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MANUAL REVISION TRANSMITTAL

MANUAL 142 (61-10-42)
Four Blade Lightweight Turbine Propeller Overhaul Manual

REVISION 20 dated March 2024

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NOTE 1: Record the removal of a Temporary Revision on the Record of Temporary Revisions pages in this manual.

NOTE 2: When the manual revision has been inserted in the manual, record the information required on the Record of Revisions page in this manual.

NOTE 3: Pages distributed in this revision may include pages from previous revisions if they are on the opposite side of revised pages. This is done as a convenience to those

Manual No. 142
61-10-42
Revision 20
March 2024

Four Blade Lightweight Turbine Propeller Overhaul Manual

HC-D4N-2( )
HC-E4A-2( )
HC-E4N-2( )

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REVISION 20 HIGHLIGHTS

Revision 20, dated March 2024, incorporates the following:

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

Removed references to "Hartzell Propeller Inc.". Revised to "Hartzell Propeller LLC" where applicable.

Minor language/format changes and renumbering, if applicable are marked with a revision bar, but are not listed below.

- INTRODUCTION
  - Revised the section, "Reference Publications"
  - Added the section, "Video" Icon/QR Code
  - Added Figure 1, "Video" Icon/QR Code
- DESCRIPTION AND OPERATION
  - Revised the section, "General"
- TESTING AND FAULT ISOLATION
  - Revised the section, "Troubleshooting Guide"
  - Revised Figure 1-2, "Checking Blade Play"
  - Revised the section, "Lightning Strike on Hub or Blade"
- DISASSEMBLY
  - Revised the section, "Blade Disassembly"
  - Added Figure 3-3, "Pitch Change Knob Bracket Unit Disassembly"
- REPAIR
  - Revised the section, "Repair/Modification Procedures"
  - Revised Figure 6-2, "Optical Comparator Overlay"
  - Revised the section, "Inspection of the Internal Surface of a Cylinder"
  - Revised Figure 6-3, "Inspection for a Sharp Corner"
- ASSEMBLY
  - Removed composite blade references where applicable.
  - Revised Figure 7-27, "Blade Angle Tolerance Check"
  - Revised Figure 7-36, "Checking Blade Play"

REVISION 20 HIGHLIGHTS

- FITS AND CLEARANCES
  - Revised the section, "Torque Values"
  - Revised Figure 8-2, "Blade Play"
  - Revised the section, "Blade Tolerances"
- ILLUSTRATED PARTS LIST
  - Revised the Parts List for Propeller Model HC-D4N-2( )
  - Revised the Parts List for Propeller Model HC-E4A-2( )
  - Revised the Parts List for Propeller Model HC-E4N-2(B,C)
  - Revised the Parts List for Propeller Model HC-E4N-2D

REVISION 20 HIGHLIGHTS

1. Introduction

A. General

(1) This is a list of current revisions that have been issued against this manual. Please compare to RECORD OF REVISIONS page to make sure that all revisions have been added to the manual.

B. Components

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

(2) Issue Date is the date of 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 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 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 format changes over a large portion of the manual. The manual is distributed in its entirety. All the 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 20 HIGHLIGHTS

Revision No.	Issue Date	Comments
Revision 8	Apr/03	Reissue
Revision 9	Dec/03	Minor Revision
Revision 10	Jun/05	Minor Revision
Revision 11	Feb/08	Minor Revision
Revision 12	Nov/08	Minor Revision
Revision 13	Oct/09	Minor Revision
Revision 14	Jun/13	Minor Revision
Revision 15	Jan/17	Minor Revision
Revision 16	Jul/17	Minor Revision
Revision 17	Mar/21	Major Revision
Revision 18	Mar/22	Minor Revision
Revision 19	May/23	Major Revision
Revision 20	Mar/24	Minor Revision

RECORD OF REVISIONS

This is a record of revisions inserted into this manual.
Revision 19 includes all prior revisions.

Revision Number	Issue Date	Date Inserted	Inserted By
19	May/23	May/23	HPI
20	Mar/24	Mar/24	Hartzell

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RECORD OF TEMPORARY REVISIONS

Update this page to show all Temporary Revisions inserted into this manual.
Revision 19 includes all prior temporary revisions, up to and including TR-009.

Temporary Revision No.	Section/ Page	Issue Date	Date Inserted	Inserted By	Date Removed	Removed By

RECORD OF TEMPORARY REVISIONS

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Revision 19 includes all prior temporary revisions, up to and including TR-009.

Temporary Revision No.	Section/ Page	Issue Date	Date Inserted	Inserted By	Date Removed	Removed By

SERVICE DOCUMENT LIST

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

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

Service Document Number	Incorporation Rev./Date
Service Bulletins:	
SB 199B	Rev. 8 Apr/03
HC-SB-61-235	Rev. 8 Apr/03
HC-SB-61-276	Rev. 12 Nov/08
HC-SB-61-314	Rev. 13 Oct/09
HC-SB-61-346, R1	Rev. 15 Jan/17
HC-SB-61-346, R3	Rev. 19 May/23
HC-SB-61-389, R1	Rev. 19 May/23

Service Document Number	Incorporation Rev./Date
Service Letters:	
HC-SL-61-187	Rev. 9 Dec/03
HC-SL-61-240	Rev. 12 Nov/08
HC-SL-61-250	Rev. 15 Jan/17
HC-SL-61-301	Rev. 14 Jun/13
HC-SL-61-321	Rev. 14 Jun/13
HC-SL-61-354	Rev. 15 Jan/17
Service Instructions:	
SI 202	Rev. 8 Apr/03
SI 180	Rev. 8 Apr/03

SERVICE DOCUMENT LIST

Service Document Number	Incorporation Rev./Date	Service Document Number	Incorporation Rev./Date

AIRWORTHINESS LIMITATIONS

1. Airworthiness Limitations

   A. Life Limits

      (1) Certain component parts, as well as the entire propeller, may have specific life limits established by the FAA. Such limits require replacement of items after a specific number of hours of use.

      (2) For airworthiness limitations information, refer to Hartzell Propeller Owner's Manual 149 (61-00-49).

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INTRODUCTION - CONTENTS

LIST OF FIGURES

1. General (Rev. 2)

A. Statement of Purpose

(1) This manual has been reviewed and accepted by the FAA. Additionally, this manual contains data that has been approved in a manner acceptable to the FAA administrator.

(2) This manual provides maintenance and overhaul procedures for use in propeller repair stations by personnel that are trained and experienced with Hartzell Propeller LLC products.

(a) This manual does not provide complete information for an inexperienced technician to attempt propeller overhaul without supervision.

(3) This manual is intended to be the primary source of maintenance and overhaul information for the applicable Hartzell propeller/component models.

(a) Propeller models addressed in this manual may be Type Certificated by the FAA, or may be experimental. Experimental parts must not be installed on a Type Certificated propeller. Always use the current illustrated parts list for the assembly of any propeller. Always refer to the aircraft Type Certificate (TC) or Supplemental Type Certificate (STC) to determine installation eligibility of any propeller. If installation eligibility is not identifiable, an additional installation approval, such as FAA form 337 field approval or Supplemental Type Certificate may be required. If in doubt, contact Hartzell Propeller Product Support.

(b) Information published in Service Bulletins, Service Letters, Service Advisories, and Service Instructions may supersede information published in this manual. The reader must consult active Service Bulletins, Service Letters, Service Advisories, and Service Instructions for information that may have not yet been incorporated into the latest revision of this manual.

(4) This manual makes reference to other Hartzell Propeller manuals that provide important details for procedures such as anodizing, penetrant inspection, and overhaul procedures for hub units.

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

B. Item References

(1) Item references throughout the text in this manual refer to item numbers in the Illustrated Parts List chapter of this manual. The item numbers appear in parentheses directly following the part name. Only the item base number will appear in the text of the manual. Item base numbers and the alpha variants of the base numbers will appear in the illustrated parts list. There are two reasons for the use of alpha variants:

(a) A part may be superseded, replaced, or obsoleted by another part. For example, the pitch change block unit (105733) that is item 320 was superseded by the pitch change block unit (105733-1) that is item 320A.

(b) An Illustrated Parts List may contain multiple configurations. Effectivity codes are used to distinguish different part numbers within the same list. For example, one configuration may use a piston (B-2419) that is item 80, yet another configuration uses a piston (104256) that is item 80A. Effectivity codes are very important in the determination of parts in a given configuration.

2. Reference Publications

A. Hartzell Propeller Publications

(1) Information published in Service Bulletins, Service Letters, Service Advisories, and Service Instructions may supersede information published in this manual. The reader must consult active Service Bulletins, Service Letters, Service Advisories, and Service Instructions for information that may have not yet been incorporated into the latest revision of this manual.

(2) In addition to this manual, one or more of the following publications are required for information regarding specific recommendations and procedures to maintain propeller assemblies that are included in this manual.

Manual No. (ATA No.)	Available at www.hartzellprop.com	Hartzell Propeller Manual Title
n/a	Yes	Active Hartzell Propeller Service Bulletins, Service Letters, Service Instructions, and Service Advisories
Manual 127 (61-16-27)	Yes	Metal Spinner Maintenance Manual
Manual 133C (61-13-33)	-	Aluminum Blade Overhaul Manual
Manual 149 (61-00-49)	Yes	Propeller Owner's Manual and Logbook for Lightweight Turbine Propeller Models with Aluminum Blades
Manual 159 (61-02-59)	Yes	Application Guide
Manual 165A (61-00-65)	Yes	Illustrated Tool and Equipment Manual
Manual 180 (30-61-80)	Yes	Ice Protection System Manual
Manual 202A (61-01-02)	Vol. 7, Yes Vol. 11, Yes	Standard Practices Manual, Volumes 1 through 11

B. Vendor Publications

None.

3. Personnel Requirements (Rev. 2)

A. Service and Maintenance Procedures in this Manual

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

(2) Compliance to the applicable regulatory requirements established by the Federal Aviation Administration (FAA) or international equivalent is mandatory for anyone performing or accepting responsibility for the inspection and/or repair of any Hartzell Propeller LLC product.

(a) Maintenance records must be kept in accordance with the requirements established by the Federal Aviation Administration (FAA) or international equivalent.

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

4. Special Tooling and Consumable Materials (Rev. 2)

A. Special Tooling

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

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

B. Consumable Materials

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

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

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

A. Instructions for Use

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

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

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

6. Calendar Limits and Long Term Storage (Rev. 3)

A. Calendar Limits

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

(2) A calendar limit between overhauls is specified in Hartzell Propeller Service Letter HC-SL-61-61Y.

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

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

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

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

B. Long Term Storage

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

7. Component Life and Overhaul (Rev. 3)

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

A. Component Life

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

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

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

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

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

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

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

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

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

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

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

(b) Hub replacement

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

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

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

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

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

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

B. Overhaul

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

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

(a) Overhaul intervals are specified in Hartzell Propeller Service Letter HC-SL-61-61Y.

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

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

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

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

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

8. Damage/Repair Types (Rev. 2)

A. Airworthy/Unairworthy Damage

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

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

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

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

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

(b) Unairworthy damage must be repaired before the propeller is returned to service.

B. Minor/Major Repair

(1) Minor Repair

(a) Minor repair is that which may be done safely in the field by a certified aircraft mechanic.

1 For serviceable limits and repair criteria for Hartzell propeller components, refer to the applicable Hartzell Propeller component maintenance manual.

(2) Major Repair

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

(b) Major repair work must be accepted by an individual that is certified by the Federal Aviation Administration (FAA) or international equivalent.

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

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

9. Propeller Critical Parts (Rev. 2)

A. Propeller Critical Parts

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

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

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

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

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

10. Warranty Service (Rev. 2)

A. Warranty Claims

(1) If you believe you have a warranty claim, contact the Hartzell Propeller Product Support Department to request a *Warranty Application* form. Complete this form and return it to Hartzell Propeller Product Support for evaluation **before proceeding with repair or inspection work**. Upon receipt of this form, the Product Support Department will provide instructions on how to proceed.

(a) For Hartzell Propeller Product Support Department contact information, refer to the “Contact Information” section in this chapter.

11. Hartzell Propeller Contact Information (Rev. 3)

A. Product Support Department

(1) Contact the Hartzell Propeller Product Support Department about any maintenance problems or to request information not included in this publication.

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

(a) The Product Support Department may be reached during business hours (8:00 a.m. through 5:00 p.m., United States Eastern Time) at (937) 778-4379 or at (800) 942-7767, toll free from the United States and Canada.

(b) The Product Support Department can also be reached by fax at (937) 778-4215, and by e-mail at techsupport@hartzellprop.com.

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

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

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

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

B. Technical Publications Department

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

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

C. Recommended Facilities

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

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

12. "Video" Icon/QR Code

A. Instructions for Use

(1) The "Video" icon/QR code (refer to Figure 1) that appears in this manual allows you to access a video or animated demonstration of the applicable procedure.

CAUTION: THESE VIDEOS/ANIMATIONS ARE INTENDED TO SUPPLEMENT THE APPLICABLE INSTRUCTIONS. THEY SHOULD NOT BE USED WITHOUT FIRST READING AND UNDERSTANDING THE LATEST REVISION OF THE PROCEDURE AND ANY APPLICABLE WARNINGS/CAUTIONS.

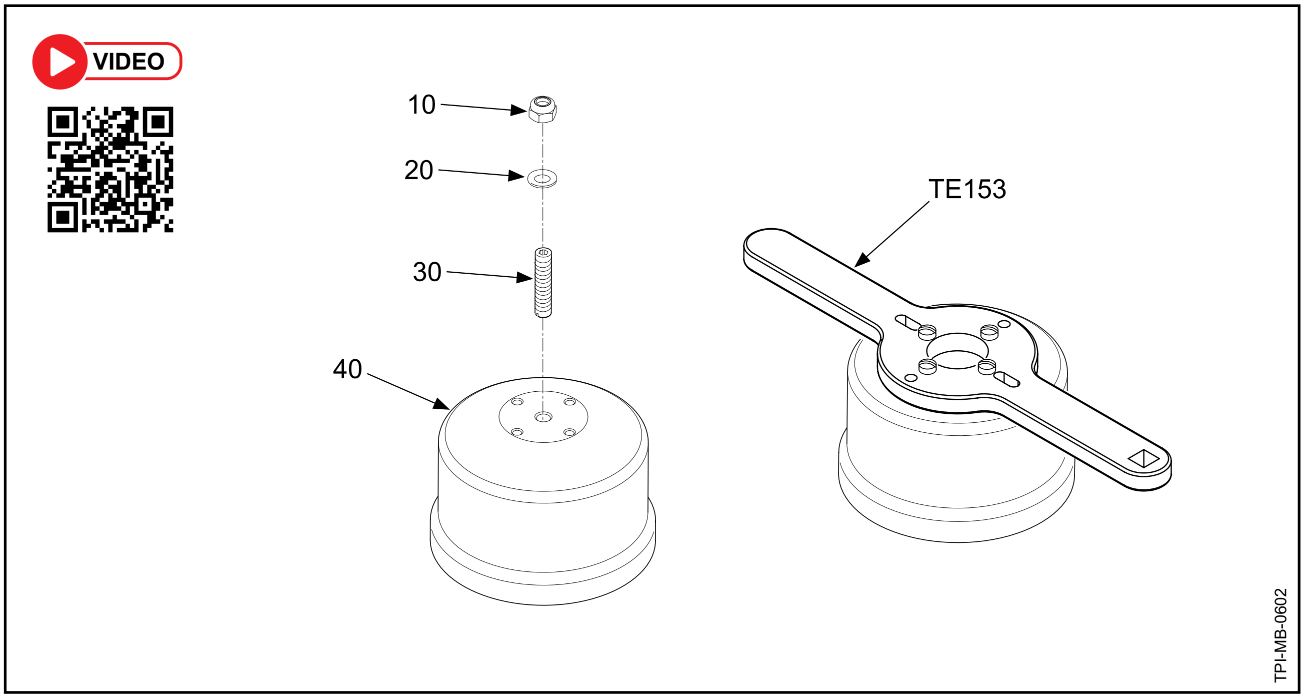
(2) To access the video/animated demonstration:

(a) If viewing the document file digitally:

1 Click on the QR code

(b) From a printed copy of the page:

1 Scan the QR code from any mobile device equipped with a QR reader application.



"Video" Icon/QR Code
Figure 1

13. Definitions (Rev. 5)

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

Term	Definition
Annealed	Softening of material due to overexposure to heat
Aviation Certified	Intended for FAA or international equivalent type certificated aircraft applications. A TC and PC number must be stamped on the hub, and a PC number must be stamped on blades.
Aviation Experimental	Intended for aircraft/propeller applications not certified by the FAA or international equivalent. Products marked with an “X” at or near the end of the model number or part number are not certified by the FAA or international equivalent and are not intended to use on certificated aircraft.
Beta Operation	A mode of pitch control that is directed by the pilot rather than by the propeller governor
Beta Range	Blade angles between low pitch and maximum reverse blade angle
Beta System	Parts and/or equipment related to operation (manual control) of propeller blade angle between low pitch blade angle and full reverse blade angle
Blade Angle	Measurement of blade airfoil location described as the angle between the blade airfoil and the surface described by propeller rotation
Blade Centerline	An imaginary reference line through the length of a blade around which the blade rotates
Blade Station	Refers to a location on an individual blade for blade inspection purposes. It is a measurement from the blade “zero” station to a location on a blade, used to apply blade specification data in blade overhaul manuals. Note: Do not confuse *blade station* with *reference blade radius*; they may not originate at the same location.
Blemish	An imperfection with visible attributes, but having no impact on safety or utility
Brinelling	A depression caused by failure of the material in compression

Term	Definition
Bulge	An outward curve or bend
Camber	The surface of the blade that is directed toward the front of the aircraft. It is the low pressure, or suction, side of the blade. The camber side is convex in shape over the entire length of the blade.
Chord	A straight line distance between the leading and trailing edges of an airfoil
Chordwise	A direction that is generally from the leading edge to the trailing edge of an airfoil
Co-bonded	The act of bonding a composite laminate and simultaneously curing it to some other prepared surface
Composite Material	Kevlar®, carbon, or fiberglass fibers bound together with, or encapsulated within an epoxy resin
Compression Rolling	A process that provides improved strength and resistance to fatigue
Constant Force	A force that is always present in some degree when the propeller is operating
Constant Speed	A propeller system that employs a governing device to maintain a selected engine RPM
Corrosion (Aluminum)	The chemical or electrochemical attack by an acid or alkaline that reacts with the protective oxide layer and results in damage of the base aluminum. Part failure can occur from corrosion due to loss of structural aluminum converted to corrosion product, pitting, a rough etched surface finish, and other strength reduction damage caused by corrosion.
Corrosion (Steel)	Typically, an electrochemical process that requires the simultaneous presence of iron (component of steel), moisture and oxygen. The iron is the reducing agent (gives up electrons) while the oxygen is the oxidizing agent (gains electrons). Iron or an iron alloy such as steel is oxidized in the presence of moisture and oxygen to produce rust. Corrosion is accelerated in the presence of salty water or acid rain. Part failure can occur from corrosion due to loss of structural steel converted to corrosion product, pitting, a rough etched surface finish and other strength reduction damage caused by corrosion.

Term	Definition
Corrosion Product (Aluminum)	A white or dull gray powdery material that has an increased volume appearance (compared to non-corroded aluminum). Corrosion product is not to be confused with damage left in the base aluminum such as pits, worm holes, and etched surface finish.
Corrosion Product (Steel)	When iron or an iron alloy such as steel corrodes, a corrosion product known as rust is formed. Rust is an iron oxide which is reddish in appearance and occupies approximately six times the volume of the original material. Rust is flakey and crumbly and has no structural integrity. Rust is permeable to air and water, therefore the interior metallic iron (steel) beneath a rust layer continues to corrode. Corrosion product is not to be confused with damage left in the base steel such as pits and etched surface finish.
Crack	Irregularly shaped separation within a material, sometimes visible as a narrow opening at the surface
Debond	Separation of two materials that were originally bonded together in a separate operation
Defect	An imperfection that affects safety or utility
Delamination	Internal separation of the layers of composite material
Dent	The permanent deflection of the cross section that is visible on both sides with no visible change in cross sectional thickness
Depression	Surface area where the material has been compressed but not removed
Distortion	Alteration of the original shape or size of a component
Edge Alignment	Distance from the blade centerline to the leading edge of the blade
Erosion	Gradual wearing away or deterioration due to action of the elements
Exposure	Leaving material open to action of the elements

Term	Definition
Face	The surface of the blade that is directed toward the rear of the aircraft. The face side is the high pressure, or thrusting, side of the blade. The blade airfoil sections are normally cambered or curved such that the face side of the blade may be flat or even concave in the midblade and tip region.
Face Alignment	Distance from the blade centerline to the highest point on the face side perpendicular to the chord line
Feathering	The capability of blades to be rotated parallel to the relative wind, thus reducing aerodynamic drag
Fraying	A raveling or shredding of material
Fretting	Damage that develops when relative motion of small displacement takes place between contacting parts, wearing away the surface
Galling	To fret or wear away by friction
Gouge	Surface area where material has been removed
Hazardous Propeller Effect	The hazardous propeller effects are defined in Title 14 CFR section 35.15(g)(1)
Horizontal Balance	Balance between the blade tip and the center of the hub
Impact Damage	Damage that occurs when the propeller blade or hub assembly strikes, or is struck by, an object while in flight or on the ground
Inboard	Toward the butt of the blade
Intergranular Corrosion	Corrosion that attacks along the grain boundaries of metal alloys
Jog	A term used to describe movement up/down, left/right, or on/off in short incremental motions
Laminate	To unite composite material by using a bonding material, usually with pressure and heat
Lengthwise	A direction that is generally parallel to the pitch axis
Loose Material	Material that is no longer fixed or fully attached
Low Pitch	The lowest blade angle attainable by the governor for constant speed operation

Term	Definition
Major Propeller Effect	The major propeller effects are defined in Title 14 CFR section 35.15(g)(2)
Minor Deformation	Deformed material not associated with a crack or missing material
Monocoque	A type of construction in which the outer skin carries all or a major part of the load
Nick	Removal of paint and possibly a small amount of material
Non-Aviation Certified	Intended for non-aircraft application, such as Hovercraft or Wing-in-Ground effect (WIG) applications. These products are certificated by an authority other than FAA. The hub and blades will be stamped with an identification that is different from, but comparable to TC and PC.
Non-Aviation Experimental	Intended for non-aircraft application, such as Hovercraft or Wing-In-Ground effect (WIG) applications. Products marked with an “X” at or near the end of the model number or part number are not certified by any authority and are not intended for use on certificated craft.
Onspeed	Condition in which the RPM selected by the pilot through the propeller control/condition lever and the actual engine (propeller) RPM are equal
Open Circuit	Connection of high or infinite resistance between points in a circuit which are normally lower
Outboard	Toward the tip of the blade
Overhaul	The periodic disassembly, inspection, repair, refinish, and reassembly of a propeller assembly to maintain airworthiness
Overspeed	Condition in which the RPM of the propeller or engine exceeds predetermined maximum limits; the condition in which the engine (propeller) RPM is higher than the RPM selected by the pilot through the propeller control/condition lever
Pitch	Same as “Blade Angle”
Pitting	Formation of a number of small, irregularly shaped cavities in surface material caused by corrosion or wear

Term	Definition
Pitting (Linear)	The configuration of the majority of pits forming a pattern in the shape of a line
Porosity	An aggregation of microvoids. See “voids”.
Propeller Critical Parts	A part on the propeller whose primary failure can result in a hazardous propeller effect, as determined by the safety analysis required by Title 14 CFR section 35.15
Reference Blade Radius	Refers to the propeller reference blade radius in an assembled propeller, e.g., 30-inch radius. A measurement from the propeller hub centerline to a point on a blade, used for blade angle measurement in an assembled propeller. An adhesive stripe (blade angle reference tape CM160) is usually located at the reference blade radius location. Note: Do not confuse *reference blade radius* with *blade station*; they may not originate at the same point.
Reversing	The capability of rotating blades to a position to generate reverse thrust to slow the aircraft or back up
Scratch	Same as “Nick”
Short Circuit	Connection of low resistance between points on a circuit between which the resistance is normally much greater
Shot Peening	Process where steel shot is impinged on a surface to create compressive surface stress, that provides improved strength and resistance to fatigue
Single Acting	Hydraulically actuated propeller that utilizes a single oil supply for pitch control
Split	Delamination of blade extending to the blade surface, normally found near the trailing edge or tip
Station Line	See "Blade Station"
Synchronizing	Adjusting the RPM of all the propellers of a multi-engine aircraft to the same RPM
Synchrophasing	A form of propeller sychronization in which not only the RPM of the engines (propellers) are held constant, but also the position of the propellers in relation to each other
Ticking	A series of parallel marks or scratches running circumferentially around the diameter of the blade

Term	Definition
Track	In an assembled propeller, a measurement of the location of the blade tip with respect to the plane of rotation, used to verify face alignment and to compare blade tip location with respect to the locations of the other blades in the assembly
Trailing Edge	The aft edge of an airfoil over which the air passes last
Trimline	Factory terminology referring to where the part was trimmed to length
Underspeed	The condition in which the actual engine (propeller) RPM is lower than the RPM selected by the pilot through the propeller control/condition lever
Unidirectional Material	A composite material in which the fibers are substantially oriented in the same direction
Variable Force	A force that may be applied or removed during propeller operation
Vertical Balance	Balance between the leading and trailing edges of a two-blade propeller with the blades positioned vertically
Voids	Air or gas that has been trapped and cured into a laminate
Windmilling	The rotation of an aircraft propeller caused by air flowing through it while the engine is not producing power
Woven Fabric	A material constructed by interlacing fiber to form a fabric pattern
Wrinkle (aluminum blade)	A wavy appearance caused by high and low material displacement
Wrinkle (composite blade)	Overlap or fold within the material

14. Abbreviations (Rev. 2)

Abbreviation	Term
AD	Airworthiness Directives
AMM	Aircraft Maintenance Manual
AOG	Aircraft on Ground
AR	As Required
ATA	Air Transport Association
CSU	Constant Speed Unit
FAA	Federal Aviation Administration
FH	Flight Hour
FM	Flight Manual
FMS	Flight Manual Supplement
Ft-Lb	Foot-Pound
HMI	Human Machine Interface
ICA	Instructions for Continued Airworthiness
ID	Inside Diameter
In-Lb	Inch-Pound
IPL	Illustrated Parts List
IPS	Inches Per Second
kPa	Kilopascals
Lb(s)	Pound(s)
Max.	Maximum
Min.	Minimum
MIL-X-XXX	Military Specification
MPI	Major Periodic Inspection (Overhaul)
MS	Military Standard
MSDS	Material Safety Data Sheet

Abbreviation	Term
N	Newtons
N/A	Not Applicable
NAS	National Aerospace Standards
NASM	National Aerospace Standards, Military
NDT	Nondestructive Testing
NIST	National Institute of Standards and Technology
N•m	Newton-Meters
OD	Outside Diameter
OPT	Optional
PC	Production Certificate
PCP	Propeller Critical Part
PLC	Programmable Logic Controller
PMB	Plastic Media Blasting (Cleaning)
POH	Pilot's Operating Handbook
PSI	Pounds per Square Inch
RF	Reference
RPM	Revolutions per Minute
SAE	Society of Automotive Engineers
STC	Supplemental Type Certificate
TBO	Time Between Overhaul
TC	Type Certificate
TSI	Time Since Inspection
TSN	Time Since New
TSO	Time Since Overhaul
UID	Unique Identification
WIG	Wing-In-Ground-Effect

DESCRIPTION AND OPERATION - CONTENTS

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1. General (Rev. 3)

A. Propeller/Blade Model Designation

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

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

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

(a) For additional information about the propeller model number designation system, refer to the applicable Hartzell Propeller owner's manual.

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

(a) For additional information about the model number designation system for aluminum blades, refer to Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33).

2. Operation

A. Feathering Propellers HC-(D,E)4( )-2( ) Series

(1) The propellers described in this section are constant speed and feathering.

(a) They use a single oil supply from a governing device to hydraulically actuate a change in blade angle.

(b) The propellers have four blades and are used primarily on Pratt & Whitney turbine engines.

(2) A two piece aluminum hub retains each propeller blade on a thrust bearing.

(a) A cylinder is threaded onto the hub and contains a feathering spring and piston.

(b) The hydraulically actuated piston transmits linear motion through a pitch change rod and fork to each blade to result in blade angle change.

(3) While the propeller is operating, the following forces are constantly present: 1) spring force, 2) counterweight force, 3) centrifugal twisting moment of each blade and 4) blade aerodynamic twisting forces.

(a) The spring and counterweight forces attempt to rotate the blades to higher blade angle while the centrifugal twisting moment of each blade is generally toward lower blade angle.

(b) Blade aerodynamic twisting force is generally very small in relation to the other forces and can attempt to increase or decrease blade angle.

(4) The summation of the propeller forces is toward higher pitch (low RPM) and is opposed by a variable force toward lower pitch (high RPM).

(a) The variable force is oil under pressure from a governor with an internal pump that is mounted on and driven by the engine.

(b) The oil from the governor is supplied to the propeller and hydraulic piston through a hollow engine shaft. Increasing the volume of oil within the piston and cylinder will decrease the blade angle and increase propeller RPM.

(c) Decreasing the volume of oil will increase blade angle and decrease propeller RPM.

(d) By changing the blade angle, the governor can vary the load on the engine and maintain constant engine RPM (within limits), independent of where the power lever is set.

(e) The governor uses engine speed sensing mechanisms that allow it to supply or drain oil as necessary to maintain constant engine speed (RPM).

(5) If governor supplied oil is lost during operation, the propeller will increase pitch and feather.

(a) Feathering occurs because the summation of internal propeller forces causes the oil to drain out of the propeller until the feather stop position is reached.

(6) Normal in-flight feathering is accomplished when the pilot retards the propeller condition lever past the feather detent.

(a) This allows control oil to drain from the propeller and return to the engine sump.

(b) Engine shutdown is normally accomplished during the feathering process.

(7) Normal in-flight unfeathering is accomplished when the pilot positions the propeller condition lever into the normal flight (governing) range and restarts the engine.

(a) As engine speed increases, the governor supplies oil to the propeller and the blade angle decreases.

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TESTING AND FAULT ISOLATION - CONTENTS

LIST OF FIGURES

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1. Troubleshooting Guide

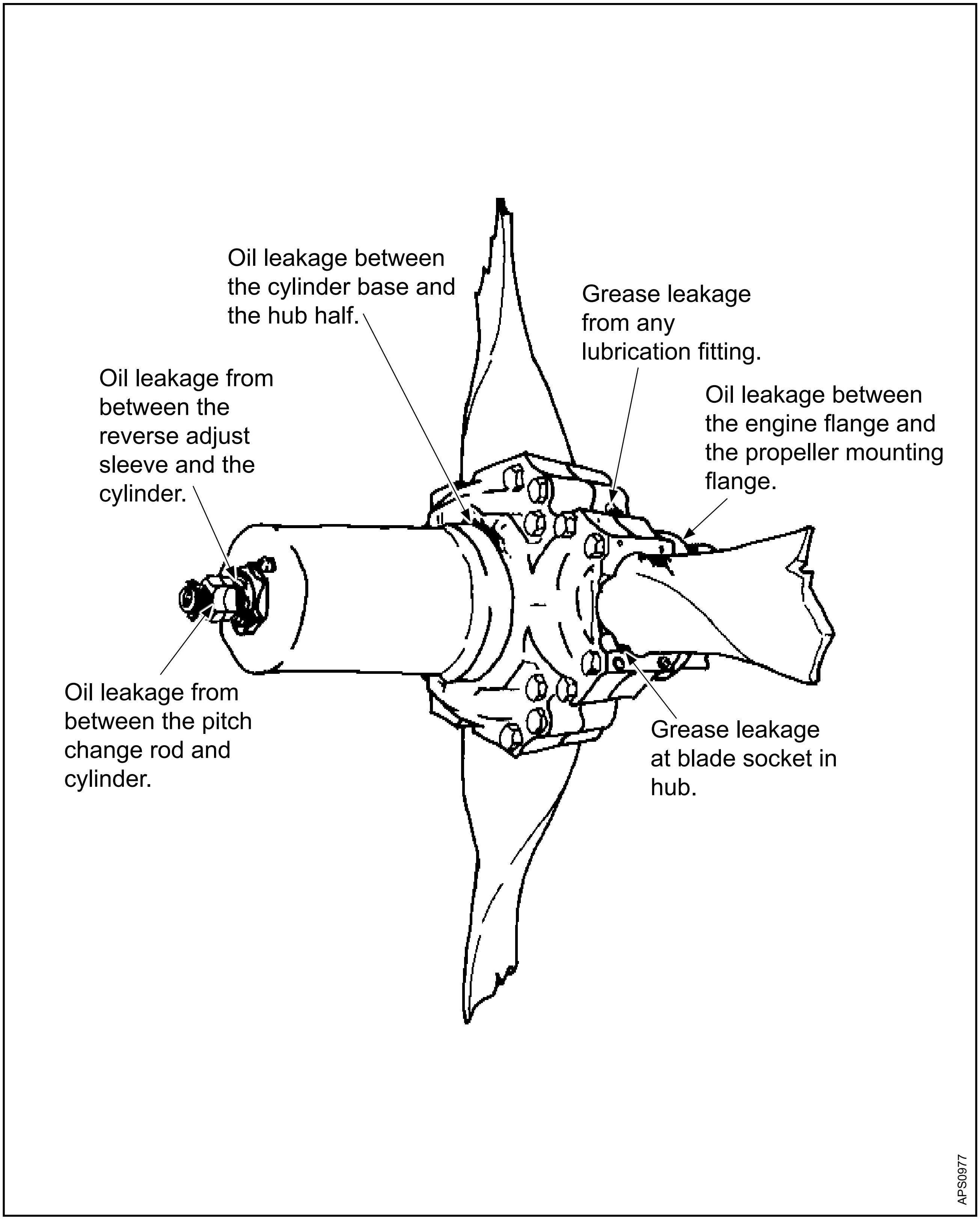
CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

The purpose of this chapter is to isolate probable causes and suggest remedies for common propeller service problems. In all cases, the remedy for a problem should follow the procedures detailed in the applicable section of this manual.

Problem		Probable Cause	Remedy
A. Pitch Control Difficulty		Excessive friction in moving parts.	Refer to problem B, Friction.
	or	Oil passages are not clear and open.	Check the hydraulic system.
	or	Incorrect governor has been installed.	Refer to the airframe or the engine manufacturer's maintenance manual for installation instructions.
B. Friction		Lack of lubrication.	Add approved lubricant.
	or	Blade Preload is excessive.	Disassemble the propeller and readjust the blade preload.
	or	Balls in the blade retention split-bearing are unusually rough, corroded, or chipped.	Replace the blade retention split-bearing assembly.
	or	Insufficient clearances between various moving parts in the pitch change mechanism.	Check the moving parts individually. Increase the clearances between the individual parts as necessary to decrease friction in the mechanism.

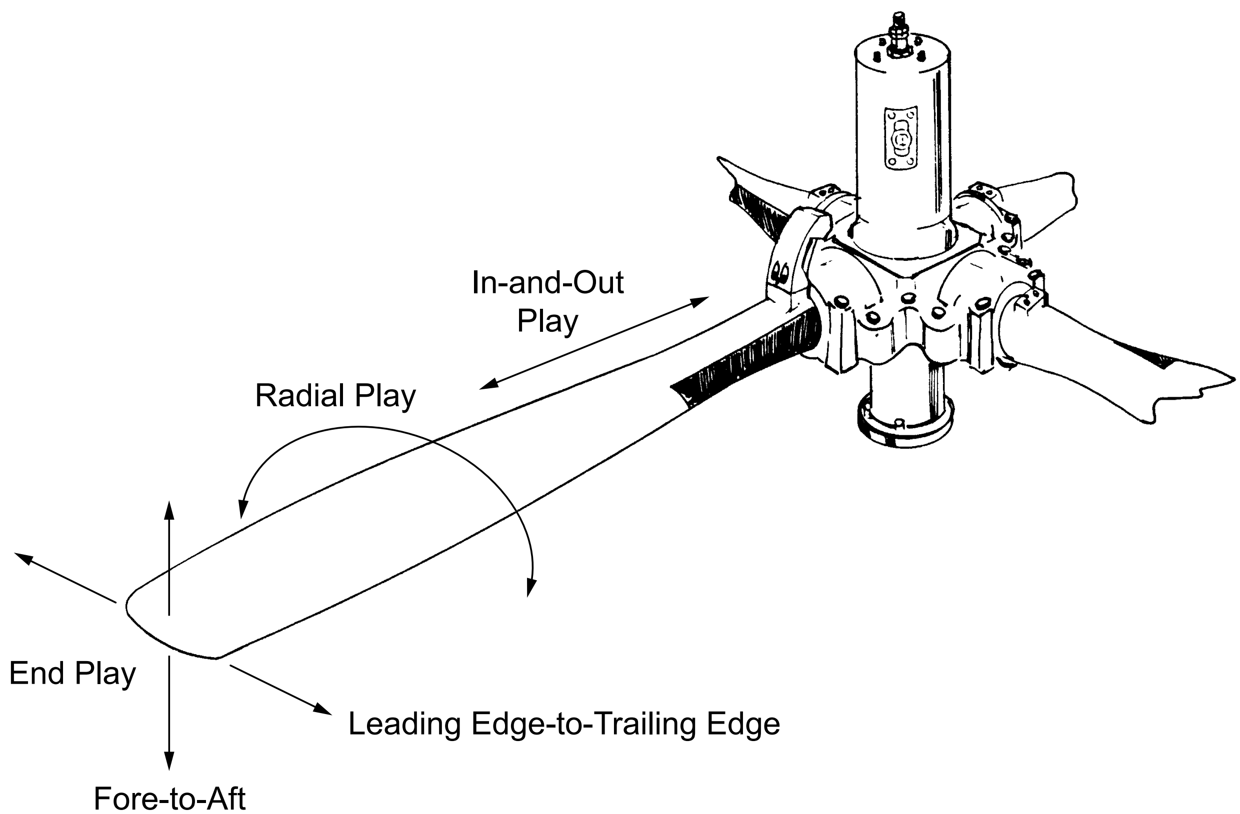
Problem		Probable Cause	Remedy
C. Abnormal Propeller Vibration		Aerodynamic Imbalance	Inspect blade track.
	or	Mass Imbalance	Refer to Grease Leakage Problem in this manual.
	or	Bent, cracked, or damaged blade.	For aluminum blades, refer to Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33).
	or	Cracked or damaged hub.	Refer to the Aluminum Hub Overhaul chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).
	or	Broken blade retention split bearings.	Replace the bearings and inspect the other blade retention components.
D. Slight Vibration		Grease Leakage	Refer to Grease Leakage Problem in this chapter.
	or	Dynamic balance incorrect.	Refer to the Static and Dynamic Balance chapter in Hartzell Propeller Standard Practices Manual 202A (61-01-02).
	or	Blades not tracking.	Refer to Blades Not Tracking Problem in this chapter.
	or	Static balance incorrect.	Refer to the Static and Dynamic Balance chapter in Hartzell Propeller Standard Practices Manual 202A (61-01-02).
	or	Blade Wear	For aluminum blades, refer to Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33).

Problem		Probable Cause	Remedy
E. Surging RPM or Torque		Excessive friction in the pitch change mechanism.	Refer to Friction Problem in this chapter.
	or	Air is trapped in the propeller actuating piston or in the engine shaft.	After propeller installation and before each flight, exercise the propeller by changing pitch or feathering. The engine should have a provision for allowing trapped air to escape from the system during one-half of the pitch cycle.
	or	Governor problem.	Refer to the airframe or the engine manufacturer's maintenance manual for installation instructions.



Inspection for Leakage of Oil or Grease
Figure 1-1

Problem		Probable Cause	Remedy
F. Oil Leakage (Refer to Figure 1-1)		Faulty O-ring seal between the engine flange and the propeller mounting flange.	Remove the propeller from the engine and inspect the O-ring and the sealing surface. Replace the defective O-ring.
	or	Faulty O-ring seal between the cylinder and the hub.	Remove the cylinder and inspect the O-ring and the sealing surface. Replace the defective O-ring.
	or	Faulty O-ring seal between the piston and the cylinder, resulting in leakage between the sleeve unit and the cylinder.	Remove the cylinder and inspect the piston O-ring and cylinder sealing surface. Replace the defective O-ring.
	or	Faulty O-ring seal between the pitch change rod and either hub half, resulting in leakage from the hub and around the blade shanks.	Remove the propeller form the engine and disassemble. Inspect both O-rings and sealing surfaces. Replace the defective O-ring(s).
G. Grease Leakage (Refer to Figure 1-1) NOTE 1: The blade retention split-bearing is the only source for grease leakage. NOTE 2: A new or newly overhauled propeller may leak slightly during the first several hours of operation. The leakage may be caused by the seating of seals and o-rings and the slinging of lubricants used during assembly. Such leakage should cease within the first ten hours of operation.		Defective lubrication fitting.	Replace defective lubrication fittings.
	or	Too much grease was used for lubrication, resulting in leakage.	Disassemble the propeller and remove excess grease from the hubs.
	or	Faulty seal at blade socket in hub.	Disassemble the propeller and inspect the seal and the sealing surface. Replace defective seal. Reapply approved adhesive sealant to mating surfaces of the hub halves.



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

TPI-LW-143A-01412

Checking Blade Play
Figure 1-2

Problem	Probable Cause	Remedy
H. End-Play (Leading Edge to Trailing Edge) of the Blade Refer to Figure 1-2 and the section, "Blade Tolerances" in the Fits and Clearances chapter of this manual.	Buildup of manufacturing tolerances.	Disassemble the propeller and reset the preload. Replace the preload plate unit (570), if necessary.
	or Blade retention bearing (620) is worn.	Follow Blade Retention Split Bearing Inspection and Replacement Procedures.
	or Internal blade bearing is worn.	Disassemble the propeller, remove the blade, and inspect the bearing. Replace the worn bearing.
I. End-Play (Fore-to-Aft) of the Blade Refer to Figure 1-2 and the section, "Blade Tolerances" in the Fits and Clearances chapter of this manual.	Buildup of manufacturing tolerances.	Disassemble the propeller and reset the preload. Replace the preload plate unit (570), if necessary.
	or Blade retention bearing (610) is worn.	Follow Blade Retention Split Bearing Inspection and Replacement Procedures.
	or Internal blade bearing is worn.	Disassemble the propeller, remove the blade, and inspect the bearing. Replace the worn bearing.
J. In-and-Out Play of the Blade Refer to Figure 1-2 and the section, "Blade Tolerances" in the Fits and Clearances chapter of this manual.	Buildup of manufacturing tolerances.	Disassemble the propeller and reset the preload. Replace the preload plate unit (570), if necessary.
	or Blade retention bearing (610) is worn.	Follow Blade Retention Split Bearing Inspection and Replacement Procedures.
K. Excessive Radial Play of the Blade (backlash) Refer to Figure 1-2 and the section, "Blade Tolerances" in the Fits and Clearances chapter of this manual.	Pitch change fork is worn.	Disassemble the propeller. Inspect and replace the fork, as required.
	or Pitch change cam follower (540) is worn.	Disassemble the propeller. Inspect and replace the cam follower, as required.

Problem		Probable Cause	Remedy
L. Blades Not Tracking Refer to the section, "Blade Tolerances" in the Fits and Clearances chapter of this manual for blade track tolerances.		Ground strike damage.	For aluminum blade repair procedure, refer to Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33).
	or	Blade twist is not correct.	For aluminum blade repair procedure, refer to Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33).

2. Lightning Strike on Hub or Blade (Rev. 3)

A. Before Further Flight

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

(a) A lightning strike on the propeller usually leaves arcing damage on the hub or blade, as evidence of where it entered or left the propeller.

(b) Refer to the Special Inspections chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02) for lightning strike inspection criteria.

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AUTOMATIC TEST REQUIREMENTS (NOT APPLICABLE) (Rev. 2)

NOTE: In accordance with ATA iSpec 2200 specification, this space is reserved for automatic test requirements. Such requirements are not applicable to the Hartzell propeller models included in this manual.

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DISASSEMBLY - CONTENTS

LIST OF FIGURES

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1. Important Information (Rev. 4)

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

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER 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 IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

A. Removing the Propeller

(1) Remove the propeller from the aircraft in accordance with the applicable Hartzell Propeller owner's manual.

B. Record Serial Numbers/Blade Location Before Disassembly

(1) Make a record of the serial number and model number of the hub, blades, and any other serial-numbered parts and compare with the data in the propeller logbook.

(a) For the location of the serial number on the hub, refer to the Parts Identification and Marking chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

CAUTION 1: DO NOT ETCH, SCRIBE, PUNCH MARK, OR SIMILARLY IDENTIFY PARTS IN ANY MANNER THAT MAY BE HARMFUL TO THE STRENGTH OR FUNCTION OF THE PROPELLER.

CAUTION 2: GRAPHITE ("LEAD") PENCIL MARKS WILL CAUSE CORROSION. ALL MARKS MADE ON PARTS MUST BE MADE WITH A CRAYON OR SOFT, NON-GRAPHITE PENCIL SUCH AS CM162.

(2) Before disassembly, use a crayon or soft, non-graphite pencil such as CM162 to number the blades counterclockwise from the propeller serial number impression stamped on the propeller hub unit.

(a) Make a record of each blade serial number and the hub socket/arm from which it was removed.

C. Ice Protection System (if applicable)

(1) If the propeller is equipped with an ice protection system supplied by Hartzell, refer to Hartzell Propeller Ice Protection System Manual 180 (30-61-80) for technical information about the applicable ice protection system.

(2) If the propeller is equipped with an ice protection system not supplied by Hartzell Propeller, refer to the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA) for technical information about the applicable ice protection system.

2. Propeller Disassembly

WARNING: THE USE OF BLADE PADDLES TO MOVE BLADES CAN RESULT IN THE OVERLOAD AND DAMAGE OF THE BLADE PITCH CHANGE MECHANISM. THIS DAMAGE IS NOT REPAIRABLE AND CAN RESULT IN SEPARATION BETWEEN THE BLADE AND THE PITCH CHANGE MECHANISM, CAUSING LOSS OF PITCH CONTROL DURING FLIGHT.

CAUTION 1: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

CAUTION 2: USE COMPRESSED AIR THAT HAS BEEN FILTERED FOR MOISTURE, OR NITROGEN TO ACTUATE THE PROPELLERS.

CAUTION 3: DO NOT USE MORE THAN 200 PSI (13.78 BARS) OF PRESSURE WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

CAUTION 4: USE ENOUGH PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

A. Hub Balance Weight Removal

(1) Remove the safety wire from the balance weight fillister head screws or hex head bolts (700), whichever is applicable.

(2) Remove and discard the balance weight fillister head screws or hex head bolts (700), whichever is applicable.

(3) Remove the balance weights (710).

B. Counterweight Removal

(1) Aluminum Blade Counterweight Removal

(a) Remove and discard all counterweight slug nuts (9060) and bolts (9050).

(b) Remove the counterweight slugs (9040).

(c) For counterweight removal instructions, refer to the Blade Shank Overhaul chapter of Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33).

(2) Composite Blade Counterweight Clamp Removal

(a) For counterweight clamp removal instructions, refer to the Overhaul chapter of Hartzell Propeller Composite Blade Overhaul Manual 135F (61-13-35).

C. Hydraulic System and Pitch Adjustment Unit Disassembly

(1) Remove and discard the hex head bolt (220), self-locking hex nut (200), and flat washer (210).

(2) Remove and discard the safety wire from the drilled thin hex nuts (10, 20) on the pitch change rod.

(3) Apply 200 psi (13.8 bar) air or oil pressure to the propeller to move the pitch change rod drilled thin hex nuts (10, 20) off the reverse adjust sleeve (120).

(4) Separate the drilled thin hex nuts (10, 20) from each other, by rotating in opposite directions.

(5) Remove the drilled thin hex nuts (10, 20) from the pitch change rod (230).

(6) Release the air pressure from the propeller to reach maximum feather angle.

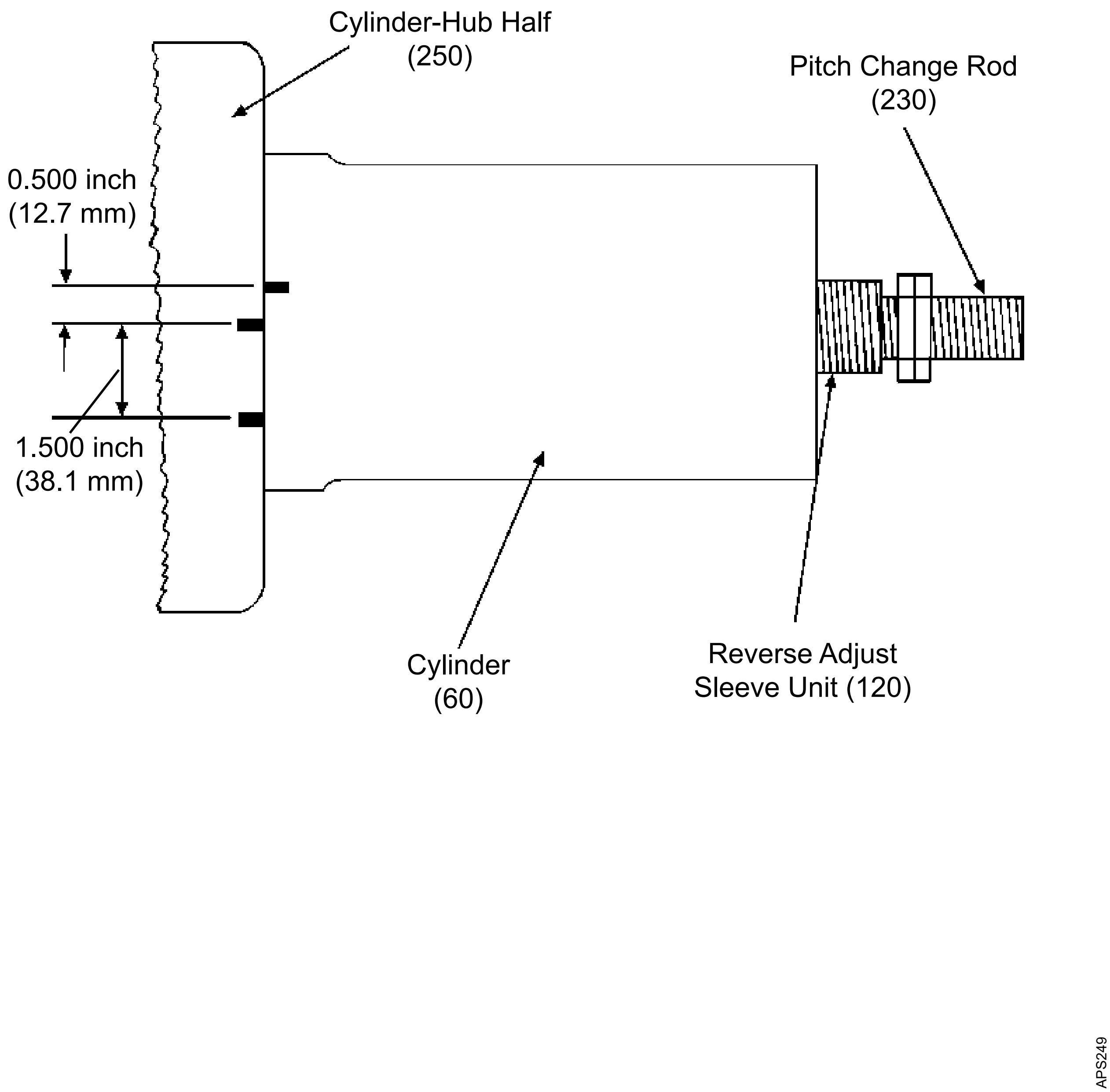
WARNING: PROPELLER BLADE ANGLE MUST BE AT FEATHER POSITION WITH ALL AIR PRESSURE RELEASED BEFORE CONTINUING DISASSEMBLY.

(7) Turn the pitch change rod plug (40) and remove from the pitch change rod (230).

(8) For a propeller that does not have a UID Plate:

(a) Remove and discard the safety wire between the fillister head screw (70) on the cylinder (60) and the drilled thin hex nut (30) on the reverse adjust sleeve unit (120).

(b) Remove and discard the fillister head screw (70) and flat washer (80) from the cylinder (60).



Cylinder Removal
Figure 3-1

(9) For a propeller that has a UID Plate:

(a) Remove and discard the safety wire between the fillister head screws (71) on the cylinder (60) and the drilled thin hex nut (30) on the reverse adjust sleeve unit (120).

(b) Remove and discard the fillister head screws (71) and flat washers (81) from the cylinder (60).

(10) Loosen and remove the drilled thin hex nut (30) from the reverse adjust sleeve unit (120).

WARNING: THE FEATHERING COMPRESSION SPRING IS PRELOADED TO APPROXIMATELY 600 POUNDS (271.8 kg) OF FORCE. FAILURE TO FULLY COMPRESS THE FEATHERING COMPRESSION SPRING INTO THE CYLINDER BEFORE CYLINDER REMOVAL COULD RESULT IN INJURY OR DEATH.

(11) Turn the reverse adjust sleeve unit (120) counterclockwise with a 1-3/16 inch open-end wrench on the flats, to fully compress the feathering compression spring (100).

NOTE: The feathering compression spring (100) will compress between the cylinder (60) or forward spring retainer (90) and the spring guide (110).

(12) Rotate the blades by hand to confirm that the feathering compression spring (100) is fully compressed.

(13) Attach a cylinder wrench TE153 to the top of the cylinder (60).

NOTE: Install a 1/4-28 UNF-3B screw through the wrench TE153 into each of the four threaded holes provided in the cylinder (60).

WARNING: USE EXTREME CAUTION WHEN REMOVING THE CYLINDER AND FEATHERING COMPRESSION SPRING ASSEMBLY. WHEN COMPRESSED, THE FEATHERING COMPRESSION SPRING ASSEMBLY IS LOADED TO APPROXIMATELY 1800 POUNDS (815.4 kg) FORCE. ENSURE THE SAFETY OF PERSONNEL IN THE VICINITY DURING THE DISASSEMBLY PROCEDURES.

CAUTION: DO NOT DAMAGE THE CYLINDER THREADS WHEN REMOVING THE CYLINDER (60) FROM THE HUB (250).

(14) Removing the cylinder (60) from the hub (250).

(a) Using permanent ink, place a mark on the lower end of the cylinder (60), then place a mark on the hub (250) 0.500 inch (12.7 mm) counterclockwise from the mark on the cylinder. Place another mark on the hub 1.500 inches (38.1 mm) counterclockwise from the first hub marking. Refer to Figure 3-1.

(b) Using a breaker bar, turn the cylinder (60) counterclockwise 0.500 inch until the mark on the cylinder lines up with the first mark on the hub (250).

CAUTION: ACTUAL TORQUE SETTINGS MUST BE CORRECTED TO INCLUDE THE LENGTH OF THE CYLINDER WRENCH USING THE TORQUE VALUES FORMULA IN FIGURE 8-1 OF THE FITS AND CLEARANCES CHAPTER OF THIS MANUAL.

(c) Using a calibrated torque wrench to apply 235 Ft-Lb (319 N•m) of corrected torque to the cylinder threads, turn the cylinder (60) counterclockwise 1.500 inches (38.1 mm) until the mark on cylinder lines up with second mark on the hub (250). Make sure that the torque required to turn the cylinder the required 1.500 inches (38.1 mm) does not exceed 235 Ft-Lb (319 N•m). If the torque exceeds 235 Ft-Lb (319 N•m), refer to the Cylinder Removal section in the Repair chapter of this manual.

(d) If the torque required to turn the cylinder (60) an additional 1.500 inches (38.1 mm) did not exceed 235 Ft-Lb (319 N•m), reset the torque wrench to achieve an actual torque of 55 Ft-Lb (75 N•m). If the torque required to remove the cylinder exceeds 55 Ft-Lb (75 N•m) actual torque, refer to the Cylinder Removal section in the Repair chapter of this manual.

(e) Turn the cylinder (60) counterclockwise to remove the cylinder from the hub (250). Make sure that torque required to remove the cylinder does not exceed 55 Ft-Lb (75 N•m).

(15) Lift the cylinder (60) and the retained feathering compression spring (100) off the pitch change rod (230) and place on a bench for further disassembly.

(16) Remove the cylinder wrench TE153 from the cylinder (60) by removing the four (4) 1/4-28 UNF-3B screws that hold them together.

(17) Rotate the reverse adjust sleeve unit (120) clockwise to extend the feathering compression spring (100) and turn the reverse adjust sleeve unit from the cylinder (60).

NOTE: The feathering compression spring (100) will fully extend before the reverse adjust sleeve unit (120) turns from the cylinder (60).

(18) Remove the reverse adjust sleeve (120), spring retainer (110), feathering compression spring (100), and forward spring retainer (90), if applicable, from the cylinder (60).

NOTE: If the propeller contains the C-447 feathering compression spring (100), B-442 spring retainer (110), and B-476 sleeve unit (120), the forward spring retainer (90) will not exist. If the propeller contains a B-6768 forward spring retainer (90), it will also contain a C-6760 feathering compression spring (100), B-6761 spring retainer (110), and B-6758 sleeve unit (120).

(19) Install the modified deep well socket TE120 over the pitch change rod and on the self-locking hex piston nut (150). Engage the modified deep well socket TE120 with a 1-3/8 inch crowfoot wrench and remove the pitch change rod (230) and piston (160) from the fork (450).

(a) If the self-locking hex nut (150) comes loose from the pitch change rod (230) and piston (160) before the pitch change rod comes loose from the fork (450), perform the following procedure:

1 Remove and discard the self-locking hex nut (150) from the pitch change rod (230).

2 Remove the piston (160) from the pitch change rod (230).

3 Using a 1-5/16 inch wrench, unthread and remove the pitch change rod (230) from the fork (450).

(b) If the pitch change rod (230) comes loose from the fork (450) before the self-locking hex nut (150) comes loose, perform the following procedures:

1 Remove the pitch change rod (230) with the self-locking hex nut (150) and piston (160) from the fork (450).

2 Place the modified deep well socket TE120 on the self-locking hex nut (150).

3 Engage the modified deep well socket TE120 with a 1-3/8 inch crowfoot wrench.

4 Using a 1-5/16 inch wrench, engage the pitch change rod (230) flats under the piston (160) to loosen the self-locking hex nut.

5 Remove and discard the self-locking hex nut (150) from the pitch change rod (230).

6 Remove the piston (150) from the pitch change rod (230).

(20) Remove and discard the piston felt dust seal (180), piston OD O-ring (190), and piston ID O-ring (170).

(21) Remove and discard the cylinder mounting O-ring (240) from the cylinder-half hub shoulder.

(22) Remove all hex head bolts (370, 380), flat washers (390), and self-locking hex nuts (400) from the hub unit (250).

(23) Discard all self-locking hex nuts (400) and flat washers (390).

CAUTION 1: DO NOT DAMAGE BLADE WHILE TRYING TO SEPARATE THE HUB HALVES.

CAUTION 2: IF THE PROPELLER IS EQUIPPED WITH A DE-ICE SYSTEM, TAP THE BLADE IN A PLACE OTHER THAN THE BOOT AREA.

(24) With a soft mallet, lightly tap the end of one blade to loosen and separate the halves of the hub unit (250).

CAUTION: DO NOT USE A SCREWDRIVER OR OTHER SHARP TOOL TO PRY THE HUB HALVES (250) APART.

(25) Use a plastic wedge TE138, or similar tool, to gently pry the hub halves (250) apart.

CAUTION: USE CARE TO KEEP THE BLADE ASSEMBLIES FROM FALLING OUT OF THEIR SOCKETS WHEN THE CYLINDER-SIDE HALF OF THE HUB UNIT IS REMOVED.

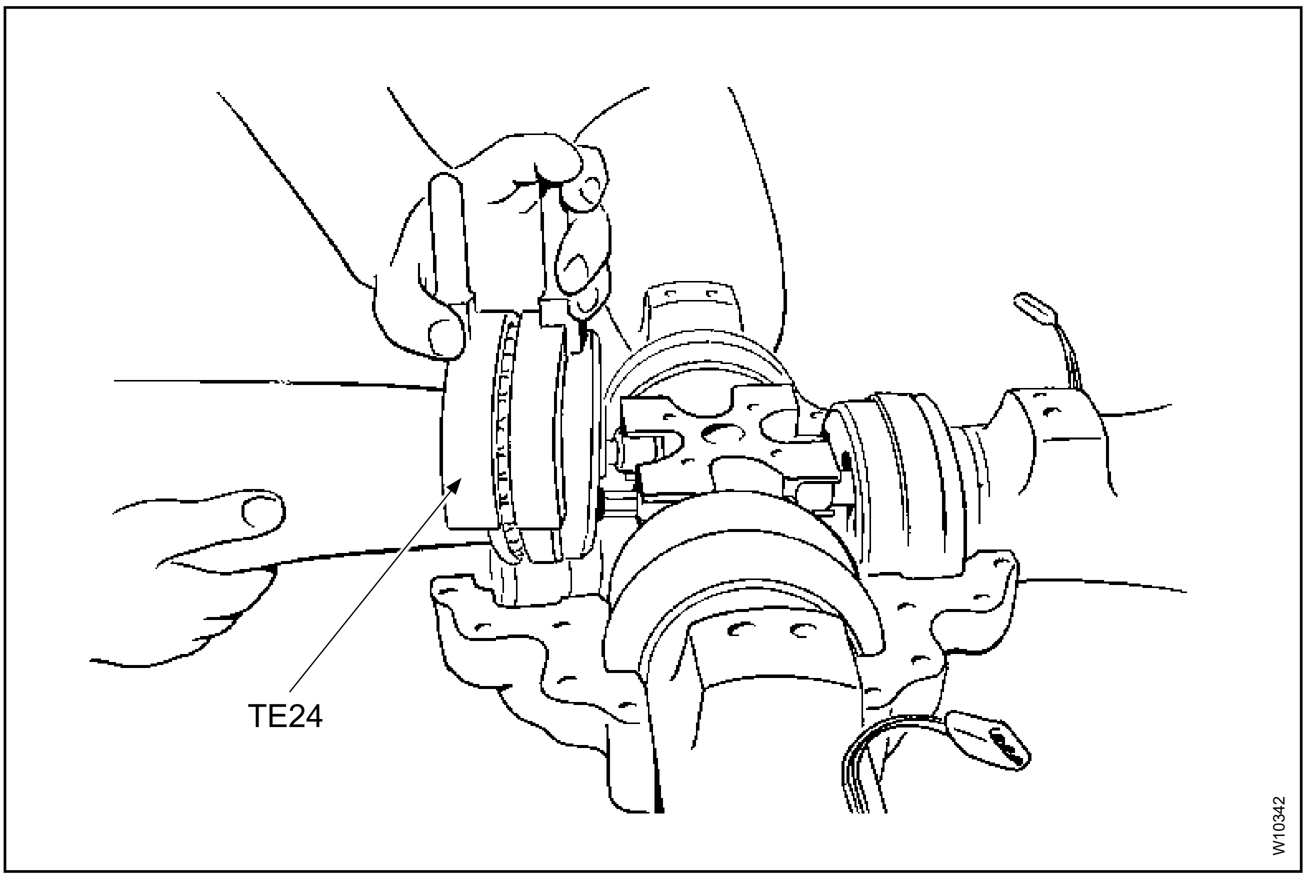
(26) Remove the cylinder-side hub half of the hub unit (250).

(27) Remove and discard the cylinder-side hub half O-ring (260) that seals between the hub unit (250) and pitch change rod (230).

(28) Using blade clamp TE24, if desired, remove two adjacent blade assemblies from the fork (450) and hub half (250). Refer to Figure 3-2.

(29) Remove the fork unit (450).

(30) Remove the two remaining blade assemblies from the hub half (250).



Removing Blades from the Hub
Figure 3-2

(33) Remove and discard the spinner bulkhead mounting bolts and washers.

NOTE: This permits the engine-side spinner bulkhead unit to drop clear of the engine-side hub half that remains on the rotatable fixture.

(34) Remove the engine-side hub half (250) from the rotatable fixture.

(35) Remove the spinner bulkhead from the rotatable fixture bench.

D. Pitch Change Fork Disassembly

(1) Using a 3/8 inch wrench, turn and remove the bumper extension (460) from each fork arm.

CAUTION: DO NOT DAMAGE THE BUMPER EXTENSION (460) WHEN REMOVING THE FORK BUMPER (470).

(2) Remove and discard the fork bumper (470) from each bumper extension (460).

E. Pitch Change Knob Unit Disassembly

(1) Knob unit retaining washer (550).

(a) Using a suitable gear puller, pull the cam follower (540) until the knob unit retaining washer (550) comes off.

(b) Discard the knob unit washer (550).

(2) Remove and discard the cam follower (540) from the pitch change knob bracket (530).

3. Hub Disassembly

A. All Propeller Models

(1) Remove components of the hub unit (250) in accordance with the Aluminum Hub Overhaul chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

(a) The inspection criteria for hub unit components is located in the Aluminum Hub Overhaul chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

4. Blade Disassembly

A. All Propeller Models

(1) Remove and discard safety wire and silicone tubing (511), if applicable.

(2) Remove and discard the blade O-ring (670) or the two-piece seal energizer ring (680) and the blade seal, as applicable.

(3) Remove the hub-side blade bearing race (630).

(4) Remove and discard the ball bearings (640).

(5) Remove and discard the ball spacer (660).

(6) Remove the preload plate (570).

(7) Remove and discard the thin hex nut (600) and set screw (590) from the preload plate (570).

(8) Remove the blade seal (1035) from the butt of the blade, if applicable.

(9) Remove and discard the blade seal O-ring (1036), if applicable.

(10) Remove and discard the twelve point bolts (500) or self-locking screws, as applicable, that attach the pitch change knob unit (510).

B. Pitch Change Knob Bracket Unit

(1) Remove the pitch change knob bracket unit (510) from the blade using the following steps and Figure 3-3:

(a) If the dowel pin (520) stays in the blade, remove and discard the dowel pin.

(b) If the dowel pin (520) stays in the pitch change knob bracket (530), removal of the dowel pin from the pitch change knob bracket is not required.

(2) For a pitch change knob bracket (530) that uses a swaged washer to retain the cam follower (540), remove the cam follower from the pitch change knob bracket using the following steps:

(a) Install the puller TE98, or equivalent, so that the center post pushes on the pitch change knob bracket (530).

(b) Put the arms of the puller TE98, or equivalent, on the back of the cam follower (540).

(c) Turn in the handle of the puller TE98, or equivalent, to pull off the cam follower (540) and the knob unit retaining washer (550).

(d) Discard the cam follower (540) and the knob unit retaining washer (550).

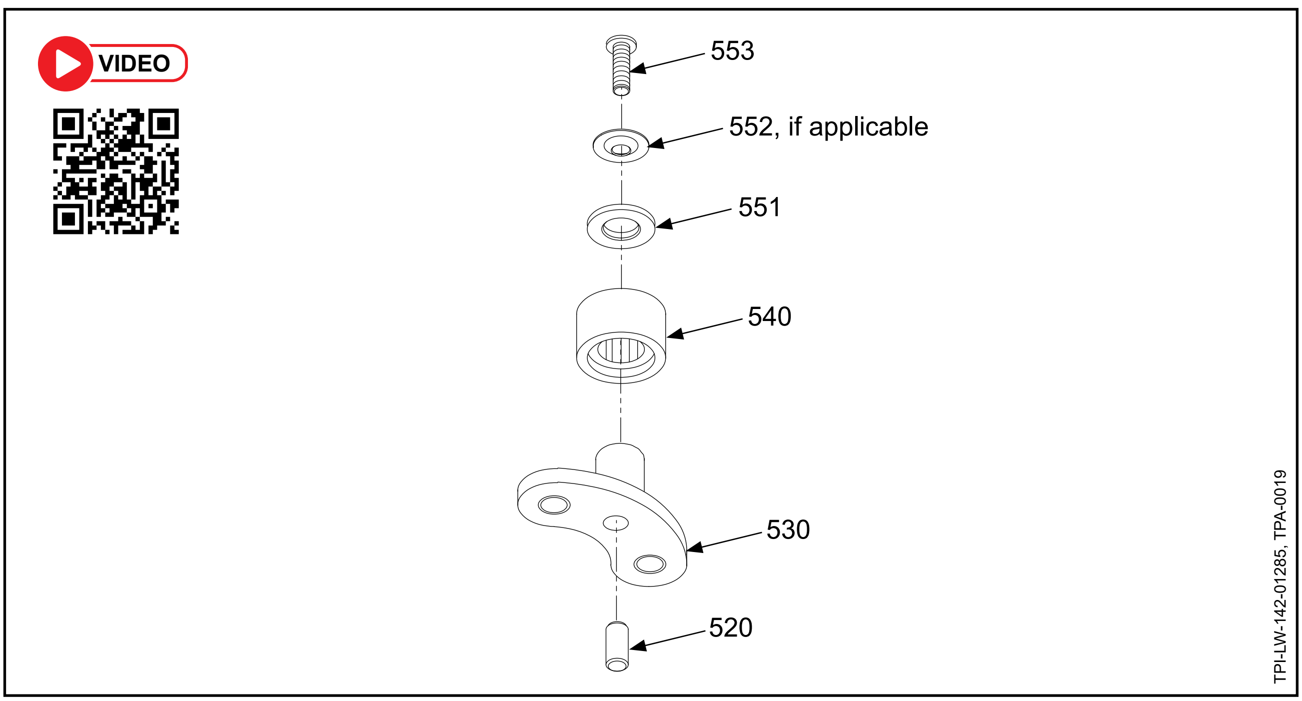
(13) For a pitch change knob bracket (530) that uses a screw to retain the cam follower (540), remove the cam follower from the pitch change knob bracket, using the following steps and Figure 3-3:

(a) Remove and discard the screw (553) from the end of the pitch change knob bracket (530).

(b) Remove and discard the dimpled washer (552).

(c) Remove the knob unit retaining washer (551).

(d) Remove and discard the cam follower (540).



Pitch Change Knob Bracket Unit Disassembly
Figure 3-3

(14) Using a suitable gear puller or brass drift, remove the bearing retaining ring (610).

(15) Remove the blade-side bearing race (650) of the blade retention bearing (620).

(16) For additional aluminum blade disassembly instructions, refer to Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33).

(17) For additional composite blade disassembly instructions, refer to Hartzell Propeller Composite Blade Overhaul Manual 135F (61-13-35).

CLEANING - CONTENTS

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1. Cleaning Procedures (Rev. 4)

A. General Cleaning

(1) Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

B. Cleaning Steel Parts for Magnetic Particle Inspection

(1) Refer to the Magnetic Particle Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

C. Cleaning Steel Parts for Cadmium Replating Procedures

(1) Refer to the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

D. Cleaning Aluminum Parts for Penetrant Inspection

(1) Refer to the Penetrant Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

E. Cleaning Titanium Parts for Penetrant Inspection

(1) Refer to the Penetrant Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

F. Cleaning Aluminum Parts for Chromic Acid Anodizing Procedures

(1) Refer to the Chromic Acid Anodizing chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

G. Cleaning Cylinder Threads (Propellers with screw-on cylinders only)

(1) It is preferable that the cylinder threads be cleaned only with solvent CM23; however, removal of sealant in the threaded area can be difficult.

CAUTION: DO NOT USE GLASS BEAD OR OTHER ABRASIVE CLEANING METHODS, AS THEY MAY CAUSE EXCESSIVE DAMAGE TO THE CYLINDER THREADS.

(2) Use plastic media in accordance with the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02) to remove the sealant from the cylinder threads.

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CHECK - CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. Inspection Interval Requirements (Rev. 2)

A. General

(1) For information about life limited components and mandatory inspections, refer to the Airworthiness Limitations chapter of the applicable Hartzell Propeller owner's manual.

(2) For overhaul periods of Hartzell propellers, refer to Hartzell Propeller Service Letter HC-SL-61-61Y.

2. Dimensional Inspection (Rev. 1)

A. Diameter Measurements

(1) When measuring the diameter of a part with a two point measuring instrument, take at least two measurements unless specified differently.

(a) Obtaining a measurement outside the specified tolerance at any point of measurement is cause for retirement of the part when a minimum of two measurements are taken.

(b) Alternately, take eight evenly spaced measurements, unless specified differently.

1 Obtaining a measurement outside the specified tolerance on three or more measurements is cause for retirement of the part when eight measurements are taken (two of eight measurements may be out of specified tolerance).

2 This alternate method may not be used to accept a diameter that has obvious damage beyond repairable (serviceable) limits.

(2) When measuring the diameter of a part with a three point measuring instrument, take one measurement. A measurement outside the specified tolerance is cause for retirement of the part.

B. Decimal Places

(1) Inspect the part features to the number of decimal places specified. If three decimal places are specified, inspect the part to three decimal places only.

3. Inspection Criteria/Procedures (Rev. 4)

A. Propeller Components (Except for those listed separately in this section)

(1) Refer to Table 5-1, "Component Inspection Criteria" in this chapter.

B. Hubs

(1) Aluminum Hubs: Refer to the Aluminum Hub Overhaul chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

C. Blades

(1) Aluminum Blades: Refer to Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33).

D. Ice Protection Systems

(1) For ice protection systems supplied by Hartzell, refer to Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(2) For ice protection systems not supplied by Hartzell, refer to the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

E. Spinner Assemblies

(1) Metal Spinners: Refer to Hartzell Propeller Metal Spinner Maintenance Manual 127 (61-16-27).

(2) Composite Spinners: Refer to Hartzell Propeller Composite Spinner Maintenance Manual 148 (61-16-48)

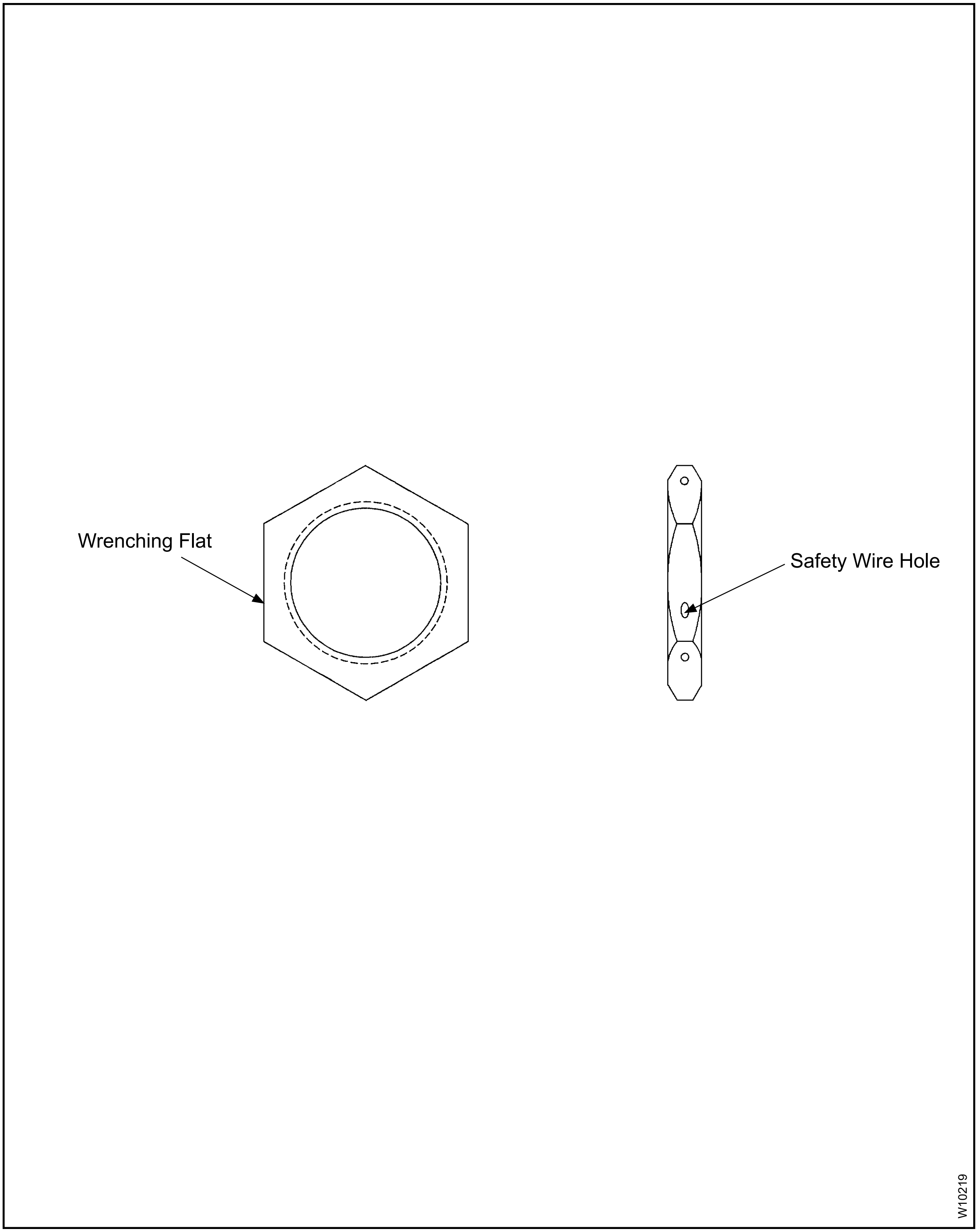
F. Special Inspections (Lightning Strike, Foreign Object Strike, etc.)

(1) Refer to the Special Inspections chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

4. Propeller Component Checks

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

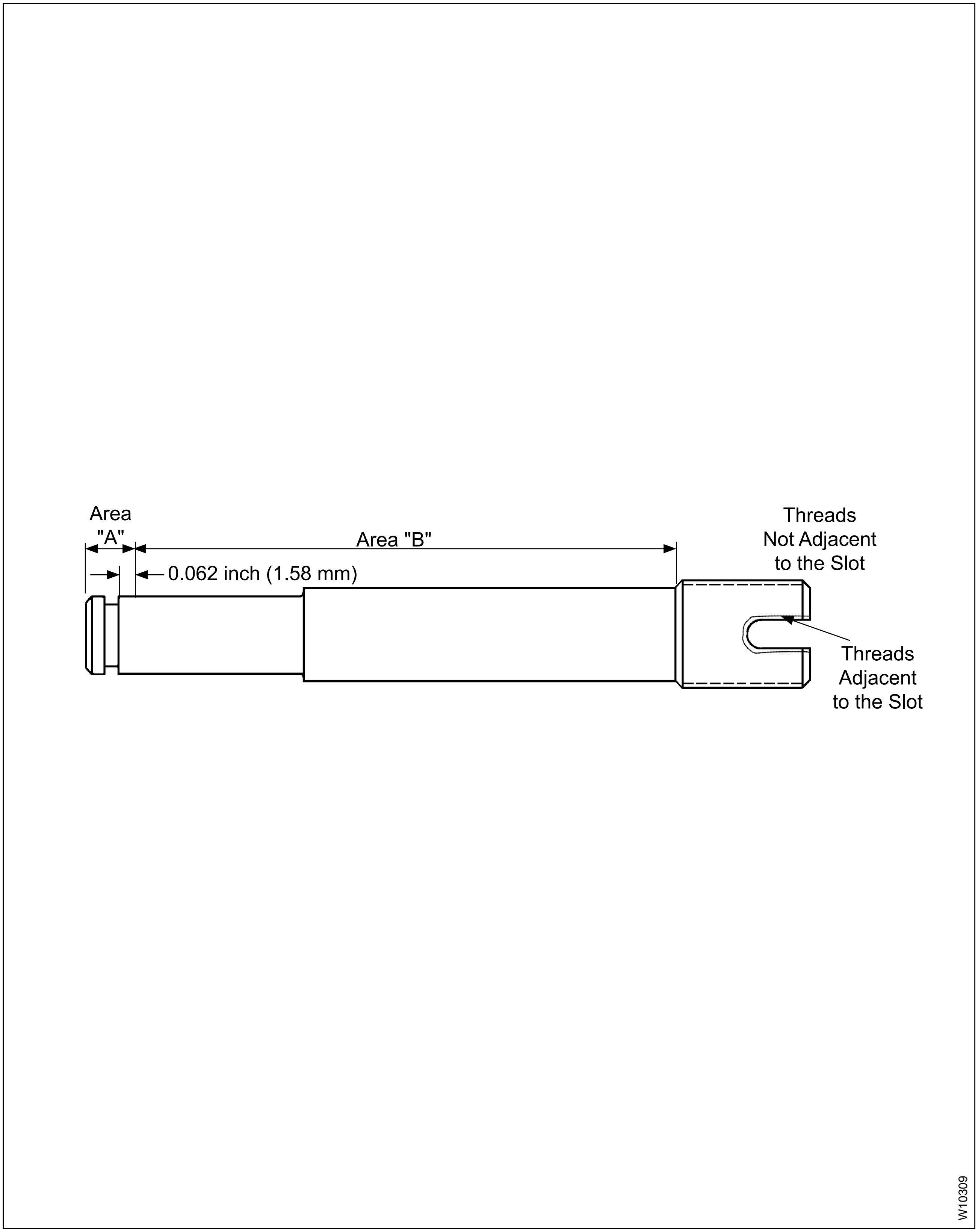
Refer to Table 5-1, "Component Inspection Criteria" in this chapter.



Drilled Thin Hex Nut
Figure 5-1

Component Inspection Criteria
Table 5-1

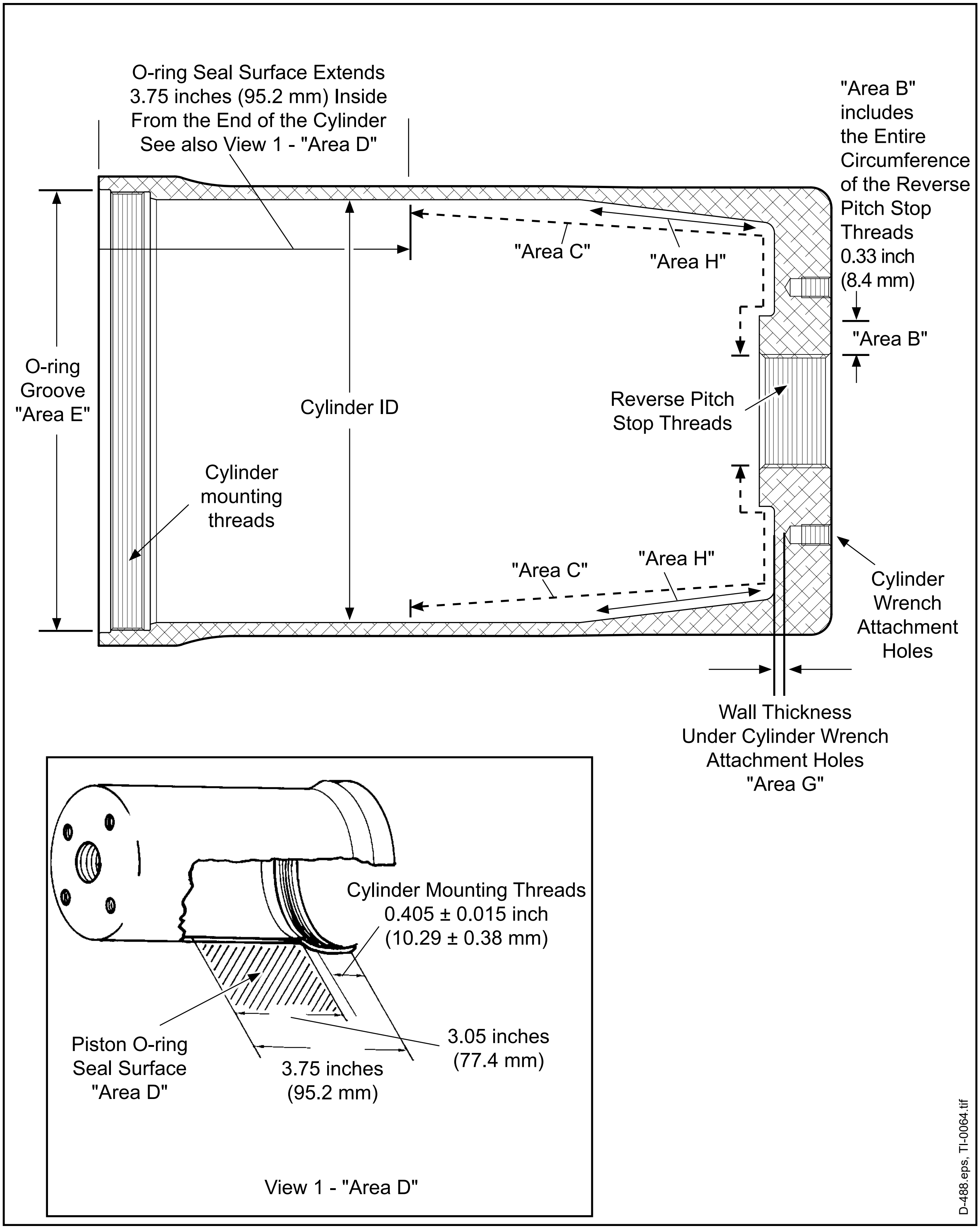
Inspect	Serviceable Limits	Corrective Action
A. DRILLED THIN HEX NUT (Item 10, 20, 30) Refer to Figure 5-1.		
(1) Visually examine each drilled thin hex nut for wrench damage.	Corners between the wrenching flats may be rounded. Two (2) wrenching flats must be sufficiently undamaged to withstand installation torque. Material may not be displaced above or below the nut that could result in interference with the mating parts.	File away unwanted material displacement. If a minimum of two (2) flats will not withstand installation torque, replace the drilled thin hex nut.
(2) Visually examine each drilled thin hex nut for corrosion product and pitting on all surfaces.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the drilled thin hex nut. If pitting is greater than the permitted serviceable limits, replace the drilled thin hex nut.
(3) Visually examine each drilled thin hex nut for wear on surfaces other than the wrenching flats.	The maximum permitted depth of material loss is 0.005 inch (0.12 mm).	If the material loss is greater than the permitted serviceable limits, replace the drilled thin hex nut.
(4) Visually examine the safety wire holes.	Wrenching flat damage must not expose the holes and prevent retention of safety wire.	If the damage is greater than the permitted serviceable limits, replace the drilled thin hex nut.
(5) Visually examine the threads.	A maximum of 1/4 of one thread total accumulated damage is permitted.	If the damage is greater than the permitted serviceable limits, replace the drilled thin hex nut.
(6) Visually examine the drilled thin hex nut for cadmium plating coverage.	Cadmium plating must be on all surfaces of the drilled thin hex nut.	If the cadmium plating coverage is less than the permitted serviceable limits, replate the drilled thin hex nut in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).



Pitch Change Rod Plug
Figure 5-2

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
B. PITCH CHANGE ROD PLUG (Item 40) Refer to Figure 5-2.		
(1) Visually examine the pitch change rod plug for corrosion product and pitting.	Corrosion product is not permitted. The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If pitting is greater than the permitted serviceable limits, replace the pitch change rod plug.
(2) Visually examine the threads of the pitch change rod plug that are not adjacent to the slot for damage.	A maximum of 1/2 of one thread total accumulated damage is permitted. Damage must not prevent correct threading into the pitch change rod.	If damage is greater than the permitted serviceable limits, replace the pitch change rod plug.
(3) Visually examine the threads adjacent to the slot for damage.	Damage must not prevent correct threading into the pitch change rod.	Thread edges adjacent to the slot only may be filed to remove damage. If damage is greater than the permitted serviceable limits, replace the pitch change rod plug.
(4) Visually examine the non-threaded areas for damage, Area "A" and Area "B".	The maximum permitted depth of damage in Area "A" is 0.005 inch (0.12 mm). The maximum permitted depth of damage in Area "B" is 0.015 inch (0.38 mm).	If damage is greater than the permitted serviceable limits, replace the pitch change rod plug.
(5) Visually examine for cadmium plating coverage.	A few random scratches are permitted; otherwise, cadmium plating must cover the pitch change rod plug.	If the cadmium plating coverage is less than the permitted serviceable limits, cadmium replate the pitch change rod plug in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).



Cylinder: D-488 and D-6539
Figure 5-3

Component Inspection Criteria
Table 5-1

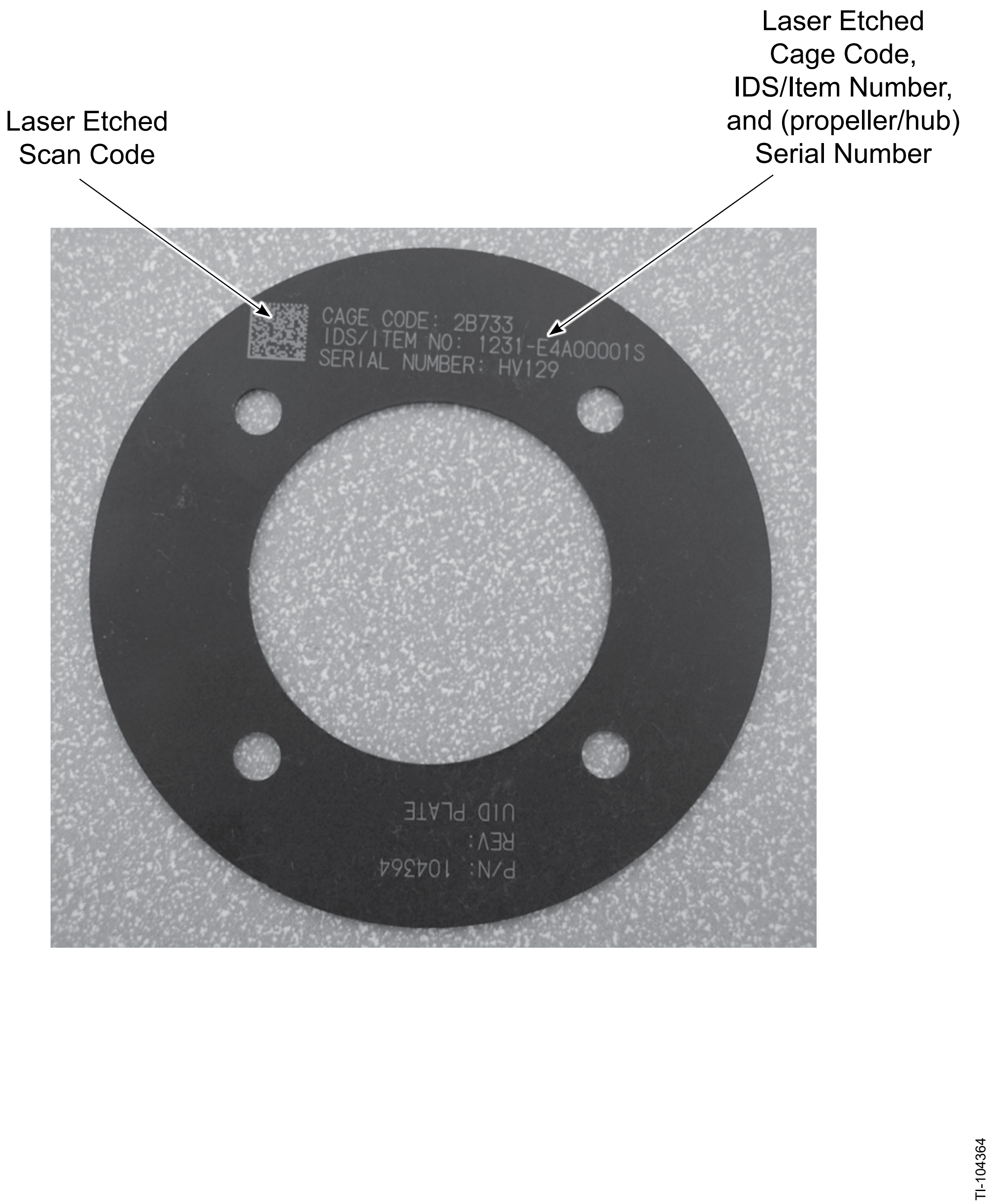
Inspect	Serviceable Limits	Corrective Action
C. <u>CYLINDER D-488 and D-6539</u> (Item 60) Refer to Figure 5-3.		
(1) Except "Area B", visually examine the external surfaces of the cylinder for wear, nicks, scratches, or other damage.	The maximum permitted damage (including linear corrosion pitting) is: 0.5 inch (12 mm) length, 0.05 inch (1.2 mm) width, and 0.005 inch (0.12 mm) depth. Two damage marks closer than 0.5 inch (12 mm) at the nearest point are not permitted. Raised material is not permitted.	Using abrasive pad CM47 or equivalent, lightly polish to blend out damage. If base aluminum is exposed, apply a chemical conversion coating in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If damage is greater than the permitted serviceable limits, replace the cylinder.
(2) Visually examine "Area B" for damage.	The maximum permitted depth of damage in "Area B" (around the entire circumference of the reverse pitch stop threads) is 0.020 inch (0.50 mm). Sufficient flat surface must remain to support the drilled thin hex nut.	If damage is greater than the permitted serviceable limits, replace the cylinder.
(3) Visually examine the cylinder wrench attachment holes for thread damage.	If there is damage, install a 1/4-28UNF-3B screw and verify that it will tighten to secure the cylinder wrench for installation and removal.	If damage is greater than the permitted serviceable limits, repair the cylinder wrench attachment holes in accordance with the Standard Repairs and Instructions chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If a previously repaired hole has damage that is greater than the permitted serviceable limits, replace the cylinder.
(4) If a cylinder wrench attachment hole is repaired with a Slimsert®, measure the depth of the cylinder wrench attachment hole ("Area G").	The minimum permitted wall thickness between the center point of the hole and the inner surface is 0.080 inch (2.03 mm).	If the wall thickness is less than the permitted serviceable limits, replace the cylinder.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
C. CYLINDER D-488 and D-6539, CONTINUED (Item 60) Refer to Figure 5-3.		
(5) Visually examine the reverse pitch stop threads for damage.	A maximum of 1/2 of one thread total accumulated damage is permitted.	If damage is greater than the permitted serviceable limits, replace the cylinder.
(6) Visually examine the cylinder-to-hub O-ring groove for wear ("Area E"). If there is wear in the O-ring groove, measure the ID. ("Area E").	D-488 Cylinder: The maximum permitted O-ring groove ID is 5.376 inches (136.55 mm) D-6539 Cylinder: The maximum permitted O-ring groove ID is 5.494 inch (139.54 mm).	If the ID is greater than the permitted serviceable limits, replace the cylinder.
(7) Visually examine the cylinder mounting threads for damage.	A maximum of 1/4 of one thread total accumulated damage is permitted.	If damage is greater than the permitted serviceable limits, replace the cylinder.
(8) Visually examine the internal surfaces, between the piston O-ring seal surface and the reverse pitch stop threads, for nicks, scratches, or other damage (Area "C").	The maximum permitted damage (including linear corrosion pitting) is: 0.5 inch (12 mm) length, 0.05 inch (1.2 mm) width, and 0.005 inch (0.12 mm) depth. Two damage marks closer than 0.5 inch (12 mm) at the nearest point are not permitted. Raised material is not permitted.	Using an abrasive pad CM47 or equivalent, lightly polish to blend out damage. If base aluminum is exposed, chemical conversion coat in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If damage is greater than the permitted serviceable limits, replace the cylinder.
(9) Visually examine the internal surface in Area "H" for material deviation	If there is material deviation, measure the internal surface in accordance with the instructions in the Repair chapter of this manual. The maximum permitted deviation of material is 0.030 inch (076 mm). A sharp corner is not permitted.	If there is a sharp corner, replace the cylinder. If the material deviation is greater than the permitted serviceable limits, replace the cylinder.

Component Inspection Criteria
Table 5-1

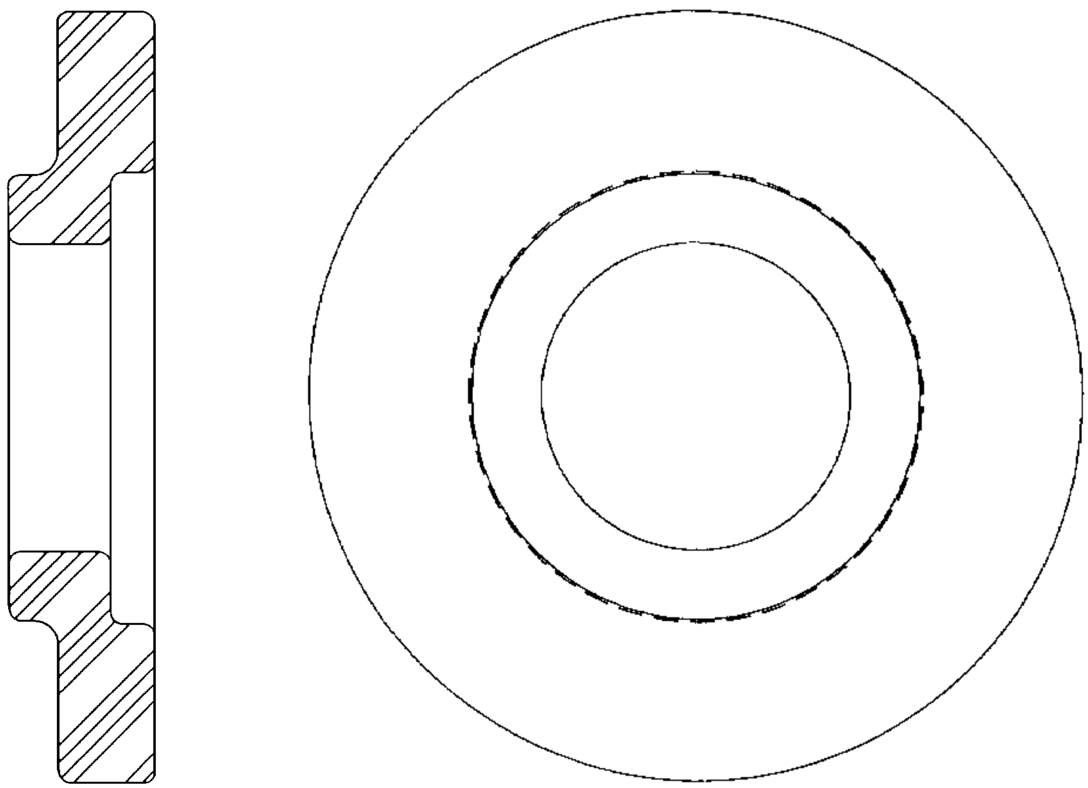
Inspect	Serviceable Limits	Corrective Action
C. CYLINDER D-488 and D-6539, CONTINUED (Item 60) Refer to Figure 5-3.		
(10) Measure the cylinder mounting thread ID within the 0.405 ± 0.015 inch (10.29 ± 0.38 mm) dimension from the end of the cylinder at six positions, 30 degrees apart.	D-488 Cylinder: The maximum permitted cylinder thread ID for the D-488 cylinder is 5.2691 inch (133.835 mm). D-6539 Cylinder: The maximum permitted cylinder thread ID for the D-6539 cylinder is 5.3000 inches (134.620 mm).	If thread ID is greater than the permitted serviceable limits, replace the cylinder.
(11) Measure the cylinder ID where the piston O-ring seals (Area "D").	The maximum permitted cylinder ID is 5.131 inches (130.33 mm).	If the cylinder ID is greater than the permitted serviceable limits, replace the cylinder.



UID Plate
Figure 5-4

Component Inspection Criteria
Table 5-1

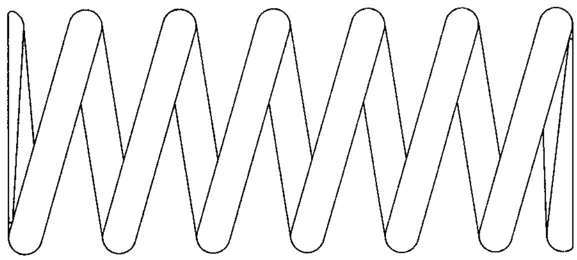
Inspect	Serviceable Limits	Corrective Action
D. UID PLATE (Item 62) Refer to Figure 5-4.		
(1) Visually examine the UID plate for damage.	Damage to the scan code is not permitted. The scan code must be able to be scanned successfully.	If damage is greater than the permitted serviceable limits, replace the UID plate. For ordering, removal, and installation instructions, refer to the section "Installing the UID Plate" in the Assembly chapter of this manual. If the UID plate must be discarded, make the 104364 UID plate unserviceable by one of the following methods: 1) Cut the plate in half through the scan code, 2) Sand the plate to remove the scan code, 3) Use any other method identified and/or required by the military/ government authority that requires the use of the UID plate.
(2) Visually examine the serial number on the UID plate.	The serial number must match the serial number of the hub.	If the serial numbers do not match or if the hub must be retired from service, replace the UID plate. If the UID plate must be discarded, make the 104364 UID plate unserviceable by one of the following methods: 1) Cut the plate in half through the scan code, 2) Sand the plate to remove the scan code, 3) Use any other method identified and/or required by the military/ government authority that requires the use of the UID plate.



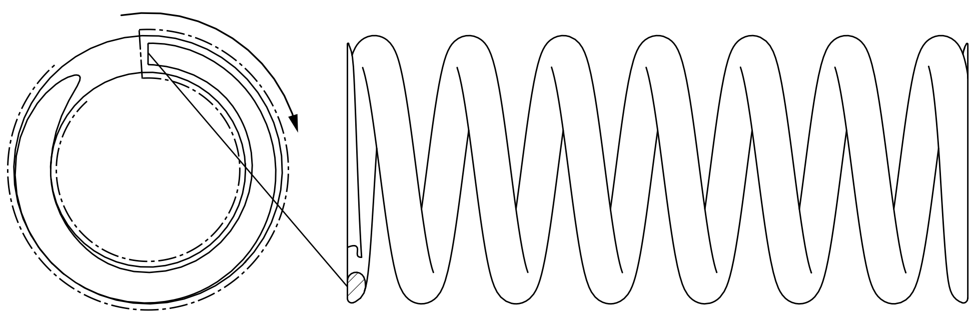
Forward Spring Retainer
Figure 5-5

Component Inspection Criteria
Table 5-1

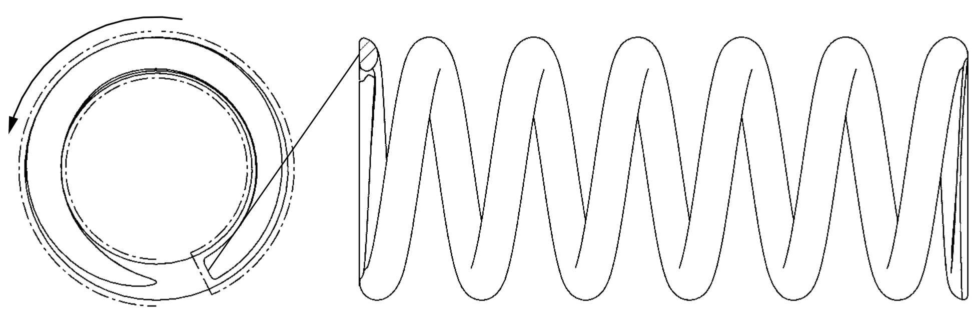
Inspect	Serviceable Limits	Corrective Action
E. FORWARD SPRING RETAINER (Item 90) Refer to Figure 5-5.		
(1) Visually examine the forward spring retainer for wear or damage	The maximum permitted depth of damage or wear is 0.020 inch (0.50 mm).	If the depth of damage or wear is greater than the permitted serviceable limits, replace the forward spring retainer.



Feathering Compression Spring



106926 Feathering Compression Spring
Right Hand Winding



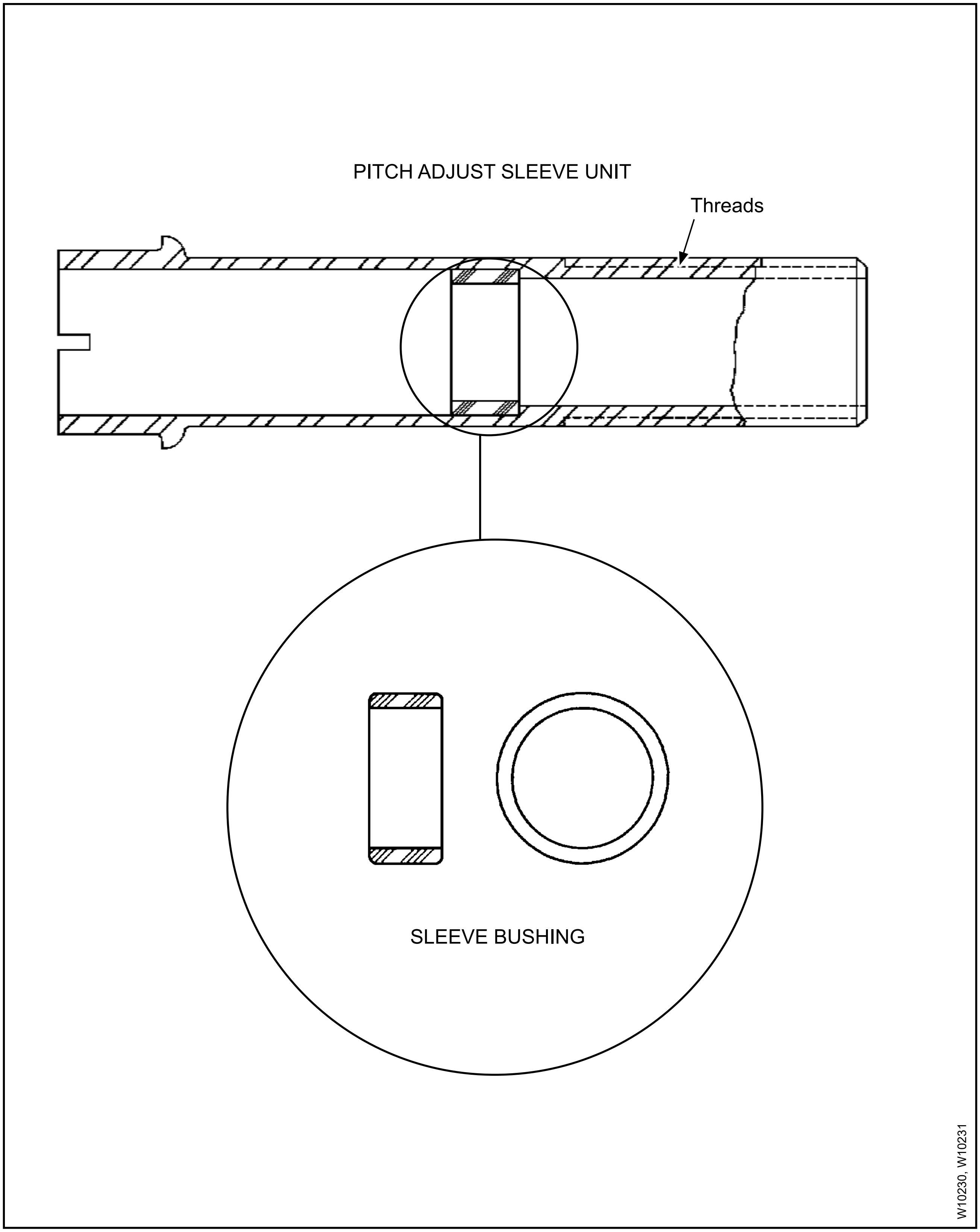
C-6760 Feathering Compression Spring
Left Hand Winding

W10226, TPI-LW-143A-00702, TPI-LW-143A-00703

Feathering Compression Springs
Figure 5-6

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
F. FEATHERING COMPRESSION SPRING (Item 100) Refer to Figure 5-6.		
NOTE: If the C-447 feathering compression spring is currently in the propeller and must be replaced, the A-6828 feathering spring kit must be used. The A-6828 feathering spring kit contains: B-6758 pitch adjust sleeve unit, C-6760 feathering compression spring, B-6761 spring guide, and B-6768 forward spring retainer.		
(1) Visually examine the feathering compression spring for corrosion product and pitting.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the feathering compression spring. If the pitting is greater than the permitted serviceable limits, replace the feathering compression spring.
(2) Visually examine the feathering compression spring for wear, nicks, or other damage.	The maximum permitted depth of wear, nicks, or other damage is 0.005 inch (0.12 mm).	If wear, nicks, or damage is greater than the permitted serviceable limits, replace the feathering compression spring.
(3) Magnetic particle inspect the feathering compression spring in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). Do not strip the original zinc plating or zinc chromate primer.	A relevant indication is not permitted.	If there is a relevant indication, replace the feathering compression spring.
(4) After magnetic particle inspection, visually examine the feathering compression spring for zinc plating or zinc chromate primer coverage.	A few random scratches are permitted; otherwise, complete coverage of zinc plating or zinc chromate primer on all surfaces of the feathering compression spring is required.	Apply a layer of zinc chromate primer CM67, or equivalent, to the feathering compression spring in accordance with the Repair chapter of this manual. Do not apply zinc chromate primer before magnetic particle inspection.



Pitch Adjust Sleeve Unit and Sleeve Bushing
Figure 5-7

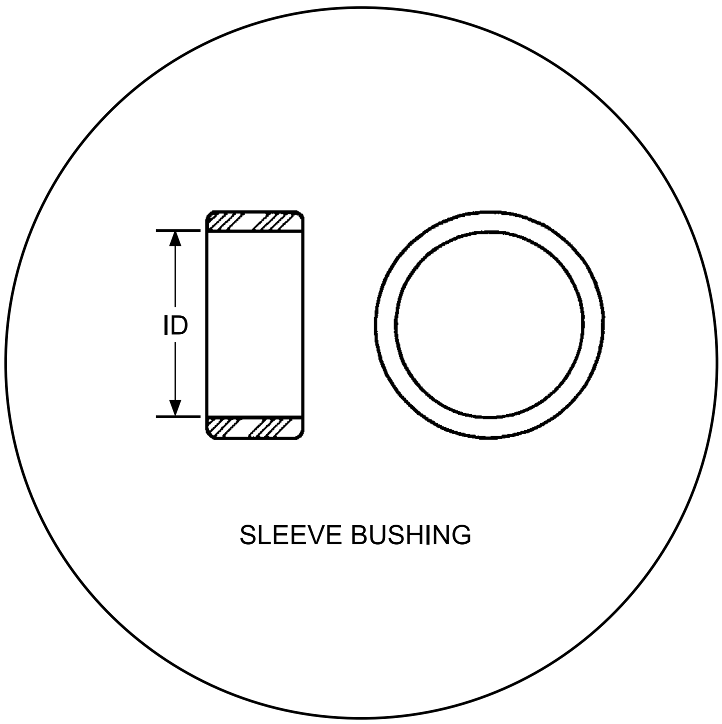
Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
G. PITCH ADJUST SLEEVE UNIT (Item 120) Refer to Figure 5-7.		

NOTE 1: If a pitch adjust sleeve unit is found cracked, in addition to replacement of the pitch adjust sleeve unit, it is now considered necessary to also replace the feathering compression spring, the spring guide, and forward spring retainer

NOTE 2: If the C-447 feathering compression spring is currently in the propeller and must be replaced, the A-6828 feathering unit kit must be used. The A-6828 feathering unit kit contains: B-6768 sleeve unit, C-6760 feathering compression spring, B-6761 spring guide, and B-6867 forward spring retainer.

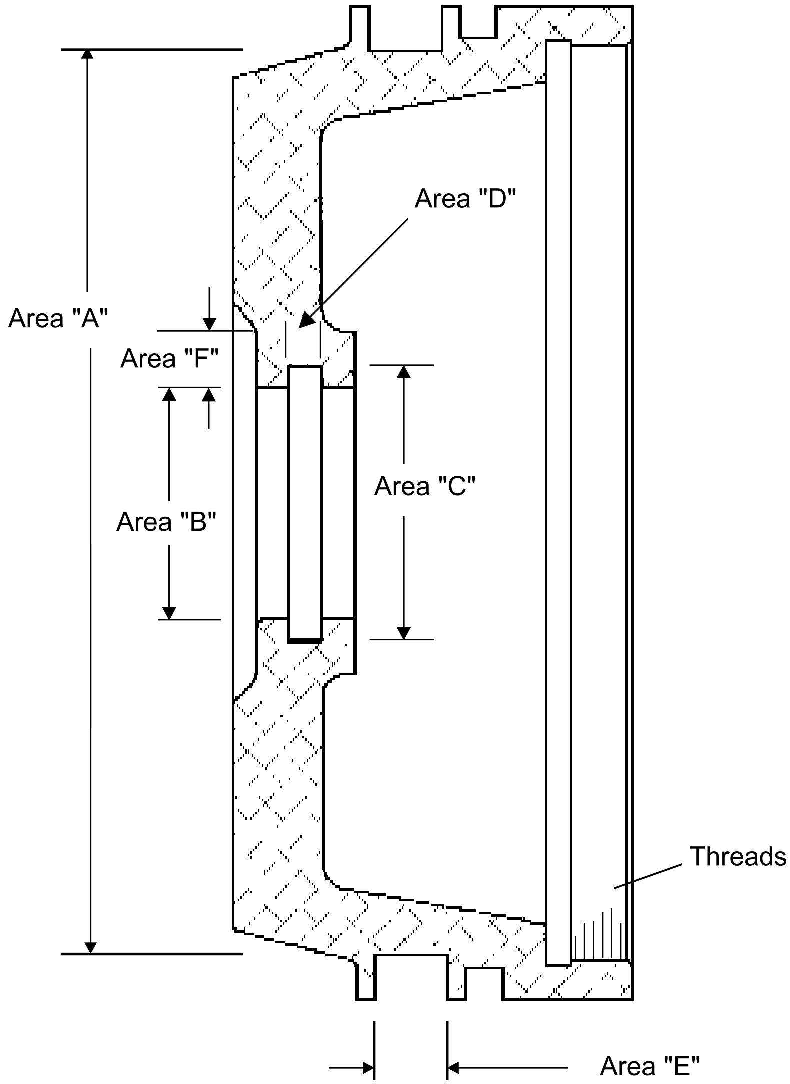
Inspect	Serviceable Limits	Corrective Action
(1) Visually examine the pitch adjust sleeve threads for damage or distortion.	A total of one thread accumulated damage is permitted. Thread damage must not interfere with the movement of the mating jam nut or movement on the pitch adjust sleeve in the cylinder.	If damage is greater than the permitted serviceable limits, replace the pitch adjust sleeve unit. Refer to NOTE 1 and NOTE 2 above.
(2) Visually examine the pitch adjust sleeve unit for cadmium plating coverage.	A few scratches, corners with plating missing, and light wear of the plating from the threads because of nut installation is permitted; otherwise, complete cadmium plating coverage is required.	If the cadmium plating coverage is less than the permitted serviceable limits, remove the sleeve bushing (140) and replate the pitch adjust sleeve in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). For sleeve bushing removal procedures, refer to the Repair chapter of this manual.
(3) Magnetic particle inspect the pitch adjust sleeve unit in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). NOTE: It is not necessary to remove the sleeve bushing.	A relevant indication is not permitted.	If there is a relevant indication, replace the pitch adjust sleeve unit. Refer to NOTE 1 and NOTE 2 above.



Sleeve Bushing, Pitch Adjust Sleeve Unit
Figure 5-8

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
H. <u>SLEEVE BUSHING</u> (Item 140) Refer to Figure 5-8.		
(1) Visually examine the sleeve bushing ID for damage.	The maximum permitted depth of damage is 0.010 inch (0.25 mm). The maximum permitted total accumulated damage to the ID surface is 10 percent.	If damage is greater than the permitted serviceable limits, remove and replace the sleeve bushing in accordance with the Repair section of this manual. <u>NOTE</u>: If the pitch adjust sleeve unit (130) must be replated, install the sleeve bushing after plating.
(2) Measure the ID of the sleeve bushing.	The maximum permitted ID is 1.006 inch (25.55 mm).	If the ID is greater than the permitted serviceable limits, remove and replace the sleeve bushing in accordance with the Repair section of this manual. <u>NOTE</u>: If the pitch adjust sleeve unit (130) must be replated, install the sleeve bushing after plating.



Piston Inspection Criteria
Figure 5-9

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
I. PISTON (Item 160) Refer to Figure 5-9.		
(1) Excluding the O-ring grooves, visually examine the anodized surfaces of the piston for wear, nicks, scratches, or other damage.	The maximum permitted depth of wear, nicks, scratches, or other damage is 0.005 inch (0.12 mm).	If damage is greater than the permitted serviceable limits, replace the piston. If not already disassembled, remove the spring pin and disassemble the piston from the ring or piston bushing. Replace the piston.
(2) If the piston has the ring or piston bushing removed, visually examine the threads.	A maximum of 1/2 of one thread total accumulated damage is permitted. Damage must not interfere with the ability to thread a ring or piston bushing onto the piston.	If damage is greater than the permitted serviceable limits, replace the piston.
(3) Visually examine the piston bore recessed area around the entire circumference of the center hole for scoring or gouging caused by pitch change rod wrenching flats (Area "F").	The maximum permitted depth of damage is 0.030 inch (0.76 mm). Sufficient flat surface must remain in Area "F" to support the piston correctly on the pitch change rod shoulder.	If damage is greater than the permitted serviceable limits, replace the piston. If not already disassembled, remove the spring pin and disassemble the piston from the ring or piston bushing. Replace the piston
(4) Measure the OD of the piston O-ring groove (Area "A").	The minimum permitted O-ring groove OD is 4.644 inches (117.96 mm).	If the OD is less than the permitted serviceable limits, replace the piston. If not already disassembled, remove the spring pin and disassemble the piston from the ring or piston bushing. Replace the piston.
(5) Measure the ID of the piston bore (Area "B").	The maximum permitted bore ID is 1.191 inch (30.25 mm).	If the ID is greater than the permitted serviceable limits, replace the piston. If not already disassembled, remove the spring pin and disassemble the piston from the ring or piston bushing. Replace the piston.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
I. PISTON, CONTINUED (Item 160) Refer to Figure 5-9.		
(6) Measure the ID of the piston O-ring groove (Area "C")	The maximum permitted O-ring groove ID is 1.416 inch (35.96 mm).	If the ID is greater than the permitted serviceable limits, replace the piston. If not already disassembled, remove the spring pin and disassemble the piston from the ring or piston bushing. Replace the piston.
(7) Measure the width of the piston O-ring groove (Area "D")	The maximum permitted O-ring groove width in area "D" is 0.180 inch (4.57 mm). The minimum permitted O-ring groove width in area "D" is 0.163 inch (4.15 mm).	If the width is not within the permitted serviceable limits, replace the piston. If not already disassembled, remove the spring pin and disassemble the piston from the ring or piston bushing. Replace the piston.
(8) Measure the piston O-ring groove width area (Area "E")	The maximum permitted O-ring groove width in area "E" is 0.385 inch (9.77 mm).	If the width is greater than the permitted serviceable limits, replace the piston. If not already disassembled, remove the spring pin and disassemble the piston from the ring or piston bushing. Replace the piston.
(9) Perform penetrant inspection of the piston in accordance with the Hartzell Propeller Standard Practices Manual 202A (61-01-02). CAUTION: DO NOT REMOVE THE ANODIZE COATING BEFORE PENETRANT INSPECTION.	A relevant indication is not permitted	If there is a relevant indication, replace the piston.

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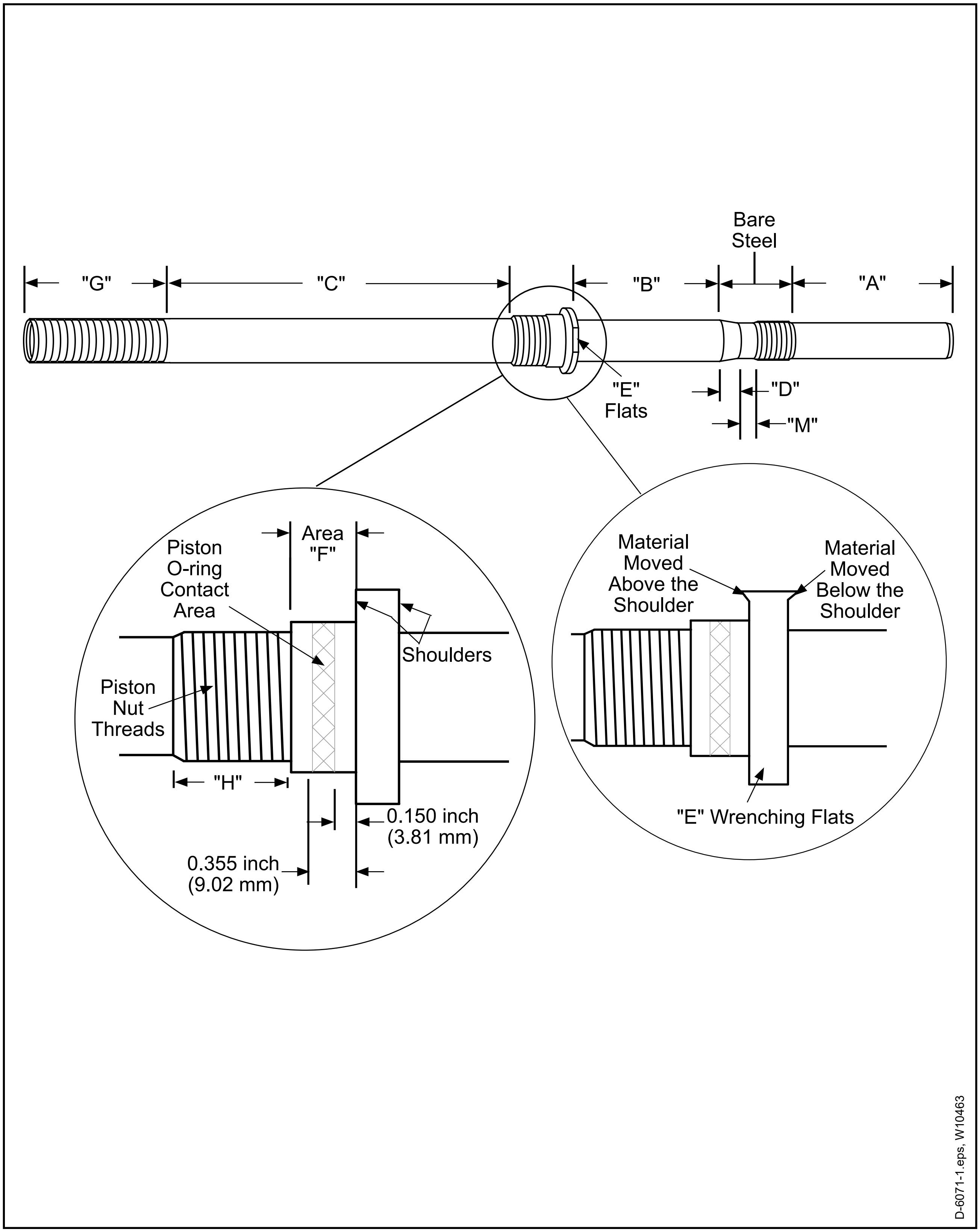
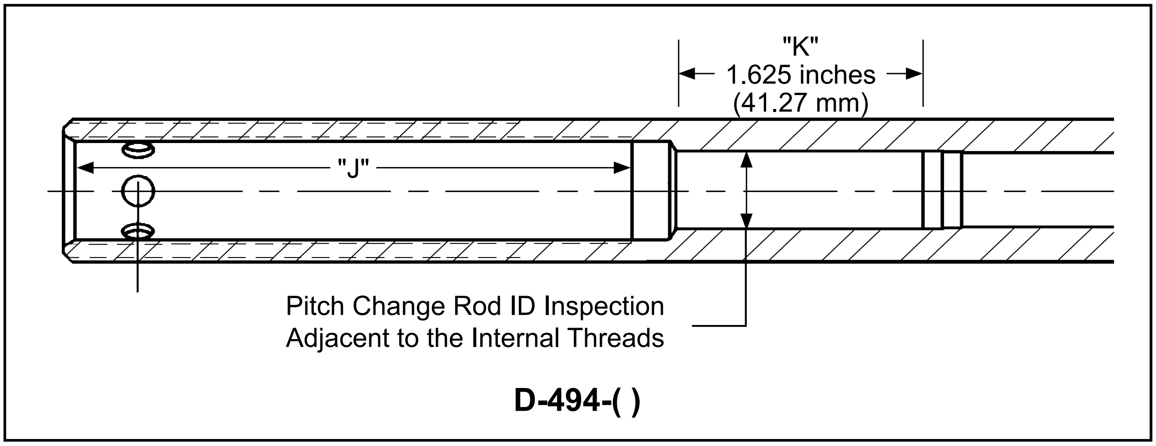
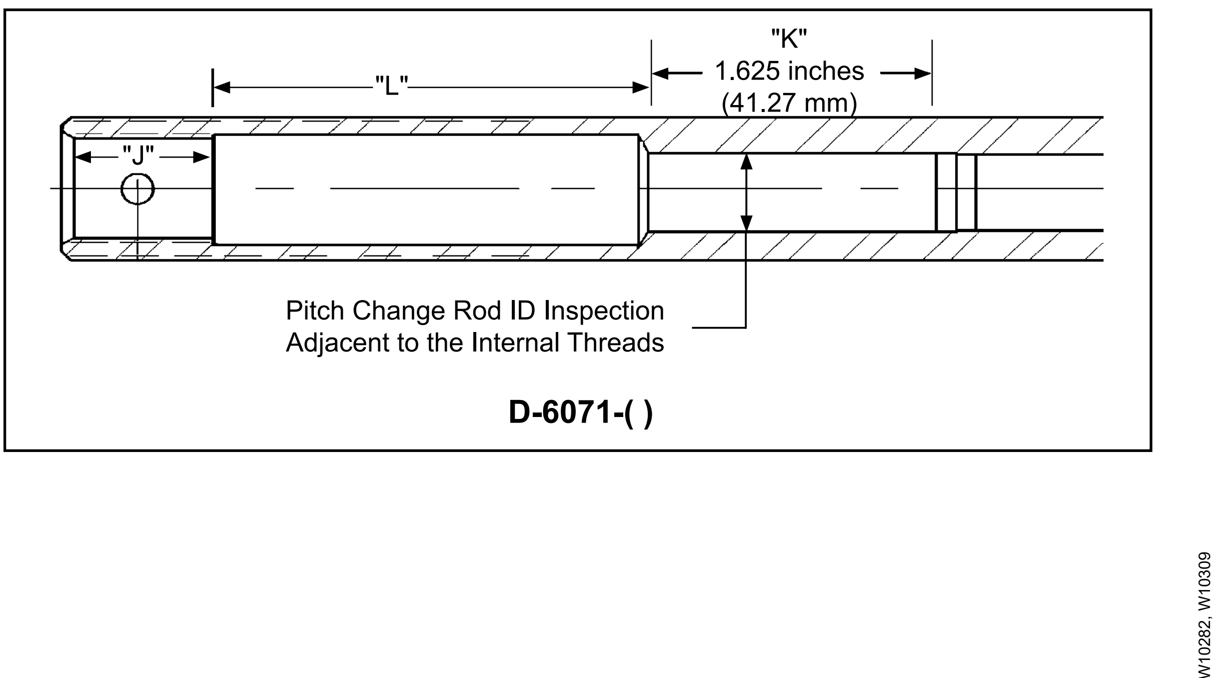


Pitch Change Rod
Figure 5-10





D-494-( ) and D-6071-( ) Pitch Change Rods
Figure 5-11

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
J.	PITCH CHANGE ROD (Item 230) Refer to Figure 5-10 and Figure 5-11.		
(1)	Visually examine the pitch change rod for corrosion product and pitting.	Except where specifically permitted in this section, corrosion product is not permitted. Pitting is not permitted,	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the pitch change rod. If the pitting is greater than the permitted serviceable limits, replace the pitch change rod.
(2)	Visually examine the pitch change rod for chrome plating coverage (Areas "A", "B", and "C")	Minor wear that is within the dimensional limits in this table and random, light scratches that are not greater than the chrome plate depth and do not affect the seal with the O-ring are permitted; otherwise, complete chrome plating coverage is required.	Using an abrasive pad CM47 or equivalent, lightly hand polish to remove high spots as necessary. If the wear or damage is greater than the permitted serviceable limits, either replace the pitch change rod or return to Hartzell Propeller LLC.
(3)	Visually examine the pitch change rod threads for cadmium plating coverage (Areas "G" and "H") (Area "J" if applicable)	Minor wear on corners and random light scratches are permitted; otherwise, complete cadmium plating coverage is required.	If the cadmium plating coverage is less than the permitted serviceable limits, cadmium replate the threaded areas of the pitch change rod in accordance with the Cadmium Replating chapter of the Hartzell Propeller Standard Practices Manual 202A (61-01-02).
(4)	Visually examine the pitch change rod for straightness.	The pitch change rod must be straight.	If the pitch change rod is not straight, replace the pitch change rod.
(5)	Visually examine the pitch change rod external threads for damage.	A maximum of 1/2 of one thread total accumulated damage in each threaded area is permitted. A damaged thread must not interfere with mating part threads.	If damage is greater than the permitted serviceable limits, replace the pitch change rod.

Component Inspection Criteria
Table 5-1

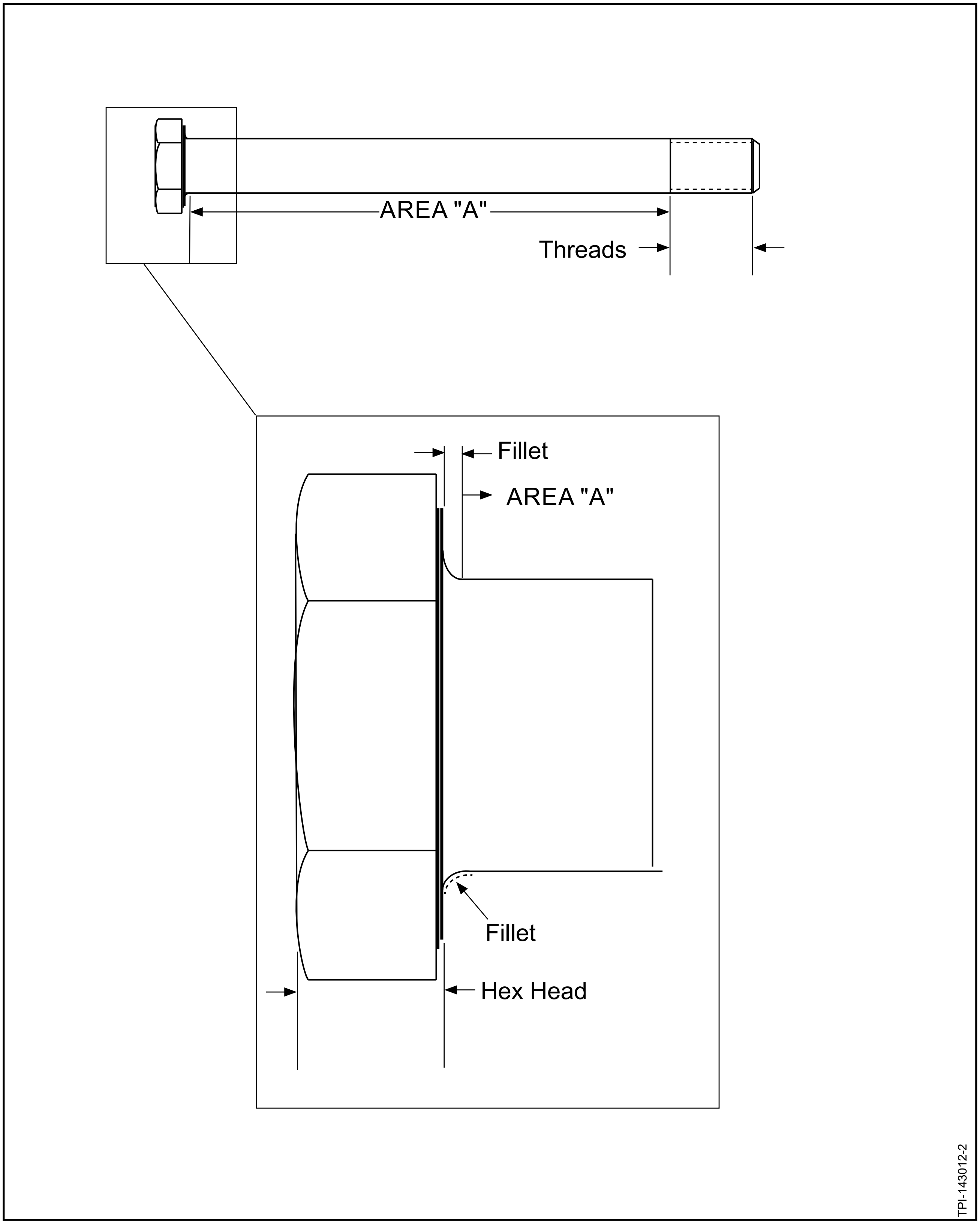
Inspect		Serviceable Limits	Corrective Action
J. PITCH CHANGE ROD, CONTINUED (Item 230) Refer to Figure 5-10 and Figure 5-11.			
(6)	Visually examine the pitch change rod fork taper for pitting, wear, or damage (Area "D").	Pitting, wear, or damage is not permitted at the smallest diameter of the taper or within 0.093 inch (2.36 mm) of the thread. The remaining taper surface may have a maximum damage depth of 0.004 inch (0.10 mm) over 10% of the surface area. Raised material is not permitted.	If damage causes raised material above the existing surface, remove only the raised material. If pitting, wear, or damage is greater than the permitted serviceable limits, replace the pitch change rod.
(7)	Visually examine the pitch change rod fork taper for pitting, wear, or damage (Area "M).	Pitting, wear, or damage is not permitted. The minimum permitted OD including repair is 0.794 inch (20.16 mm).	Pitting or damage may be repaired by polishing with emery cloth to a maximum permitted depth of 0.002 inch (0.05 mm). If pitting, wear, or damage is greater than the permitted serviceable limits or corrective action limits replace the pitch change rod.
(8)	Visually examine the pitch change rod wrenching flats for moved material (Area "E").	Moved material caused by wrench engagement must not be above or below the pitch change rod shoulder surfaces. Sufficient flat surfaces must remain to support applied open-end wrench torque.	Remove the moved material flush with the pitch change rod shoulder thickness. If damage is greater than the permitted serviceable limits, replace the pitch change rod.
(9)	Visually examine the pitch change rod-to-piston contact area of Area "F" between the shoulder and threads for damage or pitting.	Pitting, or damage is not permitted in the area between 0.150 inch (3.81 mm) and 0.355 inch (9.01 mm) from the shoulder.	If there is pitting, or damage, replace the pitch change rod.
(10)	Visually examine the pitch change rod-to-piston contact area between the shoulder and threads outside of the piston O-ring contact area of Area "F" for damage or pitting.	The maximum permitted depth of pitting or damage is 0.007 inch (0.178 mm).	Using an abrasive pad CM47 or equivalent, polish to remove damage or pitting. If damage or pitting is greater than the permitted serviceable limits, replace the pitch change rod.

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
J.	PITCH CHANGE ROD, CONTINUED (Item 230) Refer to Figure 5-10 and Figure 5-11.		
(11)	Using a borescope or fiber optic flashlight, visually examine the oil supply bore for unwanted material.	Unwanted material is not permitted.	Remove all unwanted material. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).
(12)	If applicable, visually examine the pitch change rod internal threads for damage.	A maximum of one thread total accumulated damage is permitted. A damaged thread must not interfere with mating part threads.	If damage is greater than the permitted serviceable limits, replace the pitch change rod.
(13)	For D-6071( ) and D-494( ) rods, visually examine the pitch change rod ID adjacent to the internal threads, in the 1.625 inch (41.27 mm), area for wear or damage. (Area "K")	If there is wear or damage, measure the ID in Area "K". The maximum permitted ID is 0.550 inch (13.97 mm). Damage is not permitted.	If wear or damage is greater than the permitted serviceable limits, replace the pitch change rod.
(14)	For D-6071( ) rods, visually examine the pitch change rod ID adjacent to the internal threads (Area "L").	If there is wear, measure the ID in Area "L". The maximum permitted ID is 0.788 inch (20.01 mm). Damage is not permitted.	If wear or damage is greater than the permitted serviceable limits, replace the pitch change rod.
(15)	Measure the pitch change rod OD in areas "A", "B", and "C".	The minimum permitted OD in area "A" is 0.807 inch (20.50 mm). The minimum permitted OD in area "B" is 0.932 inch (23.67 mm). The minimum permitted OD in area "C" is 0.994 inch (25.25 mm).	If the OD in area "A","B", or "C" is less than the permitted serviceable limits, replace the pitch change rod.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
J. PITCH CHANGE ROD, CONTINUED (Item 230) Refer to Figure 5-10 and Figure 5-11.		
(16) Magnetic particle inspect the pitch change rod in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02) NOTE: Do not strip the chrome.	A relevant indication is not permitted.	If there is a relevant indication, replace the pitch change rod.

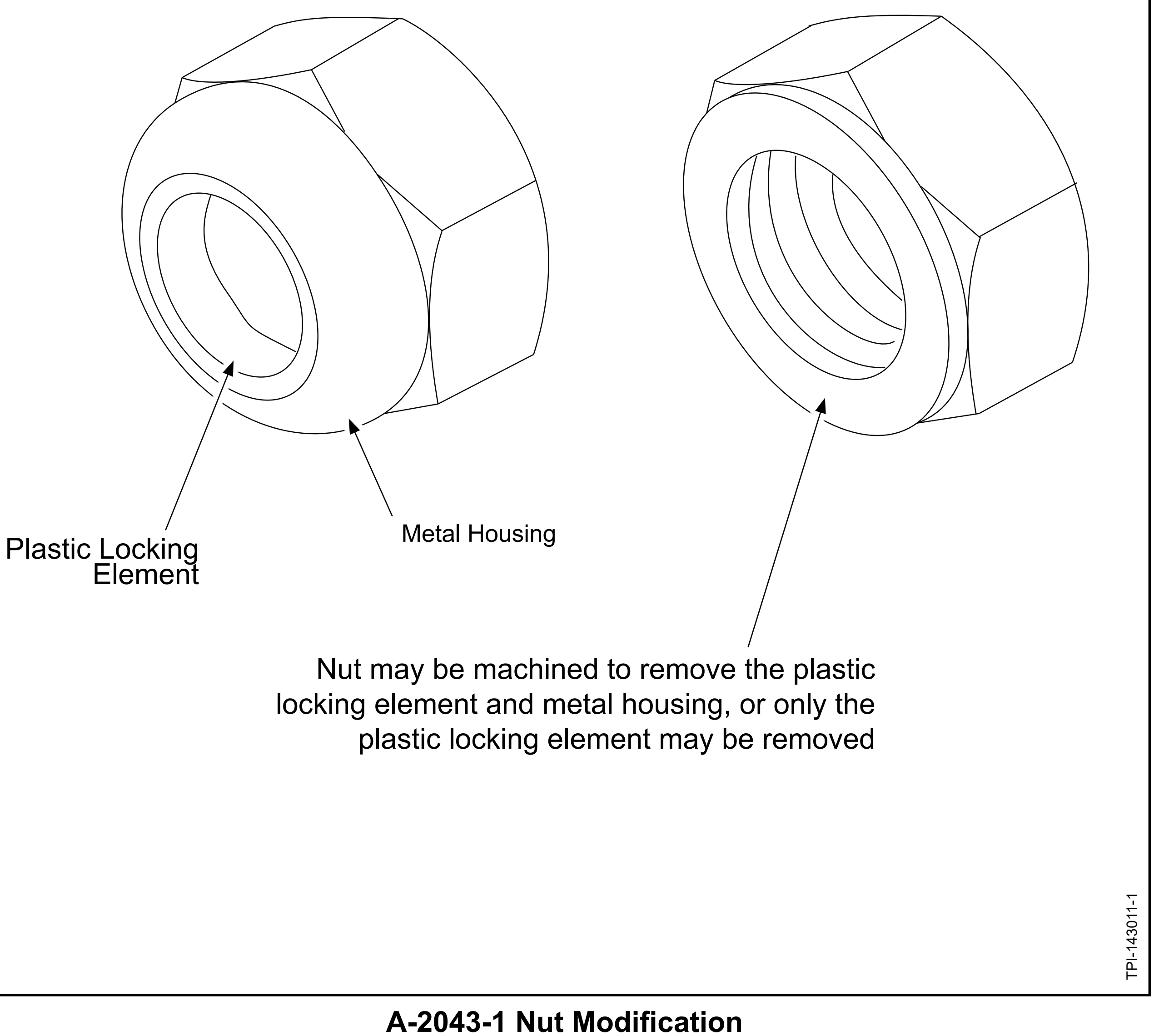


Hex Head Bolt
Figure 5-12

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
K. HEX HEAD BOLT (Items 370, 380) Refer to Figure 5-12.		
(1) Visually examine the hex head bolt for corrosion product and pitting.	Corrosion product is not permitted. The maximum permitted depth of pitting is 0.002 inch (0.05 mm). No more than 5% of the total unthreaded surface may be pitted. The maximum permitted diameter of an individual pit is 0.032 inch (0.81 mm). Pitting is not permitted in the fillet between the hex head and the grip, Area "A". Pitting must not affect the fit or function of the hex head bolt.	Remove corrosion product using glass bead cleaning in accordance with the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If corrosion product cannot be removed, replace the hex head bolt. If the pitting is greater than the permitted serviceable limits, replace the hex head bolt.
(2) Except for the threads, visually examine the hex head bolt for damage or scratches.	The maximum permitted depth of damage or a scratch is 0.002 inch (0.05 mm). Scratches or damage must not affect the fit or function of the hex head bolt. Pushed up material is not permitted.	Pushed up material may be removed with a thread file. Use of the thread file must not affect the fit or function of the hex head bolt. If the depth of a scratch or damage is greater than the permitted serviceable limits or if the scratch, damage, or repair affects the fit or function of the hex head bolt, replace the hex head bolt.
(3) Visually examine the hex head bolt for circumferential scoring caused by installation and removal.	Circumferential scoring that reduces the diameter of the hex head bolt is not permitted. The minimum permitted OD in Area "A" is 0.370 inch (9.40 mm).	If scoring is greater than the permitted serviceable limits or if the OD in Area "A" is less than the permitted serviceable limits, replace the hex head bolt.
(4) Visually examine the wrenching surfaces of the head of the hex head bolt for metal movement caused by wrenching.	Limited damage from wrenching is permitted, but it must be possible to torque the hex head bolt and metal movement must not interfere with the installation of the hex head bolt or cause damage to the hub.	Remove metal movement with a file or equivalent. Only corners may be repaired. Refacing a complete surface is not permitted. If metal movement is greater than the permitted serviceable limits, replace the hex head bolt.

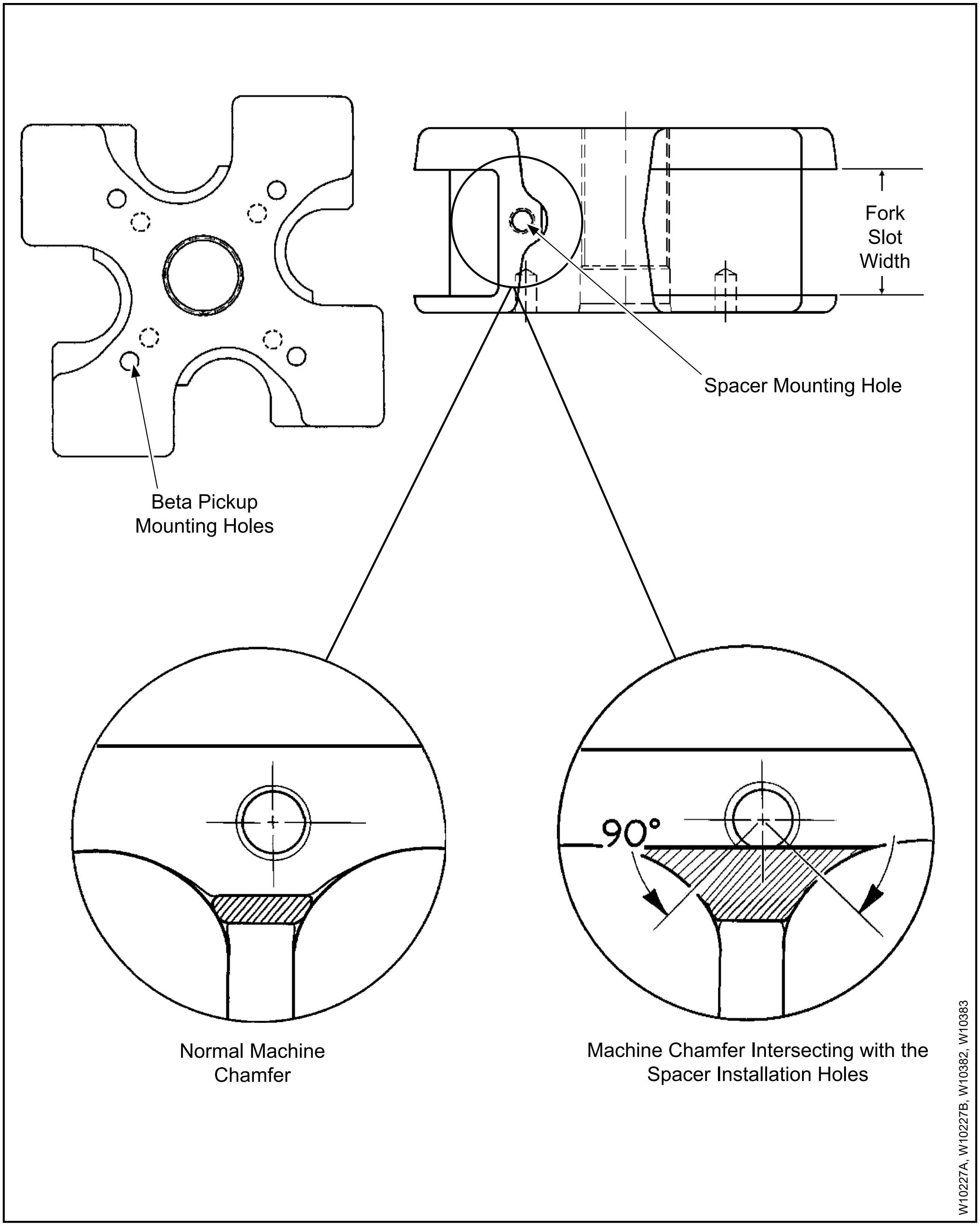
CAUTION: DO NOT USE MODIFIED A-2043-1 NUTS ON THE PROPELLER ASSEMBLY. A-2043-1 NUTS THAT HAVE BEEN MODIFIED ARE TO BE USED ONLY FOR THE HEX HEAD BOLT THREAD CHECK.



A-2043-1 Nut Modification
Figure 5-13

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
K.	HEX HEAD BOLT, CONTINUED (Items 370, 380) Refer to Figure 5-13.		
(5)	Visually examine the threads of the hex head bolt for damage and pitting.	A maximum total accumulation of 3/4 thread of damage and pitting is permitted. Thread damage must not cause damage to the mating part. An A-2043-1 nut with the plastic locking element removed should be able to be freely rotated by hand on the bolt threads. For the modification of the nut, refer to Figure 5-2.	Limited thread file repair is permitted, but must be considered as thread damage. If the damage and pitting is greater than the permitted serviceable limits, replace the hex head bolt.
(6)	Magnetic particle inspect each bolt in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the hex head bolt.
(7)	Visually examine the hex head bolt for cadmium plating coverage.	Cadmium plating must completely cover the bolt with the following exceptions: A few scratches and corners with cadmium plating missing, minor abrading of cadmium plating on the threads, or minor abrading of the cadmium plating on the hex head because of wrenching are permitted.	If the cadmium plating coverage is less than the permitted serviceable limits, cadmium replate and bake for a minimum of 23 hours within four hours after plating the hex head bolt in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).



Fork
Figure 5-14

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
L. FORK (Item 450) Refer to Figure 5-14.		
(1) Visually examine the pitch change rod engagement threads of the fork bore for damage.	One thread total accumulated damage is permitted.	If damage is greater than the permitted serviceable limits, replace the fork.
(2) Visually examine the spacer mounting holes for thread damage.	One thread total accumulated damage is permitted.	If damage is greater than the permitted serviceable limits, replace the fork.
(3) Visually examine the tapered portion of the fork bore for wear, nicks, fretting or other damage.	The maximum permitted depth of damage is 0.003 inch (0.07 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the fork.
(4) Visually examine the fork slots for damage.	The maximum permitted depth of damage is 0.006 inch (0.15 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the fork.
(5) Measure the fork slot.	The maximum permitted width of the fork slot is 1.266 inches (32.15 mm).	If the slot width is greater than the permitted serviceable limits, replace the fork.
(6) For D-495-( ) only: examine the spacer attachment holes for excessive chamfer. refer to Figure 5-14.	The chamfer may intersect the spacer installation holes no more than 90 degrees of the circumference of the hole.	If the chamfer is greater than the permitted serviceable limits, replace the fork.
(7) Magnetic particle inspect the machined areas of the fork in accordance with the Magnetic Particle Inspection chapter of the Hartzell Propeller Standard Practices Manual 202A (61-01-02). NOTE: It is not necessary to strip the fork before magnetic particle inspection.	A relevant indication is not permitted.	If there is a relevant indication, replace the fork.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
L. FORK, CONTINUED (Item 450) Refer to Figure 5-14.		
(8) Magnetic particle inspect the non-machined areas of the fork in accordance with the Magnetic Particle Inspection chapter of the Hartzell Propeller Standard Practices Manual 202A (61-01-02). NOTE: It is not necessary to strip the fork before magnetic particle inspection.	A shallow forging lap or fold indication must be removed.	Refer to the Repair chapter in this manual for the procedure for repair of the non-machined areas of the fork.
(9) Visually examine the cadmium plating of the fork (excluding the slots, threaded bore and tapered section of the bore) for wear, scratches, or other damage.	The maximum permitted depth of damage is 0.003 inch (0.07 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the fork.
(10) Visually examine the fork for cadmium plating coverage.	A few random scratches, corners with plating missing, normal wear of the plating from the threads, internal taper, and fork slots are permitted; otherwise, cadmium plating must cover the fork.	If the cadmium plating coverage is less than the permitted serviceable limits, replate the fork in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

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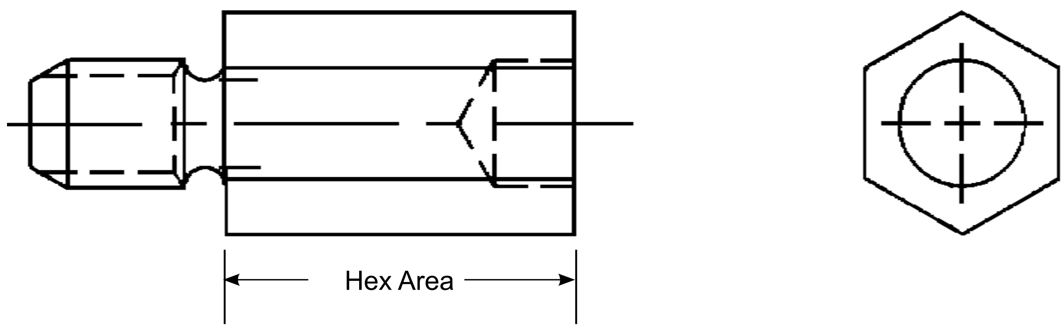
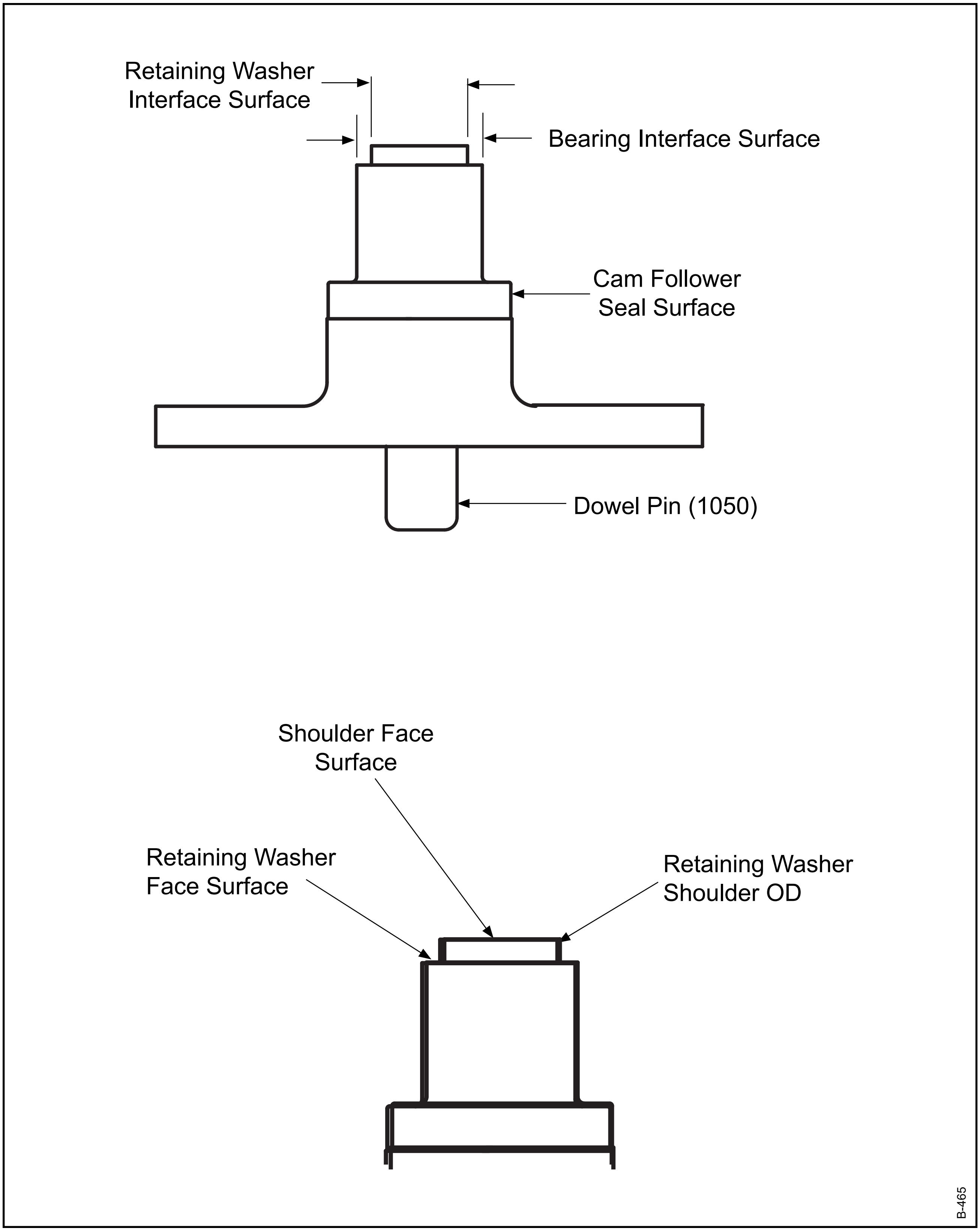


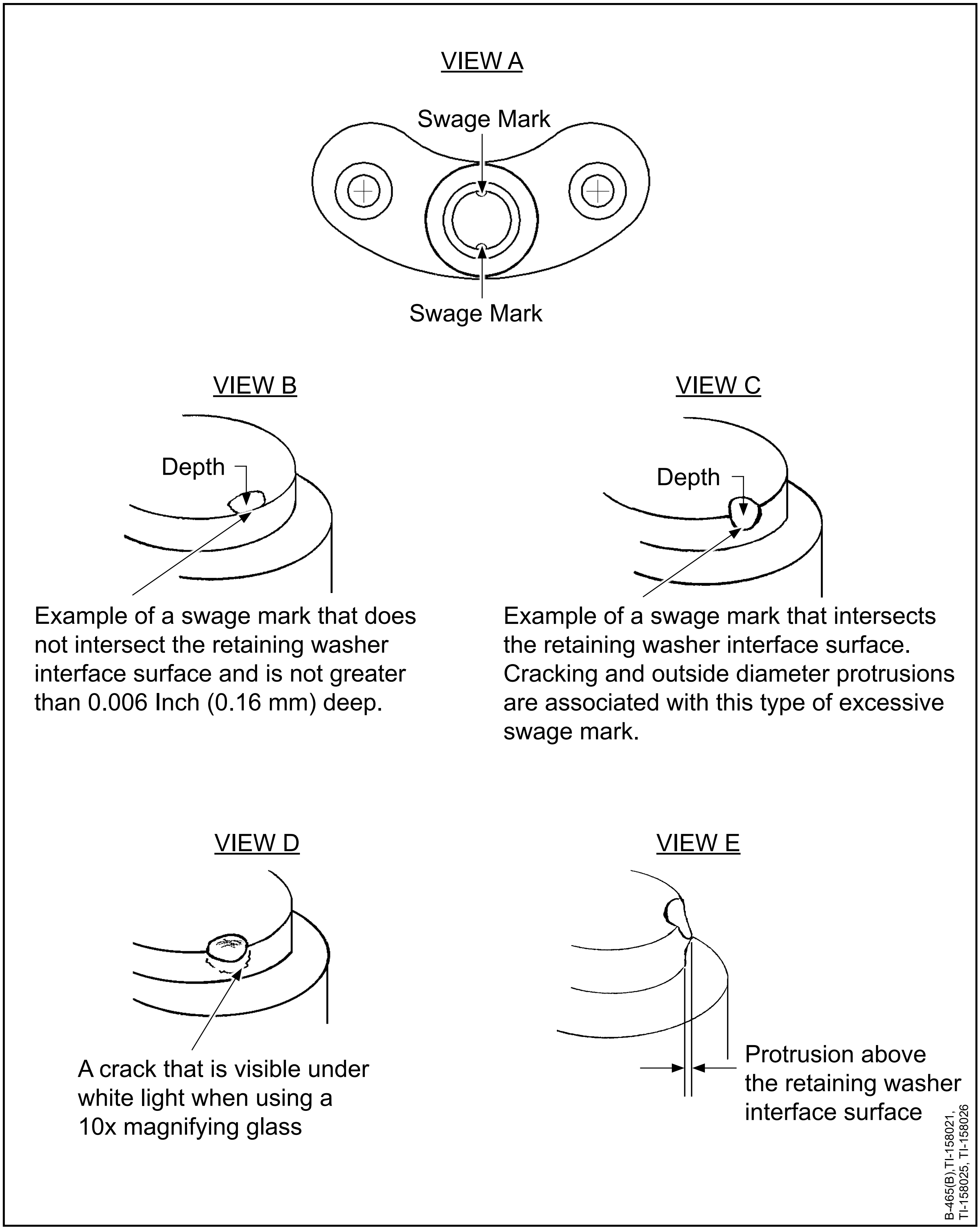
Spacer
Figure 5-15

Component Inspection Criteria
Table 5-1

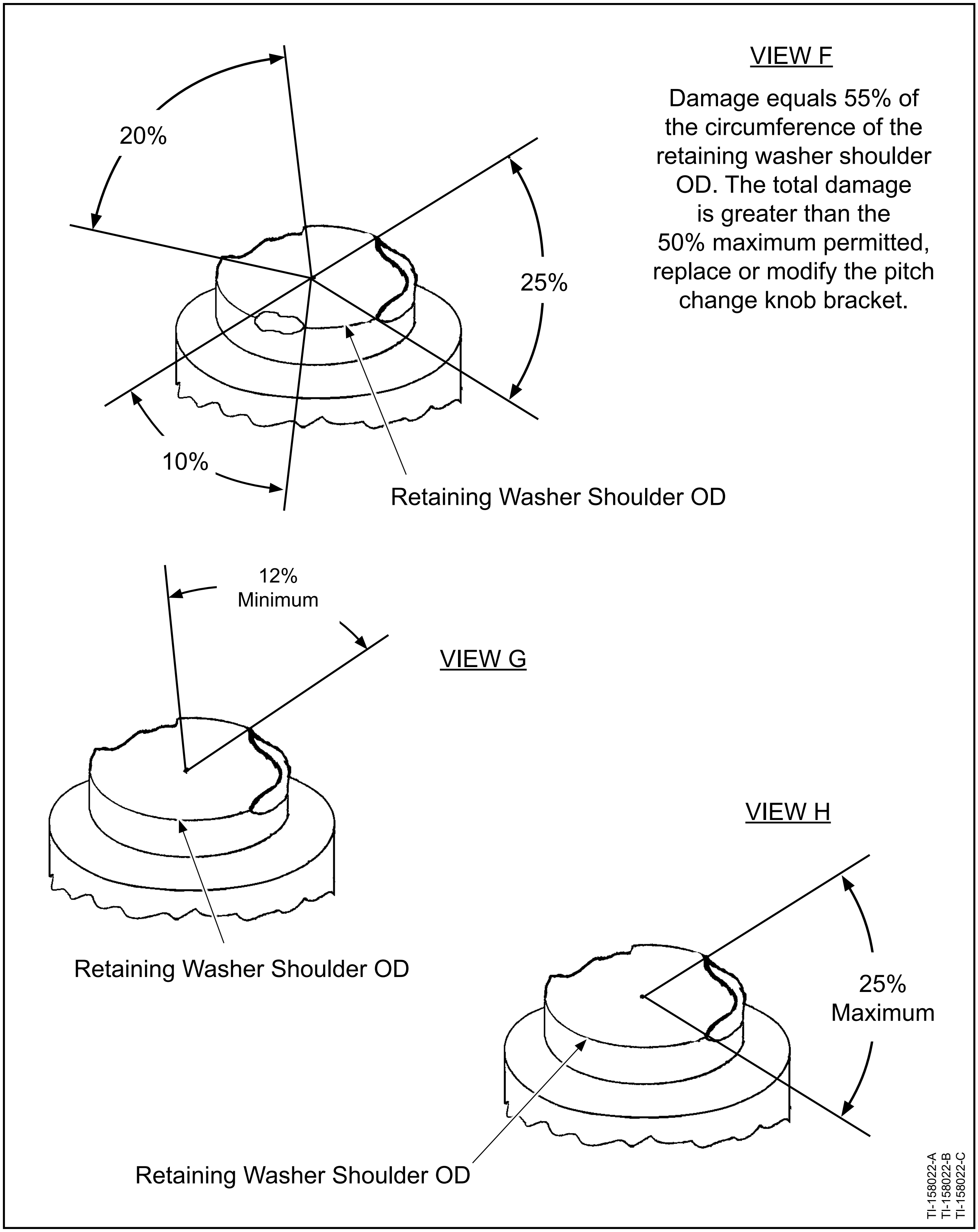
Inspect		Serviceable Limits	Corrective Action
M.	SPACER (FORK) (Item 460) Refer to Figure 5-15.		
	(1) Visually examine the spacer for damage.	A slight wrenching depression on the outer hex area of the spacer is permitted.	If damage is greater than the permitted serviceable limits, replace the spacer.
	(2) Visually examine the spacer for corrosion product.	Corrosion product is not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). Replate the spacer in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).
	(3) Visually examine the threads of the spacer for damage.	A maximum of 1/2 of one thread total accumulated damage is permitted.	If the damage is greater than the permitted serviceable limits, replace the spacer.
	(4) Visually examine the spacer for cadmium plating coverage.	A few random scratches and slight wear on the threads are permitted; otherwise, cadmium plating must completely cover the spacer.	If the cadmium plating coverage is less than the permitted serviceable limits, replate the extension bumper in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).



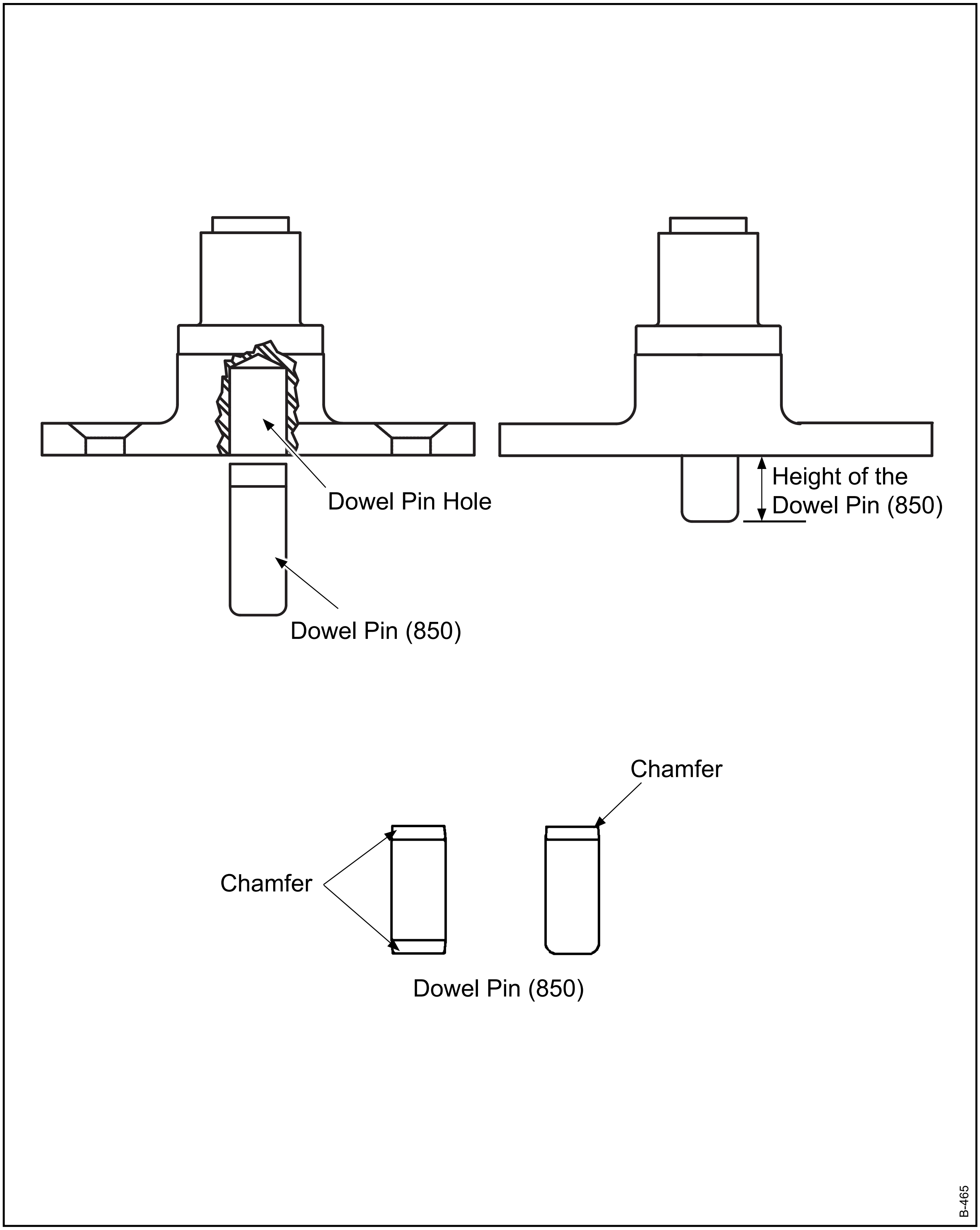
Pitch Change Knob Bracket That Uses a Swaged Washer to Retain the Cam Follower
Figure 5-16



Pitch Change Knob Bracket That Uses a Swaged Washer to Retain the Cam Follower
Figure 5-17



Pitch Change Knob Bracket That Uses a Swaged Washer to Retain the Cam Follower
Figure 5-18



Pitch Change Knob Bracket That Uses a Swaged Washer to Retain the Cam Follower
Figure 5-19

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action

N. PITCH CHANGE KNOB BRACKET
THAT USES A SWAGED WASHER TO RETAIN THE CAM FOLLOWER
(Item 530)
Refer to Figure 5-16 through Figure 5-19.

(1) Before inspection, remove cadmium plating in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

(2) An example of correct swaging is shown in Figure 5-17, View B. An example of incorrect swaging is shown in Figure 5-17, View C.

(3) A pitch change knob bracket that does not meet the serviceable limits specified in step N.(4), N.(6), N.(7), N.(8), or N.(9) may be modified in accordance with the section, "Pitch Change Knob Bracket Modification" in the Repair chapter of this manual.

Inspect	Serviceable Limits	Corrective Action
(4) Using white light and a 10X magnifying glass, visually examine each swage mark on the washer shoulder of the pitch change knob bracket for cracks.	A crack is not permitted. Refer to Figure 5-17, View D.	A crack may be removed by spot polishing using an emery cloth or abrasive pad CM47. Crack removal must not interfere with the retaining washer face surface or be greater than 25% of the retaining washer shoulder OD in one location. Refer to Figure 5-16 and Figure 5-18, View H. Total accumulated damage or repair must not be greater than 50% of the circumference of the retaining washer shoulder OD. Refer to Figure 5-18, View F. If the damage or repair is greater than the limits given, replace the pitch change knob bracket or modify the pitch change knob bracket to use a screw to retain the cam follower in accordance with the section, "Pitch Change Knob Bracket Modification" in the Repair chapter of this manual.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
N.	PITCH CHANGE KNOB BRACKET THAT USES A SWAGED WASHER TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 530) Refer to Figure 5-16 through Figure 5-19.		
(5)	Visually examine each swage mark on the retaining washer shoulder OD and the retaining washer interface surface for material protrusion. Refer to Figure 5-17, View E.	Material protrusion is not permitted above the retaining washer interface surface.	If there is material protrusion, use an emery cloth to remove the material protrusion to flush or below the surface of the retaining washer interface surface or modify the pitch change knob bracket to use a screw to retain the cam follower in accordance with the section, "Pitch Change Knob Bracket Modification" in the Repair chapter of this manual.
(6)	Visually examine the retaining washer shoulder OD for two undamaged swaging sites to hold the retention washer. Refer to Figure 5-18, View G.	Two unswaged areas that are a minimum width of 12% or 0.188 inch (4.78 mm) of the circumference positioned 120 to 180 degrees apart from each other are required.	If the available swaging sites are not within the permitted serviceable limits, replace the pitch change knob bracket or modify the pitch change knob bracket to use a screw to retain the cam follower in accordance with the section, "Pitch Change Knob Bracket Modification" in the Repair chapter of this manual.
(7)	Measure the OD of the unplated retaining washer interface surface. Refer to Figure 5-16.	The minimum permitted OD of the unplated retaining washer interface surface is 0.5005 inch (12.713 mm).	If the OD of the unplated retaining washer interface surface is less than the serviceable limits, replace the pitch change knob bracket or modify the pitch change knob bracket to use a screw to retain the cam follower in accordance with the section, "Pitch Change Knob Bracket Modification" in the Repair chapter of this manual.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
N. PITCH CHANGE KNOB BRACKET THAT USES A SWAGED WASHER TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 530) Refer to Figure 5-16 through Figure 5-19.		
(8) Visually examine the retaining washer interface surface for damage, corrosion product, or pitting. Refer to Figure 5-16	Minor scratches less than 0.001 inch (0.025 mm) deep are permitted. A sharp edge, material protrusion, or raised material from scratches or swaging are not permitted. Corrosion product or pitting is not permitted.	Using an emery cloth or abrasive pad CM47, lightly polish to remove a sharp edge, material protrusion, or raised material and blend into machined surfaces. If the damage, corrosion product, or pitting is greater than the permitted serviceable limits, replace the pitch change knob bracket or modify the pitch change knob bracket to use a screw to retain the cam follower in accordance with the section, "Pitch Change Knob Bracket Modification" in the Repair chapter of this manual.
(9) Visually examine the bearing interface surface for damage, corrosion product, or pitting. Refer to Figure 5-16.	Bearing roller impressions of any depth are not permitted. Minor scratches less than 0.001 inch (0.025 mm) deep are permitted. Sharp edges or pushed up edges from scratches are not permitted. Corrosion product or pitting is not permitted.	If the damage, corrosion product, or pitting is greater than the permitted serviceable limits, replace the pitch change knob bracket.
(10) Measure the OD of the bearing interface surface.(unplated). Refer to Figure 5-16.	The minimum permitted OD of the unplated bearing interface surface is 0.653 inch (16.59 mm).	If the OD of the unplated bearing interface surface is less than the serviceable limits, replace the pitch change knob bracket.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
N. PITCH CHANGE KNOB BRACKET THAT USES A SWAGED WASHER TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 530) Refer to Figure 5-16 through Figure 5-19.		
(11) Visually examine the cam follower seal surface for scratches, corrosion product, or pitting. Refer to Figure 5-16.	Minor scratches less than 0.001 inch (0.025 mm) deep are permitted. Sharp or pushed up edges from scratches are not permitted. Corrosion product or pitting is not permitted.	If the scratches, corrosion product, or pitting is greater than the permitted serviceable limits, replace the pitch change knob bracket.
(12) Measure the OD of the cam follower seal surface. Refer to Figure 5-16.	The minimum permitted unplated OD of the cam follower seal surface is 0.948 inch (24.08 mm).	If the OD of the cam follower seal surface is less than the permitted serviceable limits, replace the pitch change knob bracket.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
N. PITCH CHANGE KNOB BRACKET THAT USES A SWAGED WASHER TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 530) Refer to Figure 5-16 through Figure 5-19.		
(13) Visually examine the pitch change knob bracket for corrosion product and pitting. NOTE: This inspection and repair does not include the bearing interface surface, the cam follower seal surface, or the retaining washer interface surface.	Corrosion product is not permitted. If the pitch change knob bracket has pitting, measure the depth, diameter and area of pitting. The maximum permitted depth of pitting is 0.003 inch (0.07 mm). The maximum permitted total area of pitting is 0.500 square inch (322 square mm) area. The maximum permitted diameter of an individual pit is 0.032 inch (0.81 mm). A maximum of 10 non-linear pits within 1 square inch (645 square mm) area are permitted. Linear pitting is not permitted.	Do not glass bead clean the bearing interface surface, the cam follower seal surface, or the retaining washer interface surface. For all surfaces of the pitch change knob bracket other than those listed above, remove corrosion product using glass bead cleaning or local polishing using emery cloth. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the pitch change knob bracket. The maximum permitted depth for repair is 0.005 inch (0.12 mm). The maximum permitted total area of repair is 1 square inch (645 square mm). For each hole used to attach the pitch change bracket to the blade, the maximum permitted repair is 25% of the surface area of the hole. Using an emery cloth or abrasive pad CM47, lightly polish to remove raised material or pushed up edge and blend into machined surfaces. If pitting or repair is greater than the permitted serviceable limits or corrective action repair limits, replace the pitch change knob bracket.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
N. PITCH CHANGE KNOB BRACKET THAT USES A SWAGED WASHER TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 530) Refer to Figure 5-16 through Figure 5-19.		
(14) Visually examine the pitch change knob bracket for nicks, scratches, or other damage. NOTE: This inspection and repair does not include the bearing interface surface, the retaining washer interface surface, or the cam follower seal surface.	If the pitch change knob bracket is damaged, measure the depth and area of nicks, scratches, or other damage. The maximum permitted depth of nicks, scratches, or other damage is 0.003 inch (0.07 mm). The maximum permitted total area of nicks, scratches, or other damage is 0.500 square inch (322 square mm) area. Raised material or edges of pushed up material on the surfaces that interface with other components are not permitted.	The maximum permitted depth of repair is 0.005 inch (0.12 mm). The maximum permitted total area of repair is 1 square inch (645 square mm). For each hole used to attach the pitch change bracket to the blade, the maximum permitted repair is 25% of the surface area of the hole. Using an emery cloth or abrasive pad CM47, lightly polish to remove raised material or pushed up edges and blend into machined surfaces. If the nicks, scratches, other damage, or repair is greater than the permitted serviceable or corrective action repair limits, replace the pitch change knob bracket.
(15) Examine the dowel pin for movement in the pitch change knob bracket.	Using firm hand pressure, try to move the dowel pin. Movement is not permitted.	If there is movement of the dowel pin, replace the dowel pin.
(16) Measure the height of the dowel pin from the pitch change knob bracket base. Refer to Figure 5-19.	The maximum permitted height is 0.440 inch (11.17 mm).	If the height of the dowel pin is greater than the permitted permitted serviceable limits, press the pin into the bracket to the correct height.
	The minimum permitted height is 0.390 inch (9.91 mm).	If the height of the dowel pin is less than the permitted serviceable limits, replace the pin. The replacement pin must fit tightly.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action

N. PITCH CHANGE KNOB BRACKET
THAT USES A SWAGED WASHER TO RETAIN THE CAM FOLLOWER, CONTINUED
(Item 530)
Refer to Figure 5-16 through Figure 5-19.

Inspect	Serviceable Limits	Corrective Action
(17) Visually examine the OD of the exposed portion of the dowel pin for damage or corrosion product.	Damage or corrosion product is not permitted.	If there is damage or corrosion product, replace the dowel pin.
(18) If the dowel pin is removed, visually examine the dowel pin hole for corrosion product or pitting. Refer to Figure 5-19.	Corrosion product or pitting is not permitted.	If there is corrosion product or pitting, replace the pitch change knob bracket.
(19) Perform magnetic particle inspection of the pitch change knob bracket in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). NOTE: It is not necessary to remove the dowel pin.	A relevant indication is not permitted.	If there is a relevant indication, replace the pitch change knob bracket.

(20) If removal of the dowel pin is not required, apply masking material to protect the dowel pin from cadmium plating materials.

(21) If all of the inspections of the pitch change knob were successfully completed, apply masking material to the Bearing Interface Surface, cadmium replate, and bake in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

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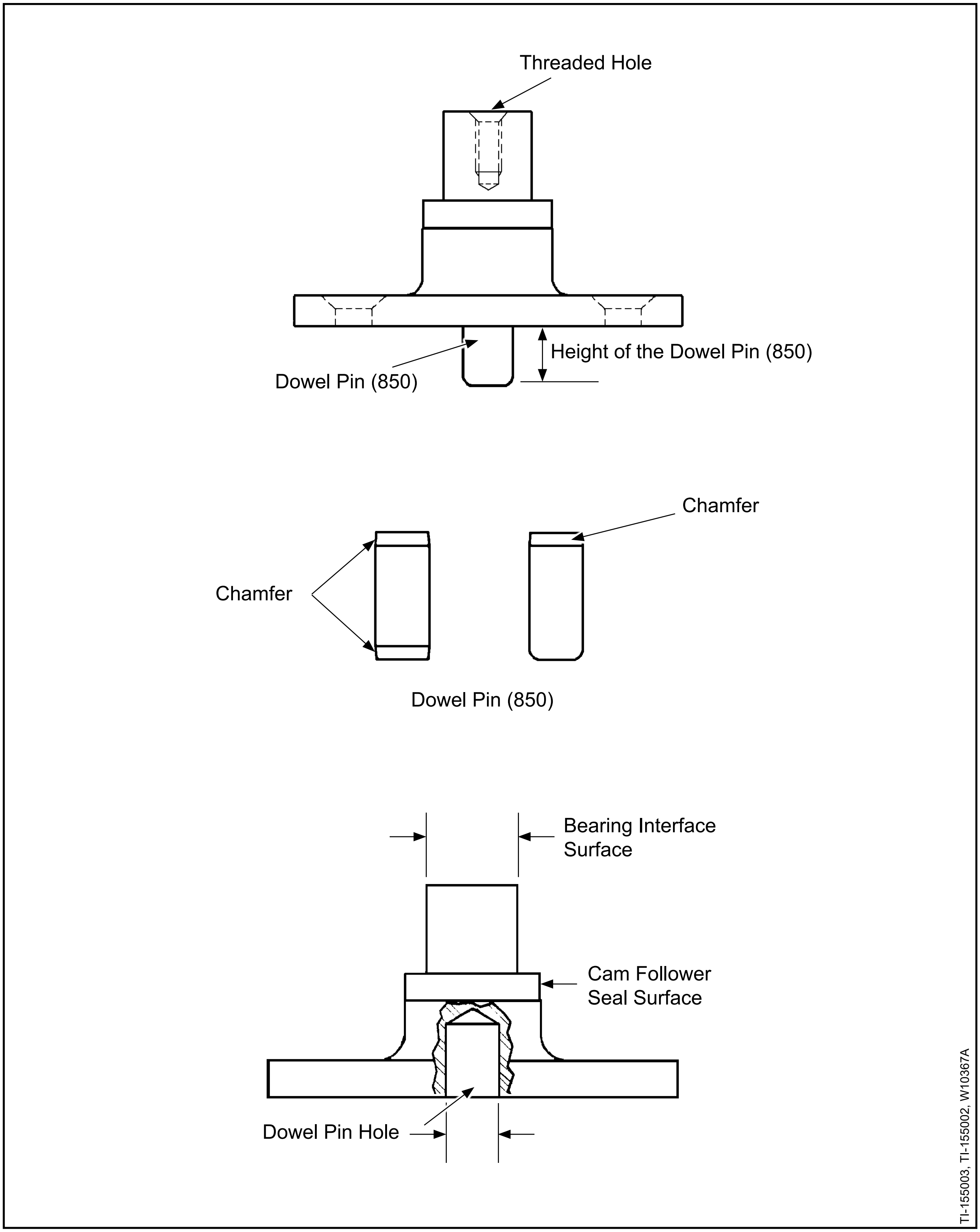


Pitch Change Knob Bracket That Uses a Screw to Retain the Cam Follower
Figure 5-20

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
O.	PITCH CHANGE KNOB BRACKET THAT USES A SCREW TO RETAIN THE CAM FOLLOWER (Item 530) Refer to Figure 5-20.		
(1)	Before inspection, remove cadmium plating in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).		
(2)	If dowel pin removal is not required, apply masking material to protect the dowel pin from stripping materials. Dowel pin extension from the pitch change knob bracket base must meet the permitted serviceable limits for the dowel pin specified in this section.		
(3)	Visually examine the bearing interface surface for damage, corrosion product, or pitting.	Bearing roller impressions of any depth are not permitted. Minor scratches less than 0.001 inch (0.025 mm) deep are permitted. Sharp edges or pushed up edges from scratches are not permitted. Corrosion product or pitting is not permitted.	If the damage, corrosion product, or pitting is greater than the permitted serviceable limits, replace the pitch change knob bracket.
(4)	Measure the OD of the unplated bearing interface surface.	The minimum permitted OD of the unplated bearing interface surface is 0.653 inch (16.59 mm).	If the OD of the unplated bearing interface surface is less than the serviceable limits, replace the pitch change knob bracket.
(5)	Visually examine the cam follower seal surface for scratches, corrosion product, or pitting.	Minor scratches less than 0.001 inch (0.025 mm) deep are permitted. Sharp or pushed up edges from scratches are not permitted. Corrosion product or pitting is not permitted.	If the scratches, corrosion product, or pitting is greater than the permitted serviceable limits, replace the pitch change knob bracket.
(6)	Measure the OD of the cam follower seal surface.	The minimum permitted unplated OD of the cam follower seal surface is 0.948 inch (24.08 mm).	If the OD of the cam follower seal surface is less than the permitted serviceable limits, replace the pitch change knob bracket.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
O. PITCH CHANGE KNOB BRACKET THAT USES A SCREW TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 530) Refer to Figure 5-20.		
(7) Visually examine the pitch change knob bracket for corrosion product and pitting. NOTE: This inspection and repair does not include the bearing interface surface, the cam follower seal surface, or the threaded hole.	Corrosion product is not permitted. If the pitch change knob bracket has pitting, measure the depth, diameter, and area of pitting. The maximum permitted depth of pitting is 0.003 inch (0.07 mm). The maximum permitted total area of pitting is 0.500 square inch (322 square mm) area. The maximum permitted diameter of an individual pit is 0.032 inch (0.81 mm). A maximum of 10 non-linear pits within 1 square inch (645 square mm) area are permitted. Linear pitting is not permitted.	Do not glass bead clean the bearing interface surface, the cam follower seal surface, or the threaded hole. For all surfaces of the pitch change knob bracket other than those listed above, remove corrosion product using glass bead cleaning or local polishing using emery cloth. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the pitch change knob bracket. The maximum permitted depth for repair is 0.005 inch (0.12 mm). The maximum permitted total area of repair is 1 square inch (645 square mm). For each hole used to attach the pitch change bracket to the blade, the maximum permitted repair is 25% of the surface area of the hole. Using an emery cloth or abrasive pad CM47, lightly polish to remove raised material or pushed up edges and blend into machined surfaces. If pitting or repair is greater than the permitted serviceable limits or corrective action repair limits, replace the pitch change knob bracket.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
O. PITCH CHANGE KNOB BRACKET THAT USES A SCREW TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 530) Refer to Figure 5-20.		
(8) Visually examine the pitch change knob bracket for nicks, scratches, or other damage. NOTE: This inspection and repair does not include the bearing interface surface, the threaded hole, or the cam follower seal surface.	If the pitch change knob bracket is damaged, measure the depth, diameter, and area of pitting. The maximum permitted depth of nicks, scratches, or other damage is 0.003 inch (0.07 mm). The maximum permitted total area of nicks, scratches, or other damage is 0.500 square inch (322 square mm) area. Raised material or edges of pushed up material on the surfaces that interface with other components are not permitted.	The maximum permitted depth of repair is 0.005 inch (0.12 mm). The maximum permitted total area of repair is 1 square inch (645 square mm). For each hole used to attach the pitch change bracket to the blade, the maximum permitted repair is 25% of the surface area of the hole. Using an emery cloth or abrasive pad CM47, lightly polish to remove raised material or pushed up edges and blend into machined surfaces. If the nicks, scratches, other damage, or repair is greater than the permitted serviceable or corrective action repair limits, replace the pitch change knob bracket.
(9) Examine the dowel pin for movement in the pitch change knob bracket.	Using firm hand pressure, try to move the dowel pin. Movement is not permitted.	If there is movement of the dowel pin, replace the dowel pin.
(10) Measure the height of the dowel pin from the pitch change knob bracket base.	The maximum permitted height is 0.440 inch (11.17 mm).	If the height of the dowel pin is greater than the permitted serviceble limits, press the dowel pin into the bracket to the correct height.
	The minimum permitted height is 0.390 inch (9.91 mm).	If the height of the dowel pin is less than the permitted serviceable limits, replace the pin. The replacement pin must fit tightly.

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
O. PITCH CHANGE KNOB BRACKET THAT USES A SCREW TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 530) Refer to Figure 5-20.			
(11)	Visually examine the OD of the exposed portion of the dowel pin for damage or corrosion product.	Damage or corrosion product is not permitted.	If there is damage or corrosion product, replace the dowel pin.
(12)	If the dowel pin is removed, visually examine the dowel pin hole.	Corrosion product or pitting is not permitted.	If there is corrosion product or pitting, replace the pitch change knob bracket.
(13)	Visually examine the pitch change knob bracket threaded hole for corrosion product or damage.	Corrosion product is not permitted. A maximum of 3/4 of one thread total accumulated damage is permitted.	If damage is greater than the permitted serviceable limits, replace the pitch change knob bracket.
(14)	Perform magnetic particle inspection of the pitch change knob bracket in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). NOTE: It is not necessary to remove the dowel pin.	A relevant indication is not permitted.	If there is a relevant indication, replace the pitch change knob bracket.

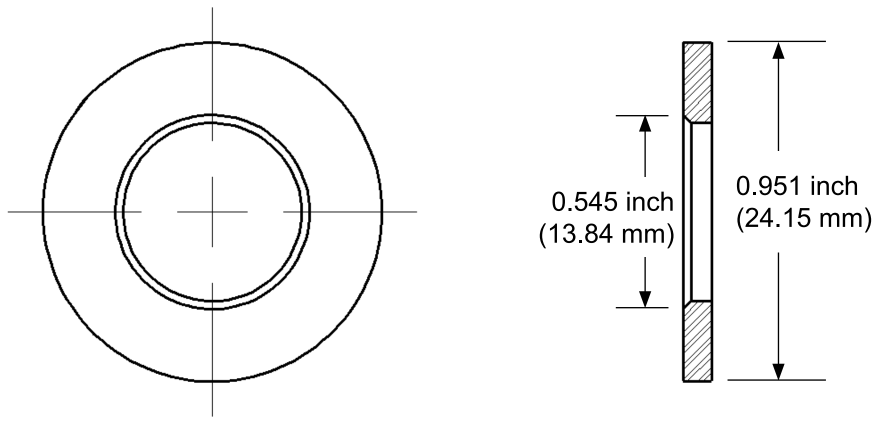
Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action

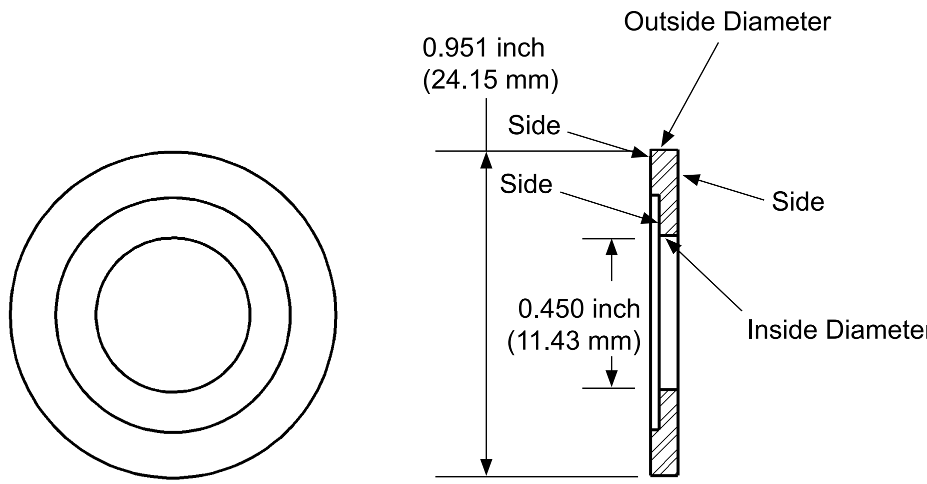
O. PITCH CHANGE KNOB BRACKET THAT USES A SCREW TO RETAIN THE CAM FOLLOWER, CONTINUED
(Item 530)
Refer to Figure 5-20.

(15) If removal of the dowel pin is not required, apply masking material to protect the dowel pin from cadmium plating materials.

(16) If all of the inspections of the pitch change knob were successfully completed, apply masking material to the Bearing Interface Surface, cadmium replate, and bake in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).



B-475 Knob Unit Retaining Washer
(Used Only With the Swaged Washer Method
for Retention of the Cam Follower
and is Required to be Replaced at Overhaul)



103395 Knob Unit Retaining Washer
(Used Only With the Screw Method
for Retention of the Cam Follower
and is Not Required to be Replaced at Overhaul)

Dimensions are for identification purposes only.

B-475, 103395

Knob Unit Retaining Washer
Figure 5-21

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
P.	KNOB UNIT RETAINING WASHER 103395 (Item 551) Refer to Figure 5-21.		
(1)	Visually examine the sides and inside diameter of the knob unit retaining washer for corrosion product and pitting.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting is 0.002 inch (0.05 mm). The maximum permitted total surface area that may have pitting is 5%. The maximum permitted diameter of an individual pit is 0.062 inch (1.57 mm). Pitting must not affect the fit or function of the knob unit retaining washer.	After applying masking material to the outside diameter of the knob unit retaining washer, corrosion product may be removed by glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the knob unit retaining washer. If pitting is greater than the serviceable limits, replace the knob unit retaining washer.
(2)	Visually examine the sides and inside diameter of the knob unit retaining washer for scratches.	The maximum permitted depth of a scratch is 0.002 inch (0.05 mm). Scratches must not affect the fit or function of the knob unit retaining washer.	If scratches are greater than the serviceable limits, replace the retaining washer.
(3)	Visually examine the knob unit retaining washer for wear or damage.	Wear or damage is not permitted.	If there is wear or damage, replace the knob unit retaining washer.
(4)	Visually examine the outside diameter of the knob unit retaining washer for corrosion product and pitting.	Corrosion product or pitting is not permitted.	If there is corrosion product or pitting, replace the knob unit retaining washer.
(5)	Visually examine the outside diameter of the knob unit retaining washer for scratches.	A scratch is not permitted.	If there is a scratch, replace the knob unit retaining washer.

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
P.	KNOB UNIT RETAINING WASHER 103395, CONTINUED (Item 551) Refer to Figure 5-21.		
(6)	Visually examine the outside diameter of the knob unit retaining washer for wear or damage.	Wear or damage in the base metal is not permitted. If the sides or inside diameter were glass bead cleaned to remove corrosion product, examine the outside diameter for a rough surface from the glass bead cleaning. The maximum permitted surface finish is 16 Ra.	If wear or damage is greater than the serviceable limits, replace the knob unit retaining washer.
(7)	Measure the outside diameter of the knob unit retaining washer.	The minimum permitted outside diameter after or over cadmium plate is 0.950 inch (24.13 mm).	If the outside diameter is less than the serviceable limits, replace the knob unit retaining washer.
(8)	Visually examine the knob unit retaining washer for cadmium plate coverage.	A few random scratches are permitted on the sides and inside diameter; otherwise, cadmium plate must completely cover the sides and inside diameter of the knob unit retaining washer. Cadmium plate must completely cover the outside diameter without scratches, although slight cadmium loss on the corners between sides and outside diameter is permitted.	Cadmium replate and bake the knob unit retaining washer in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

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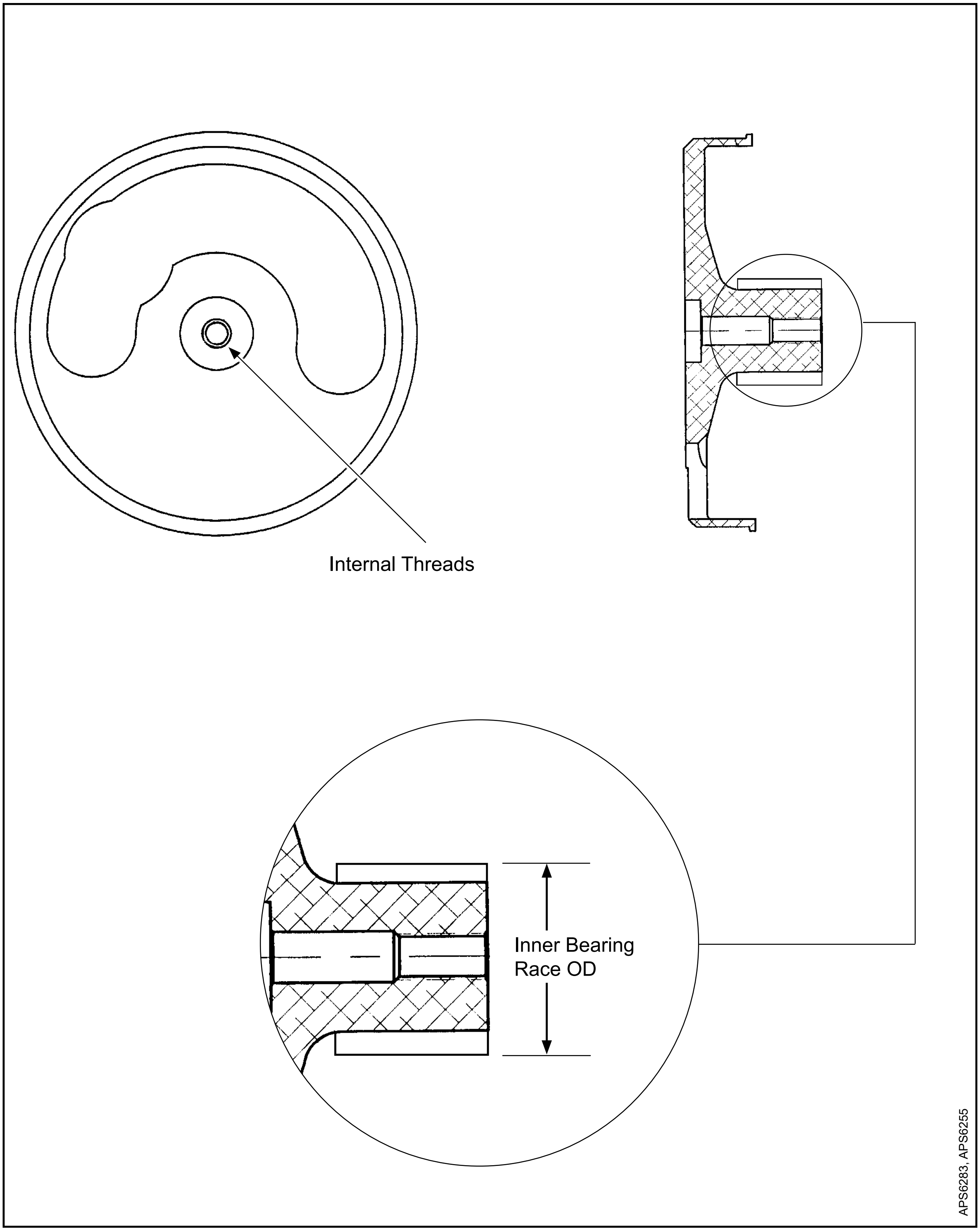


Preload Plate With the Inner Bearing Race
Figure 5-22

Component Inspection Criteria
Table 5-1

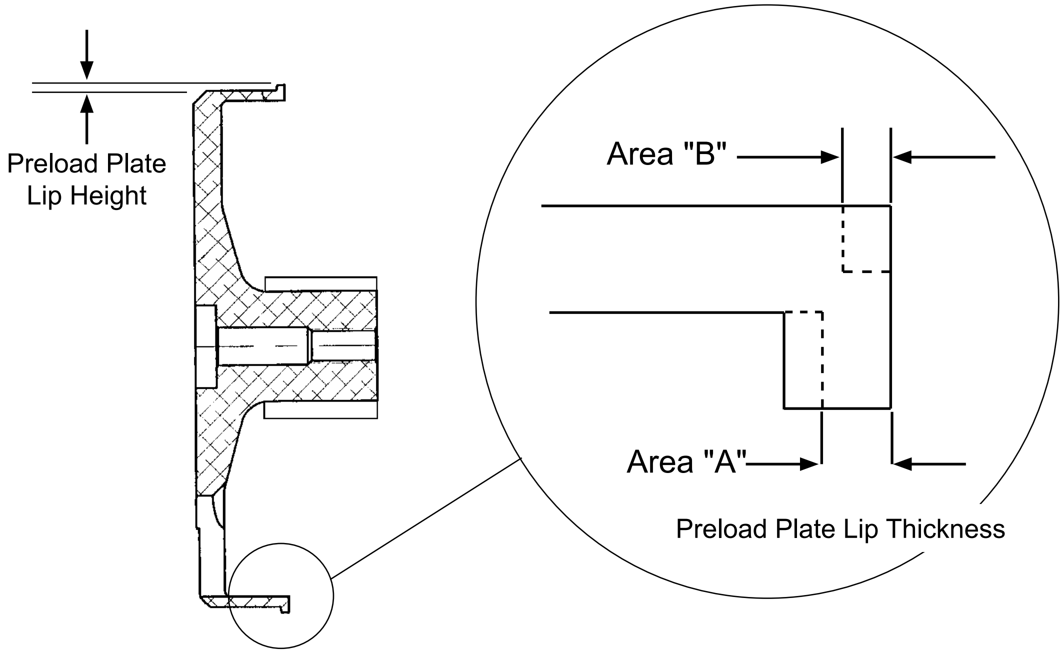
	Inspect	Serviceable Limits	Corrective Action
Q.	PRELOAD PLATE ASSEMBLY w/INNER BEARING RACE (Item 570) Refer to Figure 5-22.		
(1)	Visually examine the aluminum part of the preload plate assembly for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Mask the internal threads then remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the preload plate assembly.
(2)	Visually examine the aluminum part of the preload plate assembly for pitting.	The maximum permitted depth of pitting is 0.004 inch (0.10 mm).	Pitting may be removed by polishing using an abrasive pad CM47 or equivalent, up to 0.007 inch (0.17 mm) deep. If the depth of pitting or polishing is greater than the permitted serviceable limits, replace the preload plate assembly.
(3)	Visually examine the internal threads for damage.	A maximum of two threads of total accumulated damage are permitted.	If the damage is greater than the permitted serviceable limits, replace the preload plate assembly.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Q. PRELOAD PLATE ASSEMBLY w/INNER BEARING RACE, CONTINUED (Item 570) Refer to Figure 5-22.		
(4) Visually examine the OD of the inner bearing race (580) for corrosion product, brinelling, pitting, and damage.	Corrosion product is not permitted. If there is corrosion, remove it in accordance with the corrective action repair limits. Raised material is not permitted. The maximum permitted depth of brinelling is 0.003 inch (0.07 mm). The maximum permitted depth of pitting and damage is 0.005 inch (0.12 mm). The maximum permitted total area of brinelling, pitting, and damage is 5%.	Mask the internal threads then remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). Polish raised material using abrasive pad CM47 or equivalent. B-6679 inner bearing race: If corrosion product cannot be removed, or if raised material, brinelling, pitting, or damage of the inner bearing race is greater than the permitted serviceable limits, remove the inner bearing race in accordance with the Repair chapter of this manual, then examine the preload plate spindle in accordance with the applicable step in this Preload Plate Assembly inspection criteria. A-1272 inner bearing race: If corrosion product cannot be removed, or if raised material, brinelling, pitting, or damage of the inner bearing race is greater than the permitted serviceable limits, replace the preload plate assembly.

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
Q.	PRELOAD PLATE ASSEMBLY w/INNER BEARING RACE, CONTINUED (Item 570) Refer to Figure 5-22.		
(5)	Measure the OD of the inner bearing race (580).	**B-6679 inner bearing race:** The minimum permitted OD is 1.249 inch (31.73 mm). **A-1272 inner bearing race:** The minimum permitted OD is 1.124 inch (28.55 mm).	**B-6679 inner bearing race:** If the OD is less than the permitted serviceable limits, remove the inner bearing race in accordance with the Repair chapter of this manual, then examine the preload plate spindle in accordance with the applicable step in this Preload Plate Assembly inspection criteria. **A-1272 inner bearing race:** If the OD is less than the permitted serviceable limits, replace the preload plate assembly.
(6)	If the inner bearing race (580) is removed, visually examine the preload plate spindle for corrosion product, raised material, and damage.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. Raised material is not permitted. The maximum permitted depth of damage is 0.004 inch (0.10 mm).	Mask the internal threads then remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). Polish raised material using abrasive pad CM47 or equivalent. If the corrosion product cannot be removed, or if raised material or damage to the preload plate spindle is greater than the permitted serviceable limits, replace the preload plate assembly.



Lip Thickness in Area "A"	Maximum Permitted Depth of Damage in Area "B"
0.060 inch (1.53 mm)	0.013 inch (0.33 mm) or less
0.061 inch (1.55 mm)	0.014 inch (0.35 mm)
0.062 inch (1.58 mm)	0.015 inch (0.38 mm)
0.063 inch (1.61 mm)	0.016 inch (0.40 mm)
0.064 inch (1.63 mm)	0.017 inch (0.43 mm)
0.065 inch (1.66 mm)	0.018 inch (0.45 mm)
0.066 inch (1.68 mm)	0.019 inch (0.48 mm)
0.067 inch (1.71 mm) or greater	0.020 inch (0.50 mm)

Example 1: Lip thickness in Area "A" is greater than 0.063 inch (1.61 mm)
Depth of damage in Area "B" is 0.016 inch (0.40 mm).
Preload plate is within permitted serviceable limits

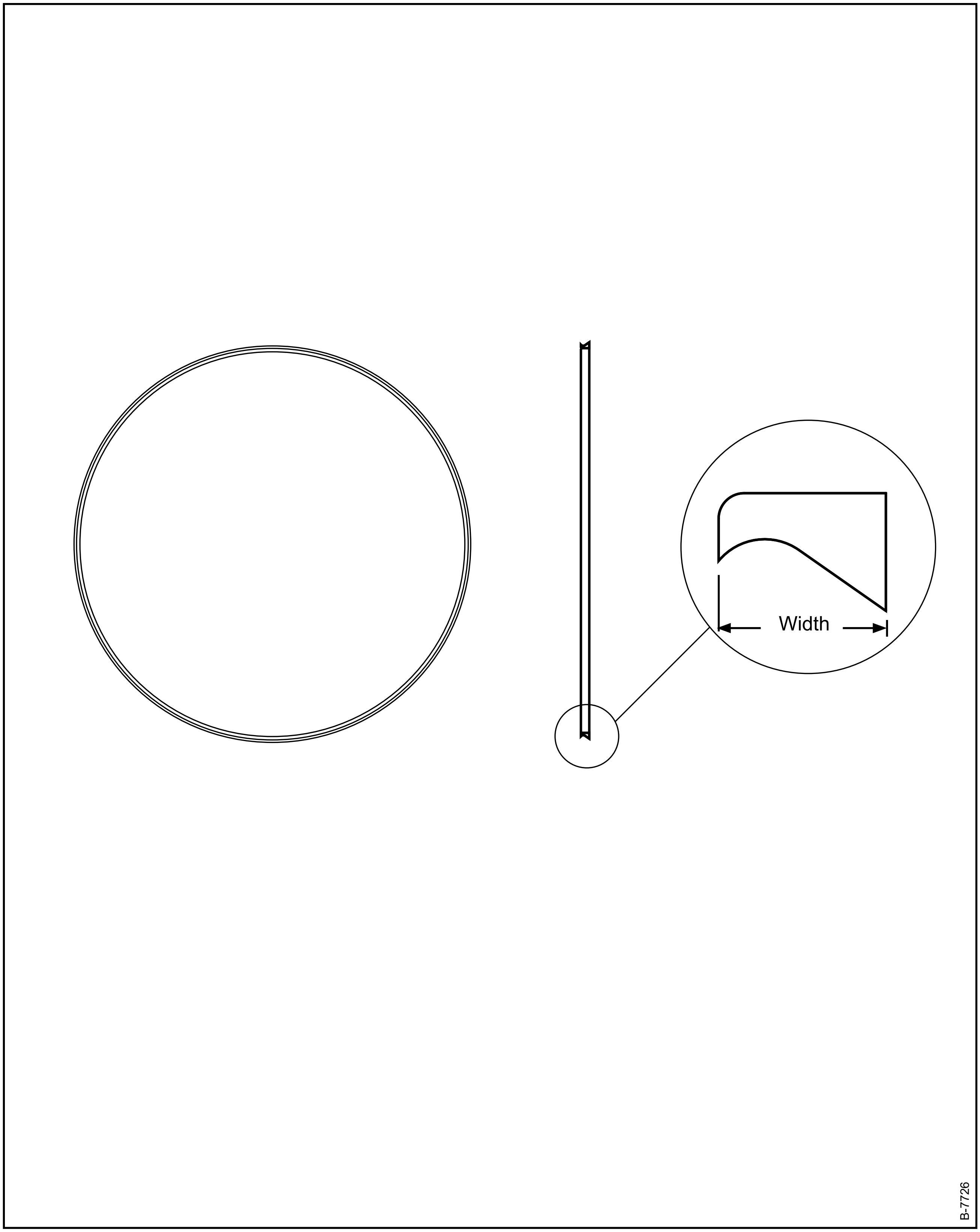
Example 2: Lip thickness in Area "A" is less than 0.063 inch (1.61 mm)
Depth of damage in Area "B" is 0.018 inch (0.45 mm)
Damage is greater than the permitted serviceable limits, replace the preload plate.

APS6283, APS6284

Preload Plate Lip Measurement
Figure 5-23

Component Inspection Criteria
Table 5-1

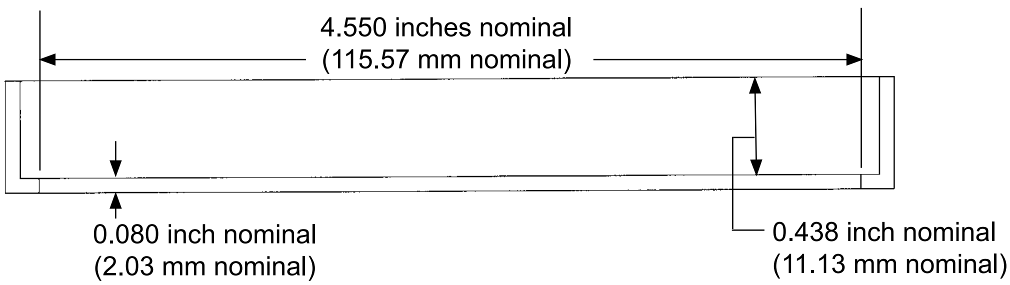
	Inspect	Serviceable Limits	Corrective Action
Q.	PRELOAD PLATE ASSEMBLY w/INNER BEARING RACE, CONTINUED (Item 570) Refer to Figure 5-23.		
(7)	Visually examine the preload plate lip for damage. If the lip is damaged, measure the height.	The minimum permitted lip height is 0.040 inch (1.02 mm).	Remove any rough edges or evidence of fretting. If damage or repair is greater than the permitted serviceable limits, or if the lip height is less than the permitted serviceable limits, replace the preload plate assembly.
(8)	Visually examine the preload plate lip for damage. If the lip is damaged, measure the lip thickness.	The minimum lip thickness in Area "A" is 0.060 inch (1.53 mm). The maximum permitted depth of damage in Area "B" of the lip of the preload plate is dependent on the thickness in Area "A" of the lip of the preload plate. Use the information and examples in Figure 5-23 to find the maximum permitted depth of damage in Area "B" when lip thickness in Area "A" is equal to or greater than the dimension specified in Figure 5-23.	If the lip thickness in Area "A" is less than the permitted serviceable limits, replace the preload plate. If the depth of damage in Area "B" is greater than the permitted serviceable limits, replace the preload plate assembly.
(9)	Penetrant inspect the preload plate in accordance with the Penetrant Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). Pre-penetrant etch is not required.	A relevant indication is not permitted.	If there is a relevant indication, replace the preload plate assembly.



Blade Seal
Figure 5-24

Component Inspection Criteria
Table 5-1

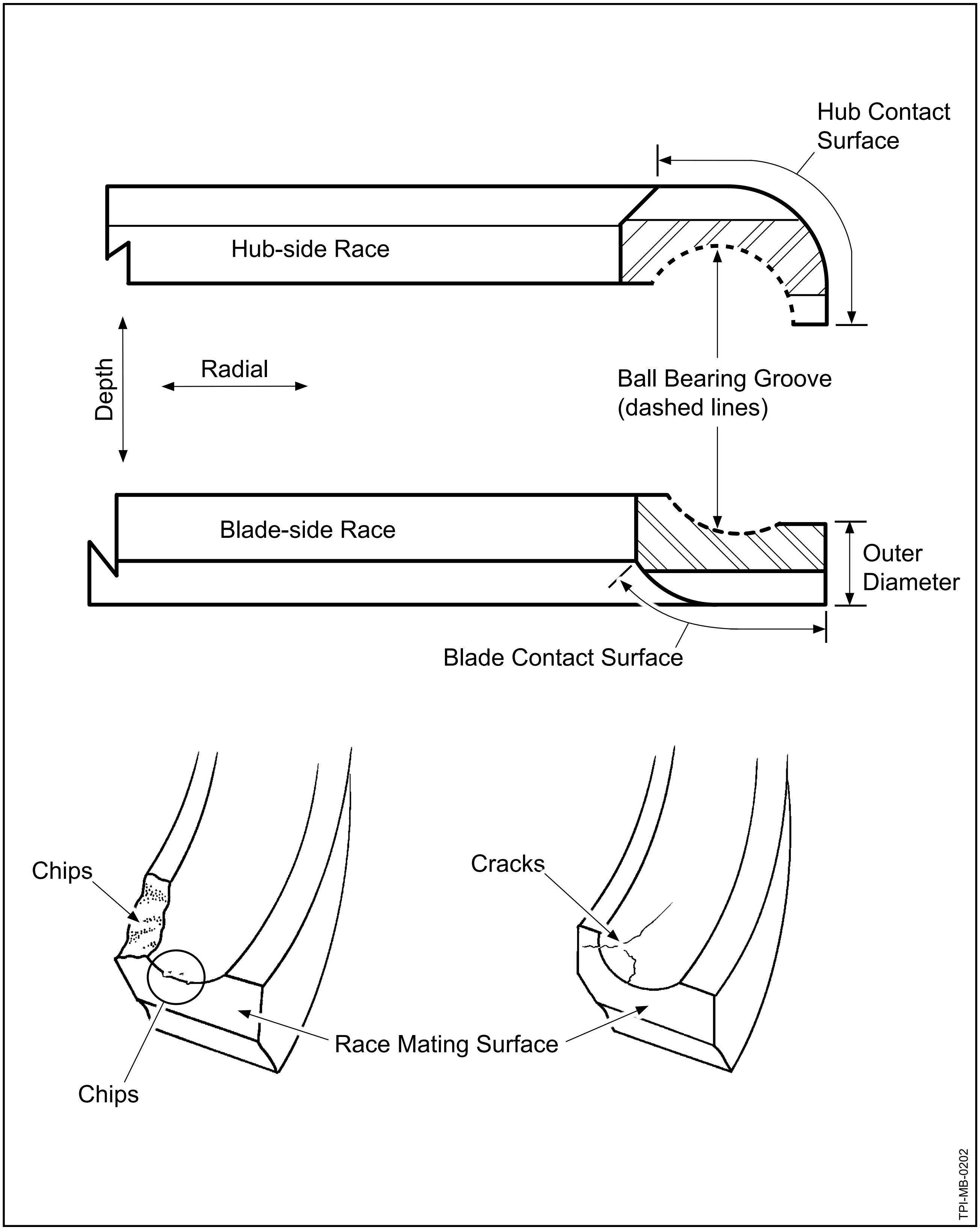
Inspect		Serviceable Limits	Corrective Action
R.	<u>BLADE SEAL</u> (Item 615) Refer to Figure 5-24.		
	(1) Using 10X magnification and an appropriate light source, visually inspect the blade seal for damage, missing material, separation, or form irregularities of the continuous ring.	Damage, missing material, separation, or irregularities are not permitted.	If the damage or other conditions are greater than the permitted serviceable limits, replace the blade seal.
	(2) Visually examine the width of the blade seal for wear. If worn, measure the width of the blade seal.	The minimum permitted width is 0.090 inch (2.29 mm).	If the width is less than the permitted serviceable limits, replace the blade seal.



Bearing Retaining Ring
Figure 5-25

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
S. BEARING RETAINING RING (Item 610) Refer to Figure 5-25.		
(1) Except for Area "A",, visually examine the bearing retaining ring for corrosion product and pitting.	Corrosion product is not permitted. The maximum permitted depth of pitting is 0.005 inch (0.12 mm). Pitting must not interfere with the ability of the bearing retaining ring to fit tight to the blade and the bearing race.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If damage is greater than the permitted serviceable limits, replace the bearing retaining ring.
(2) Visually examine the bearing retaining ring for wear, damage, or fretting.	The bearing retaining ring must fit tight to the blade and the bearing race when installed over the blade and bearing race.	If wear, damage, or fretting is greater than the permitted serviceable limits, replace the bearing retaining ring.
(3) Visually examine the entire bearing retaining ring for cadmium plating coverage.	A few random scratches and corners with cadmium plating missing are permitted; otherwise, complete coverage is required.	If cadmium plating is less than the permitted serviceable limits, replate the bearing retaining ring in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).



Bearing Race
Figure 5-26

Component Inspection Criteria
Table 5-1

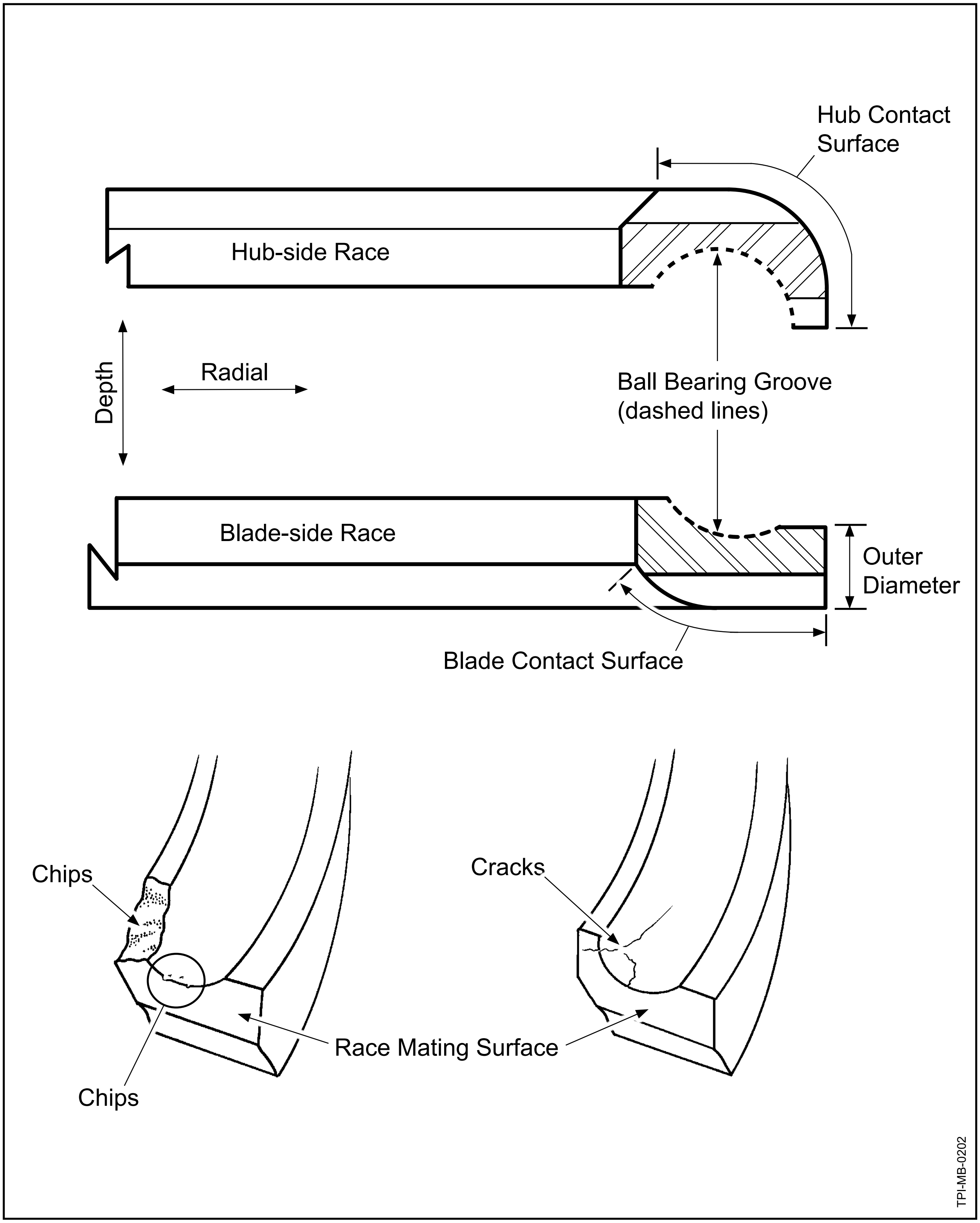
Inspect	Serviceable Limits	Corrective Action
T. BEARING RACE, FOR ALL EXCEPT C-792-1 (Items 630, 650) Refer to Figure 5-26.		
(1) Visually examine the ball bearing groove in each bearing race for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Remove corrosion product using glass bead cleaning. For glass bead cleaning refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the bearing race.
(2) Visually examine the ball bearing groove in each bearing race for pitting, wear, fretting, and damage.	The maximum permitted depth of pitting is 0.003 inch (0.076 mm) in the ball bearing groove. The maximum permitted diameter of a pit is 0.032 inch (0.81 mm). The maximum permitted total area of pitting in the ball bearing groove on a complete bearing race is 0.12 square inch (77.4 square mm) (two bearing races for each bearing set). Pitting must not interfere with bearing ball movement or support.	If the pitting is greater than the serviceable limits, replace the bearing race.
	If the ball bearing groove has wear, measure the wear. The maximum permitted depth of wear is 0.005 inch (0.12 mm).	If the wear is greater than the permitted serviceable limits, replace the bearing race.
	Fretting damage is not permitted.	If there is fretting damage, replace the bearing race.
	For damage other than pitting or fretting, the maximum permitted depth of damage is 0.003 inch (0.076 mm) and must not interfere with bearing ball movement or support.	If damage is greater than the permitted serviceable limits, replace the bearing race.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
T. BEARING RACE, FOR ALL EXCEPT C-792-1, CONTINUED (Items 630, 650) Refer to Figure 5-26.		
(3) Except for the ball bearing groove, visually examine all other surfaces of each bearing race for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Remove corrosion product using glass bead cleaning. For glass bead cleaning refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the bearing race.
(4) Except for the ball bearing groove, visually examine all other surfaces of each bearing race for pitting, wear, fretting, and damage.	The maximum permitted depth of pitting is 0.005 inch (0.12 mm). The maximum permitted diameter of a pit is 0.062 inch (1.57 mm). The maximum permitted total area of pitting on all surfaces except the ball bearing groove of a complete bearing race is 0.25 square inch (161.2 square mm) (two bearing races for each bearing set).	If the pitting is greater than the permitted serviceable limits, replace the bearing race.
	Fretting damage is permitted on the outer diameter of the bearing races that interface with the bearing retaining ring (610). Fretting must not loosen the tight fit with the bearing retaining ring (610).	Clean the fretted area thoroughly using an abrasive pad CM47 or equivalent to decrease fretting damage to a minimum. If the fit of the bearing retaining ring (610) to the bearing race is not tight, replace the bearing race.
	Wear is not permitted.	If there is wear, replace the bearing race.
	For damage other than pitting or fretting, the maximum permitted depth of damage is 0.005 inch (0.12 mm) and must not interfere with the mating surfaces.	If the damage is greater than the permitted serviceable limits, replace the bearing race.

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
T.	BEARING RACE, FOR ALL EXCEPT C-792-1, CONTINUED (Items 630, 650) Refer to Figure 5-26.		
(5)	Visually examine the bearing race for chips or cracks that are adjacent to the mating surfaces of the bearing race.	Chips or cracks that are adjacent to the mating surfaces of the bearing race are not permitted.	If there are chips or cracks adjacent to the mating surfaces of the bearing race, replace the bearing race.
(6)	Magnetic particle inspect each bearing race in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the bearing race.



C-792-1 Bearing Race
Figure 5-27

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
U. BEARING RACE, C-792-1 ONLY (Items 630, 650) Refer to Figure 5-27.		
(1) Visually examine the ball bearing groove in each bearing race for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Remove corrosion product using glass bead cleaning. For glass bead cleaning refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the bearing race.
(2) Visually examine the ball bearing groove in each bearing race for pitting, wear, fretting, and damage.	The maximum permitted depth of pitting is 0.003 inch (0.076 mm) in the ball bearing groove. The maximum permitted diameter of a pit is 0.032 inch (0.81 mm). The maximum permitted total area of pitting in the ball bearing groove on a complete bearing race is 0.12 square inch (77.4 square mm) (two bearing races for each bearing set). Pitting must not interfere with bearing ball movement or support.	If the pitting is greater than the serviceable limits, replace the bearing race.
	If the ball bearing groove has wear, measure the wear. The maximum permitted depth of wear is 0.005 inch (0.12 mm).	If the wear is greater than the permitted serviceable limits, replace the bearing race.
	Fretting damage is not permitted.	If there is fretting damage, replace the bearing race.
	For damage other than pitting or fretting, the maximum permitted depth of damage is 0.003 inch (0.076 mm) and must not interfere with bearing ball movement or support.	If damage is greater than the permitted serviceable limits, replace the bearing race.
(3) Visually examine the hard chrome plating in the ball bearing groove of each bearing race for flaking.	The maximum permitted total area of flaking in the ball bearing groove on a complete bearing race (blade side or hub side) is 5%.	If the flaking is greater than the serviceable limits, replace the bearing race.

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
U.	BEARING RACE, C-792-1 ONLY, CONTINUED (Items 630, 650) Refer to Figure 5-27.		
(4)	Except for the ball bearing groove, visually examine all other surfaces of each bearing race for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Remove corrosion product using glass bead cleaning. For glass bead cleaning refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the bearing race.
(5)	Except for the ball bearing groove, visually examine all other surfaces of each bearing race for pitting, wear, fretting, and damage.	The maximum permitted depth of pitting is 0.005 inch (0.12 mm). The maximum permitted diameter of a pit is 0.062 inch (1.57 mm). The maximum permitted total area of pitting on all surfaces except the ball bearing groove of a complete bearing race is 0.25 square inch (161.2 square mm) (two bearing races for each bearing set).	If the pitting is greater than the permitted serviceable limits, replace the bearing race.
		Fretting damage is permitted on the outer diameter of the bearing races that interface with the bearing retaining ring (610). Fretting must not loosen th ring (610).	Clean the fretted area thoroughly using an abrasive pad CM47 or equivalent to decrease fretting damage to a minimum. If the fit of the bearing retaining ring (610) to the bearing race is not tight, replace the bearing race.
		Wear is not permitted.	If there is wear, replace the bearing race.
		For damage other than pitting or fretting, the maximum permitted depth of damage is 0.005 inch (0.12 mm) and must not interfere with the mating surfaces.	If the damage is greater than the permitted serviceable limits, replace the bearing race.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
U. BEARING RACE, C-792-1 ONLY, CONTINUED (Items 630, 650) Refer to Figure 5-27.		
(6) Except for the ball bearing groove, visually examine the hard chrome plating on all other surfaces of each bearing race for flaking.	The maximum permitted total area of flaking for all other surfaces except the ball bearing groove on a complete bearing race (blade side or hub side) is 5%.	If the flaking is greater than the serviceable limits, replace the bearing race.
(7) Visually examine the race for chips or cracks that are adjacent to the mating surfaces of the bearing race.	Chips or cracks that are adjacent to the mating surfaces of the bearing race are not permitted.	If there are chips or cracks adjacent to the mating surfaces of the bearing race, replace the bearing race.
(8) Magnetic particle inspect each bearing race in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). NOTE: It is not necessary to strip the hard chrome plating from the bearing race before magnetic particle inspection.	A relevant indication is not permitted.	If there is a relevant indication, replace the bearing race.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
V. BALANCE WEIGHT (Item 710)		
(1) Visually examine the balance weight for corrosion product.	Corrosion product is not permitted. Remove corrosion product in accordance with the corrective action instructions.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the balance weight.
(2) Visually examine the balance weight for pitting, wear, or damage.	The maximum permitted depth of pitting, wear, or damage is 0.003 inch (0.07 mm).	Using an abrasive pad CM47 or equivalent, polish to a maximum depth of 0.005 inch (0.12 mm). If the depth of pitting, wear, or damage is greater than the permitted serviceable limits or the corrective action limits, replace the balance weight.
(3) For an aluminum (gray color) balance weight: Visually examine the balance weight for anodize coverage.	Except for a few scratches and corners with anodize coating missing, complete coverage is required.	If the coverage is less than the permitted serviceable limits, re-anodize the weight in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).
(4) For a steel (silver color) balance weight: Visually examine for cadmium plating coverage.	Except for a few scratches and corners with cadmium plating missing, complete cadmium plating coverage is required.	If the coverage is less than the permitted serviceable limits, replate the weight in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
W. COUNTERWEIGHT SLUG (Item 9040)		
(1) Visually examine each counterweight slug for corrosion product.	Corrosion product is not permitted.	Remove the corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Standard practices Manual 202A (61-01-02).

CAUTION: MAJOR MATERIAL REMOVAL WILL AFFECT WEIGHT AND COULD AFFECT PROPELLER DYNAMIC BALANCE AS BLADES CHANGE ANGLE DURING PROPELLER ROTATION.

Inspect	Serviceable Limits	Corrective Action
(2) Visually examine each counterweight slug for pitting or wear.	The maximum permitted depth of pitting or wear is 0.005 inch (0.12 mm). Pitting, wear, or repair that interferes with installation, fit, or function of the counterweight slug is not permitted.	Using an abrasive pad CM47 or equivalent, pitting or wear may be polished up to 0.010 inch (0.25 mm) deep. If the depth of pitting, wear, or polishing is greater than the serviceable limits or the corrective action limits, replace the counterweight slug.
(3) Visually examine each counterweight slug for scratches, gouges, or other damage.	The maximum permitted depth of a scratch, gouge, or other damage is 0.035 inch (0.88 mm). Damage that interferes with installation, fit, or function of the counterweight slug is not permitted.	Material that is pushed up above the normal surface is not permitted. Remove all pushed up material by polishing using an abrasive pad CM47 or equivalent. If a scratch, gouge, or other damage is greater than the permitted serviceable limits, replace the counterweight slug.
(4) Visually examine each counterweight slug for cadmium plating coverage.	Except for a few scratches and corners with cadmium plating missing, complete coverage is required.	If the cadmium plating coverage is less than the permitted serviceable limits, replate the counterweight slug in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

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REPAIR - CONTENTS

LIST OF FIGURES

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WARNING 1: DO NOT ATTEMPT IN THE FIELD ANY REPAIR, REPLACEMENT, REPLATING, RE-ANODIZING, OR RE-SHOT PEENING PROCEDURE NOT SPECIFICALLY AUTHORIZED BY HARTZELL PROPELLER LLC OR NOT SPECIFICALLY REFERRED TO IN HARTZELL PROPELLER MANUALS. CONTACT HARTZELL PROPELLER LLC FOR GUIDANCE ABOUT THE AIRWORTHINESS OF ANY PART WITH UNUSUAL WEAR OR DAMAGE.

WARNING 2: ADHESIVES AND SOLVENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT AND BREATHING OF VAPORS. USE SOLVENT RESISTANT GLOVES TO MINIMIZE SKIN CONTACT AND WEAR SAFETY GLASSES FOR EYE PROTECTION. USE IN A WELL VENTILATED AREA AWAY FROM SPARKS AND FLAME. READ AND OBSERVE ALL WARNING LABELS.

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER 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 IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

1. General Repair Requirements (Rev. 3)

A. Shot Peening

CAUTION: THE PEENING MARKS ON CERTAIN PROPELLER PARTS ARE NOT TOOL MARKS AND MUST NOT BE REMOVED.

(1) Some propeller assembly parts have been shot peened at Hartzell Propeller LLC to improve fatigue strength.

(2) Shot peened surfaces may require re-shot peening because of rust, corrosion, fretting, or nicks. For shot peeing procedures, refer to the Shot Peening chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

WARNING: FAILURE TO CORRECTLY SHOT PEEN APPLICABLE PROPELLER PARTS MAY CREATE AN UNSAFE CONDITION THAT MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE. A QUALITY SHOT PEENING PROCESS IS CRITICAL FOR FLIGHT SAFETY. SHOT PEENING OF PROPELLER PARTS REQUIRES SPECIAL TECHNIQUES, TRAINING, MATERIALS, AND EQUIPMENT.

(a) Only repair stations that are properly certified by Hartzell Propeller LLC should shot peen Hartzell propeller parts.

1 For certification requirements, refer to the Approved Facilities chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

2 For a list of repair stations that are certified by Hartzell Propeller LLC to perform shot peening on Hartzell propeller parts:

a Go to the Sample Program Approvals page on the Hartzell Propeller LLC website at www.hartzellprop.com

b Contact Hartzell Propeller Product Support

(1) Refer to the section, "Contact Information" in the Introduction chapter of this manual.

B. Aluminum and Steel Parts

(1) Remove scratches, nicks, burrs, and other minor damage using a fine emery cloth or abrasive pad, such as CM47.

(a) Blend the polished area in with the surrounding area.

(b) Use extreme care to completely remove the damage while removing as little material as possible.

(2) After any repair, inspect the part in accordance with the applicable inspection criteria to be sure it is within the permitted limits.

2. Repair/Modification Procedures (Rev. 4)

A. Propeller Components (Except for those listed separately in this section)

(1) For repair and modification procedures of propeller components (except for those listed separately in this section), refer to the applicable section in this chapter.

B. Hubs

(1) Aluminum Hubs: Refer to the Aluminum Hub Overhaul chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

C. Blades

(1) Aluminum Blades: Refer to Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33).

D. Spinner Assemblies

(1) Metal Spinners: Refer to Hartzell Propeller Metal Spinner Maintenance Manual 127 (61-16-27).

(2) Composite Spinners: Refer to Hartzell Propeller Composite Spinner Maintenance Manual 148 (61-16-48).

E. Ice Protection Systems

(1) For ice protection systems supplied by Hartzell, refer to Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(2) For ice protection systems not supplied by Hartzell, refer to the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

3. Specific Repair Requirements

A. Repair of Damaged Balance Weight Attachment Holes

(1) For requirements and procedures for repair of balance weight attachment holes and lubrication fitting holes, refer to the Aluminum Hub Overhaul chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

B. Repair of Damaged Cylinder Wrench Attachment Holes

(1) For requirements and procedures for repair of damaged cylinder wrench attachment holes, refer to the Standard Repairs and Instructions chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

C. Repair of Fork Non-machined Areas

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 IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

(1) General

(a) Shallow forging laps or folds in non-machined areas of the fork are repairable in accordance with the following procedure.

(b) Perform the procedure only on forks with the following part numbers:

D-495-( )

(2) Procedure

(a) Remove the Cadmium plating from the fork. Refer to the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

(b) Magnetic particle inspect the fork and mark the indications. Refer to the Magnetic Particle Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

(c) Refer to the Check chapter of this manual for serviceable limits.

(d) Grind and then polish the fork using an abrasive pad CM47 or equivalent to remove all indications found in the forged surfaces between the arms with milled slots.

1 Indications must not be closer than 0.200 inch (5.08 mm) to the adjacent milled surfaces, except indications may come up to the corner of the forged and machined surface within 0.5 inch (12.7 mm) radius of the spacer knob center.

2 Inside radii must not be less than 0.125 inch (3.18 mm).

(e) Inspect the depth of the repair.

1 The maximum permitted repair depth is 0.015 inch (0.38 mm).

(f) Inspect the surface finish of the repair.

1 The maximum permitted repair finish is 63 micro-inch.

(g) Magnetic particle inspect the fork. Refer to the Magnetic Particle Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

1 If an indication is found, repeat steps C.(2)(c) through C.(2)(f) in this section.

a The maximum total depth of repair is 0.015 inch (0.38 mm).

2 If there are no indications found, continue with the steps below.

(h) Cadmium plate and bake the fork. Refer to the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

(i) Inspect the cadmium plating in accordance with the serviceable limits in the Check chapter of this manual.

D. Cylinder Removal

(1) General

(a) This procedure is to help in the removal of a cylinder when the threads have bound on the hub threads. Although this procedure requires the replacement of the cylinder, the hub may not have to be replaced. Refer to Figure 6-1.

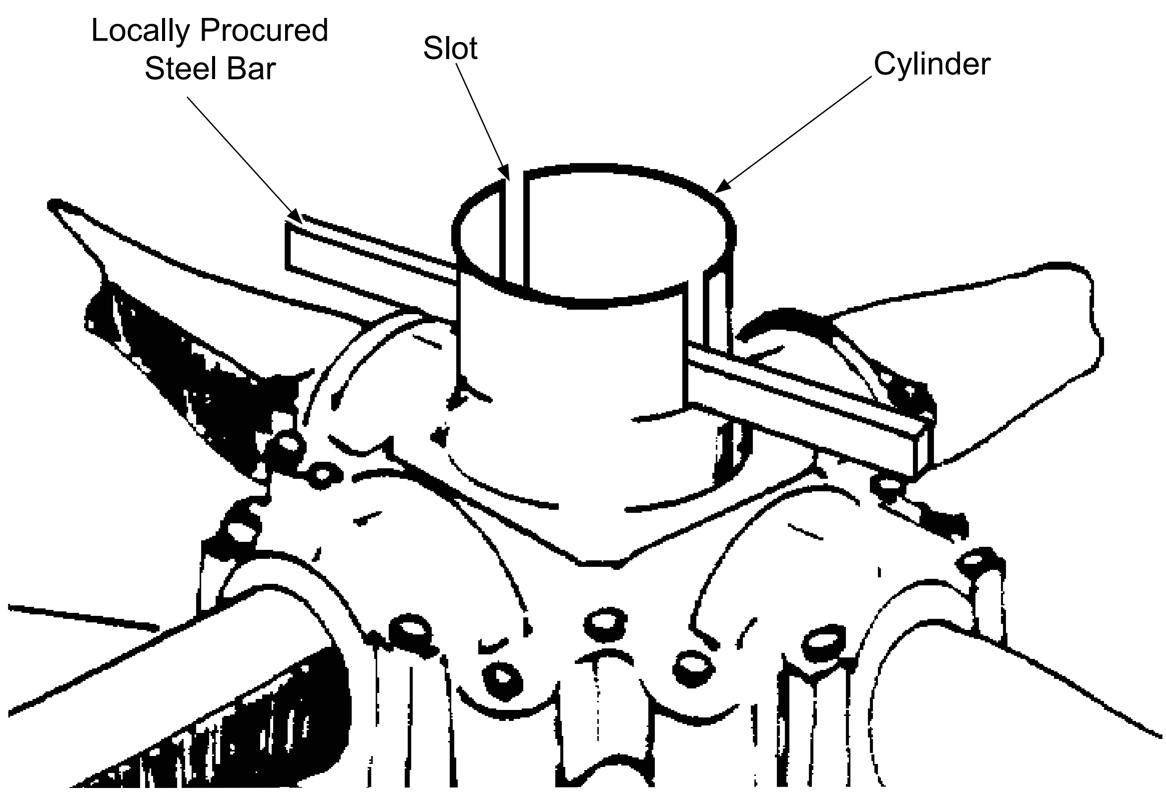
(2) Removal Procedure

CAUTION: MAKE SURE THE PROPELLER IS IN FEATHER BEFORE ATTEMPTING THE REMOVAL OF THE CYLINDER.

(a) Mark a line around the cylinder 3 to 4 inches (76 to 102 mm) above the hub.

CAUTION: DO NOT DAMAGE THE PISTON AND/OR FEATHERING COMPRESSION SPRING WHEN CUTTING THE CYLINDER.

(b) Cut around the circumference of the cylinder and remove the portion that is cut.



Cylinder Removal
Figure 6-1

(c) Remove the pitch change rod from the fork.

CAUTION: DO NOT DAMAGE THE HUB THREADS WHILE CUTTING THE SLOTS INTO THE CYLINDER.

(d) Cut two slots from the outboard end of the cylinder to the outboard end of the hub threads as follows:

1 The slots must be 180 degrees from each other.

2 The slots must be approximately 0.75 inch (19 mm) wide.

3 Each slot must come to a point at the outboard end of the hub threads.

CAUTION: DO NOT DAMAGE THE HUB THREADS WHEN CHISELING A NOTCH IN THE CYLINDER.

(e) Using a chisel, notch the cylinder just below the slots.

(f) Put a locally procured bar in the cut slots of the cylinder.

(a) The locally procured bar must:

1 Be a steel bar that is square or rectangular in shape

2 Have one side that will fit in the approximately 0.75 inch (19 mm) wide slots that were cut in the cylinder

3 Have a minimum length of 3 feet (914 mm)

(g) Using the locally procured bar, turn the cylinder counterclockwise.

1 The cylinder will either turn off or break at the chiseled notches.

E. Feather Compression Spring Zinc Chromate Primer Repair

(1) Cleaning

(a) For procedures for cleaning the feather spring (100), refer to the section Cleaning of Steel Parts in the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

(b) Inspect the feather compression spring (100) for scratches, corrosion, and zinc plate coverage in accordance with the Check chapter of this manual.

(c) Remove any loose material and feather the existing coating with 120 to 180 grit sandpaper.

(d) Using solvent CM106, clean the entire feather spring (100).

(e) Permit the solvent CM106 to air dry.

(2) Painting

NOTE: For general information about finishing procedures, refer to the Paint and Finish chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

(a) Apply a layer of zinc chromate primer, CM67, or equivalent, to the entire surface of the feather compression spring (100).

(b) Permit the primer to dry for a minimum of 24 hours before handling.

(c) Examine the feather compression spring (100) for complete primer coverage.

F. Reverse Adjust Sleeve Bushing Removal and Installation

(1) Removal Procedure

(a) Put a customer supplied 1.187 inch diameter reamer in a vise.

(b) Put the non-threaded end of the reverse adjust sleeve over the reamer.

CAUTION: DO NOT DAMAGE THE REVERSE ADJUST SLEEVE OR REMOVE METAL FROM THE REVERSE ADJUST SLEEVE SHOULDER THAT IS NEXT TO THE BUSHING WHEN REMOVING THE BUSHING.

(c) Manually turn the reverse adjust sleeve on the reamer to cut out the bushing.

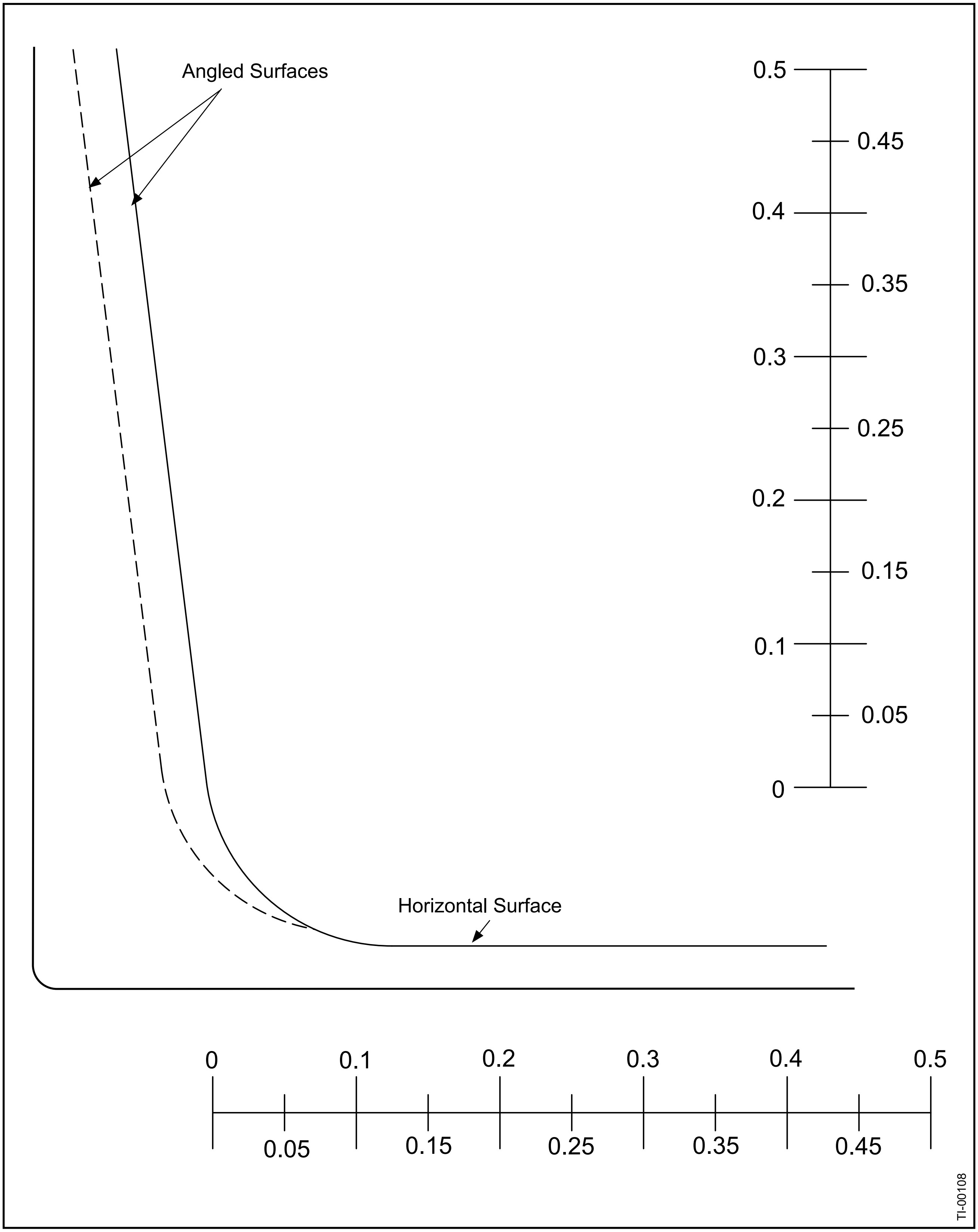
1 To make it easier to turn the reverse adjust sleeve, a tool may be made that functions as a handle.

2 To make the tool, weld a small metal bar to a nut that will fit on the threaded end of the reverse adjust sleeve. Install the tool on the reverse adjust sleeve.

(d) Using plastic media, remove the remaining bushing and adhesive. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

(2) Installation Procedure

(a) Install a new bushing. Refer to the Special Adhesive and Bonding chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).



Optical Comparator Overlay
Figure 6-2

G. Inspection of the Internal Surface of a Cylinder

(1) General

(a) Use this procedure to inspect the rough part of an internal surface of a cylinder for depth of material loss when required by the Serviceable Limits in the Check chapter of this manual. Refer to Figure 6-3.

(b) An optical comparator and replication putty CM125 is required for this inspection.

1 An optical comparator is a device that projects a magnified profile image of the object onto a screen. The image is then compared to a clear overlay that has the required shape imprinted on its surface.

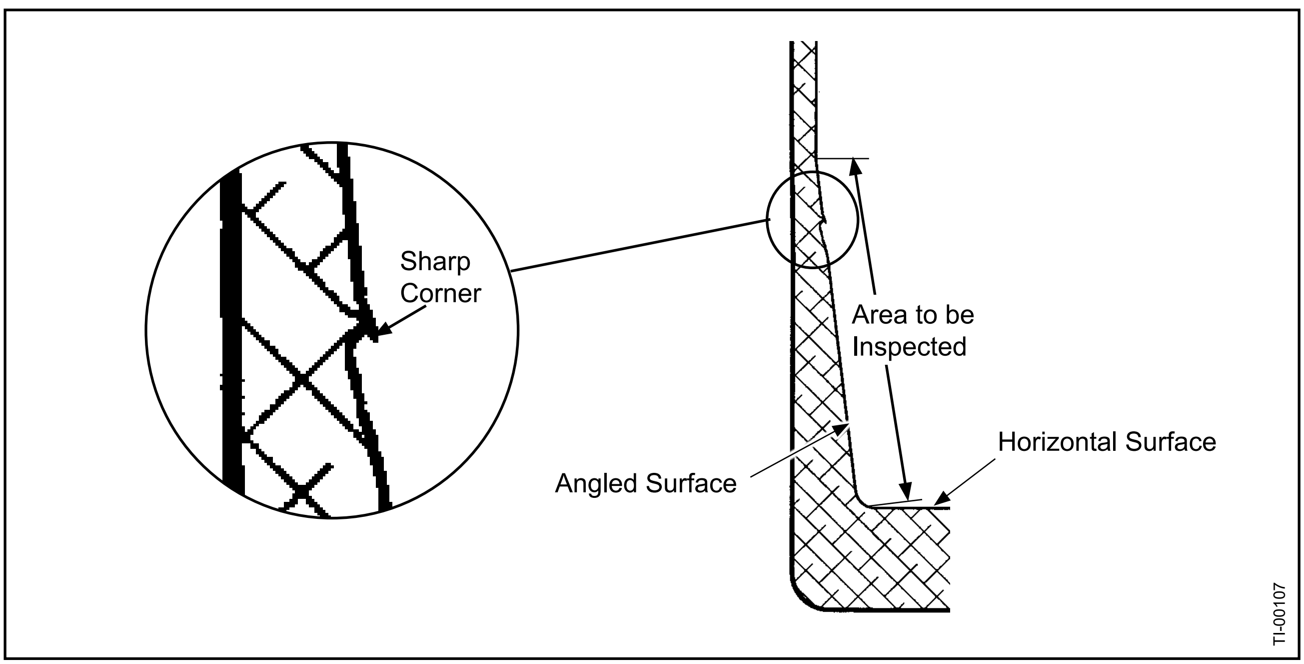
2 For a list of vendors that produce an optical comparator considered acceptable for inspection purposes, refer to optical comparators TE28 in the Hartzell Propeller Tool and Equipment Manual 165A (61-00-65).

(c) A pattern for the overlay required for this inspection is provided as Figure 6-2.

1 Figure 6-2 is drawn correctly for 20X magnification.

2 If a different magnification is desired, use Figure 6-2 as a pattern and adjust the scale, as necessary, for the different magnification.

3 Make a clear overlay to use with the optical comparator.



Inspection for a Sharp Corner
Figure 6-3

(2) Inspection for a Sharp Corner. Refer to Figure 6-3.

(a) Move your finger across the rough surface area of the cylinder.

(b) If there is any material that catches on the skin of your finger, then there is a sharp corner. Refer to the Check chapter of this manual for the serviceable limits about a sharp corner of the cylinder.

(3) Dimensional Inspection

(a) Making the Mold

NOTE: Make sure that the replication mold includes the deepest area of the rough part of the internal surface of the area to be inspected and some of the horizontal surface used for staging.

1 Using two-part replication putty CM125, make a replication mold of the area that will be dimensionally inspected. Refer to the section "Measuring Depth of Damage with Replication Material" in the Standard Repairs and Instructions chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

(b) Alignment of the Overlay on the Optical Comparator Screen

1 Set the optical comparator for the magnification that correctly matches the overlay.

2 Put the overlay on the screen of the optical comparator in approximately the final position.

3 Lightly clip the overlay in place so that the overlay can be shifted for exact alignment.

4 Adjust the stage so that an image of the stage surface appears halfway up on the screen.

5 Adjust the overlay on the screen so that the horizontal surface of the overlay aligns with the stage surface.

(c) Alignment of the Cylinder Replication Mold on the Overlay

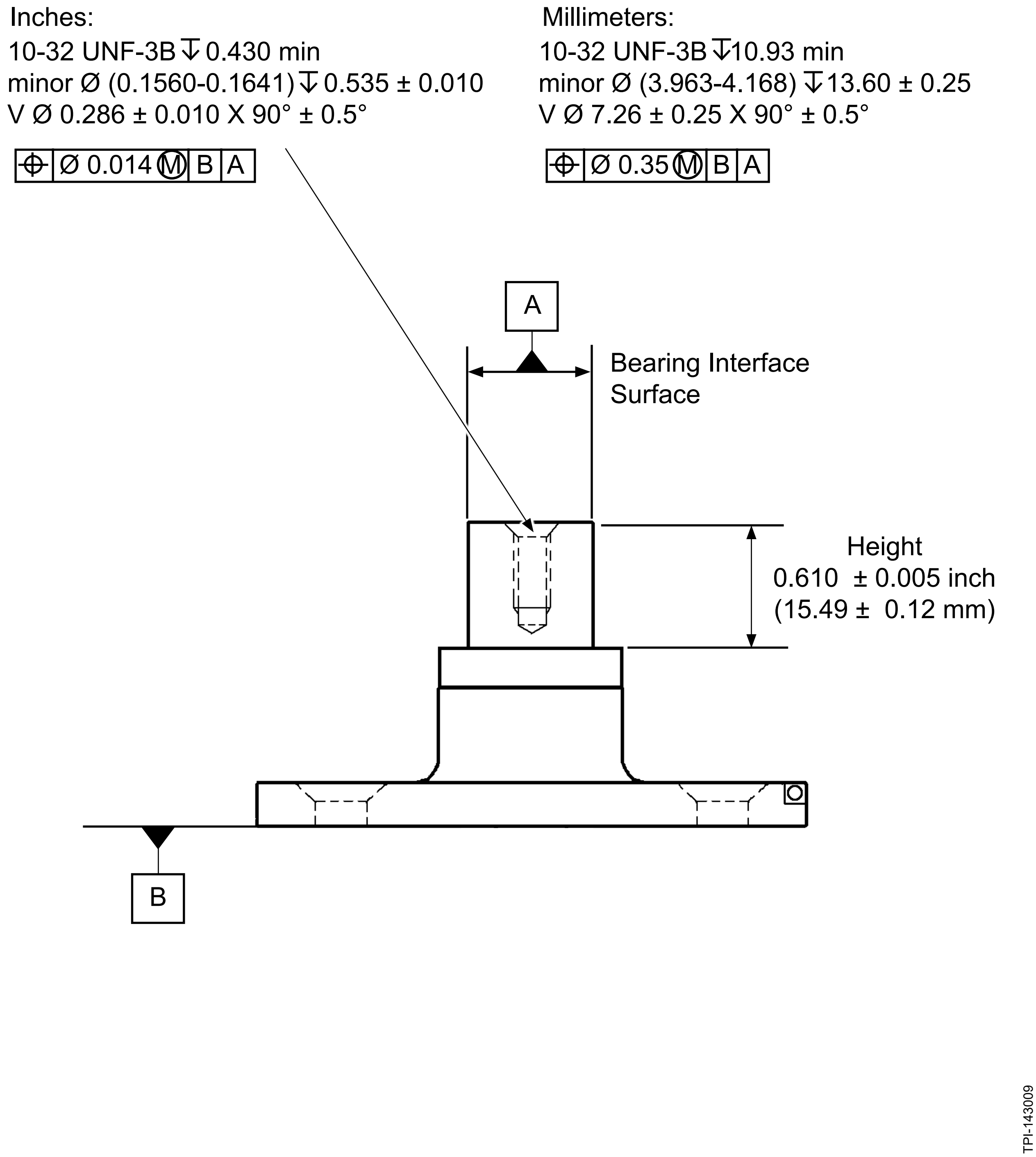
1 Put the horizontal surface of the cured cylinder replication mold on the stage.

2 Adjust the horizontal position of the vertical surface of the cylinder replication mold to position all parts of the vertical surface of the replication mold between the vertical surface lines on the optical comparator overlay, if possible.

(d) Compare the projected image with the overlay.

1 If the projected image of the vertical surface of the cylinder replication mold falls between the solid line on the overlay and the dotted line on the overlay, the depth below the surrounding machined surface is 0.030 inch (0.76 mm) or less.

2 Refer to the Check chapter of this manual for the serviceable limits about the permitted depth for the rough surface of the cylinder.



Modified Pitch Change Knob Bracket
Figure 6-4

H. Pitch Change Knob Bracket Modification - Refer to Figure 6-4

(1) Mill off the retaining washer shoulder of the pitch change knob bracket to the height given in Figure 6-4.

(2) Drill, thread, and countersink/chamfer to the true position requirement as specified in Figure 6-4.

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

(3) Using solvent CM106 MEK or CM219 MPK, clean the threaded hole and permit the threads to dry.

(4) Inspect the pitch change knob bracket in accordance with the section, "Pitch Change Knob Bracket That Uses a Screw to Retain the Cam Follower" in the Check chapter of this manual.

(5) If all of the inspections of the pitch change knob were successfully completed, apply masking material to the pitch change knob bearing OD interface surface, cadmium replate, and bake in accordance with the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

(6) Use metal impression stamping or vibra engraving to mark the modified pitch change knob bracket with the letter "**A**" at the end of the part number in accordance with the Parts Identification and Marking chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

NOTE: A part number with an **A** suffix will identify that it is a modified pitch change knob bracket unit.

I. Preload Plate Assembly Inner Bearing Race Replacement

(1) Removing and Installing the Preload Plate Inner Bearing Race (580) to the Preload Plate Spindle

CAUTION: WHEN REMOVING THE INNER BEARING RACE (580), USE CARE TO NOT DAMAGE THE PRELOAD PLATE (570) THREADS.

(a) Remove the inner bearing race (580) using the puller TE98 or a locally procured tool.

1 If using puller TE98, put a spacer below the collar of the puller TE98 to keep the puller TE98 from touching the preload plate (570) threads.

(b) Discard the inner bearing race (580).

(c) Do the required inspections of the preload plate spindle in accordance with the Check chapter of this manual.

(d) Using number 4 oil CM80, lubricate the inside diameter of the new inner bearing race (580).

(e) Put the preload plate (570) in a locally procured fixture.

CAUTION 1: WHEN PUSHING THE INNER BEARING RACE (580) ONTO THE PRELOAD PLATE (570), THE FORCE MUST NOT BE GREATER THAN 5000 POUNDS.

CAUTION 2: WHEN PUSHING THE INNER BEARING RACE (580) ONTO THE PRELOAD PLATE SPINDLE, USE CARE TO NOT DAMAGE THE PRELOAD PLATE (570) THREADS.

(f) Push the inner bearing race (580) over the preload plate spindle. Refer to Figure 6-5.

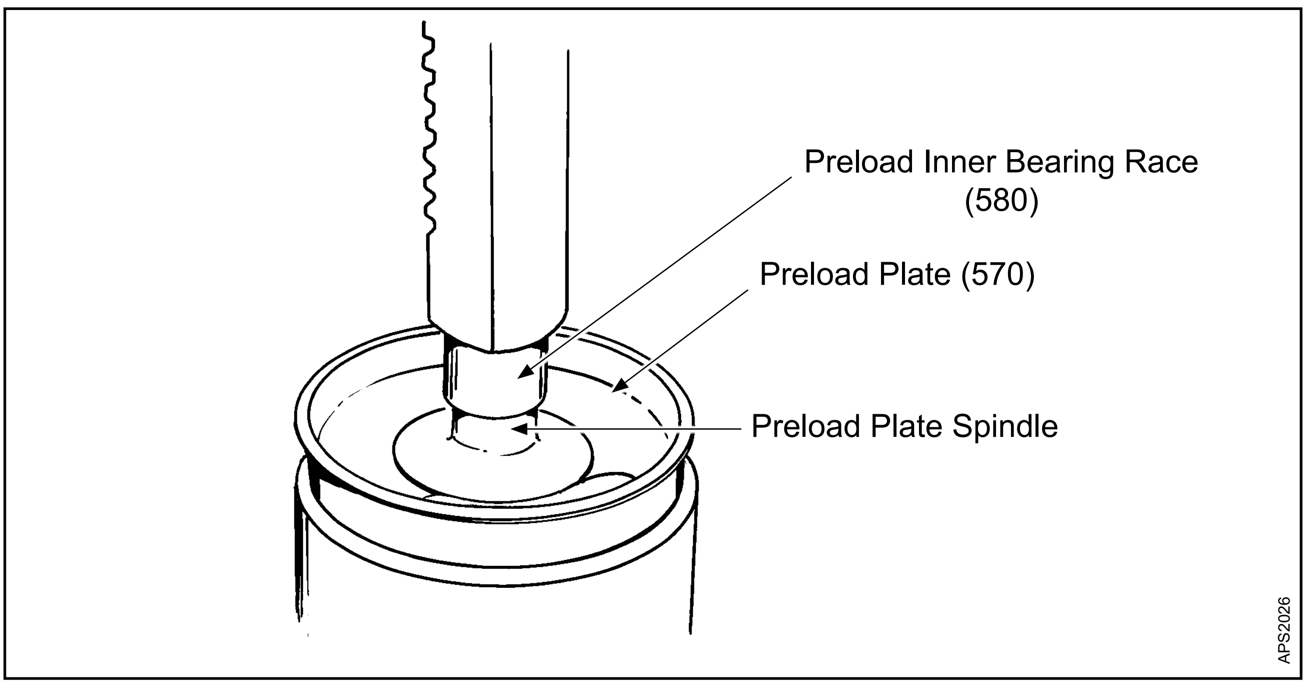
1 The top of the inner bearing race (580) must be flush to 0.005 inch (0.12 mm) below the top surface of the preload plate spindle.

(g) Turn the set screw (590) into the preload plate (570) to test the preload plate threads.

1 If the set screw (590) does not turn smoothly into the preload plate (570), replace the preload plate assembly.

(h) Twist, turn, and pull by hand the inner bearing race (580) to make sure it holds a press fit on the preload plate (570).

1 If the inner bearing race (580) does not hold a press fit on the preload plate (570), replace the preload plate assembly.



Pushing the Preload Bearing onto the Preload Plate Spindle
Figure 6-5

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ASSEMBLY - CONTENTS

ASSEMBLY - CONTENTS, CONTINUED

LIST OF FIGURES

LIST OF FIGURES, CONTINUED

LIST OF TABLES

1. General (Rev. 7)

WARNING 1: ANY PART IDENTIFIED IN THIS MANUAL AS AN EXPERIMENTAL OR NON-AVIATION PART MUST NOT BE USED IN AN FAA OR INTERNATIONAL EQUIVALENT TYPE CERTIFICATED PROPELLER. A PART IDENTIFIED AS EXPERIMENTAL OR NON-AVIATION DOES NOT HAVE FAA OR INTERNATIONAL EQUIVALENT APPROVAL EVEN THOUGH IT MAY STILL SHOW AN AVIATION TC OR PC NUMBER STAMP. USE ONLY THE APPROVED ILLUSTRATED PARTS LIST PROVIDED IN THE APPLICABLE OVERHAUL MANUAL OR ADDITIONAL PARTS APPROVED BY AN FAA ACCEPTED DOCUMENT FOR ASSEMBLY OF A PROPELLER. THE OPERATOR ASSUMES ALL RISK ASSOCIATED WITH THE USE OF EXPERIMENTAL PARTS. USE OF EXPERIMENTAL PARTS ON AN AIRCRAFT MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE.

WARNING 2: ADHESIVES AND SOLVENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT AND BREATHING OF VAPORS. USE SOLVENT RESISTANT GLOVES TO MINIMIZE SKIN CONTACT AND WEAR SAFETY GLASSES FOR EYE PROTECTION. USE IN A WELL VENTILATED AREA AWAY FROM SPARKS AND FLAME. READ AND OBSERVE ALL WARNING LABELS.

CAUTION 1: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

CAUTION 2: THE USE OF BLADE PADDLES TO MOVE BLADES CAN RESULT IN THE OVERLOAD AND DAMAGE OF THE BLADE PITCH CHANGE MECHANISM. THIS DAMAGE IS NOT REPAIRABLE AND CAN RESULT IN SEPARATION BETWEEN THE BLADE AND THE PITCH CHANGE MECHANISM, CAUSING LOSS OF PITCH CONTROL DURING FLIGHT.

A. Important Information

(1) Read all assembly instructions before beginning the assembly procedures.

(2) Protect all unassembled components from damage.

(3) Use applicable torque values. Refer to Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual.

(4) Unless specified differently, safety wire in accordance with NASM33540 using 0.032 inch (0.81 mm) safety wire.

(5) For information about additional weight slugs that may be required to be attached to the counterweight arms of certain clamp models, refer to the Hartzell Propeller Application Guide Manual 159 (61-02-59).

CAUTION: BEFORE ASSEMBLING THE PROPELLER, DETERMINE IF AN ICE PROTECTION SYSTEM IS REQUIRED.

B. Ice Protection Systems

(1) If installing an ice protection system supplied by Hartzell, refer to Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(2) If installing an ice protection system not supplied by Hartzell, refer to the applicable TC or STC holder’s Instructions for Continued Airworthiness (ICA).

C. O-rings

(1) Unless specified differently, lubricate all O-rings with lubricant CM12 before installing them in the propeller assembly.

(2) Hartzell Propeller LLC recommends that the lot number and cure date for each O-ring be recorded with all work orders when an O-ring is installed in any propeller assembly.

D. Blade Bore Plug/Bearing Installation

(1) For aluminum blades, refer to Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33).

E. Blade Angle Information

(1) For specific blade angle information, refer to the Hartzell Propeller Application Guide Manual 159 (61-02-59).

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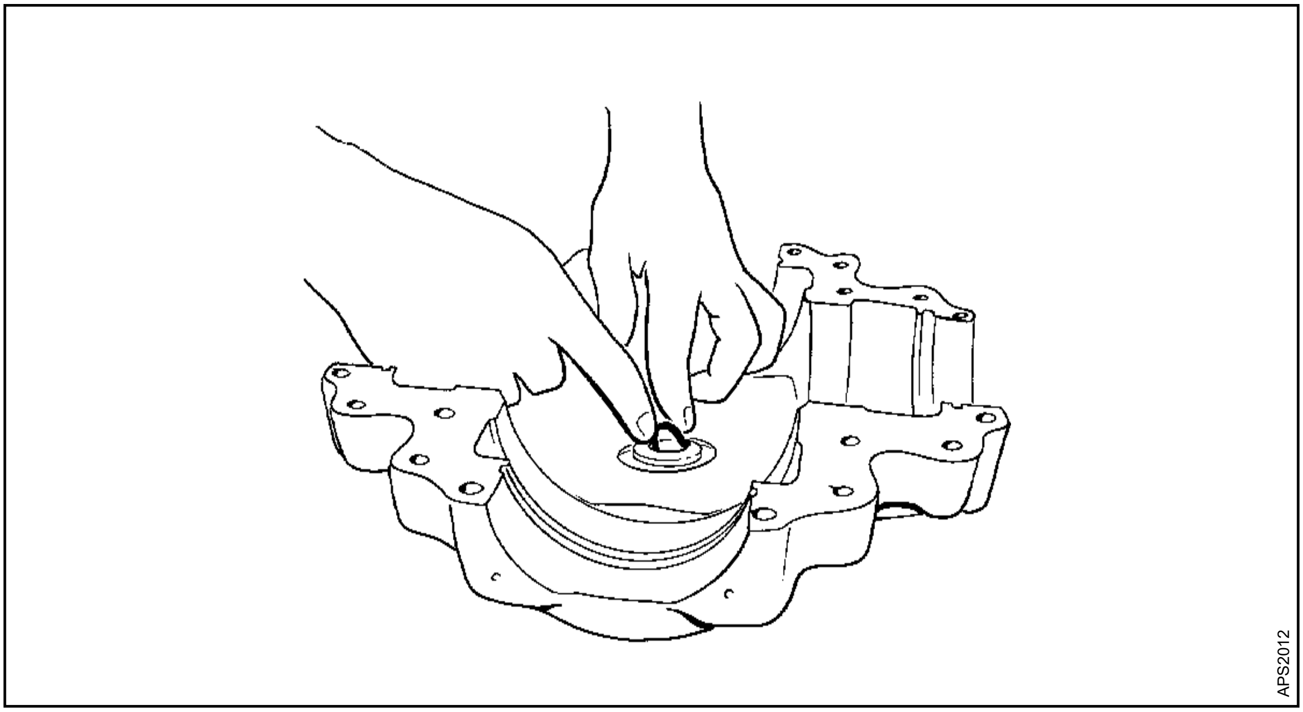
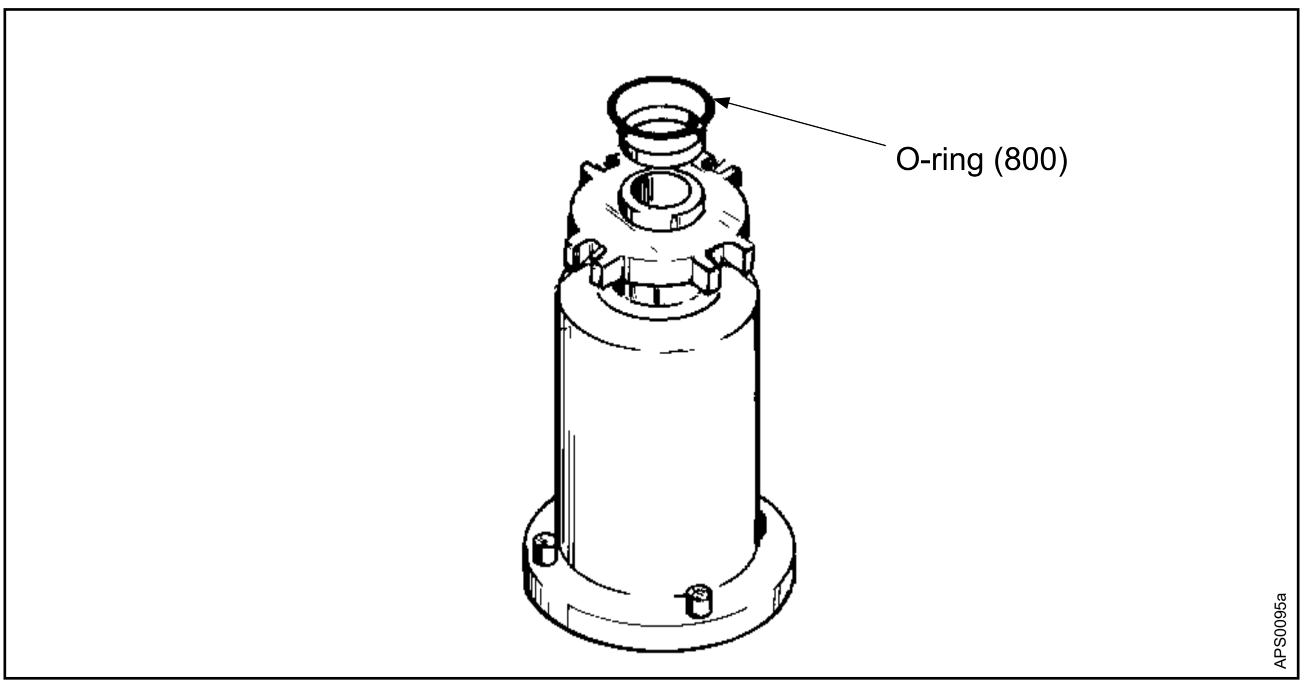


Installing the Pitch Change Rod Bore O-Ring in the Engine-Side Hub Half Flange
Figure 7-1



Installing the O-ring on the Rotatable Fixture
Figure 7-2

2. Hub Assembly Procedures

A. Hub Preparation

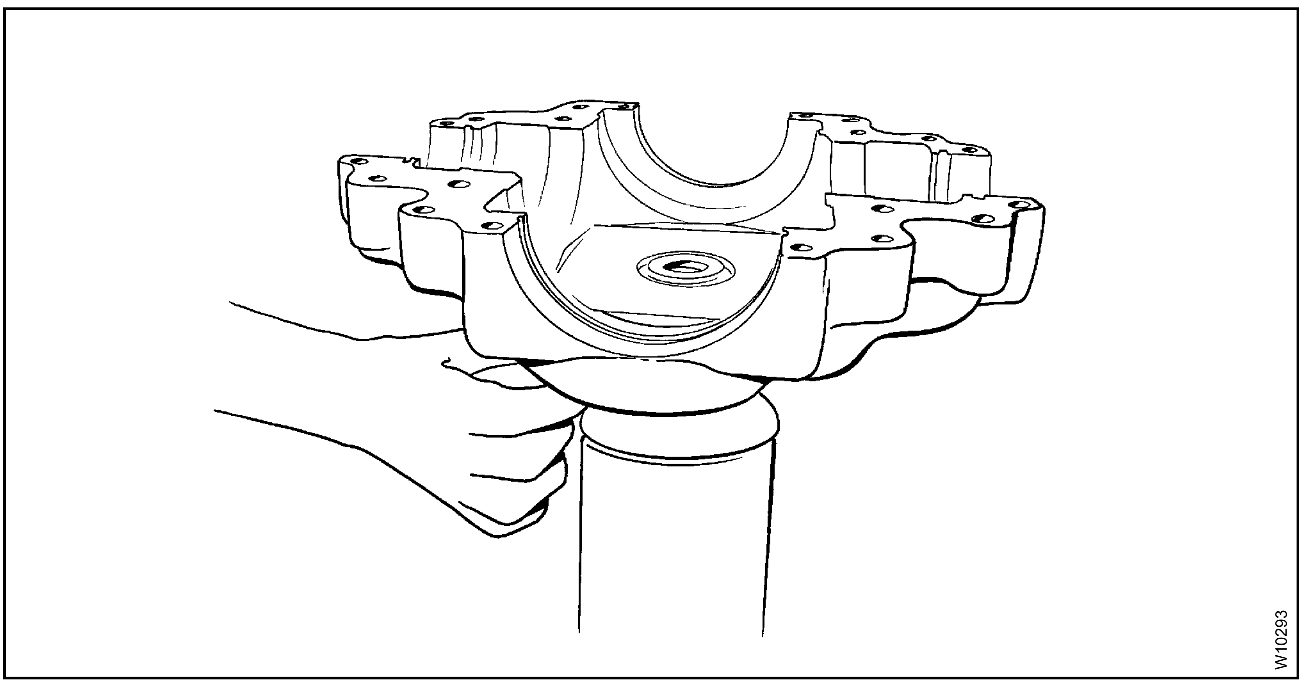
(1) Refer to the Aluminum Hub Overhaul chapter of the Hartzell Propeller Standard Practices Manual 202A (61-01-02), for assembly procedures of the hub unit before following the propeller assembly procedures in this manual.

(2) Install a new pitch change rod O-ring (260) in the cylinder-side hub half (250). Refer to Figure 7-1.

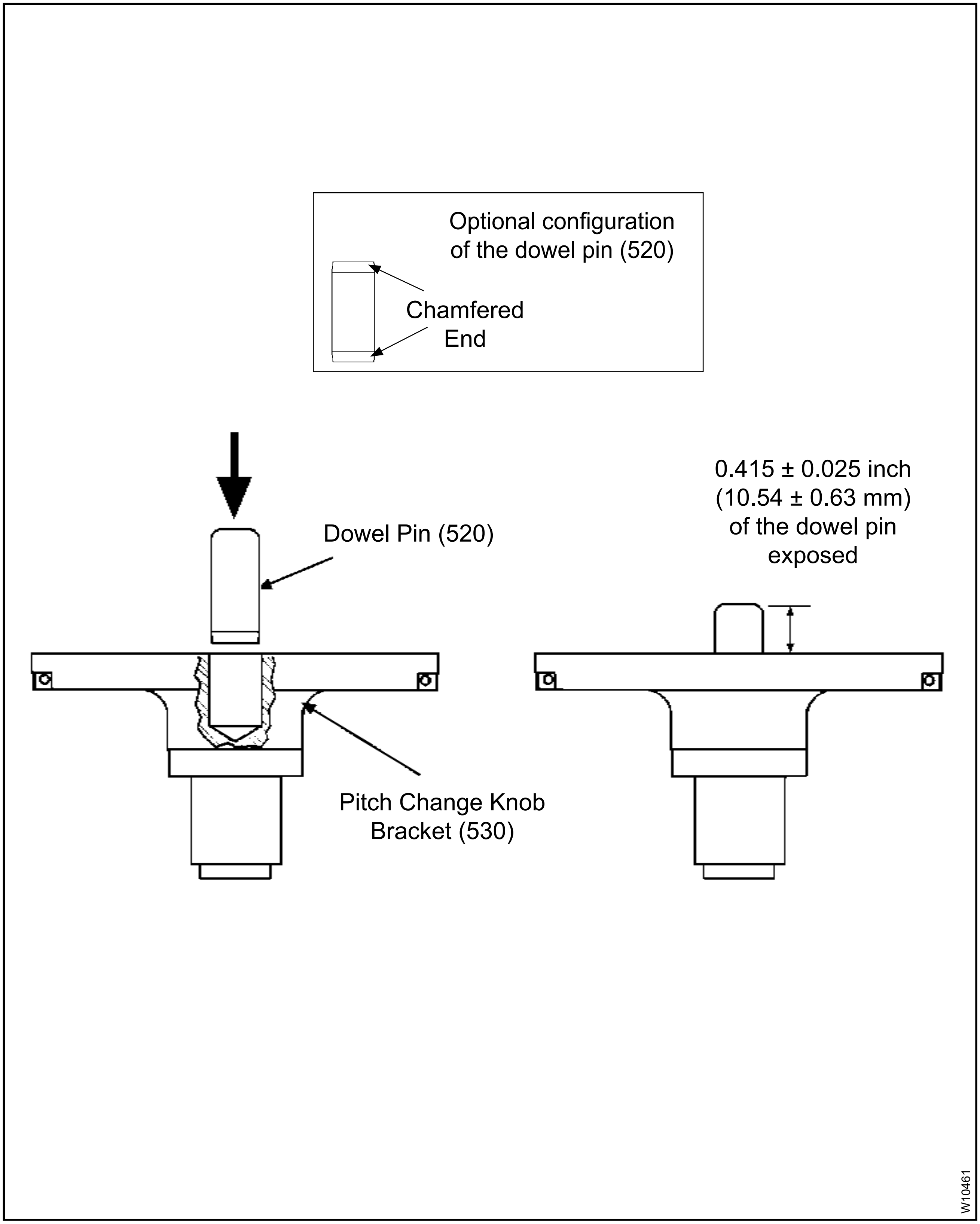
(3) Install a new pitch change rod O-ring (360) in the engine-side hub half. Refer to Figure 7-1.

(4) Install the flange O-ring (800) on the rotatable fixture to seal between the hub and rotatable fixture. Refer to Figure 7-2.

(5) Install and secure the engine-side hub half on the rotatable fixture on the propeller assembly table TE129. Refer to Figure 7-3.



Installing the Engine-Side Hub Half on the Rotatable Fixture
Figure 7-3



Installing the Dowel Pin into the Pitch Change Knob Bracket
Figure 7-4

3. Propeller Assembly Procedures

A. General

(1) The following procedure assumes that the blade has been inspected and repaired and that the blade bore plug, blade bore bearing, counterweight or counterweight clamp, and blade thrust bearings are installed in accordance with Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33).

(2) Use protractor TE96, TE97, or equivalent when measuring a blade angle. Refer to Hartzell Propeller Tool and Equipment Manual 165A (61-00-65).

B. Assembly of the Pitch Change Knob Unit

(1) Push the chamfered end of the dowel pin (520) into the pitch change knob bracket (530), leaving 0.415 ± 0.025 inch (10.54 ± 0.63 mm) of the dowel pin exposed. Refer to Figure 7-4.

(2) Lubricating the cam follower (540).

NOTE: The cam followers (540) are shipped from Hartzell Propeller LLC greased with approved lubricant.

(a) Lubricating of the cam follower (540) is not necessary if one of the following two criteria are met:

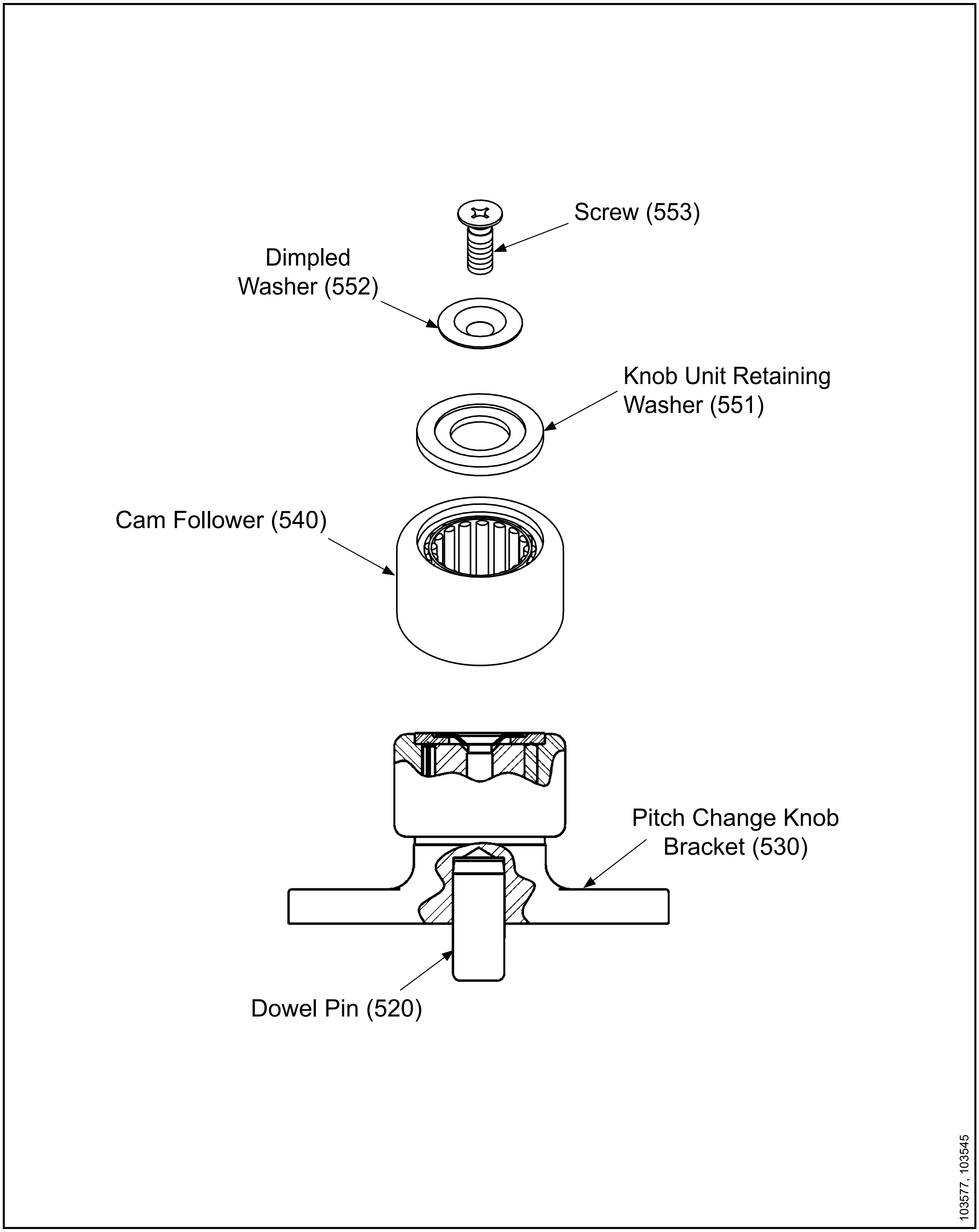
1 It has been less than two years from the date marked on the packaging by Hartzell Propeller LLC.

2 It has been less than one year from the date of receipt if there is no date marked on the packaging.

(b) If none of the above criteria are met, complete the following lubrication procedure:

1 Using solvent CM23, flush the grease from the cam follower (540).

2 Using lubricant CM12, lubricate the cam follower (540).



Assembly of the Pitch Change Knob Unit That Uses a Screw
Figure 7-5

(4) For a pitch change knob bracket (530) that uses a screw to retain the cam follower (540), install the cam follower on the pitch change knob bracket, using the following steps. Refer to Figure 7-5.

(a) Using solvent CM106 or CM219, clean the threads of the screw (553) and the threads of the pitch change knob bracket (530).

(b) Permit the solvent CM106 or CM219 to dry.

(c) Apply threadlocker CM21 to the clean, dry threads in the top of the pitch change knob bracket (530).

(d) Put the cam follower (540) onto the pitch change knob bracket (530).

(e) With the counterbored side up, put the knob unit retaining washer (551) on the end of the pitch change knob bracket (530).

(f) With the raised side pointing down, put the dimpled washer (552) on the knob unit retaining washer (551).

(g) Examine the knob unit retaining washer (551) and the dimpled washer (552) on the pitch change knob bracket (530) to make sure that the parts are seated correctly.

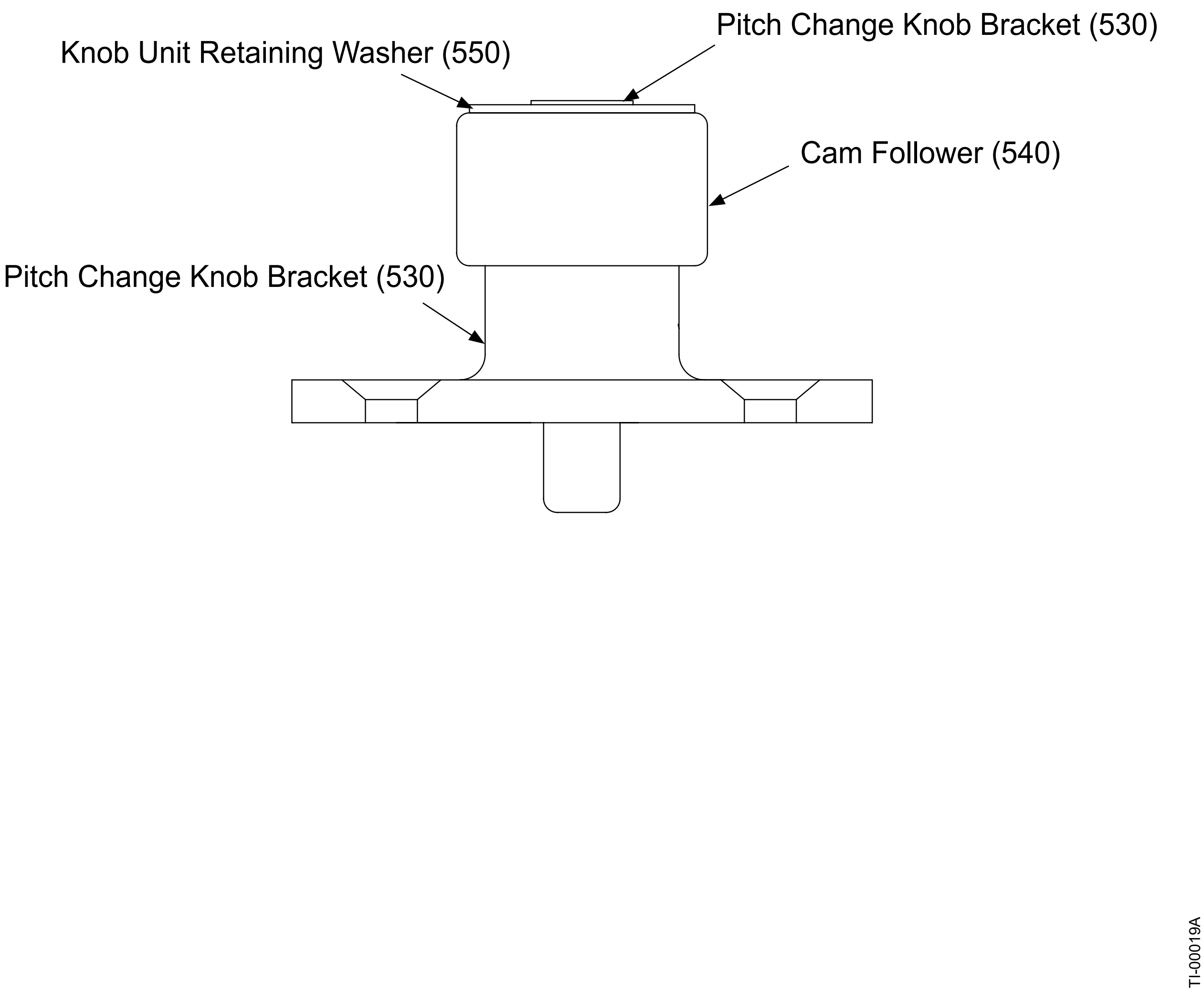
CAUTION: USE CARE TO PREVENT THREADLOCKER CM21 FROM GETTING BETWEEN THE KNOB UNIT RETAINING WASHER (551) AND THE CAM FOLLOWER (540). TOO MUCH THREADLOCKER CM21 CAN INTERFERE WITH THE PERFORMANCE OF THE CAM FOLLOWER (540).

(h) Apply a small amount of threadlocker CM21 to the clean, dry threads of the screw (553).

(i) Using the screw (553), attach the knob unit retaining washer (551) and the dimpled washer (552) to the pitch change knob bracket (530).

(j) Torque the screw (553) in accordance with Table 8-1 "Torque Values" in the Fits and Clearances chapter of this manual.

(k) Repeat steps.(4)(a) through (4)(j) in this section for each of the remaining pitch change knob brackets (530).



Assembly of the Pitch Change Knob Unit That Uses a Swaged Washer
Figure 7-6

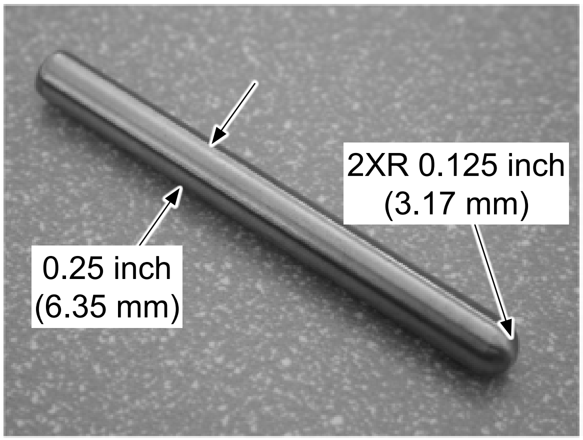
(5) For a pitch change knob bracket (530) that uses a swaged washer to retain the cam follower (540), install the cam follower on the pitch change knob bracket using the following steps.

(a) Put the cam follower (540) onto the pitch change knob bracket (530). Refer to Figure 7-5.

CAUTION: PUSH THE KNOB UNIT RETAINING WASHER (550), COUNTERSUNK SIDE DOWN, EVENLY AGAINST THE SHOULDER OF THE PITCH CHANGE KNOB BRACKET (530). THE KNOB UNIT RETAINING WASHER MUST BE COMPLETELY SEATED ON THE PITCH CHANGE KNOB BRACKET.

(b) Push the knob unit retaining washer (550), bevel down, on the top of the pitch change knob bracket (530). Refer to Figure 7-6.

1 The knob unit retaining washer (550) is completely seated on the pitch change knob bracket (530) when the pitch change knob bracket extends slightly through the top of the knob unit retaining washer.



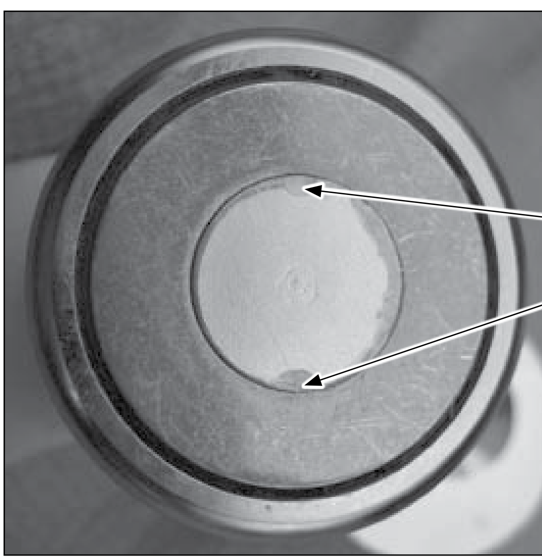
Locally Fabricated Swage Tool

Description:
Dowel Pin with 0.25 inch (6.3 mm) spherical radius tip.

Material:
A2 tool steel
hardened to 55-62 HRC (recommended)

TI-00100

Swage Tool
Figure 7-7



TI-0019C

Swaged Pitch Change Knob Bracket
Figure 7-8

CAUTION: DO NOT USE EXCESSIVE FORCE OR USE A SWAGE TOOL THAT DOES NOT MEET THE REQUIREMENTS SPECIFIED WHEN SWAGING THE PITCH CHANGE KNOB BRACKET (530) BECAUSE DAMAGE MAY RESULT THAT WILL SCRAP THE PITCH CHANGE KNOB BRACKET.

(c) Swage the end of the pitch change knob bracket (530).

1 Locally procure a swage tool that meets the specifications given in Figure 7-7.

CAUTION: DIMPLES CAUSED BY SWAGING MUST NOT CONTACT PREVIOUS DIMPLES. THERE MUST BE AN UNSWAGED AREA BETWEEN THE CENTER OF PREVIOUS SWAGE HITS.

2 Using sufficient force and a locally fabricated swage tool, swage the end of the pitch change knob bracket (530) in two places 180 degrees apart to force a small amount of material over the edge of the knob unit retaining washer (550). Refer to Figures 7-7 and 7-8.

(d) After assembly of the parts, perform the following pull test:

1 Hold the pitch change knob bracket (530) firmly in one hand.

2 Grip the cam follower (540) firmly in the other hand.

3 Firmly pull on the cam follower (540) to test the interference fit between the knob unit retaining washer (550) and the swaging to the pitch change knob bracket (530).

4 If the knob unit retaining washer (550) remains firmly in position on the pitch change knob bracket (530), perform the turn test in step (e) in this section.

5 If the knob unit retaining washer (550) does not remain firmly in position on the pitch change knob bracket (530), perform the following:

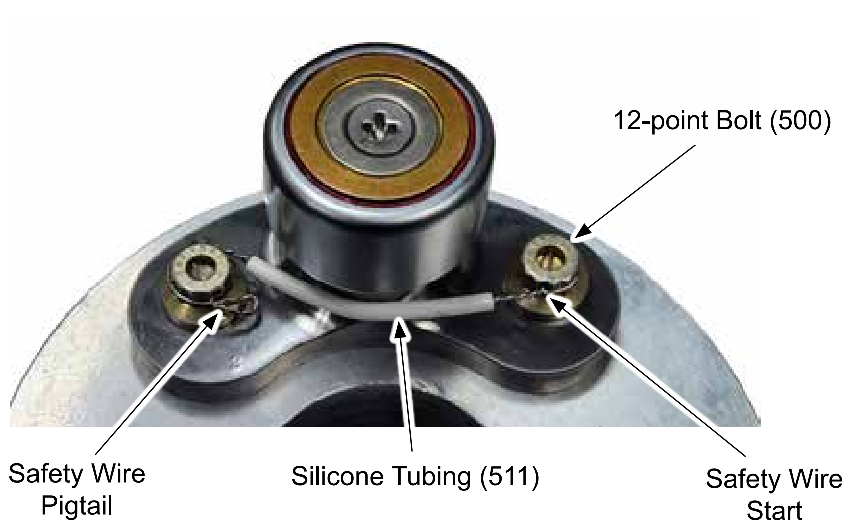
a Discard the knob unit retaining washer (550).

b Reassemble a pitch change knob bracket (530), a cam follower (960), and a new knob unit retaining washer (550), using new or overhauled parts as necessary, in accordance with the applicable steps in this manual.

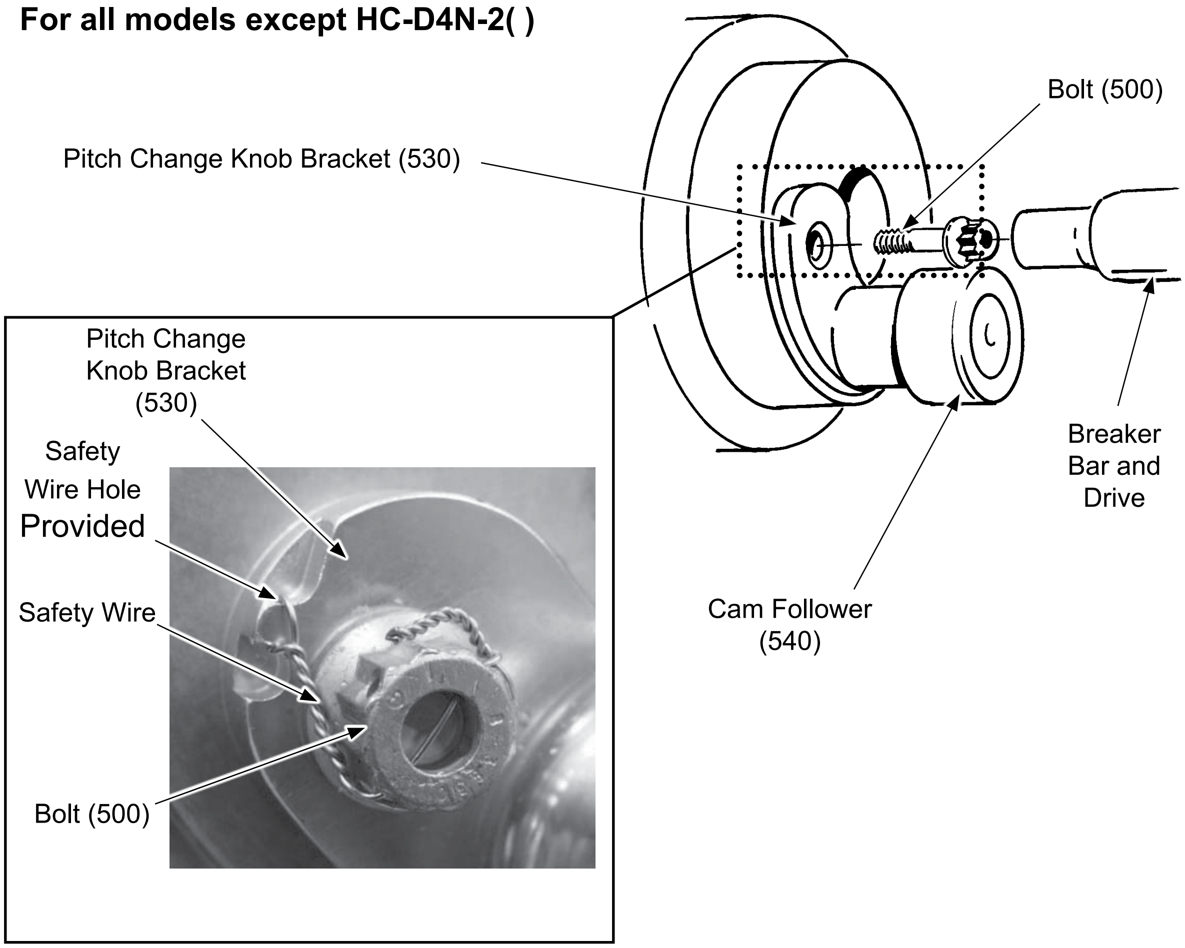
c Swage the pitch change knob bracket (530) in accordance with step (c) in this section.

d Repeat the pull test in accordance with step (d) in this section.

For HC-D4N-2( ) only



For all models except HC-D4N-2( )



APS0169, TPI-MB-0618, TI-0087A, W10555

Attaching the Pitch Change Knob Bracket
Figure 7-9

e If the knob unit retaining washer (550) does not remain firmly in position on the pitch change knob bracket (530), measure the diameter of the knob unit retaining surface of the pitch change knob bracket. If the OD is less than the serviceable limits as specified in the Check chapter of this manual, discard the pitch change knob bracket and replace it.

f Report to Hartzell Propeller LLC each occurrence of a pitch change knob bracket (530) that is less than the serviceable limits specified.

(e) After assembly of the parts, perform the following turn test:

1 Grip and turn the cam follower (540) on the pitch change knob bracket (530).

a If the cam follower (540) turns freely on the pitch change knob bracket (530), continue the propeller assembly process.

b If the cam follower (540) does not turn freely on the pitch change knob bracket (530), replace the cam follower in accordance with steps (5)(a) through (5)(d).

(f) Repeat the pull test and the turn test until the results are satisfactory.

(g) Repeat steps (5)(a) through (5)(f) for each remaining pitch change knob bracket (530).

C. Pitch Change Unit Installation (Refer to Figure 7-9)

(1) Make sure the butt of the blade and pitch change knob unit surfaces are clean and free of oil, dirt, and other foreign materials. Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

(2) Put the pitch change knob unit (510) on the butt of the blade.

(3) Line up the holes in the pitch change knob unit (510) with the threaded holes in the butt of the blade.

(4) Using a mallet, tap the pitch change knob bracket (530) until it is firmly in position against the butt of the blade.

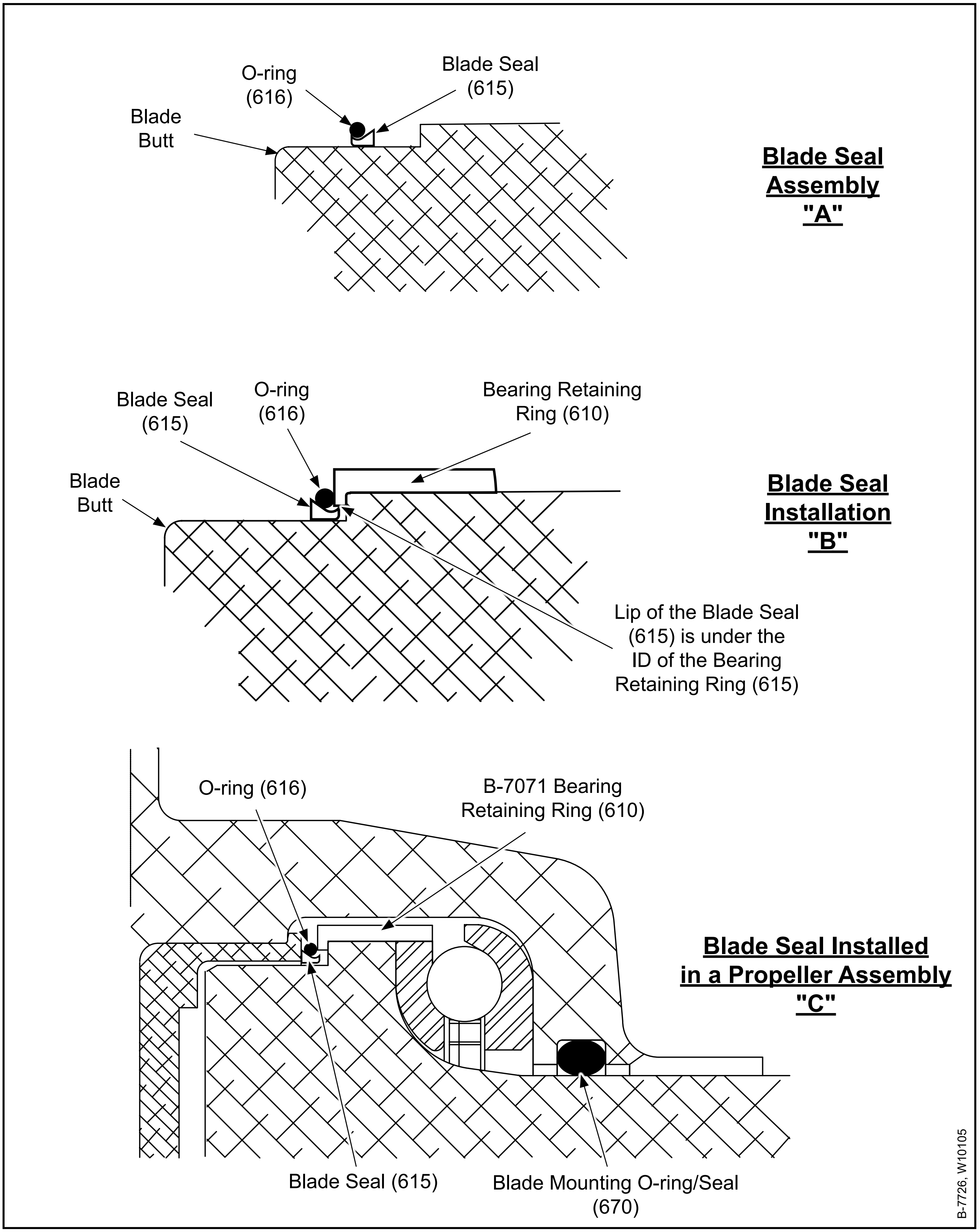
(a) Refer to the pitch change knob unit selection data in Table 7-1, "Blade Pitch Change Knob Unit Selection" in this chapter. Use the alternate pitch change knob unit choices as necessary to bring the floating pitch angle of all four blades within the specified tolerance of ± 0.1 degree.

(5) **For all models except HC-D4N-2( )**:

(a) Install a bolt (500) in the holes of the pitch change knob bracket (530).

(b) Torque the bolts (500) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual. Refer to Figure 7-9.

(c) Safety wire the bolts (500) to the hole in the pitch change knob bracket (530) in accordance with NASM33540.



Blade Seal Installation for E-Shank Blades
Figure 7-10

(6) **For HC-D4N-2( ) only**:

(a) Install a bolt (500) in the holes of the pitch change knob bracket (530).

(b) Torque the bolts (500) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual. Refer to Figure 7-9.

(c) Safety wire the bolts (500) to each other in accordance with NASM33540 with the silicone tubing (511) positioned as shown in Figure 7-9.

(7) Repeat steps (1) through (6)(c) in this section for the remaining blades.

D. Optional Blade Seal Assembly Installation, E-shank blades only

CAUTION: THE B-7071 BEARING RETAINING RING (610) MUST BE INSTALLED WHEN USING THIS BLADE SEALING METHOD.

(1) Assemble the blade seal (615) and O-ring (616). Refer to Figure 7-10, "A".

CAUTION: DO NOT OVER STRETCH OR TWIST THE BLADE SEAL (615) DURING INSTALLATION.

(a) Install the blade seal (615) on the butt of the blade with the recessed area of the blade seal pointing away from the bearing retaining ring (610). If the blade seal stretches, replace the blade seal.

NOTE: Initial installation of the blade seal (615) with the recessed area pointing away from the bearing retaining ring (610) will make it easier to install the O-ring (616) onto the blade seal. An optional method may be to pre-assemble the blade seal assembly on an unserviceable blade butt, or equivalent fixture.

(b) Install the O-ring (616) into the recessed area of the blade seal (615).

1 If the O-ring (616) does not stay in position, replace the blade seal (615).

(c) Remove the blade seal assembly from the butt of the blade.

CAUTION 1: DO NOT DEFORM THE BLADE SEAL ASSEMBLY WHEN INSTALLING THE BLADE SEAL AND O-RING ASSEMBLY ONTO THE BLADE.

CAUTION 2: THE CORRECT INSTALLATION OF THE BLADE SEAL ASSEMBLY IS CRITICAL TO THE SEAL FUNCTION AND BLADE ROTATION.

(2) Reinstall the blade seal/O-ring assembly onto the butt of the blade with the recessed area facing the bearing retaining ring (610). Refer to Figure 7-10, "B".

(a) The blade seal assembly must move easily into position on the blade butt.

E. Installation of the Blade Seal

(1) For a propeller model that uses the blade O-ring (670):

(a) Using lubricant CM12, lubricate the blade O-ring (670).

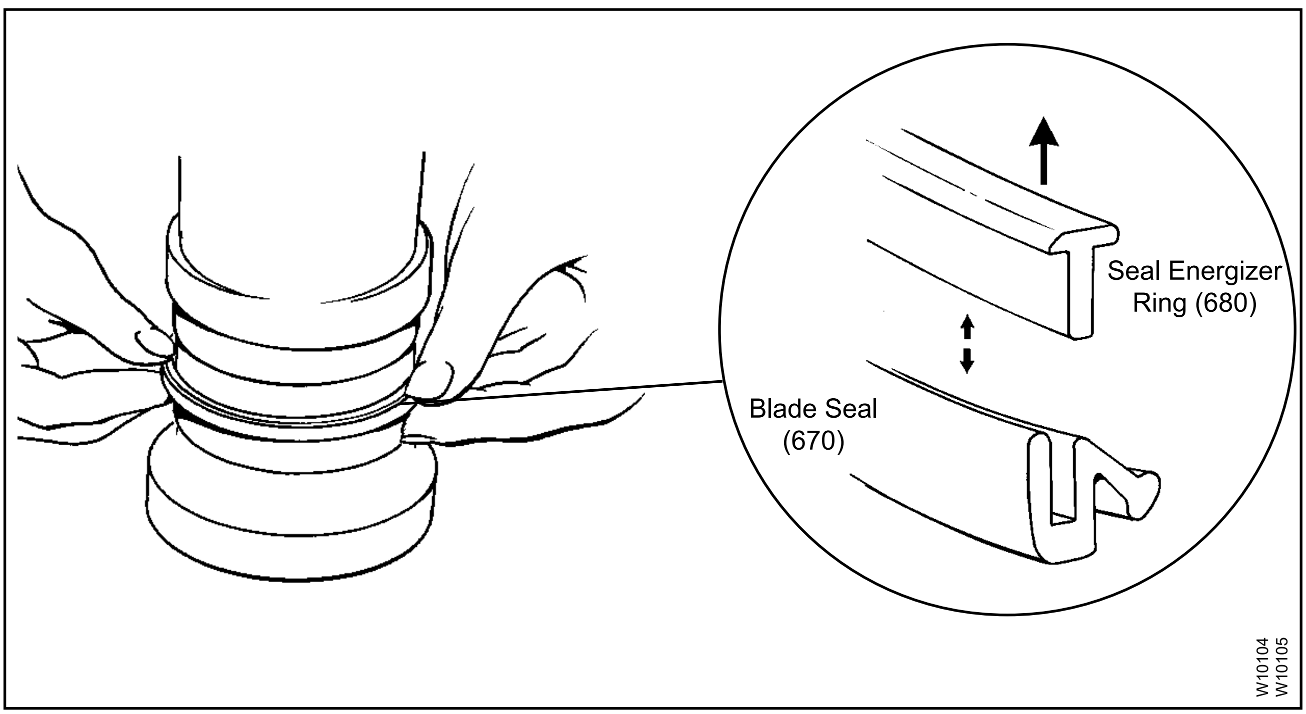
(b) Install the blade O-ring (670) over the base of the blade shank.

(2) For a propeller model that uses the blade seal (670) and seal energizer ring (680) (HC-E4A-2[ ] only) - Refer to Figure 7-11.

CAUTION: THE BLADE SEAL (615) MUST BE INSTALLED SO THAT THE GROOVE PROVIDED FOR THE SEAL ENERGIZER RING (680) IS FACING TOWARD THE TIP OF THE BLADE.

(a) Install the blade seal (670) over the base of the blade shank.

(b) Apply a small amount of lubricant CM12 in the groove of the blade seal (670) where the seal energizer ring (680) will be installed.



Installing the Lip Seal onto the Blade
Figure 7-11

F. Installation of the Blade Bearing Race and Balls - Refer to Figure 7-12

(1) Using lubricant CM12, lubricate the blade-side blade bearing race (630).

(2) Put the ball spacer (660) on the blade-side blade bearing race (630).

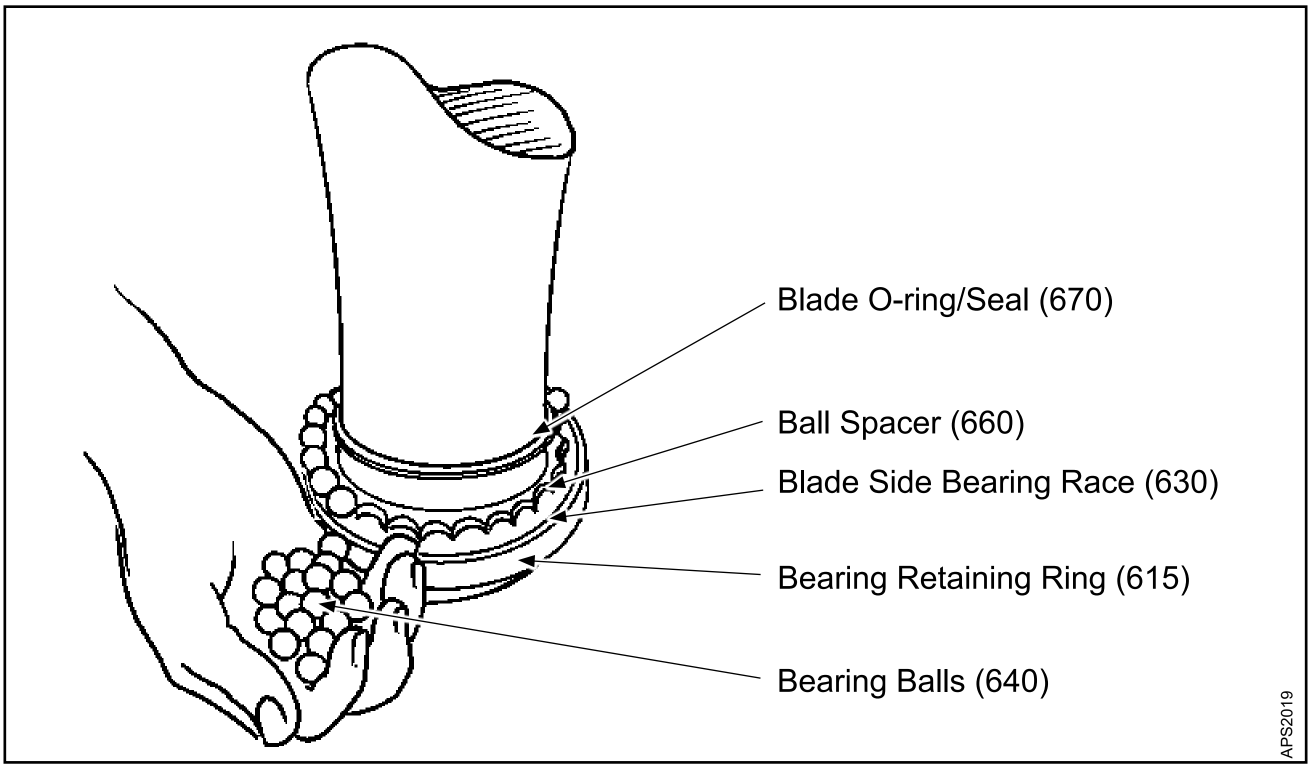
CAUTION: ALL BEARING BALLS (640) INSTALLED IN A SINGLE BEARING MUST BE OF THE SAME GAUGE. BEARING BALLS SUPPLIED BY HARTZELL PROPELLER LLC ARE OF THE SAME GAUGE.

(3) Put the bearing balls (640) in the openings of the ball spacer (660) on the blade-side bearing race (630).

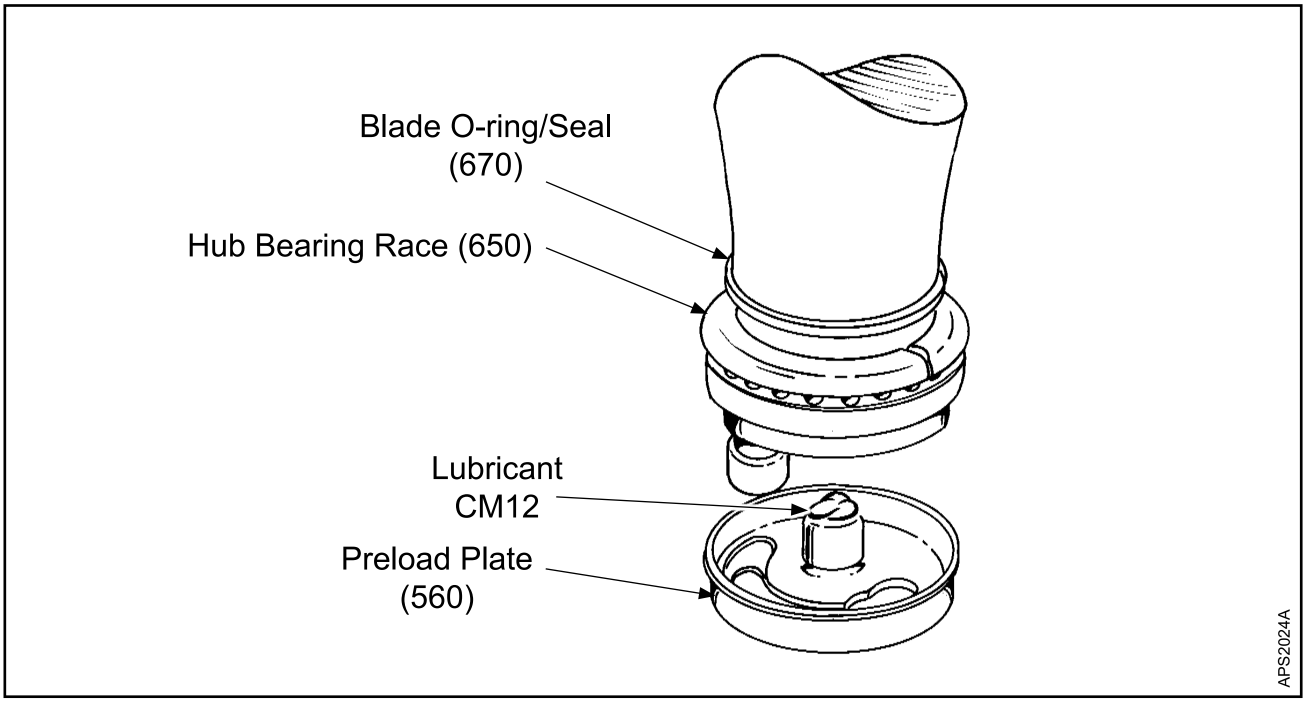
CAUTION: THE BEARING RACE HALVES MUST HAVE MATCHING SERIAL NUMBERS.

(4) Put the hub-side bearing race (650) on the bearing balls (640). Refer to Figure 7-10.

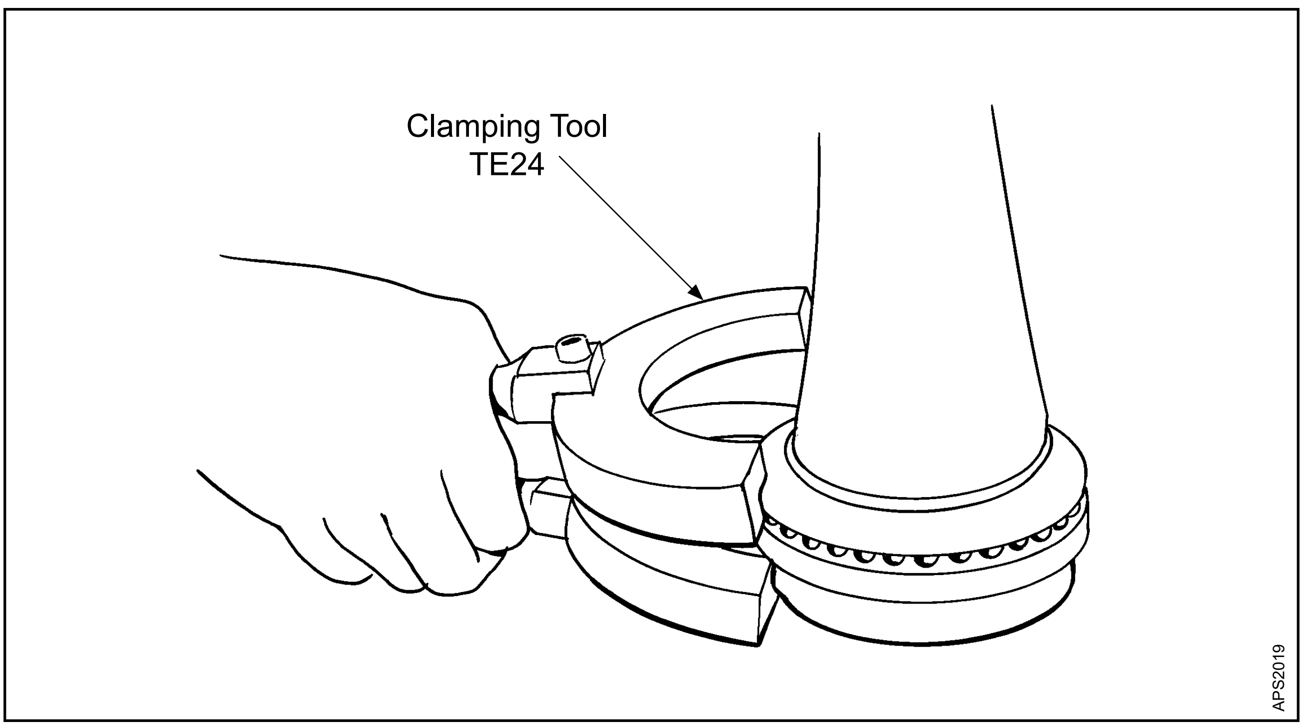
NOTE: The hub-side bearing race (650) parting line should be perpendicular to the hub parting line when installed in the hub. Refer to Figure 7-16.



Installing the Blade Retention Bearing
Figure 7-12



Installing the Preload Plate on the Blade Shank
Figure 7-13



Applying the Clamping Tool TE24 to the Blade Assembly
Figure 7-14

G. Preload Plate Assembly

(1) Install the set screw (590) in the preload plate (560) so the end of the set screw that is toward the blade butt is flush with the preload plate.

NOTE: The set screw (590) will be repositioned later to set the blade preload.

(2) Install the nut (600) on the set screw (590) and position the nut a short distance from the preload plate.

NOTE: Thread locking compound will be applied to the set screw (590) between the nut (600) and the preload plate (560) later in the build process.

(3) Put approximately one tablespoon of grease CM12 on top of the preload plate inner bearing race (580) to lubricate the blade bore bearing. Refer to Figure 7-13.

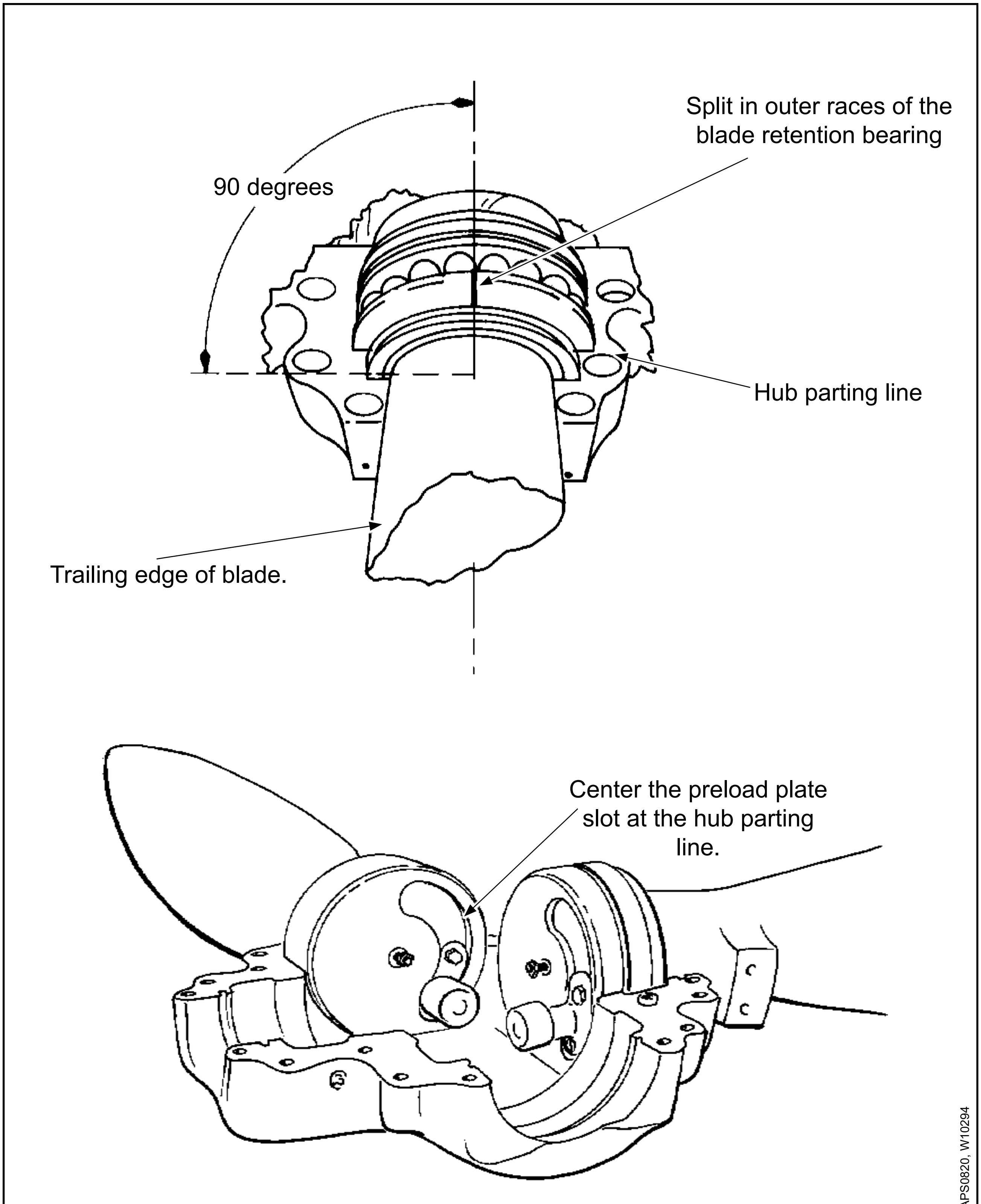
NOTE: Using this amount of lubricant will force lubrication into the blade bore bearing when the preload plate (560) is installed on the blade.

CAUTION: THE SPLIT-BEARING RACE PARTING LINE MUST BE PERPENDICULAR TO THE HUB PARTING LINE WHEN INSTALLED IN THE HUB (250). REFER TO FIGURE 7-15.

(4) Install the preload plate (560) on the butt of the blade. Refer to Figure 7-13.

NOTE: If desired, to ease installation of the blade into the hub (250), hold the split bearing and preload plate assembly to the blade butt with the clamping tool TE24. Refer to Figure 7-14.

(5) Repeat the blade and preload plate assembly procedures for the remaining blades.



Installing a Blade in the Hub Socket
Figure 7-15

H. Blade Installation

(1) Apply a thin layer of grease CM12 to the hub blade retention radii of the hub (250) and O-ring grooves of the hub.

CAUTION: BLADES MUST BE PRELOADED WHILE RESTING IN THE SOCKET OF THE HUB (250) THAT THEY WILL OCCUPY WHEN ASSEMBLED. DO NOT PRELOAD ALL THE BLADES IN THE SAME SOCKET.

(2) Install blade number one and blade number two assemblies into the sockets of the engine-side half hub (250). Refer to Figure 7-15.

(3) Center the slot of the preload plate (570) at the hub parting line. Refer to Figure 7-15.

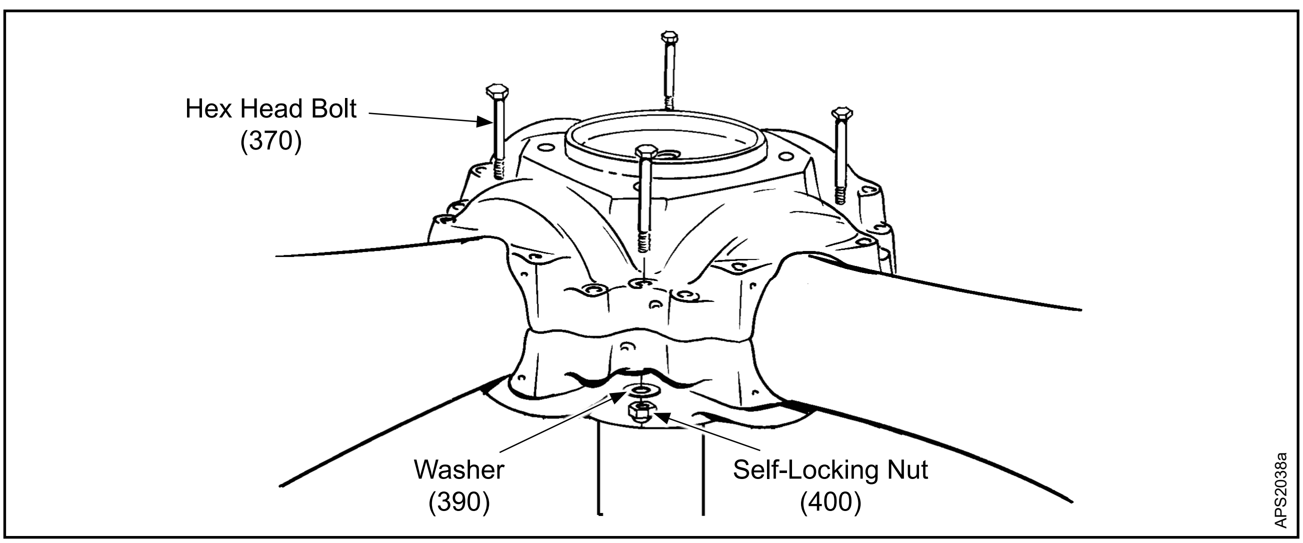
(a) Position the blade knob slot in the preload plate (570) to permit the blade to travel within the full blade angle range without restriction.

CAUTION: INCORRECT PRELOAD CAN CAUSE THE BLADES TO BE LOOSE IN THE HUB (250) OR MAY APPLY TOO MUCH PRESSURE THAT CAN INTERFERE WITH PITCH CHANGE MOVEMENT.

(4) Setting the blade preload.

(a) Install the cylinder-side hub half. Refer to Figure 7-16.

(b) Bolt the hub halves together using four hex head bolts (370), four washers (390), and four self-locking nuts (400) located midway between the blades. Refer to Figure 7-16.



Installing the Cylinder-side Hub Half to Set Preload
Figure 7-16

(c) Torque the self-locking nuts (400) in accordance with Table 8-1 in the Fits and Clearances chapter of this manual.

(d) On blade number one, tighten the preload set screw (590) through the open end of the hub (250). Refer to Figure 7-17.

1 The loose blade will become rigid in the hub (250) as the set screw (590) is tightened.

(e) Tighten the preload set screw (590) until the tip of the blade stops moving vertically. Refer to Figure 7-17.

(f) Gently push on the tip of the blade to make sure the blade is correctly seated in the retention socket.

(g) Loosen the set screw (590) and retighten.

1 When the blade tip stops moving, turn the set screw (590) an additional 1/4 turn into the preload plate (570).

(h) Check the blade for free rotation. If the blade is not free, check the following:

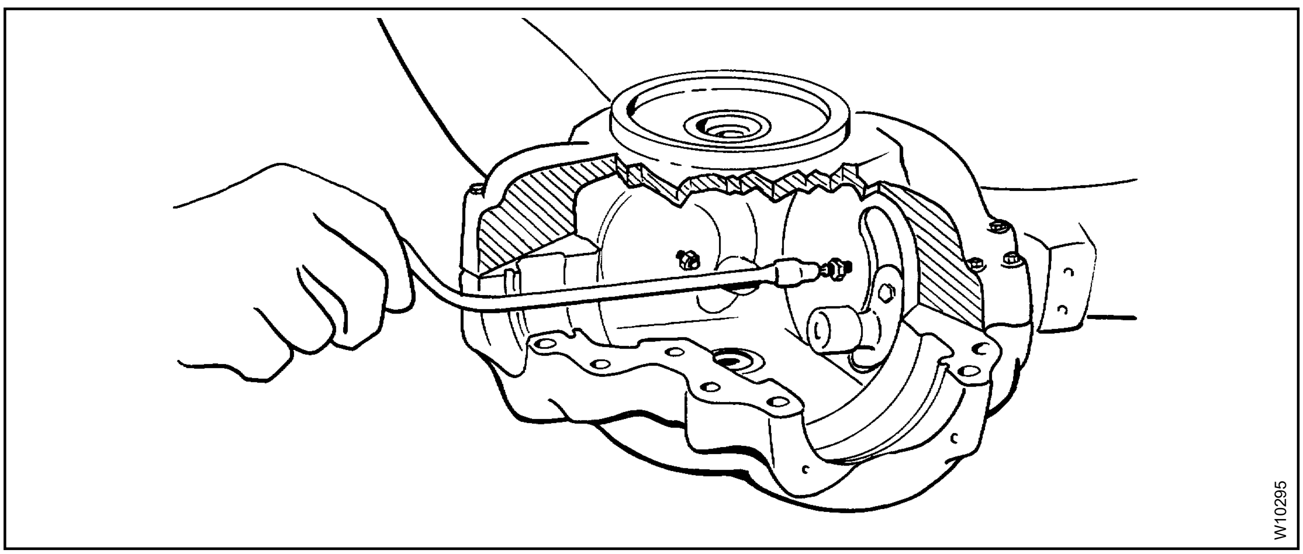
1 Blade seal (670) for correct fit in the hub groove.

2 The needle rollers in the blade bore bearing may be skewed. The needle rollers should be parallel to the axis of blade pitch change.

3 Blade preload may be too tight.

(i) Repeat the preload setting procedure on blade number two.

(j) Remove the four bolts (370), four washers (390), and four nuts (400).



Tightening Preload Plate Socket Drive Set Screw and Jam Nut
Figure 7-17

(k) Remove the cylinder-side hub (250) half.

(l) Apply one drop of thread locking compound CM21 on the threads of the preload set screws (590) between the thin hex nut (600) and the preload plate (570).

CAUTION: MAKE SURE TO PREVENT THE SET SCREW (590) FROM ROTATING WHEN TORQUING THE THIN HEX NUT (600).

(m) Torque the thin hex nuts (600) against the preload plate (570) in accordance with Table 8-1 in the Fits and Clearances chapter of this manual.

(5) Using clamping tool TE24, if desired, remove blades one and two from the hub (250).

CAUTION: THE PARTING LINE OF THE SPLIT BEARING RACE CONTACTING THE HUB (250) MUST BE PERPENDICULAR TO THE HUB PARTING SURFACE WHEN INSTALLED IN THE HUB.

(6) Install blades three and four in the hub (250) and set the blade preload.

(a) Set the preload for blades three and four following the same blade installation and preload setting procedures as specified for blades one and two.

(7) Reinstalling blades one and two.

CAUTION: THE PARTING LINE OF THE SPLIT BEARING RACE CONTACTING THE HUB (250) MUST BE PERPENDICULAR TO THE HUB PARTING SURFACE WHEN INSTALLED IN THE HUB.

(a) Using clamping tool TE24, if desired, install blade two into the engine-side hub (250) half.

(b) Center the slot of the preload plate (570) at the hub parting line. Refer to Figure 7-15.

(c) Position the pitch change knob unit in the preload plate (570) to permit the blade to travel the full blade angle range without restriction.

(d) Move the three blades into full reverse position.

(e) Apply thread locking compound CM74 to the threads of each bumper extension (460).

(f) Install the bumper extension (460) onto the pitch change fork (450) and torque the spacers in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.

(g) Install a fork bumper (470) on each bumper extension (460).

1 Using a plastic mallet, tap the fork bumper (470) into the hole in bumper extension (460).

NOTE: The fork bumper (470) nipple is an interference fit with the hole in the bumper extension (460).

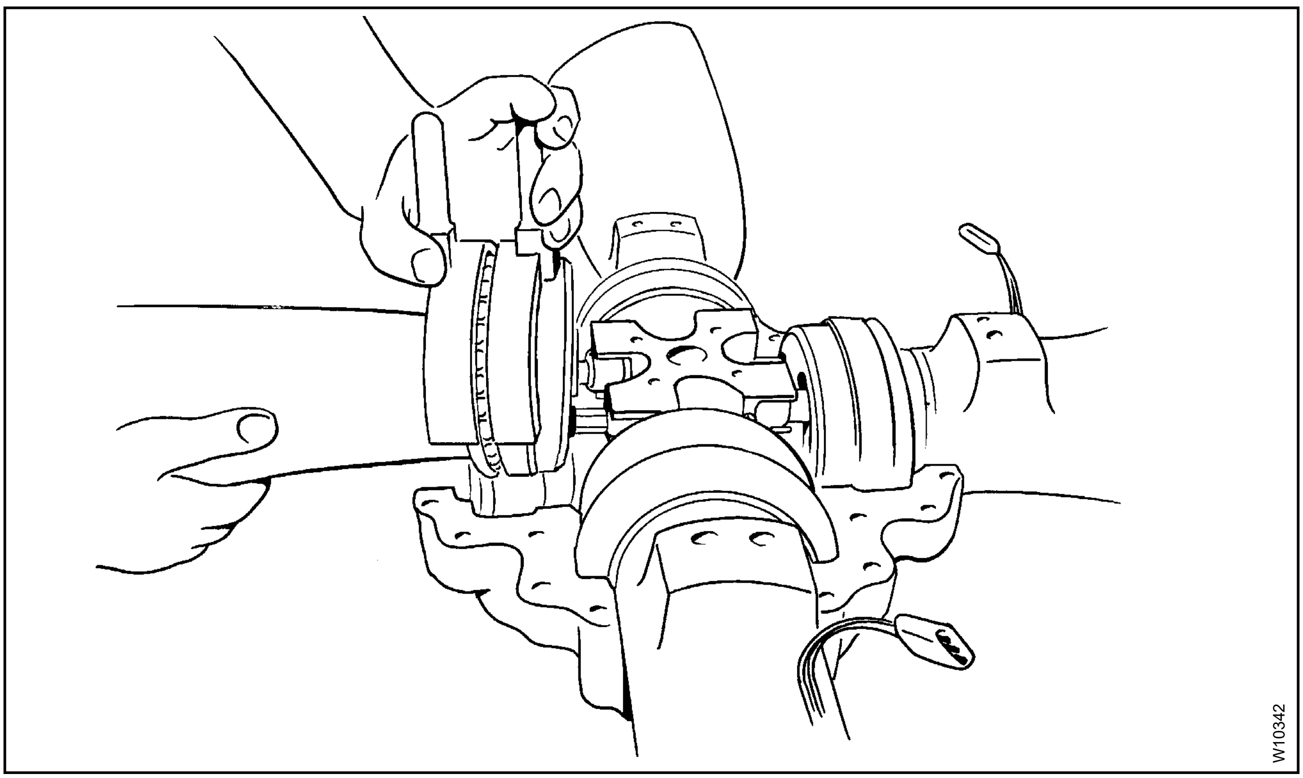
(h) Apply anti-seize compound CM118 to the threads of the fork (450).

CAUTION: MAKE SURE THAT THE TAPER IN THE CENTER THREADED HOLE OF THE FORK UNIT (440) IS POINTING TOWARD THE CYLINDER HUB HALF TO CORRECTLY FIT ONTO THE PITCH CHANGE ROD (230) THAT WILL BE INSTALLED LATER.

(i) Install the fork unit (440) by positioning the fork slots around the pitch change knobs of the blades.

(j) Reinstall blade number one. Refer to Figure 7-18.

1 Put the pitch change knob into the fork (450) slot, then lower the blade and blade retention bearing into the hub (250).



Reinstalling Blade Number One in the Hub
Figure 7-18

(k) Position the center of each slot in the preload plate (570) on the plane of the parting line of the hub (250).

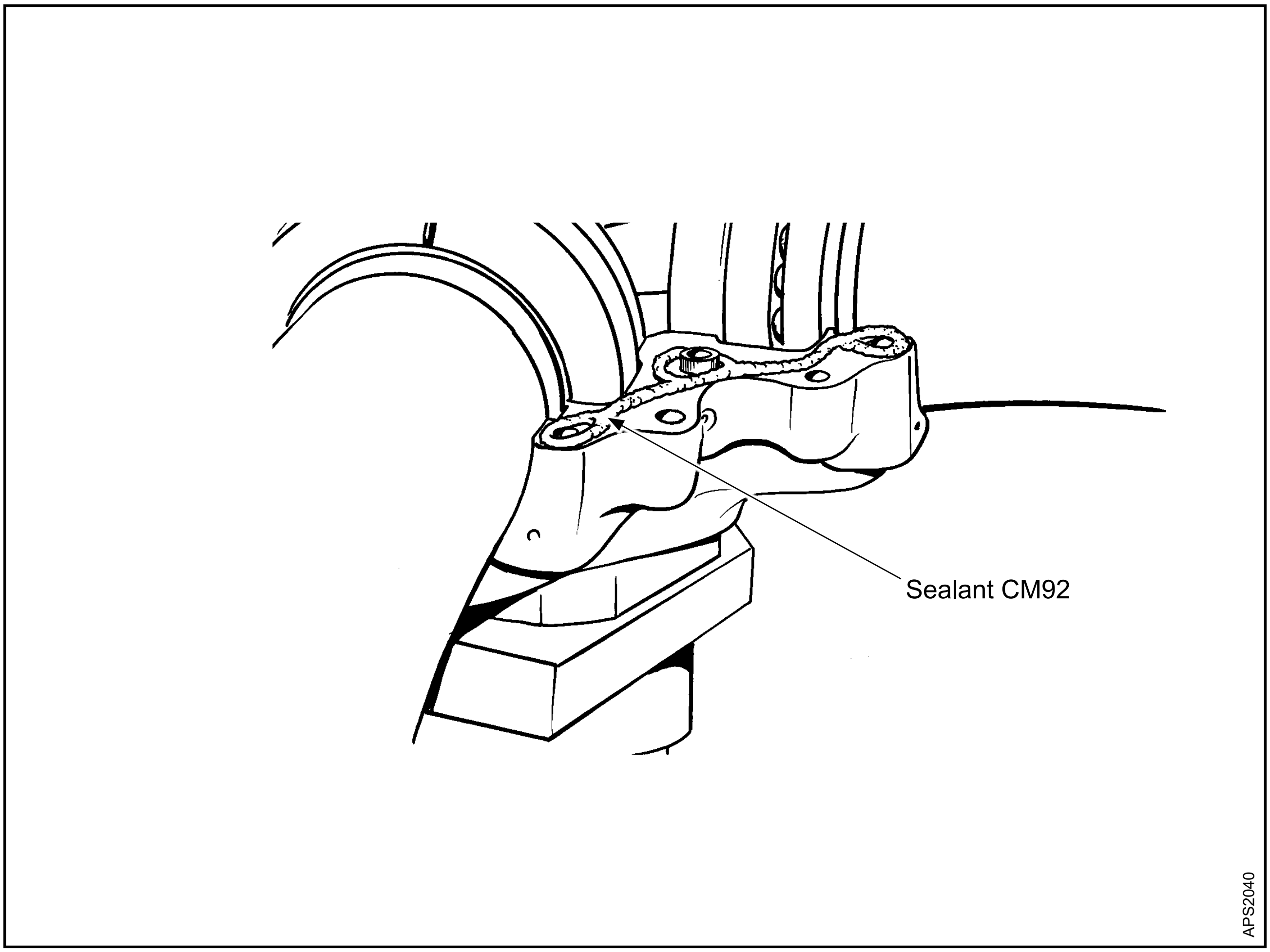
1 Position the blade knob slot in the preload plate (570) to permit the blade to travel within the full blade angle range without restriction.

CAUTION: TOO MUCH SEALANT IN THE RETENTION POCKET COULD DEGRADE THE BLADE SEAL (670) EFFECTIVITY.

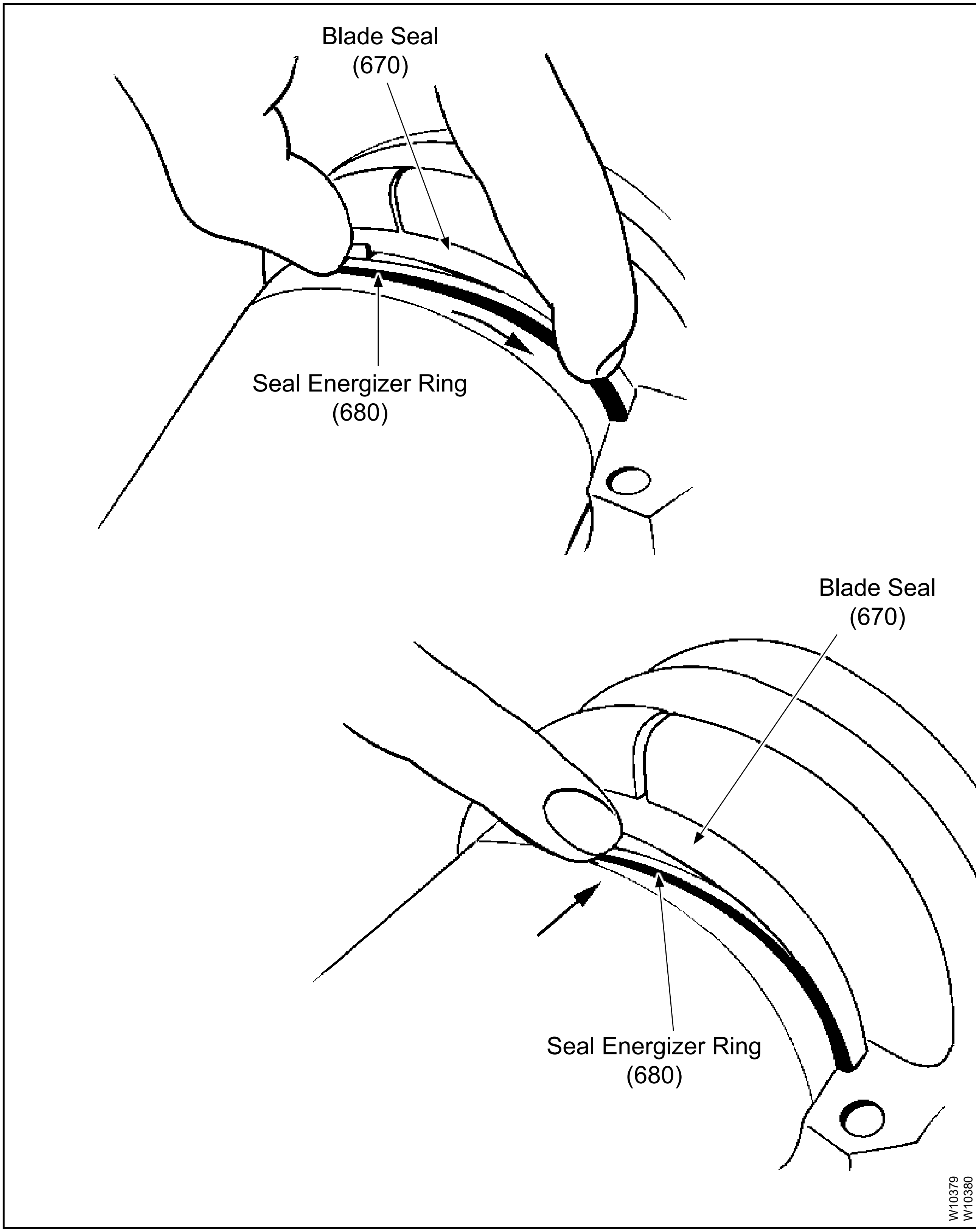
(l) Put a bead of sealant CM92 on the mating surfaces of the hub (250). Refer to Figure 7-19.

(a) Sealant must contact the blade O-rings.

(b) Use only enough sealant CM92 on the mating surfaces so that a small amount will be squeezed out along the full parting surface when the hub bolts are correctly torqued.



Applying Sealant Between the Hub Halves
Figure 7-19



Installing the Energizer Ring Seal into the Blade Seal
Figure 7-20

(m) **For HC-E4A-2( ) models only**: Install the seal energizer ring (680) into the blade seal (670) groove. Refer to Figure 7-20.

1 Move a seal energizer ring (680) half into the blade seal (670) groove.

CAUTION: THE SEAL ENERGIZER RING (680) HALVES MUST BE POSITIONED SO THAT THE SPLIT LINES ARE IN VERTICAL POSITION.

2 Gently move the remaining seal energizer ring (680) half into the groove and around the blade shank.

NOTE: It is recommended to use TE440 to aid in seating the blade seal (670) in the blade seal groove.

3 Repeat for the remaining blades.

CAUTION: MAKE SURE THE BLADE SEAL (670) IS CORRECTLY ALIGNED IN THE HUB GROOVE WHEN INSTALLING THE CYLINDER-SIDE HUB (250) HALF.

(n) Use the guide bushing (330) to line up the halves of the hub (250), and fit the cylinder half of the hub unit onto the engine half of the hub unit.

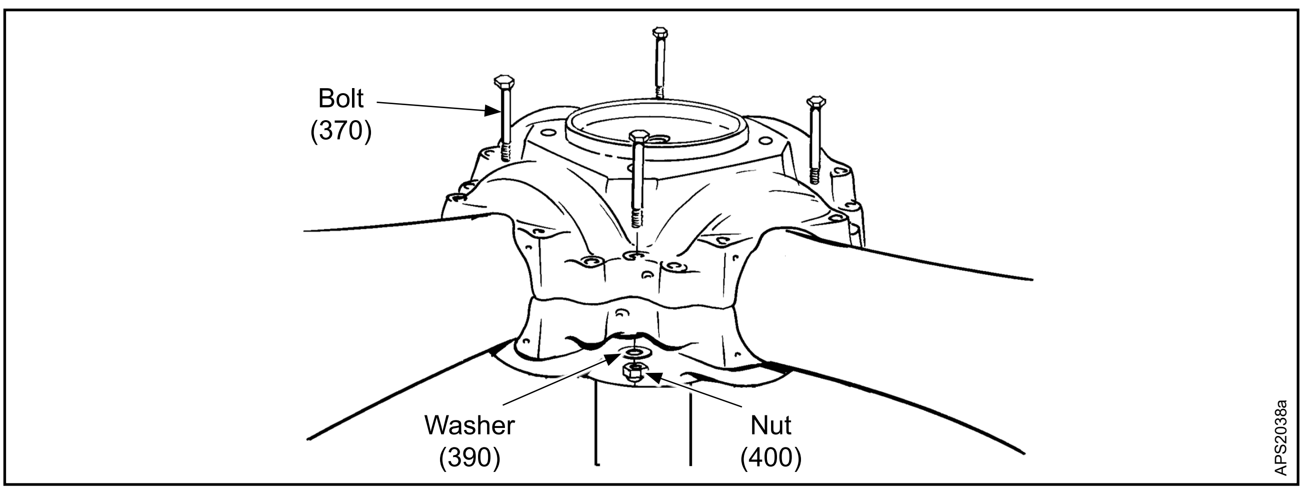
CAUTION: EXAMINE THE BLADE O-RING/BLADE SEAL (670) FOR BINDING OR PINCHING WHEN THE CYLINDER-SIDE HUB (250) HALF IS INSTALLED.

(o) Install the cylinder-side hub (250) half.

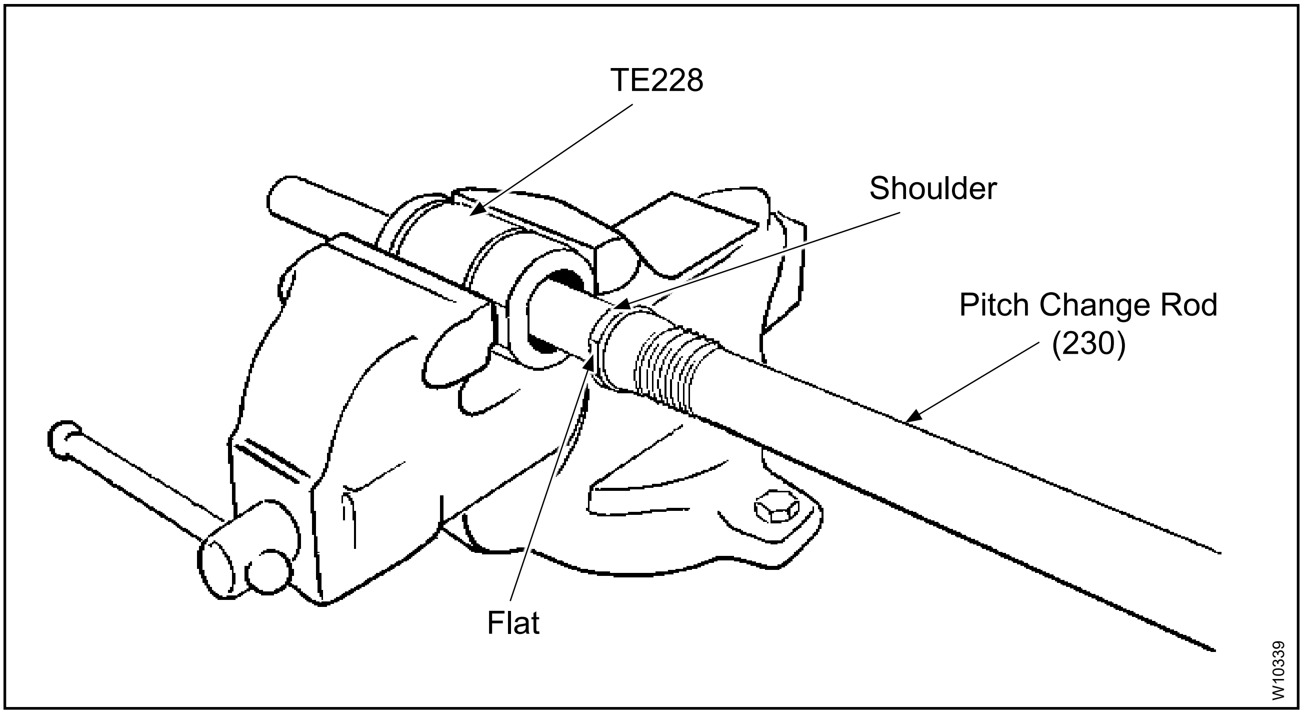
1 Position the hub (250) half, using a rubber mallet if necessary.

(p) Positioned midway between each of the four blade sockets, install a bolt (370), washer (390), and nut (400). Refer to Figure 7-21.

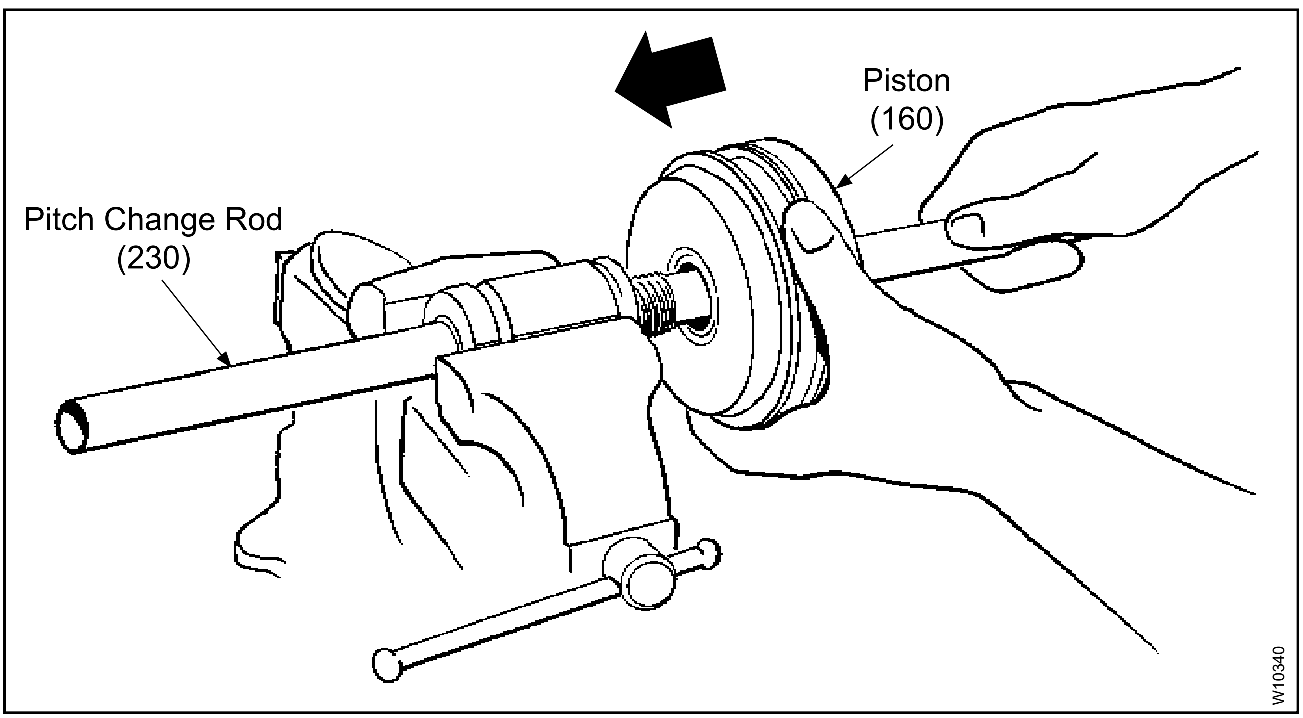
(q) Using a staggered sequence, torque each nut (400) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.



Installing the Cylinder-side Hub Half
Figure 7-21



Using the Piston Installation Socket TE228
Figure 7-22



Installing the Piston
Figure 7-23

I. Hydraulic System Assembly

(1) Install the small piston O-ring (170) in the piston (160).

(2) Install the piston (160) on the pitch change rod (230).

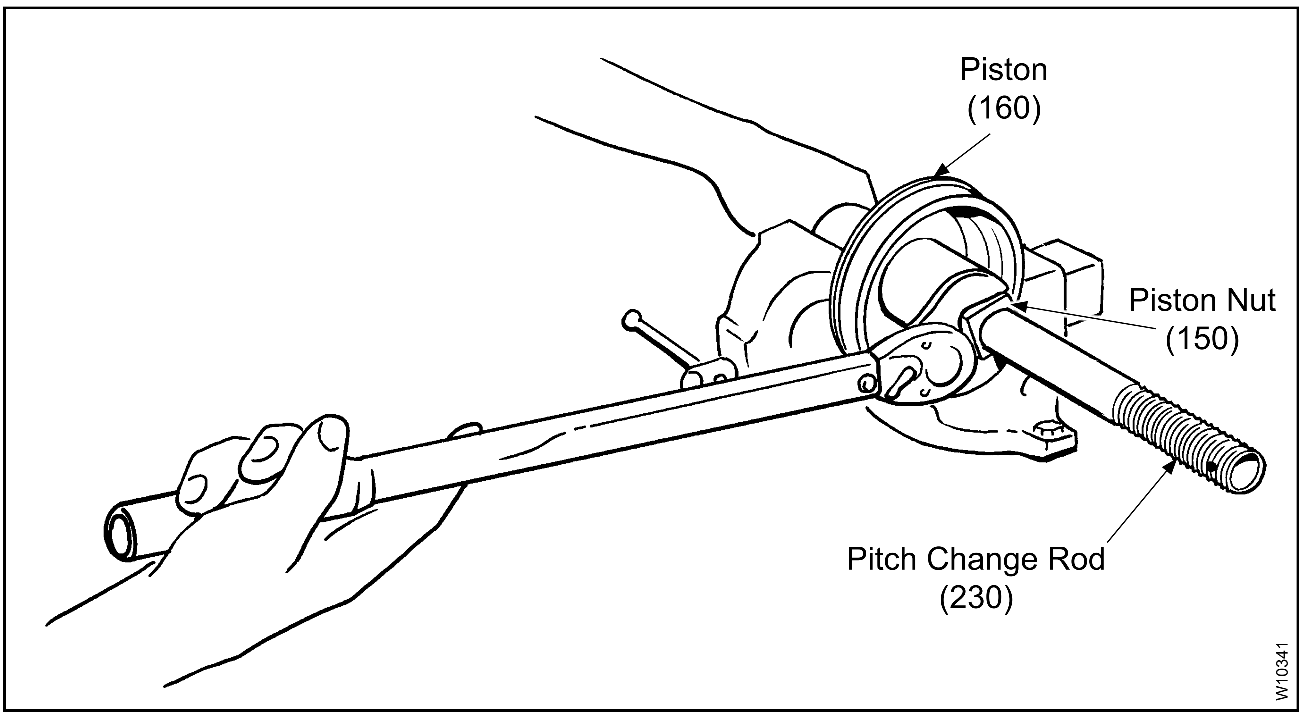
(a) Put the piston unit installation socket TE228 in a vise. Refer to Figure 7-22.

(b) Put the pitch change rod (230) through the piston installation socket TE228, fitting the socket over the shoulder flats on the pitch change rod as shown in Figure 7-22.

(c) Move the piston (160) into position against the shoulder on the pitch change rod (230). Refer to Figure 7-23.

(d) Turn the piston self-locking nut (150) onto the pitch change rod (230) until the self-locking nut (150) locking mechanism engages the threads of the pitch change rod.

(3) Using the modified deep well socket TE120, torque the piston self-locking nut (150) against the piston (160) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual. Refer to Figure 7-24.



Torquing the Piston Nut
Figure 7-24

(4) Apply approved anti-seize compound CM118 to the external threads adjacent to the tapered section of the pitch change rod (230). Refer to Figure 7-25.

(5) Put the small diameter end of the pitch change rod (230) into the cylinder-side hub (250) half and through the fork unit (440) and engine-side hub half.

CAUTION: WHEN INSTALLING THE PITCH CHANGE ROD (230) INTO THE FORK (450), DO NOT EXCEED THE MAXIMUM TORQUE IN ACCORDANCE WITH TABLE 8-1, "TORQUE VALUES" IN THE FITS AND CLEARANCES CHAPTER OF THIS MANUAL.

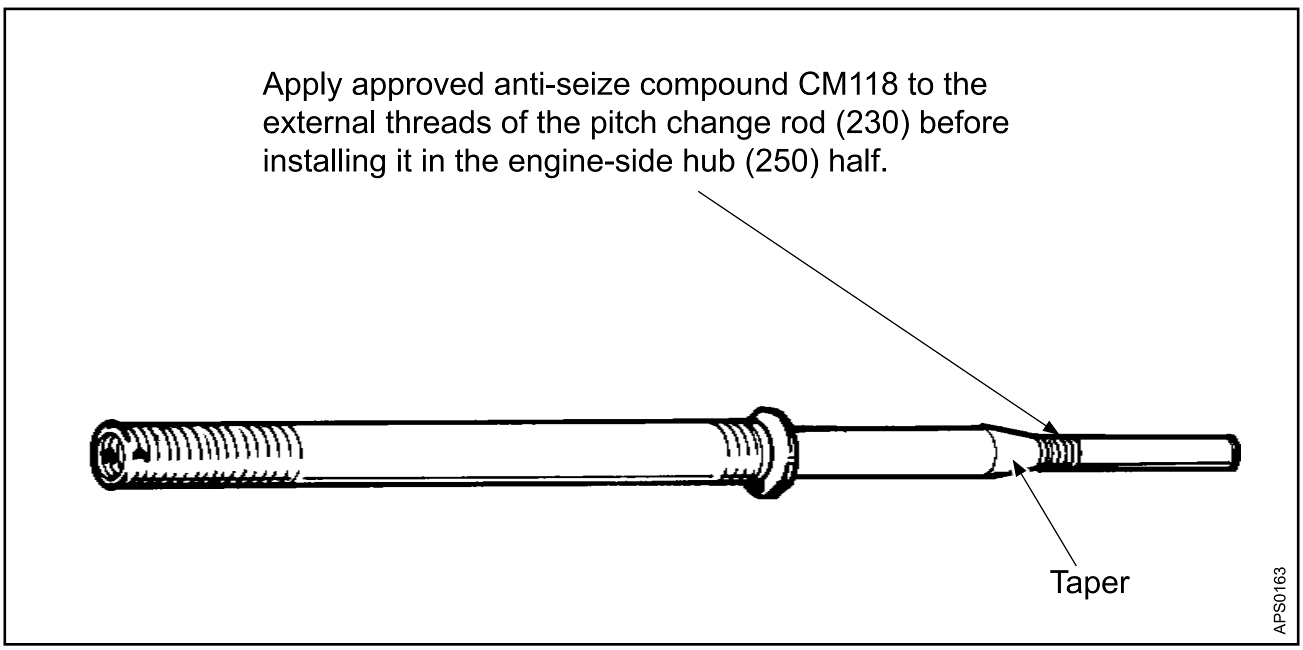
(6) Turn the pitch change rod (230) into the fork unit (440).

(7) Using the modified deep well socket TE120 on the self-locking hex nut (150), torque the pitch change rod (230) in accordance with Table 8-1, Torque Values, in the Fits and Clearances chapter of this manual.

(8) Move the blades by hand to make sure the blades have full range of movement from reverse pitch to feather pitch.

(a) If there is not full blade angle movement, remove the hub-clamping bolts (370) and nuts (400) and slightly separate the hub (250) halves to permit preload plate (570) rotation.

(b) Repeat the hub-clamping bolt (370) installation procedure after the preload plates (570) have been correctly positioned.



Applying CM118 to the Pitch Change Rod
Figure 7-25

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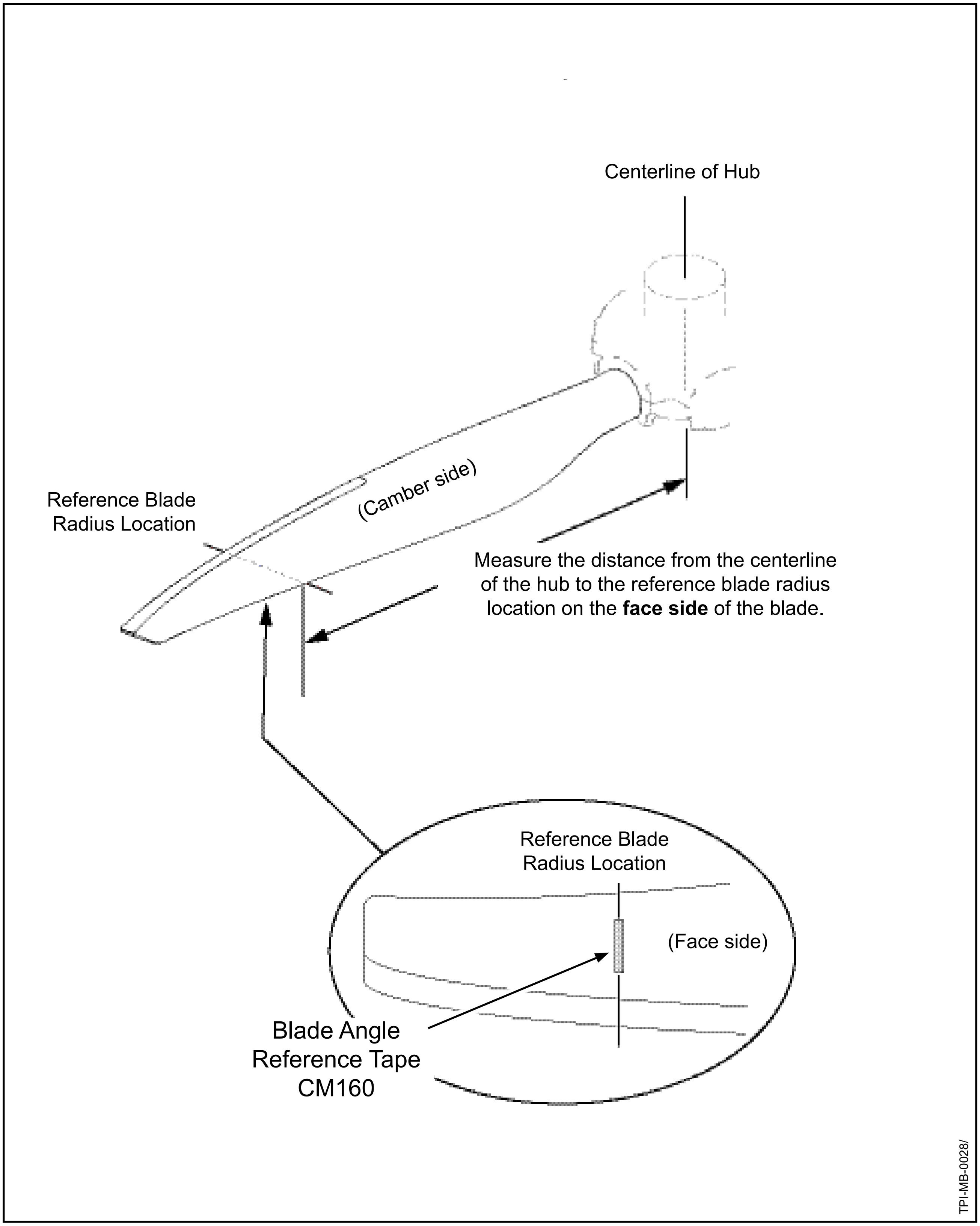


Blade Angle Reference Tape
Figure 7-26

J. Blade Angle Reference Tape Application (Optional) (Rev. 3)

CAUTION: DO NOT CONFUSE REFERENCE BLADE RADIUS WITH BLADE STATION. REFERENCE BLADE RADIUS AND BLADE STATION OF THE SAME NUMBER MAY NOT ALWAYS INDICATE THE SAME LOCATION ON THE BLADE.

(1) Reference blade radius is measured from the center of the propeller hub to a predetermined reference location on the blade for blade angle measurement.

(2) Blade stations are used during the repair or overhaul process of a blade to define a blade span location for dimensional measurement.

(3) Establish a reference blade radius location

(a) Refer to the Aircraft Type Certificate Data Sheet or the Hartzell Propeller Application Guide Manual 159 (61-02-59), for the reference blade radius location specified for the applicable aircraft installation.

(b) Beginning with blade one, measure from the center of the propeller hub to the reference blade radius location specified. Refer to Figure 7-26.

(c) Apply a piece of reference tape CM160 to the face side of the blade at the reference blade radius location, perpendicular to the blade centerline as shown in Figure 7-26.

1 Put the reference tape CM160 on the blade so that the reference blade radius location runs through the centerline of the tape.

(d) Repeat steps (3)(b) and (3)(c) for the remaining blades in the hub assembly.

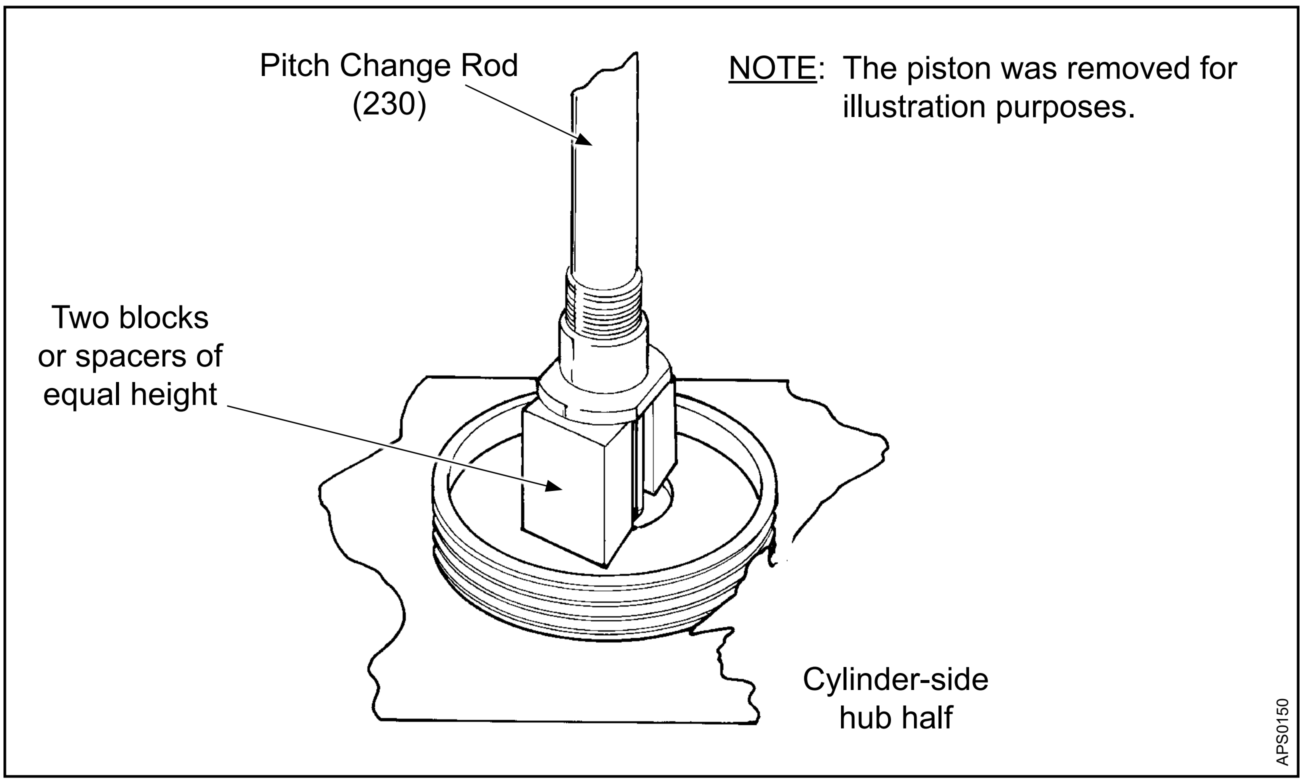
(e) Put a pattern cut-out over each piece of reference tape CM160.

(f) Spray each piece of reference tape CM160 with clear lacquer CM129 to prevent peeling.

PITCH CHANGE KNOB BRACKET UNIT PART NUMBER	CHANGE OF BLADE ANGLE
B-464-1( )	-0.3°
B-464-2( )	---
B-464-3( )	+0.3°
B-6257-1	-0.3°
B-6257-2	---
B-6257-3	+0.3°
100028-1	-0.3°
100028-2	---
100028-3	+0.3°

PITCH CHANGE KNOB BRACKET UNIT PART NUMBER	CHANGE OF BLADE ANGLE
100032-1	-0.3°
100032-2	---
100032-3	+0.3°
108303-1	-0.3°
108303-2	---
108303-3	+0.3°

Blade Pitch Change Knob Bracket Unit Selection
Table 7-1



Blade Angle Tolerance Check
Figure 7-27

K. Checking the Blade Angles

NOTE: The purpose of checking the blade angles is to make sure that the blade angles of all four blades are within 0.2 degree of each other at the blade radius.

(1) Put two blocks or spacers of equal height (± 0.0005 inch [0.012 mm]) under the piston (160) and on opposite sides of the pitch change rod (230) to hold the propeller in a low blade angle position. Refer to Figure 7-27.

(2) Check the blade angle at the reference blade radius location that is shown by the blade angle reference tape.

(a) The propeller does not have to be at the final low pitch position for this check, but the low blade angle for this check is 18-25 degrees.

(b) Move the blades by hand toward the high pitch position to make sure that the cam followers (540) are correctly seated against the fork (450).

(3) Using a protractor, check to make sure that the angle of each blade within the propeller varies no more than 0.2 degree from highest to lowest angle measurement.

(a) If the difference between the highest blade angle and the lowest blade angle is greater than 0.2 degree:

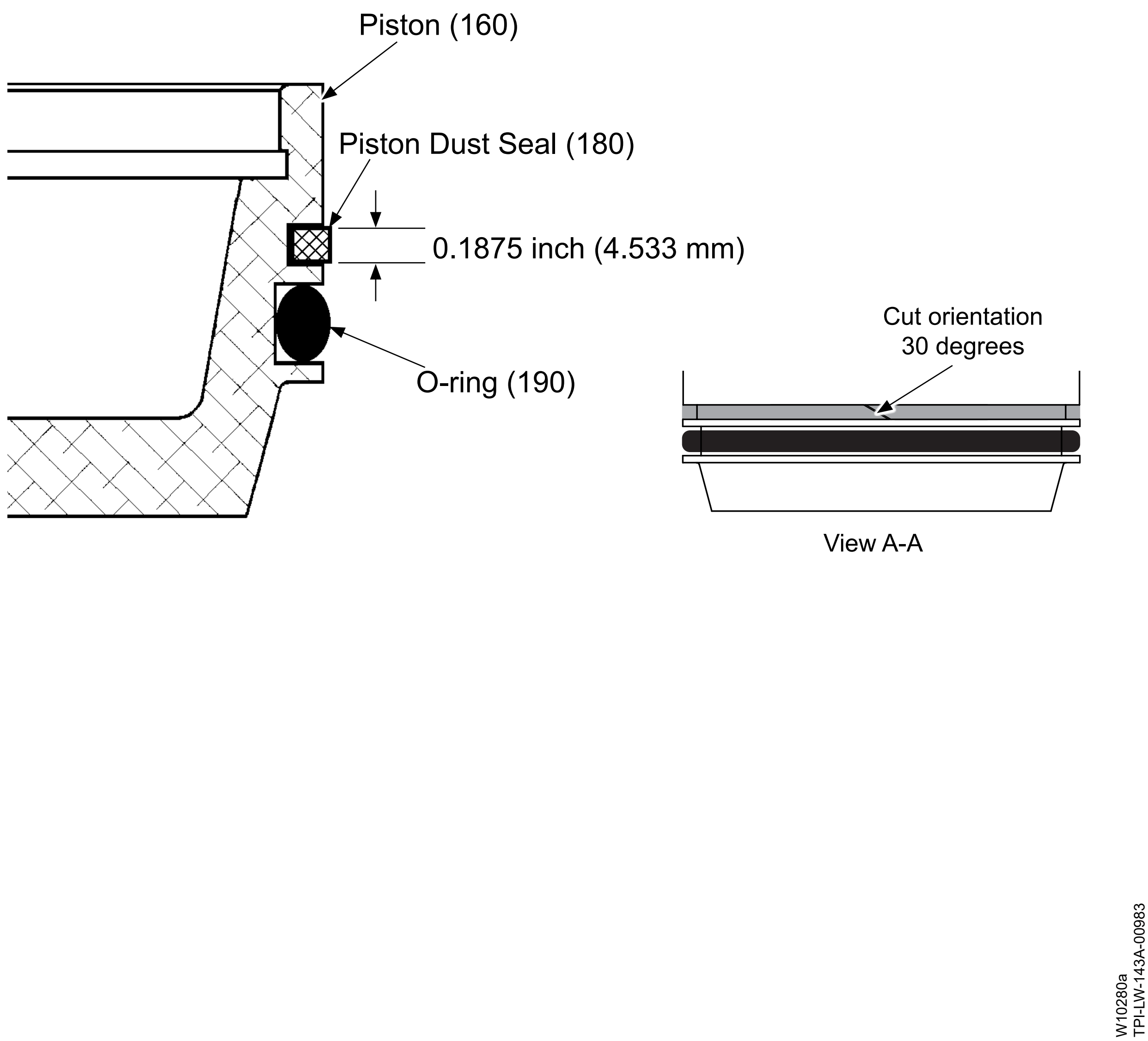
1 Replace the pitch change knob bracket unit(s) (510) on the blade(s) in accordance with the section "Pitch Change Unit Installation" in this chapter.

a Refer to Table 7-1, "Blade Pitch Change Knob Bracket Unit Selection" to select the applicable pitch change bracket unit (510) to increase or decrease the blade angle.

2 Measure the blade-to-blade angle tolerance until all four blades are within tolerance.

NOTE: Each blade has tolerances for blade angles at the various blade stations. The ultimate effects of these tolerances upon vibration during operation are magnified by the blade-to-blade tolerances in the assembled propeller. Maintaining a blade-to-blade tolerance within 0.2 degree at the reference blade radius has been found to be an acceptable limit. Although not a requirement, an additional check of the blade-to-blade tolerance at the outermost blade station may be a worthwhile verification that all blades of a set are within tolerance. The difference between the highest blade angle and the lowest blade angle at the outermost station should not be greater than 0.4 degree.

(4) When the difference between the highest blade angle and the lowest blade angle is within 0.2 degree, continue to the next step.



Locations of the Piston O-ring and Dust Seal
Figure 7-28

(5) Install the remaining hex head bolts (370, 380), washers (390), and self-locking nuts (400).

(6) Torque the self-locking nuts (400) on the remaining hex head bolts (370, 380) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.

L. Pitch Adjust Unit Assembly (Rev. 3)

CAUTION: REFER TO THE APPLICABLE AIRCRAFT TYPE CERTIFICATE DATA SHEET AND/OR HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR SPECIFIC BLADE ANGLES REQUIRED.

(1) Install the piston OD O-ring (190) in the groove closest to the hub (250). Refer to Figure 7-28.

(2) Cut the necessary length of piston dust seal (180) material.

(a) Cut the piston dust seal (180) material on a 30 degree diagonal so there will be an overlap at the parting line with a smooth surface, free of fuzz. Refer to Figure 7-28, A-A.

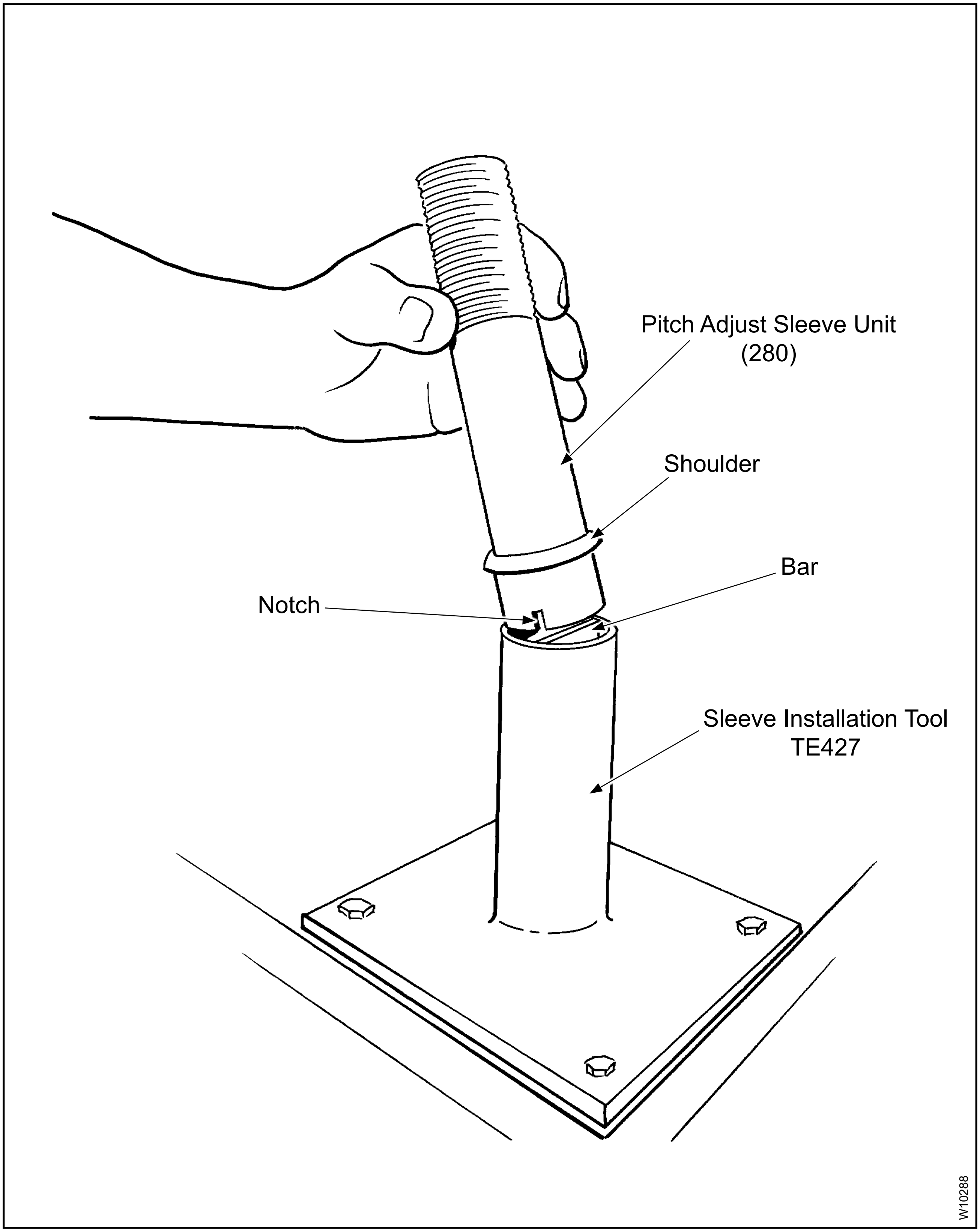
(3) Soak the piston dust seal (180) in aviation grade turbine engine oil until the seal is completely saturated.

(4) Squeeze the excess oil from the piston dust seal (180).

CAUTION: MAKE SURE THAT THE PISTON DUST SEAL (180) IS FREE OF FUZZ.

(5) If the piston dust seal (180) has fuzz or long strands that could interfere with O-ring operation, replace the piston dust seal.

(6) Install the thinnest section of the piston dust seal (180) in the remaining piston (160) OD groove. Refer to Figure 7-28.



Putting the Pitch Adjustment Sleeve Unit on the Sleeve Installation Tool TE427
Figure 7-29

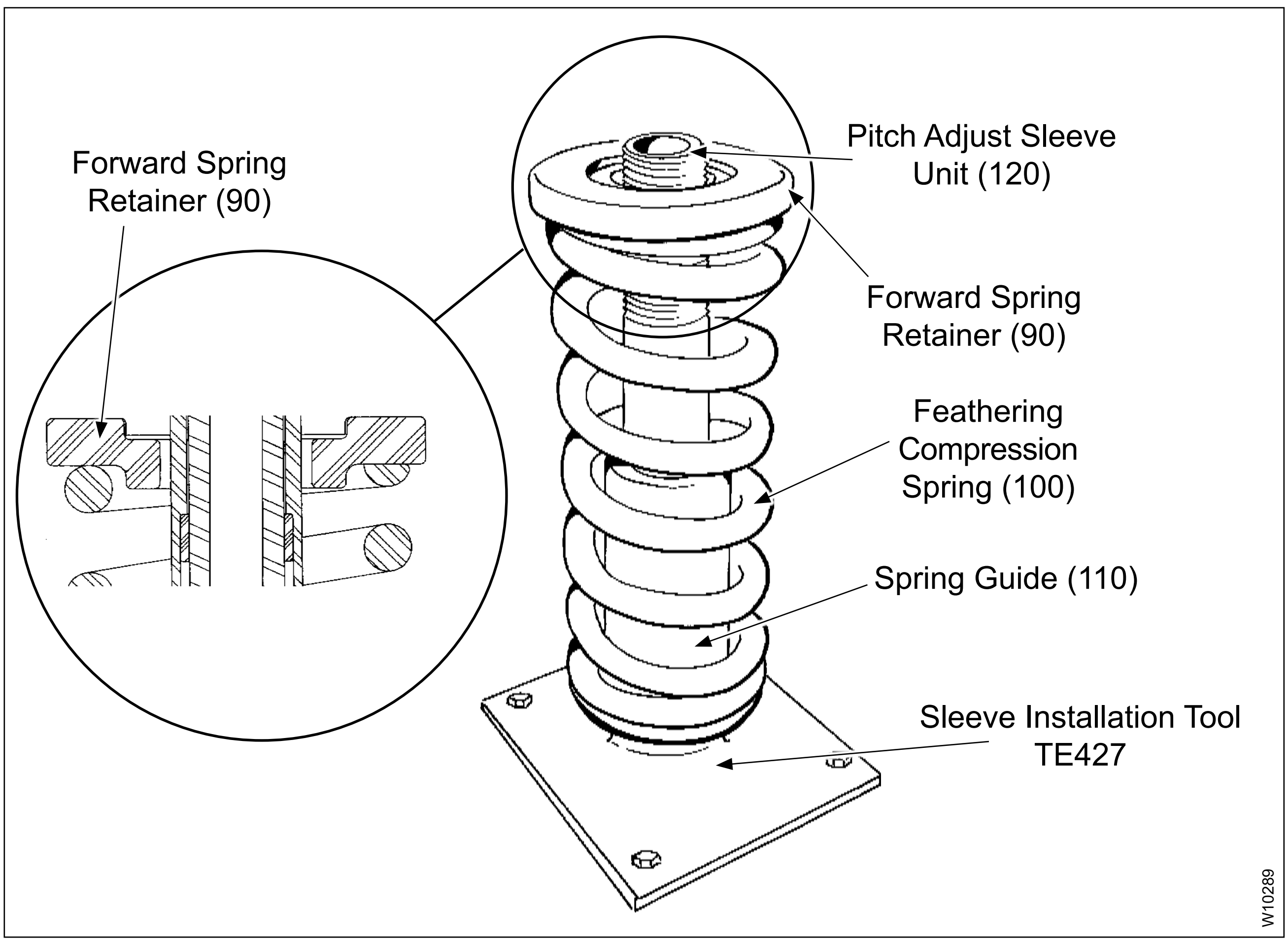
(7) Installing the cylinder (60)

(a) Install the pitch adjust sleeve unit (120) into the cylinder (60) using the sleeve installation tool TE427, or equivalent.

1 Fit the notches of the pitch adjust sleeve unit (120) into position on the bar of the sleeve installation tool TE427, or equivalent. Refer to Figure 7-29.

2 Move the spring guide (110) over the pitch adjust sleeve unit (120) on the sleeve installation tool TE427, or equivalent, until the spring guide is resting on the shoulder of the pitch adjust sleeve unit. Refer to Figures 7-29 and 7-30.

3 Apply anti-seize compound CM118 or CM151 to both end coils of the feathering compression spring (100) and the first two threads of the pitch adjust sleeve unit (120).



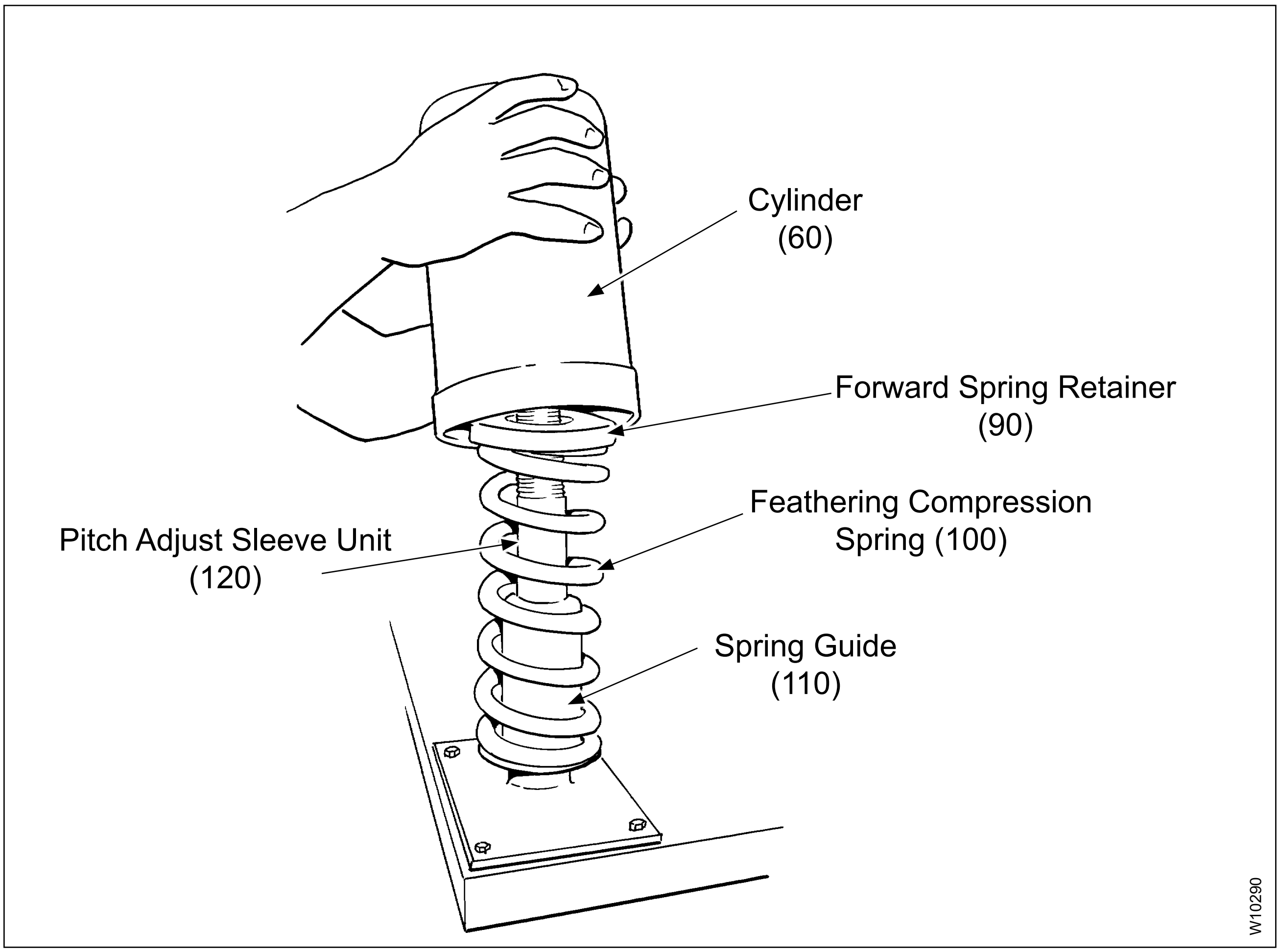
Installing the Feathering Compression Spring on the Pitch Adjust Sleeve Unit
Figure 7-30

4 Put the feathering compression spring (100) over the pitch adjust sleeve unit (120) and spring guide (110) on the sleeve installation tool TE427, or equivalent, with the feathering compression spring resting on the lip of the spring guide. Refer to Figure 7-31.

5 With the raised shoulder of the forward spring retainer (90) toward the feathering compression spring (100), install the forward spring retainer, if applicable, over the pitch adjust sleeve unit (120) on the sleeve installation tool TE427, or equivalent. Refer to Figure 7-30.

CAUTION: DO NOT DAMAGE THE PITCH ADJUST SLEEVE UNIT (120) OR CYLINDER THREADS WHEN INSTALLING THE CYLINDER (60).

6 Put the cylinder (60) over the parts on the sleeve installation tool TE427, or equivalent, and turn the cylinder onto the pitch adjust sleeve unit (120). Refer to Figure 7-31.



Starting the Cylinder on the Pitch Adjust Sleeve
Figure 7-31

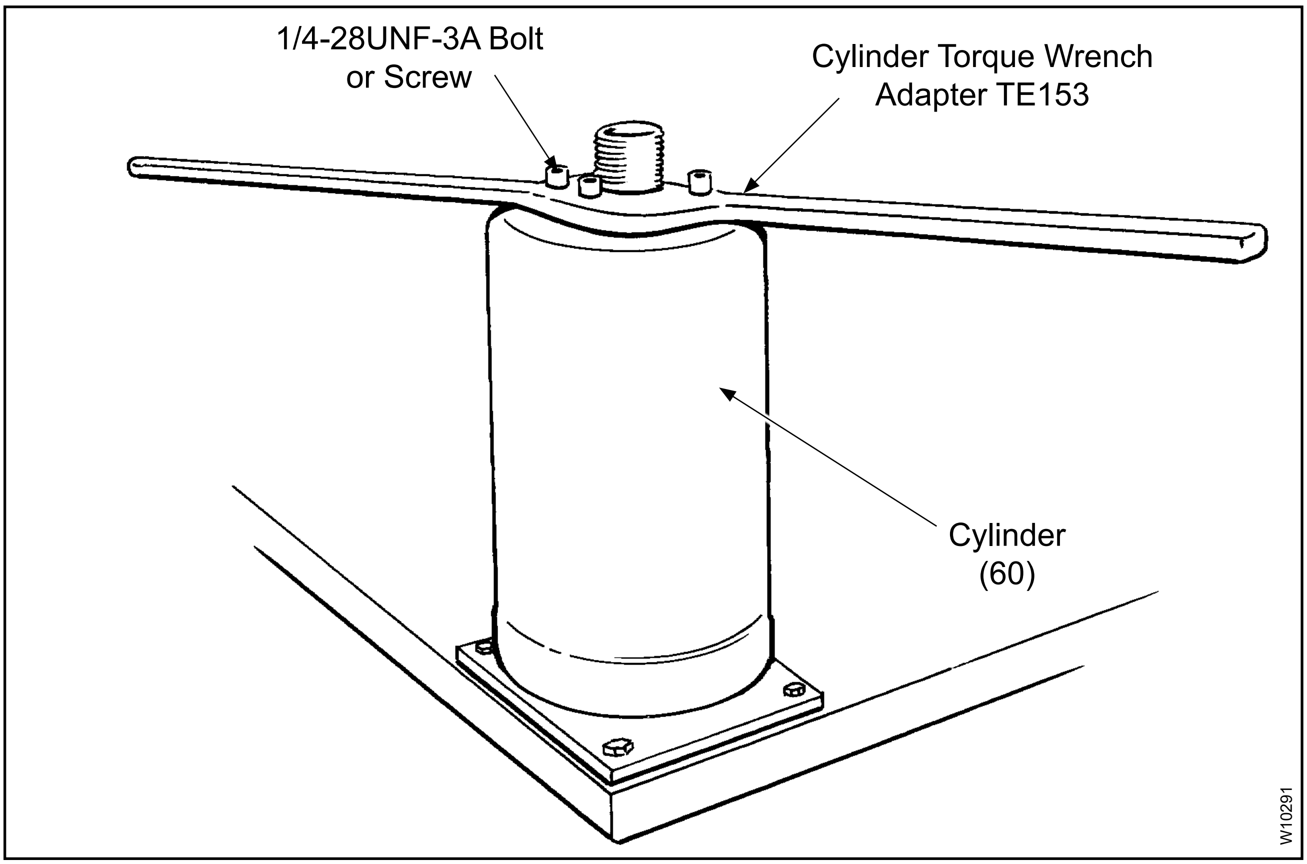
7 Using four 1/4-28UNF-3A bolts or screws, attach the cylinder torque wrench adapter TE153, or equivalent, to the cylinder (60). Refer to Figure 7-32.

WARNING: MAKE SURE OF THE SAFETY OF PERSONNEL IN THE AREA DURING THE ASSEMBLY PROCEDURE. WHEN COMPRESSED, THE FEATHERING COMPRESSION SPRING (100) IS LOADED TO APPROXIMATELY 1000 POUNDS (454 KG) FORCE.

8 Turn the cylinder torque wrench adapter TE153, or equivalent, until the feathering compression spring (100) is fully compressed. Refer to Figure 7-32.

WARNING: USE CARE WHEN HANDLING A CYLINDER (60) CONTAINING A COMPRESSED FEATHERING COMPRESSION SPRING (100).

9 With the cylinder torque wrench adapter TE153, or equivalent, attached, remove the cylinder (60) from the sleeve installation tool TE427, or equivalent.



Compressing the Feathering Compression Spring
Figure 7-32

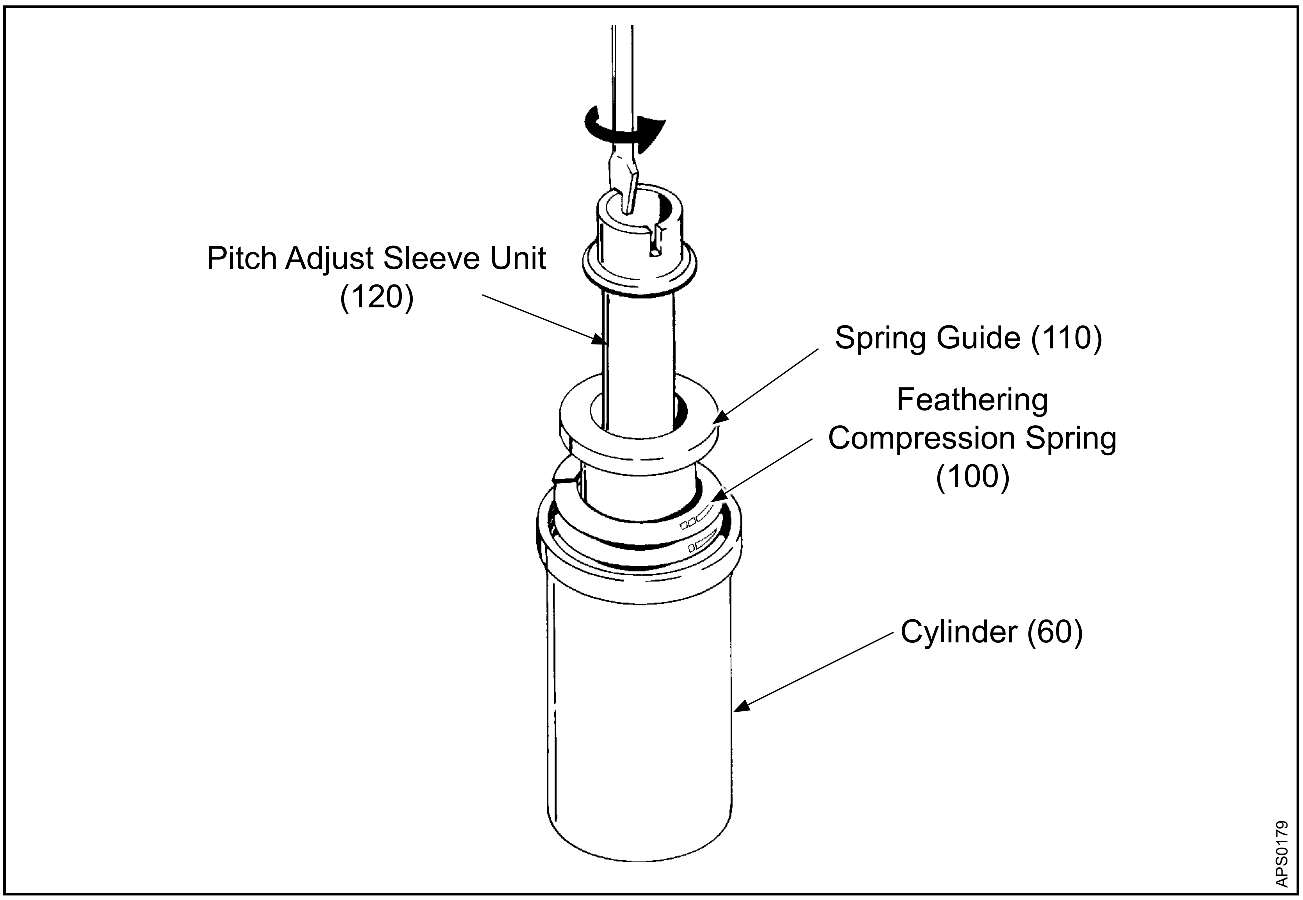
(b) Installing the pitch adjust sleeve unit (120) into the cylinder (60) without using the sleeve installation tool TE427 or equivalent:

1 Apply anti-seize compound C118 or CM151 to both end coils of the feathering compression spring (100) and the first two threads of the pitch adjust sleeve unit (120).

2 Install the pitch adjust sleeve unit (120) through the spring guide (110), feathering compression spring (100), and the forward spring retainer (90).

3 As shown in Figure 7-33, use a screwdriver in the slot in the pitch adjust sleeve unit (120) to thread the sleeve through the cylinder (60) far enough that a wrench can be applied to the flat surface on the end of the sleeve to continue screwing it into the cylinder until the feathering compression spring (100) is fully compressed.

4 Using four 1/4-28UNF-3A bolts or screws, attach the cylinder torque wrench adapter TE153, or equivalent, to the cylinder (60).



Using a Screwdriver to Thread the Pitch Adjust Sleeve Unit Through the Cylinder
Figure 7-33

(c) Install the cylinder-half hub shoulder O-ring (240). Refer to Figure 7-34.

CAUTION: DO NOT APPLY ANTI-SEIZE COMPOUND CM118 TO THE MOUNTING THREADS ON THE CYLINDER (60).

(d) Apply anti-seize compound CM118 to the cylinder mounting threads on the hub (250) only.

1 Using a clean cloth, remove any unwanted anti-seize compound CM118 from the area above the cylinder mounting threads on the hub (250).

NOTE: When assembling a propeller that will be disassembled for shipping, it is not necessary to apply sealant CM92 around the shoulder of the cylinder-half of the hub (250) next to the O-ring (240).

(e) Apply a bead of sealant CM92 around the shoulder of the cylinder-half of the hub (250) next to the O-ring (240). Refer to Figure 7-34.

CAUTION 1: DO NOT DAMAGE THE CYLINDER THREADS WHEN INSTALLING THE CYLINDER (60).

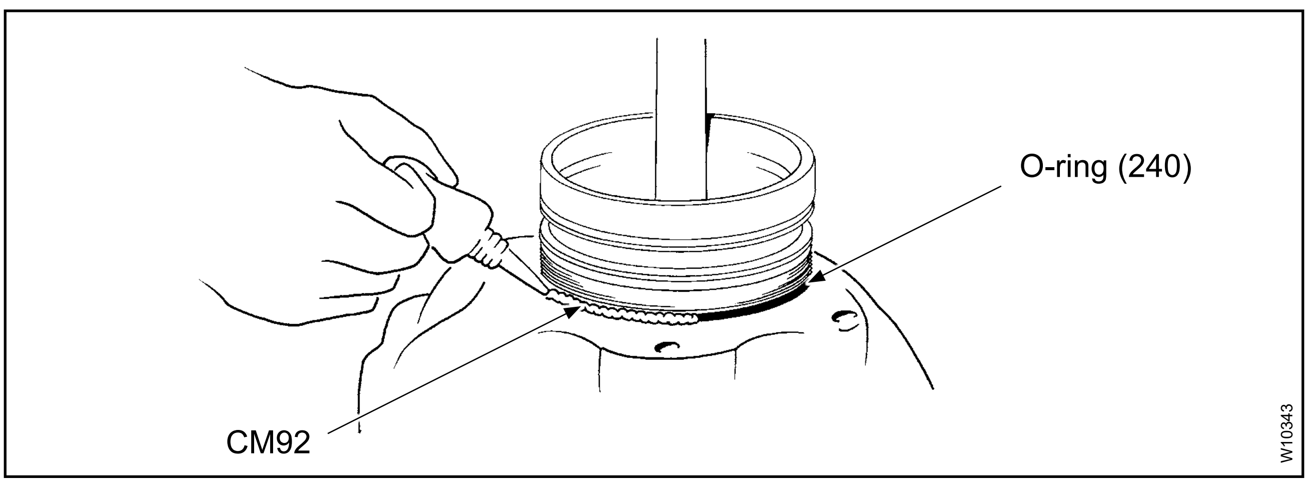
CAUTION 2: DO NOT DAMAGE THE PISTON OD O-RING (190) WHEN INSTALLING THE CYLINDER (60).

(f) Carefully move the cylinder (60) over the piston (160) onto the hub (250) threads.

CAUTION: MAKE SURE THE CYLINDER (60) THREADS ARE ALIGNED WITH THE HUB (250) THREADS.

(g) Turn the cylinder (60) counterclockwise until the threads align.

(h) Turn the cylinder (60) on the hub (250) threads by hand.



Applying a Bead of Sealant to the Hub Shoulder
Figure 7-34

(i) Using the torque wrench adapter TE153, or equivalent, torque the cylinder (60) onto the hub (250) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.

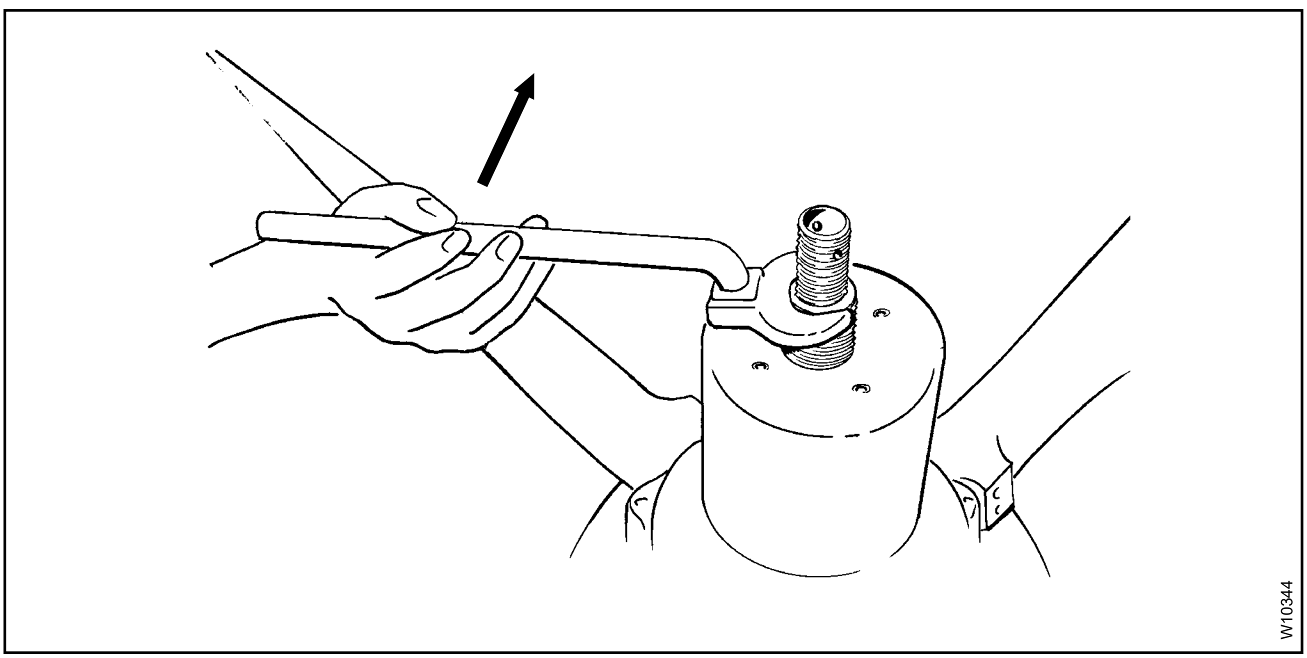
(j) Remove the four 1/4-28UNF-3A bolts or screws from the torque wrench adapter TE153, or equivalent, and cylinder (60).

(k) Remove the torque wrench adapter TE153, or equivalent, from the cylinder (60).

(8) Install the drilled hex nut (30) on the pitch adjust sleeve unit (120).

CAUTION: IF THE FEATHERING COMPRESSION SPRING (100) IS NOT IN CONTACT WITH THE PISTON (160), THE PISTON WILL SLAM UP ONTO THE BOTTOM OF THE FEATHERING COMPRESSION SPRING WHEN 200 PSI IS APPLIED.

(9) Using a 1-3/16 inch open end wrench, engage two of the flats on the pitch adjust sleeve unit (120) and turn the wrench approximately three turns clockwise, or until all resistance is stopped, to permit the feathering compression spring (100) to touch the piston (160). Refer to Figure 7-35.



Turning the Pitch Adjust Sleeve Unit
Figure 7-35

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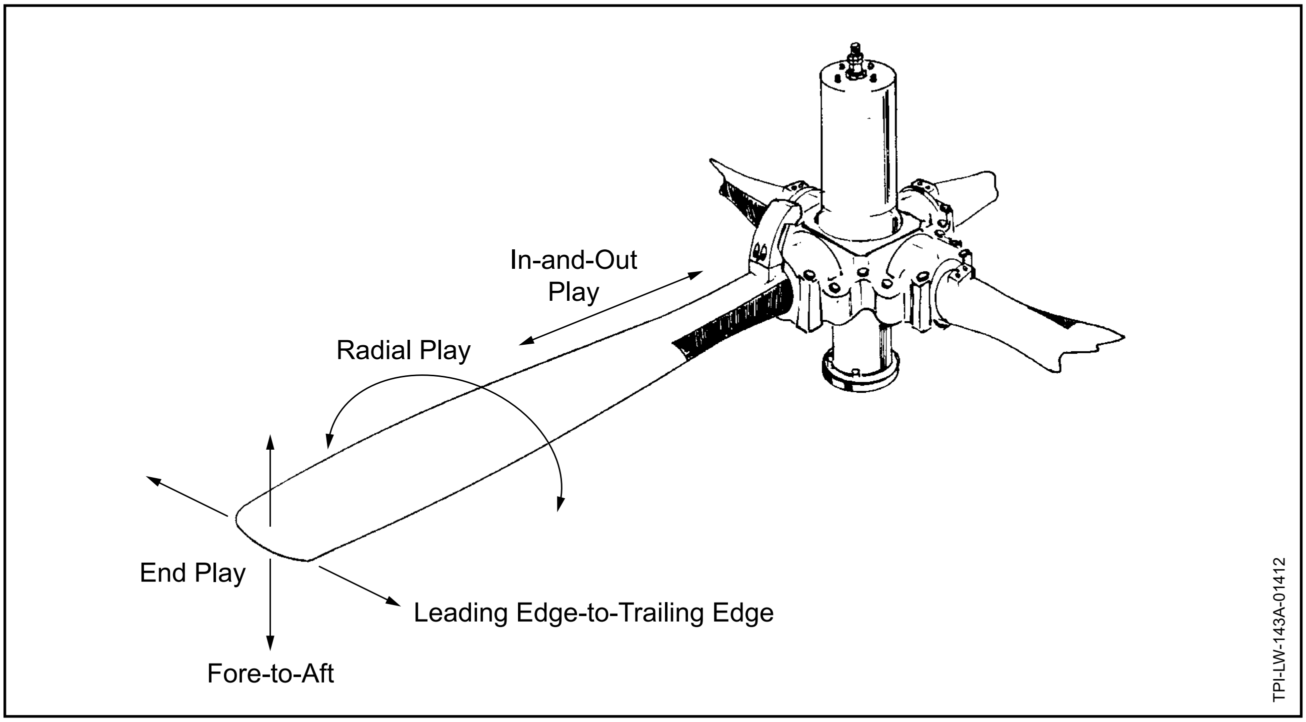
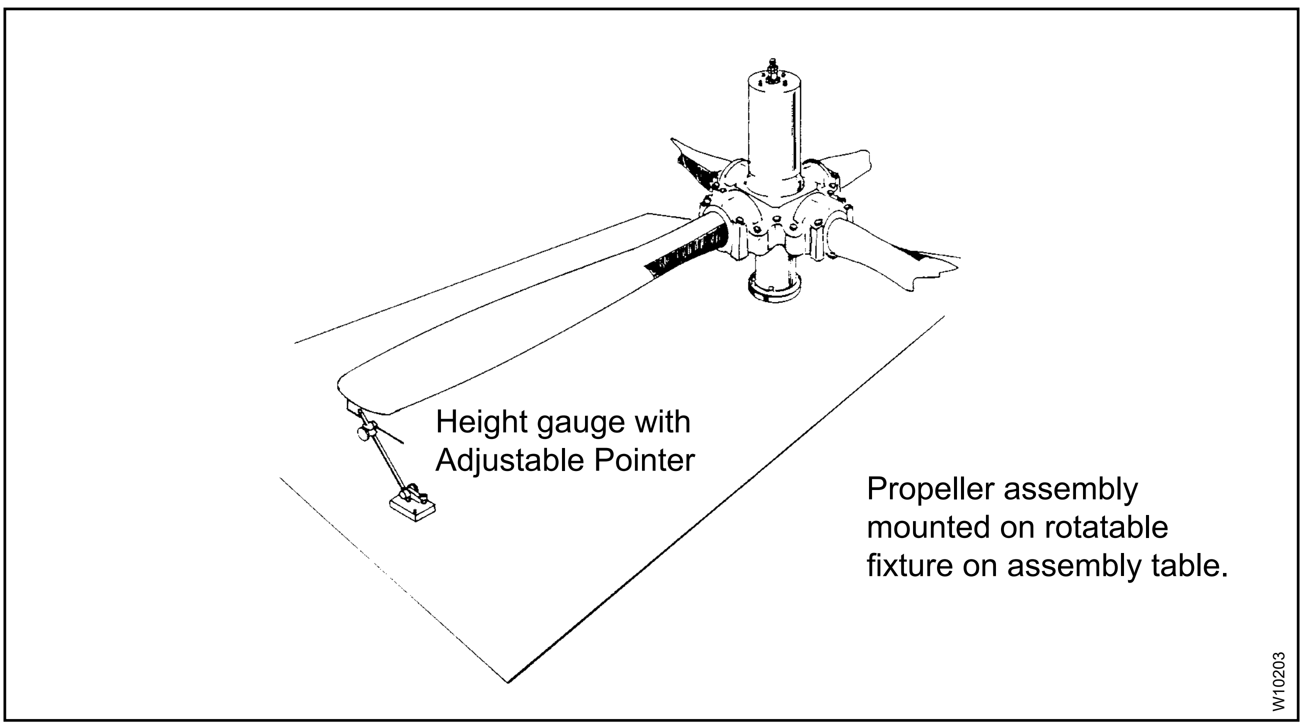


Checking Blade Play
Figure 7-36



Checking Blade Track
Figure 7-37

For HC-D4N-2( ) only:

(10) Using lubricant CM12, lubricate the O-ring (50) and install it in the groove of the pitch change rod plug (40).

(11) Thread the pitch change rod plug (40) into the pitch change rod (230) until the end of the pitch change rod plug is flush or slightly below flush with the end of the pitch change rod.

(a) The slot in the pitch change rod plug (40) must be aligned with the holes in the pitch change rod (230).

M. Blade Installation Checks

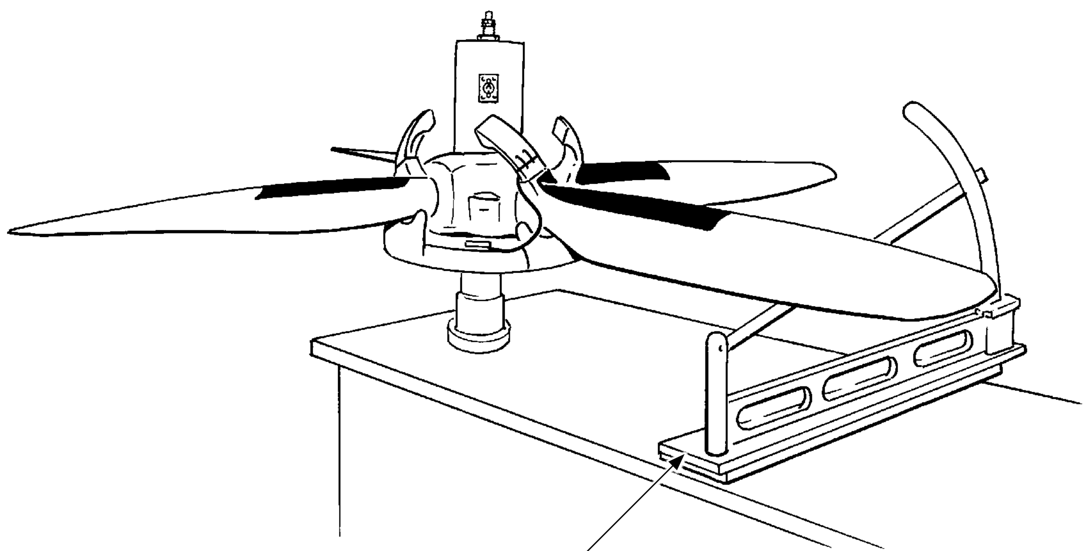
(1) Apply 200 psi (13.78 bars) air pressure to the propeller to move the blades toward low pitch until the blade tips are approximately parallel to the bench surface.

(2) Check for fore-and-aft or end play movement in each blade. Refer to the Fits and Clearances chapter of this manual for blade tolerances. Refer to Figure 7-36.

(a) If there is fore-and-aft movement in a blade, it may indicate that the blade preload is set too loose. Refer to the section, "Setting Blade Preload" in this chapter.

CAUTION: BLADE TRACK MUST NOT VARY MORE THAN THE TOLERANCE SPECIFIED FROM HIGHEST BLADE HEIGHT TO LOWEST BLADE HEIGHT.

(3) Using a height gauge, check the blade track at the tip/face of each blade. Refer to Figure 7-37. Refer to the Fits and Clearances chapter of this manual for blade tolerances.



Checking Blade Angles With the Bench Top Protractor TE96
Figure 7-38

N. Setting the Low Pitch Angle of the Blades

(1) Refer to the applicable Aircraft Type Certificate Data Sheet or Hartzell Propeller Application Guide Manual 159 (61-02-59) for the specific low pitch blade angle and blade radius required.

(2) Apply 200 PSI (13.78 bars) air pressure to the propeller to move the propeller pitch change components against the reverse adjust sleeve (130).

(3) Remove play from the blades by pushing the counterweight or counterweight clamp toward feather.

(4) Using a protractor TE96, TE97, or equivalent, check the low pitch angle of each blade at the appropriate blade radius location. Refer to Figure 7-38.

(5) If the low pitch blade angle is not correct:

(a) Relieve the pressure from the propeller

(b) Turn the pitch adjust sleeve unit (120) clockwise to increase the blade angle, or counterclockwise to decrease the blade angle.

NOTE: One full turn of the pitch adjust sleeve unit (120) equals approximately five degrees.

(6) After adjustment, repressurize the propeller and recheck the low pitch angle.

(7) When the correct low pitch angle has been established in all four blades, thread the drilled hex nut (30) on the pitch adjust sleeve unit (120) against the cylinder (60).

CAUTION: DO NOT PERMIT THE PITCH ADJUST SLEEVE UNIT (120) TO ROTATE WHEN TORQUING THE DRILLED THIN HEX NUT (30).

(8) While holding the pitch adjust sleeve unit (120) to prevent rotation, torque the drilled thin hex nut (30) against the cylinder (60) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.

(9) Install the washer (80) and safety screw (70) into one of the holes provided in the cylinder (60) and tighten.

NOTE: When assembling a propeller that will be disassembled for shipping, it is not necessary to install safety wire to the drilled thin hex nut (30) and safety screw (70).

(10) Using 0.032 inch (0.81 mm) minimum diameter stainless steel wire, safety wire the drilled thin hex nut (30) to the safety screw (70).

(11) After adjustment, repressurize the propeller and recheck the low pitch angle.

O. Setting the Feathering Angle of the Blades

(1) Refer to the applicable Aircraft Type Certificate Data Sheet or Hartzell Propeller Application Guide Manual 159 (61-02-59) for the specific feather blade angle and reference blade radius required.

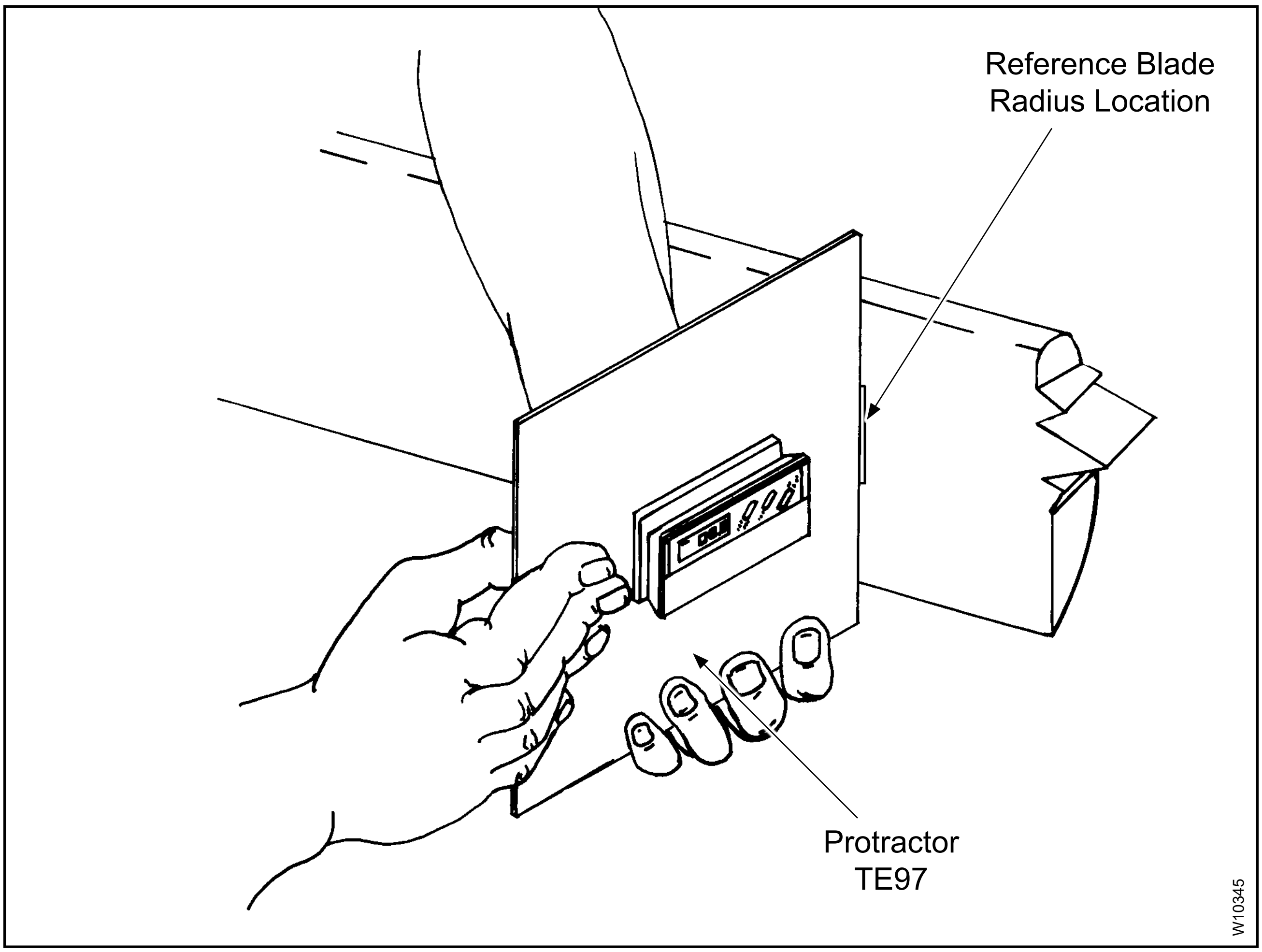
CAUTION: TO ACHIEVE THE CORRECT FEATHER BLADE ANGLE, THE THIN HEX NUT (20) MUST CONTACT THE SHOULDER OF THE PITCH ADJUST SLEEVE UNIT (120).

(2) Release all air pressure from the propeller.

(3) Install the thin drilled hex nut (20) on the pitch change rod (230) and turn the thin drilled hex nut until it bottoms against the pitch adjust sleeve unit (120).

(4) Apply air pressure to the propeller to move the pitch change rod (230) and the thin drilled hex nut (20) off of the pitch adjust sleeve unit (120).

(5) Turn the thin drilled hex nut (20) clockwise approximately five turns to provide a starting point for feather blade angle adjustment.



Checking Feathering Angle with Protractor TE97
Figure 7-39

(6) Release the air pressure from the propeller and permit the thin drilled hex nut (20) to rest on the pitch adjust sleeve (120).

(7) Remove play from the blades by pushing the counterweight or counterweight clamp toward feather position.

(8) Using a protractor TE96, TE97, or equivalent, measure the feather angle of blade number one at the appropriate reference blade radius. Refer to Figure 7-39.

(9) If the feather blade angle is not correct, apply enough air pressure to the propeller to move the pitch change rod (230) and thin drilled hex nut (20) off of the pitch adjust sleeve unit (120).

(10) Adjust the feather blade angle by turning the thin drilled hex nut (20) on the pitch change rod (230).

NOTE: One full turn of the thin drilled hex nut (20) equals approximately five degrees.

(a) To decrease the angle, turn the thin drilled hex nut (20) clockwise.

(b) To increase the angle, turn the thin drilled hex nut (20) counterclockwise.

(11) When the correct feather angle is established for all four blades, install a second thin drilled hex nut (10).

CAUTION: THE THIN DRILLED HEX NUT (20) MUST NOT MOVE WHEN TORQUING THE THIN DRILLED HEX NUT (10) AGAINST THE THIN DRILLED HEX NUT.

(12) Torque the thin drilled hex nut (10) against the first thin drilled hex nut (20), in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.

(13) Cycle the propeller to reverse and then back to feather.

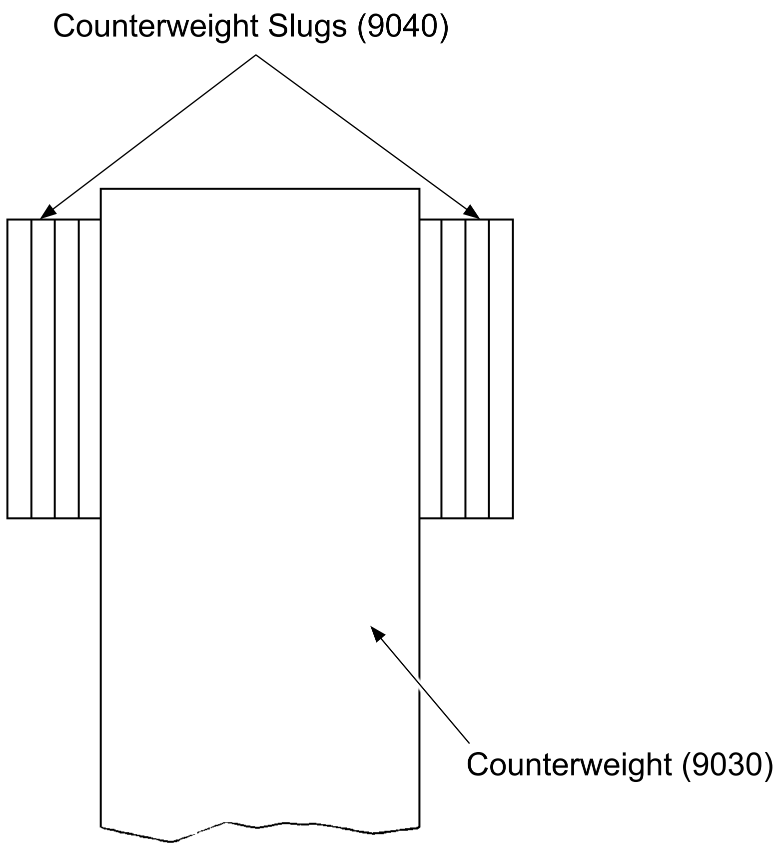
(14) Measure the feather blade angle.

(a) If the angle is incorrect, loosen the thin drilled hex nut (10) and repeat steps (8) through (13) of this procedure.

(b) When the feather blade angle is correct, continue to the next step.

(15) After torquing the drilled thin hex nuts (10, 20), remeasure the feather blade angle.

NOTE: When assembling a propeller that will be disassembled for shipping, it is not necessary to install safety wire to the drilled thin hex nuts (10, 20).



NOTE: Counterweight slugs (9040) are application specific. For the number of counterweight slugs (9040) to be used, refer to Hartzell Propeller Application Guide Manual 159 (61-02-59).

Counterweight Slugs Placement
Figure 7-40

(16) Using 0.032 inch (0.81 mm) minimum diameter stainless steel wire, wire together the two thin drilled hex nuts (10, 20) for safety.

NOTE: When assembling a propeller that will be disassembled for shipping, it is not necessary to install the hex head bolt (220), washer (210), and nut (200).

(17) Install the hex head bolt (220) through the hole in the pitch change rod (230) and the slot in the pitch change rod plug (40).

(18) Install the washer (210) and nut (200) on the hex head bolt (220).

(19) Hold the hex head bolt (220) to keep it from turning and torque the nut (200) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.

4. Counterweight Slug Installation

A. Installing Counterweight Slugs

(1) For the applicable blade counterweight slugs to be installed on each propeller model, refer to the Hartzell Propeller Application Guide Manual 159 (61-02-59).

CAUTION: MAKE SURE THAT THE HEAD OF THE COUNTERWEIGHT BOLT (9050) THAT ATTACHES THE COUNTERWEIGHT SLUGS (9040) TO THE COUNTERWEIGHT (9030) IS ON THE ENGINE FLANGE OR BULKHEAD SIDE OF THE BLADE WHEN THE BLADE IS IN HIGH PITCH OR FEATHER POSITION.

(2) Using new counterweight slug mounting bolts (9050), install the counterweight slugs (9040).

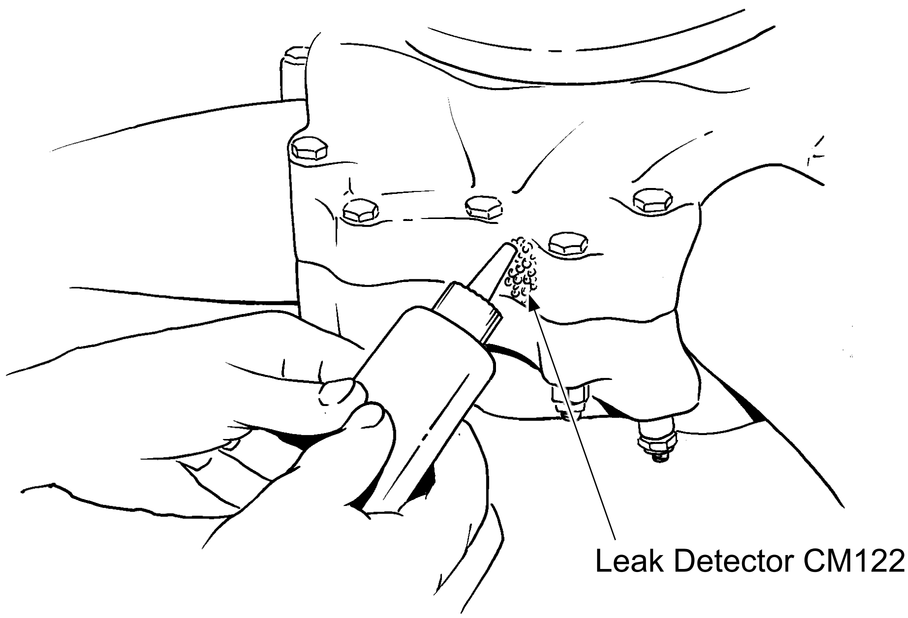
(a) With the head of the counterweight slug mounting bolt (9050) on the engine flange or bulkhead-side of the blade, install the applicable number of counterweight slugs (9040) on each side of the blade counterweight (9030), as shown in Figure 7-40.

1 For the number of counterweight slugs (9040) to be used, refer to Hartzell Propeller Application Guide Manual 159 (61-02-59).

2 If there is an odd number of counterweight slugs (9040), put the extra counterweight slug on the spinner bulkhead-side of the counterweight (9030).

(b) Install a counterweight slug mounting nut (9060) on each counterweight slug mounting bolt (9050).

(c) Torque each counterweight slug mounting nut (9060) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.



Hub Leak Test
Figure 7-41

5. Leak Test (Rev. 3)

A. Leak Test Procedure

NOTE: Refer to the Illustration Parts List chapter of this manual for the location of the lubrication fittings and lubrication plugs (engine-side/cylinder-side) for the applicable propeller model.

(1) Except for propeller model HC-E4A-2 that use the blade seal (670) and energizer ring (680), test for leaks using the following steps:

(a) Install the lubrication fittings (410) in the applicable side of the hub.

1 Tighten each lubrication fitting (410) until finger-tight, then tighten one additional 360 degree turn.

(b) Install the lubrication plugs (411) in the applicable side of the hub.

1 Leave one lubrication plug hole open for leak testing.

2 Tighten each lubrication plug (411) until finger-tight, then tighten one additional 360 degree turn.

(c) With the hub installed on the propeller test stand, perform the leak test in accordance with the following steps:

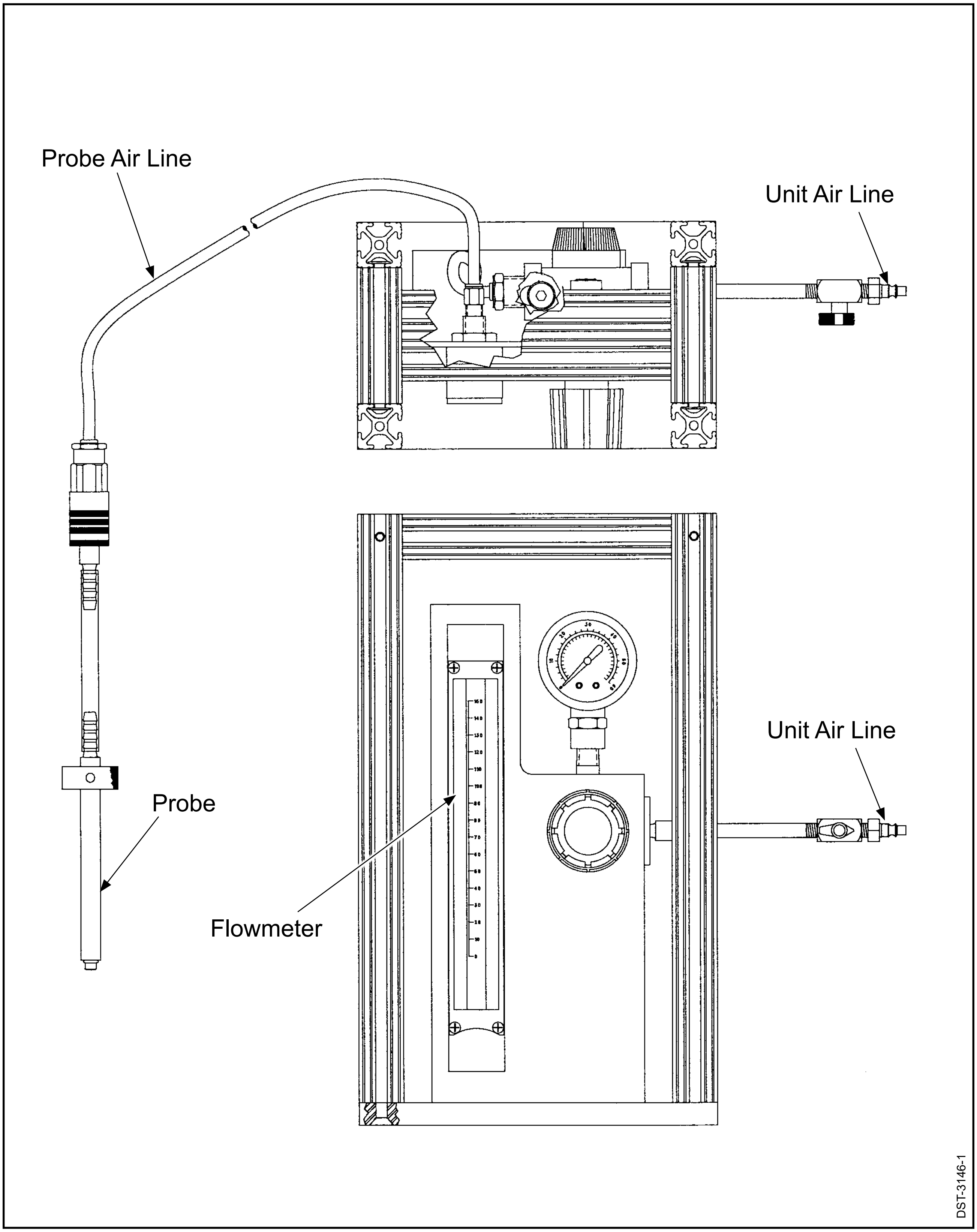
1 Move the propeller to low pitch.

2 Apply leak detector CM122 to the open lubrication plug hole. Refer to Figure 7-41.

a If there is any indication of air exiting the hub, refer to the Testing and Fault Isolation chapter of this manual.

(d) After the leak test is complete, install the remaining lubrication plug (411) in the applicable side of the hub.

1 Tighten the lubrication plug (411) until finger-tight, then tighten one additional 360 degree turn.



Blade Seal Effectiveness Check
Figure 7-42

(2) For propeller models HC-E4A-2( ) that use the blade seal (670) and the energizer ring (680), test for leaks using the Blade Seal Effectiveness Check in the following steps:

(a) To perform the blade seal effectiveness check, use Blade Seal Effectiveness Kit DST-3146-1 (TE382). Refer to Figure 7-42.

CAUTION: MAKE SURE THAT THE ONE LUBRICATION FITTING HOLE THAT DOES NOT HAVE AN AIRFLOW PLUG IN IT IS ACCESSIBLE PAST THE COUNTERWEIGHT WHEN THE PROPELLER IS IN FEATHER POSITION.

(b) Install an airflow plug that has a metal spacer and an O-ring in all except one lubrication fitting (410) hole in the hub (250).

(c) Make a check of the flowmeter by obstructing the air flow.

1 If the flowmeter moves to the "0" position, indicating no airflow, continue to step (4) in this section.

2 If the flowmeter does not move to the "0" position, indicating airflow, troubleshoot the flowmeter.

(d) If not using the BT-3838-1 probe, install the BT-3838 fitting in the open lubrication fitting hole.

NOTE: The BT-3838-1 probe does not require an adaptor. If the BST-3117 Probe Assembly is used, adaptor BT-3838 (TE443) must be used.

(e) Connect a shop air line to the unit air line.

(f) Adjust the regulator until the gauge reads 1 bar.

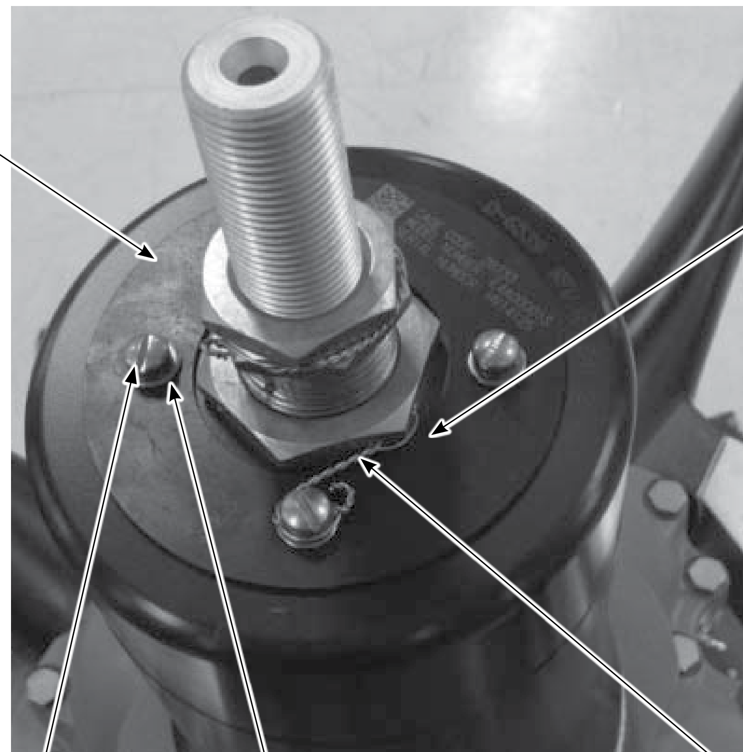
(g) Connect the probe air line to the probe.

(h) Perform the blade seal effectiveness check.

1 Initially the ball in the flowmeter will rise in the gauge and then should slowly return to the "0" position.

2 If the ball in the flowmeter returns to the "0" position, indicating no air flow, the blade seal effectiveness check has been satisfactorily completed.

3 If the ball in the flowmeter does not return to the "0" position, indicating an air flow, troubleshoot the leak, repair, and perform the blade seal effectiveness check until the check is satisfactory.



There are four B-3841-6 screws (71) and four B-3837-0432 (81) washers used for each UID plate (62) installation. Three of the four locations are visible in this photo, but only one location is pointed to.

TI-104364assy

Installation of the UID Plate
Figure 7-43

6. Installing the UID Plate

A. General

(1) Examine the UID plate (62) and the propeller hub (250) to make sure the serial numbers match.

(a) If the serial numbers do not match, do one of the following:

1 Find the correct UID plate (62) with a serial number that matches the propeller hub (250).

2 Order the correct UID plate (62).

a To order the UID plate (62), contact Hartzell Propeller LLC.

(2) Additional procedures for use of the UID plate (62) may be required by the military and/or government authority.

(3) The UID plate (62) does affect the safety of flight.

B. Installation Procedures

(1) With the laser etched side of the UID plate (62) pointing outward, align the four screw holes in the UID plate (62) with the four screw holes in the cylinder (60) and hold in position. Refer to Figure 7-43.

(2) Apply one drop of adhesive CM21 to one of the screws (71).

NOTE: When assembling a propeller that will be disassembled for shipping, it is not necessary to install adhesive CM21 or safety wire.

(3) Install one washer (81) onto the screw (71).

(4) Install the washer (81) and screw (71) into one of the four screw holes provided on the top of the cylinder (60). Refer to Figure 7-43.

(5) Torque the screw (71) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.

(6) Repeat section 6.B.(2) through section 6.B.(5) for each of the three remaining screws (71) and washers (81).

(7) Locate a path from one corner of the drilled thin hex nut (30) to one of the screws (71) that will not cross any of the laser etched information on the UID plate (62).

NOTE: When assembling a propeller that will be disassembled for shipping, it is not necessary to install CM21 or safety wire.

(a) Using 0.032 inch (0.81 mm) diameter stainless steel wire, safety wire the drilled thin hex nut (30) to the one screw (71) along the path located. Refer to Figure 7-43.

(8) Print a new 102751 blade serial number label in accordance with the Parts Identification and Marking chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

(9) Apply the new 102751 blade serial number label to the side of the cylinder (60) in a position between 2.3 inches (58.42 mm) and 6.7 inches (170.18 mm) from the top of the cylinder.

7. Propeller Lubrication

A. Lubricate the propeller in accordance with the Propeller Lubrication chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

8. Static Balance

NOTE: When assembling a propeller that will be disassembled for shipping, it is not necessary to install safety wire to the static balance weight screws (700).

A. Perform static balance of the propeller in accordance with the Static and Dynamic Balance chapter of the Hartzell Propeller Standard Practices Manual 202A (61-01-02).

9. Label Placement

A. For information about labels, refer to the Parts Identification and Marking chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

10. Propeller Disassembled for Shipping

A. General

(1) A propeller disassembled for shipping has had one or more blades removed from the propeller after assembly. The propeller was fully assembled, tested, inspected, lubricated and statically balanced before blade removal and shipping.

(2) A propeller disassembled for shipping must be assembled by trained personnel in accordance with Hartzell Propeller manuals.

(3) For additional general assembly information, refer to the section, "General" at the beginning of this chapter.

B. Preparing Propeller for Shipping

NOTE 1: New hardware was installed during propeller assembly for shipping. When disassembling a propeller for shipping, it is not necessary to discard hardware that would require replacement at overhaul.

NOTE 2: New O-rings have been installed during propeller assembly for shipping. During propeller disassembly for shipping, it is not necessary to replace O-rings unless damaged during component installation or removal.

(1) Before removal, make a mark to show the alignment of each blade assembly, fork unit, spinner bulkhead and balance weight location with the hub unit. Refer to the section, "Marking before Disassembly" in the Disassembly chapter of this manual.

(2) If the propeller will be shipped without the bulkhead installed, put index labels AR-20 and AR-30 on the hub (250) and bulkhead to show alignment of the bulkhead to the hub, before removing the bulkhead from the hub.

(3) Remove all balance weight screws (700) and balance weights (710).

(4) Disconnect the electric de-ice lead wires from the hub (250) and bulkhead, if applicable.

(5) Disassemble the beta system. Refer to the section, "Beta System Disassembly" in the Disassembly chapter of this manual.

(6) Disassemble the hydraulic system and pitch adjustment unit. Refer to the section, "Hydraulic System and Pitch Adjustment Unit Disassembly" in the Disassembly chapter of this manua.

NOTE: It is not necessary to remove the pitch adjust sleeve unit (280) from the cylinder (60) or the piston (330) and hex nut (310) from the pitch change rod (230).

(7) Propeller Reassembly with Blades Removed for Shipping

(a) When reassembling the propeller with the blades removed, do not do procedures related to blade installation or setting of blade angles.

(b) Reassemble the propeller without the blade assemblies. Refer to the section, "Propeller Assembly Procedures" in this chapter.

(8) Packing the Propeller and Blades for Shipping

(a) Refer to the Packaging and Storage chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02), for packing the propeller and blades for shipping.

(b) Pack the propeller without blades for shipping.

(c) Pack the blades for shipping with the preload plate (570), thrust bearing (650), blade seal (670), and grease on each blade shank.

11. Reassembly of a Propeller Disassembled for Shipping

A. Unpacking the Propeller and Blades

(1) Carefully unpack the propeller and blades from shipping.

(2) Visually examine all propeller components for shipping damage. If damage is found, refer to the Check chapter of this manual for specific inspection, serviceable limits, and corrective action criteria.

B. Preparing Propeller for Reassembly

NOTE 1: New hardware was installed during propeller assembly for shipping. When disassembling a propeller from shipping, it is not be necessary to discard hardware that would require replacement at overhaul.

NOTE 2: New O-rings have been installed during propeller assembly for shipping. During propeller disassembly from shipping, it is not necessary to replace O-rings, unless they were damaged during component installation or removal.

(1) Make sure that each blade assembly, the fork unit (440), the spinner bulkhead, and each balance weight (710) has been marked for alignment with the hub unit (250).

(2) Remove all balance weight screws (700) and balance weights (710).

(3) Disassemble the beta system. Refer to the section, "Beta System Disassembly" in the Disassembly chapter of this manual.

(4) Disassemble the hydraulic system and pitch adjustment unit. Refer to the section, "Hydraulic System and Pitch Adjustment Unit Disassembly" in the Disassembly chapter of this manual.

NOTE: It is not necessary to remove the pitch adjust sleeve unit (280) from the cylinder (60) or the piston (330) and hex nut (310) from the pitch change rod (230).

C. Propeller Reassembly

(1) Reassemble the propeller in accordance with the section, "Propeller Assembly Procedures" in this chapter.

(2) Reconnect the electric de-ice lead wires to the bulkhead, if applicable.

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FITS AND CLEARANCES - CONTENTS

LIST OF FIGURES

LIST OF TABLES

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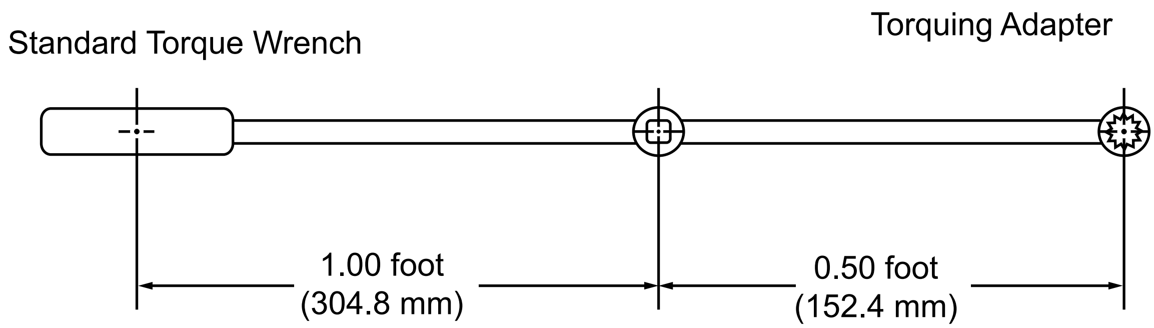


$$\frac{\text{(actual torque required) x (torque wrench length)}}{\text{(torque wrench length) + (length of adapter)}} = \text{torque wrench reading to achieve required actual torque}$$

EXAMPLE:

$$\frac{\text{100 Ft-Lb (136 N•m) x 1 ft (304.8 mm)}}{\text{1 ft (304.8 mm) + 0.50 ft (152.4 mm)}} = \text{66.7 Ft-Lb (90.4 N•m)}$$

reading on torque wrench with 6-inch (152.4 mm) adapter for actual torque of 100 Ft-Lb (136 N•m)

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

APS212

Calculating Torque When Using a Torque Wrench Adapter
Figure 8-1

1. Torque Values (Rev. 3)

A. Important Information

(1) The structural integrity of joints in the propeller that are held together with threaded fasteners is dependent upon proper torque application.

(a) Vibration can cause an incorrectly tightened fastener to fail in a matter of minutes.

(b) Correct tension in a fastener depends on a variety of known load factors and can influence fastener service life.

(c) Correct tension is achieved by application of measured torque.

(2) Use accurate wrenches and professional procedures to make sure of correct tensioning.

(3) For the torque values to use when assembling a Hartzell propeller, refer to Table 8-1, "Torque Values" in this chapter.

(4) When an adapter is used with a torque wrench, use the equation in Figure 8-1 to determine the correct torque value.

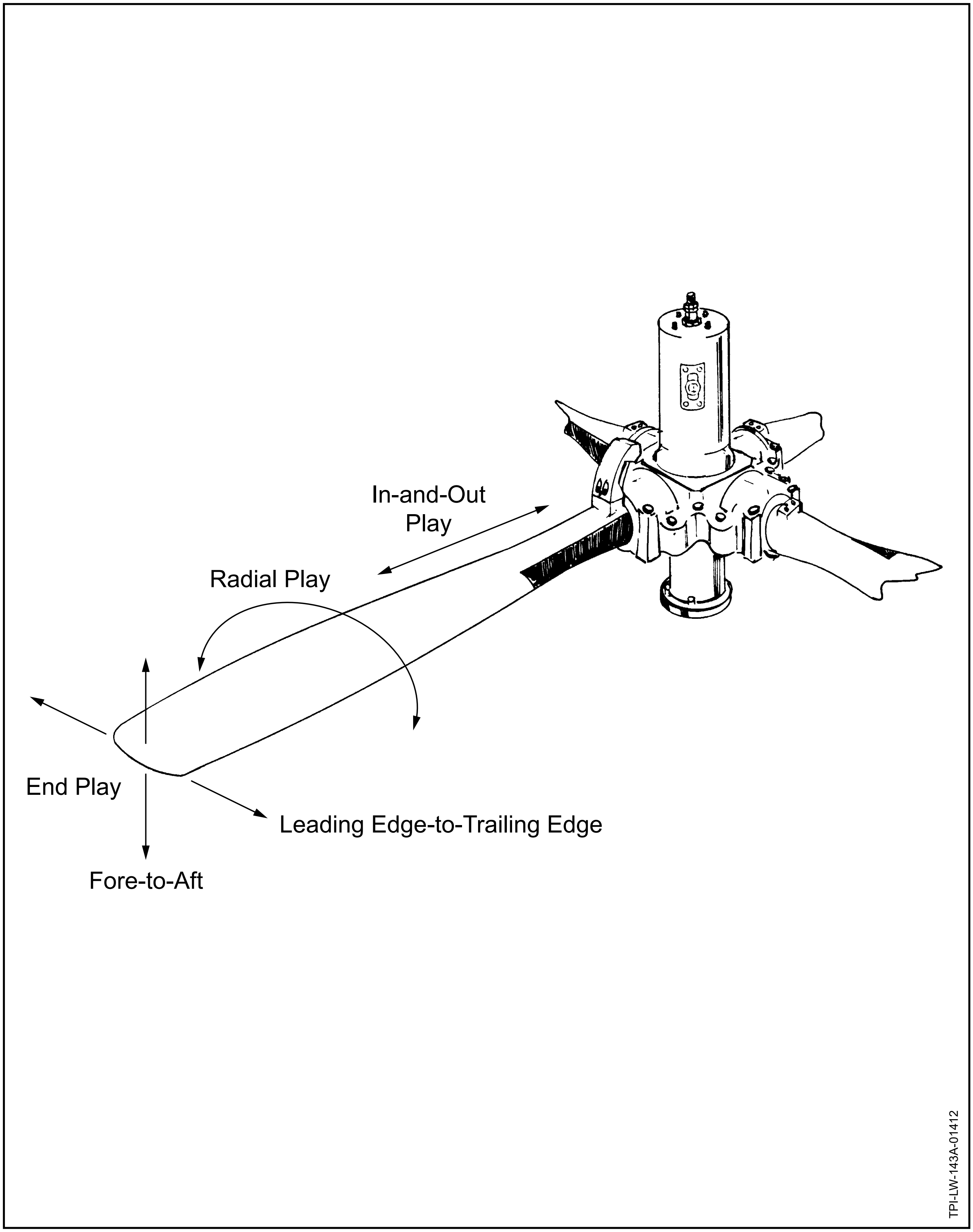
CAUTION 1: TORQUE VALUES ARE BASED ON NON-LUBRICATED THREADS, UNLESS SPECIFIED IN TABLE 8-1.

CAUTION 2: FOR TORQUE READING WHEN USING A TORQUE WRENCH ADAPTER, REFER TO FIGURE 8-1.

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

Item Number	Part Number	**Description**	Torque		
			Ft-Lb	In-Lb	N•m
10	B-3839-16	PCP: Nut, Hex, Thin, Drilled	120	1440	163
30	B-3375	PCP: Nut, 1 3/8-12, Hex, Thin, Drilled	165	1980	224
60	D-488	PCP: Cylinder	200 wet	2400 wet	271 wet
	D-6539	PCP: Cylinder	200 wet	2400 wet	271 wet
70	B-3841-5	Screw, 1/4-28, Fillister Head	--	41	4.6
71	B-3841-6	Screw, 1/4-28, Fillister Head	--	41	4.6
150	B-474	Nut, 1 1/8-12, Hex, Self-Locking	100	1200	136
200	B-3808-3	Nut, Hex, Self-Locking	--	43-53	4.9-5.9
230	D-494-( )	PCP: Rod, Pitch Change	80 wet	960 wet	109 wet
	D-6071-( )	PCP: Rod, Pitch Change	80 wet	960 wet	109 wet
	D-6506	PCP: Rod, Pitch Change	80 wet	960 wet	109 wet
400	A-2043-1	Nut, 3/8-24, Hex, Self-Locking	22	264	30
460	B-468	Extension, Bumper	--	72-96	8.1-10.8
500	108142	Bolt, 1/4-28, 12 Point	16-18	192-216	22-24
	B-3825	Screw, 1/4-28, 100 Deg Head	16	192	22
	B-3830	Bolt, 5/16-24, 12-Point	18-22	216-264	25-30
553	B-3867-272	Screw, 10-32, 100° Head, Cres	--	8-10	0.9-1.1
600	B-3368	Nut, 5/16-24, Hex, Thin	--	120	13.5
9060	***	Nut, 3/8-24, Hex, Self-Locking (Counterweight Slug attachment)	22	264	30
*** Counterweight slug mounting hardware is application specific. Refer to Hartzell Propeller Application guide Manual 159 (61-02-59).					

Torque Values
Table 8-1



Blade Play
Figure 8-2

2. Blade Tolerances (Rev. 6)

A. Blade Play

(1) Limits for blade play are specified below. Refer to Figure 8-2.

(a) End Play:

1	Leading Edge-to-Trailing Edge	± 0.0625 inch (1.58 mm) Total: 0.125 inch (3.17 mm)
2	Fore-to-Aft (face-to-camber)	± 0.0625 inch (1.58 mm) Total: 0.125 inch (3.17 mm)

(b) In-and-Out Play — None permitted

(c) Radial Play (pitch change) — ±0.5 degree (1 degree total) measured at reference station

(2) Blades should be tight in the propeller; however, play that is within the allowable limits is acceptable if the blade returns to its original position when released.

(a) If blade play is greater than the allowable limits, or if the blade(s) do not return to their original position when released, there may be internal wear or damage that should be referred to a certified propeller repair station with the appropriate rating.

B. Blade Track

(1) Aluminum Blades — ± 0.0625 inch (1.58 mm) Total: 0.125 inch (3.17 mm)

C. Blade Pitch Tolerance

(1) Blade pitch setting tolerance between blades at low pitch — 0.2 degree

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SPECIAL TOOLS, FIXTURES, AND EQUIPMENT - CONTENTS

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1. Tooling and Facility Requirements (Rev. 2)

A. Standard Tooling

(1) Propeller repair stations certified by the FAA or international equivalent to overhaul Hartzell Propeller LLC propellers are expected to possess precision fixtures, tools, and blade tables for blade inspection and repair.

(a) Except as specifically required in this manual, locally fabricated tooling is acceptable for most repair and inspection operations.

B. Special Tooling

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

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

(b) It is the responsibility of the repair station or the technician performing the repair or servicing to use these special tools as required.

C. Facilities

(1) Grinding, plating, and painting of propeller components can create health and safety hazards beyond that of other areas of a typical workshop.

(a) Areas where grinding, plating, and painting are performed should comply with governmental regulations for occupational safety and health, industry standards, and environmental regulations.

(2) Workshop areas need to be segregated to prevent contamination.

(a) Separate areas should be designated for cleaning, inspection, painting, plating, and assembly.

(b) Propeller balancing must be performed in a draft free area.

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ILLUSTRATED PARTS LIST - CONTENTS

PROPELLER PARTS LISTS and FIGURES

SUB-ASSEMBLY PARTS LISTS and FIGURES

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1. Introduction (Rev. 2)

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

A. General

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

(1) This chapter includes the parts lists and applicable illustrations for the propeller models included in this manual.

CAUTION: THE ILLUSTRATIONS IN THIS CHAPTER ARE PROVIDED FOR PART IDENTIFICATION AND LOCATION REFERENCE ONLY. THEY SHOULD NOT BE USED FOR ASSEMBLY.

(a) The illustrations in this chapter use some general views of parts that may not exactly depict every propeller part configuration.

B. Counterweights/Slugs/Mounting Hardware

(1) Counterweights, counterweight slugs, and the applicable mounting hardware are application specific. Refer to Hartzell Propeller Application Guide Manual 159 (61-02-59).

C. Spinner Assemblies/Mounting Hardware

(1) Spinner assemblies and the applicable mounting hardware are application specific. Refer to Hartzell Propeller Application Guide Manual 159 (61-02-59).

D. Ice Protection System Components

(1) Ice protection systems are application specific. Refer to Hartzell Propeller Application Guide Manual 159 (61-02-59).

(a) For components of ice protection systems supplied by Hartzell, refer to Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(b) For components of ice protection systems not supplied by Hartzell, refer to the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

2. Description of Columns (Rev. 2)

A. Fig./Item Number

(1) Figure Number refers to the illustration where items appear.
Item Numbers refer to the specific part callout in the applicable illustration.

(a) Item Numbers that are listed but not shown in the illustration are identified by a dash to the left of the item number. (example: "-800")

(b) Alpha variants will be used to add additional items. There are two reasons for the use of alpha variants:

1 A part may have an alternate, or may be superseded, replaced, or obsoleted by another part.

a For example, the self-locking nut (A-2043) that is item 20 was superseded by the self-locking nut (A-2043-1) that is item 20A.

2 An Illustrated Parts List may contain multiple configurations. Effectivity codes are used to distinguish different part numbers within the same list.

a For example, one propeller configuration may use a mounting bolt (B-3339-1) that is item 30, yet another propeller configuration uses a mounting bolt (B-3347) that is item 30A. Effectivity codes are very important in the determination of parts in a given configuration.

B. Part Number

(1) The Part Number is the Hartzell Propeller identification number for the part.

(2) Use the Hartzell Propeller part number when ordering the part from Hartzell or a Hartzell-approved distributor.

C. Description

(1) This column provides the Hartzell Propeller description of the part.

(2) Bullets and indentations are used to indicate parts that are components of a sub-assembly.

(a) For example, a Fork Assembly that is part of a HC-C2YR-1 propeller assembly will have one bullet (•) before the description. This indicates that the Fork Assembly is part of the propeller assembly.

1 A Fork Bumper that is part of the Fork Assembly will appear directly below the Fork Assembly with two bullets (• •) before the description. This indicates that the Fork Bumper is part of the Fork Assembly - that is part of the Propeller Assembly.

a Example: HC-C2YR-1
• Fork Assembly
• • Fork Bumper

(3) If the description in this column includes a "PCP:" prefix, the part is classified as a Propeller Critical Part.

(4) If applicable, information regarding part alternatives, supersedures, replacements, or obsolescence will appear in the Description column.

(a) Refer to the section, "Description of Terms" in this chapter for definitions and requirements for part "alternates", "supersedures", etc.

(b) When part alternatives, supersedures, replacements, etc. are listed, the service document number related to the change may be included for reference.

(5) If applicable, vendor CAGE codes will be listed in the Description column.

D. Effectivity Code (EFF CODE)

(1) This column is used when additional information about a part is required.

(a) Effectivity codes can be used to identify parts that are only used on a particular model, or to direct the user to additional information in the "Effectivity" box at the bottom of the page.

(b) Whenever an effectivity code is present, refer to the "Effectivity" box at the bottom of the page for the applicable information.

(2) Parts common to all assembly models on the page show no effectivity code.

E. Units Per Assembly (UPA)

(1) Designates the total quantity of an item required for the next higher assembly or subassembly.

F. Overhaul (O/H)

(1) Designates the parts to be replaced at overhaul. A “Y” identifies the parts that must be replaced at overhaul.

NOTE: An overhaul kit may not contain all the parts identified with a "Y" for a particular model propeller. An example of parts that may not be included in the overhaul kit is spinner mounting parts.

G. Propeller Critical Part (PCP)

(1) This column identifies the Propeller Critical Parts (PCP) that are contained in each propeller model.

(a) Refer to the Introduction chapter of this manual for the definition of Propeller Critical Parts (PCP).

3. Description of Terms (Rev. 1)

A. Alternate

(1) Alternate parts are identified by the term "ALTERNATE" in the Description column. Alternate items are considered airworthy for continued flight and existing stock of parts may be used for maintenance and/or repair. The new or alternate part number may be used interchangeably when ordering/stocking new parts.

B. Supersedure

(1) Part changes are identified by the terms “SUPERSEDES ITEM _____” or “SUPERSEDED BY ITEM _____” in the Description column. Superseded items are considered airworthy for continued flight and existing stock of superseded parts may be used for maintenance and/or repair. Once the superseding part has been incorporated/installed into an assembly, the original superseded part may no longer be used. Superseded parts may no longer be available, and the new part number must be used when ordering/stocking new parts.

C. Replacement

(1) Part changes identified by the terms "REPLACES ITEM _____” or “REPLACED BY ITEM _____” in the Description column are considered airworthy for continued flight, but must be replaced with a part with the new part number at overhaul. Existing stock of replaced parts may not be used for maintenance and/or repair of effected assemblies. Replaced parts may no longer be available, and the new part number must be used when ordering/stocking new parts.

D. Obsolete

(1) Obsolete parts are identified by "OBS” in the Units Per Assembly (UPA) column. Obsolete items are considered unairworthy for continued flight.(5) Service Documents and Airworthiness Directives

(a) In the event of modification or repair of an existing part, the supersedure, replacement, or obsolescence of a part, or the addition of parts installed by a Service Bulletin (SB) or Service Letter (SL), the SB or SL number will appear in the Description column as “SB_____”, or "SL_____” after the description.

(b) When a SB has a relationship to an Airworthiness Directive (AD), the AD will be shown in parentheses after the SB number as SB_____ (AD_____).

4. Vendor Supplied Hardware (Rev. 2)

A. Important Information

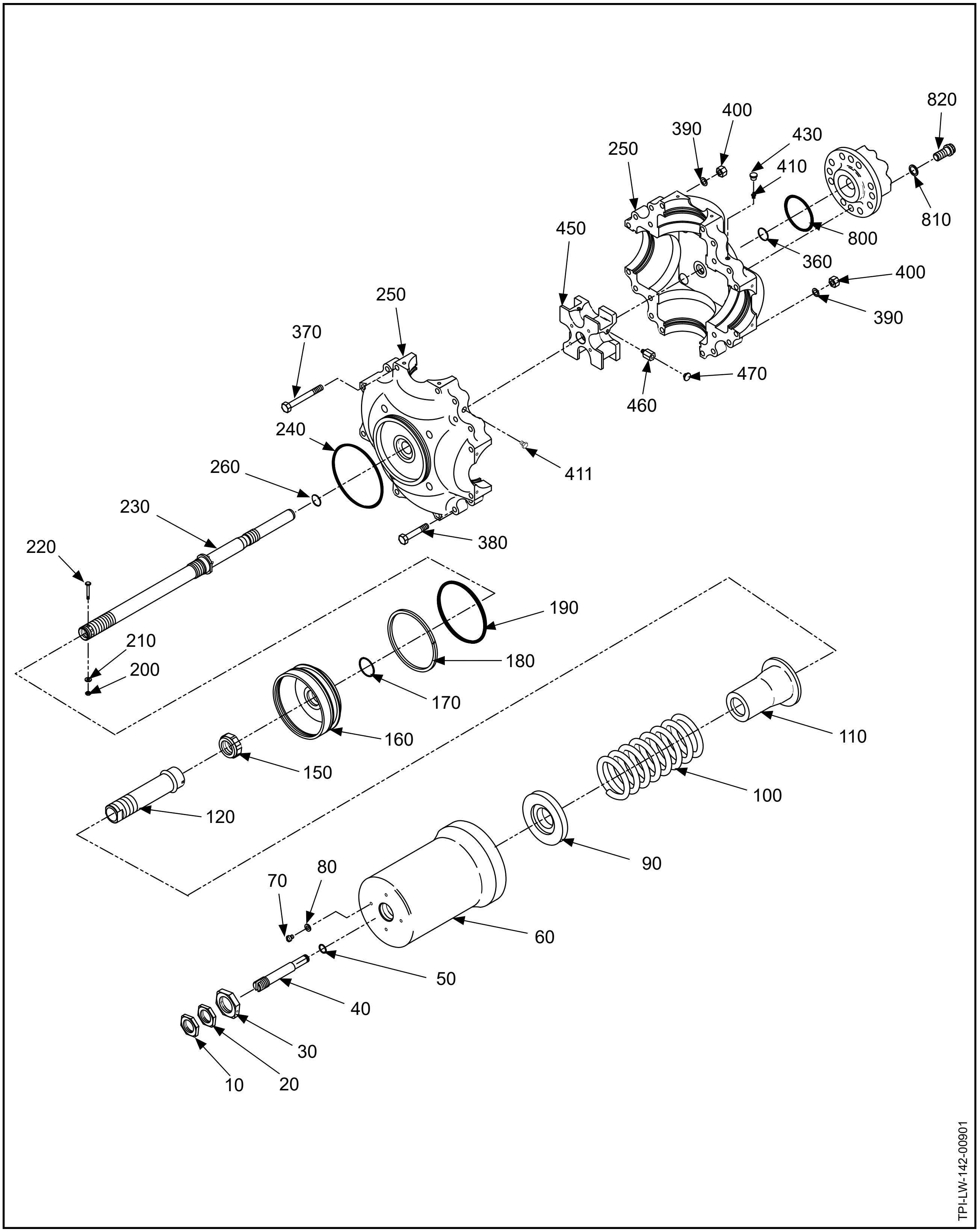
(1) Many O-rings, fasteners, and other vendor supplied hardware listed in Hartzell Propeller LLC manuals have previously been specified with AN, MS, NAS, or vendor part number. To provide internal controls and procurement flexibility, Hartzell part numbers have been assigned to all O-rings, fasteners, and hardware. Part shipments from Hartzell Propeller LLC will specify only the Hartzell part numbers.

(2) Some O-rings, fasteners, and hardware manufactured in accordance with established industry specifications (certain AN, MS, NAS items) are acceptable for use in Hartzell Propeller products without additional standards imposed by Hartzell.

(a) For a listing of part number interchangeability, refer to the Vendor Cross Reference chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

(b) Where permitted, both the Hartzell part number item and AN, MS, NAS, and other specified vendor number items can be used interchangeably.

(c) The Hartzell part number must be used when ordering these parts from Hartzell Propeller LLC.



HC-D4N-2( ): Propeller Parts
Figure 10-1

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**PROPELLER PARTS - HC-D4N-2( )**				
10	B-3839-16	• PCP: NUT, HEX, THIN, DRILLED		1		PCP
20	B-3839-16	• PCP: NUT, HEX, THIN, DRILLED		1		PCP
30	B-3375	• PCP: NUT, 1 3/8-12, HEX, THIN, DRILLED		1		PCP
40	B-449	• PLUG, ROD, PITCH CHANGE (NOT USED WITH ITEM 230D)		1		
50	C-3317-013	• O-RING (NOT USED WITH ITEM 230D)		1	Y	
60	D-488	• PCP:CYLINDER		1		PCP
70	B-3841-5	• SCREW, 1/4-28, FILLISTER HEAD		1	Y	
80	B-3837-0432	• WASHER, CORROSION RESISTANT, SUPERSEDED BY ITEM 80A		1	Y	
80A	B-3837-0463	• WASHER, CORROSION RESISTANT, SUPERSEDES ITEM 80		1	Y	
90	B-6768	• SPRING RETAINER, FORWARD		1		
100	C-447	• PCP: SPRING, COMP, FEATHERING, SUPERSEDED BY ITEM 100A		1		PCP
100A	C-6760	• PCP: SPRING, COMP, FEATHERING, SUPERSEDES ITEM 100		1		PCP
110	B-442	• GUIDE, SPRING, PLASTIC, SUPERSEDED BY ITEM 110A		1	Y	
110A	B-6761	• GUIDE, SPRING, PLASTIC, SUPERSEDES ITEM 110		1	Y	
120	B-476	• PCP: SLEEVE, PITCH ADJUST - UNIT, SUPERSEDED BY ITEM 120A		1		PCP
-130	C-438	• • PCP: SLEEVE, REVERSE ADJUST, SUPERSEDED BY ITEM 120A		1		PCP
-140	A-441	• • BUSHING, SLEEVE		1		
120A	B-6758	• PCP: SLEEVE, PITCH ADJUST - UNIT, SUPERSEDES ITEM 120		1		PCP
-130A	C-6759	• • PCP: SLEEVE, REVERSE ADJUST SUPERSEDES ITEM 130 - PART OF ITEM 120A CANNOT BE PURCHASED SEPARATELY		1		PCP
-140	A-441	• • BUSHING, SLEEVE		1		

NOTE: If the C-447 Spring or the B-476 Sleeve Unit are currently in the propeller assembly and must be replaced, an A-6828 Feathering Kit must be ordered. The A-6828 Feathering Kit contains the C-6760 Spring to replace the C-447, the B-6761 Spring Retainer to replace the B-442, the B-6758 Sleeve Unit to replace the B-476, and the B-6768 Forward Spring Retainer. Item 130A can no longer be purchased separately and is included as part of item 120A.

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
150	B-474	• NUT, 1 1/8-12, HEX, SELF-LOCKING		1	Y	
160	C-492	• PISTON		1		
170	C-3317-217	• O-RING, PISTON ID		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**PROPELLER PARTS - HC-D4N-2( ) - CONTINUED**				
180	B-1843	• SEAL, DUST, PISTON		1	Y	
190	C-3317-426-2	• O-RING, PISTON OD		1	Y	
200	B-3808-3	• NUT, HEX, SELF-LOCKING (NOT USED WITH ITEM 230D)		1	Y	
210	B-3851-0363	• WASHER (NOT USED WITH ITEM 230D)		1	Y	
220	B-3383-15H	• HEX HEAD BOLT (NOT USED WITH ITEM 230D)		1	Y	
230	D-6071	• PCP: ROD, PITCH CHANGE, SUPERSEDED BY ITEM 230A		1		PCP
230A	D-6071-1	• PCP: ROD, PITCH CHANGE, SUPERSEDES ITEM 230 SUPERSEDED BY ITEM 230D - (POST HC-SL-61-240)		1		PCP
230B	D-494	• PCP: ROD, PITCH CHANGE, ALTERNATE SUPERSEDED BY ITEM 230C		1		PCP
230C	D-494-1	• PCP: ROD, PITCH CHANGE, ALTERNATE SUPERSEDES ITEM 230B		1		PCP
230D	D-6506	• PCP: ROD, PITCH CHANGE SUPERSEDES ITEM 230A (POST HC-SL-61-240)		1		PCP
240	C-3317-251	• O-RING, CYLINDER MOUNTING		1	Y	
260	C-3317-213-2	• O-RING, CYLINDER-SIDE BUSHING ID		1	Y	
250	D-489	• PCP:HUB UNIT, SUPERSEDED BY ITEM 250B (REFER TO “D-489-( ) HUB UNIT”, (2 DOWEL HOLES) IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-2A( ), -2D, -2E, -2F, -2G	1		PCP
250A	D-489-1	• PCP: HUB UNIT, (4 DOWEL HOLES), ALTERNATE SUPERSEDED BY ITEM 250C (REFER TO “D-489-( ) HUB UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-2A( ), -2D, -2E, -2F, -2G	1		PCP
250B	D-489-2	• PCP: HUB UNIT HC-D4(N,P)-(2,5), (2 DOWEL HOLES) SUPERSEDES ITEM 250 (REFER TO “D-489-( ) HUB UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	1 -2A( ), -2D, -2E, -2F, -2G		PCP	
250C	D-489-3	• PCP: HUB UNIT, HC-D4(N,P)-(2,5), (4 DOWEL HOLES) ALTERNATE, SUPERSEDES ITEM 250A (REFER TO “D-489-( ) HUB UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-2A( ), -2D, -2E, -2F, -2G	1		PCP
250D	D-489-4	• PCP: HUB UNIT, HC-D4N-2DA, (4 DOWEL HOLES) (REFER TO “D-489-( ) HUB UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-2DA	1		PCP
360	C-3317-211-2	• O-RING, ENGINE-SIDE BUSHING ID		1	Y	
370	A-2431	• BOLT, 3/8-24, HEX HEAD		12		
380	A-2432	• BOLT, 3/8-24, HEX HEAD		8		
390	B-3834-0632	• WASHER		20	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-2A( )	HC-D4N-2A( )	-2E	HC-D4N-2E
-2D	HC-D4N-2D	-2F	HC-D4N-2F
-2DA	HC-D4N-2DA	-2G	HC-D4N-2G

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**PROPELLER PARTS - HC-D4N-2( ) - CONTINUED**				
400	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		20	Y	
410	A-279	• FITTING, LUBRICATION REPLACED BY ITEMS 410A AND 411		8	Y	
410A	A-279	• FITTING, LUBRICATION REPLACES ITEM 410 IN ENGINE-SIDE OF HUB		4	Y	
-410B	C-6349	• FITTING, LUBRICATION, 45° (POST HC-SL-61-187) ALTERNATE FOR ITEM 410A		4	Y	
411	106545	• PLUG, LUBRICATION (POST HC-SL-61-354) REPLACES ITEM 410 IN CYLINDER-SIDE OF HUB		4	Y	
430	B-6544	• CAP, FITTING, LUBRICATION USED WITH ITEMS 410, 410A, AND 410B		4	Y	
-440	C-635	• FORK, FOUR BLADE - ASSEMBLY		1		
450	D-495-1	• • FORK, FOUR BLADE, SUPERSEDED BY ITEM 450B		OBS		
450A	D-495	• • FORK, FOUR BLADE, SUPERSEDED BY ITEM 450B		OBS		
450B	D-495-2	• • FORK, FOUR BLADE, SUPERSEDES ITEMS 450 AND 450A		1		
460	B-468	• • EXTENSION, BUMPER		4		
470	A-3256	• • BUMPER, FORK		4	Y	
10A-1		**BLADE RETENTION PARTS**				
		(REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		BALANCE PARTS				
-700	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR		
-710	A-2424( )	• BALANCE WEIGHT		AR		

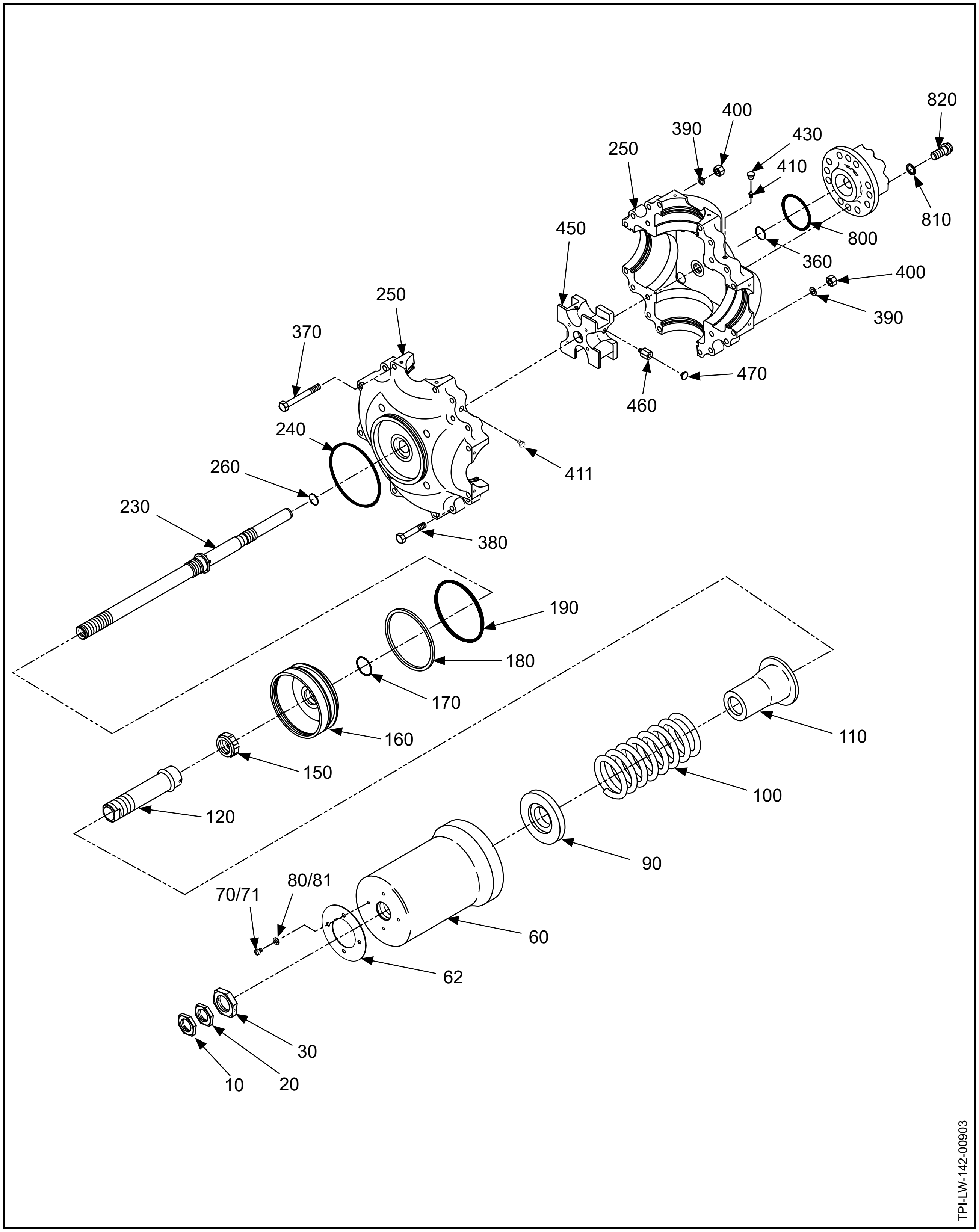
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**PROPELLER PARTS - HC-D4N-2( ) - CONTINUED**				
		PROPELLER MOUNTING PARTS				
800	C-3317-230	• FLANGE O-RING		1	Y	
810	A-2048-2	• WASHER, MOUNTING, 9/16" CSK		8	Y	
820	B-3339-1	• BOLT, MOUNTING, 9/16-18, 12-POINT		8	Y	
		COUNTERWEIGHTS AND COUNTERWEIGHT SLUGS				
-9030		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				PCP
-9040		• COUNTERWEIGHT SLUG APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				
		COUNTERWEIGHT SLUG MOUNTING HARDWARE				
-9050		• BOLT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
-9060		• NUT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED



HC-E4A-2( ): Propeller Parts
Figure 10-3

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-3		**PROPELLER PARTS - HC-E4A-2( )**				
10	B-3839-16	• PCP: NUT, HEX, THIN, DRILLED		1		PCP
20	B-3839-16	• PCP: NUT, HEX, THIN, DRILLED		1		PCP
30	B-3375	• PCP: NUT, 1 3/8-12, HEX, THIN, DRILLED		1		PCP
60	D-6539	• PCP: CYLINDER		1		PCP
62	104364	• PLATE, UID, REPLACEMENT, POST HC-SL-61-321 USED WITH ITEMS 71 AND 81	M	1		
70	B-3841-5	• SCREW, 1/4-28, FILLISTER HEAD USED WITH ITEM 80		1	Y	
71	B-3841-6	• SCREW, 1/4-28, FILLISTER HEAD POST HC-SL-61-321 USED WITH ITEMS 62 AND 81	M	4	Y	
80	B-3837-0463	• WASHER, CORROSION RESISTANT USED WITH ITEM 70		1	Y	
81	B-3837-0432	• WASHER, CORROSION RESISTANT POST HC-SL-61-321 USED WITH ITEMS 62 AND 71	M	4	Y	
90	B-6768	• SPRING RETAINER, FORWARD		1		
100	C-447	• PCP: SPRING, COMP, FEATHERING, SUPERSEDED BY ITEM 100A		1		PCP
100A	C-6760	• PCP: SPRING, COMP, FEATHERING, SUPERSEDES ITEM 100		1		PCP
110	B-442	• GUIDE, SPRING, PLASTIC, SUPERSEDED BY ITEM 110A		1	Y	
120	B-476	• PCP: SLEEVE, PITCH ADJUST - UNIT, SUPERSEDED BY ITEM 120A		1		PCP
-130	C-438	• • PCP: SLEEVE, REVERSE ADJUST, SUPERSEDED BY ITEM 130A		1		PCP
-140	A-441	• • BUSHING, SLEEVE		1		
110A	B-6761	• GUIDE, SPRING, PLASTIC, SUPERSEDES ITEM 110		1	Y	
120A	B-6758	• PCP: SLEEVE, PITCH ADJUST - UNIT, SUPERSEDES ITEM 120		1		PCP
-130A	C-6759	• • PCP: SLEEVE, REVERSE ADJUST SUPERSEDES ITEM 130 - PART OF ITEM 120A CANNOT BE PURCHASED SEPARATELY		1 1		PCP
-140	A-441	• • BUSHING, SLEEVE		1		

NOTE: If the C-447 Spring or the B-476 t Sleeve Unit are currently in the propeller assembly and must be replaced, an A-6828 Feathering Kit must be ordered. The A-6828 Feathering Kit contains the C-6760 Spring to replace the C-447, the B-6761 Spring to replace the B-442, the B-6758 Sleeve Unit to replace the B-476, and the B-6768 Forward Spring Retainer. Item 130A can no longer be purchased separately and is included as part of item 120A.

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
M	WHERE REQUIRED BY MILITARY AND/OR GOVERNMENT AUTHORITY		

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-3		**PROPELLER PARTS - HC-E4A-2( ) - CONTINUED**				
150	B-474	• NUT, 1 1/8-12, HEX, SELF LOCKING		1	Y	
160	C-492-1	• PISTON			1	
170	C-3317-217	• O-RING, PISTON ID		1	Y	
180	B-1843	• SEAL, DUST, PISTON		1	Y	
190	C-3317-426-2	• O-RING, PISTON OD		1	Y	
230	D-6506	• ROD, PITCH CHANGE		1		
240	C-3317-354	• O-RING, CYLINDER MOUNTING		1	Y	
260	C-3317-213-2	• O-RING, CYLINDER-SIDE BUSHING ID		1	Y	
250	E-6468	• PCP: HUB UNIT, HC-E4A-(2,5) (REFER TO “E-6468 HUB UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
360	C-3317-211-2	• O-RING, ENGINE-SIDE BUSHING ID		1	Y	
370	A-2431	• BOLT, 3/8-24, HEX HEAD		12		
380	A-2432	• BOLT, 3/8-24, HEX HEAD		8		
390	B-3834-0632	• WASHER		20	Y	
400	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		20	Y	
410	A-279	• FITTING, LUBRICATION REPLACED BY ITEMS 410A AND 411		8	Y	
410A	A-279	• FITTING, LUBRICATION REPLACES ITEM 410 IN ENGINE-SIDE OF HUB		4	Y	
-410B	C-6349	• FITTING, LUBRICATION, 45° (POST HC-SL-61-187) ALTERNATE FOR ITEM 410A		4	Y	
411	106545	• PLUG, LUBRICATION (POST HC-SL-61-354) REPLACES ITEM 410 IN CYLINDER-SIDE OF HUB		4	Y	
430	B-6544	• CAP, FITTING, LUBRICATION USED WITH ITEMS 410, 410A, AND 410B		4	Y	
-440	C-635	• FORK, FOUR BLADE - ASSEMBLY		1		
450	D-495-1	• • FORK, FOUR BLADE, SUPERSEDED BY ITEM 450A		OBS		
450A	D-495-2	• • FORK, FOUR BLADE, SUPERSEDES ITEM 450		1		
460	B-468	• • EXTENSION, BUMPER		4		
470	A-3256	• • BUMPER, FORK		4	Y	
10A-2		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		BALANCE PARTS				
-700	B-3840-( )	• SCREW, FILLISTER HEAD		AR		
-710	A-2424( )	• BALANCE WEIGHT		AR		

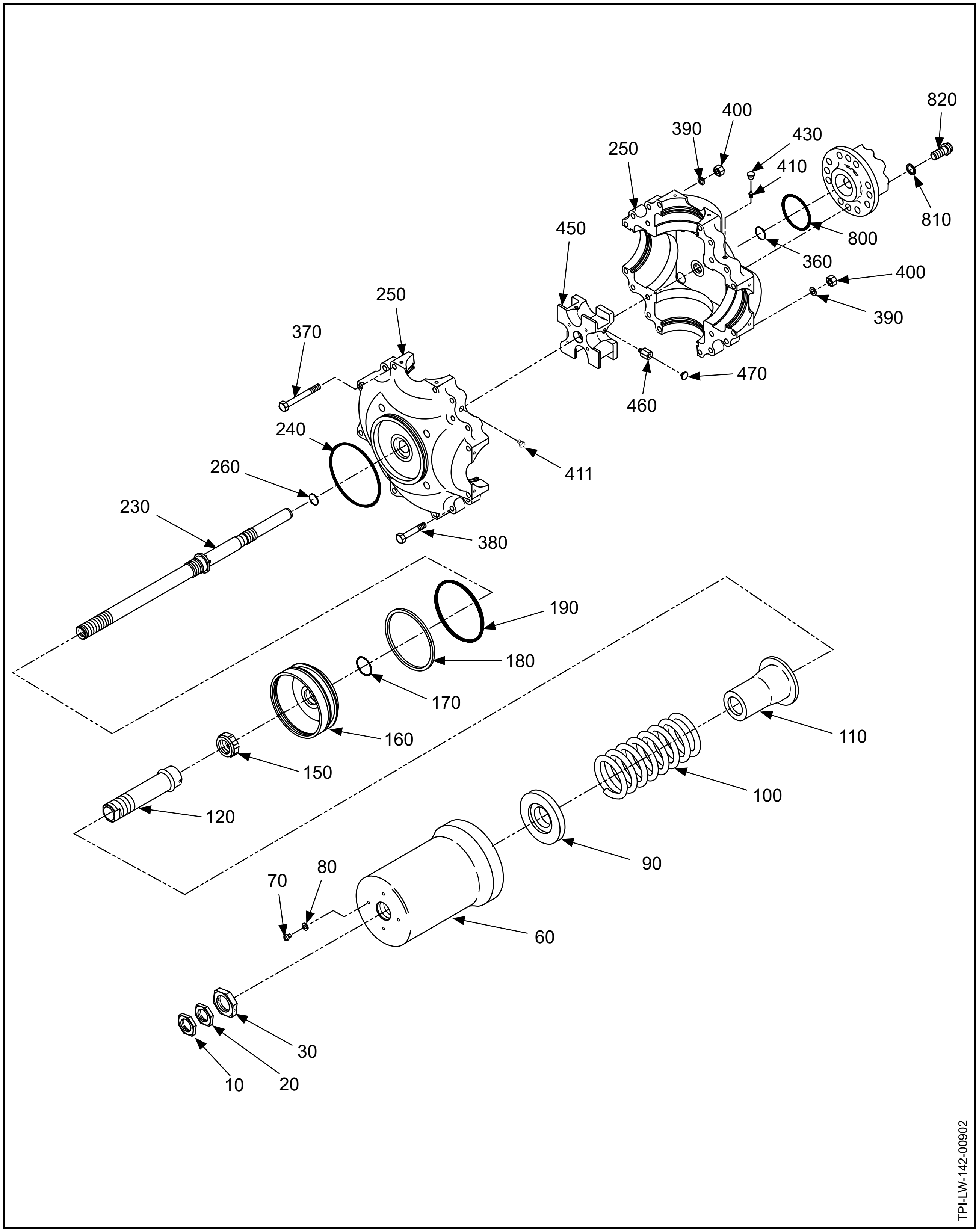
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-3		**PROPELLER PARTS - HC-E4A-2( ) - CONTINUED**				
		PROPELLER MOUNTING PARTS				
800	C-3317-239-2	• O-RING, FLANGE		1	Y	
810	A-2048-2	• WASHER, MOUNTING, 9/16" CSK		12	Y	
820	B-3347	• BOLT, MOUNTING, 12 POINT		12	Y	
		COUNTERWEIGHTS AND COUNTERWEIGHT SLUGS				
-9030		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				PCP
-9040		• COUNTERWEIGHT SLUG APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				
		COUNTERWEIGHT SLUG MOUNTING HARDWARE				
-9050		• BOLT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
-9060		• NUT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED



HC-E4N-2(B,C): Propeller Parts
Figure 10-5

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-5		**PROPELLER PARTS HC-E4N-2(B,C)**				
10	B-3839-16	• PCP: NUT, HEX, THIN, DRILLED		1		PCP
20	B-3839-16	• PCP: NUT, HEX, THIN, DRILLED		1		PCP
30	B-3375	• PCP: NUT, 1 3/8-12, HEX, THIN, DRILLED		1		PCP
60	D-6539	• PCP: CYLINDER		1		PCP
70	B-3841-5	• SCREW, 1/4-28, FILLISTER HEAD		1	Y	
80	B-3837-0463	• WASHER, CORROSION RESISTANT		1	Y	
90	B-6768	• SPRING RETAINER, FORWARD		1		
100	C-6760	• PCP: SPRING, COMP, FEATHERING		1		PCP
110	B-6761	• GUIDE, SPRING, PLASTIC		1	Y	
120	B-6758	• PCP: SLEEVE, PITCH ADJUST - UNIT		1		PCP
-130	C-6759	• • SLEEVE, REVERSE ADJUST - PART OF ITEM 120 - CANNOT BE PURCHASED SEPARATELY		1		
-140	A-441	• • BUSHING, SLEEVE		1		
150	B-474	• NUT, 1 1/8-12, HEX, SELF LOCKING		1	Y	
160	C-492-1	• PISTON			1	
170	C-3317-217	• O-RING, PISTON ID		1	Y	
180	B-1843	• SEAL, DUST, PISTON		1	Y	
190	C-3317-426-2	• O-RING, PISTON OD		1	Y	
230	D-6506	• ROD, PITCH CHANGE		1		
240	C-3317-354	• O-RING, CYLINDER MOUNTING		1	Y	
260	C-3317-213-2	• O-RING, CYLINDER-SIDE BUSHING ID		1	Y	
250	E-6771	• PCP: HUB UNIT, HC-E4(N,P)-(2,5) (REFER TO “E-6771 HUB UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
360	C-3317-211-2	• O-RING, ENGINE-SIDE BUSHING ID		1	Y	
370	A-2431	• BOLT, 3/8-24, HEX HEAD		12		
380	A-2432	• BOLT, 3/8-24, HEX HEAD		8		
390	B-3834-0632	• WASHER		20	Y	
400	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		20	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-5		**PROPELLER PARTS HC-E4N-2(B,C) - CONTINUED**				
410	A-279	• FITTING, LUBRICATION REPLACED BY ITEMS 410A AND 411		8	Y	
410A	A-279	• FITTING, LUBRICATION REPLACES ITEM 410 IN ENGINE-SIDE OF HUB		4	Y	
-410B	C-6349	• FITTING, LUBRICATION, 45° (POST HC-SL-61-187) ALTERNATE FOR ITEM 410A		4	Y	
411	106545	• PLUG, LUBRICATION (POST HC-SL-61-354) REPLACES ITEM 410 IN CYLINDER-SIDE OF HUB		4	Y	
430	B-6544	• CAP, FITTING, LUBRICATION USED WITH ITEMS 410, 410A, AND 410B		4	Y	
-440	C-635	• FORK, FOUR BLADE - ASSEMBLY		1		
450	D-495-1	• • FORK, FOUR BLADE, SUPERSEDED BY ITEM 450B		OBS		
450A	D-495	• • FORK, FOUR BLADE, SUPERSEDED BY ITEM 450B		OBS		
450B	D-495-2	• • FORK, FOUR BLADE, SUPERSEDES ITEMS 450 AND 450A		1		
460	B-468	• • EXTENSION, BUMPER		4		
470	A-3256	• • BUMPER, FORK		4	Y	
10A-3		**BLADE RETENTION PARTS**				
		(REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		BALANCE PARTS				
-700	B-3840-( )	• SCREW, FILLISTER HEAD		AR		
-710	A-2424( )	• BALANCE WEIGHT		AR		

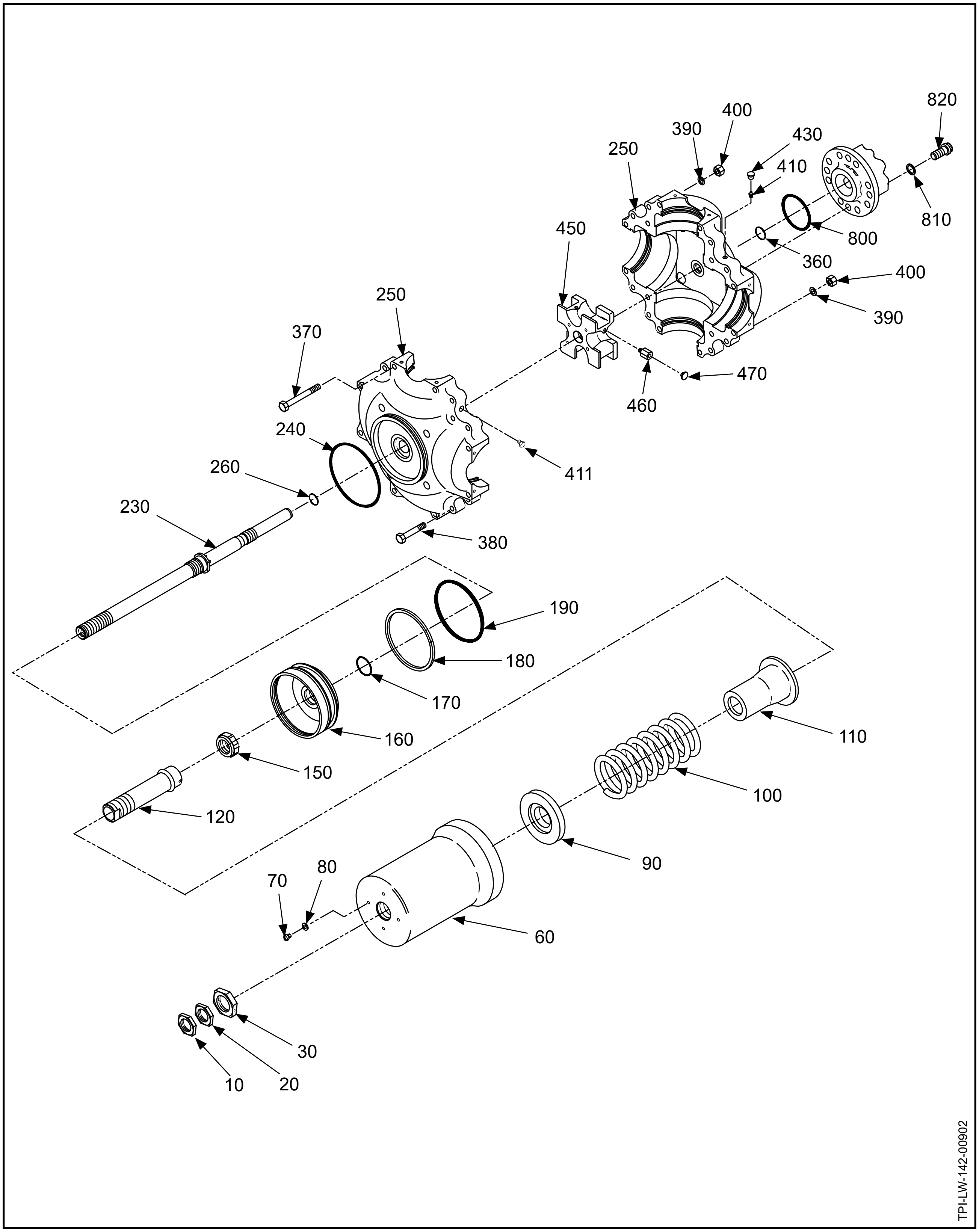
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-5		**PROPELLER PARTS HC-E4N-2(B,C) - CONTINUED**				
		PROPELLER MOUNTING PARTS				
800	C-3317-230	• O-RING, FLANGE		1	Y	
810	A-2048-2	• WASHER, MOUNTING, 9/16" CSK		8	Y	
820	B-3339-1	• BOLT, MOUNTING, 9/16-18, 12-POINT		8	Y	
		COUNTERWEIGHTS AND COUNTERWEIGHT SLUGS				
-9030		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				PCP
-9040		• COUNTERWEIGHT SLUG APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				
		COUNTERWEIGHT SLUG MOUNTING HARDWARE				
-9050		• BOLT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
-9060		• NUT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED



HC-E4N-2D: Propeller Parts
Figure 10-7

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-7		**PROPELLER PARTS HC-E4N-2D**				
10	B-3839-16	• PCP: NUT, HEX, THIN, DRILLED		1		PCP
20	B-3839-16	• PCP: NUT, HEX, THIN, DRILLED		1		PCP
30	B-3375	• PCP: NUT, 1 3/8-12, HEX, THIN, DRILLED		1		PCP
60	D-6539	• PCP: CYLINDER		1		PCP
70	B-3841-5	• SCREW, 1/4-28, FILLISTER HEAD		1	Y	
80	B-3837-0463	• WASHER, CORROSION RESISTANT		1	Y	
90	B-6768	• SPRING RETAINER, FORWARD		1		
100	C-6760	• PCP: SPRING, COMP, FEATHERING		1		PCP
110	B-6761	• GUIDE, SPRING, PLASTIC		1	Y	
120	B-6758	• PCP: SLEEVE, PITCH ADJUST - UNIT		1		PCP
-130	C-6759	• • SLEEVE, REVERSE ADJUST - PART OF ITEM 120 - CANNOT BE PURCHASED SEPARATELY		1		PCP
-140	A-441	• • BUSHING, SLEEVE		1		
150	B-474	• NUT, 1 1/8-12, HEX, SELF LOCKING		1	Y	
160	C-492-1	• PISTON			1	
170	C-3317-217	• O-RING, PISTON ID		1	Y	
180	B-1843	• SEAL, DUST, PISTON		1	Y	
190	C-3317-426-2	• O-RING, PISTON OD		1	Y	
230	D-6506	• ROD, PITCH CHANGE		1		
240	C-3317-354	• O-RING, CYLINDER MOUNTING		1	Y	
260	C-3317-213-2	• O-RING, CYLINDER-SIDE BUSHING ID		1	Y	
250	E-6771	• PCP: HUB UNIT, HC-E4(N,P)-(2,5) (REFER TO “E-6771 HUB UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
360	C-3317-211-2	• O-RING, ENGINE-SIDE BUSHING ID		1	Y	
370	A-2431	• BOLT, 3/8-24, HEX HEAD		12		
380	A-2432	• BOLT, 3/8-24, HEX HEAD		8		
390	B-3834-0632	• WASHER		20	Y	
400	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		20	Y	
410	A-279	• FITTING, LUBRICATION REPLACED BY ITEMS 410A AND 411		8	Y	
410A	A-279	• FITTING, LUBRICATION REPLACES ITEM 410 IN ENGINE-SIDE OF HUB		4	Y	
-410B	C-6349	• FITTING, LUBRICATION, 45° (POST HC-SL-61-187) ALTERNATE FOR ITEM 410A		4	Y	
411	106545	• PLUG, LUBRICATION (POST HC-SL-61-354) REPLACES ITEM 410 IN CYLINDER-SIDE OF HUB		4	Y	
430	B-6544	• CAP, FITTING, LUBRICATION USED WITH ITEMS 410, 410A, AND 410B		4	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-7		**PROPELLER PARTS HC-E4N-2D - CONTINUED**				
-440	C-635	• FORK, FOUR BLADE - ASSEMBLY		1		
450	D-495-1	• • FORK, FOUR BLADE, SUPERSEDED BY ITEM 450A		OBS		
450A	D-495-2	• • FORK, FOUR BLADE, SUPERSEDES ITEM 450		1		
460	B-468	• • EXTENSION, BUMPER		4		
470	A-3256	• • BUMPER, FORK		4	Y	
10A-4		**BLADE RETENTION PARTS**				
		(REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		BALANCE PARTS				
-700	B-3840-( )	• SCREW, FILLISTER HEAD		AR		
-710	A-2424( )	• BALANCE WEIGHT		AR		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

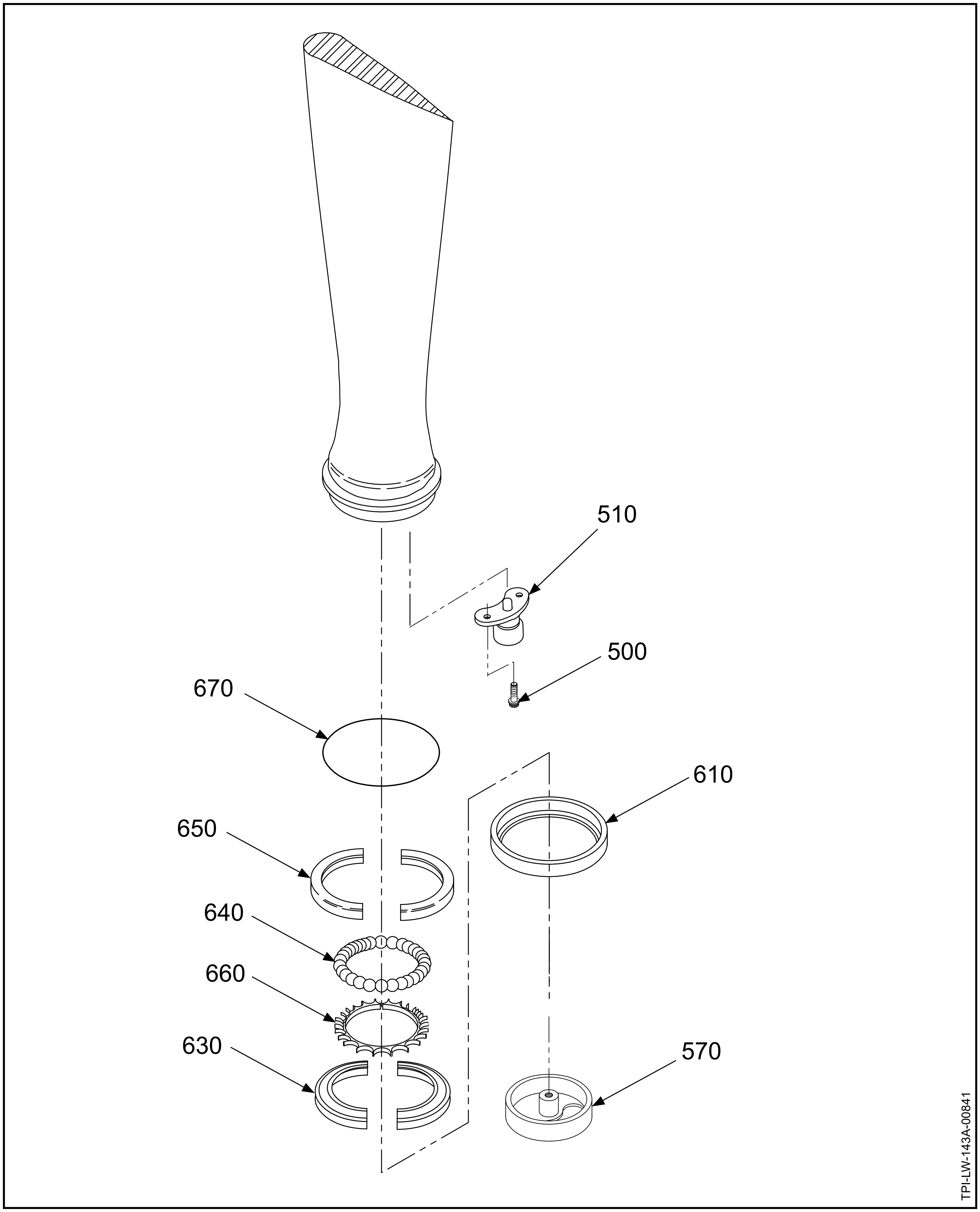
HC-E4N-2D

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-7		**PROPELLER PARTS HC-E4N-2D - CONTINUED**				
		PROPELLER MOUNTING PARTS				
800	C-3317-230	• O-RING, FLANGE		1	Y	
810	A-2048-2	• WASHER, MOUNTING, 9/16" CSK		8	Y	
820	B-3339-1	• BOLT, MOUNTING, 9/16-18, 12-POINT		8	Y	
		COUNTERWEIGHTS AND COUNTERWEIGHT SLUGS				
-9030		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				PCP
-9040		• COUNTERWEIGHT SLUG APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				
		COUNTERWEIGHT SLUG MOUNTING HARDWARE				
-9050		• BOLT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
-9060		• NUT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

SUB-ASSEMBLY
PARTS LISTS and FIGURES



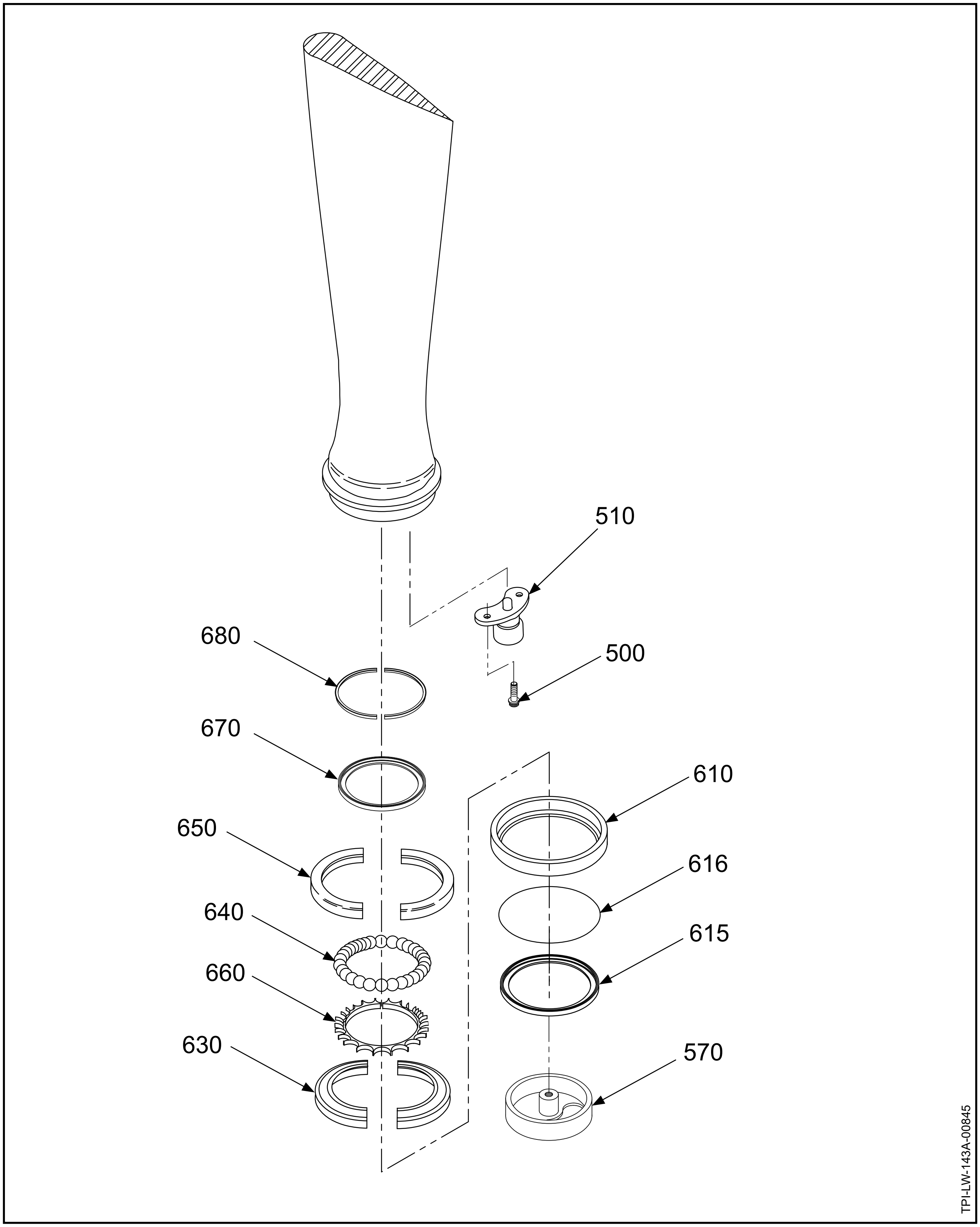
Blade Retention Parts
Figure 10A-1

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-1		**BLADE RETENTION PARTS FOR HC-D4N-2( ) PROPELLERS** **All quantities (UPA) in this parts list are per blade assembly.**				
500	108142	BOLT, 1/4-28, 12 POINT, REPLACES ITEM 500A, POST HC-SB-61-389		2	Y	
500A	B-3825	SCREW, 1/4-28, 100° HEAD, REPLACED BY ITEM 500		2	Y	
510	100028-( )	BRACKET, KNOB, PITCH CHANGE - UNIT REPLACED BY ITEM 510B (REFER TO “100028-( ): PITCH CHANGE KNOB BRACKET UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
510A	B-464-( )	BRACKET, KNOB, PITCH CHANGE - UNIT ALTERNATE FOR ITEM 510, POST HC-SB-61-346 REPLACED BY ITEM 510B (REFER TO “B-464-( ): PITCH CHANGE KNOB BRACKET UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
510B	108303-( )	BRACKET, KNOB, PITCH CHANGE - UNIT REPLACES ITEM 510 AND 510A, POST HC-SB-61-389 (REFER TO “108303-( ): PITCH CHANGE KNOB BRACKET UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
-511	102632	TUBING, SILICONE (DO NOT USE IF ITEM 500A OR ITEM 510A ARE USED, POST HC-SB-61-389.)		1	Y	
570	C-459	PRELOAD PLATE ASSEMBLY REPLACED BY ITEM 570A (REFER TO “C-459 PRELOAD PLATE ASSEMBLY” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
570A	101004	PRELOAD PLATE ASSEMBLY REPLACES ITEM 570, POST HC-SB-61-289 (REFER TO “101004 PRELOAD PLATE ASSEMBLY” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
610	A-2204	RING, RETAINING, BEARING		1		
-620	A-2202	BEARING, RETENTION, BLADE		1		
630	A-2202-B	• RACE, BLADE SIDE		1		
640	B-6144	• BALL, BEARING, 1/2" DIA		25	Y	
640A	B-6144-650	• BALL, BEARING, 1/2" DIA (BOX OF 650)		RF		
650	A-2202-A	• RACE, HUB SIDE		1		
660	B-3211	BALL SPACER		1	Y	
670	C-3317-340	O-RING, SUPERSEDED BY ITEM 670A		1	Y	
670A	C-3317-340-8	O-RING, SUPERSEDES ITEM 670, POST HC-SL-61-301	E	1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
E	BLADES MUST HAVE 0.010 INCH (0.25 mm) THICK CM155 TEFLON® TAPE INSTALLED IN ACCORDANCE WITH HARTZELL PROPELLER ALUMINUM BLADE MANUAL 133C (61-13-33)		

- ITEM NOT ILLUSTRATED

Blade Retention Parts



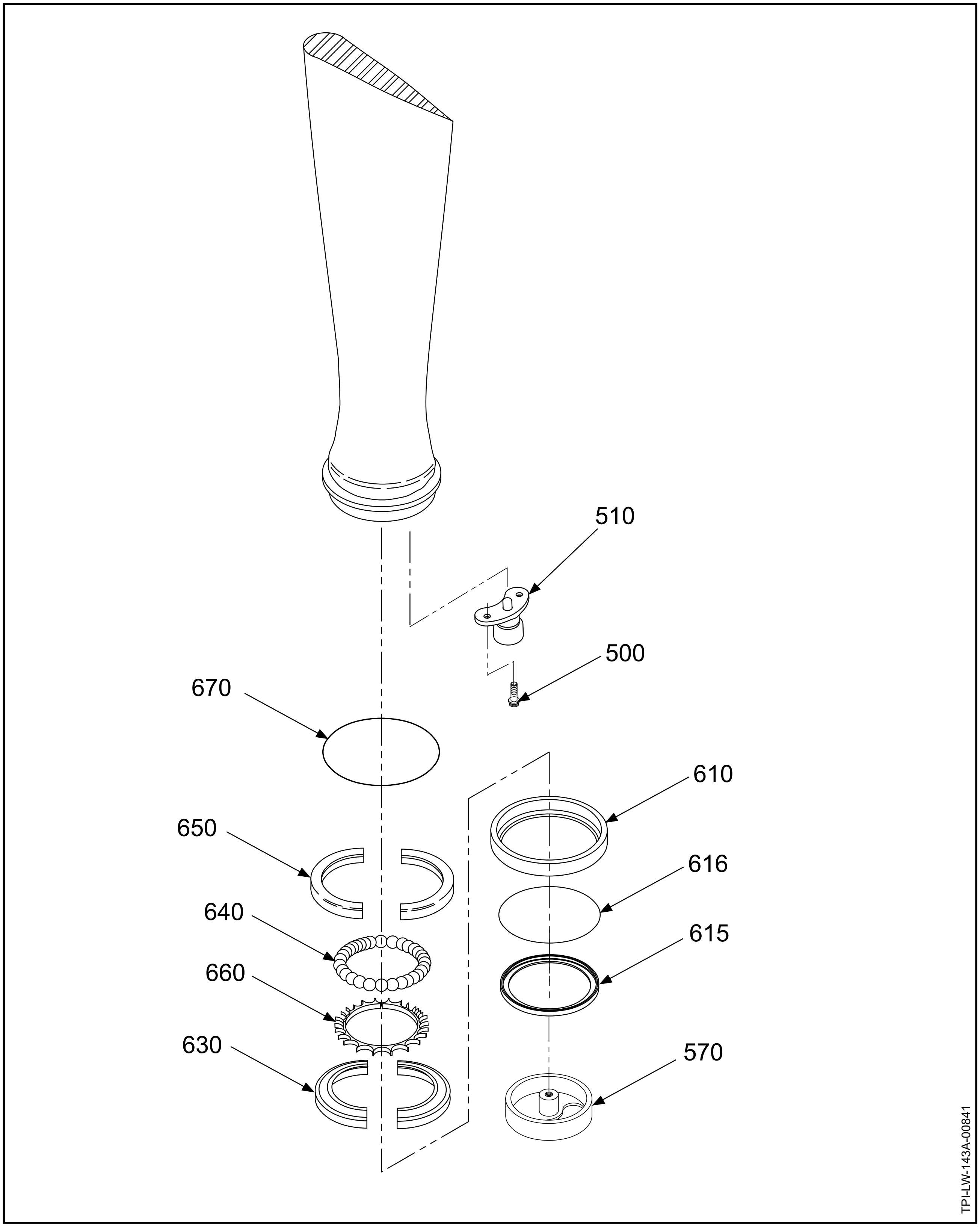
Blade Retention Parts
Figure 10A-2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-2		**BLADE RETENTION PARTS FOR HC-E4A-2( ) PROPELLERS** **All quantities (UPA) in this parts list are <u>per blade assembly</u>.**				
500	B-3830	BOLT, 5/16-24, 12-POINT		2	Y	
510	100032-( )	BRACKET, KNOB, PITCH CHANGE - UNIT (REFER TO “100032-( ): PITCH CHANGE KNOB BRACKET UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
510A	B-6257-( )	BRACKET, KNOB, PITCH CHANGE - UNIT ALTERNATE FOR ITEM 510, POST HC-SB-61-346 (REFER TO “B-6257-( ): PITCH CHANGE KNOB BRACKET UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
570	B-6770	PRELOAD PLATE ASSEMBLY, REPLACED BY ITEM 570A		1		
570A	100641	PRELOAD PLATE ASSEMBLY REPLACES ITEM 570, POST HC-SB-61-289 (REFER TO “100641-( ) PRELOAD PLATE ASSEMBLY” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
610	B-1041	RING, RETAINING, BEARING, SUPERSEDED BY ITEM 610A		1		
610A	B-7071	RING, RETAINING, BEARING, SUPERSEDES ITEM 610		1		
615	B-7726	SEAL, BLADE, OPTIONAL (USED WITH ITEM 610A)		1		
616	C-3317-045	O-RING, OPTIONAL (USED WITH ITEM 610A)		1	Y	
-620	C-792-1	BEARING, RETENTION, BLADE, REPLACED BY ITEM 620A		1		
630	C-792-1A	• RACE, HUB-SIDE		1		
640	B-6144-1	• BALL, BEARING, 3/8" DIA		33	Y	
	B-6144-1-1500	• BALL, BEARING, 3/8" DIA (BOX OF 1500)		RF		
650	C-792-1B	• RACE, BLADE-SIDE		1		
-620A	D-7745	BEARING, THRUST - BLADE REPLACES ITEM 620, POST HC-SB-61-314		1		
630A	D-7745-A	• RACE, HUB SIDE		1		
640	B-6144-1	• BALL, BEARING, 3/8" DIA		33	Y	
	B-6144-1-1500	• BALL, BEARING, 3/8" DIA (BOX OF 1500)		RF		
650A	D-7745-B	• RACE, BLADE SIDE		1		
660	B-793	BALL SPACER		1	Y	
670	C-3317-340	O-RING, BLADE MOUNTING SUPERSEDED BY ITEMS 670A AND 680 SUPERSEDED BY ITEM 670B		1	Y	
670A	C-6337-1	BLADE SEAL, SUPERSEDES ITEM 670 USED WITH ITEM 680, SUPERSEDED BY ITEM 670B		1	Y	
670B	C-3317-340-9	O-RING, BLADE MOUNTING SUPERSEDES ITEMS 670 AND 670A		1	Y	
680	B-6376-3	SEAL, ENERGIZER RING, SUPERSEDES ITEM 670 USED WITH ITEM 670A		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

Blade Retention Parts



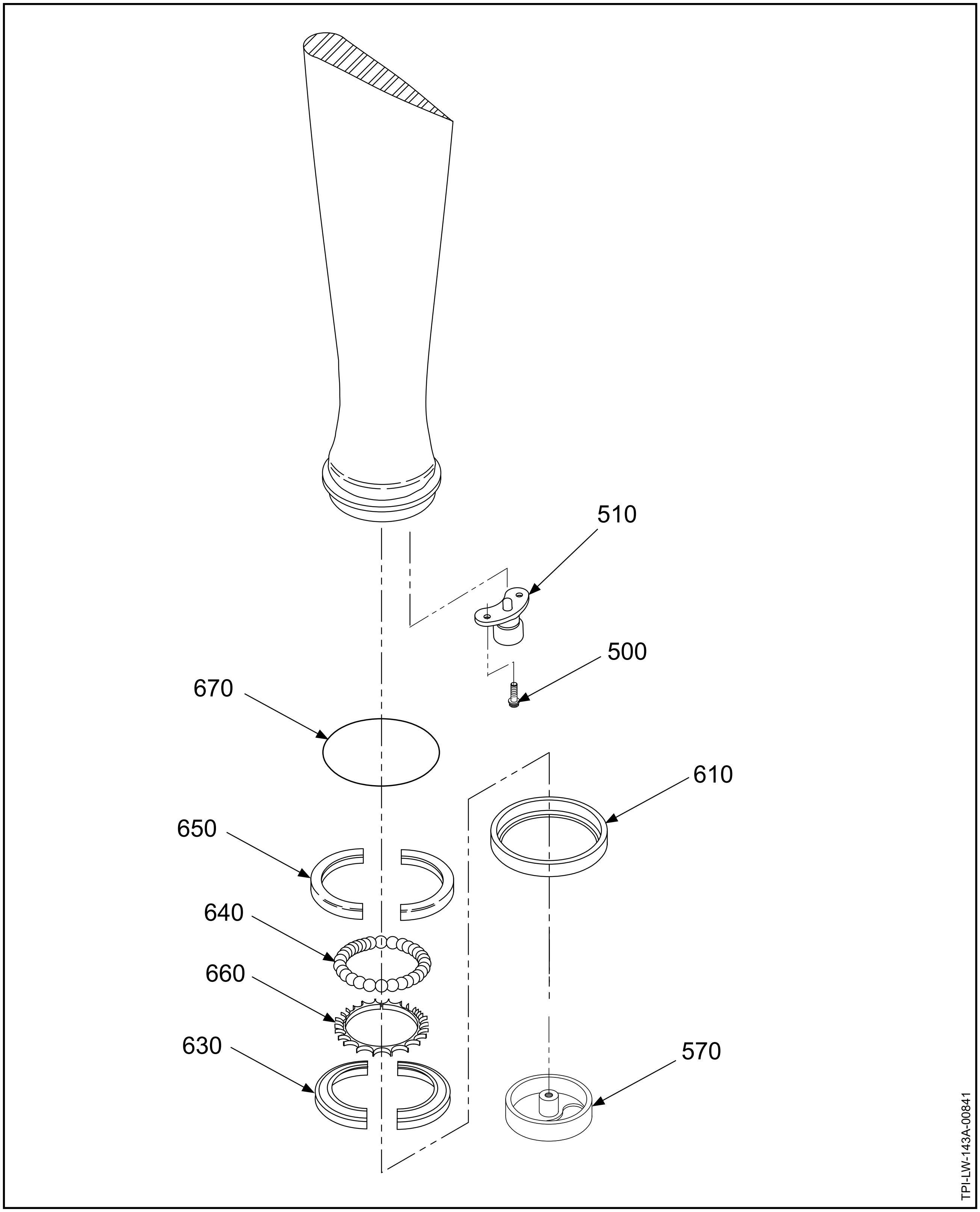
Blade Retention Parts
Figure 10A-3

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-3		**BLADE RETENTION PARTS FOR HC-E4N-2(B,C) PROPELLERS**				
		All quantities (UPA) in this parts list are per blade assembly.				
500	B-3830	BOLT, 5/16-24, 12-POINT		2	Y	
510	100032-( )	BRACKET, KNOB, PITCH CHANGE - UNIT REPLACES ITEM 510A, POST HC-SB-61-346, R3 (REFER TO “100032-( ): PITCH CHANGE KNOB BRACKET UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
510A	B-6257-( )	BRACKET, KNOB, PITCH CHANGE - UNIT REPLACED BY ITEM 510 (REFER TO “B-6257-( ): PITCH CHANGE KNOB BRACKET UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
570	B-6770	PRELOAD PLATE ASSEMBLY, REPLACED BY ITEM 570A		1		
570A	100641	PRELOAD PLATE ASSEMBLY REPLACES ITEM 570, POST HC-SB-61-289 (REFER TO “100641-( ) PRELOAD PLATE ASSEMBLY” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
610	B-1041	RING, RETAINING, BEARING, SUPERSEDED BY ITEM 610A		1		
610A	B-7071	RING, RETAINING, BEARING, SUPERSEDES ITEM 610		1		
615	B-7726	SEAL, BLADE, OPTIONAL, USED WITH ITEM 610A		1		
616	C-3317-045	O-RING, OPTIONAL, USED WITH ITEM 610A		1	Y	
-620	C-792-1	BEARING, RETENTION, BLADE, SUPERSEDED BY ITEM 620A		1		
630	C-792-1A	• RACE, HUB-SIDE, SUPERSEDED BY ITEM 630A		1		
640	B-6144-1	• BALL, BEARING, 3/8" DIA		33	Y	
	B-6144-1-1500	• BALL, BEARING, 3/8" DIA (BOX OF 1500)		RF		
650	C-792-1B	• RACE, BLADE-SIDE, SUPERSEDED BY ITEM 650A		1		
-620A	D-7745	BEARING, THRUST - BLADE, SUPERSEDES ITEM 620	F	1		
630A	D-7745-A	• RACE, HUB SIDE, SUPERSEDES ITEM 630	F	1		
640	B-6144-1	• BALL, BEARING, 3/8" DIA		33	Y	
	B-6144-1-1500	• BALL, BEARING, 3/8" DIA (BOX OF 1500)		RF		
650A	D-7745-B	• RACE, BLADE SIDE, SUPERSEDES ITEM 650	F	1		
660	B-793	BALL SPACER		1	Y	
670	C-3317-340	O-RING, BLADE MOUNTING SUPERSEDED BY ITEMS 670A		1	Y	
670A	C-3317-340-8	O-RING, BLADE MOUNTING SUPERSEDES ITEMS 670, POST HC-SL-61-301	E	1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
E	BLADES MUST HAVE 0.010 INCH (0.25 mm) THICK CM155 TEFLON® TAPE INSTALLED IN ACCORDANCE WITH HARTZELL PROPELLER ALUMINUM BLADE MANUAL 133C (61-13-33)	F	INSTALLATION OF C-792-1 AND D-7745 BEARING RACES IN THE SAME PROPELLER ASSEMBLY IS NOT PERMITTED.

- ITEM NOT ILLUSTRATED

Blade Retention Parts



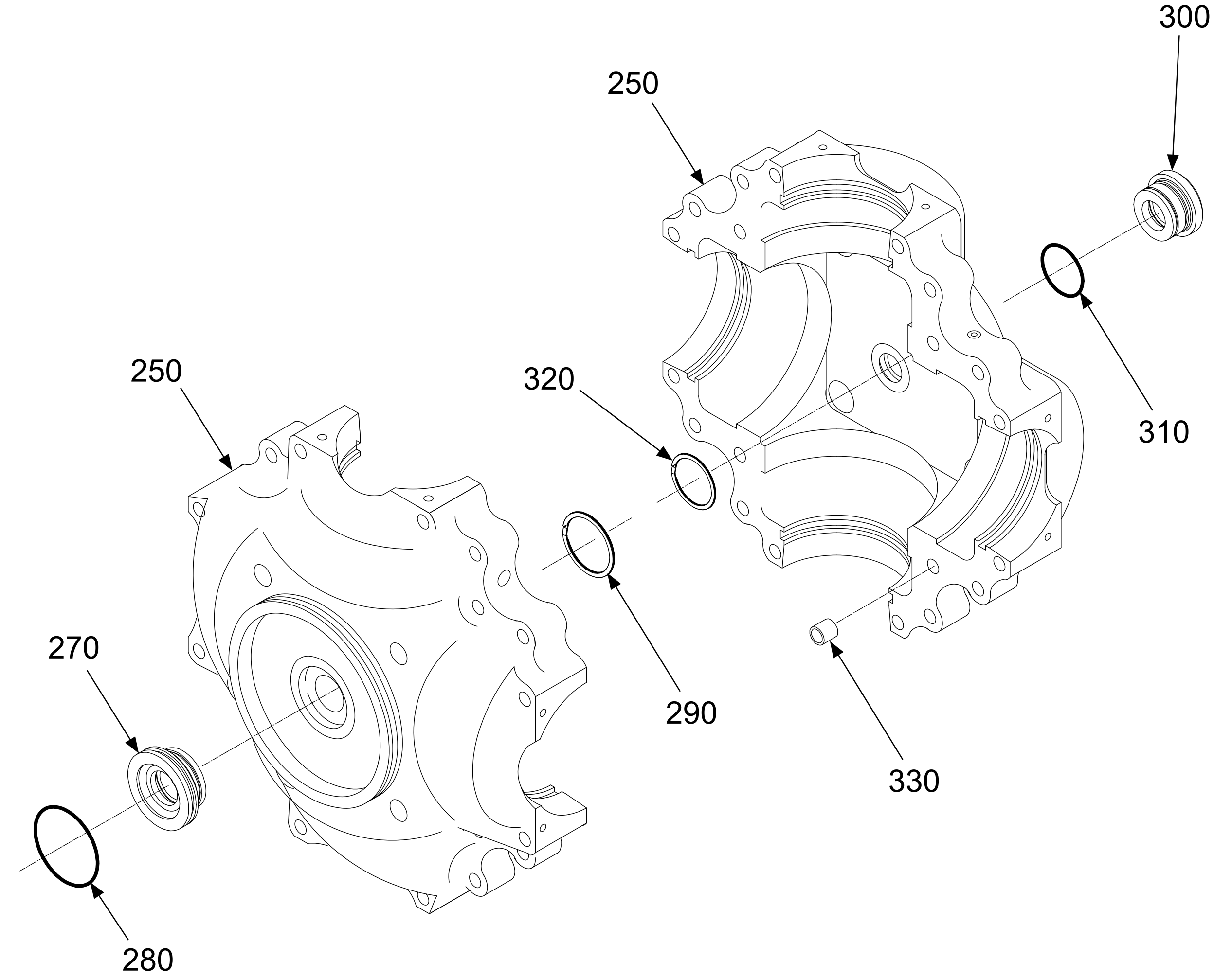
Blade Retention Parts
Figure 10A-4

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-4		**BLADE RETENTION PARTS**				
		FOR HC-E4N-2D, PROPELLERS **All quantities (UPA) in this parts list are per blade assembly.**				
500	B-3830	BOLT, 5/16-24, 12-POINT		2	Y	
510	100032-( )	BRACKET, KNOB, PITCH CHANGE - UNIT (REFER TO “100032-( ): PITCH CHANGE KNOB BRACKET UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
510A	B-6257-( )	BRACKET, KNOB, PITCH CHANGE - UNIT ALTERNATE FOR ITEM 510, POST HC-SB-61-346 (REFER TO “B-6257-( ): PITCH CHANGE KNOB BRACKET UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
570	100641	PRELOAD PLATE ASSEMBLY (REFER TO “100641-( ) PRELOAD PLATE ASSEMBLY” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
610	B-7071	BEARING RETAINING RING		1		
615	B-7726	SEAL, BLADE		1		
616	C-3317-045	O-RING		1	Y	
-620	C-792-1	BEARING, RETENTION, BLADE, SUPERSEDED BY ITEM 620A		1		
630	C-792-1A	• RACE, HUB-SIDE, SUPERSEDED BY ITEM 630A		1		
640	B-6144-1	• BALL, BEARING, 3/8" DIA		33	Y	
	B-6144-1-1500	• BALL, BEARING, 3/8" DIA (BOX OF 1500)		RF		
650	C-792-1B	• RACE, BLADE-SIDE, SUPERSEDED BY ITEM 650A		1		
-620A	D-7745	BEARING, THRUST - BLADE, SUPERSEDES ITEM 620	F	1		
630A	D-7745-A	• RACE, HUB SIDE, SUPERSEDES ITEM 630	F	1		
640	B-6144-1	• BALL, BEARING, 3/8" DIA		33	Y	
	B-6144-1-1500	• BALL, BEARING, 3/8" DIA (BOX OF 1500)		RF		
650A	D-7745-B	• RACE, BLADE SIDE, SUPERSEDES ITEM 650	F	1		
660	B-793	BALL SPACER		1	Y	
670	C-3317-340-8	O-RING	E	1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
E	BLADES MUST HAVE 0.010 INCH (0.25 mm) THICK CM155 TEFLON® TAPE INSTALLED IN ACCORDANCE WITH HARTZELL PROPELLER ALUMINUM BLADE MANUAL 133C (61-13-33)	F	INSTALLATION OF C-792-1 AND D-7745 BEARING RACES IN THE SAME PROPELLER ASSEMBLY IS NOT PERMITTED.

- ITEM NOT ILLUSTRATED

Blade Retention Parts



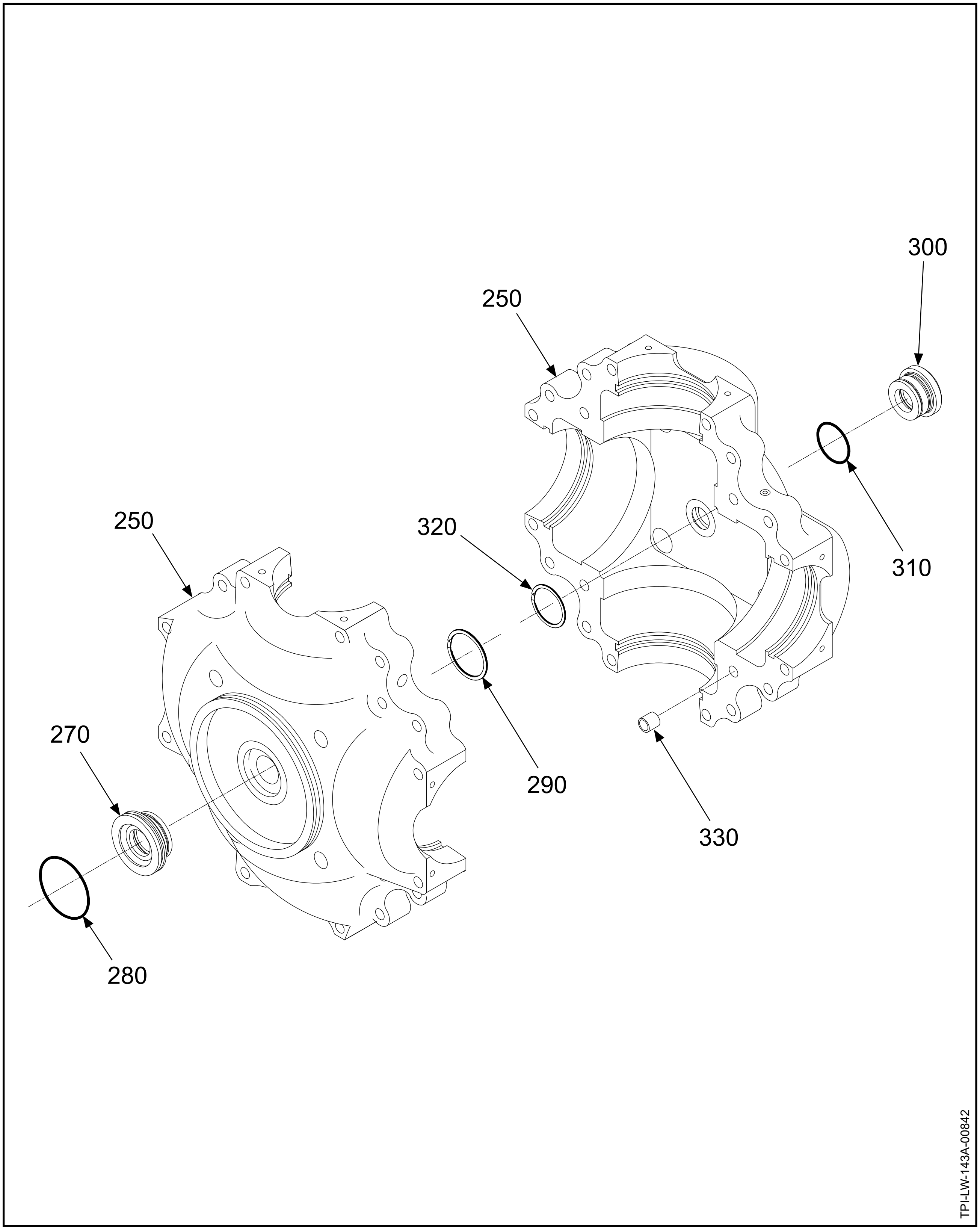
D-489-( ): Hub Unit
Figure 10A-5

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-5		**D-489-( ): HUB UNIT PARTS**				
250	D-489-(1,2,3,4)	PCP:HUB UNIT		1		PCP
270	B-5952	• HUB BUSHING, ROD		1		
280	C-3317-135-2	• O-RING (CYLINDER-SIDE BUSHING OD)		1	Y	
290	A-6153-162	• RING, RETAINING, EXTERNAL, SPIRAL (CYLINDER-SIDE)		1	Y	
300	B-6108	• HUB BUSHING, ROD		1		
310	C-3317-026-2	• O-RING (ENGINE-SIDE BUSHING OD)		1	Y	
320	A-6153-137	• RING, RETAINING, EXTERNAL, SPIRAL (ENGINE-SIDE)		1	Y	
330	A-2249	• HUB BUSHING, GUIDE		1	Y	
-340	B-6142	• INSERT, 1/4-28, CRES, COILED		8	Y	
-350	B-1243	• INSERT, 9/16-18, CRES, STAKED		8	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

D-489-( ): Hub Unit



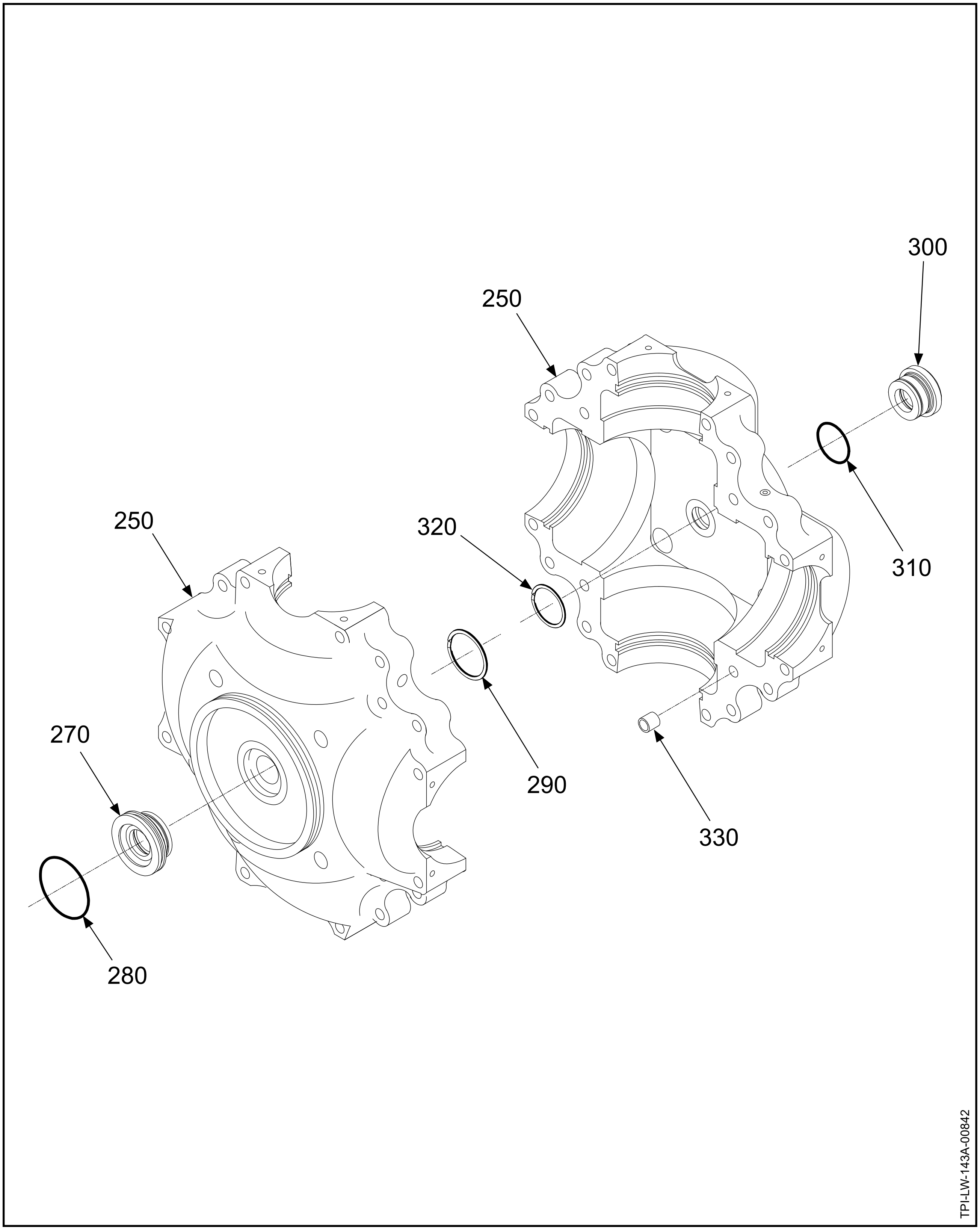
E-6468: Hub Unit
Figure 10A-6

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-6		**E-6468: HUB UNIT PARTS**				
250	E-6468	PCP:HUB UNIT, HC-E4A-(2,5)		1		PCP
-251	104336	• PLATE, UID-BLANK		1		
270	B-5952	• HUB BUSHING, ROD		1		
280	C-3317-135-2	• O-RING (CYLINDER-SIDE BUSHING OD)		1	Y	
290	A-6153-162	• RING, RETAINING, EXTERNAL, SPIRAL (CYLINDER-SIDE)		1	Y	
300	B-6108	• HUB BUSHING, ROD		1		
310	C-3317-026-2	• O-RING (ENGINE-SIDE BUSHING OD)		1	Y	
320	A-6153-137	• RING, RETAINING, EXTERNAL, SPIRAL (ENGINE-SIDE)		1	Y	
330	A-2249	• HUB BUSHING, GUIDE		1	Y	
-340	B-6142	• INSERT, 1/4-28, CRES, COILED		8	Y	
-350	B-1243	• INSERT, 9/16-18, CRES, STAKED		12	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

E-6468: Hub Unit



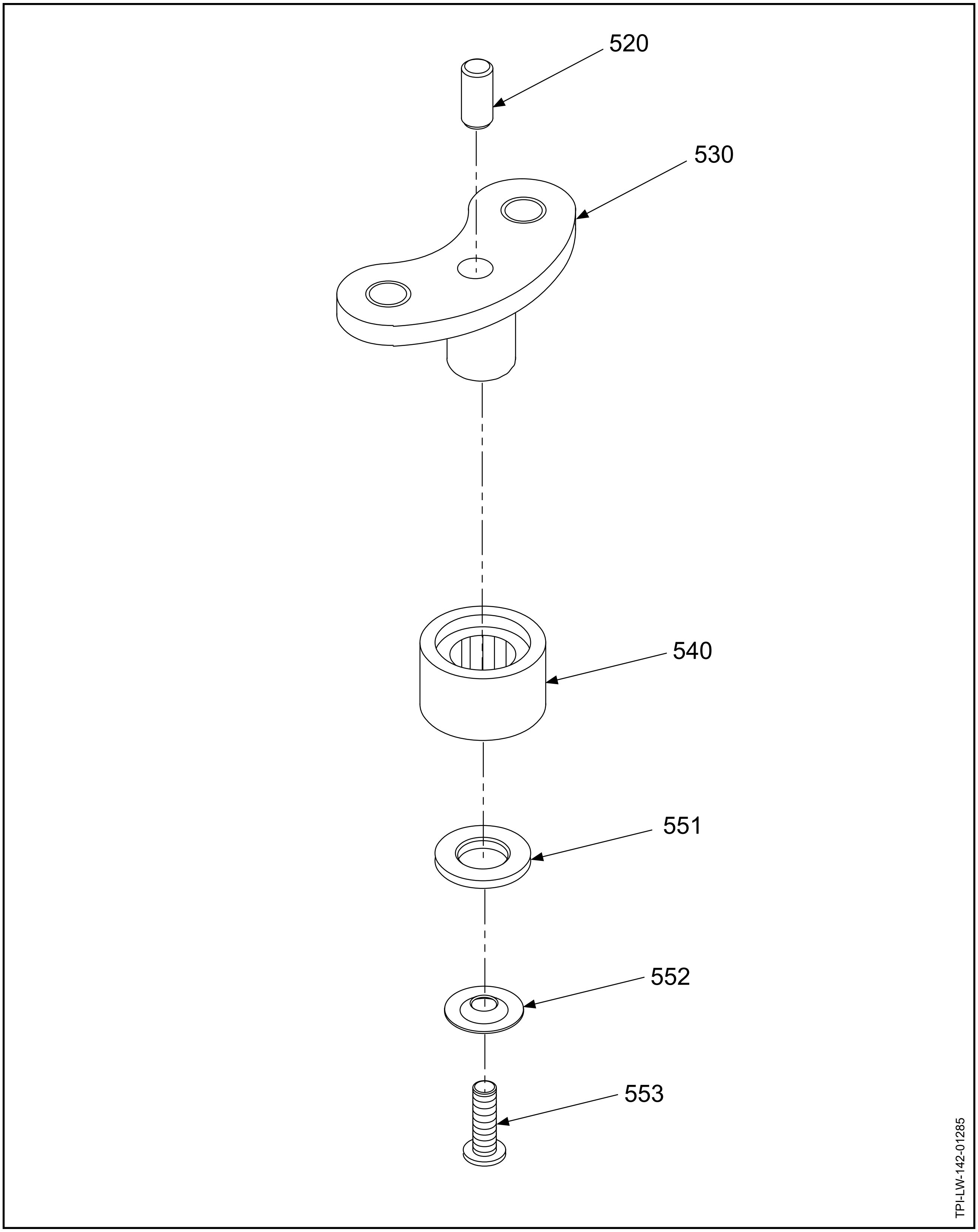
E-6771: Hub Unit
Figure 10A-7

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-7		**E-6771: HUB UNIT PARTS**				
250	E-6771	PCP:HUB UNIT, HC-E4(N,P)-(2,5)		1		PCP
270	B-5952	• HUB BUSHING, ROD		1		
280	C-3317-135-2	• O-RING (CYLINDER-SIDE BUSHING OD)		1	Y	
290	A-6153-162	• RING, RETAINING, EXTERNAL, SPIRAL (CYLINDER-SIDE)		1	Y	
300	B-6108	• HUB BUSHING, ROD		1		
310	C-3317-026-2	• O-RING (ENGINE-SIDE BUSHING OD)		1	Y	
320	A-6153-137	• RING, RETAINING, EXTERNAL, SPIRAL (ENGINE-SIDE)		1	Y	
330	A-2249	• HUB BUSHING, GUIDE		1	Y	
-340	B-6142	• INSERT, 1/4-28, CRES, COILED		8	Y	
-350	B-1243	• INSERT, 9/16-18, CRES, STAKED		8	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

E-6771: Hub Unit



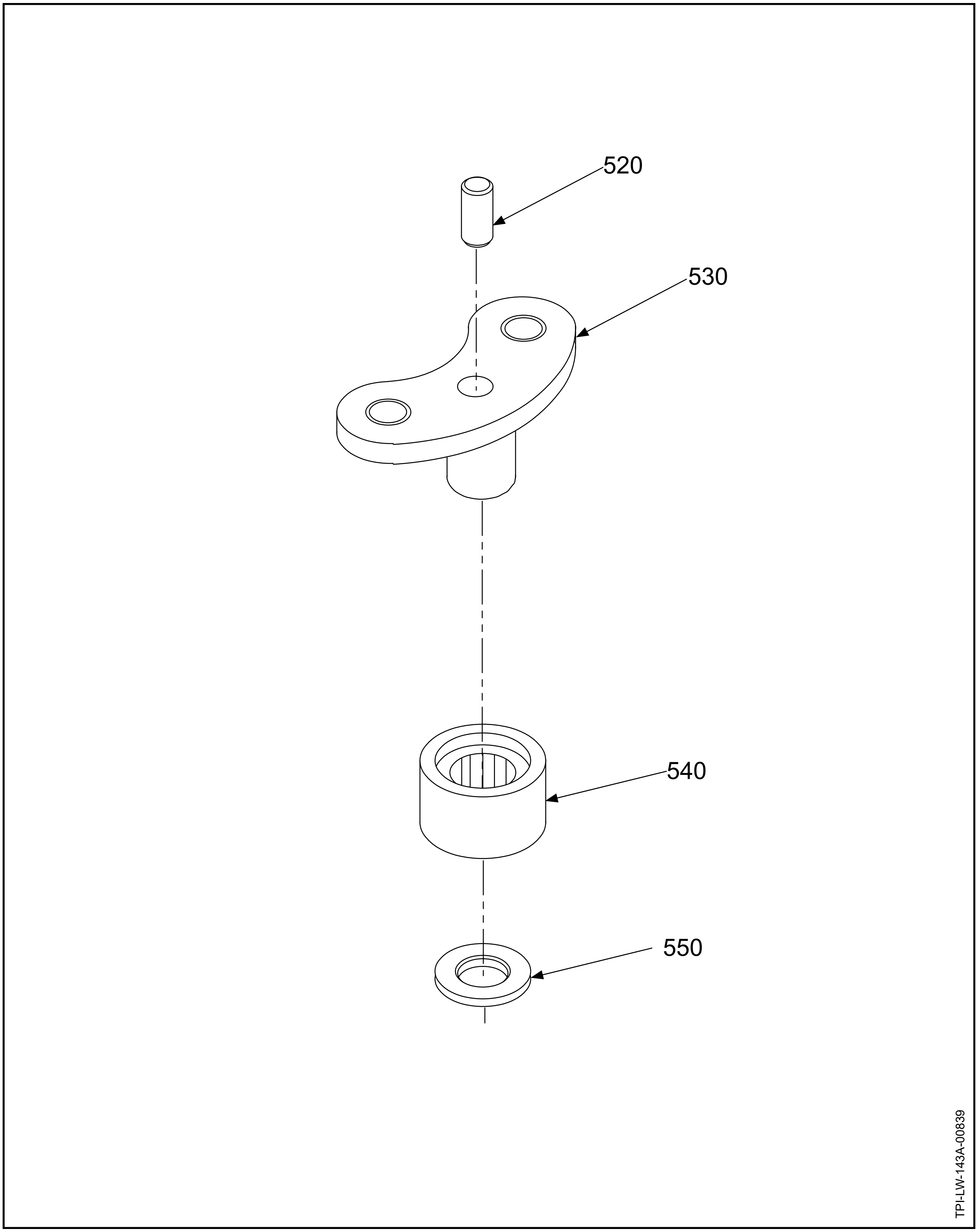
B-464-( ): Pitch Change Knob Bracket Unit
Figure 10A-8

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-8		**B-464-( ): PITCH CHANGE KNOB BRACKET UNIT**				
-510	B-464-( )	BRACKET, KNOB, PITCH CHANGE - UNIT		1		
520	B-6260	• DOWEL PIN, 3/8 INCH		1		
530	B-465-( )	• BRACKET, KNOB, PITCH CHANGE USE WITH ITEM 550		1		
530A	B-465-( )A	• BRACKET, KNOB, PITCH CHANGE (MODIFIED) ALTERNATE FOR ITEM 530 USE WITH ITEMS 551, 552, AND 553 POST HC-SB-61-346	A	1		
540	B-6545	• CAM FOLLOWER		1	Y	
-550	B-475	• WASHER, RETAINING, KNOB UNIT USE WITH ITEM 830		1	Y	
551	103395	• KNOB UNIT RETAINING WASHER USE WITH ITEMS 530, 552, AND 553 POST HC-SB-61-346		1		
552	B-3860-10L	• WASHER, DIMPLED, 100° CRES USE WITH ITEMS 530A, 551, AND 553 POST HC-SB-61-346		1	Y	
553	B-3867-272	• SCREW, 10-32 100°, HEAD, CRES USE WITH ITEMS 530A, 551, AND 552 POST HC-SB-61-346		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
A	A-465-( )A IS A MODIFICATION OF THE A-465-( ). REFER TO THE CHECK CHAPTER AND THE REPAIR CHAPTER IN THIS MANUAL.		

- ITEM NOT ILLUSTRATED

B-464-( ): Pitch Change Knob Bracket Unit



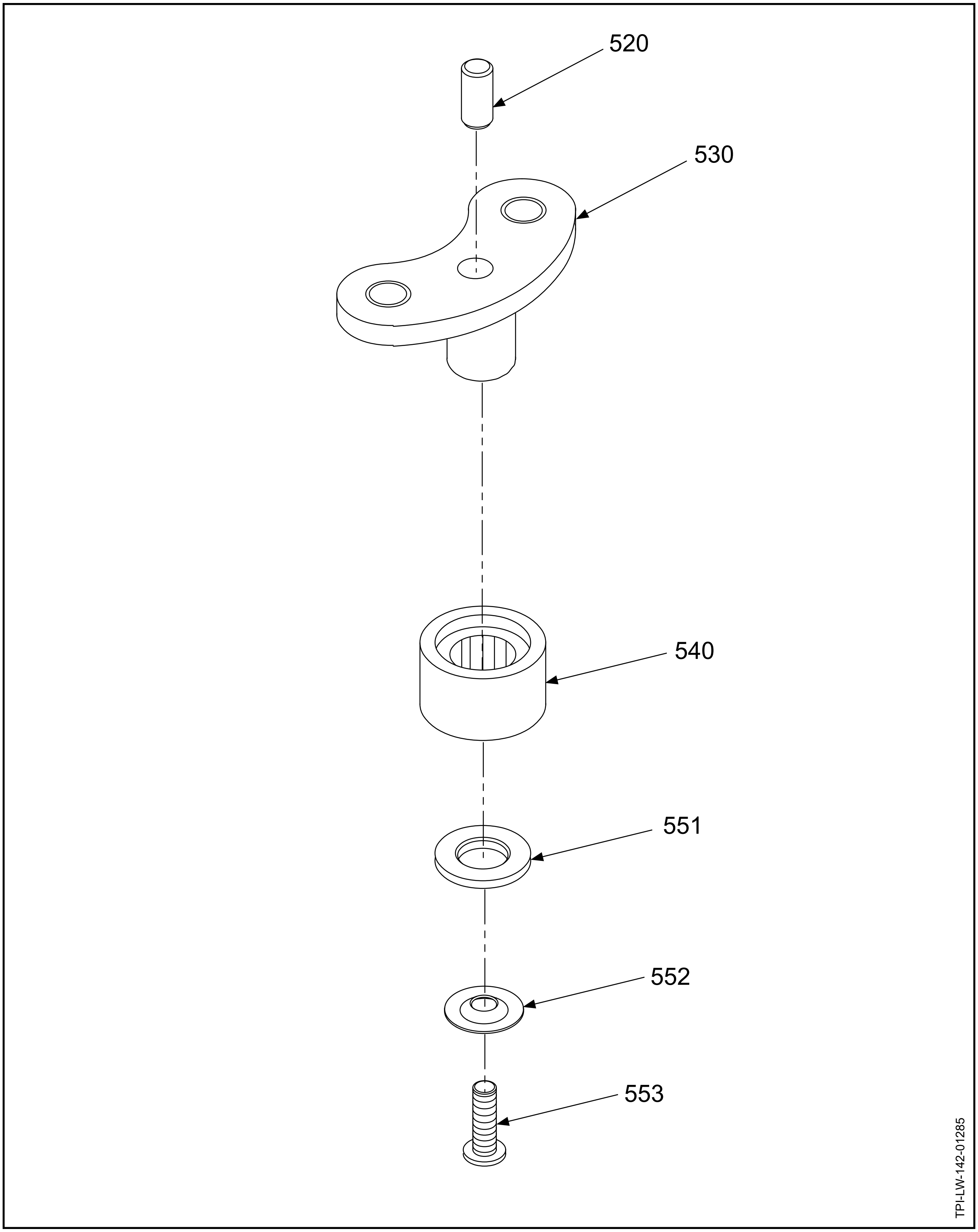
B-6257-( ): Pitch Change Knob Bracket Unit
Figure 10A-9

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-9		**B-6257-( ): PITCH CHANGE KNOB BRACKET UNIT**				
-510	B-6257-( )	BRACKET, KNOB, PITCH CHANGE - UNIT		1		
520	B-6260	• DOWEL PIN, 3/8 INCH		1		
530	C-6253-( )	• BRACKET, KNOB, PITCH CHANGE	A	1		
540	B-6545	• CAM FOLLOWER		1	Y	
550	B-475	• WASHER, RETAINING, KNOB UNIT		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
A	THE C-6253-( ) MAY BE MODIFIED TO THE C-6253-( )A. REFER TO THE CHECK CHAPTER AND THE REPAIR CHAPTER IN THIS MANUAL.		

- ITEM NOT ILLUSTRATED

B-6257-( ): Pitch Change Knob Bracket Unit



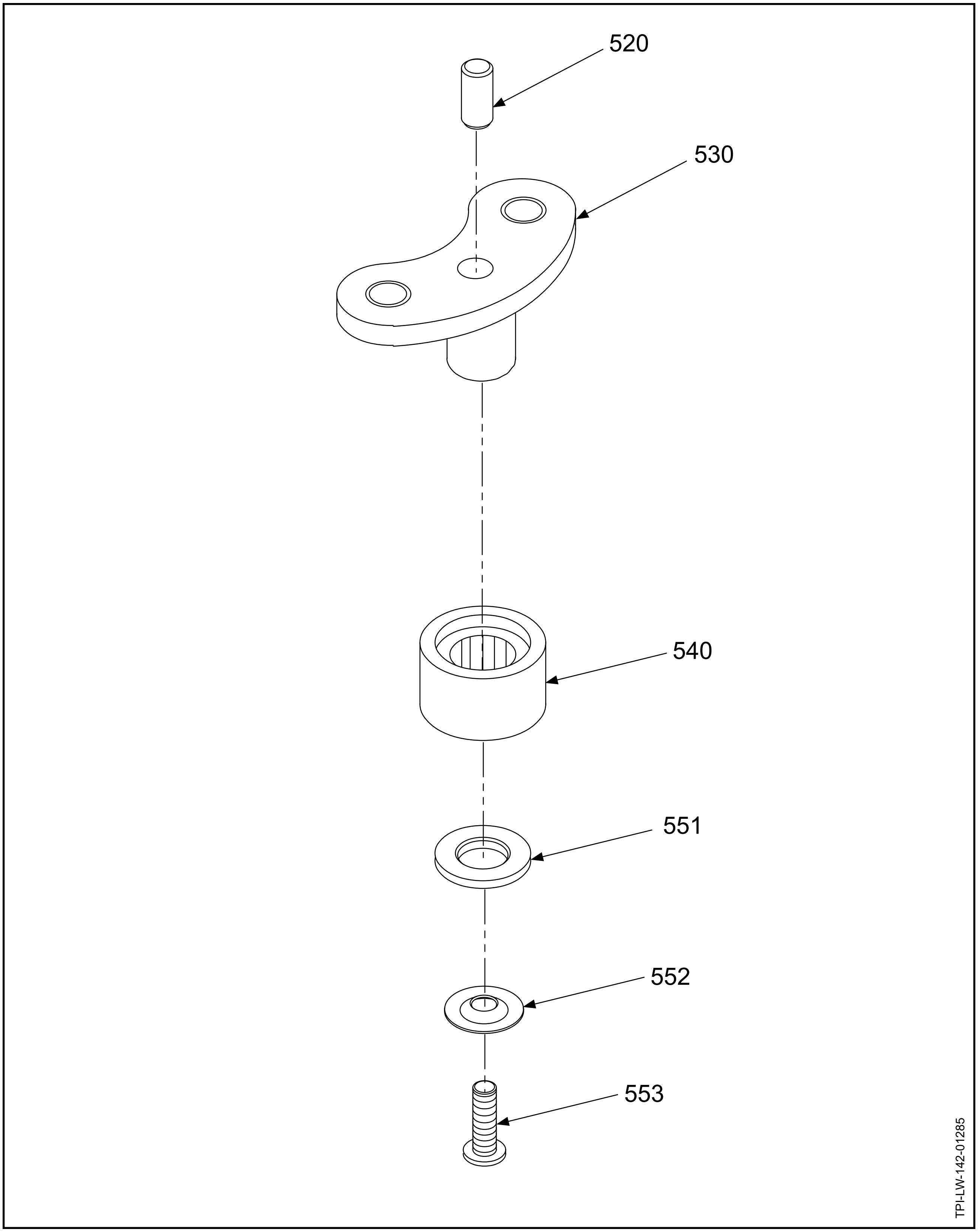
100028-( ): Pitch Change Knob Bracket Unit
Figure 10A-10

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-10		**100028-( ): PITCH CHANGE KNOB BRACKET UNIT**				
-510	100028-( )	BRACKET, KNOB, PITCH CHANGE - UNIT		1		
520	B-6260	• DOWEL PIN, 3/8 INCH		1		
530	100027-( )	• BRACKET, KNOB, PITCH CHANGE		1		
540	B-6545	• CAM FOLLOWER		1	Y	
551	103395	• WASHER, RETAINING, KNOB UNIT		1		
552	B-3860-10L	• WASHER, DIMPLED, 100° CRES		1	Y	
553	B-3867-272	• SCREW, 10-32 100°, HEAD, CRES		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

100028-( ): Pitch Change Knob Bracket Unit



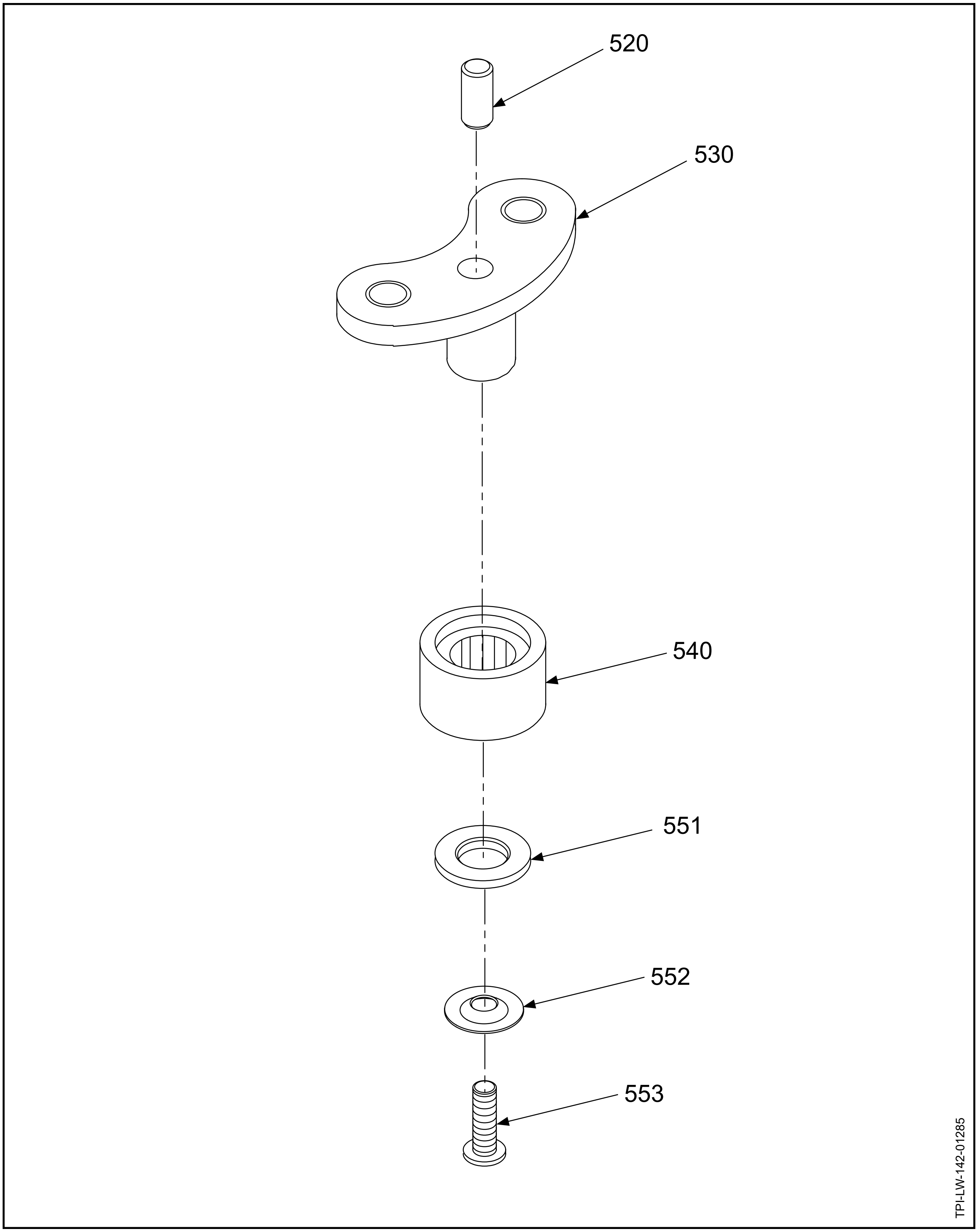
100032-( ): Pitch Change Knob Bracket Unit
Figure 10A-11

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-11		**100032-( ): PITCH CHANGE KNOB BRACKET UNIT**				
-510	100032-( )	BRACKET, KNOB, PITCH CHANGE - UNIT		1		
520	B-6260	• DOWEL PIN, 3/8 INCH		1		
530	100031-( )	• BRACKET, KNOB, PITCH CHANGE		1		
540	B-6545	• CAM FOLLOWER		1	Y	
551	103395	• WASHER, RETAINING, KNOB UNIT		1		
552	B-3860-10L	• WASHER, DIMPLED, 100° CRES		1	Y	
553	B-3867-272	• SCREW, 10-32 100°, HEAD, CRES		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

100032-( ): Pitch Change Knob Bracket Unit



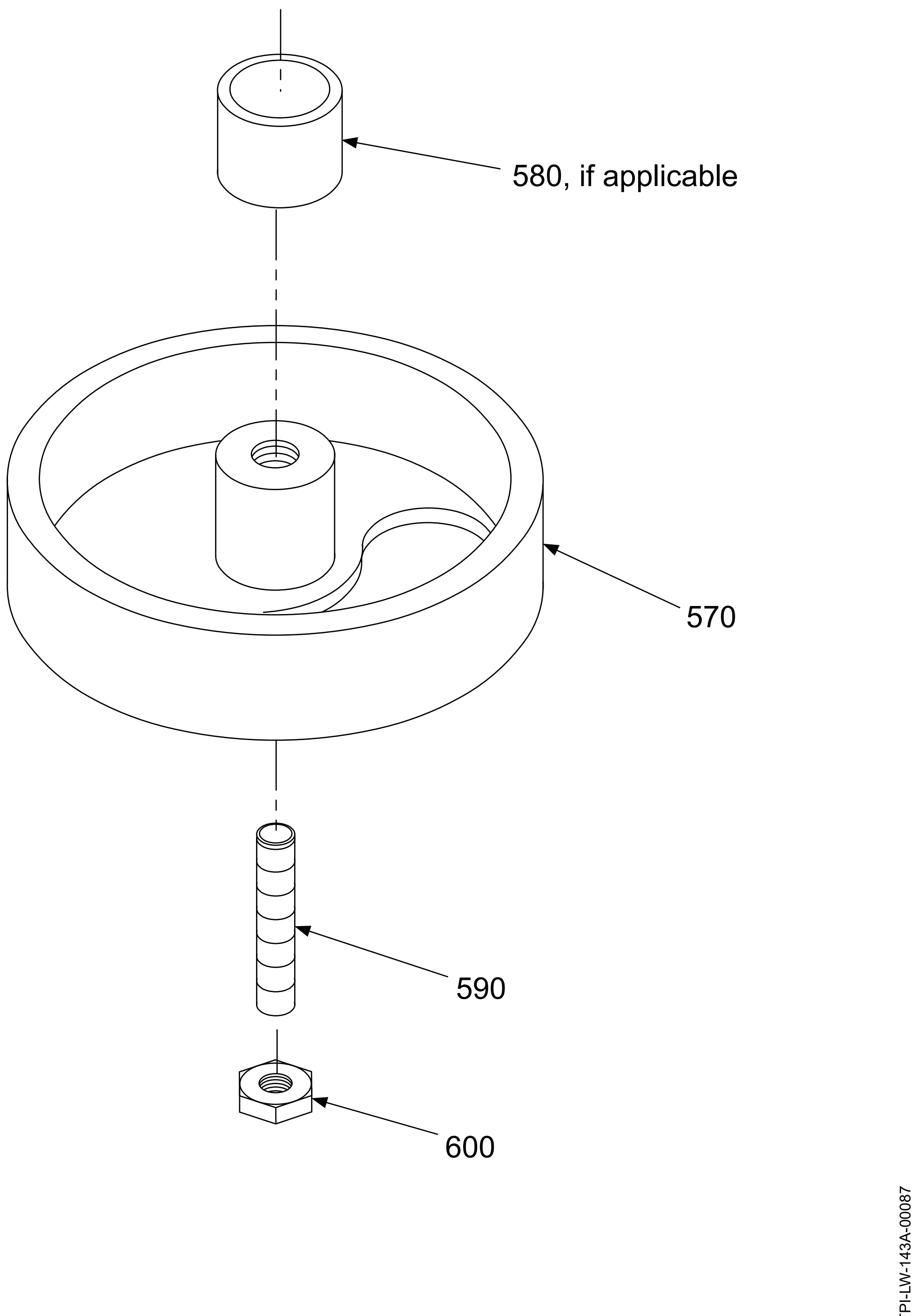
108303-( ): Pitch Change Knob Bracket Unit
Figure 10A-12

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-12		**108303-( ): PITCH CHANGE KNOB BRACKET UNIT**				
-510	108303-( )	BRACKET, KNOB, PITCH CHANGE - UNIT		1		
520	B-6260	• DOWEL PIN, 3/8 INCH		1		
530	108302-( )	• BRACKET, KNOB, PITCH CHANGE		1		
540	B-6545	• CAM FOLLOWER		1	Y	
551	103395	• WASHER, RETAINING, KNOB UNIT		1		
552	B-3860-10L	• WASHER, DIMPLED, 100° CRES		1	Y	
553	B-3867-272	• SCREW, 10-32 100°, HEAD, CRES		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

108303-( ): Pitch Change Knob Bracket Unit



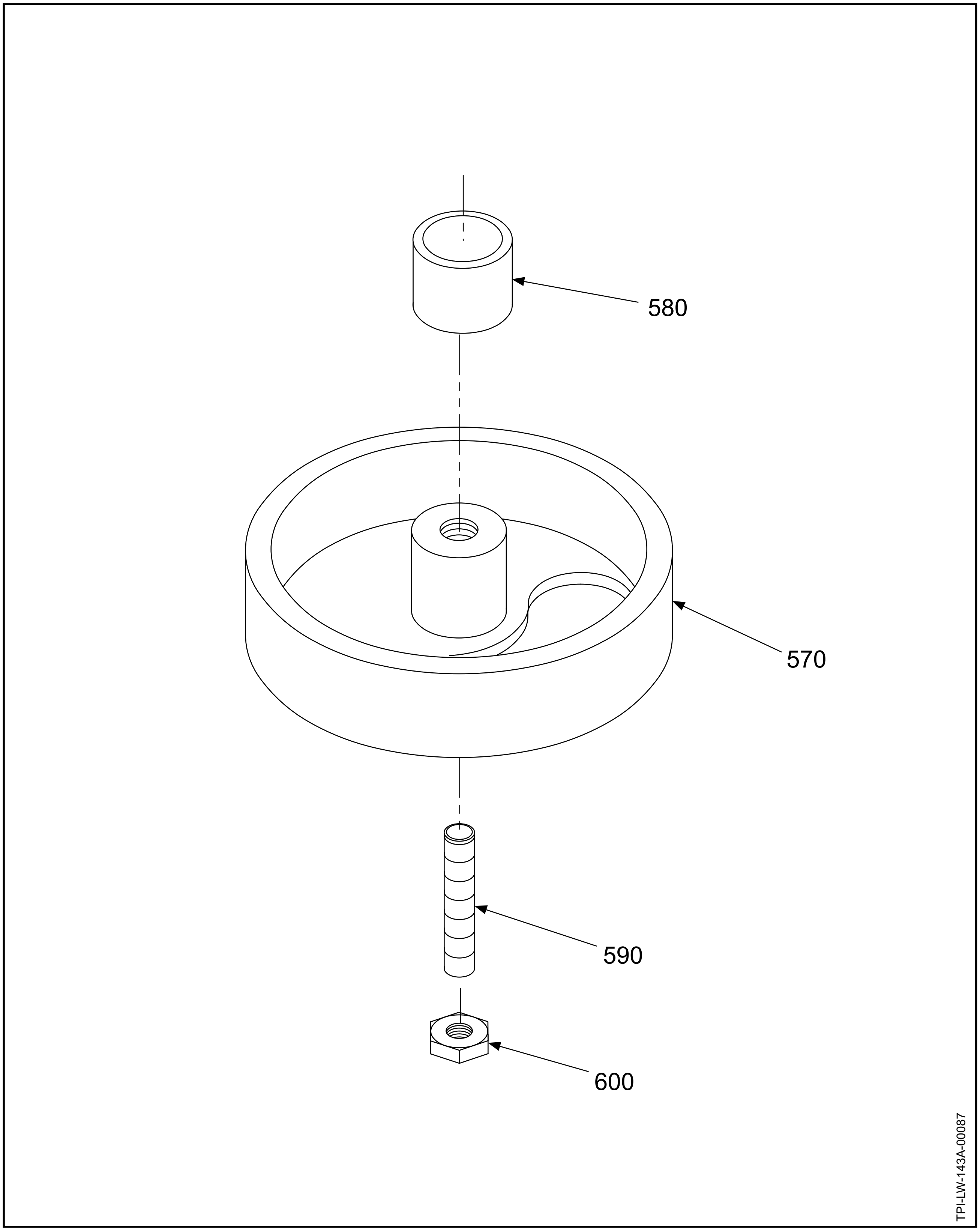
100641: Preload Plate Assembly
Figure 10A-13

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-13		**100641: PRELOAD PLATE ASSEMBLY**				
570	100641	PRELOAD PLATE ASSEMBLY		1		
580	A-1272	• RACE, INNER BEARING		1		
590	A-3204-2	• SCREW, SET, 5/16-24		1	Y	
600	B-3368	• NUT, 5/16-24, HEX, THIN		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

100641: Preload Plate Assembly



101004: Preload Plate Assembly
Figure 10A-14

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-14		**101004: PRELOAD PLATE ASSEMBLY**				
570	101004	PRELOAD PLATE ASSEMBLY		1		
580	B-6679	• RACE, INNER, BEARING		1		
590	A-3204	• SCREW, SET, 5/16-24, SUPERSEDED BY ITEM 590A		1	Y	
590A	A-3204-2	• SCREW, SET, 5/16-24, SUPERSEDES ITEM 590		1	Y	
600	B-3368	• NUT, 5/16-24, HEX, THIN		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

101004: Preload Plate Assembly

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