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MANUAL REVISION TRANSMITTAL

Manual 152 (61-10-52)
Compact Constant Speed and Reversing Propeller
Overhaul and Maintenance Manual

REVISION 2 dated April 2023

Remove Pages:	**Insert Pages:**
Entire Manual	**Entire Manual**

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

This page may be discarded after proper filing of the revision.

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Manual No. 152
61-10-52
Revision 2
April 2023

Compact Constant Speed and Reversing Propeller Overhaul and Maintenance Manual

HC-E3YR-7( )

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REVISION 2 HIGHLIGHTS

Revision 2, dated April 2023, incorporates the following:

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

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

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

- DISASSEMBLY
  - Revised the section, "Hub Disassembly"
- CHECK
  - Revised the section, "Fork"
  - Revised the section, "Hex Head Bolt"
- ASSEMBLY
  - Revised the section, "Leak Test"
- FITS AND CLEARANCES
  - Revised Table 8-1, "Torque Values"
  - Revised Figure 8-2, "Blade Play"
  - Revised the section, "Blade Tolerances"
  - Removed Table 8-2, "Blade Tolerances"
- ILLUSTRATED PARTS LIST
  - Revised the figures as applicable
  - Revised the structure of the propeller parts lists
  - Illustrations and parts lists for common sub-assemblies (example: hub units) are now located in the "Sub-Assembly Parts Lists and Figures" section in the Illustrated Parts List chapter and revised as necessary

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REVISION 2 HIGHLIGHTS

1. Introduction

   A. General

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

   B. Components

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

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

      (3) Comments indicates the level of the revision.

         1 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.

         2 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.

         3 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.

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

Revision No.	Issue Date	Comments
Original	Feb/17	New Issue
1	Dec/21	Major Revision
2	Apr/23	Major Revision

RECORD OF REVISIONS

This is a record of revisions inserted into this manual.
Revision 2 includes all prior revisions.

Revision Number	Issue Date	Date Inserted	Inserted By
2	Apr/23	Apr/23	HPI

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RECORD OF TEMPORARY REVISIONS

Update this page to show all Temporary Revisions inserted into this manual.
Revision 2 includes all prior temporary revisions, up to and including TR-001.

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

RECORD OF TEMPORARY REVISIONS

Update this page to show all Temporary Revisions inserted into this manual.
Revision 2 includes all prior temporary revisions, up to and including TR-001.

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 Document Number	Incorporation Rev./Date
Service Letters:			
HC-SL-61-187, R3	Rev. 1 Dec/21		
HC-SL-61-354	Rev. 1 Dec/21		

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 Inc. Owner's Manual 136 (61-00-36).

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LIST OF EFFECTIVE PAGES

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INTRODUCTION - CONTENTS

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1. General (Rev. 1)

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 Inc. 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 Inc. 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 Inc. 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 Inc. Publications

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

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

Manual No. (ATA No.)	Available at www.hartzellprop.com	Hartzell Propeller Inc. Manual Title
n/a	Yes	Active Hartzell Propeller Inc. Service Bulletins, Service Letters, Service Instructions, and Service Advisories
Manual 127 (61-16-27)	Yes	Metal Spinner Maintenance Manual
Manual 133C (61-13-33)	-	Aluminum Blade Overhaul Manual
Manual 136 (61-00-36)	Yes	Propeller Owner's Manual and Logbook for Reversible Propeller HC-E3YR-7( ) and Pressure Control Unit B-4270-( )
Manual 148 (61-16-48)	Yes	Composite Spinner Maintenance Manual
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	Propeller 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. 1)

   A. Service and Maintenance Procedures in this Manual

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

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

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

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

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

   A. Special Tooling

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

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

   B. Consumable Materials

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

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

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. 2)
   A. Calendar Limits
      (1) The effects of exposure to the environment over a period of time create a need for propeller overhaul regardless of flight time.
      (2) A calendar limit between overhauls is specified in Hartzell Propeller Inc. Service Letter HC-SL-61-61Y.
      (3) Experience has shown that special care, such as keeping an aircraft in a hangar, is not sufficient to permit extension of the calendar limit.
      (4) The start date for the calendar limit is when the propeller is first installed on an engine.
      (5) The calendar limit is not interrupted by subsequent removal and/or storage.
      (6) The start date for the calendar limit must not be confused with the warranty start date, that is with certain exceptions, the date of installation by the first retail customer.
   B. Long Term Storage
      (1) Propellers that have been in storage have additional inspection requirements before installation. Refer to the Packaging and Storage chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

7. Component Life and Overhaul (Rev. 2)

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

A. Component Life

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

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

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

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

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

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

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

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

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

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

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

(b) Hub replacement

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

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

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

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

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

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

B. Overhaul

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

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

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

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

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

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

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

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

8. Damage/Repair Types (Rev. 1)

A. Airworthy/Unairworthy Damage

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

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

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

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

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

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

B. Minor/Major Repair

(1) Minor Repair

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

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

(2) Major Repair

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

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

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

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

9. Propeller Critical Parts (Rev. 1)

A. Propeller Critical Parts

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

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

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

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

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

10. Warranty Service (Rev. 1)

A. Warranty Claims

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

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

11. Hartzell Propeller Inc. Contact Information (Rev. 2)

A. Product Support Department

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

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

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

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

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

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

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

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

B. Technical Publications Department

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

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

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

C. Recommended Facilities

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

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

12. Definitions (Rev. 4)

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

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

Term	Definition
Brinelling	A depression caused by failure of the material in compression
Bulge	An outward curve or bend
Camber	The surface of the blade that is directed toward the front of the aircraft. It is the low pressure, or suction, side of the blade. The camber side is convex in shape over the entire length of the blade.
Chord	A straight line distance between the leading and trailing edges of an airfoil
Chordwise	A direction that is generally from the leading edge to the trailing edge of an airfoil
Co-bonded	The act of bonding a composite laminate and simultaneously curing it to some other prepared surface
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.

Term	Definition
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.
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

Term	Definition
Distortion	Alteration of the original shape or size of a component
Edge Alignment	Distance from the blade centerline to the leading edge of the blade
Erosion	Gradual wearing away or deterioration due to action of the elements
Exposure	Leaving material open to action of the elements
Face	The surface of the blade that is directed toward the rear of the aircraft. The face side is the high pressure, or thrusting, side of the blade. The blade airfoil sections are normally cambered or curved such that the face side of the blade may be flat or even concave in the midblade and tip region.
Face Alignment	Distance from the blade centerline to the highest point on the face side perpendicular to the chord line
Feathering	The capability of blades to be rotated parallel to the relative wind, thus reducing aerodynamic drag
Fraying	A raveling or shredding of material
Fretting	Damage that develops when relative motion of small displacement takes place between contacting parts, wearing away the surface
Galling	To fret or wear away by friction
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

Term	Definition
Laminate	To unite composite material by using a bonding material, usually with pressure and heat
Lengthwise	A direction that is generally parallel to the pitch axis
Loose Material	Material that is no longer fixed or fully attached
Low Pitch	The lowest blade angle attainable by the governor for constant speed operation
Major Propeller Effect	The major propeller effects are defined in Title 14 CFR section 35.15(g)(2)
Minor Deformation	Deformed material not associated with a crack or missing material
Monocoque	A type of construction in which the outer skin carries all or a major part of the load
Nick	Removal of paint and possibly a small amount of material
Non-Aviation Certified	Intended for non-aircraft application, such as Hovercraft or Wing-in-Ground effect (WIG) applications. These products are certificated by an authority other than FAA. The hub and blades will be stamped with an identification that is different from, but comparable to TC and PC.
Non-Aviation Experimental	Intended for non-aircraft application, such as Hovercraft or Wing-In-Ground effect (WIG) applications. Products marked with an “X” at or near the end of the model number or part number are not certified by any authority and are not intended for use on certificated craft.
Onspeed	Condition in which the RPM selected by the pilot through the propeller control/condition lever and the actual engine (propeller) RPM are equal
Open Circuit	Connection of high or infinite resistance between points in a circuit which are normally lower
Outboard	Toward the tip of the blade
Overhaul	The periodic disassembly, inspection, repair, refinish, and reassembly of a propeller assembly to maintain airworthiness

Term	Definition
Overspeed	Condition in which the RPM of the propeller or engine exceeds predetermined maximum limits; the condition in which the engine (propeller) RPM is higher than the RPM selected by the pilot through the propeller control/condition lever
Pitch	Same as “Blade Angle”
Pitting	Formation of a number of small, irregularly shaped cavities in surface material caused by corrosion or wear
Pitting (Linear)	The configuration of the majority of pits forming a pattern in the shape of a line
Porosity	An aggregation of microvoids. See “voids”.
Propeller Critical Parts	A part on the propeller whose primary failure can result in a hazardous propeller effect, as determined by the safety analysis required by Title 14 CFR section 35.15
Reference Blade Radius	Refers to the propeller reference blade radius in an assembled propeller, e.g., 30-inch radius. A measurement from the propeller hub centerline to a point on a blade, used for blade angle measurement in an assembled propeller. An adhesive stripe (blade angle reference tape CM160) is usually located at the reference blade radius location. Note: Do not confuse *reference blade radius* with *blade station*; they may not originate at the same point.
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

Term	Definition
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
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

13. 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
N	Newtons

Abbreviation	Term
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

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DESCRIPTION AND OPERATION - CONTENTS

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1. General (Rev. 1)

   A. Propeller/Blade Model Designation

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

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

      (2) The 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 Inc. 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 composite blades, refer to Hartzell Propeller Inc. Composite Propeller Blade Maintenance Manual 135F (61-13-35).

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

2. Operation

   A. HC-E3YR-7( )

      (1) Hartzell Propeller Inc. compact HC-E3YR-7( ) propellers use aluminum blades mounted in an aluminum hub. The hub is held together with bolts and contains the pitch change mechanism. The pitch change components include the pitch change rod, fork, pitch change blocks, and pitch change mechanisms.

      (2) The series HC-E3YR-7( ) compact propellers are constant speed (RPM) control in flight and manually controlled positive and reverse thrust for (slow speed) maneuvering. They use a single oil supply from a governing device to hydraulically actuate a change in blade angle. The propellers are three-bladed and are used primarily on Lycoming engines.

      (3) The propeller may be used on a single engine fixed wing amphibian aircraft for constant speed (RPM) control in flight and manually controlled blade angle for water maneuvering, docking, and undocking of the aircraft in a waterborne environment. This propeller will not accommodate reverse thrust use during landing to shorten the landing distance.

      (4) A second use for the propeller is on a lighter than air vehicle such as a blimp. Constant speed (RPM) control would be used during constant forward motion and manually controlled blade angle for maneuvering when close to the ground and during docking with a mooring mast.

(5) The propeller will reach a high blade angle although it will not feather (a higher blade angle) to accommodate the possibility of an in-flight shutdown to prevent propeller windmilling. This propeller is not intended for multiple engine fixed wing aircraft although it is available for use on lighter than air vehicles (blimps) with a single engine or multiple engines.

(a) Lighter than air vehicles float and do not depend on forward speed and airflow over a wing to produce lift. This results in an aircraft that does not require feathering even though it utilizes multiple engines.

(6) A two piece aluminum hub retains each propeller blade on a blade retention bearing which allows blade angle change during propeller rotation on the engine shaft. A cylinder is attached to the hub and contains a hydraulic piston and a spring set. The hydraulically actuated piston transmits linear motion through a pitch change mechanism to a fork that attaches to each blade through a pitch change that is attached to each blade. The propeller attaches to the engine flange on the end of the engine shaft. The pressure control unit installs between the engine and governor on the governor accessory pad provided on the engine.

(a) A drive extension must be installed for the engine to drive the governor and permit installation of the pressure control unit.

(7) In flight the propeller is controlled by an engine speed sensing device (governor) to maintain a constant engine/propeller RPM by changing blade angle through the supply or drain of oil through a hollow engine shaft to the hydraulic piston of the propeller. The linear motion of the hydraulic piston is transmitted to each blade through a pitch change rod and an attached fork that engages a pitch change knob on each blade. Each blade is supported and retained by the hub at its root by a blade retention bearing that permits the blade to rotate for pitch change during propeller rotation.

(8) The governor uses an internal pump that is driven by the engine through an accessory drive location. The governor pump increases engine oil pressure for supply to the propeller. Engine speed sensing hardware within the governor controls the supply of oil to, or the drain of oil from, the propeller as appropriate to change blade angle to maintain constant engine speed (RPM). Increasing the volume of oil within the hydraulic piston and cylinder will decrease blade angle and increase propeller RPM. Decreasing the volume of oil within the hydraulic piston and cylinder will increase blade angle and decrease propeller RPM. By changing the blade angle, the governor can vary the load on the engine and maintain constant engine/propeller RPM.

(9) During propeller operation 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. Spring and counterweight forces attempt to rotate the blades to higher blade angles while the centrifugal twisting moment of each blade is generally toward lower blade angles. Blade aerodynamic twisting force is generally very small in relation to the other forces and can attempt to increase or decrease blade angle based on blade design. Summation of the propeller forces is toward higher pitch (low RPM) and is opposed by a variable force toward lower pitch (high RPM). The variable force is oil under pressure from a governor with an internal pump that is mounted on and driven by the engine. The supply of oil will move the propeller pitch to a lower blade pitch (higher RPM), the drain of oil will move the propeller pitch to a higher blade pitch (lower RPM) and no change of oil will maintain the current blade pitch (no change of RPM).

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TESTING AND FAULT ISOLATION - CONTENTS

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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 1.B. Friction.
	or	Oil leaking past the piston causing underspeed.	Disassemble the propeller and inspect the O-ring and piston-to-cylinder sealing surfaces. Replace defective O-ring.
B. Friction		Lack of lubrication.	Add approved lubrication.
	or	Blade preload is too much.	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	Not enough clearance between the various moving parts in the pitch change mechanism.	Check/increase the clearances between the individual parts as necessary to decrease friction in the mechanism.
C. Abnormal Propeller Vibration		Bent, cracked, or damaged blade.	Refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33) or Hartzell Propeller Inc. Composite Propeller Blade Manual 135F (61-13-35).
	or	Cracked or damaged hub.	Refer to the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Problem		Probable Cause	Remedy
D. Blades Not Tracking		Foreign object strike damage.	Refer to the Special Inspections chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) for inspection procedure.
E. End-Play Movement of the Blade Refer to Figure 8-1 in the Fits and Clearances chapter of this manual.		Buildup of wear or repair tolerances.	Disassemble the propeller and reset the preload.
	or	Blade retention bearing is worn.	Inspect/Replace blade retention bearing.
	or	Blade alignment bearing is worn.	Replace the blade alignment bearing.
F. In-and-Out Movement of the Blade Refer to Figure 8-1 in the Fits and Clearances chapter of this manual.		Buildup of wear or repair tolerances.	Disassemble the propeller and reset the preload.
	or	Blade retention bearing is worn.	Inspect/Replace blade retention bearing.
G. Fore-and-Aft Movement of the Blade Refer to Figure 8-1 in the Fits and Clearances chapter of this manual.		Buildup of wear or repair tolerances.	Disassemble the propeller and reset the preload.
	or	Blade retention bearing is worn.	Replace blade retention bearing.
	or	Blade alignment bearing is worn.	Replace the blade alignment bearing.
H. Radial Play in the Blade		Pitch change fork is worn.	Disassemble the propeller. Inspect and replace parts, as required.
	or	Pitch change knob bushing is worn.	Disassemble the propeller. Inspect and replace parts, as required.
	or	Pitch change block is worn.	Disassemble the propeller. Inspect and replace parts, as required.

Problem		Probable Cause	Remedy
I. Oil Leakage		Defective O-ring seal between the engine flange and the propeller mounting flange.	Remove the propeller from the engine and examine the O-ring and the sealing surface. Replace the defective O-ring.
	or	Engine crankshaft seal leaking.	Replace the engine crankshaft seal.
	or	Defective O-ring seal between the hub-half and the cylinder.	Remove the cylinder and inspect the O-ring and the sealing surface. Replace the defective O-ring.
	or	Defective internal propeller O-ring.	Disassemble the propeller and inspect the O-ring and pitch change rod-to-hub sealing surface (cylinder-side). Replace the defective O-ring.
J. External Grease Leakage		Defective, loose, missing, or incorrectly torqued lubrication fitting.	Replace the missing or defective lubrication fitting. Torque the lubrication fitting in accordance with Table 8-1 in the Fits and Clearances chapter of this manual.
	or	Grease leaking between blade and hub.	Disassemble the propeller and inspect the hub-to-blade seal and sealing surfaces. Replace the defective seal.

2. Lightning Strike on Hub or Blade (Rev. 1)

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 blade, as evidence of where it entered or left the tip of the blade.

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

AUTOMATIC TEST REQUIREMENTS (NOT APPLICABLE) (Rev. 1)

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 Inc. propellers included in this manual.

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DISASSEMBLY - CONTENTS

LIST OF FIGURES

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1. Important Information (Rev. 3)

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 Inc. 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 Inc. 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 Inc. 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 Inc., refer to the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA) for technical information about the applicable ice protection system.

2. Disassembly of the Propeller Model HC-E3YR-7( )

WARNING 1: THE PROPELLER MODEL IN THIS SECTION USES SPRINGS UNDER PRESSURE. THE SPRINGS COULD BECOME PROJECTILES THAT COULD CAUSE INJURY OR DEATH AND MUST BE CAREFULLY DISASSEMBLED ACCORDING TO THE DIRECTIONS.

WARNING 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.

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 175 PSI (12.06 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. Disassembly of the Hub Balance Weights

(1) Remove and discard the safety wire from the balance weight screws (9000).

(2) Remove and discard the balance weight screws (9000).

B. Disassembly of the Blade Counterweights

(1) Remove the counterweights (9030) from the aluminum blades in accordance with Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

(a) If the blade counterweights (9030) are not removed from the blades, the blades cannot be turned far enough to remove the fork (280).

C. Disassembly of the Cylinder-side Pitch Adjustment Components

(1) For propellers using one-piece spinners, remove and discard the set screw (50) from the cylinder wrench attachment hole.

(2) Remove the pitch stop nut (10).

(3) Remove the pitch stop (30).

(a) The plug (20) in the end of the pitch stop (30) is only removed if it does not meet the requirements for serviceable limits. For the serviceable limits, refer to the section for the pitch stop (30) in the Check chapter of this manual.

(4) Remove and discard the pitch stop O-ring (40) from the end of the cylinder (60).

(5) Using air pressure in the rotatable fixture TE125, move the propeller to low pitch position.

WARNING: HOLD THE PROPELLER BLADES AT LOW PITCH WITH AIR PRESSURE IN THE ROTATABLE FIXTURE. REMOVAL OF THE STOP SCREW (160) WITHOUT AIR PRESSURE COULD RESULT IN SUDDEN AND EXPLOSIVE ROTATION OF THE BLADES TO HIGH PITCH, RESULTING IN PERSONAL INJURY AND DAMAGE TO THE INTERNAL COMPONENTS OF THE PROPELLER.

(6) Using the T-handle wrench TE381 or equivalent, remove and discard the cap screw (160) from the end of the pitch change rod (250).

(7) Using a locally procured magnet if desired, remove the feather adjust washer(s) (170), stop collar (180), and high pitch adjust washer(s) (190).

(a) To make propeller reassembly easier, make a record of the number of washers (170, 190) both under the stop collar (180) and on top of the stop collar (180).

(8) Keep the stop collar (180). Discard the feather adjust washer(s) (170), and high pitch adjust washer(s) (190).

(9) Slowly release the air pressure in the rotatable fixture to permit the propeller to move to high pitch position.

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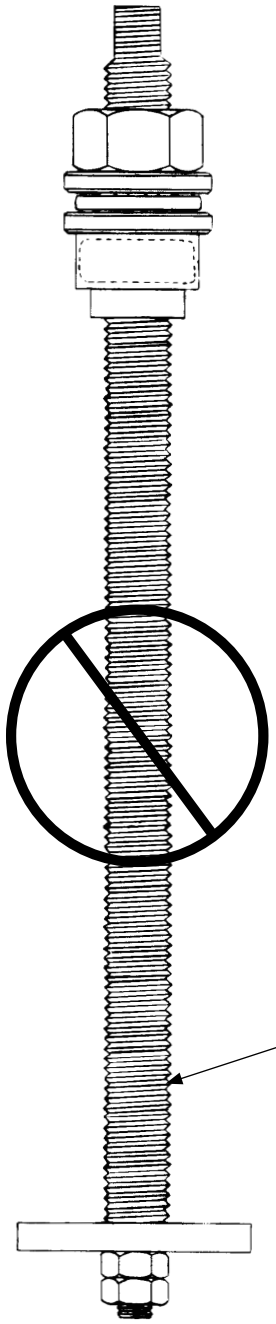


OD of
Assembling Tool

Assembling Tool TE9
Do **NOT** use for the
HC-E3YR-7( ) Propeller

Assembling Tool TE627
USE for the
HC-E3YR-7( ) Propeller

TPI-APS6326

Using the Correct Assembling Tool TE627
Figure 3-1

D. Disassembly of the Cylinder and Piston

WARNING: USE CAUTION WHEN REMOVING THE CYLINDER AND COMPRESSION SPRINGS. WHEN COMPRESSED, THE COMPRESSION SPRINGS ARE LOADED TO APPROXIMATELY 750 POUNDS (341 KG) FORCE. MAKE SURE OF THE SAFETY OF PERSONNEL IN THE AREA DURING THE DISASSEMBLY PROCEDURES.

CAUTION: CYCLE THE PROPELLER BEFORE BEGINNING THE CYLINDER REMOVAL PROCESS. FAILURE TO CYCLE THE PROPELLER MAY CAUSE THE PITCH CHANGE ROD TO PREMATURELY DISENGAGE FROM THE FORK.

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

(a) Install four 1/4-28 UNF-3B screws through the cylinder wrench TE153 into the four threaded holes provided in the cylinder unit (60).

WARNING: MAKE SURE TO USE ASSEMBLING TOOL TE627 WHEN DISASSEMBLING THE HC-E3YR-7( ) PROPELLER. DO NOT USE ASSEMBLING TOOL TE9. USING THE WRONG TOOL WILL CAUSE THE CYLINDER TO BE FORCEFULLY RELEASED RESULTING IN SERIOUS BODILY INJURY AND/OR SUBSTANTIAL PROPERTY DAMAGE.

(2) Make sure that the assembling tool that will be used is TE627. For identification of TE627, refer to Figure 3-1.

(a) The OD of assembling tool TE9 is too large to fit through the ID of the high pitch stop (90) and will not thread correctly into the pitch change rod (250) to prevent the springs (130, 140) from forcefully releasing when the cylinder unit (60) is removed.

(b) Assembling tool TE627 has a smaller OD than assembling tool TE9 that will fit through the ID of the high pitch stop (90) and thread correctly into the pitch change rod (250) to prevent the springs (130, 140) from forcefully releasing when the cylinder unit (60) is removed.

(3) Insert the small, threaded end of the assembling tool TE627 into the cylinder unit (60) and turn the assembling tool TE627 into the end of the pitch change rod (250) until tight.

NOTE: Using the assembling tool TE627 prevents the springs (130, 140) from forcefully releasing when the cylinder unit (60) is removed.

(4) Tighten the hex nut on the assembling tool TE627 until the guide washer and the thrust bearing are snug against the cylinder unit (60).

(5) Loosen the hex nut on the assembling tool TE627 approximately two full turns. Refer to Figure 3-2.

CAUTION: DO NOT DAMAGE THE THREADS OF THE CYLINDER (60) WHEN REMOVING THE CYLINDER FROM THE HUB (400).

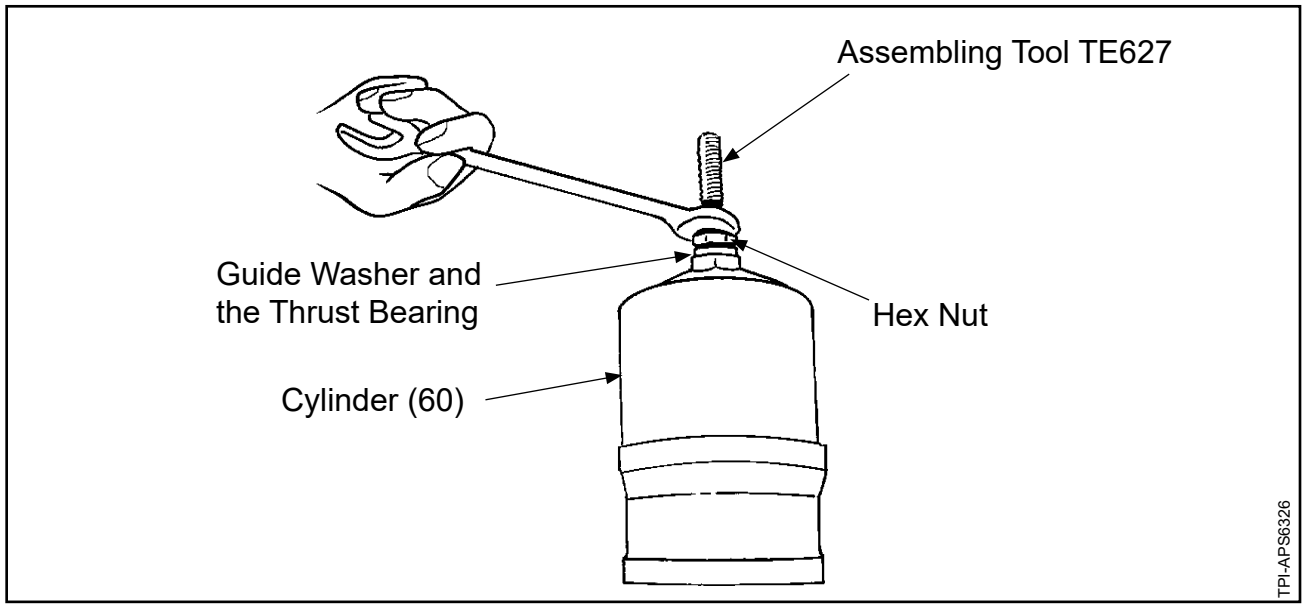
(5) Turn the cylinder wrench TE153 counterclockwise until the threads of the cylinder (60) are free from the hub (400).

NOTE: The high pitch stop (90) that is attached to the cylinder unit (60) is removed with the cylinder unit (60).

(6) Slowly unthread the hex nut on the assembling tool TE627, permitting the compression springs (130, 140) to gradually extend.

(a) The compression springs (130, 140) are completely extended when the hex nut, washer, and thrust bearing on the assembling tool TE627 become loose.

(7) Remove the assembling tool TE627 and the cylinder wrench TE153 from the cylinder unit (60).



Loosening the Assembling Tool
Figure 3-2

(8) Remove the cylinder unit (60), with the high pitch stop (90), from the propeller.

(9) Remove and discard the screws (100) that attach the high pitch stop (90) to the cylinder unit (60).

(10) Remove the high pitch stop (90) from the cylinder unit (60).

(11) Remove the O-ring (80) from the cylinder unit (60).

(12) Remove the spring guide (110).

(13) Remove the large compression spring (140).

(14) Remove the ball thrust bearing (120).

(15) Remove the small compression spring (130).

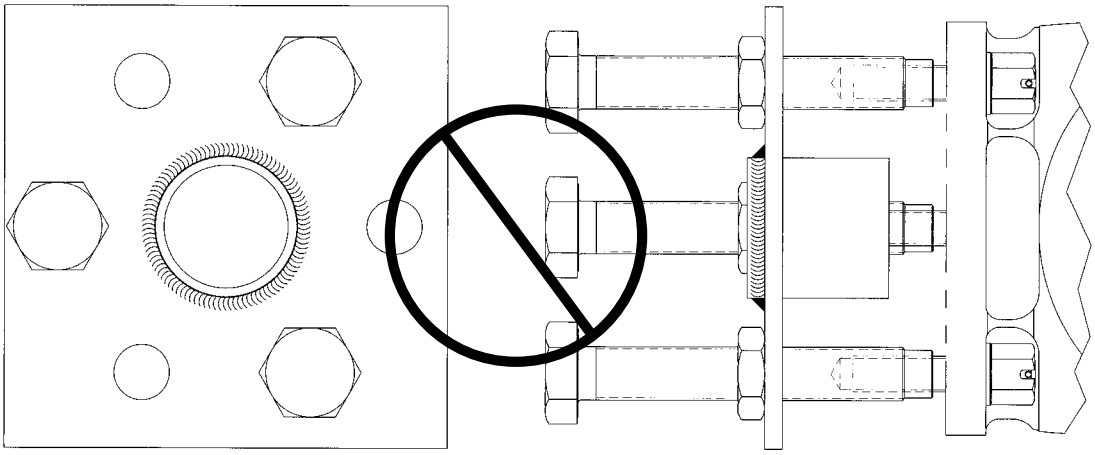
(16) Remove the spring guide (150).

(17) Remove and discard the piston nut (200).

(18) Remove the piston unit (210).

(19) Remove and discard the piston O-ring (240).

(20) Remove and discard the cylinder mounting O-ring (260) from the cylinder-side half of the hub (400).



Spring Compressor Assembly TE31
Do **NOT** use for disassmbly of the HC-E3YR-7( ) Propeller

Spring Compressor Assembly TE625
Use for disassmbly of the HC-E3YR-7( ) Propeller

TPI-BST-2826-1,TPI-152-043

Using the Correct Spring Compressor Assembly TE625
Figure 3-3

E. Disassembly of the Hub-side Pitch Adjustment Components

WARNING: MAKE SURE TO USE SPRING COMPRESSOR ASSEMBLY TOOL TE625 WHEN DISASSEMBLING THE HC-E3YR-7( ) PROPELLER. DO NOT USE SPRING COMPRESSOR ASSEMBLY TOOL TE31. USING THE WRONG TOOL WILL CAUSE THE SPRING (610) TO BE FORCEFULLY RELEASED RESULTING IN SERIOUS BODILY INJURY AND/OR SUBSTANTIAL PROPERTY DAMAGE.

(1) Make sure that the spring compressor assembly tool TE625 is used. For identification of TE625, refer to Figure 3-3.

(a) The OD of the spring compressor slide of the spring compressor assembly tool TE31 is too large to permit the removal of the parts in a way that will prevent the spring (610) from being forcefully released during disassembly.

(b) Spring compressor assembly tool TE625 has a different configuration than spring compressor assembly tool TE31 and will permit the removal of the parts in a way that will prevent the spring (610) from being forcefully released during disassembly.

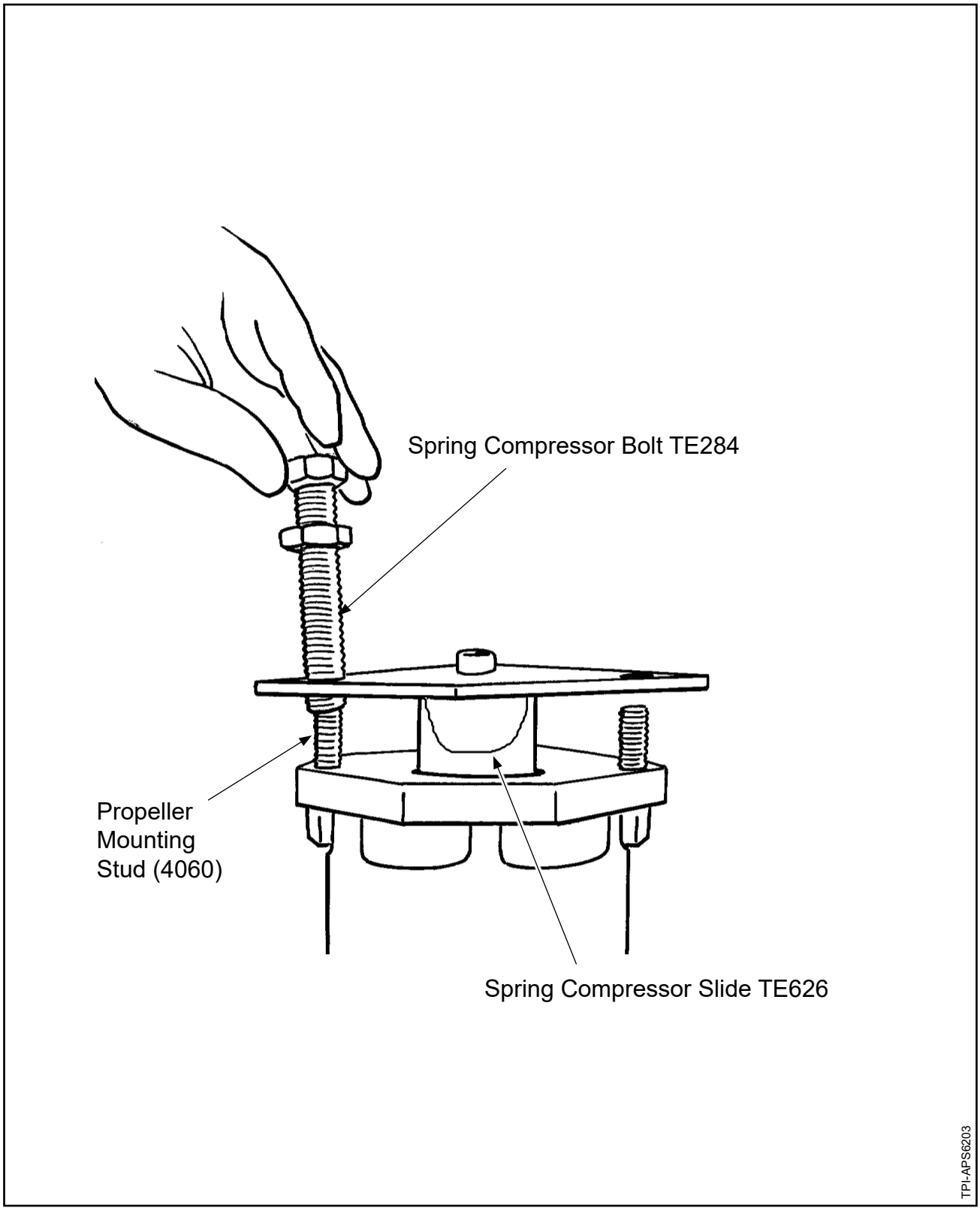
WARNING: USE EXTREME CAUTION WHEN MOVING THE PROPELLER. WHEN COMPRESSED, THE HUB COMPRESSION SPRINGS (130, 140) ARE LOADED TO APPROXIMATELY 1000 POUNDS (454 KG) FORCE. MAKE SURE OF THE SAFETY OF PERSONNEL IN THE AREA DURING THE DISASSEMBLY PROCEDURES.

(2) Using a sling, remove the propeller from rotatable fixture TE125 on the assembly table TE129.

CAUTION: DO NOT DAMAGE THE PITCH CHANGE ROD (250) WHEN MOVING THE PROPELLER.

(3) Turn the propeller over and put it on a support to get access to the propeller mounting flange of the hub (400).

(a) A sturdy barrel or drum with the rim well padded, may be used as a support.



Installing the Spring Compressor Assembly TE625
Figure 3-4

(4) Install the spring compressor assembly TE625 on the propeller mounting flange. Refer to Figure 3-4.

NOTE: The spring compressor assembly TE625 has six holes to clear the studs already installed.

(a) Center the spring compressor slide TE626 on the beta lockout assembly (620) in the propeller hub bore and align the spring compressor bolts TE284 with the studs (4060) in the mounting flange of the hub (400).

1 The spring may be compressed using only two of the three spring compressor bolts TE284 supplied, positioned approximately 180 degrees apart.

(b) Install the nuts on the spring compressor bolts TE284.

1 Put the nuts close to the heads of the spring compressor bolts TE284.

(c) Turn the ends of the spring compressor bolts TE284 into the propeller mounting studs until tight. Refer to Figure 3-4.

NOTE: The spring compressor bolts TE284 have both ID and OD threads.

WARNING: WHEN COMPRESSED, THE HUB COMPRESSION SPRING (610) IS LOADED TO APPROXIMATELY 1000 POUNDS (454 KG) FORCE. MAKE SURE OF THE SAFETY OF PERSONNEL IN THE AREA DURING ASSEMBLY PROCEDURES.

CAUTION: TIGHTEN THE SPRING COMPRESSOR NUTS EVENLY TO PREVENT BINDING.

(5) Compress the compression spring (610) by evenly tightening the spring compressor nuts until there is no pressure on the internal retaining ring (680). Refer to Figure 3-5.

(6) Using a locally procured retaining ring removal tool, remove and discard the internal retaining ring (680).

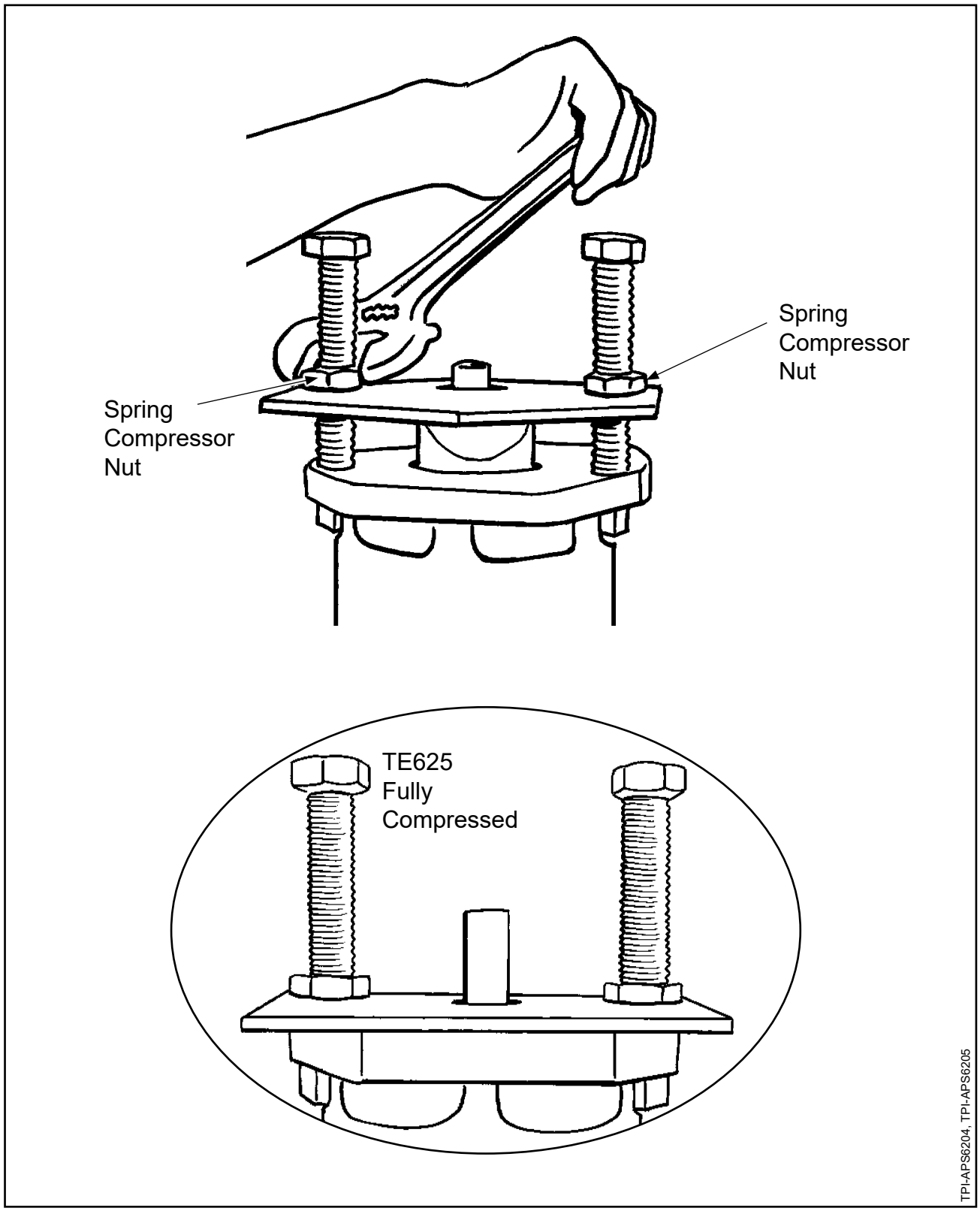
(7) Compress the compression spring (610) by evenly tightening the spring compressor nuts to move the beta lockout assembly (620) and the stop collar (700) so the split keeper (730) can be removed.

(8) Remove and discard the internal retaining ring (720) from the pitch change rod (250).

(9) Remove the washer (710).

(10) Move the stop collar (700) away from the mounting flange of the hub (400).

(11) Remove and discard the split keeper (730).



Compressing the Compression Spring with the Spring Compressor Assembly TE625
Figure 3-5

(12) Remove the stop collar (700).

(13) Remove the pitch adjust spacer(s) (690).

(a) Make a record of the quantity and thickness of the pitch adjust spacer(s) (690) that were removed.

NOTE: Knowing the quantity and thickness of the pitch adjust spacer(s) (690) that were removed will help when the propeller is reassembled.

CAUTION: MAKE SURE TO DECOMPRESS THE SPRING COMPRESSOR NUTS EVENLY TO PREVENT BINDING OF THE BETA LOCKOUT ASSEMBLY (620) IN THE BORE OF THE HUB (400).

(14) Slowly decompress the compression spring (610) by evenly loosening the nuts on the spring compressor assembly TE625.

(15) Remove the spring compressor assembly TE625 from the propeller mounting bolts.

(16) Remove the beta lockout assembly (620) and put aside for further disassembly.

(17) Remove the compression spring (610).

(18) Remove the spring guide (600).

F. Disassembly of the Cylinder-side Pitch Adjustment Components

CAUTION: DO NOT DAMAGE THE PITCH CHANGE ROD (250) WHEN MOVING THE PROPELLER.

(1) Reinstall the propeller on the rotatable fixture TE125 of the assembly table TE129.

(2) Using the wrench adapter TE6, remove the pitch change rod (250).

(3) Remove and discard the hub clamping nuts (450) and washers (440).

(4) Remove the short and long hub clamping bolts (420, 430).

(5) Lift off the cylinder-side half of the hub (400).

(a) A plastic wedge and rubber mallet may be used to separate the halves of the hub (400).

NOTE: The cylinder-side half of the hub (400) can be difficult to remove because sealant was applied between the halves of the hub (400).

(6) Remove and discard the pitch change rod O-ring (270) from the cylinder-side half of the hub (400).

(7) Using blade retention components clamp TE24, if desired, remove blade number one, preload plate (3080), and race (3020).

(a) Set aside the blade and blade retention parts for later disassembly.

(8) Remove the pitch change fork (280).

(9) Remove and discard each pitch change fork button (290) from the fork (280).

(10) Using blade retention components clamp TE24, if desired, remove the remaining blade(s).

(a) Put the blades and the blade retention parts aside for later disassembly.

(11) Remove the pitch change block (300) from each blade.

G. Disassembly of the Blade Retention Parts - Refer to Figure 10-3.

(1) Remove and discard the blade seal (3010).

(2) Remove the hub-side race (3020).

(3) Remove and discard the ball bearings (3030).

(4) Remove and discard the ball spacer (3040).

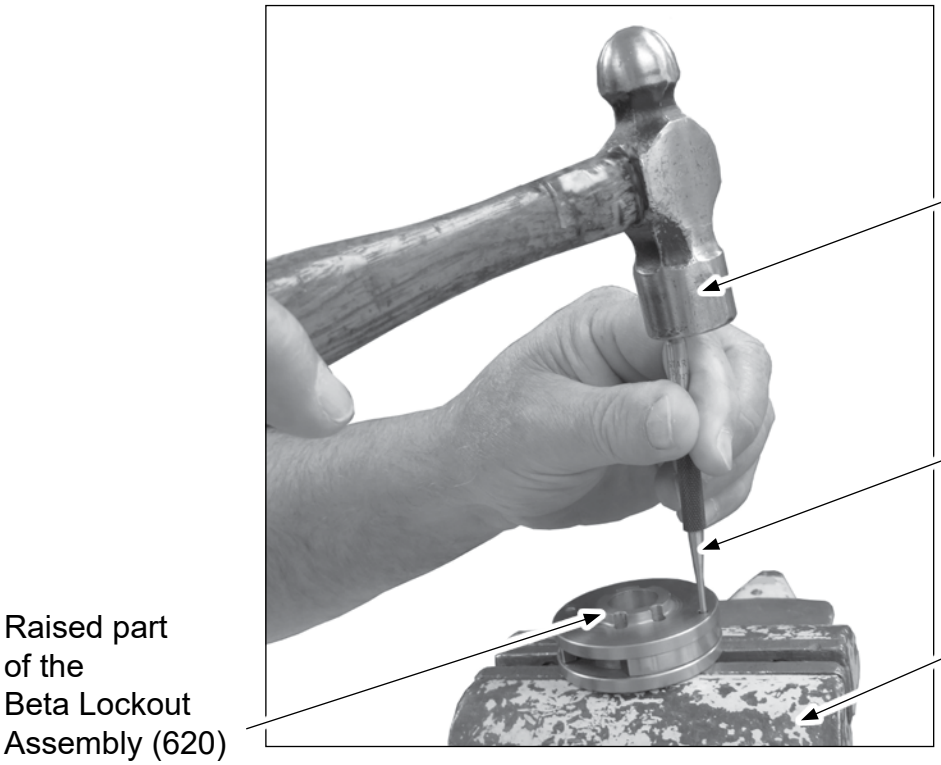
(5) Remove the preload plate assembly (3080).

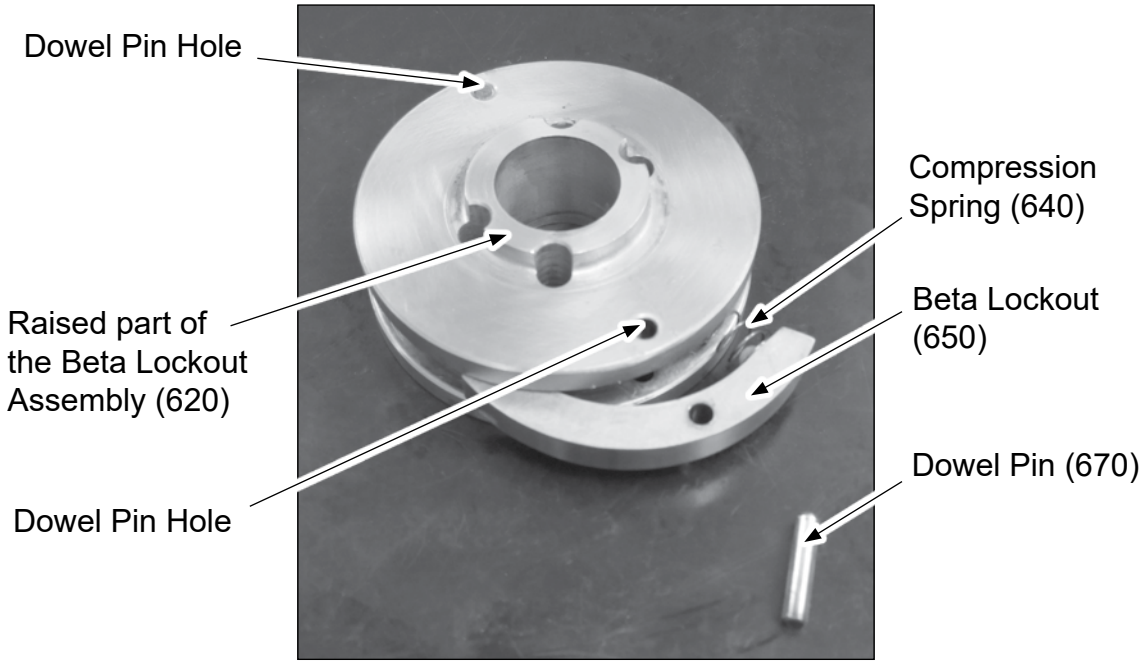
(6) Remove and discard the nut (3110) and set screw (3100) from each preload plate assembly (3080).

(7) Remove and discard the pitch change knob bushing (3000) from the blade.

(8) Remove the blade-side blade retention bearing (3050) of the blade retention split-bearing.

(9) For blade overhaul procedures, refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).





Disassembly of the Beta Lockout Assembly
Figure 3-6

H. Disassembly of the Beta Lockout Assembly - Refer to Figure 3-6.

(1) With the raised part of the beta lockout assembly (620) pointing upwards, put the beta lockout assembly (620) on a surface that will permit the dowel pin (670) to be pushed out of the dowel pin hole in the beta lockout assembly (620).

NOTE: A locally procured bench vise with the jaws of the vise spread apart wide enough for the dowel pin (670) to easily pass between the jaws of the vise may be used as a surface.

(2) Using a locally procured pin punch of an appropriate size and a hammer, tap the two dowel pins (670) out of the beta lockout assembly (620).

(3) Discard the dowel pins (670).

CAUTION: DO NOT DAMAGE THE CORNERS OF THE BETA LOCKOUT (650) WHEN REMOVING IT FROM THE BETA LOCKOUT ASSEMBLY (620). DAMAGE TO THE CORNERS CAN CAUSE THE BETA LOCKOUT (650) TO HAVE TO BE REPLACED.

(4) Remove the two beta lockouts (650) from the beta lockout assembly (650).

(a) If the beta lockout (650) cannot be easily removed, a locally procured small, non-metallic wedge can be used to carefully pry the beta lockout (650) out of the beta lockout assembly (620).

(b) The beta lockout spring guide (660) in the beta lockout (650) is only removed if it does not meet the requirements for serviceable limits. For the serviceable limits, refer to the section for the beta lockout (650) in the Check chapter of this manual.

(5) Remove and discard the two springs (640) from the beta lockout assembly (620).

3. Hub Disassembly

A. All Propeller Models

(1) Remove components of the hub unit/assembly (400) in accordance with the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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

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CLEANING - CONTENTS

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1. Cleaning Procedures (Rev. 3)

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.

A. General Cleaning

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

D. Cleaning Aluminum Parts for Penetrant Inspection

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

E. Cleaning Titanium Parts for Penetrant Inspection

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

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

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

(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.

(2) Plastic media may be used to remove the sealant from the cylinder threads, if minimal pressure and duration is used to minimize possible abrasion of the aluminum threads.

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CHECK - CONTENTS

CHECK - CONTENTS, CONTINUED

LIST OF FIGURES

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1. Inspection Interval Requirements (Rev. 1)
   A. General
      (1) For information about life limited components and mandatory inspections, refer to the Airworthiness Limitations chapter of the applicable Hartzell Propeller Inc. owner's manual.
      (2) For overhaul periods of Hartzell Propeller Inc. propellers, refer to Hartzell Propeller Inc. 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. 2)

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 Inc. Standard Practices Manual 202A (61-01-02).

C. Blades

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

D. Ice Protection Systems

(1) For ice protection systems supplied by Hartzell, refer to Hartzell Propeller Inc. 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 Inc. Metal Spinner Maintenance Manual 127 (61-16-27).

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

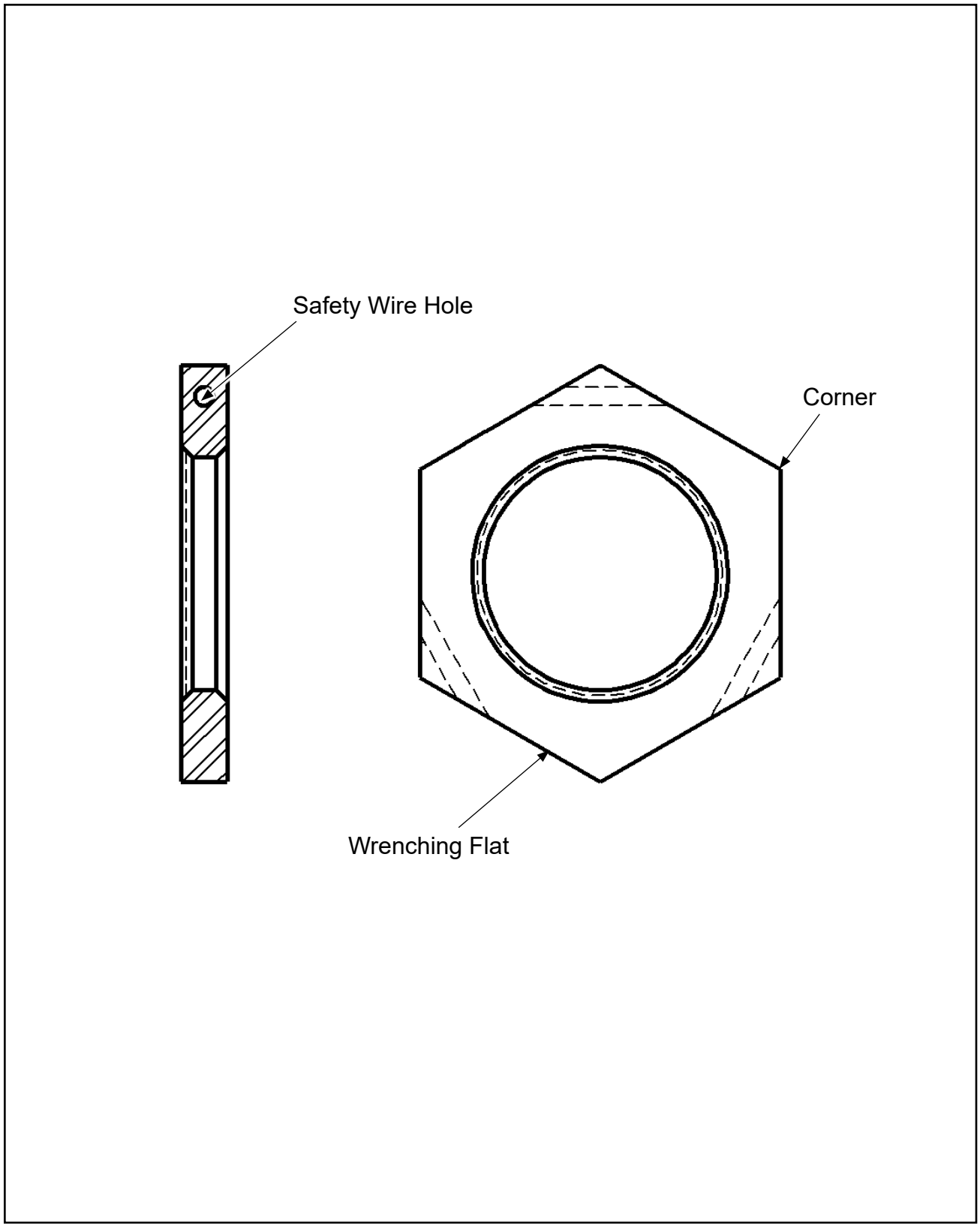
F. Special Inspections (Lightning Strike, Foreign Object Strike, etc.)

(1) Refer to the Special Inspections chapter of Hartzell Propeller Inc. 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.

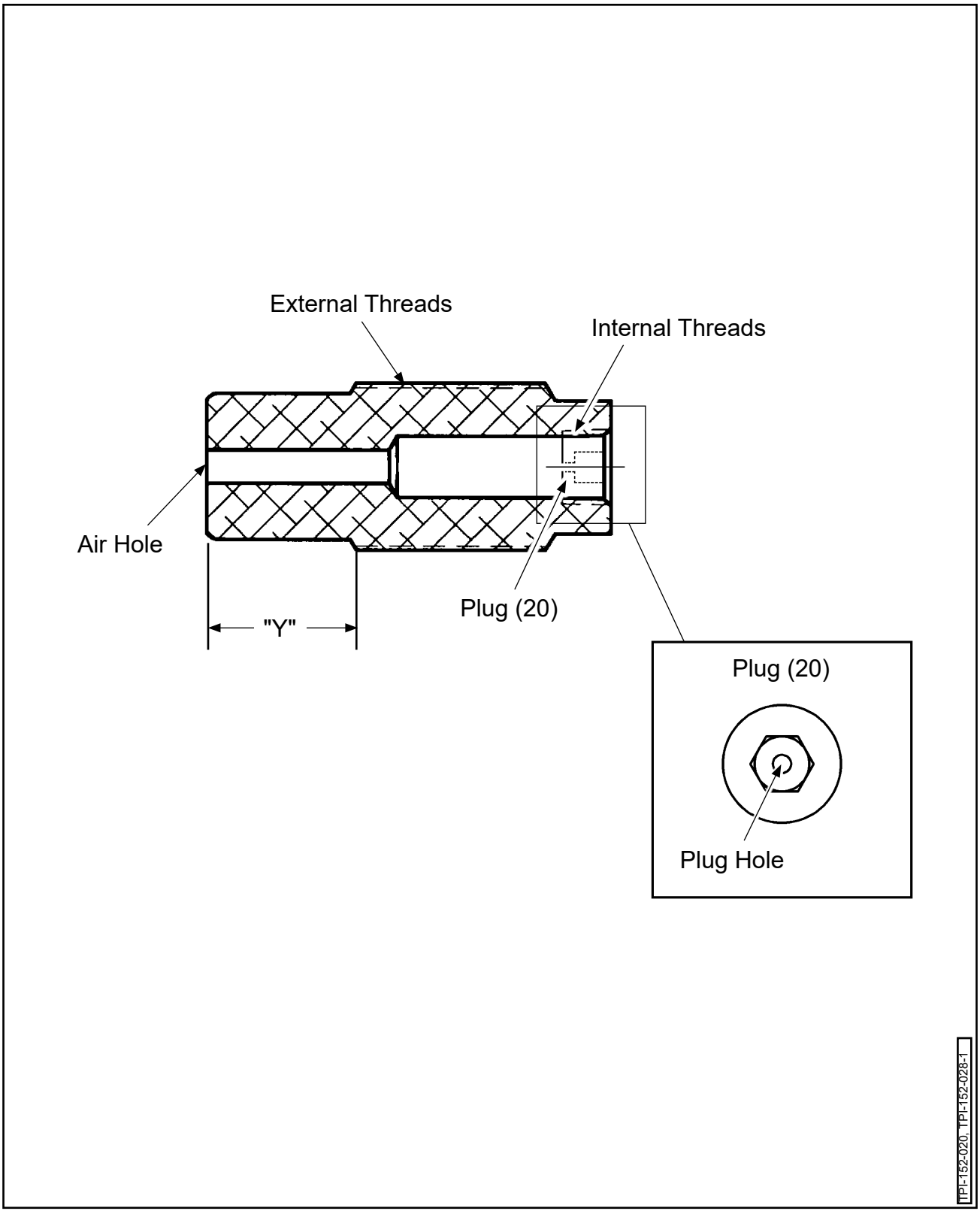
Refer to Table 5-1, "Component Inspection Criteria" in this chapter.



Nut
Figure 5-1

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
A. NUT (Item 10) (Refer to Figure 5-1.)			
(1)	Visually examine each 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 Inc. Standard Practices Manual 202A (61-01-02). If pitting is greater than the permitted serviceable limits, replace the nut.
(2)	Visually examine the nut for damage to the wrenching flats.	The corners between the wrenching flats may be rounded. Two (2) wrenching flats must be sufficiently undamaged to withstand installation torque. Material must not be displaced above or below the nut that could result in interference with the mating parts.	File away unwanted displaced material. If a minimum of two (2) flats will not withstand installation torque, replace the nut
(3)	Visually examine each nut for wear on surfaces other than the wrenching flats.	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 nut.
(4)	Visually examine the safety wire holes in the nut.	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 nut.
(5)	Visually examine the threads of the nut.	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 nut.
(6)	Visually examine the nut for cadmium plating coverage.	Cadmium plating must be on all surfaces of the nut.	Replate the nut in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc.Standard Practices Manual 202A (61-01-02).



Pitch Stop
Figure 5-2

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
B.	PITCH STOP (Item 30) (Refer to Figure 5-2.)		
	NOTE: To identify the pitch stop, refer to Table 7-1 in the Assembly chapter of this manual.		
(1)	Visually examine the pitch stop contact surface for damage.	Slight damage is permitted. Damage must not affect the performance of the pitch stop.	If the damage is greater than the permitted serviceable limits, replace the pitch stop.
(2)	Visually examine the external threads of the pitch stop for damage.	One damaged thread is permitted.	If the damage is greater than the permitted serviceable limits, replace the pitch stop.
(3)	Visually examine the air hole in the center of the pitch stop for unwanted material.	Unwanted material in the air hole of the pitch stop is not permitted.	Remove the unwanted material in the air hole of the pitch stop. If the unwanted material in the air hole cannot be removed, replace the pitch stop.
(4)	Visually examine the plug hole of the plug (20) in the end of the pitch stop.	Unwanted material in the plug hole of the plug (20) is not permitted.	Remove the unwanted material in the plug hole of the plug (20). If the unwanted material in the plug hole of the plug (20) cannot be removed, replace the plug (20) in accordance with the section, "Removing and Installing the Plug in the Pitch Stop" in the Repair chapter of this manual.
(5)	Using a pin gauge, measure the ID of the plug hole of the plug (20) in the end of the pitch stop.	The maximum permitted ID of the plug hole of the plug (20) in the end of the pitch stop is 0.072 inch (1.82 mm).	If the ID of the plug hole of the plug (20) in the end of the pitch stop is greater than the permitted serviceable limits, replace the plug (20) in accordance with the section, "Removing and Installing the Plug in the Pitch Stop" in the Repair chapter of this manual.
(6)	If the plug (20) in the end of the pitch stop must be removed, visually examine the internal threads of the pitch stop for damage.	One damaged thread is permitted.	If the damage is greater than the permitted serviceable limits, replace the pitch stop.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
B. PITCH STOP, CONTINUED (Item 30) (Refer to Figure 5-2.) NOTE: To identify the pitch stop, refer to Table 7-1 in the Assembly chapter of this manual.		
(7) Visually examine the hard anodize on the "Y" dimension surface of the pitch stop.	Loss of hard anodize on the "Y" dimension is not permitted. The OD threads may be bare aluminum or be coated with anodize.	If there is loss of hard anodize on the "Y" dimension, replace the pitch stop.

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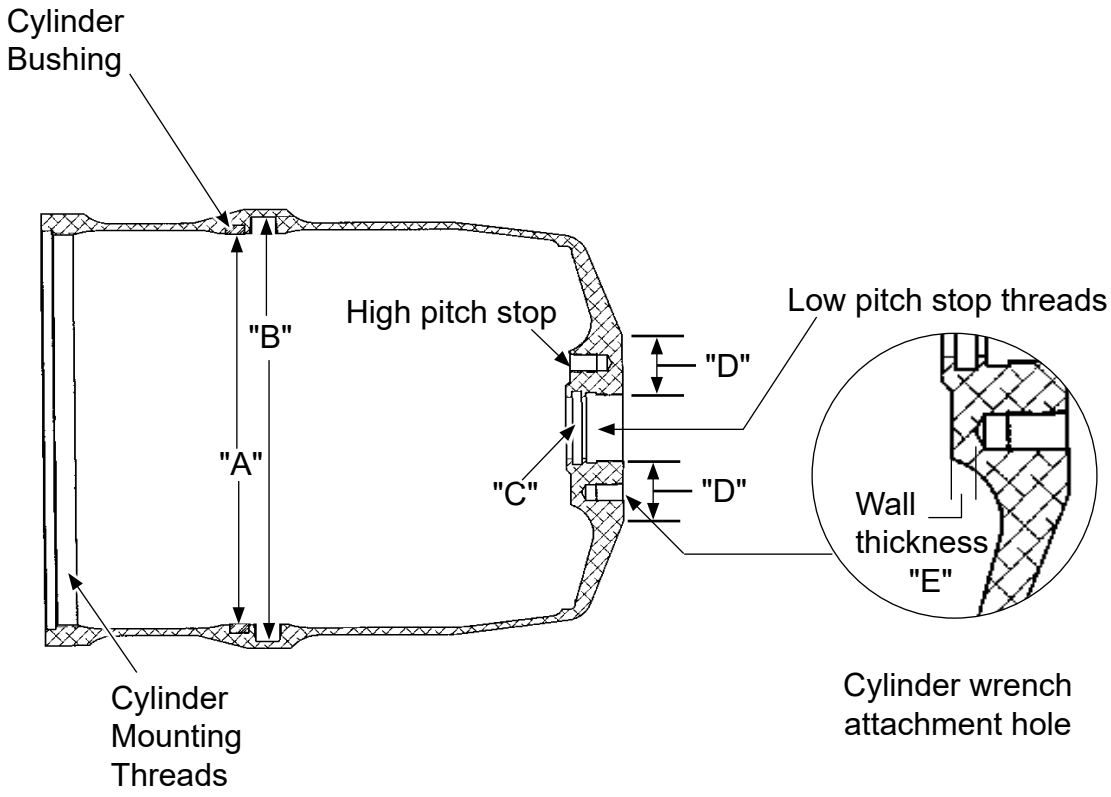

Part Number	"A" Bushing Maximum Diameter	"B" O-ring Groove Maximum Diameter	"C" Low Pitch Stop O-ring Groove Maximum Diameter
B-2423-1	4.759 inch (120.88 mm)	5.235 inch (132.97 mm)	0.989 inch (25.12 mm)

APS6230

Cylinder Dimensional Inspection Criteria
Figure 5-3

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
C.	CYLINDER UNIT (Item 60) (Refer to Figure 5-3.)		
(1)	Visually examine the external surfaces of the cylinder unit for wear, nicks, scratches, or other damage.	All external surfaces: maintain a wall thickness of 0.079 inch (2.00 mm), repaired area must be less than 0.5 inch (12.7 mm) in diameter, repairs must be separated by a minimum of 0.5 inch (12.7 mm).	Using an abrasive pad CM47 or equivalent, polish to blend out damage. High spots are not permitted. If base aluminum is exposed, chromate conversion coat. If damage is greater than the permitted serviceable limits, replace the cylinder unit.
		The maximum permitted depth of damage in circular area "D" is 0.020 inch (0.50 mm). Sufficient flat surface must remain to support the nut (10).	If the damage is greater than the permitted serviceable limits, replace the cylinder unit.
(2)	Visually examine the cylinder wrench attachment threads for damage.	The maximum permitted damage for each wrench attachment hole is 1/4 of one thread accumulated damage.	If the damage is greater than the permitted serviceable limits, replace the cylinder unit.
(3)	If a cylinder wrench attachment hole is repaired with a slimsert, measure the wall thickness, "E".	The minimum permitted wall thickness under the center point of the cylinder wrench attachment hole is 0.080 inch (2.03 mm).	If the wall thickness is less than the permitted serviceable limits, replace the cylinder unit.
(4)	Visually examine the low pitch stop threads for damage.	Damage is not permitted.	If there is damage, replace the cylinder unit.
(5)	Visually examine the ID of the cylinder bushing (70) and the immediate surrounding cylinder wall area for bushing wear.	If the cylinder bushing (70) or the surrounding area has wear, measure the cylinder ID in accordance with Figure 5-3.	If the ID of the cylinder bushing (70) is greater than the permitted serviceable limits, replace the cylinder bushing (70).in accordance with the section, "Bonding A-862-( ) Plastic Bushing into Pistons and Cylinders" in the Special Adhesive and Bonding Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
C.	CYLINDER UNIT, CONTINUED (Item 60) (Refer to Figure 5-3.)		
(6)	Visually examine the adhesive bond of the cylinder bushing (70).	An area that is not bonded is not permitted.	If there is an area that is not bonded, replace the cylinder bushing (70). For cylinder bushing (70) replacement procedures, refer to the Special Adhesive and Bonding Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(7)	Visually examine the O-ring groove for wear.	If there is wear, measure the ID of the O-ring groove in accordance with Figure 5-3.	If the wear is greater than the permitted serviceable limits, replace the cylinder unit.
(8)	Visually examine the cylinder mounting threads for damage.	One damaged thread is permitted.	If the thread damage is greater than the permitted serviceable limits, replace the cylinder unit.
(9)	Visually examine the high pitch stop bracket attachment hole threads for damage. NOTE: Some older cylinders may have smaller, additional holes in the high pitch stop bracket attachment area. If there are no large, threaded holes (0.25 inch, 6.4 mm), replace the cylinder unit.	One damaged thread is permitted for each attachment hole.	If the thread damage is greater than the permitted serviceable limits, replace the cylinder unit.
(10)	Visually examine the low pitch stop O-ring groove.	If the O-ring groove has wear, measure the ID "C" in accordance with Figure 5-3.	If the wear is greater than the permitted serviceable limits, replace the cylinder unit.

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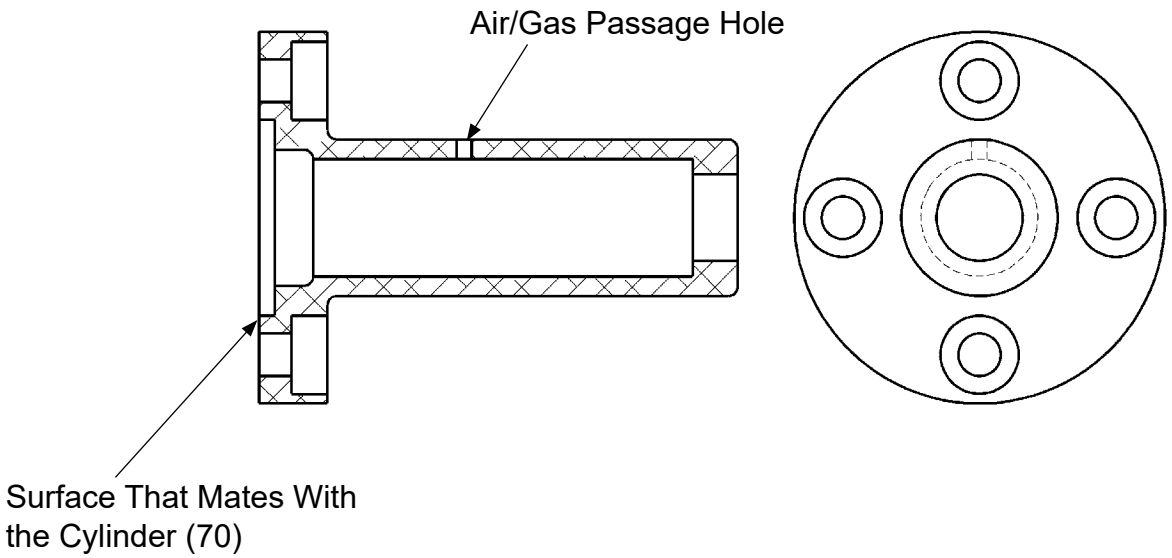
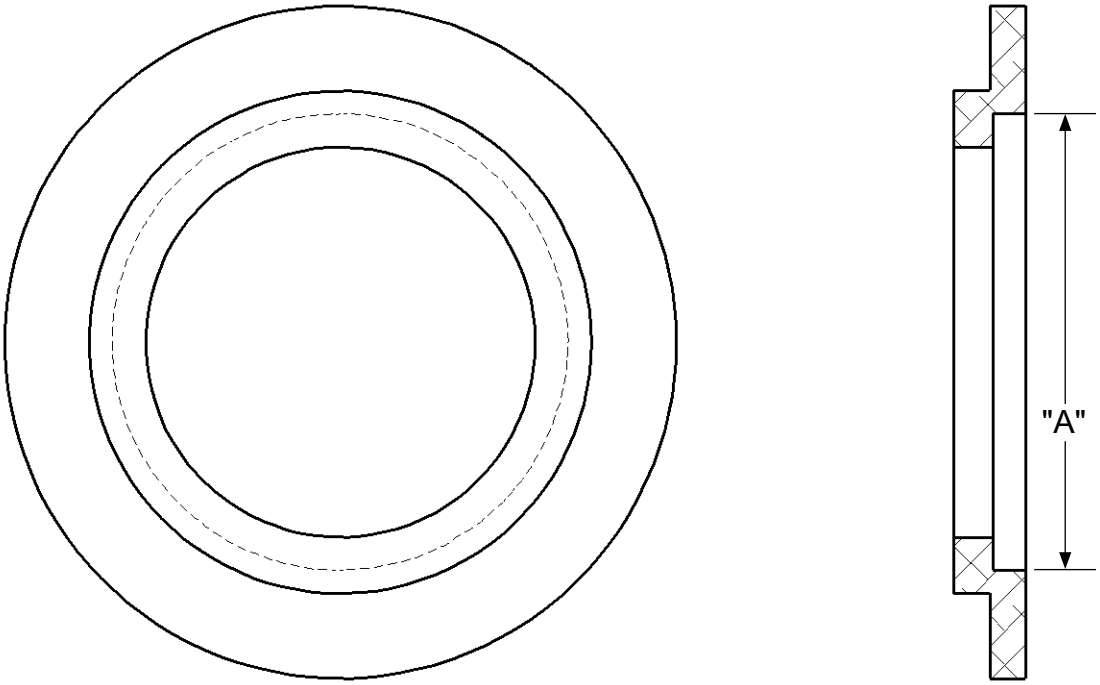


High Pitch Stop
Figure 5-4

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
D.	HIGH PITCH STOP (Item 90) (Refer to Figure 5-4.)		
	(1) Visually examine the high pitch stop for corrosion product, pitting, wear, or damage.	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, wear, or damage is 0.010 inch (0.25 mm).	Remove corrosion product using an abrasive pad CM47 or equivalent. If the corrosion product cannot be removed or if the pitting, wear, or damage is greater than the permitted serviceable limits, replace the high pitch stop.
		Material that is pushed up above the normal high pitch stop bracket surface that mates with the cylinder (60) and ball thrust bearing (120) is not permitted.	Material that is pushed up above the normal high pitch stop bracket surface that mates with the cylinder (60) and ball thrust bearing (120) may be spot polished using an abrasive pad CM47 or equivalent. If the pushed up material cannot be removed, replace the high pitch stop.
	(2) Visually examine the air/gas passage hole of the high pitch stop.	The maximum permitted ID of the air/gas passage hole is 0.110 inch (2.79 mm). Unwanted material in the air/gas passage hole is not permitted.	Remove any unwanted material that is in the air/gas passage hole in accordance with the serviceable limits. If the ID of the air/gas passage hole is greater than the permitted serviceable limits, replace the high pitch stop.



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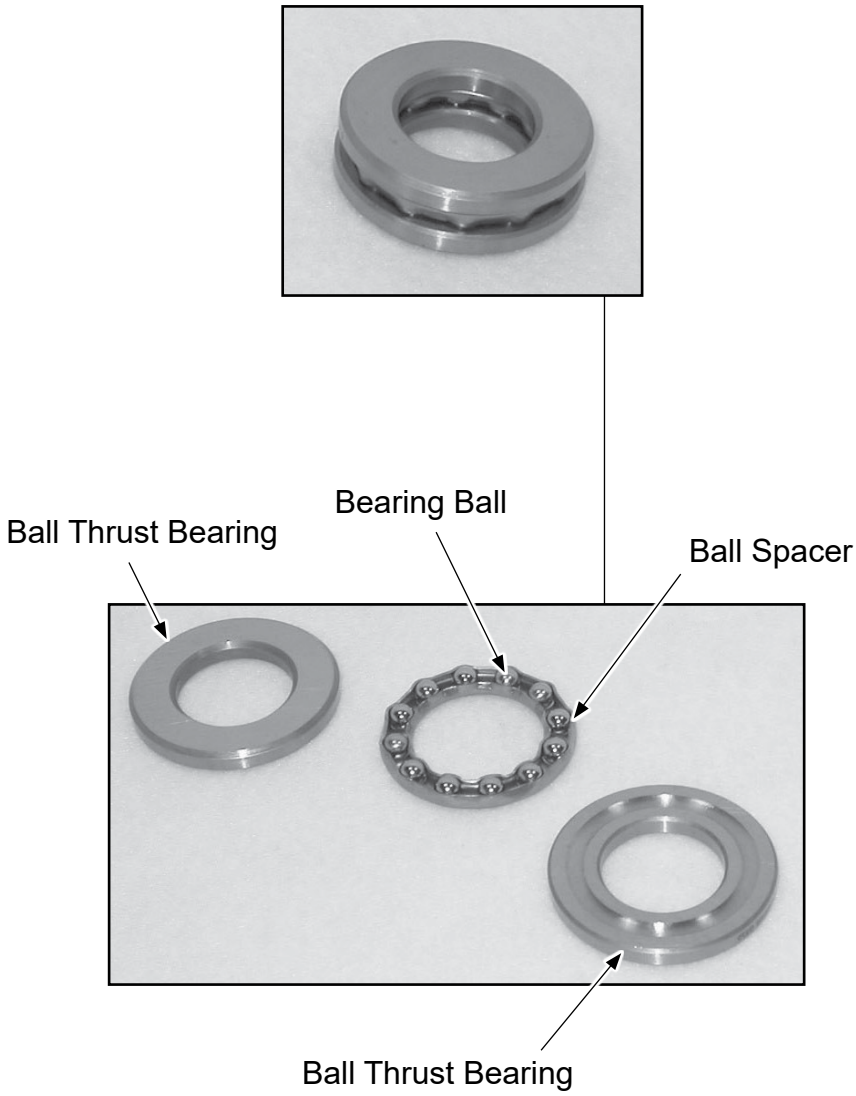
Spring Guide
Figure 5-5

Component Inspection Criteria
Table 5-1

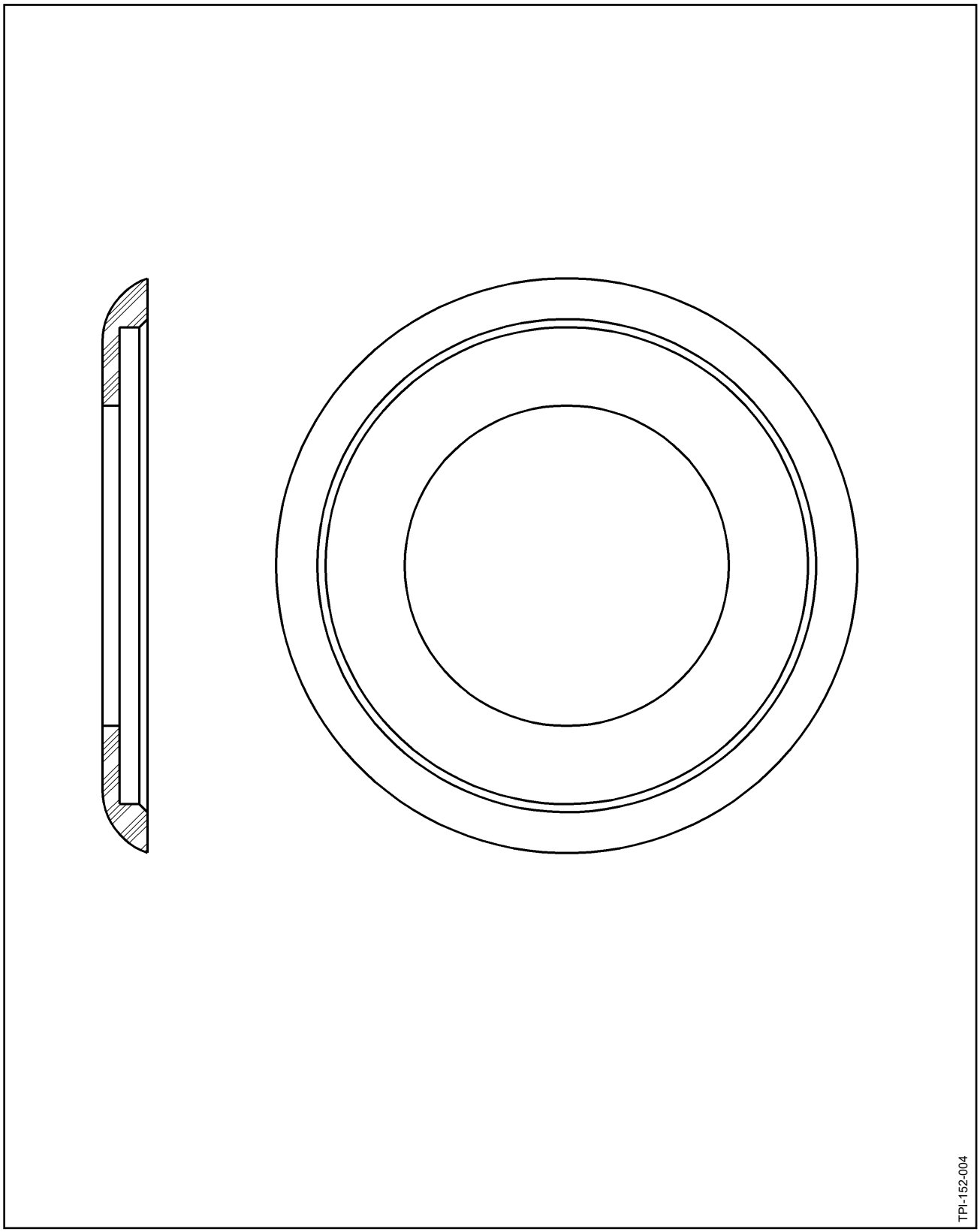
	Inspect	Serviceable Limits	Corrective Action
E.	SPRING GUIDE (Item 110) (Refer to Figure 5-5.)		
(1)	Visually examine the spring guide for corrosion product, pitting, damage, and wear.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting, damage, or wear is 0.005 inch (0.12 mm).	Remove corrosion product using an abrasive pad CM47 or equivalent. If the corrosion product cannot be removed or if the pitting or damage is greater than the permitted serviceable limits, replace the spring guide.
(2)	Visually examine the spring guide for material that is raised above the normal machined surface.	Material that is raised above the normal machined surface is not permitted.	Remove material that is raised above the normal machined surface. If the material that is raised above the normal machined surface cannot be removed, replace the spring guide.
(3)	Visually examine bore "A" for wear.	If there is wear, measure the ID of the bore. The maximum permitted ID is 2.379 inch (60.42 mm).	If the wear is greater than the permitted serviceable limits, replace the spring guide.



Ball Thrust Bearing
Figure 5-6

Component Inspection Criteria
Table 5-1

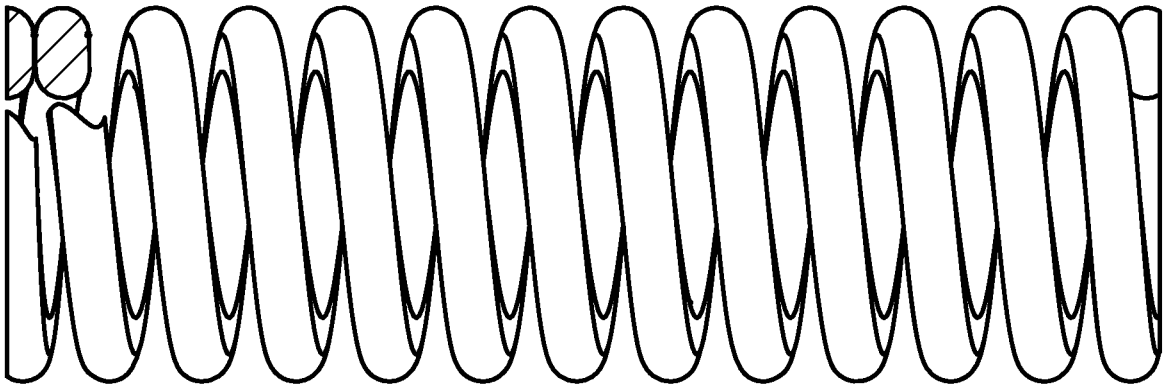
	Inspect	Serviceable Limits	Corrective Action
F.	BALL THRUST BEARING (Item 120) (Refer to Figure 5-6.)		
(1)	Visually examine the ball thrust bearing for smooth operation.	The ball thrust bearing must turn smoothly.	If the ball thrust bearing does not turn smoothly, replace the ball thrust bearing.
(2)	Visually examine the ball thrust bearing for pitting or wear.	If there is pitting or wear, measure the ball thrust bearing races. The maximum permitted depth of pitting or wear is 0.002 inch (0.05 mm).	If the pitting or wear is greater than the permitted serviceable limits, replace the ball thrust bearing.
(3)	Visually examine each bearing ball that is inside of the ball spacer for corrosion product or pitting.	Corrosion product or pitting is not permitted.	If there is corrosion product or pitting, replace the ball thrust bearing.
(4)	Visually examine the holes in the ball spacer for wear.	The bearing balls must stay in the holes in the ball spacer.	If a bearing ball cannot stay in the hole of the ball spacer, replace the ball thrust bearing.



Spring Guide
Figure 5-7

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
G.	SPRING GUIDE (Item 150) (Refer to Figure 5-7.)		
	(1) Visually examine the spring guide for wear or damage.	The maximum permitted depth of wear or damage is 0.010 inch (0.25 mm).	If the depth of wear or damage is greater than the permitted serviceable limits, replace the spring guide.



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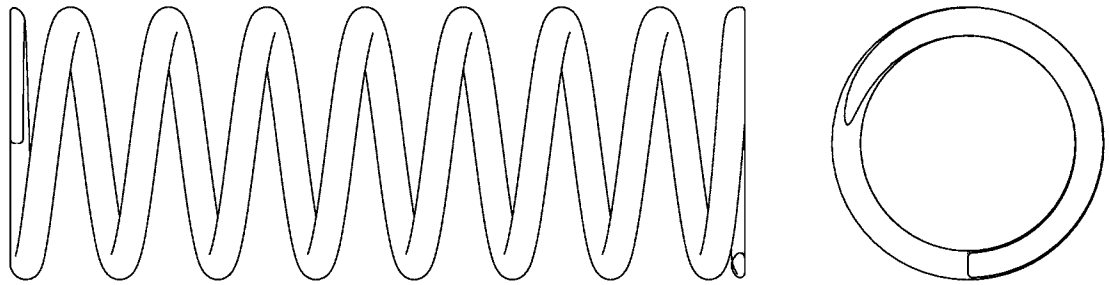
Compression Spring
Figure 5-8

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
H.	COMPRESSION SPRING (Item 130) (Refer to Figure 5-8.)		
(1)	Visually examine the compression spring for corrosion product, pitting, wear, and damage.	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, wear, or damage is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed or if the pitting, wear, or damage is greater than the permitted serviceable limits, replace the compression spring.
(2)	Magnetic particle inspect the compression spring in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the compression spring.

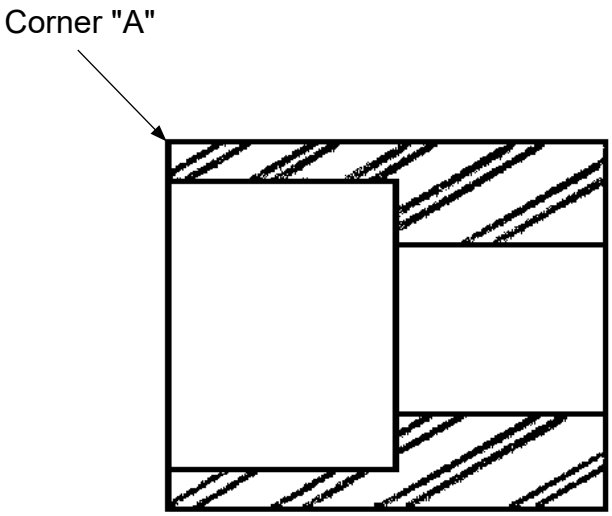


TPI-152-005

Compression Spring
Figure 5-9

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
I.	COMPRESSION SPRING (Item 140) (Refer to Figure 5-9.)		
	(1) Visually examine the compression spring for corrosion product, pitting, wear, and damage.	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, wear, or damage is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed or if the pitting, wear, or damage is greater than the permitted serviceable limits, replace the compression spring.
	(2) Magnetic particle inspect the compression spring in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the compression spring.

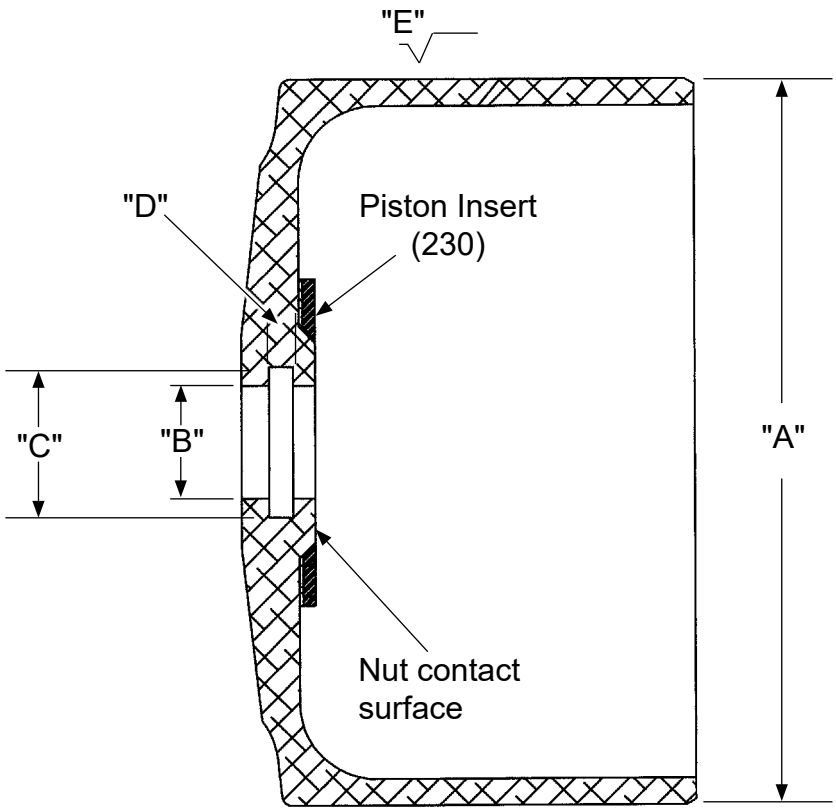


TPI-152-007

Stop Collar
Figure 5-10

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
J.	STOP COLLAR (Item 180) (Refer to Figure 5-10.)		
(1)	Visually examine the OD of the stop collar for wear, nicks, scratches, or other damage that would affect fit or performance.	The maximum permitted depth of damage is 0.005 inch (0.12 mm).	Using an abrasive pad CM47 or equivalent, smooth out the damaged area. If the depth of damage is greater than the permitted serviceable limits, replace the stop collar.
(2)	Visually examine corner "A" of the stop collar for rounding and damage.	Minor rounding of corner "A" that does not affect the engagement by the high pitch stop pins is permitted.	If the rounding or damage of the corner affects the engagement of the high pitch stop pins, replace the stop collar.
(3)	Visually examine the cadmium plating on the surface of the stop collar.	Except for a few scratches and corners with cadmium plating missing, complete coverage is required.	If the cadmium plating coverage is less than the serviceable limits, cadmium replate and bake the stop collar for 23 hours in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Part Number	"A" Minimum Piston OD	"B" Maximum Bore ID	"C" Maximum O-ring ID	"D" Minimum O-ring Width	"E" Max. Surface Micro Finish
B-3683	4.746 inch (120.55 mm)	0.739 inch (18.77 mm)	0.982 inch (24.94 mm)	0.146 inch (3.71 mm)	16

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Piston Dimensional Inspection Criteria
Figure 5-11

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
K.	PISTON UNIT (Item 210) (Refer to Figure 5-11.)		
(1)	Visually examine the anodized surfaces of the piston unit (that are not referenced below or in Figure 5-11), for wear, nicks, scratches, or other damage.	The maximum permitted depth of wear, nicks, scratches, or damage is 0.005 inch (0.12 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the piston unit.
(2)	Visually examine the OD of the piston unit for pitting, wear, damage, and anodize coverage.	There must be anodize on all OD surfaces. The maximum permitted diameter of damage is 0.030 inch (0.76 mm). The maximum permitted depth of damage is 0.002 (0.50 mm). Damage must not go through the anodize. Pushed up material is not permitted.	If pitting, wear, damage, or loss of anodize coverage is greater than the permitted serviceable limits, replace the piston unit.
(3)	Visually examine the piston unit areas "A", "B", "C", and "E".	If there is wear, measure the piston in accordance with Figure 5-11.	If the wear is greater than the permitted serviceable limits, replace the piston unit.
(4)	Visually examine the nut contact surface for pitting, wear, or damage.	If there is pitting, wear, or damage, measure area "D" in accordance with Figure 5-11. The maximum permitted depth of pitting, wear, or damage is 0.007 inch (0.17 mm).	If the pitting, wear, or damage is greater than the permitted serviceable limits, replace the piston unit.
(5)	Visually examine the assembled piston (220) and piston insert (230) where they are joined together.	Looseness between the piston insert (230) and the piston (220) is not permitted.	If there is looseness between the piston insert (230) and the piston (220), replace the piston insert (230) in accordance with the section, "Replacing the Piston Insert in a B-4049 Piston Unit" in the Repair chapter of this manual.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
K.	PISTON UNIT, CONTINUED (Item 210) (Refer to Figure 5-12.)		
	(6) Visually examine the piston insert (230) for wear or damage.	The maximum permitted depth of wear or damage is 0.005 inch (0.12 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the piston insert (230) in accordance with the section, "Replacing the Piston Insert in a B-4049 Piston Unit" in the Repair chapter of this manual.

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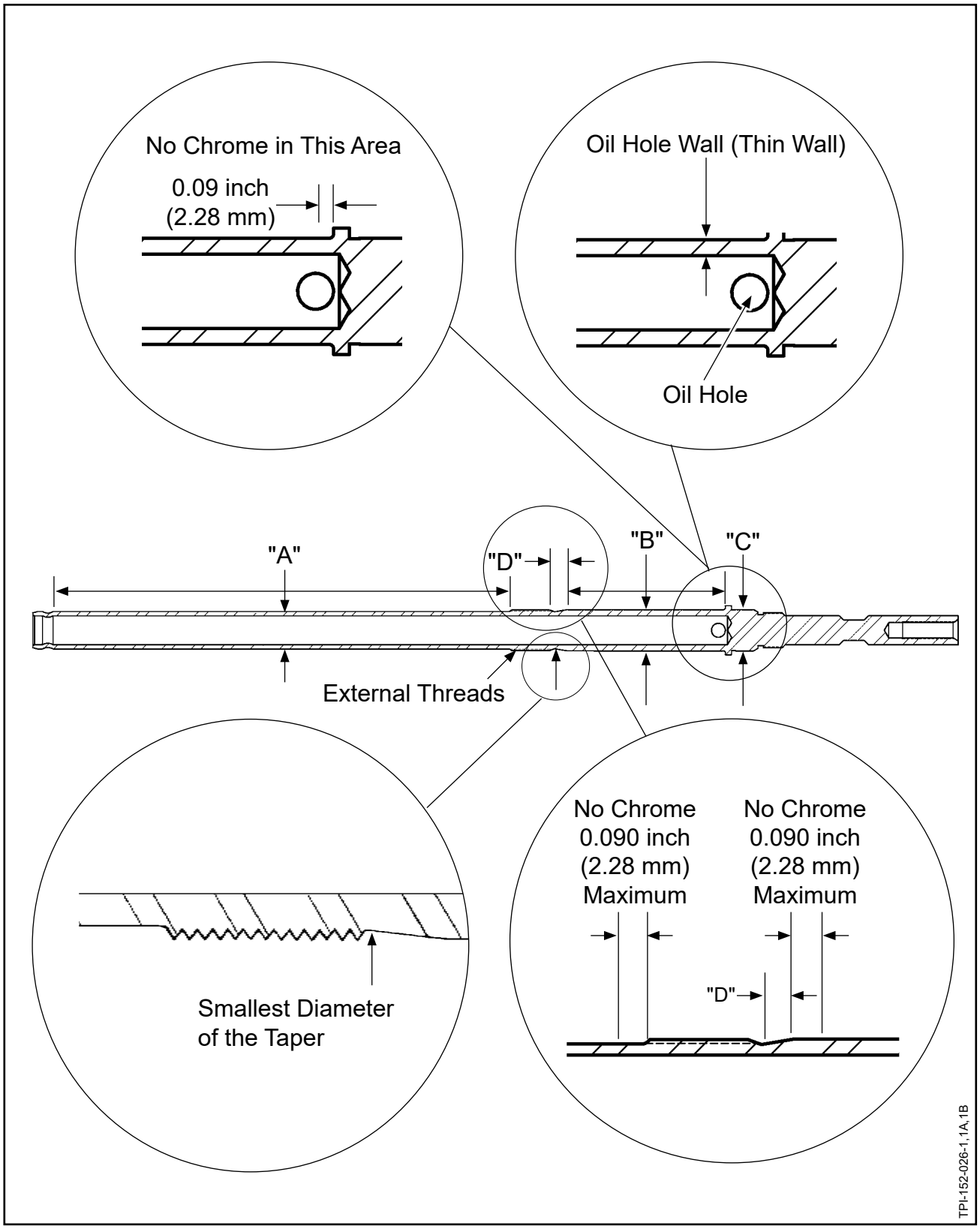
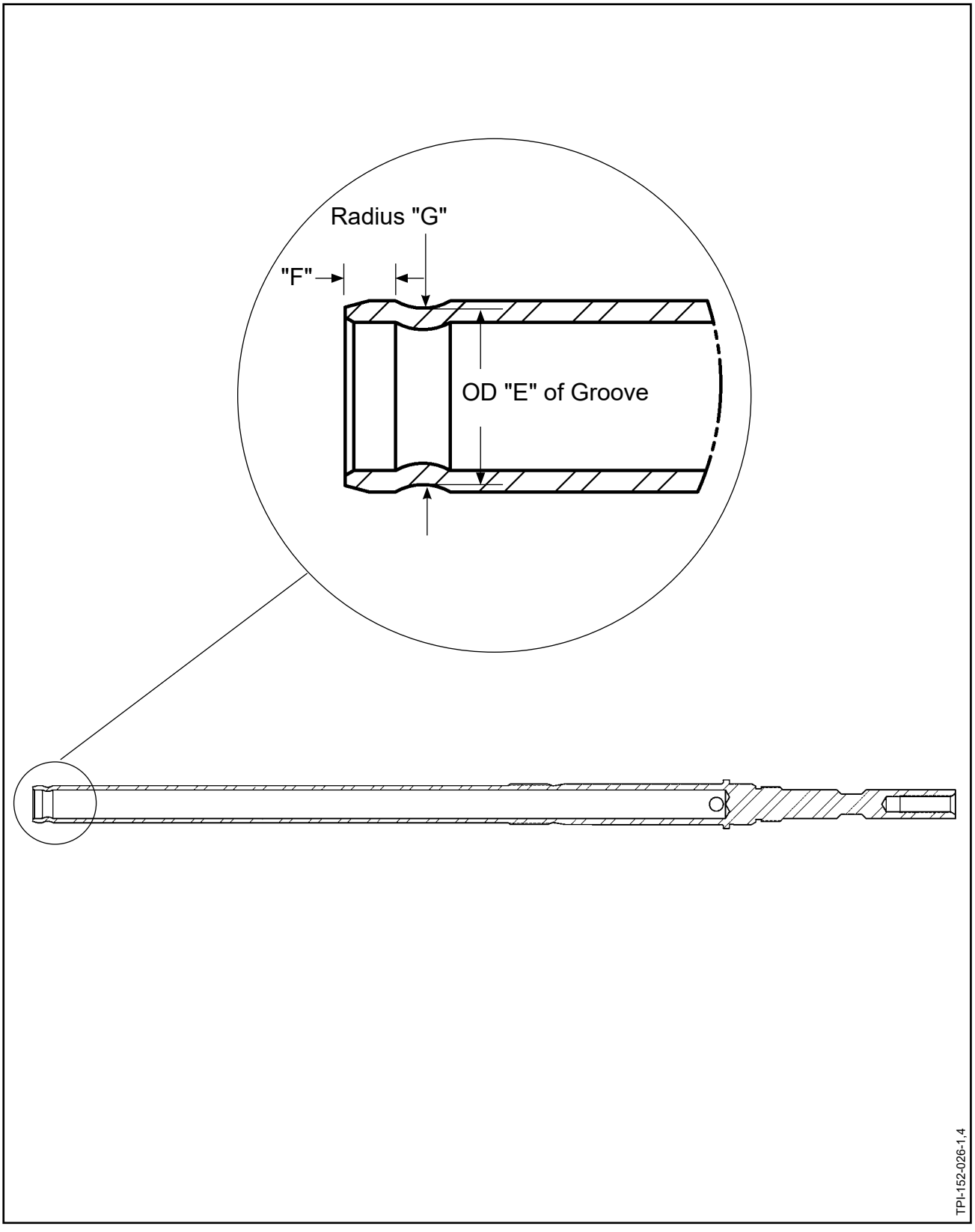


Pitch Change Rod
Figure 5-12

Component Inspection Criteria
Table 5-1

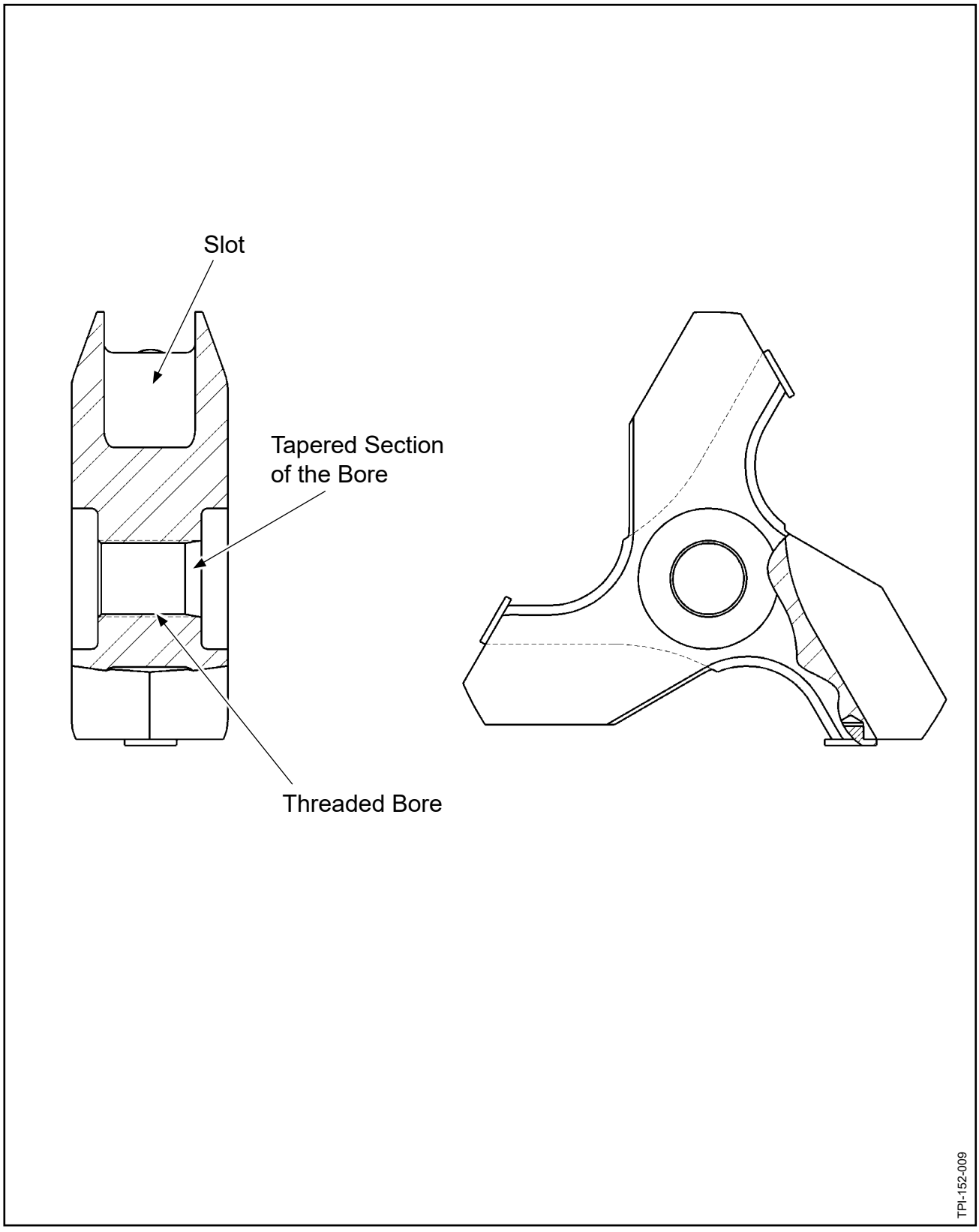
	Inspect	Serviceable Limits	Corrective Action
L.	PITCH CHANGE ROD (Item 250) (Refer to Figure 5-12.)		
	(1) Visually examine the pitch change rod for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. Pitting is not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed or if the pitting is greater than the permitted serviceable limits, replace the pitch change rod.
	(2) Visually examine the chrome plating of the pitch change rod for wear and damage, in the areas of diameters "A and "B".	Wear or damage that is below the chrome plating is not permitted.	If the wear or damage is greater than the permitted serviceable limits, replace the pitch change rod.
	(3) Visually examine the external threads for damage.	One damaged thread is permitted.	If the damage is greater than the permitted serviceable limits, replace the pitch change rod.
	(4) Measure OD "B" of the pitch change rod.	The minimum permitted diameter of OD "B" is 0.732 inch (18.60 mm).	If the diameter of OD "B" is less than the permitted serviceable limits, replace the pitch change rod.
	(5) Measure OD "A" of the pitch change rod.	The minimum permitted diameter of OD "A" is 0.662 inch (16.82 mm).	If the diameter of OD "A" is less than the permitted serviceable limits, replace the pitch change rod.
	(6) Visually examine the taper area "D" for pitting, wear, and damage.	Pitting, wear, or damage is not permitted at the smallest diameter of the taper. For the remaining taper surface, the maximum depth of damage is 0.004 inch (0.10 mm) over 25% of the surface area.	If damage causes high spots above the existing surface, remove only the high spots with a file. If pitting, wear, or damage is greater than the permitted serviceable limits, replace the pitch change rod.
	(7) Measure OD "C" of the pitch change rod.	The minimum permitted diameter of OD "C" is 0.732 inch (18.60 mm).	If the diameter of OD "C" is less than the permitted serviceable limits, replace the pitch change rod.



Pitch Change Rod
Figure 5-13

Component Inspection Criteria
Table 5-1

		Inspect	Serviceable Limits	Corrective Action
L.	PITCH CHANGE ROD, CONTINUED (Item 250) (Refer to Figure 5-13.)			
	(8)	Measure the OD "E" of the groove in the pitch change rod.	The minimum permitted diameter of OD "E" is 0.610 inch (15.50 mm).	If OD "E" is less than the permitted serviceable limits, replace the pitch change rod.
	(9)	Measure the length of area "F".	The minimum permitted length of area "F" is 0.160 inch (4.07 mm).	If the length of area "F" is less than the permitted serviceable limits, replace the pitch change rod.
	(10)	Measure radius "G".	The maximum permitted radius "G" is 0.200 inch (5.08 mm).	If radius "G" is greater than the permitted serviceable limits, replace the pitch change rod.
	(11)	Visually examine the pitch change rod for damage in OD "E", area "F", and radius "G".	Damage is not permitted.	Remove damage using an abrasive pad CM47 or equivalent. If the damage cannot be removed within the permitted serviceable limits, replace the pitch change rod.
	(12)	Visually examine the pitch change rod for straightness.	The pitch change rod must be straight. Bending is not permitted.	If the rod is not straight, replace the pitch change rod.
	(13)	Examine the oil supply bore using a borescope or fiberoptic flashlight.	Unwanted material in the oil supply bore is not permitted.	Remove all unwanted material from the oil supply bore.
	(14)	Magnetic particle inspect the pitch change rod in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). NOTE: Do not strip the chrome plating.	A relevant indication is not permitted.	If there is a relevant indication, replace the pitch change rod.



Fork
Figure 5-14

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
M.	FORK (Item 280) (Refer to Figure 5-14.)		
	(1) 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.	Damage is not permitted.	Damage may be repaired to a maximum depth of 0.004 inch (0.10 mm). Refer to the Repair chapter in this manual for general repair procedures of steel parts. Some surfaces may appear rough (in the "as forged" condition), repair of such surfaces is not required. If repaired, cadmium replate the fork and bake for a minimum of 23 hours in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If damage is greater than the permitted corrective action limits, replace the fork.
	(2) Visually examine the threaded bore of the fork for damage.	One damaged thread is permitted.	If the damage is greater than the permitted serviceable limits, replace the fork.
	(3) Visually examine the tapered section of the fork bore for wear, nicks, fretting or other damage.	The maximum permitted depth of damage is 0.003 inch (0.07 mm). Push-up material from the damage that may interfere with the pitch change rod taper is not permitted.	Remove pushed-up material until flush with the surrounding machined surfaces. If repaired, cadmium replate the fork and bake for a minimum of 23 hours in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the depth of damage is greater than the permitted serviceable limits, replace the fork.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
M.	FORK, CONTINUED (Item 280) (Refer to Figure 5-14.)		
	(4) Visually examine the fork slots for damage.	Damage is not permitted.	Damage may be repaired to a maximum depth of 0.006 inch (0.15 mm). Refer to the Repair chapter in this manual for general repair procedures of steel parts. Repair must not interfere with support of the pitch change block. If repaired, cadmium replate the fork and bake for a minimum of 23 hours in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the damage is greater than the permitted corrective action limits, replace the fork.
	(5) Magnetic particle inspect the fork in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the fork.

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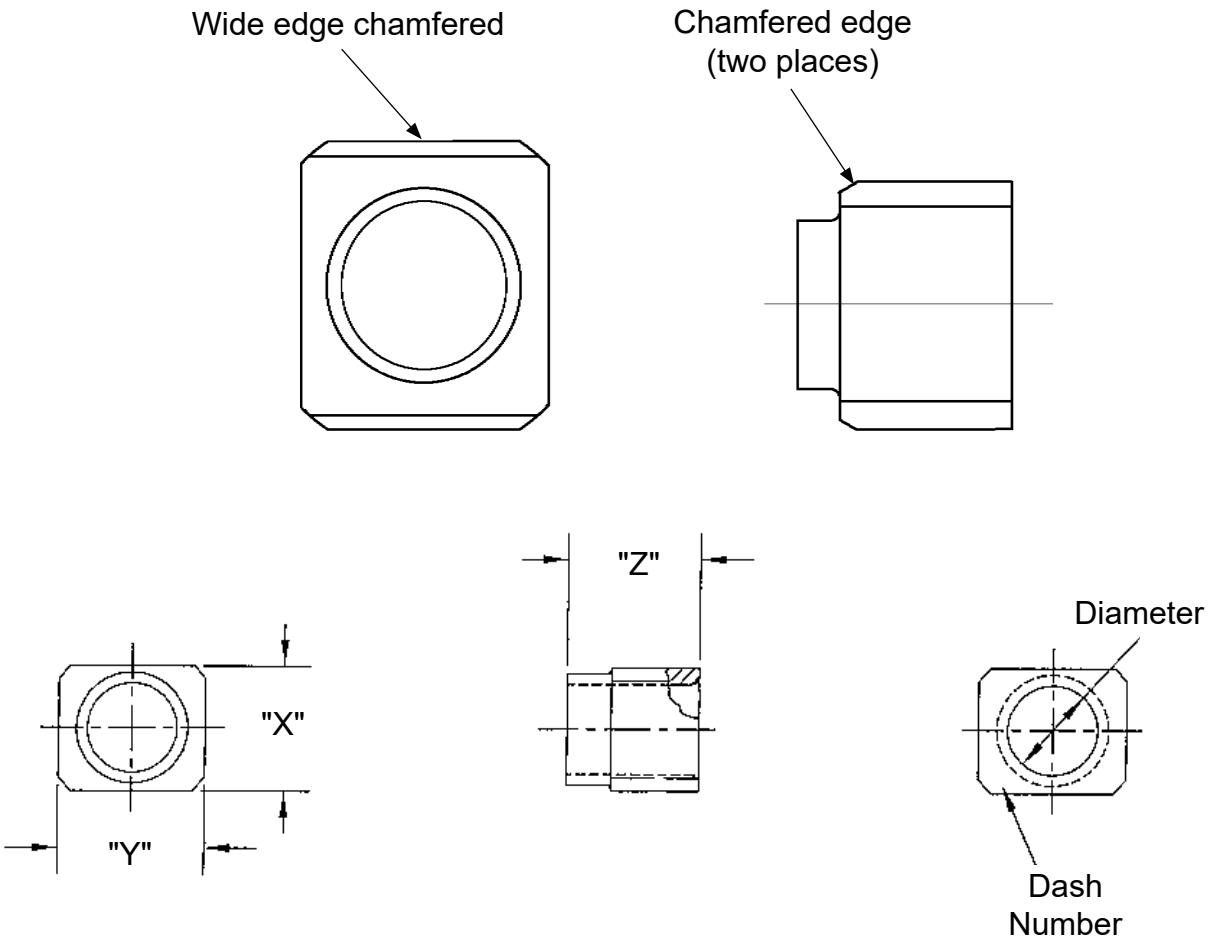


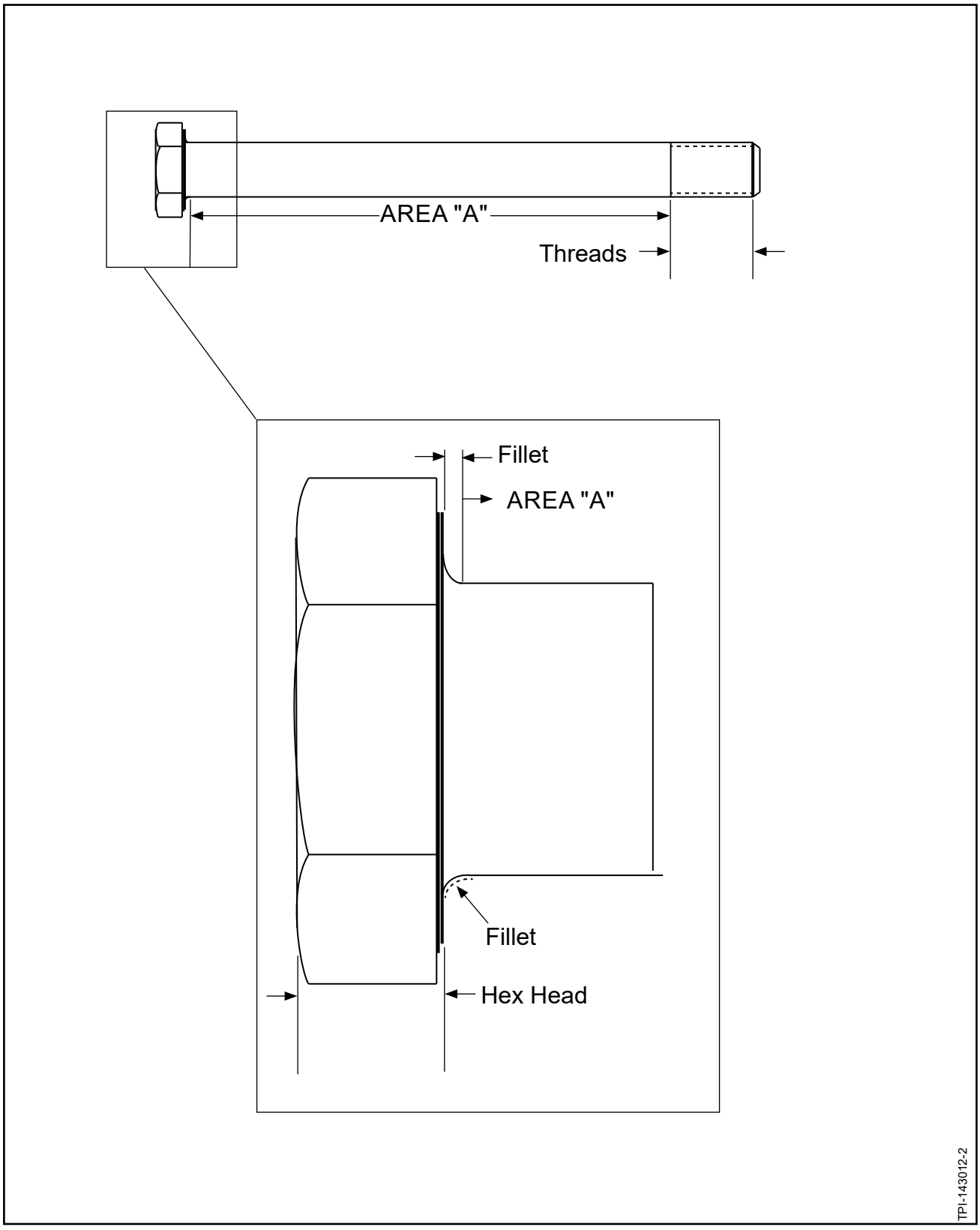
Part Number	"X" Minimum	"Y" Minimum	"Z" Minimum	Hole Diameter Maximum
A-3253	0.871 inch (22.12 mm)	Not a wear surface, no measurement required	0.745 inch (18.92 mm)	0.6250 inch (15.875 mm)
A-3253-1	0.869 inch (22.07 mm)	Not a wear surface, no measurement required	0.745 inch (18.92 mm)	0.6250 inch (15.875 mm)
A-3253-2	0.869 inch (22.07 mm)	Not a wear surface, no measurement required	0.745 inch (18.92 mm)	0.6890 inch (17.500 mm)
A-3253-3	0.874 inch (22.19 mm)	Not a wear surface, no measurement required	0.745 inch (18.92 mm)	0.6890 inch (17.500 mm)

APS2058, 3253chamferA

Pitch Change Block
Figure 5-15

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
N.	PITCH CHANGE BLOCK (Item 300) (Refer to Figure 5-15.)		
	NOTE 1: To identify the pitch change blocks, refer to Figure 5-15.		
	NOTE 2: The pitch change knob hole in the pitch change knob block is offset from the block center. Pitch change blocks should be installed in the fork with the thin wall pointing toward the engine-side half of the hub during initial assembly.		
(1)	Visually examine the pitch change block for damage.	The maximum permitted depth of damage is 0.005 inch (0.12 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the pitch change block.
(2)	Visually examine the pitch change block for wear.	If there is wear, measure the pitch change block in accordance with Figure 5-15.	If wear is greater than the permitted serviceable limits, replace the pitch change block.
(3)	Visually examine the pitch change block for a chamfer.	The pitch change block must have a chamfer as shown in Figure 5-15.	If the pitch change block does not have a chamfer, modify the pitch change block in accordance with the section "Modification of the A-3253-( ) Pitch Change Block" in the Repair chapter of this manual.
(4)	Magnetic particle inspect the pitch change block in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the pitch change block.

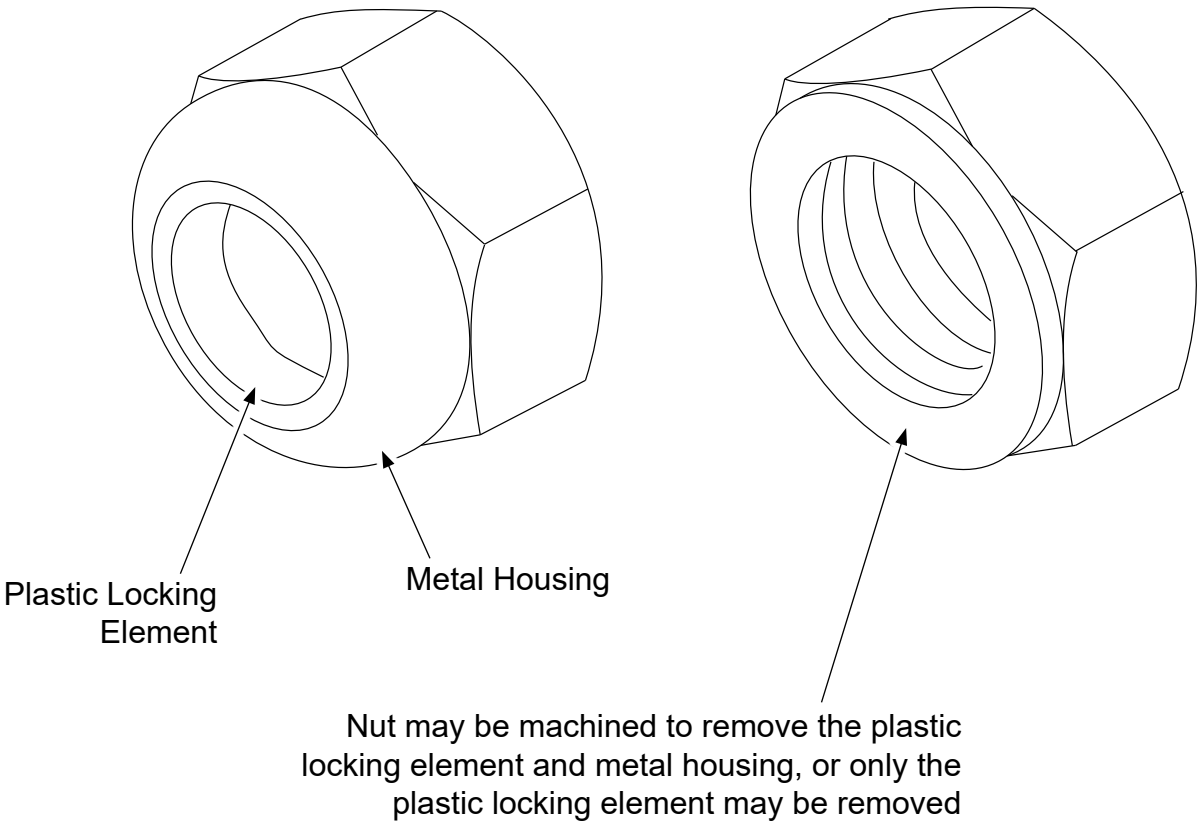


Hex Head Bolt
Figure 5-16

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
O.	HEX HEAD BOLT (Items 420, 430) (Refer to Figure 5-16 and Figure 5-17.)		
(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 Inc. 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.

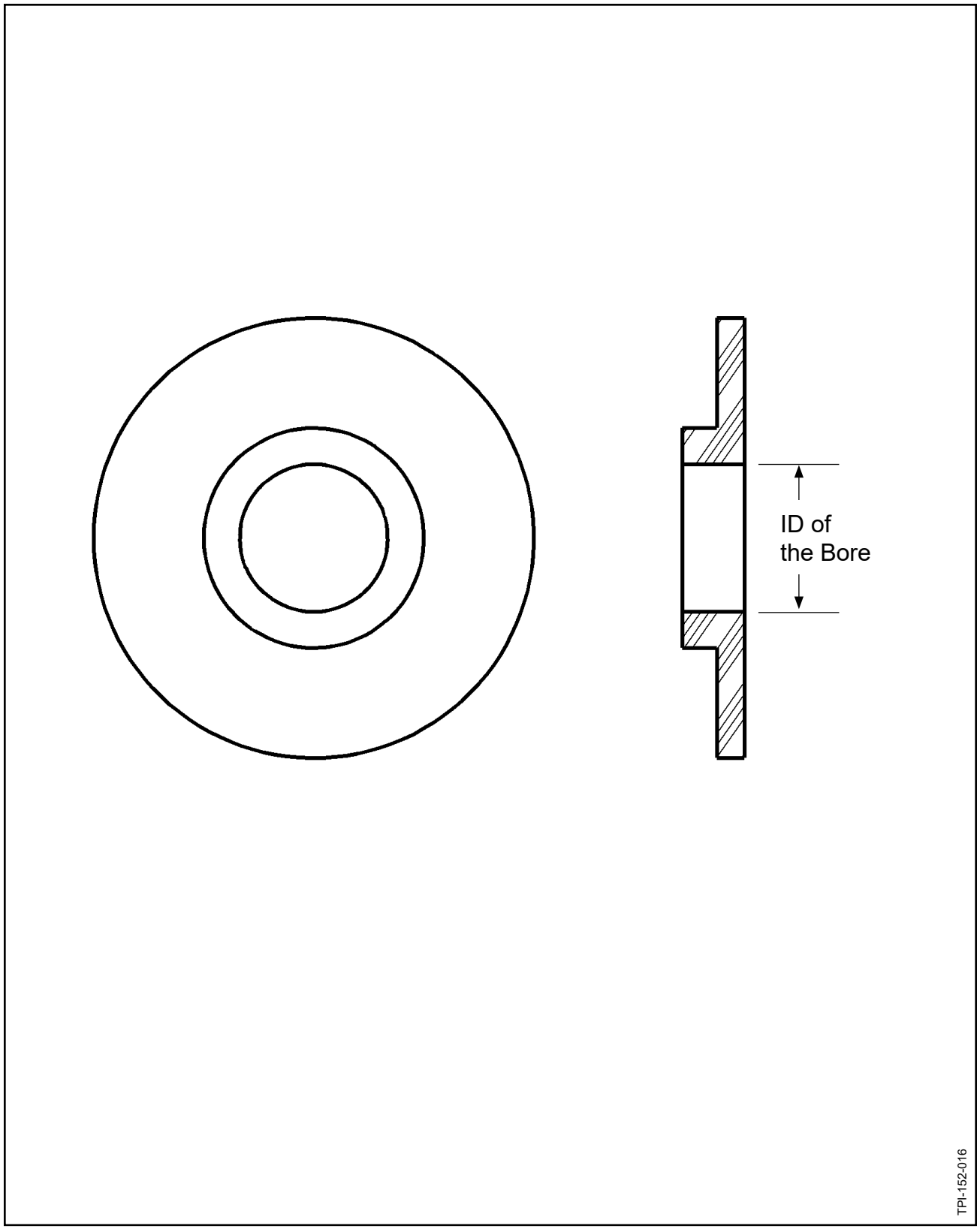
CAUTION: DO NOT USE MODIFIED A-2043-1 NUTS ON THE PROPELLER ASSEMBLY. A-2043-1 NUTS THAT HAVE BEEN MODIFIED ARE TO BE USED ONLY FOR THE HEX HEAD BOLT THREAD CHECK.



A-2043-1 Nut Modification
Figure 5-17

Component Inspection Criteria
Table 5-1

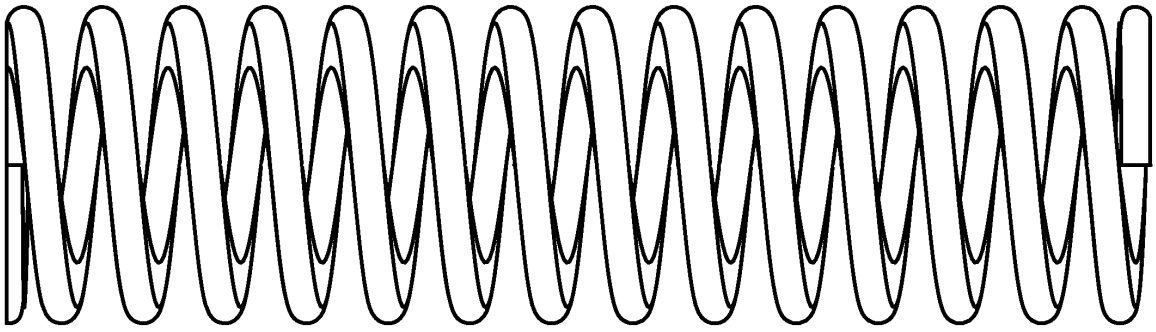
	Inspect	Serviceable Limits	Corrective Action
O.	HEX HEAD BOLT, CONTINUED (Items 420, 430) (Refer to Figure 5-16 and Figure 5-17.)		
(5)	Visually examine the threads of the hex head bolt for damage and pitting.	A maximum total accumulation of 3/4 thread of damage and pitting is permitted. Thread damage 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 5-17.	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 Inc. 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 Inc. Standard Practices Manual 202A (61-01-02).



Spring Guide
Figure 5-18

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
P.	SPRING GUIDE (Item 600) (Refer to Figure 5-18.)		
	(1) Visually examine the spring guide 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 serviceable limits, replace the spring guide.
	(2) Visually examine the bore of the spring guide for wear.	If there is wear, measure the ID of the bore. The maximum permitted ID of the bore is 0.685 inch (17.39 mm).	If the ID is greater than the permitted serviceable limits, replace the spring guide.

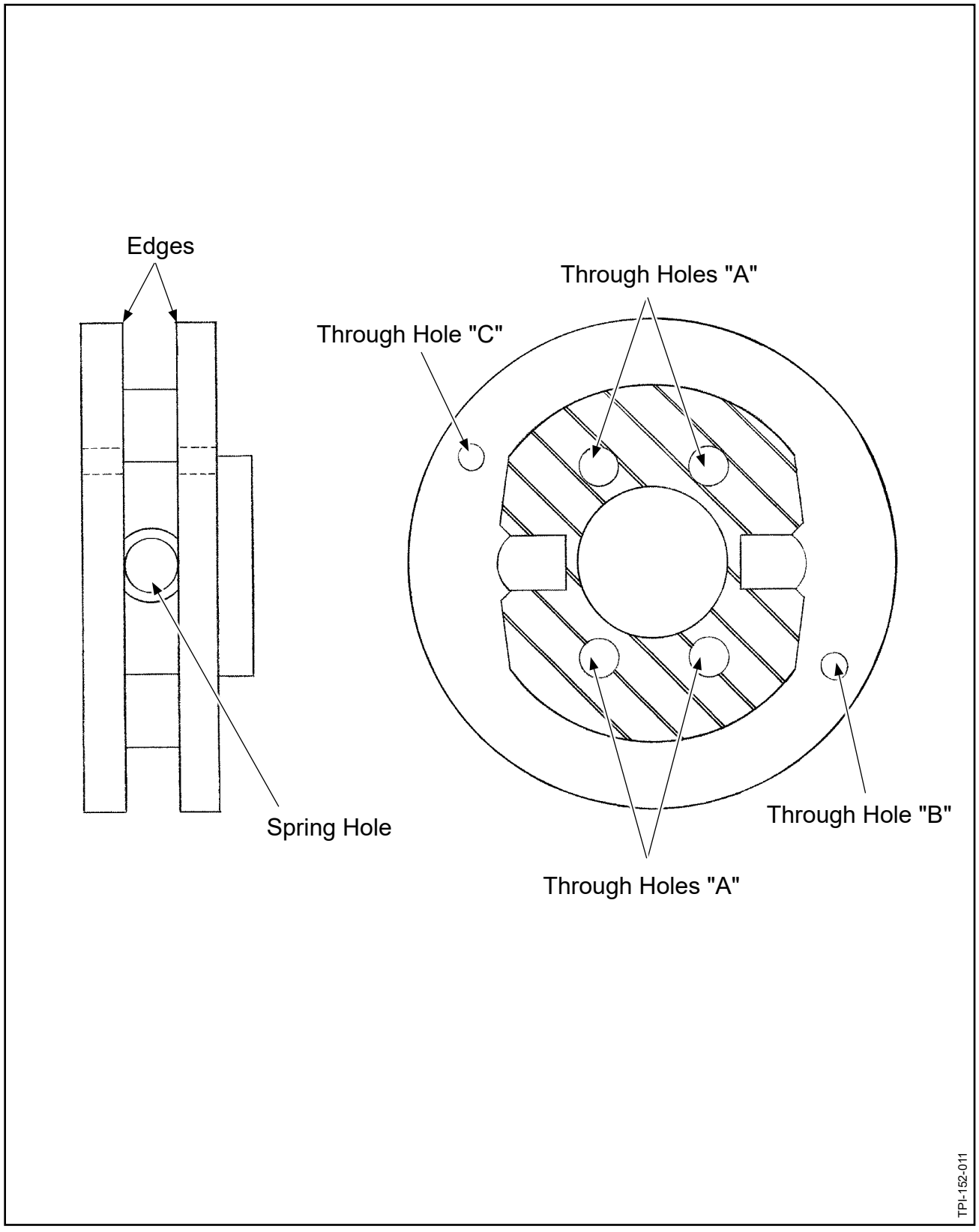


TPI-152-010

Compression Spring
Figure 5-19

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
Q.	COMPRESSION SPRING (Item 610) (Refer to Figure 5-19.)		
(1)	Visually examine the compression spring for corrosion product, pitting, wear, and damage.	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, wear, or damage is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed or if the pitting, wear, or damage is greater than the permitted serviceable limits, replace the compression spring.
(2)	Magnetic particle inspect the compression spring in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the compression spring.



Beta Lockout Housing
Figure 5-20

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
R.	BETA LOCKOUT HOUSING (Item 630) (Refer to Figure 5-20.)		
(1)	Except for the two through holes "B" and the two through holes "C", visually examine the beta lockout housing for corrosion product, pitting, wear, or damage.	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, wear, or damage is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed or if the pitting, wear, or damage is greater than the permitted serviceable limits, replace the beta lockout housing.
(2)	Visually examine the edges of the beta lockout housing for damage.	Material missing from the edges of the beta lockout housing is not permitted.	If there is material missing from the edges of the beta lockout housing, replace the beta lockout housing.
(3)	Visually examine the two through holes "B" and the two through holes "C" of the beta lockout housing for 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 beta lockout housing.
(4)	Visually examine the four through holes "A" of the beta lockout housing for damage.	The maximum permitted depth of damage is 0.005 inch (0.12 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the beta lockout housing.
(5)	Do an inspection of the two through holes "B" of the beta lockout housing using a 0.125 inch gauge pin and 0.127 inch gauge pin.	The 0.125 inch gauge pin must not go through at least one of the holes. The 0.127 inch gauge pin must not go through either of the holes.	If the results of the inspection are not within the permitted serviceable limits, replace the beta lockout housing.
(6)	Do an inspection of the two through holes "C" of the beta lockout housing using a 0.125 inch gauge pin and 0.127 inch gauge pin.	The 0.125 inch gauge pin must not go through at least one of the holes. The 0.127 inch gauge pin must not go through either of the holes.	If the results of the inspection are not within the permitted serviceable limits, replace the beta lockout housing.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
R.	BETA LOCKOUT HOUSING, CONTINUED (Item 630) (Refer to Figure 5-20.)		
(7)	Visually examine the spring holes of the beta lockout housing for damage.	The maximum permitted depth of damage is 0.005 inch (0.12 mm). The damage must not affect the fit or function of the compression spring (640).	If the damage affects the fit or function of the compression spring (640) or if the depth of damage is greater than the permitted serviceable limits, replace the beta lockout housing.

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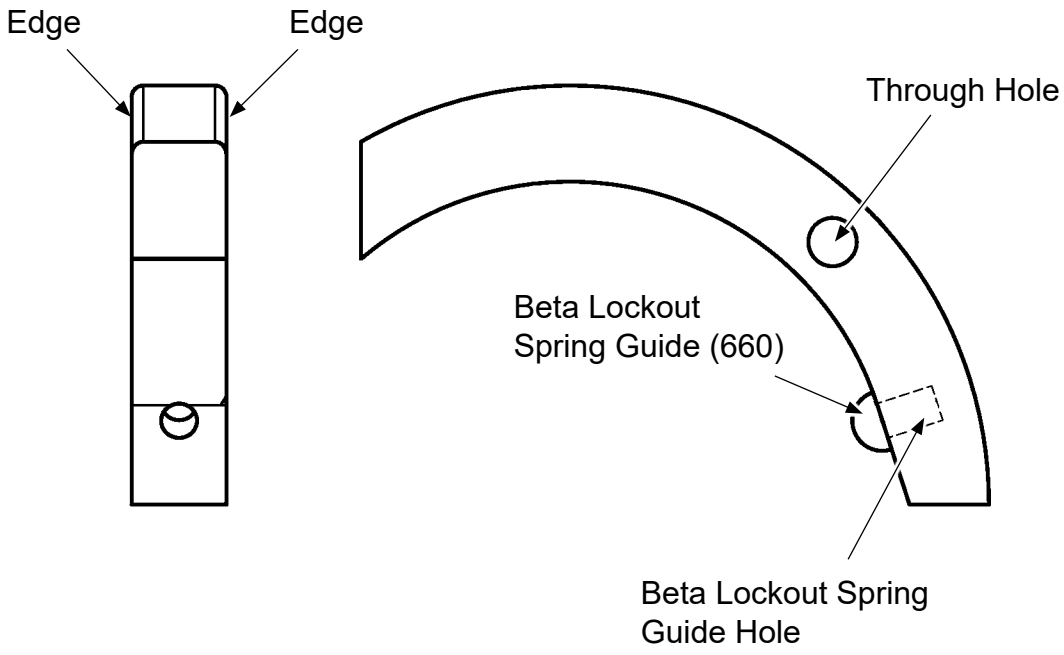

Beta Lockout
Figure 5-21

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
S.	BETA LOCKOUT (Item 650) (Refer to Figure 5-21.)		
(1)	Except for the through hole, visually examine each beta lockout for corrosion product, pitting, wear, or damage.	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, wear, or damage is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed or if the depth of the pitting, wear, or damage is greater than the permitted serviceable limits, replace the beta lockout.
(2)	Visually examine the edges of the beta lockout for damage.	Material missing from the edges of the beta lockout is not permitted.	If there is material missing from the edges of the beta lockout, replace the beta lockout.
(3)	Visually examine the through hole for damage.	The maximum permitted depth of damage is 0.005 (0.12 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the beta lockout.
(4)	Visually examine each beta lockout spring guide (660) for wear or damage.	Wear or damage is not permitted.	If there is wear or damage, replace the beta lockout spring guide (660).
(5)	Examine the fit of the beta lockout spring guide (660) in the beta lockout.	The beta lockout spring guide (660) must fit tightly in the beta lockout.	If the beta lockout spring guide (660) does not fit tightly in the beta lockout, replace the beta lockout spring guide (660) in accordance with the section, "Installing the Beta Lockout Spring Guide" in the Repair chapter of this manual.
(6)	If the beta lockout spring guide (660) must be replaced, measure the diameter of the beta lockout spring guide hole in the beta lockout.	The maximum permitted diameter of the beta lockout spring guide hole is 0.0960 (2.438 mm).	If the diameter of the beta lockout spring guide hole is greater than the permitted serviceable limits, replace the beta lockout.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
S.	BETA LOCKOUT, CONTINUED (Item 650) (Refer to Figure 5-21.)		
	(7) Visually examine the fit of dowel pin (670) in the through hole of the beta lockout.	The beta lockout must move freely on the dowel pin (670).	If the beta lockout does not move freely on the dowel pin (670), polish the through hole of the beta lockout with emery cloth until the beta lockout moves freely on the dowel pin (670).
	(8) Using a 0.130 inch gauge pin, inspect the diameter of the through hole in the beta lockout.	The 0.130 inch gauge pin must not go through the through hole in the beta lockout.	If the 0.130 inch gauge pin goes through the through hole in the beta lockout, replace the beta lockout.

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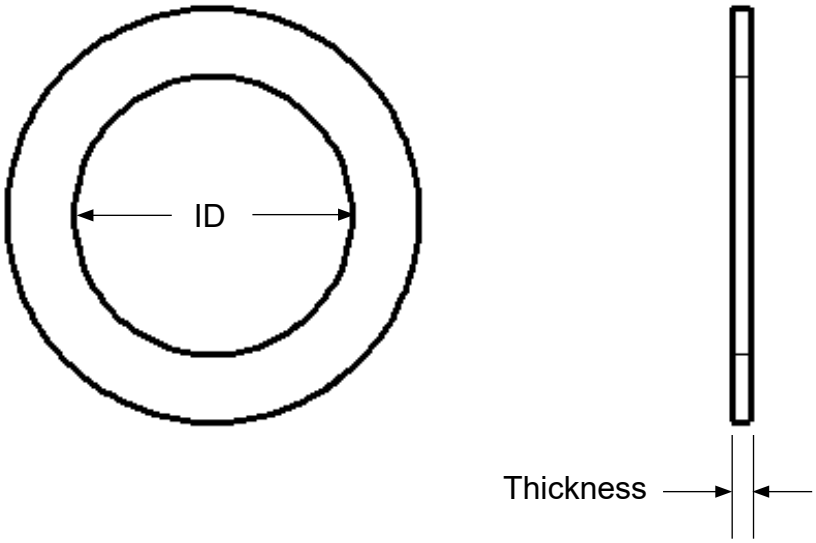


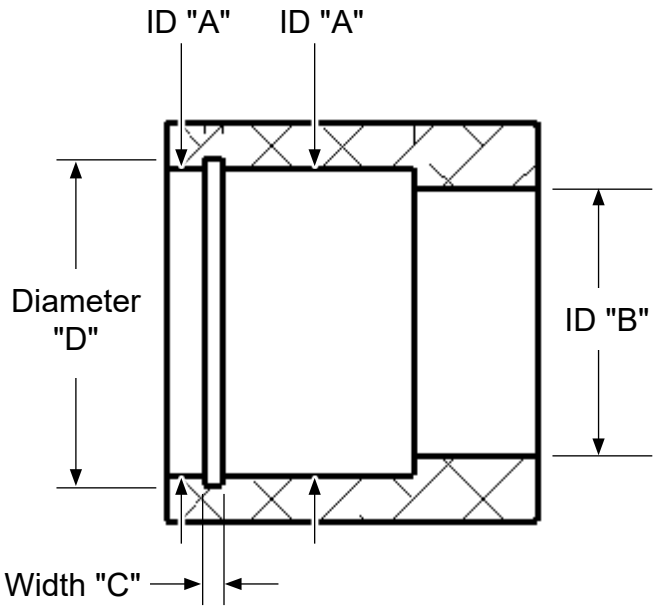
Part Number	Minimum Thickness
A-4239	0.040 inch (1.02 mm)
A-4239-1	0.027 inch (0.69 mm)

TPI-152-016

Pitch Adjust Spacer
Figure 5-22

Component Inspection Criteria
Table 5-1

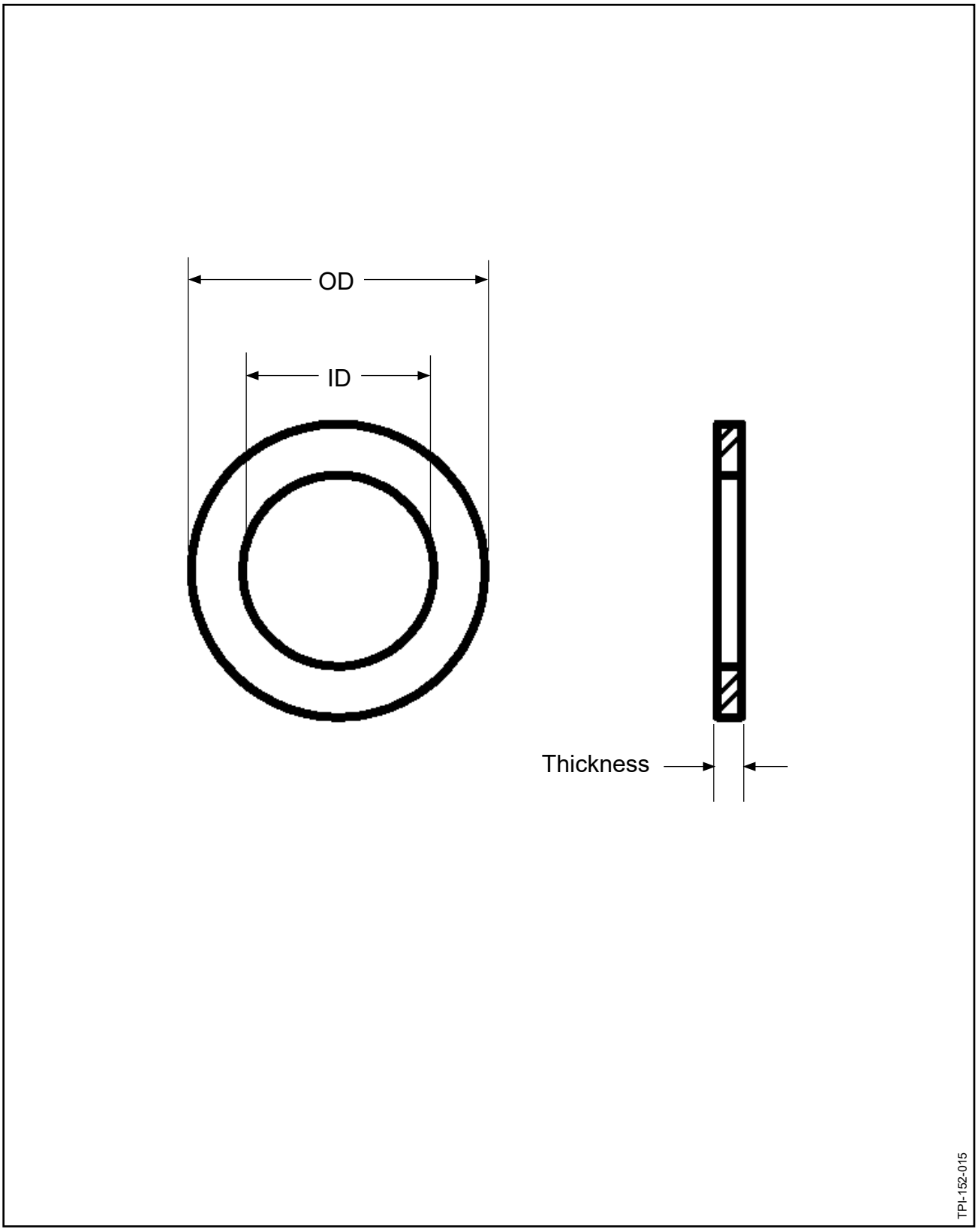
	Inspect	Serviceable Limits	Corrective Action
T.	PITCH ADJUST SPACER (Item 690) (Refer to Figure 5-22.)		
	(1) Visually examine the washer for corrosion product, pitting, wear, or damage.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting, wear, or damage is 0.002 inch (0.05 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). If the pitting, wear, or damage is greater than the permitted serviceable limits, replace the washer.
	(2) Measure the thickness of the washer.	For the minimum permitted thickness of the washer, refer to Figure 5-22.	If the thickness of the washer is less than the permitted serviceable limits, replace the washer.
	(3) Measure the ID of the washer.	The maximum permitted ID of the washer is 0.680 inch (17.27 mm).	If the ID is greater than the permitted serviceable limits, replace the washer.
	(4) Visually examine the washer for cadmium plating coverage.	Except for a few scratches and corners with cadmium plating missing, complete coverage is required.	If the cadmium coverage is less than the permitted serviceable limits, cadmium replate and bake the washer in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Stop Collar
Figure 5-23

Component Inspection Criteria
Table 5-1

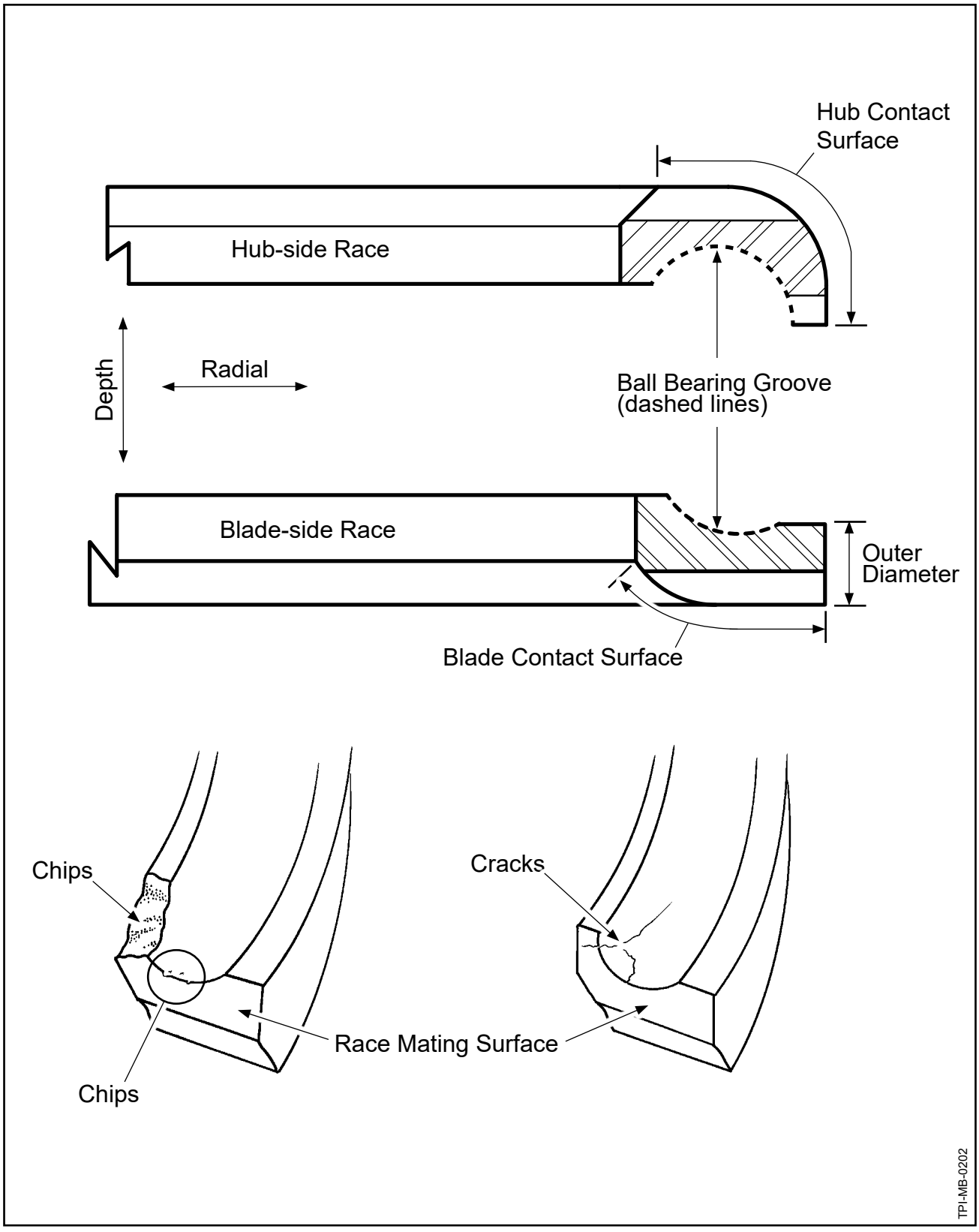
	Inspect	Serviceable Limits	Corrective Action
U.	STOP COLLAR (Item 700) (Refer to Figure 5-23.)		
	(1) Visually examine the stop collar for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Remove corrosion product using an abrasive pad CM47 or equivalent. If the corrosion product cannot be removed, replace the stop collar.
	(2) Visually examine the OD of the stop collar for pitting, wear, or damage.	The maximum permitted depth of pitting, wear, or damage is 0.005 inch (0.12 mm).	Using an abrasive pad CM47 or equivalent, smooth out the pitting, wear, or damage. If the depth of the pitting, wear, or damage is greater than the permitted serviceable limits, replace the stop collar.
	(3) Measure the diameter of ID "A" of the stop collar.	The maximum permitted width of ID "A" is 0.773 inch (19.63 mm).	If the width of ID "A" is greater than the permitted serviceable limits, replace the stop collar.
	(4) Measure the diameter of ID "B" of the stop collar.	The maximum permitted width of ID "B" is 0.673 inch (17.09 mm).	If the width of ID "B" is greater than the permitted serviceable limits, replace the stop collar.
	(5) Measure the width of internal retaining ring groove "C" of the stop collar.	The maximum permitted width of O-ring groove "C" is 0.050 inch (1.27 mm).	If the width of O-ring groove "C" is greater than the permitted serviceable limits, replace the stop collar.
	(6) Measure the diameter of internal retaining ring groove "D" of the stop collar.	The maximum permitted diameter of internal retaining ring groove "D" is 0.829 inch (21.05 mm).	If the diameter of internal retaining ring groove "D" is greater than the permitted serviceable limits, replace the stop collar.



Washer
Figure 5-24

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
V.	WASHER (Item 710) (Refer to Figure 5-24.)		
	(1) Visually examine the washer for corrosion product, pitting, wear, or damage.	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, wear, or damage is 0.002 inch (0.05 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the pitting, wear, or damage is greater than the permitted serviceable limits, replace the washer.
	(2) Measure the thickness of the washer.	The minimum permitted thickness of the washer is 0.057 inch (1.45 mm).	If the thickness of the washer is less than the permitted serviceable limits, replace the washer.
	(3) Measure the ID of the washer.	The maximum permitted ID of the washer is 0.510 inch (12.95 mm).	If the ID of the washer is greater than the permitted serviceable limits, replace the washer.
	(4) Measure the OD of the washer.	The minimum permitted OD of the washer is 0.757 inch (19.22 mm).	If the OD of the washer is less than the permitted serviceable limits, replace the washer.
	(5) Visually examine the washer 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, cadmium replate and bake the washer in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Bearing Race
Figure 5-25

Component Inspection Criteria
Table 5-1

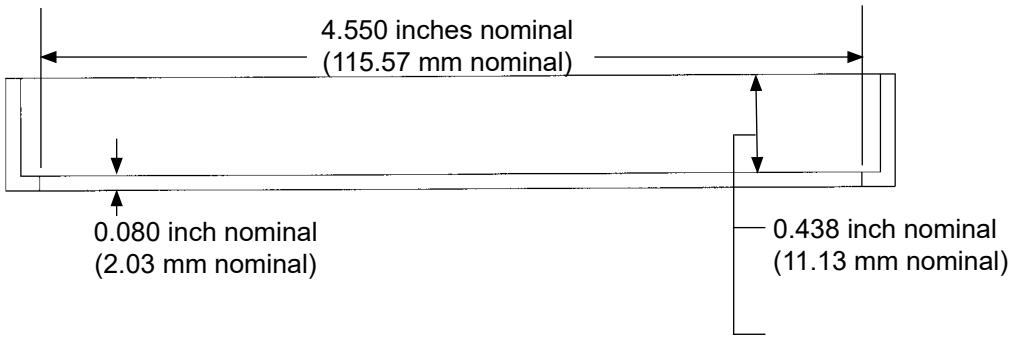
	Inspect	Serviceable Limits	Corrective Action
W.	BEARING RACE (Item 3020, 3050) (Refer to Figure 5-25.)		
	(1) Visually examine the ball bearing groove in each bearing race for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Remove corrosion product using glass bead cleaning. For glass bead cleaning refer to the Cleaning chapter of Hartzell Propeller Inc. 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
W.	BEARING RACE, CONTINUED (Item 3020, 3050) (Refer to Figure 5-25.)		
	(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 Inc. 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 (3060). Fretting must not loosen the tight fit with the bearing retaining ring (3060).	Thoroughly clean the fretted area using an abrasive pad CM47 or equivalent to reduce fretting damage to a minimum. If the fit of the bearing retaining ring (3060) 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, 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
W.	BEARING RACE, CONTINUED (Item 3020, 3050) (Refer to Figure 5-25.)		
	(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 Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the bearing race.



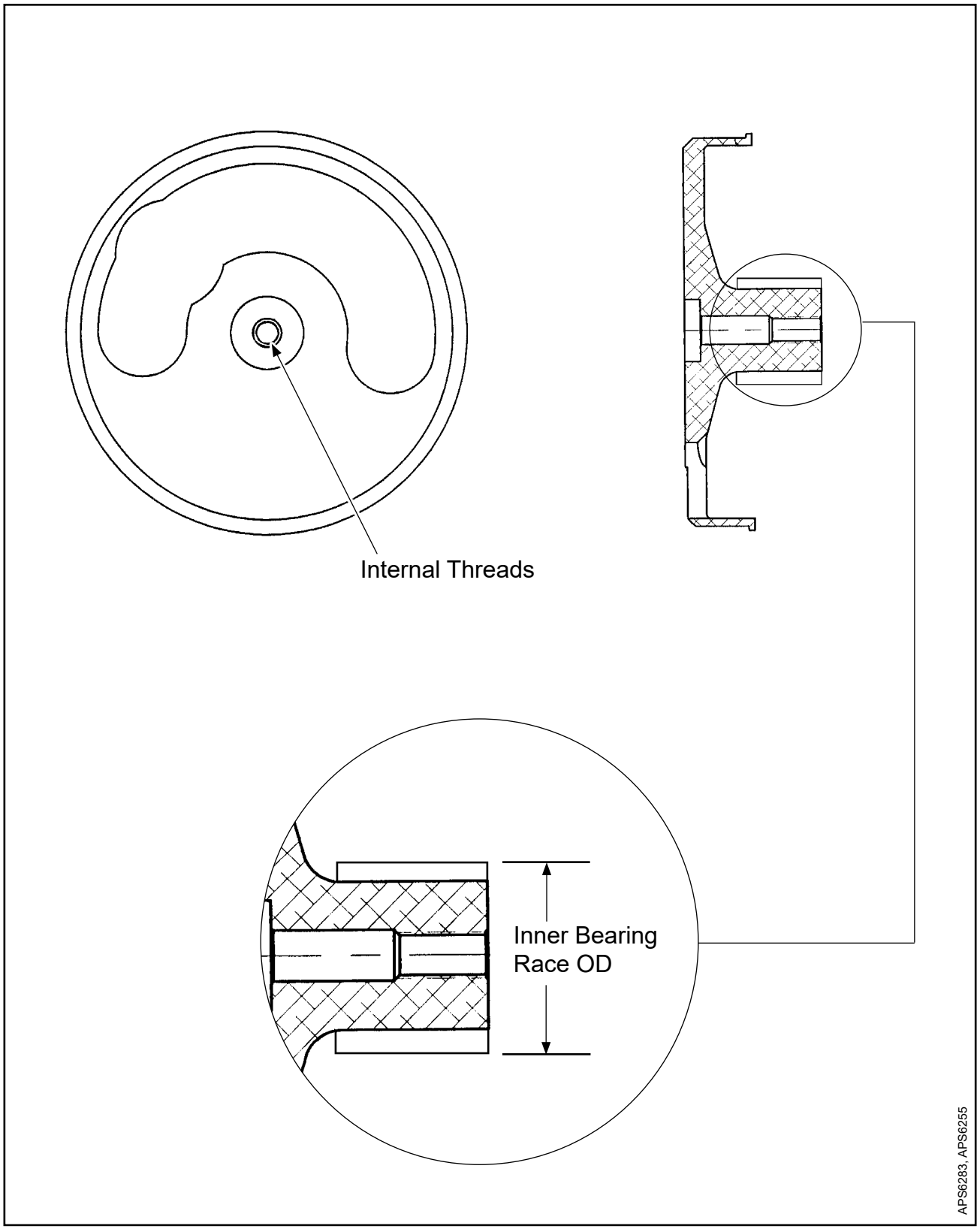
NOTE: Dimensions are for identification purposes only.

B-1041

Bearing Retaining Ring
Figure 5-26

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
X.	BEARING RETAINING RING (Item 3060) (Refer to Figure 5-26.)		
	(1) Visually examine the bearing retaining ring 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). Pitting must not interfere with the ability of the bearing retaining ring to fit tightly to the blade and to the race.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed or if the pitting 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 tightly to the blade and the race when installed over the blade and race.	If the wear, damage, or fretting is greater that the permitted limits, replace the bearing retaining ring.
	(3) Visually examine the 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 coverage is less than the permitted serviceable limits,cadmium replate the bearing retaining ring in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Preload Plate Assembly with Inner Bearing Race
Figure 5-27

Component Inspection Criteria
Table 5-1

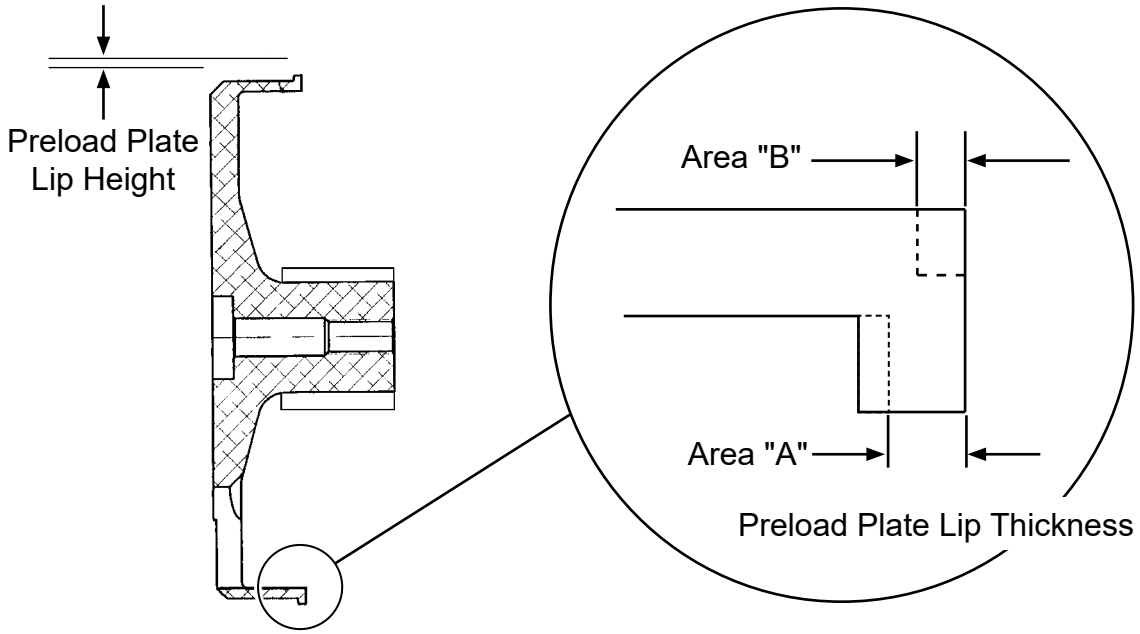
	Inspect	Serviceable Limits	Corrective Action
Y.	PRELOAD PLATE ASSEMBLY w/INNER BEARING RACE (Item 3080) (Refer to Figure 5-27.)		
	(1) Visually examine the aluminum part of the preload plate assembly for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in 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 Inc. 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
Y.	PRELOAD PLATE ASSEMBLY w/INNER BEARING RACE, CONTINUED (Item 3080) (Refer to Figure 5-27.)		
	(4) Visually examine the OD of the inner bearing race (3090) for corrosion product, brinelling, pitting, 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 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 Inc. 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.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
Y.	PRELOAD PLATE ASSEMBLY w/INNER BEARING RACE, CONTINUED (Item 3080) (Refer to Figure 5-27.)		
	(5) Measure the OD of the inner bearing race (3090).	**B-6679 inner bearing race:** The minimum permitted OD is 1.249 inch (31.73 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.
	(6) If the inner bearing race (3090) 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 Inc. Standard Practices Manual 202A (61-01-02). Polish raised material using abrasive pad CM47 or equivalent. If 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.

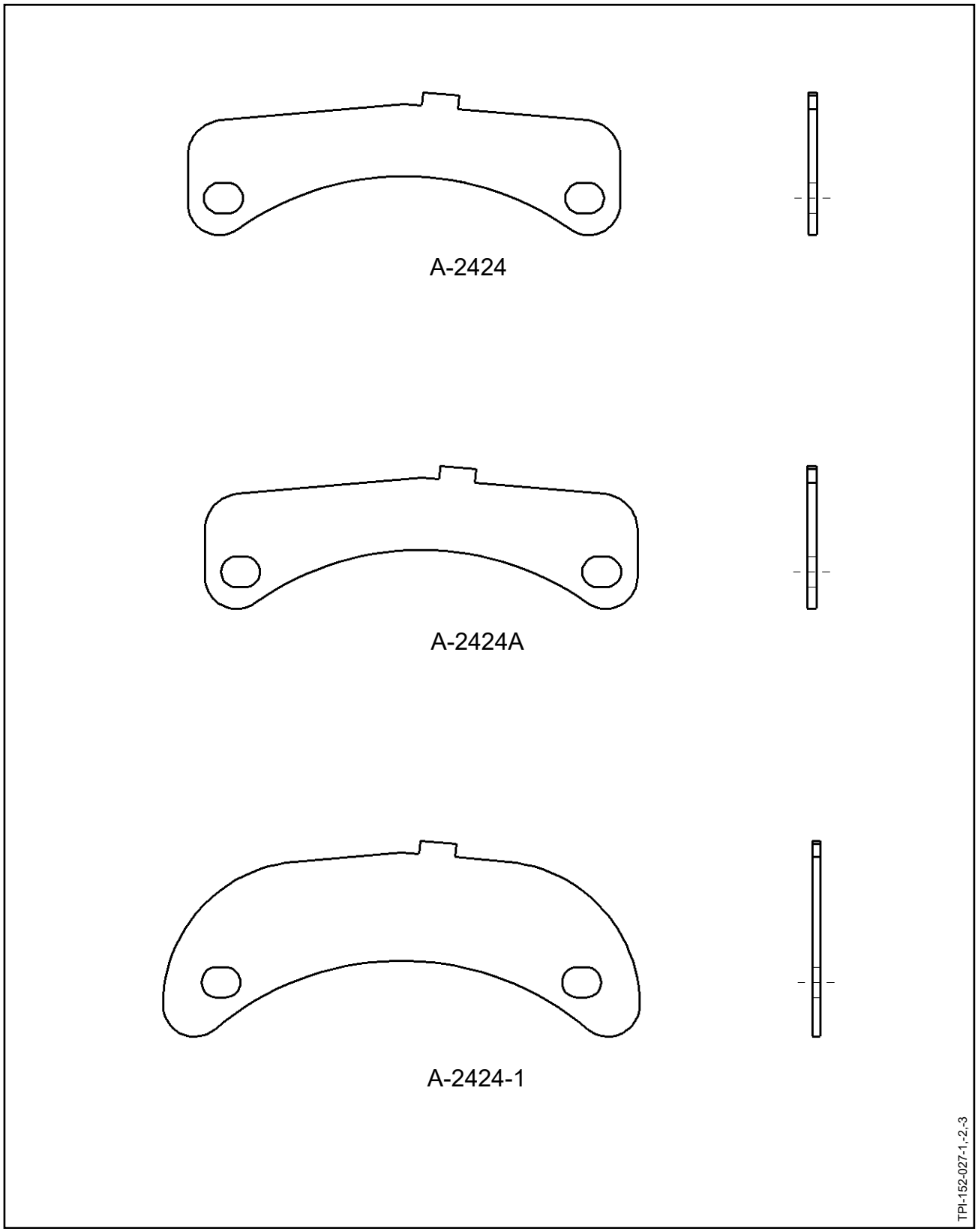
Example 2: Lip thickness in Area "A" is less than 0.063 inch (1.61 mm)
Depth of damage in Area "B" is 0.018 inch (0.45 mm).
Damage is greater than the permitted serviceable limits,
replace the preload plate.

APS6283, APS6284

Preload Plate Lip Measurement
Figure 5-28

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
Y.	PRELOAD PLATE ASSEMBLY w/INNER BEARING RACE, CONTINUED (Item 3080) (Refer to Figure 5-27 and 5-28.)		
	(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 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 5-28 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 5-28.	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 of the preload plate in accordance with the Penetrant Inspection chapter of Hartzell Propeller Inc. 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.



Balance Weight
Figure 5-29

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
Z.	BALANCE WEIGHT (Item 9020) (Refer to Figure 5-29.)		
	(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 Inc. 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 balance weight in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
	(4) For a steel (silver color) balance weight: Visually examine the balance weight for cadmium plating coverage.	Except for a few scratches and corners with cadmium plating missing, complete coverage is required.	If the coverage is less than the permitted serviceable limits, replate the balance weight in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. 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 INC. OR NOT SPECIFICALLY REFERRED TO IN HARTZELL PROPELLER INC. MANUALS. CONTACT HARTZELL PROPELLER INC. 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. 2)

   A. Shot Peening

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

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

      (2) Shot peened surfaces may require re-shot peening because of rust, corrosion, fretting, or nicks. For shot peening procedures, refer to the Shot Peening chapter of Hartzell Propeller Inc. 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 Inc. should shot peen Hartzell propeller parts.

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

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

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

b Contact Hartzell Propeller Inc. 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. 2)

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 Inc. Standard Practices Manual 202A (61-01-02).

C. Blades

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

D. Spinner Assemblies

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

E. Ice Protection Systems

(1) For ice protection systems supplied by Hartzell, refer to Hartzell Propeller Inc. 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

NOTE: Balance weight attachment hole and lubrication fitting hole repair procedures are described in the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Manual 202A (61-02-02).

A. Replacing the Piston Insert in a B-4049 Piston Unit

(1) General

(a) This repair procedure provides the instructions for replacing a piston insert A-4051 in a piston unit B-4049.

(2) Materials

NOTE: Specific Hartzell Propeller Inc. manuals and service documents are available on the Hartzell website at www.hartzellprop.com. Refer to the Required Publications section in the Introduction chapter of this manual for the identification of these publications.

(a) Refer to the Consumable Materials chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

1 Solvent - acetone CM11, MPK CM219, or MEK CM106

2 Epoxy CM16

3 Clean cheesecloth CM159

4 Piston insert A-4051

(3) Removing the piston insert A-4051 from the piston unit B-4049.

(a) Using a locally procured non-metallic scraper, carefully separate the piston insert A-4051 from the piston.

(b) Using plastic media cleaning, remove any glue that remains on the surface of the piston. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(4) Installing a new piston insert A-4051 in the piston unit B-4049

(a) Using plastic media cleaning, remove any glue that remains on the surface of the piston. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(b) At room temperature, using a clean cheesecloth CM159 dampened with a solvent that is listed in paragraph (2)(a) of this procedure, clean all surfaces to be bonded.

(c) Permit the solvent to dry.

(d) Do not touch the surface of the parts after they have been cleaned.

(e) Following the manufacturer's instructions, prepare the epoxy CM16.

(f) Apply the epoxy CM16 mixture to the areas to be bonded.

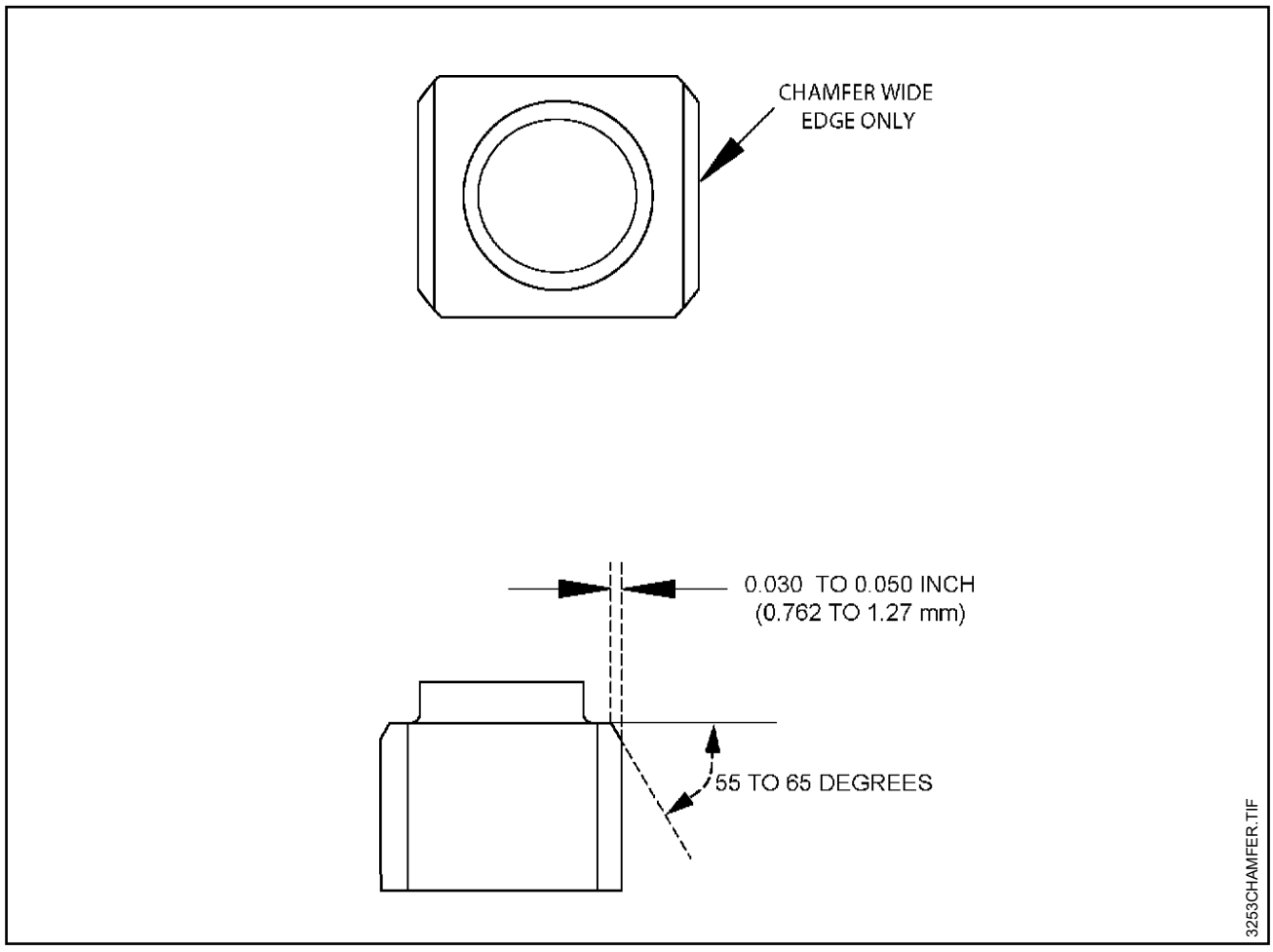
(g) Assemble the parts.

(h) Permit the adhesive to cure to full strength. For cure time refer to the Consumable Materials chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

B. Modification of the A-3253-( ) Pitch Change Block

(1) Installation of the new pitch change knob bushings, C-7645 or C-7645-1 requires the modification of the A-3253-( ) pitch change blocks on three blade propellers.

(2) Modify the A-3253-( ) pitch change block in accordance with the dimensions specified in Figure 6-1.



Pitch Change Block Modification
Figure 6-1

C. Removing and Installing the Plug in the Pitch Stop

(1) General

(a) This procedure provides the instructions to remove and install the plug (20) from the pitch stop (30) when required. Refer to the Check chapter for the serviceable limits of the pitch stop (30).

(2) Materials

NOTE: Specific Hartzell Propeller Inc. manuals and service documents are available on the Hartzell website at www.hartzellprop.com. Refer to the Required Publications section in the Introduction chapter of this manual for the identification of these publications.

(a) Refer to the Consumable Materials chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

1 Solvent - acetone CM11, MPK CM219, or MEK CM106

2 Retaining compound CM74

3 Clean cheesecloth CM159

4 Plug (20), Hartzell Propeller Inc. part number A-4268

(3) Plug Removal

(a) Using a locally procured 3/16 inch hex head wrench, remove and discard the plug (20) from the pitch stop (30).

1 If the plug cannot be removed using the locally procured 3/16 inch hex head wrench, remove and discard the plug using a locally procured screw extractor of the appropriate size.

2 If the plug cannot be removed using the locally procured screw extractor, discard the pitch stop (30) and the plug (20).

a Install a new plug (20) in a serviceable pitch stop (30) in accordance with the instructions in this section.

(4) Plug Installation

(a) Examine the pitch stop (30) for damage to the internal threads. Refer to the Check chapter of this manual.

1 If the examination of the internal threads of the pitch stop (30) is not satisfactory, replace the pitch stop.

(b) Using a clean cheesecloth CM159 dampened with a solvent that is listed in paragraph (2)(a) of this procedure, clean the threads of the plug (20) and the internal threads of the pitch stop (30).

(c) Permit the solvent to dry.

(d) At room temperature, apply the retaining compound CM74 to the threads of the plug (20) and to the internal threads of the pitch stop (30).

(e) With the hex head side of the plug (20) pointed away from the pitch stop (30), turn the plug (20) into the pitch stop (30) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.

(f) Using a clean, dry cheesecloth CM159, wipe away any unwanted retaining compound CM74.

(g) Permit the retaining compound CM74 to dry for 8 hours.

D. Brass Counterweight Slug Mounting Hole Repair

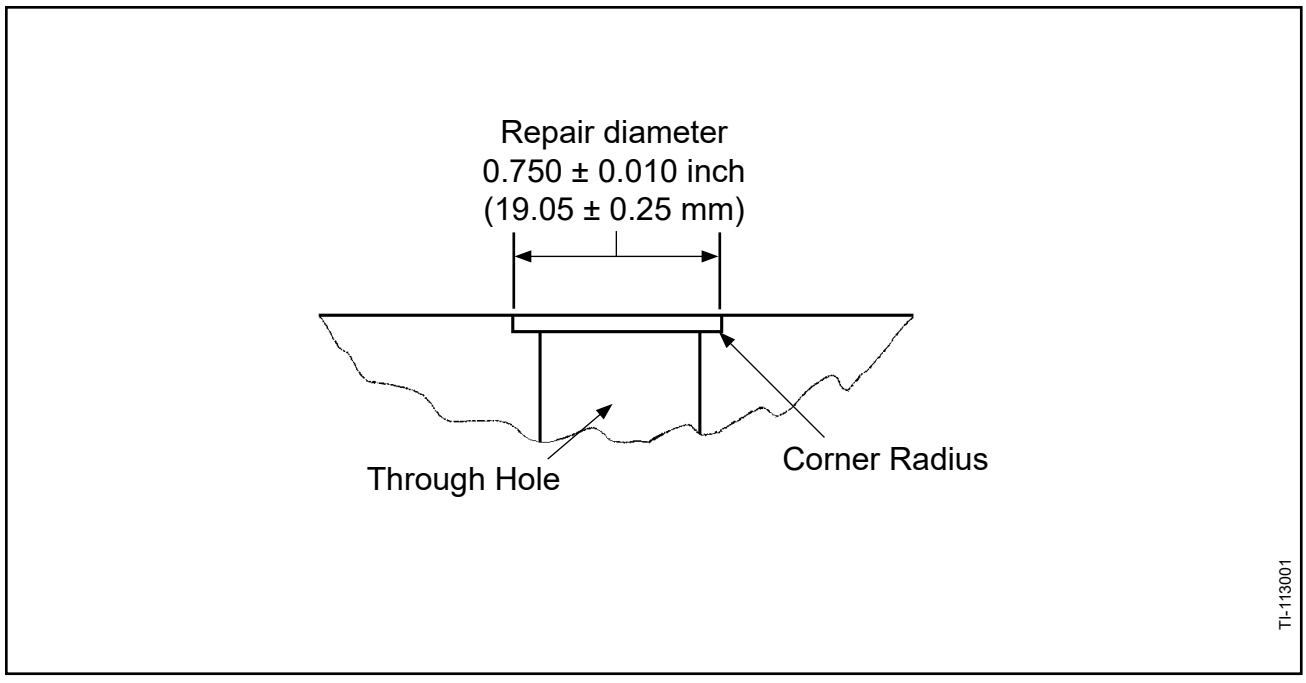
(1) General

(a) This procedure provides the instructions to remove wear around the counterweight slug mounting through hole.

(2) Procedure

(a) Use a locally procured end mill cutter that is 0.750 ± 0.010 inch (19.05 ± 0.25 mm) outside diameter.

1 The corner radius blending between the outside diameter and the cutting end must be 0.005 to 0.033 inch (0.13 to 0.83 mm). Refer to Figure 6-2.



Brass Counterweight Slug Mounting Hole Repair
Figure 6-2

(b) Put the brass weight slug in the end mill.

CAUTION: MAKE SURE THAT THE BRASS WEIGHT SLUG IS HELD TIGHTLY IN PLACE WITH THE THROUGH HOLE CENTERED UNDER THE END MILL CUTTER.

(c) Center the through hole that will be repaired under the end mill cutter and make sure that the brass weight slug is held tightly in place.

CAUTION: DO NOT SPOTFACE DEEPER THAN THE MAXIMUM PERMITTED DEPTH.

(d) Spotface the brass weight slug to remove wear damage.

1 The maximum permitted depth of repair is 0.020 inch (0.50 mm).

2 Spotface to a greater depth is not permitted.

3 If the repair is greater than the maximum permitted depth of repair, replace the brass weight slug.

(e) Using an abrasive pad CM47 or equivalent, remove all burrs.

(f) Break any sharp corners.

(g) Visually examine the repair to make sure that the repair is centered on the through hole.

(h) Cadmium plating of any bare brass surface is required. Refer to the Check chapter of this manual.

E. Installing the Beta Lockout Spring Guide

(1) General

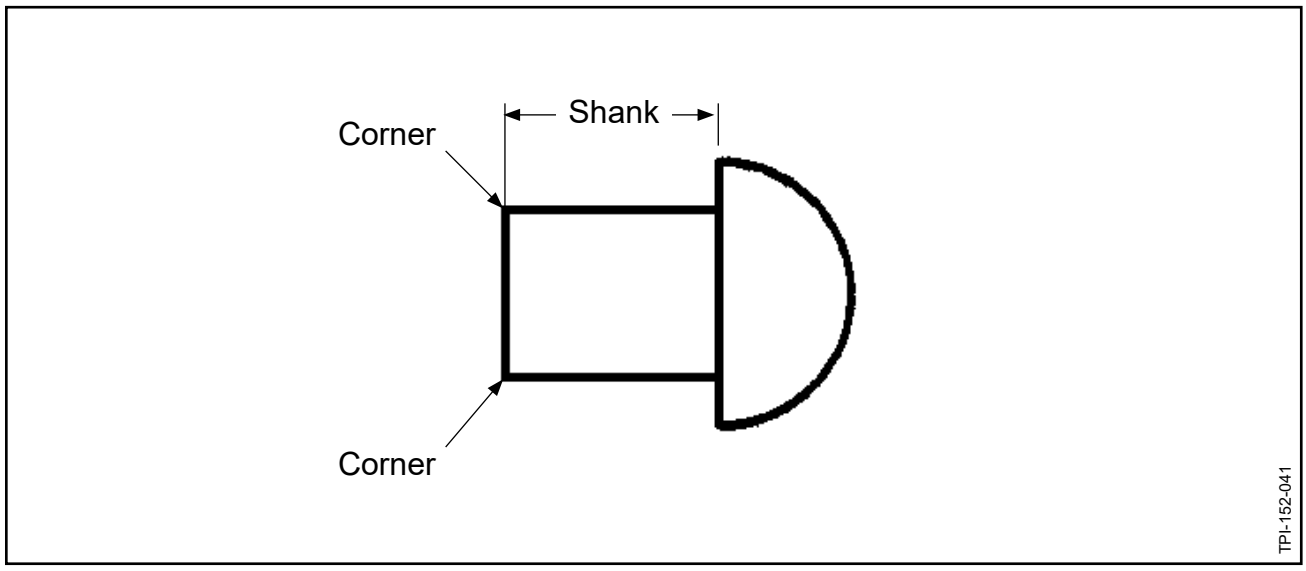
(a) This procedure provides the instructions to install the beta lockout spring guide (660) in the beta lockout (650).

(2) Procedure

(a) Using a fine grit sandpaper, slightly taper each corner of the beta lockout spring guide (660). Refer to Figure 6-3.

1 The maximum permitted length of the taper is 20% of the shank.

(b) Using a locally procured hand press, press the beta lockout spring guide (660) in the hole provided for it in the beta lockout (650).



Beta Lockout Spring Guide
Figure 6-3

F. Preload Plate Assembly Inner Bearing Race Replacement

CAUTION: ONLY DO THIS PROCEDURE IF THERE IS A SUFFICIENT AMOUNT OF SPACE BETWEEN THE BOTTOM OF THE INNER BEARING RACE (3090) AND THE SURFACE OF THE PRELOAD PLATE ASSEMBLY (3080). DO NOT DO THIS PROCEDURE IF THE BOTTOM OF THE INNER BEARING RACE IS TOUCHING THE PRELOAD PLATE ASSEMBLY.

(1) Removing and Installing the Preload Plate Inner Bearing Race (3090) to the Preload Plate Spindle

CAUTION: WHEN REMOVING THE INNER BEARING RACE (3090), USE CARE TO NOT DAMAGE THE PRELOAD PLATE ASSEMBLY (3080) THREADS.

(a) Remove the inner bearing race (3090) 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 assembly (3080) threads.

(b) Discard the inner bearing race (3090).

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

(d) Using number 4 oil, CM80, lubricate the inside diameter of the new inner bearing race (3090).

(e) Put the preload plate assembly (3080) in a locally procured fixture.

CAUTION 1: THE FORCE WHEN PUSHING THE INNER BEARING RACE (3090) ONTO THE PRELOAD PLATE ASSEMBLY (3080) MUST NOT BE GREATER THAN 5000 POUNDS.

CAUTION 2: WHEN PUSHING THE INNER BEARING RACE (3090) ONTO THE PRELOAD PLATE SPINDLE, USE CARE TO NOT DAMAGE THE PRELOAD PLATE ASSEMBLY (3080) THREADS.

(f) Push the inner bearing race (3090) over the preload plate spindle. Refer to Figure 6-4.

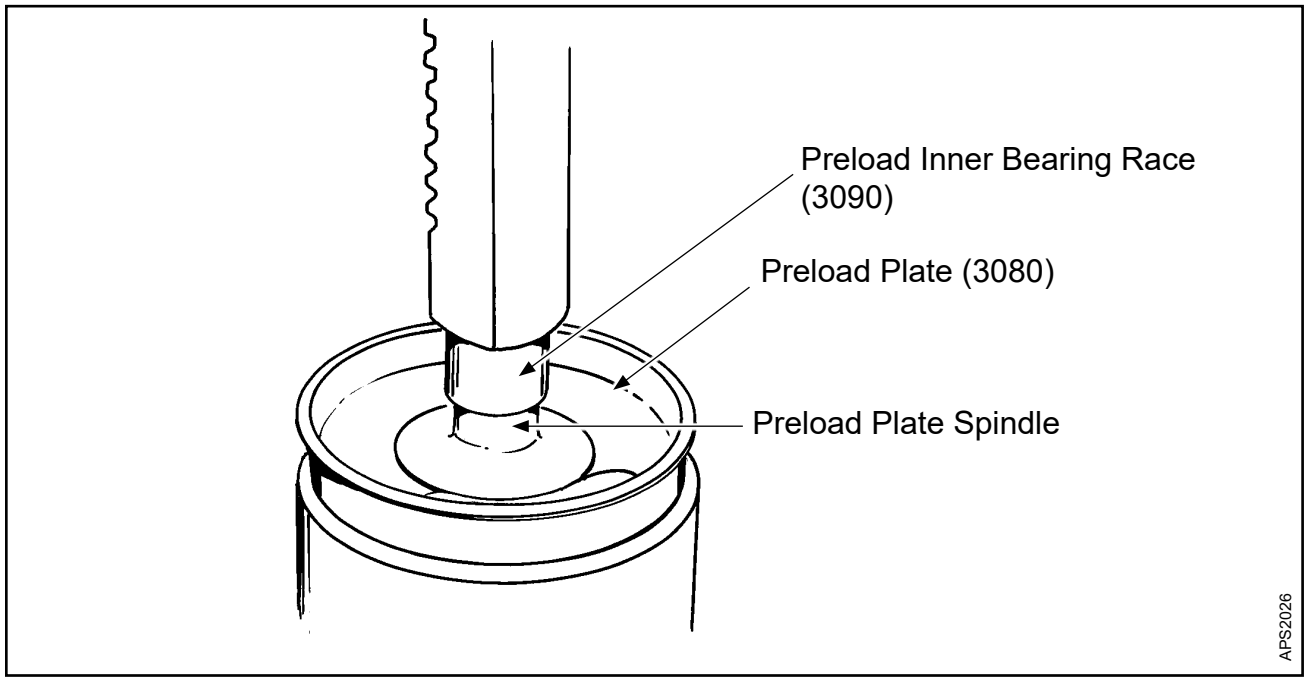
1 The top of the inner bearing race (3090) must be flush to 0.005 inch (0.12 mm) below the top surface of the preload plate spindle.

(g) Turn the set screw (3100) into the preload plate assembly (3080) to test the preload plate assembly threads.

1 If the set screw (3100) does not turn smoothly into the preload plate (3080), replace the preload plate assembly (3080).

(h) Twist, turn, and pull by hand the inner bearing race (3090) to make sure it holds a press fit on the preload plate assembly (3080).

1 If the inner bearing race (3090) does not hold a press fit on the preload plate assembly (3080), replace the preload plate assembly.



Pressing the Preload Bearing onto the Preload Plate Spindle
Figure 6-4

ASSEMBLY - CONTENTS

LIST OF FIGURES

LIST OF FIGURES, CONTINUED

LIST OF TABLES

(This page is intentionally blank.)

1. General (Rev. 5)

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 Inc. 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 Inc. 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 Inc. 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 Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

E. Blade Angle Information

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

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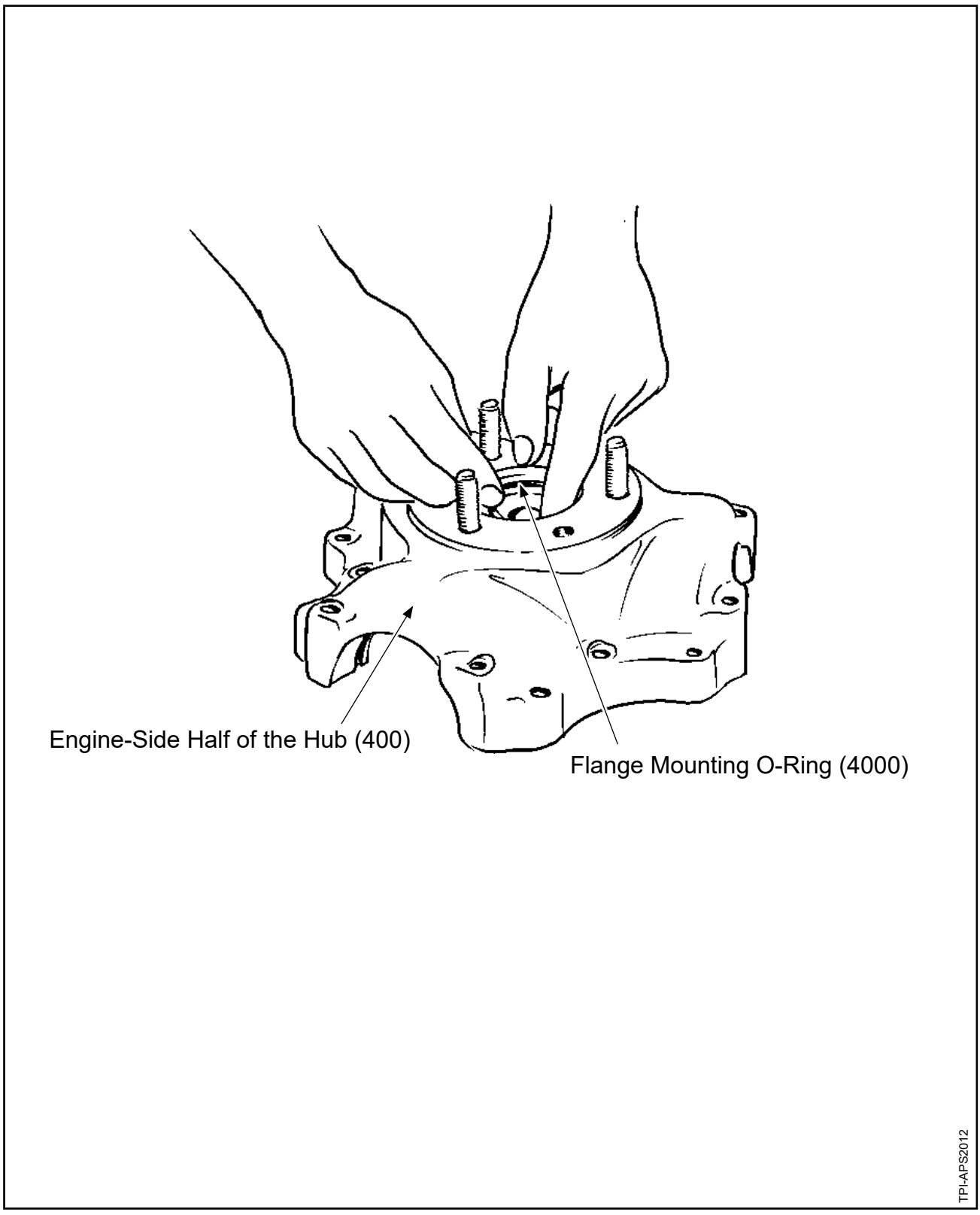


Installing the Flange O-ring in the Engine-Side Hub Half Flange
Figure 7-1

2. Assembly of HC-E3YR-7( ) Propellers

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: ACTUATION OF PROPELLERS IS TO BE ACCOMPLISHED USING COMPRESSED AIR THAT HAS BEEN FILTERED FOR MOISTURE, OR NITROGEN.

CAUTION 3: DO NOT EXCEED A PRESSURE OF 175 PSI (12.06 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

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

A. Hub Assembly Procedures

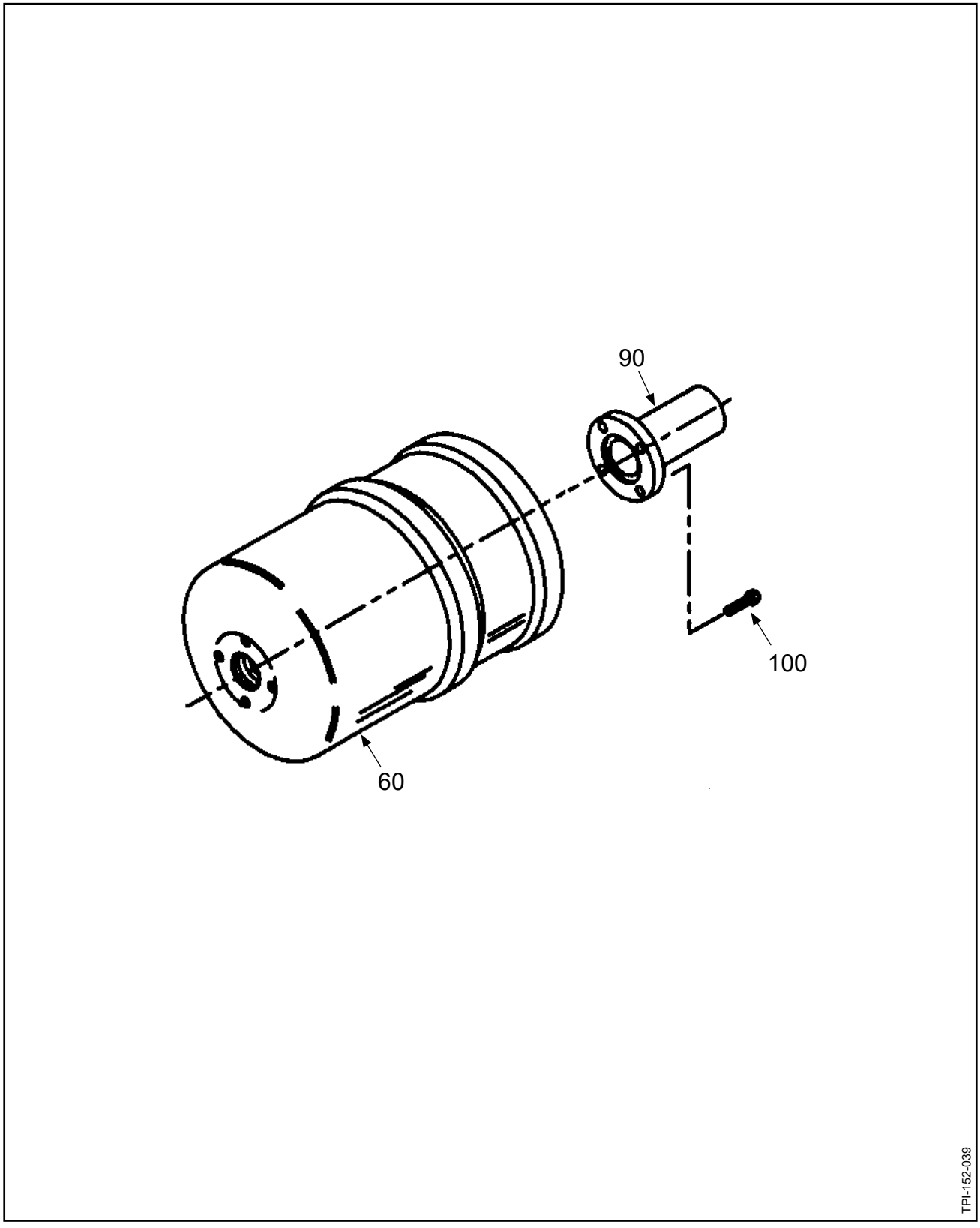
NOTE: Verify the spinner and bulkhead assembly and installation procedures, if applicable, before beginning the assembly of the hub. Use the alternate hub clamping nuts and bolts that are supplied with a spinner mounting kit.

(1) Refer to the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) for procedures to install the propeller mounting hardware.

(2) Install a new pitch change rod O-ring (270) in the cylinder-side half of the hub (400).

(3) Install the pitch change rod O-ring (460) on the engine-side half of the hub (400).

(4) Install the flange mounting O-ring (4000) on the engine-side half of the hub (400). Refer to Figure 7-1.



Installing the High Pitch Stop in the Cylinder
Figure 7-2

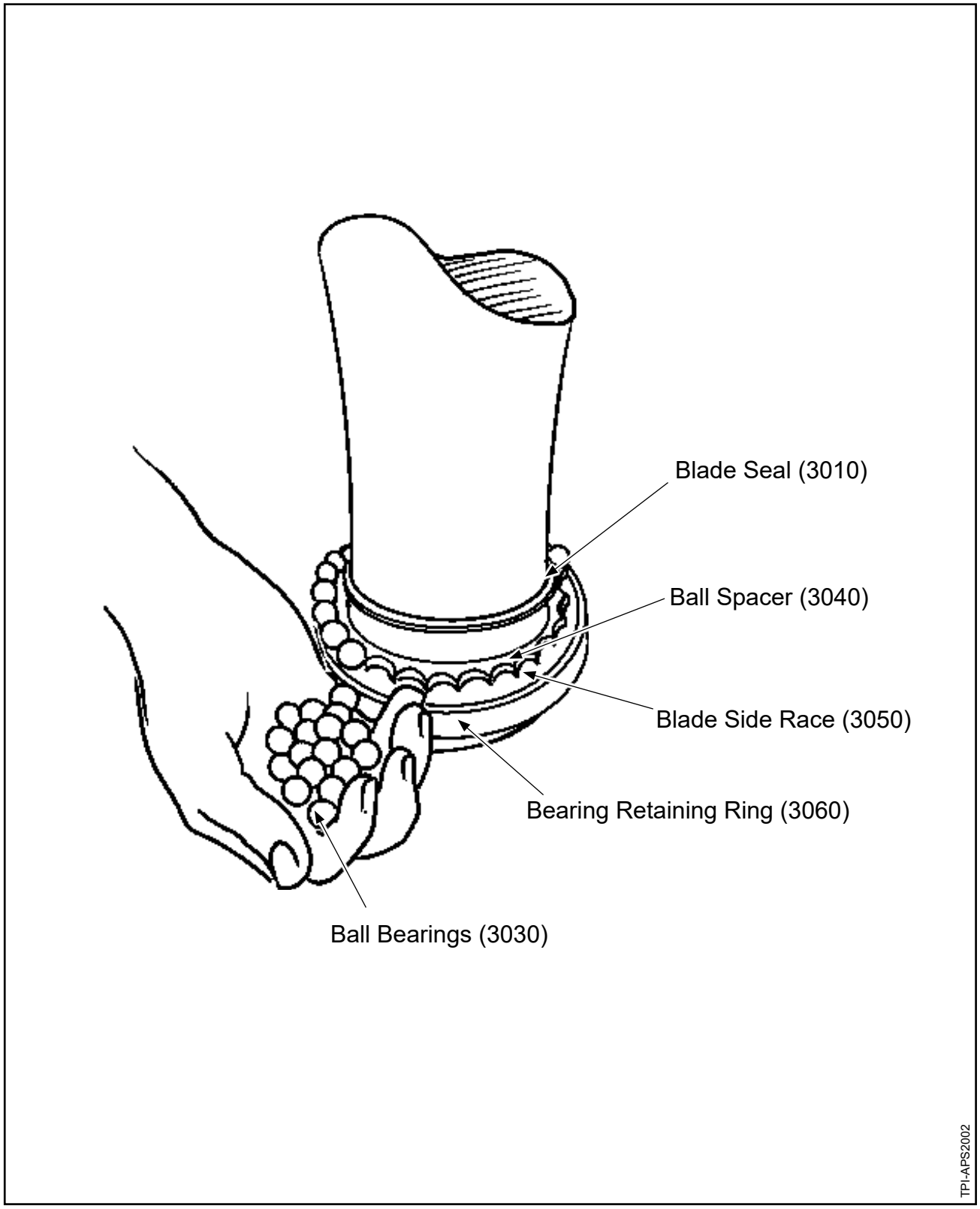
B. Installing the High Pitch Stop in the Cylinder - Refer to Figure 7-2.

(1) Put the high pitch stop (90) in the cylinder (60), aligning the holes in the high pitch stop (90) with the holes in the cylinder (60).

(2) Apply thread locking compound CM21 to the high pitch stop screws (100).

(3) Using the high pitch stop screws (100), attach the high pitch stop (90) to the cylinder (60).

(4) Torque the screws (100) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.



Installing the Blade Retention Bearing
Figure 7-3

C. Blade Assembly Procedures

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

(2) Pitch Change Knob Bushing Installation

(a) For pitch change knob bushing installation, refer to the Special Adhesive and Bonding Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(3) Install the hub-side blade race and ball bearings. Refer to Figure 7-3.

(a) Lubricate the blade seal (3010) with lubricant CM12 and install on the blade.

(b) Lubricate the blade-side race (3050) with lubricant CM12.

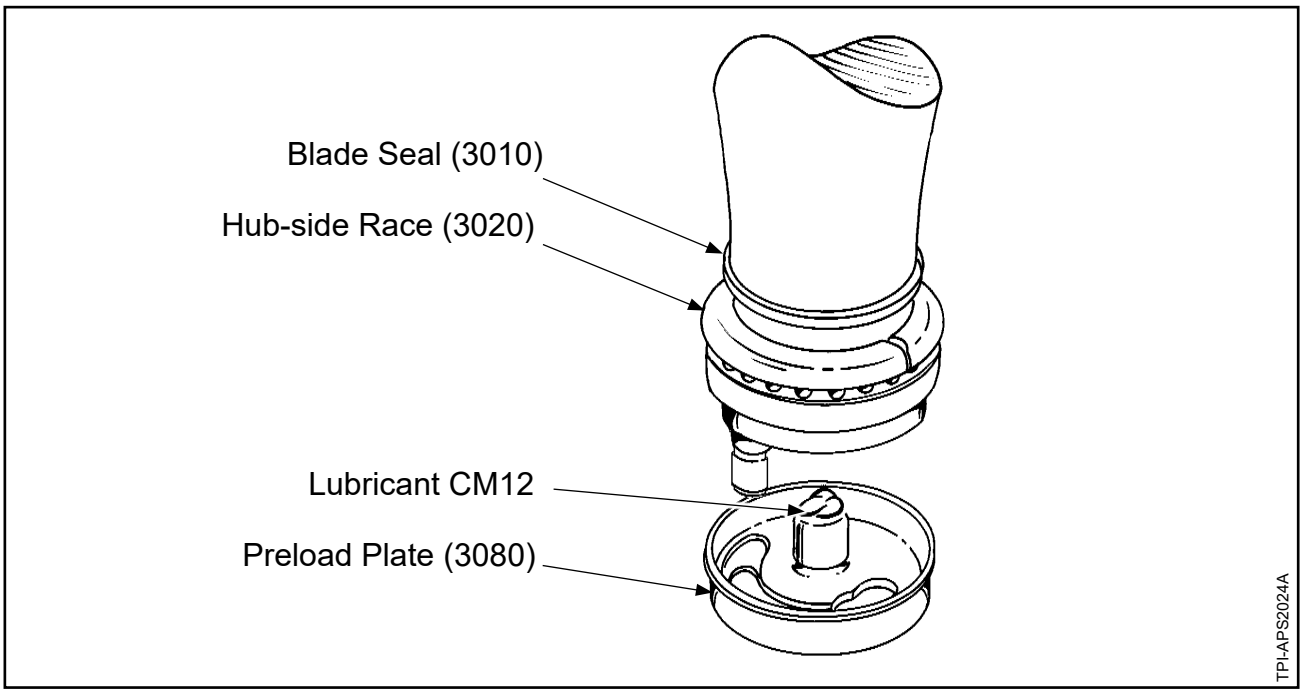
(c) Put the ball spacer (3040) on the race (3050).

CAUTION: ALL THE BEARING BALLS IN A SINGLE BEARING MUST BE OF THE SAME SIZE AND GAUGE. BEARING BALLS SUPPLIED BY HARTZELL PROPELLER INC. ARE THE SAME GAUGE.

(d) Using a small amount of lubricant CM12 around the bearing balls, put the ball bearings (3030) in the openings of the ball spacer (3040) on the blade side race (3050).

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

(e) Put the hub-side bearing race (3020) on the ball bearings (3030). Refer to Figure 7-4.



Installing the Preload Plate on the Blade Shank
Figure 7-4

D. Assembling and Installing the Preload Plate Assembly

(1) Install the set screw (3100) in the preload plate so the end of the screw protruding toward the blade butt is flush with the preload plate (3080).

NOTE: The set screw (3100) will be repositioned later to set the blade preload.

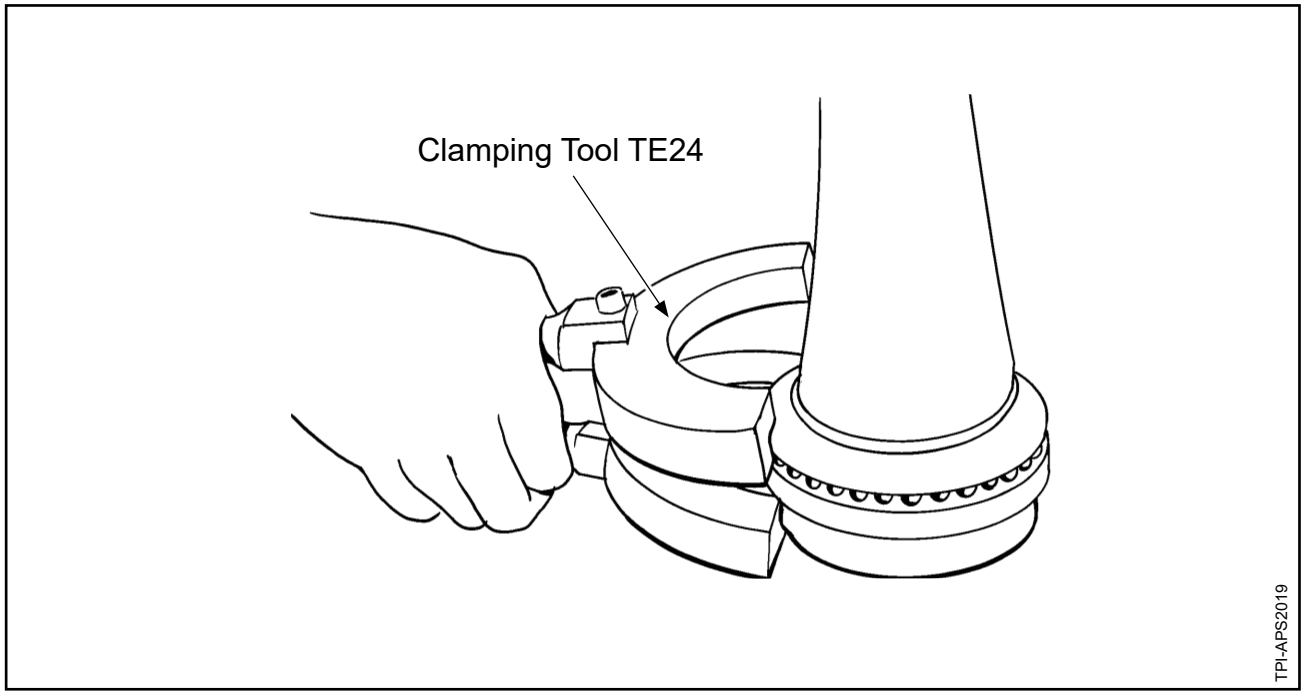
(2) Install the nut (3110) on the set screw (3100).

(3) Put approximately one tablespoon of lubricant CM12 on top of the preload plate inner bearing race spindle. Refer to Figure 7-4.

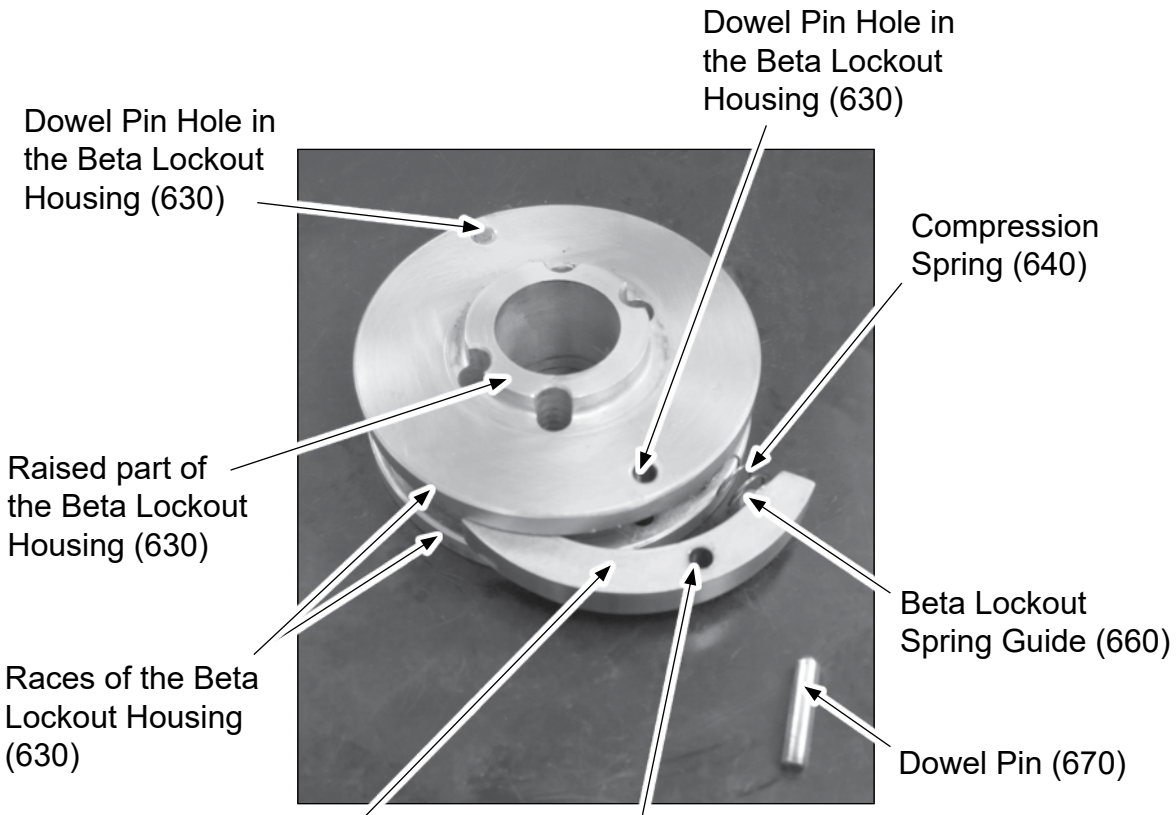
NOTE: Using this amount of lubricant will push lubrication into the blade bore bearing when the preload plate is installed on the blade.

(4) Install the preload plate (3080) on the butt of the blade. Refer to Figure 7-4.

NOTE: For installation into the hub, clamping tool TE24 is available to hold the split bearing and preload plate assembly to the blade butt. Refer to Figure 7-5.



Applying the Clamping Tool TE24 to the Blade Assembly
Figure 7-5



Assembling the Beta Lockout Assembly
Figure 7-6

E. Assembling the Beta Lockout Assembly - Refer to Figure 7-6.

(1) Put a compression spring (640) in the hole between the races of the beta lockout housing (630).

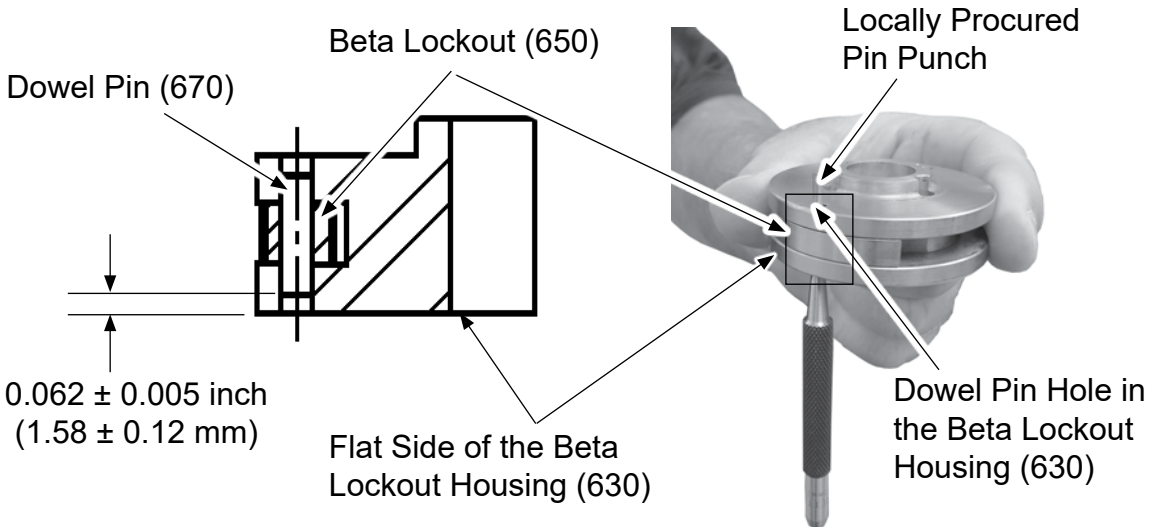
(2) Put one beta lockout (650) in the groove between the races of the beta lockout housing (630) with the beta lockout spring guide (660) of the beta lockout (650) in the end of the compression spring (640) and the dowel pin hole in the beta lockout housing (630) near the dowel pin hole in the beta lockout (650).

(3) Push the beta lockout into the groove between the races of the beta lockout housing (630), aligning the dowel pin hole in the beta lockout housing (630) with the dowel pin hole in the beta lockout (650).

(4) From the flat side of the beta lockout housing (630), put a locally procured pin punch of an appropriate size through the dowel pin holes in the beta lockout housing (630) and the beta lockout (650). Refer to Figure 7-7.

NOTE: The pin punch will help keep the dowel pin holes aligned as the dowel pin (670) is installed.

(5) Align a dowel pin (670) with the end of the locally procured pin punch.



TPI-152-133,TPI-152-038

Aligning the Dowel Pin
Figure 7-7

(6) Carefully install the dowel pin (670) into the dowel pin holes in the beta lockout housing (630) and the beta lockout (650) until the dowel pin (670) is 0.062 ± 0.005 inch (1.58 ± 0.12 mm) below the surface on the flat side of the beta lockout housing (630). Refer to Figure 7-7.

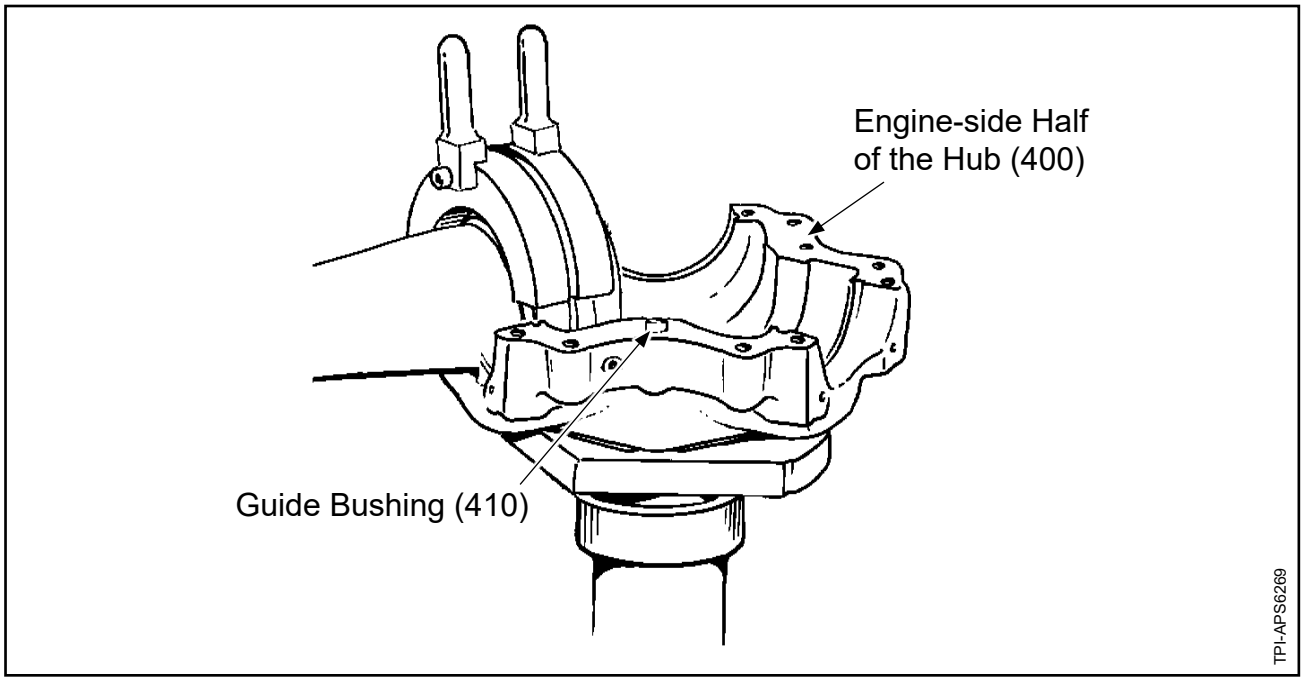
(a) There must be an interference fit between the dowel pin (670) and the dowel pin hole in the beta lockout housing (630) for one of the two dowel pins (670) used in the beta lockout housing (630).

(7) Using a 0.5 inch (0.12 mm) locally procured swaging tool, swage the dowel pin holes on each side in the beta lockout housing (630) to make sure that the dowel pin (670) is held in the dowel pin hole.

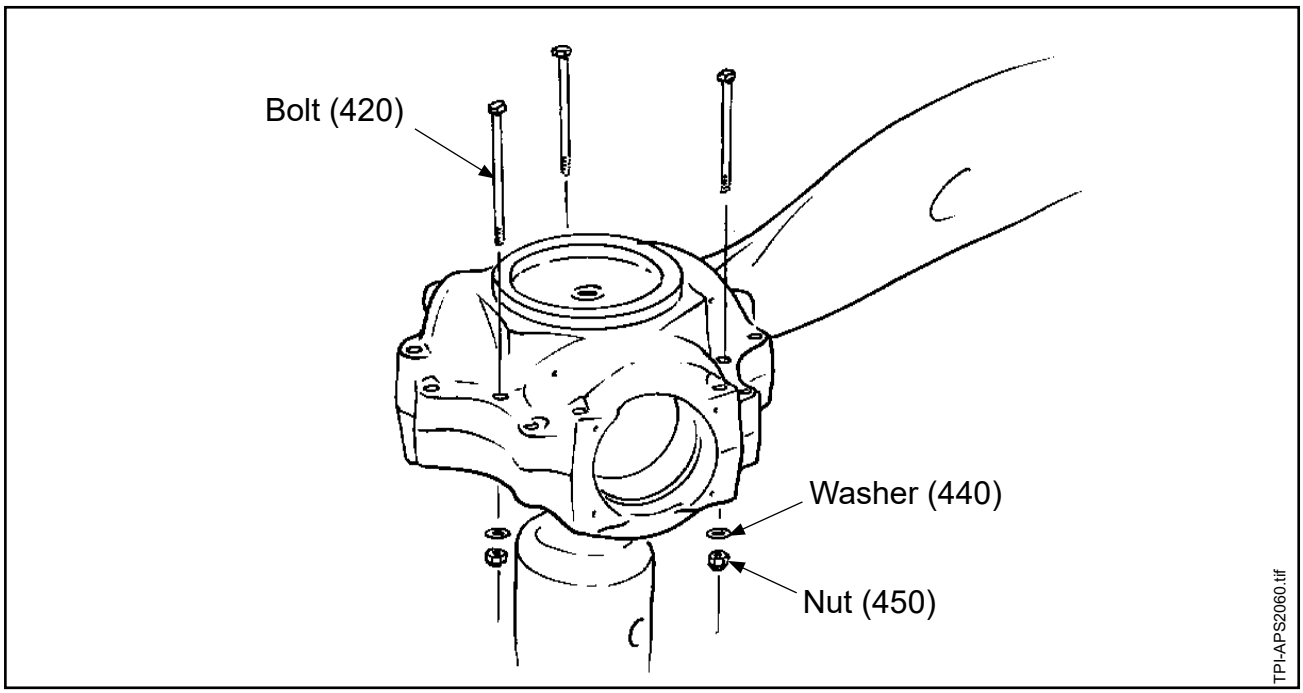
(a) The locally procured swaging tool is a dowel pin with a spherical radius tip, made from A2 tool steel hardened to 55-62 HRC (recommended).

(8) The beta lockout (650) must move freely in the beta lockout housing (630).

(9) Install the other beta lockout (650) in accordance with step 2.E.(1) through step 2.E.(8).



Installing Blade Assembly Number One in the Hub
Figure 7-8



Installing the Cylinder-side Half of the Hub
Figure 7-9

F. Installing the Blades

(1) If building a pusher configuration propeller, install the counterweights before installing the blades in accordance with the section, "Counterweight Installation" in this chapter.

(a) For propeller configuration information, refer to the Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

(2) Apply a thin layer of lubricant CM12 to the blade retention radius and to the seal grooves of the hub (400).

CAUTION: BLADES MUST BE PRELOADED WHILE RESTING IN THE SOCKET OF THE HUB (400) THAT THEY WILL OCCUPY WHEN ASSEMBLED. DO NOT PRELOAD ALL OF THE BLADES IN THE SAME SOCKET OF THE HUB (400).

(3) Using clamping tool TE24, install blade assembly number one into the socket of the engine-side half of the hub (400). Refer to Figure 7-8.

(a) For a pusher configuration, install the blades with the face-side of the blade pointing upward.

(4) Center the slot of the preload plate (3080) at the parting line of the hub (400).

(a) Put the pitch change knob slot in the preload plate (3080) in a position that permits 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 (400) OR MAY APPLY TOO MUCH PRESSURE THAT CAN INTERFERE WITH PITCH CHANGE MOVEMENT.

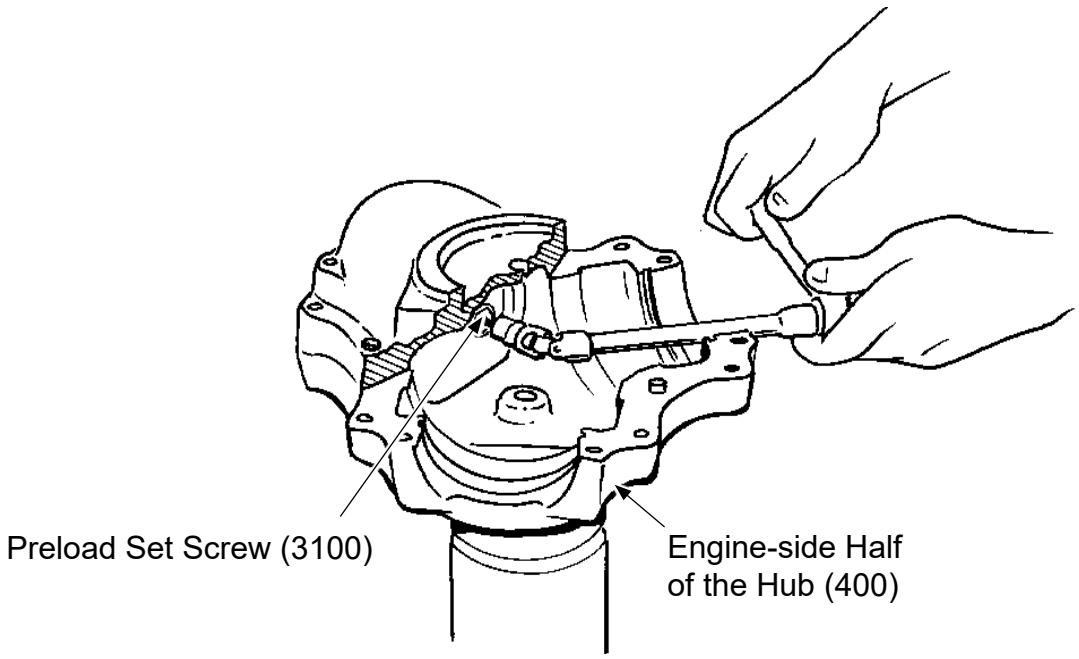
(5) Setting the blade preload.

(a) Install the guide bushing (410) in the hole provided for it in the hub (400). Refer to Figure 7-8.

(b) Install the cylinder-side half of the hub (400). Refer to Figure 7-9.

(c) Bolt the halves of the hub (400) together using three bolts (420), three washers (440), and three nuts (450) located midway between the blades. Refer to Figure 7-9.

(d) Torque the nuts (450) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.



Tightening Preload Socket Screw and Hex Nut
Figure 7-10

(e) Tighten the preload set screw (3100) through the open end of the hub (400). Refer to Figure 7-10.

NOTE: The loose blade will become rigid in the hub (400) as the preload set screw (3100) is tightened.

(f) Tighten the preload set screw (3100) until the tip of the blade stops moving vertically.

(g) Gently move the tip of the blade to make sure that the blade is correctly seated in the retention socket.

(h) Loosen the preload set screw (3100) and retighten.

1 When the blade tip stops moving, turn the preload set screw (3100) approximately 1/4 to 1/2 additional turn into the preload plate (3080).

(i) Examine the blade for free rotation. If the blade does not rotate freely, remove the blade and examine the following:

1 The blade seal (3010) must fit correctly in the groove in the hub (400).

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

3 Blade preload may be too tight.

(j) Remove the three nuts (450), three washers (440), and three bolts (420).

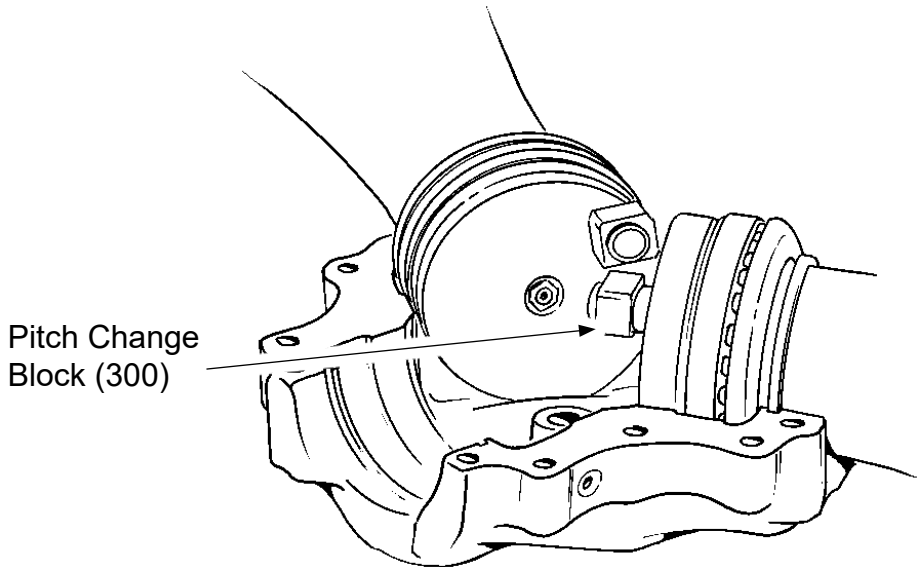
(k) Remove the cylinder-side half of the hub (400).

(l) Apply one drop of thread locking compound CM21 on the threads of the preload socket set screw (3100).

CAUTION: MAKE SURE TO PREVENT THE PRELOAD SET SCREW (3100) FROM ROTATING WHEN TORQUING THE HEX NUT (3110).

(m) Torque the hex nut (3110) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.

(6) Remove blade assembly number one.



Installing the Pitch Change Blocks
Figure 7-11

(7) Install blade assembly number two and blade assembly number three into the sockets of the engine-side half of the hub (400). Refer to Figure 7-11.

(8) Center the slot of each preload plate (3080) at the parting line of the hub (400).

(a) Position the blade knob slot in each preload plate (3080) to permit the blade to travel within the full blade angle range without restriction.

(9) Set the blade preload using the procedures in steps 2.F.(5)(a) through 2.F.(5)(m).

(10) Install the three fork bumpers (290) on the pitch change fork (280).

NOTE: The fork bumpers (290) press fit into the holes provided in the pitch change fork (280).

(11) Apply anti-seize compound CM118 to the outside of each pitch change knob bushing (3000).

(12) Apply anti-seize compound CM118 to each pitch change block groove in the pitch change fork (280).

(13) Apply anti-seize compound CM118 to the threads of the fork (280).

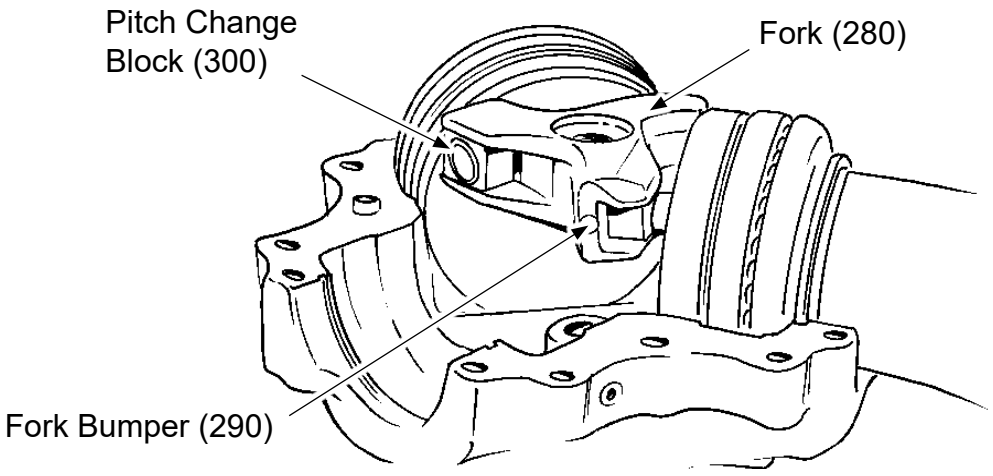
(14) Examine the pitch change block (300) for a chamfer. Refer to the Check chapter of this manual for pitch change block (300) inspection criteria.

(a) If the pitch change block (300) does not have a chamfer, modify the pitch change block (300) in accordance with the section, "Modification of the A-3253-( ) Pitch Change Block" in the Repair chapter of this manual.

(15) With the round extension of the pitch change block (300) pointed away from the blades, install a pitch change block (300) on each blade pitch change knob. Refer to Figure 7-11.

(a) Examine the position of the pitch change block (300).

1 During initial assembly, each pitch change block (300) should be installed in the fork (280) with the thin wall of the pitch change block (300) pointing toward the engine-side half of the hub (400).



Installing the Pitch Change Fork
Figure 7-12

CAUTION: MAKE SURE THE TAPER IN THE FORK (280) MATCHES THE TAPER IN THE PITCH CHANGE ROD (250). IF THE PITCH CHANGE ROD (250) IS INCORRECTLY ATTACHED TO THE FORK (280), THE SEATING AREA OF THE PITCH CHANGE ROD (250) WILL BE DAMAGED.

NOTE: Forks manufactured in the 1980s were intended to be universal (both left and right handed) and were tapered on both sides. Universal forks are no longer manufactured.

(16) Install the fork (280) on the pitch change blocks (300) of blade assembly number two and blade assembly number three. Refer to Figure 7-12.

(17) Put the pitch change block (300) for blade number one into the fork (280).

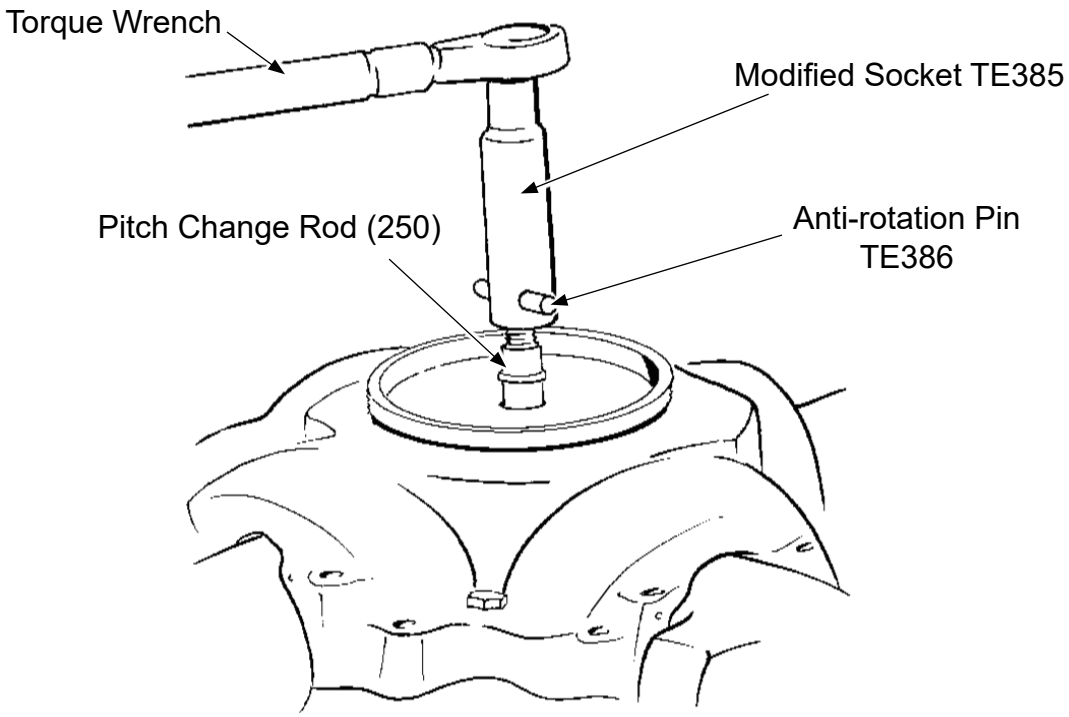
(18) Insert the pitch change knob of blade number one into the pitch change block (300) that is installed on the fork (280) and rotate blade number one into the blade socket of the hub (400).

(19) Remove the blade retention components clamp TE24 from blade assembly number one.

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.

(20) Using a clean cloth dampened with solvent MEK CM106 or MPK CM219, wipe the mating surfaces of the hub (400).

(21) Permit the solvent MEK CM106 or MPK CM219 to dry.



Using the Torque Wrench Adaptor TE6 on the Pitch Change Rod
Figure 7-13

CAUTION: MAKE SURE THAT THE BLADE SEAL IS CORRECTLY ALIGNED IN THE HUB GROOVE WHEN INSTALLING THE CYLINDER-SIDE HALF OF THE HUB (400).

(22) Install the cylinder-side half of the hub (400).

(a) If necessary, use a rubber mallet to help install the cylinder-side half of the hub (400).

(23) Insert the pitch change rod (250) through the cylinder-side half of the hub (400) and start the pitch change rod (250) in the threads of the fork (280).

(24) Put the modified socket TE385 of the torque wrench adaptor TE6 on the pitch change rod (250). Refer to Figure 7-13.

(25) Insert the anti-rotation pin TE386 of the torque wrench adaptor TE6 into the hole in the modified socket TE385, making sure that the flat side of the anti-rotation pin TE386 is pointing toward the pitch change rod (250).

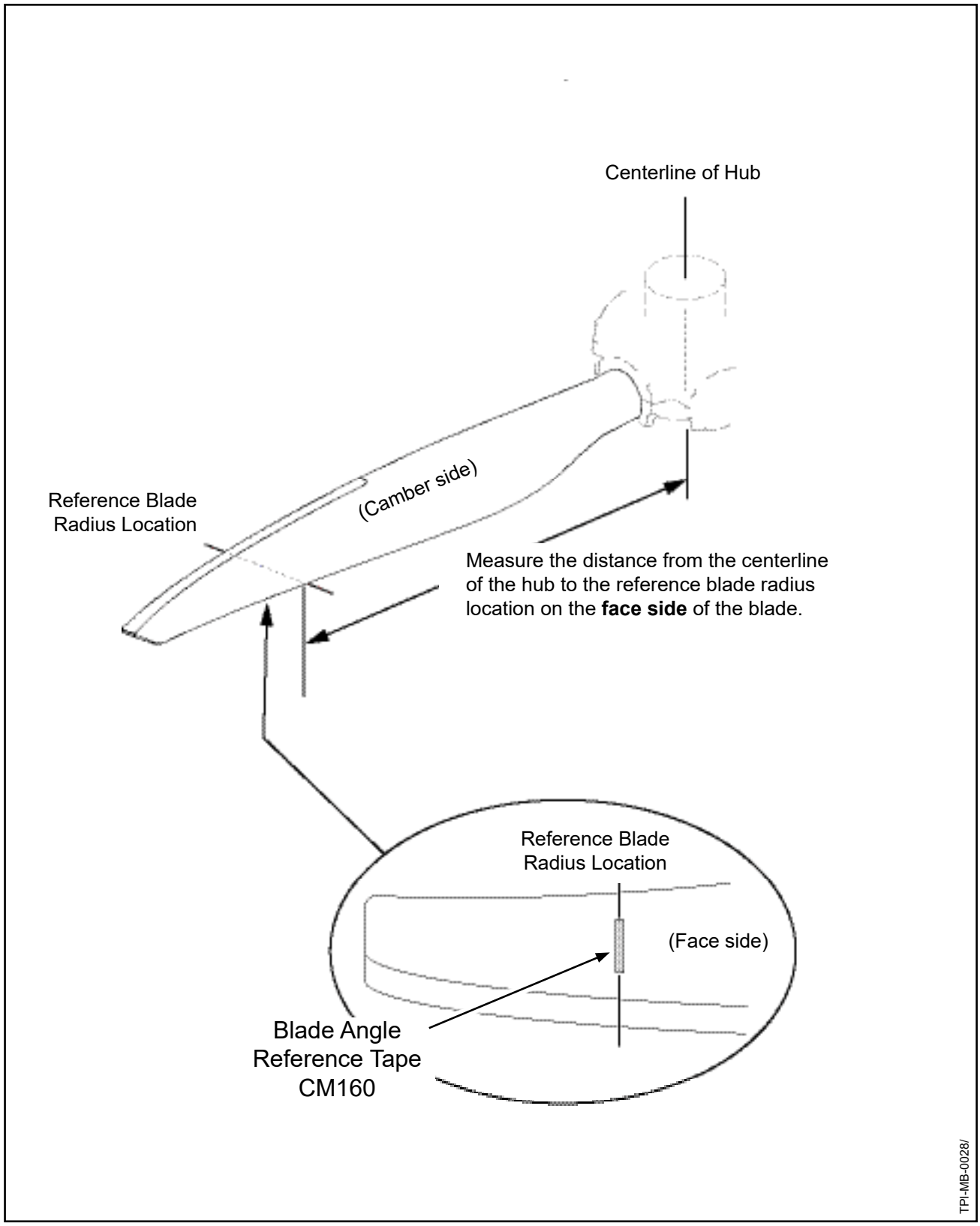
NOTE: The anti-rotation pin TE386 keeps the modified socket TE385 from turning on the pitch change rod (250).

(26) Torque the pitch change rod (250) in accordance with Table 8-1 "Torque Values" in the Fits and Clearances chapter of this manual.

(27) Positioned midway between each of the three blade sockets, install a bolt (420), washer (440), and nut (450). Refer to Figure 7-9.

(28) Tighten each nut (450) until there is a slight gap between the halves of the hub (400).

(29) Move the blades by hand to make sure that the blades have a full range of movement from low pitch to high pitch.



Blade Angle Reference Tape
Figure 7-14

G. Blade Angle Reference Tape Application (Optional) Rev. 2

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 Inc. 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 7-14.

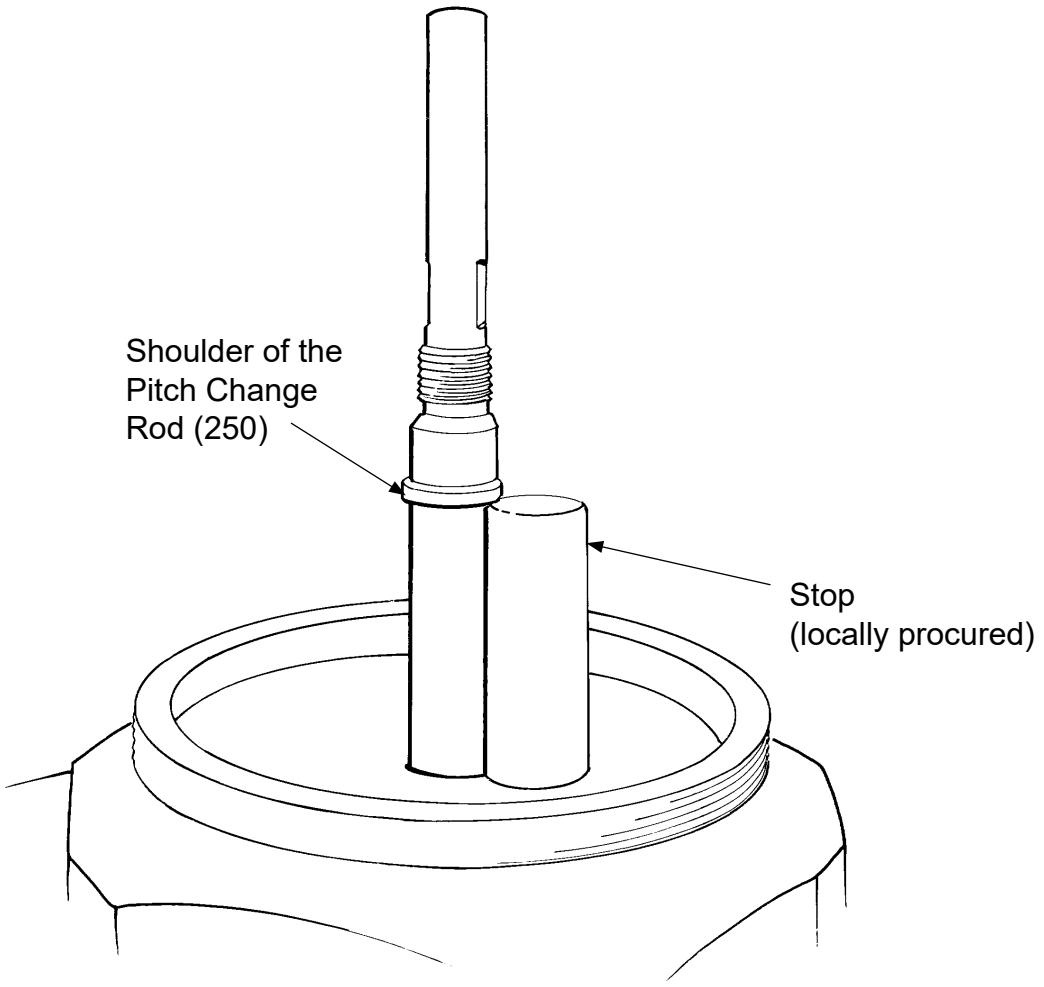
(c) Apply a piece of reference tape CM160 to the face side of the blade at the reference blade radius location, perpendicular to the blade centerline as shown in Figure 7-14.

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.



Using a Spacer to Check Blade Angles
Figure 7-15

H. Pitch Change Unit Assembly and Blade Tolerance Checks

(1) Put a locally procured stop between the shoulder of the pitch change rod (250) and the hub (400). Refer to Figure 7-15.

(a) The stop should be long enough to permit measurement of the blade angles near low pitch.

(2) Rotate the blades by hand until the shoulder of the pitch change rod (250) touches the stop, making sure that the pitch change parts are firmly engaging the pitch change knob of the blades.

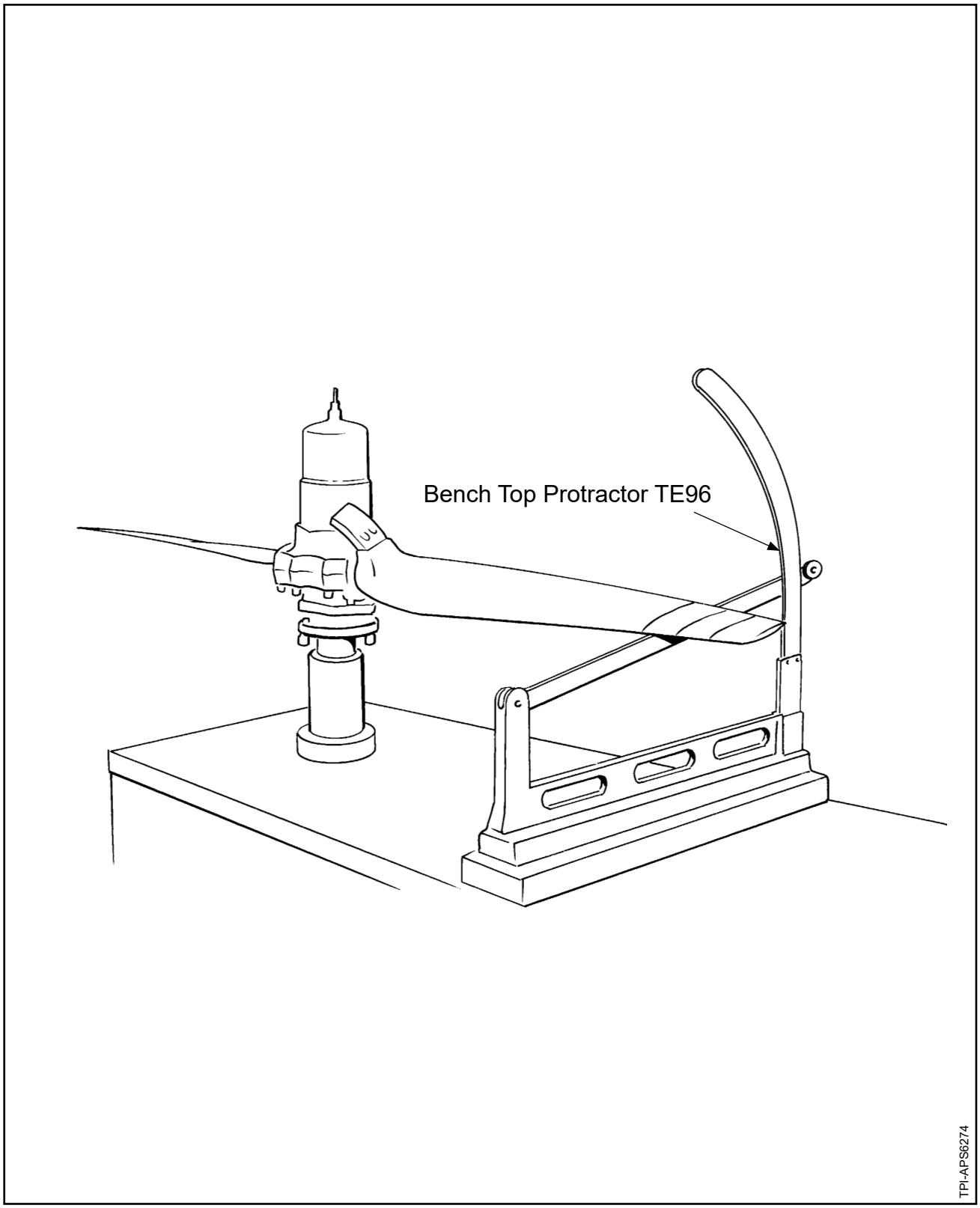
NOTE: Rotate the blades by hand toward low pitch to remove any slight blade angular looseness.

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.

(3) Using a crayon or soft non-graphite pencil CM162 or equivalent, draw a line on each blade at the 30-inch reference blade radius.

NOTE: The line at the 30-inch reference blade radius is for measurement reference purposes and will also be used when measuring the high pitch angle of the blade.



Checking Blade Angles With a Bench Top Protractor TE96
Figure 7-16

(4) Using a protractor TE96, TE97, or equivalent, measure all the blade angles at the 30-inch reference blade radius for 0.2 degree maximum tolerance between blades. Refer to Figure 7-16.

(5) If the blade angle differs more than 0.2 degree between blades, turn one or more of the pitch change blocks (300).

a To turn the blocks, remove the pitch change rod (250), and the cylinder-side half of the hub (400).

b Make the necessary adjustments to the pitch change blocks (300).

1 Pitch change blocks (300) should be installed in the fork (280) with the thin wall of the pitch change block (300) pointing toward the engine-side half of the hub (400) during initial assembly.

2 Rotating the pitch change block (300) 180 degrees will **decrease** the pitch of the corresponding blade approximately 0.3 to 0.4 degree on a tractor propeller.

3 Rotating the pitch change block (300) 180 degrees will **increase** the pitch of the corresponding blade approximately 0.3 to 0.4 degree on a pusher propeller.

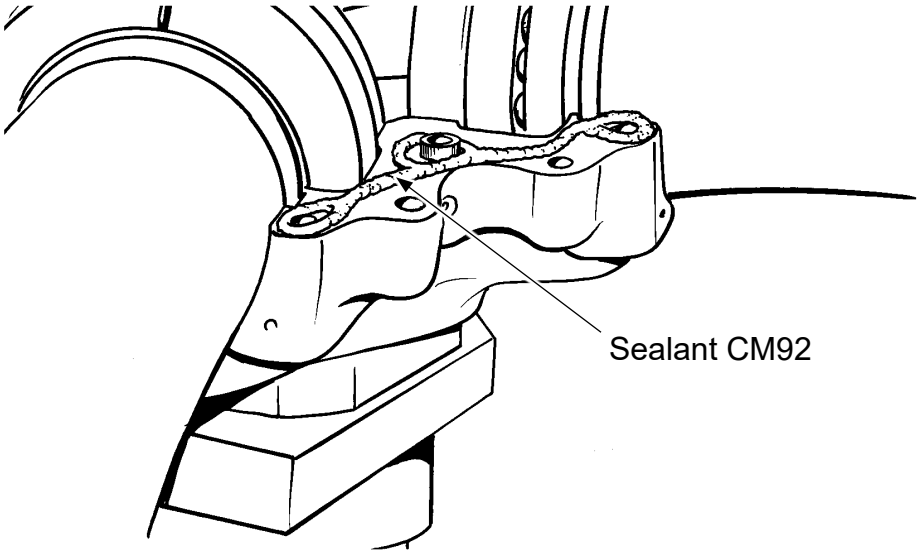
4 It is possible to bring pitch angles differing as much as 0.5 degree into 0.2 tolerance by rotating the blocks.

5 Reassemble the propeller.

6 Remeasure the blade angle tolerance between the blades.

(6) When all the blades are within 0.2 degree of each other, remove the pitch change rod (250).

(7) Remove the top half of the hub (400).



TPI-APS2040

Applying Sealant Between the Halves of the Hub
Figure 7-17

(8) Apply a bead of sealant CM92 on the mating surfaces of the hub (400). Refer to Figure 7-17.

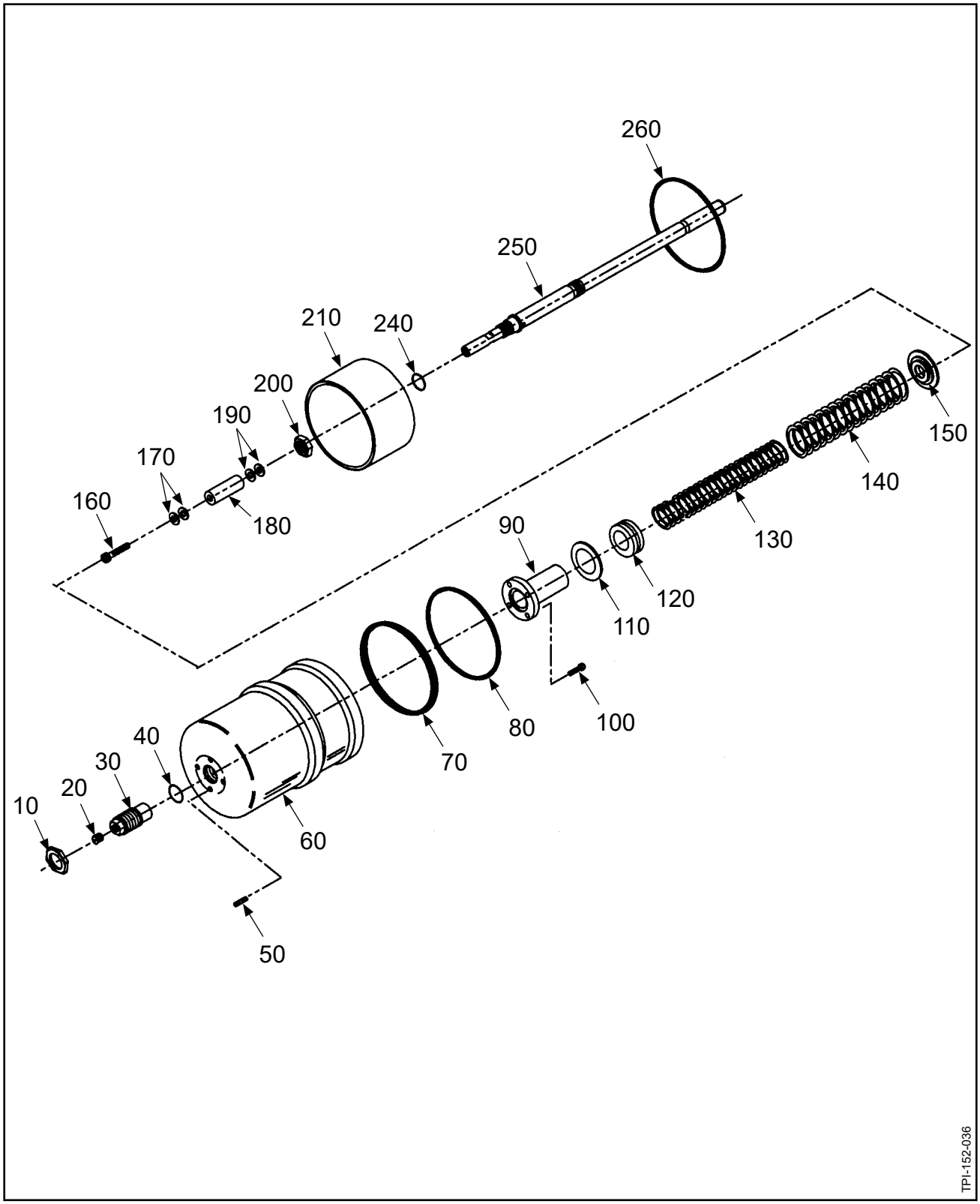
(a) Use enough sealant on the mating surfaces of the hub (400) so that a small amount will be squeezed out along the entire parting surface of the halves of the hub (400) when the hub bolts (420, 430) are torqued.

(9) Install the remaining hub bolts (420, 430), washers (440), and nuts (450).

(a) For a pusher configuration, install the bolts (430) that are adjacent to the blade with the head of the bolt (430) on the engine-side of the hub (400) and the nuts (450) on the cylinder-side of the hub (400).

(b) When the propeller is assembled without the bulkhead, as many as four additional washers (440) may be used to help in clamping the halves of the hub (400) during the cure of the sealant CM92.

(10) Torque the hub nuts (450) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.



Installing the Springs, Piston, and Cylinder
Figure 7-18

I. Installing the Springs, Piston, and Cylinder - Refer to Figure 7-18

(1) Install a new O-ring (240) in the groove in the small opening of the piston unit (210).

(2) With the small opening of the piston unit (210) pointing toward the hub (400), install the piston unit (210) on the pitch change rod (250).

(3) Install the piston nut (200) on the pitch change rod (250).

(4) Torque the piston nut (200) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.

(5) Install the cylinder ID O-ring (80) in the groove that is inside of the cylinder (60).

(6) Install the cylinder O-ring (260) at the base of the cylinder attachment threads of the cylinder-side half of the hub (400).

(7) With the concave part of the spring guide (150) pointing away from the hub (400), put the spring guide (150) in the piston unit (210).

(8) Pour 2.25 fluid ounces (63.93 ml) of hydraulic oil CM157 into the piston unit (210).

(9) Put the small diameter compression spring (130) in the piston unit (210) over the piston nut (200) on the spring guide (150).

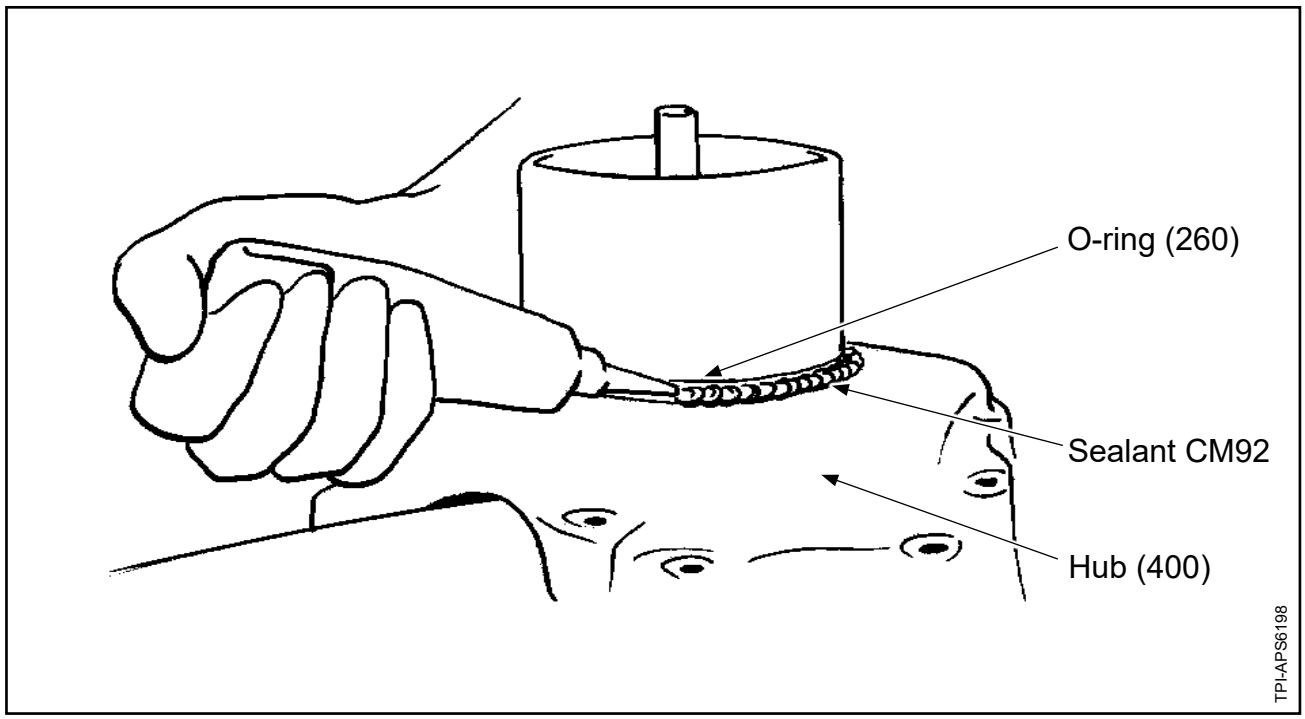
(10) Put the large diameter compression spring (140) over the small diameter compression spring (130) on the spring guide (150).

(11) Put the ball thrust bearing (120) on top of the spring guide (110).

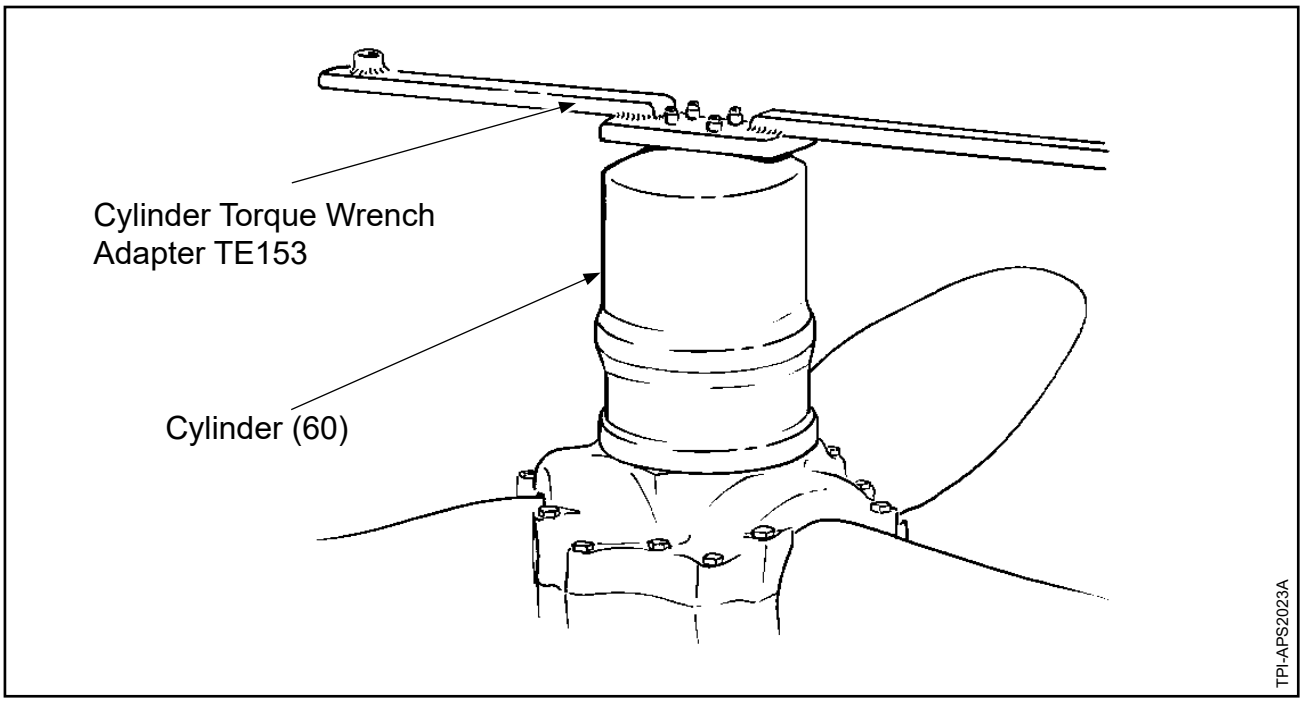
(12) Using lubricant CM12, lubricate the outside of the piston unit (210).

(13) Put the spring guide (110) on top of the compression springs (130, 140).

(a) Lubricant CM12 may be used on the spring guide (110) to help hold it on top of the compression springs (130, 140).



Applying a Bead of Sealant Where the Cylinder and Hub Meet
Figure 7-19



Installing the Cylinder with Cylinder Torque Wrench Adapter TE153
Figure 7-20

NOTE: When assembling a propeller that will be disassembled for shipping, it is not necessary to apply CM92 around the shoulder of the cylinder half of the hub (400) next to the O-ring (260).

(14) Apply a bead of sealant CM92 on the cylinder O-ring (260) where the cylinder (60) and the hub (400) will touch at installation. Refer to Figure 7-19.

(15) Apply lubricant CM12 to the threads of the cylinder (60).

(16) Attach the cylinder torque wrench adapter TE153 to the cylinder (60). Refer to Figure 7-20.

(a) Install four 1/4-28 UNF-3B screws through the cylinder torque wrench adapter TE153 into the four threaded holes provided in the cylinder (60).

CAUTION: USE CARE NOT TO MOVE THE WASHERS (190) OFF OF THE PITCH CHANGE ROD (250) WHEN PUTTING THE CYLINDER (60) OVER THE PISTON UNIT (210).

(17) Put the cylinder (60) over the spring guide (110), compression springs (130, 140), and piston unit (210).

WARNING: MAKE SURE TO USE ASSEMBLING TOOL TE627 WHEN ASSEMBLING THE HC-E3YR-7( ) PROPELLER. DO NOT USE ASSEMBLING TOOL TE9. USING THE WRONG TOOL WILL CAUSE THE CYLINDER TO BE FORCEFULLY RELEASED RESULTING IN SERIOUS BODILY INJURY AND/OR SUBSTANTIAL PROPERTY DAMAGE.

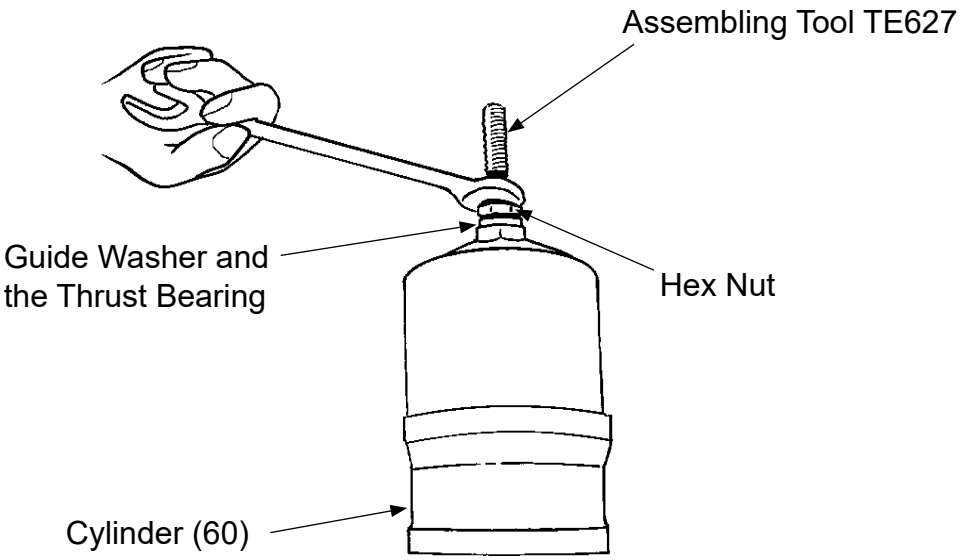
(18) Make sure that the TE627 assembling tool is used. For identification of TE627, refer to Figure 3-1.

(a) The OD of assembling tool TE9 is too large to fit through the ID of the high pitch stop (90) and will not thread correctly into the pitch change rod (250) to prevent the compression springs (130, 140) from forcefully releasing when the cylinder unit (60) is assembled.

(b) Assembling tool TE627 has a smaller OD than assembling tool TE9 that will fit through the ID of the high pitch stop (90) and thread correctly into the pitch change rod (250) to prevent the compression springs (130, 140) from forcefully releasing when the cylinder unit (60) is assembled.

(19) Put the small, threaded end of the assembling tool TE627 through the hole in the end of the cylinder unit (60).

(20) Turn the small, threaded end of assembling tool TE627 into the end of the pitch change rod (250).



Using the Assembling Tool
Figure 7-21

(21) Turn the hex nut of the assembling tool TE627 to compress the compression springs (130, 140) until the cylinder can be installed. Refer to Figure 7-21.

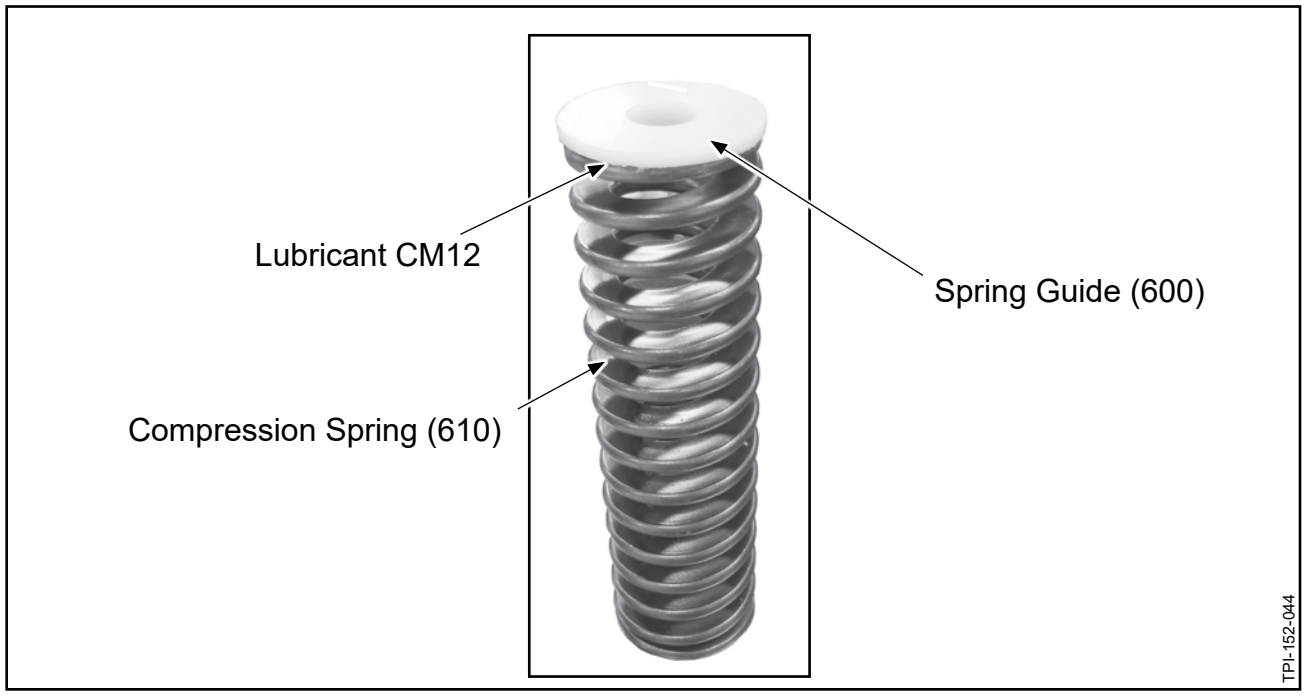
CAUTION: DO NOT DAMAGE THE THREADS WHEN INSTALLING THE CYLINDER (60).

(22) While making sure that the threads of the cylinder (60) are aligned with the threads of the hub (400), turn the cylinder (60) on the threads of the hub (400) by hand.

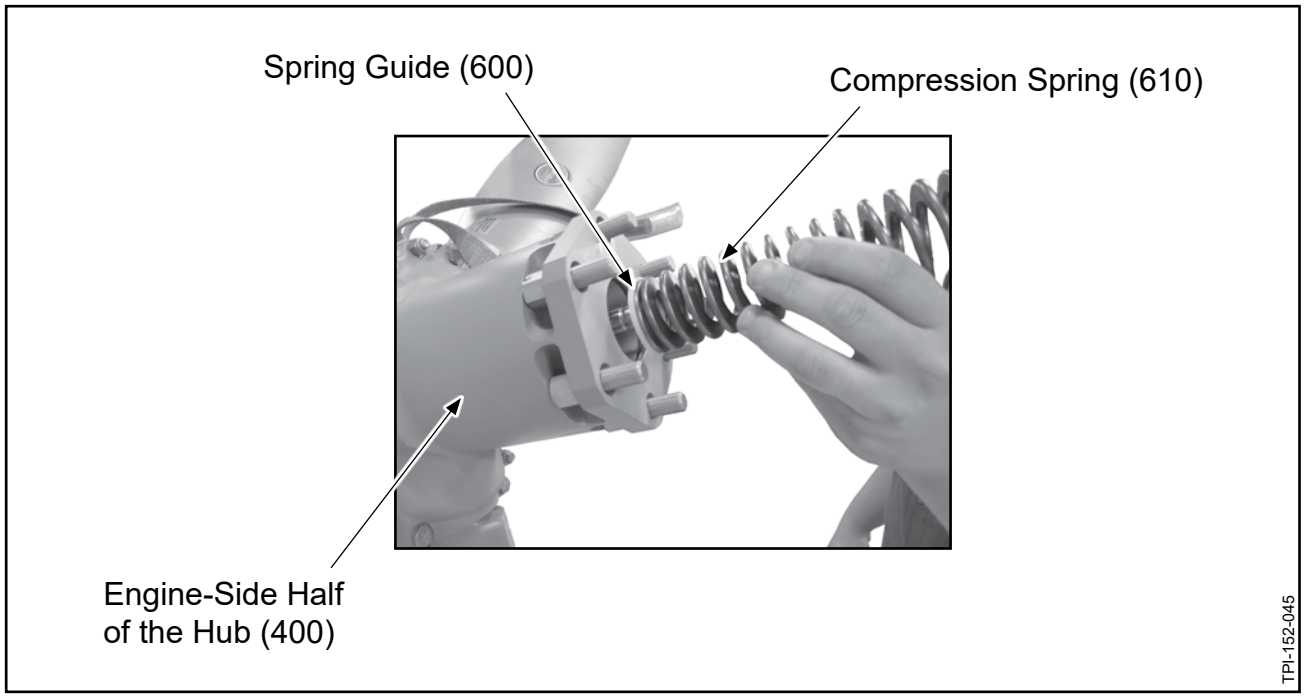
(23) Torque the cylinder (60) in accordance with Table 8-1 "Torque Values" in the Fits and Clearances chapter of this manual.

(24) Remove the assembling tool TE627 from the cylinder (60).

(25) Remove the cylinder torque wrench adapter TE153 from the cylinder (60).



Installing the Spring Guide
Figure 7-22



Installing the Compression Spring on the Pitch Change Rod
Figure 7-23

J. Hub Spring Installation

WARNING: MAKE SURE SLINGS AND SUPPORTS ARE RATED UP TO 800 POUNDS (363 KG) TO PREVENT PERSONAL INJURY.

(1) Using a sling, turn the propeller over and put it on a support so that the propeller mounting flange is accessible.

NOTE: A sturdy barrel or drum with the rim well padded or a blade truck may be used as a support.

(2) Apply lubricant CM12 to the raised side of the spring guide (600).

(3) With the raised side of the spring guide (600) pointing toward the spring, put the spring guide (600) on top of the compression spring (610). Refer to Figure 7-22.

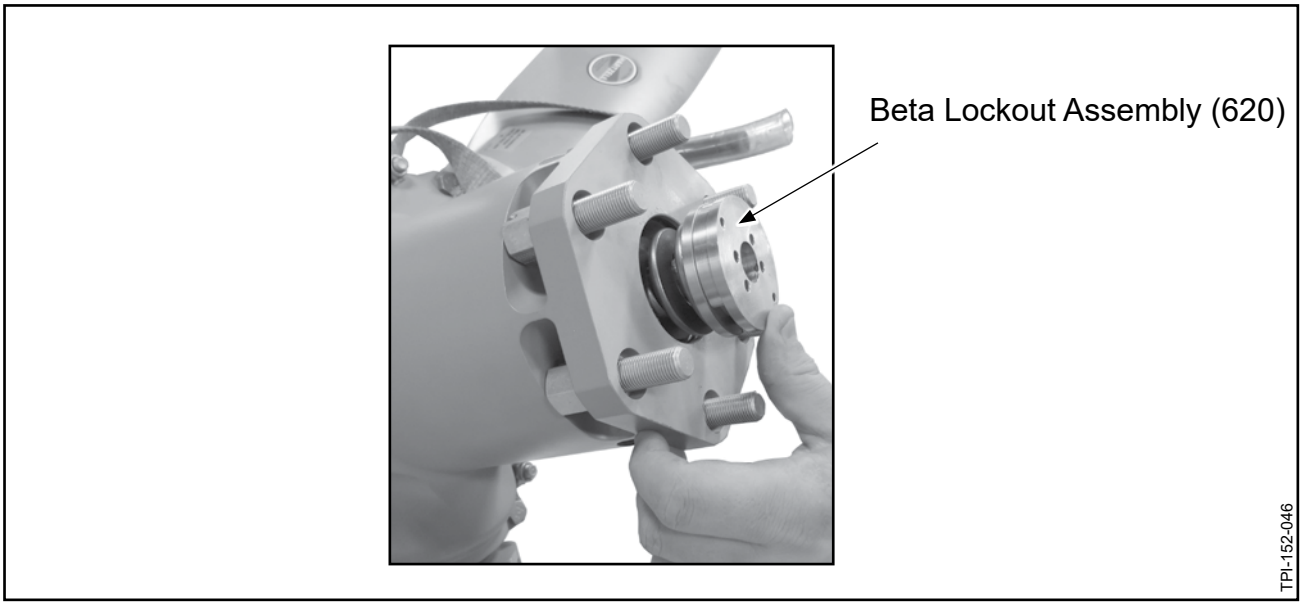
(4) Put the spring guide (600) and the compression spring (610) in the bore of the engine-side half of the hub. Refer to Figure 7-23.

(a) Align the hole in the spring guide (600) with the hole for the pitch change rod (250) in the engine-side half of the hub (400).

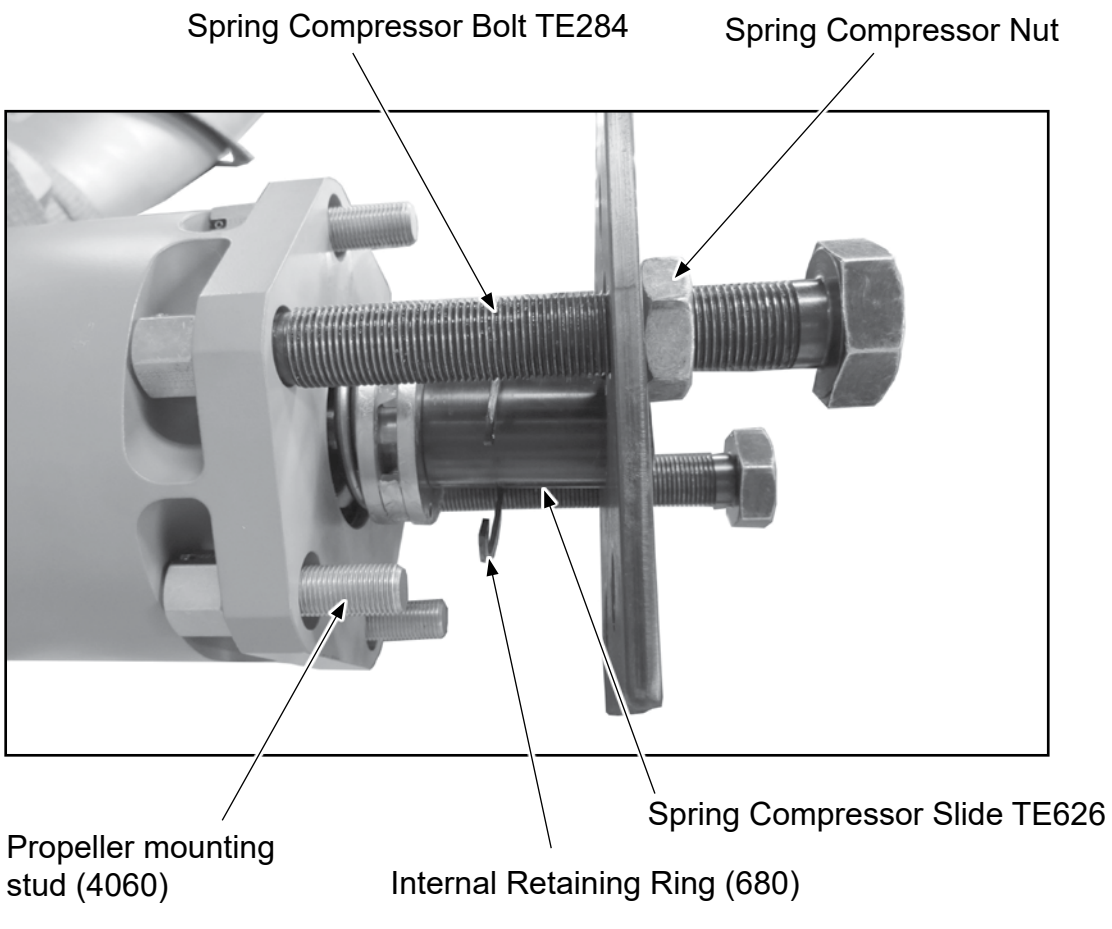
(5) Apply lubricant CM12 to the OD of the beta lockout assembly (620).

(6) With the raised side of the beta lockout assembly (620) pointing toward the spring, put the beta lockout assembly (620) on the end of the pitch change rod (250). Refer to Figure 7-24.

NOTE: The beta lockout assembly (620) was previously assembled in the section "Assembling the Beta Lockout Assembly" in this chapter.



Putting the Beta Lockout Assembly on the Pitch Change Rod
Figure 7-24



Installing the Spring Compressor Assembly TE625
Figure 7-25

WARNING: MAKE SURE TO USE SPRING COMPRESSOR ASSEMBLY TOOL TE625 WHEN ASSEMBLING THE HC-E3YR-7( ) PROPELLER. DO NOT USE SPRING COMPRESSOR ASSEMBLY TOOL TE31. USING THE WRONG TOOL WILL CAUSE THE COMPRESSION SPRING (610) TO BE FORCEFULLY RELEASED RESULTING IN SERIOUS BODILY INJURY AND/OR SUBSTANTIAL PROPERTY DAMAGE.

(7) Make sure that the spring compressor assembly tool that will be used is TE625. For identification of TE625, refer to Figure 3-3, "Using the Correct Spring Compressor Assembly TE625" in the Disassembly chapter of this manual.

(a) The OD of the spring compressor slide TE626 of the spring compressor assembly tool TE31 is too large to permit the assembly of the parts in a way that will prevent the compression spring (610) from being forcefully released during assembly.

(b) Spring compressor assembly tool TE625 has a spring compressor slide TE626 with a smaller OD than assembling tool TE31 and has special openings that will permit the assembly of the parts in a way that will prevent the compression spring (610) from being forcefully released during assembly.

(8) Put the internal retaining ring (680) over the bore of the spring compressor slide TE626.

(9) Install the spring compressor assembly TE625 on the propeller mounting flange. Refer to Figure 7-25.

NOTE: The spring compressor assembly TE625 has six holes to clear the studs already installed.

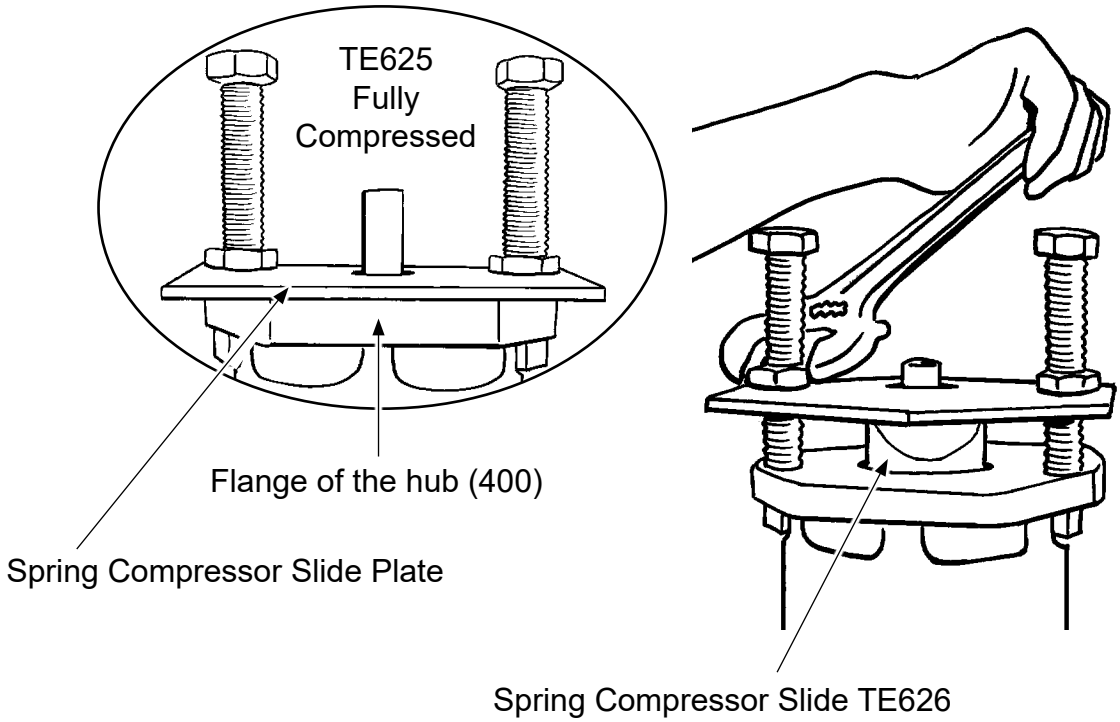
(a) Center the spring compressor slide TE626 on the beta lockout assembly (620) in the bore of the engine-side half of the hub (400) and align the spring compressor bolts TE284 with the holes in the mounting flange of the hub (400).

(b) Install the spring compressor nuts on the spring compressor bolts TE284.

NOTE: The spring compressor nuts should be close to the heads of the spring compressor bolts TE284.

(c) Turn the propeller mounting studs (4060) into the ends of the spring compressor bolts TE284 until tight. Refer to Figure 7-25.

NOTE: The spring compressor bolts TE284 have both ID and OD threads.



Compressing the Compresion Spring with the Spring Compressor Assembly TE625
Figure 7-26

(10) Install a locally procured alignment tool through the bore of the beta lockout assembly (620) and into the ID of the pitch change rod (250).

(a) Refer to Figure 7-27 for the criteria for the locally procured alignment tool.

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

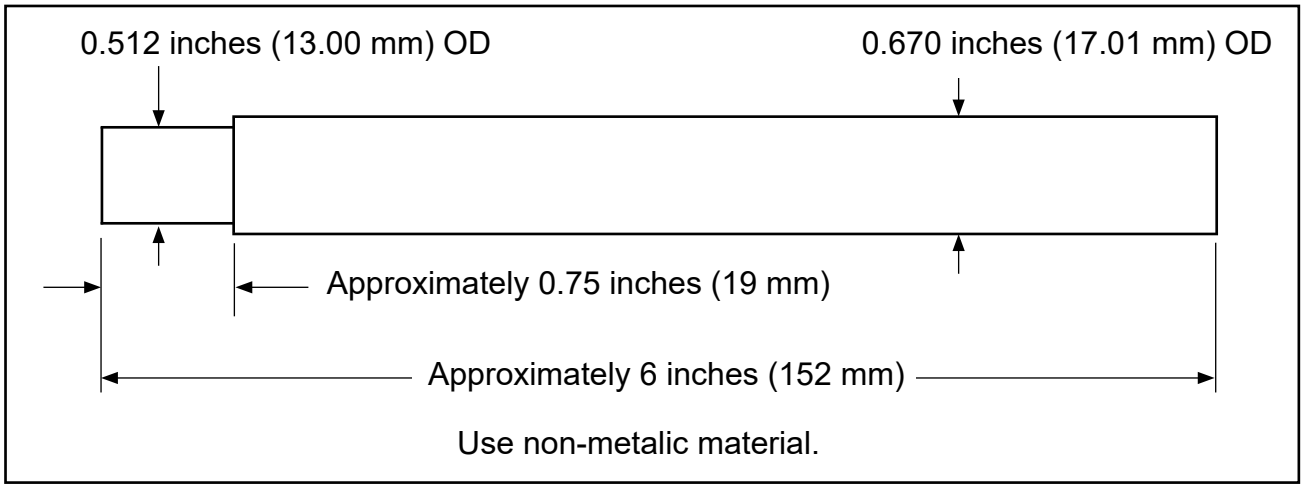
CAUTION 1: TIGHTEN THE SPRING COMPRESSOR NUTS EVENLY TO PREVENT BINDING OF THE BETA LOCKOUT ASSEMBLY (620).

CAUTION 2: MAKE SURE THAT THE BETA LOCKOUT ASSEMBLY (620) IS CORRECTLY ALIGNED WITH THE PITCH CHANGE ROD (250) AND THE BORE OF THE HUB (400) WHEN TIGHTENING THE SPRING COMPRESSOR ASSEMBLY TE626.

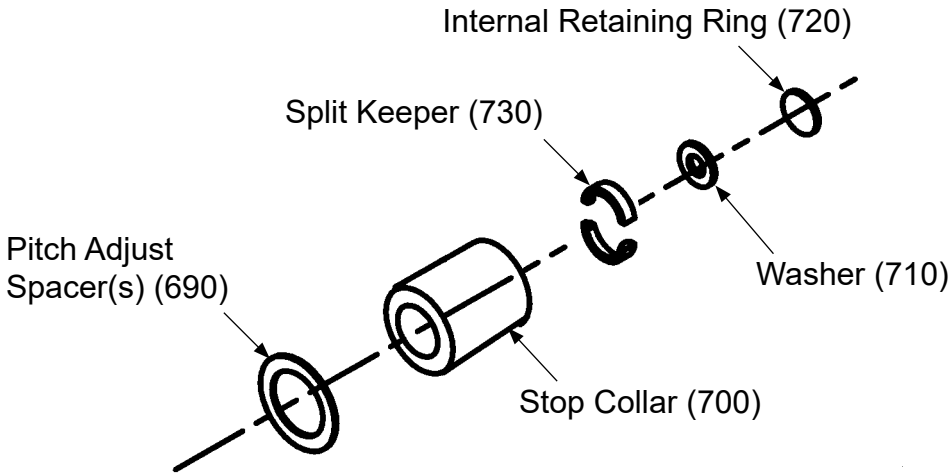
CAUTION 3: UNEVEN TIGHTENING OF THE SPRING COMPRESSOR NUTS OR MISALIGNMENT OF THE BETA LOCKOUT ASSEMBLY (620) CAN CAUSE DAMAGE TO THE PITCH CHANGE ROD (250), HUB (400), AND BETA LOCKOUT ASSEMBLY (620).

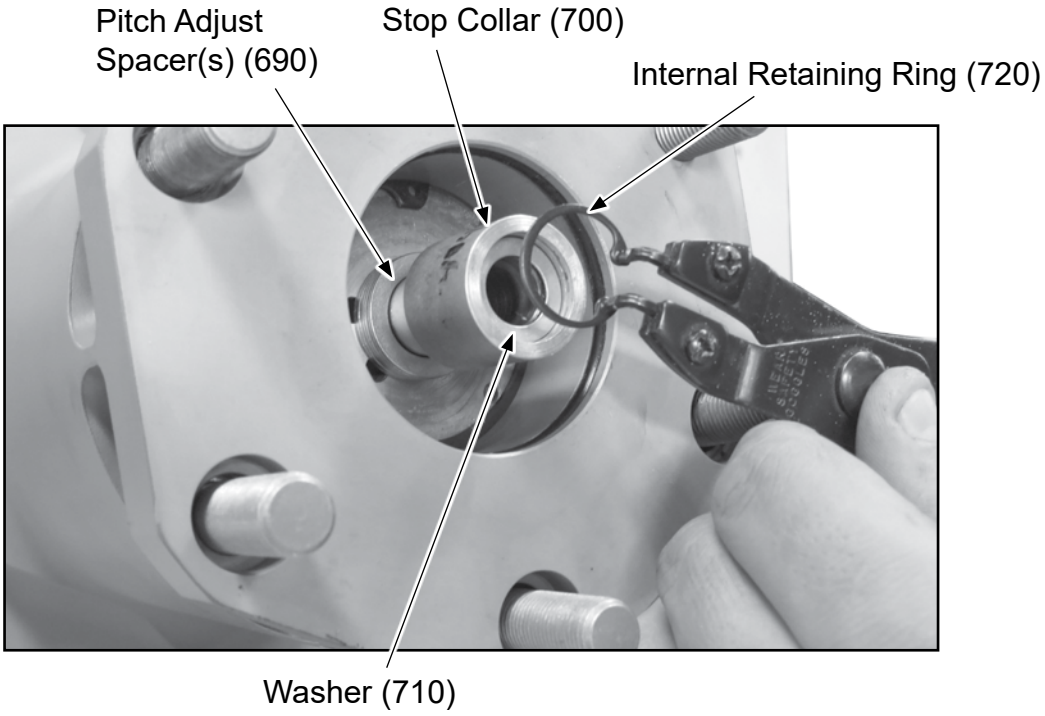
(11) Compress the compression spring (610) by evenly tightening the spring compressor nuts. Refer to Figure 7-26.

NOTE: Tightening the spring compressor nuts will move the beta lockout assembly (620) away from the groove in the engine-side half of the hub (400) and permit the installation of the internal retaining ring (680).



Locally Procured Alignment Tool
Figure 7-27





TPI-152-034, TPI-152-048

Installing the Engine-side Pitch Adjust Spacer and Stop Collar
Figure 7-28

(12) Compress the compression spring (610) and the beta lockout assembly (620) until the groove in the bore of the engine-side half of the hub (400) for the internal retaining ring (680) can be seen.

(13) Install the internal retaining ring (680) in the groove in the bore of the engine-side half of the hub (400).

(a) Visually examine the internal retaining ring (680) to make sure that it is correctly installed in the groove in the bore of the engine-side half of the hub (400).

(14) Install the engine-side pitch adjust spacer (690) and the stop collar (700) using the following steps, refer to Figure 7-24:

(a) Install the pitch adjust spacer(s) (690) on the end of the pitch change rod (250).

1 Install the same quantity of pitch adjust spacer(s) (690) that were removed at disassembly.

(b) With the ID groove in the stop collar (700) pointing toward the mounting flange of the hub (400), install the stop collar (700) on the pitch change rod (250).

(c) Install the split keeper (730) in the groove made for it in the pitch change rod (250).

NOTE: Lubricant CM12 may be used on the halves of the split keeper (730) to help hold it in the groove of the pitch change rod (250).

CAUTION: MAKE SURE THAT THE INTERNAL RETAINING RING (680) DOES NOT DISLODGE FROM THE ENGINE-SIDE HALF OF THE HUB (400) DURING DECOMPRESSION OF THE COMPRESSION SPRING (610).

(15) Decompress the compression spring (610) by evenly loosening the spring compressor nuts.

(16) Remove the spring compressor assembly TE625 from the propeller mounting studs (4060).

(17) Install the washer (710) in the ID of the stop collar (700).

(18) Pull the stop collar (700) toward the mounting flange of the hub (400).

(19) Install the internal retaining ring (720) in the groove made for it in the ID of the stop collar (700).

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K. Setting the Low Pitch Blade Angle - Refer to Figure 7-28

WARNING 1: USE CAUTION WHEN MOVING THE PROPELLER. WHEN COMPRESSED, THE COMPRESSION SPRING ASSEMBLY IS LOADED TO APPROXIMATELY 1000 POUNDS (454 KG) FORCE. MAKE SURE OF THE SAFETY OF PERSONNEL IN THE AREA DURING ASSEMBLY PROCEDURES.

WARNING 2: MAKE SURE SLINGS AND SUPPORTS ARE RATED UP TO 800 POUNDS (363 KG) TO PREVENT PERSONAL INJURY.

(1) Using a sling, turn the propeller over so that the mounting flange of the engine-side half of the hub (400) is pointing downwards.

(2) Attach the engine-side half of the hub (400) to the rotatable fixture on the propeller assembly table.

(3) Set the pressure of the propeller assembly table to 120 psi (8.2 bars).

(4) Cycle the propeller to low pitch angle.

(a) Confirm a hard stop that does not overcome the spring pressure.

(5) For the propeller low pitch blade angle, refer to the Type Certificate Data Sheet or Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

(6) Measure the low pitch angle of the blades.

(7) If the low pitch blade angle requires adjustment, use the following steps:

WARNING: MAKE SURE SLINGS AND SUPPORTS ARE RATED UP TO 800 POUNDS (363 KG) TO PREVENT PERSONAL INJURY.

(a) Using a sling, turn the propeller over and put it on a support so that the propeller mounting flange is accessible.

NOTE: A sturdy barrel or drum with the rim well padded or a blade truck may be used as a support.

(b) Pull the stop collar (700) toward the mounting flange of the hub (400).

(c) Remove the internal retaining ring (720) from the ID of the stop collar (700).

(d) Remove the washer (710) from the ID of the stop collar (700).

WARNING: MAKE SURE TO USE SPRING COMPRESSOR ASSEMBLY TOOL TE625 WHEN ASSEMBLING THE HC-E3YR-7( ) PROPELLER. DO NOT USE SPRING COMPRESSOR ASSEMBLY TOOL TE31. USING THE WRONG TOOL WILL CAUSE THE SPRING (610) TO BE FORCEFULLY RELEASED RESULTING IN SERIOUS BODILY INJURY AND/OR SUBSTANTIAL PROPERTY DAMAGE.

(e) Make sure that the spring compressor assembly tool that will be used is TE625. For identification of TE625, refer to Figure 3-3, "Using the Correct Spring Compressor Assembly TE625" in the Disassembly chapter of this manual.

1 The OD of the spring compressor slide TE626 of the spring compressor assembly tool TE31 is too large to permit the assembly of the parts in a way that will prevent the compression spring (610) from being forcefully released during assembly.

2 Spring compressor assembly tool TE625 has a spring compressor slide TE626 with a smaller OD than assembling tool TE31 and has special openings that will permit the assembly of the parts in a way that will prevent the compression spring (610) from being forcefully released during assembly.

(f) Install the spring compressor assembly TE625 on the propeller mounting flange. Refer to Figure 7-25.

NOTE: The spring compressor assembly TE625 has six holes to clear the studs already installed.

1 Center the spring compressor slide TE626 on the beta lockout assembly (620) in the bore of the engine-side half of the hub (400) and align the spring compressor bolts TE284 with the holes in the mounting flange of the hub (400).

2 Install the spring compressor nuts on the spring compressor bolts TE284.

NOTE: The spring compressor nuts should be close to the heads of the spring compressor bolts TE284.

3 Turn the propeller mounting studs (4060) into the ends of the spring compressor bolts TE284 until tight. Refer to Figure 7-25.

NOTE: The spring compressor bolts TE284 have both ID and OD threads.

(g) Compress the compression spring (610) and the beta lockout assembly (620) until the split keeper (730) on the pitch change rod (250) can be removed.

(h) Remove the split keeper (730).

(i) Remove the stop collar (700).

(j) Remove or add pitch adjust spacer(s) (690) as necessary.

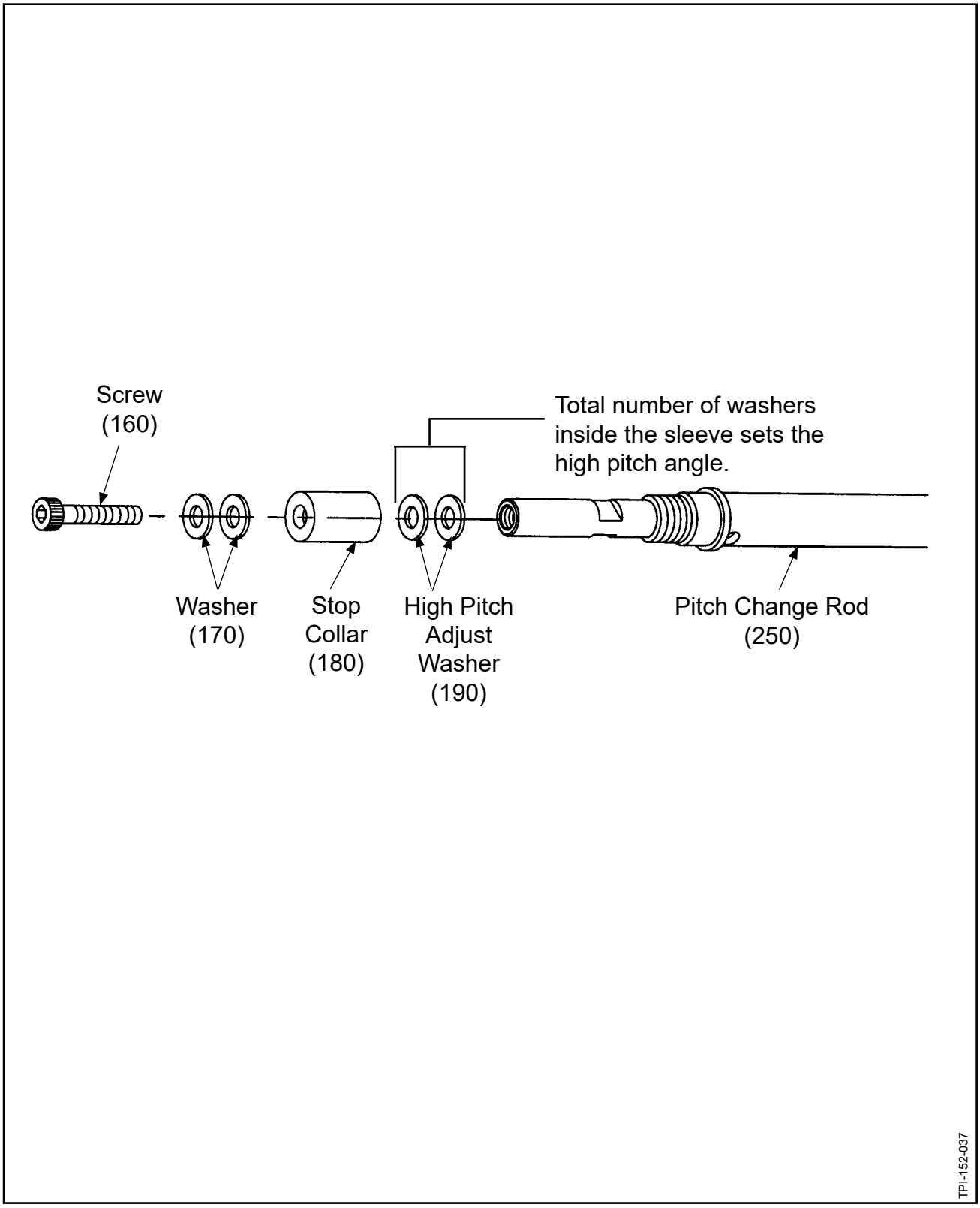
1 To increase the low pitch blade angle, add pitch adjust spacers (690).

2 To decrease the low pitch blade angle, remove pitch adjust spacers (690).

NOTE: When setting low pitch angle, the approximate degree of movement achieved for each pitch adjust spacer is:
A-4239 washer equals 1.5 degree
A-4239-1 washer equals 1 degree

(k) Reassemble the parts by following the steps for installing the engine-side pitch adjust spacer (690) and the stop collar (700) in the section, "Hub Spring Installation in this chapter.

(8) Repeat steps 2.K.(7) through 2.K.(7)(k) until the low pitch blade angle is correct.



Parts for Adjusting the High Pitch Angle
Figure 7-29

L. Setting the High Pitch Blade Angles - Refer to Figure 7-29

(1) Set the pressure of the propeller assembly table to 175 psi (12.06 bars).

(2) Cycle the propeller to reverse pitch angle.

(a) For the propeller high pitch blade angle, refer to the Type Certificate Data Sheet or Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

NOTE 1: Grease may be used between the washers (190) and the stop collar (180) for ease of removal if blade angle adjustment is required. Washers (190) that fall into the propeller can be retrieved with a magnet.

NOTE 2: When setting high pitch angles, the approximate degree of movement achieved for each washer is:
A-2435-1 washer equals 1.5 degrees
A-2435 washer equals 3 degrees

(3) Using feathering tool TE383, install washers (190) inside of the stop collar (180).

(a) The total number of washers inside of the stop collar (180) set the high pitch angle. Refer to Figure 7-29.

(4) Tighten the feathering tool TE383 into the pitch change rod (250) until snug.

(5) Release the air pressure to put the propeller on the stop collar (180).

(6) Using protractor TE96, TE97, or equivalent, measure the high pitch blade angle at the reference blade radius location previously marked.

(a) If high pitch blade angle adjustment is required, apply air pressure to cycle the propeller to reverse blade angle.

(b) Loosen the feathering tool TE383 and remove the stop collar (180) and washer(s) (190) by skewing the tool sideways.

(c) Remove or add washer(s) (190) as needed.

1 To increase the high pitch blade angle, add washers (190).

2 To decrease the high pitch blade angle, remove washers (190).

(d) Install the washer(s) (190) and the stop collar (180) with the feathering tool TE383.

(e) Release the air pressure and measure the high pitch blade angle at the reference blade radius previously marked.

(f) Repeat steps 2.L.(3) through 2.L.(6)(e) until the high pitch blade angle is correct.

(7) When the high pitch blade angle is correct and the feathering tool TE383 is still installed, apply air pressure to move the propeller into reverse pitch position.

CAUTION: TO AVOID DAMAGE TO THE PROPELLER COMPONENTS, MAKE SURE THE AIR PRESSURE IS APPLIED BEFORE REMOVING THE FEATHERING TOOL TE383.

(8) Remove the feathering tool TE383.

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.

(9) Using a clean cloth dampened with solvent acetone CM173, MEK CM106, or MPK CM219, clean the threads of the screw (160).

(10) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(11) Apply one drop of threadlocker CM116 to the threads of the screw (160).

(12) Put two washers (170) onto the screw (160) .

(13) Using the T-handle wrench TE381, install the screw (160) through the top of the cylinder (60) into the pitch change rod (250), making sure that the washers (170) are still in position on top of the pitch change rod (250).

NOTE: A small amount of lubricant CM12 on the head of the screw (160) will hold the screw (160) to the T-handle wrench TE381 long enough to guide the screw (160) into the threaded hole in the pitch change rod (250).

(14) Tighten the screw (160) with the T-handle wrench TE381.

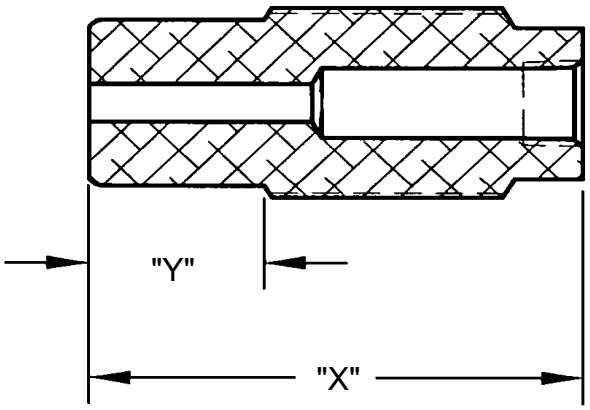
(a) There must be a minimum engagement of seven threads of the screw (160).

(15) Release the air pressure, permitting the propeller to move to high pitch blade angle.

(16) Remeasure the high pitch blade angles.

(a) If high pitch angle adjustment is required, repeat steps 2.(L)(3) to 2(L)(6)(e).

(17) When the high pitch angle is correct, torque the screw (160) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.



TPI-APS6256

Part No.	"X" Dimension	"Y" Dimension
A-2404-4	2.00 ± 0.03 inch (50.8 ± 0.8 mm)	0.500 ± 0.010 inch (12.70 ± 0.05 mm)
A-2404-3	2.35 ± 0.03 inch (59.7 ± 0.8 mm)	0.700 ± 0.010 inch (17.78 ± 0.05 mm)
A-2404-2	2.00 ± 0.03 inch (50.8 ± 0.8 mm)	0.600 ± 0.010 inch (15.24 ± 0.05 mm)
A-2404-1	2.10 ± 0.03 inch (53.3 ± 0.8 mm)	0.700 ± 0.010 inch (17.78 ± 0.05 mm)
A-2404	2.25 ± 0.03 inch (57.2 ± 0.8 mm)	0.800 ± 0.010 inch (20.32 ± 0.05 mm)

Pitch Stop Dimensions
Table 7-1

M. Installing the Reverse Pitch Stop

(1) Install a pitch stop O-ring (40) in the top of the cylinder (60).

CAUTION: THE PITCH STOP (30) MUST BE TURNED A MINIMUM OF FIVE THREADS INTO THE CYLINDER (60).

(2) Install the pitch stop (30) in the top of the cylinder (60).

(a) If necessary, refer to Table 7-1, "Pitch Stop Dimensions" in this chapter to determine the applicable pitch stop (30) for the blade angle required.

(b) Apply threadlocker CM21 to the threads of the pitch stop (30).

(c) Turn the pitch stop (30) a minimum of five threads into the cylinder (60).

(3) Measure the reverse pitch stop angle.

(a) Rotate the blades to the reverse pitch position and set the propeller pitch in accordance with the aircraft Type Certificate Data Sheet and/or the Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

(b) Adjust the reverse pitch angle with the pitch stop (30).

1 If adjusting the pitch stop (30) does not change the blade angle:

a Make sure that the slots in the preload plate (3080) are not interfering with the pitch angle.

b Make sure the screw (160) is touching the bottom of the pitch stop (30).

(1) If the screw (160) is not touching the bottom of the pitch stop (30), remove the screw (160), add the applicable number of washers (170), then reinstall the screw (160).

2 To increase reverse pitch, turn the pitch stop (30) clockwise.

3 To decrease reverse pitch, turn the pitch stop (30) counterclockwise.

(4) Install the nut (10) on the pitch stop (30).

(5) Holding the pitch stop (30) in position with a wrench, torque the nut (10) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.

(6) Install the set screw (50) in the top of the cylinder in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.

N. Counterweight Installation

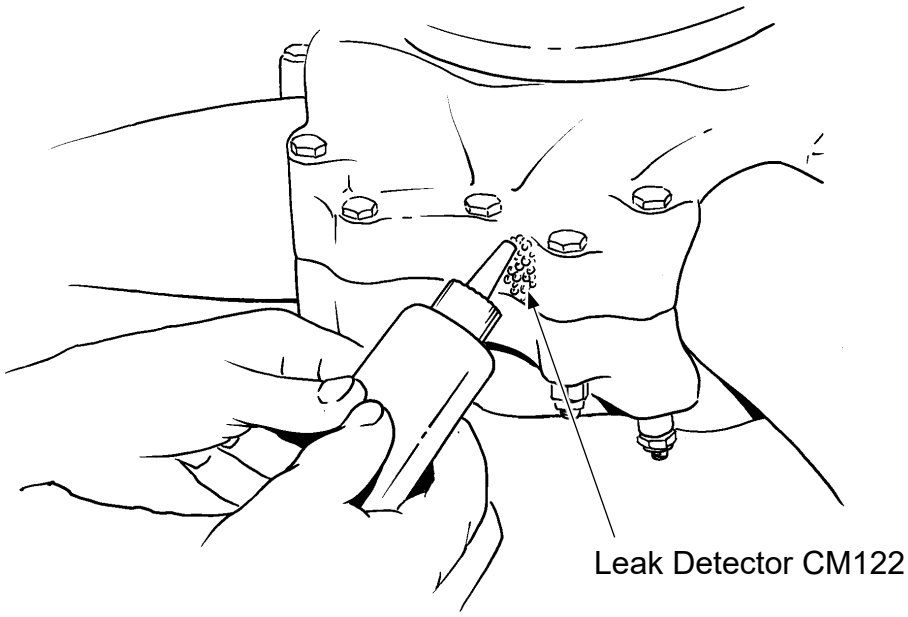
(1) For the correct counterweight (9030) for the propeller, refer to the Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

(2) For installation of a counterweight (9030) on an aluminum blade, refer to Hartzell Propeller Inc. Aluminum Blade Manual 133C (61-13-33).

CAUTION: ACTUATE THE PROPELLER SLOWLY TO MAKE SURE THAT THE COUNTERWEIGHTS (9030) DO NOT HIT THE CYLINDER (70).

(3) Actuate the propeller blades to examine the clearance between the counterweights (9030) and the hub bolts (420, 430).

(a) If necessary, loosen the nuts (450) and turn the bolts (420, 430) in the hub (400) to permit the maximum clearance between the bolts (420, 430) and the counterweights (9030).



Hub Leak Test
Figure 7-30

3. Leak Test (Rev. 3)

A. Leak Test Procedure

NOTE: Refer to the Illustrated 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) Install the lubrication fittings (470) in the applicable side of the hub.

(a) Tighten each lubrication fitting (470) until finger-tight, then tighten one additional 360 degree turn.

(2) Install the lubrication plugs (475) in the applicable side of the hub.

(a) Leave one lubrication plug hole open for leak testing.

(b) Tighten each lubrication plug (475) until finger-tight, then tighten one additional 360 degree turn.

(3) With the hub installed on the propeller test stand, perform the leak test in accordance with the following steps:

(a) Move the propeller to low pitch position.

(b) Apply leak detector CM122 to the open lubrication plug hole. Refer to Figure 7-30.

1 If there is any indication of air exiting the hub, refer to the Testing and Fault Isolation chapter of this manual.

(4) After the leak test is complete, install the remaining lubrication plug (475) in the applicable side of the hub.

(a) Tighten the lubrication hole plug (475) until finger-tight, then tighten one additional 360 degree turn.

4. Blade Track

   A. Measure the blade track.

      (1) Using a height gauge, measure the blade track at the tip of each blade. Refer to Figure 7-31.

         (a) Refer to the Fits and Clearances chapter of this manual for the blade tolerances.

5. Propeller Lubrication

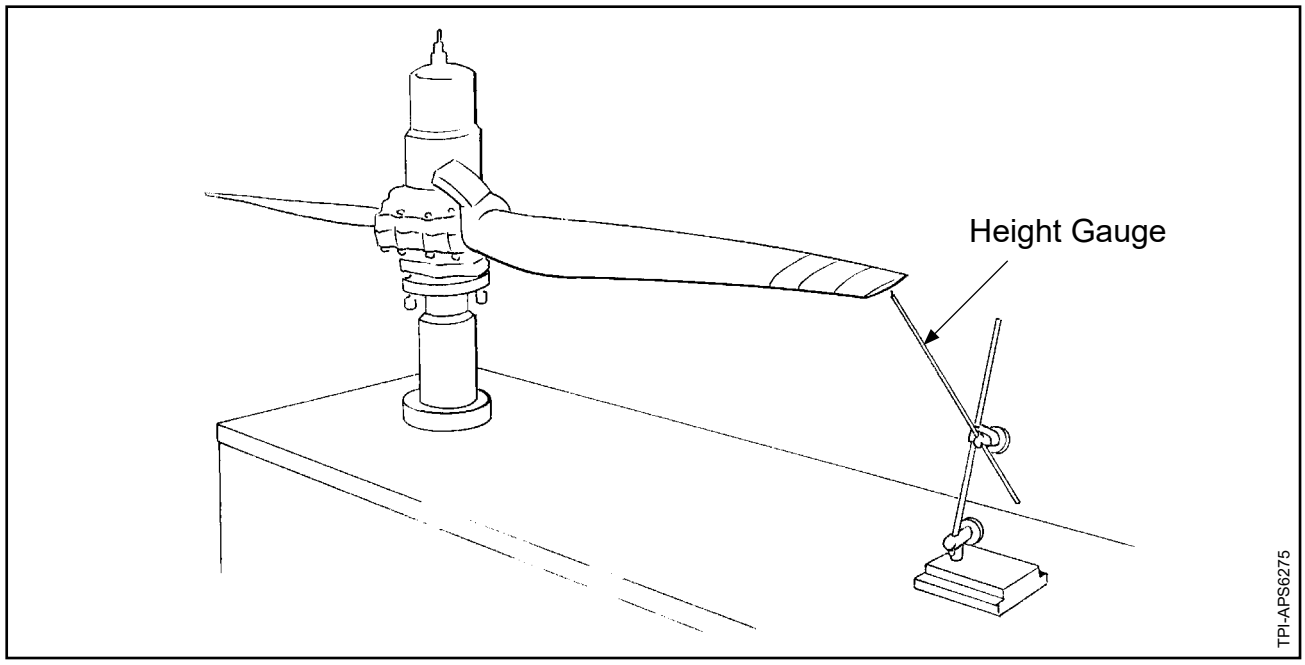
   A. Lubricate the propeller in accordance with the Propeller Lubrication chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

6. Static Balance

   A. Perform static balance of the propeller in accordance with the Static and Dynamic Balance chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

7. Labels

   A. For installation of labels, refer to the Parts Identification and Marking chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Blade Track
Figure 7-31

8. 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 Inc. manuals.

(3) For additional general assembly information, refer to the General section at the beginning of this chapter.

B. Preparing the 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 indicate alignment of each blade assembly, fork unit, spinner bulkhead, and balance weight location with the hub unit. Refer to the Marking before Disassembly section in the Disassembly chapter of this manual.

(a) Before removal, make a mark to indicate position and orientation of each pitch change block (300) in the pitch change fork assembly (280).

(2) Remove all balance weight screws (9000) and balance weights (9020).

(3) Disconnect the electric de-ice lead wires from the hub and bulkhead, if applicable.

(4) Disassemble the propeller to the point of blade removal. Refer to the Propeller Disassembly section in the Disassembly chapter of this manual.

(5) Propeller Reassembly with Blades Removed for Shipping

(a) When reassembling the propeller with the blades removed, do not accomplish procedures related to blade installation or setting of blade angles.

NOTE: The pitch change blocks (300) may be taped in position in the pitch change fork assembly (280).

(b) Reassemble the propeller without the blade assemblies. Refer to the Assembly section in this chapter.

(6) Packing the Propeller and Blades for Shipping

(a) For packing the propeller and blades for shipping, refer to the Packaging and Storage chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(b) Pack the propeller without blades for shipping.

(c) Pack the blades for shipping with the preload plate, blade seal, and grease on each blade shank.

9. 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 each propeller component for shipping damage.

(a) If damage is found, refer to the Check chapter of this manual for the inspection, serviceable limits, and corrective action criteria for the specific component.

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 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, and each balance weight has been marked for alignment with the hub unit.

(2) Remove all balance weight screws (9000) and balance weights (9020).

C. Propeller Reassembly

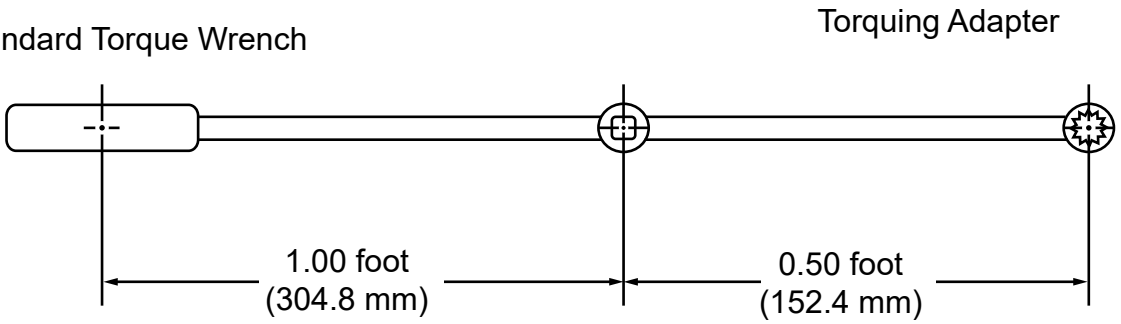
(1) Reassemble the propeller in accordance with the Assembly instructions in this chapter.

(2) Reconnect the electric de-ice lead wires to the bulkhead, if applicable.

FITS AND CLEARANCES - CONTENTS

LIST OF FIGURES

LIST OF TABLES



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

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.

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Calculating Torque When Using a Torque Wrench Adapter
Figure 8-1

1. Torque Values (Rev. 1)

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. 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 Inc. 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.

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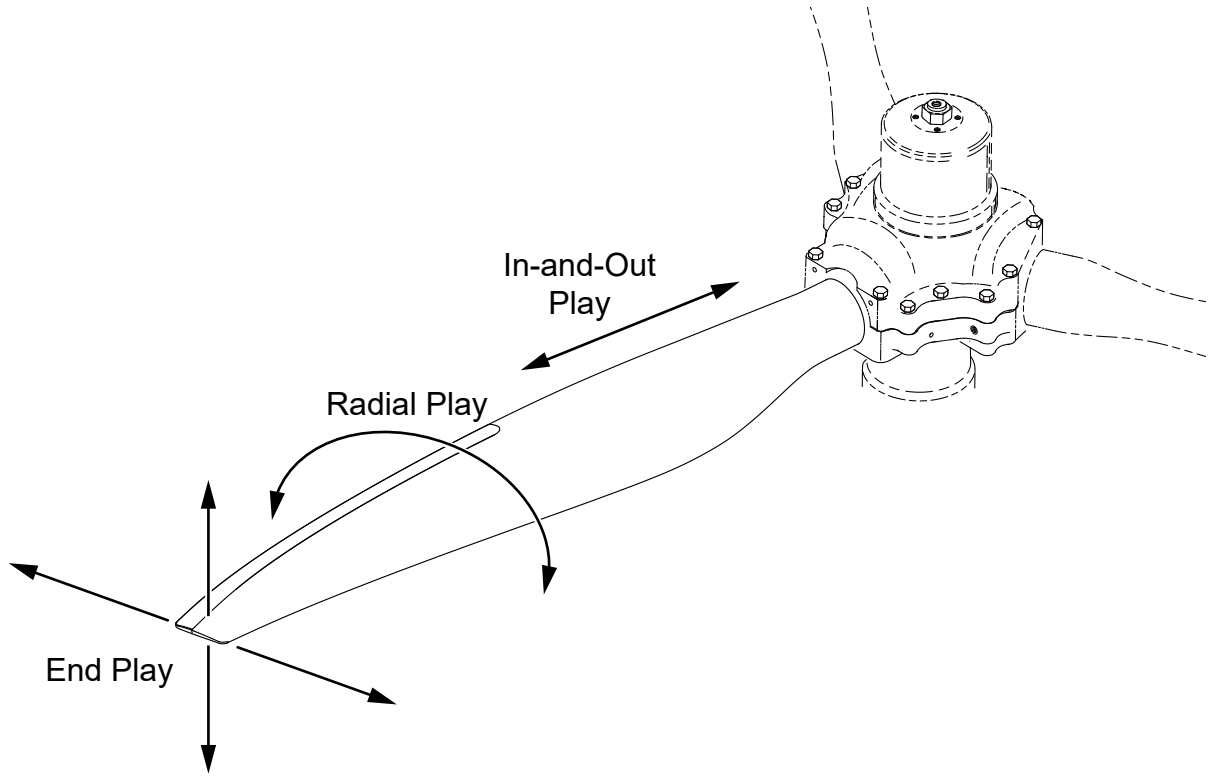
CAUTION 1: TORQUE VALUES ARE BASED ON NON-LUBRICATED THREADS, UNLESS SPECIFIED IN TABLE 8-1.

CAUTION 2: FOR TORQUE READING WHEN USING A TORQUE WRENCH ADAPTER, REFER TO FIGURE 8-1.

NOTE: Torque tolerance is ±10% unless otherwise specified.

Item No.	Part Number	Description	Torque Ft-Lb	Torque In-Lb	Torque N•m
10	A-2405-4	Nut, 15/16-20, Hex	25 - 30	300 - 360	34 - 40
50	B-7589	Screw, Set, 1/4-28, drilled	Maximum height flush with the top of the A-2405-4 nut.		
20	A-4268	Plug, 1/8 NPT	Torque until tight and no air leaks from around the pitch stop		
60	B-2423-1	Cylinder Unit	120 - 150 wet	1440 - 1800 wet	163 -203 wet
100	B-3841-8	Screw, 1/4 -28, Fillister Head (High Pitch Stop Bracket)	---	50	5.7
160	A-3205-1	Screw, 5/16-24, Cap	10 - 15	120 - 180	14 - 20
	B-3812	Screw, 5/16-24, Cap	10 - 15	120 - 180	14 - 20
200	106823	Nut, 5/8-18 Hex, Self-locking (Piston Nut)	15 - 25	180 - 300	20 - 34
250	B-4052	Rod, Pitch Change (Pitch Change Rod Fitted To Fork)	40 wet	480 wet	54 wet
450	A-2043-1	Nut, 3/8-24, Hex Self-locking (Hub Clamping Nut)	20 - 22	240 - 264	27 - 30
470	A-279	Fitting, Lubrication	Finger-tight then tighten one additional 360 degree turn		
	C-6349	Fitting, Lubrication	Finger-tight then tighten one additional 360 degree turn		
475	106545	Plug, Lubrication	Finger-tight then tighten one additional 360 degree turn		
3110	B-3368	Nut, Hex, 5/16-24 Thin (Preload lock nut)	---	120	13.6

Torque Values
Table 8-1



Blade Play
Figure 8-2

2. Blade Tolerances (Rev. 3)

A. Blade Play

(1) Limits for blade play are specified below. Refer to Figure 8-2.

(a)	End Play:	
	Leading Edge to Trailing Edge	0.125 inch (3.17 mm) total
	Fore-and-Aft (face to camber)	0.125 inch (3.17 mm) total
(b)	In-and-Out Play	0.032 inch (0.81 mm)
(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)	Blade Track	0.125 inch (3.17 mm) total

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. 1)

   A. Standard Tooling

      (1) Propeller repair stations certified by the FAA or international equivalent to overhaul Hartzell Propeller Inc. 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 Inc. Illustrated Tool and Equipment Manual 165A (61-00-65).

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

         (b) 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

1. Introduction (Rev. 1)

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 Inc. 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 Inc. Application Guide Manual 159 (61-02-59).

D. Ice Protection System Components

(1) Ice protection systems are application specific. Refer to Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

(a) For components of ice protection systems supplied by Hartzell, refer to Hartzell Propeller Inc. 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. 1)

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 Inc. identification number for the part.

(2) Use the Hartzell Propeller Inc. part number when ordering the part from Hartzell or a Hartzell-approved distributor.

C. Description

(1) This column provides the Hartzell Propeller Inc. 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.

4. Vendor Supplied Hardware (Rev. 1)

A. Important Information

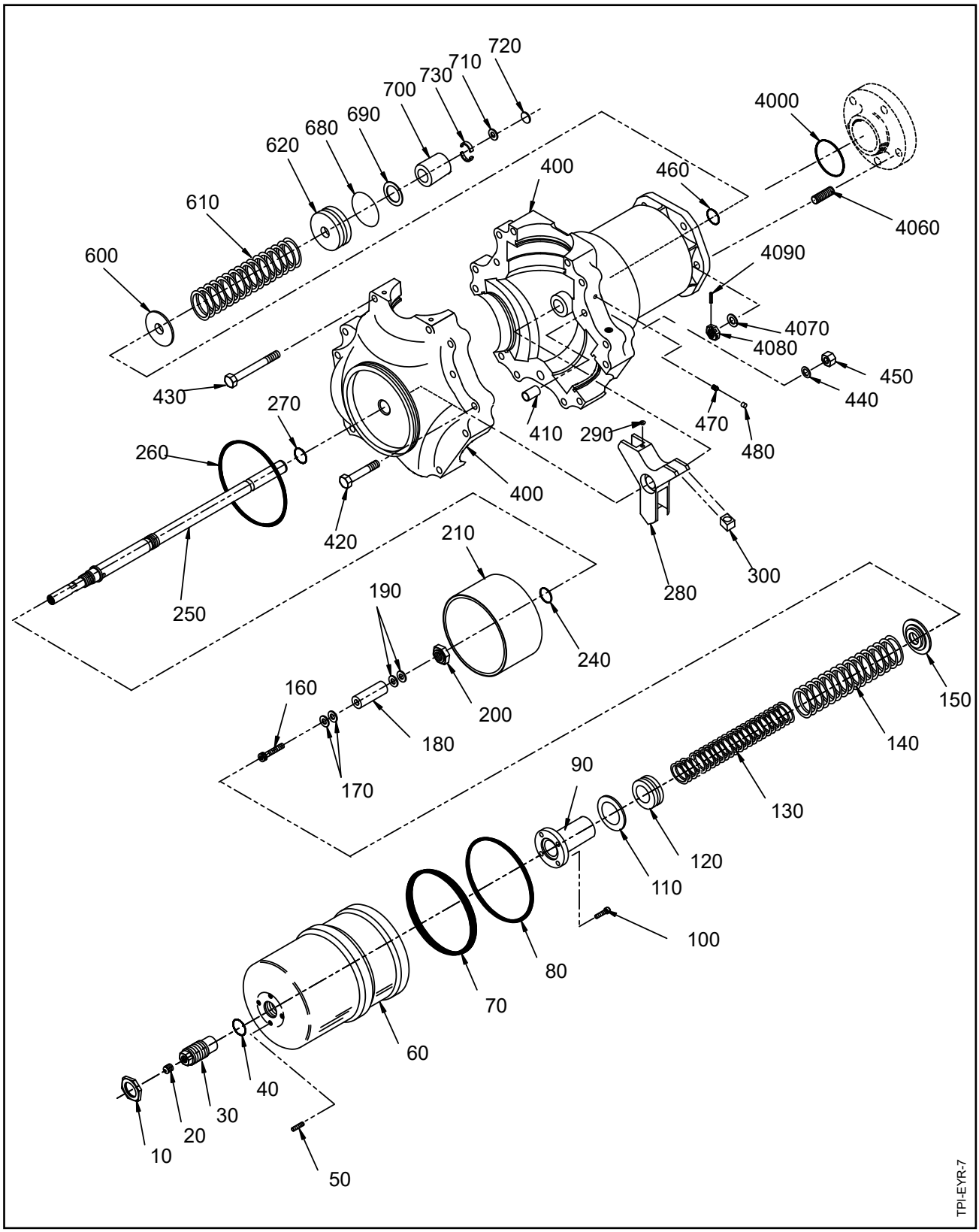
(1) Many O-rings, fasteners, and other vendor supplied hardware listed in Hartzell Propeller Inc. manuals have previously been specified with AN, MS, NAS, or vendor part number. To provide internal controls and procurement flexibility, Hartzell part numbers have been assigned to all O-rings, fasteners, and hardware. Part shipments from Hartzell Propeller Inc. 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 Inc. 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 Inc. 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 Inc.



HC-E3YR-7LF Propeller Assembly
Figure 10-1

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**PROPELLER PARTS - HC-E3YR-7LF**				
10	A-2405-4	• NUT, 15/16-20, HEX		1		
20	A-4268	• PLUG, 1/8 NPT		1		
30	A-2404( )	• STOP, PITCH (DETERMINED BY BLADE ANGLE)		1		
40	C-3317-117	• O-RING (STOP, PITCH)		1	Y	
50	B-7589	• SCREW, SET, 1/4-28, DRILLED		1	Y	
60	B-2423-1	• CYLINDER UNIT		1		
70	A-862-3	• • BUSHING, PLASTIC		1		
80	C-3317-427-1	• O-RING (CYLINDER ID)		1	Y	
90	B-4233	• HIGH PITCH STOP		1		
100	B-3841-8	• SCREW, 1/4-28, FILLISTER HEAD		4	Y	
110	A-3296	• GUIDE, SPRING (HC-()3Y(R,F)-7)		1		
120	A-3497	• BEARING, THRUST, BALL		1		
130	A-4213	• SPRING, COMPRESSION		1		
140	B-1594-1	• SPRING, COMPRESSION		1		
150	A-1591	• SPRING GUIDE		1		
160	A-3205-1	• SCREW, 5/16-24, CAP		1	Y	
160A	B-3812	• SCREW, 5/16-24, CAP, ALTERNATE FOR ITEM 160		1	Y	
170	B-3837-0563	• WASHER (FEATHER ADJUST)		AR	Y	
	B-3837-0532	• WASHER (FEATHER ADJUST)		AR	Y	
180	A-4232	• COLLAR, STOP		1		
190	A-2435	• WASHER, 5/16 INCH (HIGH PITCH ADJUST)		AR	Y	
	A-2435-1	• WASHER, 5/16 INCH (HIGH PITCH ADJUST)		AR	Y	
200	106823	• NUT, 5/8-18,HEX,SELF-LOCKING		1	Y	
210	B-4049	• PISTON UNIT		1		
-220	B-3683	• • PISTON		1		
-230	A-4051	• • INSERT, PISTON		1		
240	C-3317-210-1	• O-RING (PISTON ID)		1	Y	
250	B-4052	• ROD, PITCH CHANGE		1		
260	C-3317-247	• O-RING (CYLINDER MOUNTING)		1	Y	
270	C-3317-210-1	• O-RING (PITCH CHANGE ROD, CYLINDER-SIDE HUB HALF)		1	Y	
280	B-3252-2L	• FORK, THREE BLADE, LH - ASSEMBLY		1		
290	A-3256	• • BUMPER, FORK		3	Y	
300	A-3253-2	• BLOCK, PITCH CHANGE		3		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**PROPELLER PARTS - HC-E3YR-7LF, CONTINUED**				
400	D-4261	• PCP: HUB UNIT, HC-E3YR-7 SUPERSEDED BY ITEM 400A		1		PCP
410	A-2249	• • HUB BUSHING, GUIDE		1	Y	
400A	E-7176-11	• PCP: HUB UNIT, HC-E3YR-7 SUPERSEDES ITEM 400		1		PCP
410A	A-2249	• • HUB BUSHING, GUIDE		1	Y	
420	A-2431	• BOLT, 3/8-24, HEX HEAD		9		
430	A-2432	• BOLT, 3/8-24, HEX HEAD		6		
440	B-3834-0632	• WASHER		15	Y	
450	A-2043-1	• NUT, 3/8-24, HEX,SELF-LOCKING		15	Y	
460	C-3317-115-1	• O-RING		1	Y	
470	A-279	• FITTING, LUBRICATION REPLACED BY ITEMS 470A AND 475		6	Y	
470A	A-279	• FITTING, LUBRICATION REPLACES ITEM 470 IN CYLINDER-SIDE OF HUB		3	Y	
470B	C-6349	• FITTING, LUBRICATION, 45° (POST HC-SL-61-187) ALTERNATE FOR ITEM 470A		3	Y	
-475	106545	• PLUG, LUBRICATION (POST HC-SL-61-354) REPLACES ITEM 470 IN ENGINE-SIDE OF HUB		3	Y	
480	B-6544	• CAP, FITTING, LUBRICATION USED WITH ITEMS 470, 470A, AND 470B		3	Y	
		HUB-SIDE PITCH ADJUSTMENT PARTS				
600	A-4262	• GUIDE, SPRING		1		
610	A-4266	• SPRING, COMPRESSION		1		
620	A-4267	• BETA LOCKOUT ASSEMBLY (REFER TO “A-4267: BETA LOCKOUT ASSEMBLY” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
680	B-6629-225PP	• RING, RETAINING, INTERNAL		1	Y	
690	A-4239-( )	• SPACER, PITCH ADJUST		1		
700	A-4047	• COLLAR, STOP		1		
710	A-4048	• SPACER		1		
720	B-6629-77PP	• RING, RETAINING, INTERNAL		1	Y	
730	A-2272	• KEEPER, SPLIT		1	Y	
		BLADE RETENTION PARTS (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**PROPELLER PARTS - HC-E3YR-7LF, CONTINUED**				
		BALANCE PARTS				
-9000	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
-9020	A-2424(A)-( )	• BALANCE WEIGHT		AR		
		COUNTERWEIGHTS/MOUNTING BOLTS				
-9030		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				PCP
		• COUNTERWEIGHT MOUNTING BOLTS REFER TO THE APPLICABLE HARTZELL PROPELLER INC. BLADE MAINTENANCE MANUAL: MANUAL 135F (61-13-35) - COMPOSITE BLADES MANUAL 133C (61-13-33) - ALUMINUM BLADES				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. 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 INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. 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

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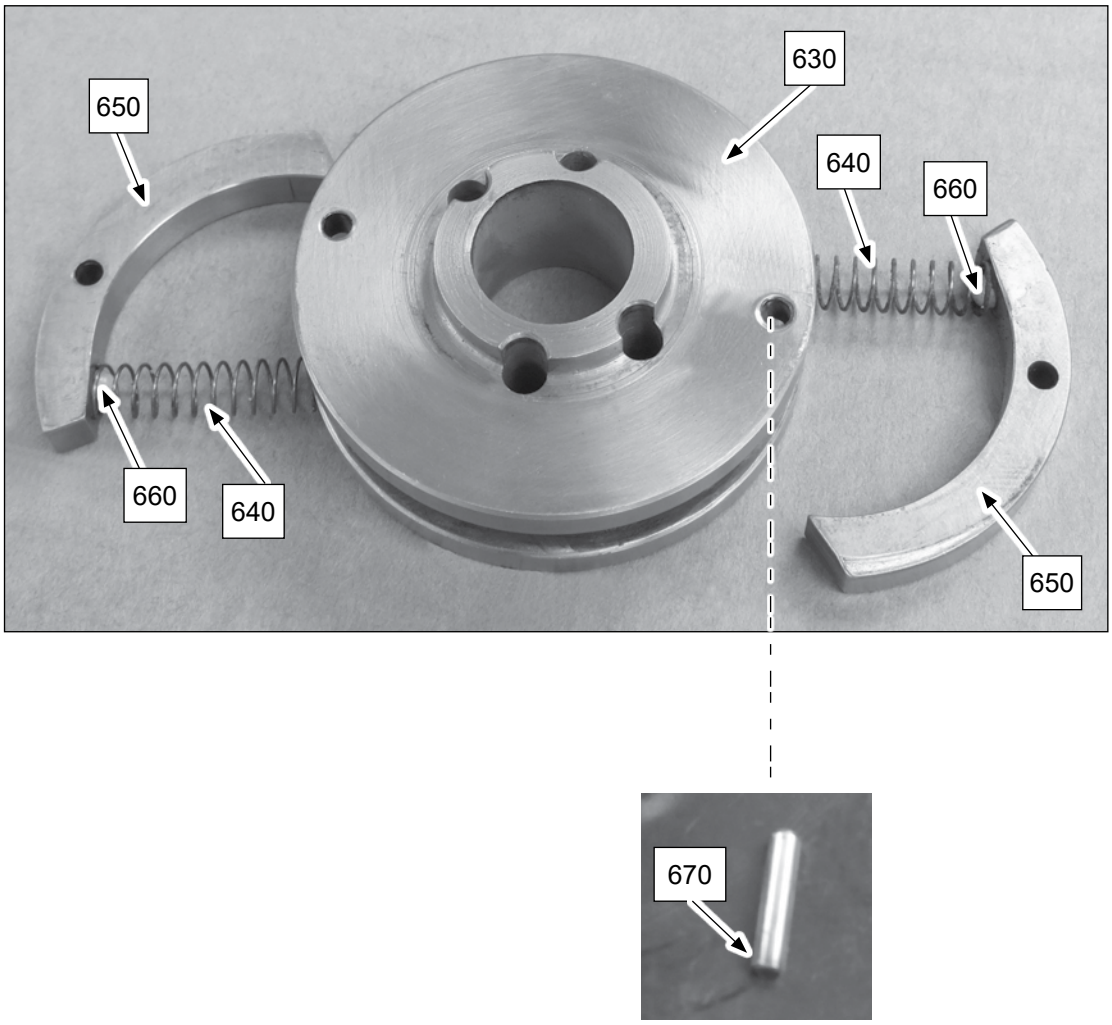
SUB-ASSEMBLY
PARTS LISTS and FIGURES



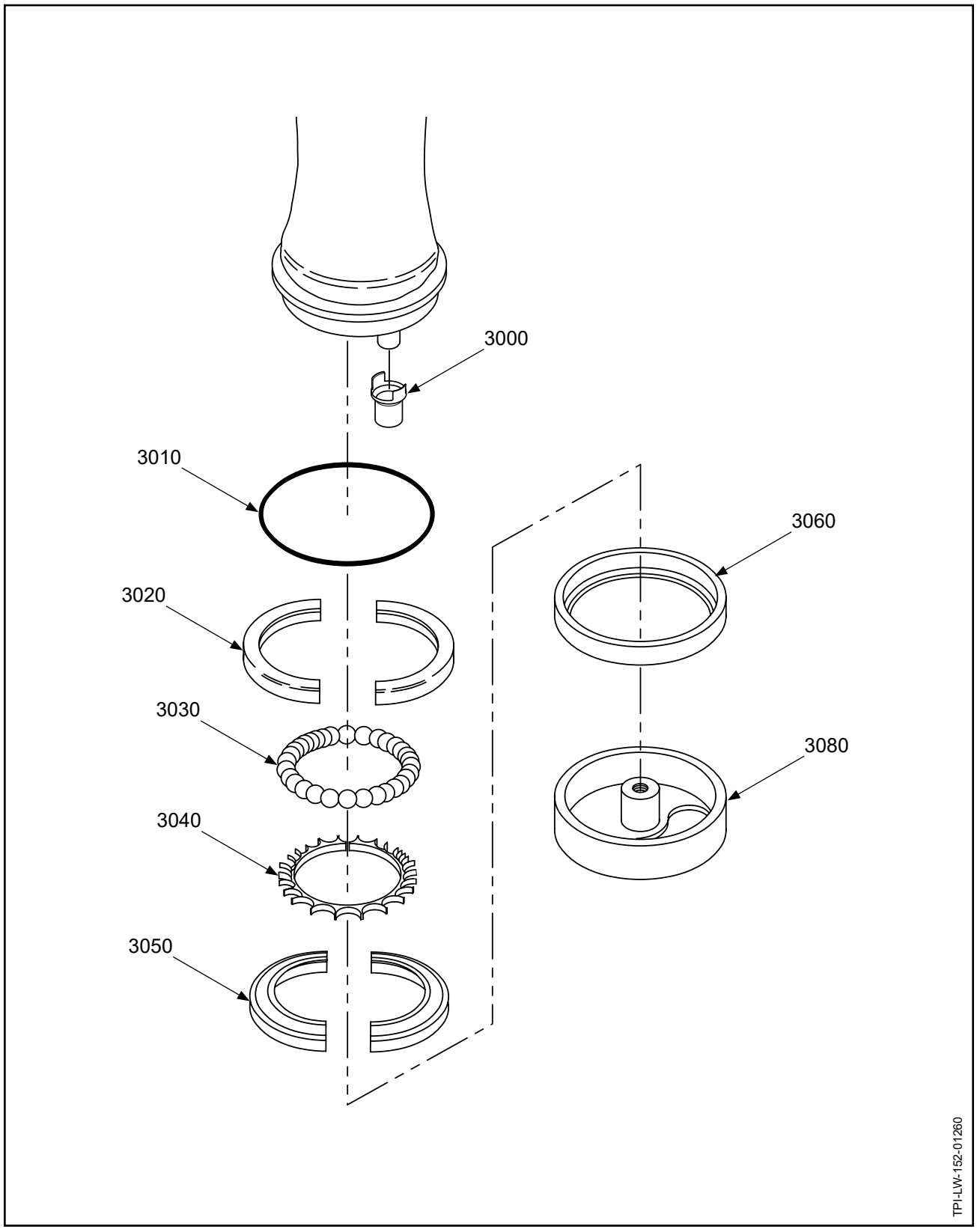
A-4267: Beta Lockout Assembly
Figure 10A-1

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-1		**A-4267: BETA LOCKOUT ASSEMBLY**				
-620	A-4267	BETA LOCKOUT ASSEMBLY		1		
630	B-4263	• HOUSING, BETA LOCKOUT		1		
640	A-4269	• SPRING, COMPRESSION		2	Y	
650	B-4264	• BETA LOCKOUT		2		
660	B-7641	• • BETA LOCKOUT SPRING GUIDE		2		
670	B-6734	• DOWEL PIN, 1/8 INCH				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

A-4267: Beta Lockout Assembly



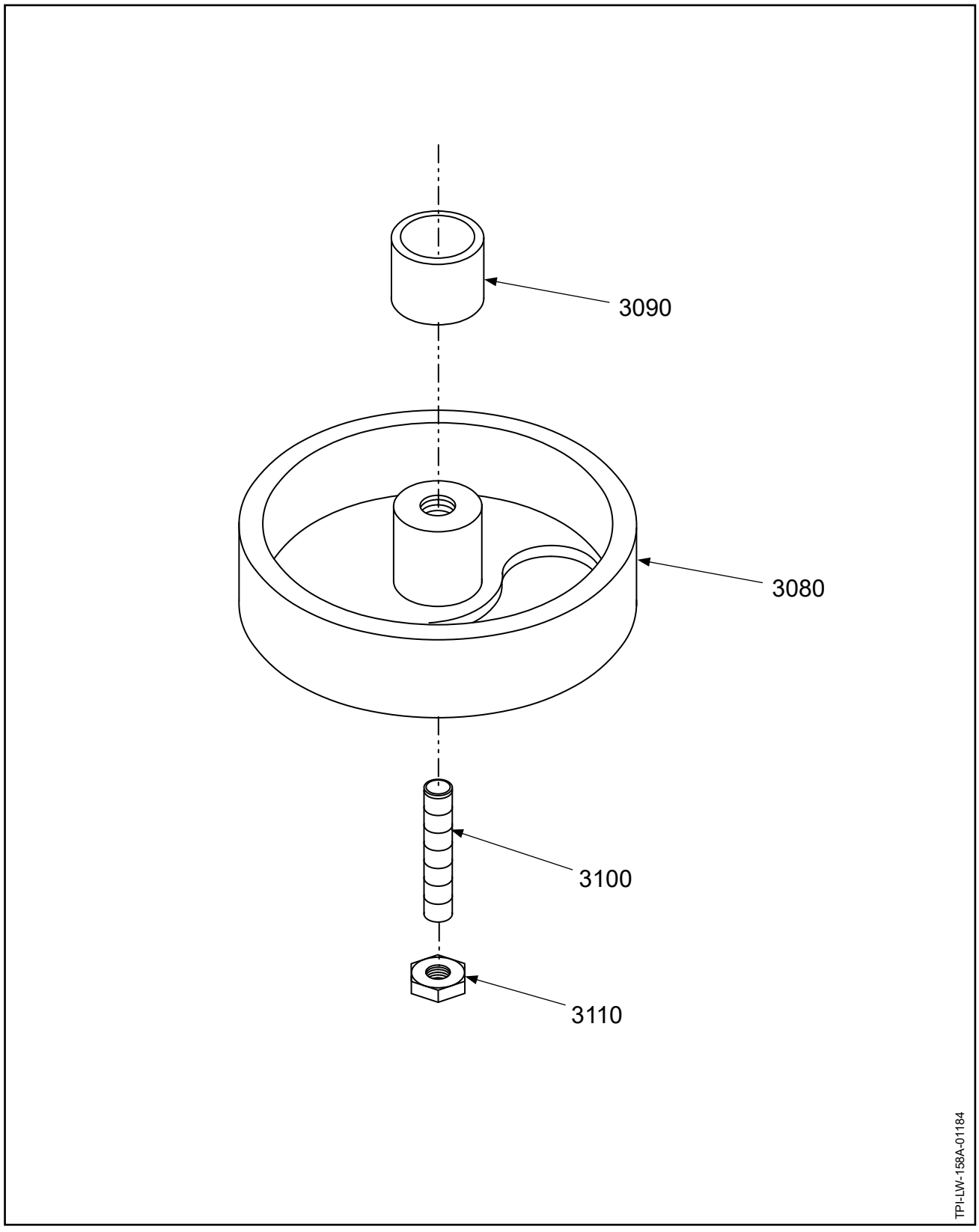
Blade Retention System Exploded View
Figure 10A-2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-2		**BLADE RETENTION PARTS** **All quantities (UPA) in this parts list are per blade assembly.**				
3000	C-7645-1	BUSHING, KNOB, PITCH CHANGE		3	Y	
3010	B-3883-4339	QUAD-RING (BLADE SEAL)		3	Y	
3010A	C-3317-340-8	O-RING, ALTERNATE FOR ITEM 3010	E	3	Y	
3020	A-2202-A	RACE, HUB SIDE		3		
3030	B-6144	BALL, BEARING, 1/2 INCH DIAMETER		75	Y	
	B-6144-650	BALL, BEARING, 1/2 INCH DIAMETER (650 PIECE BOX)		RF		
3040	B-3211	BALL SPACER		3	Y	
3050	A-2202-B	RACE, BLADE SIDE		3		
3060	A-2204	RING, RETAINING, BEARING		3		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
E	BLADES MUST HAVE 0.010 INCH (0.25 mm) THICK CM155 TEFLON® TAPE INSTALLED IN ACCORDANCE WITH HARTZELL PROPELLER INC. ALUMINUM BLADE MANUAL 133C (61-13-33)		

- ITEM NOT ILLUSTRATED

Blade Retention System



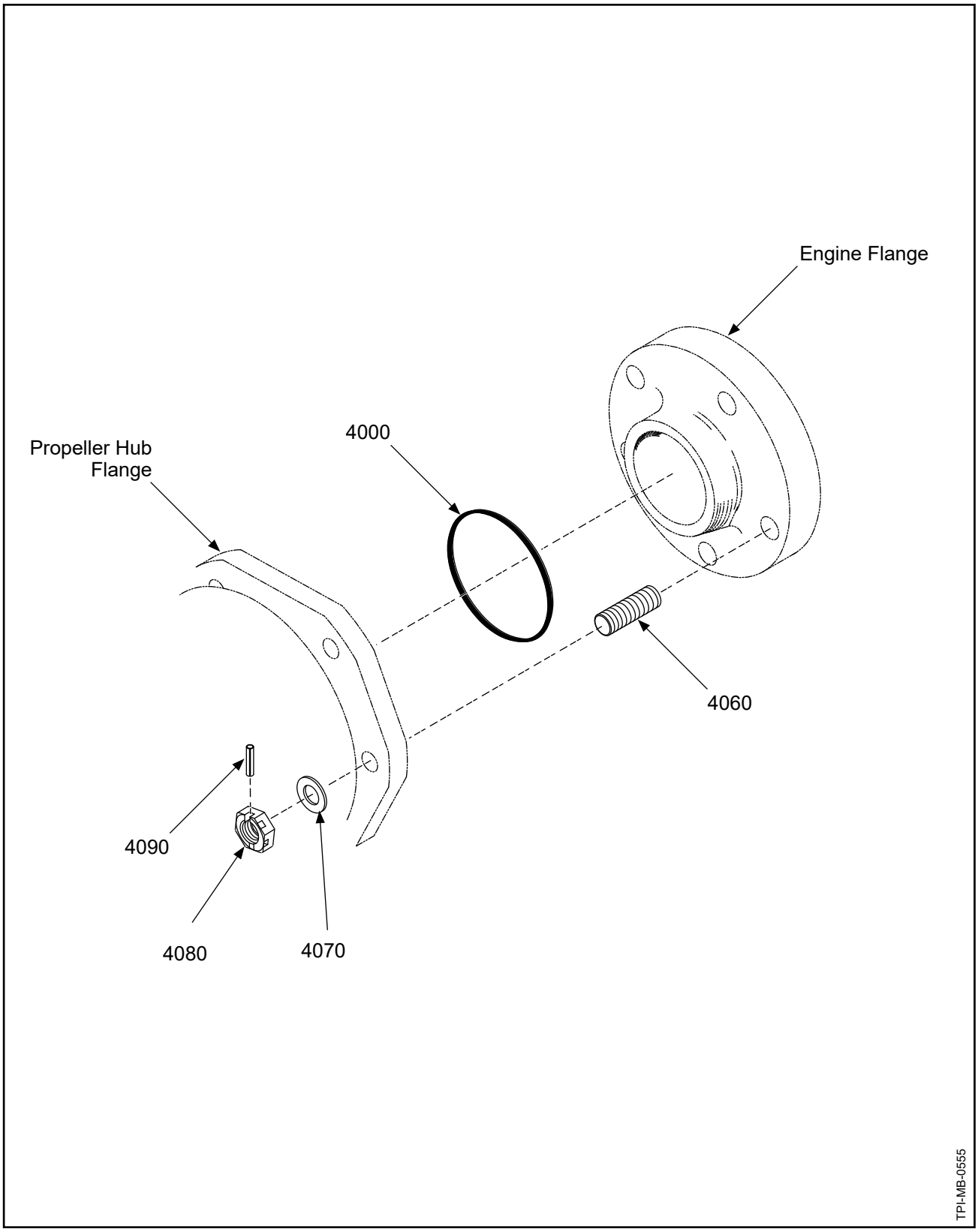
B-2256: Preload Plate Assembly
Figure 10A-3

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-3		**B-2256: PRELOAD PLATE ASSEMBLY**				
3080	B-2256	PRELOAD PLATE ASSEMBLY		3		
3090	B-6679	• RACE, INNER, BEARING		1		
3100	A-3204	• SCREW, SET, 5/16-24		1	Y	
3110	B-3368	• NUT, HEX, 5/16-24, THIN		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

B-2256: Preload Plate Assembly



R-flange Mounting Parts
Figure 10A-4

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-4		**R-FLANGE MOUNTING PARTS**				
4000	C-3317-228	O-RING		1	Y	
4060	A-2067	STUD, MOUNTING, 1/2-20		6	Y	
4070	A-1381	WASHER, 1/2 INCH CRES		6	Y	
4080	A-2069	NUT, MOUNTING, CASTLLATED		6	Y	
4090	B-3842-0750	SPRING PIN, 3/32 INCH, CRES		6	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

R-flange Mounting Parts

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