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HARTZELL

MANUAL REVISION TRANSMITTAL
Manual 168 (61-00-68)
Propeller Owner's Manual and Logbook

REVISION 5 dated August 2015

Attached is a copy of Revision 5 to Hartzell Manual 168.

Page Control Chart for Revision 5:

Remove Page No.	**Insert** Page No.
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pages 3-201 thru 3-206	pages 3-201 thru 3-206
MAINTENANCE PRACTICES pages 6-7 and 6-8	MAINTENANCE PRACTICES pages 6-7 and 6-8

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. 168
61-00-68
Revision 5
August 2015

Propeller Owner's Manual
and Logbook

Steel Hub Reciprocating Propellers with Aluminum Blades

Two Blade	Three Blade
(B)HC-A2(MV,V)(F,K,L)-1( )	**(E,P)HC-A3(MV,V)F-2( )**
HC-A2(MV,V)(F,K,L)-2( )	**HC-A3(MV,V)K-2( )( )**
BHC-A2(MV,V)F-3	**HC-A3(MV,V)F-3L**
HC-A2(MV,V)L-6F	**(E,P)HC-A3(MV,V)(F,K)-4( )**
HA-A2(MV,V)20-1B	**HC-A3(MV,V)F-5A( )**
HC-A2(MV,V)20-1A	**(P)HC-A3(MV,V)F-5R**
HC-A2(MV,V)20-2	**HC-A3(MV,V)20-1( )**
HC-A2(MV,V)20-3L	**HC-A3(MV,V)20-2( )**
	HC-A3(MV,V)20-3L

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Product Support Fax: 937-778-4391

REVISION HIGHLIGHTS

Revision 5, dated August 2015, incorporates the following:

- Revised Cover, Revision Highlights, List of Effective Pages, and Table of Contents to reflect changes.
- Revised the Service Documents List.
- Introduction Chapter
  - Revised the Reference Publications section.
  - Revised the Maintenance Practices section to include alternate use of safety cable.
- Installation and Removal Chapter
  - Revised the Tools, Consumables, and Expendables section.
  - Revised Table 3-1.
  - Revised Table 3-2.
  - Revised to allow equivalent aircraft safety cable and associated hardware in place of safety wire for mounting bolts.
  - Revised feathering spring assembly removal instructions.
  - Revised Post-Installation Checks section
- Maintenance Practices Chapter
  - Revised the Caution about using a pneumatic grease gun to lubricate the propeller.

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REVISIONS HIGHLIGHTS

1. Introduction
   A. General

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

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

Revision No.	Issue Date	Comments
Original	July/01	New Issue
Rev. 1	Oct/04	Minor Revision
Rev. 2	July/08	Minor Revision
Rev. 3	Mar/11	Minor Revision
Rev. 4	Oct/13	Minor Revision
Rev. 5	Aug/15	Minor Revision

SERVICE DOCUMENTS LIST

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

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
HC-SL-61-176	Original, Jul/01
HC-SL-61-324	Rev. 4, Oct/13
HC-SL-61-256	Rev. 5, Aug/15

SERVICE DOCUMENTS LIST

LIST OF EFFECTIVE PAGES

Chapter	Page	Revision	Date
Cover	Cover and Inside Cover	Rev. 5	Aug/15
Message	1 thru 4	Original	July/01
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Record of Revisions	9 and 10	Original	July/01
Record of Temporary Revisions	11 and 12	Original	July/01
Service Documents List	13 and 14	Rev. 5	Aug/15
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Description and Operation	2-1	Rev. 2	July/08
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Description and Operation	2-37	Rev. 1	Oct/04
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Installation and Removal	3-15	Rev. 2	July/08
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Maintenance Practices	6-11 and 6-12	Original	July/01
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Maintenance Practices	6-21 thru 6-25	Rev. 3	Mar/11
Maintenance Practices	6-26 and 6-27	Rev. 4	Oct/13
Maintenance Practices	6-28 thru 6-32	Rev. 2	July/08
Anti-Ice and De-Ice Systems	7-1 thru 7-3	Rev. 2	July/08
Anti-Ice and De-Ice Systems	7-4	Original	July/01
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Records	8-1 thru 8-4	Original	July/01

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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 possible. 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) 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.

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 must be accomplished in accordance with the procedures and limitations in the Maintenance Practices chapter of this manual. Additional procedures can be found in the aircraft maintenance manual.

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

(9) 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.

(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 anti-ice system, applicable instructions and technical information can be obtained by contacting Hartzell Propeller Inc. Product Support at (937) 778-4379 (business hours are 8:00 a.m. through 5:00 p.m., United States Eastern Time).

(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) Hartzell Propeller Inc. Manual No. 180 (30-61-80) - Propeller Ice Protection System Manual

(b) Hartzell Propeller Inc. Manual No. 181 (30-60-81) - Propeller Ice Protection System Component Maintenance Manual

(c) Hartzell Propeller Inc. Manual No. 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual

(d) Hartzell Propeller Inc. Manual No. 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) 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 Maintenances Practices chapter of this manual. Operation of blades without the specified coatings and finishes, e.g., "polished blades" is not permitted.

C. Continued Airworthiness

Operators are urged to stay informed of airworthiness information via Hartzell Propeller Inc. Service Bulletins and Service Letters which are available from Hartzell Propeller Inc. distributors, or from the Hartzell Propeller Inc. factory by subscription. Selected information is also available on Hartzell Propeller's 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 Propeller 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 contain information vital to the airworthiness of the propeller models covered in this manual:

Hartzell Propeller Inc. Manual No. 114C (61-10-14) - Steel Hub Propeller Maintenance Manual

Hartzell Propeller Inc. Manual No. 171 (61-10-71) - -1, -4, -6 Series Steel "A" Hub Propeller Maintenance Manual

Hartzell Propeller Inc. Manual No. 172 (61-10-72) - -2 Series Steel "A" Hub Propeller Maintenance Manual

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

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

Hartzell Propeller Inc. Manual No. 130B (61-23-30) - Mechanically Actuated Governor Maintenance Manual

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

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

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

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 System 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. l Manual No. 202A (61-01-02) - Standard Practices Manual - Volumes 1 through 11

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

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1. Tools, Consumables, and Expendables

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-A3MV**F**-2B indicates an "F" flange. HC-A3MV**20**-2 indicates a "20" 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 shipped completely assembled. The spline mounted propeller is shipped with the piston removed.

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

A. Tooling

NOTE: The use of torque wrench adapters for F and K flange installations will vary according to specific application.

F Flange

- Safety wire pliers (Alternate safety cable tool)
- Calibrated torque wrench
- Torque wrench adapter, Hartzell P/Ns AST-2917, AST-2805, or a locally procured torque wrench adapter of the appropriate size

K Flange

- Safety wire pliers (Alternate safety cable tool)
- Calibrated torque wrench
- Torque wrench adapter, Hartzell P/N AST-2805 or a locally procured torque wrench adapter of the appropriate size

L Flange

- Safety wire pliers (Alternate safety cable tool)
- Calibrated torque wrench
- Locally procured torque wrench adapter of the appropriate size

20 Spline

- Shaft nut wrench Hartzell P/N BST-2910

B. Consumables
   - Quick Dry Stoddard Solvent or Methyl-Ethyl-Ketone (MEK)
   - Anti-Seize Compound (MIL-PRF-83483)

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-rings (see Table 3-1)

Part	Propeller Model	Part No.
Nut, Piston Rod	HC-A2(MV,V)20-2	B-3368
	(E,P)HC-A3(MV,V)F-2( )	B-3368
	HC-A3(MV,V)K-2( )( )	B-3368
	HC-A3(MV,V)F-4( )	B-3368
	HC-A3(MV,V)K-4	B-3368
	HC-A3(MV,V)F-5A( )	B-3368
	(P)HC-A3(MV,V)20-2( )	B-3368
Nut, Fork Rod	(B)HC-A2(MV,V)F-1A	A-848-2
	HC-A2(MV,V)K-1	A-848-2
	HC-A2(MV,V)L-1	A-848-2
	HC-A2VL-6F	A-848-2
	HC-A3(MV,V)20-1( )	A-848-2
Nut, Pitch change	BHC-A2(MV,V)F-3	A-880-2
	HA-A2(MV,V)20-1B	A-880-1
	HC-A2(MV,V)20-2	A-880-1
	HC-A2(MV,V)20-3L	A-880-1
	(E,P)HC-A3(MV,V)F-2( )	A-880-2
	HC-A3(MV,V)K-2( )( )	A-880-2
	HC-A3(MV,V)F-3L	A-880-2
	HC-A3(MV,V)F-5A( )	A-880-1
	PHC-A3(MV,V)F-5R	A-880-1
	HC-A3(MV,V)20-2( )	A-880-1
	HC-A3(MV,V)20-3L	A-880-1
Nut, Shaft/Hub and Puller Ring	HC-A2(MV,V)20-1A	A-63-B + A-870
	HA-A2(MV,V)20-1B	A-63-B + A-870
	HC-A2(MV,V)20-2	A-63-B + A-870
	HC-A2(MV,V)20-3L	A-63-B + A-870
	HC-A3(MV,V)20-1( )	A-63-B + A-870
	HC-A3(MV,V)20-2( )	A-63-B + A-870
	HC-A3(MV,V)20-3L	A-63-B + A-870
Nut, Mounting Stud	EHC-A3(MV,V)F-2B	A-2044
	HC-A3(MV,V)F-3L	A-2044

O-ring and Propeller Mounting Hardware Identification
Table 3-1, Continued

Part	Propeller Model	Part No.
O-ring, Shaft/Engine Flange	(B)HC-A2(MV,V)F-1( )	C-3317-228
	(B)HC-A2(MV,V)(K,L)-1( )	C-3317-329
	HC-A2(MV,V)F-2( )	C-3317-228
	HC-A2(MV,V)(K,L)-2( )	C-3317-329
	BHC-A2(MV,V)F-3	C-3317-228
	HC-A2(MV,V)L-6F	C-3317-329
	(E,P)HC-A3(MV,V)F-2( )	C-3317-228
	HC-A3(MV,V)F-3L	C-3317-228
	(P)HC-A3(MV,V)F-5R	C-3317-228
	HC-A3(MV,V)F-5A( )	C-3317-228
	(E,P)HC-A3(MV,V)F-4( )	C-3317-228
	(E,P)HC-A3(MV,V)K-2( )	C-3317-329
	(E,P)HC-A3(MV,V)K-4( )	C-3317-329
O-ring, Propeller Side (for use with B-2982 spacer)	EHC-A3(MV,V)F-2B	C-3317-228
O-ring, Propeller Mounting	EHC-A3(MV,V)F-2B	C-3317-228
O-ring, Piston	HA-A2(MV,V)20-1B	C-3317-343-1
	HC-A2(MV,V)20-1A	C-3317-343-1
	HC-A2(MV,V)20-2	C-3317-343-1
	HC-A2(MV,V)20-3L	C-3317-343-1
	HC-A3(MV,V)20-1( )	C-3317-343-1
	HC-A3(MV,V)20-2( )	C-3317-343-1
	HC-A3(MV,V)20-3L	C-3317-343-1
O-ring, Rear Cone	HA-A2(MV,V)20-1B	C-3317-229
	HC-A2(MV,V)20-1A	C-3317-229
	HC-A2(MV,V)20-2	C-3317-229
	HC-A2(MV,V)20-3L	C-3317-229
	HC-A3(MV,V)20-1( )	C-3317-229
	HC-A3(MV,V))20-2(L)	C-3317-229
	HC-A3(MV,V)20-3L	C-3317-229
O-ring, Rod	HA-A2(MV,V)20-1B	C-3317-020
	HC-A2(MV,V)20-2	C-3317-020
	HC-A2(MV,V)20-3L	C-3317-020
	HC-A3(MV,V)20-2( )	C-3317-020
	HC-A3(MV,V)20-3L	C-3317-020
Pitch Change Block	(B)HC-A2(MV,V)F-1A	A-95-A
	HC-A2(MV,V)K-1	A-95-A
	HC-A2(MV,V)L-1	A-95-A
	HC-A2(MV,V)L-6	A-95-A
	HC-A2(MV,V)20-1A	A-95-A
	HC-A3(MV,V)20-1( )	A-95-A

O-ring and Propeller Mounting Hardware Identification
Table 3-1, Continued

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

(5) Slide the spinner bulkhead onto the propeller flange OD.

(6) Align the spinner bulkhead mounting holes with the holes in the four tabs that are bolted to the propeller hub.

(7) Install the spinner bulkhead attachment bolts, washers, and self-locking hex head nuts to hold the spinner bulkhead to the hub flange mounted tabs.

(8) Torque the spinner attachment bolts and self-locking hex head nuts to 8 to 12 Ft-Lb (11-16 N•m).

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

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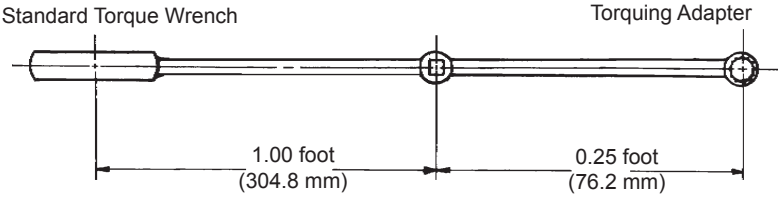

$$\frac{\text{(actual torque required) X (torque wrench length)}}{\text{(torque wrench length) + (length of adapter)}} = \text{Torque wrench reading to achieve required actual torque}$$

EXAMPLE:

$$\frac{\text{100 Ft-Lb (136 N•m) x 1 ft (304.8 mm)}}{\text{1 ft (304.8 mm) + 0..25 ft (76.2 mm)}} = \text{80 Ft-Lb (108 N•m)}$$

< reading on torque wrench with 3-inch (76.2 mm) adapter for actual torque of 100 Ft-Lb (136 N•m)

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

Determining Torque Value When Using Torquing Adapter
Figure 3-4

F Flange propeller mounting bolts	
A-1333-( )	80-90 Ft-Lb (108-122 N•m)
A-1328-( )	80-90 Ft-Lb (108-122 N•m)
F Flange mounting nut (on stud)	
A-2044 Nut	80-90 Ft-Lb (108-122 N•m)
K Flange propeller mounting bolts	
A-1333-( ) & A-1328 except on Lycoming IO-720	60-70 Ft-Lb (81-95 N•m)
A-1333-( ) & A-1328 Lycoming IO-720 engine only	100-125 Ft-Lb (136-170 N•m)
L Flange propeller mounting bolts	
B-322	50 Ft-Lb (68 N•m)
B-6489-( )	50 Ft-Lb (68 N•m)
Shaft Nut	
A-63B	450 Ft-Lb (610 N•m)
Piston Nut	
A-880-( )	120 Ft-Lb (163 N•m)
Low-pitch stop nut (on piston rod)	
A-848-2	20-22 Ft-Lb. (27-30 N•m)
A-2043-( )	20-22 Ft-Lb. (27-30 N•m)
A-3359	20-22 Ft-Lb. (27-30 N•m)
B-3382 or alternate A-3439	20-22 Ft-Lb. (27-30 N•m)

NOTE 1: Torque tolerance is ± 10 percent unless otherwise noted.

NOTE 2: Torque values are based on non-lubricated threads.

Torque Table
Table 3-2

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

CAUTION 2: USE CARE TO AVOID SCRAPING ALUMINUM FROM THE BORE OF THE SPINNER BULKHEAD. SCRAPINGS COULD BECOME WEDGED BETWEEN THE FLANGE SURFACES.

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

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

(11) Install the mounting bolts (Table 3-1) with washers (if applicable) through the engine flange from the engine side and into the tapped holes in the propeller flange. Refer to Figures 3-2 and 3-3.

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

(12) Use a torque wrench with the appropriate torque wrench adapter to torque all mounting bolts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque, beginning with any mounting bolt, and moving around the clock in either direction.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(13) 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).

(14)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 can be found in the following publications, available on the Hartzell 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

(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).

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 onto the engine flange, against the starter ring gear and shim.

NOTE: Insert the engine bushings into the counterbores that encircle the propeller mounting bolts in the propeller flange.

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

(8) Thread the six preinstalled mounting bolts (Table 3-1) through the propeller flange from the propeller side, and into the bushings in the engine flange. Refer to Figure 3-6.

NOTE: The mounting bolts are preinstalled during the assembly of the propeller. Replacement of one of these bolts between overhauls must be performed only by a certified propeller repair station with the appropriate rating.

(9) Use a torque wrench with the appropriate torque wrench adapter (Figure 3-6) to torque all mounting bolts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque, beginning with any mounting bolt, and moving around the clock in either direction.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(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 for the components supplied by Hartzell Propeller Inc. can be found in the following publications available on the Hartzell website at www.hartzellprop.com.

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

(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).

WARNING: CLEANING AGENT MEK IS 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.

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

WARNING: USE CAUTION DURING INSTALLATION IF THE START LOCKS HAVE BEEN ENGAGED TO FACILITATE INSTALLATION OF THE SPINNER BULKHEAD. IF THE BLADES ARE RELEASED SUDDENLY, THE EXTREME FORCE CAN CAUSE SERIOUS INJURY AND DAMAGE TO THE PROPELLER.

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

NOTE: The start locks must be engaged to provide access to the spinner bulkhead mounting bolts when installing the spinner bulkhead.

(a) Position the spinner bulkhead on the propeller.

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

(c) Install the washers and locking nuts (Table 3-1) on the propeller side of the start locks to secure the attaching bolts and the bulkhead.

(5) Lubricate the specified shaft O-ring (Table 3-1) and install it on the engine flange (Figure 3-8).

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 shaft.

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

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

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

(9) Use a torque wrench with the appropriate torque wrench adapter (Figure 3-6) to torque all mounting bolts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque, beginning with any mounting bolt, and moving around the clock in either direction.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(10) Safety all mounting bolts with 0.032 inch (0.810 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 toward the engine, rotate the blades to feather position, and attach the piston nut to the pitch change rod.

(5) Install the specified O-ring (Table 3-1) on the engine flange. Refer to Figure 3-9.

CAUTION: USING A FELT-TIPPED PEN, IDENTIFY EACH START LOCK AND ITS ADJACENT BLADE CLAMP WITH A CORRESPONDING LETTER. THIS WILL INSURE THAT EACH START LOCK WILL BE REINSTALLED WITH THE CORRECT BLADE CLAMP TO MAINTAIN THE SAME BLADE ANGLES FOR ENGINE START.

(6) Remove each start lock to allow access to preinstalled propeller mounting bolts.

(7) Align the two mounting bolts (already installed in the propeller hub flange) with the threaded bushings in the engine flange.

NOTE: Two propeller mounting bolts will already be installed in the propeller flange. Interference with blade clamps requires that the bolts be installed during propeller assembly.

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

(8) Slide the propeller flange onto the engine flange, against the starter ring gear and shim.

NOTE: Insert the engine bushings into the counterbores that encircle the propeller mounting bolts in the propeller flange.

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

(9) Thread the two preinstalled mounting bolts (Table 3-1) through the propeller flange from the propeller side, and into the bushings in the engine flange. Refer to Figure 3-9.

NOTE: Two of the mounting bolts are preinstalled during the assembly of the propeller. Replacement of one of these bolts between overhauls must be performed only by a certified propeller repair station with the appropriate rating.

(10) Install four mounting bolts (Table 3-1) in the remaining four mounting holes and thread them through the propeller flange from the propeller side into the bushings in the engine flange. Refer to Figure 3-9.

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

(11) Use a torque wrench with the appropriate torque wrench adapter to torque all mounting bolts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque, beginning with any mounting bolt, and moving around the clock in either direction.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(12) Reinstall each start lock adjacent to the blade clamp that has a corresponding felt-tip marked letter.

(13) Safety all mounting bolts with 0.032 inch (0.810 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware (two bolts per safety).

NOTE: The mounting bolts that are adjacent to the start lock units must be safety-wired to the hex head bolts that attach the start lock brackets to the hub.

(14) 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 toward the engine, 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 1-13/16 inch crowfoot wrench and a torque wrench, torque the piston nut. Refer to Table 3-2 and Figure 3-4 for the proper torque value.

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

(15) 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.

(16) Position the propeller on the start locks.

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

(17) 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.

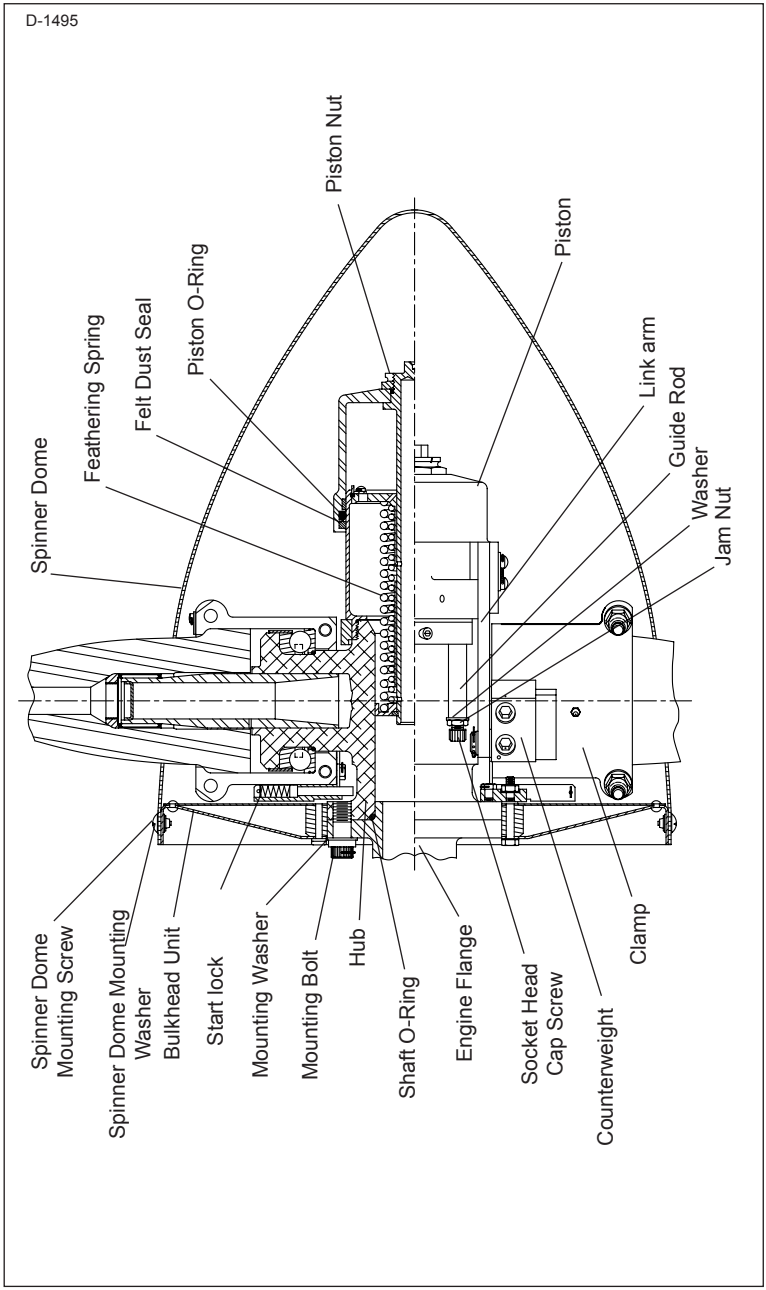
(a) Manual 180 (30-61-80) - Propeller Ice Protection System Manual

(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

(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).



(E,P)HC-A3(MV,V)F-2( )( ) Propeller Assembly
Figure 3-10

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(9) Use a torque wrench with the appropriate torque wrench adapter (Figure 3-3) to torque all mounting bolts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque, beginning with any mounting bolt, and moving around the clock in either direction.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(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 toward the engine, rotating 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 1-13/16 inch crowfoot wrench and a torque wrench, torque the piston nut. Refer to Table 3-2 and Figure 3-4 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.

(15) Position the propeller on the start locks.

(a) Using the blade paddles, slowly rotate the blades simultaneously toward low pitch until the start lock pins engage the start lock plates.

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

(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 spinner dome as follows:

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

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, AND MAY AFFECT THE BALANCE OF THE PROPELLER.

(a) Carefully slide the spinner dome over the reinstalled propeller.

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

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

(8) Slide the propeller flange onto the engine flange against the starter ring gear and shim.

NOTE: Insert the engine bushings into the counterbores that encircle the propeller mounting bolts in the propeller flange.

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

(9) Thread the three mounting bolts (Table 3-1) through the propeller flange from the propeller side, and into the bushings in the engine flange. Refer to Figure 3-9.

(10) Install three mounting bolts in the remaining three mounting holes and thread them through the propeller flange from the propeller side, into the bushings in the engine flange. Refer to Figure 3-9.

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

(11) Use a torque wrench with the appropriate torque wrench adapter (Figure 3-6) to torque all mounting bolts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque, beginning with any mounting bolt, and moving around the clock in either direction.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(12) Reinstall each start lock adjacent to the blade clamp that has a corresponding felt-tip marked letter.

(13)Safety all mounting bolts with 0.032 inch (0.810 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware (two bolts per safety).

NOTE: The mounting bolts that are adjacent to the start lock units must be safety-wired to the hex head bolts that attach the start lock brackets.

(14)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 toward the engine, rotating 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 1-13/16 inch crowfoot wrench and a torque wrench, torque the piston nut. Refer to Table 3-2 and Figure 3-4 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.

(15)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.

(16)Position the propeller on the start locks.

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

(17)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.

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(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 spinner dome as follows:

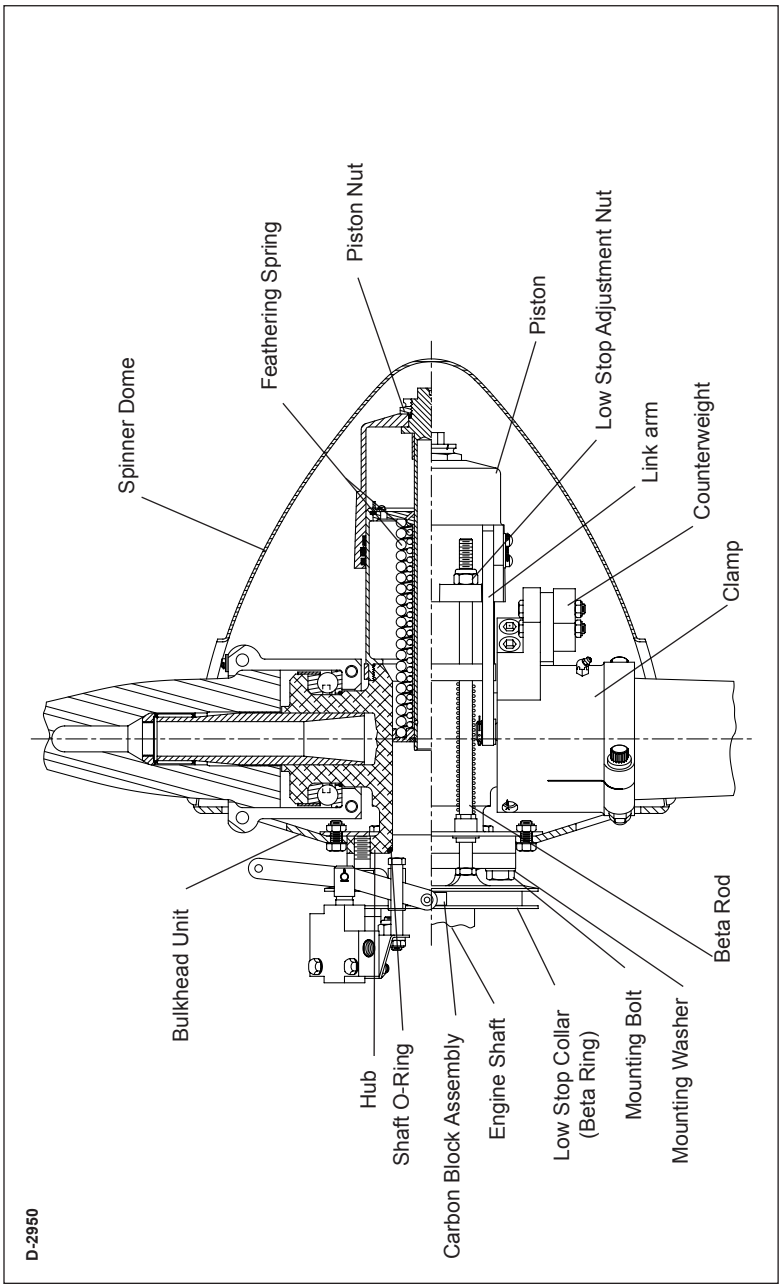
NOTE: The following instructions relate to Hartzell Propeller Inc. spinners only. In some cases, the airframe manufacturer produced the spinner assembly. In those cases, refer to the airframe manufacturer's manual for spinner installation instructions.

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, AND MAY AFFECT THE BALANCE OF THE PROPELLER.

(a) Carefully slide the spinner dome over the reinstalled propeller.

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



BHC-A2(MV,V)F-3 Propeller Assembly
Figure 3-14

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

(8) Install mounting bolts with washers (Table 3-1) through the engine flange and into the propeller hub flange. Refer to Figure 3-14.

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

(9) Use a torque wrench with the appropriate torque wrench adapter (Figure 3-3) to torque all mounting bolts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque, beginning with any mounting bolt, and moving around the clock in either direction.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(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) Decompress and remove the beta system puller.

(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.

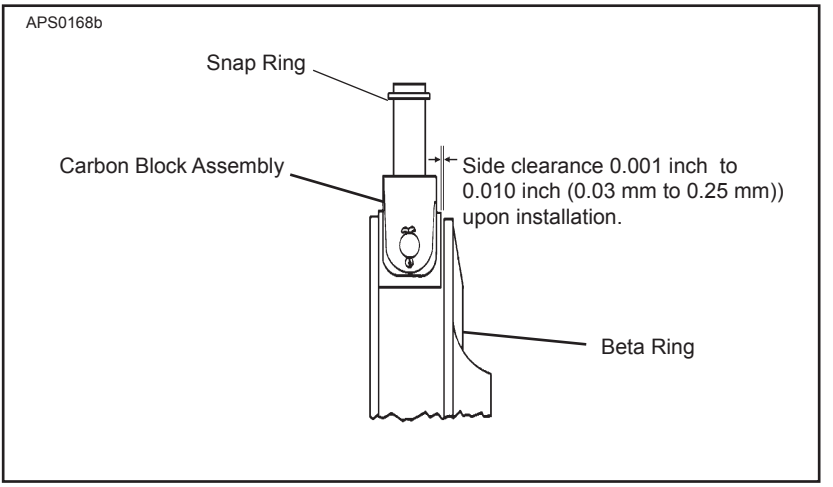
(a) Manual 180 (30-61-80) - Propeller Ice Protection System Manual

(b) Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

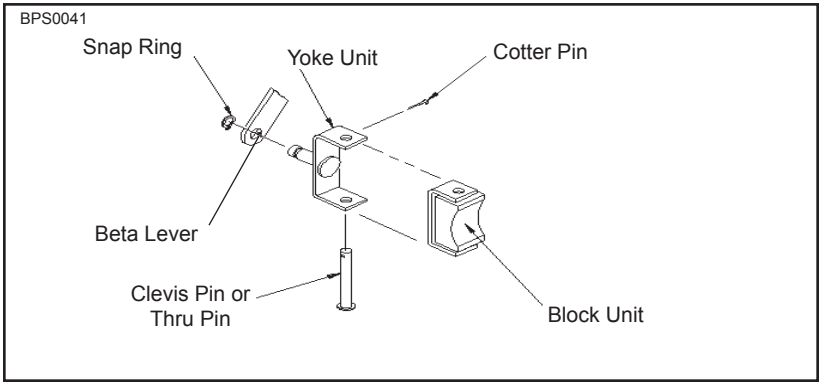
(c) Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual

(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).



Carbon Block and Beta Ring Clearance
Figure 3-16



Carbon Block Assembly
Figure 3-17

CAUTION: MAKE SURE THE STUDS DO NOT TURN WHEN THE MOUNTING NUTS ARE TORQUED. ALLOWING THE STUDS TO TURN WILL LOAD THEM AGAINST THE SPINNER MOUNTING PLATE AND MAY LEAD TO FAILURE OF THE SPINNER MOUNTING BOLTS.

(12)Use a torque wrench with the appropriate torque wrench adapter (Figure 3-22) to torque all mounting nuts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting nuts to half of the final torque, beginning with any mounting nut, and moving around the clock in either direction.

(b) Final torque the mounting nuts in sequence, beginning with any mounting nut, and moving around the clock in either direction.

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

(14)Decompress and remove the beta system puller.

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

(16) 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 can be found in the following publications available on the Hartzell 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

(17) 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).

(18) Install the spinner dome as follows:

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

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, AND MAY AFFECT THE BALANCE OF THE PROPELLER.

(a) Carefully slide the spinner dome over the reinstalled propeller.

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

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

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

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

(9) Use a torque wrench with the appropriate torque wrench adapter (Figure 3-6) to torque all mounting bolts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque, beginning with any mounting bolt, and moving around the clock in either direction.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(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 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

(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 spinner dome as follows:

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, AND MAY AFFECT THE BALANCE OF THE PROPELLER.

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

NOTE 2: No spinner dome is installed on the EHC-A3(MV,V)F-4 propeller model.

(a) Carefully slide the spinner dome over the reinstalled propeller.

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

(10) Use a torque wrench with the appropriate torque wrench adapter (Figure 3-6) to torque all mounting bolts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque, beginning with any mounting bolt, and moving around the clock in either direction.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(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 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 spinner dome as follows:

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

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, AND MAY AFFECT THE BALANCE OF THE PROPELLER.

(a) Carefully slide the spinner dome over the reinstalled propeller.

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

N. Installing F Flange Propeller Models HC-A3(MV,V)F-5A(L)

Refer to Figure 3-24.

(1) Install the beta valve inside the engine shaft. Refer to the engine manufacturer's instructions.

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. REFER TO THE ILLUSTRATED PARTS LIST CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

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

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

WARNING: CLEANING AGENT MEK IS 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.

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

(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 engine flange with the mounting holes and dowel pins in the propeller hub flange.

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

CAUTION 2: MAKE SURE THE PITCH CHANGE ROD ACCURATELY ALIGNS WITH THE ENGINE-MOUNTED BETA VALVE. MISALIGNMENT WILL DAMAGE THE BETA VALVE AND/OR THE PITCH CHANGE ROD.

(6) Slide the propeller onto the engine flange.

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

(7) Install the mounting bolts with washers through the engine flange and into the propeller hub flange. Refer to Figure 3-24.

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

(8) Use a torque wrench with the appropriate torque wrench adapter to torque all mounting bolts in sequences and steps shown in Figure 3-3. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque, beginning with any mounting bolt, and moving around the clock in either direction.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(9) 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).

CAUTION: INSERT THE DOWEL PINS INTO THE SPACER USING A BRASS HAMMER OR EQUIVALENT TOOL TO PREVENT DAMAGE TO THE DOWEL PINS. THE DOWEL PINS ARE AN INTERFERENCE FIT WITH THE SPACER.

(b) Insert two dowel pins (Table 3-1) into the dowel pin holes on the engine-side of the spacer. (Figure 3-26).

NOTE: The dowel pins must protrude 0.50 inch (12.7 mm) from the engine side of the spacer.

(5) Install the specified O-ring (Table 3-1) on the side of the spacer, facing the propeller flange.

(6) Align the mounting and dowel pin holes in the spacer with the mounting studs and dowel pins in the propeller flange.

(7) Slide the spacer onto the propeller flange.

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

(8) Install the specified O-ring (Table 3-1) in the inside diameter groove of the spacer, facing the engine.

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

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

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

(10) Install mounting washers and nuts (Table 3-1) onto the protruding studs in the engine flange. Refer to Figure 3-26.

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

CAUTION: MAKE SURE THE STUDS DO NOT TURN WHEN THE NUTS ARE TORQUED. ALLOWING THE STUDS TO TURN WILL LOAD THEM AGAINST THE SPINNER MOUNTING PLATE AND MAY LEAD TO FAILURE OF THE SPINNER MOUNTING BOLTS.

(11) Use a torque wrench with the appropriate torque wrench adapter (Figure 3-3) to torque all mounting nuts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting nuts to half of the final torque, beginning with any mounting bolt, and moving around the clock in either direction.

(b) Final torque the nuts in sequence, beginning with any mounting nut, and moving around the clock in either direction.

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

S. Installing Splined Propeller Models HC-A2(MV,V)20-2 and HC-A3(MV,V)20-2( )

Refer to Figures 3-36 AND 3-37.

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

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

NOTE: If the propeller is equipped with an anti-ice or a de-ice system, follow the applicable manufacturer's instructions for installation of the anti-ice or de-ice system hardware.

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

(2) Piston Removal (Refer to Figures 3-28, 3-36, and 3-37.)

(a) Remove the piston nut, if it was not previously removed to facilitate boxing and shipping of the propeller.

(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 and 2 on a 2-blade propeller; 1, 2, and 3 on a 3-blade propeller) 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.

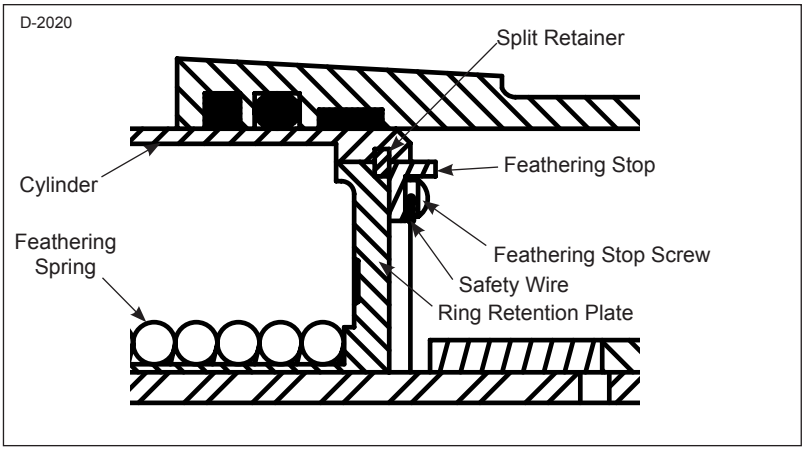
(f) Slide the link arms out of the piston slots.

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

(h) Slide the piston off the cylinder.

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

(3) Feathering spring assembly removal:
Refer to Figure 3-38.



Spring Assembly-to-Cylinder Attachment Details
Figure 3-38

WARNING: DO NOT FORCE THE FEATHERING SPRING TO RELEASE THE SPLIT RINGS IN THE CYLINDER. FORCING THE FEATHERING SPRING MAY CAUSE THE RELEASE OF THE SPLIT RING RETAINERS IN THE SPRING ASSEMBLY, RESULTING IN THE EXPLOSIVE RELEASE OF THE FEATHERING SPRINGS.

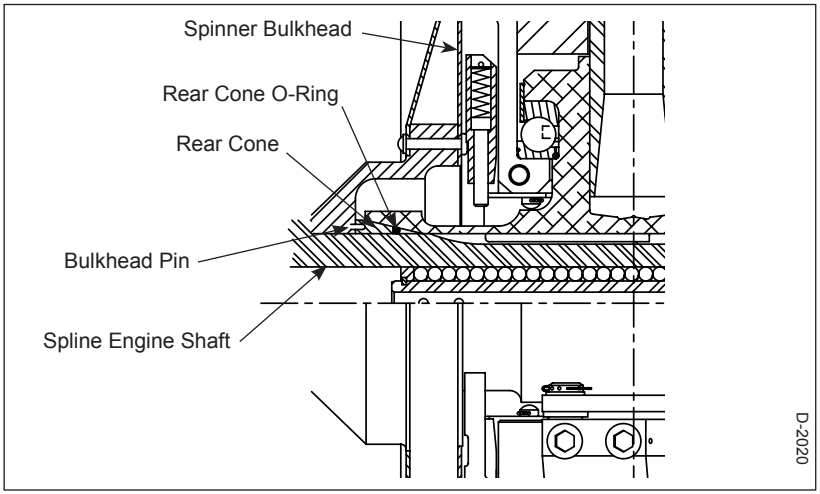
(a) Remove the safety wire (if installed) from the feathering stop screws.

(b) Remove the two screws from each of the two feathering stops on the front spring retainer.

(c) Remove the feathering stops.

(d) Remove the front spring retainer split rings by first pushing the spring assembly into the cylinder about 0.25 inch (6.3 mm), allowing the split rings to fall out of the groove in the piston.

(e) Remove the feathering spring assembly from the cylinder.



Rear Hub Mounting Parts
Figure 3-39

WARNING: CLEANING AGENT MEK IS 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.

(4) Clean the propeller hub spline and engine spline surfaces with Quick Dry Stoddard Solvent or MEK.

(5) Slide the spinner bulkhead onto the shaft.

(6) Install the rear cone onto the bulkhead (Figure 3-39), matching the holes in the cone with the pins in the bulkhead.

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

(8) Install the rear cone O-ring (Table 3-1) over the shaft. (Refer to Figure 3-39).

(9) 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 INSTALLING THE SPINNER DOME. REMOVE THE TAPE AFTER THE SPINNER IS INSTALLED.

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

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

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

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

(13) Remove the spinner dome.

(14) Using tool BST-2910, torque the propeller shaft nut (Table 3-1). Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

(15) Safety the shaft nut to the engine shaft using a hub lock safety pin (Table 3-1). Refer to Figure 3-31.

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

(16) Install the spring assembly.

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

(b) Install the front 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 front split retainer.

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

(e) Install the stop screws and tighten them until they are snug.

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

(17) If the piston O-ring (Table 3-1) and the felt dust seal are not already installed in the piston, perform the following steps. Refer to Figure 3-32.

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

(b) Cut the felt dust seal material to the necessary length.

NOTE: Cut the felt dust seal material on a 30 degree diagonal so there will be an overlap with a smooth, fuzz-free surface.

(c) Soak the felt dust seal material in aviation grade reciprocating engine oil until it is completely saturated.

(d) Squeeze the excess oil from the felt dust seal.

(e) Install the felt dust seal material in the outer groove provided for it in the piston.

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

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

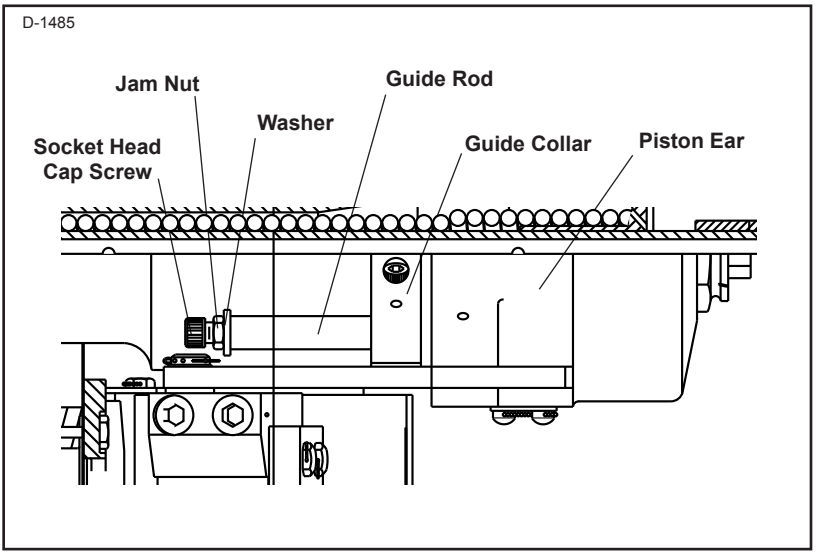
CAUTION: TO MAINTAIN PROPER BLADE ANGLES, REINSTALL THE PISTON IN THE SAME POSITION AS WHEN IT WAS ORIGINALLY ASSEMBLED. INDEX NUMBERS ON THE PISTON AND THE GUIDE COLLAR ARE PROVIDED TO INSURE PROPER POSITIONING.

(19)Locate and match up the index numbers (1 and 2 on 2-blade propeller; 1, 2, and 3 on 3-blade propeller) on the piston ears with the corresponding index numbers on the guide collar. Refer to Figure 3-40.

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

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

(21)Slide the piston onto the cylinder and pass the guide rods through the collar bushing (Figure 3-40).



Guide Rod Attachment Details
Figure 3-40

T. Installing the 20 Splined Propeller Models HC-A2(MV,V)20-3L and HC-A3(MV,V)20-3L

Refer to Figures 3-41 and 3-42.

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

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

NOTE: If the propeller is equipped with an anti-ice or a de-ice system, follow the applicable manufacturer's instructions for installation of the anti-ice or de-ice system hardware.

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

(2) Piston Removal:

Refer to Figure 3-28.

(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 and 2 for a two blade propeller, and 1, 2, and 3 for a three blade propeller) 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.

CAUTION: THE POSITION OF THE LOW STOP COLLAR (BETA RING) IS ADJUSTED AT THE FACTORY AND MUST BE REINSTALLED IN THE SAME POSITION.

(g) Measure and record the distance from the end of the rod to the top surface of the self-locking nut to insure that the hydraulic low pitch will be in the same blade angle when the piston and nut are reinstalled.

(h) Remove the hardware from each rod.

1 Model HC-A2(MV,V)20-3L: Self-locking low pitch nut (Table 3-1) and spacer. Refer to Figure 3-41.

2 Model HC-A3(MV,V)20-3L: Self-locking nut, rod end ring, check nut, self-locking low pitch nut, and spacer (Table 3-1). Refer to Figure 3-42.

(i) Slide the piston off the cylinder.

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

(3) Feathering spring assembly removal:

Refer to Figure 3-38.

WARNING: DO NOT FORCE THE FEATHERING SPRING TO RELEASE THE SPLIT RINGS IN THE CYLINDER. FORCING THE FEATHERING SPRING MAY CAUSE THE RELEASE OF THE SPLIT RING RETAINERS IN THE SPRING ASSEMBLY, RESULTING IN THE EXPLOSIVE RELEASE OF THE FEATHERING SPRINGS.

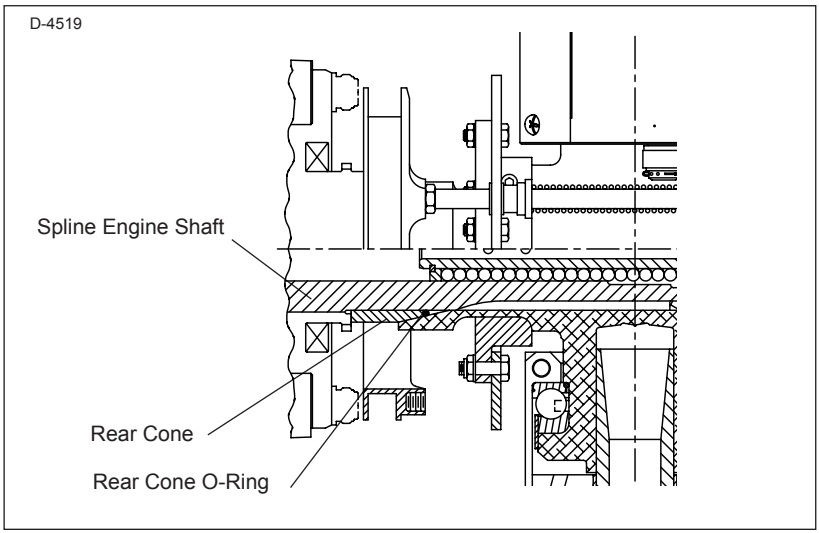
(a) Remove the safety wire (if installed) from the feathering stop screws.

(b) Remove the two screws from each of the two feathering stops on the front spring retainer.

(c) Remove the feathering stops.

(d) Remove the front spring retainer split rings by first pushing the feathering spring assembly into the cylinder about 0.25 inch (6.35 mm), allowing the split rings to fall out of the groove in the piston.

(e) Remove the feathering spring assembly from the cylinder.



Rear Hub Mounting Parts on HC-A(2,3)(MV,V)20-3L Propeller
Figure 3-43

WARNING: CLEANING AGENT MEK IS 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.

(4) Clean the propeller hub spline and engine spline surfaces with Quick Dry Stoddard Solvent or MEK.

(5) Slide the rear cone onto the shaft.

(6) Install the rear cone O-ring (Table 3-1) over the shaft and against the cone. (Refer to Figure 3-43).

(7) Slide the propeller hub onto the engine and torque the propeller hub nut (Table 3-1) using tool BST-2910. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

(8) Safety the hub nut to the engine shaft using a hub lock safety pin (Table 3-1). Refer to Figure 3-31.

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

(9) Install the spring assembly. Refer to Figures 3-41 and 3-42.

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

(b) Install the front 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 front split retainer.

(d) Install the two feathering stops that secure the split retainer into place on the front of the spring retainer.

(e) Install the feathering stop retention screws and tighten them until they are snug.

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

(10) If the piston O-ring (Table 3-1) and the felt dust seal are not already installed in the piston, perform the following steps. Refer to Figure 3-32.

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

(b) Cut the felt dust seal material to the necessary length.

NOTE: Cut the felt dust seal material on a 30 degree diagonal so there will be an overlap with a smooth, fuzz-free surface.

(c) Soak the felt dust seal material in aviation grade reciprocating engine oil until it is completely saturated.

(d) Squeeze the excess oil from the felt dust seal.

(e) Install the felt dust seal material in the outer groove provided for it in the piston.

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

(11) 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, REINSTALL THE PISTON IN THE SAME POSITION AS WHEN IT WAS ORIGINALLY ASSEMBLED. INDEX NUMBERS ON THE PISTON AND THE GUIDE COLLAR ARE PROVIDED TO INSURE PROPER POSITIONING.

(12) Locate and match up the index numbers (1 and 2 on a two blade propeller, and 1, 2, and 3 on a three blade propeller) 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.

(13) Oil the entire surface of the cylinder and install the piston.

(14) Align the piston with the beta rods, and slide the piston onto the beta rods and cylinder.

(15) Connect the link arms to the piston (Figure 3-28).

(16) Install the link pin units.

(17) Install the link pin safety screws.

(18)Safety the link pin screws together with 0.032 inch (0.81 mm) minimum diameter stainless steel wire (Figure 3-28).

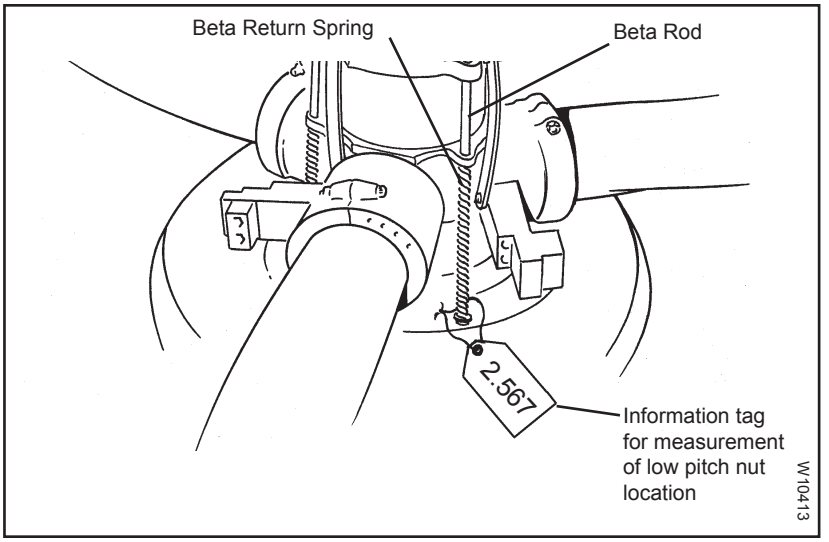
(19)Carefully rotate the blades into feather position and fasten the piston to the pitch change rod with the piston nut (Table 3-1).

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

(21)Install the spacer and self-locking low pitch nut (Table 3-1) on each beta rod.

WARNING: TO MAKE SURE OF PROPER LOW PITCH BLADE ANGLE, THE LOW PITCH NUTS MUST BE SET IN THE PROPER POSITION ON THE BETA RODS. OTHERWISE, POSSIBLE SERIOUS INJURY AND PROPELLER DAMAGE COULD RESULT.

(22)If the propeller was received with the piston already removed, there should be an information tag attached to each beta return spring (Figure 3-44) indicating the proper position for the self-locking low-pitch nut on the end of the beta rod.



Information Tag on Beta Return Spring
Figure 3-44

(a) Adjust the position of each self-locking low pitch nut so that the distance from the top surface of the self-locking nut to the end of the beta rod is as indicated on the information tag attached to the corresponding beta return spring on the beta rod. Refer to Figure 3-44.

(23) If it was necessary to remove the piston for installation of the propeller, and no information tags were found on the beta return springs:

(a) Refer to the distance measurements recorded in step 6.T.(2)(g) of this section to insure that the low pitch nuts will be set at the same position as before removal of the piston.

(b) Refer to the Type Certificate Data sheet or Hartzell Propeller Application Guide to verify the proper low pitch blade angle.

(24) On propeller model HC-A2MV20-3L only, install the check nut, rod end ring, and self-locking nut on each beta rod.

(25) Torque the self-locking nut against the rod end ring. Refer to Table 3-2.

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

CAUTION 1: FIT THE BLOCK IN THE BETA RING WITH A MINIMUM SIDE CLEARANCE OF 0.001 INCH (0.03 MM). REFER TO FIGURE 3-16.

CAUTION 2: MAXIMUM SIDE CLEARANCE PERMITTED IS 0.010 INCH (0.25 mm) IN ACCORDANCE WITH THE CARBON BLOCK ASSEMBLIES SECTION IN THE MAINTENANCE PRACTICES CHAPTER OF THIS MANUAL.

(27) Install the carbon block assembly (Figure 3-17) into the beta ring.

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

5. Post-Installation Checks
   A. Refer to the airframe manufacturer's instructions for post-installation checks.
   B. Perform a static RPM check as outlined in the Testing and Troubleshooting chapter of this manual.

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 OVERHAUL MANUALS.

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

(2) 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:

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 start lock 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.

(3) Piston removal (Refer to figure 3-28)

(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 and 2 for a 2-blade propeller; 1, 2, and 3 for a 3-blade propeller) impression-stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will insure 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.

(4) Feathering spring assembly removal: Refer to Figure 3-38.

WARNING: DO NOT FORCE THE FEATHERING SPRING TO RELEASE THE SPLIT RINGS IN THE CYLINDER. FORCING THE FEATHERING SPRING MAY CAUSE THE RELEASE OF THE SPLIT RING RETAINERS IN THE SPRING ASSEMBLY, RESULTING IN THE EXPLOSIVE RELEASE OF THE FEATHERING SPRINGS.

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

(b) Remove the ring retention plate screws.

(c) Remove the front spring retainer split rings by first pushing the feathering spring assembly into the cylinder about 0.25 inch (6.35 mm), allowing the split rings to fall out of the groove in the piston.

(d) Remove the feathering spring assembly from the cylinder.

(5) Remove the hub lock safety pin.

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 on the engine splined shaft (Figure 3-39).

(10) If necessary, remove the rear cone (Figure 3-39).

(11) If necessary, remove the rear spinner bulkhead.

(12) Put the propeller and associated parts on a suitable cart for transportation.

R. Removing the 20 Splined Propeller Models HC-A2(MV,V)20-3L and HC-A3(MV,V)20-3L

Refer to Figures 3-41 and 3-42.

NOTE: If the propeller is equipped with an anti-ice or a de-ice system, follow the manufacturer's instructions for removing the components necessary for propeller removal.

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.

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 IN THE HARTZELL PROPELLER OVERHAUL MANUALS.

(1) HC-A3(MV,V)20-3L propeller models

(a) Remove the elastic nut from the end of each beta rod.

(b) Remove the ring that connects all beta rods together.

(c) From each beta rod, remove the check nut that was used to secure the ring in place

NOTE: One lock nut should still be installed on each beta rod. Do not remove the nut at this time.

(2) Make sure the piston is located at the highest blade pitch attainable.

WARNING: WHEN THE PROPELLER IS REINSTALLED, THE PROPELLER BLADE LOW PITCH ANGLE MUST BE MAINTAINED.

CAUTION: TO REESTABLISH THE LOCATION OF LOW PITCH WHEN THE PROPELLER IS REASSEMBLED, A PRECISE LOCATION OF THE LOW PITCH SELF-LOCKING NUT MUST BE ESTABLISHED. MEASUREMENT WITH A RULER IS NOT SUFFICIENT.

(3) Using a dial caliper, measure the distance from the inboard surface of each self-locking low pitch nut to the end of the corresponding beta rod.

(4) Using a separate information tag for each low pitch nut measurement, write the distance measured from the inboard surface of the self-locking low pitch nut to the end of the beta rod.

(5) Securely attach each information tag to its corresponding beta return spring on the beta rod.

(6) Remove the spacer and self-locking low pitch nut from each beta rod.

(7) Piston removal (Refer to figure 3-28)

(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 and 2 for a 2-blade propeller; 1, 2, and 3 for a 3-blade propeller 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 piston off the cylinder.

(8) Feathering spring assembly removal:

Refer to Figure 3-38.

WARNING: DO NOT FORCE THE FEATHERING SPRING TO RELEASE THE SPLIT RINGS IN THE CYLINDER. FORCING THE FEATHERING SPRING MAY CAUSE THE RELEASE OF THE SPLIT RING RETAINERS IN THE SPRING ASSEMBLY, RESULTING IN THE EXPLOSIVE RELEASE OF THE FEATHERING SPRINGS.

(a) Remove the safety wire (if installed) from the feathering stop screws.

(b) Remove the two screws from each of the two feathering stops on the front spring retainer.

(c) Remove the feathering stops.

(d) Remove the front spring retainer split rings by first pushing the feathering spring assembly into the cylinder about 0.25 inch (6.35 mm), allowing the split rings to fall out of the groove in the piston.

(e) Remove the feathering spring assembly from the cylinder.

(9) Remove the shaft nut lock.

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

(10) Support the propeller assembly with a sling.

(5) A label (Hartzell P/N A-3494) is normally applied to the propeller to indicate the type of grease previously used (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) Purging of old grease through lubrication fittings is only about 30 percent effective.

(c) To completely replace one grease with another, the propeller must be disassembled in accordance with the applicable overhaul manual.

CAUTION: IF A PNEUMATIC GREASE GUN IS USED TO LUBRICATE THE PROPELLER, TAKE EXTRA CARE TO AVOID EXCESSIVE PRESSURE BUILDUP.

(6) Pump grease into the blade clamp grease fitting until grease emerges from the hole of the removed lubrication fitting.

NOTE: Lubrication is complete when grease emerges in a steady flow with no air pockets or moisture, and has the color and texture of the new grease.

(7) Reinstall the removed lubrication fitting on each clamp.

(8) Tighten the lubrication fittings until snug.

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

(9) Install a new lubrication fitting cap on each lubrication fitting.

C. Approved Lubricants

(1) The following lubricants are approved for use in Hartzell 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 (approximately 100°F [38°C]).
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.
Royco 22CF -	Not widely used. Qualities similar to Aeroshell 22.

(2) A label (Figure 6-2) indicating the type of grease used for previous lubrication (if used) is installed on the propeller piston or on the blade clamp. If the propeller is to be lubricated with a different type of grease, the propeller must be disassembled and cleaned of old grease before relubricating.