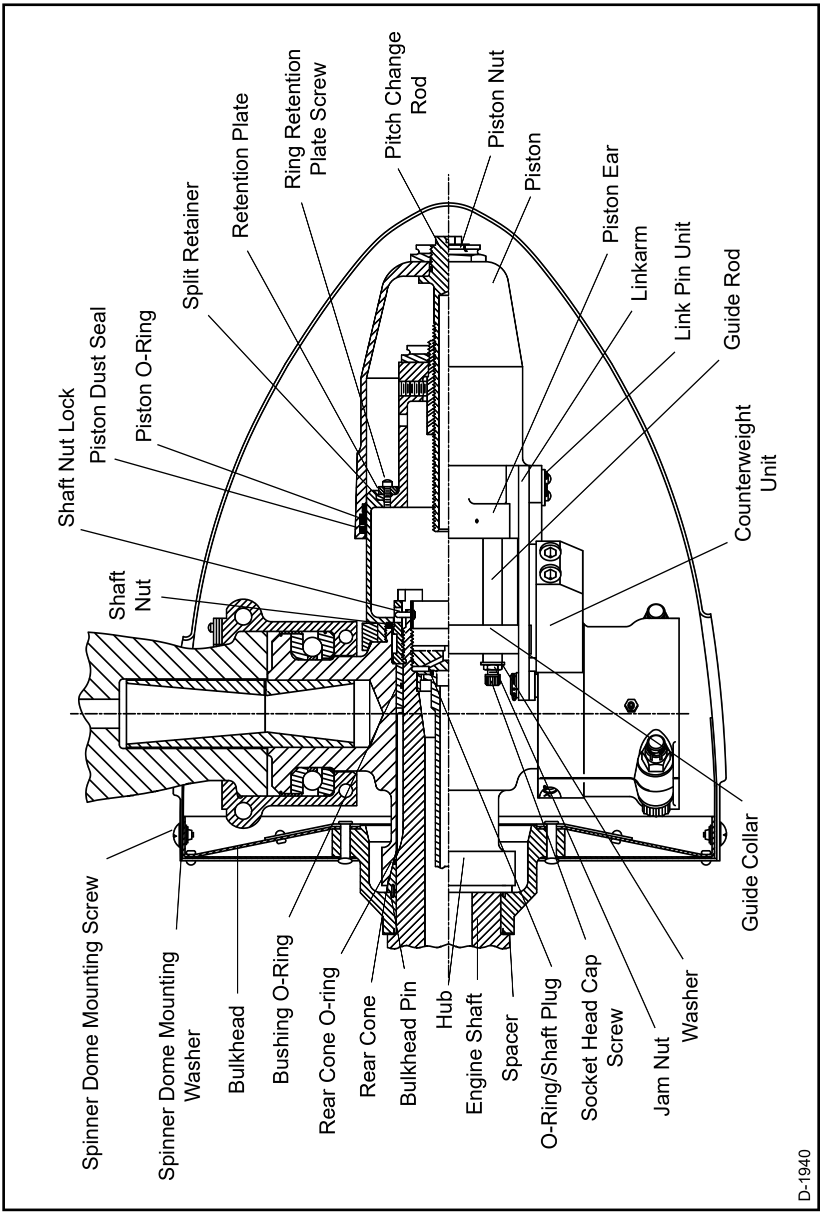


HA-B3( )30-1B Propellers
Figure 3-20

K. Installing the HA-B3( )30-1B Propellers
- Refer to Figure 3-20.

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) Plug the engine shaft.

(a) Install O-ring C-3317-210-1.

(b) If applicable, install the new shaft plug A-1857 plug (1-15/16 -16 threads) or A-1857-1 plug (1-3/4 -16 threads).

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

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

(2) Using a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange.

CAUTION: THE PISTON MUST BE REMOVED BEFORE INSTALLING THE PROPELLER ON THE AIRCRAFT. IF THE PISTON HAS ALREADY BEEN REMOVED, PROCEED TO STEP 4.K.(4).

(3) Piston Removal - Refer to Figures 3-20 and 3-12

(a) Remove the piston nut.

(b) Remove the safety wire (if installed) from the link pin units.

(c) Remove the safety screw from each link pin unit.

(d) Remove each link pin unit.

(e) The piston ears and guide collar should have corresponding index numbers (1, 2, and 3) impression stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(f) Slide the link arms out of the piston slots.

(g) Remove the socket head cap screw, jam nut, and washer from each piston guide rod.

(h) Slide the piston off the cylinder.

CAUTION: THE PITCH ADJUSTMENT ASSEMBLY MUST BE REMOVED BEFORE INSTALLING THE PROPELLER ON THE AIRCRAFT. IF THE PITCH ADJUSTMENT ASSEMBLY HAS ALREADY BEEN REMOVED, PROCEED TO STEP 4.K.(5).

(4) Pitch adjustment assembly removal

(a) Remove the ring retention plate screw safety wire (if installed).

(b) Remove the ring retention plate screws.

(c) Remove the retention plate.

(d) Remove the split retainer.

(e) Remove the pitch adjustment assembly from the cylinder.

(5) Install the bushing O-ring (Table 3-1) into the shaft bushing ID.

NOTE: The shaft bushing is press fit into the hub.

(6) Make sure the propeller hub spline and engine spline surfaces are clean.

(7) Slide the spacers (Table 3-1), as required, onto the shaft.

(8) Slide the rear spinner bulkhead onto the shaft.

(9) Install the rear cone onto the bulkhead, matching the holes in the cone with the pins in the bulkhead.
Refer to Figure 3-15.

(10) Install the rear cone O-ring (Table 3-1) over the shaft. Refer to Figure 3-15.

(11) Slide the propeller hub onto the engine shaft and tighten the shaft nut until the rear bulkhead is snug, but not tight.

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

(12) Carefully slide the spinner dome over the reassembled propeller.

(13) To properly position the rear bulkhead, temporarily install the spinner dome with at least three screws.

(14) Adjust the spinner to equalize the clearance between the blades and the blade cutouts in the dome.

(15) Remove the spinner dome.

(16) Torque the propeller shaft nut using tool BST-2910. Refer to Table 3-2 and Figure 3-1 to determine the proper torque value to which the torque wrench must be set.

(17) Safety the shaft nut (Table 3-1) to the engine shaft using a shaft nut lock. Refer to Figure 3-13.

NOTE: The shaft nut lock is normally supplied in a separate package when the propeller is shipped new from the factory.

(18) Install the pitch adjustment assembly into the cylinder.

(19) Install the split retainer between the cylinder and the front spring retainer. Slide the split retainer into the recess in the cylinder.

(20) Pull the pitch adjustment assembly forward, tight against the split retainer, locking the split retainer into place.

(21) Install the ring retention plate, which secures the split retainer, into place.

(22) Install the ring retention plate screws and tighten them until snug.

(23) Safety the plate screws using 0.032 inch (0.81 mm) minimum diameter stainless steel wire (two screws per safety).

(24) If the piston O-ring (Table 3-1) and the piston dust seal are not already installed in the piston, perform the following steps. Refer to Figure 3-16.

(a) Lubricate the piston O-ring and carefully install it in the groove provided for it in the piston.

(b) Cut the necessary length of oiled piston dust seal material.

1 Cut the piston dust seal material on a 30 degree diagonal so there will be an overlap with a smooth surface, free of fuzz.

(c) Apply a layer of aviation grade reciprocating engine oil to the piston dust seal.

CAUTION: MAKE SURE THAT THE PISTON DUST SEAL IS FREE OF FUZZ.

(d) Install the piston dust seal material in the groove provided for it in the piston.

(e) Install the rod O-ring (Table 3-1) in the groove at the end of the threaded portion of the pitch change rod.

CAUTION: TO MAINTAIN PROPER BLADE ANGLES, IT IS IMPORTANT THAT THE PISTON BE REINSTALLED IN THE SAME POSITION AS WHEN IT WAS ORIGINALLY ASSEMBLED. INDEX NUMBERS ON THE PISTON AND THE GUIDE COLLAR ARE PROVIDED TO MAKE SURE OF PROPER POSITIONING.

(25) Locate and match up the index numbers (1, 2, and 3) on the piston ears with the corresponding index numbers on the guide collar.

NOTE: The index marks will be either impression stamped or drawn with a felt-tipped pen.

(26) Oil the surface of the cylinder.

(27) Slide the piston onto the cylinder and pass the guide rods through the guide collar bushings.

(28) Install the washer, socket head cap screw, and jam nut (Table 3-1), at the end of each guide rod.

(29) Connect the link arms to the piston.

(30) Install the link pin units.

(31) Install the link pin safety screws.

(32) Safety the link pin screws together with 0.032 inch (0.81 mm) minimum diameter stainless steel wire. Refer to Figure 3-12.

(33) Rotate the blades to a higher pitch to seat the piston onto the pitch change rod.

(34) Install the piston nut. Torque per Table 3-2.

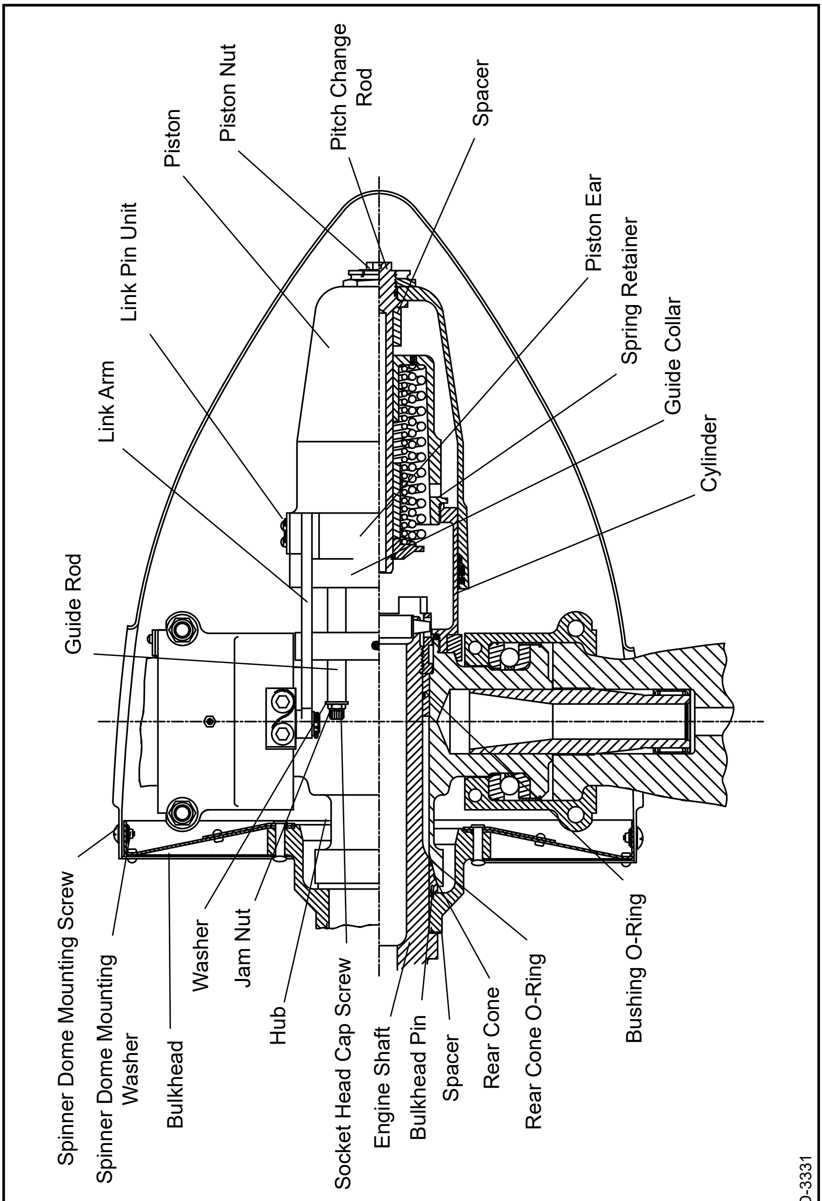
(35) Install the low-pitch stop components: washer, socket head cap screw, and jam nut (Table 3-1), at the end of each guide rod.

(36) Torque the jam nut against the guide rod per Table 3-2.

(37) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(38) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(39) Install the propeller spinner dome in accordance with the section, "Spinner Dome Installation" in this chapter.



HC-B3R30-4A,-4B Propeller
Figure 3-21

L. Installing the HC-B3R30-4A,-4B Propeller
- Refer to Figure 3-21.

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

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.

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

(1) Using a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange.

CAUTION: THE PISTON MUST BE REMOVED BEFORE INSTALLING THE PROPELLER ON THE AIRCRAFT. IF THE PISTON HAS ALREADY BEEN REMOVED, PROCEED TO STEP 4.L.(3).

(2) Piston Removal - Refer to Figures 3-21 and 3-12
   (a) Remove the piston nut.
   (b) Remove the safety wire (if installed) from the link pin units.
   (c) Remove the safety screw from each link pin unit.
   (d) Remove each link pin unit.

(e) The piston ears and guide collar should have corresponding index numbers (1, 2, and 3) impression stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(f) Slide the link arms out of the piston slots.

(g) Remove the socket head cap screw, jam nut, and washer from each piston guide rod.

(h) Slide the piston off the cylinder.

CAUTION: THE SPRING ASSEMBLY MUST BE REMOVED BEFORE INSTALLING THE PROPELLER ON THE AIRCRAFT. IF THE SPRING ASSEMBLY HAS ALREADY BEEN REMOVED, PROCEED TO STEP 4.L.(4).

(3) Spring assembly removal - Refer to Figure 3-14

(a) Remove the safety wire (if installed).

(b) Unthread the spring retainer from the cylinder using spanner wrench BT-461 or strap wrench 100923. Refer to Figure 3-18.

(c) Remove the spring retainer and the attached spring assembly from the cylinder.

(4) Install the bushing O-ring (Table 3-1) into the ID groove of the shaft bushing, located in the hub bore. Refer to Figure 3-13.

NOTE: The shaft bushing is press fit into the hub.

(5) Make sure the propeller hub spline and engine spline surfaces are clean.

(6) Slide the spacers (Table 3-1), as required, onto the shaft. Refer to Figure 3-15.

(7) Slide the rear spinner bulkhead onto the shaft.

(8) Install the rear cone onto the bulkhead, matching the holes in the cone with the pins in the bulkhead. Refer to Figure 3-15.

(9) Install the rear cone O-ring (Table 3-1) over the shaft. Refer to Figure 3-15.

(10) Slide the propeller hub onto the engine shaft and tighten the shaft nut until the rear bulkhead is snug, but not tight.

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

(11) Carefully slide the spinner dome over the reassembled propeller.

(12) To properly position the rear bulkhead, temporarily install the spinner dome with at least three screws.

(13) Adjust the spinner to equalize the clearance between the blades and the blade cutouts in the dome.

(14) Remove the spinner dome.

(15) Torque the propeller shaft nut (Table 3-1) using tool BST-2910. Refer to Table 3-2 and Figure 3-1 to determine the proper torque value to which the torque wrench must be set.

(16) Safety the shaft nut to the engine shaft using a shaft nut lock. Refer to Table 3-1 and Figure 3-13.

NOTE: The shaft nut lock is normally supplied in a separate package when the propeller is shipped new from the factory.

(17) Insert the feathering spring assembly into the cylinder.

(18) Use the special spanner wrench BT 461 to thread the feathering spring into place in the cylinder. Refer to Figure 3-18.

(19) Torque the feathering spring assembly. Refer to Table 3-2 and Figure 3-1 to determine the proper torque value to which the torque wrench must be set.

(20) Using a number 51 drill bit, drill a hole through the lip on the spring cup to line up with the slot in the cylinder. Refer to Figure 3-18.

(21) Insert 0.032-inch minimum diameter stainless steel wire CM131 through the hole in the spring cup, matching it with the slots in the cylinder. Refer to Figure 3-18.

(a) Use three loops of wire to safety the feathering spring assembly.

(b) Tuck the "pigtail" into the slotted area.

(22) If the piston O-ring (Table 3-1) and the piston dust seal are not already installed in the piston, perform the following steps. Refer to Figure 3-16.

(a) Lubricate the piston O-ring and carefully install it in the groove provided for it in the piston.

(b) Cut the necessary length of oiled piston dust seal material.

1 Cut the piston dust seal material on a 30 degree diagonal so there will be an overlap with a smooth surface, free of fuzz.

(c) Apply a layer of aviation grade reciprocating engine oil to the piston dust seal.

CAUTION: MAKE SURE THAT THE PISTON DUST SEAL IS FREE OF FUZZ.

(d) Install the piston dust seal material in the groove provided for it in the piston

(e) Install the rod O-ring (Table 3-1) in the groove at the end of the threaded portion of the pitch change rod.

CAUTION: TO MAINTAIN PROPER BLADE ANGLES, IT IS IMPORTANT THAT THE PISTON BE REINSTALLED IN THE SAME POSITION AS WHEN IT WAS ORIGINALLY ASSEMBLED. INDEX NUMBERS ON THE PISTON AND THE GUIDE COLLAR ARE PROVIDED TO MAKE SURE OF PROPER POSITIONING.

(23) Locate and match up the index numbers (1, 2, and 3) on the piston ears with the corresponding index numbers on the guide collar.

NOTE: The index marks will be either impression stamped or drawn with a felt-tipped pen.

(24) Oil the surface of the cylinder and install the piston.

(25) Slide the piston onto the cylinder and pass the guide rods through the collar bushings.

(26) Install the washer, socket head cap screw, and jam nut (Table 3-1), at the end of each guide rod.

(27) Connect the link arms to the piston. Refer to Figure 3-12.

(28) Install the link pin units.

(29) Install the link pin safety screws.

(30) Safety the link pin screws together with 0.032 inch (0.81 mm) minimum diameter stainless steel wire. Refer to Figure 3-12.

(31) By hand, carefully rotate the blades into low pitch position, and fasten the piston to the pitch change rod with the piston nut (Table 3-1).

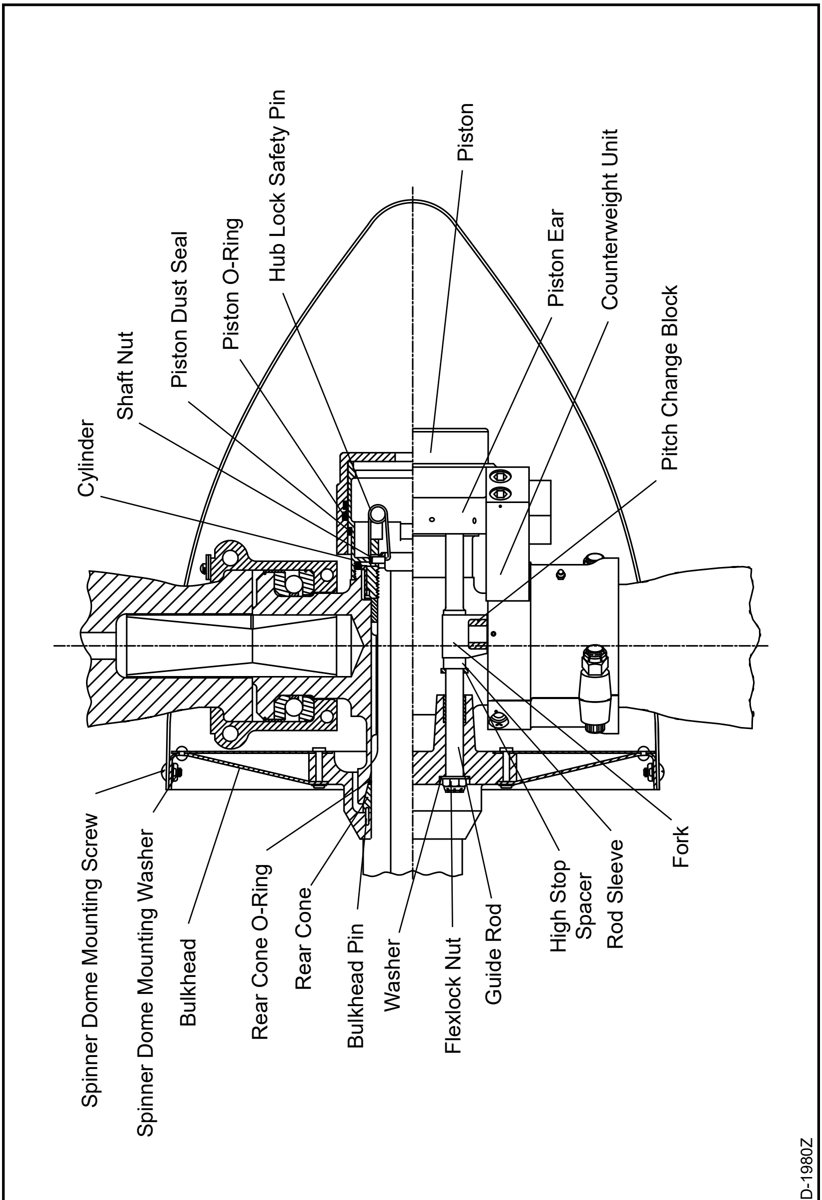
(32) Torque the piston nut in accordance with Table 3-2.

(33) Torque the jam nut against the guide rod. Refer to Table 3-2.

(34) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(35) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(36) Install the propeller spinner dome in accordance with the section, "Spinner Dome Installation" in this chapter.



HC-B3(W,Z)20-1 Propeller
Figure 3-22

M. Installing the HC-B3(W,Z)20-1 Propeller - Refer to Figure 3-22

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

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.

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

(1) Using a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange.

NOTE: In most cases, the piston is not installed on the cylinder when the propeller is not installed on the engine.

(2) If the piston is installed on the cylinder, perform the following steps. Refer to Figure 3-22:

(a) Move the piston to low pitch and rotate the forks away from the clamp linkscrews.

(b) Remove the flexlock nut from each piston rod.

(c) Remove the washer from each piston rod.

(d) Loosen the set screw in each fork.

(e) Lift the piston from the cylinder.

(f) Remove the sleeve from each bulkhead boss.

(g) Remove the high stop spacer from each sleeve.

(h) The piston ears, forks, and counterweights should have corresponding index numbers (1, 2, and 3) impression-stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(3) Make sure the propeller hub spline and engine spline surfaces are clean.

(4) Slide the rear spinner bulkhead onto the shaft.

(5) Install the rear cone onto the bulkhead, matching the holes in the cone with the pins in the bulkhead. Refer to Figure 3-15.

(6) Install the rear cone O-ring (Table 3-1) over the shaft. Refer to Figure 3-15.

(7) Slide the propeller hub onto the engine shaft and tighten the hub nut until the rear bulkhead is snug, but not tight.

CAUTION: 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.

(8) Carefully slide the spinner dome over the reassembled propeller.

(9) To properly position the rear bulkhead, temporarily install the spinner dome with at least four screws.

(10) Adjust the spinner to equalize the clearance between the blades and the blade cutouts in the dome.

(11) Remove the spinner dome.

(12) Using tool BST-2910, torque the propeller shaft nut (Table 3-1). Refer to Table 3-2 and Figure 3-1 to determine the proper torque value to which the torque wrench must be set.

(13) Safety the hub nut using the hub lock safety pin (Table 3-1). Refer to Figure 3-13.

(14) If the piston O-ring (Table 3-1) and the piston dust seal are not already installed in the piston, perform the following steps. Refer to Figure 3-16.

(a) Lubricate the piston O-ring and carefully install it in the groove provided for it in the piston.

(b) Cut the necessary length of oiled piston dust seal material.

1 Cut the piston dust seal material on a 30 degree diagonal so there will be an overlap with a smooth surface, free of fuzz.

(c) Apply a layer of aviation grade reciprocating engine oil to the piston dust seal.

CAUTION: MAKE SURE THAT THE PISTON DUST SEAL IS FREE OF FUZZ.

(d) Install the piston dust seal material in the groove provided for it in the piston.

CAUTION: TO MAINTAIN PROPER BLADE ANGLES, IT IS IMPORTANT THAT THE PISTON BE REINSTALLED IN THE SAME POSITION AS WHEN IT WAS ORIGINALLY ASSEMBLED. INDEX NUMBERS ON THE PISTON AND THE GUIDE COLLAR ARE PROVIDED TO MAKE SURE OF PROPER POSITIONING.

(15) Locate and match up the index numbers (1, 2, and 3) on the forks and piston ears with the corresponding index numbers on the counterweights.

NOTE: The index marks will be either impression stamped or drawn with a felt-tipped pen.

(16) Install the rod sleeve (Table 3-1) on each piston rod.

(17) Install the high stop spacer(s) (Table 3-1) on each of the guide rods and over each rod sleeve.

(18) Oil the surface of the cylinder and install the piston.

(19) Install the pitch change block on each clamp linkscrew.

(20) Install the piston
   (a) Engage the forks on the pitch change blocks.
   (b) Slide the guide rods through the bores in the spinner bulkhead.

(21) Install the washer and flexlock nut (Table 3-1) on the end of each of the guide rods.

(22) Torque the flexlock nut against the guide rod. Refer to Table 3-2.

(23) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(24) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(25) Install the propeller spinner dome in accordance with the section, "Spinner Dome Installation" in this chapter.

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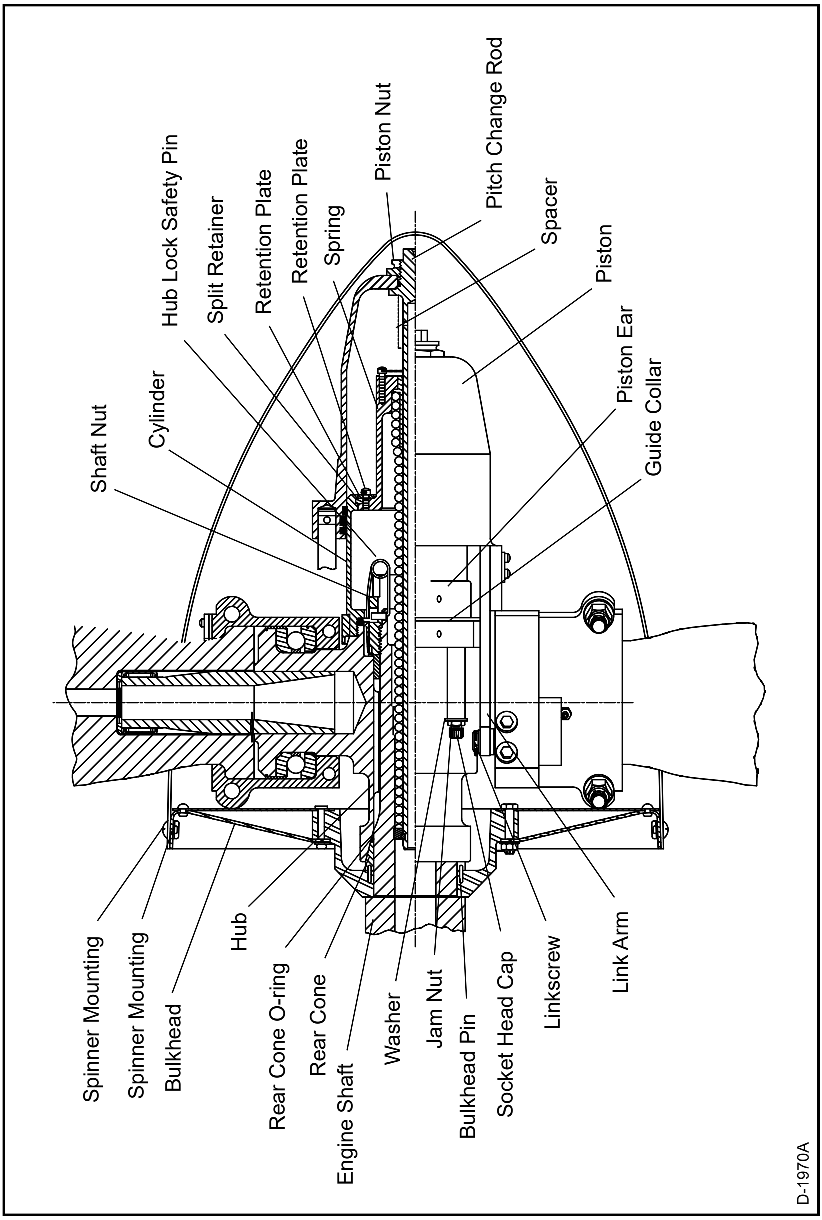

HC-B3Z20-1F Propeller
Figure 3-23

N. Installing the HC-B3Z20-1F Propeller
- Refer to Figure 3-23.

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

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.

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

(1) Using a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange.

CAUTION: THE PISTON MUST BE REMOVED BEFORE INSTALLING THE PROPELLER ON THE AIRCRAFT. IF THE PISTON HAS ALREADY BEEN REMOVED, PROCEED TO STEP 4.N.(4).

(2) Piston Removal - Refer to Figures 3-23 and 3-12

(a) Remove the piston nut.

(b) Remove the safety wire (if installed) from the link pin units.

(c) Remove the safety screw from each link pin unit.

(d) Remove each link pin unit.

(e) The piston ears and guide collar should have corresponding index numbers (1, 2, and 3) impression stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(f) Slide the link arms out of the piston slots.

(g) Remove the socket head cap screw, jam nut (Table 3-1), and washer from each piston guide rod.

(h) Slide the piston off the cylinder.

CAUTION: THE SPRING ASSEMBLY MUST BE REMOVED BEFORE INSTALLING THE PROPELLER ON THE AIRCRAFT. IF THE SPRING ASSEMBLY HAS ALREADY BEEN REMOVED, PROCEED TO STEP 4.N.(5).

(3) Spring assembly removal - Refer to Figure 3-14

(a) Remove the ring retention plate screw safety wire (if installed).

(b) Remove the ring retention plate screws.

(c) Remove the retention plate.

(d) Remove the split retainer.

(e) Remove the spring assembly from the cylinder.

(4) Make sure the propeller hub spline and engine spline surfaces are clean.

(5) Slide the rear spinner bulkhead onto the shaft.

(6) Install the rear cone onto the bulkhead, matching the holes in the cone with the pins in the bulkhead. Refer to Figure 3-15.

(7) Install the rear cone O-ring (Table 3-1) over the shaft. Refer to Figure 3-15.

(8) Slide the propeller hub onto the shaft and tighten the shaft nut until the rear bulkhead is snug, but not tight.

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

(9) Carefully slide the spinner dome over the reassembled propeller.

(10) To properly position the rear bulkhead, temporarily install the spinner dome with at least four screws.

(11) Adjust the spinner to equalize the clearance between the blades and the blade cutouts in the dome.

(12) Remove the spinner dome.

(13) Torque the propeller shaft nut (Table 3-1) using tool BST-2910. Refer to Table 3-2 and Figure 3-1 to determine the proper torque value to which the torque wrench must be set.

(14) Safety the shaft nut to the engine shaft using a hub lock safety pin (Table 3-1). Refer to Figure 3-13.

NOTE: The hub lock safety pin is normally supplied in a separate package when the propeller is shipped new from the factory.

(15) Install the spring assembly -
Refer to Figures 3-23 and 3-14

(a) Place the feathering spring assembly into the engine shaft, with the front spring retainer inside the cylinder.

(b) Install the split retainer between the cylinder and the front spring retainer, sliding the split retainer into recess in the cylinder.

(c) Pull the spring retainer tight against the split retainer.

(d) Install the ring retainer plate, which secures the split retainer, into place.

(e) Install the ring retention plate screws and tighten them until they are snug.

(f) Safety the ring retention plate screws with 0.032 inch (0.81 mm) minimum diameter stainless steel wire (two screws per safety).

(16) If the piston O-ring (Table 3-1) and the piston dust seal are not already installed in the piston, perform the following steps. Refer to Figure 3-16.

(a) Lubricate the piston O-ring and carefully install it in the groove provided for it in the piston.

(b) Cut the necessary length of oiled piston dust seal material.

1 Cut the piston dust seal material on a 30 degree diagonal so there will be an overlap with a smooth surface, free of fuzz.

(c) Apply a layer of aviation grade reciprocating engine oil to the piston dust seal.

CAUTION: MAKE SURE THAT THE PISTON DUST SEAL IS FREE OF FUZZ.

(d) Install the piston dust seal material in the groove provided for it in the piston.

(17) Install the rod O-ring (Table 3-1) in the groove at the end of the threaded portion of the pitch change rod.

CAUTION: TO MAINTAIN PROPER BLADE ANGLES, IT IS IMPORTANT THAT THE PISTON BE REINSTALLED IN THE SAME POSITION AS WHEN IT WAS ORIGINALLY ASSEMBLED. INDEX NUMBERS ON THE PISTON AND THE GUIDE COLLAR ARE PROVIDED TO MAKE SURE OF PROPER POSITIONING.

(18) Locate and match up the index numbers (1, 2, and 3) on the piston ears with the corresponding index numbers on the guide collar.

NOTE: The index marks will be either impression stamped or drawn with a felt-tipped pen.

(19) Oil the surface of the cylinder and install the piston.

(20) Slide the piston onto the cylinder and pass the guide rods through the guide collar bushings.

(21) Connect the link arms to the piston. Refer to Figure 3-12.

(22) Install the link pin units.

(23) Install the link pin safety screws.

(24) Safety the link pin screws together with 0.032 inch (0.81 mm) minimum diameter stainless steel wire. Refer to Figure 3-12.

(25) By hand, carefully rotate the blades into high pitch position and fasten the piston to the pitch change rod with the piston nut (Table 3-1).

(26) Torque the piston nut per Table 3-2.

(27) Install the low-pitch stop components: washer, socket head cap screw, and jam nut (Table 3-1), at the end of each guide rod. Refer to Figure 3-23.

(28) Torque the jam nut against the guide rod. Refer to Table 3-2.

(29) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(30) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(31) Install the propeller spinner dome in accordance with the section, "Spinner Dome Installation" in this chapter.

6. 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: 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) 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.

Spinner Dome/Cap	Washer	Screw
Metal Dome	A-1020 Washer, Fiber	B-3845-8 10-32, Truss Head

Spinner Dome and Spinner Cap Mounting Hardware
Table 3-3

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

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.

(2) 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. Post-Installation Checks

A. Important Information

(1) Refer to the airframe manufacturer's instructions for post-installation checks.

(2) Perform a static RPM check as outlined in the Testing and Troubleshooting chapter of this manual.

8. Spinner Dome Removal

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

A. Procedure

(1) Remove the screws and washers that secure the spinner dome to the spinner bulkhead.

(2) Remove the spinner dome.

9. Propeller Removal

A. Removing the HC-B3( )F-2( ) Propeller

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 Dome Removal" in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE. PROPELLER FAILURE CAN RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER INC. OVERHAUL MANUALS.

WARNING 3: FOR SAFETY REASONS, THE PROPELLER MUST BE PLACED IN THE FEATHER POSITION BEFORE IT IS REMOVED FROM THE AIRCRAFT.

(4) Routine propeller engine shutdown will engage the start lock units, preventing the propeller from feathering. For purposes of propeller removal, the propeller should be placed in feather position during engine shutdown. If this was not accomplished, then the propeller may be feathered as follows:

  (a) Rotate the blades simultaneously to a slightly lower pitch to disengage the stop plates from the start lock units.

  (b) Retract the start lock pins and hold them in place with a heavy wire inserted through the hole of each start lock housing.

  (c) Slowly and carefully allow the blades to rotate to high/feather pitch.

(5) Cut and remove the safety wire from the propeller mounting bolts.

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

(6) Support the propeller assembly with a sling.

NOTE 1: Supporting the propeller with a sling may be delayed until all but two mounting bolts and washers have been removed to permit rotating the propeller for ease of bolt removal.

NOTE 2: If the propeller will be reinstalled, and it has been dynamically balanced, make an identifying mark on the propeller hub and a matching mark on the engine flange to ensure proper orientation. This mark will ensure proper orientation during reinstallation to prevent dynamic imbalance.

CAUTION: DISCARD THE PROPELLER MOUNTING BOLTS IF THEY ARE DAMAGED OR CORRODED, OR IF THE PROPELLER IS REMOVED FOR OVERHAUL.

(7) Remove the propeller mounting bolts and washers.

(a) For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(8) Using the support sling, lift the propeller from the mounting flange.

(9) Remove and discard the shaft O-ring.

(10) Place the propeller and spinner dome on a suitable cart for transportation.

B. Removing the HC-B3WF-4 Propeller

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 Dome Removal" in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE. PROPELLER FAILURE CAN RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER INC. OVERHAUL MANUALS.

(4) Cut and remove the safety wire from the propeller mounting bolts.

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

(5) Support the propeller assembly with a sling.

NOTE 1: Supporting the propeller with a sling may be delayed until all but two mounting bolts and washers have been removed to permit rotating the propeller for ease of bolt removal.

NOTE 2: If the propeller will be reinstalled, and it has been dynamically balanced, make an identifying mark on the propeller hub and a matching mark on the engine flange to ensure proper orientation. This mark will ensure proper orientation during reinstallation to prevent dynamic imbalance.

CAUTION: DISCARD THE PROPELLER MOUNTING BOLTS IF THEY ARE DAMAGED OR CORRODED, OR IF THE PROPELLER IS REMOVED FOR OVERHAUL.

(6) Remove the propeller mounting bolts and washers.

NOTE: For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(7) Using the support sling, lift the propeller from the mounting flange.

(8) Remove the fasteners that attach the spinner bulkhead, airframe manufacturer supplied alternator pulley, shim (if installed), and ring to each other.

(9) Remove the airframe manufacturer supplied split ring.

(10) Remove the spinner bulkhead.

(11) Remove the alternator pulley.

(12) Remove the shim.

(13) Remove and discard the shaft O-ring.

(14) Place the propeller and spinner dome on a suitable cart for transportation.

C. Removing the HC-B3WN-2L Propeller

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 Dome Removal" in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE. PROPELLER FAILURE CAN RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER INC. OVERHAUL MANUALS.

WARNING 3: FOR SAFETY REASONS, THE PROPELLER MUST BE PLACED IN THE FEATHER POSITION BEFORE IT IS REMOVED FROM THE AIRCRAFT.

(4) Routine propeller engine shutdown will engage the start locks, preventing the propeller from feathering. For purposes of propeller removal, the propeller should be placed in feather position during engine shutdown. If this was not accomplished, then the propeller may be feathered as follows:

CAUTION: DO NOT PUT THE BLADE PADDLES IN THE AREA OF THE DE-ICE BOOT WHEN APPLYING TORQUE TO A BLADE ASSEMBLY. PUT THE BLADE PADDLES IN THE THICKEST AREA OF THE BLADE, JUST OUTBOARD OF THE DE-ICE BOOT. USE ONE BLADE PADDLE PER BLADE.

(a) Rotate the blades simultaneously to a slightly lower pitch to disengage the stop plates from the start locks.

(b) Retract the start lock pins and hold them in place with a heavy wire inserted through the hole of each start lock housing.

(c) Slowly and carefully allow the blades to rotate to high/feather pitch.

(5) Cut and remove the safety wire on the propeller mounting bolts.

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

(6) Support the propeller assembly with a sling.

NOTE 1: Supporting the propeller with a sling may be delayed until all but two mounting bolts and washers have been removed to permit rotating the propeller for ease of bolt removal.

NOTE 2: If the propeller will be reinstalled, and it has been dynamically balanced, make an identifying mark on the propeller hub and a matching mark on the engine flange to ensure proper orientation. This mark will ensure proper orientation during reinstallation to prevent dynamic imbalance.

CAUTION: DISCARD THE PROPELLER MOUNTING BOLTS IF THEY ARE DAMAGED OR CORRODED, OR IF THE PROPELLER IS REMOVED FOR OVERHAUL.

(7) Remove the propeller mounting bolts and washers.

(a) For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(8) Using the support sling, lift the propeller from the mounting flange.

(9) Remove the one-piece spinner mounting plate and the attached spinner bulkhead.

(10) Remove and discard the shaft O-ring.

(11) Place the propeller and spinner on a suitable cart for transportation.

D. Removing the HC-B4TN-1 Propeller With a One-piece Spinner Mounting Plate

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 Dome Removal" in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. ce Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE. PROPELLER FAILURE CAN RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER INC. OVERHAUL MANUALS.

(4) Cut and remove the safety wire from the propeller mounting bolts.

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

(5) Support the propeller assembly with a sling.

NOTE 1: Supporting the propeller with a sling may be delayed until all but two mounting bolts and washers have been removed to permit rotating the propeller for ease of bolt removal.

NOTE 2: If the propeller will be reinstalled, and it has been dynamically balanced, make an identifying mark on the propeller hub and a matching mark on the engine flange to ensure proper orientation. This mark will ensure proper orientation during reinstallation to prevent dynamic imbalance.

CAUTION: DISCARD THE PROPELLER MOUNTING BOLTS IF THEY ARE DAMAGED OR CORRODED, OR IF THE PROPELLER IS REMOVED FOR OVERHAUL.

(6) Remove the propeller mounting bolts and washers.

(a) For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

(7) Using the support sling, lift the propeller from the mounting flange.

(8) Remove the one-piece spinner mounting plate and the attached spinner bulkhead.

(9) Remove and discard the shaft O-ring.

(10) Place the propeller and spinner on a suitable cart for transportation.

E. Removing the HC-B4TN-1 Propeller With a Two-piece Spinner Mounting Plate

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 Dome Removal" in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE. PROPELLER FAILURE CAN RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER INC. OVERHAUL MANUALS.

(4) Cut and remove the safety wire from the propeller mounting bolts.

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

(5) Support the propeller assembly with a sling.

NOTE 1: Supporting the propeller with a sling may be delayed until all but two mounting bolts and washers have been removed to allow rotating the propeller for ease of bolt removal.

NOTE 2: If the propeller will be reinstalled, and it has been dynamically balanced, make an identifying mark on the propeller hub and a matching mark on the engine flange to ensure proper orientation. This mark will ensure proper orientation during reinstallation to prevent dynamic imbalance.

CAUTION: DISCARD THE PROPELLER MOUNTING BOLTS IF THEY ARE DAMAGED OR CORRODED, OR IF THE PROPELLER IS REMOVED FOR OVERHAUL.

(6) Remove the propeller mounting bolts and washers.

(a) For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(7) Using the support sling, lift the propeller from the mounting flange.

(8) Remove and discard the shaft O-ring.

(9) Place the propeller and attached spinner bulkhead on a suitable cart for transportation.

F. Removing the HC-B3( )20-2( ) and HC-B3( )30-2B( ) 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 Dome Removal" in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE. PROPELLER FAILURE CAN RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER INC. OVERHAUL MANUALS.

WARNING 3: FOR SAFETY REASONS, THE PROPELLER MUST BE PLACED IN THE FEATHER POSITION BEFORE IT IS REMOVED FROM THE AIRCRAFT.

(4) Routine propeller engine shutdown will engage the start locks, preventing the propeller from feathering. For purposes of propeller removal, the propeller should be placed in feather position during engine shutdown. If this was not accomplished, then the propeller may be feathered as follows:

CAUTION: DO NOT PUT THE PADDED BAR IN THE AREA OF THE DE-ICE BOOT WHEN APPLYING TORQUE TO A BLADE ASSEMBLY. PUT THE BAR IN THE THICKEST AREA OF THE BLADE, JUST OUTBOARD OF THE DE-ICE BOOT. USE ONE BLADE PADDLE PER BLADE.

(a) Rotate the blades simultaneously to a slightly lower pitch to disengage the stop plates from the start lock units.

(b) Retract the start lock pins and hold them in place with a heavy wire inserted through the hole of each start lock housing.

(c) Slowly and carefully allow the blades to rotate to high/feather pitch.

(5) Piston removal - Refer to Figures 3-11 and 3-12

(a) Remove the piston nut.

(b) Remove the safety wire from the link pin units.

(c) Remove the safety screws from each link pin unit.

(d) Remove each link pin unit.

(e) The piston ears and guide collar should have corresponding index numbers (1, 2, and 3) impression stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(f) Remove the socket head cap screw, jam nut, and washer from each piston guide rod.

(g) Slide the piston off the cylinder.

(6) Spring assembly removal - Refer to Figure 3-14

(a) Remove the safety wire from the ring retention plate screws.

(b) Remove the ring retention plate screws.

(c) Remove the ring retention plate.

(d) Remove the split retainer.

(e) Remove the spring assembly from the cylinder.

(7) Remove the hub lock safety pin (20 spline models) or the shaft nut lock (30 spline models).

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

(8) Support the propeller assembly with a sling.

(9) Completely loosen the shaft nut from the engine shaft threads.

NOTE: Because the shaft nut is pulling the propeller hub off the tapered rear cone, there will be significant resistance to the loosening of the shaft nut.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(10) Using the support sling, slide the propeller from the engine splined shaft and lift the propeller from the engine.

(11) On 30 spline shaft models only, remove and discard the bushing O-ring from the ID groove of the bushing, located in the hub bore.

(12) Remove and discard the rear cone O-ring on the engine splined shaft.

(13) Place the propeller and associated parts on a suitable cart for transportation.

G. Removing HC-B3( )30-1( ) and HC-B3( )30-2E( ) 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 Dome Removal" in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE. PROPELLER FAILURE CAN RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER INC. OVERHAUL MANUALS.

WARNING 3: FOR SAFETY REASONS, THE PROPELLER MUST BE PLACED IN THE HIGH/FEATHER PITCH POSITION BEFORE IT IS REMOVED FROM THE AIRCRAFT.

(4) Routine propeller engine shutdown will engage the start lock units, preventing the propeller from going to high/feather pitch. For purposes of propeller removal, the propeller should be placed in high/feather pitch position during engine shutdown. If this was not accomplished, it may be done as follows:

CAUTION: DO NOT PUT THE PADDED BAR IN THE AREA OF THE DE-ICE BOOT WHEN APPLYING TORQUE TO A BLADE ASSEMBLY. PUT THE BAR IN THE THICKEST AREA OF THE BLADE, JUST OUTBOARD OF THE DE-ICE BOOT. USE ONE BLADE PADDLE PER BLADE.

(a) Rotate the blades simultaneously to a slightly lower pitch to disengage the stop plates from the start lock units.

(b) Retract the auto high pitch stop pins and hold them in place with a heavy wire inserted through the hole of each start lock housing.

(c) Slowly and carefully allow the blades to rotate to high/feather pitch.

CAUTION: OIL WILL FLOW OUT OF THE PROPELLER WHEN THE PISTON IS REMOVED. PLACE A DRIP PAN UNDER THE PROPELLER TO CATCH THE EXCESS OIL.

(5) Piston removal - Refer to Figures 3-17 and 3-12
   (a) Remove the piston nut.
   (b) Remove the safety wire from the link pin units.
   (c) Remove the safety screws from each link pin unit.
   (d) Remove each link pin unit.
   (e) The piston ears and guide collar should have corresponding index numbers (1, 2, and 3) impression stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

   NOTE: This will make sure that the components are reassembled in their original location.

   (f) Remove the socket head cap screw, jam nut, and washer from each piston guide rod.
   (g) Slide the piston off the cylinder.
   (h) Remove and discard the piston O-ring.
(6) Spring assembly removal
   (a) Remove the safety wire.
   (b) Unthread the spring retainer from the cylinder using spanner wrench BT-461 or strap wrench 100923. Refer to Figure 3-18.
   (c) Remove the spring retainer and the attached spring assembly from the cylinder.

(7) Remove the shaft nut lock. Refer to Figure 3-13.

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

(8) Support the propeller assembly with a sling.

(9) Completely loosen the shaft nut from the engine shaft threads.

NOTE: Because the shaft nut is pulling the propeller hub off the tapered rear cone, there will be significant resistance to the loosening of the shaft nut.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(10) Using the support sling, slide the propeller from the engine splined shaft and lift the propeller from the engine.

(11) Remove and discard the bushing O-ring from the ID groove of the bushing, located in the hub bore.

(12) Remove and discard the rear cone O-ring from the engine shaft.

(13) Place the propeller and associated parts on a suitable cart for transportation.

H. Removing HC-B3( )20-4 and HC-B3( )30-4 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 Dome Removal" in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE. PROPELLER FAILURE CAN RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER INC. OVERHAUL MANUALS.

(4) Piston removal - Refer to Figures 3-19 and 3-12

(a) Remove the safety wire from the link pin units.

(b) Remove the safety screws from each link pin unit.

(c) Remove each link pin unit.

(d) The piston ears and guide collar should have corresponding index numbers (1, 2, and 3) impression stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(e) Remove the socket head cap screw, jam nut, and washer from each piston guide rod.

(f) Slide the piston off the cylinder.

(5) Remove the hub lock safety pin (20 spline models) or the shaft nut lock (30 spline models). Refer to Figure 3-13.

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

(6) Support the propeller assembly with a sling.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(7) Completely loosen the shaft nut from the engine shaft threads.

NOTE: Because the shaft nut is pulling the propeller hub off the tapered rear cone, there will be significant resistance to the loosening of the shaft nut.

(8) Using the support sling, slide the propeller from the engine splined shaft and lift the propeller from the engine.

(9) Remove and discard the rear cone O-ring from the engine shaft.

(10) Place the propeller and associated parts on a suitable cart for transportation.

I. Removing HA-B3( )30-1B 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 Dome Removal" in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE. PROPELLER FAILURE CAN RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER INC. OVERHAUL MANUALS.

CAUTION: OIL WILL FLOW OUT OF THE PROPELLER WHEN THE PISTON IS REMOVED. PLACE A DRIP PAN UNDER THE PROPELLER TO CATCH THE EXCESS OIL.

(4) Piston Removal - Refer to Figures 3-20 and 3-12
   (a) Remove the piston nut.
   (b) Remove the safety wire from the link pin units.
   (c) Remove the safety screw from each link pin unit.
   (d) Remove each link pin unit.
   (e) The piston ears and guide collar should have corresponding index numbers (1, 2, and 3) impression stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

      NOTE: This will make sure that the components are reassembled in their original location.

   (f) Slide the link arms out of the piston slots.
   (g) Remove the socket head cap screw, jam nut, and washer from each piston guide rod.
   (h) Slide the piston off the cylinder.
(5) Pitch adjustment assembly removal
   (a) Remove the ring retention plate screw safety wire.
   (b) Remove the ring retention plate screws.
   (c) Remove the ring retention plate.
   (d) Remove the split retainer.
   (e) Remove the pitch adjustment assembly from the cylinder.
(6) Remove the shaft nut lock. Refer to Figure 3-13.

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

(7) Support the propeller assembly with a sling.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(8) Completely loosen the shaft nut from the engine shaft threads.

NOTE: Because the shaft nut is pulling the propeller hub off the tapered rear cone, there will be significant resistance to the loosening of the shaft nut.

(9) Using the support sling, slide the propeller from the engine splined shaft and lift the propeller from the engine.

(10) Remove and discard the bushing O-ring in the ID groove of the bushing located in the hub bore.

(11) Remove and discard the rear cone O-ring from the engine shaft.

(12) Place the propeller and associated parts on a suitable cart for transportation.

J. Removing HC-B3R30-4A,-4B Propeller

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 Dome Removal" in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE. PROPELLER FAILURE CAN RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER INC. OVERHAUL MANUALS.

CAUTION: OIL WILL FLOW OUT OF THE PROPELLER WHEN THE PISTON IS REMOVED. PLACE A DRIP PAN UNDER THE PROPELLER TO CATCH THE EXCESS OIL.

(4) Piston Removal - Refer to Figures 3-21 and 3-12

(a) Remove the piston nut.

(b) Remove the safety wire from the link pin units.

(c) Remove the safety screw from each link pin unit.

(d) Remove each link pin unit.

(e) The piston ears and guide collar should have corresponding index numbers (1, 2, and 3) impression stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(f) Slide the link arms out of the piston slots.

(g) Remove the socket head cap screw, jam nut, and washer from each piston guide rod.

(h) Slide the piston off the cylinder.

(5) Spring assembly removal

(a) Remove the safety wire (if installed).

(b) Unthread the spring retainer from the cylinder using spanner wrench BT-461 or strap wrench 100923. Refer to Figure 3-18.

(c) Remove the spring retainer and the attached spring assembly from the cylinder.

(6) Remove the shaft nut lock. Refer to Figure 3-13.

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

(7) Support the propeller assembly with a sling.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(8) Completely loosen the shaft nut from the engine shaft threads.

NOTE: Because the shaft nut is pulling the propeller hub off the tapered rear cone, there will be significant resistance to the loosening of the shaft nut.

(9) Using the support sling, slide the propeller from the engine splined shaft and lift the propeller from the engine.

(10) Remove and discard the rear cone O-ring from the engine shaft.

(11) Place the propeller and associated parts on a suitable cart for transportation.

K. Removing the HC-B3(W,Z)20-1 Propeller

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 Dome Removal" in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE. PROPELLER FAILURE CAN RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER INC. OVERHAUL MANUALS.

CAUTION 1: OIL WILL FLOW OUT OF THE PROPELLER WHEN THE PISTON IS REMOVED. PLACE A DRIP PAN UNDER THE PROPELLER TO CATCH THE EXCESS OIL.

CAUTION 2: USING A FELT-TIPPED PEN, IDENTIFY EACH PISTON ROD AND ITS COMPONENTS WITH A CORRESPONDING LETTER. THIS WILL MAKE SURE THAT THE COMPONENTS ARE REASSEMBLED ON THE PISTON ROD FROM WHICH THEY WERE REMOVED.

(4) Piston Removal - Refer to Figures 3-22 and 3-12

(a) Remove the flexlock nut from each piston rod.

(b) Loosen the set screw in each fork.

(c) Remove the washer from each piston rod.

(d) Slide the piston away from the hub and to the low pitch position, until the piston rods clear the bulkhead.

(e) Rotate the piston and forks away from the clamp link screws.

(f) Remove the pitch change block from each clamp linkscrew.

(g) The piston ears and guide collar should have corresponding index numbers (1, 2, and 3) impression stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(h) Slide the piston off the cylinder.

(i) To prevent the loss of the sleeve, fork, and high pitch stop washers, reinstall the flexlock nut on each piston rod.

(5) Remove the hub lock safety pin. Refer to Figure 3-13.

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

(6) Support the propeller assembly with a sling.

(7) Completely loosen the shaft nut from the engine shaft threads.

NOTE: Because the shaft nut is pulling the propeller hub off the tapered rear cone, there will be significant resistance to the loosening of the shaft nut.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(8) Using the support sling, slide the propeller from the engine splined shaft and lift the propeller from the engine.

(9) Remove and discard the rear cone O-ring.

(10) Remove the rear cone.

(11) Remove the rear spinner bulkhead.

(12) Put the propeller and associated parts on a suitable cart for transportation.

L. Removing the HC-B3Z20-1F Propeller

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 Dome Removal" in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information can be found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE. PROPELLER FAILURE CAN RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER INC. OVERHAUL MANUALS.

CAUTION: OIL WILL FLOW OUT OF THE PROPELLER WHEN THE PISTON IS REMOVED. PLACE A DRIP PAN UNDER THE PROPELLER TO CATCH THE EXCESS OIL.

(4) Piston Removal - Refer to Figures 3-23 and 3-12
   (a) Remove the piston nut.
   (b) Remove the safety wire from the link pin units.
   (c) Remove the safety screw from each link pin unit.
   (d) Remove each link pin unit.
   (e) The piston ears and guide collar should have corresponding index numbers (1, 2, and 3) impression stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

   NOTE: This will make sure that the components are reassembled in their original location.

   (f) Slide the link arms out of the piston slots.
   (g) Remove the socket head cap screw, jam nut, and washer from each piston guide rod.
   (h) Slide the piston off the cylinder.

(5) Spring assembly removal - Refer to Figure 3-14
   (a) Remove the ring retention plate screw safety wire.
   (b) Remove the ring retention plate screws.
   (c) Remove the retention plate.
   (d) Remove the split retainer.
   (e) Remove the spring assembly from the cylinder.

(6) Remove the hub lock safety pin. Refer to Figure 3-13.

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

(7) Support the propeller assembly with a sling.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(8) Completely loosen the shaft nut from the engine shaft threads.

NOTE: Because the shaft nut is pulling the propeller hub off the tapered rear cone, there will be significant resistance to the loosening of the shaft nut.

(9) Using the support sling, slide the propeller from the engine splined shaft and lift the propeller from the engine.

(10) Remove and discard the rear cone O-ring from the engine shaft.

(11) Remove the rear cone.

(12) Remove the rear spinner bulkhead.

(13) Place the propeller and associated parts on a suitable cart for transportation.

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. Propeller Ice Protection Systems (Rev. 1)

WARNING: CONSULT THE PILOT OPERATING HANDBOOK (INCLUDING ALL SUPPLEMENTS) REGARDING FLIGHT INTO CONDITIONS OF KNOWN ICING. THE AIRCRAFT MAY NOT BE CERTIFICATED FOR FLIGHT INTO KNOWN ICING CONDITIONS, EVEN THOUGH AN ICE PROTECTION SYSTEM IS INSTALLED.

A. Operational Checks and Troubleshooting

(1) Refer to the Anti-ice and De-ice Systems chapter of this manual for operational checks and troubleshooting information for Hartzell Propeller Inc. ice protection systems.

3. 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.

NOTE: Propeller model HA-B3( )30-1B only does not change blade pitch in flight; therefore, it does not hunt or surge as a result of propeller pitch control issues. Only a cyclic variation in engine power would result in a cyclic variation in engine speed.

(b) If the propeller is hunting, a certified airframe and powerplant mechanic with the appropriate rating or a certified propeller repair station with the appropriate rating 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 a certified propeller repair station with the appropriate rating.

(b) Hunting and/or surging may also be caused by friction or binding within the governor control, or 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 a certified propeller repair station with the appropriate rating.

B. Engine Speed Varies with Airspeed

NOTE: Propeller model HA-B3( )30-1B is not constant speed and does not change blade pitch in flight; therefore, engine speed will increase with increasing airspeed and will decrease with decreasing airspeed.

(1) Constant speed propeller models HC-B( )( )( )-1( ), HC-B( )( )( )-2( ) and HC-B( )( )( )-4( ) will experience some small variances in engine speed that are normal and are no cause for concern.

(2) Increase in engine speed while descending or increasing airspeed:

(a) HC-B( )( )( )-4( ) propeller models:

1 Governor is not increasing oil volume in the propeller.

2 Engine oil transfer bearing is leaking excessively.

3 Excessive friction in the blade bearings, in the pitch change mechanism, or in the misalignment between the guide collar and the piston rods.

(b) HC-B( )( )( )-1( ) and HC-B( ) ( )( )-2( ) propeller models:

1 Governor is not reducing oil volume in the propeller.

2 Excessive friction in the blade bearings or the pitch change mechanism.

3 Excessive friction in the misalignment between the guide collar and the piston rods - HC-B( )( )( )-2( ) propellers only.

(3) Decrease in engine speed while increasing airspeed:

(a) HC-B( )( )( )-4( ) propeller models:

1 Governor pilot valve is stuck and is excessively increasing oil volume.

(b) HC-B( )( )( )-1( ) and HC-B( )( )( ) propeller models:

1 Governor pilot valve is stuck and is excessively decreasing oil volume.

2 Feathering command is engaged on the propeller pitch control - HC-B( )( )( )-2( ) propeller models only.

(4) Increase in engine speed while decreasing airspeed:

(a) HC-B( )( )( )-4 propeller models:

1 Governor pilot valve is stuck and is excessively decreasing oil volume in the propeller.

(b) HC-B( )( )( )-1( ) and HC-B( )( )( )-2( ) propeller models:

1 Governor pilot valve is stuck and is excessively increasing oil volume.

(5) Decrease in engine speed while decreasing airspeed:

(a) HC-B( )( )( )-4( ) propeller models:

1 Governor is not reducing oil volume in the propeller.

2 Excessive friction in the blade bearings or pitch change mechanism.

(b) HC-B( )( )( )-1( ) and HC-B( )( )( )-2( ) propeller models:

1 Governor is not increasing oil volume in the propeller.

2 Engine oil transfer bearing is leaking excessively.

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

C. Loss of Propeller Control - HC-B( )( )( )-4( ) propeller models:

(1) Propeller goes to uncommanded low pitch (high RPM)

(a) Loss of oil pressure - check:

1 Governor pressure relief valve for proper operation.

2 Governor pilot valve sticking.

3 Governor drive for damage.

4 Adequate engine oil supply.

5 Engine oil transfer bearing for excessive leakage.

(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 blade bearings or pitch change mechanism.

(b) Misalignment between the guide collar and piston rods.

D. Loss of propeller Control - HC-B( )( )( )-1( ) and HC-B( )( )( )-2( ) propeller models:

(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 oil transfer bearing for excessive leakage.

(b) Start Locks not engaging - HC-B( )( )( )-2( ) propeller models only

(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 change mechanism.

(b) Excessive friction in misalignment between the guide collar and the piston rods - HC-B( )( )( )-2( ) propeller models only.

(c) Broken spring

NOTE: Does not apply to some HC-B( )( )( )-1( ) propeller models.

Refer to the propeller assembly figures in the Description and Operation chapter of this manual to determine if a spring is installed.

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

(1) Broken feathering spring (if applicable).

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

(3) Check the governor function.

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

(a) This inspection must be performed by a certified propeller repair station with the appropriate rating.

F. Failure to Unfeather - HC-B( )( )( )-2( ) propeller models only:

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

(2) Check 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 accomplished by a certified propeller repair station with the appropriate rating.

G. Start Locks Fail to Engage on Shutdown - HC-B( )( )( )-2( ) propeller models:

(1) Refer to the propeller assembly figures in the Description and Operation chapter of this manual to determine if start locks are installed.

CAUTION: DO NOT POSITION THE BLADE PADDLE IN THE AREA OF THE DE-ICE BOOT WHEN APPLYING TORQUE TO A BLADE ASSEMBLY. POSITION THE BLADE PADDLE IN THE THICKEST AREA OF THE BLADE, JUST OUTSIDE OF THE DE-ICE BOOT. USE ONE BLADE PADDLE PER BLADE.

(2) Propeller was feathered before shutdown.

(a) The problem may be corrected by using blade paddles as follows:

(b) Using the blade paddles, simultaneously rotate the blades toward low pitch until the start lock pins engage a clamp mounted stop plate.

(3) Shutdown occurred at high RPM with the propeller control set for coarse blade angle or low RPM.

(a) Using the blade paddles, simultaneously rotate the blades toward low pitch until the auto high pitch stop pins engage a clamp mounted stop plate.

(4) Excessive engine oil transfer bearing leakage.

(a) Refer to an appropriately licensed propeller repair facility.

(5) Excessive governor pump leakage.

(a) Refer to an appropriately licensed propeller repair facility.

(6) Broken start lock(s).

(a) Refer to an appropriately licensed propeller repair facility.

H. Vibration (Rev. 1)

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

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 BY A CERTIFIED PROPELLER REPAIR STATION WITH THE APPROPRIATE RATING.

(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 a certified propeller repair station with the appropriate rating 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 the 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 airframe manufacturer to make certain the propeller/engine combination is balanced properly before operation.

1 Refer to the engine or airframe 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 - HC-B( )( )( )-4C( ) propeller models

1 Governor failure

2 Excessive leakage in the governor oil supply to the propeller.

(e) Broken spring causes momentary overspeed - HC-B( )( )( )-1( ) and HC-B( )( )( )-2( ) propeller models, except HC-B3Z20-1( ).

(f) Governor pilot valve jammed, supplying high pressure only - HC-B( )( )( )-1( ) and HC-B( )( )( )-2( )propeller models.

J. Propeller Underspeed

(1) Check:

(a) Tachometer error.

(b) Excessive transfer bearing leakage - HC-B( )( )( )-1( ) and HC-B( )( )( )-2( ) propeller models.

(c) Governor oil pressure low - HC-B( )( )( )-1( ) and HC-B( )( )( )-2( ) propeller models.

(d) Governor oil passage clogged - HC-B( )( )( )-1( ) and HC-B( )( )( )-2( ) propeller models

(e) Governor pilot valve jammed, supplying high pressure only - HC-B( )( )( )-4( ) propeller models.

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INSPECTION AND CHECK - CONTENTS

INSPECTION AND CHECK - CONTENTS, CONTINUED

LIST OF FIGURES

1. Pre-Flight 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, and cracks.

(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) If an ice protection system is installed, visually examine the anti-icing or de-ice boot for damage.

(a) Refer to the Anti-ice and De-ice Systems chapter in this manual for operational checks and troubleshooting information for Hartzell Propeller Inc. ice protection systems.

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 flight.

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. AN IN-FLIGHT BLADE SEPARATION CAN RESULT IN A CATASTROPHIC AIRCRAFT 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 airframe 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. 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. Initial Run-Up

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

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

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

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

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

(a) Repeat this step at least three times.

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

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

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

1 A typical RPM drop for a feathering propeller is 300-500 RPM.

2 A typical RPM drop for a non-feathering propeller is 100-300 RPM.

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

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

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

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 airframe 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 aircraft or tie aircraft 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 TC or STC holder, 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) Test fly the aircraft to confirm the maximum rated RPM specified in the aircraft TC or STC 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 Aircraft 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.

D. Propeller Ice Protection System

(1) Refer to the Anti-ice and De-ice Systems chapter in this manual for operational checks and troubleshooting information for Hartzell Propeller Inc. ice protection systems.

3. Required Periodic Inspections and Maintenance (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. Periodic Inspection

(1) Perform the following inspection procedures at 100 hour intervals, not to exceed twelve (12) calendar months. Procedures involved in these inspections are detailed below.

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

1 In this situation, the airframe manufacturer's schedule may be applied as long as the calendar limit for the inspection interval does not exceed twelve (12) 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 section, "Aluminum Blades" in the Maintenance Practices chapter of this manual for damage evaluation and repair information.

(4) Check for oil and grease leaks. Refer to Oil and Grease Leakage in the Inspection Procedures section of this chapter.

(5) Check the blade track. Refer to Blade Track in the Inspection Procedures section of this chapter.

(6) For the model HC-B3( )30-2( ) propeller installed on the Pratt & Whitney R-985-( ) engine

(a) Inspect the A-944 clamp linkscrew sleeve for lubrication and wear in the area between the A-304 link screw and the A-861-3 link arm.

(b) For propellers with 300 hours or more of time in service from new or overhaul, replace the A-944 linkscrew sleeve with an A-944 linkscrew sleeve manufactured of Delrin material and lubricate.

(c) Replace the A-944 linkscrew sleeve with an A-944 linkscrew sleeve manufactured of Delrin material and lubricate at 300 hour intervals of service time following the initial change.

1 Lubricate the A-944 clamp linkscrew sleeve with approved lubricant, as specified in the Approved Lubricants section of the Maintenance Practices chapter of this manual.

(7) Check the accuracy of the tachometer. Refer to the section, "Tachometer Calibration" in the Maintenance Practices chapter of this manual.

(8) Clean or replace the anti-ice system filter (if anti-ice system is installed).

(9) 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. Airworthiness Limitations

(1) Certain components, as well as the entire propeller may have specific life limits established as part of the certification by the FAA. Such limits call for 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 covered in this manual. Refer to the Airworthiness Limitations chapter of this manual.

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

D. Overhaul Periods

(1) In flight, 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 HC-SL-61-61Y.

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 INFLIGHT BLADE SEPARATION CAN 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 the propeller flange or a lubrication fitting, field repair is permitted.

2 All other leakage repairs should be referred to a certified propeller repair station with the appropriate rating.

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

(c) Grease Leakage - probable causes:

1 Loose/defectice lubrication fitting

2 Grease leaks between the blade clamp and the propeller hub

a Refer to a certified propeller repair station with the appropriate rating.

3 Grease leaks past the blade clamp seal gaskets

4 Grease leaks from between the blade clamp and the blade

a Refer to a certified propeller repair station with the appropriate rating.

5 Grease leaks from the clamp when the blade is pointed up and in a static position.

a Oil separating from the grease. Approved lubricants are listed in the Maintenance Practices chapter of this manual. These lubricants have varying separation rates.

1 If a clamp seal leaks after the first ten hours of operation, consult a certified propeller repair station with the appropriate rating.

(d) Oil Leakage - probable causes:

1 Faulty O-ring seal between the hub and the cylinder

2 Faulty O-ring seal between the piston and the cylinder

3 Displaced felt seal between the piston and the cylinder

4 Faulty O-ring(s) between the propeller hub and the engine flange

5 Faulty O-ring between the piston and the pitch change rod

(e) Beta Tube/Valve System Oil Leakage (if applicable) - probable causes:

1 Faulty O-rings between the beta tube/valve.

a Refer to a certified propeller repair station with the appropriate rating for replacement.

(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 EMANATING FROM THE CRACK. CLEANING CAN REMOVE SUCH EVIDENCE AND MAKE A CRACK VIRTUALLY IMPOSSIBLE TO SEE.

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

1 If the source of the grease leak is a non-critical part such as an O-ring, gasket, or sealant, repairs can be accomplished during scheduled maintenance as long as flight safety is not compromised.

2 If cracks are suspected, additional inspections to verify the condition must be performed before further flight.

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

(1) These inspections must be performed by a certified propeller repair station with the appropriate rating.

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

1 Report such occurrences to the appropriate airworthiness 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 airframe manufacturer's instructions.

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

1 Perform the checks to determine 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, blades, and blade clamps (if applicable) for cracks.

1 Pay particular attention to the blade retention areas of an aluminum hub, or the blade clamps on steel hub propellers.

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 flight.

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 at a certified propeller repair station with the appropriate rating.

(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 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 flight.

1 These inspections must be performed at a certified propeller repair station with the appropriate rating.

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

1 Report such occurrences to airworthiness authorities and Hartzell Propeller Inc. Product Support.

D. Blade Track - Refer to Figure 5-1

(1) Check the blade track as follows:

(a) Chock the aircraft wheels securely.

(b) Place a fixed reference point beneath the propeller, within 0.25 inch (6 mm) of the lowest point of the propeller arc.

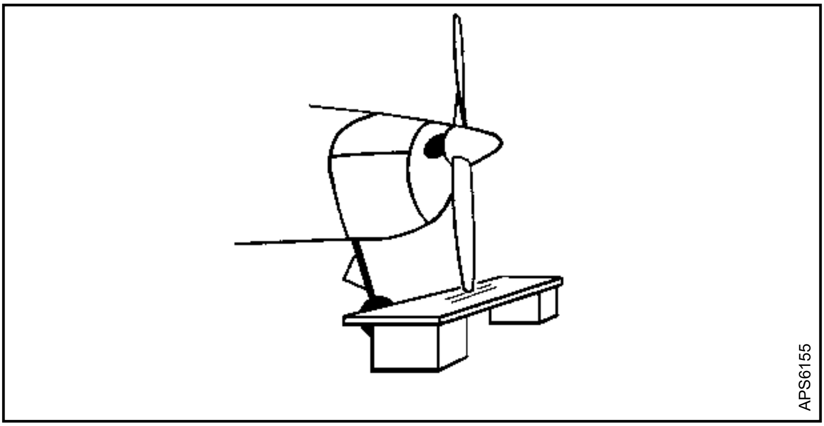
NOTE: This reference point may be a flat board with a sheet of paper attached to it. The board may then be blocked up to within 0.25 inch (6.0 mm) of the propeller arc.

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

(c) Rotate the propeller by hand (the opposite 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 ± 0.062 inch (1.57 mm) or 0.125 inch (3.17 mm) total.



Checking Blade Track
Figure 5-1

(2) Possible Correction

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

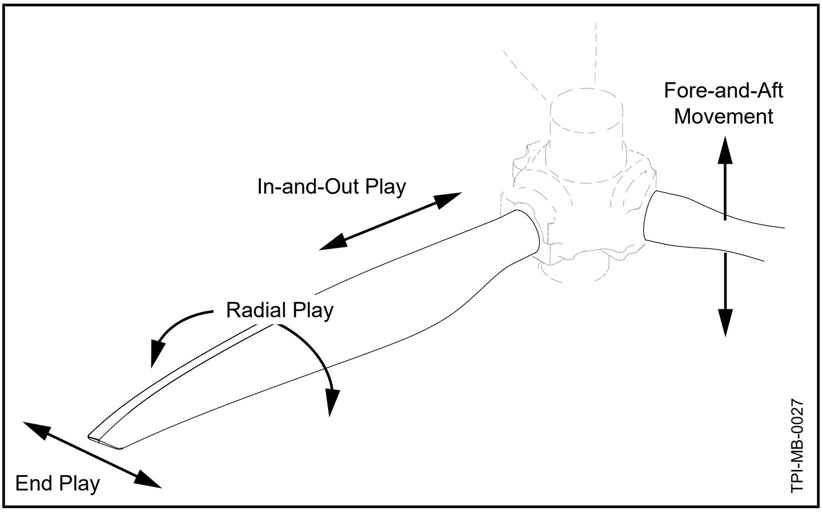
(b) If no foreign matter is present, refer to an appropriately licensed propeller repair facility.

E. Loose Blades

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

(a)	End Play	± 0.062 inch (1.57 mm)
(b)	Fore-and-Aft Movement	± 0.062 inch (1.57 mm)
(c)	In and Out	0.032 inch (0.81 mm)
(d)	Radial Play (pitch change)	± 0.5 degree (1 degree total)

(2) Blade movement that is greater than the allowable limits, should be referred to a certified propeller repair station with the appropriate rating.



Blade Movement
Figure 5-2

F. Corrosion (Rev. 1)

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 a certified propeller repair station with the appropriate rating.

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 local airworthiness authority for repair approval.

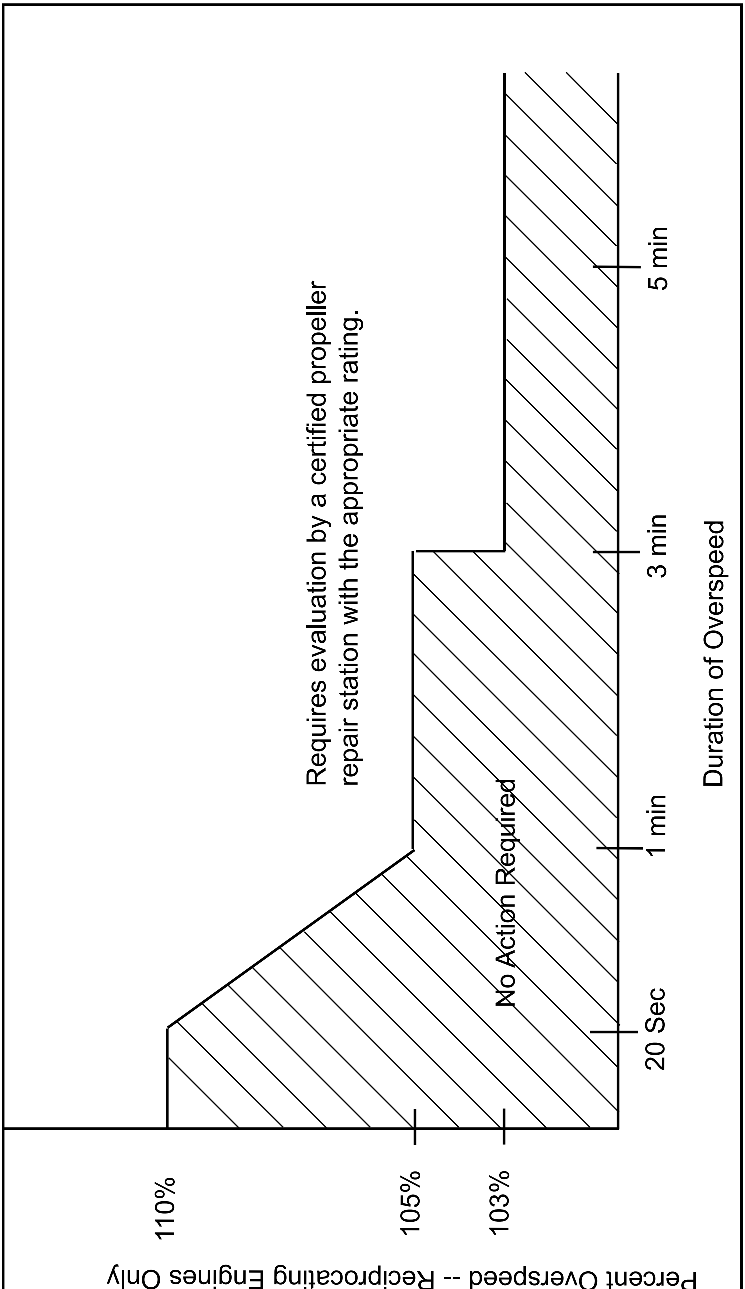
(b) Composite Spinners

1 For damage evaluation and repair information, refer to Hartzell Propeller Inc. Manual 148 (61-10-73) or a certified propeller repair station with the appropriate rating.

2 Contact the local airworthiness authority for repair approval.

H. Propeller Ice Protection Systems (Rev. 1)

(1) Refer to the Anti-ice and De-ice Systems chapter of this manual for operational checks and troubleshooting information.



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 airframe/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 (Rev. 1)

<u>CAUTION</u>: REFER TO THE ENGINE AND AIRFRAME 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 flight.

(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, spinner, and ice protection system for evidence of damage that would require repair before flight (such as broken wires or arcing damage to propeller hub).

<u>CAUTION</u>: 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 FLIGHT.

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

<u>2</u> If there is evidence of additional damage, beyond minor arcing burns to the blades, temporary operation is <u>not</u> 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.

(b) Perform an operational check of the propeller ice protection system (if installed) in accordance with the Anti-ice and De-ice Systems chapter of this manual.

(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 a certified propeller repair station with the appropriate rating.

C. 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 an aircraft 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 flight.

(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 aircraft, disassembled, and overhauled by a certified propeller repair station with the appropriate rating.

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

2 Blade(s) loose in the hub (if applicable)

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

3 Blade(s) rotated in the clamp (if applicable)

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

5 Any blade diameter reduction

6 Bent, cracked, or failed engine shaft

7 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 flight.

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

(d) 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.

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

D. 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 a certified propeller repair station with the appropriate rating before further flight.

E. 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.

F. Engine Oil Contamination (Rev. 1)

(1) Following an incident of oil contamination, the components of the propeller that were exposed to oil contamination must be removed, cleaned, and inspected.

(a) A propeller that was exposed to oil contamination must be removed and sent to a certified propeller repair station with the appropriate rating for disassembly, cleaning, and inspection.

(b) A governor that was exposed to oil contamination must be inspected and repaired in accordance with the applicable component maintenance manual.

6. <u>Long Term Storage</u>

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).

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MAINTENANCE PRACTICES - CONTENTS

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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.

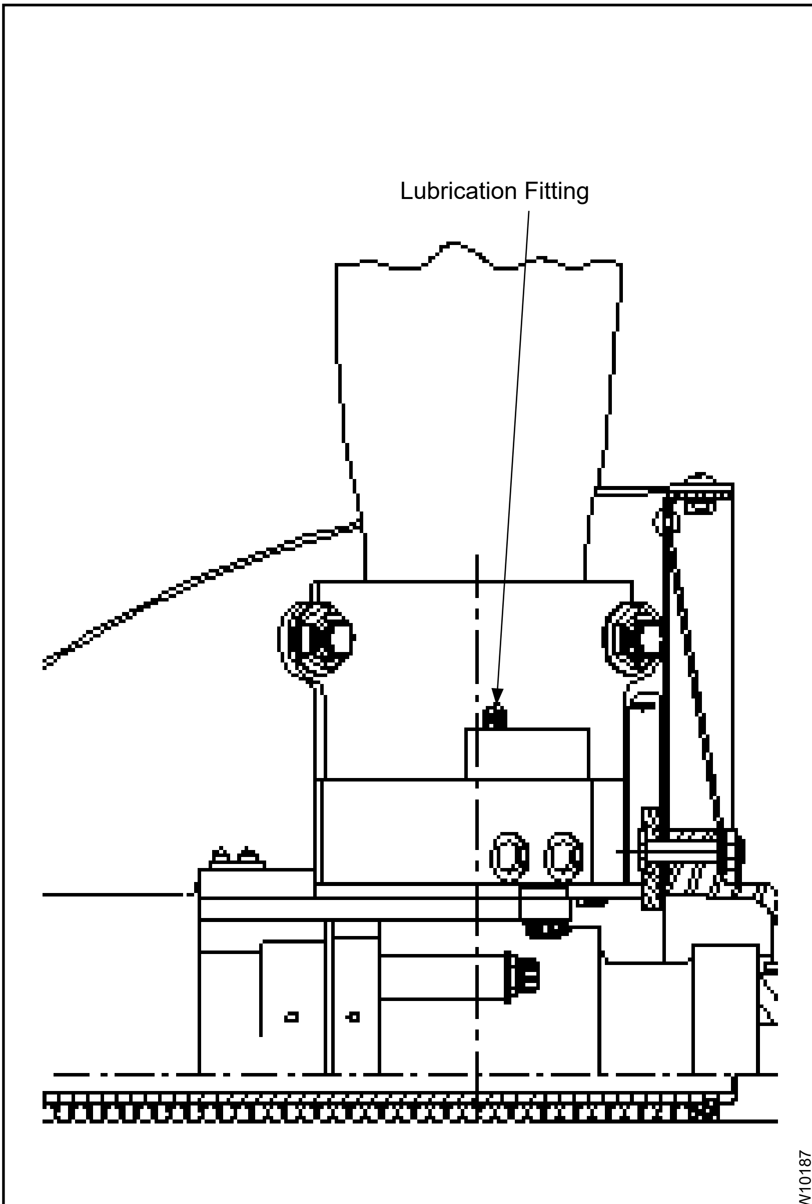
(9) Let the propeller dry.

(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.



Lubrication Fitting
Figure 6-1

2. Lubrication (Rev. 5)

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 aircraft 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 high use aircraft 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 new aircraft should check the propeller logbook to verify whether the propeller was lubricated by the manufacturer during flight testing. If it was not lubricated, the propeller should be serviced at the earliest convenience.

B. Lubrication Procedure

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

(1) Remove the propeller spinner.

CAUTION: STEEL BLADE CLAMPS PRODUCED BEFORE 1967 MAY HAVE ONLY ONE LUBRICATION FITTING. DO NOT REMOVE THIS FITTING WHEN SERVICING.

(2) Remove the outboard lubrication fitting from the blade clamp, and the cap from the inboard lubrication fitting. Refer to Figure 6-1.

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

(3) If there is a blockage in the threaded hole where the lubrication fitting 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.

(4) 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

(5) 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 flights 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 A STEEL HUB PROPELLER MAY CAUSE THE GREASE TO DISLODGE THE CLAMP GASKET OR SEAL, LEADING TO A POTENTIAL GREASE LEAK. THE CLAMP MUST THEN BE DISASSEMBLED TO REMOVE THE SEAL OR CLAMP GASKET.

(6) Apply grease in accordance with the applicable step below.

(a) For blade clamps with two lubrication fittings:

1 Pump a maximum of 1 fl. oz. (30 ml) grease into the inboard lubrication fitting or until grease emerges from the hole where the lubrication fitting was removed, whichever occurs first.

a Repeat for each blade clamp assembly.

(b) For blade clamps with only one lubrication fitting:

1 Without using excessive pressure, slowly pump a maximum of 1 fl. oz. (30 ml) grease into the lubrication fitting.

a If there is too much pressure, loosen the lubrication fitting used to add the grease, then tighten the fitting until snug.

b Repeat for each blade clamp assembly.

(7) Reinstall the lubrication fittings on each blade clamp that were removed at the beginning of this procedure.

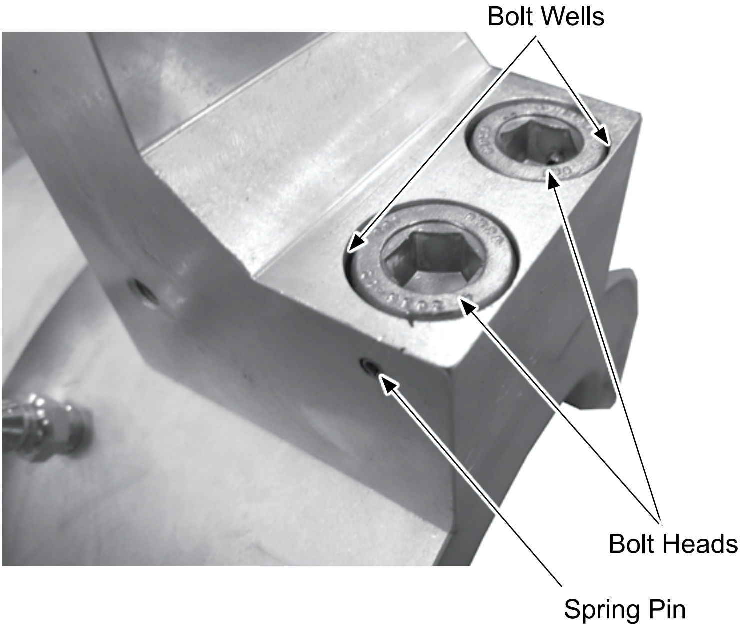
(8) Tighten the lubrication fittings until snug.

(a) Make sure the ball of each lubrication fitting is properly seated.

(9) Install 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).



NOTE: Non-painted clamp unit is shown.

TPI-LW-202A-VOL-5-00402

Applying Corrosion Inhibitor CM352
Figure 6-3

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.

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 6-3.

(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.

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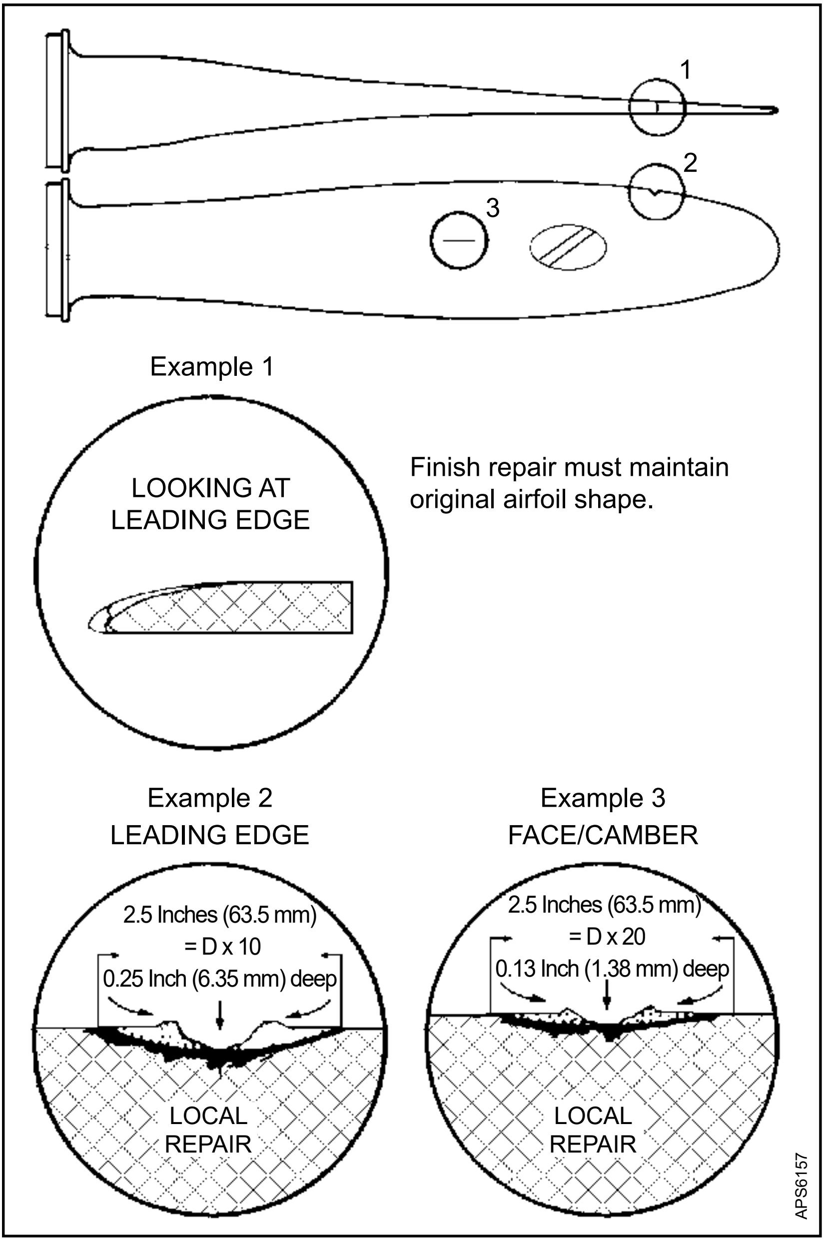


Repair Limitations
Figure 6-4

4. 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 FLIGHT 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 flight.

(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 flight.

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).

(2) Calculate the area of repair using Figure 6-4 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, “Painting After Repair” in this chapter.

C. Repair of Bent Blades

CAUTION: DO NOT ATTEMPT TO “PRE-STRAIGHTEN” A BLADE BEFORE DELIVERY TO A CERTIFIED PROPELLER REPAIR STATION WITH THE APPROPRIATE RATING. 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 a certified propeller repair station with the appropriate rating, and only within approved guidelines.

5. 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) 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 6-1 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.

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 6-1

(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

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: 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, anti-icing or de-ice boot, 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 anti-icing or de-ice boot and 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.

6. Dynamic Balance

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. Overview

CAUTION: WHEN USING REFLECTIVE TAPE FOR DYNAMIC BALANCING, DO NOT APPLY THE TAPE ON EXPOSED BARE METAL OF A BLADE. THIS WILL PERMIT MOISTURE TO COLLECT UNDER THE TAPE AND CAUSE CORROSION THAT CAN PERMANENTLY DAMAGE THE BLADE. REFLECTIVE TAPE MUST BE REMOVED IMMEDIATELY AFTER DYNAMIC 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, airframe, 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 manufacturer's instructions also contain information about dynamic balance limits.

(4) Unless otherwise specified by the engine or airframe manufacturer, Hartzell Propeller Inc. recommends that the propeller be dynamically balanced to a reading of 0.2 IPS, or less.

B. Inspection Procedures Before Balancing

(1) Visually inspect the propeller assembly before dynamic balancing.

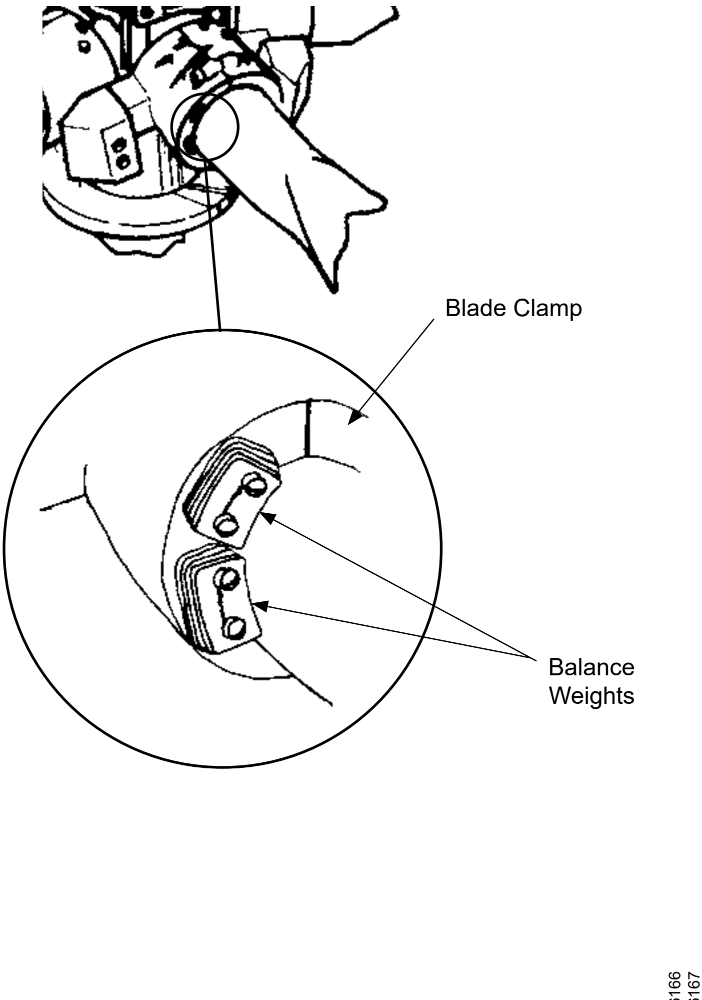
NOTE: The first run-up of a new or overhauled propeller assembly may leave a small amount of grease on the blades and inner surface of the spinner dome.

(a) Visually examine each propeller blade assembly for evidence of grease leakage.

(b) Visually examine the inner surface of the spinner dome for evidence of grease leakage.

(c) Using Stoddard solvent or equivalent, completely remove any grease on the blades or inner surface of the spinner dome.

(2) If there is no evidence of grease leakage, lubricate the propeller in accordance with the Lubrication section in this chapter.



Location of Balance Weights
Figure 6-5

(3) If grease leakage is evident, determine the location of the leak and correct before re-lubricating the propeller and dynamic balancing.

(4) Before dynamic balancing, record the number and location of all static balance weights.

(5) Static balance is required when an overhaul or major repair is performed at a certified propeller repair station with the appropriate rating.

NOTE: If static balancing is not accomplished before dynamic balancing, the propeller may be so severely unbalanced that dynamic balance may not be achievable due to limitations of measurement equipment.

C. Placement of Balance Weights for Dynamic Balance

The preferred method of attachment of dynamic balance weights is to add the weights to the spinner bulkhead; however, the configuration of the spinner bulkhead on propeller models covered in this manual may make it impractical to mount dynamic balance weights in this manner. In this case, dynamic balance must be accomplished through the removal or addition and/or the relocation of the static balance weights located on the blade clamps.

(1) Each blade clamp has four balance weight locations on the outboard circular surface of the clamp. Refer to Figure 6-5.

(2) The maximum number of balance weights per location:

(a) Propeller model HC-B3(P,R)30-2E/(P,R)10152( )-5.5 installed on a Beech aircraft: The maximum number of balance weights per location is two (2).

(b) All other propeller models: The maximum number of balance weights per location is four (4).

NOTE: For propellers with a de-ice system using a blade clamp-mounted terminal block, a maximum of three weights may be attached to the de-ice terminal block mounted on the blade clamp.

CAUTION 1: BEFORE DYNAMIC BALANCE, RECORD THE NUMBER AND LOCATION OF ALL STATIC BALANCE WEIGHTS.

CAUTION 2: USE ONLY STEEL BALANCE WEIGHTS A-1305.

CAUTION 3: DO NOT EXCEED THE MAXIMUM NUMBER OF BALANCE WEIGHTS PER LOCATION.

(3) Alter the number and/or location of static balance weights as necessary to achieve dynamic balance.

(4) If reflective tape is used for dynamic balancing, remove the tape immediately after balancing is completed.

(5) 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.

7. Propeller Low Pitch Setting

WARNING 1: RPM ADJUSTMENTS MUST BE MADE WITH REFERENCE TO A CALIBRATED TACHOMETER. AIRCRAFT 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 CONSULTATION WITH THE APPLICABLE TYPE CERTIFICATE OR SUPPLEMENTAL TYPE CERTIFICATE HOLDER’S APPROVED MAINTENANCE DATA.

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. Low Pitch Stop - All Propeller Models

(1) The propeller low pitch stop is set at Hartzell Propeller Inc. in accordance with the aircraft TC or STC Holder's requirements and should not require any additional adjustment.

(2) The TC or STC Holder provides the required low pitch stop blade angle and may also provide the acceptable RPM range for a maximum power static condition.

(a) Be aware that the aircraft TC or STC holder may specify the static RPM to be less than the RPM to which the engine is rated.

B. Low Pitch Measurement on Propeller Models HC-B3( )30-2B, HC-B3R30-4A,4B, HC-B3WF-2, HC-B3WN-2L, HC-B3ZF-2( ), HC-B3( )30-2E( ), and HC-B3( )30-E:

NOTE: On propeller models HC-B4TN-1( ) the low pitch blade angle is not easily measured on the aircraft. It is recommended that the propeller be removed and sent to an appropriately licensed propeller repair facility for blade angle measurement and adjustment as applicable.

CAUTION: PUT A PAN UNDER THE PROPELLER PISTON BEFORE REMOVING THE NUT AND MOVING THE PISTON, AS ENGINE OIL MAY COME OUT OF THE OPENING IN THE PISTON.

(1) Untorque and remove the piston nut from the pitch change rod.

(2) Rotate the blades by hand to move the blades and piston to low pitch.

NOTE: Low pitch is reached when a washer on the end of each piston guide rod stops against the guide collar.

(3) With the blade in a horizontal position, measure low pitch blade angle.

(4) If the blade angle requires adjustment, have the low pitch stop adjusted by a certified propeller repair station with the appropriate rating or by Hartzell Propeller Inc.

C. Low Pitch Measurement on Propeller Models HC-B3( )20-4, HC-B3( )30-4( ), HC-B3W( )-4, and HC-B3Z20-1:

(1) Rotate the blades by hand to move the blades and piston to low pitch.

NOTE: Low pitch is reached when the piston is seated on the cylinder.

(2) With the blade in a horizontal position, measure the low pitch blade angle.

WARNING: LOW PITCH BLADE ANGLE ADJUSTMENTS MUST BE MADE IN CONSULTATION WITH THE APPLICABLE TYPE CERTIFICATE OR SUPPLEMENTAL TYPE CERTIFICATE HOLDER'S MAINTENANCE DATA..

(3) If the blade angle requires adjustment, have the low pitch stop adjusted by a certified propeller repair station with the appropriate rating or by Hartzell Propeller Inc.

8. Propeller High Pitch Settings (Rev. 1)

A. High Pitch (Minimum RPM) Stop Adjustment

(1) The high pitch stop is set by Hartzell Propeller Inc. in accordance with the aircraft manufacturer's recommendations.

(2) The high pitch stop can only be adjusted by Hartzell or by a certified propeller repair station with the appropriate rating.

9. 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.

10. Start Lock Settings (Rev. 1)

A. Start Lock Adjustment

(1) The start locks are set by Hartzell Propeller Inc. in accordance with the aircraft manufacturer’s recommendations.

(2) The start locks can only be adjusted by Hartzell or by a certified propeller repair station with the appropriate rating.

11. Propeller Ice Protection Systems (Rev. 1)

A. Maintenance Information

(1) Refer to the Anti-ice and De-ice Systems chapter of this manual for ice protection system maintenance information.

12. 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 aircraft.

(a) Some tachometers have been found to be in error by as much as 200 RPM.

(b) Operating the aircraft 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.

ANTI-ICE AND DE-ICE SYSTEMS - CONTENTS

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1. Anti-ice System Description (Rev. 1)

WARNING: CONSULT THE PILOT OPERATING HANDBOOK (INCLUDING ALL SUPPLEMENTS) REGARDING FLIGHT INTO CONDITIONS OF KNOWN ICING. THE AIRCRAFT MAY NOT BE CERTIFICATED FOR FLIGHT INTO KNOWN ICING CONDITIONS, EVEN THOUGH AN ICE PROTECTION SYSTEM IS INSTALLED.

NOTE: There are many configurations of anti-ice systems. This section provides a general overview of system operation. Consult the airframe manufacturer's manual for a description of your specific anti-ice system and controls.

A. Overview of an Anti-ice System

(1) A propeller anti-ice system prevents formation of ice on the propeller blades. The system dispenses a liquid (usually isopropyl alcohol) onto the propeller blades. This liquid mixes with moisture on the blades and lowers the freezing point of the water, allowing the water/alcohol mixture to flow off of the blades before ice forms.

(a) Anti-ice systems must be in use before ice forms. This system is not effective for removing ice after it has formed.

B. Components of an Anti-ice System

(1) A typical anti-ice system includes the following components:

(a) Fluid tank, pump, slinger ring, blade mounted anti-icing boots, and fluid dispensing tubes located at each blade mounted anti-icing boot

C. Anti-ice System Operation

(1) The anti-ice system is typically controlled by the pilot using a cockpit mounted rheostat. The rheostat controls the pump and the flow of anti-ice fluid from the fluid tank.

(2) The anti-ice fluid is pumped through airframe mounted distribution tubing and into a rotating slinger ring that is mounted on the rear of the propeller hub.

(3) From the slinger ring, centrifugal force pushes the anti-icing fluid through the fluid dispensing tubes onto the blade mounted anti-icing boots.

(4) The anti-icing boots evenly distribute the fluid along the leading edge of the propeller blade to prevent ice from forming.

2. De-ice System Description (Rev. 1)

WARNING: CONSULT THE PILOT OPERATING HANDBOOK (INCLUDING ALL SUPPLEMENTS) REGARDING FLIGHT INTO CONDITIONS OF KNOWN ICING. THE AIRCRAFT MAY NOT BE CERTIFICATED FOR FLIGHT INTO KNOWN ICING CONDITIONS, EVEN THOUGH AN ICE PROTECTION SYSTEM IS INSTALLED.

NOTE: There are many configurations of de-ice systems. This section provides a general overview of system operation. Consult the airframe manufacturer's manual for a description of your specific de-ice system and controls.

A. Overview of a De-ice System

(1) A propeller de-ice system removes ice after it forms on the propeller blades. The system uses electrical heating elements to melt the ice layer next to the blade permitting the ice to be thrown from the blade by centrifugal force.

B. Components of a De-ice System

(1) A typical de-ice system includes the following components:

(a) ON/OFF switch(es), ammeter, timer or cycling unit, slip ring, brush blocks, and blade mounted de-ice boots.

C. De-ice System Operation

(1) The de-ice system is controlled by the pilot using a cockpit control switch. When this switch is ON, electrical power is supplied to the de-ice system.

(a) Some systems may have additional controls to adjust for different icing conditions.

1 A mode selector switch lets the pilot set the cycling speed for heavy or light icing conditions.

2 For twin engine aircraft, a full de-ice mode switch lets the pilot de-ice both propellers simultaneously. This switch is used when ice builds up on the propeller before the system is turned on and may only be used for short periods.

(2) The ammeter indicates current draw by the system. It is typically located near the de-ice system switches. The ammeter may indicate total system load, or in twin engine aircraft, a separate ammeter may be supplied for each propeller.

(3) The timer or cycling unit is controlled by the pilot using a cockpit control switch. When the timer/cycling unit is ON, power is applied to each de-ice boot (or boot segment) in a sequential order for a preset amount of time. This heating interval evenly de-ices the propeller.

(4) The brush block supplies electrical current to the de-ice boot on each propeller blade via a slip ring. The brush block is typically mounted on the engine just aft of the propeller. The slip ring rotates with the propeller and is typically mounted on the spinner bulkhead.

(5) The de-ice boots contain internal heating elements that melt the ice layer from the blades when electrical current is applied. De-ice boots are attached to the leading edge of each blade using adhesive.

3. <u>Operational Checks</u> (Rev. 1)

   A. De-ice and Anti-ice Systems

      (1) Perform the applicable Operational Check procedure(s) in accordance with the Check chapter in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80) and/or the Aircraft Maintenance Manual.

4. <u>Troubleshooting</u> (Rev. 1)

   A. De-ice and Anti-ice Systems

      (1) Refer to the applicable chapter(s) in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80) to troubleshoot malfunctions in Hartzell de-ice and anti-ice systems.

         (a) Part numbers for components used in Hartzell de-ice and anti-ice systems are found in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

5. <u>Periodic Inspections</u> (Rev. 1)

   A. De-ice and Anti-ice Systems

      (1) Refer to the Check chapter in Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80) for detailed information about inspection intervals and procedures.

RECORDS - CONTENTS

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1. Record Keeping (Rev. 1)

A. General

(1) Federal Aviation Regulations require that a record be kept of any repairs, adjustments, maintenance, or required inspections performed on a propeller or propeller system.

B. Information to be Recorded

(1) Refer to Part 43 of the U.S. Federal Aviation Regulations for a list of information that must be recorded.

(2) The logbook may also be used to record:

(a) Propeller position (on aircraft)

(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) Aircraft information (aircraft type, model, serial number and registration number).

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