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HARTZELL

MANUAL REVISION TRANSMITTAL
Manual 149 (61-00-49)
Propeller Owner's Manual and Logbook
REVISION 21 dated October 2015

Attached is a copy of Revision 21 to Hartzell Manual 149.

Page Control Chart for Revision 21:

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pages 2-9 and 2-10

INSTALLATION AND REMOVAL

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NOTE 1: When the manual revision has been inserted in the manual, record the information required on the Record of Revisions page in this manual.

NOTE 2: Pages distributed in this revision may include pages from previous revisions if they are on the opposite side of revised page. This is done as a convenience to those users who wish to print a two-sided copy of the new revision.

Manual No. 149
61-00-49
Revision 21
October 2015

Propeller Owner's Manual and Logbook

Models: HC-(D,E)4()-2()
HC-(D,E)4()-3()
HC-(D,E)4()-5()
HC-D3F-7()
HC-E5N-3()

Lightweight Turbine Propellers with Aluminum Blades

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REVISION HIGHLIGHTS

Revision 21, dated October 2015, incorporates the following:

- COVER
 - Revised to match the manual revision
- REVISION HIGHLIGHTS
 - Revised to match the manual revision
- LIST OF EFFECTIVE PAGES
 - Revised to match the manual revision
- TABLE OF CONTENTS
 - Revised to match the manual revision
- INTRODUCTION
 - Revised the section "Personnel Requirements"
 - Revised the section "Maintenance Practices"
 - Revised the section "Reference Publications"
- INSTALLATION AND REMOVAL
 - Revised the section "Tools, Consumables, and Expendables"
 - Revised Table 3-1, "Propeller/Engine Flange O-rings and Mounting Hardware"
 - Revised Table 3-2, "Torque Table"
 - Revised figure 3-6, Tool for Decompressing HC-(D,E)(4,5)()-3() Series External Beta System
 - Revised the section "Installing the HC-(D,E)(4,5)(A,N)-3() Propeller on the Aircraft Engine"
 - Added the section "Installing the HC-E4P-3K Propeller on the Aircraft Engine"
 - Revised the section "Post-Installation Checks"
 - Revised the section "Removal of HC-(D,E)(4,5)(A,N)-3() Propellers"
 - Added the section "Removal of HC-E4P-3K Propellers"

REVISION HIGHLIGHTS, continued

- INSPECTION AND CHECK
 - Revised Figure 5-3, "Turbine Engine Overspeed Limits"
 - Revised Figure 5-4, "Turbine Engine Overtorque Limits"
- MAINTENANCE PRACTICES
 - Revised the section "Lubrication Procedure"

REVISION HIGHLIGHTS1. Introduction

A. General

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

B. Components

- (1) Revision No. indicates the revisions incorporated in this manual.
- (2) Issue Date is the date of the revision.
- (3) Comments indicates the level of the revision.
 - (a) New Issue is a new manual distribution. The manual is distributed in its entirety. All the page revision dates are the same and no change bars are used.
 - (b) Reissue is a revision to an existing manual that includes major content and/or major format changes. The manual is distributed in its entirety. All the page revision dates are the same and no change bars are used.
 - (c) Major Revision is a revision to an existing manual that includes major content or minor content changes over a large portion of the manual. The manual is distributed in its entirety. All the page revision dates are the same, but change bars are used to indicate the changes incorporated in the latest revision of the manual.
 - (d) Minor Revision is a revision to an existing manual that includes minor content changes to the manual. Only the revised pages of the manual are distributed. Each page retains the date and the change bars associated with the last revision to that page.

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Revision 8	Nov/99	Reissue
Revision 9	July/03	Minor Revision
Revision 10	Sep/07	Minor Revision
Revision 11	Nov/09	Minor Revision
Revision 12	Apr/11	Minor Revision
Revision 13	Aug/12	Minor Revision
Revision 14	Nov/12	Minor Revision
Revision 15	Feb/13	Minor Revision
Revision 16	May/13	Minor Revision
Revision 17	Mar/14	Minor Revision
Revision 18	Apr/14	Minor Revision
Revision 19	May/14	Minor Revision
Revision 20	Dec/14	Minor Revision
Revision 21	Oct/15	Minor Revision

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4. Restrictions and Placards

- A. The propellers covered by this manual may have a restricted operating range that requires a cockpit placard. The restrictions, if present, will vary depending on the propeller, blade, engine, and/or aircraft model. Review the propeller and aircraft type certificate data sheet (TCDS), Pilot Operating Handbook (POH), and any applicable Airworthiness Directives for specific information.

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

- B. The propeller operating restrictions or limitations are found in the Airplane Flight Manual (AFM) or Airplane Flight Manual Supplement (AFMS).
- C. If a propeller RPM operating restriction or limitation is violated, refer to the Special Inspections section in the Inspection and Check chapter of this manual for corrective actions.

5. General**A. Personnel Requirements****(1) Inspection, Repair, and Overhaul**

- (a) Compliance to the applicable regulatory requirements established by the Federal Aviation Administration (FAA) or foreign equivalent is mandatory for anyone performing or accepting responsibility for any inspection and/or repair and/or overhaul of any Hartzell Propeller Inc. product.
- (b) Personnel performing maintenance on aluminum hub propellers are expected to have sufficient training and certifications (when required by the applicable Aviation Authority) to accomplish the work required in a safe and airworthy manner.

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 place the blade paddle in the area of the de-ice boot when applying torque to a blade assembly. Place the blade paddle in the thickest area of the blade, just outside of the de-ice boot. Use one blade paddle per blade.
- (4) Use only the approved consumables, e.g., cleaning agents, lubricants, etc.
- (5) Safe Handling of Paints and Chemicals
 - (a) Always use caution when handling or being exposed to paints and/or chemicals during propeller overhaul and maintenance procedures.
 - (b) Before using paint or chemicals, always read the manufacturer's label on the container and follow specified instructions and procedures for storage, preparation, mixing, and application.

- (c) Refer to the product's Material Safety Data Sheet (MSDS) for detailed information about physical properties, health, and physical hazards of any chemical.
- (6) Observe applicable torque values during maintenance.
- (7) Approved corrosion protection followed by approved paint must be applied to all aluminum blades. For information concerning 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.
- (8) Before installing the propeller on the engine, the propeller must be static balanced. New propellers are statically balanced at Hartzell Propeller Inc. Overhauled propellers must be statically balanced by a certified propeller repair station with the appropriate rating before return to service.

NOTE: Dynamic balance is recommended, but may be accomplished at the discretion of the operator, unless specifically required by the airframe or engine manufacturer. Dynamic balancing is to be accomplished in accordance with the procedures and limitations in Maintenance Practices chapter of this manual. Additional procedures may be found in the aircraft maintenance manual.

- (9) As necessary, use a soft, non-graphite pencil or crayon to make identifying marks on components.
- (10) As applicable, follow military standard NASM33540 for safety wire and cotter pin general practices. Use 0.032 inch (0.81 mm) diameter stainless steel safety wire unless otherwise indicated.

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

- (11) The information in this manual supersedes data in all previously published revisions of this manual.
- (12) Refer to the airframe manufacturer's manuals in addition to the information in this manual because of possible special requirements for specific aircraft applications.
- (13) 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 supplied by Hartzell Propeller Inc. can be found in the following publications available on the Hartzell Propeller Inc. website at www.hartzellprop.com:
 - (a) Hartzell Propeller Inc. Manual 180 (30-61-80) - Propeller Ice Protection System Manual
 - (b) Hartzell Propeller Inc. Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual
 - (c) Hartzell Propeller Inc. Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual

(d) Hartzell Propeller Inc. Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual

(14) 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).

(15) Approved corrosion protection followed by approved paint must be applied to all aluminum blades. For information concerning 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.

C. Continued Airworthiness

(1) Operators are urged to stay informed of airworthiness information via Hartzell Propeller Inc. Service Bulletins and Service Letters, that are available from Hartzell Propeller Inc. distributors or from the Hartzell Propeller Inc. factory by subscription. Selected information is Available on the Hartzell Propeller Inc. website at www.hartzellprop.com.

D. Propeller Critical Parts

(1) The following maintenance procedures may involve propeller critical parts. 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. Refer to the Illustrated Parts List chapter of the applicable maintenance manual for the applicable propeller model for the identification of specific 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 Critical Parts. 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.

6. Reference Publications

The following publications are referenced within this manual:

Active Hartzell Propeller Inc. Service Bulletins, Service Letters, Service Instructions, and Service Advisories

Hartzell Propeller Inc. Manual No. 127 (61-16-27) - Metal Spinner Assembly Maintenance

Hartzell Propeller Inc. Manual No. 133C (61-13-33) - Aluminum Propeller Blade Maintenance Manual

Hartzell Propeller Inc. Manual No. 141 (61-10-41) - Four-Blade Lightweight Turbine Propeller Maintenance Manual

Hartzell Propeller Inc. Manual No. 142 (61-10-42) - Three and Four-Blade Lightweight Turbine Propeller Maintenance Manual

Hartzell Propeller Inc. Manual No. 143A (61-10-43) - Four-Blade Lightweight Turbine Propeller Maintenance Manual

Hartzell Propeller Inc. Manual No. 159 (61-02-59) - Application Guide - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual No. 158A (61-10-58) - Five and Six-Blade Lightweight Turbine Propeller Maintenance Manual

Hartzell Propeller Inc. Manual No. 165A (61-00-65) - Illustrated Tool and Equipment

Hartzell Propeller Inc. Manual No. 180 (30-61-80) - Propeller Ice Protection System Manual - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual No. 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual No. 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual No. 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual No. 202A (61-01-02) - Standard Practices Manual - Volumes 1 through 11 (Volume 7, Consumable Materials is available on the Hartzell Propeller Inc. website at www.hartzellprop.com)

Hartzell Propeller Inc. Service Letter HC-SL-61-61Y - Overhaul Periods and Service Life Limits for Hartzell Propeller Inc. Aviation Components - Propellers, Governors, and Propeller Damper Assemblies - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

7. Definitions

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

<u>Term</u>	<u>Definition</u>
Annealed	Softening of material due to overexposure to heat.
Blade Angle	Measurement of blade airfoil location described as the angle between the blade airfoil and the surface described by propeller rotation.
<u>Term</u>	<u>Definition</u>
Brinelling	A depression caused by failure of the material in compression.
Chord	A straight line between the leading and trailing edges of an airfoil.
Cold Rolling	Compressive rolling process for the retention area of single shoulder blades which provides improved strength and resistance to fatigue.
Constant Force.	A force which is always present in some degree when the propeller is operating.
Constant Speed	A propeller system which employs a governing device to maintain a selected engine RPM.

<u>Term</u>	<u>Definition</u>
Corrosion	Gradual material removal or deterioration due to chemical action.
Crack	Irregularly shaped separation within a material, sometimes visible as a narrow opening at the surface.
Depression	Surface area where the material has been compressed but not removed.
Distortion	Alteration of the original shape or size of a component.
Erosion	Gradual wearing away or deterioration due to action of the elements.
Exposure	Material open to action of the elements.
Feathering	A propeller with blades that may be positioned parallel to the relative wind, thus reducing aerodynamic drag.
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.
Major Propeller Effect	The major propeller effects are defined in Title 14 CFR section 35.15(g)(2).
Nick	Removal of paint and possibly a small amount of material.

<u>Term</u>	<u>Definition</u>
Onspeed	Condition in which the RPM selected by the pilot through the propeller control lever and the actual engine (propeller) RPM are equal.
Overhaul	The periodic disassembly, inspection, repair, refinish, and reassembly of a propeller assembly to maintain airworthiness.
Overspeed	Condition in which the RPM of the propeller or engine exceeds predetermined maximum limits; the condition in which the engine (propeller) RPM is higher than the RPM selected by the pilot through the propeller control lever.
Overspeed Damage	Damage that occurs when the propeller hub assembly rotates at a speed greater than the maximum limit for which it is designed.
Pitch	Same as "Blade Angle".
Pitting	Formation of a number of small, irregularly shaped cavities in surface material caused by corrosion or wear
Propeller Critical Part	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
Reversing	The capability of rotating blades to a position to generate reverse thrust to slow the aircraft or back up.
Scratch	Same as "Nick".
Single Acting	Hydraulically actuated propeller which utilizes a single oil supply for pitch control.

<u>Term</u>	<u>Definition</u>
Superseded	Parts that are considered airworthy for continued flight but may no longer be available.
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.
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
Underspeed	The condition in which the actual engine (propeller) RPM is lower than the RPM selected by the pilot through the propeller control lever.
Variable Force	A force which may be applied or removed during propeller operation.
Windmilling	The rotation of an aircraft propeller caused by air flowing through it while the engine is not producing power.

8. Abbreviations

<u>Abbreviation</u>	<u>Term</u>
AMM	Aircraft Maintenance Manual
AN	Air Force-Navy (or Army-Navy)
AOG	Aircraft on Ground
FAA	Federal Aviation Administration
Ft-Lb	Foot-Pound
ICA	Instructions for Continued Airworthiness
ID	Inside Diameter
In-Lb	Inch-Pound
IPS	Inches Per Second
Lbs	Pounds
MIL-X-XXX	Military Specification
MPI	Major Periodic Inspection
MS	Military Standard
MSDS	Material Safety Data Sheet
NAS	National Aerospace Standards
NASM	National Aerospace Standards, Military
NIST	National Institute of Standards and Technology
N•m	Newton-Meters
OD	Outside Diameter
POH	Pilot's Operating Handbook
PSI	Pounds per Square Inch
RPM	Revolutions per Minute
TBO	Time Between Overhaul
TSN	Time Since New
TSO	Time Since Overhaul
<u>NOTE:</u>	TSN/TSO is considered as the time accumulated between rotation and landing, i.e., flight time.

9. Hartzell Propeller Inc. Product Support

Hartzell Propeller Inc. is ready to assist you with questions concerning your propeller system. 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. Hartzell Propeller Inc. Product Support can also be reached by fax at (937) 778-4391, and by e-mail at techsupport@hartzellprop.com. 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. A technical representative will contact you during normal business hours. Urgent AOG support is Available 24 hours per day, seven days per week via this message service. Additional information is available on our website at www.hartzellprop.com.

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

10. Warranty Service

If you believe you have a warranty claim, it is necessary to contact Hartzell Propeller Inc.'s Warranty Administrator. Hartzell Propeller Inc.'s Warranty Administrator will provide a blank *Warranty Application* form. It is necessary to complete this form and return it to the Warranty Administrator for evaluation **before proceeding with repair or inspection work**. Upon receipt of this form, the Warranty Administrator will provide instructions on how to proceed. Hartzell Propeller Inc. Warranty may be reached during business hours (8:00 a.m. through 5:00 p.m., United States Eastern Time) at (937) 778-4380, or toll free from the United States and Canada at (800) 942-7767. Hartzell Propeller Inc. Warranty Administration can also be reached by fax, at (937) 778-4391, or by e-mail at warranty@hartzellprop.com.

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

11. Hartzell Propeller Inc. Recommended Facilities

- A. Hartzell Propeller Inc. recommends using Hartzell Propeller Inc. approved distributors and repair facilities for the purchase, repair and overhaul of Hartzell Propeller Inc. propeller assemblies or components.
- B. Information about the Hartzell Propeller Inc. worldwide network of aftermarket distributors and approved repair facilities is available on the Hartzell Propeller Inc. website at www.hartzellprop.com.

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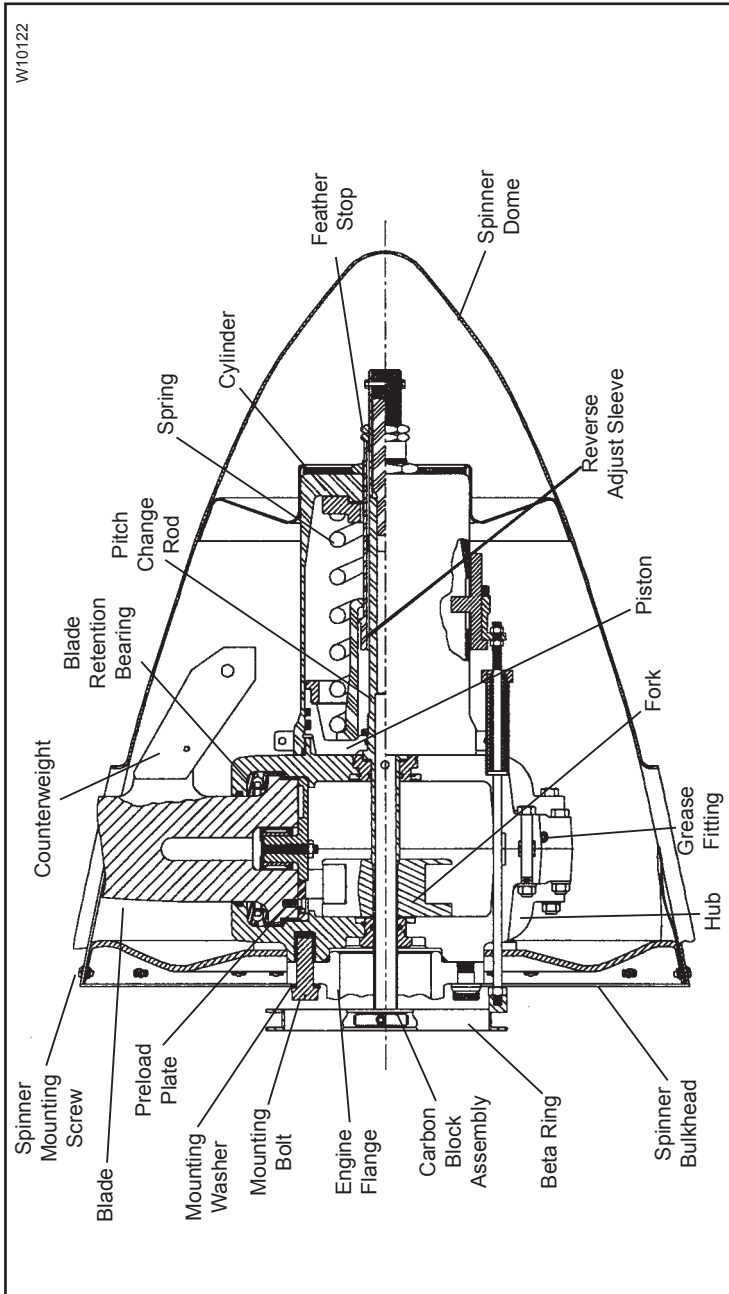
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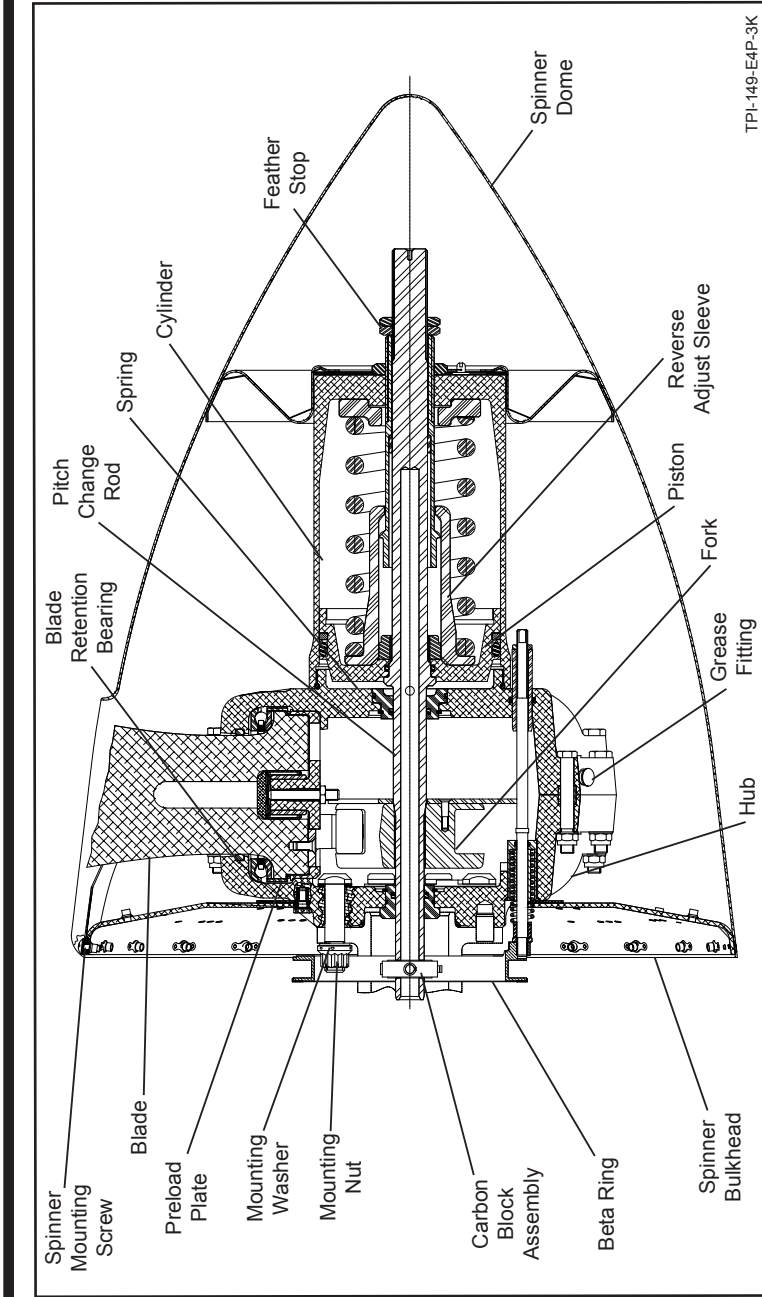


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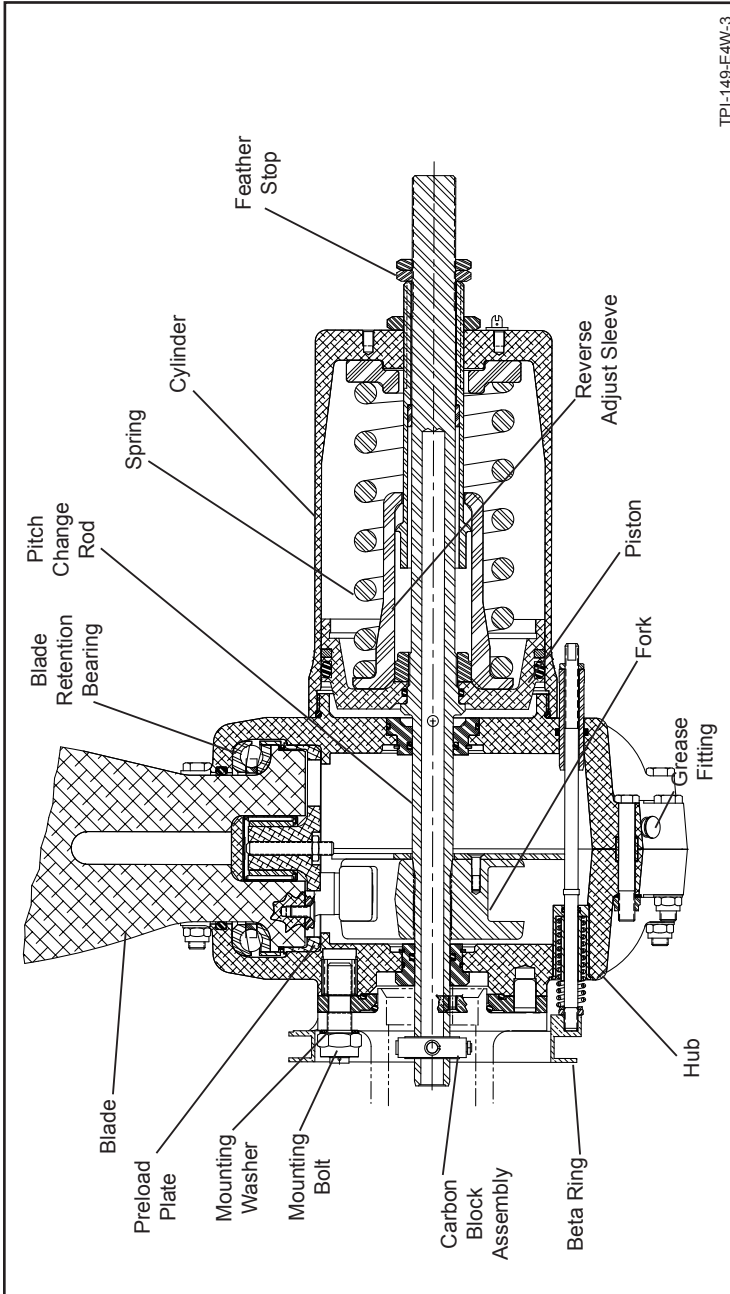
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HC-(D,E)4A-3() Series Propeller
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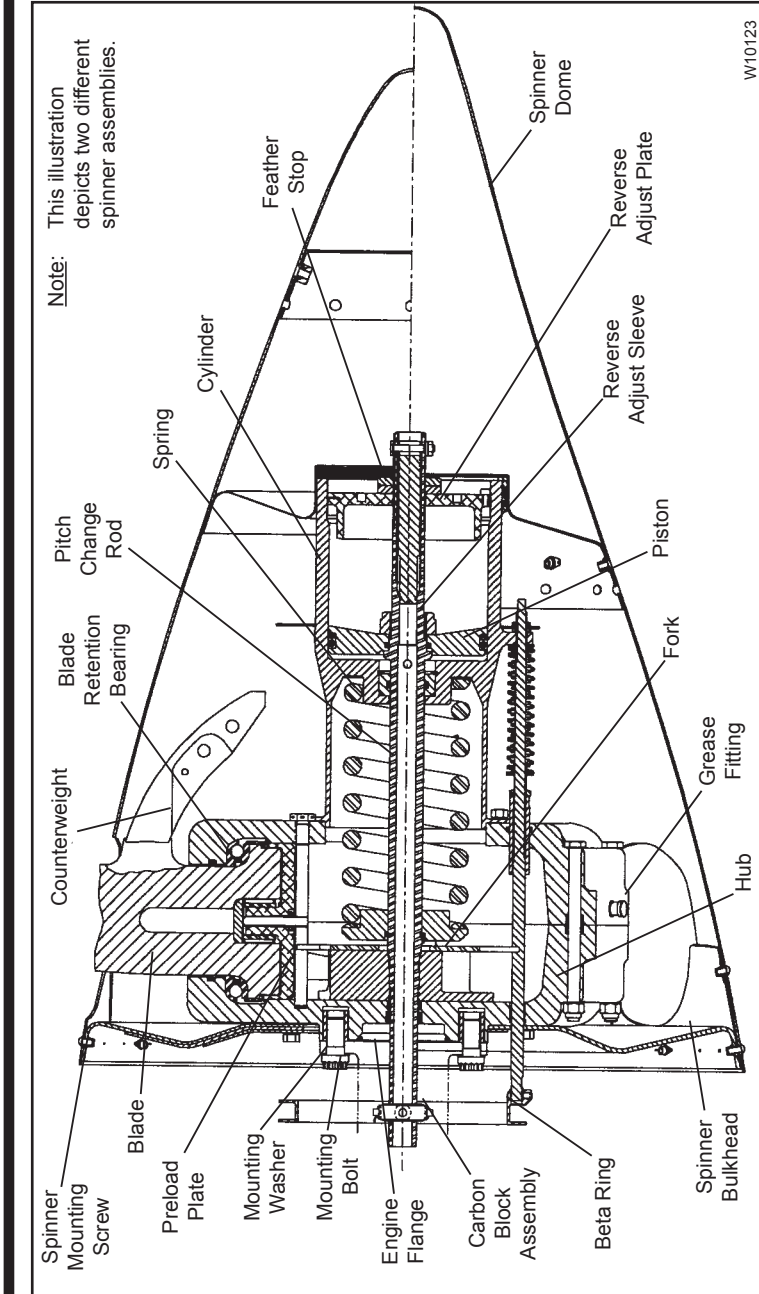


HC-E4P-3K Series Propeller
Figure 2-5.1

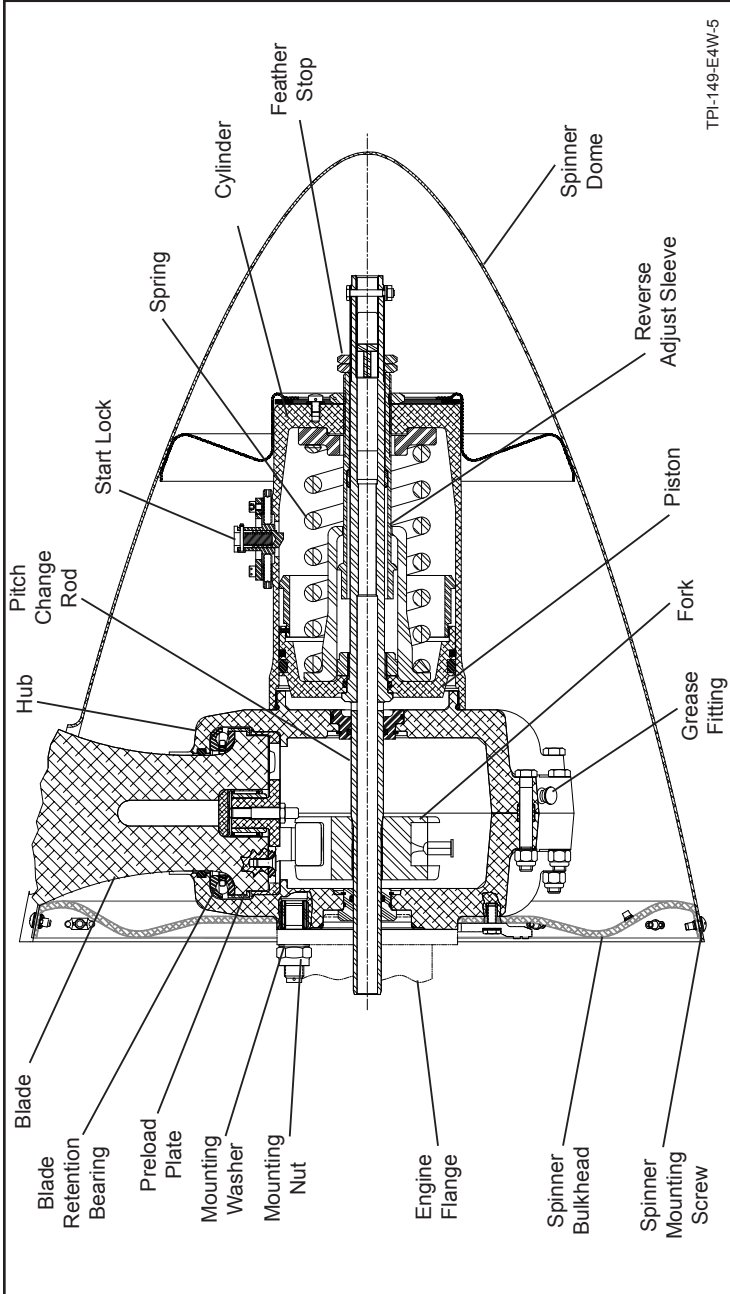


TPI-149-E4W-3

HC-E4W-3 () Series Propeller
Figure 2-5.2



HC-(D,E)5(-)3() Series Propeller
Figure 2-6



TPI-149-E4W-5

**HC-E4W-5() Series Propeller
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1. Tools, Consumables, and Expendables**A. General**

- (1) The following tools, consumables, and expendables are required for propeller removal or installation:

B. Tooling**A Flange**

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench
- Torque wrench adapter (Hartzell Propeller Inc. P/N AST-2877)

F Flange

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench
- Torque wrench adapter (Hartzell Propeller Inc. P/N AST-2917)

N Flange

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench
- Torque wrench adapter (Hartzell Propeller Inc. P/N AST-2877)

P Flange

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench
- Torque wrench adapter
(Hartzell Propeller Inc. P/N AST-2877 that use bolt)
(Hartzell Propeller Inc. P/N AST-2877-1 that use nut)

W Flange

- Torque wrench adapter (Hartzell Propeller Inc. P/N AST-3175)
- Torque check tool (Hartzell Propeller Inc. P/N AST-2968-1)
- Feeler gage
- Beta system puller (Hartzell Propeller Inc. P/N CST-2987)
- 5/8 inch deep well socket
- 1-7/16 inch crowfoot wrench

- C. Consumables
 - Quick Dry Stoddard Solvent or Methyl-Ethyl-Ketone (MEK)
- D. Expendables
 - 0.032 inch (0.81 mm) Stainless Steel Aircraft Safety wire (Alternate: 0.032 inch [0.81 mm] aircraft safety cable and associated washers and ferrules)
 - O-ring, Propeller-to-Engine Seal (see Table 3-1)

2. Pre-Installation

A. Inspection of Shipping Package

- (1) Examine the exterior of the shipping container for signs of shipping damage, especially at the box ends around each blade. A hole, tear or crushed appearance at the end of the box (blade tips) may indicate the propeller was dropped during shipment, possibly damaging the blades.

B. Uncrating

- (1) Put the propeller on a firm support.
- (2) Remove the banding and any external wood bracing from the 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 propeller over a large area.
- (5) Remove the plastic dust cover cup from the propeller mounting flange (if installed).

C. Inspection after Shipment

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

D. Reassembly of a Propeller Disassembled for Shipment

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

- (2) Follow the airframe manufacturer's instructions for installing the propeller.
 - (a) 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 the scope of this manual.
 - (b) In addition to propeller installation procedures, items such as rigging and preflight testing of flight idle blade angle, and propeller synchronization devices are normally found in the airframe manufacturer's manuals.

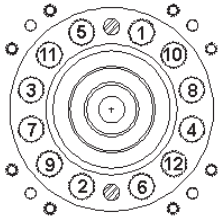
Flange	O-ring	Bolt/Stud	Washer	Nut	Misc
A	C-3317-239-2	B-3347	A-2048-2	---	
F	C-3317-228	A-1328	A-1381	---	
N	C-3317-230	B-3339-1	A-2048-2	---	
P except for Pratt engine	C-3317-230	B-3347	A-2048-2	---	
P Pratt engine, except for HC-E4P-3K	C-3317-230	B-3339-1	A-2048-2	---	
HC-E4P-3K	C-3317-230	103560	A-2048-2	C-6006	
W (HC-E4W-3[A])	C-3317-230 (Spacer-to-engine) C-3317-233 (Hub-to-spacer)	A-3254	B-7624	B-7458	C-7620 Spacer B-3868-S52 Screw
W (HC-E4W-5L)	C-3317-230	A-3254	B-7624	B-7458	101058 Propeller Mounting Shim

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

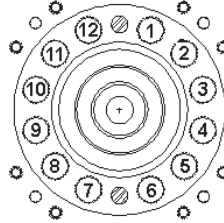
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W10107C.
W10107B.
W10108C.
W10109C.
W10109B.

A or B Flange



SEQUENCE A

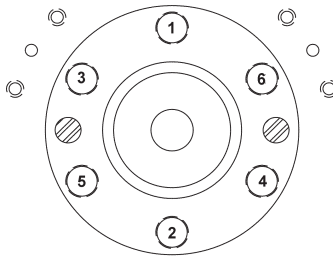


SEQUENCE B

Use Sequence A for steps one and two. Use Sequence B for step three.

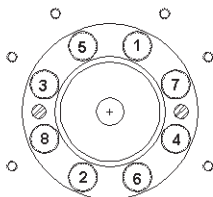
Step 1 - Torque all bolts to 40 Ft-Lbs (54 N•m). **Step 3** - Torque all bolts to Table 3-2.
Step 2 - Torque all bolts to 80 Ft-Lbs (108 N•m).

F Flange

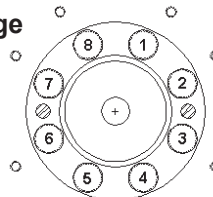


Step 1 - Torque all bolts to 40 Ft-Lbs (54 N•m).
Step 2 - Torque all bolts to Table 3-2.

N, P or W Flange



SEQUENCE A



SEQUENCE B

Use Sequence A for steps one and two. Use Sequence B for step three.

Step 1 - Torque all bolts to 40 Ft-Lbs (54 N•m). **Step 3** - Torque all bolts to Table 3-2.
Step 2 - Torque all bolts to 80 Ft-Lbs (108 N•m).

**Diagram of Torquing Sequence for Propeller Mounting Bolts
Figure 3-5**

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

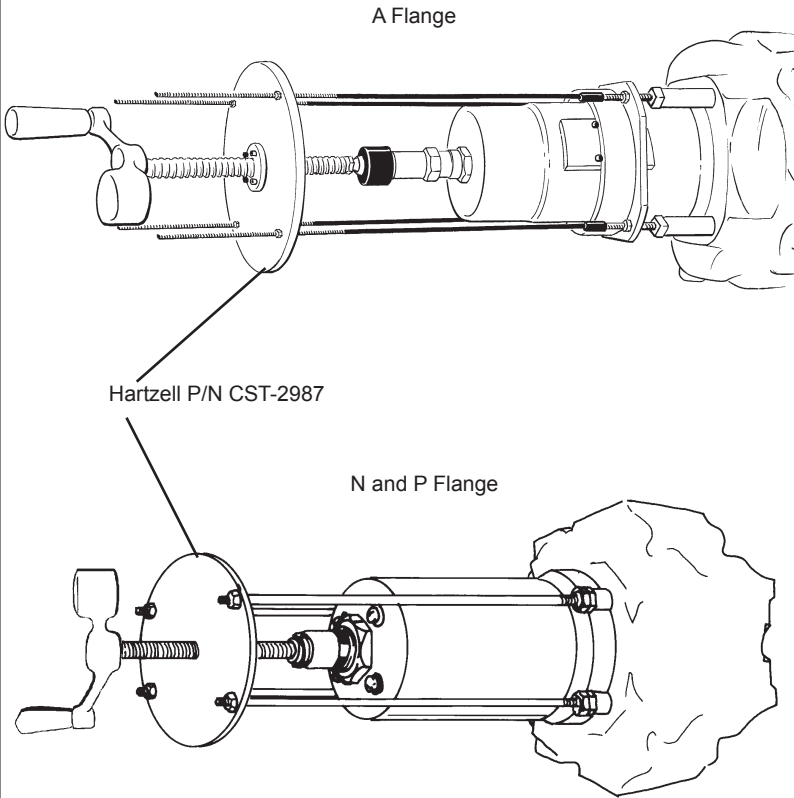
- (9) Install the mounting bolts with washers through the engine flange and into the propeller hub flange. Refer to Figure 3-2.

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 3-4 FOR TORQUE READING WHEN USING A TORQUE WRENCH ADAPTER.
Accessory mounting. bolts	36-44 In-Lbs (4.1-4.9 N•m) Wet
A flange propeller mounting bolts	100-105 Ft-Lbs (136-142 N•m) Wet
F flange propeller mounting bolts	80-90 Ft-Lbs (108-122 N•m)
N flange propeller mounting bolts	100-105 Ft-Lbs (136-142 N•m) Wet
P flange propeller mounting bolts except HC-E4P-3K	100-105 Ft-Lbs (136-142 N•m) Wet
P flange propeller mounting nuts HC-E4P-3K	120-130 Ft-Lbs (163-176 N•m) Wet
W flange propeller mounting nuts	120-125 Ft-Lbs (163-170 N•m)

**Torque Table
Table 3-2**

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W10115
W10171



**Tool for Decompressing HC-(D,E)(4,5)()-3() Series
External Beta System
Figure 3-6**

C. Installing the HC-(D,E)(4,5)(A,N)-3() Propeller on the Aircraft Engine

- (1) Using a beta system puller CST-2987 (Figure 3-6), compress the beta system and pull the beta ring forward to permit installation of the double hex head propeller mounting bolts.

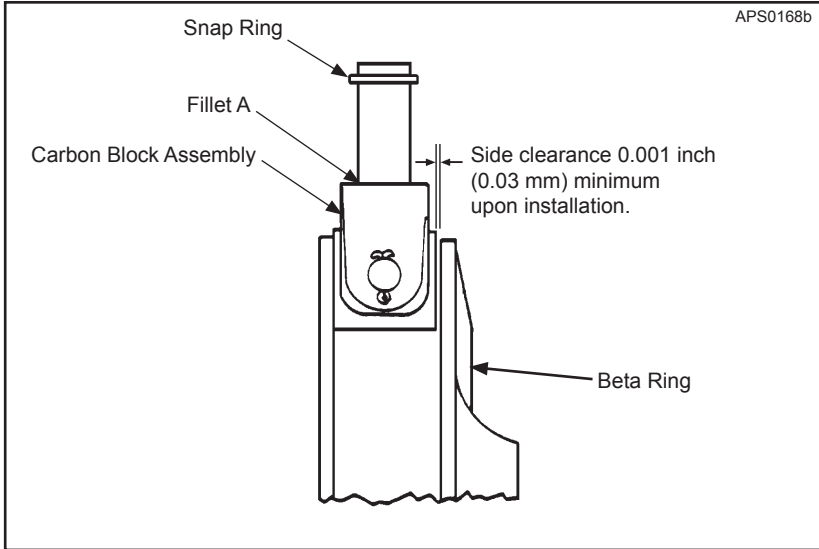
WARNING: MAKE SURE THE SLING IS RATED UP TO 800 LBS (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION.

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

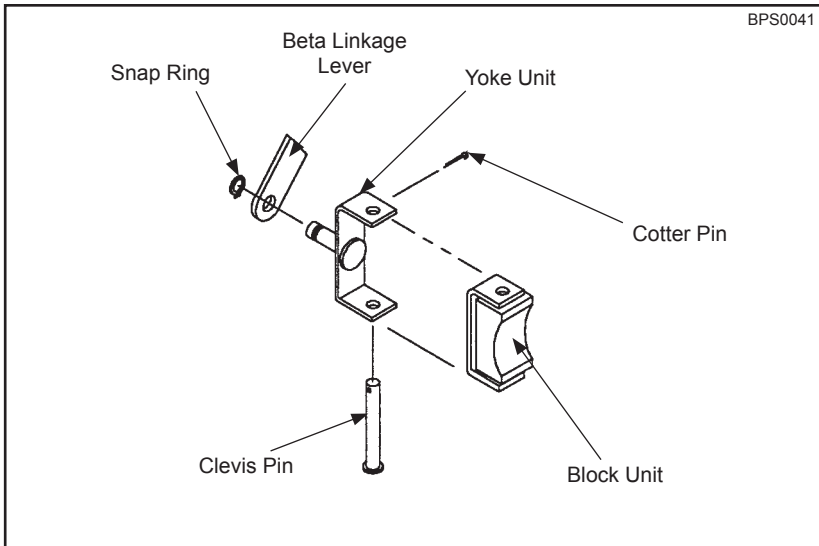
CAUTION 2: DO NOT CONTACT THE ANTI-ICE TRAVEL TUBES WITH THE SLING WHEN LIFTING THE PROPELLER.

CAUTION 3: 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.

- (2) With a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange.
 - (a) Some propellers may require installation of an accessory drive pulley. If installation procedures are not in this manual, refer to the aircraft manufacturer's instructions.
- (3) Using Quick Dry Stoddard Solvent or MEK, clean the engine flange and the propeller flange.
- (4) Remove the pitch change rod cap, if applicable.



Carbon Block and Beta Ring Clearance
Figure 3-7



Carbon Block Assembly
Figure 3-8

- (5) Install the specified O-ring on the engine flange. Refer to Table 3-1.
- (6) Align the mounting and dowel pin holes in the propeller hub flange with the mounting holes and dowel pins in the engine flange.
- (7) Slide the propeller onto the engine flange.

CAUTION 1: MAKE SURE THAT COMPLETE AND TRUE SURFACE CONTACT IS ESTABLISHED BETWEEN THE PROPELLER HUB FLANGE AND THE ENGINE FLANGE.

CAUTION 2: NEW PROPELLER MOUNTING BOLTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

- (8) Apply a MIL-PRF-83483() anti-seize compound to the threaded surfaces of the mounting bolts. Refer to Table 3-1 for the applicable mounting hardware.
 - (a) If the propeller is removed between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

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

- (9) Install the mounting bolts with washers through the engine flange and into the propeller hub flange. Refer to Figure 3-2.
- (10) Using a torque wrench and a torque wrench adapter Hartzell Propeller Inc. P/N AST-2877, torque all mounting bolts in sequences and steps shown in Figure 3-5. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value.
- (11) Safety all mounting bolts with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable. (Two bolts per safety.)
- (12) Decompress the external beta system and remove the beta system puller.

CAUTION: THE BETA FEEDBACK COLLAR MUST NOT CONTACT ANY ENGINE COMPONENT OR MOUNTING BOLT SAFETY WIRE. THE BETA FEEDBACK MECHANISM COULD BE DAMAGED IF IT CONTACTED ANY STATIC ENGINE COMPONENT WHILE ROTATING.

- (13) Examine the beta feedback collar to make sure that it is not in contact with any engine components or mounting bolt safety wire.
- (a) If there is contact between the beta feedback collar and any engine components or mounting bolt safety wire, consult qualified personnel at an appropriately licensed propeller service facility.
- (14) Install the carbon block into the beta linkage lever, in accordance with the airframe manufacturer's instructions.
- (a) If the beta linkage lever and the snap ring are not installed correctly, there may be interference between the beta linkage lever and Fillet A, as shown in Figure 3-7. Refer to Figure 3-7 and Figure 3-8.
- 1 If there is interference at Fillet A, make a chamfer in the beta linkage lever to clear Fillet A, as shown in Figure 3-7. The maximum radius in Fillet A as manufactured is 0.015 inch (0.38 mm).

CAUTION: FIT THE BLOCK IN THE BETA RING WITH A MINIMUM SIDE CLEARANCE OF 0.001 INCH (0.03 mm). REFER TO FIGURE 3-7.

- (15) Install the carbon block assembly into the beta ring. Refer to Figure 3-8.
- (16) Install, adjust and safety the beta linkage per the airframe manufacturer's instructions.
- (17) If the propeller is equipped with an accessory drive pulley, follow the applicable manufacturer's instructions for installation of the accessory drive pulley hardware.

- (18) 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 supplied by Hartzell Propeller Inc. can be found in the following publications available on the Hartzell Propeller Inc. website at www.hartzellprop.com:
- (a) Manual 180 (30-61-80) - Propeller Ice Protection System Manual
 - (b) Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual
 - (c) Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual
 - (d) Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual
- (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.

C1. Installing the HC-E4P-3K Propeller on the Aircraft Engine

- (1) Using a beta system puller CST-2987 (Figure 3-6), compress the beta system and pull the beta ring forward to permit access to the propeller mounting flange.

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

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

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.

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

CAUTION: IF THE PROPELLER IS REMOVED BETWEEN OVERHAUL INTERVALS, A TORQUE CHECK OF THE MOUNTING STUDS MUST BE PERFORMED.

- (3) Using Quick Dry Stoddard Solvent or MEK, clean the engine flange and the propeller flange.
- (4) Install the specified O-ring on the engine flange. Refer to Table 3-1.

(5) Put the propeller onto the engine flange.

CAUTION 1: NEW PROPELLER MOUNTING NUTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

CAUTION 2: THE SIDE OF THE WASHER WITH THE OD CHAMFER MUST BE AGAINST THE ENGINE FLANGE. REFER TO FIGURE 3-10.

(6) Install self locking mounting nuts with washers onto the propeller mounting bolts with the chamfer on the washer against the engine flange. Refer to Table 3-2 for applicable mounting hardware. Refer to Figure 3-11.

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

(7) Using a torque wrench and the specified torque wrench adapter (refer to the Tooling section in this chapter), torque all mounting nuts in the sequences and steps shown in Figure 3-3. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value.

(8) Safety all propeller mounting nuts with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable. (Two nuts per safety.)

(9) Decompress the external beta system and remove the beta system puller.

CAUTION: THE BETA FEEDBACK COLLAR MUST NOT CONTACT ANY ENGINE COMPONENT OR MOUNTING BOLT SAFETY WIRE. THE BETA FEEDBACK MECHANISM COULD BE DAMAGED IF IT CONTACTED ANY STATIC ENGINE COMPONENT WHILE ROTATING.

(10) Examine the beta feedback collar to make sure that it is not in contact with any engine components or mounting bolt safety wire.

(a) If there is contact between the beta feedback collar and any engine components or mounting bolt safety wire, consult qualified personnel at a certified propeller repair station with the appropriate rating.

(11) Install the carbon block into the beta linkage lever, in accordance with the airframe manufacturer's instructions.

(a) If the beta linkage lever and the snap ring are not installed correctly, there may be interference between the beta linkage lever and Fillet A, as shown in Figure 3-7. Refer to Figure 3-7 and Figure 3-8.

1 If there is interference at Fillet A, make a chamfer in the beta linkage lever to clear Fillet A, as shown in Figure 3-7. The maximum radius in Fillet A as manufactured is 0.015 inch (0.38 mm).

CAUTION: FIT THE BLOCK IN THE BETA RING WITH A SIDE CLEARANCE OF 0.001 TO 0.002 INCH (0.03 TO 0.05 mm). REFER TO FIGURE 3-7.

(12) Install the carbon block assembly into the beta ring. Refer to Figure 3-8.

(13) Install, adjust, and safety the beta linkage in accordance with the airframe manufacturer's instructions.

(14) If the propeller is equipped with an accessory drive pulley, follow the applicable manufacturer's instructions for installation of the accessory drive pulley hardware.

- (15) 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 supplied by Hartzell Propeller Inc. can be found in the following publications available on the Hartzell Propeller Inc. website at www.hartzellprop.com:
- (a) Hartzell Propeller Inc. Manual 180 (30-61-80) - Propeller Ice Protection System Manual
 - (b) Hartzell Propeller Inc. Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual
 - (c) Hartzell Propeller Inc. Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual
 - (d) Hartzell Propeller Inc. Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual
- (16) 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).
- (17) Install the propeller spinner dome in accordance with the section "Spinner Dome Installation" in this chapter.

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CAUTION 1: MAKE SURE THAT COMPLETE AND TRUE SURFACE CONTACT IS ESTABLISHED BETWEEN THE SPACER AND THE ENGINE FLANGE.

CAUTION 2: IF THE C-7620 SPACER IS NOT ATTACHED TO THE HUB, MAKE SURE THE HUB-TO-SPACER O-RING STAYS IN THE GROOVE IN THE SPACER. IF THE O-RING IS TWISTED OR PINCHED, OIL LEAKAGE WILL RESULT WHEN THE PROPELLER IS OPERATED ON THE AIRCRAFT.

(8) Slide the propeller onto the engine flange.

CAUTION 1: NEW PROPELLER MOUNTING NUTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

CAUTION 2: THE SIDE OF THE WASHER WITH THE OD CHAMFER MUST BE AGAINST THE ENGINE FLANGE. REFER TO FIGURE 3-10.

(9) Install self locking mounting nuts with washers onto the propeller mounting studs. Refer to Table 3-2 for applicable mounting hardware. Refer to Figure 3-11.

NOTE: The OD chamfer on the washer is for clearance of the engine flange fillet. Refer to Figure 3-11.

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

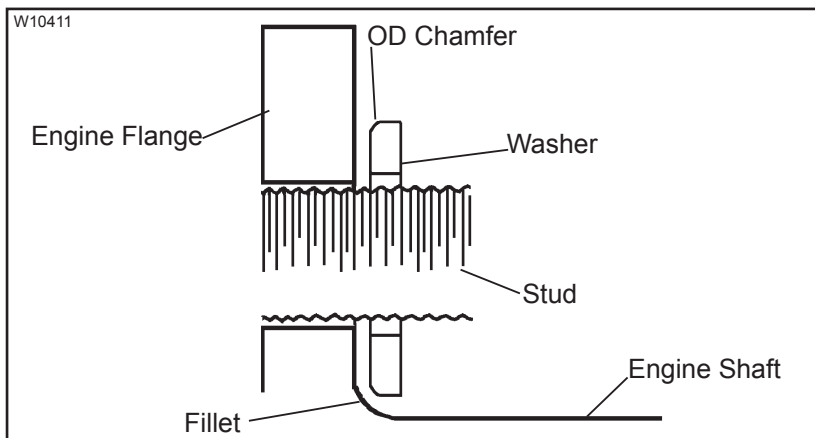
(10) Using a torque wrench and the specified torque wrench adapter (refer to the Tooling section in this chapter), torque all mounting nuts in the sequences and steps shown in Figure 3-3. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value.

(11) Safety all propeller mounting studs with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable. (Two studs per safety.)

(12) Decompress the external beta system and remove the beta system puller.

CAUTION: THE BETA FEEDBACK COLLAR MUST NOT CONTACT ANY ENGINE COMPONENT OR MOUNTING BOLT SAFETY WIRE. THE BETA FEEDBACK MECHANISM COULD BE DAMAGED IF IT CONTACTED ANY STATIC ENGINE COMPONENT WHILE ROTATING.

- (13) Examine the beta feedback collar to make sure that it is not in contact with any engine components or mounting bolt safety wire.
- (a) If there is contact between the beta feedback collar and any engine components or mounting bolt safety wire, consult qualified personnel at an appropriately licensed propeller service facility.
- (14) Install the carbon block into the beta linkage lever, in accordance with the airframe manufacturer's instructions.
- (a) If the beta linkage lever and the snap ring are not installed correctly, there may be interference between the beta linkage lever and Fillet A, as shown in Figure 3-7. Refer to Figure 3-7 and Figure 3-8.
- 1 If there is interference at Fillet A, make a chamfer in the beta linkage lever to clear Fillet A, as shown in Figure 3-7. The maximum radius in Fillet A as manufactured is 0.015 inch (0.38 mm).



**Installing the Washer on the Mounting Stud
Figure 3-11**

- (11) Safety all propeller mounting studs with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable. (Two studs 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 for the components supplied by Hartzell Propeller Inc. can be found in the following publications available on the Hartzell Propeller Inc. website at www.hartzellprop.com:
- (a) Manual 180 (30-61-80) - Propeller Ice Protection System Manual
 - (b) Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual
 - (c) Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual
 - (d) Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual
- (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.

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- F. Installing the HC-(D,E)4()-5() Propeller on the Aircraft Engine, Except HC-E4W-5L

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

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

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.

- (1) With a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange.
 - (a) Some propellers may require installation of an accessory drive pulley. If installation procedures are not in this manual, refer to the aircraft manufacturer's instructions.
- (2) Using Quick Dry Stoddard Solvent or MEK, clean the engine flange and the propeller flange.
- (3) Remove the pitch change rod cap, if applicable.
- (4) Install the specified O-ring on the engine flange. Refer to Table 3-1.
- (5) Align the mounting and dowel pin holes in the propeller hub flange with the mounting holes and dowel pins in the engine flange.
- (6) Slide the propeller onto the engine flange.

CAUTION 1: MAKE SURE THAT COMPLETE AND TRUE SURFACE CONTACT IS ESTABLISHED BETWEEN THE PROPELLER HUB FLANGE AND THE ENGINE FLANGE.

CAUTION 2: NEW PROPELLER MOUNTING BOLTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

(7) Apply a MIL-PRF-83483() anti-seize compound to the threaded surfaces of the mounting bolts. Refer to Table 3-1 for the applicable mounting hardware.

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

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

(8) Install the mounting bolts with washers through the engine flange and into the propeller hub flange. Refer to Figure 3-2.

(9) Using a torque wrench and a torque wrench adapter Hartzell Propeller Inc. P/N AST-2877, torque all mounting bolts in sequences and steps shown in Figure 3-5. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value.

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

(11) Install the beta tube per airframe and/or engine manufacturer's instructions.

- (a) Follow the airframe manufacturer's instructions for adjusting the beta tube to obtain the correct low pitch (flight idle blade angle).
- (b) Refer to the Aircraft Type Certificate Data Sheet for the low pitch blade angle setting.

C. Propeller Models HC-E5N-3() with D-5527-1() Spinner Assembly

- (1) Install the C-3317-257-5 O-rings into the OD grooves of the bulkhead locating ring that encircles the propeller cylinder. Refer to Figure 3-20.

NOTE: The bulkhead locating ring is bonded to the outboard end of the cylinder OD.

- (a) For a cylinder bulkhead locating ring that has one narrow O-ring groove and one wide O-ring groove:

- 1 Install two O-rings in the wide OD groove.
- 2 Install one O-ring in the narrow OD groove.

- (b) For a cylinder bulkhead locating ring that has two narrow O-ring grooves:

- 1 Install an O-ring in each of the narrow OD grooves.

- (2) Carefully slide the spinner dome over the propeller and cylinder. Align the spinner dome mounting holes with the spinner bulkhead holes.

- (a) Slide the forward bulkhead unit, that is attached to the ID of the spinner dome, over the O-rings installed on the cylinder mounted metal ring.

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

D. Propeller Model HC-D3F-7 Installed on Goodyear Airship GZ-22

- (1) Carefully slide the spinner bulkhead over the propeller and cylinder. Align the spinner dome mounting holes with the spinner bulkhead holes.

- (2) Attach the spinner dome to the spinner bulkhead with the supplied screws and washers.

5. Post-Installation Checks

- A. Refer to the airframe manufacturer's instructions for post-installation checks.
- B. Perform a Maximum RPM (Static) Hydraulic Low Pitch Stop Check as outlined in the Testing and Troubleshooting chapter of this manual.

6. 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. Remove the screws and washers that secure the spinner dome to the spinner bulkhead.
- B. Remove the spinner dome.
 - (1) When the spinner dome is removed from the HC-E5N-3() propeller model with the D-5527-1() spinner assembly check the three C-3317-257-5 O-rings in the metal ring encircling the propeller cylinder.
 - (2) Replace the O-rings if they are damaged or worn.

- (8) For propeller models with air conditioning accessories:
removal of air conditioning drive accessories, if installed.
- (a) Remove the accessory mounting bolts and washers.
 - (b) Remove the two-piece air conditioning pulley.
 - (c) Temporarily reattach the spinner bulkhead and pulley containment ring to the hub with two of the accessory mounting bolts.

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

- (9) Remove the propeller mounting bolts and washers.
- (a) If the propeller is removed 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.

- (10) Using the support sling, lift the propeller from the mounting flange.
- (11) Remove and discard the propeller mounting O-ring.
- (12) Install suitable covers on the pitch change rod opening, propeller mounting flange, and engine flange to prevent the introduction of contamination.
- (13) For propeller models with air conditioning accessories:
- (a) Remove the temporary fasteners attaching the spinner bulkhead and pulley containment ring.
 - (b) Remove the spinner bulkhead and pulley containment ring.
- (14) Put the propeller on a suitable cart for transportation.

B. Removal of HC-(D,E)(4,5)(A,N)-3() Propellers

WARNING: FOR SAFETY REASONS, PUT THE PROPELLER IN THE FEATHER POSITION BEFORE IT IS REMOVED FROM THE AIRCRAFT.

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.

- (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 for the components supplied by Hartzell Propeller Inc. can be found in the following publications available on the Hartzell Propeller Inc. website at www.hartzellprop.com:
 - (a) Manual 180 (30-61-80) - Propeller Ice Protection System Manual
 - (b) Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual
 - (c) Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual
 - (d) Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual
- (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).

B1. Removal of HC-E4P-3K Propellers

WARNING: FOR SAFETY REASONS, PUT THE PROPELLER IN THE FEATHER POSITION BEFORE IT IS REMOVED FROM THE AIRCRAFT.

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.

- (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 for the components supplied by Hartzell Propeller Inc. can be found in the following publications available on the Hartzell Propeller Inc. website at www.hartzellprop.com:
 - (a) Hartzell Propeller Inc. Manual 180 (30-61-80) - Propeller Ice Protection System Manual
 - (b) Hartzell Propeller Inc. Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual
 - (c) Hartzell Propeller Inc. Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual
 - (d) Hartzell Propeller Inc. Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual

- (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).
- (4) Some propellers may require installation of an accessory drive pulley. If installation procedures are not in this manual, refer to the aircraft manufacturer's instructions.
- (5) Disconnect the engine beta linkage and the carbon block assembly from the beta ring in accordance with the airframe manufacturer's instructions. Refer to Figure 3-8.
- (6) Remove the snap ring that retains the carbon block assembly to the beta linkage.
- (7) Remove the carbon block assembly. Refer to Figure 3-7.
- (8) Using the beta system puller, CST-2987, compress the beta system and pull the beta ring forward to expose the propeller mounting nuts and washers. Refer to Figure 3-6.

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 AND 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 THE HARTZELL PROPELLER INC. OVERHAUL MANUALS.

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

(9) Support the propeller assembly with a sling.

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

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

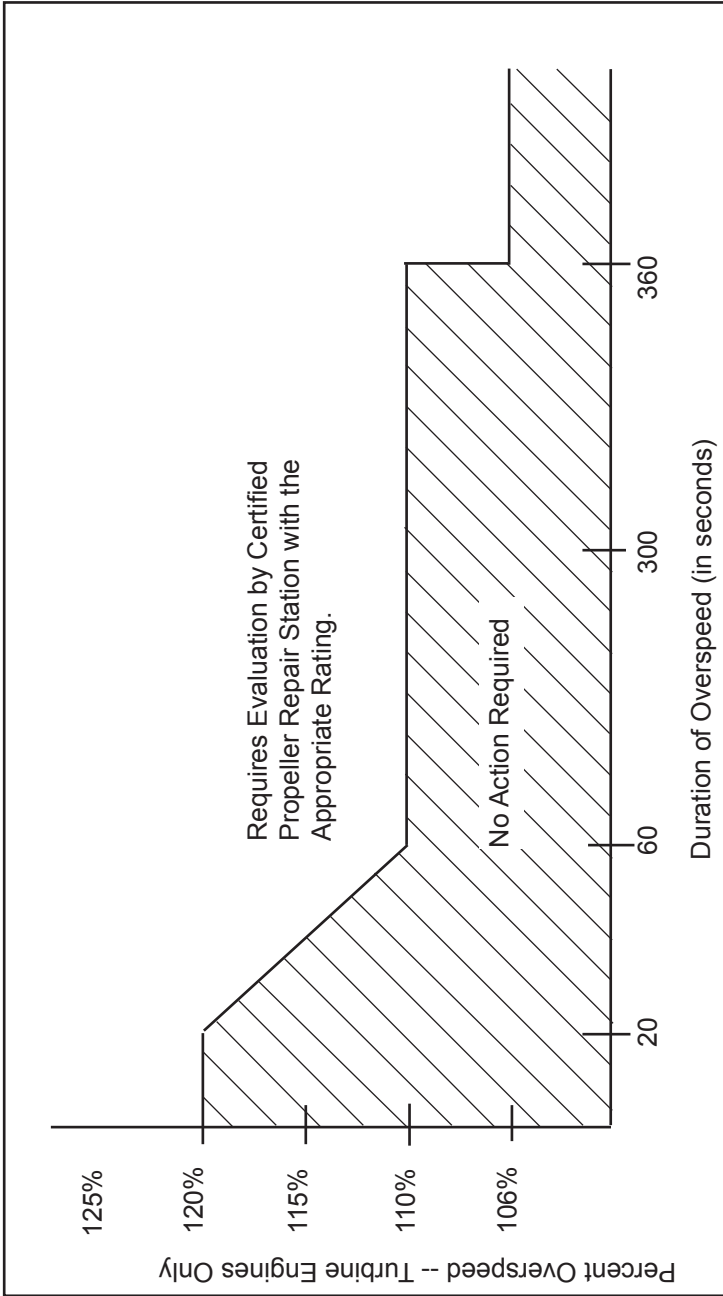
(11) Remove the propeller mounting nuts and washers.

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

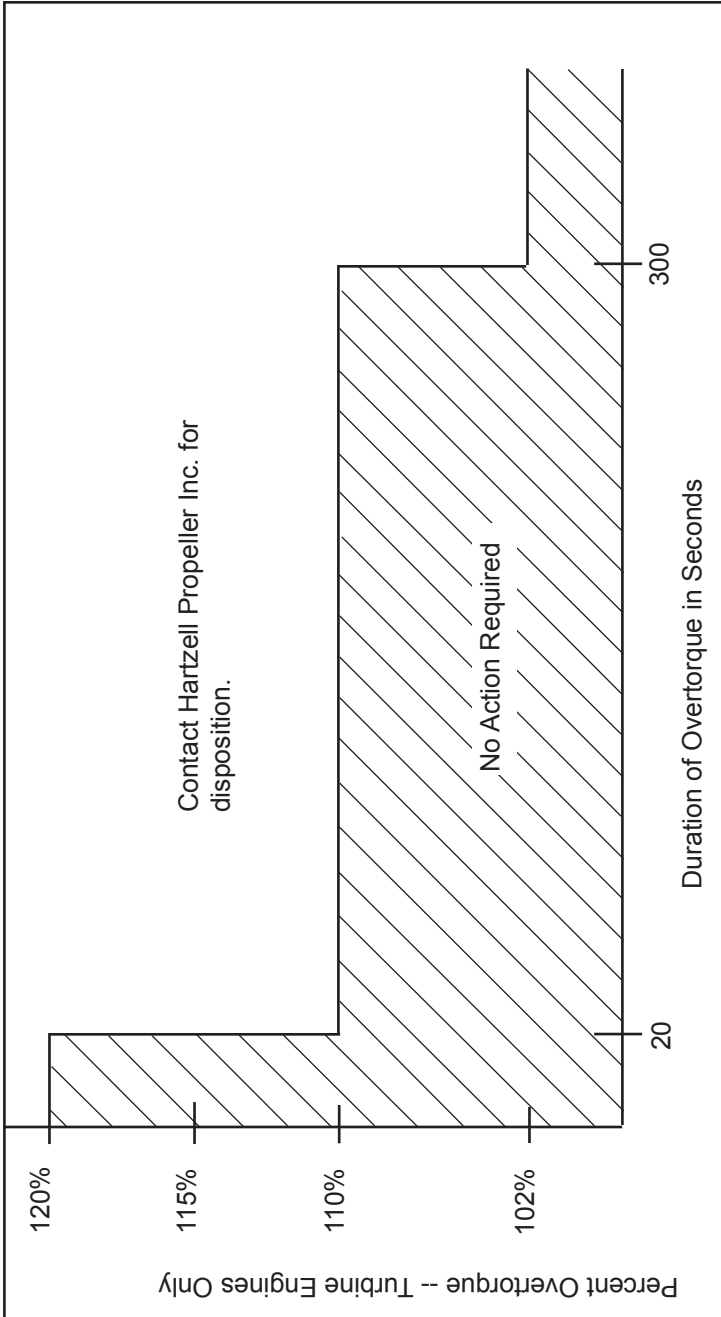
CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

- (12) Using the support sling, lift the propeller from the mounting flange.
- (13) Remove and discard the propeller mounting O-ring.
- (14) Install suitable covers on the pitch change rod opening, propeller mounting flange, and engine flange to prevent the introduction of contamination.
- (15) Decompress and remove the beta system puller.
- (16) Put the propeller on a suitable cart for transportation.

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Turbine Engine Overspeed Limits
Figure 5-3



**Turbine Engine Overtorque Limits
Figure 5-4**

6. Special Inspections

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/Overtorque

An overspeed has occurred when the propeller RPM has exceeded the maximum RPM stated in the applicable Aircraft Type Certificate Data Sheet. An overtorque condition occurs when the engine load exceeds the limits established by the engine, propeller, or airframe manufacturer. The duration of time at overspeed/overtorque for a single event determines the corrective action that must be taken to ensure no damage to the propeller has occurred.

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.

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

- (3) Using a piece of safety wire, loosen any blockage or hardened grease at the threaded holes where the lubrication fitting was removed.

WARNING: WHEN MIXING AEROSHELL GREASES 5 AND 6, AEROSHELL GREASE 5 MUST BE INDICATED ON THE LABEL (HARTZELL PROPELLER INC. P/N A-3594) AND THE AIRCRAFT MUST BE PLACARDED TO INDICATE THAT FLIGHT IS PROHIBITED IF THE OUTSIDE AIR TEMPERATURE IS LESS THAN -40°F (-40°C).

CAUTION: USE HARTZELL PROPELLER INC. APPROVED GREASE ONLY. EXCEPT IN THE CASE OF AEROSHELL GREASES 5 AND 6, DO NOT MIX DIFFERENT SPECIFICATIONS AND/OR BRANDS OF GREASE.

- (4) Aeroshell greases 5 and 6 both have a mineral oil base and have the same thickening agent; therefore, mixing of these two greases is acceptable in Hartzell propellers.
- (5) A label (Hartzell Propeller Inc. P/N A-3494) is normally applied to the propeller to indicate the type of grease previously used. Refer to Figure 6-2.
- (a) This grease type should be used during re-lubrication unless the propeller has been disassembled and the old grease removed.
 - (b) It is NOT possible to purge old grease through lubrication fittings.
 - (c) To completely replace one grease with another, the propeller must be disassembled in accordance with the applicable overhaul manual.

CAUTION 1: OVER LUBRICATING AN ALUMINUM HUB PROPELLER MAY CAUSE THE GREASE TO ENTER THE HUB CAVITY, LEADING TO EXCESSIVE VIBRATION AND/OR SLUGGISH OPERATION. THE PROPELLER MUST THEN BE DISASSEMBLED TO REMOVE THIS GREASE.

CAUTION 2: IF A PNEUMATIC GREASE GUN IS USED, EXTRA CARE MUST BE TAKEN TO AVOID EXCESSIVE PRESSURE BUILDUP.

CAUTION 3: GREASE MUST BE APPLIED TO ALL BLADES OF A PROPELLER ASSEMBLY AT THE TIME OF LUBRICATION.

- (6) Pump 1 fl. oz. (30 ml) grease into each engine-side lubrication fitting, or until grease emerges from the hole where the lubrication fitting was removed - whichever occurs first.

NOTE: 1 fl. oz. (30 ml) is approximately 6 pumps with a hand-operated grease gun.

- (7) Reinstall the removed lubrication fittings.

(a) A 45 degree lubrication fitting, Hartzell Propeller Inc. part number C-6349, may be installed on the engine-side or cylinder-side of the propeller aluminum hub in any location where a straight lubrication fitting, Hartzell Propeller Inc. part number A-279, was originally installed.

- 1 The lubrication fittings installed on the engine-side of the aluminum hub must be either all straight, Hartzell Propeller Inc. part number A-279, or all 45 degree, Hartzell Propeller Inc. part number C-6349.
- 2 The lubrication fittings installed on the cylinder-side of the aluminum hub must be either all straight, Hartzell Propeller Inc. part number A-279, or all 45 degree, Hartzell Propeller Inc. part number C-6349.

(b) Tighten the fittings until snug.

(c) Make sure that the ball of each lubrication fitting is properly seated.

(8) Reinstall a lubrication fitting cap on each lubrication fitting.

C. Approved Lubricants

The following lubricants are approved for use in Hartzell Aluminum hub propellers:

Aeroshell 6 - Recommended "all purpose" grease. Used in most new production propellers since 1989. Higher leakage/oil separation than Aeroshell 5 at higher temperatures.

Aeroshell 5 - Good high temperature qualities, very little oil separation or leakage. Cannot be used in temperatures colder than -40°F (-40°C). Aircraft serviced with this grease must be placarded to indicate that flight is prohibited if the outside air temperature is less than -40°F (-40°C).

Aeroshell 7 - Good low temperature grease, but high leakage/oil separation at higher temperatures. This grease has been associated with sporadic problems involving seal swelling.

Aeroshell 22 - Qualities similar to Aeroshell 7. Used in Piaggio P-180 and the Grob Egret applications.

Royco 22CF - Not widely used. Qualities similar to Aeroshell 22.

3. Carbon Block Assemblies**A. Inspection**

The clearance between the yoke pin and the corresponding linkage (beta lever bushing) can become too close because of a buildup of plating and foreign particles between the two pieces. This can cause a binding action, resulting in excessive wear to the carbon block, low stop collar, and beta linkage.

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.

- (1) Inspect the beta lever and carbon block interface for free movement. If there is binding, do the following:
 - (a) Disconnect the beta linkage and remove the carbon block assemblies from the beta ring.
 - (b) Using an abrasive pad, lightly polish the yoke pin to provide adequate clearance and eliminate binding.
 - (c) Reinstall the carbon block assembly into the beta ring.
 - (d) Install, adjust and safety the beta linkage per the airframe manufacturer's instructions.

B. Replacement of the A-3026 Carbon Block Unit in the A-3044 Carbon Block Assembly

Replace an A-3026 carbon block unit if the side clearance between the beta ring and carbon block exceeds 0.010 inch (0.25 mm).

- (1) Remove the cotter pin from the end of the clevis pin.
- (2) Slide the pin from the assembly and remove and discard the carbon block unit.
- (3) Inspect the yoke for wear or cracks. Replace the yoke if necessary.

- (4) Do not exceed a maximum weight per location of 1.0 oz. (28 g).

NOTE: This is approximately equal to six AN970 style washers (0.188 inch ID, 0.875 inch OD, 0.063 inch thickness) (4.78 mm ID, 22.23 mm OD, 1.60 mm thickness).

- (5) Install weights using aircraft quality #10-32 or AN-3() type screws or bolts.
- (6) Balance weight screws attached to the spinner bulkhead must protrude through the self-locking nuts or nut plates a minimum of one thread and a maximum of four threads.
- (7) Unless otherwise specified by the engine or airframe manufacturer, Hartzell recommends that the propeller be dynamically balanced to a reading of 0.2 IPS, or less.

CAUTION: IF REFLECTIVE TAPE IS USED FOR DYNAMIC BALANCING, REMOVE THE TAPE IMMEDIATELY UPON COMPLETION. TAPE THAT REMAINS ON THE BLADE WILL CAUSE MOISTURE TO COLLECT UNDER THE TAPE AND CAUSE CORROSION THAT CAN PERMANENTLY DAMAGE THE BLADE.

- (8) If reflective tape is used for dynamic balancing, remove the tape immediately after balancing is completed.
- (9) Make a record in the logbook of the number and location of dynamic balance weights and static balance weights, if they have been reconfigured.

7. Propeller Ice Protection Systems**A. Electric De-ice System**

- (1) Consult the Pilot Operating Handbook (including all supplements) regarding flight into conditions of known icing. The aircraft may not be certificated for flight in known icing conditions, even though propeller de-ice equipment is installed.
- (2) Refer to the Anti-ice and De-ice Systems chapter of this manual for functional tests of the de-ice system.

B. Anti-ice System

- (1) Consult the Pilot Operating Handbook (including all supplements) regarding flight into conditions of known icing. The aircraft may not be certificated for flight in known icing conditions, even though propeller anti-ice equipment is installed.
- (2) Refer to the Anti-ice and De-ice Systems chapter of this manual for functional tests of the anti-ice system.