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MANUAL REVISION TRANSMITTAL

MANUAL 490 (61-10-90)
Raptor Series Reciprocatiing Propeller Overhaul Manual

REVISION 6 dated September 2023

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

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

NOTE 3: Pages distributed in this revision may include pages from previous revisions if they are on the opposite side of revised pages. This is done as a convenience to those users who wish to print a two-sided copy of the new revision.

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Manual No. 490
61-10-90
Revision 6
September 2023

Raptor Series Reciprocating Propeller Overhaul Manual

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REVISION 6 HIGHLIGHTS

Revision 6, dated September 2023, incorporates the following:

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

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

INTRODUCTION

- Added the section, "Video" Icon/QR Code

DISASSEMBLY

- Added the "Video" icon/QR code to the following Figures:
  - Figure 3-2, "Cylinder Removal"
  - Figure 3-3, "Piston/Pitch Change Rod Removal: ( )C1- ( )( )( ) Propellers
  - Figure 3-5, "Blade/Fork Removal"

ASSEMBLY

- Added the "Video" icon/QR code to the following Figures:
  - Figure 7-7, "Fork Installation"
  - Figure 7-8, "Cylinder-side Hub Half Installation"
  - Figure 7-10, "Piston/Pitch Change Rod Installation: ( )C1-( )( )( ) Propellers"
- Revised the section, "Pitch Change Rod Installation and Blade Angle Check"
- Revised the section, "Piston and Cylinder Installation"

FITS AND CLEARANCES

- Revised Table 8-1, "Torque Values"
- Revised Figure 8-2, "Blade Play"
- Revised the section, "Blade Tolerances"

ILLUSTRATED PARTS LIST

- Added the "Video" icon/QR code to Figure 10A-3, "106153 Hub Unit"
- Revised Figure 10A-5 and the parts list for the 107402-1 Hub Unit

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REVISION 6 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 revision.

      (3) Comments indicates the level of the revision.

         (a) New Issue is a new manual distribution. The manual is distributed in its entirety. All the revision dates are the same and no change bars are used.

         (b) Reissue is a revision to an existing manual that includes major content and/or major format changes. The manual is distributed in its entirety. All the revision dates are the same and no change bars are used.

         (c) Major Revision is a revision to an existing manual that includes major content or minor format changes over a large portion of the manual. The manual is distributed in its entirety. All the revision dates are the same, but change bars are used to indicate the changes incorporated in the latest revision of the manual.

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

Revision No.	Issue Date	Comments
Original	Jul/16	New Issue
Revision 1	Nov/18	Minor Revision
Revision 2	Nov/19	Minor Revision
Revision 3	Dec/21	Minor Revision
Revision 4	Oct/22	Minor Revision
Revision 5	Jun/23	Major Revision
Revision 6	Sep/23	Minor Revision

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RECORD OF REVISIONS

This is a permanent historical record of revisions inserted into this manual.
Revision 5 includes all prior revisions.

Revision Number	Issue Date	Date Inserted	Inserted By
5	Jun/23	Jun/23	HPI
6	Sep/23	Sep/23	HPI

Revision Number	Issue Date	Date Inserted	Inserted By

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RECORD OF TEMPORARY REVISIONS

Update this page to show all temporary revisions inserted into this manual.
Revision 5 includes all Temporary Revisions up to and including TR-002.

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

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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
HC-SB-61-377	Rev. 1, Nov/18
HC-ASB-61-395	Rev. 3, Dec/21

Service Document Number	Incorporation Rev./Date

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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 480 (61-00-80).

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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 135F (61-13-35)	-	Composite Propeller Blade Maintenance Manual
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 170 (61-13-70)	Yes	Composite Propeller Blade Field Maintenance and Minor Repair 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
Manual 480 (61-00-80)	Yes	Propeller Owner's Manual and Logbook for Raptor Reciprocating Propeller Series with Composite Blades Constant Speed, Non-counterweighted

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. "Video" Icon/QR Code

A. Instructions for Use

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

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

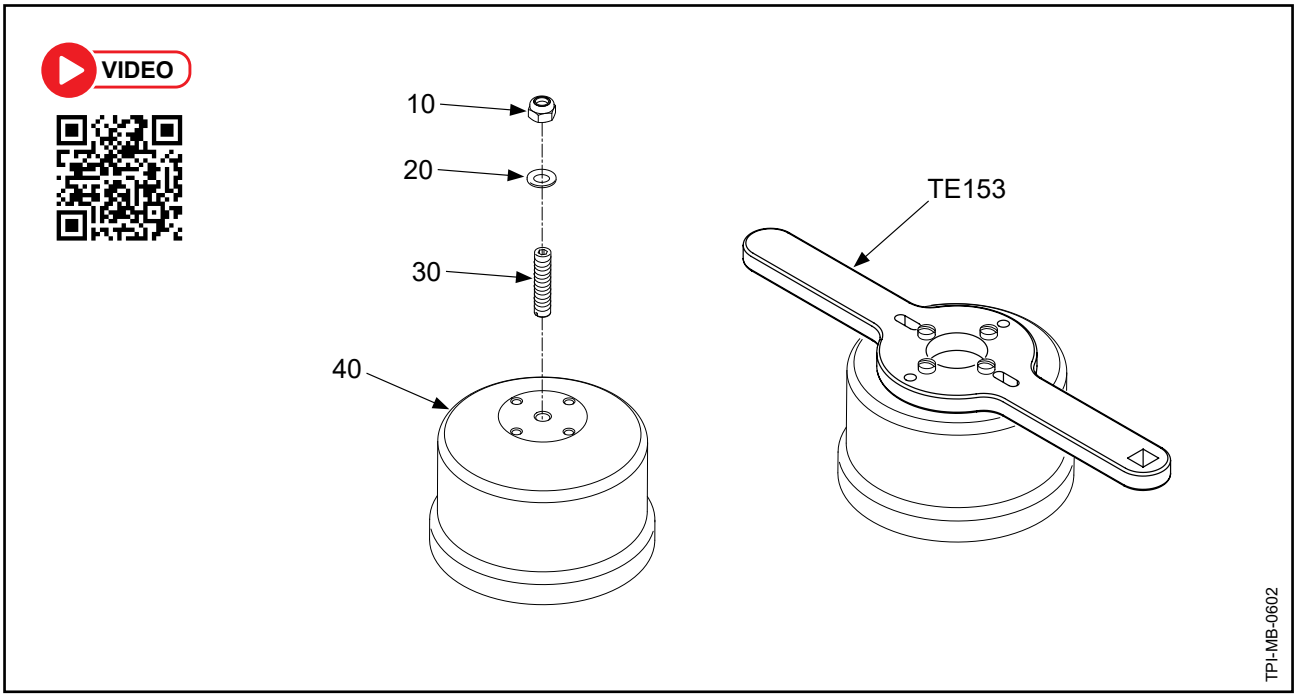
(2) To access the video/animated demonstration:

(a) If viewing the document file digitally:

1 Click on the QR code

(b) From a printed copy of the page:

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



"Video" Icon/QR Code
Figure 1

13. Definitions (Rev. 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
Brinelling	A depression caused by failure of the material in compression

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

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

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

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

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

Term	Definition
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

14. Abbreviations (Rev. 2)

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

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

DESCRIPTION AND OPERATION - CONTENTS

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1. General (Rev. 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 Blade Overhaul 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. ( )C1-( )( )( ) Series Propellers

      (1) These propeller models are constant speed, single-acting, hydraulically actuated propellers. The propellers are capable of blade angles between a low positive pitch (low pitch) and high positive pitch (high pitch).

      (2) Centrifugal twisting moment acting on the blades moves the blades to a low blade angle (low pitch) to increase RPM. Since the centrifugal twisting moment is only present when the propeller is rotating, a mechanical spring is installed within the propeller to assist movement of the blades to a lower pitch position as RPM declines, and to reduce the propeller pitch to the low pitch stop when the propeller is static. With the blades at low pitch, the load on the starter when starting the engine is reduced significantly.

      (3) Oil pressure opposes the spring and centrifugal twisting moment to move the blades to a high blade angle (high pitch), reducing engine RPM.

      (4) If oil pressure is lost at any time, the propeller will move to low pitch. This occurs because the spring and blade centrifugal twisting moment are no longer opposed by hydraulic oil pressure. The propeller will then reduce blade pitch to the low pitch stop.

B. ( )C4-( )( )( ) Series Propellers

(1) These propeller model series are constant speed propellers with blade mounted counterweights. The propellers are capable of blade angles between a low positive pitch (low pitch) and high positive pitch (high pitch). These propellers are generally used in aerobatic applications.

(2) The blade centrifugal twisting moment acts to move the blades to low blade angle (low pitch), but the counterweights are large enough to neutralize this force and produce a net increase in blade angle. Oil pressure against a propeller mounted hydraulic piston opposes the counterweight forces to move the blades to low pitch.

(3) The action of the counterweights tends to move the blades to a high blade angle (high pitch), reducing engine RPM. Oil pressure toward low pitch increases engine RPM.

(4) If oil pressure is lost at any time, the propeller will move to high pitch to avoid overspeeding. Movement to high pitch occurs because the blade counterweights are no longer opposed by hydraulic oil pressure. The blade counterweights are then free to increase blade pitch toward the high pitch stop.

TESTING AND FAULT ISOLATION - CONTENTS

LIST OF FIGURES

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1. Troubleshooting Guide

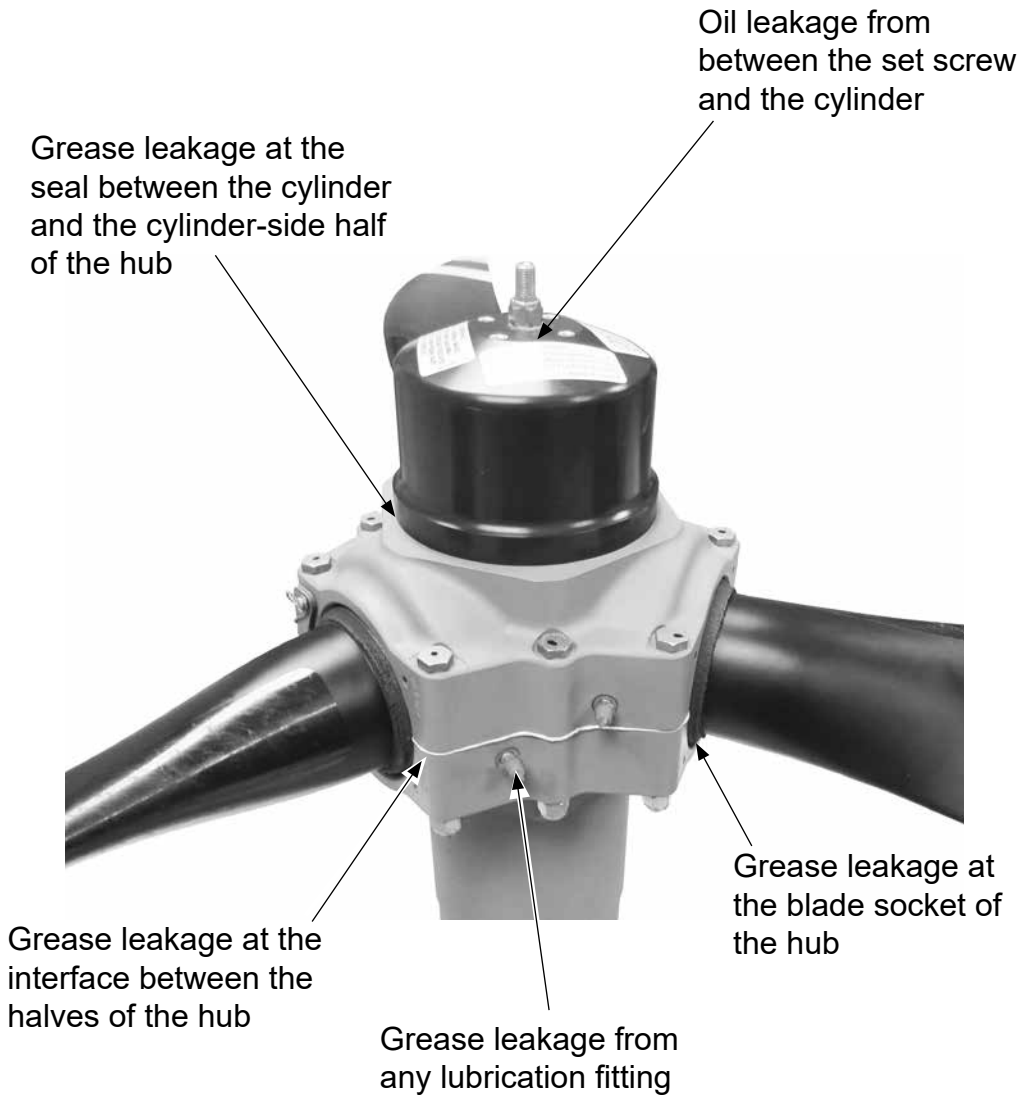
CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

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

Problem		Probable Cause	Remedy
A. Pitch Control Difficulty		Too much friction in moving parts.	Refer to problem "Friction" in this chapter.
	or	Oil leaking around the piston causing underspeed. Oil will leak out of the low pitch stop bleeder hole. ( )C4- propellers only	Disassemble the propeller and examine the piston O-rings and piston-to-cylinder sealing surfaces. Replace the defective O-ring(s).
	or	Oil leaking around the piston, between the pitch change rod and hub (engine-side), or between the pitch change rod and shaft plug causing overspeed.Hub will fill with engine oil. ( )C1- propellers only	Using caution because the grease/oil may be under pressure, remove a lubrication fitting from the hub and check for a dark grease/oil mixture leaking out of the lubrication fitting hole. Disassemble the propeller and examine the hub-to-pitch change rod O-rings and the piston O-rings, as applicable. Examine the piston-to-cylinder sealing surfaces and the pitch change rod sealing surfaces, as applicable. Replace the O-ring(s).
B. Friction		Blade is shimmed too tight.	Disassemble the propeller and readjust the blade shim.
	or	Lack of lubrication.	Add approved lubricant.
	or	Balls in the blade retention split bearing are unusually rough, corroded, or chipped.	Replace the blade retention split bearing assembly.

Problem		Probable Cause	Remedy
B. Friction, continued	or	Not enough clearance between the various moving parts in the pitch change mechanism.	Examine the moving parts individually. Increase the clearances between the individual parts as necessary to decrease friction in the mechanism. Refer to the section, "Pitch Change Block Button Modification" in the Repair chapter of this manual.
	or	Wear strip is damaged causing too much friction on the blade butt seal O-ring.	Replace the damaged wear strip and the seal O-ring.
C. Abnormal Propeller Vibration		Bent, cracked, or damaged blade or pitch change knob.	Refer to Hartzell Propeller Inc. Composite Propeller Blade Maintenance 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).
	or	Broken blade retention split bearings.	Replace the bearings and inspect the other blade retention components.
	or	Grease leakage.	Refer to the problem, "Grease Leakage" in this chapter.
D. Slight Vibration		Blades not tracking.	Refer to the problem, "Blades Not Tracking" in this chapter.
	or	Static balance incorrect.	Refer to the Static and Dynamic Balance chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
	or	Dynamic balance incorrect.	Refer to the Static and Dynamic Balance chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02.
	or	Blade wear.	Refer to Hartzell Propeller Inc. Composite Propeller Blade Maintenance Manual 135F (61-13-35).

Problem		Probable Cause	Remedy
D. Slight Vibration, continued	or	Grease leakage.	Refer to the problem, "Grease Leakage" in this chapter.
	or	Blade-to-blade pitch variance is too great.	Disassemble the propeller and correct the blade-to-blade pitch variance.
E. Surging RPM or Torque		Too much friction in the pitch change mechanism.	Refer to the problem, "Friction" in this chapter.
	or	Air is trapped in the propeller actuating piston or in the engine shaft.	After propeller installation and before each flight, exercise the propeller by changing pitch or feathering. The engine should have a provision for trapped air to escape from the system during one-half of the pitch cycle.
	or	Governor problem.	Refer to the airframe or the engine manufacturer's maintenance manual for installation instructions.



Areas of Leaking Oil or Grease
Figure 1-1

Problem	Probable Cause	Remedy
F. Oil Leakage (Refer to Figure 1-1)	Defective O-ring seal between the engine flange and the propeller mounting flange.	Remove the propeller from the engine and visually examine the O-ring and the sealing surface. Replace the defective O-ring.
	or Defective O-ring seal between the cylinder and the hub.	Remove the cylinder and visually examine the O-ring and the sealing surface. Replace the defective O-ring.
	or Defective O-ring seal between the piston and the cylinder, resulting in leakage between the pitch change rod plug and the cylinder.	Remove the cylinder and visually examine the piston O-ring and cylinder sealing surface. Replace the defective O-ring.
	or Defective O-ring seal between the pitch change rod and either hub half, resulting in leakage from the hub and from around the blade shanks.	Remove the lubrication fitting at the bottom of the hub and insert a wire. If oil runs out, then one or both O-rings are defective. Remove the propeller from the engine and disassemble. Visually examine both O-rings and sealing surfaces. Replace the defective O-ring(s).
G. Grease Leakage (Refer to Figure 1-1) A new or newly overhauled propeller can leak slightly during the first several hours of operation. The leakage can be caused by the seating of seals and O-rings, and the slinging of lubricants used during assembly. This leakage should stop within the first ten hours of operation.	Defective lubrication fitting.	Replace defective lubrication fittings.
	or Defective seal at blade socket in the hub.	Disassemble the propeller and visually examine the seal and the sealing surface. Replace defective seal.

Problem	Probable Cause	Remedy
H. End-Play Movement of the Blade NOTE: Refer to Table 8-2, "Blade Tolerances" in the Fits and Clearances chapter in this manual.	Blade retention bearing is worn.	Follow the Blade Retention Split Bearing Inspection and Replacement Procedures.
	or Internal blade shim is worn.	Disassemble the propeller, remove the blade shim, and inspect the blade shim. Replace the worn blade shim.
I. Fore-and-Aft Movement of the Blade NOTE: Refer to Table 8-2, "Blade Tolerances" in the Fits and Clearances chapter in this manual.	Blade retention bearing is worn.	Follow the Blade Retention Split Bearing Inspection and Replacement Procedures.
	or Internal blade shim is worn.	Disassemble the propeller, remove the blade, and inspect the blade shim. Replace the worn blade shim.
J. In-and-Out Movement of the Blade NOTE: Refer to Table 8-2, "Blade Tolerances" in the Fits and Clearances chapter in this manual.	Blade retention bearing is worn.	Follow the Blade Retention Split Bearing Inspection and Replacement Procedures.
K. Excessive Radial Play of the Blade (backlash) NOTE: Refer to Table 8-2, "Blade Tolerances" in the Fits and Clearances chapter in this manual.	Pitch change fork is worn.	Disassemble the propeller. Inspect and replace the fork, as required.
L. Blades Not Tracking	Ground strike damage.	For a composite blade, refer to Hartzell Propeller Inc. Composite Propeller Blade Maintenance Manual 135F (61-13-35).

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

A. Before Further Flight

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

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

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

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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

1. Important Information (Rev. 3)

WARNING 1: THE USE OF BLADE PADDLES TO MOVE BLADES CAN RESULT IN THE OVERLOAD AND DAMAGE OF BLADE PITCH CHANGE KNOBS. THIS DAMAGE IS NOT REPAIRABLE AND CAN RESULT IN SEPARATION BETWEEN THE BLADE AND THE PITCH CHANGE KNOB, CAUSING LOSS OF PITCH CONTROL DURING FLIGHT.

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

CAUTION 2: DO NOT USE MORE THAN 175 PSI (12.06 BARS) OF PRESSURE WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

CAUTION 3: USE ENOUGH PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

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.

D. Hub Balance Weight Removal

(1) Remove the safety wire from the balance weight screws (800).

(2) Remove and discard the balance weight screws (800).

(3) Remove the balance weights (810).

E. Counterweight Removal

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

2. Hub Plug Removal

A. 3C1-R619A1 and 3C1-R919A1 Propellers Only - Refer to Figure 3-1

(1) Turn the propeller over and put it on a support to get access to the propeller mounting flange.

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

(2) Using puller TE98, or equivalent, remove the hub plug (370).

(a) Put the puller TE98 on the end of the pitch change rod (150).

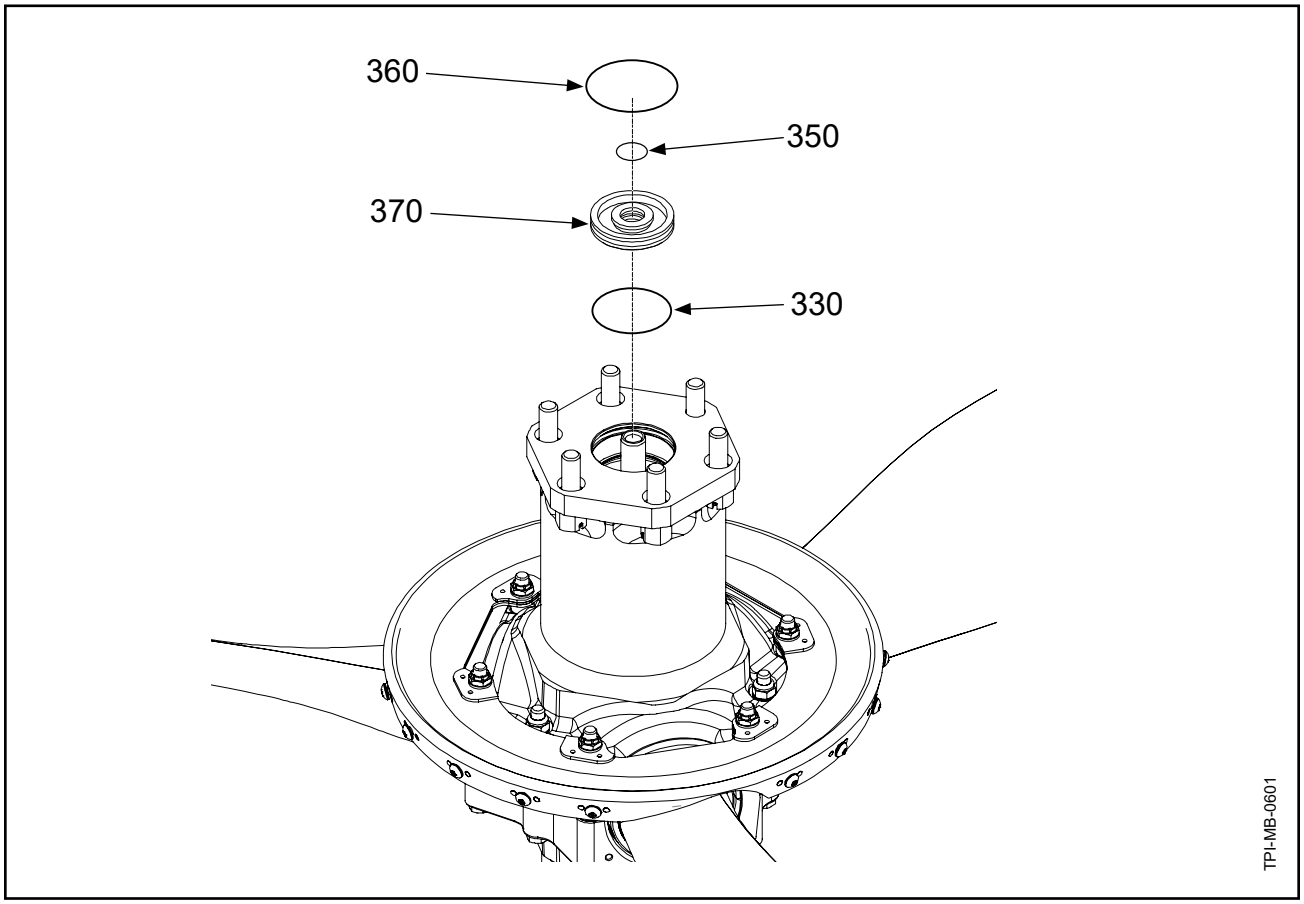
(b) Put the pulling ends of the puller TE98 firmly in the recesses of the hub plug (370).

(c) Tighten the puller TE98 until the hub plug (370) is removed from the bore of the hub (220).

(3) Remove and discard the O-ring (360) from the OD of the hub plug (370).

(4) Remove and discard the O-ring (350) from the ID of the hub plug (370).

(5) Remove and discard the internal spiral retaining ring (330).



Hub Plug Removal
Figure 3-1

3. Piston/Pitch Change Rod Removal

A. ( )C1-( )( )( ) Propeller Models

(1) To simplify the assembly process and minimize the effort to set the necessary blade angles, make a record of the location and orientation (where applicable) of each part in the propeller hub assembly.

(2) Attach the propeller assembly to the rotatable fixture TE125 or equivalent on the assembly table TE129 or equivalent.

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.

(3) Cycle the propeller through the entire range of movement and cycle back to no pressure or low pitch before beginning disassembly.

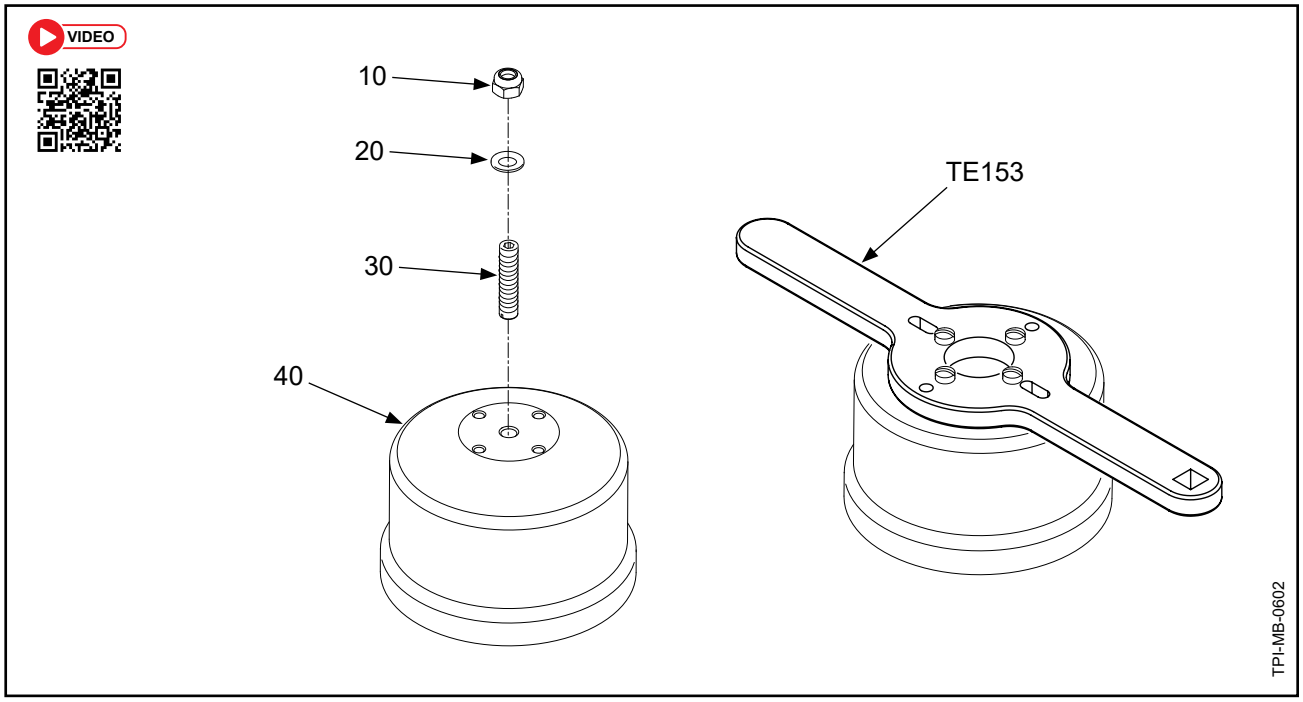
(4) Remove the cylinder (40) in accordance with Figure 3-2 and the following steps:

(a) Remove and discard the self-locking nut (10).

(b) Remove and discard the washer seal (20) from the low pitch stop set screw (30).

(c) Remove the low pitch stop set screw (30) from the cylinder (40).

(d) Using the cylinder wrench TE153 or equivalent, remove the cylinder (40).



Cylinder Removal
Figure 3-2

WARNING: USE CARE WHEN REMOVING THE PISTON BECAUSE THE PISTON IS UNDER SLIGHT FORCE.

(5) Remove the piston (80) and the pitch change rod (150) in acordance with Figure 3-3 and the following steps:

(a) Remove and discard the cylinder-to-hub O-ring (160).

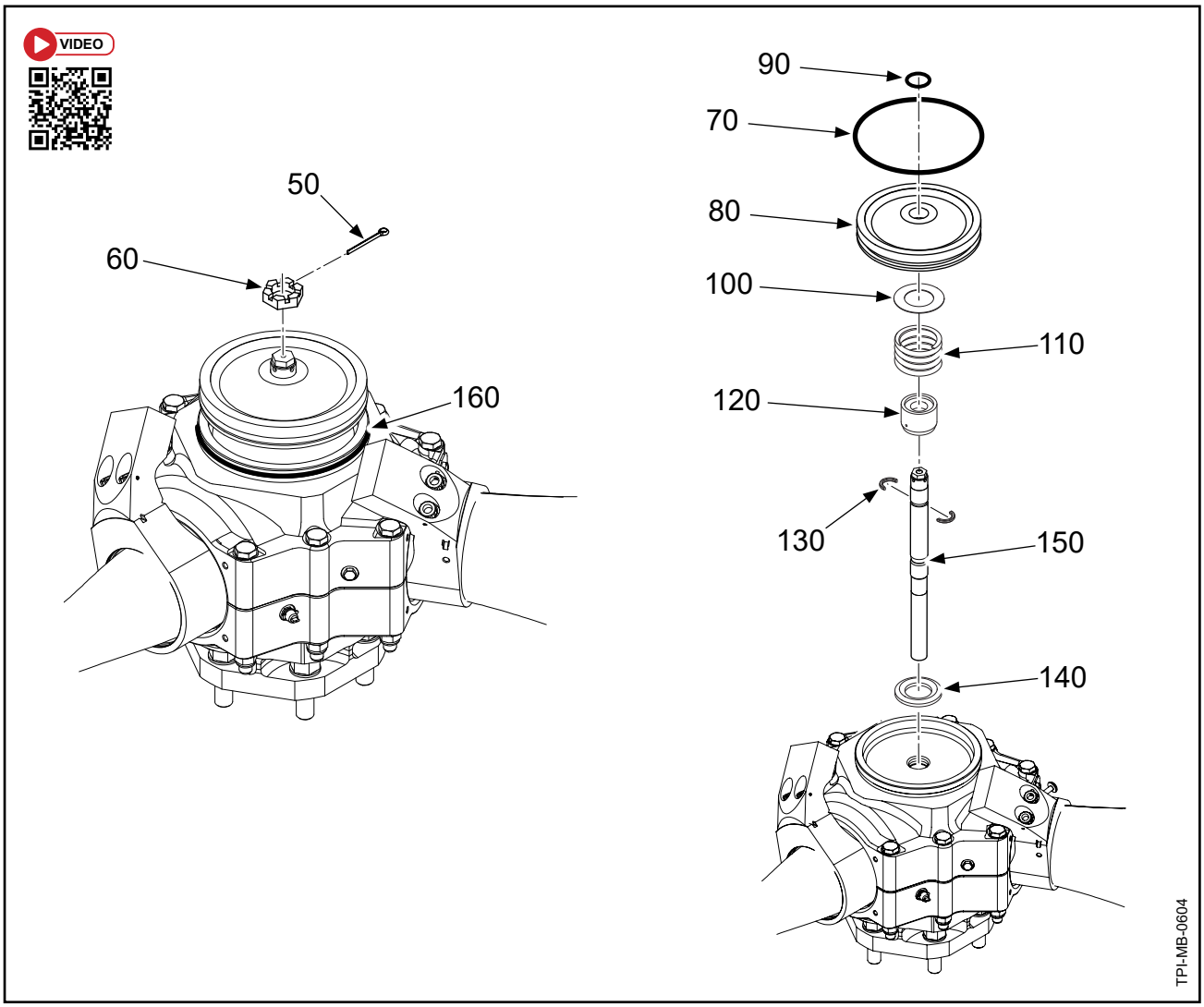
(b) Remove and discard the cotter pin (50) from the piston nut (60).

(c) Loosen the piston nut (60).

1 Do not remove the piston nut at this time.

(d) Loosen the pitch change rod (150) to release the pressure on the compression spring (110).

(e) Remove and discard the piston nut (60) from the pitch change rod (150).



Piston/Pitch Change Rod Removal: ( )C1-( )( )( ) Propellers
Figure 3-3

(f) Remove the piston (80) from the pitch change rod (150).

1 Remove and discard the O-ring (70) from the OD of the piston (80) and O-ring (90) from the ID of the piston.

(g) Remove the spring seat (100).

(h) Remove the compression spring (110).

1 4C1-Propellers Only: Remove compression spring (115).

(i) Remove the stop sleeve (120).

(j) Remove the spring guide (140).

(k) Remove and discard the stop sleeve split keeper (130).

(l) Remove the pitch change rod (150).

B. 3C4-( )( )( ) Propeller Models

(1) To simplify the assembly process and make it easier to set the necessary blade angles, make a record of the location and orientation (where applicable) of each part in the propeller hub assembly.

(2) Attach the propeller assembly to the rotatable fixture TE125 or equivalent on the assembly table TE129 or equivalent.

CAUTION: CYCLE THE PROPELLER BEFORE BEGINNING THE CYLINDER (40) REMOVAL PROCESS. FAILURE TO CYCLE THE PROPELLER MAY CAUSE THE PITCH CHANGE ROD (150) TO PREMATURELY DISENGAGE FROM THE FORK (290).

(3) Cycle the propeller through the entire range of movement and cycle back to no pressure or low pitch before beginning disassembly.

(4) Remove the cylinder (40) in accordance with Figure 3-2 and the following steps:

(a) Remove and discard the self-locking nut (10).

(b) Remove and discard the washer (20) from the low pitch stop set screw (30).

CAUTION: THE LOW PITCH STOP SCREW (30) IN AEROBATIC PROPELLERS CAN DEFORM DUE TO CONTACT WITH THE PITCH CHANGE ROD (150). DEFORMATION ON THE END OF THE LOW PITCH STOP SCREW CAN DAMAGE THE THREADS IN THE CYLINDER (40) WHEN THE LOW PITCH STOP SCREW IS REMOVED. IF RESISTANCE INCREASES WHEN REMOVING THE LOW PITCH STOP SCREW, REMOVE THE CYLINDER, THEN REMOVE THE LOW PITCH STOP SCREW BY TURNING IT INTO THE CYLINDER.

(c) Remove the low pitch stop set screw (30) from the cylinder (40).

(d) Using the cylinder wrench TE153 or equivalent, remove the cylinder (40).

(5) Remove the piston (80) and the pitch change rod (150) in acordance with Figure 3-4 and the following steps:

(a) Remove and discard the cylinder-to-hub O-ring (160).

(b) Remove and discard the cotter pin (50) from the piston nut (60).

(c) Remove and discard the piston nut (60) from the pitch change rod (150).

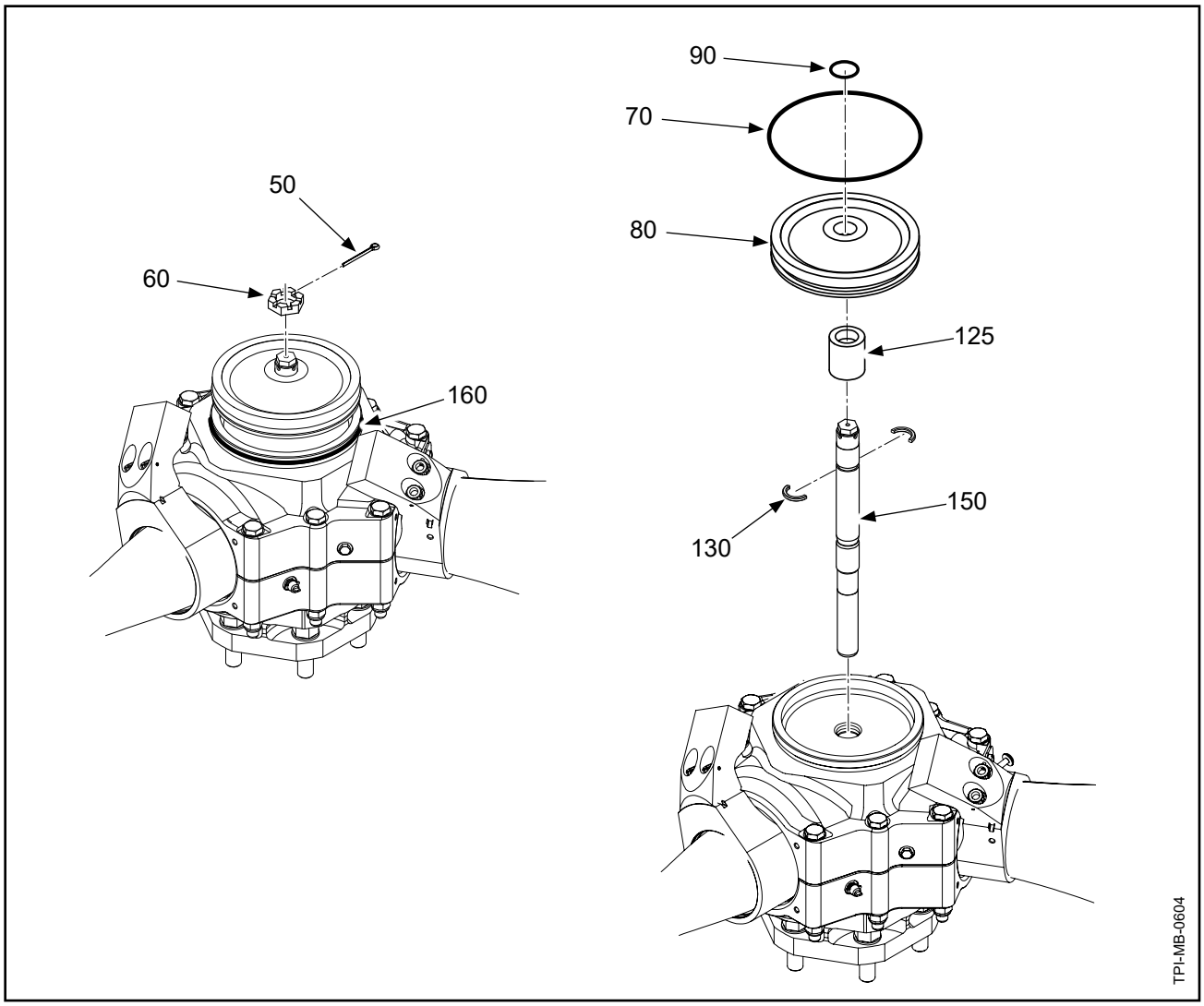
(d) Remove the piston (80) from the pitch change rod (150).

1 Remove and discard the O-ring (70) from the OD of the piston (80) and O-ring (90) from the ID of the piston.

(e) Remove the stop collar (125).

(f) Remove and discard the split keeper (130).

(g) Remove the pitch change rod (150).



Piston/Pitch Change Rod Removal: 3C4-( )( )( ) Propellers
Figure 3-4

4. Blade/Fork Removal

A. All Propeller Models

(1) Separate the hub (220) in accordance with the following steps:

(a) Remove and discard the nuts (190) and washers (200) from the hub clamping bolts.

(b) Remove the hub clamping bolts (210).

1 If applicable, remove hub clamping bolts (215) and washers (205).

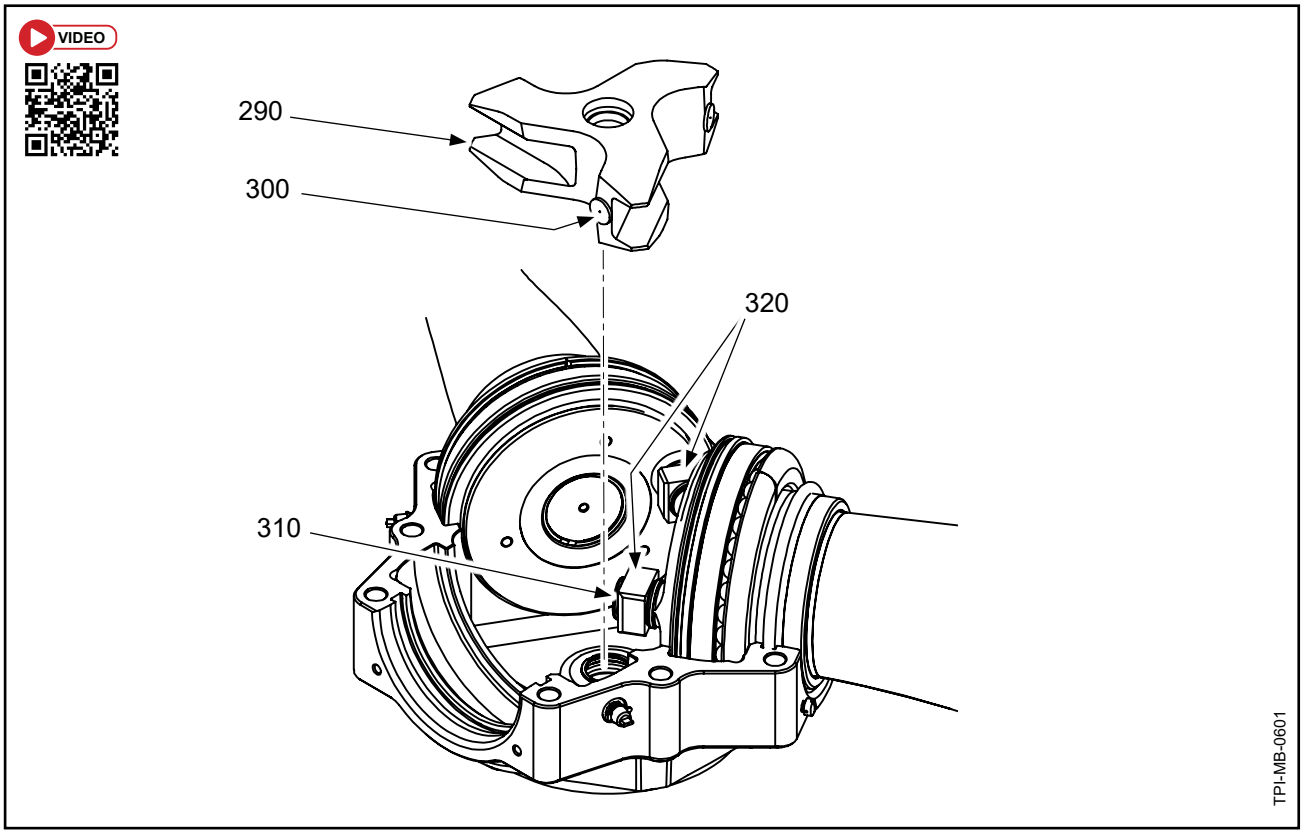
2 If the spinner bulkhead is attached to the propeller with the hub bolts (210), remove the spinner bulkhead.

(c) Loosen the sealant between the hub halves by lightly tapping or lifting the end of each blade.

CAUTION: DO NOT USE A SCREWDRIVER OR OTHER SHARP TOOL TO PRY APART THE HALVES OF THE HUB (220).

(d) Using a plastic wedge TE138, or similar tool, gently pry apart the halves of the hub (220).

(e) Remove the cylinder-side half of the hub (220).



Blade/Fork Removal
Figure 3-5

(7) Remove the blades and the fork (290) in accordance with Figure 3-5 and the following steps:

(a) Using blade clamp TE25, if desired, remove blade number one from the hub socket and set aside for disassembly.

(b) Remove the fork (290) from the hub (220).

1 Remove the fork bumpers (300) from the fork (290).

2 If applicable, remove the bumper extensions (295) from the fork (290).

(c) Remove the remaining blades from the hub (220).

(d) Remove the pitch change block (320) from each pitch change knob.

1 Make a mark to indicate the direction of the thin wall of each pitch change block (320) to the fork (290).

(e) Remove and discard the pitch change block button (310) from each pitch change block (320).

(8) If applicable, remove and discard the O-ring (340) from the ID of the rod hub bushing (280) in the engine-side of the hub unit (220).

5. Mounting Stud Removal

A. F-flange

(1) Remove F-flange mounting studs (500) and dowel pins (550) in accordance with Appendix B in the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

B. L-flange and R-flange

(1) Push out the spring pin (520) from the nut (510) and the mounting stud (500).

(2) Using a wrench, hold the mounting nut (510) and use a standard stud removal tool to remove the mounting stud (500) from the mounting nut (510).

(3) Discard the mounting stud (500), mounting nut (510), spring pin (520), and washer (530).

(4) Repeat steps (1) through (3) for the remaining mounting studs (500).

(5) Remove and discard the O-ring (540).

6. Hub Disassembly

A. All Propeller Models

(1) Remove components of the hub unit/assembly (220) in accordance with Appendix B in 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 Appendix B in the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

7. Blade Disassembly

A. All Propeller Models

(1) Remove and discard the blade O-ring (720).

(2) Remove the hub-side blade bearing race (660).

(3) Remove and discard the bearing balls (640).

(4) Remove and discard the ball spacer (650).

(5) Remove and discard the pitch change knob bushing (730).

(6) Remove the blade seal (700) and the blade shim (680) from the blade.

(a) To make the reassembly of the propeller easier, measure the thickness of the blade shim (680) and make a record of the measurement.

(7) Remove and discard the O-ring (690) from the ID of the blade seal (700).

(8) Remove and discard the O-ring (710) from the OD of the blade seal (700).

(9) Remove and discard the internal spiral retaining ring (620) from the bore of the blade.

(10) Remove the blade plug (610).

(a) Turn a screw with 8-32 UNC-3B threads into the threaded hole in the blade plug (610).

(b) Pull the blade plug (610) from the bore of the blade.

(11) Remove and discard the O-ring (600) from the OD of the blade plug (610).

(12) Using a suitable gear puller or brass drift, remove the bearing retaining ring (670).

(13) Remove the blade-side blade bearing race (630) of the blade retention bearing.

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

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CLEANING - CONTENTS

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1. Cleaning Procedures (Rev. 4)

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

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

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

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

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CHECK - CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. Inspection Interval Requirements (Rev. 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

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).

(2) Composite Blades: Refer to Hartzell Propeller Inc. Composite Blade Overhaul Manual 135F (61-13-35).

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 the following Hartzell Propeller Inc. maintenance manuals:

(a) Composite Spinner Maintenance Manual 148 (61-16-48)

(b) Composite Spinner Field Maintenance and Minor Repair Manual 173 (61-10-73)

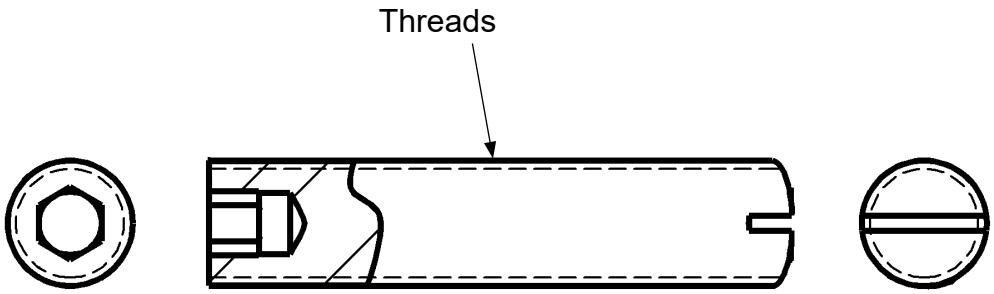
F. Special Inspections (Lightning Strike, Foreign Object Strike, etc.)

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

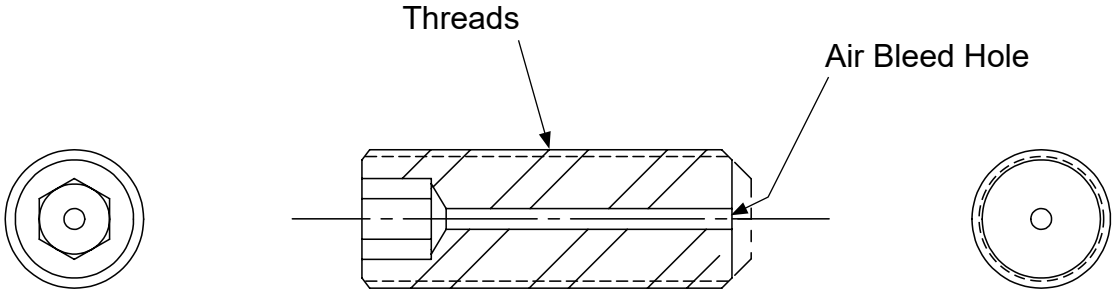
4. Propeller Component Checks

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.



102472 Set Screw



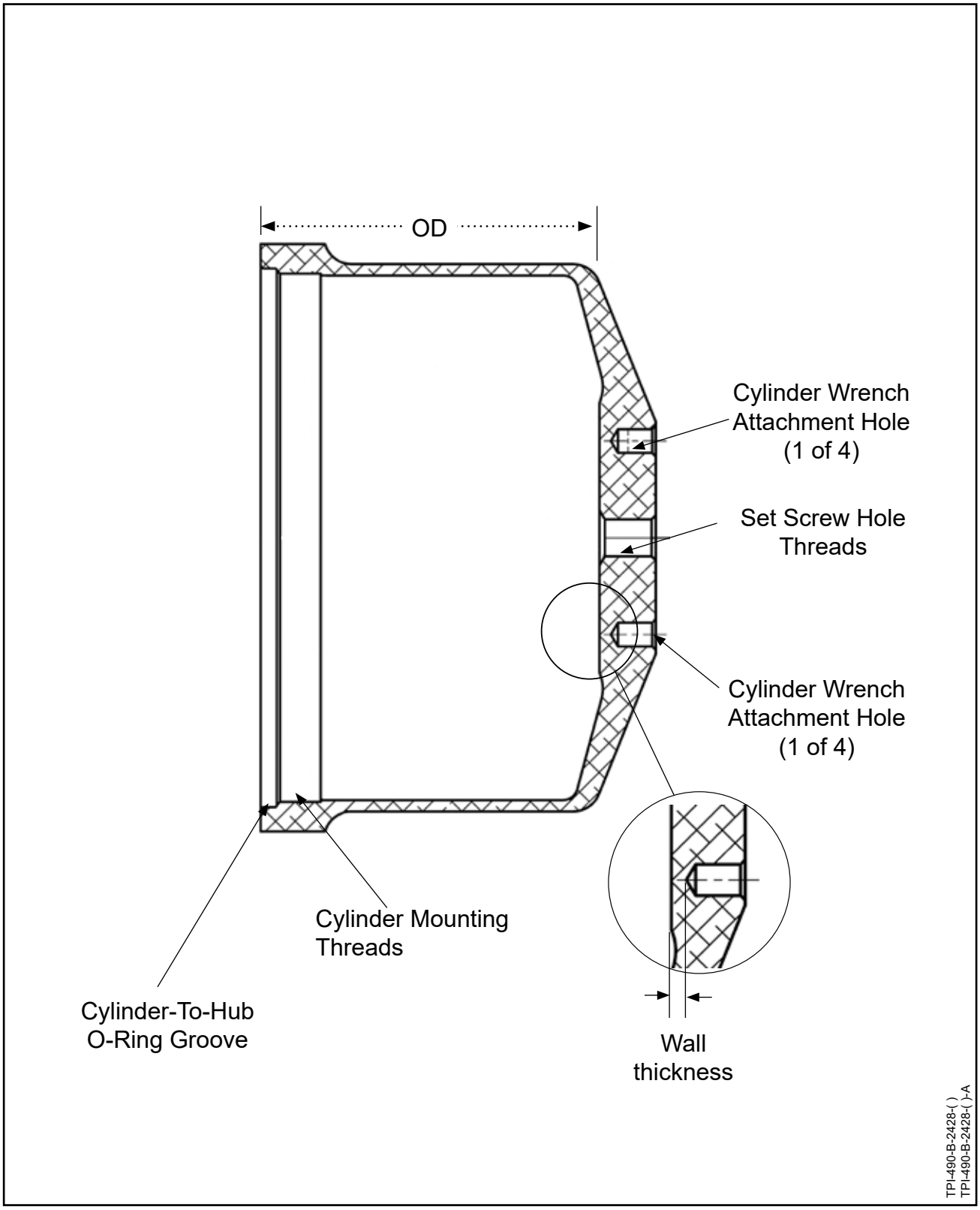
A-4257 Set Screw

TPI-102472
TPI-MB-0226

Set Screw
Figure 5-1

Component Inspection Criteria
Table 5-1

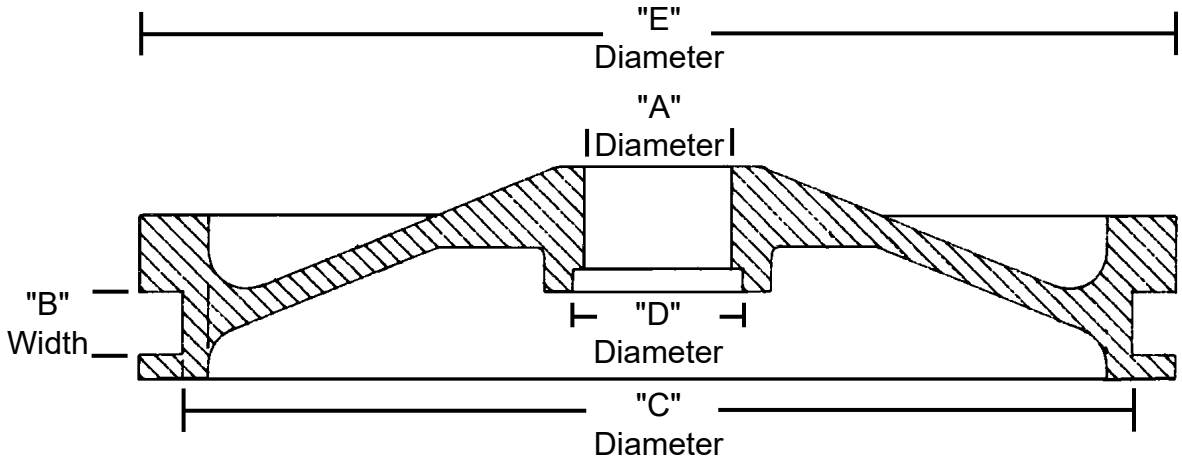
Inspect	Serviceable Limits	Corrective Action
A. SET SCREW (Item 30) Refer to Figure 5-1 NOTE: A-4257 Set Screw (Low Pitch Stop) has an air bleed hole. 102472 Set Screw (Low Pitch Stop) does not have an air bleed hole.		
(1) Visually examine the pitch change rod contact surface on the set screw for damage.	Slight damage is permitted. Damage must not affect the performance of the set screw.	If the damage is greater than the permitted serviceable limits, replace the set screw.
(2) Visually examine the set screw for corrosion and pitting.	Corrosion is not permitted. If there is corrosion, 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 using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion cannot be removed or if the depth of pitting is greater than the permitted serviceable limits, replace the set screw.
(3) Visually examine the threads of the set screw for damage.	One damaged thread is permitted.	If the damage is greater than the permitted serviceable limits, replace the set screw.
(4) A-4257 set screw only: Examine the air bleed hole in the center of the set screw.	The air bleed hole must not be blocked.	Use a piece of safety wire or equivalent to clear unwanted material from the air bleed hole. If the air bleed hole cannot be cleared, replace the set screw.
(5) Visually examine the set screw for cadmium plating coverage.	Minor wear on corners and a few light random scratches are permitted; otherwise cadmium plating must completely cover the set screw.	If the cadmium plating coverage is less than the permitted serviceable limits, cadmium replate and bake the set screw for a minimum of 23 hours within four hours of plating in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Cylinder
Figure 5-2

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
B. CYLINDER (Item 40) Refer to Figure 5-2.		
(1) Visually examine the anodized coating of the cylinder for wear, nicks, scratches, or other damage.	On the OD, the maximum permitted depth of damage is 0.003 inch (0.07 mm). For all other surfaces, damage is not permitted.	If the damage is greater than the permitted serviceable limits, replace the cylinder.
(2) Visually examine the cylinder-to-hub O-ring groove for wear.	If there is wear, measure the ID of the cylinder-to-hub O-ring groove. The maximum permitted O-ring groove ID is 4.8750 inches (123.825 mm).	If the ID is greater than the permitted serviceable limit, replace the cylinder.
(3) Visually examine the cylinder wrench attachment holes for thread damage.	If there is damage, install a 1/4-28UNF-3B screw and make sure that it will tighten to attach the cylinder wrench for installation and removal.	If the damage is greater than the permitted serviceable limits, repair the cylinder wrench attachment holes in accordance with the section "Repair of Damaged Cylinder Wrench Attachment Holes" in the Standard Repairs and Instructions chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If a previously repaired hole has damage that is greater than the permitted serviceable limits, replace the cylinder.
(4) Visually examine the set screw hole threads for damage.	1/2 of one thread total accumulated damage is permitted.	If the damage is greater than the permitted serviceable limits, replace the cylinder.
(5) If repaired with a threaded insert, measure the wall thickness under the point of the cylinder wrench attachment holes.	The minimum permitted wall thickness under the point (center) of the hole is 0.080 inch (2.04 mm).	If the wall thickness under the point of the hole is less than the permitted serviceable limits, replace the cylinder.

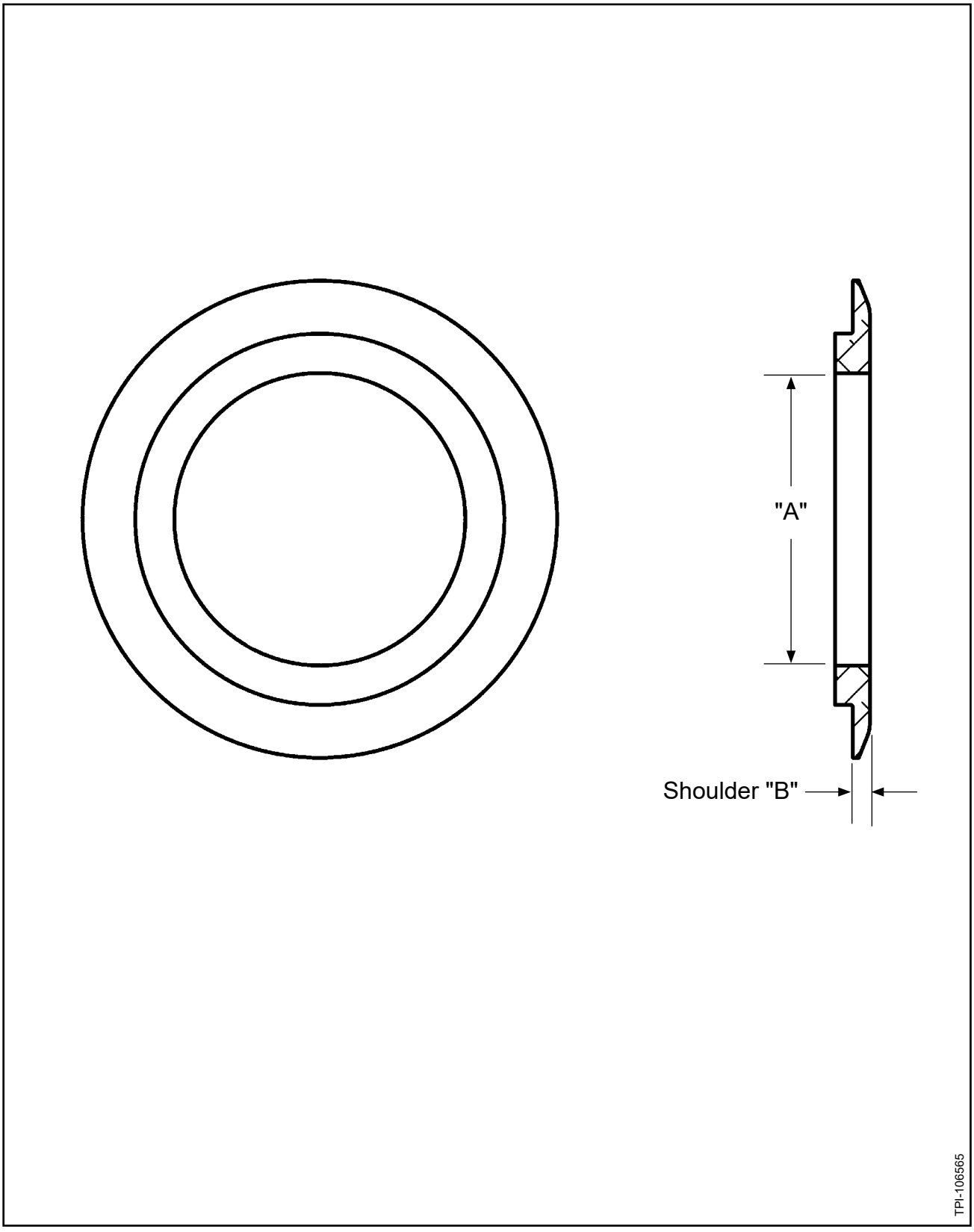


Part Number	"A" Maximum Diameter	"B" Maximum Diameter	"C" Minimum Diameter	"D" Maximum Diameter	"E" Minimum Diameter
B-2419	0.738 inch (18.74 mm)	0.270 inch (6.85 mm)	4.358 inch (110.70 mm)	0.856 inch (21.74 mm)	4.706 inch (119.54 mm)

Piston
Figure 5-3

Component Inspection Criteria
Table 5-1

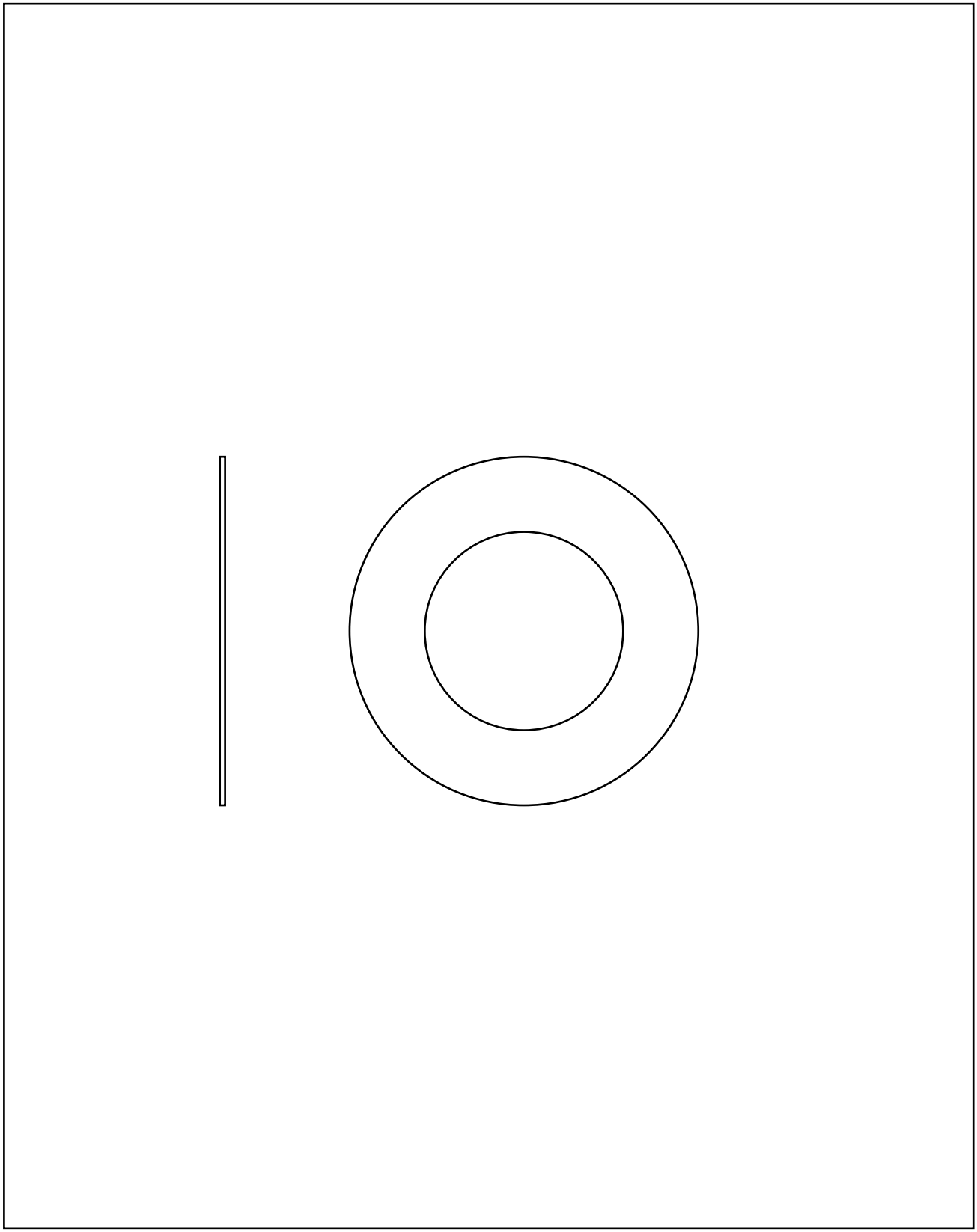
	Inspect	Serviceable Limits	Corrective Action
C.	PISTON (Item 80) Refer to Figure 5-3.		
(1)	Measure diameter "A" of the piston.	Refer to Figure 5-3 for the "A" dimensional limit.	If the diameter in area "A" is greater than the serviceable limits, replace the piston.
(2)	Visually examine the surface of the piston for nicks, scratches, or other damage.	The maximum permitted depth of a nick, scratch, or other damage is 0.005 inch (0.12 mm).	If a nick, scratch, or other damage is greater than the permitted serviceable limits, replace the piston.
(3)	Visually examine the piston for wear in areas "B" and "D".	If there is wear, measure the diameter. Refer to Figure 5-3 for the "B" and "D" dimensional limits.	If the diameter in area "B" or area "D" is greater than the serviceable limits, replace the piston.
(4)	Visually examine the piston for wear in areas "C" and "E".	If there is wear, measure the diameter. Refer to Figure 5-3 for the "C" and "E" dimensional limits.	If the diameter in area "C" or "E" is less than the serviceable limits, replace the piston.
(5)	Visually examine the nut contact surface for corrosion, wear, or damage.	Corrosion is not permitted. If there is corrosion, remove it in accordance with the corrective action repair limits. The maximum permitted depth of wear or damage is 0.007 inch (0.17 mm).	Remove corrosion using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion cannot be removed or if the wear or damage is greater than the serviceable limits, replace the piston.



Spring Seat, p/n 106565
Figure 5-4

Component Inspection Criteria
Table 5-1

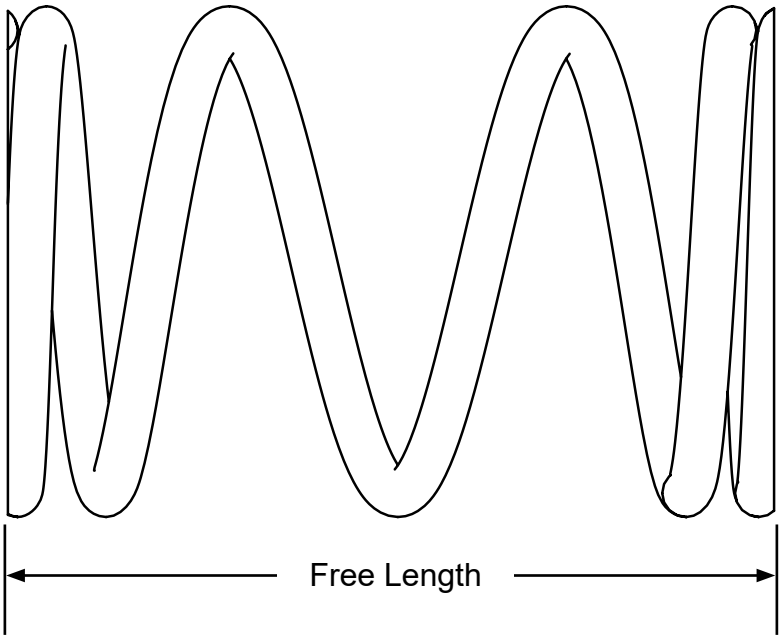
Inspect	Serviceable Limits	Corrective Action
D. SPRING SEAT, p/n 106565 (Item 100) Refer to Figure 5-4		
(1) Visually examine the spring seat for corrosion and pitting.	Corrosion is not permitted. If there is corrosion, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	Remove corrosion using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion cannot be removed or if the pitting is greater than the permitted serviceable limits, replace the spring seat.
(2) Visually examine the spring seat for damage.	The maximum permitted depth of damage is 0.010 (0.25 mm)	Remove material that is raised above the normal machined surface. If the depth of damage is greater than the permitted serviceable limits, replace the spring seat.
(3) Visually examine diameter "A" for wear.	If there is wear, measure diameter "A". The maximum permitted diameter is 2.045 inch (51.94 mm).	If the measurement of diameter "A" is greater than the permitted serviceable limits, replace the spring seat.
(4) Visually examine shoulder "B" for wear.	If there is wear, measure the thickness of shoulder "B". The minimum permitted thickness of shoulder "B" is 0.070 inch (1.78 mm).	If the thickness of shoulder "B" is less than the permitted serviceable limits, replace the spring seat.



Spring Seat, p/n 101430
Figure 5-4.1

Component Inspection Criteria
Table 5-1

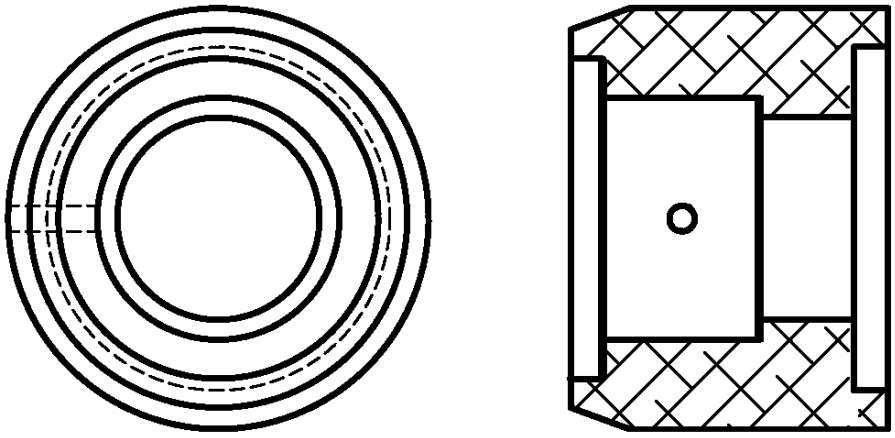
Inspect	Serviceable Limits	Corrective Action
D1. SPRING SEAT, p/n 101430 (Item 100) Refer to Figure 5-4.1		
(1) Visually examine the spring seat for corrosion and pitting.	Corrosion is not permitted. If there is corrosion, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting is 0.005 inch (0.12 mm). Pitting may not cover more than 10% of the spring seat surface.	Remove corrosion using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion cannot be removed or if the pitting is greater than the permitted serviceable limits, replace the spring seat.
(2) Visually examine the spring seat for wear.	If the spring seat is worn, measure the depth of wear. The maximum permitted depth of wear is 0.015 inch (0.38 mm). If there is wear on both sides of the spring seat, the total of both wear depths must not be greater than 0.015 inch (0.38 mm). Wear that affects the fit or function is not permitted.	If the depth of wear is greater than the permitted serviceable limits, replace the spring seat.
(3) Visually examine the spring seat for nicks, scratches, and gouges or other damage.	The maximum permitted depth of nicks, scratches, gouges, or other damage is 0.015 inch (0.38 mm). The maximum permitted total area of accumulaated damage for all surfaces combined is 0.5 sq. inch (322 sq. mm). Damage that affects the fit or function is not permitted.	If the damage is greater than the permitted serviceable limits, replace the spring seat.



Compression Spring
Figure 5-5

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
E. COMPRESSION SPRING (Item 110 and Item 115) Refer to Figure 5-5.		
CAUTION: Do not strip the zinc plating from the spring. If the plating is removed, replace the spring.		
(1) Visually examine the compression spring for wear, corrosion, or other damage.	Corrosion is not permitted. If there is corrosion, remove it in accordance with the corrective action repair limits. The maximum permitted depth of damage is 0.003 inch (0.07 mm).	Remove corrosion using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion cannot be removed or the damage is deeper than the permitted serviceable limit, replace the compression spring.
(2) Visually examine the compression spring for zinc plating or zinc chromate primer coverage.	A few random scratches are permitted; otherwise, complete coverage of zinc plating or zinc chromate primer on all surfaces is required.	Apply a layer of zinc chromate primer to the spring in accordance with the section, "Spring Zinc Chromate Primer Repair" in the Repair chapter of this manual.
(3) Measure the free length of the compression spring.	The minimum permitted free length of the spring p/n 106563 and p/n 107426 is 2.875 inches (73.02 mm). The minimum permitted free length of the spring p/n 101330 is 2.85 inches (73.4 mm).	If the free length is less than the permitted serviceable limit, replace the compression spring.
(4) Magnetic particle inspect the compression spring in accordance with the Magnetic Particle Inspect chapter of the 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.

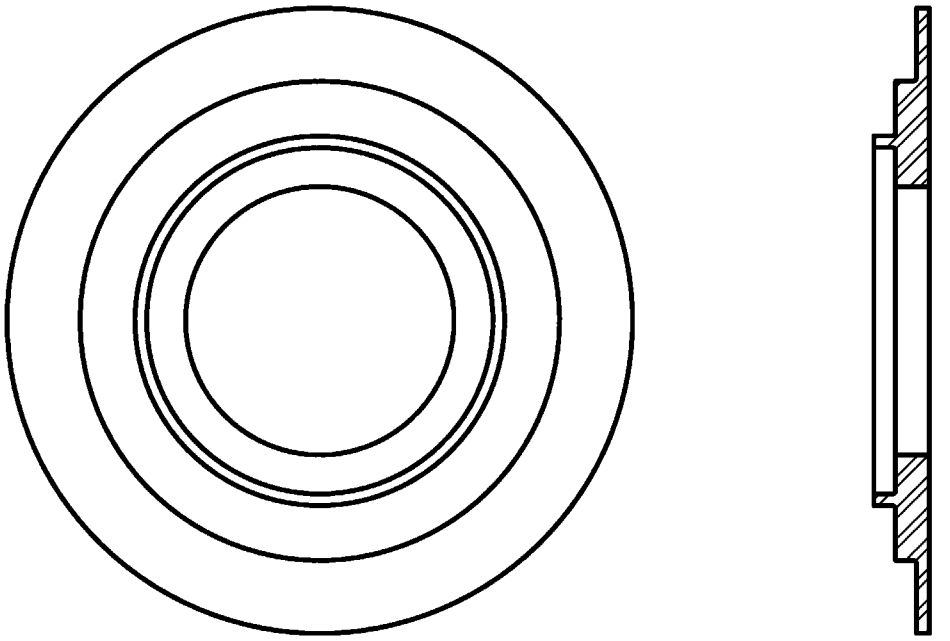


TPI-101335

Stop Sleeve
Figure 5-6

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
F. STOP SLEEVE OR STOP COLLAR (Item 120 and 125) Refer to Figure 5-6.		
(1) Visually examine the surface of the stop sleeve or stop collar for corrosion.	Corrosion is not permitted. If there is corrosion, remove it in accordance with the corrective action repair limits.	Remove corrosion using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion cannot be removed, replace the stop sleeve or stop collar.
(2) Visually examine the surface of the stop sleeve or stop collar for wear, nicks, scratches, or other damage.	The maximum permitted depth of wear, nick, scratch, or other damage is 0.05 inch (1.2 mm).	If wear, nick, scratch, or other damage is greater than the permitted serviceable limits, replace the stop sleeve or stop collar.
(3) Visually examine the stop sleeve or stop collar for pushed up material that is above the surrounding surface.	Pushed up material may not be above or outside the machined surface of the part.	Blend the pushed up material with the surrounding area. Refer to the section, "Aluminum and Steel Parts" in the Repair chapter of this manual for repair procedures.

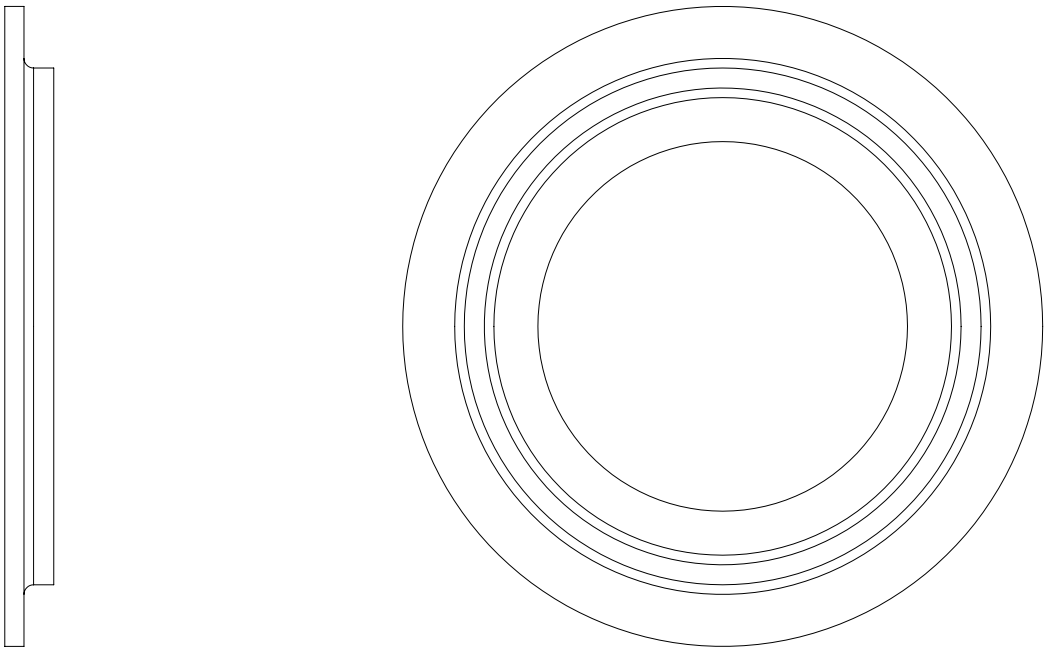


TPI-106564

Spring Guide, p/n 106564
Figure 5-7

Component Inspection Criteria
Table 5-1

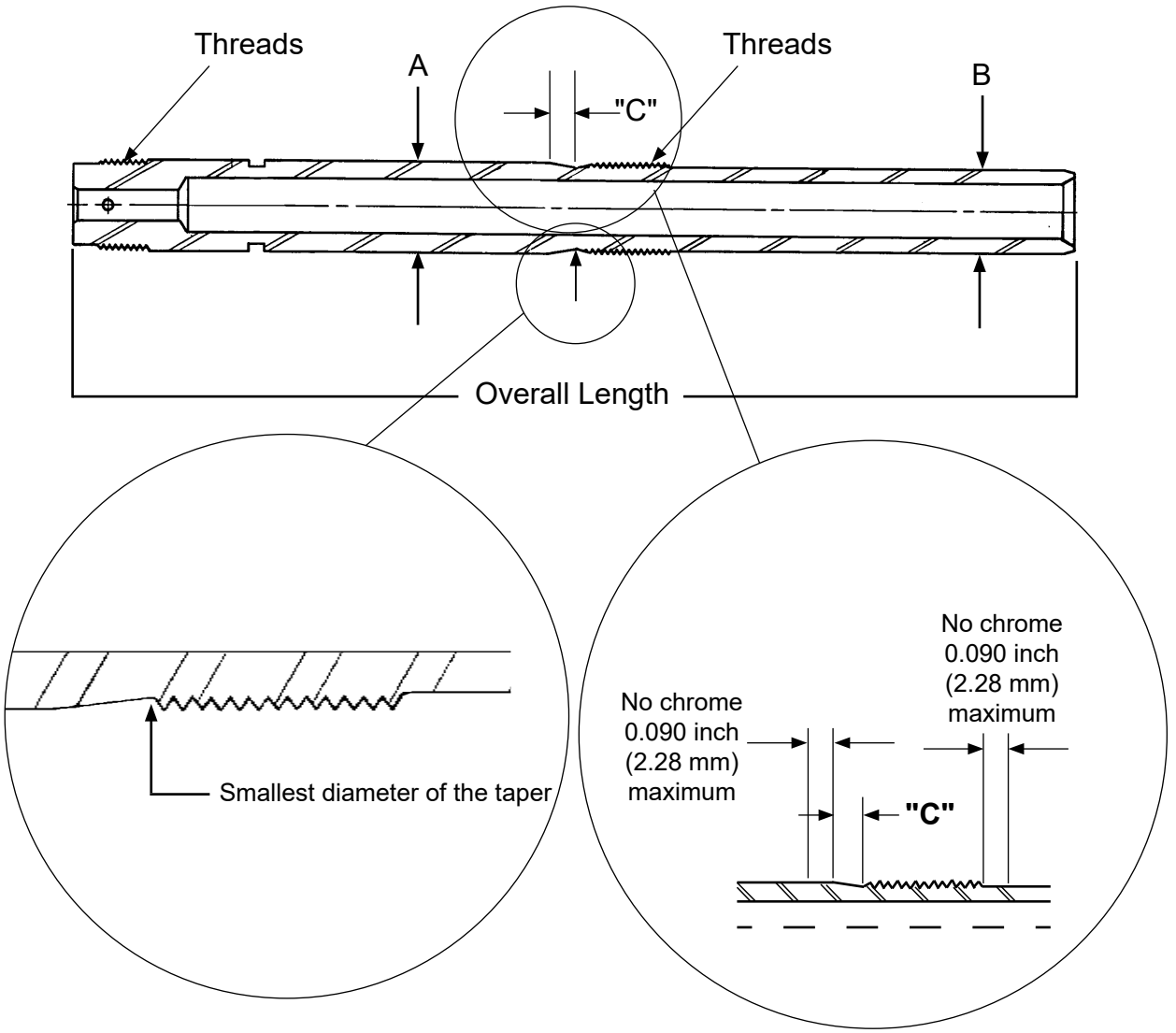
Inspect	Serviceable Limits	Corrective Action
G. SPRING GUIDE, p/n 106564 (Item 140) Refer to Figure 5-7		
(1) Visually examine the spring guide for corrosion and pitting.	Corrosion is not permitted. If there is corrosion, remove it in accordance with the corrective action repair limits. The maximum permitted area of pitting is 20% of the spring guide surface.	Remove corrosion using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion cannot be removed or if the pitting is greater than the permitted serviceable limits, replace the spring guide.
(2) Visually examine both sides of the spring guide for wear.	If there is wear, measure the depth of wear. The maximum permitted depth of wear is 0.010 inch (0.25 mm). When there is wear on both sides of the spring guide, the total of both wear depths must not be greater than 0.010 inch (0.25 mm). Wear that could affect correct fit or function is not permitted.	If the depth of wear is greater than the permitted serviceable limits, replace the spring guide.
(3) Visually examine the spring guide for nicks, scratches, gouges, or other damage.	Damage that extends all the way through the spring guide is not permitted. The maximum permitted total area of accumulated damage for both sides of the spring guide is 0.5 square inch (322 square mm). Damage that could affect correct fit or function is not permitted.	If the damage is greater than the permitted serviceable limits, replace the spring guide.
(4) Visually examine the spring guide for cadmium plating coverage.	Minor wear on corners and random light scratches are permitted; otherwise, the spring guide must have complete cadmium plating coverage.	If the cadmium plating coverage is less than the permitted serviceable limits, replate the spring guide in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). Baking is not required.



Spring Guide, p/n 101378
Figure 5-7.1

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
G1. SPRING GUIDE, p/n 101378 (Item 140) Refer to Figure 5-7.1		
(1) Visually examine the spring guide for corrosion and pitting.	Corrosion is not permitted. If there is corrosion, remove it in accordance with the corrective action repair limits. The maximum permitted area of pitting is 10% of the spring guide surface.	Remove corrosion using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion cannot be removed or if the pitting is greater than the permitted serviceable limits, replace the spring guide.
(2) Visually examine both sides of the spring guide for wear.	If there is wear, measure the depth of wear. The maximum permitted depth of wear is 0.010 inch (0.25 mm). When there is wear on both sides of the spring guide, the total of both wear depths must not be greater than 0.010 inch (0.25 mm). Wear that could affect correct fit or function is not permitted.	If the depth of wear is greater than the permitted serviceable limits, replace the spring guide.
(3) Visually examine the spring guide for nicks, scratches, gouges, or other damage.	Damage that extends all the way through the spring guide is not permitted. The maximum permitted total area of accumulated damage for both sides of the spring guide is 0.25 square inch (161 square mm). Damage that could affect correct fit or function is not permitted.	If the damage is greater than the permitted serviceable limits, replace the spring guide.

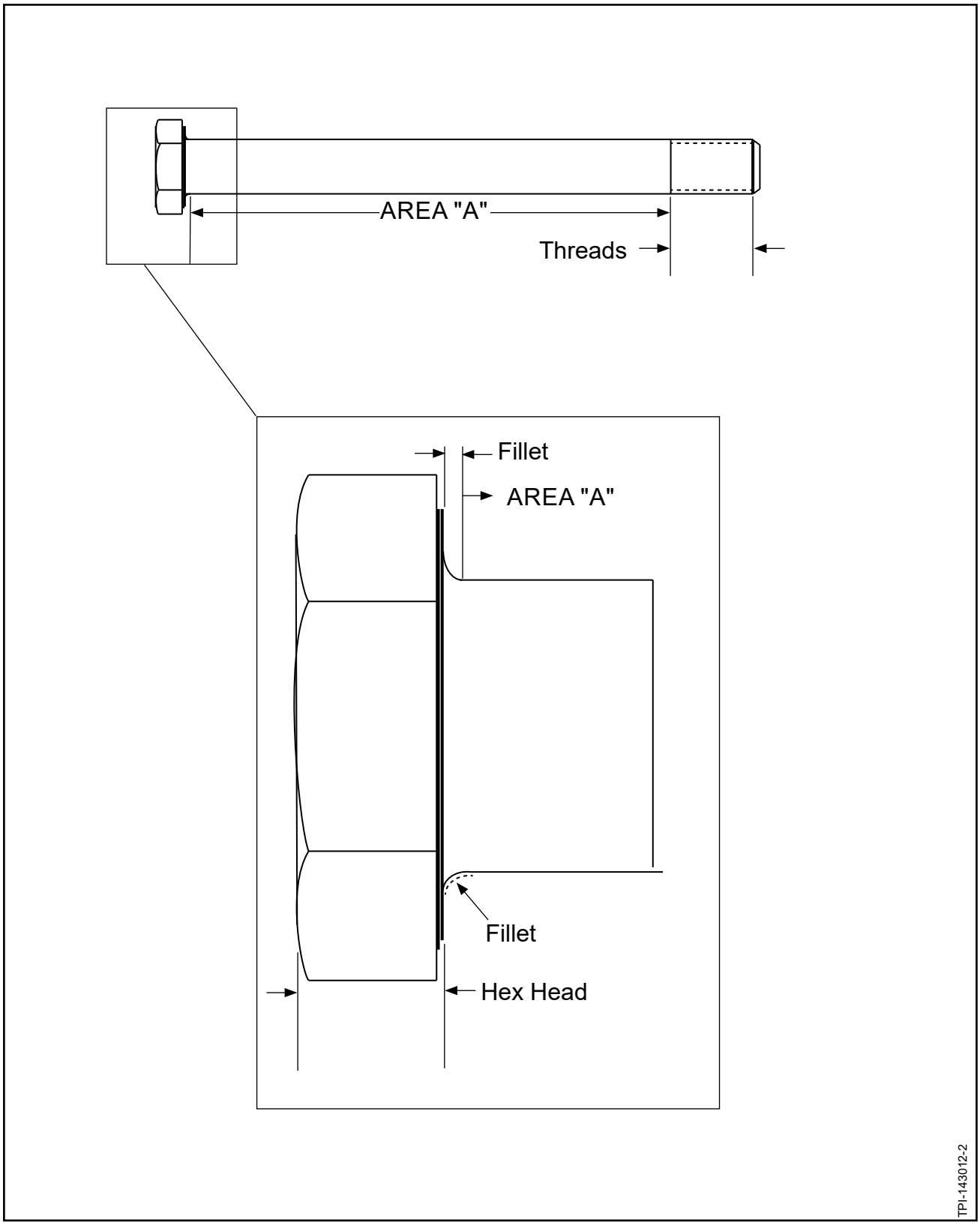


Part Number	Overall Length (inch)	Overall Length (mm)
A-2418-3	14.815	376.30
A-2418-2	8.600	218.44
A-2418-8	8.850	224.79
A-2418-14	11.815	300.10
A-2418-15	9.180	233.17
A-2418-17	9.133	231.97

Pitch Change Rod
Figure 5-8

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
H. PITCH CHANGE ROD (Item 150) Refer to Figure 5-8.		
(1) Visually examine the chrome plating of the pitch change rod for damage.	Except for spots of missing chrome around the masking areas, for example the keeper groove or the threads, any area worn below the chrome plating is not permitted.	If there is wear below the chrome plating, replace the pitch change rod.
(2) At both places on the pitch change rod, visually examine external threads for damage.	One damaged thread in each location is permitted.	If the damage is greater than the permitted serviceable limits, replace the pitch change rod.
(3) Visually examine the taper area "C" for corrosion, wear, and damage.	Corrosion, wear, or damage is not permitted at the smallest diameter of the taper. The remaining taper surface may have a maximum corrosion, wear, or damage to a depth of 0.004 inch (0.10 mm) over 25% of the surface area.	If corrosion, wear, or damage causes high spots above the existing surface, remove only the high spots. If corrosion, wear, or damage is greater than the serviceable limits, replace the pitch change rod.
(4) Measure area "A" of the pitch change rod.	The minimum permitted diameter in area "A" is 0.732 inch (18.59 mm).	If the diameter in area "A" is less than the permitted serviceable limits, replace the pitch change rod.
(5) Measure area "B" of the pitch change rod.	The minimum permitted diameter in area "B" is 0.662 inch (16.81 mm).	If the diameter in area "B" is less than the permitted serviceable limits, replace the pitch change rod.
(6) Perform a magnetic particle inspection of the pitch change rod in accordance with 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 rod.
(7) Visually examine the oil supply bore using a borescope or fiber-optic flashlight.	Unwanted material is not permitted.	Remove all unwanted material.

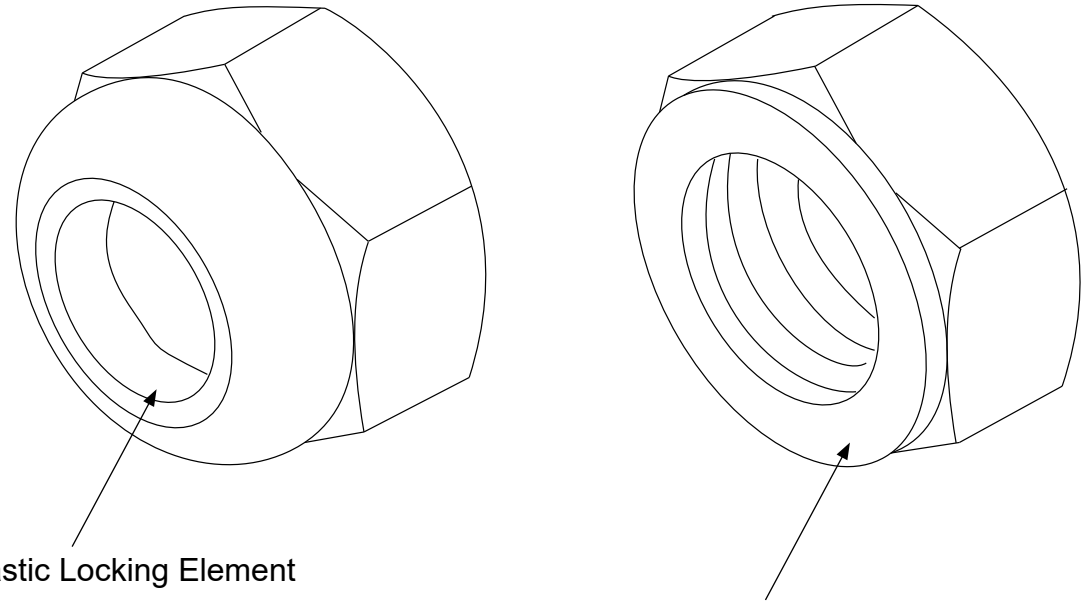


Hex Head Bolt
Figure 5-9

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
I.	HEX HEAD BOLT (Item 210 and 215) Refer to Figure 5-9		
(1)	Visually examine the hex head bolt for corrosion and pitting.	Corrosion is not permitted. The maximum permitted depth of pitting is 0.002 inch (0.05 mm). No more that 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.	Corrosion may be removed using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). 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 the 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.

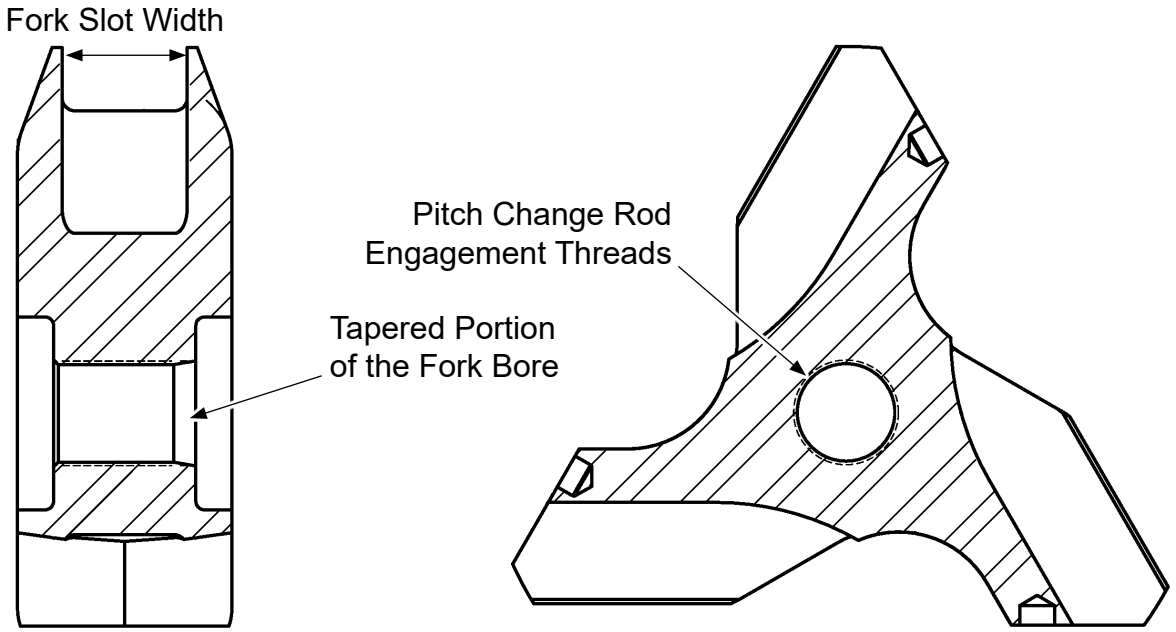


A-2043-1 Nut Modification
Figure 5-10

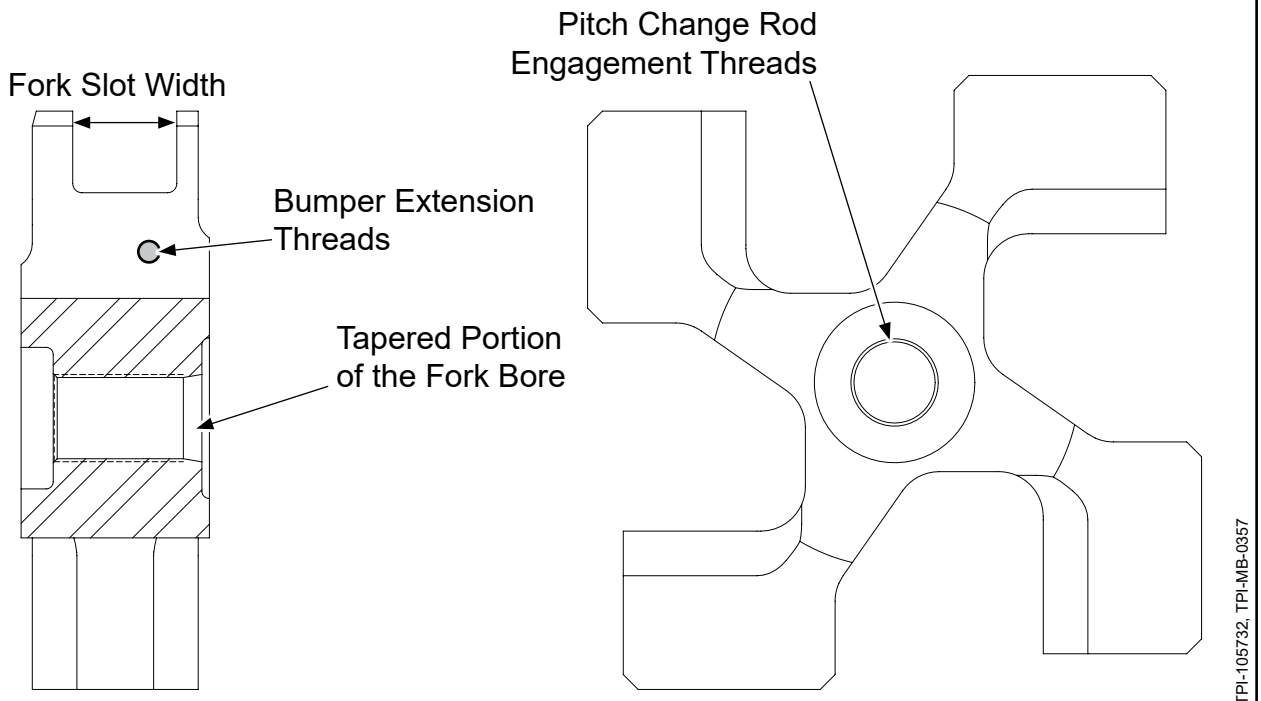
Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
I.	HEX HEAD BOLT, CONTINUED (Item 210 and 215) Refer to Figure 5-10		
	(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 5-10.	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 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 the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Three-Blade Fork Assembly, p/n 105732

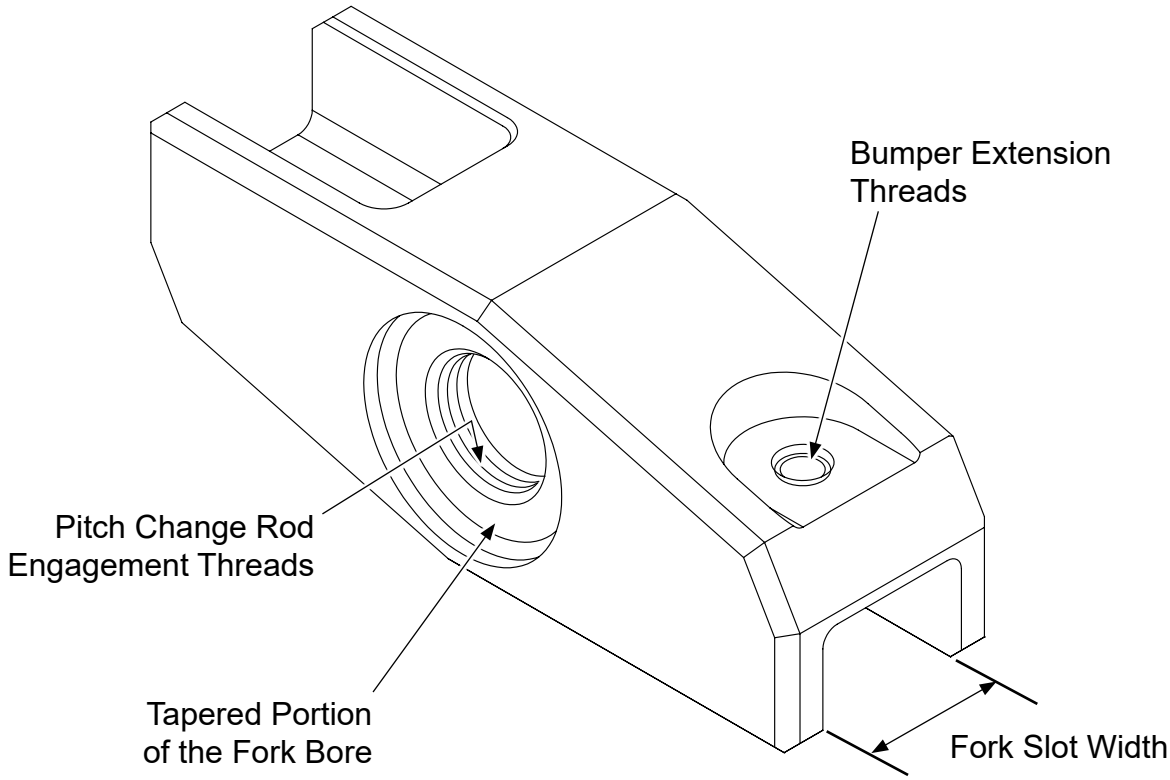


Four-Blade Fork Assembly, p/n 107378



Fork
Figure 5-11, page 1 of 2

Two-Blade Fork Assembly: p/n 108469



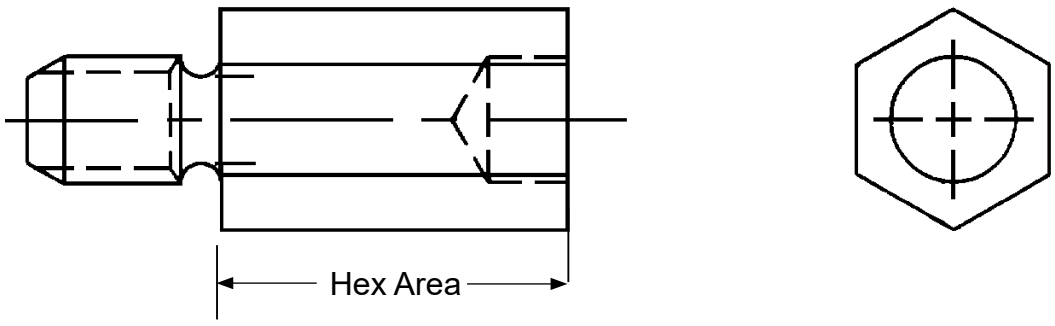
Fork
Figure 5-11, page 2 of 2

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
J.	FORK (Item 290) Refer to Figure 5-11		
(1)	Visually examine the fork (excluding the slots, threaded bore, and tapered section of the bore) for corrosion, pitting, wear, scratches, or other damage.	Corrosion is not permitted. If there is corrosion, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting, wear, scratches, or damage is 0.003 inch (0.07 mm).	Remove corrosion using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion cannot be removed or if the pitting, wear, scratches, or damage is greater than the permitted serviceable limits, replace the fork.
(2)	Visually examine the pitch change rod engagement threads of the fork bore for damage.	One thread of total accumulated damage in each hole is permitted.	If the damage is greater than the permitted serviceable limits, replace the fork.
(3)	107378 and 108469 only: Visually examine the bumper extension threads for damage.	One thread of total accumulated damage in each hole is permitted.	If the damage is greater than the permitted serviceable limits, replace the fork.
(4)	Visually examine the tapered portion of the fork bore for wear, nicks, fretting, or other damage.	If there is wear, nicks, fretting, or damage, measure the depth of wear or damage. The maximum permitted depth of wear, nicks, fretting, or damage is 0.003 inch (0.07 mm).	If wear, nicks, fretting, or damage is greater than the permitted serviceable limits, replace the fork.
(5)	Visually examine the fork slots for damage.	The maximum permitted depth of damage is 0.006 inch (0.15 mm).	If the damage is greater than the permitted serviceable limits, replace the fork.
(6)	Measure the width of each fork slot.	The maximum permitted width is 0.887 inch (22.5 mm).	If the fork slot width is greater than the permitted serviceable limits, replace the fork.

Component Inspection Criteria
Table 5-1

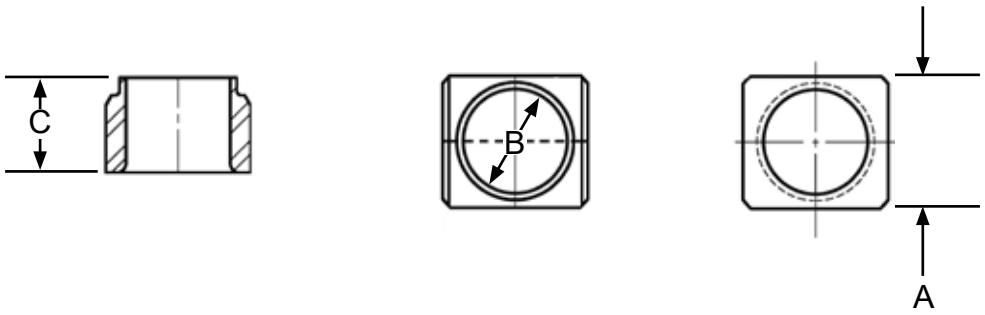
Inspect	Serviceable Limits	Corrective Action
J. FORK (Item 290) Refer to Figure 5-11		
(7) Perform a magnetic particle inspection of the fork in accordance with the Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted	If a relevant indication is within the permitted serviceable limits, repair it in accordance with the Corrective Action in this table. If the relevant indication is not within the permitted serviceable limits, replace the fork.
(8) Visually examine the fork for cadmium plate coverage.	A few random scratches, corners with plating missing, normal wear of the plating from the threads, internal taper, and fork slots are permitted; otherwise, cadmium plate must cover the fork.	If the cadmium plating coverage is less then the permitted serviceable limits, cadmium replate the fork in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Bumper Extension
Figure 5-12

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
K. BUMPER EXTENSION (Item 295) Refer to Figure 5-12		
(1) Visually examine the bumper extension for corrosion.	Corrosion is not permitted. If there is corrosion, remove it in accordance with the corrective action repair limits.	Remove corrosion using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion cannot be removed, replace the bumper extension.
(2) Visually examine the bumper extension for damage.	A slight wrenching depression on the outer hex area of the bumper extension is permitted.	If the damage is greater than the permitted serviceable limits, replace the bumper extension.
(3) Visually examine the threads of the bumper extension for damage.	A maximum of 1/2 of one thread total accumulated damage is permitted.	If the damage is greater than the permitted serviceable limits, replace the bumper extension.
(4) Visually examine the bumper extension for cadmium plate coverage.	A few random scratches and slight wear on the threads are permitted; otherwise, cadmium plating must completely cover the spacer.	If the cadmium plate coverage is less than the permitted serviceable limits, cadmium replate in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



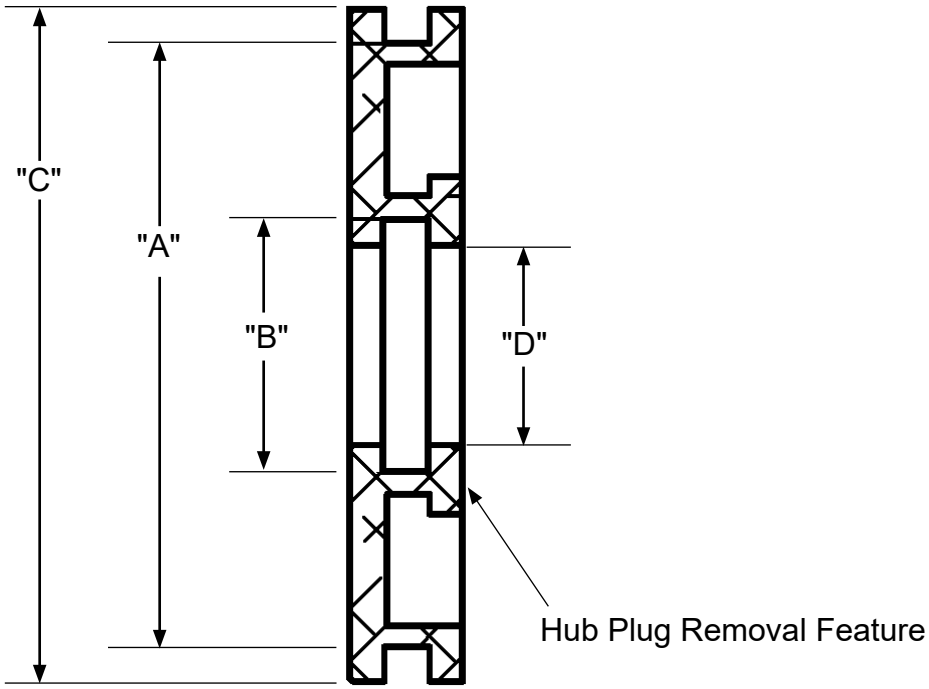
Part Number	"A" Minimum	"B" Maximum	"C" Minimum
105733	0.869 inch (22.08 mm)	0.6890 inch (17.500 mm)	0.575 inch (14.61 mm)

TPI-490-002

Pitch Change Block
Figure 5-13

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
L. PITCH CHANGE BLOCK (Item 320) Refer to Figure 5-13.		
(1) Visually examine the pitch change block for damage.	If there is damage, measure the depth of 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. Refer to Figure 5-13 for the maximum permitted wear dimensions.	If the wear is greater than the permitted serviceable limits, replace the pitch change block.
(3) Magnetic particle inspect the pitch change block in accordance with 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.



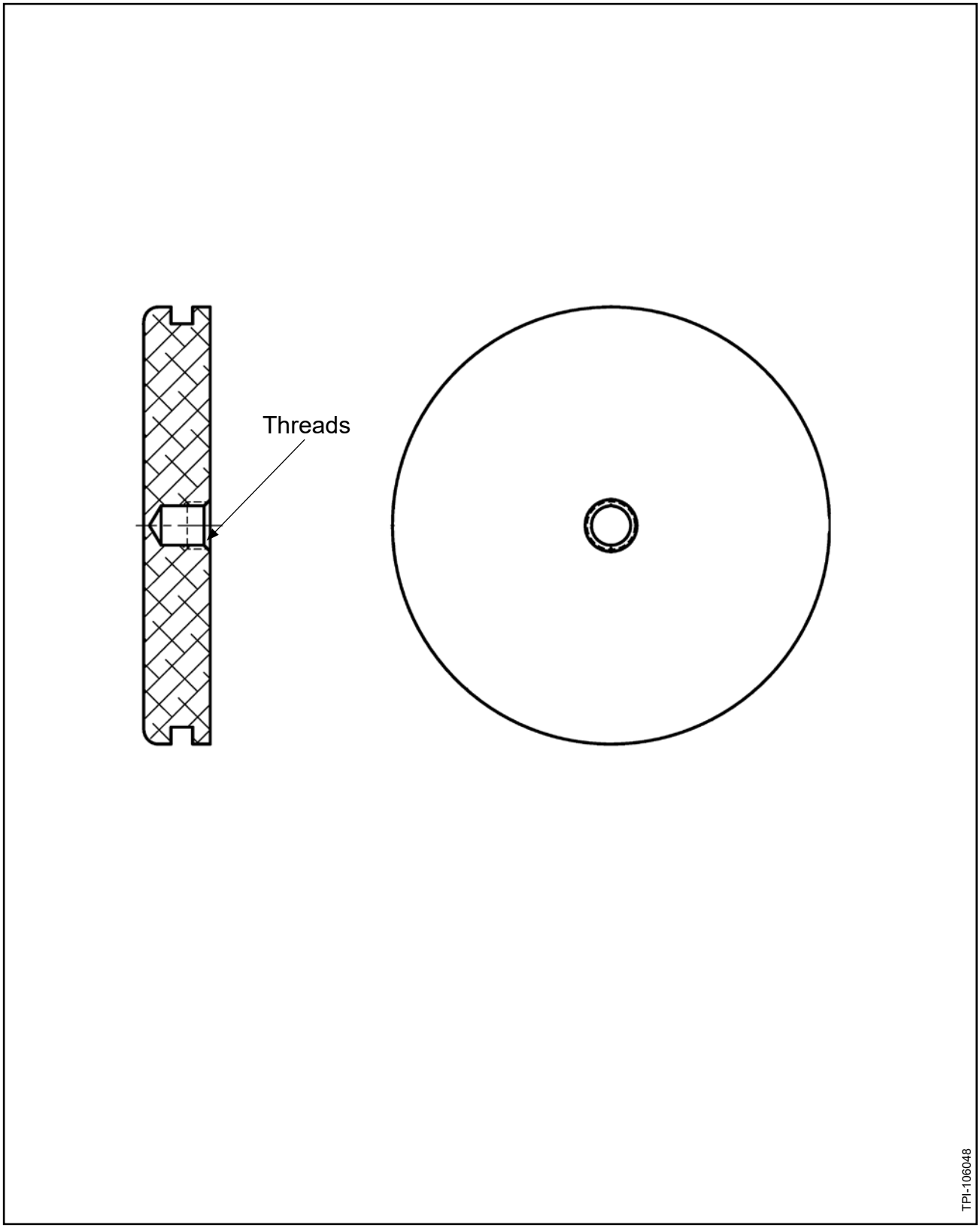
Part Number	"A" Minimum O-ring Groove OD	"B" Maximum O-ring Groove ID	"C" Minimum Plug OD	"D" Maximum Bore ID
A-2481	2.015 inch (51.18 mm)	0.846 inch (21.48 mm)	2.246 inch (57.05 mm)	0.670 inch (17.01 mm)

TPI-A2481

Hub Plug
Figure 5-14

Component Inspection Criteria
Table 5-1

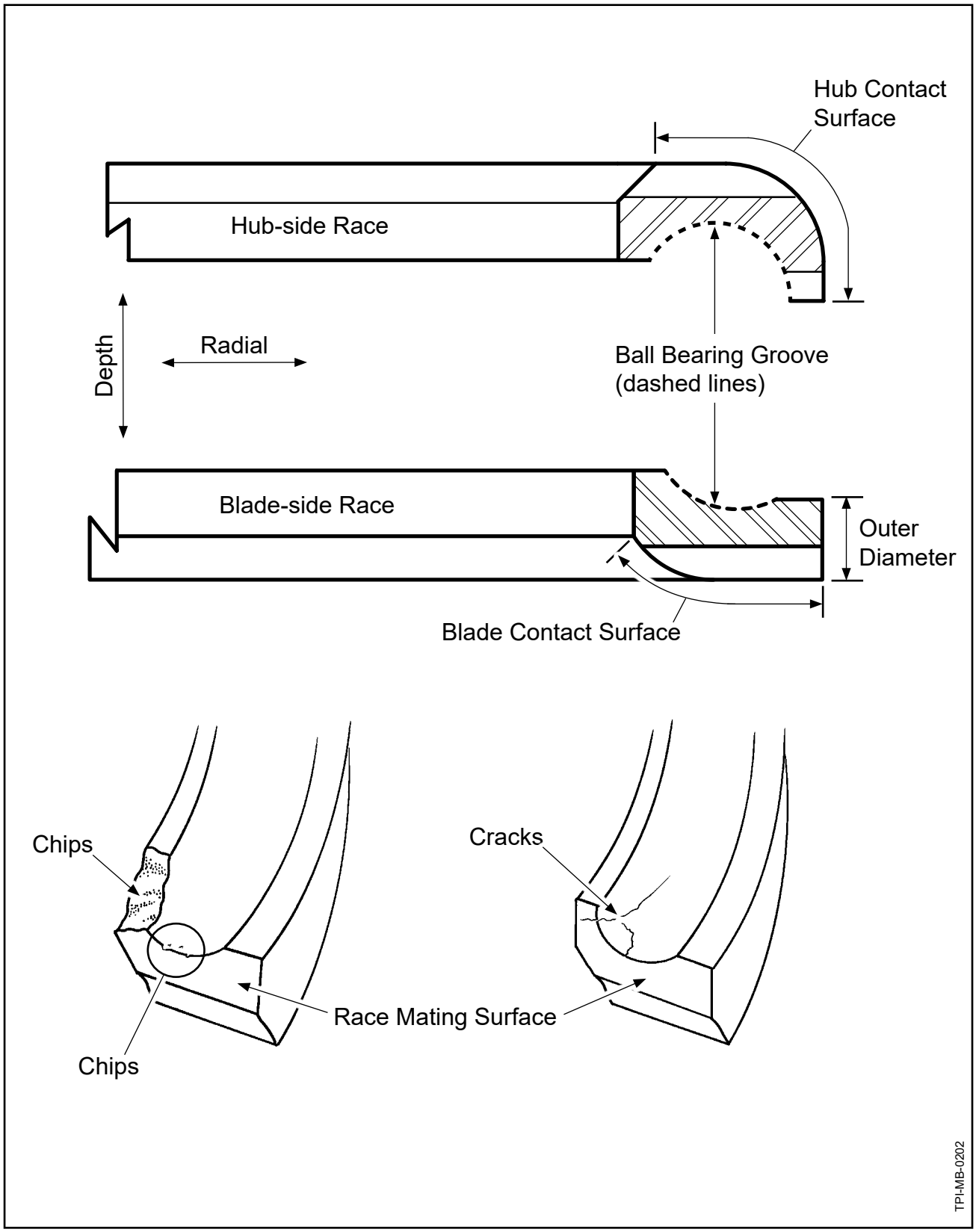
Inspect	Serviceable Limits	Corrective Action
M. HUB PLUG (Item 370) Refer to Figure 5-14.		
(1) Visually examine the hub plug for corrosion.	Corrosion is not permitted.	If there is corrosion, replace the hub plug.
(2) Visually examine the O-ring groove OD "A".	If the hub plug O-ring groove OD "A" is worn or damaged, measure in accordance with Figure 5-14.	If the hub plug O-ring groove OD "A" is less than the permitted serviceable limits, replace the hub plug.
(3) Visually examine the O-ring groove ID "B".	If the hub plug O-ring groove ID "B" is worn or damaged, measure in accordance with Figure 5-14.	If the hub plug O-ring groove ID "B" is greater than the permitted serviceable limits, replace the hub plug.
(4) Visually examine the hub plug OD "C".	If the hub plug OD "C" is worn or damaged, measure in accordance with Figure 5-14.	If the hub plug OD "C" is less than the permitted serviceable limits, replace the hub plug.
(5) Visually examine the hub plug ID bore "D".	If the hub plug ID bore "D" is worn or damaged, measure in accordance with Figure 5-14.	If the hub plug ID bore "D" is greater than the permitted serviceable limits, replace the hub plug.
(6) Visually examine the hub plug removal feature for damage.	Slight damage is permitted. Damage must not interfere with the ability to remove the hub plug from the hub.	If the damage is greater than the permitted serviceable limits, replace the hub plug.



Blade Plug Inspection Area
Figure 5-15

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
N. BLADE PLUG (Item 610) Refer to Figure 5-15.		
(1) Visually examine the blade plug for corrosion and pitting.	Corrosion is not permitted. If there is corrosion, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting is 0.010 inch (0.25 mm). The maximum permitted total area of pitting is 20% of the blade plug surface.	Remove corrosion to a maximum depth of 0.010 inch (0.25 mm) using glass bead cleaning. If the corrosion cannot be removed, replace the blade plug. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the depth or amount of pitting is greater than the permitted serviceable limits, replace the blade plug.
(2) Visually examine the threads of the blade plug for damage.	A maximum of one thread of total accumulated damage is permitted.	If the damage is greater than the permitted serviceable limits, replace the blade plug.
(3) Visually examine the blade plug for scratches, gouges, or other damage.	The maximum permitted depth of a scratch, gouge, or other damage is 0.010 inch (0.25 mm). Damage must not interfere with the fit of the blade plug in the blade bore.	Using an abrasive pad CM47 or equivalent, polish pushed up material to blend with the surrounding surfaces. If a scratch, gouge, or other damage is greater than the permitted serviceable limits, replace the blade plug.



Race
Figure 5-16

Component Inspection Criteria
Table 5-1

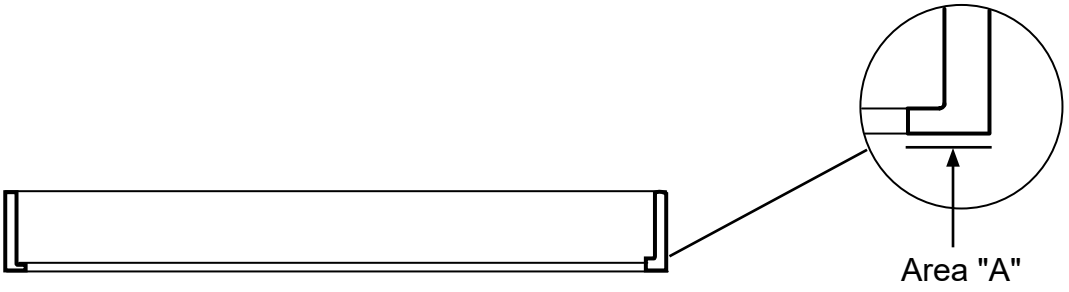
Inspect	Serviceable Limits	Corrective Action
O. RACE (Item 630 and Item 660) Refer to Figure 5-16.		
(1) Visually examine the ball bearing groove in each race for corrosion.	Corrosion is not permitted. If there is corrosion, remove it in accordance with the corrective action repair limits.	Remove corrosion 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 cannot be removed, replace the race.
(2) Visually examine the ball bearing groove in each race for pitting, wear, fretting, and damage.	The maximum permitted depth of pitting is 0.003 inch (0.076 mm) in the bearing ball 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 race is 0.12 square inch (77.4 square mm) (two 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 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 race.
	Fretting damage is not permitted.	If there is fretting damage, replace the 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 the damage is greater than the permitted serviceable limits, replace the race.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
O. RACE, CONTINUED (Item 630 and Item 660) Refer to Figure 5-16.		
(3) Except for the ball bearing groove, visually examine all other surfaces of each race for corrosion.	Corrosion is not permitted. If there is corrosion, remove it in accordance with the corrective action repair limits.	Remove corrosion 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 cannot be removed, replace the race.
(4) Except for the ball bearing groove, visually examine all other surfaces of each 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 race is 0.25 square inch (161.2 square mm) (two races for each bearing set)..	If the pitting is greater than the permitted serviceable limits, replace the race.
	Fretting damage is permitted on the outer diameter of the races that interface with the bearing retaining ring (670). Fretting must not loosen the tight fit with the bearing retaining ring (670).	Clean the fretted area thoroughly using an abrasive pad CM47 or equivalent to decrease fretting damage to a minimum. If the fit of the bearing retaining ring (670) to the race is not tight, replace the race.
	Wear is not permitted.	If there is wear, replace the 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 race.

Component Inspection Criteria
Table 5-1

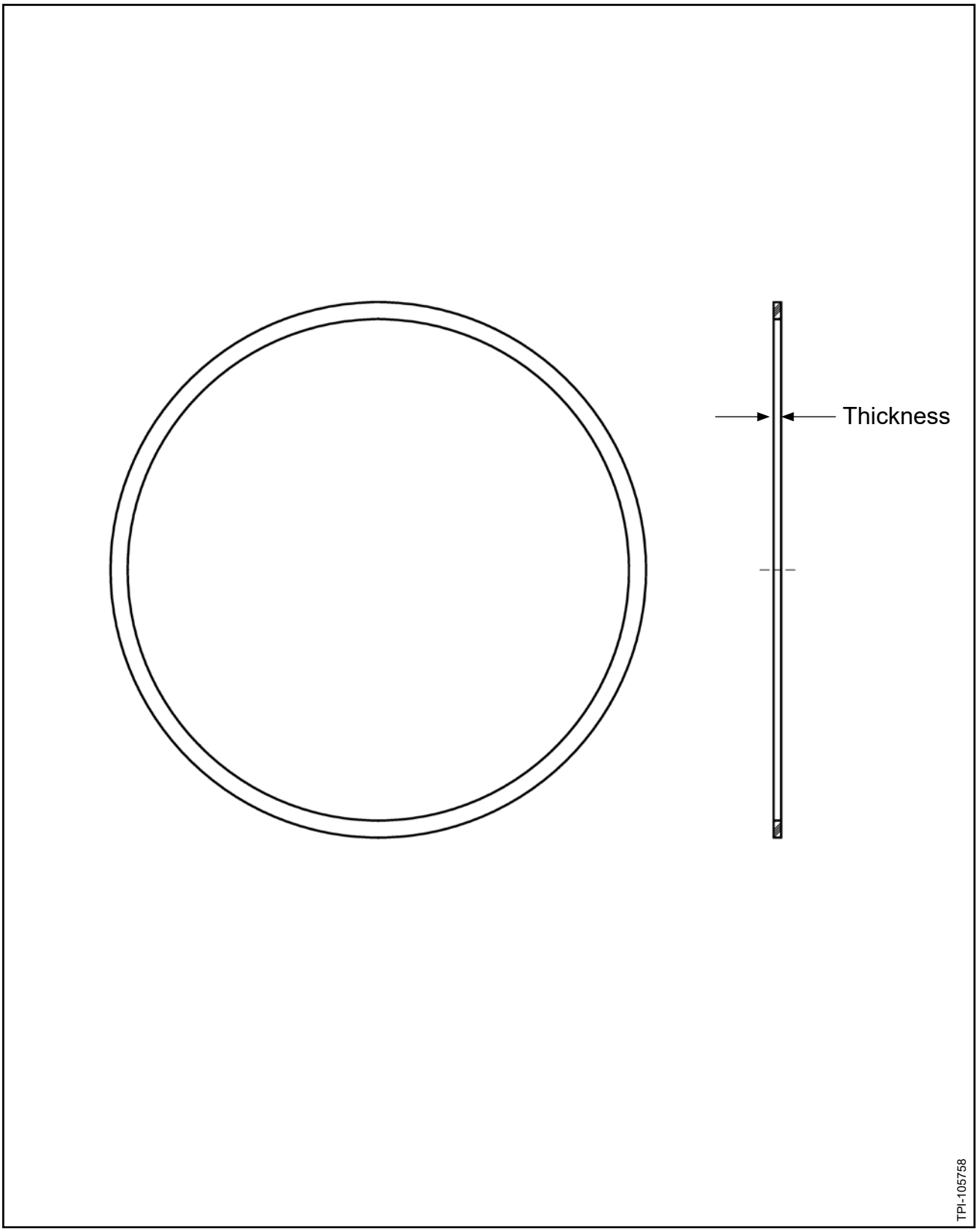
	Inspect	Serviceable Limits	Corrective Action
O.	RACE, CONTINUED (Item 630 and Item 660) Refer to Figure 5-16.		
(5)	Visually examine the race for chips or cracks that are adjacent to the mating surfaces of the race.	Chips or cracks that are adjacent to the race mating surfaces are not permitted.	If there are chips or cracks that are adjacent to the mating surfaces of the race, replace the race.
(6)	Magnetic particle inspect each 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 race.



Bearing Retaining Ring
Figure 5-17

Component Inspection Criteria
Table 5-1

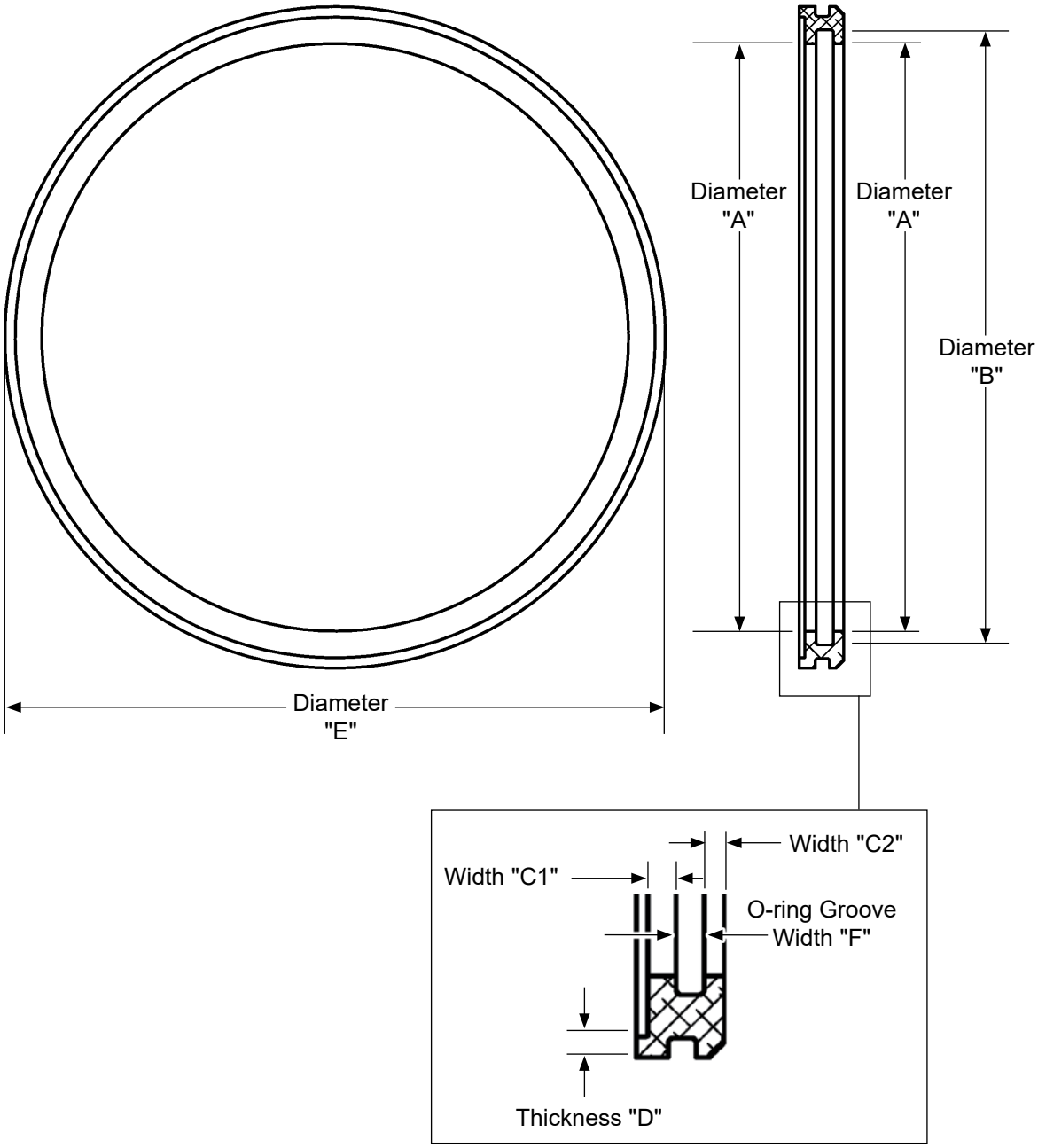
Inspect	Serviceable Limits	Corrective Action
P. BEARING RETAINING RING (Item 670) Refer to Figure 5-17.		
(1) Except for Area “A”, visually examine the bearing retaining ring for corrosion and pitting.	Corrosion is not permitted. If there is corrosion, remove it in accordance with the corrective action 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 the bearing race.	Remove corrosion using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion cannot be removed, replace the bearing retaining ring. If the corrosion or pitting is greater than the permitted serviceable limits, replace the bearing retaining ring.
(2) Visually examine the bearing retaining ring for corrosion, pitting, or wear in Area "A”.	Corrosion, pitting, or wear through the cadmium plating in Area "A" is not permitted.	If there is corrosion, pitting, or wear through the cadmium plating, replace the bearing retaining ring.
(3) Except for Area "A", visually examine the bearing retaining ring for wear, damage, or fretting.	The bearing retaining ring must fit tightly to the blade and the bearing race when installed over the blade and bearing race.	If wear, damage, or fretting is greater than the permitted serviceable limits, replace the bearing retaining ring.
(4) Visually examine the entire bearing retaining ring for cadmium plating coverage.	A few random scratches and corners with cadmium plating missing are permitted; otherwise, complete coverage is required.	If cadmium plating is not on all surfaces, replate the bearing retaining ring in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Blade Shim
Figure 5-18

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Q. BLADE SHIM (Item 680) Refer to Figure 5-18.		
(1) Visually examine the blade shim for damage, missing material, separation, or form irregularities as a continuous ring.	Damage, missing material, separation, or form irregularities are not permitted.	If there is damage, missing material, separation, or form irregularities, replace the blade shim.
(2) Measure the thickness of the blade shim.	The minimum permitted thickness of the blade shim is 0.040 inch (1.02 mm).	If the thickness is less than the permitted serviceable limits, replace the blade shim.
(3) Measure the thickness variation of the blade shim at five equally spaced places on the blade shim.	The maximum permitted thickness variation is 0.005 inch (0.12 mm).	If the thickness variation is greater than the permitted serviceable limits, replace the blade shim.

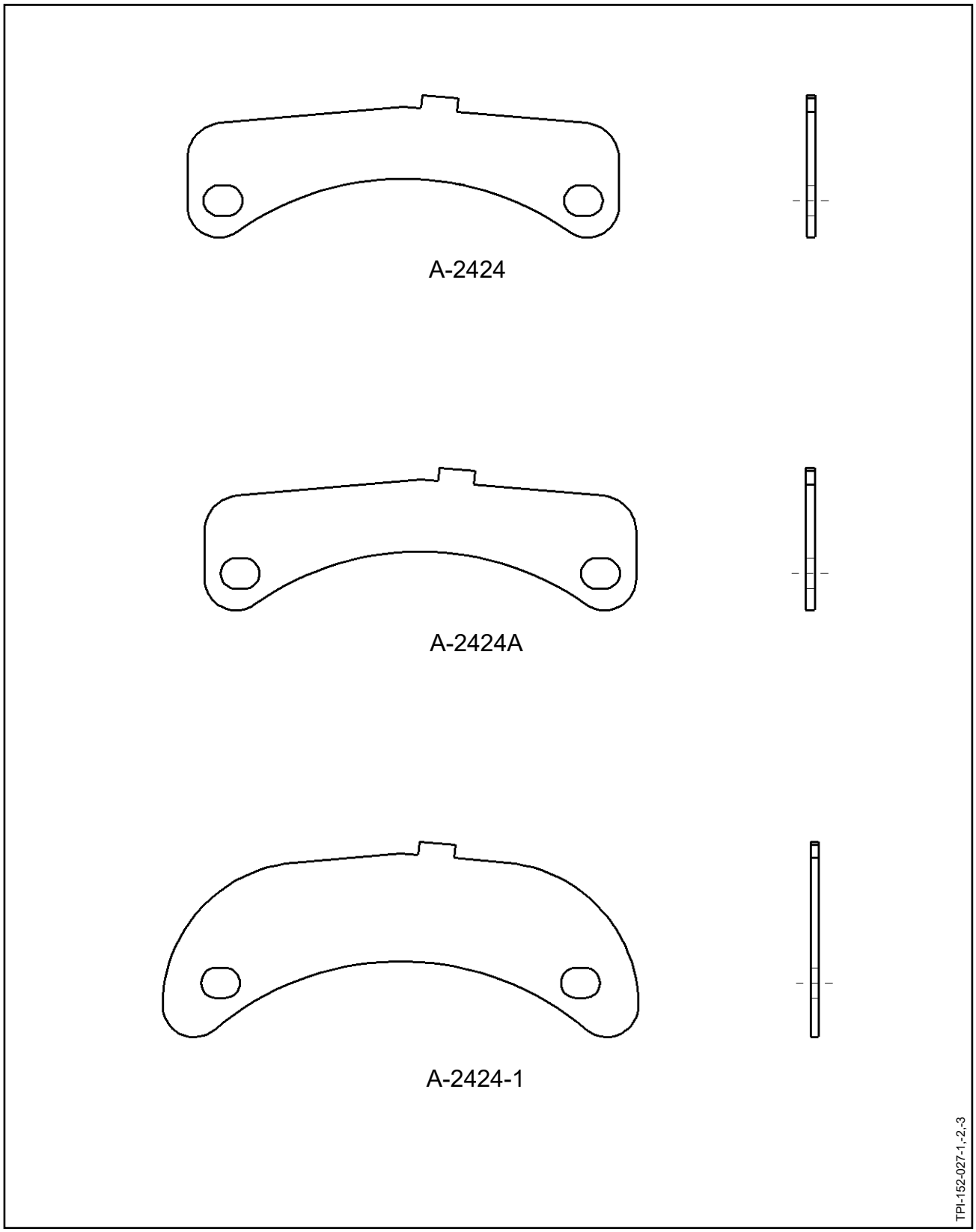


"A" MAXIMUM DIAMETER	"B" MAXIMUM DIAMETER	"C1" MINIMUM WIDTH	"C2" MINIMUM WIDTH	"D" MINIMUM THICKNESS	"E" MINIMUM DIAMETER
4.550 inches (115.57 mm)	4.750 inches (120.65 mm)	0.060 inch (1.53 mm)	0.050 inch (1.27 mm)	0.065 inch (1.66 mm)	5.075 inches (128.91 mm)

Blade Seal
Figure 5-19

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
R.	BLADE SEAL (Item 700) Refer to Figure 5-19		
	NOTE: Blade seals identified as 106117 (Rev. B or before), must be replaced with blade seals identified as 106117 (Rev. C or later) or 107223.		
(1)	Visually examine the blade seal for corrosion, pitting, wear, or damage.	Corrosion is not permitted. If there is corrosion, remove it in accordance with the corrective action repair limits. If there is pitting, wear, or damage, measure the depth. The maximum permitted depth of pitting, wear or damage is 0.007 inch (0.17 mm).	Using an abrasive pad CM47 or equivalent, polish to remove corrosion, pitting, wear, or damage to a maximum depth of 0.010 inch (0.25 mm). If the depth of corrosion, pitting, wear, damage, or repair is greater than the permitted serviceable limits or the corrective action limits, replace the blade seal.
(2)	Measure the O-ring groove Width "F".	The maximum permitted O-ring groove Width "F" is 0.175 inch (4.44 mm).	If the O-ring groove Width "F" is greater than the permitted serviceable limits, replace the blade seal.
(3)	Measure the O-ring groove Width "F" for uniform width variation.	The maximum permitted width variation is 0.015 inch (0.38 mm).	If the width variation is greater than the permitted serviceable limits, replace the blade seal.
(4)	Measure the blade seal features "A", "B", "C1", "C2", "D", and "E".	The permitted limits are given in the table in Figure 5-19.	If any measurement is not within the permitted serviceable limits, replace the blade seal.



Balance Weight
Figure 5-20

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
S.	BALANCE WEIGHT (Item 710) Refer to Figure 5-20.		
(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 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.	Re-anodize the balance weight in accordance with the Chromic Acid Anodizing chapter of Hartzell Standard Practices Manual 202A (61-01-02).
(4)	For a steel (silver color) 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 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. 3)

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).

(2) Composite Blades: Refer to Hartzell Propeller Inc. Composite Blade Overhaul Manual 135F (61-13-35).

D. 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).

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. Compression Spring: Zinc Chromate Primer Repair

A. Cleaning

(1) For procedures for cleaning the compression spring (110, 115), refer to Cleaning of Steel Parts in the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(2) Inspect the compression spring (110, 115) for scratches, corrosion, and zinc plate coverage in accordance with the Check chapter of this manual.

(3) Using 120 grit or finer sandpaper, remove any loose material and feather the existing coating.

(4) Using solvent CM106, clean the entire compression spring (110, 115).

(5) Permit the solvent CM106 to air dry.

B. Painting

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

(2) Apply a layer of zinc chromate primer CM67, or equivalent, to the entire surface of the compression spring (110, 115).

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

(4) Examine the compression spring (110, 115) for complete primer coverage.

4. Pitch Change Block Button Modification

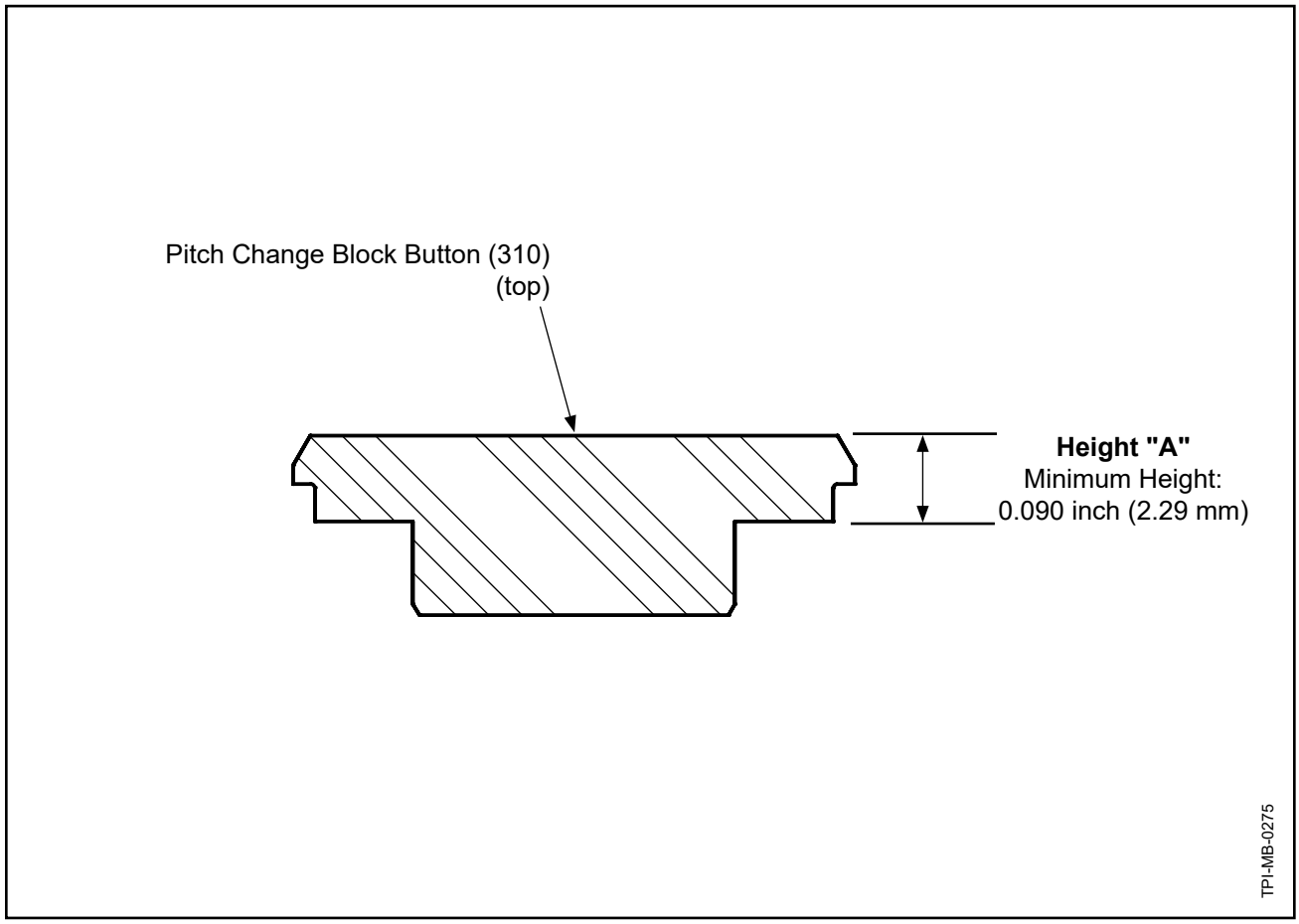
A. Purpose

(1) To improve the response rate of the propeller when going from high pitch to low pitch, modify the pitch change block buttons (310) in accordance with the procedure below.

B. Procedure

(1) Using an abrasive pad CM47, sandpaper, or equivalent, polish the top surface of the pitch change block button (310) to reduce the height "A" of the button. Refer to Figure 6-1.

(a) The minimum permitted height "A" of the pitch change block button (310) is 0.090 inch (2.29 mm).



Pitch Change Block Button Modification
Figure 6-1

ASSEMBLY - CONTENTS

ASSEMBLY - CONTENTS, continued

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1. General (Rev. 6)

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).

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

E. Blade Angle Information

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

2. Hub Assembly Procedures

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 MUST BE ACCOMPLISHED USING EITHER COMPRESSED AIR THAT HAS BEEN FILTERED FOR MOISTURE, OR NITROGEN.

CAUTION 3: DO NOT USE A PRESSURE THAT IS GREATER THAN 175 PSI (12.06 BARS) WHEN ACTUATING PROPELLERS THAT ARE INCLUDED IN THIS MANUAL.

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

A. All Propeller Models

(1) Install components of the hub unit (220) in accordance with Appendix B in 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 Appendix B in the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(2) Install the propeller flange mounting hardware (mounting studs, dowel pins, etc.) in accordance with Appendix B in the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(3) Mounting flange O-ring (540):

(a) Apply a layer of lubricant CM12 to the mounting flange O-ring (540).

(b) Install the flange mounting O-ring (540) on the engine-side half of the hub (220). Refer to Figure 7-1.

(4) Engine-side hub bushing O-ring (340) - if applicable:

(a) Apply a light layer of lubricant CM12 to the O-ring (340).

(b) Install the O-ring (340) in the groove on the ID of the engine-side hub bushing (280). Refer to Figure 7-1.

(5) 3C1-R619A1 and 3C1-R919A1 only:

(a) Install the internal spiral retaining ring (330) in the groove provided for it in the bore of the engine-side half of the hub (220).

(b) Apply a light layer of lubricant CM12 to the hub plug OD O-ring (360).

(c) Install the O-ring (360) in the groove on the OD of the hub plug (370).

(d) Apply a light layer of lubricant CM12 to the O-ring (350).

(e) Install the O-ring (350) in the groove on the ID of the hub plug (370).

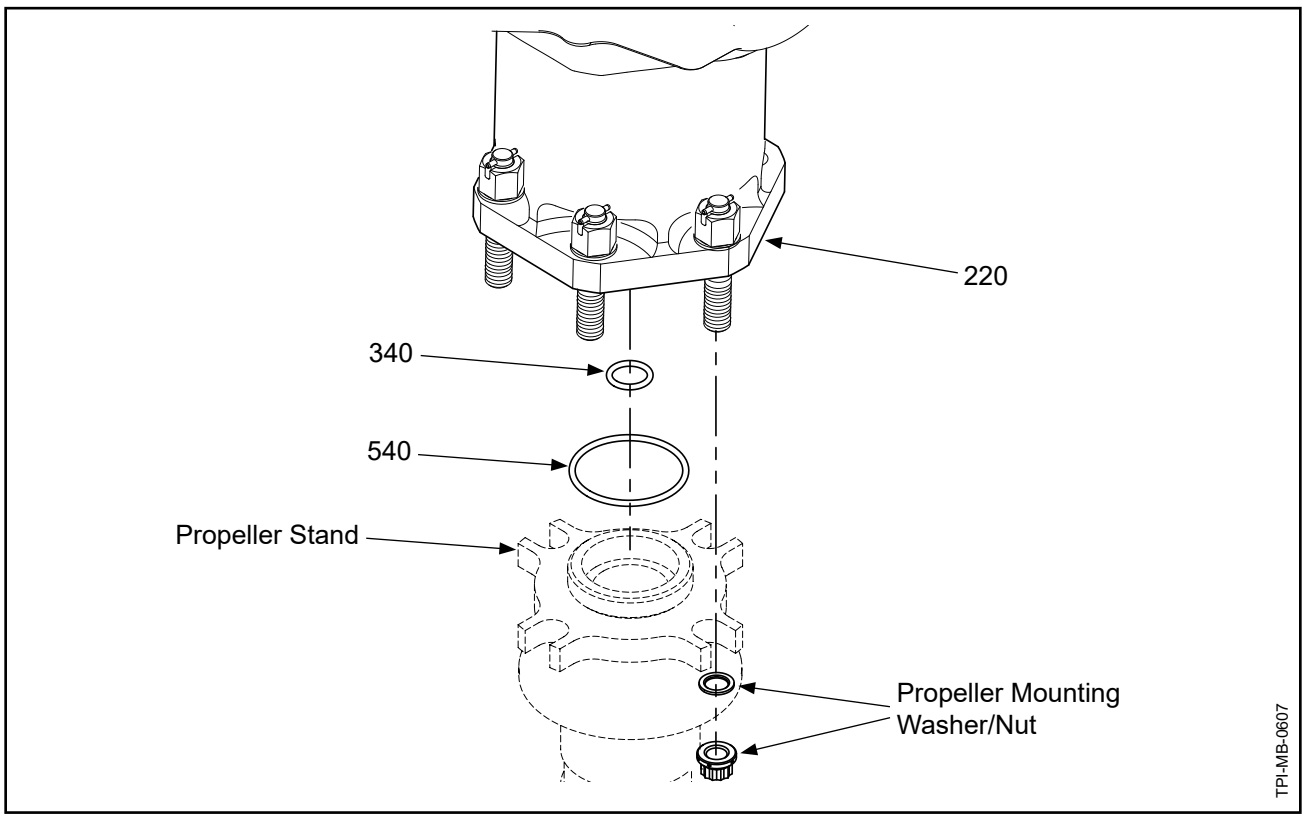
(6) 3C4-R430A1 Propellers only:

(a) Apply a light layer of lubricant CM12 to the hub-to-pitch change rod O-ring (165).

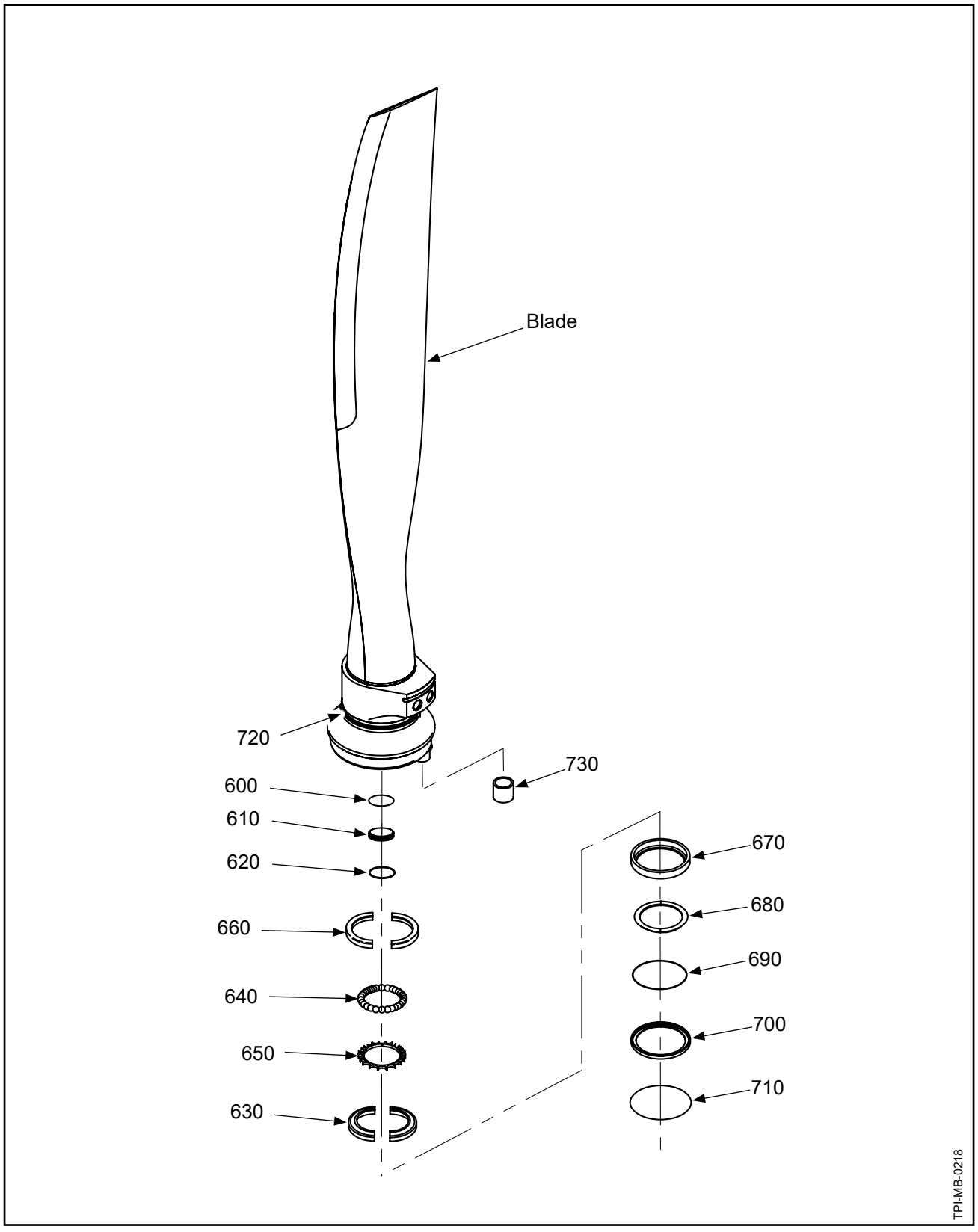
(b) Install the hub-to-pitch change rod O-ring (165) into the pitch change rod bore of the cylinder-side half of the hub (220).

(7) Install the engine-side half of the hub (220) on the propeller assembly stand using the propeller mounting washers/nuts as shown in Figure 7-1.

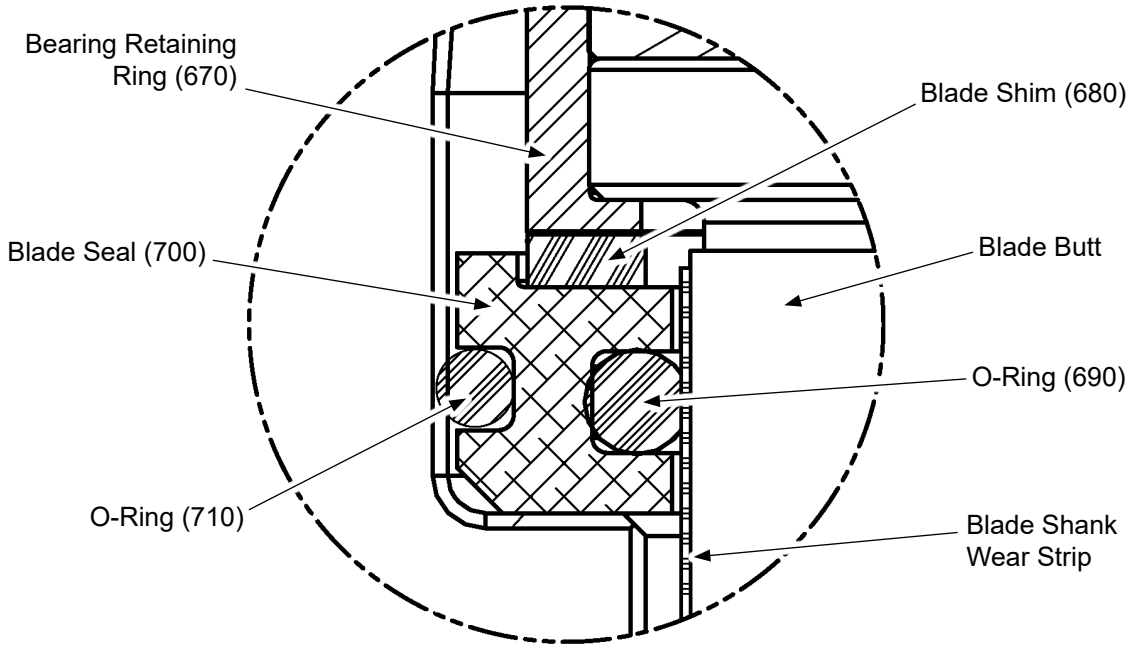
(a) Apply a layer of lubricant CM12 to the bearing seats of the blade retention sockets and the blade O-ring grooves.



Hub Assembly
Figure 7-1



Blade Assembly
Figure 7-2



Blade Seal and Blade Shim Installation
Figure 7-3

3. Blade Assembly and Installation

A. Blade Assembly

(1) The following procedure assumes that the blade has been inspected and repaired and that the blade wear strip, blade side bearing race, and bearing retaining ring are installed on each blade in accordance with Hartzell Propeller Inc. Composite Propeller Blade Maintenance Manual 135F (61-13-35).

(2) Install the pitch change knob bushing (730) in accordance with the Special Adhesive and Bonding Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(3) Install the blade plug (610) in the bore of each blade. Refer to Figure 7-2.

(a) Apply a light layer of lubricant CM12 to the blade plug O-ring (600).

(b) Install the blade plug O-ring (600) on the OD of the blade plug (610).

(c) Install the blade plug (610) in the bore of the blade.

(d) Install the internal spiral retaining ring (620) in the groove provided for it in the bore of the blade.

(4) Install the blade O-ring (720), the blade seal (700), and the O-rings (690, 710). Refer to Figure 7-2 and Figure 7-3.

(a) Using lubricant CM12, lubricate the blade O-ring (720).

(b) Install the blade O-ring (720) on the outboard blade wear strip on the blade. Refer to Figure 7-2.

(c) Using lubricant CM12, lightly lubricate the O-rings (690 and 710).

(d) Install the O-ring (690) in the groove provided for it on the ID of the blade seal (700). Refer to Figure 7-3.

(e) Install the O-ring (710) in the groove provided for it on the OD of the blade seal (700). Refer to Figure 7-3.

1 Make sure that the O-rings (690, 710) are seated in the grooves of the blade seal (700).

(f) Install the blade seal (700) with the blade shim (680) and the O-rings (690, 710) on the blade. Refer to Figure 7-3.

1 The thickness of the blade shim (680) that was measured at disassembly will help determine the thickness of the shim to be installed.

a Use a blade shim (680) that is slightly thicker than the shim that was removed to offset wear on the components. Refer to Table 7-1.

2 Using lubricant CM12, lightly lubricate the O-rings (690, 710) before installing the blade seal (700) with the blade shim (680) and the O-rings (690, 710) on the blade.

3 Using lubricant CM12, lubricate the inboard blade shank wear strip.

4 With the blade shim (680) pointing toward the bearing retaining ring (670), install the blade seal (700) with the blade shim (680) and the O-rings (690, 710) on the blade as shown in Figure 7-3.

5 Firmly seat the blade seal (700) with the blade shim (680) and the O-rings (690, 710) against the bearing retaining ring (670).

CAUTION: MAKE SURE THAT THE O-RINGS (690, 710) ARE SEATED IN THE GROOVES OF THE BLADE SEAL (700) WHEN THE BLADE SEAL (700) IS INSTALLED ON THE BLADE.

6 Make sure that the O-rings (690, 710) are seated in the grooves of the blade seal (700).

Part Number	Thickness (inch)	Thickness (mm)
105758-050	0.050	1.27
105758-055	0.055	1.39
105758-060	0.060	1.52
105758-063	0.063	1.60
105758-065	0.065	1.65
105758-067	0.067	1.70
105758-070	0.070	1.78
105758-073	0.073	1.85
105758-075	0.075	1.90
105758-077	0.077	1.95

Blade Shim Thickness
Table 7-1

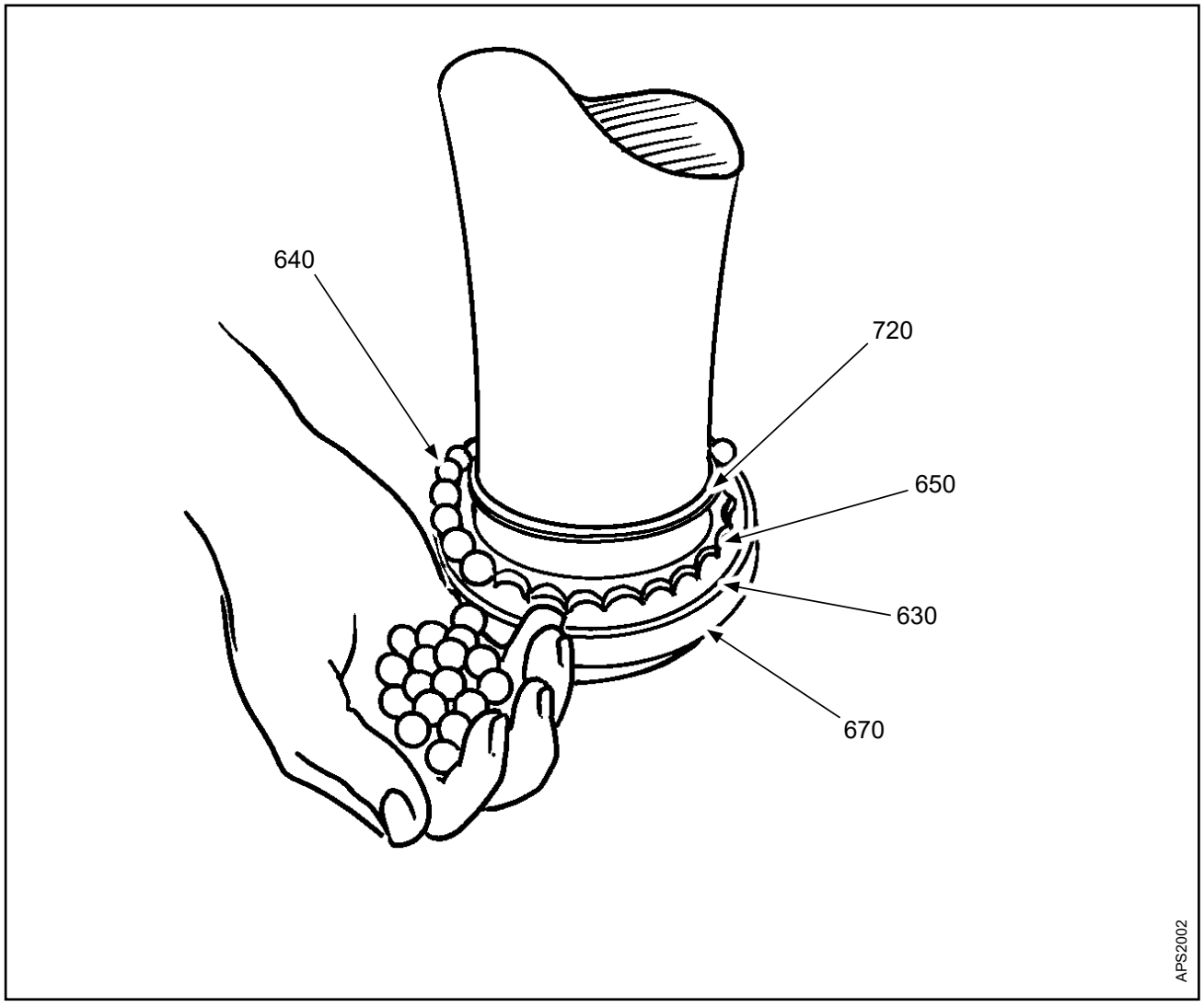
(5) Install the bearing balls (640) and the bearing races (630 and 660). Refer to Figure 7-4.

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

(b) Put the ball spacer (650) on the blade-side bearing race (630).

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

(c) Put the bearing balls (640) in the openings of the ball spacer (650) on the blade-side bearing race (630).



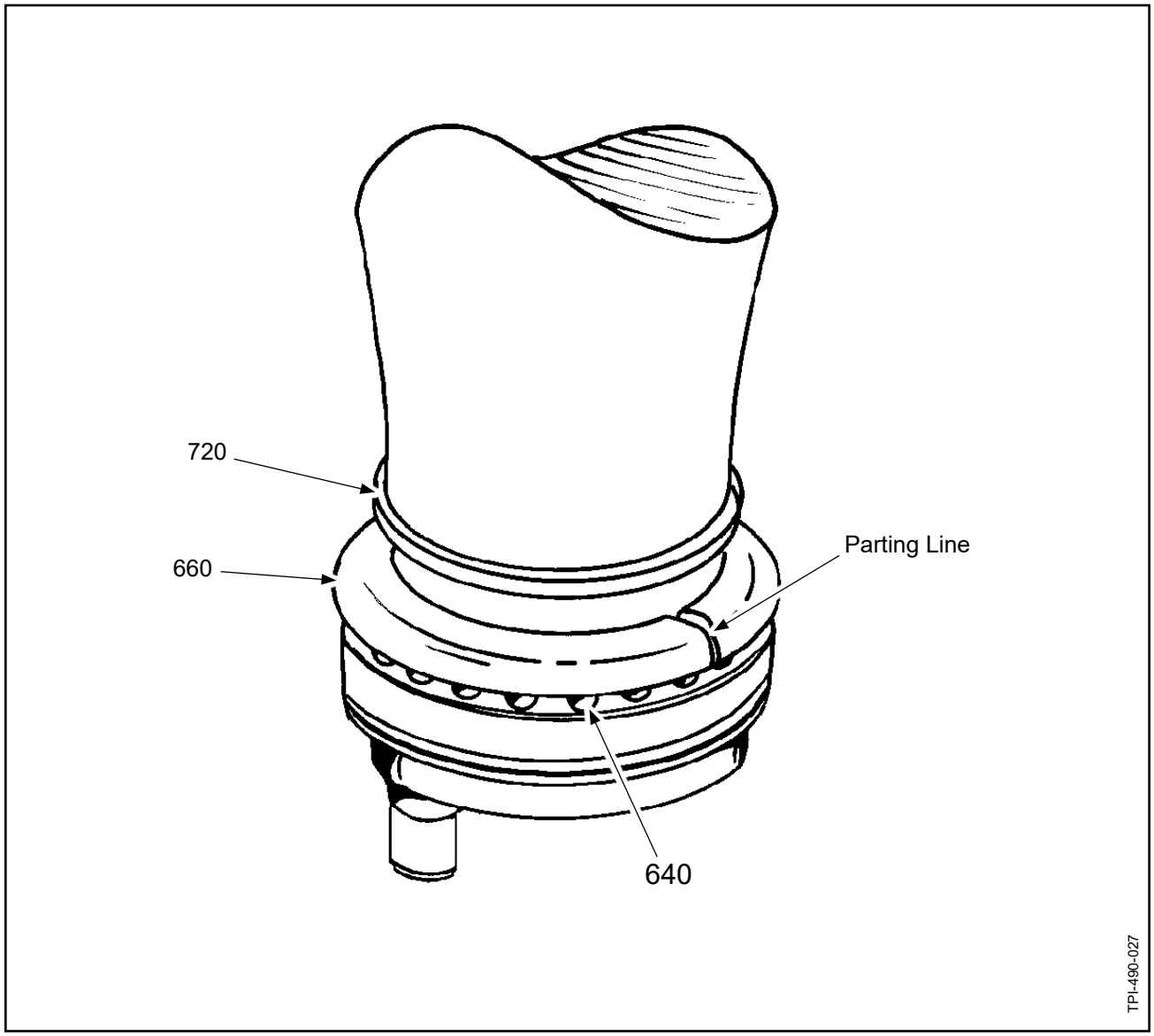
Bearing Ball Installation
Figure 7-4

CAUTION: THE BEARING RACE HALVES (630 AND 660) MUST HAVE MATCHING SERIAL NUMBERS.

(d) Put the hub-side bearing race (660) on the bearing balls (640). Refer to Figure 7-5.

1 Install the hub-side bearing race (660) with the parting line perpendicular to the hub parting line when installed in the hub (220). Refer to Figure 7-6.

(e) Repeat steps (4)(a) through (5)(d)1 of this procedure for the remaining blades.



Hub-side Bearing Race Installation
Figure 7-5

B. Blade Installation

CAUTION: TO AVOID BLADE OR HUB DAMAGE, DO NOT USE FORCE TO INSTALL THE BLADE INTO THE SOCKET.

(1) Apply a thin film of lubricant CM12 to the blade retention radii and the O-ring grooves of the hub (220).

CAUTION: EACH BLADE MUST BE SHIMMED IN THE HUB SOCKET THAT IT WILL OCCUPY WHEN ASSEMBLED. DO NOT SHIM ALL THE BLADES IN THE SAME SOCKET.

(2) Install each previously assembled blade in accordance with the following steps:

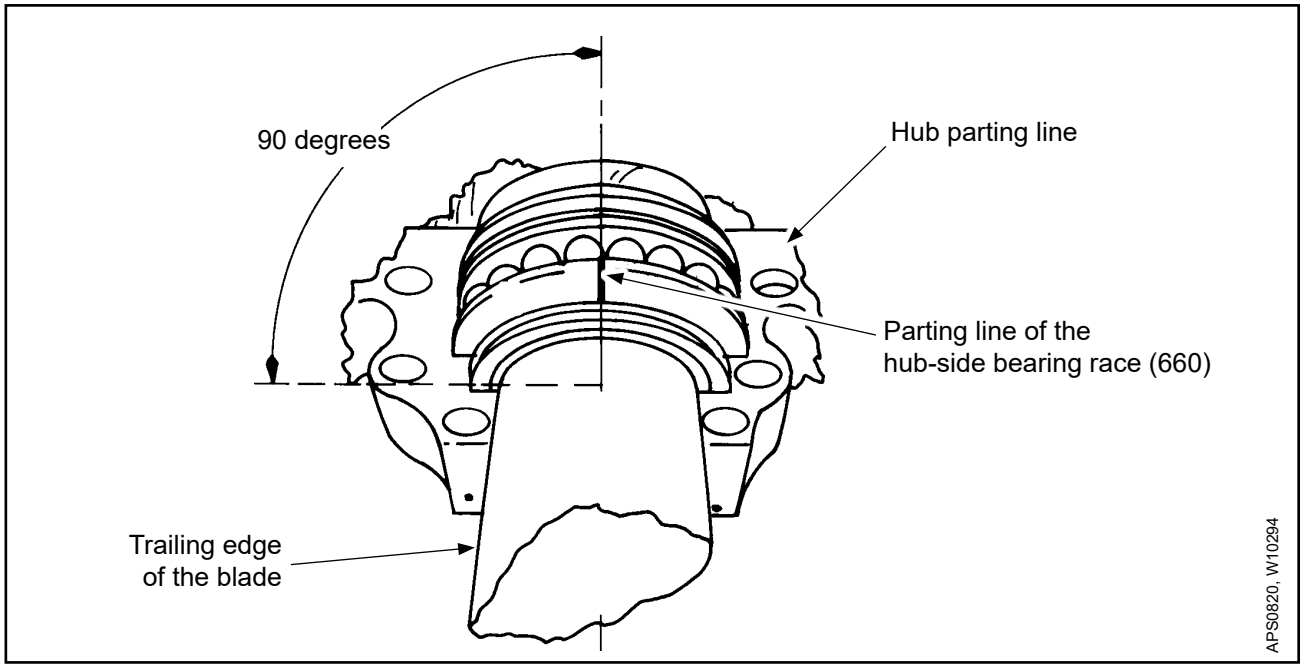
NOTE: Blade clamp TE25 may be used to hold the parts together when installing a blade.

(a) Install the blade assembly into the socket of the engine-side half of the hub (220).

(b) Using a feeler gage, measure the gap between the hub and the hub-side bearing race while pushing the blade bearing down into the hub socket. A gap of 0.005-0.008 inch (0.13-0.20 mm) is recommended.

1 If the gap is less than 0.005 inch (0.13 mm), remove the blade and replace the blade shim (680) with a thinner blade shim. Refer to Table 7-1.

2 If the gap is greater than 0.008 inch (0.20 mm), remove the blade and replace the blade shim (680) with a thicker blade shim. Refer to Table 7-1.



Installing a Blade in the Hub Socket
Figure 7-6

(3) Make sure that the parting line of the hub-side bearing race (660) is perpendicular to the hub parting line when the blade is installed in the hub (220). Refer to Figure 7-6.

(4) When all the blades have been successfully installed in the sockets of the hub (220), temporarily install the cylinder-side half of the hub (220).

(a) Install one bolt (210) in the hub clamping bolt hole next to the leading edge of each blade.

(b) Install a washer (200) and a nut (190) on each hub clamping bolt (210).

(c) Tighten the nuts (190) until snug. Do not torque the nuts (190) at this time.

CAUTION: INCORRECT SHIMMING CAN CAUSE THE BLADES TO BE TOO LOOSE OR TOO TIGHT IN THE HUB.

(5) Examine each blade for free rotation and end play.

(a) Free rotation

1 If the blade does not rotate freely in the hub socket, make sure that the blade O-ring (720) is seated correctly in the hub socket.

(b) Blade End play and Fore-and-Aft Movement

1 Using one finger and thumb, apply a light load of approximately 5 lbs. (0.45 kg) to the blade in the direction of the check being performed.

a Apply the load at the mid-span of the blade approximately in line with the blade decal.

2 Measure the blade movement at the tip of the blade.

a Make sure that the blade end play and fore-and-aft movement is within the limits specified in Table 8-2, Blade Tolerances, in the Fits and Clearances chapter of this manual.

(6) If any blade does not rotate freely in the hub socket or if blade end play for any blade is greater than the limits specified in Table 8-2 in the Fits and Clearances chapter of this manual:

(a) Remove the cylinder-side half of the hub (220).

(b) Remove the blade.

(c) Remove the blade seal (700) and O-rings (690, 710).

(d) Remove the blade shim (680).

(e) Replace the blade shim (680) with the next thinner or next thicker blade shim, as necessary. Refer to Table 7-2.

(f) Install the blade shim (680) in the recess blade seal (700).

(g) Using lubricant CM12, lightly lubricate O-rings (690, 710) before installation of the blade shim (680) and blade seal (700) with O-rings (690, 710) on the blade.

(h) With the blade shim (680) facing the bearing retaining ring (670), install the blade shim (680) and blade seal (700) with O-rings (690, 710) on the blade.

(i) Firmly seat the blade seal (700) against the blade shim (680).

CAUTION: MAKE SURE THAT THE O-RINGS (690, 710) ARE SEATED IN THE GROOVES OF THE BLADE SEAL (700) WHEN THE BLADE SEAL (700) IS INSTALLED ON THE BLADE.

(j) Make sure that the O-rings (690, 710) are seated in the grooves of the blade seal (700).

(k) Install the cylinder-side half of the hub (220).

(l) Install the hub clamping bolts (210) in the hub clamping bolt holes that are next to the leading edge of each blade.

NOTE: On 4C1-F650A1 propellers, install the bolt (210) from the engine-side of the hub as shown in the Illustrated Parts List chapter of this manual.

1 Install a washer (200) and a nut (190) on each hub clamping bolt (210).

2 Tighten the nuts (190) until snug. Do not torque the nuts at this time.

(m) Examine each blade for free rotation.

(7) Repeat steps (5) through (6)(m) of this procedure until all blades rotate freely in the hub and that the maximum permitted blade end play is within the limits specified in Table 8-2, Blade Tolerances, in the Fits and Clearances chapter of this manual.

(8) Remove the cylinder-side half of the hub (220).

(9) Remove blade(s) in accordance with the applicable step below.

(a) (2,3)C1-Propellers:

1 Remove blade number one.

(b) 4C1-Propellers:

1 Remove blade number one and blade number two.

(10) Install the fork bumpers (300) in accordance with the applicable step(s).

(a) 3C1-Propellers:

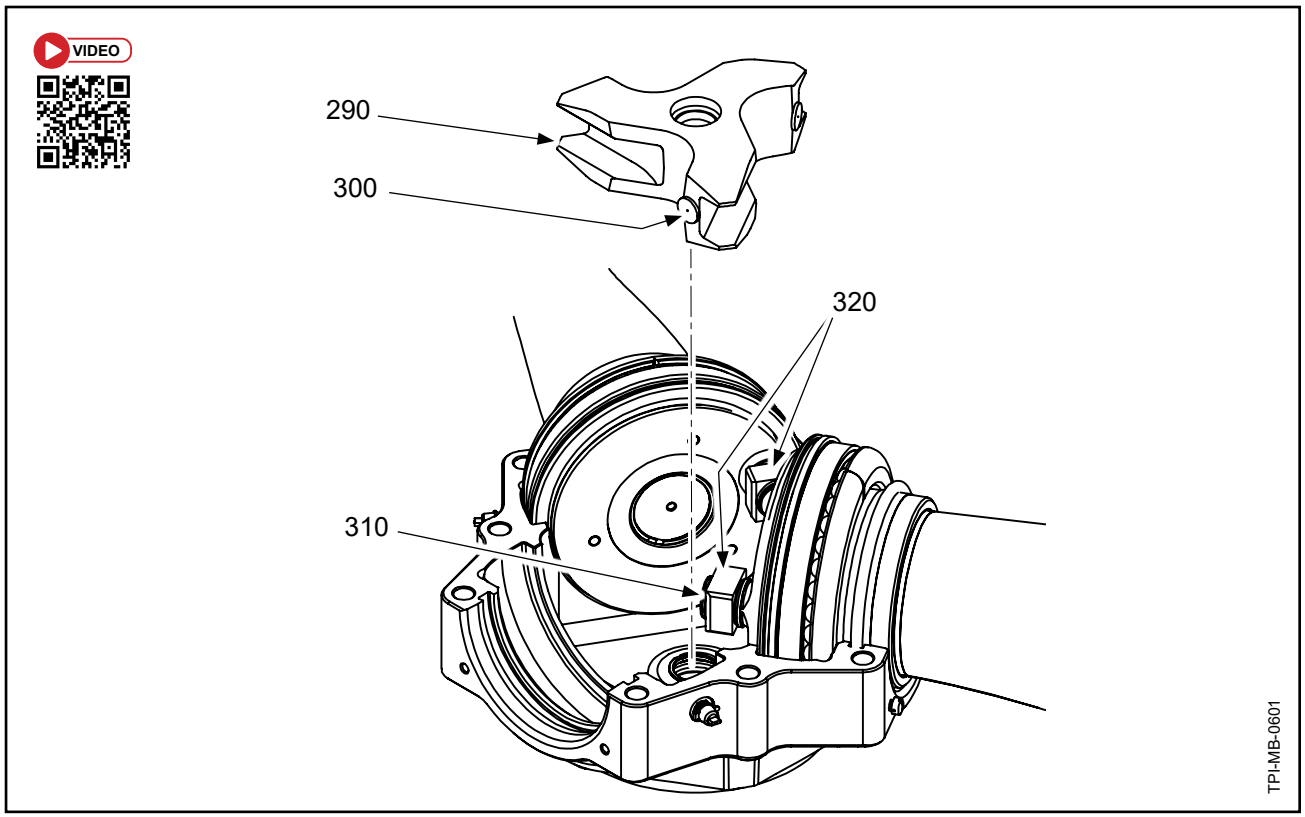
1 Install fork bumpers (300) on the fork (290). Refer to Figure 7-7.

(b) (2,4)C1-Propellers:

1 Apply retaining compound CM74 to the threads of each bumper extension (295).

2 Install the bumper extensions (295) onto the fork (290) and torque each bumper extension in accordance with Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual.

3 Install a fork bumper (300) on each bumper extension (295).



Fork Installation
Figure 7-7

(11) Install one pitch change block button (310) into each pitch change block (320). Refer to Figure 7-7.

(12) Apply anti-seize compound CM118 to the outside of each pitch change knob bushing (730).

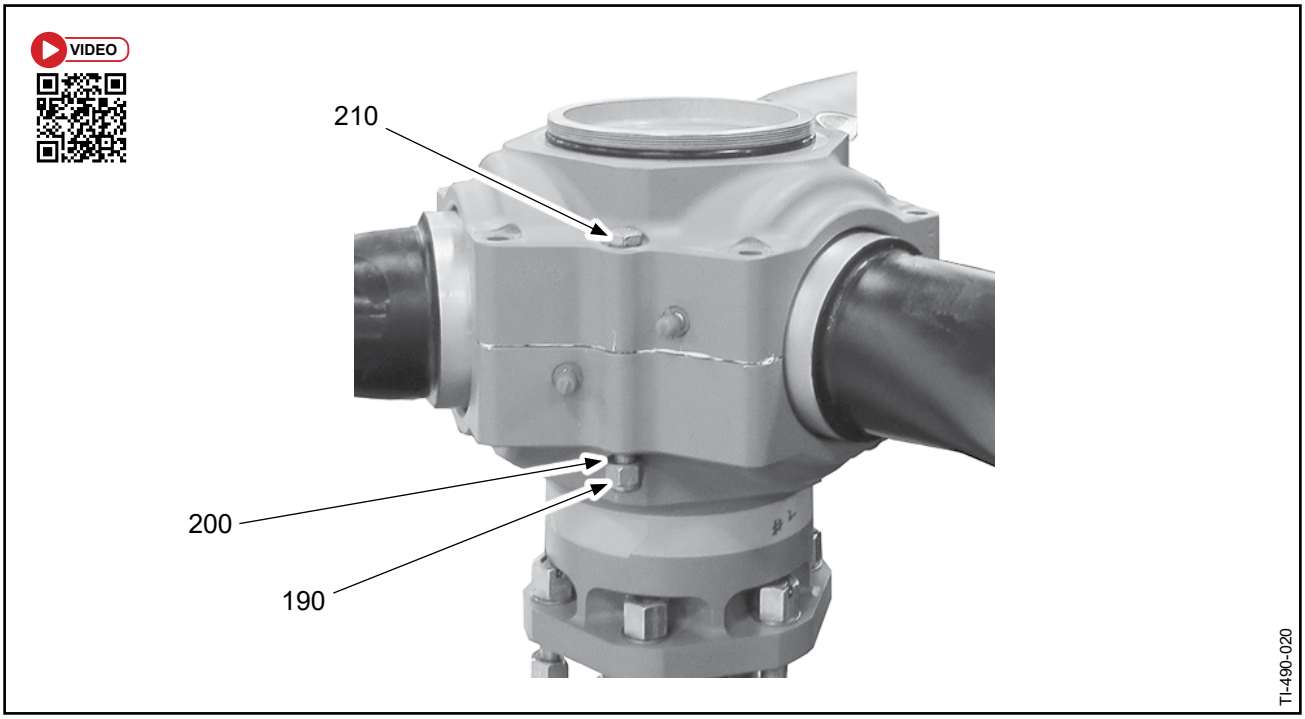
(13) Apply anti-seize compound CM118 to the threads of the fork (290) and to each pitch change block groove of the fork.

(14) With the round extension of the pitch change block (320) pointing away from the blade, install a pitch change block (320) on each pitch change knob. Refer to Figure 7-7.

(a) When installing a new pitch change block (320), make sure that the pitch change block (320) is installed with the thin wall pointing in the correct direction.

1 At initial assembly, install the pitch change blocks (320) in the fork (290) with the thin wall pointing toward the engine-side half of the hub (220).

2 For a pitch change block (320) that has been marked during disassembly to indicate the direction that the thin wall is pointing, install the pitch change block (320) in accordance with the marking.



Cylinder-side Hub Half Installation
Figure 7-8

CAUTION: BE SURE THE TAPER IN THE FORK (290) MATCHES THE TAPER IN THE PITCH CHANGE ROD (150). IF THE PITCH CHANGE ROD (150) IS INCORRECTLY ATTACHED TO THE FORK (290), THE SEATING AREA OF THE PITCH CHANGE ROD (150) WILL BE DAMAGED.

(15) Install the fork (290) on the pitch change blocks (320) of the blades that are installed in the hub. Refer to Figure 7-7.

(16) Install the blade(s) that were previously removed in accordance with the step below:

(a) Put the pitch change block (320) that is installed on the blade assembly into the fork (290), then install the blade into the socket of the engine-side half of the hub (220).

(17) Install the cylinder-side half of the hub (220).

(18) Install one bolt (210) in the hub clamping bolt hole centered between each blade as shown in Figure 7-8.

NOTE: On 4C1-F650A1 propellers, install the bolt (210) from the engine-side of the hub as shown in the Illustrated Parts List chapter of this manual.

(a) Install a washer (200) and a nut (190) on each bolt (210).

(b) Torque the nuts (190) in accordance with Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual.

4. Pitch Change Rod Installation and Blade Angle Check

A. Pitch Change Rod Installation: All Models

(1) Insert the pitch change rod (150) through the cylinder-side half of the hub (220) and into the fork (290).

(2) Torque the pitch change rod (150) in accordance with Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual.

B. Blade Angle Tolerance Check: ( )C1-( )( )( ) Propeller Models

(1) Install the cylinder (40) hand tight on the cylinder-side half of the hub (220).

(2) Install the low pitch stop screw (30) into the cylinder (40).

(a) The low pitch stop screw (30) does not have to be set to the applicable low pitch angle.

(b) The cylinder (40) and low pitch stop screw (30) only provide a contact point for the pitch change rod (150) while checking for 0.2 degrees tolerance between blades.

(3) Rotate the blades until the pitch change rod (150) touches the low pitch stop screw (30) and measure the blade angles at the 30 inch radius of all of the blades.

(4) If there is more than 0.2 degree blade angle difference between blades, turn one or more of the pitch change blocks (320).

(a) To turn the pitch change blocks (320), remove the cylinder (40) and the cylinder-side half of the hub (220).

(b) Make the necessary adjustments to the pitch change blocks (320).

1 Pitch change blocks (320) should be installed in the fork (290) with the thin wall pointing toward the engine-side half of the hub (220) during initial assembly.

2 Rotating the pitch change block (320) 180 degrees will decrease the pitch of the corresponding blade 0.3 to 0.4 degree on a tractor propeller.

3 Rotating the pitch change block (320) 180 degrees will increase the pitch of the corresponding blade 0.3 to 0.4 degree on a pusher propeller.

(c) Reassemble the propeller and follow steps (3) through (3)(d)2 of this procedure to measure the blade angle tolerance between blades.

C. Blade Angle Tolerance Check: 3C4-R( )( )( ) Propeller Models

(1) Install the split keeper (130) into the groove on the pitch change rod (150).

(2) Put the stop collar (125) over the pitch change rod (150) and split keeper (130).

(3) Turn the nut (60) onto the pitch change rod (150) until it is finger-tight.

(4) Rotate the blades toward high pitch until the nut (60) touches the stop collar (125).

(5) Measure the blade angle at the 30 inch radius on each blade.

(6) If there is more than 0.2 degree blade angle difference between blades, turn one or more of the pitch change blocks (320).

(a) To turn the pitch change blocks (320), remove the nut (60), stop collar (125), split keeper (130), and the cylinder-side half of the hub (220).

(b) Make the necessary adjustments to the pitch change blocks (320).

1 Pitch change blocks (320) should be installed in the fork (290) with the thin wall pointing toward the engine-side half of the hub (220) during initial assembly.

2 Rotating the pitch change block (320) 180 degrees will decrease the pitch of the corresponding blade 0.3 to 0.4 degree on a tractor propeller.

3 Rotating the pitch change block (320) 180 degrees will increase the pitch of the corresponding blade 0.3 to 0.4 degree on a pusher propeller.

(c) Reassemble the propeller and follow steps (3)(a) through (3)(f)2 of this procedure to measure the blade angle tolerance beween the blades.

D. Sealing the Cylinder-side Hub Half: All Models

CAUTION: THE MATING SURFACES OF THE HUB (220) MUST BE CLEAN AND FREE OF ALL UNWANTED MATERIAL TO PERMIT SEALING OF THE HUB PARTING LINE.

(1) ( )C1-( )( )( ) Propellers Only:

(a) Remove the low pitch stop screw (30) from the cylinder (40).

(b) Remove the cylinder (40).

(2) Remove the pitch change rod (150).

(3) Using solvent MEK CM106 or MPK CM219, clean the cylinder-side and engine-side mating surfaces of the hub (220) to make sure that all oil, grease, and unwanted material have been removed.

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

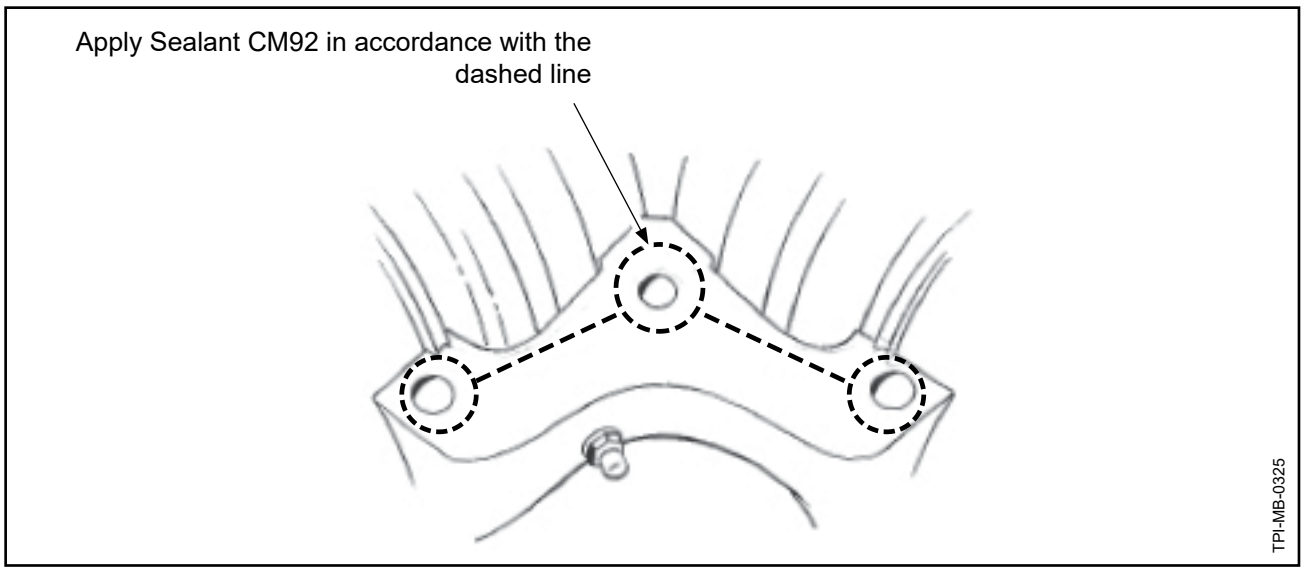
(5) Install the hub guide bushing (230) in the hole provided for it in the engine-side half of the hub (220).

(6) Apply a bead of sealant CM92 to the mating surfaces on the cylinder-side and engine-side of the hub (220) in accordance with Figure 7-9.

(a) The quantity of sealant applied to the mating surfaces must be sufficient to permit a small amount to be squeezed out along the entire parting surface when the hub bolts are correctly torqued.

(b) Do not permit the sealant CM92 to enter any of the hub clamping bolt holes.

(c) Do not permit the sealant CM92 to enter the blade O-ring groove.



Sealing the Hub Halves
Figure 7-9

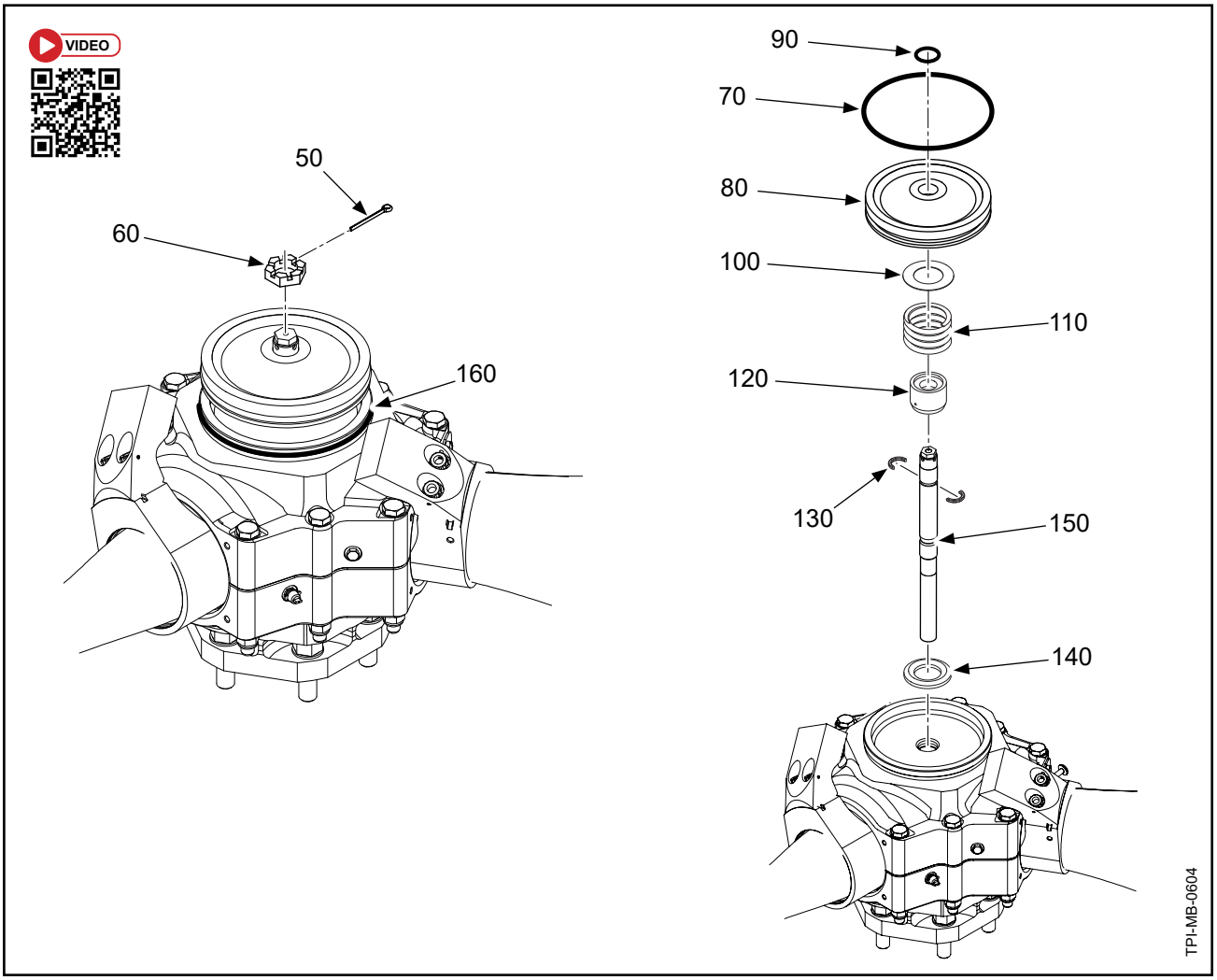
(7) Install the cylinder-side half of the hub (220).

(8) Install all of the hub clamping bolts (210), washers (200), and nuts (190).

NOTE: On 4C1-F650A1 propellers, install the bolts (210) from the engine-side of the hub as shown in the Illustrated Parts List chapter of this manual.

(a) When the propeller is assembled without the bulkhead, additional washers can be used to help with clamping the halves of the hub (220) during the cure of the sealant CM92.

(9) Torque the nuts (190) in accordance with Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual.



Piston/Pitch Change Rod Installation: ( )C1-( )( )( ) Propellers
Figure 7-10

5. Piston and Cylinder Installation

A. ( )C1-( )( )( ) Propeller Models - Refer to Figure 7-10

(1) Using lubricant CM12, lightly lubricate the spring guide (140) and put it on the hub (220) over the pitch change rod bore hole.

(2) Insert the pitch change rod (150) through the cylinder-side half of the hub (220) and into the fork (290).

(a) Torque the pitch change rod (150) in accordance with Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual.

(3) Install the stop sleeve split keeper (130) on the pitch change rod (150) groove.

(4) Install the stop sleeve (120) over the pitch change rod (150) and stop sleeve split keeper (130).

(a) Use the correct stop sleeve (120) to get the necessary high pitch stop angle. Refer to Table 7-2, "Stop Sleeve Heights" for dimensions and part numbers.

NOTE: A 1/32 (0.031) inch (0.79 mm) change in height yields approximately one degree of change in blade angle.

(5) Measure the blade high pitch stop angle.

(a) Move the blades into a low pitch position, and then, while pushing down on the stop sleeve (120), move the blades into high pitch.

(6) Using lubricant CM12, lubricate the O-ring (90).

(7) Install the O-ring (90) over the pitch change rod (150) down onto the stop sleeve (120).

(8) Using lubricant CM12, lubricate the spring seat (100).

Part Number	Height (inch)	Height (mm)
101335-9	1.270	32.26
101335-8	1.240	31.50
101335-7	1.210	30.73
101335-6	1.180	29.97
101335-5	1.150	29.21
101335-4	1.120	28.45
101335-3	1.090	27.69
101335-2	1.060	26.92
101335-1	1.030	26.16

Stop Sleeve Heights
Table 7-2

(9) Put the spring seat (100) over the pitch change rod (150) and seat it on the stop sleeve (120).

(10) With the ID O-ring groove of the piston (80) toward the stop sleeve (120), put the piston (80) onto the pitch change rod (150) as shown in Figure 7-10.

(11) Install the nut (60) on the pitch change rod (150).

CAUTION: DO NOT TORQUE THE NUT (60) MORE THAN 55 FT-LBS (74 N•m).

(12) Torque the nut (60) to the minimum torque value in accordance with Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual.

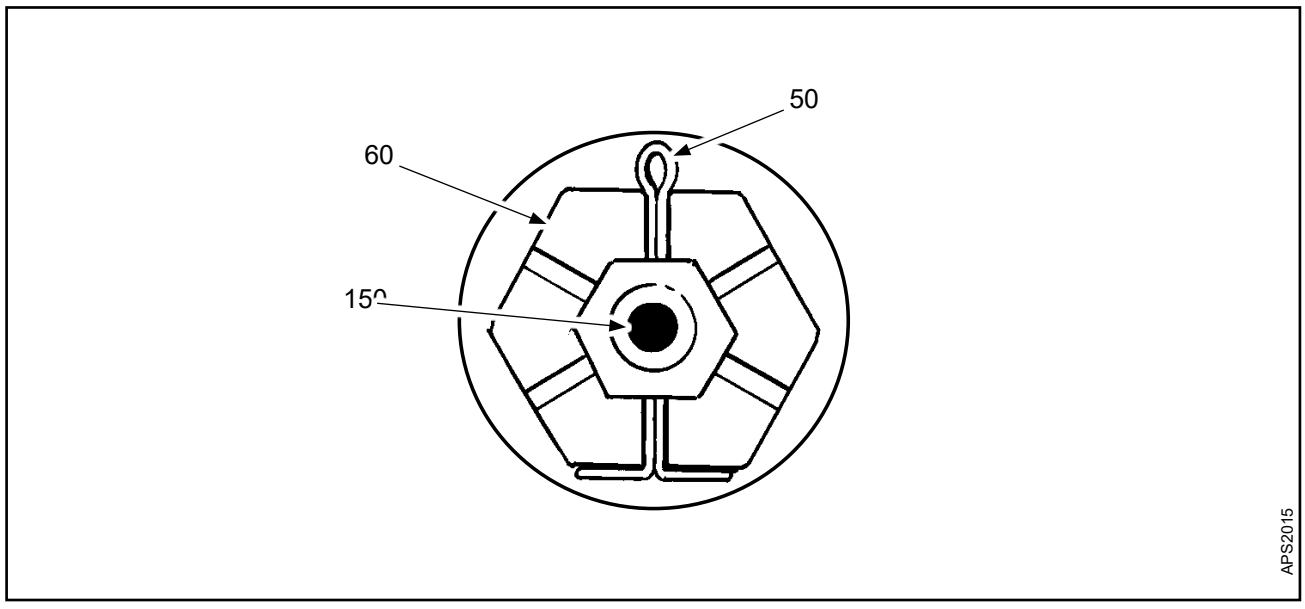
(13) If the hole in the pitch change rod (150) and the slot in the nut (60) do not align as shown in Figure 7-11, perform the following steps:

(a) Set the torque wrench to 55 Ft-Lbs (74 N•m).

(b) Slowly torque the nut (60) until a slot in the nut (60) aligns with the nearest hole in the pitch change rod (150).

CAUTION: DO NOT PERMIT THE COTTER PIN (50) TABS TO BE BENT OVER THE END OF THE PITCH CHANGE ROD (150). COTTER PIN (50) TABS BENT OVER THE END OF THE PITCH CHANGE ROD (150) INTERFERE WITH THE LOW PITCH STOP SCREW (30).

(14) Safety the nut (60) with the cotter pin (50) as shown in Figure 7-11.



Cotter Pin Installation
Figure 7-11

CAUTION: DO NOT REMOVE THE ASSEMBLED PITCH CHANGE ROD/PISTON BY ATTACHING A WRENCH TO THE COTTER-PINNED NUT (60); USE THE END OF THE PITCH CHANGE ROD (150).

(15) Unthread the assembled pitch change rod/piston from the fork (290) and remove the pitch change rod/piston and the spring seat (100) from the hub (220).

(16) Apply lubricant CM12 to each end of the compression spring (110), then put the compression spring onto the spring guide (140) as shown in Figure 7-10.

(17) 4C1-Propellers Only: Apply lubricant CM12 to each end of the compression spring (115), then put the compression spring onto the spring guide (140) inside of the compression spring (110).

NOTE: The compression spring (115) is not shown in Figure 7-10.

(18) Put the spring seat (100) over the compression spring (110).

(19) Move the blades to low pitch position.

CAUTION: DO NOT INSTALL THE ASSEMBLED PITCH CHANGE ROD/PISTON BY ATTACHING A WRENCH TO THE COTTER-PINNED NUT (60); USE THE END OF THE PITCH CHANGE ROD (150).

(20) Insert the assembled pitch change rod/piston through the compression spring(s) (110 and 115 if applicable), and the spring guide (140) into the cylinder-side half of the hub (220) and the fork (290) as shown in Figure 7-10.

NOTE: The compression spring(s) will be compressed when the pitch change rod/piston is turned into the fork (290).

(21) Torque the pitch change rod (150) in accordance with Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual.

(22) Using lubricant CM12, lubricate the piston OD O-ring (70).

(23) Install the piston OD O-ring (70) in the O-ring groove of the piston (80) as shown in Figure 7-10.

(24) Using lubricant CM12, lubricate the O-ring (160).

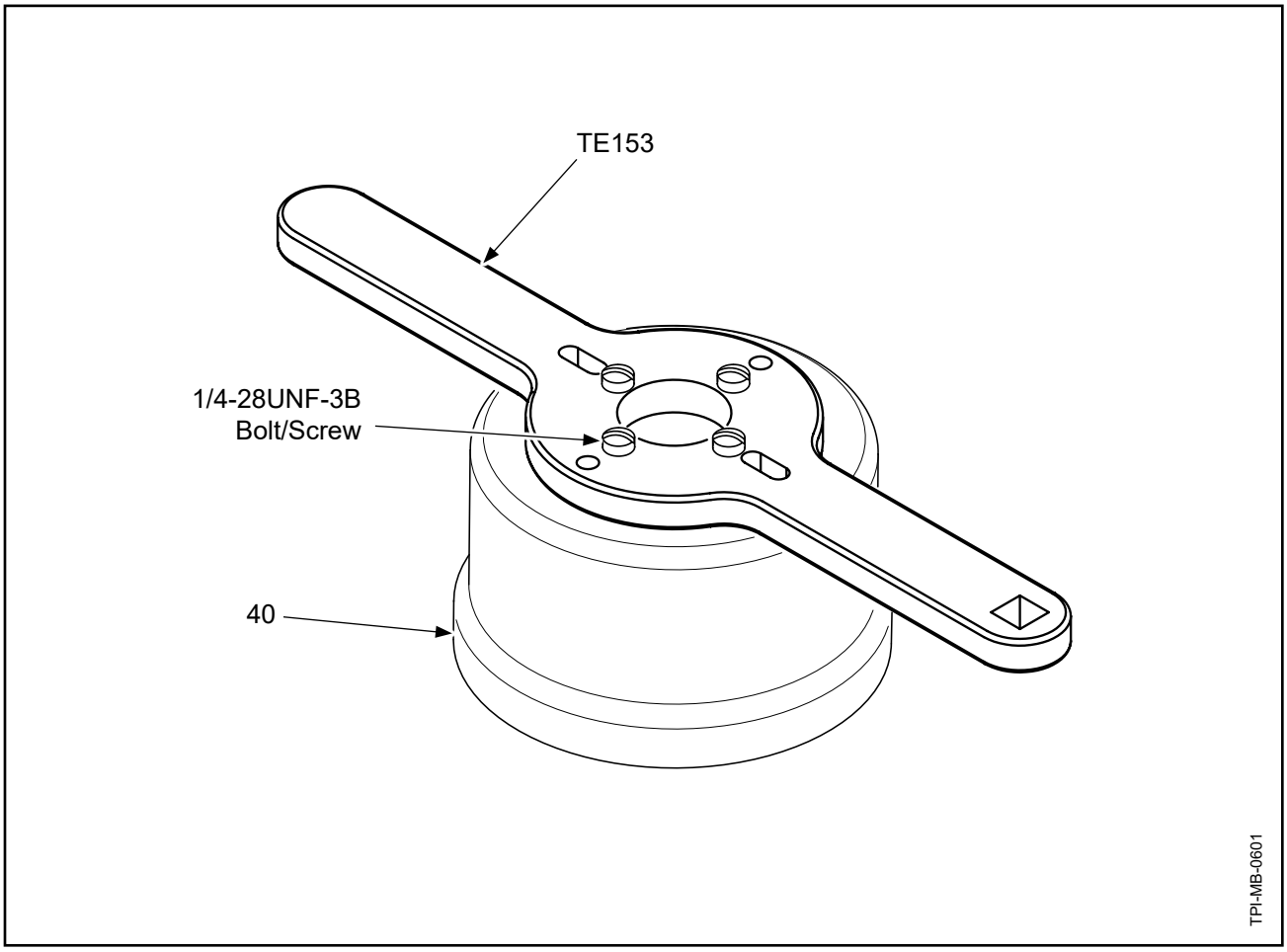
(25) Install the cylinder O-ring (160) in the groove at the base of the cylinder attachment threads in the cylinder-side half of the hub (220) as shown in Figure 7-10.

(26) Using lubricant CM12, lightly lubricate the attachment threads of the cylinder (40).

(27) Install the cylinder (40) onto the hub (220).

(28) Using four 1/4-28UNF-3B bolts or screws, attach the cylinder torque wrench adapter TE153 to the cylinder (40). Refer to Figure 7-12.

(29) Torque the cylinder (40) in accordance with Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual.



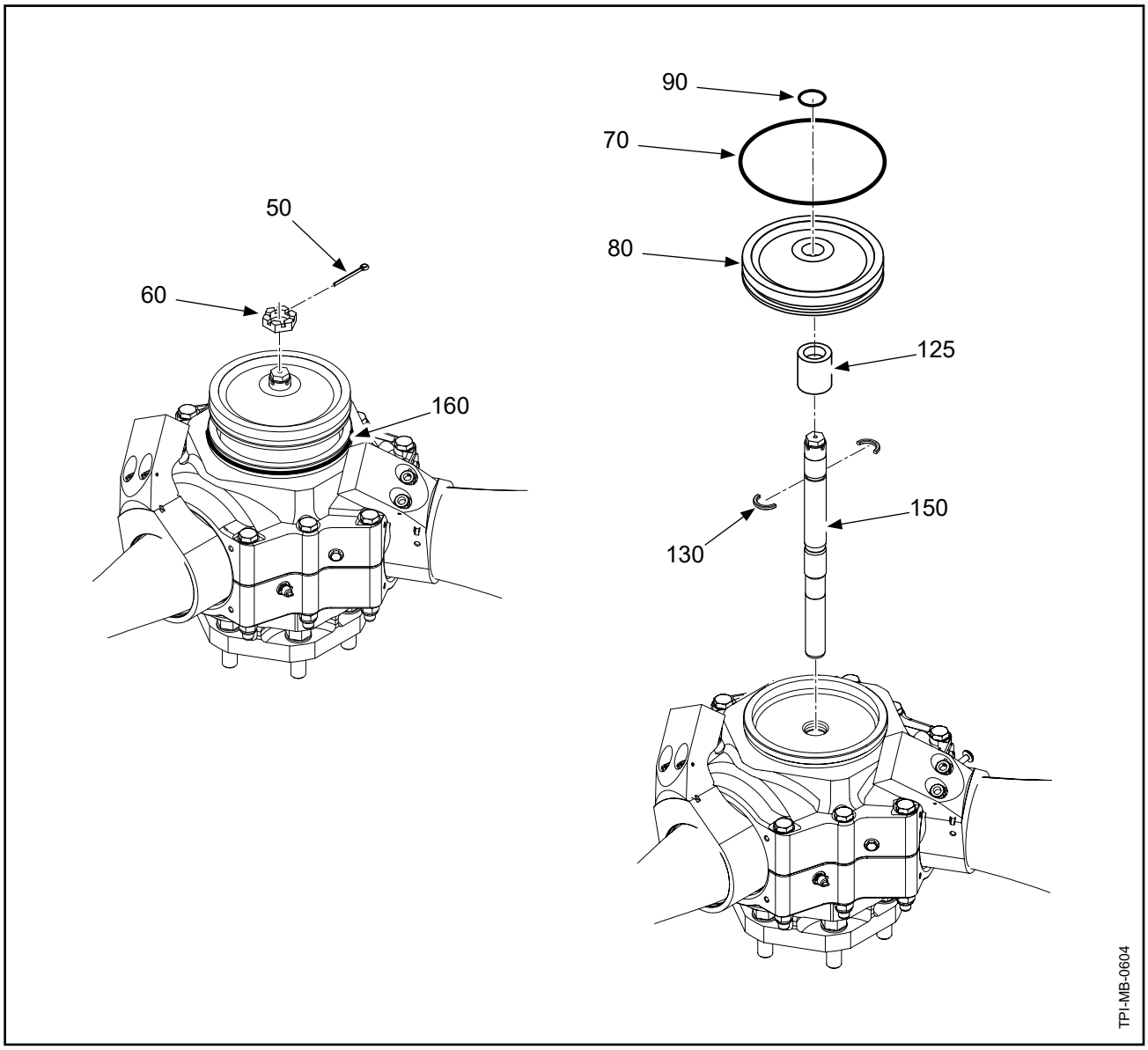
Torque Wrench Adapter TE153
Figure 7-12

B. 3C4-( )( )( ) Propeller Models - Refer to Figure 7-13

(1) Insert the pitch change rod (150) through the cylinder-side half of the hub (220) and into the fork (290).

(a) Torque the pitch change rod (150) in accordance with Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual.

(2) Install the split keeper (130) into the groove on the pitch change rod (150).



Piston/Pitch Change Rod Installation: 3C4-( )( )( ) Propellers
Figure 7-13

(3) Put the stop collar (125) over the pitch change rod (150) and split keeper (130).

(a) Use the correct stop collar (125) to get the necessary high pitch stop angle. Refer to Table 7-3 for stop collar dimensions and part numbers.

NOTE: A change in height of 1/32 inch (0.79 mm) yields approximately one degree change in blade angle.

(4) Perform a preliminary check of the blade high pitch stop angle.

(a) Move the blades to low pitch position and then move the blades into high pitch by pushing down on the stop collar (125).

(5) Install the O-ring (90) on the pitch change rod (150).

(6) Put the piston (80) onto the pitch change rod (150) with the ID O-ring groove in the piston turned toward the stop collar (125).

Part Number	Height (inch)	Height (mm)		Part Number	Height (inch)	Height (mm)
A-2420-42	0.730	18.54		A-2420-27	1.180	29.97
A-2420-41	0.760	19.30		A-2420-26	1.201	30.73
A-2420-40	0.790	20.06		A-2420-25	1.240	31.49
A-2420-39	0.820	20.82		A-2420-24	1.270	32.25
A-2420-38	0.850	21.59		A-2420-23	1.300	33.02
A-2420-37	0.880	22.35		A-2420-22	1.330	33.78
A-2420-36	0.910	23.11		A-2420-21	1.360	34.54
A-2420-35	0.940	23.87		A-2420-20	1.390	35.30
A-2420-34	0.970	24.63		A-2420-19	1.420	36.06
A-2420-33	1.000	25.40		A-2420-18	1.450	36.83
A-2420-32	1.030	26.16		A-2420-17	1.480	37.59
A-2420-31	1.060	26.92		A-2420-15	1.510	38.35
A-2420-30	1.090	27.68		A-2420-14	1.540	39.11
A-2420-29	1.120	28.44		A-2420-13	1.570	39.87
A-2420-28	1.150	29.21				

Stop Collar Heights
Table 7-3

(7) Install the nut (60) onto the pitch change rod (150).

CAUTION: DO NOT TORQUE THE NUT (60) TO MORE THAN 55 FT-LBS(74 N•m).

(a) Torque the nut (60) to the minimum torque listed in Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual.

(8) If the hole in the pitch change rod (150) and the slot in the nut (60) do not align as shown in Figure 7-14, perform the following steps::

(a) Set the torque wrench to 55 Ft-Lbs (74 N•m).

(b) Slowly torque the nut (60) until a slot in the nut aligns with the nearest hole in the pitch change rod (150).

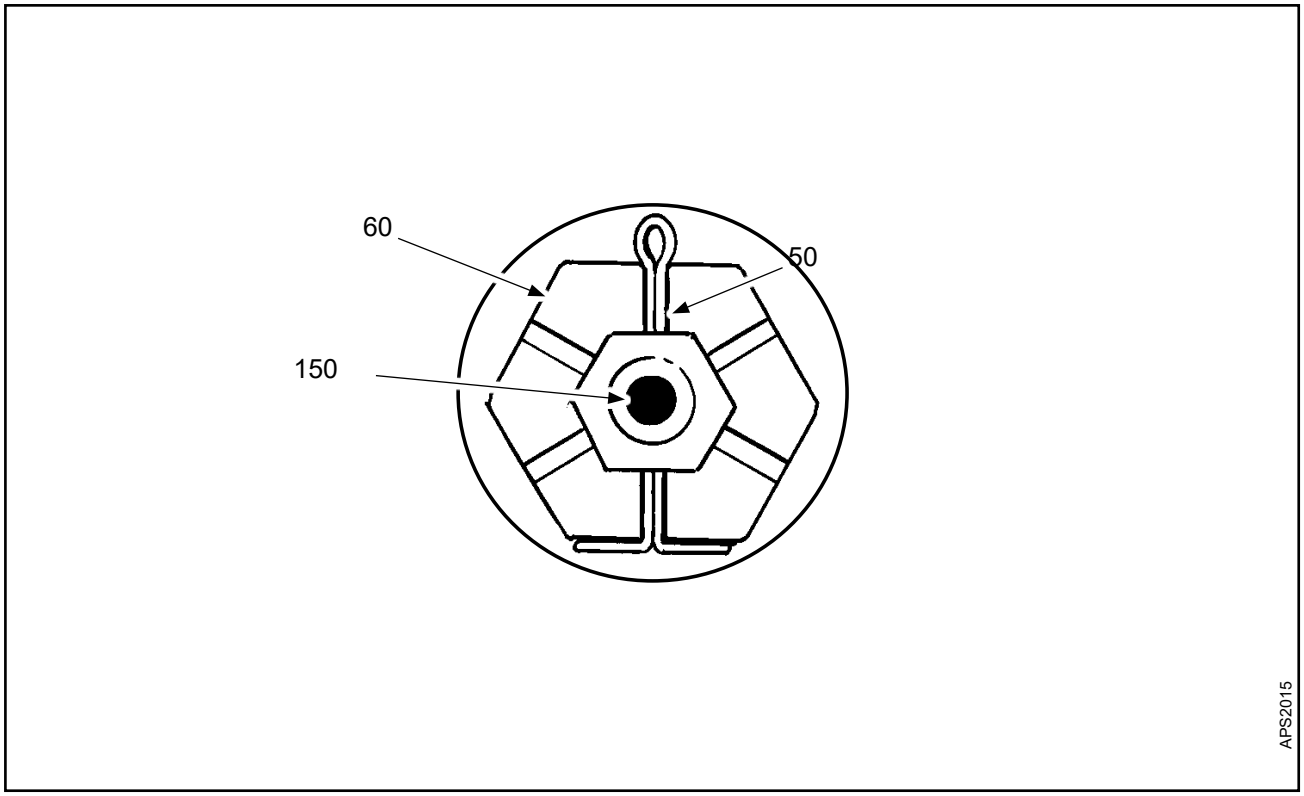
(9) Safety the nut (60) with the cotter pin (50) as shown in Figure 7-14.

(10) Install the O-ring (70) in the OD groove on the piston (80).

(11) Install the cylinder O-ring (160) on the cylinder-side of the hub (220).

(12) Apply a bead of sealant CM92 on the O-ring (160) where the cylinder (40) will touch the hub (220).

(13) Apply lubricant CM12 to the threads of the cylinder (40).

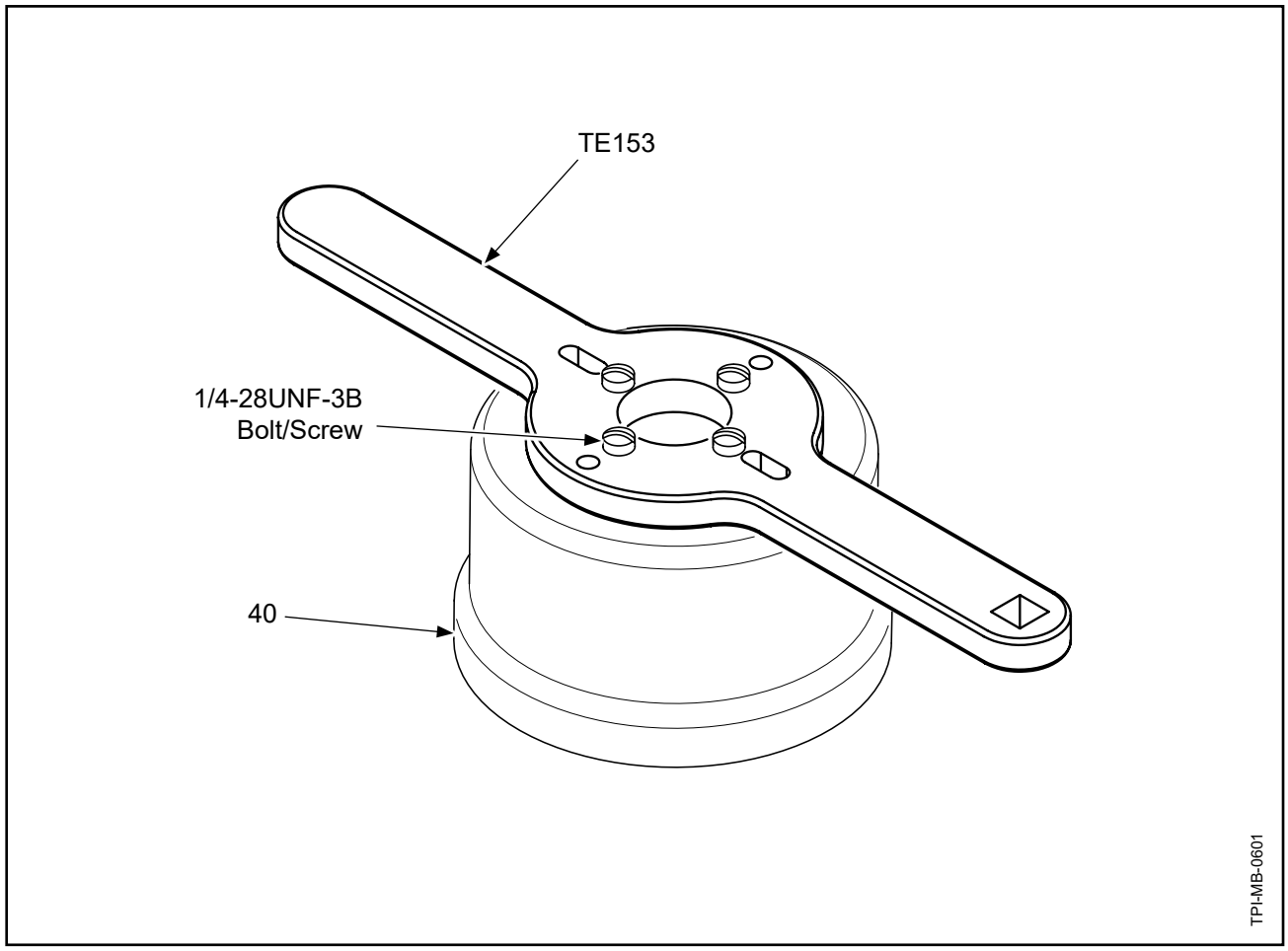


Cotter Pin Installation
Figure 7-14

(14) Install the cylinder (40) onto the hub (220).

(a) Using four 1/4-28UNF-3B bolts or screws, attach the cylinder torque wrench adapter TE153 to the cylinder (40) as shown in Figure 7-15.

(b) Torque the cylinder (40) in accordance with Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual.



Torque Wrench Adapter TE153
Figure 7-15

6. Setting Low Blade Angle

A. Low Pitch Stop Screw Installation

(1) Using solvent MEK CM106 or MPK CM219, clean the threads of the low pitch stop screw (30) to make sure that all oil, grease, and unwanted material have been removed.

(2) Apply threadlocker CM21 to the threads of the low pitch stop screw (30).

(3) Install the low pitch stop screw (30) in the cylinder (40). Refer to Figure 7-16.

B. Adjusting the Low Pitch Stop Angle - Refer to Figure 7-16.

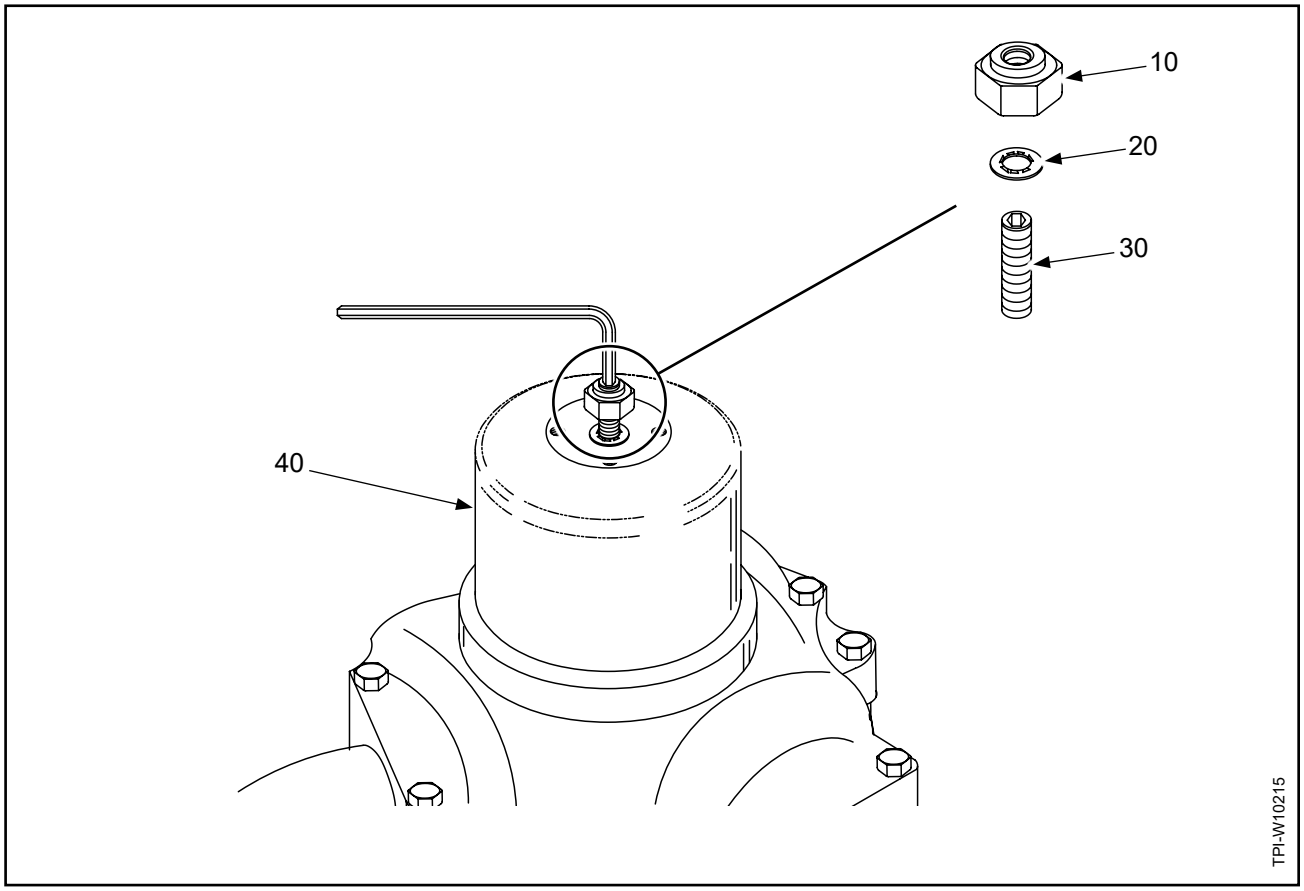
(1) Measure the low pitch stop angle.

(a) With the blades at the low pitch position, set the propeller pitch in accordance with the aircraft Type Certificate Data Sheet.

(b) Adjust the low pitch angle with the low pitch stop screw (30).

1 To increase pitch, turn the low pitch stop screw (30) clockwise.

2 To decrease pitch, turn the low pitch stop screw (30) counterclockwise.



Low Pitch Stop Screw Installation
Figure 7-16

(2) Install the washer (20) and the hex nut (10) on the low pitch stop screw (30).

(3) Torque the hex nut (10) in accordance with Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual.

(a) Holding the low pitch stop screw (30) with an allen wrench, apply torque to the low pitch stop jam nut (10).

(4) **( )C1-( )( )( ) propellers only -** Examine for air leakage around the washer seal (20) on the low pitch stop screw (30).

(a) If there is no air leakage, go to step (5) of this procedure.

(b) If there is air leakage, replace the washer seal (20) on the low pitch stop screw (30).

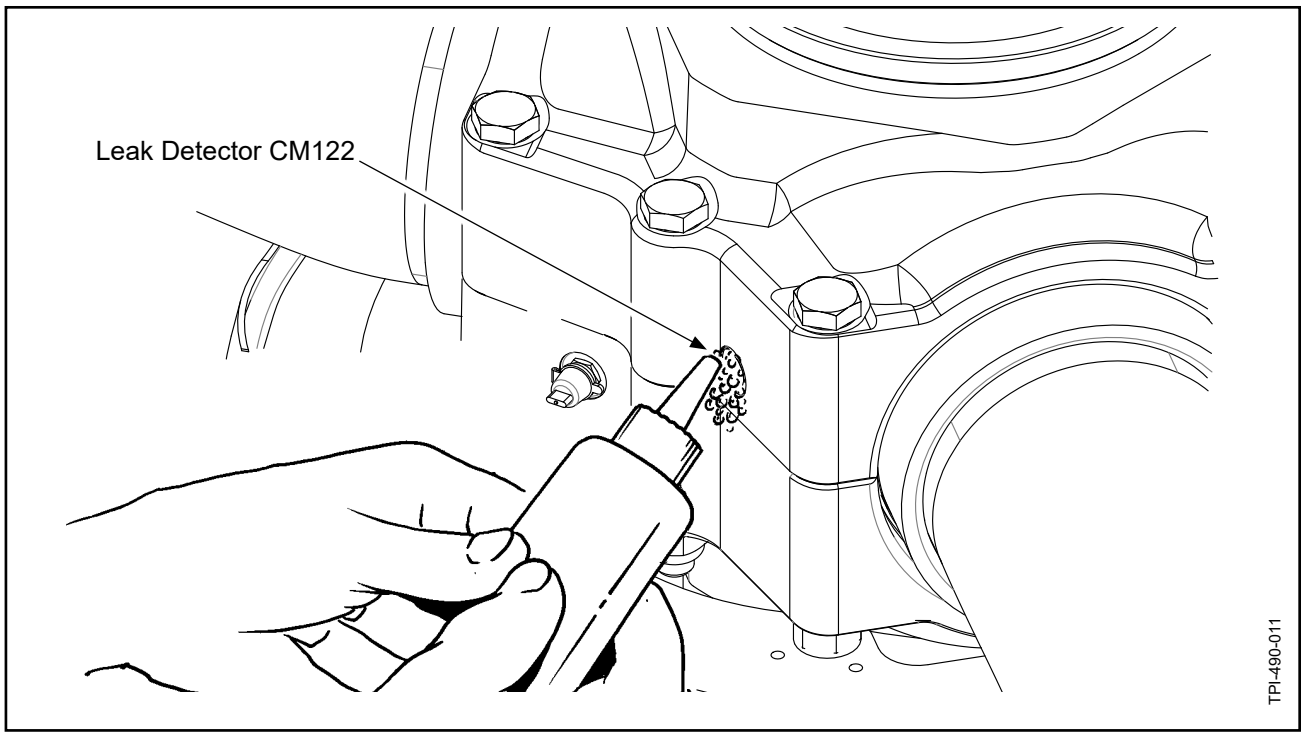
1 Repeat the check for air leakage and replace the washer seal (20) on the low pitch stop screw (30) if necessary, until the check for air leakage is satisfactory.

2 When the check for air leakage is satisfactory, continue to the next step.

(5) Measure the final low pitch angle.

(6) Measure the blade track.

(a) Refer to the section, "Blade Tolerances" in the Fits and Clearances chapter of this manual for blade track limits.



Hub Leak Check
Figure 7-17

7. 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 (180) in the applicable side of the hub.

(a) Tighten each lubrication fitting (180) until finger-tight, then tighten one additional 360 degree turn.

(2) Install the lubrication plugs (181) in the applicable side of the hub.

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

(b) Tighten each lubrication plug (181) 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 high or low pitch as applicable.

1 Non-feathering propellers (2C1, 3C1 and 4C1): High pitch

2 Feathering propellers (3C2 and 3C4): Low pitch

(b) Apply leak detector CM122 to the open lubrication plug hole. Refer to Figure 7-17.

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 (181) in the applicable side of the hub.

(a) Tighten the lubrication plug (181) until finger-tight, then tighten one additional 360 degree turn.

8. Post-Assembly Procedures

A. Counterweight Installation (3C4-series Propellers Only)

(1) For the correct counterweight (2000) for the propeller, refer to the Hartzell Propeller Inc. Application Guide Manual (61-02-59).

(2) For installation of a counterweight (2000) on a composite blade, refer to Hartzell Propeller Inc. Composite Propeller Blade Maintenance Manual 135F (61-13-35).

B. Propeller Lubrication

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

C. Static Balance

(1) 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).

D. Label Placement

(1) For installation of labels, refer to the Parts Identification and Marking chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or to Hartzell Propeller Inc. Composite Blade Manual 135F (61-13-35).

9. 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 section, "General" at the beginning of this chapter.

B. Preparing the Propeller for Shipping

(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.

(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.

(3) 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 section, "Marking Before Disassembly" in the Disassembly chapter of this manual.

(a) Before removal of the pitch change block (320), make a mark to indicate position and orientation to the pitch change fork unit.

1 The pitch change blocks may be taped in place in the pitch change fork.

(4) Remove all balance weight screws (800) and balance weights (810).

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

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

(7) Propeller Reassembly with Blades Removed for Shipping

(a) Reassemble the propeller without the blade assemblies in accordance with the applicable assembly instructions in this chapter.

1 The pitch change blocks (320) can be taped in position in the pitch change fork (290).

(8) Packing the Propeller and Blades for Shipping

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

(b) Pack the propeller without blades for shipping.

(c) Pack the blades for shipping with the blade seal (700), blade bearings, and lubricant on each blade shank.

10. 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 be necessary to discard hardware that would require replacement at overhaul.

NOTE 2: New O-rings have been installed during propeller assembly for shipping. During propeller disassembly for 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 (290), and each balance weight (810) has been marked for alignment with the hub (220).

(2) Remove all balance weight screws (800) and balance weights (810), if necessary.

C. Propeller Reassembly

(1) Reassemble the propeller in accordance with the applicable 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

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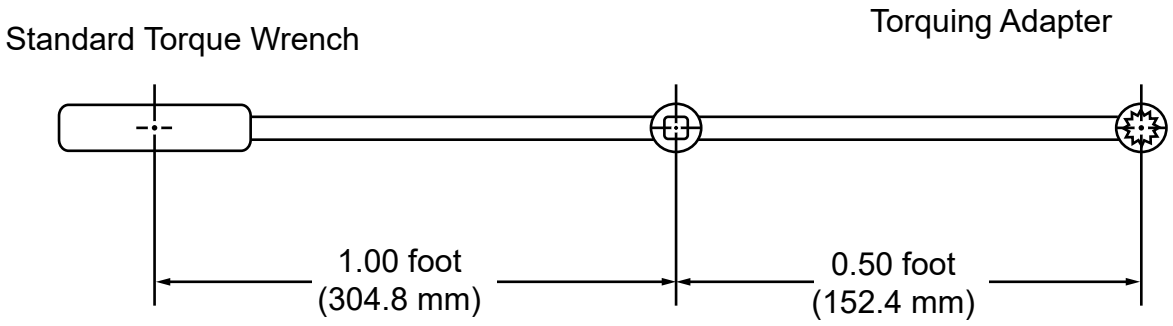


$$\frac{\text{(actual torque required) x (torque wrench length)}}{\text{(torque wrench length) + (length of adapter)}} = \text{torque wrench reading to achieve required actual torque}$$

EXAMPLE:

$$\frac{\text{100 Ft-Lb (136 N•m) x 1 ft (304.8 mm)}}{\text{1 ft (304.8 mm) + 0.50 ft (152.4 mm)}} = \text{66.7 Ft-Lb (90.1 N•m)}$$

reading on torque wrench with 6-inch (152.4 mm) adapter for actual torque of 100 Ft-Lb (136 N•m)

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

APS212

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

1. Torque Values (Rev. 2)

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.

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

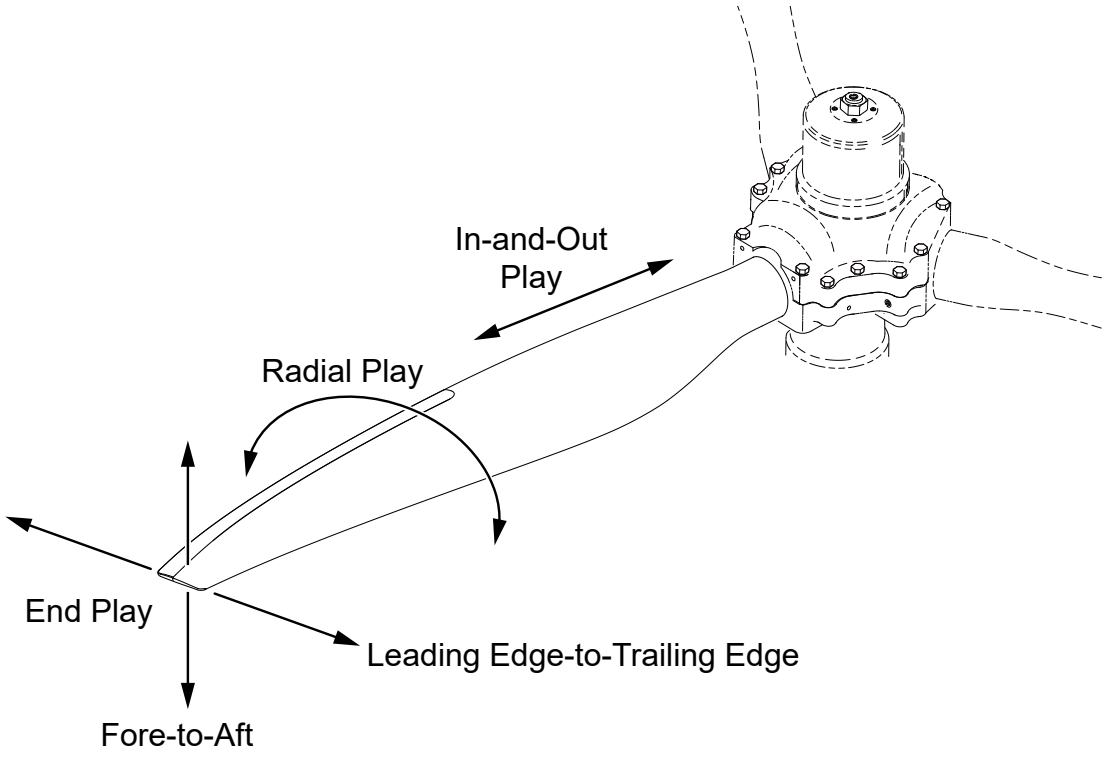
CAUTION 2: FOR TORQUE READING WHEN USING A TORQUE WRENCH ADAPTER, REFER TO FIGURE 8-1.

Item No.	Part Number	Description	Torque		
			Ft-Lb	In-Lb	N•m
10	A-2043-1	Nut, 3/8-24, Hex, Self-Locking	15	180	21
	B-3807	Nut, 5/8-18, Hex, Self-Locking	30	360	41
40	B-2428-( )	Cylinder	120-150 wet	1440-1800 wet	163-203 wet
60	A-2211	Nut, .718-20, Castelled, Thin	40 minimum Refer to NOTE 2	480 minimum Refer to NOTE 2	55 minimum Refer to NOTE 2
150	A-2418-( )	Rod, Pitch Change	40 wet	480 wet	55 wet
190	A-2043-1	Nut, 3/8-24, Hex, Self-Locking	24-26	288-312	33-35
295	B-468-2	Extension, Bumper	-	72-96	8-10

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

NOTE 2: Refer to the text in the Assembly chapter of this manual for the maximum value.

Torque Values
Table 8-1



Blade Play
Figure 8-2

2. Blade Tolerances

A. Blade Play

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

(a) End Play:

1 Check the blade end play, Leading Edge-to-Trailing Edge and Face-to-Camber (Fore and Aft) in accordance with the following steps:

NOTE 1: Hartzell Propeller Inc. Raptor-series propellers use specially designed spacers within the propeller to achieve the required blade fit. The blades may feel loose in the hub when compared to Hartzell Compact-series propellers. During propeller rotation, the blade fit within the propeller is the same as other Hartzell propeller models.

NOTE 2: Blade tip play is affected by the fit of the blade within the propeller, and also by movement of components within the engine and the aircraft. The following check will evaluate only the fit of the blade within the propeller.

a Using one finger and thumb, apply a light load of approximately 5 lbs. (2.2 kg) to the blade in the direction of the check being performed.

(1) Apply the load at the mid-span of the blade approximately in line with the blade decal.

b Measure blade play at the tip of the blade.

(1) The maximum permitted blade play is ± 0.125 inch (3.17 mm), 0.250 inch (6.35 mm) total.

2 If blade play is greater than the permitted limit, contact the Hartzell Propeller Inc. Product Support Department.

(b)	In-and-Out Play	0.020 inch (0.50 mm)
(c)	Radial Play	±0.5 degree (Total: 1 degree) measured at reference station

B. Blade Track

(1)	Composite Blades	± 0.125 inch (3.17 mm) Total: 0.250 inch (6.35 mm)

C. Blade Pitch Tolerance

(1)	Blade pitch setting tolerance between blades at low pitch	0.2 degree

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SPECIAL TOOLS, FIXTURES, AND EQUIPMENT - CONTENTS

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1. Tooling and Facility Requirements (Rev. 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

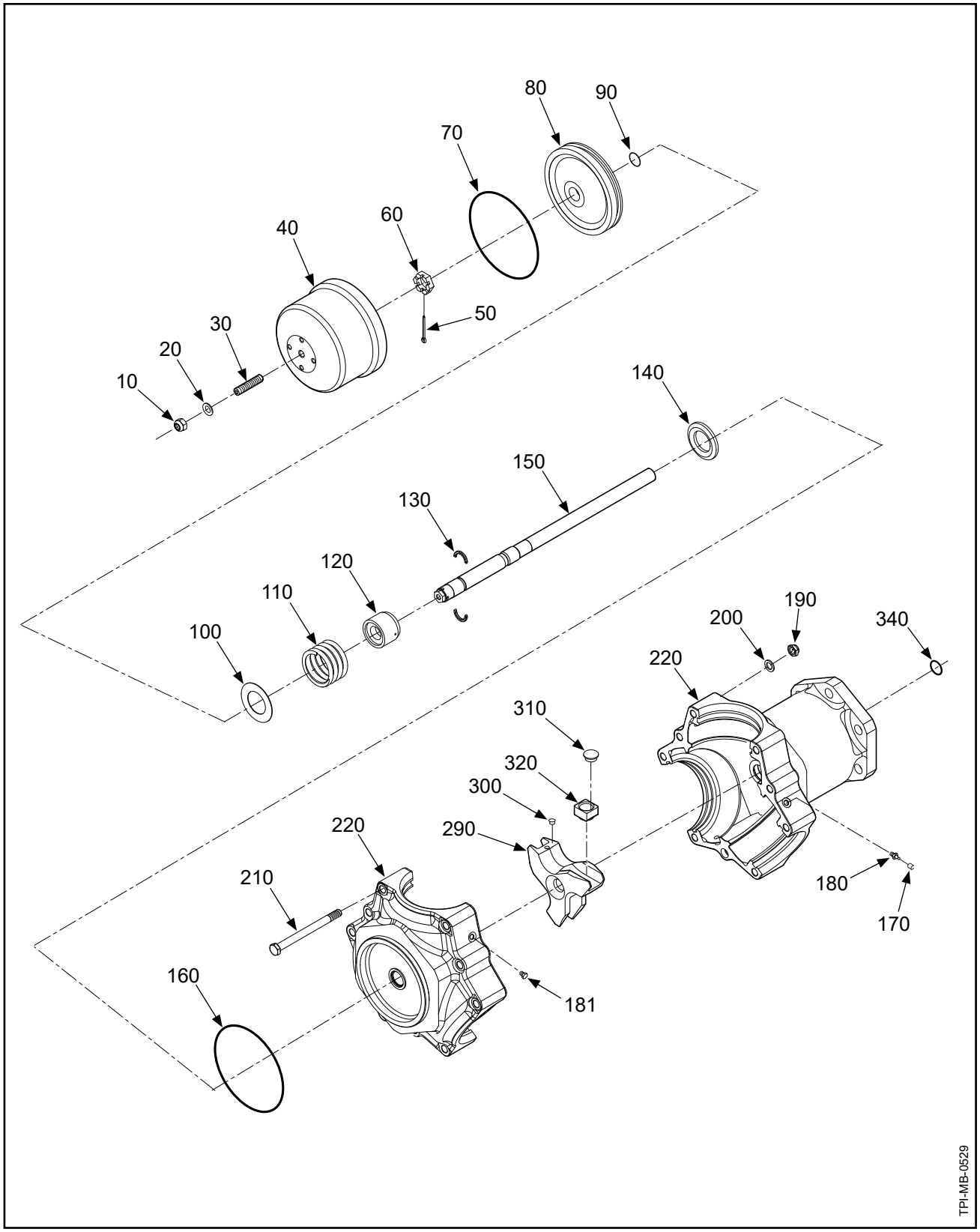
(1) Many O-rings, fasteners, and other vendor supplied hardware listed in Hartzell Propeller Inc. manuals have previously been specified with AN, MS, NAS, or vendor part number. To provide internal controls and procurement flexibility, Hartzell part numbers have been assigned to all O-rings, fasteners,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



3C1-L675A1: Propeller Parts
Figure 10-1

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3C1-L675A1				
10-1		**PROPELLER PARTS**				
10	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		1	Y	
20	B-6747	• SEAL, WASHER		1	Y	
30	102472	• SCREW, SET, 3/8-24		1		
40	B-2428-3	• CYLINDER		1		
50	B-3838-3-5	• COTTER PIN		1	Y	
60	A-2211	• NUT, .718-20, CASTELLATED, THIN		1	Y	
70	C-3317-348-1	• O-RING (PISTON OD)		1	Y	
80	B-2419	• PISTON		1		
90	C-3317-018	• O-RING (PISTON ID)		1	Y	
100	106565	• SPRING SEAT		1		
110	106563	• SPRING, COMPRESSION		1		
120	101335-( )	• SLEEVE, STOP		1		
130	A-867	• PCP: KEEPER, SPLIT (STOP SLEEVE)		1	Y	PCP
140	106564	• GUIDE, SPRING		1		
150	A-2418-15	• ROD, PITCH CHANGE		1		
160	C-3317-247	• O-RING (CYLINDER)		1	Y	
170	B-6544	• CAP, FITTING, LUBRICATION		3	Y	
180	A-279	• FITTING, LUBRICATION (ENGINE-SIDE OF HUB)		3	Y	
181	106545	• PLUG, LUBRICATION (CYLINDER-SIDE OF HUB)		3	Y	
190	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		3	Y	
200	B-3834-0632	• WASHER		3	Y	
210	A-2432	• BOLT, 3/8-24, HEX HEAD		9		
220	106153	• PCP: HUB UNIT, 3C1-L675A1 (REFER TO "106153 HUB UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
290	105732	• FORK, THREE BLADE ASSEMBLY		1		
300	A-3256	• • BUMPER, FORK		3	Y	
310	106136	• BUTTON, BLOCK, PITCH CHANGE		3	Y	
320	105733	• BLOCK, PITCH CHANGE		3		
340	C-3317-115-1	• O-RING (HUB BUSHING ID)		1	Y	

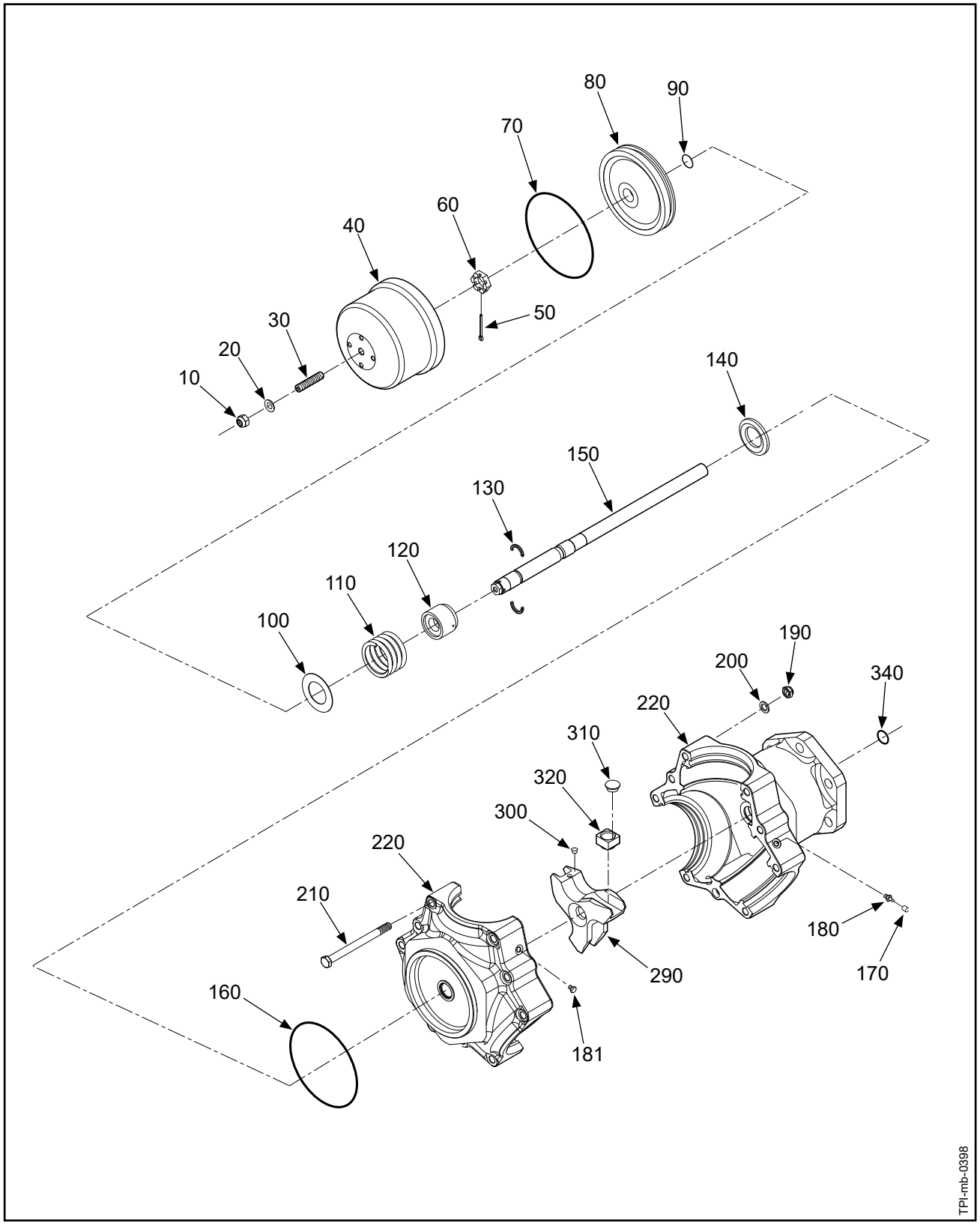
EFF CODE INFORMATION

- ITEM NOT ILLUSTRATED

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3C1-L675A1, CONTINUED				
10A-7		**L-FLANGE MOUNTING PARTS**				
		• (REFER TO "L-FLANGE MOUNTING PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
10A-1		**BLADE RETENTION PARTS**				
		• (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
N/A		**BALANCE PARTS**				
-800	B-3840-( )	• SCREW		A/R	Y	
-810	A-2424-( )	• BALANCE WEIGHT		A/R		
N/A		**SPINNER PARTS**				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC.APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFF CODE INFORMATION

- ITEM NOT ILLUSTRATED



3C1-R430A1: Propeller Parts
Figure 10-2

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3C1-R430A1				
10-2		**PROPELLER PARTS**				
10	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		1	Y	
20	B-6747	• SEAL, WASHER		1	Y	
30	102472	• SCREW, SET, 3/8-24		1		
40	B-2428-3	• CYLINDER		1		
50	B-3838-3-5	• COTTER PIN		1	Y	
60	A-2211	• NUT, .718-20, CASTELLATED, THIN		1	Y	
70	C-3317-348-1	• O-RING (PISTON OD)		1	Y	
80	B-2419	• PISTON		1		
90	C-3317-018	• O-RING (PISTON ID)		1	Y	
100	106565	• SPRING SEAT		1		
110	106563	• SPRING, COMPRESSION		1		
120	101335-( )	• SLEEVE, STOP		1		
130	A-867	• PCP: KEEPER, SPLIT (STOP SLEEVE)		1	Y	PCP
140	106564	• GUIDE, SPRING		1		
150	A-2418-2	• ROD, PITCH CHANGE - REPLACED BY ITEM 150A		1		
150A	A-2418-15	• ROD, PITCH CHANGE REPLACES ITEM 150, POST HC-ASB-61-395		1		
160	C-3317-247	• O-RING (CYLINDER)		1	Y	
170	B-6544	• CAP, FITTING, LUBRICATION		3	Y	
180	A-279	• FITTING, LUBRICATION (ENGINE-SIDE OF HUB)		3	Y	
181	106545	• PLUG, LUBRICATION (CYLINDER-SIDE OF HUB)		3	Y	
190	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		9	Y	
200	B-3834-0632	• WASHER		9	Y	
210	A-2432	• BOLT, 3/8-24, HEX HEAD		9		
220	105726-1	• PCP: HUB UNIT, 3C1-R430A1 (REFER TO "105726-(1,2) HUB UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
290	105732	• FORK, THREE BLADE ASSEMBLY		1		
300	A-3256	• • BUMPER, FORK		3	Y	
310	106136	• BUTTON, BLOCK, PITCH CHANGE		3	Y	
320	105733	• BLOCK, PITCH CHANGE		3		
340	C-3317-115-1	• O-RING (HUB BUSHING ID)		1	Y	

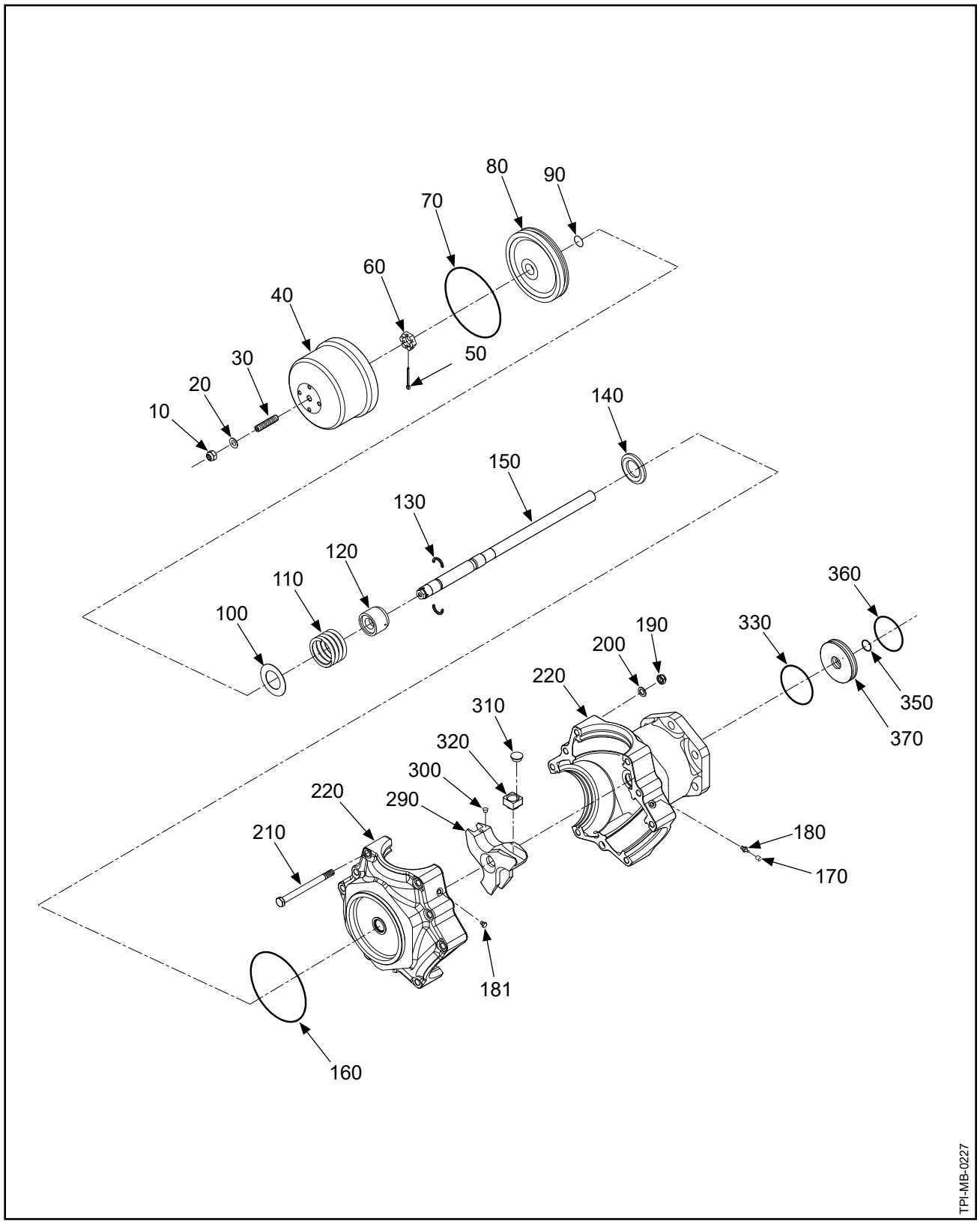
EFF CODE INFORMATION

- ITEM NOT ILLUSTRATED

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3C1-R430A1, CONTINUED				
10A-8		**R-FLANGE MOUNTING PARTS**				
		• (REFER TO "R-FLANGE MOUNTING PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
10A-1		**BLADE RETENTION PARTS**				
		• (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
N/A		**BALANCE PARTS**				
-800	B-3840-( )	• SCREW		A/R	Y	
-810	A-2424-( )	• BALANCE WEIGHT		A/R		
N/A		**SPINNER PARTS**				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC.APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFF CODE	INFORMATION

- ITEM NOT ILLUSTRATED



3C1-R619A1: Propeller Parts
Figure 10-3

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3C1-R619A1				
10-3		**PROPELLER PARTS**				
10	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		1	Y	
20	B-6747	• SEAL, WASHER		1	Y	
30	102472	• SCREW, SET, 3/8-24		1		
40	B-2428-3	• CYLINDER		1		
50	B-3838-3-5	• COTTER PIN		1	Y	
60	A-2211	• NUT, .718-20, CASTELLATED, THIN		1	Y	
70	C-3317-348-1	• O-RING (PISTON OD)		1	Y	
80	B-2419	• PISTON		1		
90	C-3317-018	• O-RING (PISTON ID)		1	Y	
100	106565	• SPRING SEAT		1		
110	106563	• SPRING, COMPRESSION		1		
120	101335-( )	• SLEEVE, STOP		1		
130	A-867	• PCP: KEEPER, SPLIT (STOP SLEEVE)		1	Y	PCP
140	106564	• GUIDE, SPRING		1		
150	A-2418-14	• ROD, PITCH CHANGE		1		
160	C-3317-247	• O-RING (CYLINDER)		1	Y	
170	B-6544	• CAP, FITTING, LUBRICATION		3	Y	
180	A-279	• FITTING, LUBRICATION (ENGINE-SIDE OF HUB)		3	Y	
181	106545	• PLUG, LUBRICATION (CYLINDER-SIDE OF HUB)		3	Y	
190	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		9	Y	
200	B-3834-0632	• WASHER		9	Y	
210	A-2432	• BOLT, 3/8-24, HEX HEAD		9		
220	105726-2	• PCP: HUB UNIT, 3C1-R619A1 (REFER TO "105726-(1,2) HUB UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
290	105732	• FORK, THREE BLADE ASSEMBLY		1		
300	A-3256	• • BUMPER, FORK		3	Y	
310	106136	• BUTTON, BLOCK, PITCH CHANGE		3	Y	
320	105733	• BLOCK, PITCH CHANGE		3		
330	A-5839-225	• RING, RETAINING, INTERNAL SPIRAL		1	Y	
350	C-3317-115-1	• O-RING (HUB PLUG ID)		1	Y	
360	C-3317-226	• O-RING (HUB PLUG OD)		1	Y	
370	A-2481	• PLUG, HUB		1		

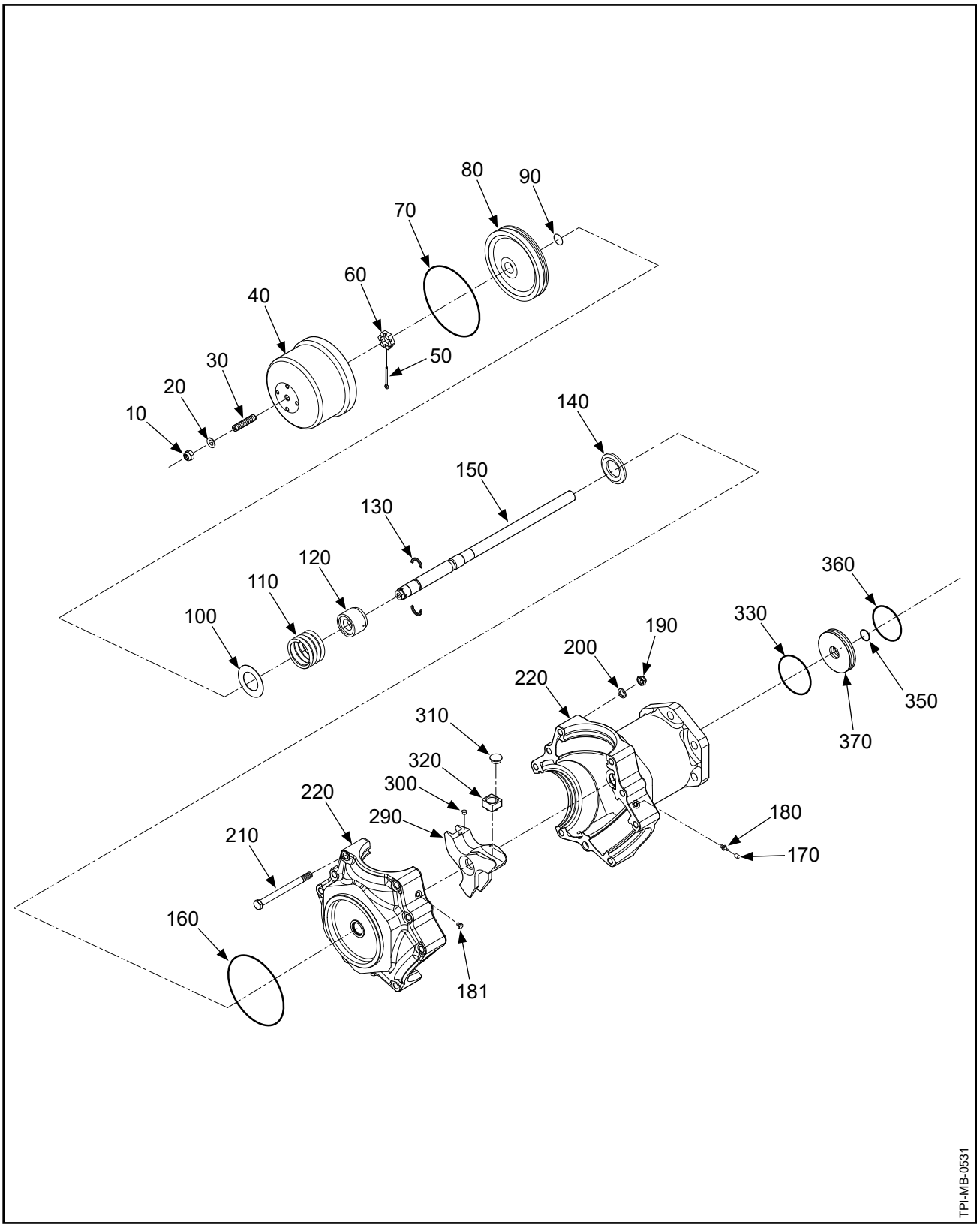
EFF CODE	INFORMATION

- ITEM NOT ILLUSTRATED

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3C1-R619A1, CONTINUED				
10A-8		**R-FLANGE MOUNTING PARTS**				
		• (REFER TO "R-FLANGE MOUNTING PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
10A-1		**BLADE RETENTION PARTS**				
		• (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
N/A		**BALANCE PARTS**				
-800	B-3840-( )	• SCREW		A/R	Y	
-810	A-2424-( )	• BALANCE WEIGHT		A/R		
N/A		**SPINNER PARTS**				
		• APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC.APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFF CODE INFORMATION

- ITEM NOT ILLUSTRATED



3C1-R919A1: Propeller Parts
Figure 10-4

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3C1-R919A1				
10-4		**PROPELLER PARTS**				
10	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		1	Y	
20	B-6747	• SEAL, WASHER		1	Y	
30	102472	• SCREW, SET, 3/8-24		1		
40	B-2428-3	• CYLINDER		1		
50	B-3838-3-5	• COTTER PIN		1	Y	
60	A-2211	• NUT, .718-20, CASTELLATED, THIN		1	Y	
70	C-3317-348-1	• O-RING (PISTON OD)		1	Y	
80	B-2419	• PISTON		1		
90	C-3317-018	• O-RING (PISTON ID)		1	Y	
100	106565	• SPRING SEAT		1		
110	106563	• SPRING, COMPRESSION		1		
120	101335-( )	• SLEEVE, STOP		1		
130	A-867	• PCP: KEEPER, SPLIT (STOP SLEEVE)		1	Y	PCP
140	106564	• GUIDE, SPRING		1		
150	A-2418-3	• ROD, PITCH CHANGE		1		
160	C-3317-247	• O-RING (CYLINDER)		1	Y	
170	B-6544	• CAP, FITTING, LUBRICATION		3	Y	
180	A-279	• FITTING, LUBRICATION (ENGINE-SIDE OF HUB)		3	Y	
181	106545	• PLUG, LUBRICATION (CYLINDER-SIDE OF HUB)		3	Y	
190	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		9	Y	
200	B-3834-0632	• WASHER		9	Y	
210	A-2432	• BOLT, 3/8-24, HEX HEAD		9		
220	105726	• PCP: HUB UNIT, 3C1-R919A1 (REFER TO "105726-(1,2) HUB UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
290	105732	• FORK, THREE BLADE ASSEMBLY		1		
300	A-3256	• • BUMPER, FORK		3	Y	
310	106136	• BUTTON, BLOCK, PITCH CHANGE		3	Y	
320	105733	• BLOCK, PITCH CHANGE		3		
330	A-5839-225	• RING, RETAINING, INTERNAL SPIRAL		1	Y	
350	C-3317-115-1	• O-RING (HUB PLUG ID)		1	Y	
360	C-3317-226	• O-RING (HUB PLUG OD)		1	Y	
370	A-2481	• PLUG, HUB		1		

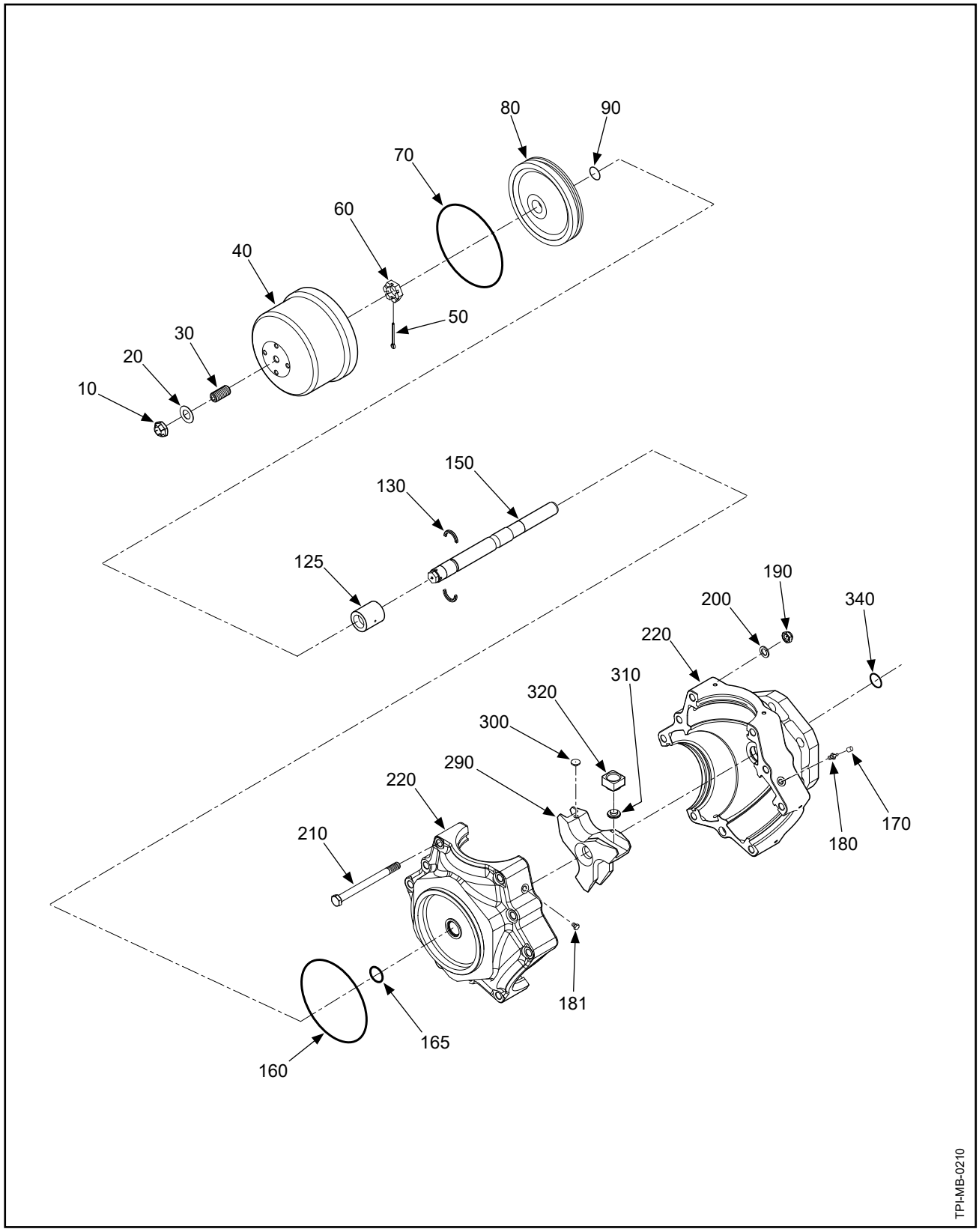
EFF CODE INFORMATION

- ITEM NOT ILLUSTRATED

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3C1-R919A1, CONTINUED				
10A-8		**R-FLANGE MOUNTING PARTS**				
		• (REFER TO "R-FLANGE MOUNTING PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
10A-1		**BLADE RETENTION PARTS**				
		• (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
N/A		**BALANCE PARTS**				
-800	B-3840-( )	• SCREW		A/R	Y	
-810	A-2424-( )	• BALANCE WEIGHT		A/R		
N/A		**SPINNER PARTS**				
		• APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC.APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFF CODE	INFORMATION

- ITEM NOT ILLUSTRATED



3C4-R430A1: Propeller Parts
Figure 10-5

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3C4-R430A1				
10-5		**PROPELLER PARTS**				
10	B-3807	• NUT, 5/8-18, HEX, SELF-LOCKING		1	Y	
20	B-3851-1032	• WASHER		1	Y	
30	A-4257	• SCREW, SET, 5/8-18, DRILLED		1		
40	B-2428-2	• CYLINDER		1		
50	B-3838-3-5	• COTTER PIN		1	Y	
60	A-2211	• NUT, .718-20, CASTELLATED, THIN		1	Y	
70	C-3317-348-1	• O-RING (PISTON OD)		1	Y	
80	B-2419	• PISTON		1		
90	C-3317-018	• O-RING (PISTON ID)		1	Y	
125	A-2420-( )	• COLLAR, STOP		1		
130	A-867	• PCP: KEEPER, SPLIT (STOP COLLAR)		1	Y	PCP
150	A-2418-8	• ROD, PITCH CHANGE		1		
160	C-3317-247	• O-RING (CYLINDER)		1	Y	
165	C-3317-210-1	• • O-RING (HUB-TO-PITCH CHANGE ROD)		1	Y	
170	B-6544	• CAP, FITTING, LUBRICATION		3	Y	
180	A-279	• FITTING, LUBRICATION (ENGINE-SIDE OF HUB)		3	Y	
181	106545	• PLUG, LUBRICATION (CYLINDER-SIDE OF HUB)		3	Y	
190	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		9	Y	
200	B-3834-0632	• WASHER		9	Y	
210	A-2432	• BOLT, 3/8-24, HEX HEAD		9		
220	106546	• PCP: HUB UNIT, 3C4-R430A1 (REFER TO "106546 HUB UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
290	105732	• FORK, THREE BLADE ASSEMBLY		1		
300	A-3256	• • BUMPER, FORK		3	Y	
310	106136	• BUTTON, BLOCK, PITCH CHANGE		3	Y	
320	105733	• BLOCK, PITCH CHANGE		3		
340	C-3317-115-1	• O-RING (HUB BUSHING ID)		1	Y	

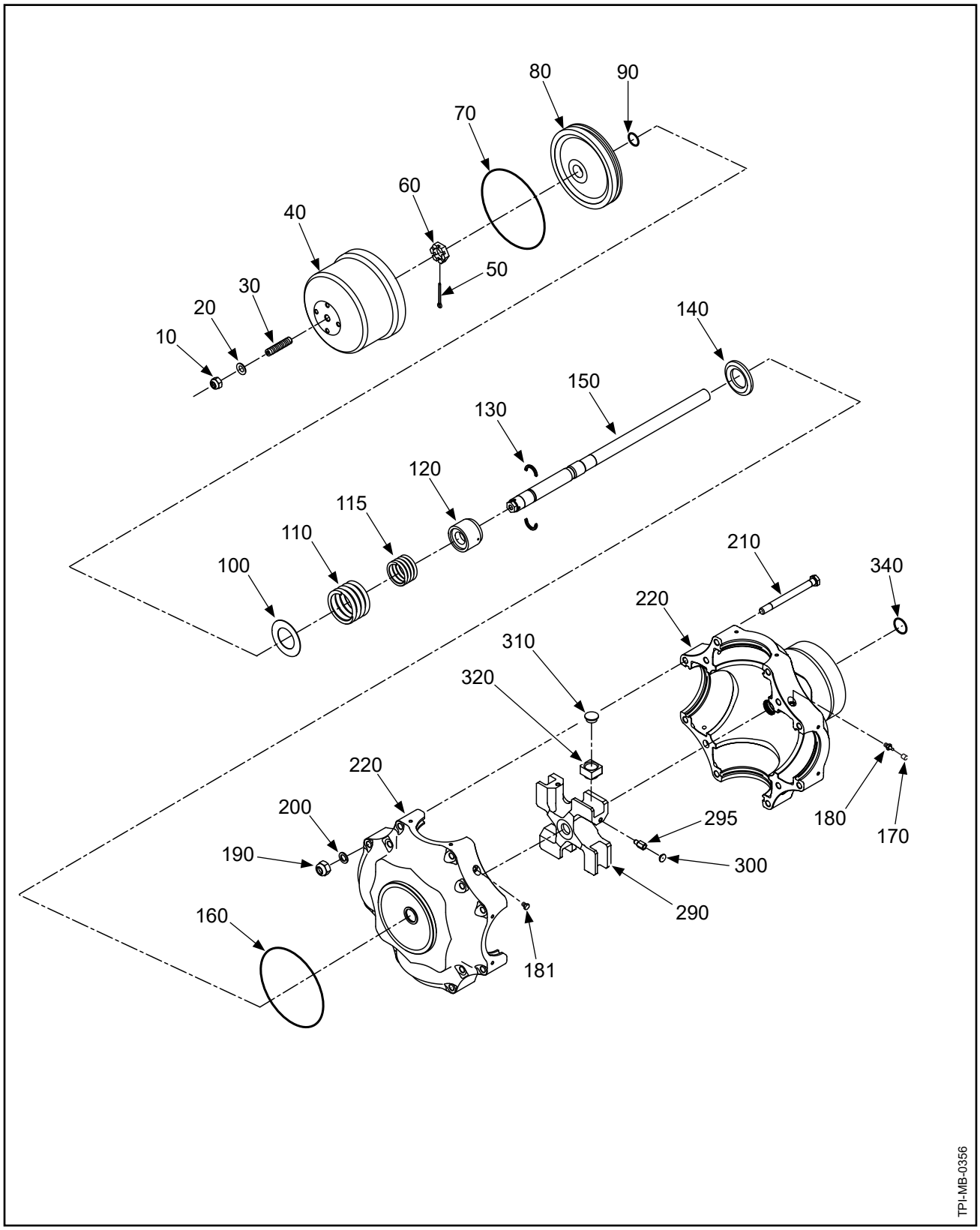
EFF CODE INFORMATION

- ITEM NOT ILLUSTRATED

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3C4-R430A1, CONTINUED				
10A-8		**R-FLANGE MOUNTING PARTS**				
		• (REFER TO "R-FLANGE MOUNTING PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
10A-1		**BLADE RETENTION PARTS**				
		• (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
N/A		**BALANCE PARTS**				
-800	B-3840-( )	• SCREW		A/R	Y	
-810	A-2424-( )	• BALANCE WEIGHT		A/R		
N/A		**SPINNER PARTS**				
		• APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC.APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				
N/A		**COUNTERWEIGHTS/MOUNTING BOLTS**				
-2000		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER 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				
N/A		**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 PART (PCP) IDENTIFICATION				

EFF CODE INFORMATION

- ITEM NOT ILLUSTRATED



4C1-F650A1: Propeller Parts
Figure 10-6

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		4C1-F650A1				
10-6		**PROPELLER PARTS**				
10	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		1	Y	
20	B-6747	• SEAL, WASHER		1	Y	
30	102472	• SCREW, SET, 3/8-24		1		
40	B-2428-3	• CYLINDER		1		
50	B-3838-3-5	• COTTER PIN		1	Y	
60	A-2211	• NUT, .718-20, CASTELLATED, THIN		1	Y	
70	C-3317-348-1	• O-RING (PISTON OD)		1	Y	
80	B-2419	• PISTON		1		
90	C-3317-018	• O-RING (PISTON ID)		1	Y	
100	106565	• SPRING SEAT		1		
110	106563	• SPRING, COMPRESSION		1		
115	107426	• SPRING, COMPRESSION		1		
120	101335-( )	• SLEEVE, STOP		1		
130	A-867	• PCP: KEEPER, SPLIT (STOP SLEEVE)		1	Y	PCP
140	106564	• GUIDE, SPRING		1		
150	A-2418-17	• ROD, PITCH CHANGE		1		
160	C-3317-247	• O-RING (CYLINDER)		1	Y	
170	B-6544	• CAP, FITTING, LUBRICATION		4	Y	
180	A-279	• FITTING, LUBRICATION (ENGINE-SIDE OF HUB)		4	Y	
181	106545	• PLUG, LUBRICATION (CYLINDER-SIDE OF HUB)		4	Y	
190	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		12	Y	
200	B-3834-0632	• WASHER		12	Y	
210	A-2432	• BOLT, 3/8-24, HEX HEAD		12		
220	107402-1	• PCP: HUB UNIT, 4C1-F650A1 (REFER TO "107402-1 HUB UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
290	107378	• FORK, FOUR BLADE ASSEMBLY		1		
295	B-468-2	• • EXTENSION, BUMPER		4		
300	A-3256	• • BUMPER, FORK		4	Y	
310	106136	• BUTTON, BLOCK, PITCH CHANGE		4	Y	
320	105733	• BLOCK, PITCH CHANGE		4		
340	C-3317-115-1	• O-RING (HUB BUSHING ID)		1	Y	

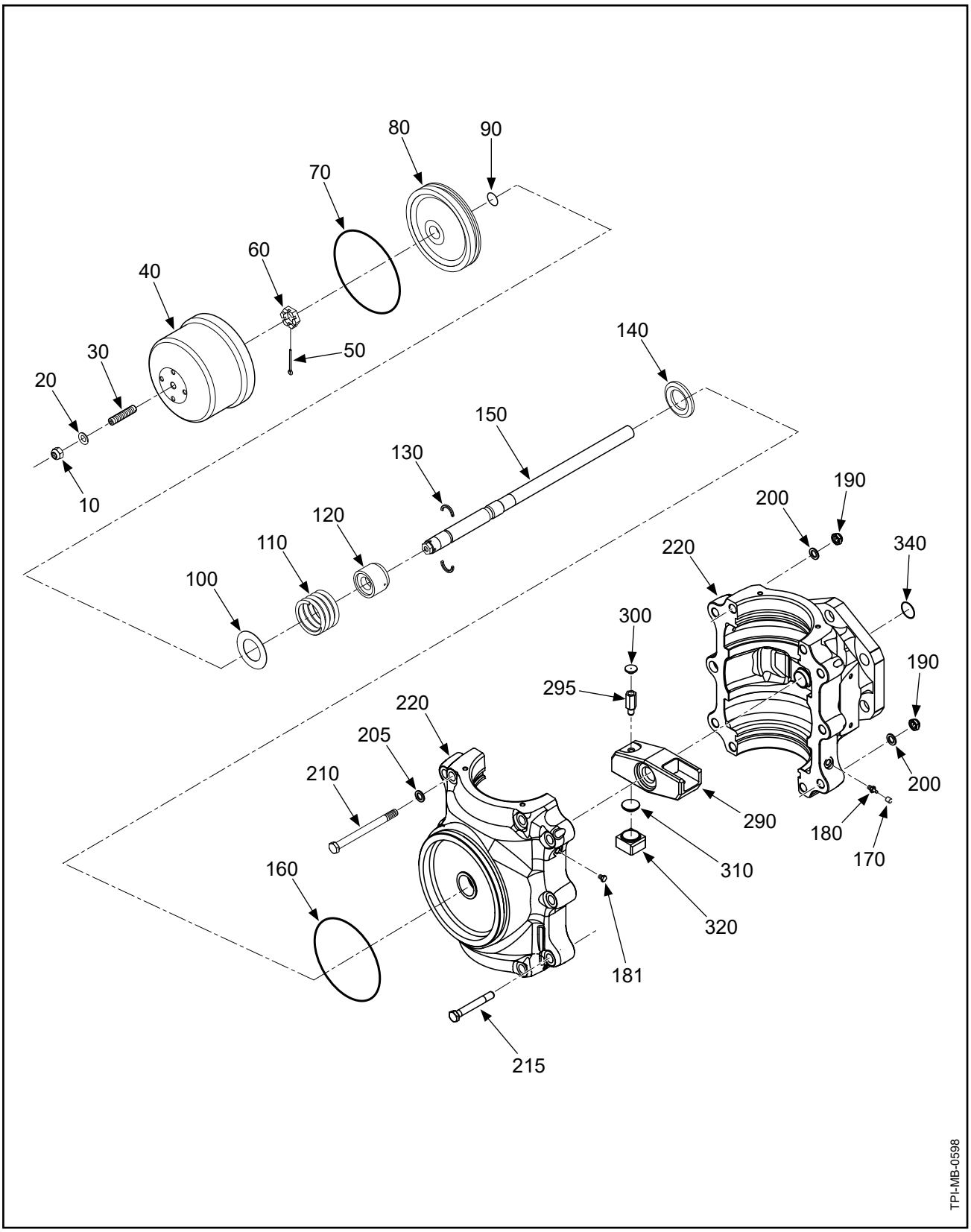
EFF CODE	INFORMATION

- ITEM NOT ILLUSTRATED

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		4C1-F650A1, CONTINUED				
10A-8		**F-FLANGE MOUNTING PARTS**				
		• (REFER TO "F-FLANGE MOUNTING PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
10A-1		**BLADE RETENTION PARTS**				
		• (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
N/A		**BALANCE PARTS**				
-800	B-3840-( )	• SCREW		A/R	Y	
-810	A-2424A-( )	• BALANCE WEIGHT		A/R		
N/A		**SPINNER PARTS**				
		• APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC.APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFF CODE INFORMATION

- ITEM NOT ILLUSTRATED



2C1-R419A1: Propeller Parts
Figure 10-7

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		2C1-R419A1				
10-7		**PROPELLER PARTS**				
10	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		1	Y	
20	B-6747	• SEAL, WASHER		1	Y	
30	102472	• SCREW, SET, 3/8-24		1		
40	B-2428-1	• CYLINDER		1		
50	B-3838-3-5	• COTTER PIN		1	Y	
60	A-2211	• NUT, .718-20, CASTELLATED, THIN		1	Y	
70	C-3317-348-1	• O-RING (PISTON OD)		1	Y	
80	B-2419	• PISTON		1		
90	C-3317-018	• O-RING (PISTON ID)		1	Y	
100	101430	• SPRING SEAT		1		
110	101330	• SPRING, COMPRESSION		1		
120	101335-( )	• SLEEVE, STOP		1		
130	A-867	• PCP: KEEPER, SPLIT (STOP SLEEVE)		1	Y	PCP
140	101378	• GUIDE, SPRING		1		
150	A-2418-15	• ROD, PITCH CHANGE		1		
160	C-3317-247	• O-RING (CYLINDER)		1	Y	
170	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
180	A-279	• FITTING, LUBRICATION (ENGINE-SIDE OF HUB)		2	Y	
181	106545	• PLUG, LUBRICATION (CYLINDER-SIDE OF HUB)		2	Y	
190	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		10	Y	
200	B-3834-0632	• WASHER		10	Y	
205	B-3834-0663	• WASHER		4	Y	
210	A-2432	• BOLT, 3/8-24, HEX HEAD		4		
215	A-2431	• BOLT, 3/8-24, HEX HEAD		6		
220	108448	• PCP: HUB UNIT, 2C1-R419A1 (REFER TO "108448 HUB UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
290	108469	• FORK, TWO BLADE		1		
295	B-468	• EXTENSION, BUMPER		2		
300	A-3256	• BUMPER, FORK		2	Y	
310	106136	• BUTTON, BLOCK, PITCH CHANGE		2	Y	
320	105733	• BLOCK, PITCH CHANGE		2		
340	C-3317-115-1	• O-RING (HUB BUSHING ID)		1	Y	

EFF CODE INFORMATION

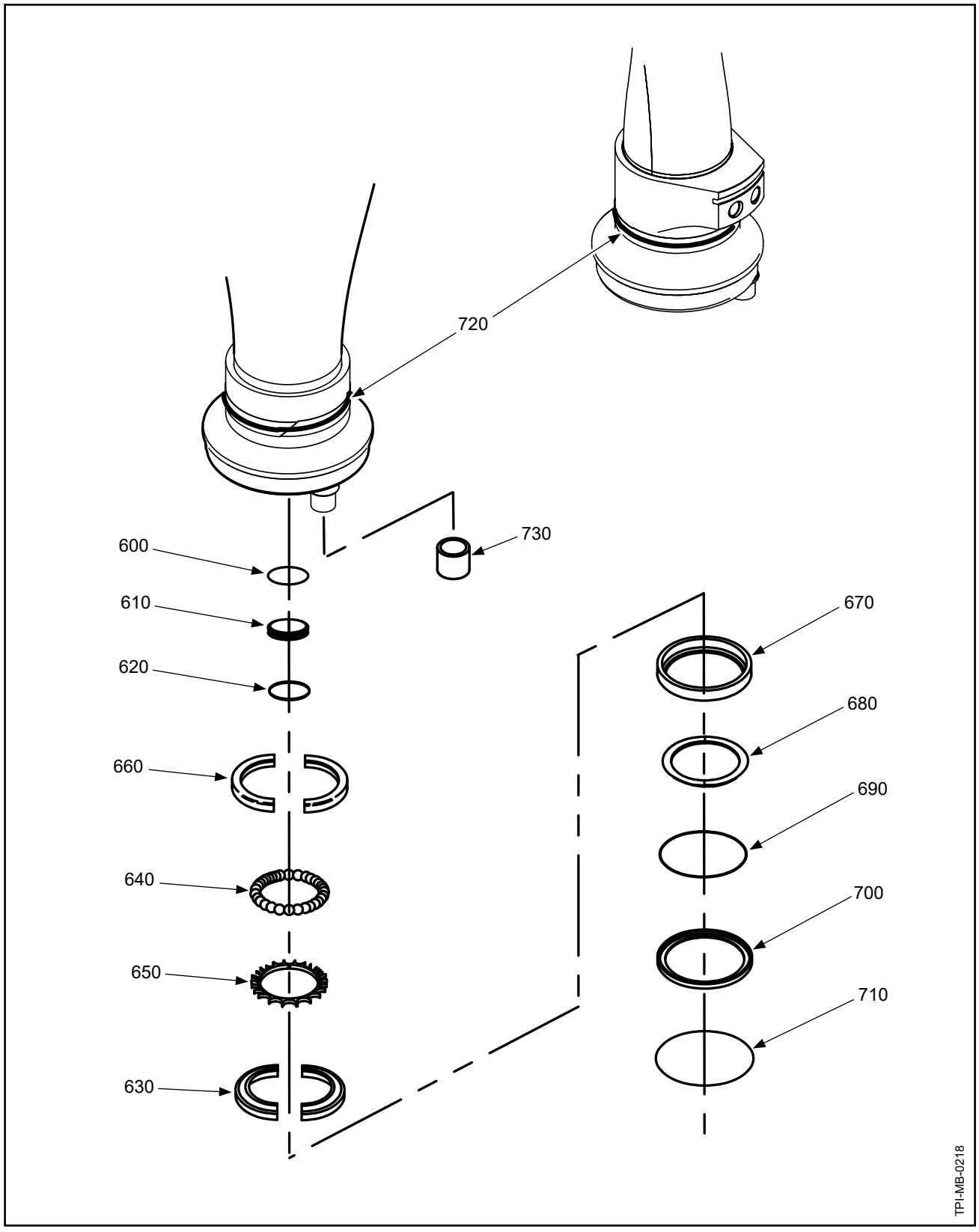
- ITEM NOT ILLUSTRATED

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		2C1-R419A1, CONTINUED				
10A-8		**R-FLANGE MOUNTING PARTS**				
		• (REFER TO "R-FLANGE MOUNTING PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
10A-1		**BLADE RETENTION PARTS**				
		• (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
N/A		**BALANCE PARTS**				
-800	B-3840-( )	• SCREW		A/R	Y	
-810	A-2424-( )	• BALANCE WEIGHT		A/R		
N/A		**SPINNER PARTS**				
		• APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC.APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				
N/A		**COUNTERWEIGHTS/MOUNTING BOLTS**				
-2000		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER 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				
N/A		**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 PART (PCP) IDENTIFICATION				

EFF CODE INFORMATION

- ITEM NOT ILLUSTRATED

SUB-ASSEMBLY
PARTS LISTS and FIGURES



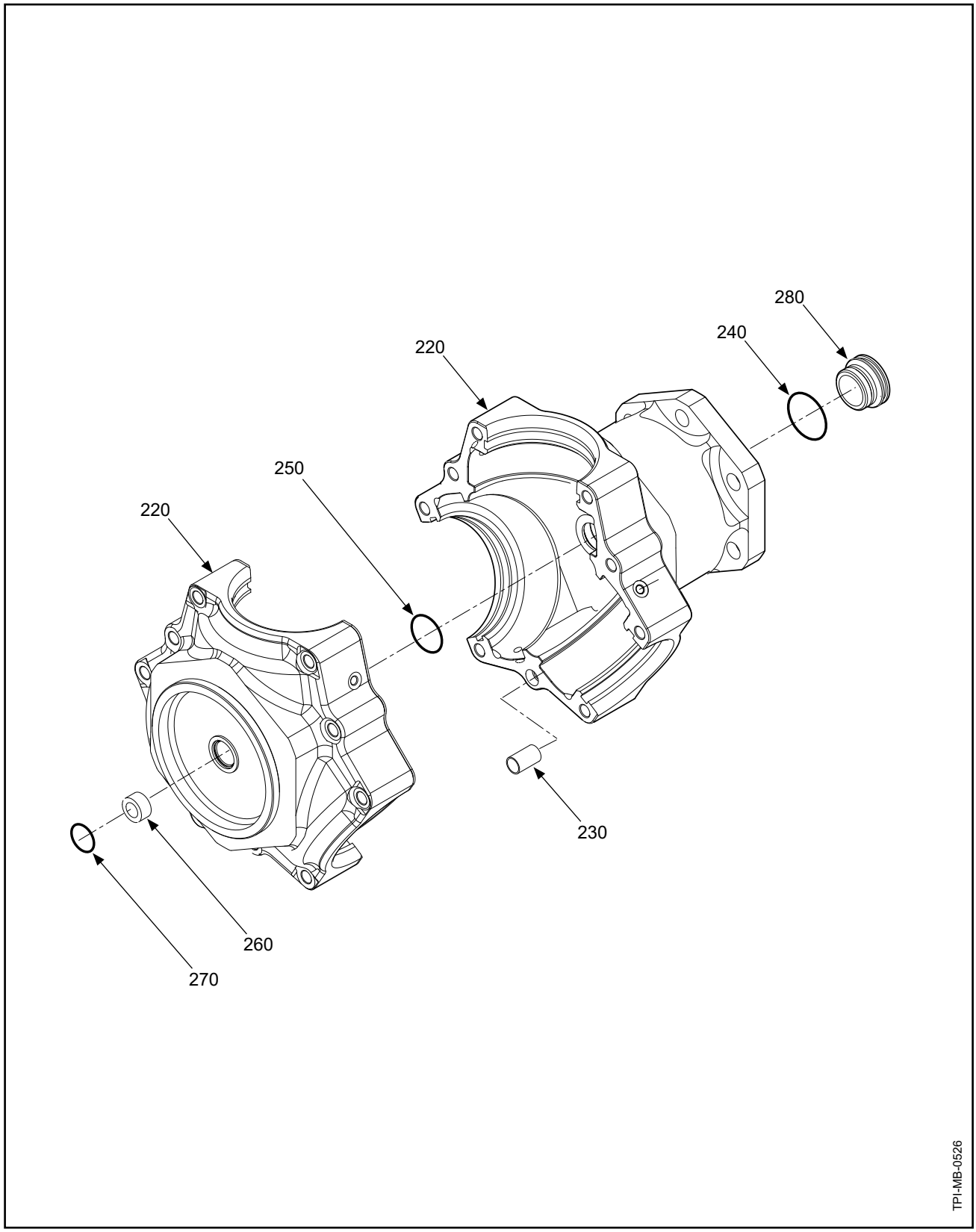
Blade Retention Parts
Figure 10A-1

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-1		**BLADE RETENTION PARTS** **All quantities (UPA) in this parts list are per blade assembly.**				
600	C-3317-028	O-RING (BLADE PLUG)		1	Y	
610	106048	PLUG, BLADE		1		
620	A-5839-156	RING, RETAINING, INTERNAL SPIRAL (BLADE PLUG)		1	Y	
630	C-792-B	RACE, BLADE SIDE		1		
640	B-6144-1	BALL, BEARING, 3/8" DIA		33	Y	
650	B-793	BALL SPACER		1	Y	
660	C-792-A	RACE, HUB SIDE		1		
670	101512	RING, RETAINING, BEARING		1		
680	105758-( )	SHIM, BLADE		1		
690	C-3317-246	O-RING (BLADE SEAL ID)		1	Y	
700	106117	SEAL, BLADE (REPLACED BY ITEM 700A)	B	1		
700A	106117	SEAL, BLADE (REPLACES ITEM 700, POST HC-SB-61-377)	C	1		
700B	107223	SEAL, BLADE (ALTERNATE FOR ITEM 700A, POST HC-SB-61-377)		1		
710	C-3317-158	O-RING (BLADE SEAL OD)		1	Y	
720	C-3317-341-8	O-RING		1	Y	
730	105731	BUSHING, KNOB, PITCH CHANGE		1	Y	

EFF CODE	INFORMATION
B	106117 Blade Seals identified as "Rev. B" or before
C	106117 Blade Seals identified as "Rev. C" or later

- ITEM NOT ILLUSTRATED

Blade Retention Parts



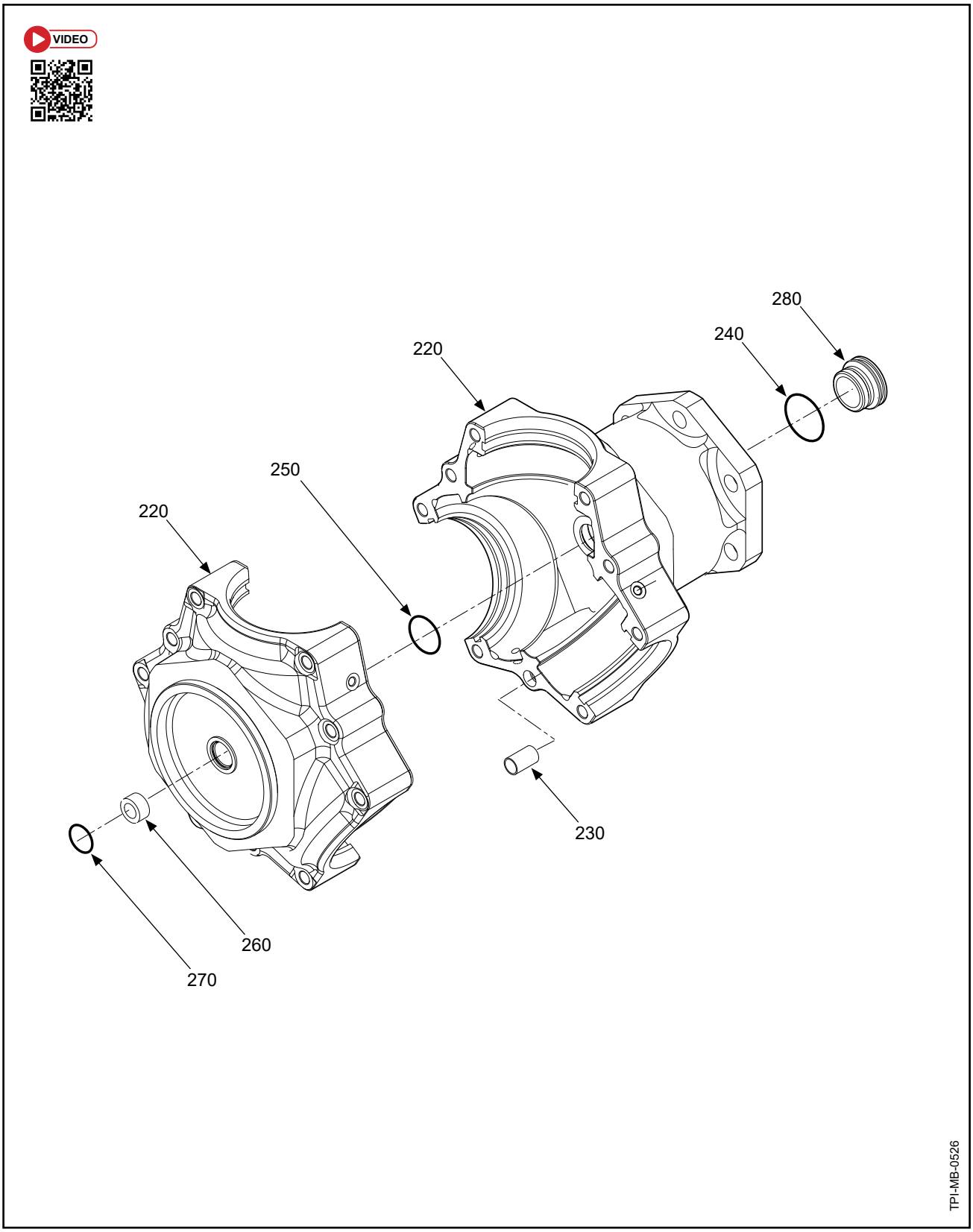
105726-(1,2) Hub Unit
Figure 10A-2

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-2		**105726-(1,2) HUB UNIT PARTS**				
220	105726	PCP: HUB UNIT, 3C1-R919A1		1		PCP
	105726-1	PCP: HUB UNIT, 3C1-R430A1		1		PCP
	105726-2	PCP: HUB UNIT, 3C1-R619A1		1		PCP
230	A-2249	• HUB BUSHING, GUIDE		1	Y	
240	C-3317-021-1	• O-RING (BUSHING-TO-HUB)		1	Y	
250	A-6153-87	• RING, RETAINING, EXTERNAL SPIRAL		1	Y	
260	A-2245-2	• HUB BUSHING, ROD (CYLINDER-SIDE)		1	Y	
270	A-5839-87	• RING, RETAINING, INTERNAL SPIRAL		1	Y	
280	105870	• HUB BUSHING, ROD (ENGINE-SIDE)	A	1		
	103434-2	• HUB BUSHING, ROD (ENGINE-SIDE)	B			

EFF CODE	INFORMATION
A	Used with 105726 and 105726-2 Hub Units only
B	Used with 105726-1 Hub Units only

- ITEM NOT ILLUSTRATED

105726-(1,2) Hub Units

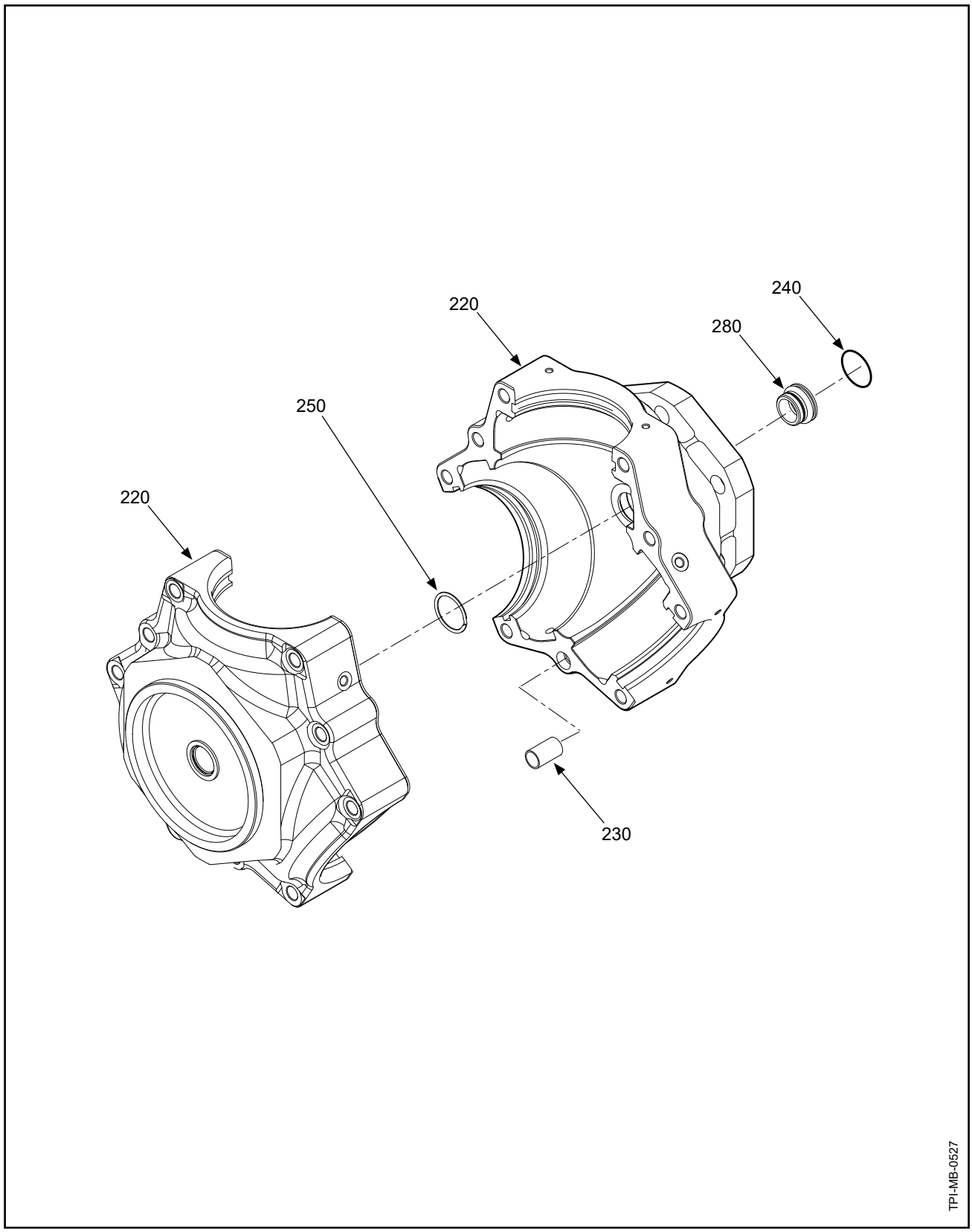


106153 Hub Unit
Figure 10A-3

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-3		**106153 HUB UNIT PARTS**				
220	106153	PCP: HUB UNIT, 3C1-L675A1		1		PCP
230	A-2249	• HUB BUSHING, GUIDE		1	Y	
240	C-3317-021-1	• O-RING (BUSHING-TO-HUB)		1	Y	
250	A-6153-87	• RING, RETAINING, EXTERNAL SPIRAL		1	Y	
260	A-2245-2	• HUB BUSHING, ROD (CYLINDER-SIDE)		1	Y	
270	A-5839-87	• RING, RETAINING, INTERNAL SPIRAL		1	Y	
280	103434-2	• HUB BUSHING, ROD (ENGINE-SIDE)		1		

EFF CODE	INFORMATION

- ITEM NOT ILLUSTRATED

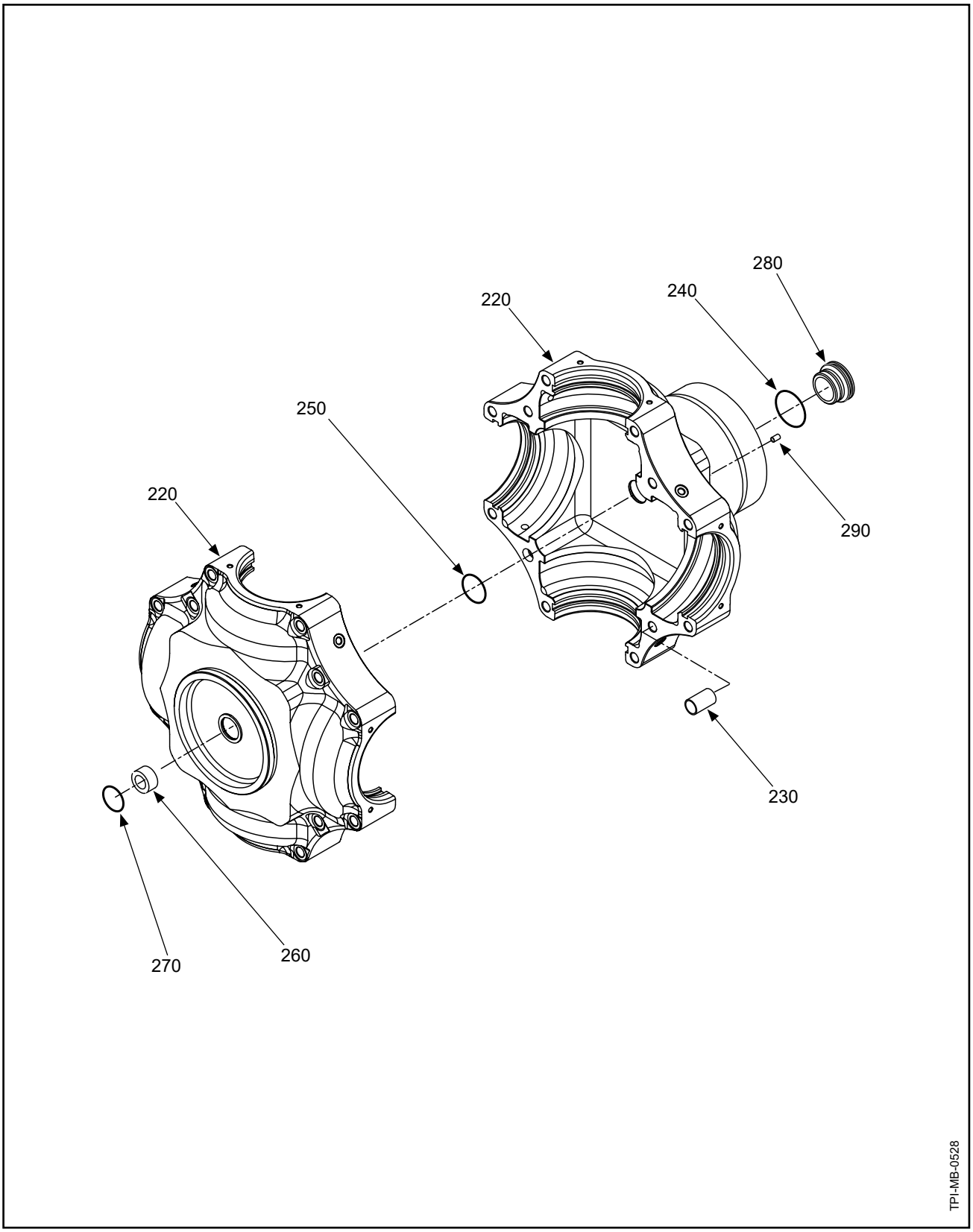


106546 Hub Unit
Figure 10A-4

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-4		**106546 HUB UNIT PARTS**				
220	106546	PCP: HUB UNIT, 3C4-R430A1		1		PCP
230	A-2249	• HUB BUSHING, GUIDE		1	Y	
240	C-3317-021-1	• O-RING (BUSHING-TO-HUB)		1	Y	
250	A-6153-87	• RING, RETAINING, EXTERNAL SPIRAL		1	Y	
280	103434-2	• HUB BUSHING, ROD (ENGINE-SIDE)		1		

EFF CODE	INFORMATION

- ITEM NOT ILLUSTRATED

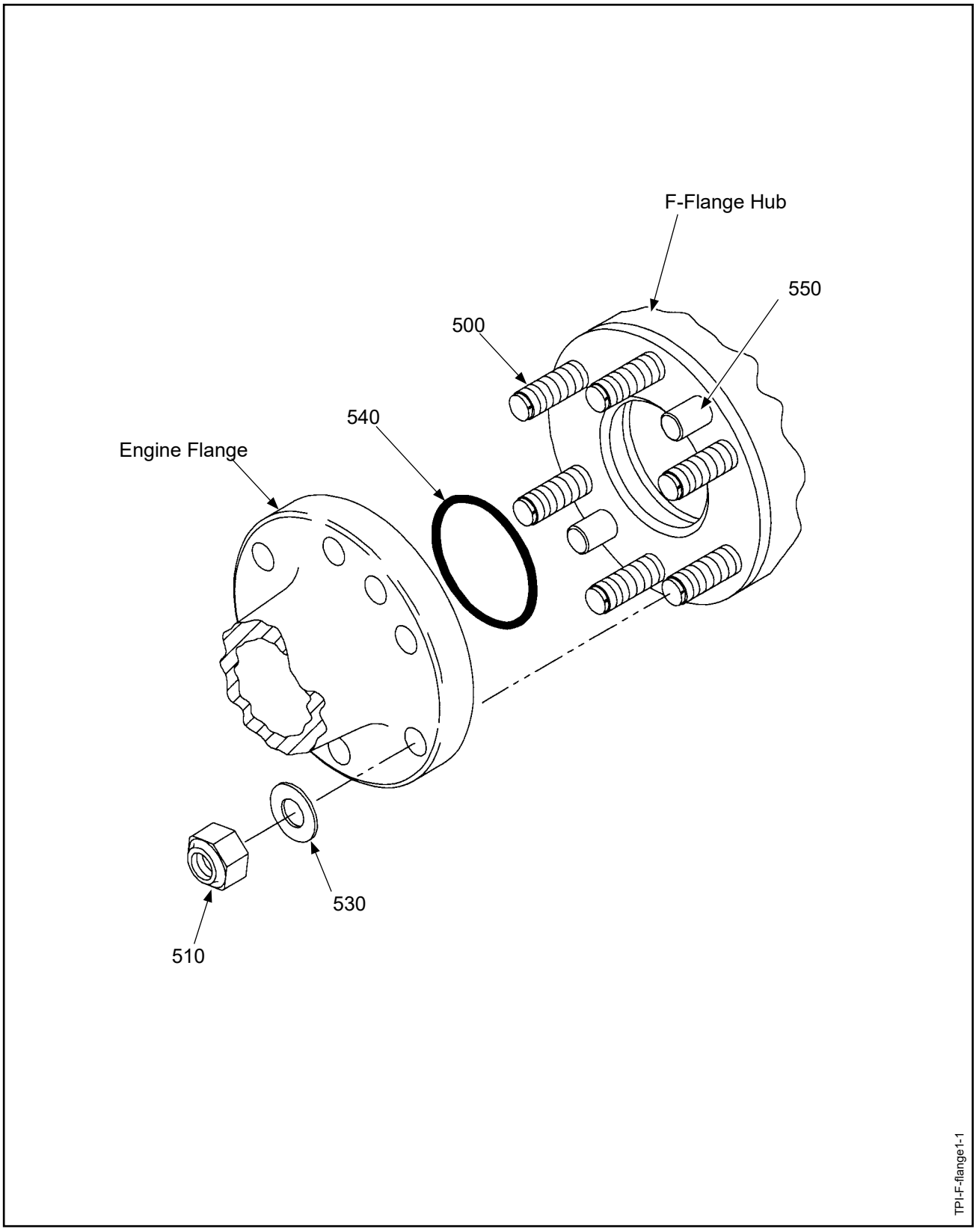


107402-1 Hub Unit
Figure 10A-5

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-5		**107402-1 HUB UNIT PARTS**				
220	107402-1	PCP: HUB UNIT, 4C1-F650A1		1		PCP
230	A-2249	• HUB BUSHING, GUIDE		1	Y	
240	C-3317-021-1	• O-RING (BUSHING-TO-HUB)		1	Y	
250	A-6153-87	• RING, RETAINING, EXTERNAL SPIRAL		1	Y	
260	A-2245-2	• HUB BUSHING, ROD (CYLINDER-SIDE)		1	Y	
270	A-5839-87	• RING, RETAINING, INTERNAL SPIRAL		1	Y	
280	103434-2	• HUB BUSHING, ROD (ENGINE-SIDE)		1		
290	B-6584-15	• INSERT, 10-32, CRES, COILED		8	Y	

EFF CODE	INFORMATION

- ITEM NOT ILLUSTRATED



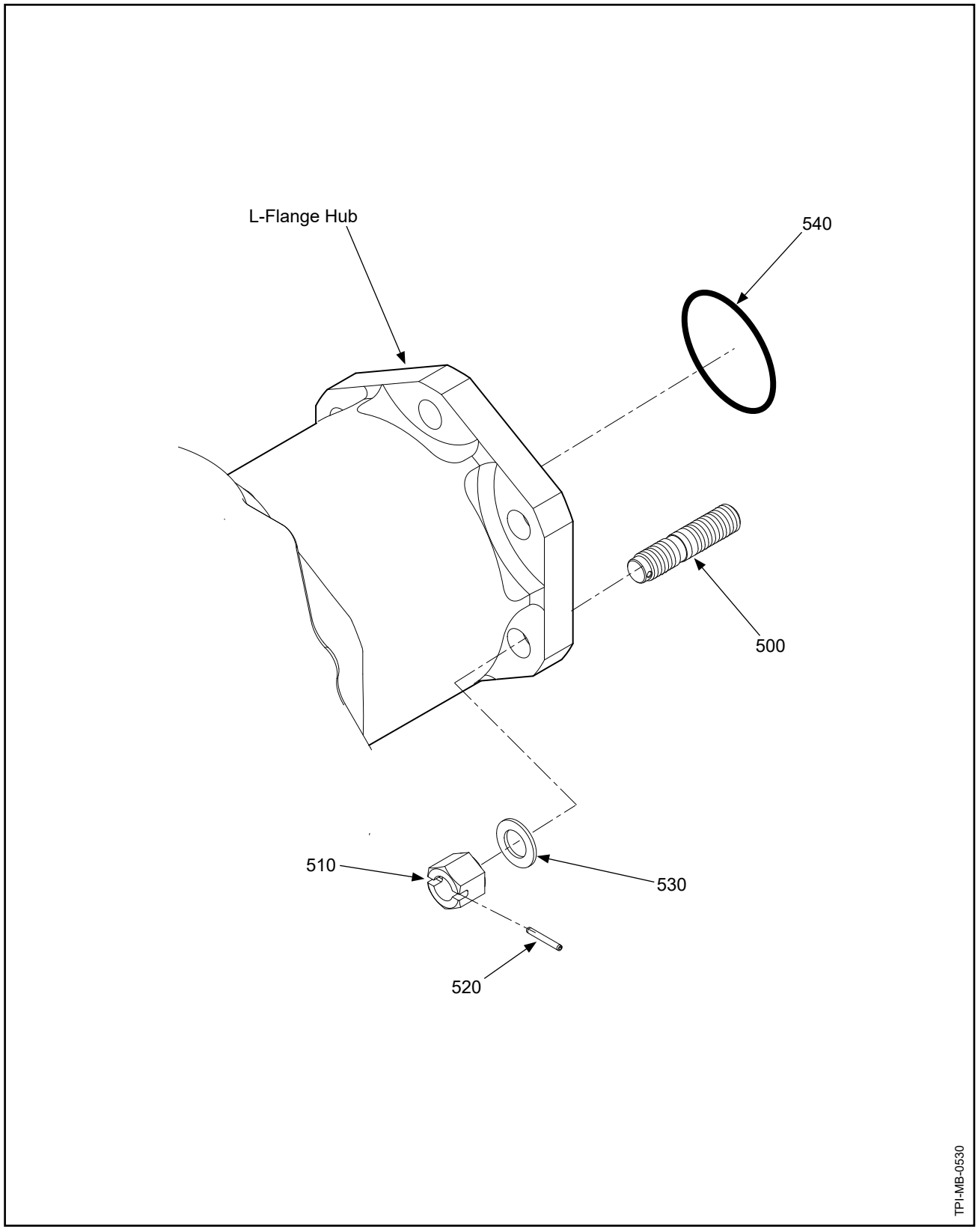
F-Flange Mounting Parts
Figure 10A-6

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-6		**F-FLANGE MOUNTING PARTS**				
500	A-2429-4	STUD, MOUNTING, 1/2-20		6	Y	
510	A-2044	NUT, 1/2-20, HEX, SELF-LOCKING		6	Y	
530	A-1381	WASHER, 1/2" CRES		6	Y	
540	C-3317-228	O-RING (MOUNTING)		1	Y	
550	B-6138-8-9	DOWEL PIN		2	Y	

EFF CODE INFORMATION

- ITEM NOT ILLUSTRATED

F-Flange Mounting Parts



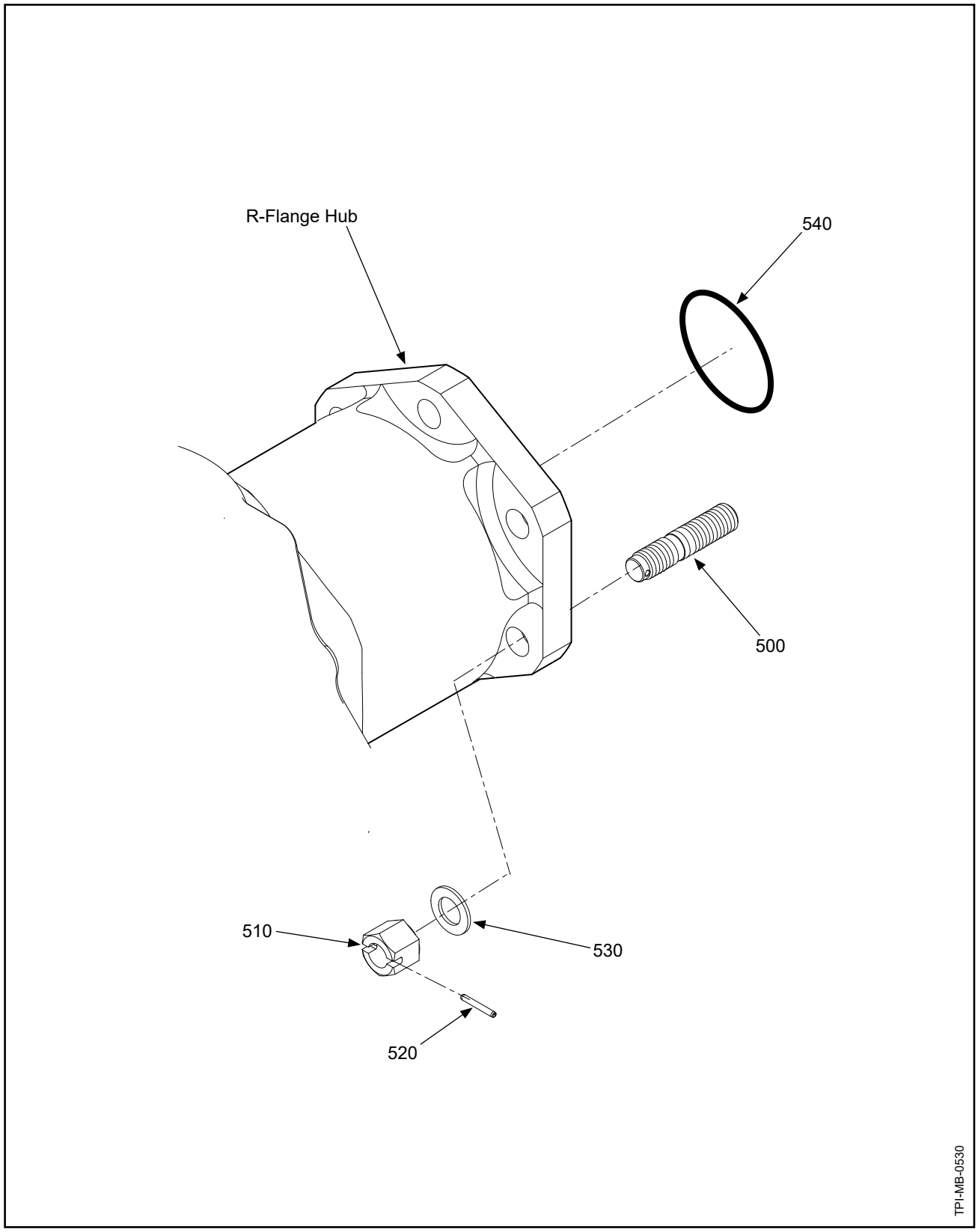
L-Flange Mounting Parts
Figure 10A-7

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-7		**L-FLANGE MOUNTING PARTS**				
500	A-2247-1	STUD, MOUNTING, 7/16-20, DRILLED		6	Y	
510	A-2498	NUT, 7/16-20, CASTELLATED		6	Y	
520	B-3842-0625	SPRING PIN, 3/32", CRES		6	Y	
530	A-2482	WASHER, MOUNTING		6	Y	
540	C-3317-228	O-RING, MOUNTING		1	Y	

EFF CODE INFORMATION

- ITEM NOT ILLUSTRATED

L-Flange Mounting Parts



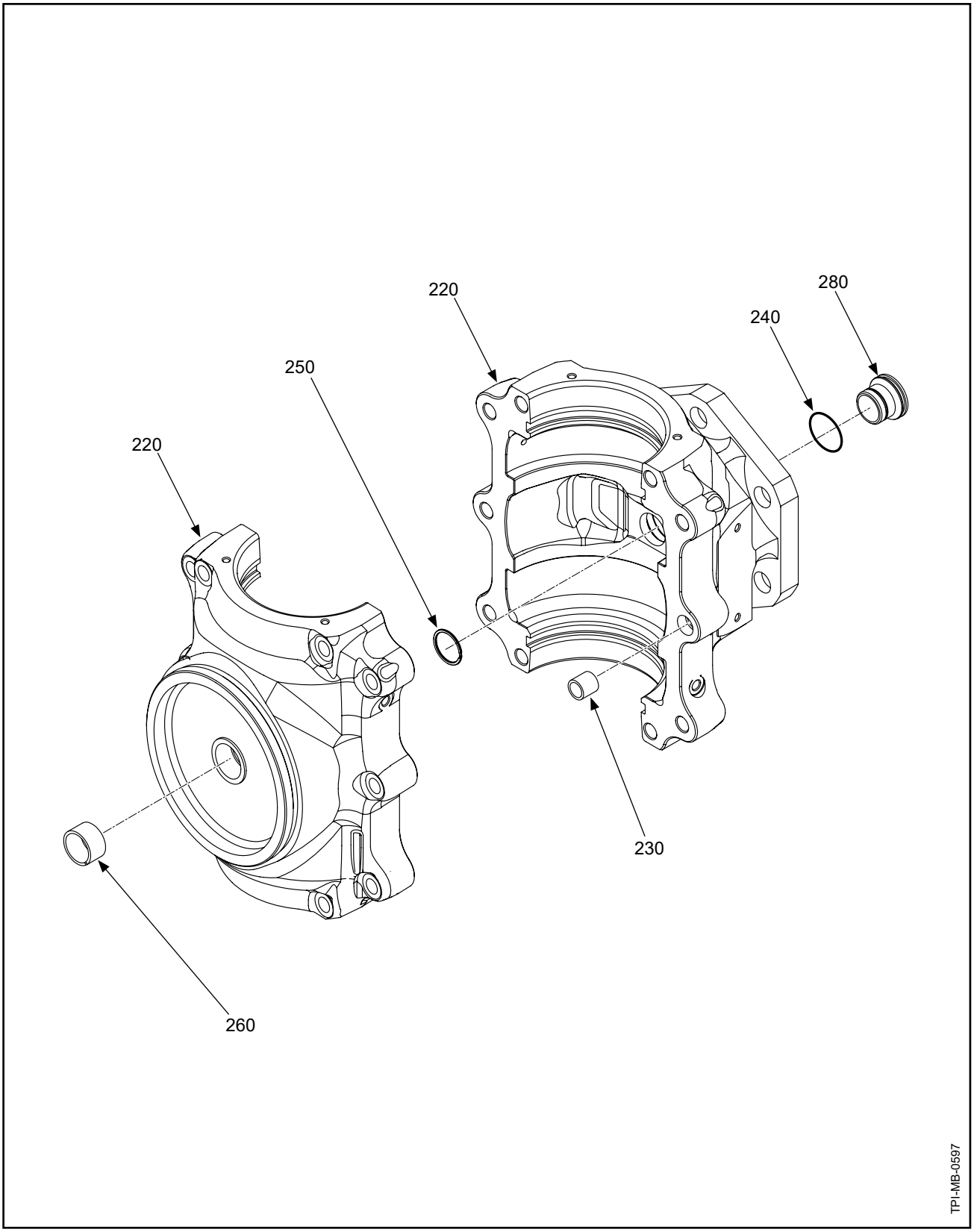
R-Flange Mounting Parts
Figure 10A-8

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-8		**R-FLANGE MOUNTING PARTS**				
500	A-2067	STUD, MOUNTING, 1/2-20		6	Y	
510	A-2069	NUT, MOUNTING, CASTELLATED		6	Y	
520	B-3842-0750	SPRING PIN, 3/32", CRES		6	Y	
530	A-1381	WASHER, 1/2" CRES		6	Y	
540	C-3317-228	O-RING (MOUNTING)		1	Y	

EFF CODE INFORMATION

- ITEM NOT ILLUSTRATED

R-Flange Mounting Parts



108448 Hub Unit
Figure 10A-9

FIG/ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-9		**108448 HUB UNIT PARTS**				
220	108448	PCP: HUB UNIT, 2C1-R419A1		1		PCP
230	A-2249	• HUB BUSHING, GUIDE		1	Y	
240	C-3317-021-1	• O-RING (BUSHING-TO-HUB)		1	Y	
250	A-6153-81	• RING, RETAINING, EXTERNAL SPIRAL		1	Y	
260	A-2245-2	• HUB BUSHING, ROD (CYLINDER-SIDE)		1	Y	
280	103433	• HUB BUSHING, ROD (ENGINE-SIDE)		1		

EFF CODE INFORMATION

- ITEM NOT ILLUSTRATED

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