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MANUAL REVISION TRANSMITTAL
Manual 157 (61-10-57)
Five Blade Lightweight Turbine
Propeller Overhaul Manual

REVISION 8 dated May 2023

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

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

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

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Manual No. 157
61-10-57
Revision 8
May 2023

Five Blade Lightweight Turbine Propeller Overhaul Manual

HC-E5A-2

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REVISION 8 HIGHLIGHTS

Revision 8, dated May 2023, incorporates the following:

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

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

Revised the titles of Hartzell Propeller Inc. Aluminum Blade Maintenance Manual 133C and Hartzell Propeller Inc. Composite Propeller Blade Maintenance Manual 135F to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C and Hartzell Propeller Inc. Composite Blade Overhaul Manual 135F where applicable

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

- CHECK
  - Revised the section, "Ring, Cylinder Mounting"
  - Revised the section, "Pitch Change Rod"
  - Revised the section, "Hub Unit"
  - Removed Figure 5-16, "Hub Unit and Hub Bolt"
  - Revised the section, "Hex Head Bolt"
  - Revised the section, "Ring, Mounting Bolt"
  - Revised the section, "Fork"
  - Revised the section, "Plate, Fork"
  - Revised Figure 5-23, "Adapter Plate Unit"
  - Revised the section, "Adapter Plate Unit"
- ASSEMBLY
  - Revised the section, "Leak Test"
- FITS AND CLEARANCES
  - Revised the section, "Torque Values"
  - Revised the section, "Blade Tolerances"
  - Removed Table 8-2, "Blade Tolerances"
- ILLUSTRATED PARTS LIST
  - Revised the parts list for the HC-E5A-2( ) Propeller Assembly

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REVISION 8 HIGHLIGHTS

1. Introduction

   A. General

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

   B. Components

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

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

      (3) Comments indicates the level of the revision.

         (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
New Issue	Apr/05	New Issue
Revision 1	Oct/09	Minor Revision
Revision 2	Feb/13	Minor Revision
Revision 3	Aug/17	Minor Revision
Revision 4	Apr/19	Minor Revision
Revision 5	Mar/20	Minor Revision
Revision 6	Dec/20	Minor Revision
Revision 7	Mar/22	Minor Revision
Revision 8	May/23	Major Revision

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RECORD OF REVISIONS

This is a record of revisions inserted into this manual.
Revision 8 includes all prior revisions.

Revision Number	Issue Date	Date Inserted	Inserted By
8	May/23	May/23	HPI

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RECORD OF TEMPORARY REVISIONS TO THIS MANUAL

Update this page to show all Temporary Revisions inserted into this manual.
Revision 8 includes all prior temporary revisions, up to and including TR-009.

Temporary Revision No.	Section/ Page	Issue Date	Date Inserted	Inserted By	Date Removed	Removed By
TR-010	5-37	Jul/23	Jul/23	HPI		

RECORD OF TEMPORARY REVISIONS TO THIS MANUAL

Update this page to show all Temporary Revisions inserted into this manual.
Revision 8 includes all prior temporary revisions, up to and including TR-009.

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

SERVICE DOCUMENT LIST

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

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

Service Document Number	Incorporation Rev./Date
Service Bulletins:	
HC-SB-61-320	Rev. 2, Feb/13
HC-SB-61-320, Rev. 3	Rev. 3, Aug/17
HC-SB-61-321	Rev. 2, Feb/13
HC-SB-61-339, Rev. 1	Rev. 2, Feb/13
HC-SB-61-339, Rev. 2	Rev. 3, Aug/17
HC-SB-61-345	Rev. 3, Aug/17
HC-SB-61-350	Rev. 3, Aug/17
HC-SB-61-374	Rev. 7, Mar/22
HC-SB-61-392, Rev. 1	Rev. 7, Mar/22

Service Document Number	Incorporation Rev./Date
Service Letters:	
HC-SL-61-187	Rev. 1, Oct/09
HC-SL-61-271	Rev. 1, Oct/09
HC-SL-61-304, Rev. 1	Rev. 2, Feb/13
HC-SL-61-354	Rev. 3, Aug/17
Service Instructions:	
SI 152A	Orig., Apr/05

SERVICE DOCUMENT LIST

Service Document Number	Incorporation Rev./Date

Service Document Number	Incorporation Rev./Date

AIRWORTHINESS LIMITATIONS

1. Airworthiness Limitations

   A. Life Limits

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

      (2) For airworthiness limitations information, refer to Hartzell Propeller Inc. Owner's Manual 147 (61-00-47).

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LIST OF EFFECTIVE PAGES

Chapter	Page	Revision Level	Date
Cover and Inside Cover	Cover and Inside Cover	Rev. 8	May/23
Revision Highlights	1 thru 4	Rev. 8	May/23
Record of Revisions	1 and 2	Rev. 8	May/23
Record of Temporary Revisions	1 and 2	Rev. 8	May/23
Service Document List	1 and 2	Rev. 8	May/23
Airworthiness Limitations	1 and 2	Rev. 8	May/23
List of Effective Pages	1 and 2	Rev. 8	May/23
Table of Contents	1 and 2	Rev. 8	May/23
Introduction	1 thru 22	Rev. 8	May/23
Description and Operation	1 thru 4	Rev. 8	May/23
Testing and Fault Isolation	1-1 thru 1-12	Rev. 8	May/23
Automatic Test Requirements	2-1 and 2-2	Rev. 8	May/23
Disassembly	3-1 thru 3-12	Rev. 8	May/23
Cleaning	4-1 thru 4-4	Rev. 8	May/23
Check	5-1 thru 5-100	Rev. 8	May/23
Repair	6-1 thru 6-20	Rev. 8	May/23
Assembly	7-1 thru 7-60	Rev. 8	May/23
Fits and Clearances	8-1 thru 8-8	Rev. 8	May/23
Special Tools, Fixtures, and Equipment	9-1 thru 9-4	Rev. 8	May/23
Illustrated Parts List	10-1 thru 10-14	Rev. 8	May/23
Illustrated Parts List	10A-1 thru 10A-10	Rev. 8	May/23

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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 135F (61-13-35)	-	Composite Blade Overhaul Manual
Manual 147 (61-00-47)	Yes	Propeller Owner's Manual and Logbook for Lightweight Turbine Propeller Models with Composite Blades
Manual 148 (61-16-48)	Yes	Composite Spinner Maintenance Manual
Manual 159 (61-02-59)	Yes	Application Guide
Manual 165A (61-00-65)	Yes	Illustrated Tool and Equipment Manual
Manual 180 (30-61-80)	Yes	Propeller Ice Protection System Manual
Manual 202A (61-01-02)	Vol. 7, Yes Vol. 11, Yes	Standard Practices Manual, Volumes 1 through 11

B. Vendor Publications

None.

3. Personnel Requirements (Rev. 1)

   A. Service and Maintenance Procedures in this Manual

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

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

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

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

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

   A. Special Tooling

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

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

   B. Consumable Materials

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

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

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

   A. Instructions for Use

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

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

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

6. Calendar Limits and Long Term Storage (Rev. 2)

   A. Calendar Limits

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

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

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

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

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

      (6) The start date for the calendar limit must not be confused with the warranty start date, that is with certain exceptions, the date of installation by the firstretail 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 Service Letter HC-SL-61-61Y.

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

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

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

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

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

8. Damage/Repair Types (Rev. 1)

A. Airworthy/Unairworthy Damage

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

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

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

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

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

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

B. Minor/Major Repair

(1) Minor Repair

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

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

(2) Major Repair

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

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

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

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

9. Propeller Critical Parts (Rev. 1)

A. Propeller Critical Parts

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

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

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

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

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

10. Warranty Service (Rev. 1)

A. Warranty Claims

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

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

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

A. Product Support Department

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

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

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

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

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

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

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

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

B. Technical Publications Department

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

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

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

C. Recommended Facilities

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

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

12. Definitions (Rev. 4)

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

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

13. Abbreviations (Rev. 2)

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

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

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DESCRIPTION AND OPERATION - CONTENTS

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1. General (Rev. 2)

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. HC-E5A-2( )

(1) The series HC-E5A-2( ) lightweight turbine propellers are constant speed and feathering. They use a single oil supply from a governing device to hydraulically actuate a change in blade angle. The propellers are five-bladed and are used primarily on Pratt & Whitney turbine engines.

(2) A two piece aluminum hub retains each propeller blade on a thrust bearing. A cylinder is attached to the hub and contains a feathering spring and piston. The hydraulically actuated piston transmits linear motion through a pitch change rod and fork to each blade to result in blade angle change.

(3) While the propeller is operating the following forces are constantly present, 1) spring force, 2) counterweight force, 3) centrifugal twisting moment of each blade and 4) blade aerodynamic twisting forces. The spring and counterweight forces attempt to rotate the blades to higher blade angle while the centrifugal twisting moment of each blade is generally toward lower blade angle. Blade aerodynamic twisting force is very small in relation to the other forces and can attempt to increase or decrease blade angle.

(4) Summation of the propeller forces is toward higher pitch (low RPM) and is opposed by a variable force toward lower pitch (high RPM). The variable force is oil under pressure from a governor with an internal pump that is mounted on and driven by the engine. The oil from the governor is supplied to the propeller and hydraulic piston through a hollow engine shaft. Increasing the volume of oil within the piston and cylinder will decrease the blade angle and increase propeller RPM. Decreasing the volume of oil will increase blade angle and decrease propeller RPM. By changing the blade angle, the governor can vary the load on the engine and maintain constant engine RPM (within limits), independent of where the power lever is set. The governor uses engine speed sensing mechanisms that allow it to supply or drain oil as necessary to maintain constant engine speed (RPM).

(5) If governor supplied oil is lost during operation, the propeller will increase pitch and feather. Feathering occurs because the summation of internal propeller forces causes the oil to drain out of the propeller until the feather stop position is reached.

(6) Normal in-flight feathering is accomplished when the pilot retards the propeller condition lever past the feather detent. This allows control oil to drain from the propeller and return to the engine sump. Engine shutdown is normally accomplished during the feathering process.

(7) Normal in-flight unfeathering is accomplished when the pilot positions the propeller condition lever into the normal flight (governing) range and restarts the engine. As engine speed increases, the governor supplies oil to the propeller and the blade angle decreases.

TESTING AND FAULT ISOLATION - CONTENTS

LIST OF FIGURES

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1. Troubleshooting Guide

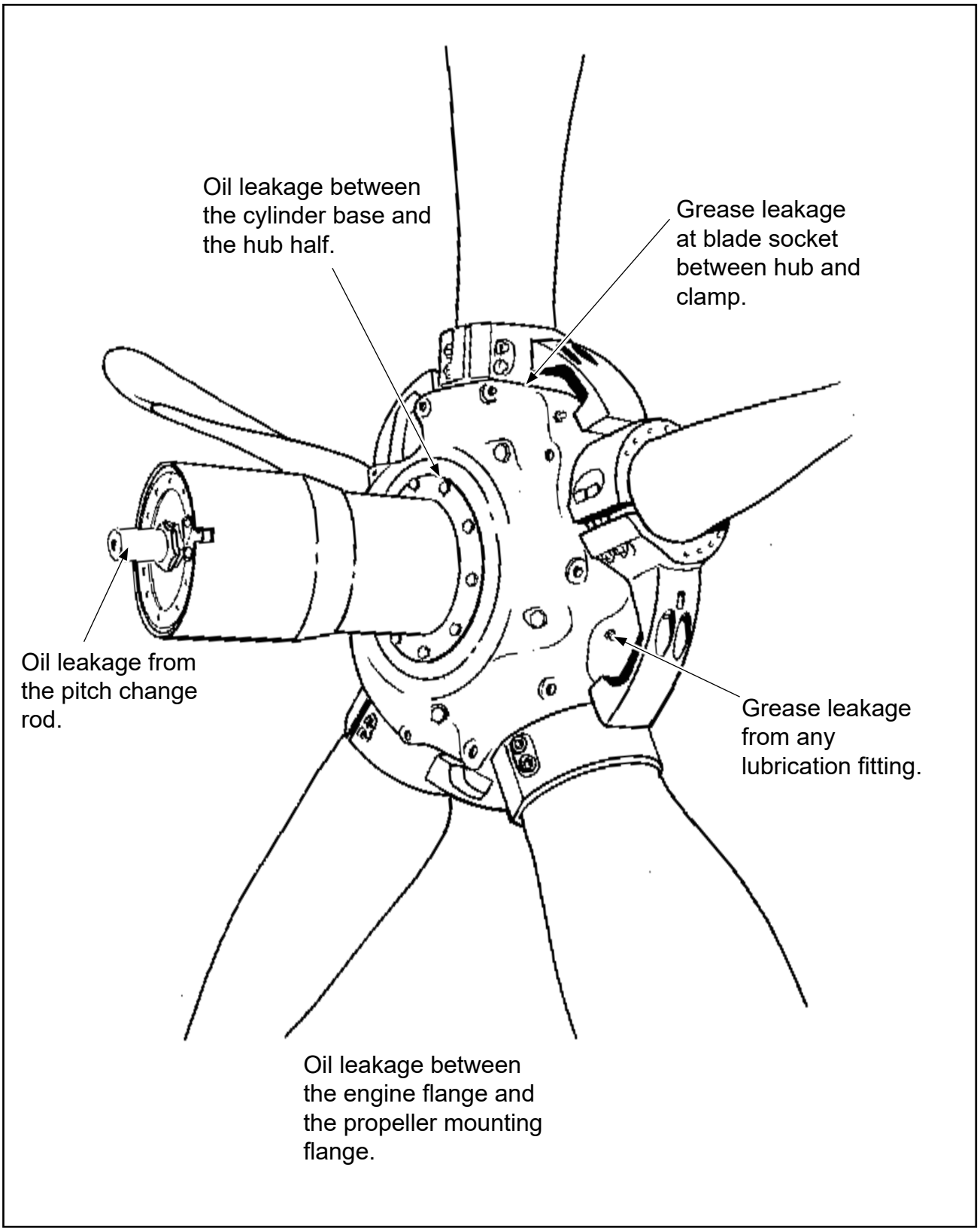
CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

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

Problem		Probable Cause	Remedy
A. Pitch Control Difficulty		Excessive friction in moving parts.	Refer to problem B, Friction.
	or	Oil passages are not clear and open.	Inspect the hydraulic system
	or	Governor oil supply problem.	Refer to the airframe or the engine manufacturer's maintenance manual for installation instructions.
B. Friction		Lack of lubrication.	Add approved lubricant.
	or	Blade preload mechanism does not move freely.	Inspect the blade preload assembly.
	or	Balls in the blades retention split-bearing are unusually rough, corroded, or chipped.	Replace the blade retention split-bearing assembly.
	or	Insufficient clearances between various moving parts in the pitch change mechanism.	Inspect the moving parts individually. Increase the clearances between the individual parts as necessary to decrease friction in the mechanism.

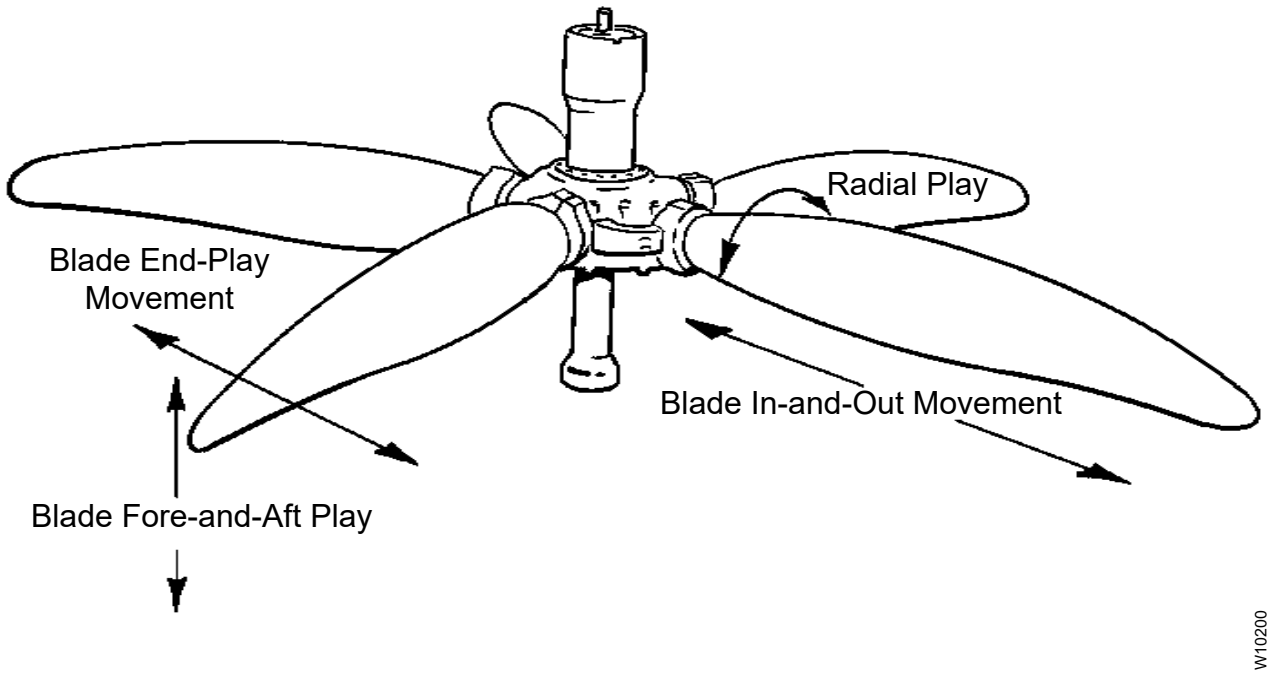
Problem	Probable Cause	Remedy
C. Slight Vibration	Dynamic balance incorrect	Refer to the Static and Dynamic Balance chapter in Standard Practices Manual 202A (61-01-02).
	or Blades not tracking	Refer to Blades Not Tracking Problem.
	or Static balance incorrect	Refer to the Static and Dynamic Balance chapter in Standard Practices Manual 202A (61-01-02).
	or Aerodynamic imbalance	Inspect the blade edge alignment, twist distribution, and leading edge profile
	or Pitch change system damage	Refer to the Check chapter of this manual for cam follower inspection criteria.
D. Abnormal Propeller Vibration	Blade damage	Refer to Hartzell Composite Blade Manual 135F (61-13-35).
	or Hub damage	Refer to the Aluminum Hub Overhaul chapter of Hartzell Standard Practices Manual 202A (61-01-02).
	or Blade wear	Refer to Hartzell Manual 135F (61-13-35) for composite blades.
	or Grease leakage	Refer to Grease Leakage problem in this chapter.

Problem		Probable Cause	Remedy
E. Surging RPM or Torque		Air is trapped in the propeller piston or in the engine shaft.	After propeller installation and before each flight, exercise the propeller by changing pitch or feathering.
	or	Governor is not functioning correctly.	Refer to the airframe or the engine manufacturer's maintenance manual for installation instructions.
	or	Excessive friction in the pitch change mechanism.	Refer to Friction problem in this chapter.



Inspection for Leakage of Oil or Grease
Figure 1-1

Problem		Probable Cause	Remedy
F. Oil Leakage (Refer to Figure 1-1.)		Faulty O-ring seal between the engine flange and the propeller mounting flange.	Remove the propeller from the engine and inspect the O-ring and the sealing surface. Replace the defective O-ring.
	or	Faulty O-ring seal between the pitch change rod and the engine hub half and/or the cylinder.	Remove the propeller from the engine and disassemble. Inspect both O-rings and sealing surfaces. Replace the defective O-ring(s).
G. Grease Leakage (Refer to Figure 1-1.) NOTE: The blade retention bearing socket is the only source for grease leakage.		Over serviced	Remove the propeller from the engine, disassemble, and clean. Replace the O-rings, reassemble, and lubricate in accordance with the Propeller Lubrication chapter of Hartzell Standard Practices Manual 202A (61-01-02).
	or	Defective lubrication fitting	Replace defective lubrication fittings.
	or	Improperly torqued or loose/ missing lubrication fitting	Replace missing lubrication fitting. Refer to the Propeller Lubrication chapter of Hartzell Standard Practices Manual 202A (61-01-02).
	or	Faulty seal at blade socket in hub	Disassemble the propeller and inspect the seal and the sealing surface. Replace defective seal. Reapply approved adhesive sealant to mating surfaces of the hub halves.



NOTE 1: The blade is equipped with a spring loaded device for preload. Excessive force at the end of the blade will result in blade movement once the mechanism force is surpassed.

NOTE 2: Blades are intended to be tight in the propeller; however, slight movement is acceptable if the blade returns to its original position when released. Blades with excessive movement, or that do not return to their original position when released may indicate internal wear or damage that should be corrected before further flight.

Checking Blade Movement
Figure 1-2

Problem	Probable Cause	Remedy
H. End-Play in the Blade	Preload screw (860) is worn	Disassemble the propeller and inspect the preload system. Replace the preload pack (980), if necessary.
	or Blade retention bearing race (910) is worn.	Perform Blade Retention Bearing Race Inspection and Replacement Procedures.
I. Fore-and-Aft Movement in the Blade	Preload pack (980) is worn.	Disassemble the propeller and inspect the preload system. Replace the preload pack (980), if necessary.
	or Blade retention bearing race (910) is worn.	Perform Blade Retention Bearing Race Inspection and Replacement Procedures.
J. In-and-Out Movement in the Blade	Preload screw (860) is worn.	Disassemble the propeller and inspect the preload system. Replace the preload pack (980), if necessary.
	or Blade retention bearing race (910) is worn.	Perform Blade Retention Bearing Race Inspection and Replacement Procedures.
K. Excessive Radial Play in the Blade (backlash) NOTE: Radial play of 0.5 degree total is permitted. (Refer to Figure 1-2.)	Pitch change fork is worn.	Disassemble the propeller. Inspect and replace the fork, as required.
	or Pitch change track roller is worn.	Disassemble the propeller. Inspect and replace the bearing, as required.
	or Preload screw (860) is worn.	Disassemble the propeller and inspect the preload system.
	or Preload pack (980) is worn.	Disassemble the propeller and inspect the preload system.

Problem	Probable Cause	Remedy
L. Blades Not Tracking	Foreign object strike damage.	For composite blade repair procedure, refer to Hartzell Composite Blade Overhaul 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

DISASSEMBLY - LIST OF ILLUSTRATIONS

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1. Important Information (Rev. 3)

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

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

A. Removing the Propeller

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

B. Record Serial Numbers/Blade Location Before Disassembly

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

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

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

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

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

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

C. Ice Protection System (if applicable)

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

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

2. Disassembly of HC-E5A-2( ) Propeller Models

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

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

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

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

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

A. Hub Balance Weight Removal

(1) Remove and discard the safety wire from the balance weight screws (1110).

(2) Remove and discard the balance weight screws (1110).

(3) Remove the balance weights (1120).

B. Counterweight Removal

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

C. Cylinder Assembly Removal and Disassembly

WARNING: INJURY OR DAMAGE TO COMPONENTS MAY OCCUR IF THE PROPELLER IS NOT FEATHERED COMPLETELY BEFORE BEGINNING DISASSEMBLY.

(1) Cut and remove the safety wire from the feather nuts (10, 20) and the stop plate attachment bolts (60).

(2) Apply minimum air pressure to the propeller.

(3) Remove the feather nuts (10), (20).

(4) Move the propeller to feather position.

(5) Remove each bolt (60) and washer (50) that attaches the stop plate (40) to the pitch stop plate (30).

(6) Remove the stop plate (40).

(7) Remove the pitch stop plate (30).

(8) Remove the relief valve bolt (205) unit and washer (190) that attach the cylinder (140) to the hub (410).

(a) Discard the washer (190).

(b) For identification of the relief valve bolt (205) unit, refer to the section, "105403 Relief Valve Bolt Unit" in the Check chapter of this manual.

(9) Remove and discard the cylinder mounting bolts (200) and washers (190) that attach the cylinder (140) to the hub (410).

(10) Rotate the blades to low pitch until the fork (600) touches the top of the hub (410).

(11) Using a crowfoot wrench and a suitable extension on the piston nut (70), loosen the pitch change rod/cylinder assembly from the fork (600).

(a) If the piston nut (70) rotates instead of the entire pitch change rod/cylinder assembly:

CAUTION: DO NOT DAMAGE THE PITCH CHANGE ROD WHEN INSTALLING AND USING THE CUSTOMER SUPPLIED DOWEL PIN.

1 Install a customer supplied dowel pin through the hole in the pitch change rod.

2 Using a crowfoot wrench and a suitable extension on the piston nut (70), use the dowel pin to help loosen the pitch change rod/cylinder assembly from the fork (600).

WARNING: USE EXTREME CAUTION WHEN REMOVING THE CYLINDER AND FEATHERING SPRING ASSEMBLY. WHEN COMPRESSED, THE FEATHERING SPRING ASSEMBLY IS LOADED TO APPROXIMATELY 800 POUNDS (362.4 kg) FORCE. MAKE SURE OF THE SAFETY OF PERSONNEL IN THE VICINITY DURING THE DISASSEMBLY PROCEDURES.

(12) Once loosened, remove the entire pitch change rod/cylinder assembly from the hub (410) by rotating the cylinder assembly (140) counterclockwise by hand until disengaged from the fork (600).

(13) Remove and discard the cylinder mounting O-ring (210).

(14) Disassemble the pitch change rod/cylinder assembly.

(a) Position the pitch change rod/cylinder assembly in an appropriate spring compressor device.

(b) Compress the spring (240) in the pitch change rod/cylinder assembly until the split retainer is accessible.

(c) Remove and discard the split retainer (260) from the feather spring retainer (250).

(d) Permit the spring (240) to decompress slowly to its free length.

(e) Remove the pitch change rod/cylinder assembly from the spring compressor device.

(f) Remove the feather spring retainer (250), feather spring (240), and the spring seat (230).

(g) Remove the pitch change rod/piston assembly from the cylinder (140).

(h) Remove and discard the piston nut (70).

(i) Remove the piston (80).

(j) Remove and discard the piston ID O-ring (90).

(k) Remove and discard the cylinder ID O-ring (220).

(l) Cylinder Bushing Removal

NOTE: During the initial installation in the cylinder, the inside diameter and O-ring grooves in the bushings are machined after the bushing is installed (necessary in order to maintain close dimensional tolerances). This results in bushings that are uniquely mated to a cylinder. During overhaul, removal of the bushings is required for inspection and O-ring replacement. Subsequent reuse of the original bushings may be possible if the bushings are not excessively worn or damaged.

1 Round bottom stamp the cylinder with a period "." next to the cylinder bushing.

2 Refer to the Check chapter in this manual for inspections that must be completed before the cylinder bushing is removed.

3 Remove and discard the retaining ring (170) that retains the cylinder bushing (160) in the cylinder (140).

CAUTION: DO NOT DAMAGE THE CYLINDER BUSHING (160) WHEN REMOVING IT FROM THE CYLINDER.

4 Push the cylinder bushing (160) from the cylinder.

a If an A-3784 cylinder bushing (160) is removed, discard the cylinder bushing.

5 Remove and discard the cylinder bushing OD O-ring (150).

D. Pitch Change Fork Disassembly

(1) Remove and discard the fork plate screws (620).

(2) Remove and discard the fork bumper screws (640).

(3) Remove the fork bumpers (630) from the fork (600).

3. Hub Disassembly

A. All Propeller Models

(1) Manually move the blades to the feather position.

(2) Loosen the preload bolt (860) on each blade.

(3) Manually rotate the blades to the low pitch position.

(4) Remove and discard all of the hub half clamping nuts (490) and washers (480).

(5) Remove the hub half clamping bolts (470).

NOTE: A soft mallet may be used to drive the bolts (470) out of the hub halves.

CAUTION: DO NOT SEPARATE HUB HALVES UNTIL EACH BLADE IS SUPPORTED BY A BLADE STAND. BLADES MAY FALL OUT OF THE HUB AFTER THE HUB HALVES ARE SEPARATED.

(6) Set up the blade stands TE126, or equivalent, approximately ten inches from the blade tip to support the blade.

CAUTION 1: DO NOT USE A SCREWDRIVER OR OTHER SHARP TOOL TO PRY APART THE HUB HALVES (410).

CAUTION 2: MAKE SURE TO TAP THE BLADE OUTSIDE OF THE DE-ICE BOOT AREA.

(7) Separate the hub halves (410) by lightly tapping or lifting the end of one blade to loosen the hub halves. Continue to lightly tap or lift each blade until the hub halves begin to part. Use a plastic wedge (TE138) or similar tool to pry the hub halves apart.

(8) Remove the cylinder-side hub half (410).

(9) Remove and discard the hub guide bushings (430).

(10) Remove the cylinder mounting ring (180).

(11) Remove and discard each anti-rotation rod spacer (130).

(12) Remove each anti-rotation rod (120).

(13) Remove the bushing (650) from each anti-rotation rod (120).

(14) Support and remove blade number one by rotating the blade until the cam follower (840) can slide out of the fork (600). Repeat for blades two and three.

NOTE: To prevent the ball bearings from being released, hold the blade bearing (920) when removing a blade. Optionally, use the bearing clamp tool TE24.

(15) Rotate the fork (600) counterclockwise to disengage the cam followers (840).

(16) Remove the fork (600) from over the cam followers (840).

(17) Remove blades number four and five.

NOTE: To prevent the ball bearings from being released, hold the blade bearing (920) when removing a blade. Optionally, use the bearing clamp tool TE24.

(18) Remove the hub half (410) from the mounting fixture.

(19) Remove and discard the ten 1/4-28 hex head bolts (710) and flat washers (700) that attach the spinner bulkhead and the adapter plate unit (660) to the engine-side half of the hub (410). Refer to Figure 3-1.

(20) Remove the spinner bulkhead from the engine-side half of the hub (410).

(21) Remove and discard the ten screws (730) and washers (720) that attach the adapter plate unit (660) to the spinner bulkhead. Refer to Figure 3-1.

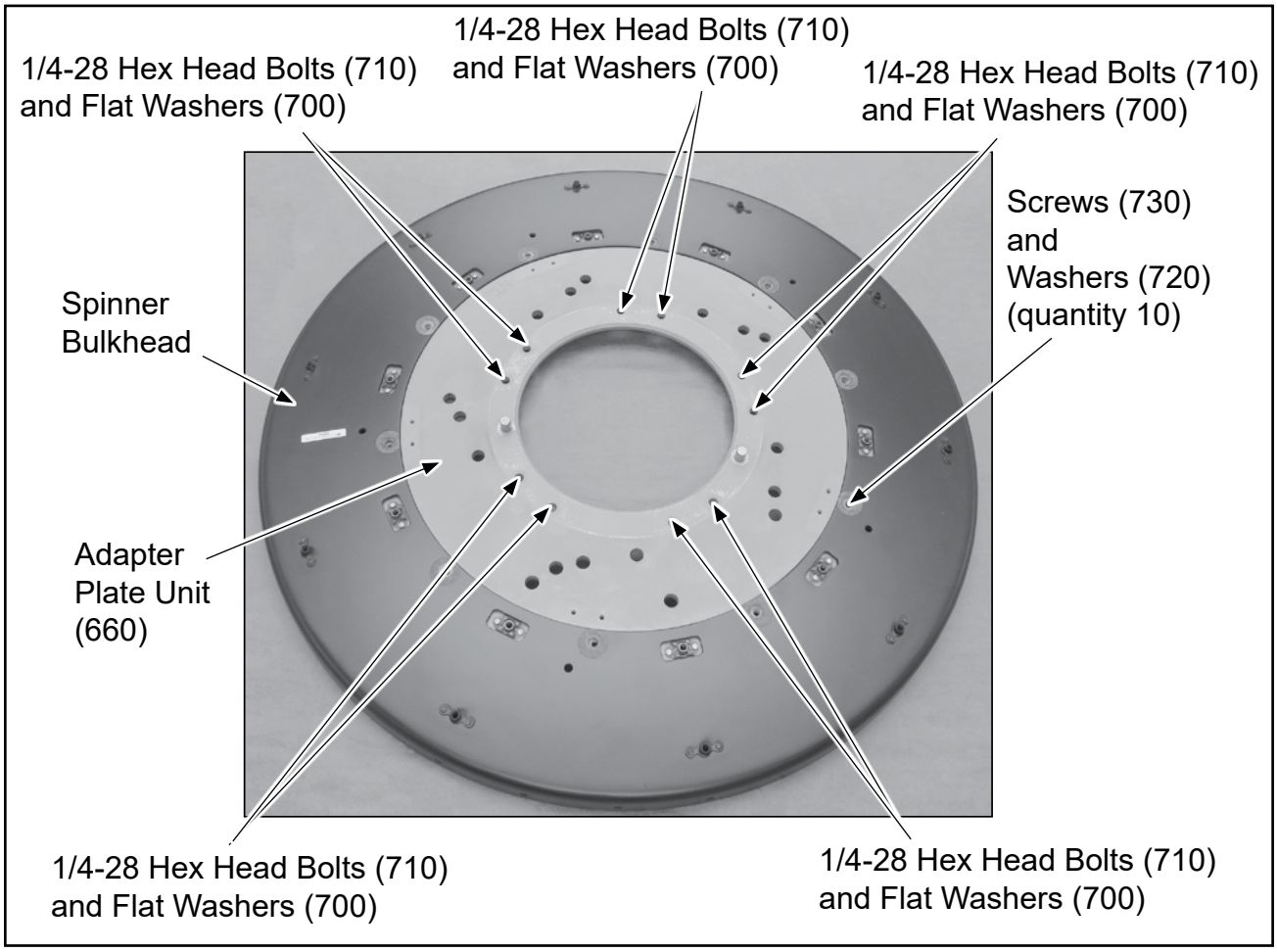
(22) Remove the adapter plate unit (660) from the spinner bulkhead. Refer to Figure 3-1.

(23) Push the studs (460) from the engine-side half of the hub (410).

(24) Discard the studs (460) that were pushed from the hub half (410).

(25) Remove the mounting bolt ring (450).

(26) Remove and discard the O-ring (290).



Removing the Spinner Bulkhead and the Adapter Plate Unit
Figure 3-1

(27) For a propeller that has not had the 104903 rod hub bushing (422) installed, remove the backup rings (280, 300) from the pitch change rod bore of the engine-side hub half (410).

(a) At overhaul, installation of the 108346 rod hub bushing (422) is necessary.

(28) For a propeller that has had the 104903 rod hub bushing (422) installed, remove the 104903 rod hub bushing (422) from the hub bore, using the following steps:

(a) Remove and discard the external spiral retaining ring (425) from the OD of the rod hub bushing (422).

(b) Remove and discard the rod hub bushing (422) from the bore of the hub (410).

(29) For a propeller that has had the 108346 rod hub bushing (422) installed, remove the 108346 rod hub bushing (422) from the hub bore, using the following steps:

(a) Remove and discard the external spiral retaining ring (425) from the OD of the rod hub bushing (422).

(b) Remove the rod hub bushing (422) from the bore of the hub (410).

(30) For additional hub disassembly instructions and overhaul procedures, refer to the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

4. Blade Disassembly

A. Propeller Blades

(1) Blade Retention Parts Disassembly

(a) Remove the blade seal.

1 Remove and discard the O-ring (975), if applicable.

2 Remove and discard the seal energizer ring (970) and the blade seal (960). t

(b) Remove the hub-side bearing race (930).

(c) Remove and discard the ball bearings (940).

(d) Remove and discard the ball spacer (950).

(e) Remove the screw (860), 2-piece lock washer (880), and anti-rotation washer (870) from the preload plate (890); discard the screw (860) and the 2-piece lock washer (880).

(f) Remove the preload plate (890).

(g) Remove the pitch change knob bracket (850) from the blade using the following steps:

1 If the dowel pin (820) remains in the blade, remove and discard the dowel pin (820).

2 If the dowel pin (820) remains in the pitch change knob bracket (850), removal of the dowel pin (820) from the pitch change knob bracket (850) is not required.

(h) For a pitch change knob bracket (850) that uses a swaged washer to retain the cam follower (840), remove the cam follower (840) from the pitch change knob bracket (850), using the following steps:

1 Install puller TE98, or equivalent, so that the center post pushes on the pitch change knob bracket (850).

2 Put the arms of the puller TE98, or equivalent, on the back of the cam follower (840).

3 Turn in the handle of the puller TE98, or equivalent, to pull off the cam follower (840) and the knob unit retaining washer (830).

4 Discard the knob unit retaining washer (830).

5 At overhaul, a pitch change knob bracket (850) that uses a screw (833) to retain the cam follower must be installed. Refer to the Repair chapter in this manual.

(i) For a pitch change knob bracket that uses a screw (833) to retain the cam follower (840), remove the cam follower (840) from the pitch change knob bracket (850), using the following steps:

1 Remove and discard the screw (833) from the end of the pitch change knob bracket (850).

2 Remove and discard the dimpled washer (832).

3 Remove the knob unit retaining washer (830).

4 Remove the cam follower (840).

(j) Using a suitable gear puller, brass drift, or bearing press, remove the bearing retention ring (900).

(k) Remove the blade-side bearing race (920) from the blade.

(l) Remove the preload pack assembly (980) from the blade bore.

1 Remove and discard the internal spiral retaining ring (1030) from the preload pack assembly (980).

2 Remove the preload pack cap (1020) from the preload pack housing (990).

3 Remove the nine Belleville spring washers (1010) from the preload pack housing (990).

4 Remove the wear disk (1000) from the preload pack housing (990).

(m) Repeat for the remaining blades.

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

CLEANING - CONTENTS

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1. Cleaning Procedures (Rev. 4)

A. General Cleaning

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

B. Cleaning Steel Parts for Magnetic Particle Inspection

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

C. Cleaning Steel Parts for Cadmium Replating Procedures

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

D. Cleaning Aluminum Parts for Penetrant Inspection

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

E. Cleaning Titanium Parts for Penetrant Inspection

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

F. Cleaning Aluminum Parts for Chromic Acid Anodizing Procedures

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

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

(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

CHECK - CONTENTS, CONTINUED

LIST OF FIGURES

LIST OF FIGURES, CONTINUED

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 (Rev. 3)

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) 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 Hartzell Propeller Inc. Composite Spinner Maintenance Manual 148 (61-16-48).

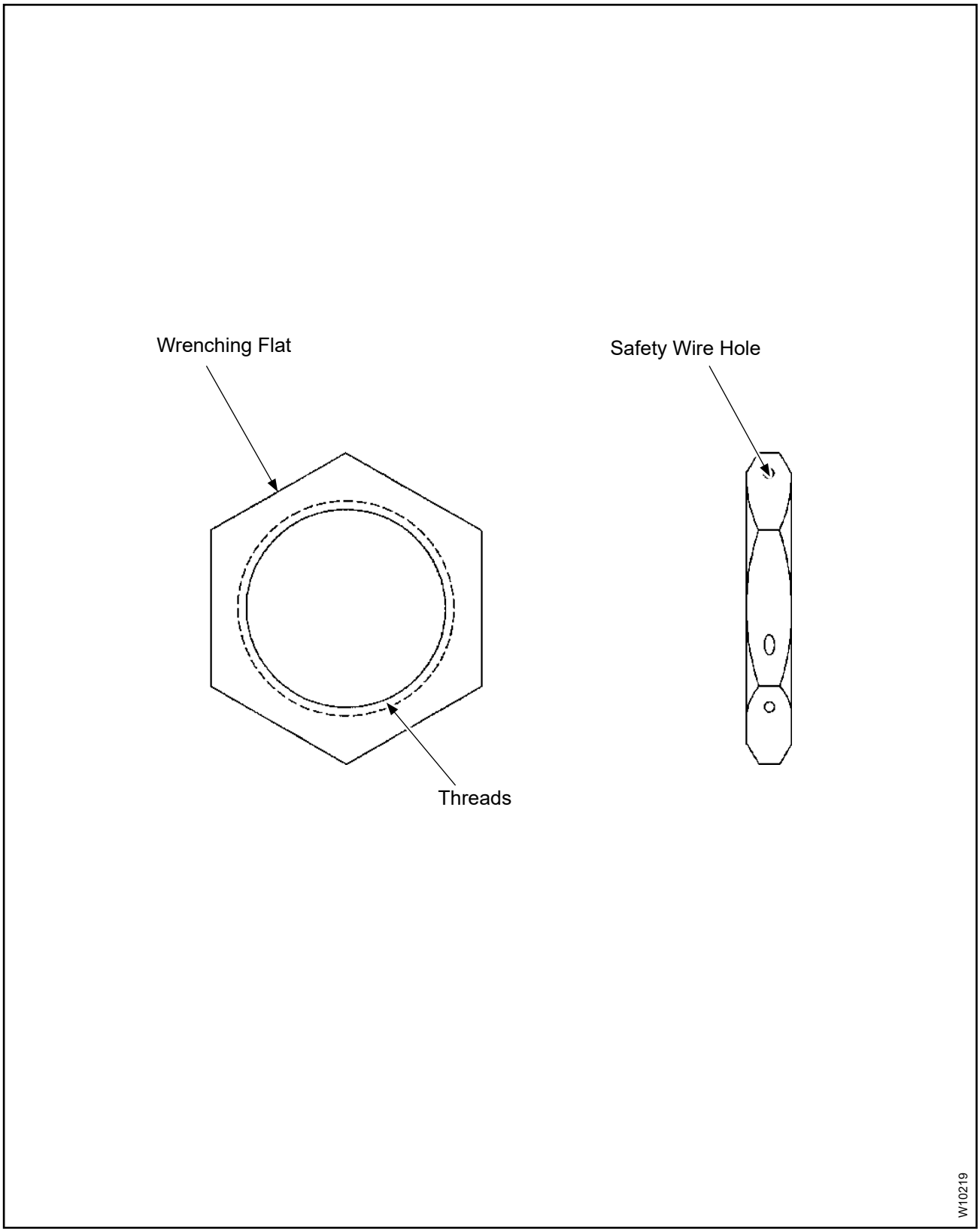
F. Special Inspections (Lightning Strike, Foreign Object Strike, etc.)

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

4. Propeller Component Checks

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

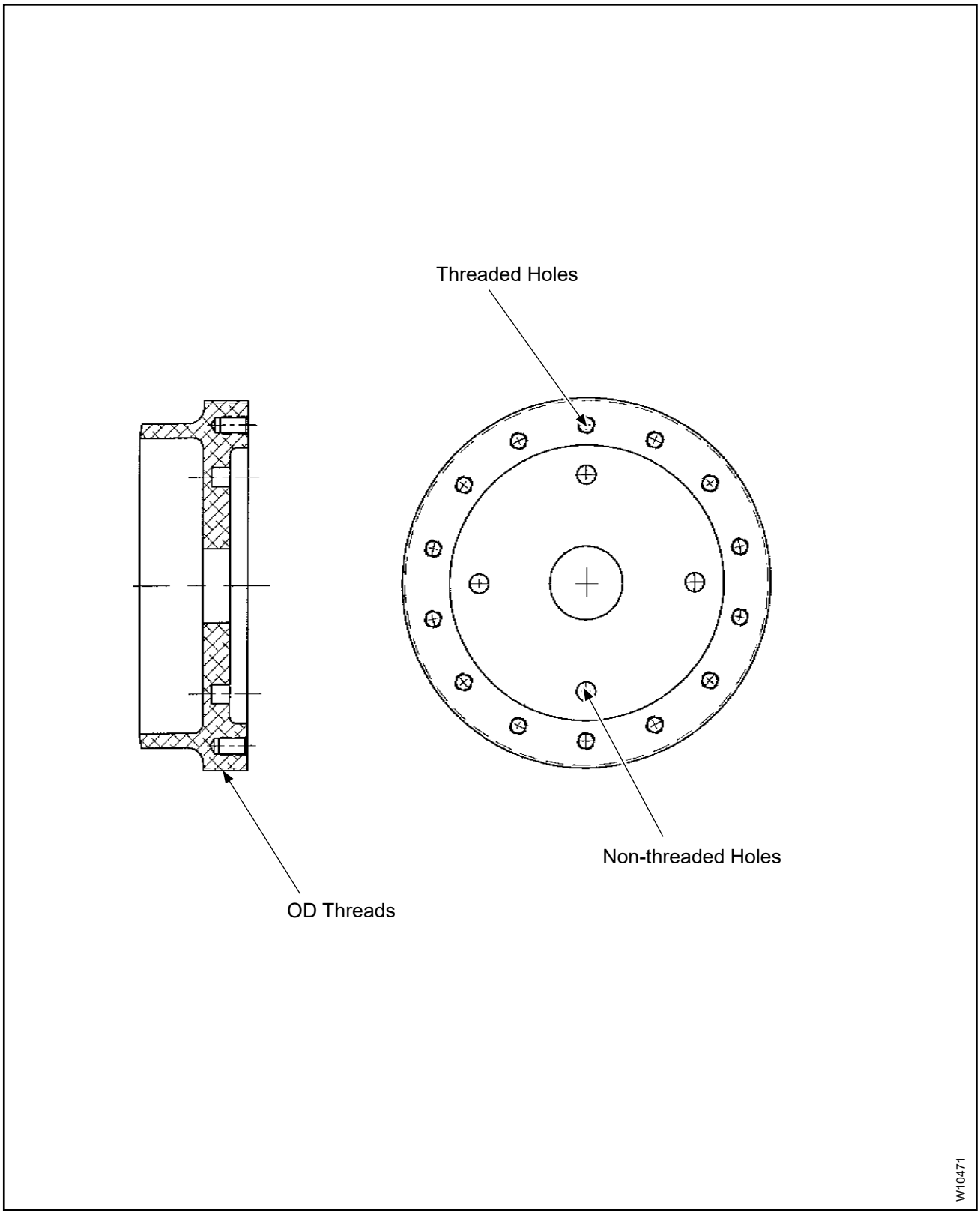
Refer to Table 5-1, "Component Inspection Criteria" in this chapter.



Drilled Thin Hex Nut
Figure 5-1

Component Inspection Criteria
Table 5-1

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



Pitch Stop Plate
Figure 5-2

Component Inspection Criteria
Table 5-1

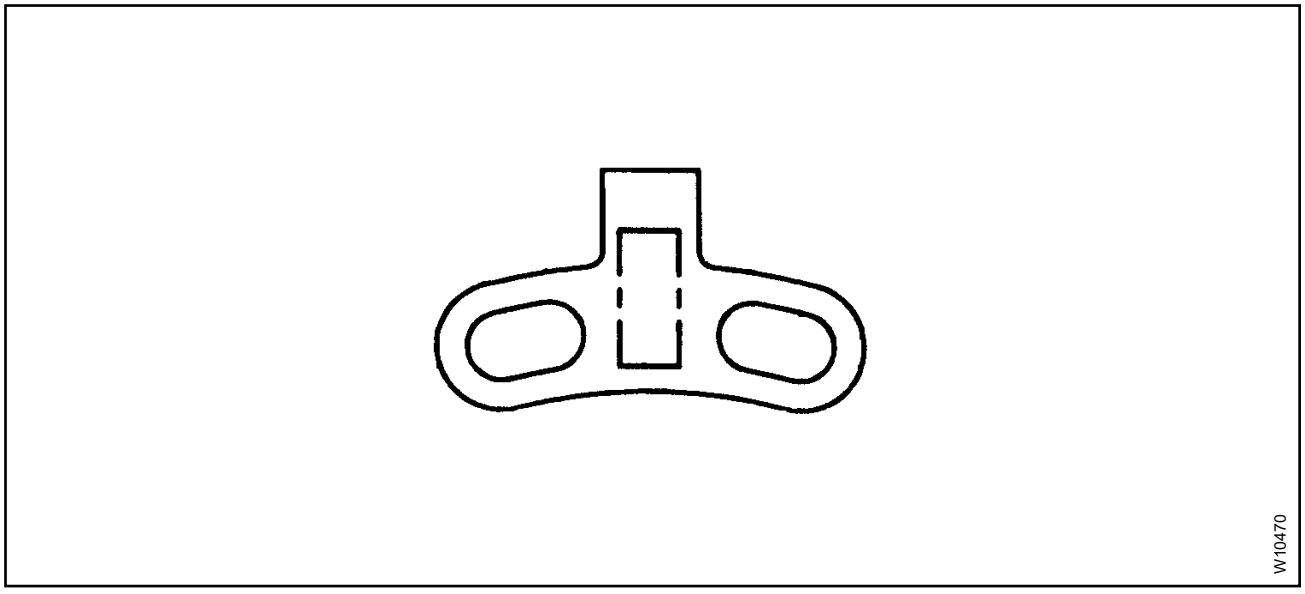
Inspect	Serviceable Limits	Corrective Action
B. PLATE, STOP, PITCH (Item 30) (Refer to Figure 5-2)		
(1) Except for the OD threads and the threaded holes, visually examine the pitch stop plate for wear or damage..	If there is wear or damage, measure the depth of the wear or damage. The maximum permitted depth of wear or damage is 0.005 inch (0.12 mm).	Repair using an abrasive pad CM47 or equivalent to a depth of 0.010 inch (0.25 mm). The maximum permitted total area of repair is 2 sq. inches (1290 sq. mm). If the wear or damage is greater than the permitted serviceable limits or the corrective action limits, replace the pitch stop plate.
(2) Except for the OD threads and the threaded holes, visually examine the pitch stop plate for corrosion product and pitting.	Corrosion product is not permitted. The maximum permitted depth of pitting is 0.005 inch (0.12 mm). The maximum permitted diameter of an individual pit is 0.062 inch (1.57 mm). A maximum of 10 non-linear pits less than 0.062 inch (1.57 mm) diameter within a 1 sq. inch (645 sq. mm) area are permitted. Pits can be no closer than 2 diameters (0.064 inch [1.62 mm]). Linear pitting is not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). Repair using an abrasive pad CM47 or equivalent is permitted to a depth of 0.010 inch (0.25 mm). The maximum permitted total area of repair is 2 sq. inches (1290 sq. mm). If repair is greater than the permitted serviceable limits or the corrective action limits, replace the pitch stop plate.
(3) Using a 10X magnifying glass, visually examine the pitch stop plate OD threads for corrosion product, pitting, or damage.	Corrosion product is not permitted. A maximum of 1/2 of one thread total accumulated damage is permitted. The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	Using an abrasive pad CM47 or equivalent, spot polish to remove corrosion product or pitting. Repair is permitted to a depth of 0.010 inch (0.25 mm). If the damage or repair is greater than the permitted serviceable limits or the corrective action limits, replace the pitch stop plate.

Component Inspection Criteria
Table 5-1

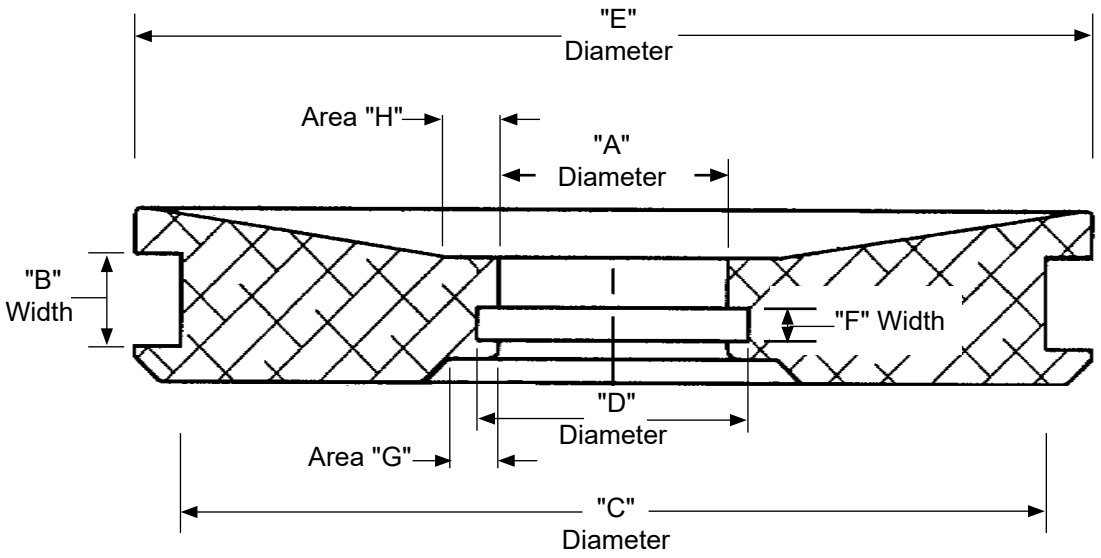
Inspect	Serviceable Limits	Corrective Action
B. PLATE, STOP, PITCH, CONTINUED (Item 30) (Refer to Figure 5-2)		
(4) Visually examine the 14 pitch stop plate threaded holes for corrosion product, pitting, or damage.	Corrosion product is not permitted. One thread of total accumulated damage is permitted for each threaded hole. The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	Repair is not permitted. If the corrosion product, pitting, or damage is greater than the permitted serviceable limits, replace the pitch stop plate.
(5) Visually examine the four flat bottom, non-threaded holes for corrosion product or damage.	Corrosion product is not permitted. Some displaced material is permitted. The maximum permitted hole ID is 0.300 inch (7.62 mm) at the widest place. The maximum permitted depth of a non-threaded hole is 0.290 inch (7.36 mm).	Using an abrasive pad CM47 or equivalent, spot polish to remove corrosion product is permitted. If the damage or repair is greater than the permitted serviceable limits, replace the pitch stop plate.
(6) Penetrant inspect the pitch stop plate in accordance with the Penetrant Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A, (61-01-02). Locally etch repaired areas to avoid covering any cracks. CAUTION: DO NOT REMOVE THE ANODIZE COATING BEFORE PENETRANT INSPECTION.	A relevant indication is not permitted. Pin-point penetrant indications (from pitting) are permitted. A crack is not permitted.	If there is a relevant indication that cannot be removed within the permitted serviceable limits or corrective action limits for the pitch stop plate in this section, replace the pitch stop plate.
(7) Visually examine the pitch stop plate for anodize coverage.	Except for a few scratches and corners with anodize missing, complete coverage is required.	If the anodize coverage is less than the permitted serviceable limits, anodize the pitch stop plate in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
C. PLATE, STOP (Item 40) (Refer to Figure 5-3)		
(1) Visually examine the stop plate for corrosion product, pitting, wear, or damage.	Corrosion product is not permitted. If the stop plate is pitted, worn, or damaged, measure the depth of pitting, wear, or damage. The maximum permitted depth of pitting, wear, or damage is 0.008 inch (0.20 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). If the pitting, wear, or damage is greater than the permitted serviceable limits, replace the stop plate.
(2) Visually examine the stop plate for cadmium plating coverage.	A maximum of 10% of the base metal visible is permitted.	If the cadmium plating coverage is less than the permitted serviceable limits, cadmium replate the stop plate in accordance with the Cadmium Replating chapter of Hartzell Standard Practices Manual 202A (61-01-02).



Stop Plate
Figure 5-3



PART NUMBER	"A" MAXIMUM DIAMETER	"B" MAXIMUM WIDTH	"C" MINIMUM DIAMETER	"D" MAXIMUM DIAMETER	"E" MINIMUM DIAMETER	"F" MAXIMUM WIDTH
C-7616	1.191 (30.25 mm)	0.492 (12.49 mm)	4.490 (114.05 mm)	1.416 (35.96 mm)	4.963 (126.07 mm)	0.180 (4.57 mm)

Piston Inspection Criteria
Figure 5-4

Component Inspection Criteria
Table 5-1

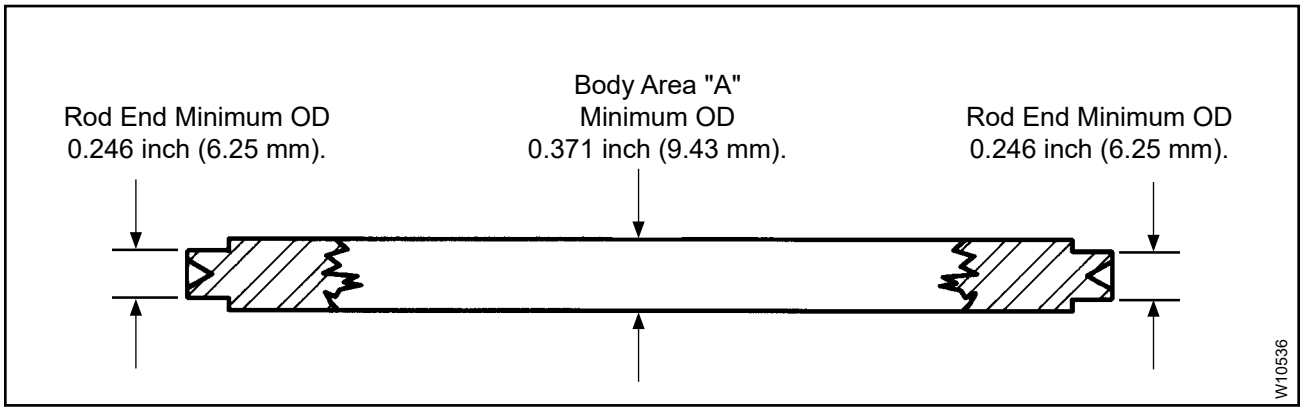
Inspect	Serviceable Limits	Corrective Action
D. PISTON (Item 80) (Refer to Figure 5-4)		
(1) Visually examine all surfaces of the piston not including O-ring grooves, area "G", and area "H" for wear, nicks, scratches, or other damage.	If the piston is worn or damaged, measure the wear or damage. The maximum permitted depth of wear or damage is 0.005 inch (0.127 mm).	If the wear or damage is greater than the permitted serviceable limits, replace the piston.
(2) Visually examine all surfaces of the piston for corrosion product and pitting.	Corrosion product is not permitted. If the piston is pitted, measure the pitting. The maximum permitted diameter of an individual pit is 0.062 inch (1.57 mm). The maximum permitted depth of an individual pit is 0.005 inch (0.127 mm). Pin-point penetrant indications (during penetrant inspection) from corrosion product pitting are permitted. A maximum of 10 non-linear pits within a 1 sq. inch (645 sq mm) area are permitted. Pitting is not permitted in the O-ring groove ID or OD, but pitting in the O-ring groove side walls is permitted. Linear pitting is not permitted.	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 or pitting is greater than the permitted serviceable limits, replace the piston.
(3) Visually examine the piston in areas "A", "B", "C", "D", "E", and "F".	If there is wear, measure the piston in accordance with Figure 5-4.	If wear is greater than the permitted serviceable limits, replace the piston.
(4) Visually examine the piston for anodize coverage.	A maximum of 10% of the base metal visible is permitted.	If the anodize coverage is less than the permitted serviceable limits, anodize the piston in accordance with the Chromic Acid Anodizing chapter of Hartzell Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria
Table 5-1

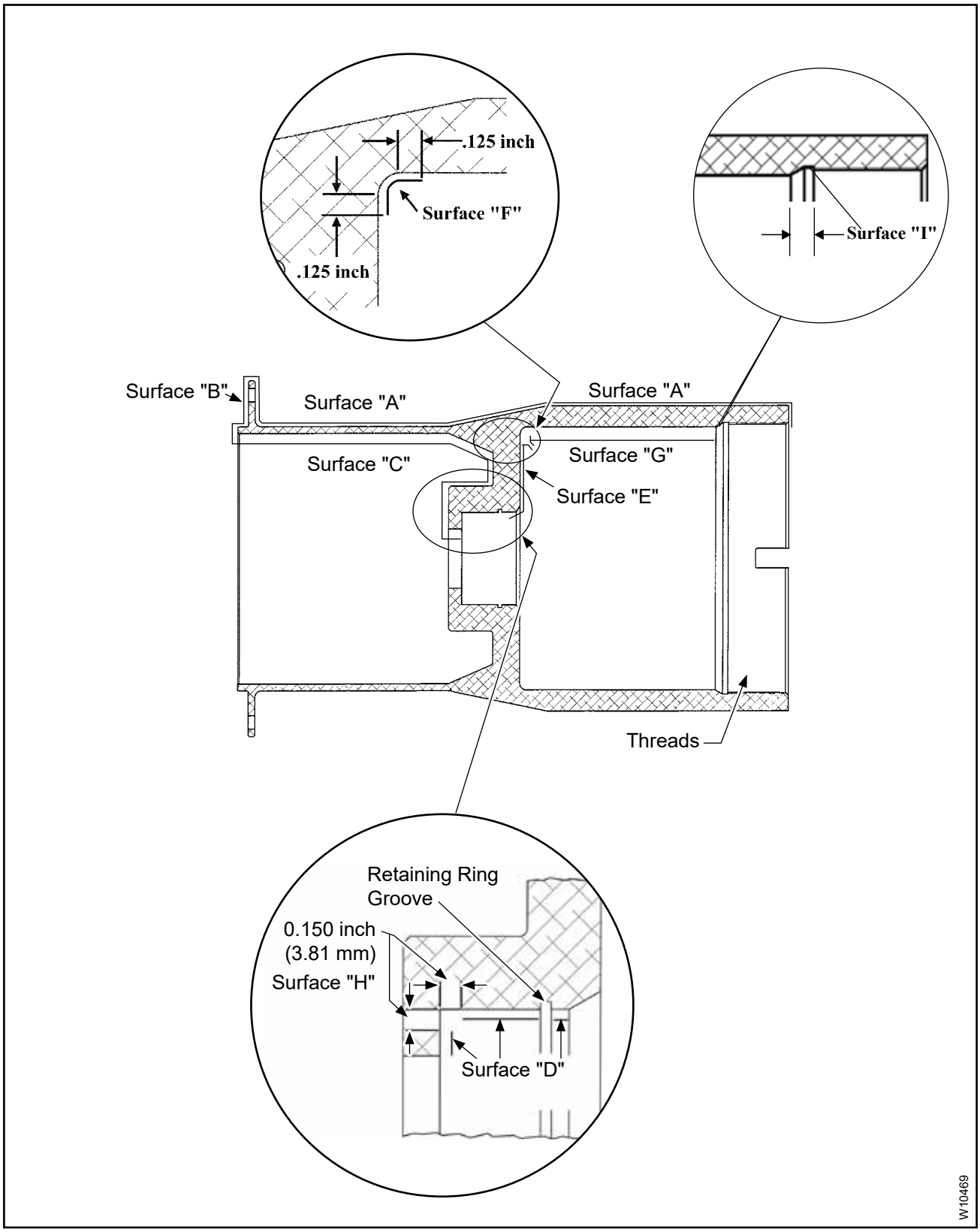
Inspect	Serviceable Limits	Corrective Action
D. PISTON,CONTINUED (Item 80) (Refer to Figure 5-4)		
(5) Visually examine area "G" around the entire circumference of the center hole for scoring and gouging caused by pitch change rod wrenching flats.	The maximum permitted depth of damage is 0.020 inch (0.50 mm). Sufficient flat surface must remain to correctly support the piston on the pitch change rod shoulder.	If damage is greater than the permitted serviceable limits, replace the piston.
(6) Visually examine area "H" around the entire circumference for scoring and gouging caused by the hex nut.	The maximum permitted depth of damage is 0.020 inch (0.50 mm). Sufficient flat surface must remain to correctly support the hex nut.	If damage is greater than the permitted serviceable limits, replace the piston.
(7) Penetrant inspect the piston in accordance with the Hartzell Standard Practices Manual 202A (61-01-02). CAUTION: DO NOT REMOVE THE ANODIZE COATING BEFORE PENETRANT INSPECTION.	A relevant indication is not permitted.	If a relevant indication cannot be removed within the permitted serviceable limits, replace the piston.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
E. ROD, ANTI-ROTATION (Item 120) (Refer to Figure 5-5)		
(1) Visually examine the anti-rotation rod for bending.	Bending is not permitted.	If there is bending, replace the anti-rotation rod.
(2) Visually examine the anti-rotation rod for corrosion product.	Corrosion product is not permitted	If there is corrosion product, replace the anti-rotation rod.
(3) Measure the OD of each anti-rotation rod end.	The minimum OD permitted is 0.246 inch (6.25 mm).	If the diameter is less than the permitted serviceable limits, replace the anti-rotation rod.
(4) Visually examine the OD of each anti-rotation rod body Area "A" for wear.	If the anti-rotation rod body Area "A" shows wear, measure the wear. The minimum OD permitted is 0.371 inch (9.43 mm).	If the diameter is less than the permitted serviceable limits, replace the anti-rotation rod.
(5) Magnetic particle inspect the anti-rotation rod in accordance with the Hartzell Standard Practices Manual 202A (61-01-02). NOTE: Do not remove the chrome plating before magnetic particle inspection.	A relevant indication is not permitted.	If a relevant indication cannot be removed within the permitted serviceable limits, replace the anti-rotation rod.



Anti-rotation Rod
Figure 5-5



Cylinder: E-7417
Figure 5-6

Component Inspection Criteria
Table 5-1

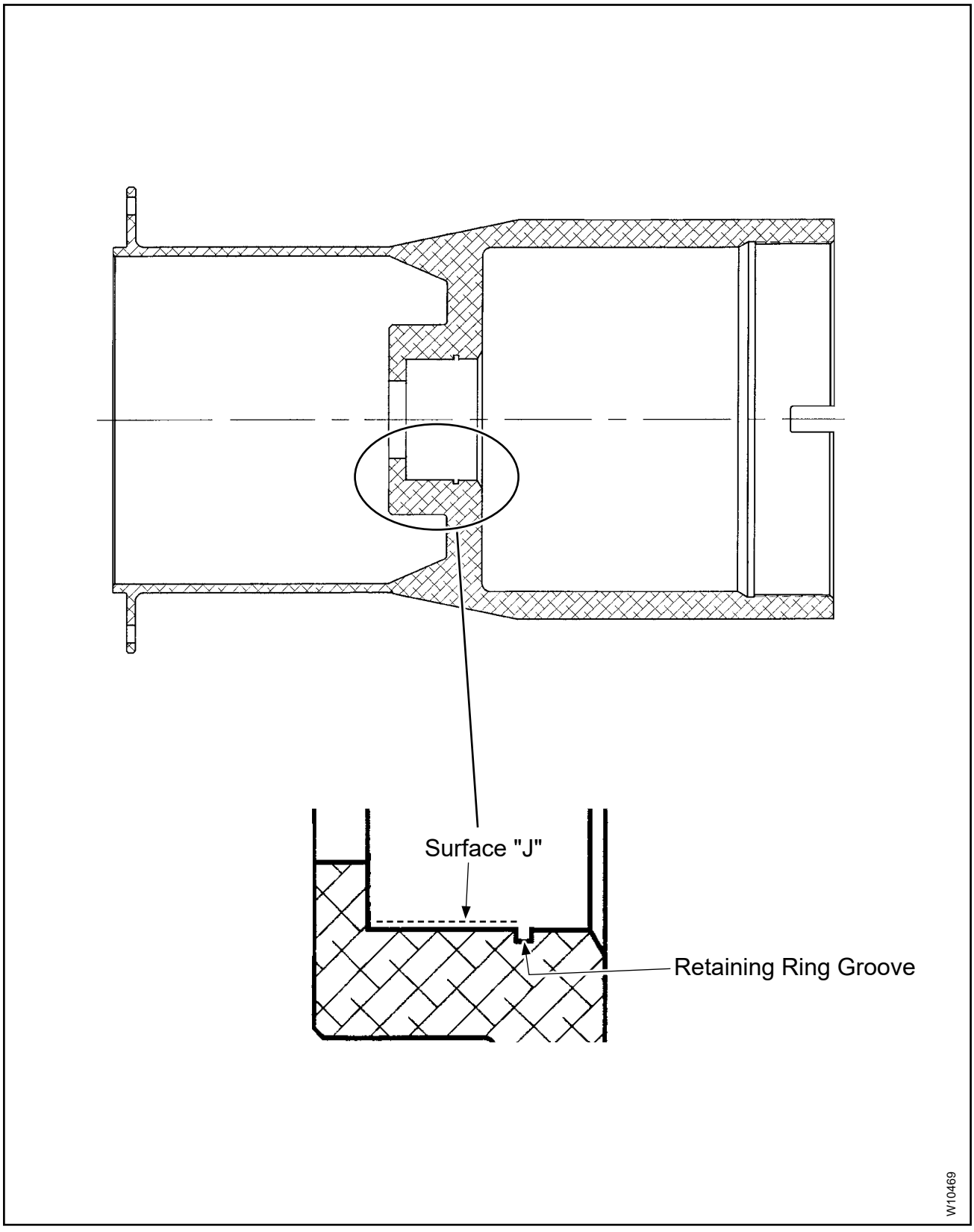
Inspect	Serviceable Limits	Corrective Action
F. CYLINDER p/n E-7417 (Item 140) (Refer to Figure 5-6)		
(1) Visually examine surface "A" for corrosion product, pitting, nicks, scratches, or other damage.	Corrosion product is not permitted. If the cylinder is damaged, measure the damage. The maximum depth of damage permitted is 0.003 inch (0.07 mm). The maximum permitted total area of damage is 1 sq. inch (645 sq. mm). The maximum permitted diameter of an individual pit is 0.032 inch (0.81 mm). A maximum of 10 non-linear pits within a 1 sq. inch (645 sq. mm) area are permitted. Linear pitting is not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). Lightly polish using an abrasive pad CM47 or equivalent to remove sharp corners. The maximum depth of repair is 0.005 inch (0.127 mm). The maximum area of repair is 2 sq. inches (1290 sq. mm). If base aluminum is exposed, chemical conversion coat in accordance with the Chromic Acid Anodizing chapter of Hartzell Standard Practices Manual 202A (61-01-02). To improve the appearance or corrosion product protection surface "A" can be painted with a polane paint. Refer to the Paint and Finish chapter of Hartzell Standard Practices Manual 202A (61-01-02). If damage is greater than the permitted serviceable limits or corrective actions, replace the cylinder.
(2) Visually examine surface "B" for corrosion product, pitting, nicks, scratches, or other damage.	Corrosion product is not permitted. If the cylinder is damaged measure the damage. The maximum permitted depth of damage is 0.003 inch (0.07 mm). The maximum permitted total area of damage is 0.5 sq. inch (322 sq. mm). The maximum permitted diameter of an individual pit is 0.032 inch (0.81 mm). A maximum of 10 non-linear pits within a 1 sq. inch (645 sq. mm) area are permitted. Linear pitting is not permitted. High spots or edges above surrounding machined surfaces are not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). Lightly polish using an abrasive pad CM47 or equivalent to remove sharp corners. The maximum depth of repair is 0.005 inch (0.127 mm) and maximum area of repair is 1 sq. inch (645 sq. mm). If base aluminum is exposed, chemical conversion coat in accordance with the Chromic Acid Anodizing chapter of Hartzell Standard Practices Manual 202A (61-01-02). If damage is greater than the permitted serviceable limits or corrective actions, replace the cylinder.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
F. CYLINDER p/n E-7417, CONTINUED (Item 140) (Refer to Figure 5-6)		
(3) Visually examine surface "C" for corrosion product, pitting, nicks, scratches, or other damage.	Corrosion product is not permitted. If the cylinder is damaged, measure the damage. The maximum depth of damage permitted is 0.003 inch (0.076 mm). The maximum permitted total area of damage is 0.75 sq. inch (483 sq. mm). The maximum permitted diameter of an individual pit is 0.032 inch (0.81 mm). A maximum of 10 non-linear pits within a 1 sq. inch (645 sq. mm) area are permitted. Linear pitting is not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). Lightly polish using an abrasive pad CM47 or equivalent to remove sharp corners. The maximum depth of repair is 0.005 inch (0.127 mm). The maximum area of repair is 1.5 sq. inch (967 sq. mm). If the base aluminum is exposed, chemical conversion coat in accordance with the Chromic Acid Anodizing chapter of Hartzell Standard Practices Manual 202A (61-01-02). To improve the appearance or corrosion product protection, surface "C" can be painted with a polane paint. Refer to the Paint and Finish chapter of Hartzell Standard Practices Manual 202A (61-01-02). If damage is greater than permitted serviceable limits or corrective actions, replace the cylinder.
(4) Visually examine surface "D" for corrosion product, pitting, nicks, scratches, or other damage.	Corrosion product is not permitted. If the cylinder is damaged measure the damage. High spots or edges above surrounding machined surfaces are not permitted. The maximum permitted depth of damage for scratches or nicks is 0.003 inch (0.076 mm). Pitting or other damage must be removed. High spots or edges above surrounding machined surfaces are not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). Lightly polish using an abrasive pad CM47 or equivalent to remove sharp corners. The maximum depth of repair is 0.008 inch (0.20 mm). The maximum permitted total area of repair is 0.5 sq. inch (322 sq. mm). Repair is not permitted to intersect with the retaining ring groove. If base aluminum is exposed, chemical conversion coat in accordance with the Chromic Acid Anodizing chapter of Hartzell Standard Practices Manual 202A (61-01-02). If damage is greater than permitted serviceable limits or corrective actions, replace the cylinder.

Component Inspection Criteria
Table 5-1

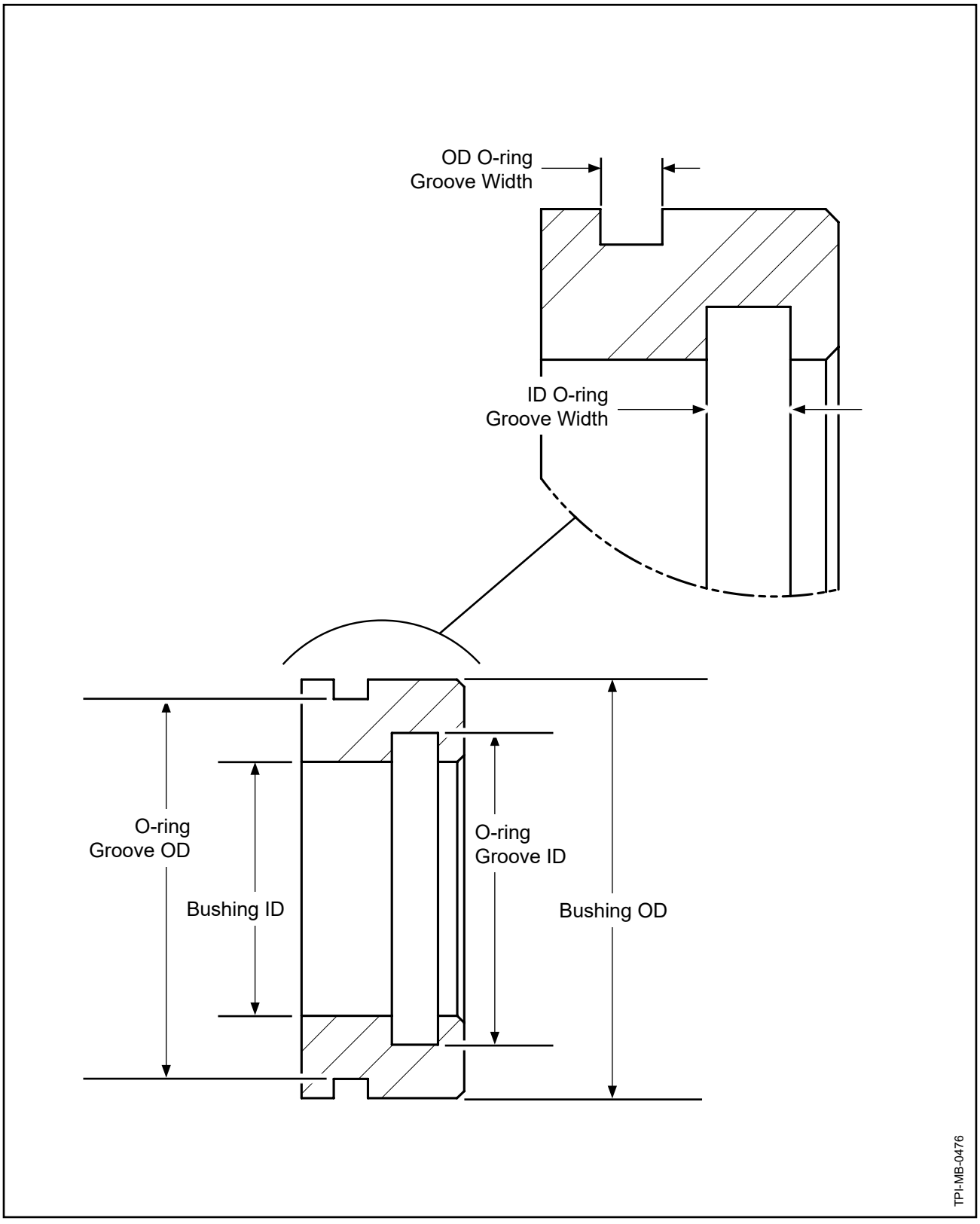
Inspect	Serviceable Limits	Corrective Action
F. CYLINDER p/n E-7417,CONTINUED (Item 140) (Refer to Figure 5-6)		
(5) Visually examine the retaining ring groove for wear or damage.	If the retaining ring groove is worn or damaged, measure the wear or damage. The maximum permitted groove width is 0.074 inch (1.88 mm). The maximum permitted ID is 1.867 inches (47.42 mm).	If the wear or damage is greater than the permitted serviceable limits, replace the cylinder.
(6) Visually examine surface "H" for corrosion product, pitting, nicks, scratches, and other damage.	Corrosion product, pitting, nicks, scratches, or other damage is not permitted.	If there is corrosion product, pitting, nicks, scratches, or other damage, replace the cylinder.
(7) Visually examine surface "E" for corrosion product, pitting, nicks, scratches, or other damage.	Corrosion product is not permitted. If the cylinder is damaged measure the damage. The maximum permitted depth of damage is 0.003 inch (0.07 mm). The maximum permitted total area of damage is 0.5 sq. inch (322 sq. mm). The maximum permitted diameter of an individual pit is 0.032 inch (0.81 mm). A maximum of 10 non-linear pits within a 1 sq. inch (645 sq. mm) area are permitted. Linear pitting is not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). Lightly polish using an abrasive pad CM47 or equivalent to remove sharp corners. The maximum depth of repair is 0.005 inch (0.127 mm). The maximum permitted area of repair is 1.0 sq. inch (645 sq. mm). If base aluminum is exposed, chemical conversion coat in accordance with the Chromic Acid Anodizing chapter of Hartzell Standard Practices Manual 202A (61-01-02). If damage is greater than permitted serviceable limits or corrective actions, replace the cylinder.
(8) Using white light perform a visual examination of surface "F" and surface "I" for cracks.	A crack is not permitted.	If there is a crack, replace the cylinder.
(9) Visually examine surface "F" for corrosion product, pitting, nicks, scratches, or other damage.	Corrosion product, pitting, nicks, scratches, or other damage is not permitted.	If there is corrosion product, pitting, nicks, scratches, or other damage, replace the cylinder.



Cylinder Inspection: Surface "J"
Figure 5-7

Component Inspection Criteria
Table 5-1

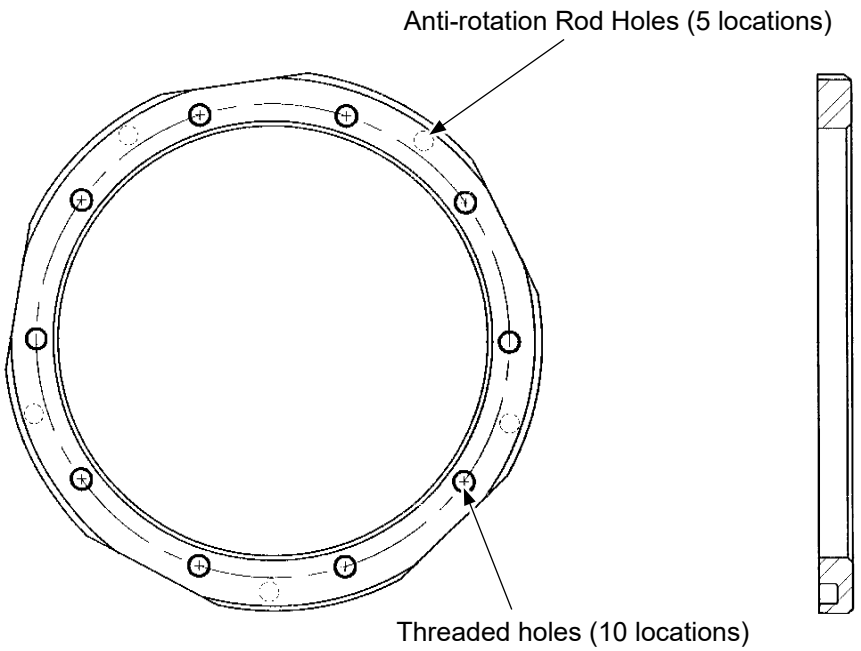
Inspect	Serviceable Limits	Corrective Action
F. CYLINDER p/n E-7417, CONTINUED (Item 140) (Refer to Figure 5-6)		
(10) Visually examine the cylinder ID, surface "G" where the piston O-ring seals to the cylinder for wear, corrosion product, pitting, and damage such as nicks and scratches.	If surface "G" shows wear, measure the cylinder ID. The maximum permitted ID is 4.981 inches (126.51 mm). Wear through the anodize to the base aluminum is not permitted. Corrosion product, pitting, nicks, scratches, or other damage is not permitted.	If there is corrosion product, pitting, nicks, scratches, or damage, replace the cylinder. If the wear is greater than the permitted serviceable limits replace the cylinder.
(11) Using a Profilometer TE436-2 or equivalent, examine the finish on Surface "J".	The maximum permitted surface finish is 32Ra.	If the surface finish is greater than the permitted serviceable limits, polish Surface "J" using 3M microfinishing film (373L), or equivalent. The maximum permitted diameter of Surface "J" after repair is 1.7560 inch (44.602 mm).
(12) Visually examine the threaded portion of the cylinder for damage.	Damage to 1/2 of one thread total accumulated damage is permitted.	If the damage is greater than the permitted serviceable limits replace the cylinder.



Cylinder Bushing
Figure 5-8

Component Inspection Criteria
Table 5-1

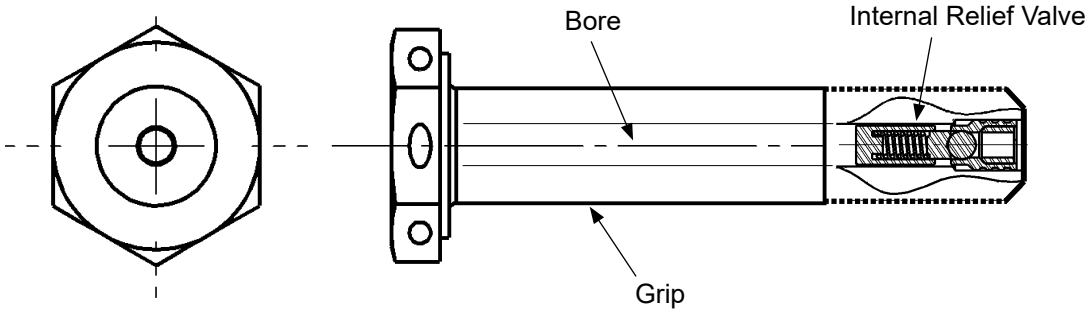
	Inspect	Serviceable Limits	Corrective Action
G.	BUSHING, CYLINDER (Item 160) (Refer to Figure 5-8)		
	(1) Visually examine both sides of the cylinder bushing for wear, damage, and distortion.	Wear, damage, or distortion is not permitted.	If there is wear, damage, or distortion, replace the cylinder bushing.
	(2) Measure the cylinder bushing OD.	The minimum permitted bushing OD is 1.750 inches (44.45 mm).	If the bushing OD is less than the permitted serviceable limit, replace the cylinder bushing.
	(3) Measure the cylinder bushing ID and examine the surface finish.	The maximum permitted ID is 1.064 inches (27.02 mm). A smooth surface is required.	If the bushing ID is greater than the permitted serviceable limit, or if the surface finish is not smooth, replace the cylinder bushing.
	(4) Measure the cylinder bushing O-ring groove ID and examine the surface finish.	The maximum permitted O-ring groove ID is 1.306 inches (33.17 mm). A smooth surface is required.	If the O-ring groove ID is greater than the permitted serviceable limit, or if the surface finish is not smooth, replace the cylinder bushing.
	(5) Measure the cylinder bushing O-ring groove OD and examine the surface finish.	The minimum permitted O-ring groove OD is 1.586 inches (40.29 mm). A smooth surface is required.	If the O-ring groove OD is less than the permitted serviceable limit, or if the surface finish is not smooth, replace the cylinder bushing.
	(6) Measure the width of the ID O-ring groove and examine the groove for wear, damage, and distortion.	The maximum permitted width of the ID O-ring groove is 0.170 inch (4.31 mm). Wear, damage, or distortion is not permitted.	If the width of the ID O-ring groove is greater than the permitted serviceable limit, or if there is wear, damage, or distortion, replace the cylinder bushing.
	(7) Measure the width of the OD O-ring groove and examine the groove for wear, damage, and distortion.	The maximum permitted width of the OD O-ring groove is 0.146 inch (3.70 mm). Wear, damage, or distortion is not permitted.	If the width of the OD O-ring groove is greater than the permitted serviceable limit, or if there is wear, damage, or distortion, replace the cylinder bushing.

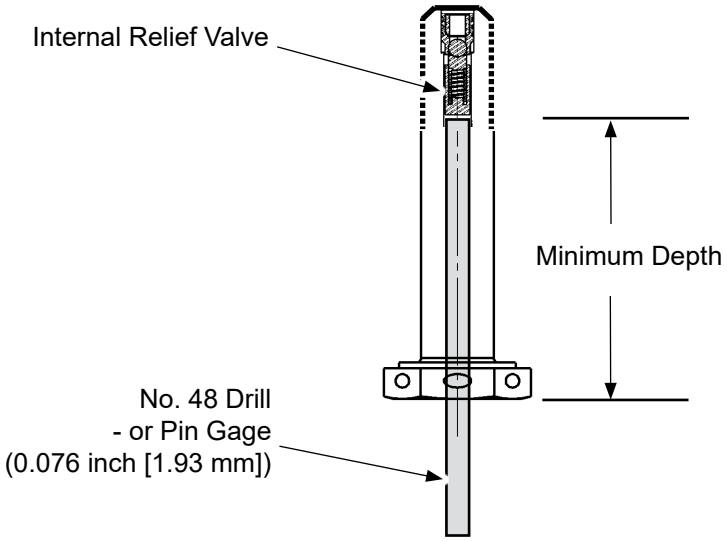


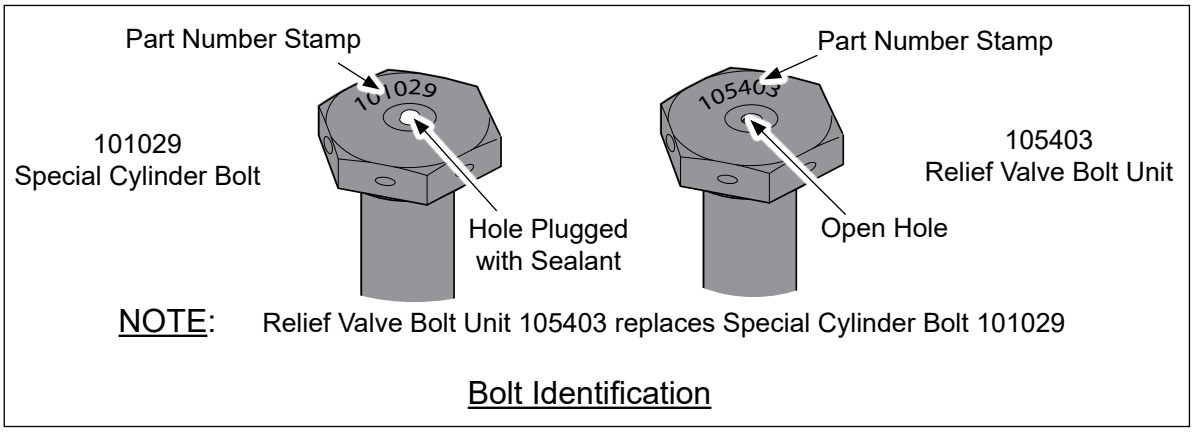
Cylinder Mounting Ring
Figure 5-9

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
H.	RING, CYLINDER MOUNTING (Item 180) (Refer to Figure 5-9)		
(1)	Visually examine the cylinder mounting ring for corrosion product, pitting, nicks, scratches, or other damage.	Corrosion product is not permitted. If the cylinder mounting ring is damaged, measure the damage. The maximum permitted depth of pitting is 0.005 inch (0.13 mm). A high spot or an edge above the surrounding machined surfaces is not permitted. The maximum permitted total area of damage is 1 sq. inch (645 sq. mm). The maximum individual pit is 0.032 inch (0.81 mm). A maximum of 10 non-linear pits within a 1 sq. inch (645 sq. mm) area are permitted. Linear pitting is not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). Remove high spots by polishing using an abrasive pad CM47 or equivalent. If the corrosion product or the damage is greater than the permitted serviceable limits, replace the cylinder mounting ring.
(2)	Visually examine the anti-rotation rod holes for wear (five locations).	If the anti-rotation rod holes are worn or damaged, measure the ID. The maximum permitted ID is 0.259 inch (6.57 mm).	If the ID is greater than the permitted serviceable limits, replace the cylinder mounting ring.
(3)	Visually examine the cylinder mounting ring threaded holes (10 holes) for damage.	One thread of total accumulated damage for each threaded hole is permitted.	If the damage is greater than the permitted serviceable limits, replace the cylinder mounting ring.
(4)	Magnetic particle inspect the cylinder mounting ring in accordance with Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If a relevant indication can be repaired within all the permitted serviceable limits for the cylinder mounting ring in this section, cadmium replate and bake the cylinder mounting ring in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the indication is greater than the permitted serviceable limits, replace the cylinder mounting ring.







TPI-MB-0022, TPI-MB-0016

105403 Relief Valve Bolt Identification and Inspection
Figure 5-10

Component Inspection Criteria
Table 5-1

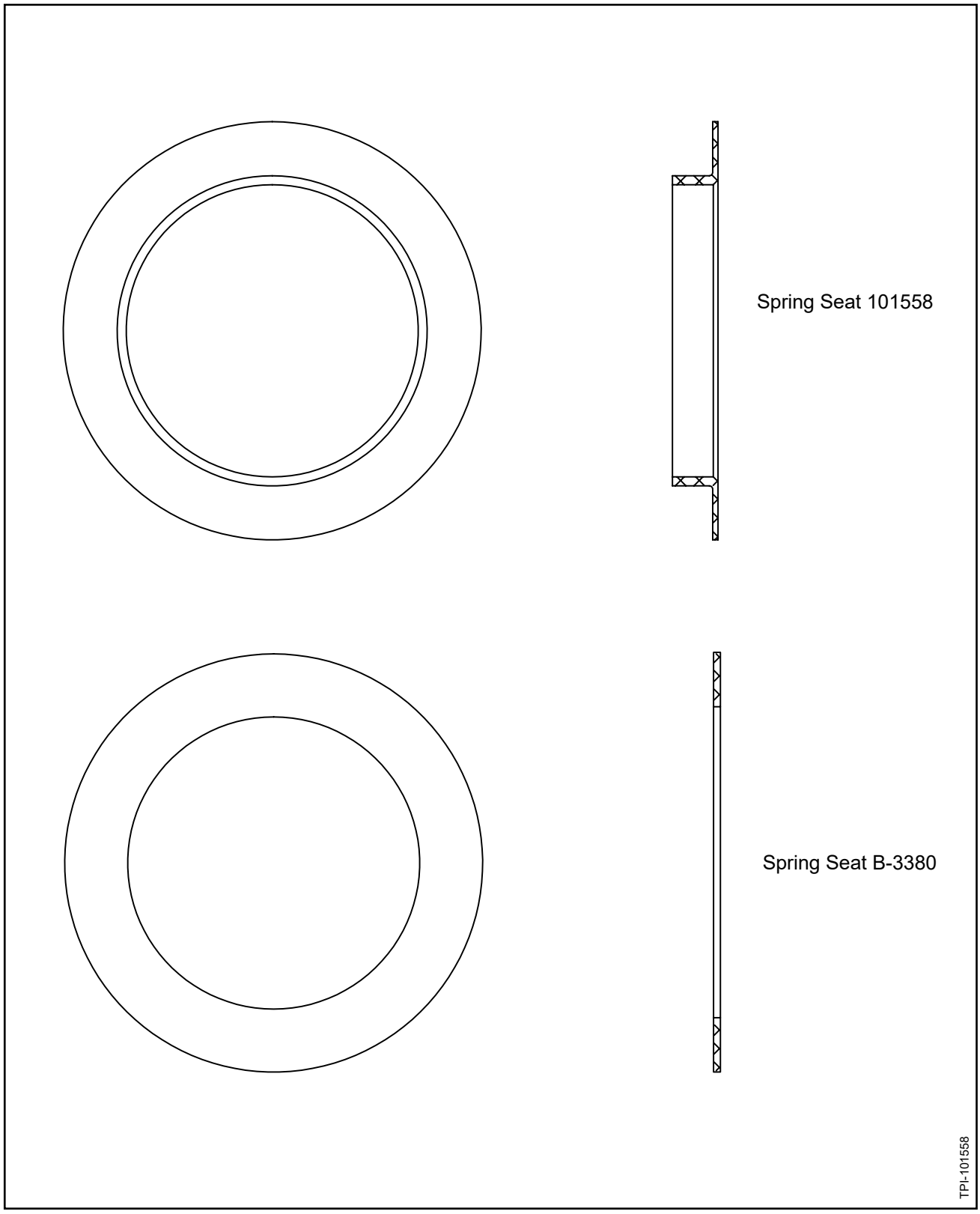
	Inspect	Serviceable Limits	Corrective Action
I.	105403 RELIEF VALVE BOLT UNIT (Item 205) (Refer to Figure 5-10)		
	NOTE: The internal relief valve installed in the threaded end of the relief valve bolt is not removed at overhaul.		
	(1) Visually examine the external surfaces of the relief valve bolt unit for corrosion product.	Corrosion product is not permitted.	Light or local surface corrosion product covering less than 30% of the external surface must be removed using an abrasive pad CM47 or equivalent, or a fine emery cloth. Replace the relief valve bolt if the area of corrosion product covers more than 30% of the external surface, or if the corrosion product cannot be removed.
	(2) Visually examine the head and grip of the relief valve bolt unit for scratches and pitting.	The maximum permitted depth of scratches or pitting is 0.003 inch (0.127 mm). The maximum area of damage from scratches and pitting is 30% of the external surface in combination with any other damage.	If damage from scratches or pitting is greater than the permitted serviceable limits, replace the relief valve bolt unit.
	(3) Visually examine the external threads of the relief valve bolt unit for damage and pitting.	A maximum total accumulated damage of one thread is permitted. Thread damage must not be great enough to cause damage to the mating part.	A file may be used to repair minor thread damage; however, the repaired area is still considered damage when calculating the total accumulated damage. If damage and pitting is greater than the permitted serviceable limits, replace the relief valve bolt unit.
	(4) Visually examine the head of the relief valve bolt unit for damage.	Minor damage is permitted if the safety wire holes are still usable and the wrenching surfaces are sufficient to torque the relief valve bolt unit into the propeller.	Use a file to remove pushed up material that could interfere with adjacent parts. If damage is greater than the serviceable limits, replace the relief valve bolt unit.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
I.	105403 RELIEF VALVE BOLT UNIT, CONTINUED (Item 205) (Refer to Figure 5-10)		
	NOTE: The internal relief valve installed in the threaded end of the relief valve bolt is not removed at overhaul.		
	(5) Examine the bore of the relief valve bolt unit for damage, corrosion product, or unwanted material build-up. This inspection must be performed before the pressure relief valve test.	Damage, corrosion product, or unwanted material build-up will cause blockage in the bore and prevent the drill or pin gage from reaching the minimum depth. To prevent unwanted material from falling into the internal relief valve, hold the relief valve bolt unit vertically with the bolt head facing down. Gently put the blank end of a No. 48 drill or equivalent pin gage (0.076 inch [1.93 mm] diameter) into the center hole in the bolt head. Use the drill or pin gage to measure the depth of the bore from the bolt head to the internal relief valve. The minimum permitted depth is 0.967 inch (24.56 mm).	If the depth of the bore is less than the permitted serviceable limits, clear the bore in accordance with the section, "Clearing the Bore in the 105403 Relief Valve Bolt" in the Repair chapter of this manual. If the minimum permitted depth cannot be met, replace the relief valve bolt unit.
	(6) Before any zinc chromate primer repair, perform a white light inspection on the external surface of the relief valve bolt unit.	A crack is not permitted.	If there is a crack, replace the relief valve bolt unit.
	(7) Visually examine the external surfaces of the relief valve bolt unit for bare metal exposure.	Bare metal exposure on external surfaces is not permitted.	Apply bare steel surfaces of the relief valve bolt unit with zinc chromate primer CM67 or equivalent in accordance with the section, "Zinc Chromate Primer Repair for the 105403 Relief Valve Bolt Unit" in the Repair chapter of this manual.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
I.	105403 RELIEF VALVE BOLT UNIT, CONTINUED (Item 205) (Refer to Figure 5-10)		
	NOTE: The internal relief valve installed in the threaded end of the relief valve bolt is not removed at overhaul.		
	(8) Using the Valve Assembly Check Tool TE547 (Hartzell P/N 105615), pressure test the internal relief valve contained in the relief valve bolt unit in accordance with the section, "Using the TE547 Valve Assembly Check Tool" in the Repair chapter of this manual.	Air passage through the internal relief valve at 40 to 80 PSI (275 to 551 kPa) is required.	If air passage through the internal relief valve is not within the permitted serviceable limits, repeat the bore inspection in step (5) of this section. If air passage through the internal relief valve is still not within the permitted serviceable limits, replace the relief valve bolt unit.



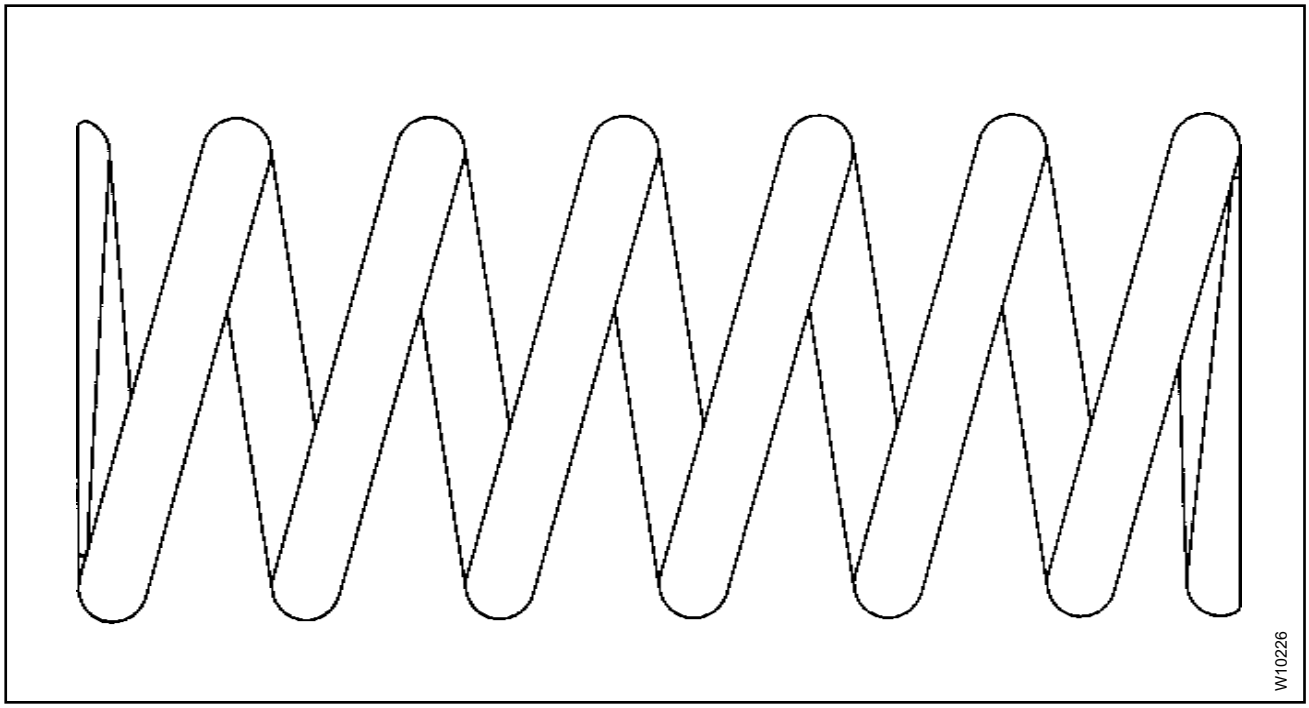
Spring Seat
Figure 5-11

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
J. SPRING SEAT (Item 230) (Refer to Figure 5-11)		
(1) 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 0.020 inch (0.50 mm).	If the wear is greater than the permitted serviceable limits, replace the spring seat.
(2) Visually examine the spring seat for nicks, scratches, and gouges.	The maximum permitted total area of accumulated damage is 0.5 sq. inch (322 sq. mm). The spring seat is not permitted to have damage that extends all the way through the part.	If the damage is greater than the permitted serviceable limits, replace the spring seat.

Component Inspection Criteria
Table 5-1

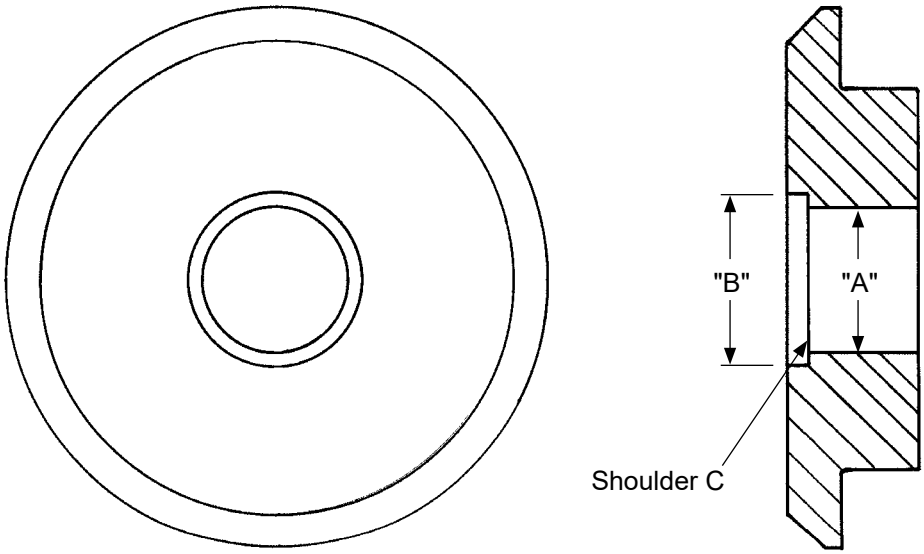
Inspect	Serviceable Limits	Corrective Action
K. SPRING, COMPRESSION, FEATHERING B-3361 (Item 240) (Refer to Figure 5-12)		
(1) Visually examine the feathering compression spring and identify all surfaces where the nylon coating has wear through to the titanium spring material. Visually examine the titanium surfaces for corrosion product, pitting, wear, or other damage.	Corrosion product on the titanium surface is not permitted. If the feathering compression spring is damaged, measure the depth of damage. The maximum permitted depth of damage to the titanium surface is 0.003 inch (0.07 mm).	Remove corrosion product using glass bead cleaning locally applied to the titanium surface only. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). Apply masking material to the nylon surfaces to protect them from abrasion by the glass bead. If the wear or damage is greater than the permitted serviceable limits, replace the feathering compression spring.



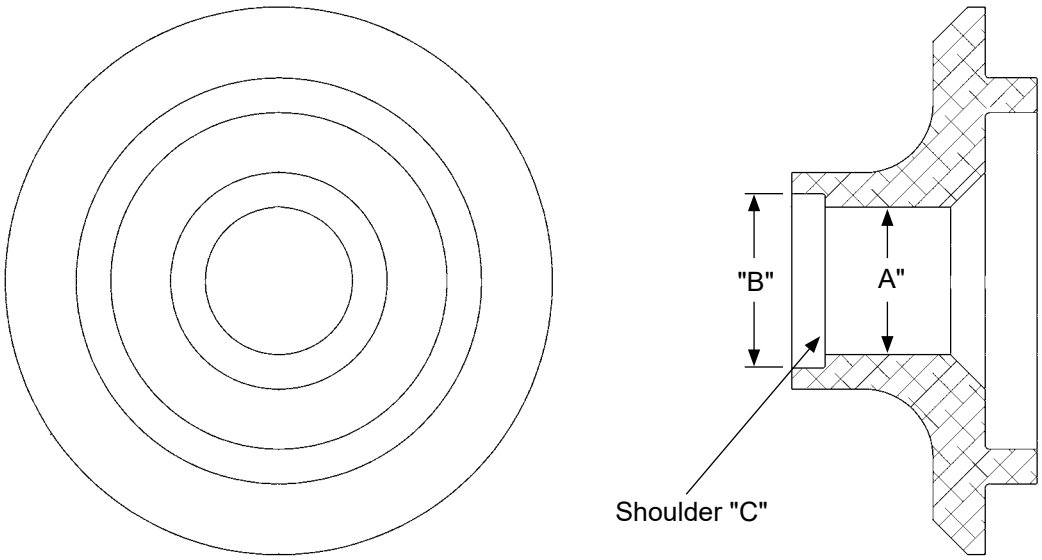
Feathering Compression Spring
Figure 5-12

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
L.	SPRING, COMPRESSION, FEATHERING 102224 (Item 240) (Refer to Figure 5-12)		
	(1) Visually examine the feathering compression spring for corrosion product and pitting.	Corrosion product is not permitted. The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the depth of pitting is greater than the permitted serviceable limits, replace the feathering compression spring.
	(2) Visually examine the feathering compression spring for wear, nicks, or other damage.	The maximum permitted depth of damage is 0.005 inch (0.12 mm).	If the damage is greater than the permitted serviceable limits, replace the feathering compression spring.
	(3) Magnetic particle inspect the feathering compression spring in accordance with the Magnetic Particle Inspection chapter of Hartzell Standard Practices Manual 202A (61-01-02). CAUTION: DO NOT STRIP THE ORIGINAL ZINC PLATING OR ZINC CHROMATE PRIMER.	A relevant indication is not permitted.	If there is a relevant indication, replace the feathering compression spring.
	(4) After magnetic particle inspection, visually examine the feathering compression spring for zinc plate or zinc chromate primer coverage.	A few random scratches are permitted, otherwise, complete coverage of zinc plate or zinc chromate primer on all surfaces of the feathering compression spring is required.	Apply a layer of zinc chromate primer CM67, or equivalent, to the feathering compression spring in accordance with the Repair chapter of this manual. Do not apply zinc chromate primer before magnetic particle inspection.
	(5) Measure the free length of the feathering compression spring.	The minimum permitted free length is 8.50 inches (215.9 mm)	If the free length is less than the permitted serviceable limits, replace the feathering compression spring.



Part Number B-3362
Superseded by 101556



Part Number 101556

B-3362
101556

Rear Spring Retainer
Figure 5-13

TEMPORARY REVISION NO. 010

To Manual 61-10-57

This Temporary Revision is now considered a part of
Hartzell Propeller Inc. Five Blade Lightweight Turbine Propeller Overhaul Manual 157.

NOTE: Record the incorporation of this temporary revision on the RECORD OF TEMPORARY REVISIONS sheet at the front of the manual.

Insert this Temporary Revision in the CHECK chapter with this transmittal page facing page 5-36 (May/23).

Reason for issue: To revise section M., "Spring Retainer, Rear" in Table 5-1, "Component Inspection Criteria".

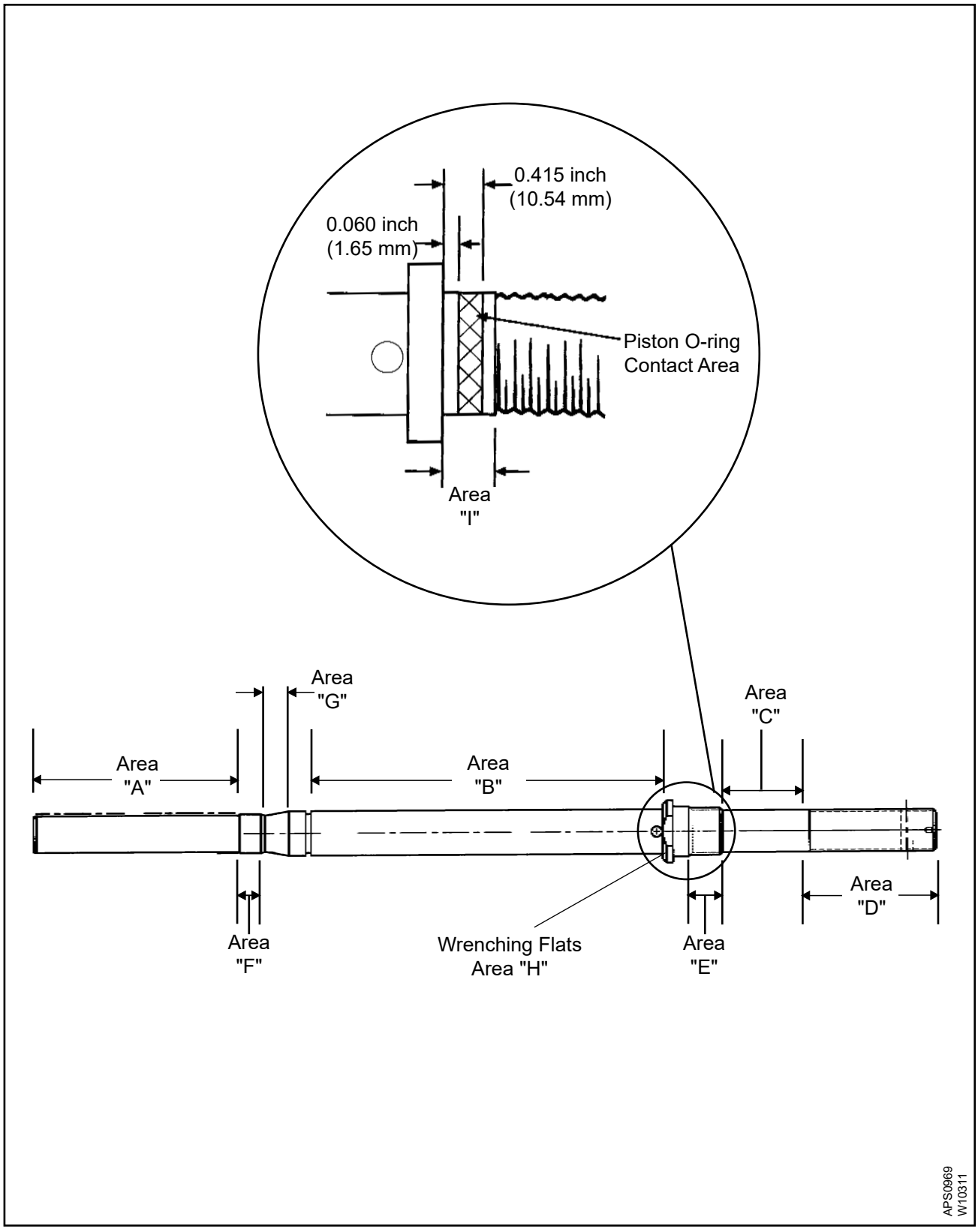
NOTE: See page 1 of this Temporary Revision.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
M.	SPRING RETAINER, REAR (Item 250) (Refer to Figure 5-13)		
(1)	Visually examine the rear spring retainer for corrosion product and pitting.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the damage is greater than the permitted serviceable limits, replace the rear spring retainer.
(2)	Visually examine the rear spring retainer for damage caused by the feathering spring.	If the rear spring retainer is damaged, measure the depth of damage. The maximum permitted depth of damage is 0.010 inch (0.25 mm).	In areas where the depth of damage is less that 0.010 inch (0.25 mm), using an abrasive pad CM47 or equivalent, polish to remove raised material above the normal machined surface. If the depth of damage is greater than the permitted serviceable limits, replace the rear spring retainer.
(3)	Visually examine the rear spring retainer for mechanically caused damage.	If the rear spring retainer is damaged, measure the damage. The maximum permitted depth of damage is 0.010 inch (0.25 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the rear spring retainer.
(4)	Visually examine bore "A" for wear.	If there is wear, measure the ID of the bore. The maximum permitted ID is 1.066 inch (27.07 mm).	If the wear is greater than the permitted serviceable limits, replace the rear spring retainer.
(5)	Visually examine bore "B" for wear.	If there is wear, measure the ID of the bore. The maximum permitted ID is 1.260 inch (32.00 mm).	If the wear is greater than the permitted serviceable limits, replace the rear spring retainer.
(6)	Visually examine shoulder "C" for damage or wear.	A few areas of wear or damage are permitted. The surface must be flat enough to support the rear spring retainer on the interfacing split retainer.	If the damage or wear is greater than the permitted serviceable limits, replace the rear spring retainer.
(7)	Penetrant inspect the rear spring retainer in accordance with the Penetrant Inspection chapter of Hartzell Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication that cannot be removed within the permitted serviceable limits or corrective action limits for the rear spring retainer in this section, replace the rear spring retainer.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
M. SPRING RETAINER, REAR (Item 250) (Refer to Figure 5-13)		
(1) Visually examine the rear spring retainer for corrosion product and pitting.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the damage is greater than the permitted serviceable limits, replace the rear spring retainer.
(2) Visually examine the rear spring retainer for damage caused by the feathering spring.	If the rear spring retainer is damaged, measure the depth of damage. The maximum permitted depth of damage is 0.010 inch (0.25 mm).	In areas where the depth of damage is less that 0.010 inch (0.25 mm), using an abrasive pad CM47 or equivalent, polish to remove raised material above the normal machined surface. If the depth of damage is greater than the permitted serviceable limits, replace the rear spring retainer.
(3) Visually examine the rear spring retainer for mechanically caused damage.	If the rear spring retainer is damaged, measure the damage. The maximum permitted depth of damage is 0.010 inch (0.25 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the rear spring retainer.
(4) Visually examine bore "A" for wear.	If there is wear, measure the ID of the bore. The maximum permitted ID is 1.066 inch (27.07 mm).	If the wear is greater than the permitted serviceable limits, replace the rear spring retainer.
(5) Visually examine bore "B" for wear.	If there is wear, measure the ID of the bore. The maximum permitted ID is 1.260 inch (32.00 mm).	If the wear is greater than the permitted serviceable limits, replace the rear spring retainer.
(6) Visually examine shoulder "C" for damage or wear.	A few areas of wear or damage are permitted. The surface must be flat enough to support the rear spring retainer on the interfacing split retainer.	If the damage or wear is greater than the permitted serviceable limits, replace the rear spring retainer.



Pitch Change Rod
Figure 5-14

Component Inspection Criteria
Table 5-1

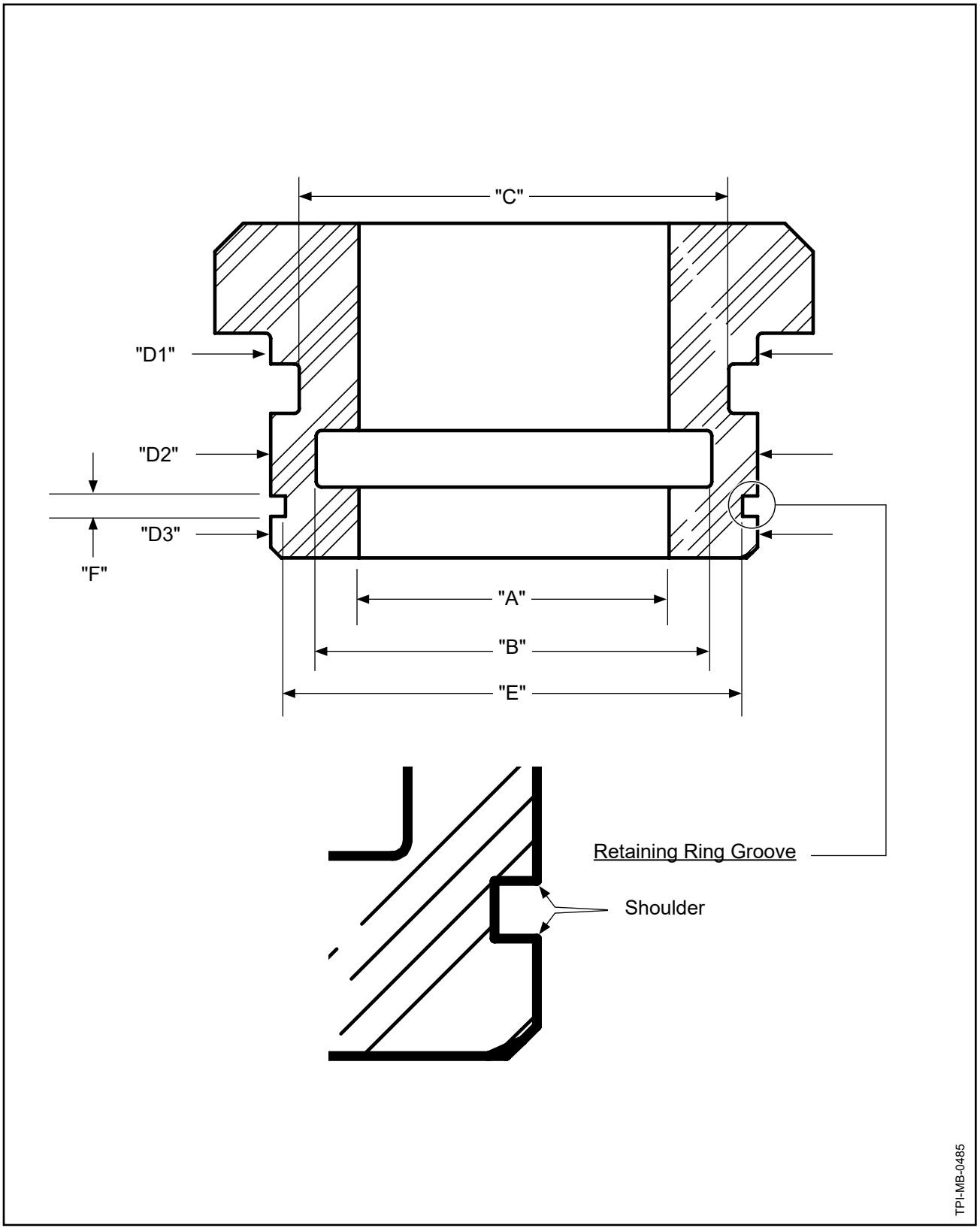
Inspect	Serviceable Limits	Corrective Action
N. PITCH CHANGE ROD (Item 270) (Refer to Figure 5-14)		
(1) Visually examine the pitch change rod for corrosion product.	Corrosion product is not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the damage is greater than the permitted serviceable limits, replace the pitch change rod.
(2) Visually examine the pitch change rod for chrome plating coverage in areas "A", "B", and "C".	Minor wear that is within the limits in this table and random, light scratches that are not greater than the chrome plating depth and do not cause damage to the seal with the O-ring are permitted; otherwise, complete coverage is required.	If the wear or damage is greater than the permitted serviceable limits, either replace the pitch change rod or return it to Hartzell Propeller Inc.
(3) Visually examine the threaded areas "D" and "E" for cadmium plating coverage.	Minor wear on corners and random light scratches are permitted; otherwise, complete cadmium plating coverage is required.	If cadmium plating coverage is less than the permitted serviceable limits, cadmium replate the threaded areas of the pitch change rod and bake in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(4) Visually examine the external threads in areas "D", "E", and "F" for damage.	A maximum of 1/2 of one thread total accumulated damage in each threaded area is permitted. The damaged thread must not interfere with mating part threads.	If the damage is greater than the permitted serviceable limits, replace the pitch change rod.
(5) Visually examine the taper area "G" for pitting, wear, and damage.	Pitting, wear, or damage is not permitted at the smallest diameter of the taper or within 0.093 inch (2.36 mm) of the thread. The remaining taper surface may have a maximum depth of damage of 0.004 inch (0.10 mm) over 10% of the surface area. High spots or edges above the surrounding machined surfaces are not permitted.	If damage causes high spots above the existing surface, remove only the high spots. If pitting, wear, or damage is greater than the permitted serviceable limits, replace the pitch change rod.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
N.	PITCH CHANGE ROD, CONTINUED (Item 270) (Refer to Figure 5-14)		
(6)	Visually examine the pitch change rod for straightness.	The pitch change rod must be straight; bending is not permitted.	If there is bending, replace the pitch change rod.
(7)	Visually examine the two wrenching flats "H" on the pitch change rod shoulder for displaced material.	Displaced material caused by open-end wrench engagement must not protrude above or below the pitch change rod shoulder surfaces.	Remove the protruding displaced material to be flush with the pitch change rod shoulder thickness.
		Sufficient flat surfaces "H" must remain to support an applied open end wrench torque.	If the damage is greater than the permitted serviceable limits, replace the pitch change rod.
(8)	Visually examine the area "I" between the pitch change rod wrenching shoulder and the threads where the piston O-ring seats for pitting or damage.	Pitting is not permitted in area "I". Damage is not permitted in the O-ring seating area. The remaining area "I" outside of the O-ring seating area may have a maximum damage depth of 0.007 inch (0.17 mm).	If pitting or damage is in the O-ring seating area, replace the pitch change rod. Remove corrosion product by polishing with an abrasive pad CM47 or equivalent, only in the remaining area "I" outside the O-ring seating area. If the repair is greater than the permitted serviceable limit, replace the pitch change rod.
(9)	Measure the diameter in area "A" of the pitch change rod.	The minimum diameter permitted is 0.870 inch (22.10 mm).	If the diameter is less than the permitted serviceable limits, replace the pitch change rod.
(10)	Measure the diameter in area "B" of the pitch change rod.	The minimum diameter permitted is 1.058 inch (26.88 mm).	If the diameter is less than the permitted serviceable limits, replace the pitch change rod.
(11)	Measure the diameter in area "C" of the pitch change rod.	The minimum diameter permitted is 0.994 inch (25.25 mm).	If the diameter is less than the permitted serviceable limits, replace the pitch change rod.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
N. PITCH CHANGE ROD, CONTINUED (Item 270) (Refer to Figure 5-14)		
(12) Magnetic particle inspect the pitch change rod in accordance with Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If a relevant indication can be repaired and is within the permitted serviceable limits, cadmium replate and bake the pitch change rod in accordance with the Cadmium Replating chapter of Hartzell Standard Practices Manual 202A (61-01-02). If the relevant indication is greater than the permitted serviceable limits, replace the pitch change rod.



Rod Hub Bushing
Figure 5-15

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
O.	HUB BUSHING, ROD, p/n 108346 (Item 422) (Refer to Figure 5-15)		
(1)	Measure the ID of the rod hub bushing ("A").	The maximum permitted ID is 0.878 inch (22.30 mm). A smooth surface finish is required.	If the ID is greater than the permitted serviceable limits or the surface finish is not smooth, replace the rod hub bushing.
(2)	Measure the ID of the rod hub bushing O-ring groove ("B").	The maximum permitted ID is 1.121 inches (28.47 mm). A smooth surface finish is required.	If the ID is greater than the permitted serviceable limits or the surface finish is not smooth, replace the rod hub bushing.
(3)	Measure the OD of the rod hub bushing O-ring groove ("C").	The minimum permitted OD is 1.211 inches (30.76 mm).	If the OD is less than the permitted serviceable limits, replace the rod hub bushing.
(4)	Measure the OD of the rod hub bushing at two locations ("D1") and ("D2").	The minimum permitted OD at each location is 1.373 inches (34.88 mm).	If the OD is less than the permitted serviceable limits, replace the rod hub bushing.
(5)	Measure the OD of the rod hub bushing at location ("D3").	The minimum permitted OD is 1.368 inches (34.75 mm).	If the OD is less than the permitted serviceable limits, replace the rod hub bushing.
(6)	Measure the OD of the retaining ring groove ("E").	The minimum permitted OD is 1.284 inches (32.62 mm).	If the OD is less than the permitted serviceable limits, replace the rod hub bushing.
(7)	Visually examine each shoulder of the retaining ring groove for damage.	The maximum permitted total accumulated damage for each shoulder is 25% of the circumference.	If the damage for either shoulder is greater than the permitted serviceable limits, replace the rod hub bushing.
(8)	Measure the width of the retaining ring groove ("F").	The maximum permitted width is 0.062 inch (1.57 mm).	If the width is greater than the permitted serviceable limits, replace the rod hub bushing.

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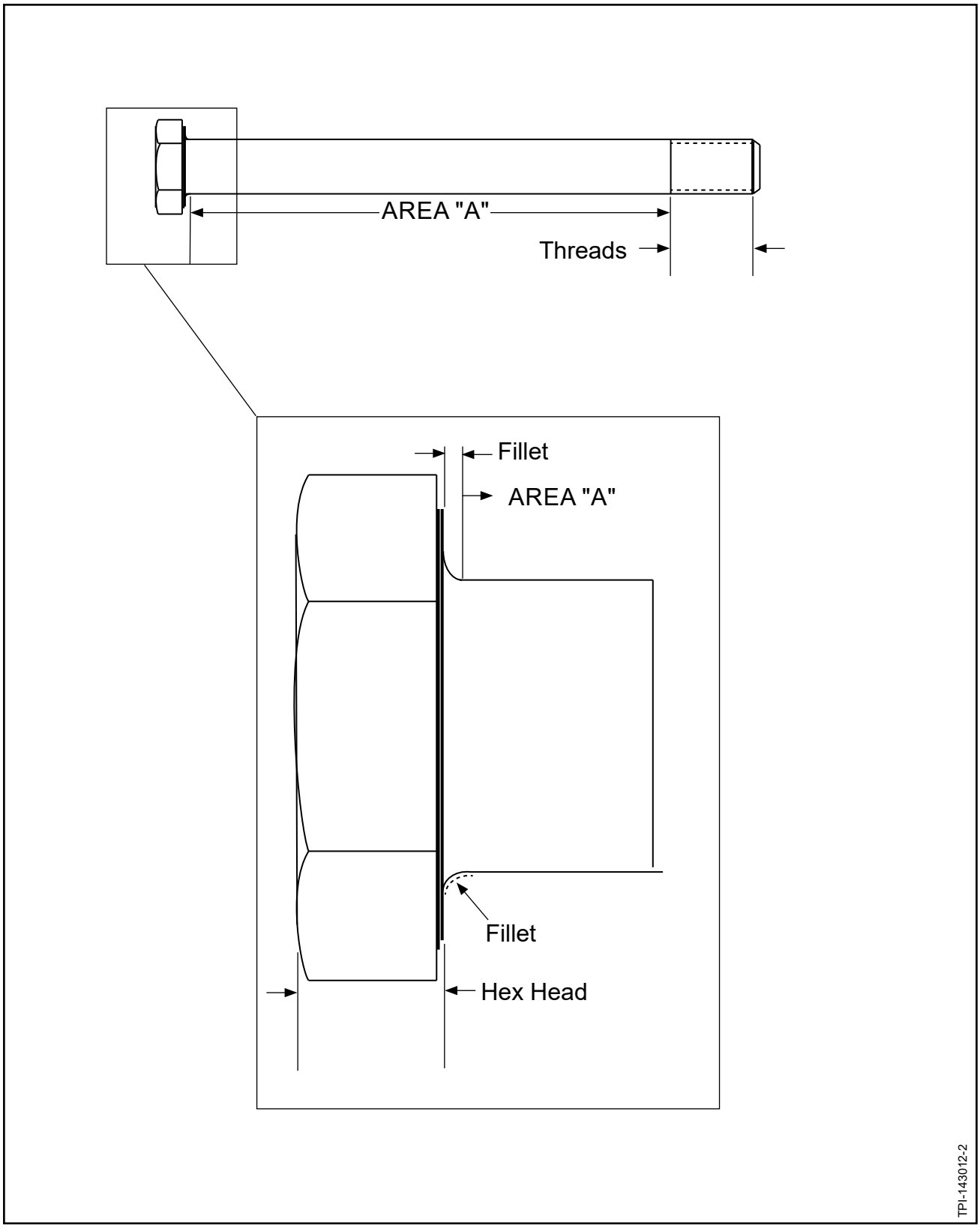
Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
P.	HUB UNIT (Item 410)		
	(1) Inspect the hub in accordance with the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).		

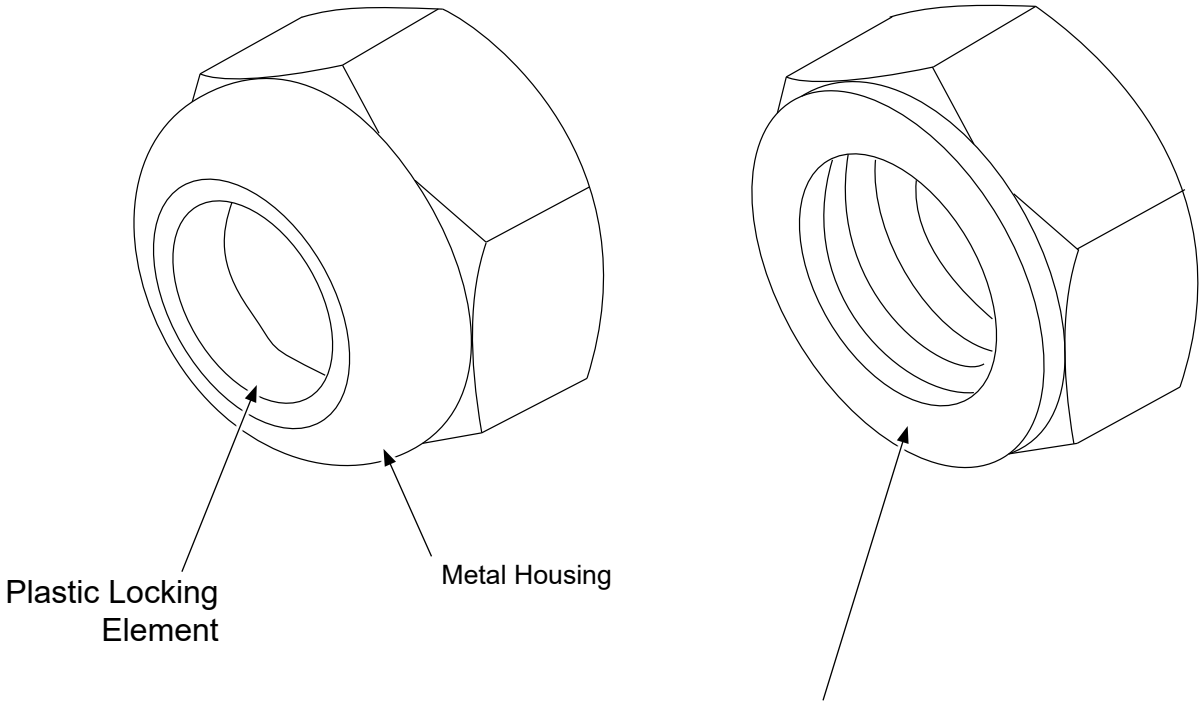


Hex Head Bolt
Figure 5-16

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Q. HEX HEAD BOLT (Items 470 and 490) (Refer to Figure 5-16 and 5-17)		
(1) Visually examine the hex head bolt for corrosion product and pitting.	Corrosion product is not permitted. The maximum permitted depth of pitting is 0.002 inch (0.05 mm). No more than 5% of the total unthreaded surface may be pitted. The maximum permitted diameter of an individual pit is 0.032 inch (0.81 mm). Pitting is not permitted in the fillet between the hex head and the grip, Area "A". Pitting must not affect the fit or function of the hex head bolt.	Remove corrosion product using glass bead cleaning in accordance with the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If corrosion product cannot be removed, replace the hex head bolt. If the pitting is greater than the permitted serviceable limits, replace the hex head bolt.
(2) Except for the threads, visually examine the hex head bolt for damage or scratches.	The maximum permitted depth of damage or a scratch is 0.002 inch (0.05 mm). Scratches or damage must not affect the fit or function of the hex head bolt. Pushed up material is not permitted.	Pushed up material may be removed with a thread file. Use of the thread file must not affect the fit or function of the hex head bolt. If the depth of a scratch or damage is greater than the permitted serviceable limits or if the scratch, damage, or repair affects the fit or function of the hex head bolt, replace the hex head bolt.
(3) Visually examine the hex head bolt for circumferential scoring caused by installation and removal.	Circumferential scoring that reduces the diameter of the hex head bolt is not permitted. The minimum permitted OD in Area "A" is 0.370 inch (9.40 mm).	If scoring is greater than the permitted serviceable limits or if the OD in Area "A" is less than the permitted serviceable limits, replace the hex head bolt.
(4) Visually examine the wrenching surfaces of the head of the hex head bolt for metal movement caused by wrenching.	Limited damage from wrenching is permitted, but it must be possible to torque the hex head bolt and metal movement must not interfere with the installation of the hex head bolt or cause damage to the hub.	Remove metal movement with a file or equivalent. Only corners may be repaired. Refacing a complete surface is not permitted. If metal movement is greater than the permitted serviceable limits, replace the hex head bolt.

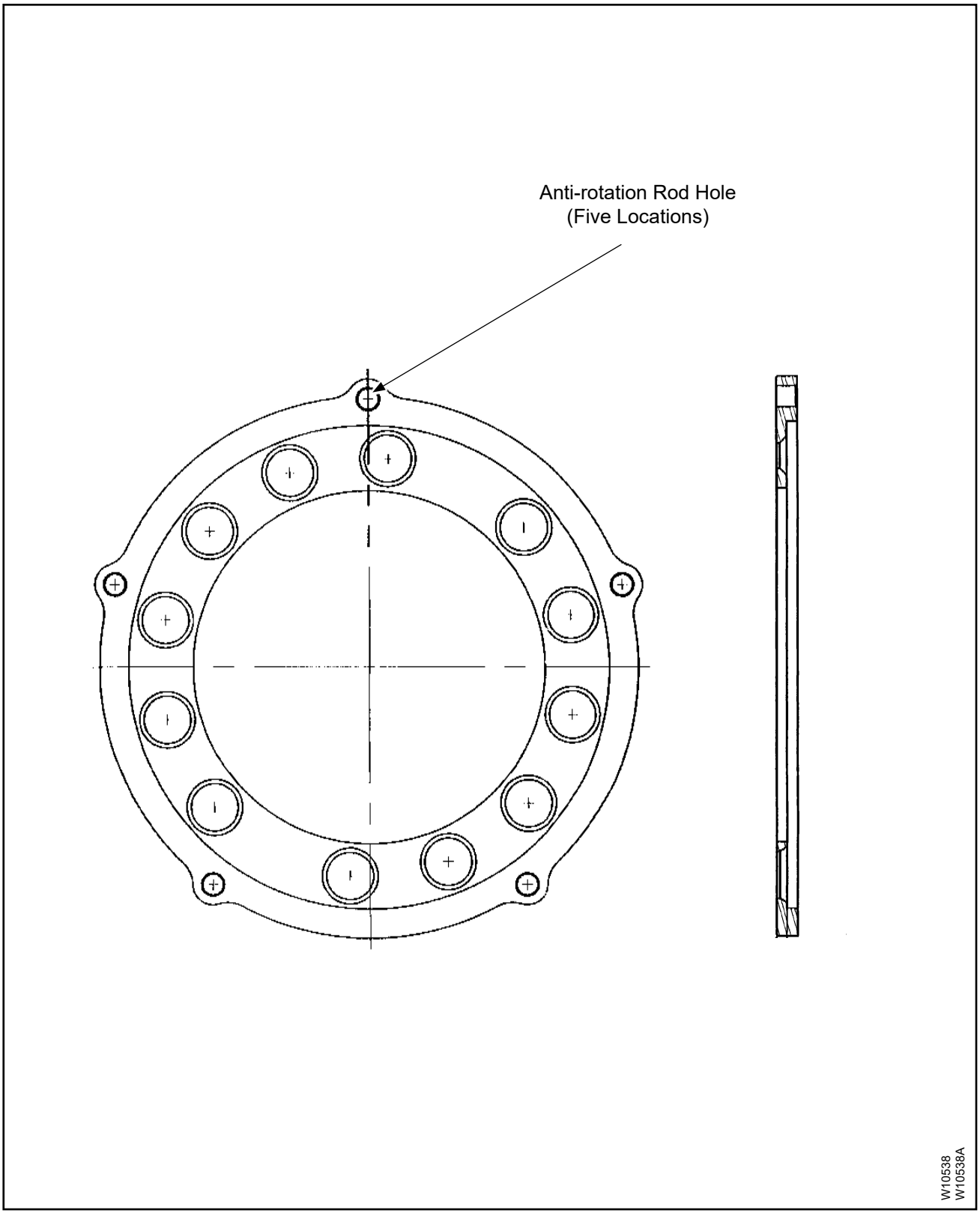
CAUTION: DO NOT USE MODIFIED A-2043-1 NUTS ON THE PROPELLER ASSEMBLY. A-2043-1 NUTS THAT HAVE BEEN MODIFIED ARE TO BE USED ONLY FOR THE HEX HEAD BOLT THREAD CHECK.



A-2043-1 Nut Modification
Figure 5-17

Component Inspection Criteria
Table 5-1

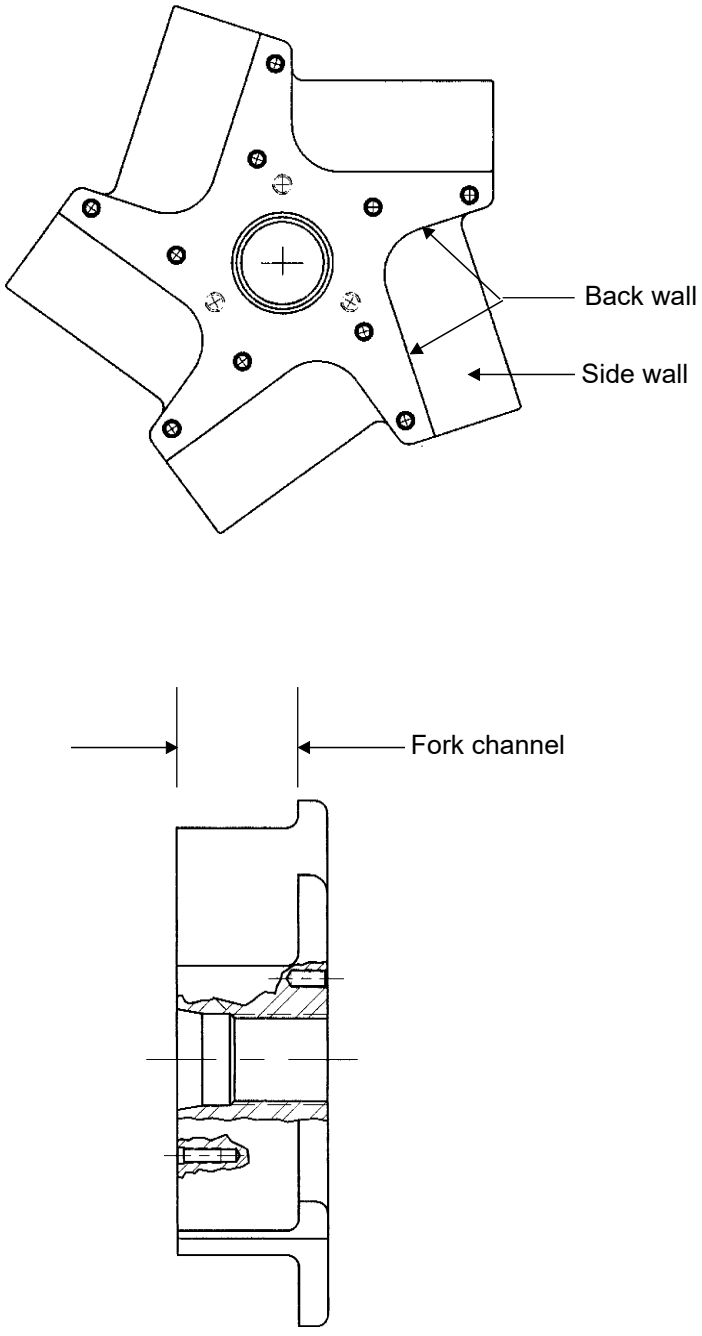
	Inspect	Serviceable Limits	Corrective Action
Q.	HEX HEAD BOLT, CONTINUED (Items 470 and 490) (Refer to Figure 5-16 and 5-17)		
(5)	Visually examine the threads of the hex head bolt for damage and pitting.	A maximum total accumulation of 3/4 thread of damage and pitting is permitted. Thread damage must not cause damage to the mating part. An A-2043-1 nut with the plastic locking element removed should be able to be freely rotated by hand on the bolt threads. For the modification of the nut, refer to Figure 5-17.	Limited thread file repair is permitted, but must be considered as thread damage. If the damage and pitting is greater than the permitted serviceable limits, replace the hex head bolt.
(6)	Magnetic particle inspect each bolt in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the hex head bolt.
(7)	Visually examine the hex head bolt for cadmium plating coverage.	Cadmium plating must completely cover the bolt with the following exceptions: A few scratches and corners with cadmium plating missing, minor abrading of cadmium plating on the threads, or minor abrading of the cadmium plating on the hex head because of wrenching are permitted.	If the cadmium plating coverage is less than the permitted serviceable limits, cadmium replate and bake for a minimum of 23 hours within four hours after plating the hex head bolt in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Mounting Bolt Ring
Figure 5-18

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
R. RING, MOUNTING BOLT (Item 450) (Refer to Figure 5-18)		
(1) Visually examine the mounting bolt ring for corrosion product, pitting, nicks, scratches, or other damage.	Corrosion product is not permitted. If the mounting bolt ring is damaged, measure the damage. The maximum permitted depth of pitting, nicks, scratches, or other damage is 0.005 inch (0.13 mm). Dimpling of the shoulder due to rotation of the flanged mounting stud head (460) is permitted. High spots or edges above the surrounding machined surfaces are not permitted. The total permitted amount of damage is 1 sq. inch (645 sq. mm). The maximum permitted diameter of an individual pit is 0.032 inch (0.81 mm). The maximum permitted number of non-linear pits within a 1 sq. inch (645 sq. mm) area is 10. Linear pitting is not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). Remove high spots by polishing with an abrasive pad CM47 or equivalent. If the corrosion product, pitting, nicks, scratches, or other damage is greater than the permitted serviceable limits, replace the mounting bolt ring.
(2) Visually examine the anti-rotation rod holes for wear (five locations).	If there is wear, measure the diameter. The maximum ID permitted is 0.265 inch (6.73 mm)	If the diameter is greater than the permitted serviceable limits, replace the mounting bolt ring.
(3) Magnetic particle inspect the mounting bolt ring in accordance with Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If the damage is within the permitted serviceable limits, cadmium replate and bake the mounting bolt ring in accordance with the Cadmium Replating chapter of Hartzell Standard Practices Manual 202A (61-01-02). If there is a relevant indication, replace the mounting bolt ring.



Fork
Figure 5-19

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
S. FORK (Item 600) (Refer to Figure 5-19)		
(1) Visually examine the fork for corrosion product or pitting.	Corrosion product is not permitted. If there is pitting, measure the pitting. The maximum depth of pitting is 0.005 inch (0.12 mm). The maximum permitted total area of damage is 0.5 sq. inch (322 sq. mm). The maximum permitted diameter of an individual pit is 0.032 inch (0.81 mm). A maximum of 10 non-linear pits within a 1 sq. inch (645 sq. mm) area are permitted. Linear pitting is not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). If 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 is permitted.	If the damage is greater than the permitted serviceable limits replace the fork.
(3) Visually examine the fork plate attachment threaded holes (10) 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 fork bumper attachment threaded holes (3) 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.
(5) Visually examine the tapered portion of the fork bore for wear, nicks, fretting, or other damage.	If the fork is worn or damaged, measure the depth of damage. The maximum permitted depth of damage is 0.003 inch (0.07 mm).	If the damage is greater than the permitted serviceable limits, replace the fork.
(6) Visually examine the fork channel side and back wall for wear or damage.	If the fork is worn or damaged, measure the depth of wear or damage. The maximum permitted depth of wear or damage is 0.008 inch (0.20 mm) compared with the adjacent undamaged surface.	If the damage is greater than the permitted serviceable limits, replace the fork.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
S.	FORK, CONTINUED (Item 600) (Refer to Figure 5-19)		
	(7) Visually examine the external surfaces not including the fork channel surfaces and pitch change rod bore for wear, nicks, scratches, or other damage.	If the fork is worn or damaged, measure the depth of wear, nicks, scratches, or damage. The maximum permitted depth of wear, nicks, scratches, or damage is 0.005 inch (0.12 mm).	If the wear, nicks, scratches, or damage is greater than the permitted serviceable limits, replace the fork.
	(8) Magnetic particle inspect the fork in accordance with the Hartzell Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If a relevant indication can be repaired and is within the permitted serviceable limits, cadmium replate and bake the fork in accordance with the Cadmium Replating chapter of Hartzell Standard Practices Manual 202A (61-01-02). If the relevant indication cannot be repaired within the permitted serviceable limits, replace the fork.

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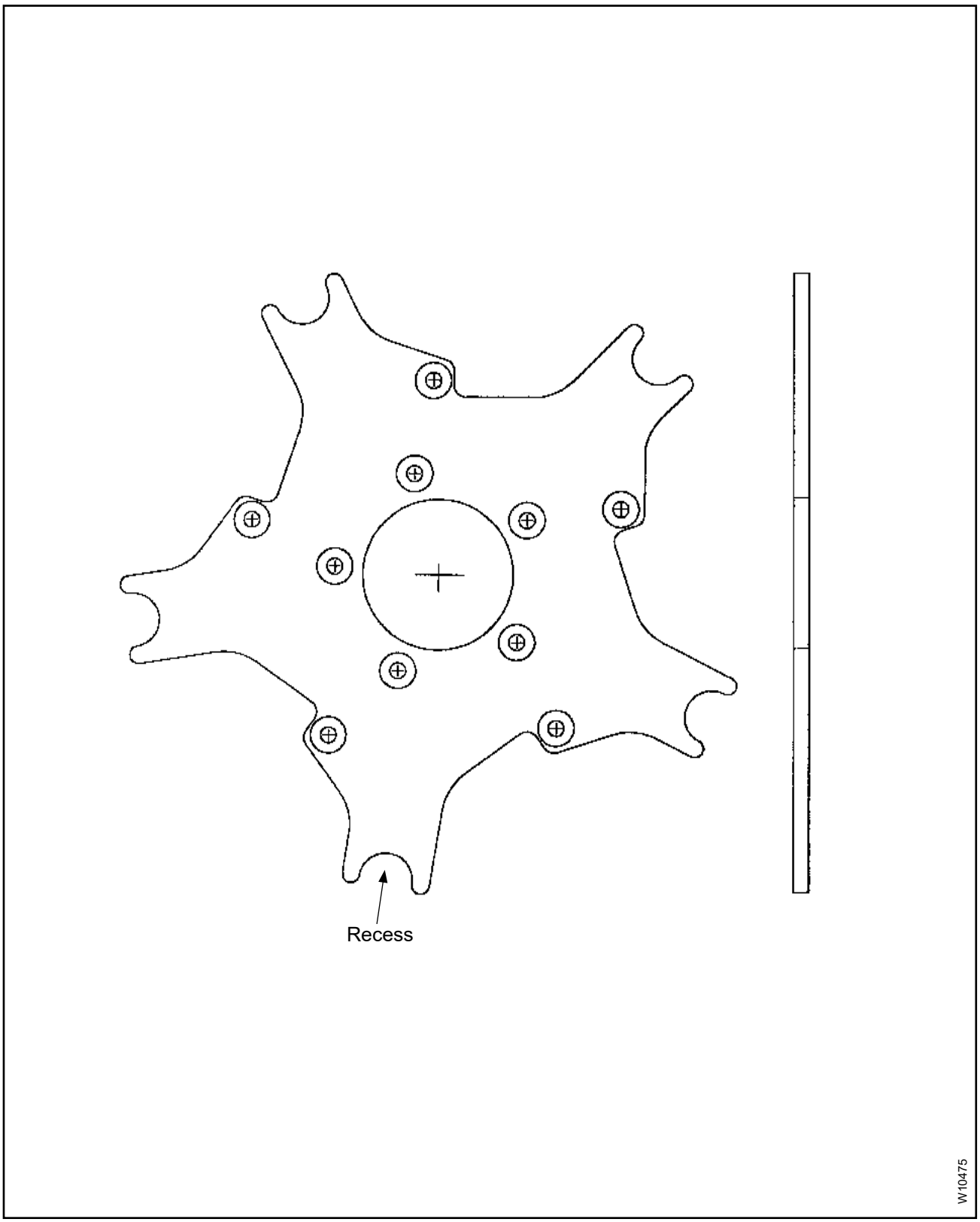

Fork Plate
Figure 5-20

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
T. PLATE, FORK (Item 610) (Refer to Figure 5-20)		
(1) Visually examine the fork plate for corrosion product, pitting, nicks, scratches, or other damage.	Corrosion product is not permitted. If the fork plate is damaged, measure the damage. The maximum permitted depth of damage is 0.005 inch (0.12 mm). The maximum permitted total area of damage is 1 sq. inch (645 sq. mm). Individual pits no greater than 0.032 inch (0.81 mm) diameter. A maximum of 10 non-linear pits within a 1 sq. inch (645 sq. mm) area are permitted. Linear pitting is not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). If damage is greater than the permitted serviceable limits, replace the fork plate.
(2) Visually examine the fork plate for wear from the cam follower.	If the fork plate is worn or damaged, measure the damage. The maximum permitted depth of damage is 0.003 inch (0.08 mm) compared with the adjacent undamaged surface.	If the damage is greater than the permitted serviceable limits, replace the fork plate.
(3) Visually examine the fork plate attachment holes and associated countersinks (10) for wear or damage.	If the fork plate is worn or damaged, measure the damage. The maximum permitted depth of damage is 0.003 inch (0.08 mm).	If the damage is greater than the permitted serviceable limits, replace the fork plate.
(4) Visually examine the fork plate for cadmium plate coverage.	A maximum of 10% of the base metal visible is permitted.	If cadmium plate coverage is less than the permitted serviceable limits, cadmium replate and bake the fork plate in accordance with the Cadmium Replating chapter of Hartzell Standard Practices Manual 202A (61-01-02).
(5) Visually examine the fork plate recess diameters (5) for wear.	If the fork plate is worn, measure the wear. The maximum permitted diameter that will fit into each slot is 0.580 inch (14.73 mm) diameter.	If the wear is greater than the permitted serviceable limits, replace the fork plate.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
T. PLATE, FORK, CONTINUED (Item 610) (Refer to Figure 5-20)		
(6) Magnetic particle inspect of the fork plate in accordance with the Hartzell Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If a relevant indication can be repaired and is within the permitted serviceable limits, cadmium replate and bake the fork in accordance with the Cadmium Replating chapter of Hartzell Standard Practices Manual 202A (61-01-02). If the relevant indication cannot be repaired within the permitted serviceable limits, replace the fork.

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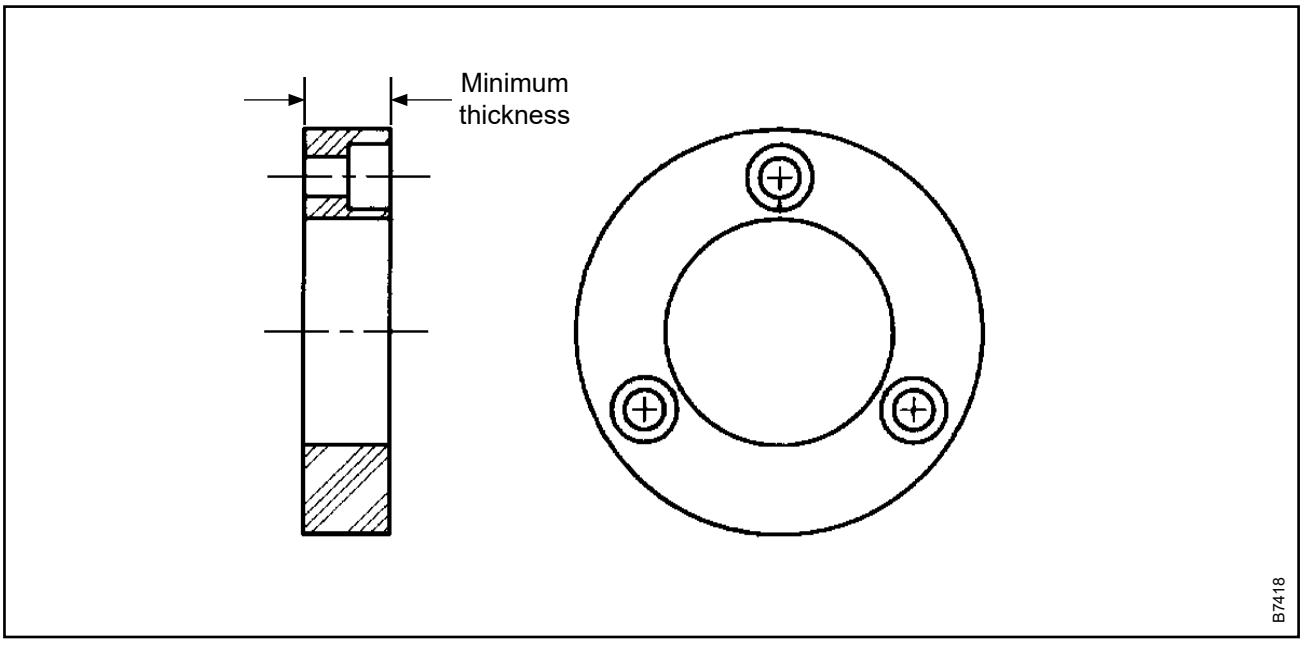
Component Inspection Criteria
Table 5-1

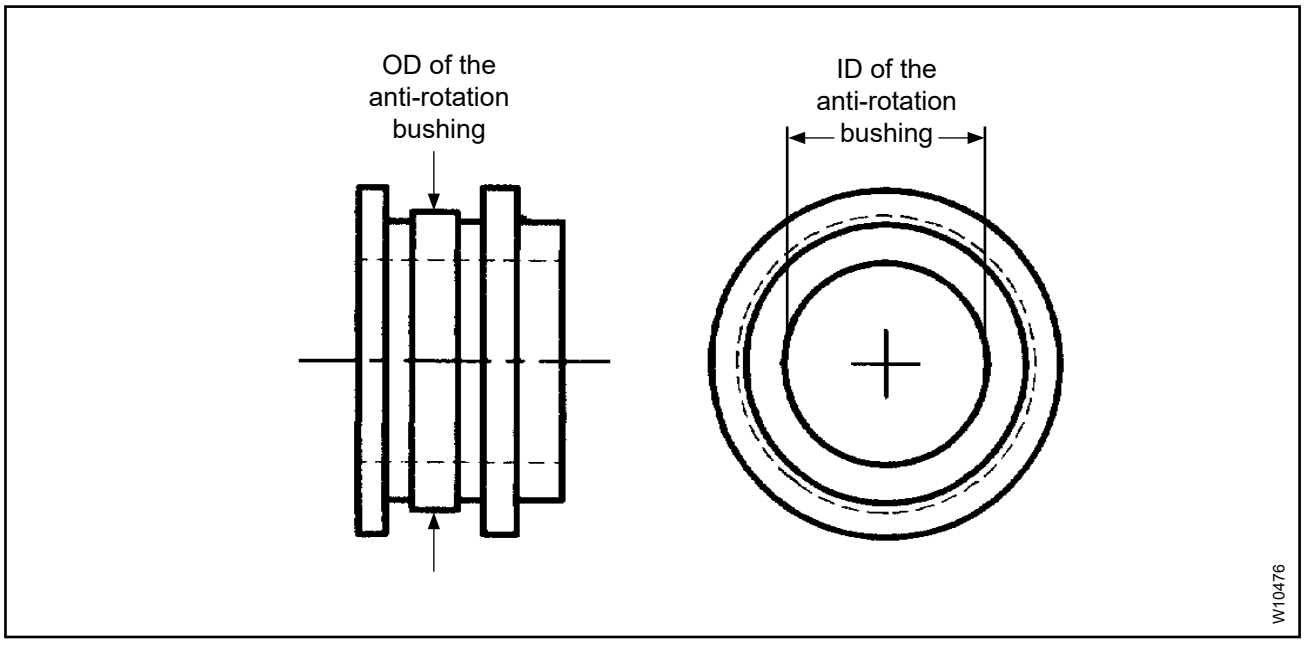
Inspect	Serviceable Limits	Corrective Action
U. BUMPER, FORK (Item 630) (Refer to Figure 5-21)		
(1) Visually examine the fork bumper for wear that reduces thickness.	If the fork bumper is worn, measure the fork bumper wear. The minimum permitted thickness is 0.440 inch (11.18 mm).	If the wear is less than the permitted serviceable limits, replace the fork bumper.



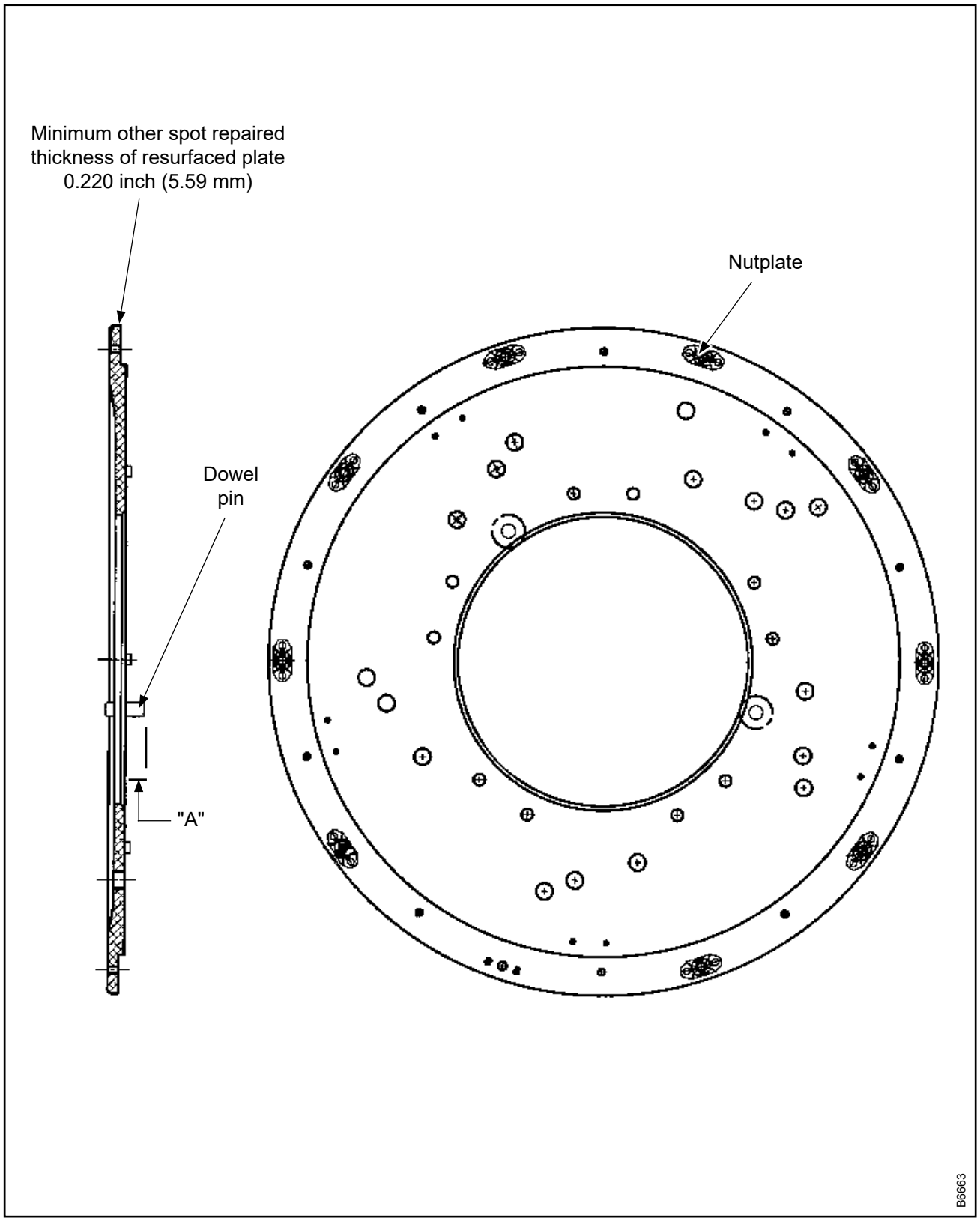
Fork Bumper
Figure 5-21

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
V. BUSHING, ANTI-ROTATION (Item 650) (Refer to Figure 5-22)		
(1) Visually examine the anti-rotation bushing for corrosion product, pitting, or other damage.	Corrosion product is not permitted. If the anti-rotation bushing is damaged, measure the damage. The maximum depth of pitting or damage permitted is 0.005 inch (0.13 mm). Anti-friction coating may have wear.	If the damage is greater than the permitted serviceable limits, replace the anti-rotation bushing.
(2) Measure the ID of the anti-rotation bushing.	The maximum ID permitted is 0.3785 inches (9.61 mm).	If the diameter is greater than the permitted serviceable limits, replace the anti-rotation bushing.
(3) Measure the OD of the anti-rotation bushing.	The minimum OD permitted is 0.540 inches (13.72 mm).	If the diameter is greater than the permitted serviceable limits, replace the anti-rotation bushing.



Bushing (Anti-rotation)
Figure 5-22



Adapter Plate Unit
Figure 5-23

Component Inspection Criteria
Table 5-1

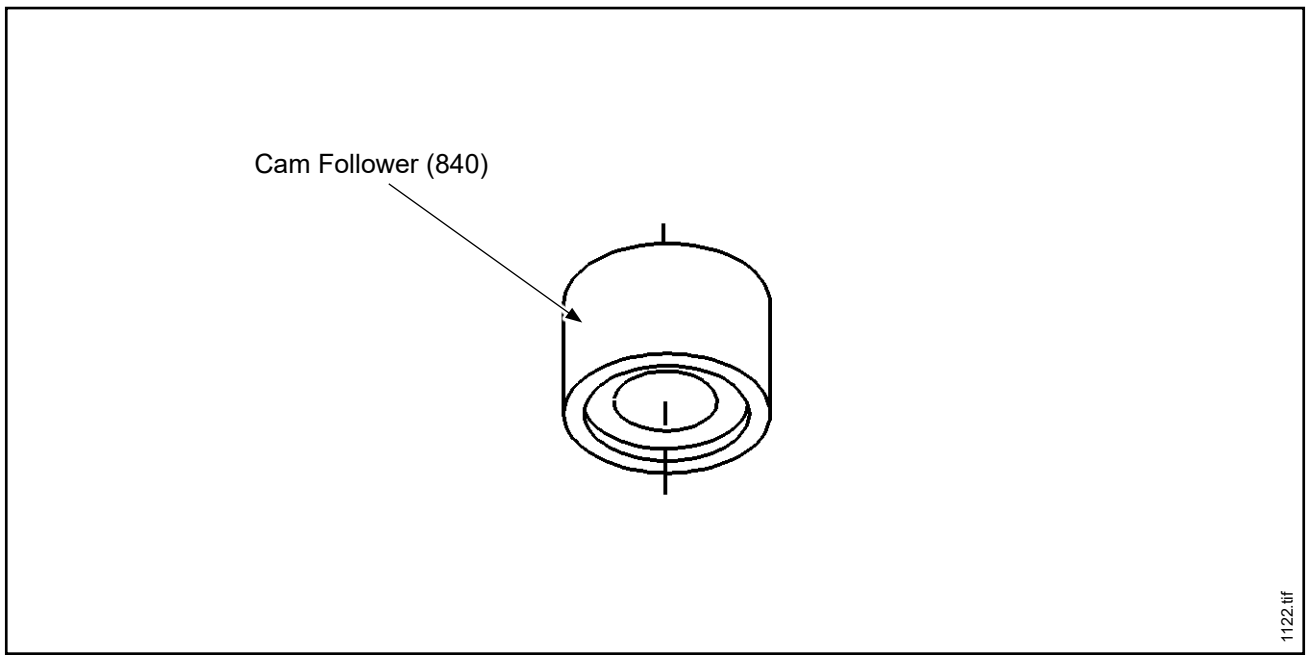
Inspect	Serviceable Limits	Corrective Action
W. ADAPTER PLATE UNIT (Item 660) (Refer to Figure 5-23)		
(1) Using white light, visually examine the adapter plate unit for cracks, especially around the dowel pin.	Cracks are not permitted.	If the damage is greater than the permitted serviceable limits, replace the adapter plate unit.
(2) Visually examine the adapter plate unit for corrosion product, pitting, nicks, scratches, or other damage.	Corrosion product is not permitted. If the adapter plate unit is damaged, measure the damage. The maximum depth of pitting permitted is 0.005 inch (0.127 mm). The total amount of damage permitted is 3 sq. inches (1935 sq. mm) of area. The maximum diameter of an individual pit is 0.064 inch (1.57 mm). A maximum of 10 non-linear pits within a 1 sq. inch (6454 sq. mm) area are permitted. Linear pitting is not permitted. High spots or pushed up edges above the surrounding machined surfaces are not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). Repair damage deeper than the permitted serviceable limits by polishing with an abrasive pad CM47 or equivalent. When other spot repairs are done on a plate that has been resurfaced, the minimum thickness of the plate in the area of those spot repairs is 0.220 inch (5.59 mm). The maximum depth of repair is 0.010 inch (0.25 mm). The maximum area of repair is 1 sq. inch (645 sq. mm) per site and 6 sq. inches (3870 sq. mm) for the entire adapter plate. Single repair sites may only involve half of the circumference of a hole used for attachment of the slip ring, pulley, bulkhead unit or adapter plate to hub. Lightly polish with an abrasive pad CM47 or equivalent to remove high spots or pushed up edges and blend into machined surfaces. If base aluminum is exposed, chemical conversion coat in accordance with the Chromic Acid Anodizing chapter of Hartzell Standard Practices Manual 202A (61-01-02). If damage is greater than the permitted serviceable or corrective action limits, repair the adapter plate unit in accordance with the repair section of this manual. If the repair procedure cannot be done, replace the adapter plate unit.

Component Inspection Criteria
Table 5-1

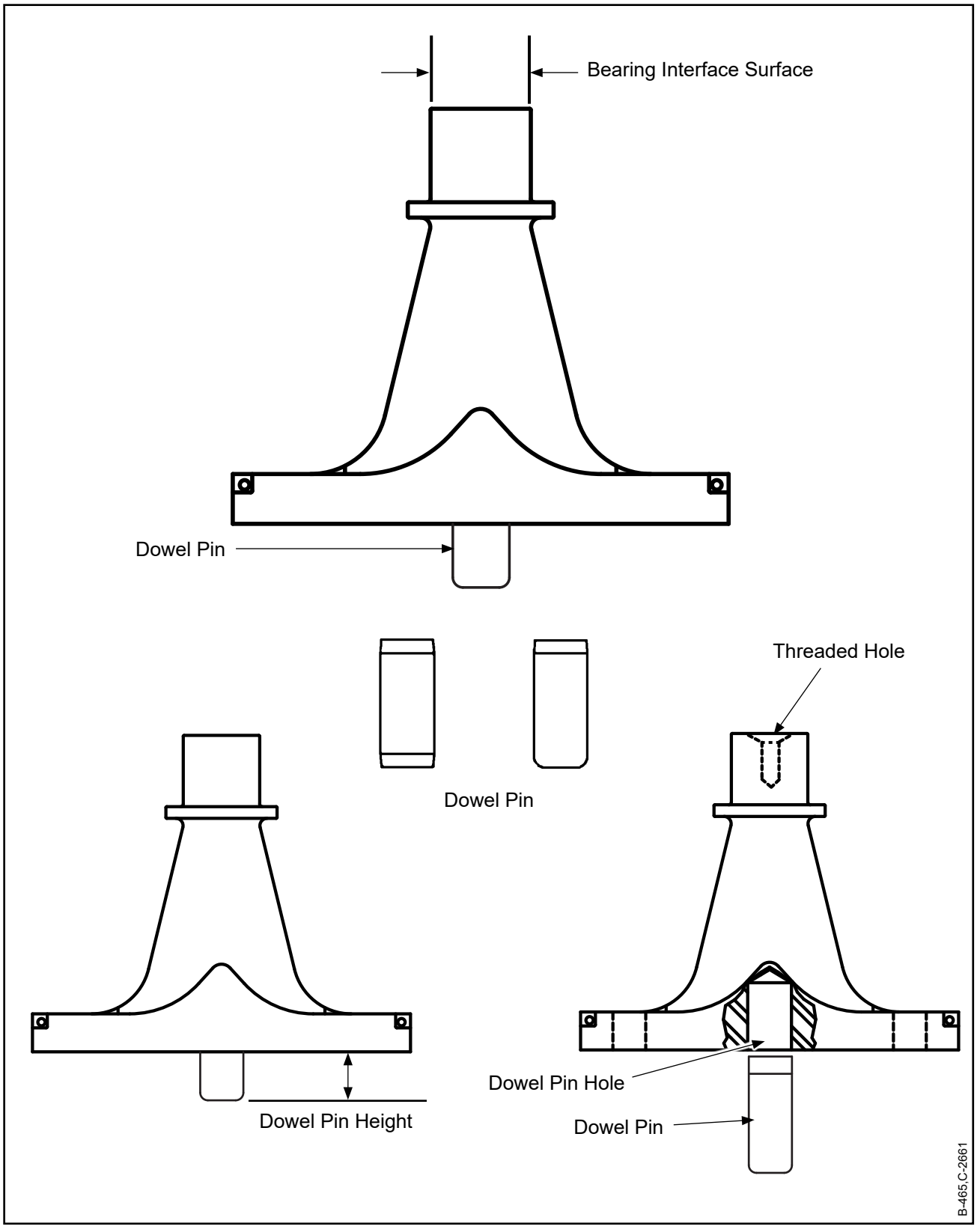
Inspect	Serviceable Limits	Corrective Action
W. ADAPTER PLATE UNIT, CONTINUED (Item 660) (Refer to Figure 5-23)		
(3) Visually examine each nutplate (680) for damaged threads and external nutplate damage.	Threads must withstand the screw installation torque. External damage must not interfere with the fit or function of the nutplate.	Replace the nutplate if the nutplate will not fit the mating screw or will not function as intended. Refer to the section, "Replacement of Nutplates and Rivets" in the Repair chapter of this manual.
(4) Visually examine each nutplate (680) for damage, looseness, or missing attachment hardware.	Damage, looseness, or missing nutplate attachment is not permitted.	If the nutplate attachment hardware is damaged, loose, or missing, replace the nutplate attachment hardware. Refer to the section, "Replacement of Nutplates and Rivets" in the Repair chapter of this manual.
(5) Visually examine the fit of the dowel pin (690) in the adapter plate unit.	An interference fit is required and relative movement is not permitted.	If the dowel pin is loose or will wobble relative to the adapter plate unit, replace the adapter plate unit
(6) Measure the protrusion of the two dowel pins (690) on the propeller hub-side of the adapter plate unit.	Required protrusion "A" from the surface of the adapter plate is 0.410 ± 0.010 (10.41 ± 0.25 mm).	Adjust as required to meet the permitted serviceable limits.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
X. CAM FOLLOWER (Item 840) (Refer to Figure 5-24)		
(1) Examine the cam follower for smooth rotation/operation.	The cam follower must rotate smoothly. Damage that could affect correct fit or function is not permitted (circumferential scratches are permitted).	Using an abrasive pad CM47, or equivalent. Clean the cam follower. If the damage is greater than the permitted serviceable limits, replace the cam follower.
(2) Measure the OD of the cam follower.	The minimum permitted OD is 1.249 inches (31.73 mm).	If the diameter is less than the permitted serviceable limits, replace the cam follower.
(3) Measure the ID of the cam follower.	The maximum permitted ID is 0.658 inch (16.71 mm)	If the diameter is greater than the permitted serviceable limits, replace the cam follower.



Cam Follower
Figure 5-24



Pitch Change Knob Bracket That Uses a Screw to Retain the Cam Follower
Figure 5-25

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
Y.	PITCH CHANGE KNOB BRACKET THAT USES A SCREW TO RETAIN THE CAM FOLLOWER (Item 850) (Refer to Figure 5-25)		
	(1) A pitch change knob bracket that uses a swaged washer to retain the cam follower must be modified in accordance with the section, "Pitch Change Knob Bracket Modification" in the Repair chapter of this manual or must be replaced.		
	(2) Before inspection, remove cadmium plating in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).		
	(3) If dowel pin removal is not required, apply masking material to protect the dowel pin from stripping materials. Dowel pin extension from the pitch change knob bracket base must meet the permitted Serviceable Limits for this part given in this section.		
	(4) Visually examine the bearing interface surface for damage, corrosion product, or pitting.	Bearing roller impressions of any depth are not permitted. Minor scratches less than 0.001 inch (0.025 mm) deep are permitted. Sharp edges or pushed up edges from scratches are not permitted. Corrosion product or pitting is not permitted.	If the damage, corrosion product, or pitting is greater than the permitted serviceable limits, replace the pitch change knob bracket.
	(5) Measure the OD of the unplated bearing interface surface.	The minimum permitted OD of the unplated bearing interface surface is 0.653 inch (16.59 mm).	If the OD of the unplated bearing interface surface is less than the serviceable limits, replace the pitch change knob bracket.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
Y.	PITCH CHANGE KNOB BRACKET THAT USES A SCREW TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 850) (Refer to Figure 5-25)		
	(6) Visually examine the pitch change knob bracket for corrosion product and pitting. NOTE: This inspection and repair does not include the bearing interface surface, the cam follower seal surface, or the threaded hole.	Corrosion product is not permitted. If the pitch change knob bracket has pitting, measure the size/ depth of the pitting. The maximum permitted depth of pitting is 0.003 inch (0.07 mm). The maximum permitted total area of pitting is 0.500 sq. inch (322 sq. mm) area. The maximum permitted diameter of an individual pit is 0.032 inch (0.81 mm). A maximum of 10 non-linear pits within 1 sq. inch (645 sq. mm) area are permitted. Linear pitting is not permitted.	Do not glass bead clean the bearing interface surface, the cam follower seal surface, or the threaded hole. For all surfaces of the pitch change knob bracket other than those listed above, remove corrosion product using glass bead cleaning or local polishing using emery cloth. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). The maximum permitted depth of repair is 0.005 inch (0.12 mm). The maximum permitted total area of repair is 1 sq. inch (645 sq. mm). For each hole used to attach the pitch change bracket to the blade, the maximum permitted repair is 25% of the surface area of the hole. Using an emery cloth or abrasive pad CM47 or equivalent, lightly polish to remove raised material or pushed up edge and blend into machined surfaces. If pitting or repair is greater than the permitted serviceable limits or Corrective Action repair limits, replace the pitch change knob bracket.

Component Inspection Criteria
Table 5-1

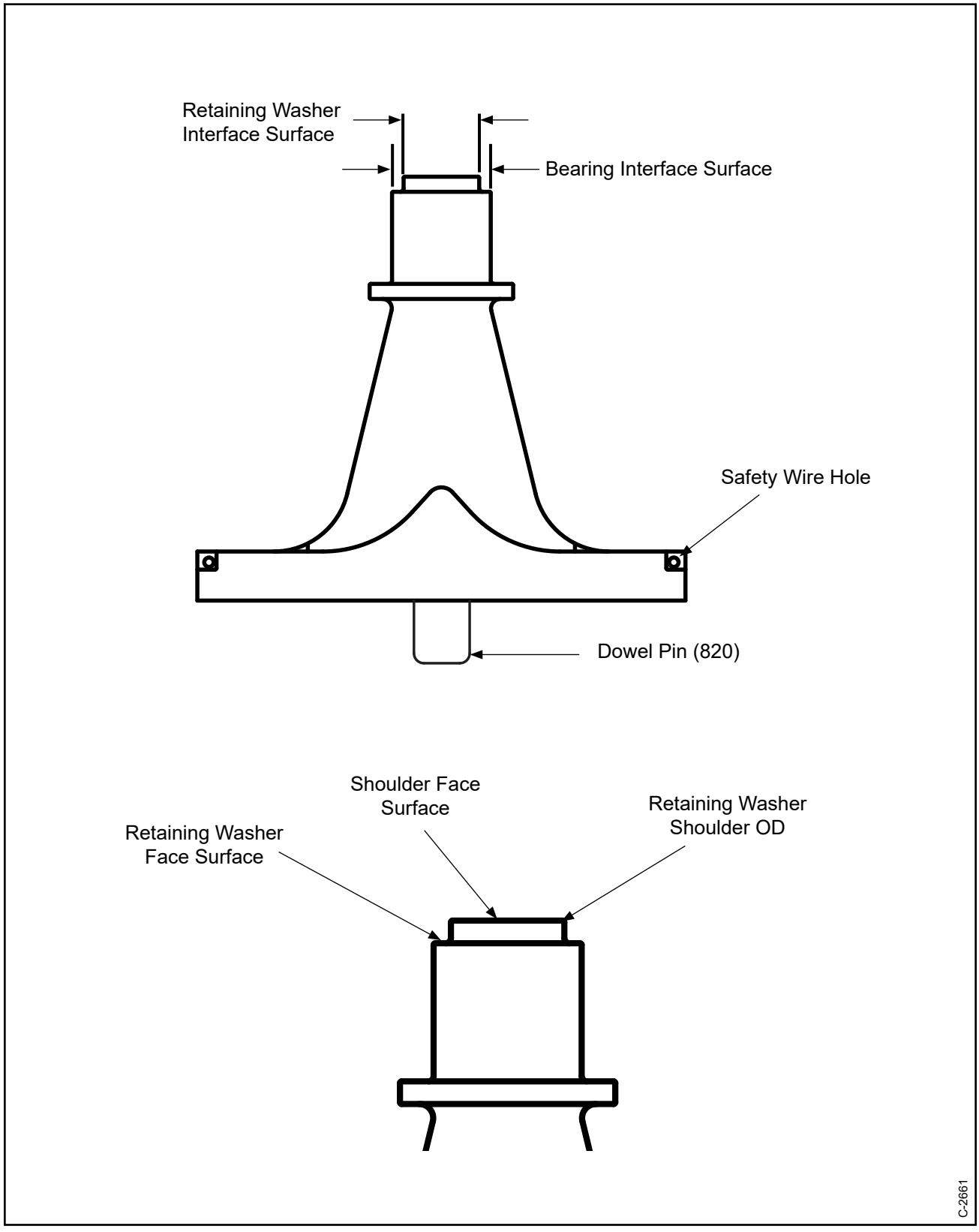
	Inspect	Serviceable Limits	Corrective Action
Y.	PITCH CHANGE KNOB BRACKET THAT USES A SCREW TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 850) (Refer to Figure 5-25)		
	(7) Visually examine the pitch change knob bracket for nicks, scratches, or other damage. NOTE: This inspection and repair does not include the bearing interface surface, the threaded hole, or the cam follower seal surface.	If the pitch change knob bracket is damaged, measure the depth/ area of nicks, scratches, or other damage. The maximum permitted depth of nicks, scratches, or other damage is 0.003 inch (0.07 mm). The maximum permitted total area of nicks, scratches, or other damage is 0.500 sq. inch (322 sq. mm) area. Raised material or edges of pushed up material on the surfaces that interface with other components are not permitted.	The maximum permitted depth of repair is 0.005 inch (0.12 mm). The maximum permitted total area of repair is 1 sq. inch (645 sq. mm). For each hole used to attach the pitch change bracket to the blade, the maximum permitted repair is 25% of the surface area of the hole. Using an emery cloth or abrasive pad CM47, lightly polish to remove raised material or pushed up edge and blend into machined surfaces. If the nicks, scratches, other damage, or repair are greater than the permitted serviceable or Corrective Action repair limits, replace the pitch change knob bracket.
	(8) Examine the dowel pin for movement in the pitch change knob bracket.	Using firm hand pressure, try to move the dowel pin. Movement is not permitted.	If there is movement of the dowel pin, replace the dowel pin.

Component Inspection Criteria
Table 5-1

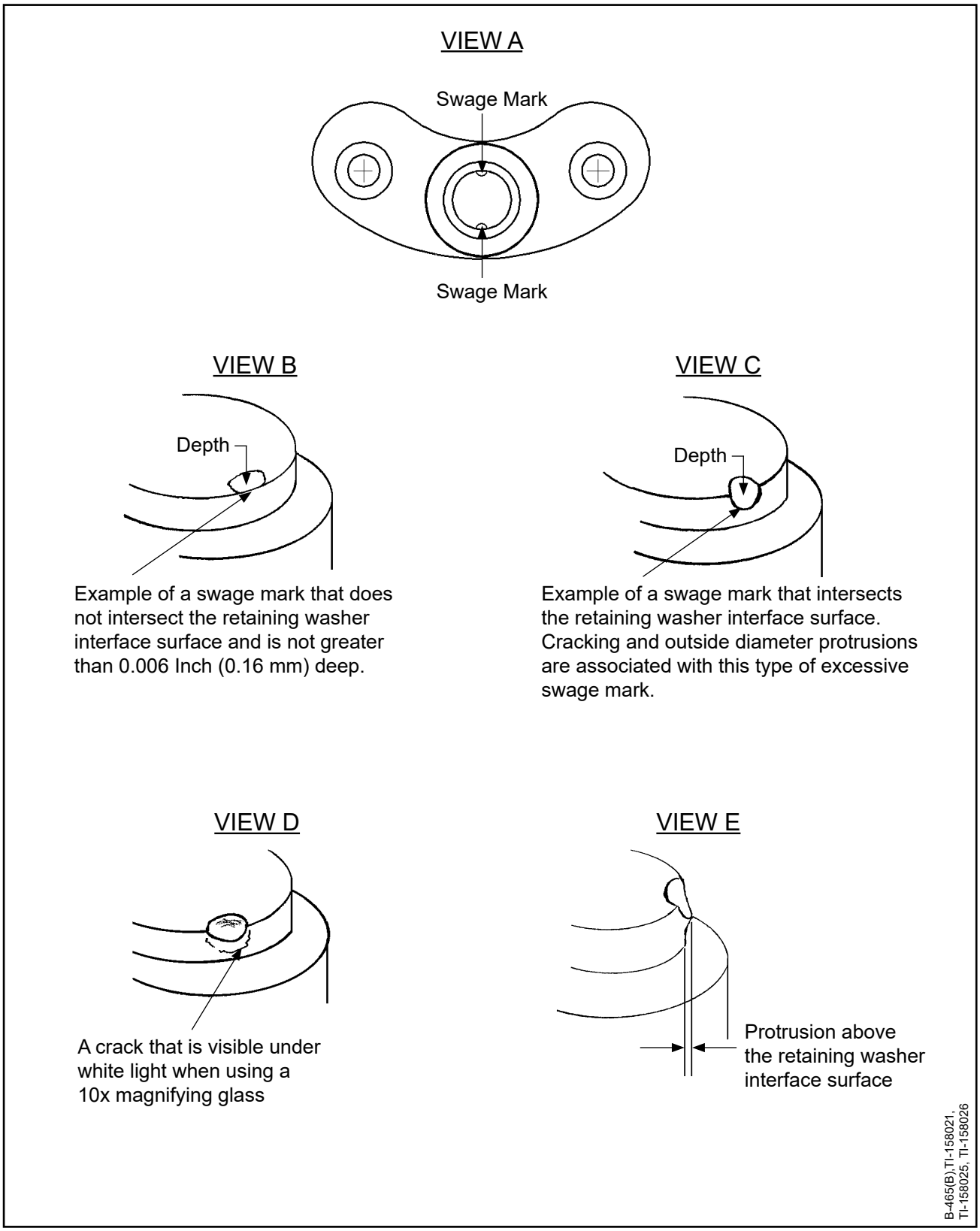
	Inspect	Serviceable Limits	Corrective Action
Y.	PITCH CHANGE KNOB BRACKET THAT USES A SCREW TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 850) (Refer to Figure 5-25)		
(9)	Measure the height of the dowel pin from the pitch change knob bracket base.	The maximum permitted height is 0.440 inch (11.17 mm).	If the height of the dowel pin is greater than the permitted height, press the pin into the bracket to the correct height.
		The minimum permitted height is 0.390 inch (9.91 mm).	If the height of the dowel pin is less than the permitted serviceable limits, replace the pin. The replacement pin must fit tightly.
(10)	Visually examine the OD of the exposed portion of the dowel pin for damage or corrosion product.	Damage or corrosion product is not permitted.	If there is damage or corrosion product, replace the dowel pin.
(11)	If the dowel pin is removed, visually examine the dowel pin hole.	Corrosion product or pitting is not permitted.	If there is corrosion product or pitting, replace the pitch change knob bracket.
(12)	Visually examine the pitch change knob bracket threaded hole for corrosion product or damage.	Corrosion product is not permitted. A maximum of 3/4 of one thread total accumulated damage is permitted.	If the damage is greater than the permitted serviceable limits, replace the pitch change knob bracket.
(13)	If present, visually examine the pitch change knob bracket safety wire holes.	The safety wire hole must be able to secure the safety wire.	If the damage is greater than the permitted serviceable limits, replace the pitch change knob bracket.

Component Inspection Criteria
Table 5-1

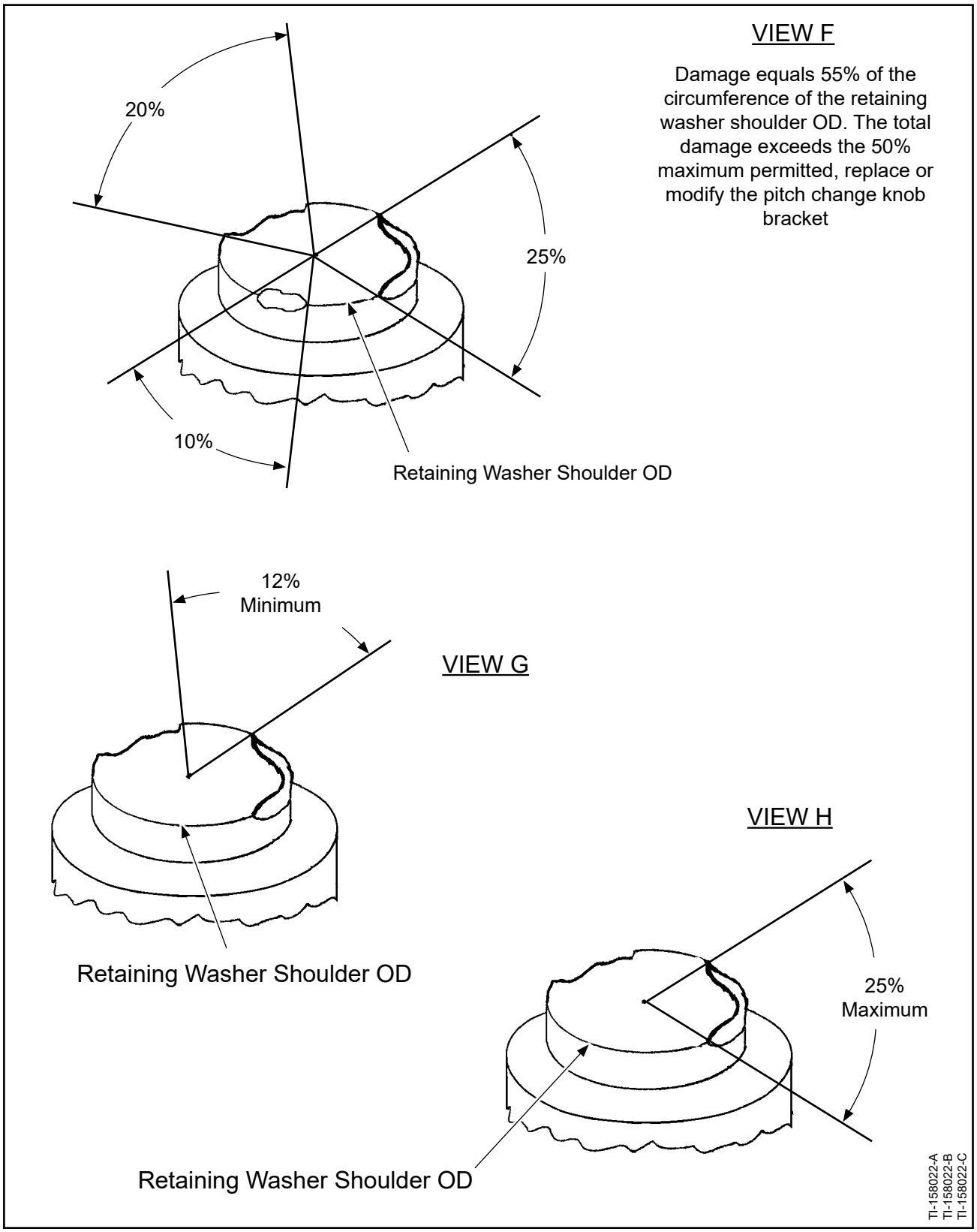
	Inspect	Serviceable Limits	Corrective Action
Y.	PITCH CHANGE KNOB BRACKET THAT USES A SCREW TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 850) (Refer to Figure 5-25)		
	(14) Perform magnetic particle inspection of the pitch change knob bracket in accordance with the Magnetic Particle Inspection chapter of Hartzell Standard Practices Manual 202A (61-01-02). NOTE: It is not necessary to remove the dowel pin.	A relevant indication is not permitted.	If there is a relevant indication, replace the pitch change knob bracket.
	(15) If removal of the dowel pin is not required, apply masking material to protect the dowel pin from cadmium plating materials.		
	(16) If the pitch change knob has successfully passed all inspections, apply masking material to the Pitch Change Knob Bearing OD Interface Surface, reapply cadmium plating, and bake in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).		



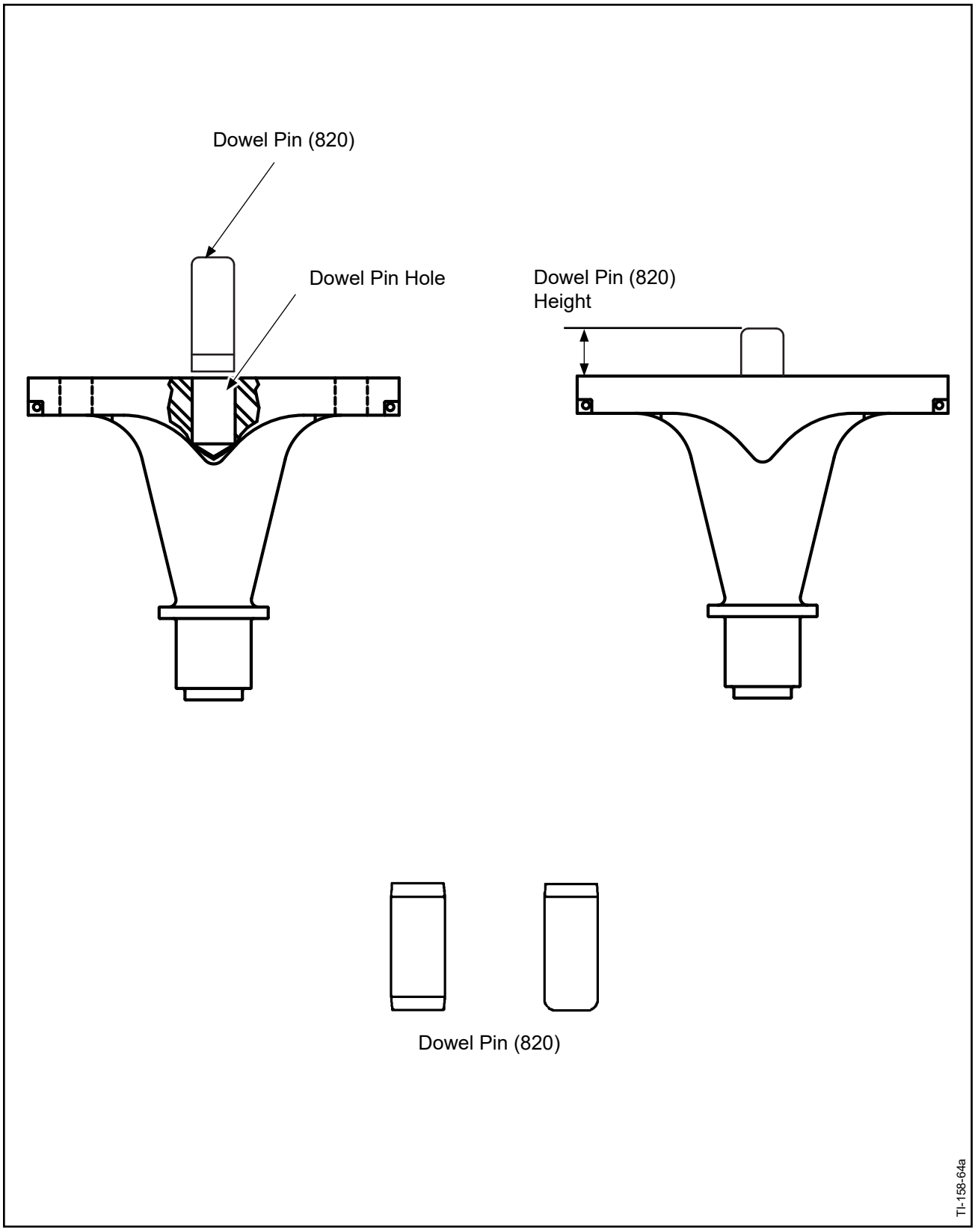
Pitch Change Knob Bracket That Uses a Swaged Washer to Retain the Cam Follower
Figure 5-26



Pitch Change Knob Bracket That Uses a Swaged Washer to Retain the Cam Follower
Figure 5-27



Pitch Change Knob Bracket That Uses a Swaged Washer to Retain the Cam Follower
Figure 5-28



Pitch Change Knob Bracket That Uses a Swaged Washer to Retain the Cam Follower
Figure 5-29

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action

Z. PITCH CHANGE KNOB BRACKET
THAT USES A SWAGED WASHER TO RETAIN THE CAM FOLLOWER
(Item 850)
(Refer to Figure 5-26, Figure 5-27, Figure 5-28, and Figure 5-29)

(1) At overhaul the HC-E5A-2 propeller must use a pitch change knob that uses a screw to retain the cam follower. Use the inspections in this section to determine if the pitch change bracket may be modified in accordance with the section, "Pitch Change Knob Bracket Modification" in the Repair chapter of this manual.

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

(3) If dowel pin removal is not required, apply masking material to protect the dowel pin from stripping materials. Dowel pin extension from the pitch change knob bracket base must meet the permitted Serviceable Limits for this part that are specified in this section.

(4) An example of correct swaging is shown in Figure 5-27, View B. An example of incorrect swaging is shown in Figure 5-27, View C.

(5) A pitch change knob bracket that does not meet the Serviceable Limits specified in step (6), (7), (8), (9), or.(10) in this section may be modified in accordance with the section, "Pitch Change Knob Bracket Modification" in the Repair chapter of this manual.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
Z.	PITCH CHANGE KNOB BRACKET THAT USES A SWAGED WASHER TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 850) (Refer to Figure 5-26, Figure 5-27, Figure 5-28, and Figure 5-29)		
	(6) Using white light and a 10X magnifying glass, visually examine each swage mark on the retaining washer shoulder OD of the pitch change knob bracket for cracks.	A crack is not permitted. Refer to Figure 5-27, View D.	A crack may be removed by spot polishing using an emery cloth or abrasive pad CM47. Crack removal must not interfere with the retaining washer face surface or be greater than 25% of the retaining washer shoulder OD in one location. Refer to Figure 5-26 and Figure 5-28, View H. Total accumulated damage or repair must not be greater than 50% of the circumference of the retaining washer shoulder OD. Refer to Figure 5-28, View F. If the damage or repair is greater than the limits given, replace the pitch change knob bracket or modify the pitch change knob bracket to use a screw to retain the cam follower in accordance with the section, "Pitch Change Knob Bracket Modification" in the Repair chapter of this manual.
	(7) Visually examine each swage mark on the retaining washer shoulder OD and the retaining washer interface surface for material protrusion. Refer to Figure 5-27, View E.	Material protrusion above the retaining washer interface surface is not permitted.	If there is material protrusion, using an emery cloth remove the material protrusion to flush or below the surface of the retaining washer interface surface modify the pitch change knob bracket to use a screw to retain the cam follower in accordance with the section, "Pitch Change Knob Bracket Modification" in the Repair chapter of this manual.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Z. PITCH CHANGE KNOB BRACKET THAT USES A SWAGED WASHER TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 850) (Refer to Figure 5-26, Figure 5-27, Figure 5-28, and Figure 5-29)		
(8) Visually examine the retaining washer shoulder OD for two undamaged swaging sites to secure the retention washer. Refer to Figure 5-28, View G.	Two unswaged areas that are a minimum width of 12% or 0.188 inch (4.78 mm) of circumference positioned 120 to 180 degrees apart from each other are required.	If the available swaging sites are not within the permitted serviceable limits, replace the pitch change knob bracket or modify the pitch change knob bracket to use a screw to retain the cam follower in accordance with the section, "Pitch Change Knob Bracket Modification" in the Repair chapter of this manual.
(9) Measure the OD of the unplated retaining washer interface surface. Refer to Figure 5-26.	The minimum permitted OD of the unplated retaining washer interface surface is 0.5005 inch (12.713 mm).	If the OD of the unplated retaining washer interface surface is less than the serviceable limits, replace the pitch change knob bracket or modify the pitch change knob bracket to use a screw to retain the cam follower in accordance with the section, "Pitch Change Knob Bracket Modification" in the Repair chapter of this manual.
(10) Visually examine the retaining washer interface surface for damage, corrosion product, or pitting. Refer to Figure 5-25.	Minor scratches less than 0.001 inch (0.025 mm) deep are permitted. A sharp edge, material protrusion, or raised material from scratches or swaging are not permitted. Corrosion product or pitting is not permitted.	Using an emery cloth or abrasive pad CM47, lightly polish to remove a sharp edge, material protrusion, or raised material and blend into machined surfaces. If the damage, corrosion product, or pitting is greater than the permitted serviceable limits, replace the pitch change knob bracket or modify the pitch change knob bracket to use a screw to retain the cam follower in accordance with the section, "Pitch Change Knob Bracket Modification" in the Repair chapter of this manual.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Z. PITCH CHANGE KNOB BRACKET THAT USES A SWAGED WASHER TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 850) (Refer to Figure 5-26, Figure 5-27, Figure 5-28, and Figure 5-29)		
(11) Visually examine the bearing interface surface for damage, corrosion product, or pitting. Refer to Figure 5-26.	Bearing roller impressions of any depth are not permitted. Minor scratches less than 0.001 inch (0.025 mm) deep are permitted. Sharp edges or pushed up edges from scratches are not permitted. Corrosion product or pitting is not permitted.	If the damage, corrosion product, or pitting is greater than the permitted serviceable limits, replace the pitch change knob bracket.
(12) Measure the OD of the unplated bearing interface surface. Refer to Figure 5-26.	The minimum permitted OD of the unplated bearing interface surface is 0.653 inch (16.59 mm).	If the OD of the unplated bearing interface surface is less than the serviceable limits, replace the pitch change knob bracket.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Z. PITCH CHANGE KNOB BRACKET THAT USES A SWAGED WASHER TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 850) (Refer to Figure 5-26, Figure 5-27, Figure 5-28, and Figure 5-29)		
(13) Visually examine the pitch change knob bracket for corrosion product and pitting. NOTE: This inspection and repair does not include the bearing interface surface, the cam follower seal surface, or the retaining washer interface surface.	Corrosion product is not permitted. If the pitch change knob bracket has pitting, measure the depth/ size of the pitting. The maximum permitted depth of pitting is 0.003 inch (0.07 mm). The maximum permitted total area of pitting is 0.500 sq. inch (322 sq. mm) area. The maximum permitted diameter of an individual pit is 0.032 inch (0.81 mm). A maximum of 10 non-linear pits within 1 sq. inch (645 sq. mm) area are permitted. Linear pitting is not permitted.	Do not glass bead clean the bearing interface surface, the cam follower seal surface, or the retaining washer interface surface. For all surfaces of the pitch change knob bracket other than those listed above, remove corrosion product using glass bead cleaning or local polishing using emery cloth. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). The maximum permitted depth of repair is 0.005 inch (0.12 mm). The maximum permitted total area of repair is 1 sq. inch (645 sq. mm). For each hole used to attach the pitch change bracket to the blade, the maximum permitted area of repair is 25% of the surface area of the hole. Using an emery cloth or abrasive pad CM47, lightly polish to remove raised material or pushed up edge and blend into machined surfaces. If pitting or repair is greater than the permitted serviceable limits or Corrective Action repair limits, replace the pitch change knob bracket.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Z. PITCH CHANGE KNOB BRACKET THAT USES A SWAGED WASHER TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 850) (Refer to Figure 5-26, Figure 5-27, Figure 5-28, and Figure 5-29)		
(14) Visually examine the pitch change knob bracket for nicks, scratches, or other damage. NOTE: This inspection and repair does not include the bearing interface surface, the retaining washer interface surface, or the cam follower seal surface.	If the pitch change knob bracket is damaged, dimensionally inspect. The maximum permitted depth of nicks, scratches, or other damage is 0.003 inch (0.07 mm). The maximum permitted total area of nicks, scratches, or other damage is 0.500 sq. inch (322 sq. mm) area. Raised material or edges of pushed up material on the surfaces that interface with other components are not permitted.	The maximum permitted depth of repair is 0.005 inch (0.12 mm). The maximum permitted total area of repair is 1 sq. inch (645 sq. mm). For each hole used to attach the pitch change bracket to the blade, the maximum permitted repair is 25% of the surface area of the hole. Using an emery cloth or abrasive pad CM47, lightly polish to remove raised material or pushed up edge and blend into machined surfaces. If the nicks, scratches, other damage, or repair is greater than the permitted serviceable or Corrective Action repair limits, replace the pitch change knob bracket.
(15) Examine the dowel pin for movement in the pitch change knob bracket.	Using firm hand pressure, try to move the dowel pin. Movement is not permitted.	If there is movement of the dowel pin, replace the dowel pin.
(16) Measure the height of the dowel pin from the pitch change knob bracket base. Refer to Figure 5-29.	The maximum permitted height is 0.440 inch (11.17 mm). The minimum permitted height is 0.390 inch (9.91 mm).	If the height of the dowel pin is greater than the permitted height, press the pin into the bracket to the correct height. If the height of the dowel pin is less than the permitted serviceable limits, replace the pin. The replacement pin must fit tightly.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Z. PITCH CHANGE KNOB BRACKET THAT USES A SWAGED WASHER TO RETAIN THE CAM FOLLOWER, CONTINUED (Item 850) (Refer to Figure 5-26, Figure 5-27, Figure 5-28, and Figure 5-29)		
(17) Visually examine the OD of the exposed portion of the dowel pin for damage or corrosion product.	Damage or corrosion product is not permitted.	If there is damage or corrosion product, replace the dowel pin.
(18) If the dowel pin is removed, visually examine the dowel pin hole. Refer to Figure 5-29.	Corrosion product or pitting is not permitted.	If there is corrosion product or pitting, replace the pitch change knob bracket.
(19) If applicable, visually examine the two safety wire holes for damage.	The safety wire hole must be able to secure the safety wire.	If the damage is greater than the permitted serviceable limits, replace the pitch change knob bracket.
(20) Magnetic particle inspect the pitch change knob bracket in accordance with the Magnetic Particle Inspection chapter of Hartzell Standard Practices Manual 202A (61-01-02). NOTE: It is not necessary to remove the dowel pin.	A relevant indication is not permitted.	If there is a relevant indication, replace the pitch change knob bracket.
(21) If removal of the dowel pin is not required, apply masking material to protect the dowel pin from cadmium plating materials.		
(22) If the pitch change knob has successfully passed all inspections, apply masking material to the Bearing Interface Surface, cadmium replate, and bake in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).		

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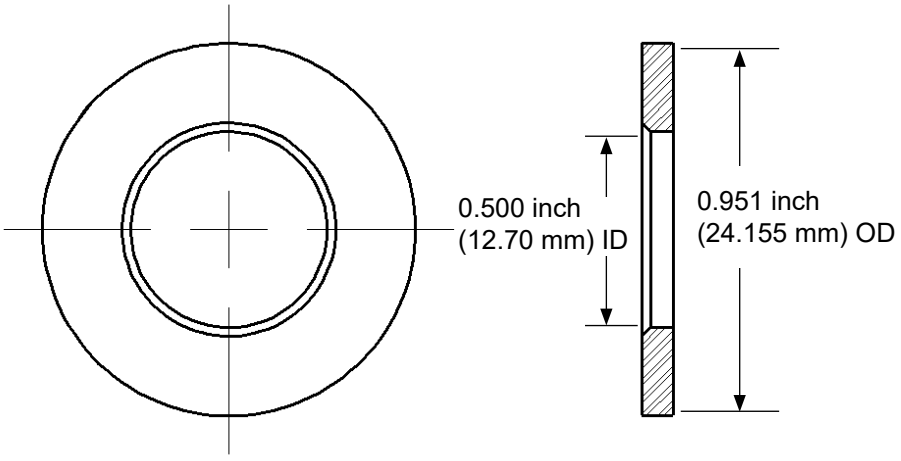
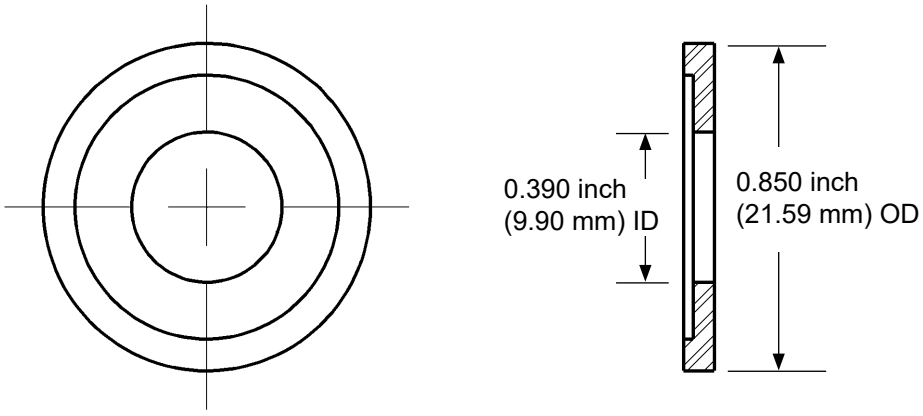


B-475 Knob Unit Retaining Washer



103574 Knob Unit Retaining Washer

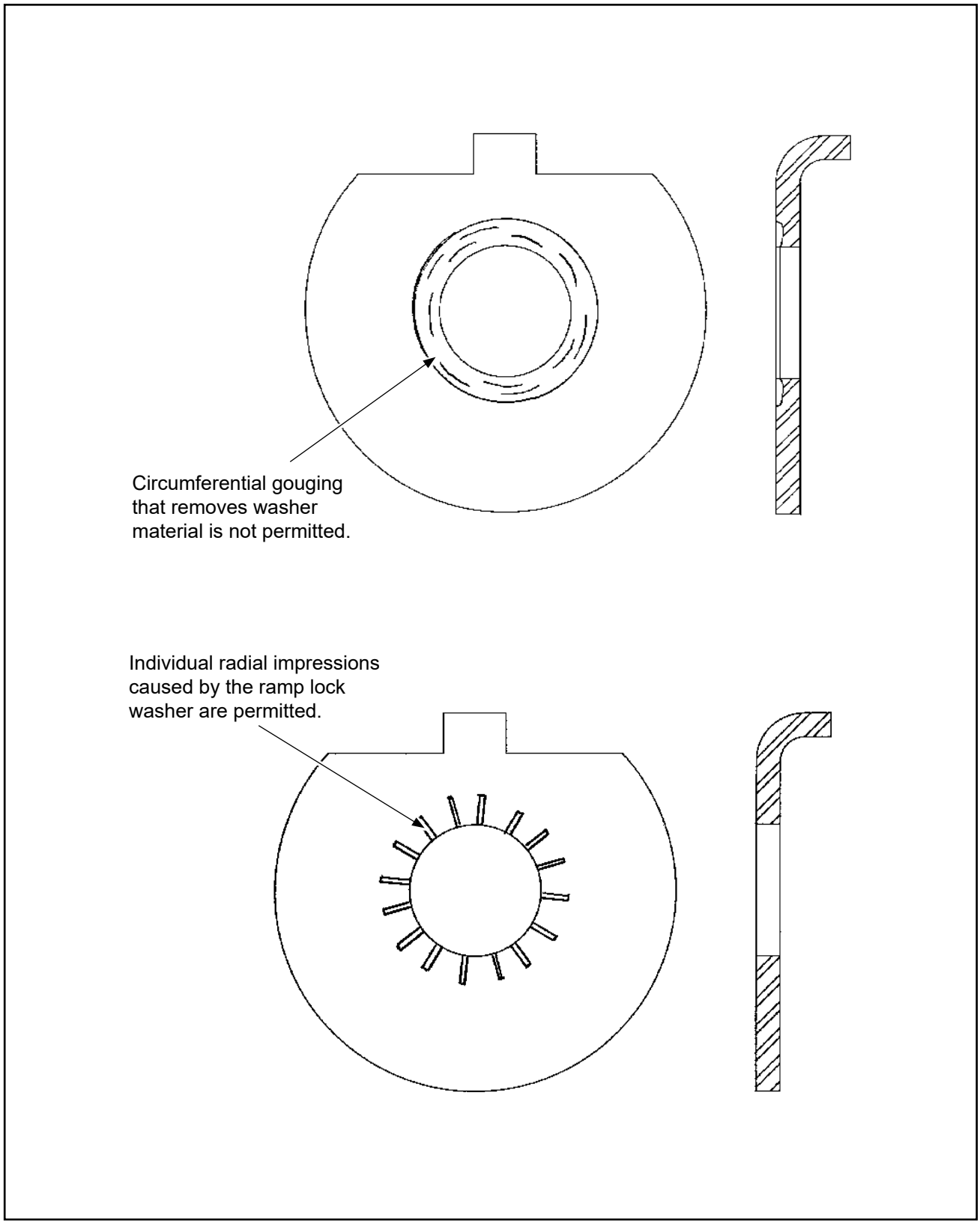
Dimensions are for identification purposes only.

103574, B-475

Knob Unit Retaining Washer
Figure 5-30

Component Inspection Criteria
Table 5-1

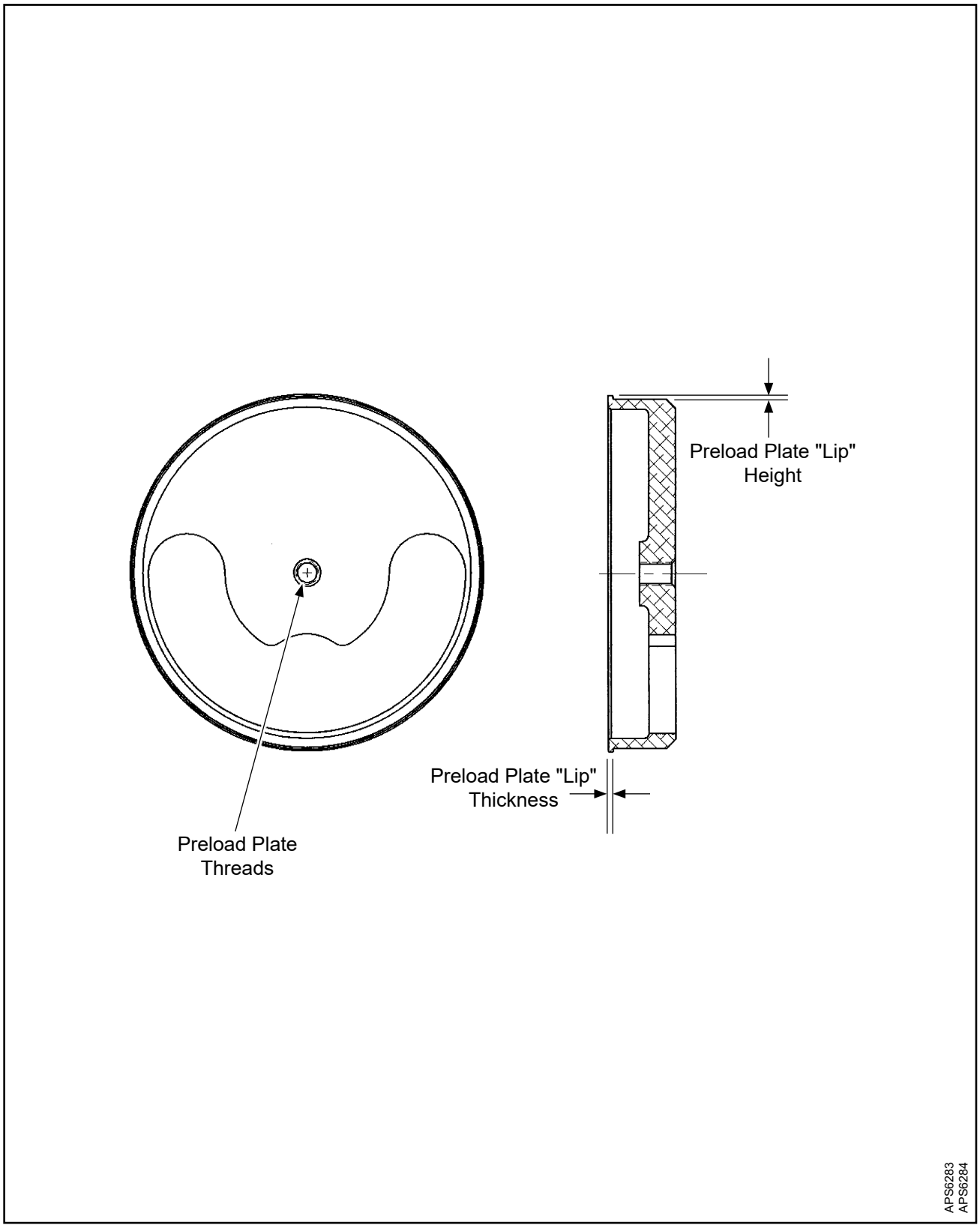
	Inspect	Serviceable Limits	Corrective Action
AA.	KNOB UNIT RETAINING WASHER (Item 830) (Refer to Figure 5-30)		
(1)	Identify the knob unit retaining washer.	The knob unit retaining washer must be identified as part number 103574. A B-475 knob unit retaining washer is not permitted.	If the knob unit retaining washer is not part number 103574, replace the knob unit retaining washer. NOTE: To use the part number 103574 knob unit retaining washer, the pitch change knob bracket may require rework. Refer to the inspection criteria for the pitch change knob bracket in this chapter.
(2)	Visually examine the knob unit retaining washer for corrosion product and pitting.	Corrosion product is not permitted. The maximum permitted depth of pitting is 0.002 inch (0.05 mm). The maximum permitted total surface area that may have pitting is 5%. The maximum permitted diameter of an individual pit is 0.062 Inch (1.57 mm). Pitting must not affect the fit or function of the knob unit retaining washer.	Corrosion product may be removed by glass bead cleaning Refer to the Cleaning chapter of Standard Practices Manual 202A (61-01-02). If pitting is greater than the serviceable limits replace the knob unit retaining washer
(3)	Visually examine the knob unit retaining washer for scratches.	The maximum permitted depth of a scratch is 0.002 inch (0.05 mm). Scratches must not affect the fit or function of the knob unit retaining washer.	If scratches are greater than the serviceable limits replace the knob unit retaining washer
(4)	Visually examine the knob unit retaining washer for wear or damage other than corrosion product, pitting, or scratches addressed in steps (2) and (3) in this section.	Wear or damage is not permitted.	If there is wear or damage, other than corrosion product, pitting or scratches addressed in steps (2) and (3) in this section, replace the knob unit retaining washer.
(5)	Visually examine the knob unit retaining washer for cadmium plate coverage.	A few random scratches are acceptable; otherwise, cadmium plate must completely cover the knob unit retaining washer.	Replate and bake the knob unit retaining washer in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Anti-rotation Washer
Figure 5-31

Component Inspection Criteria
Table 5-1

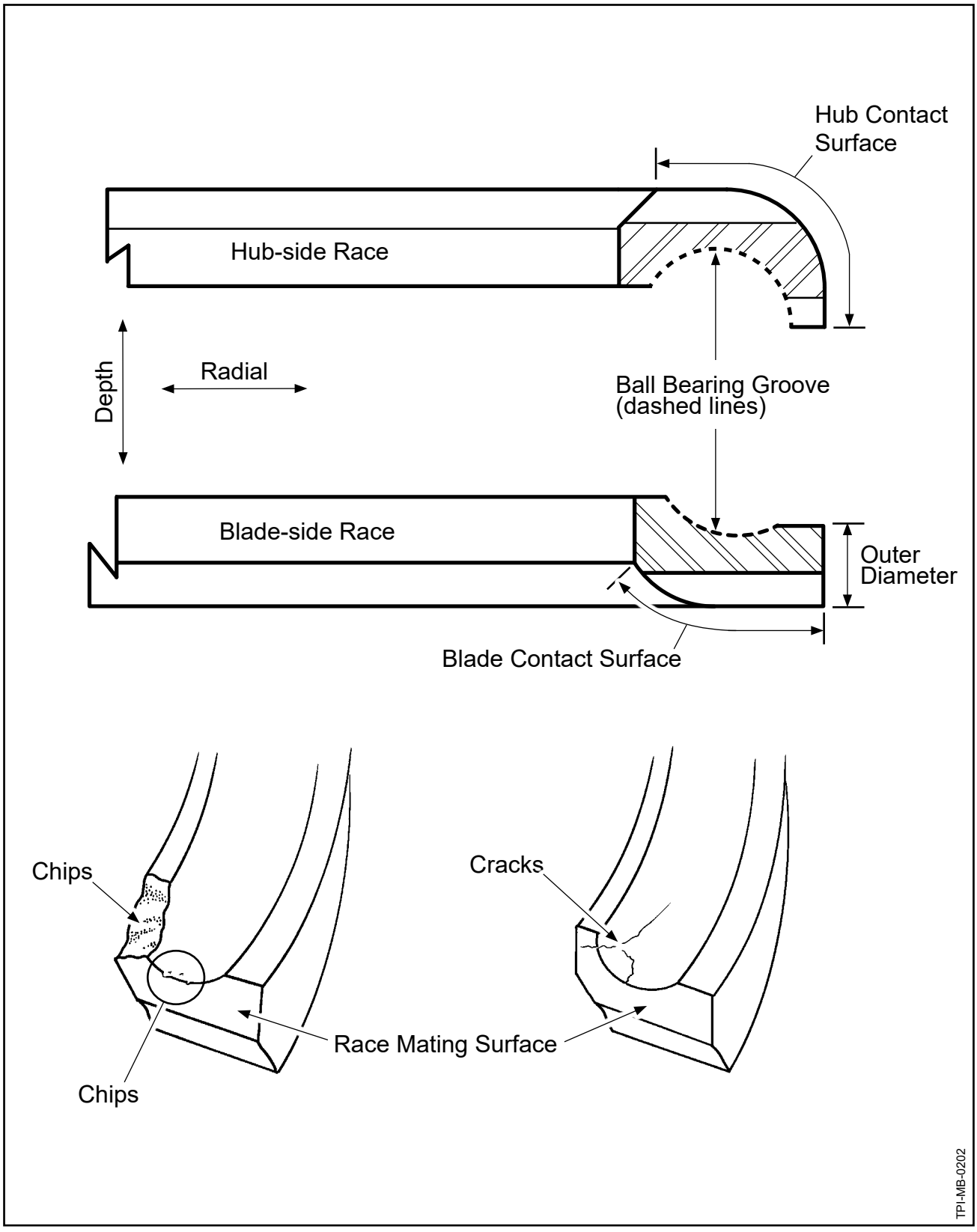
Inspect	Serviceable Limits	Corrective Action
AB. ANTI-ROTATION WASHER (Item 870) (Refer to Figure 5-31)		
(1) Visually examine the anti-rotation washer for corrosion product and pitting.	Corrosion product is not permitted. If the anti-rotation washer is damaged, measure the damage. The maximum depth of pitting permitted is 0.007 inch (0.17 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the damage is greater than the permitted serviceable limits, replace the anti-rotation washer.
(2) Using white light, visually examine tab connection to the main body of the anti-rotation washer for cracks.	A crack is not permitted.	If there is a crack, replace the anti-rotation washer.
(3) Visually examine the anti-rotation washer surface that contacts the two piece lock washer for damage.	Individual radial impressions caused by the two-piece lock washer are permitted. Circumferential gouging that removes washer material is not permitted.	If the damage is greater than the permitted serviceable limits replace the anti-rotation washer.
(4) Visually examine the anti-rotation washer for Cadmium plating coverage.	A maximum of 10% of the base metal visible is permitted.	If Cadmium plate coverage is less than the permitted serviceable limits, Cadmium replate and bake the anti-rotation washer in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Preload Plate
Figure 5-32

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AC. PRELOAD PLATE (Item 890) (Refer to Figure 5-32)		
(1) Visually examine the internal threads for damage.	A maximum of two threads of total accumulated damage are permitted.	If the damage is greater than the permitted serviceable limits, replace the preload plate.
(2) Visually examine the "lip" height and thickness.	If the "lip" height or thickness are damaged, dimensionally inspect. Minimum permitted lip thickness is 0.060 inch (1.53 mm). Minimum permitted lip height is 0.045 inch (1.15 mm). A total accumulated damage of 1.0 inch (25.4 mm) circumferential length to the lip that results in a lip height less than that permitted and does not reduce diameter below the adjacent diameter that clamps in the hub is permitted.	Polish to remove any rough edges or evidence of fretting. If damage or repair is greater than the permitted serviceable limits, replace the preload plate.
(3) Penetrant inspect of the preload plate in accordance with the Penetrant Inspection chapter of Hartzell Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If a relevant indication cannot be removed within all the permitted serviceable limits for the preload plate in this section, replace the preload plate.



Race
Figure 5-33

Component Inspection Criteria
Table 5-1

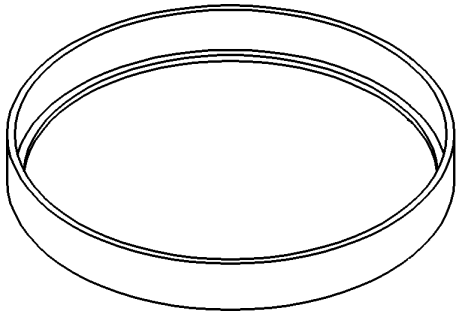
Inspect	Serviceable Limits	Corrective Action
AD. RACE (Item 920, 930) (Refer to Figure 5-33)		
(1) Visually examine the ball bearing groove in each race for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Remove corrosion product using glass bead cleaning. For glass bead cleaning refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the 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 ball bearing groove. The maximum permitted diameter of a pit is 0.032 inch (0.81 mm). The maximum permitted total area of pitting in the ball bearing groove on a complete race is 0.12 sq. inch (77.4 sq. 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 damage is greater than the permitted serviceable limits, replace the race.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
AD.	RACE, CONTINUED (Item 920, 930) (Refer to Figure 5-33)		
(3)	Except for the ball bearing groove, visually examine all other surfaces of each race for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Remove corrosion product using glass bead cleaning. For glass bead cleaning refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the 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 sq. inch (161.2 sq. 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 (900). Fretting must not loosen the tight fit with the bearing retaining ring (900).	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 (900) 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 or fretting, the maximum permitted depth of damage is 0.005 inch (0.12 mm) and must not interfere with the mating surfaces.	If the damage is greater than the permitted serviceable limits, replace the race.

Component Inspection Criteria
Table 5-1

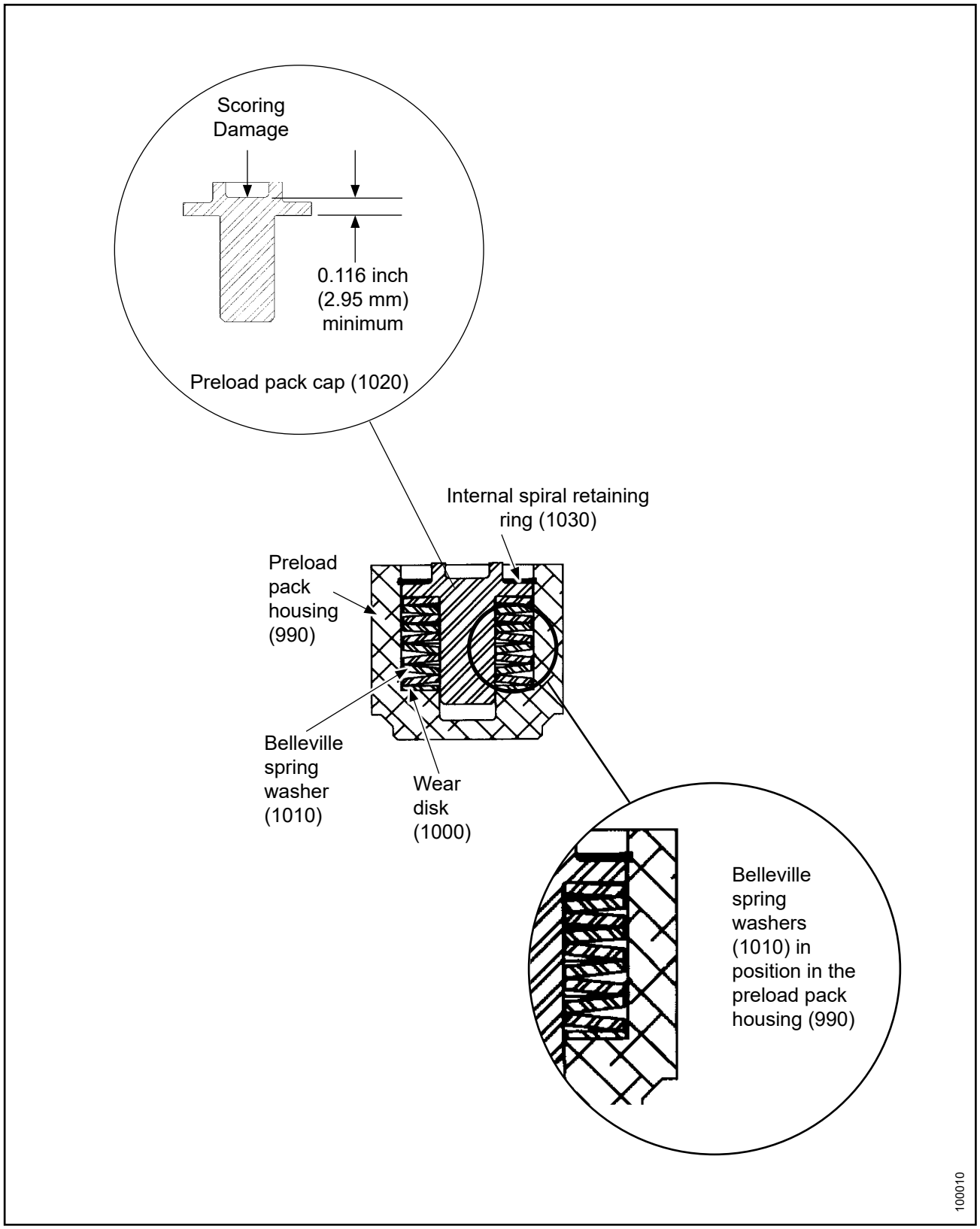
	Inspect	Serviceable Limits	Corrective Action
AD.	RACE, CONTINUED (Item 920, 930) (Refer to Figure 5-33)		
	(5) Visually examine the race for chips or cracks that are adjacent to the mating surfaces of the race.	Chips or cracks that are adjacent to the mating surfaces of the race are not permitted.	If 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 Race Retention Ring
Figure 5-34

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AE. BEARING RACE RETENTION RING (Item 900) (Refer to Figure 5-34)		
(1) Visually examine the bearing race retention ring for corrosion product, pitting, wear, or fretting.	Corrosion product is not permitted. If the bearing race retention ring is damaged, measure the damage. The maximum pitting damage depth permitted is 0.005 inch (0.127 mm). The ring must fit tight to the blade and bearing race when installed over the blade and bearing race.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). If the damage is greater than the permitted serviceable limits replace the bearing race retention ring.
(2) Visually examine the bearing race retention ring for cadmium plating coverage.	Cadmium plating must be present on all surfaces of the bearing race retention ring.	If cadmium plating coverage is less than the permitted serviceable limits, cadmium replate and bake the bearing race retention ring in accordance with the Cadmium Replating chapter of Hartzell Standard Practices Manual 202A (61-01-02).



Preload Pack Assembly
Figure 5-35

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AF. PRELOAD PACK ASSEMBLY (Items 980 through 1030) (Refer to Figure 5-35)		
(1) Visually examine the preload pack housing (990) for corrosion product, pitting, nicks, scratches, or other damage.	Corrosion product is not permitted. If the preload pack housing is damaged, measure the damage. The maximum depth of damage permitted is 0.005 inch (0.12 mm). The maximum permitted diameter of an individual pit is 0.032 inch (0.81 mm) diameter. A maximum of 10 non-linear pits within a 1 sq. inch (645 sq. mm) area are permitted. Linear pitting is not permitted. Damage may not affect the fit and function with mating parts.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If damage is greater than the permitted serviceable limits, replace the preload pack housing.
(2) Visually examine the preload pack housing (990) spiral retaining ring groove for damage.	Damage that will affect the fit or ability of the internal spiral retaining ring to correctly install or keep its position in the preload pack housing is not permitted.	If the damage is greater than the permitted serviceable limits, replace the preload pack housing.
(3) Visually examine the internal spiral retaining ring (1030) for corrosion product, pitting, and deformation from normal shape.	Corrosion product or pitting is not permitted. Deformation from the normal shape is not permitted.	If there is corrosion product, pitting, or deformation, replace the internal spiral retaining ring.
(4) Visually examine the preload pack cap (1020) for corrosion product, pitting, nicks, scratches, or other damage.	Corrosion product is not permitted. If there is pitting, nicks, scratches, or other damage, measure the depth of damage. The maximum permitted depth of damage is 0.008 inch (0.20 mm).The damage must not interfere with the operation of other mating parts. High spots or edges above the surrounding machined surfaces are not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). Using an abrasive pad CM47 or equivalent, lightly polish to remove high spots or raised edges. If the damage is greater than the permitted serviceable limits, replace the preload pack cap.
(5) Visually examine the preload pack cap (1020) for scoring damage caused by the preload plate socket cap screw.	If the preload pack cap (1020) is damaged, measure the depth of damage. The maximum permitted depth of damage is 0.116 inch (2.94 mm).	If the damage is greater than the permitted serviceable limits, replace the preload pack cap.

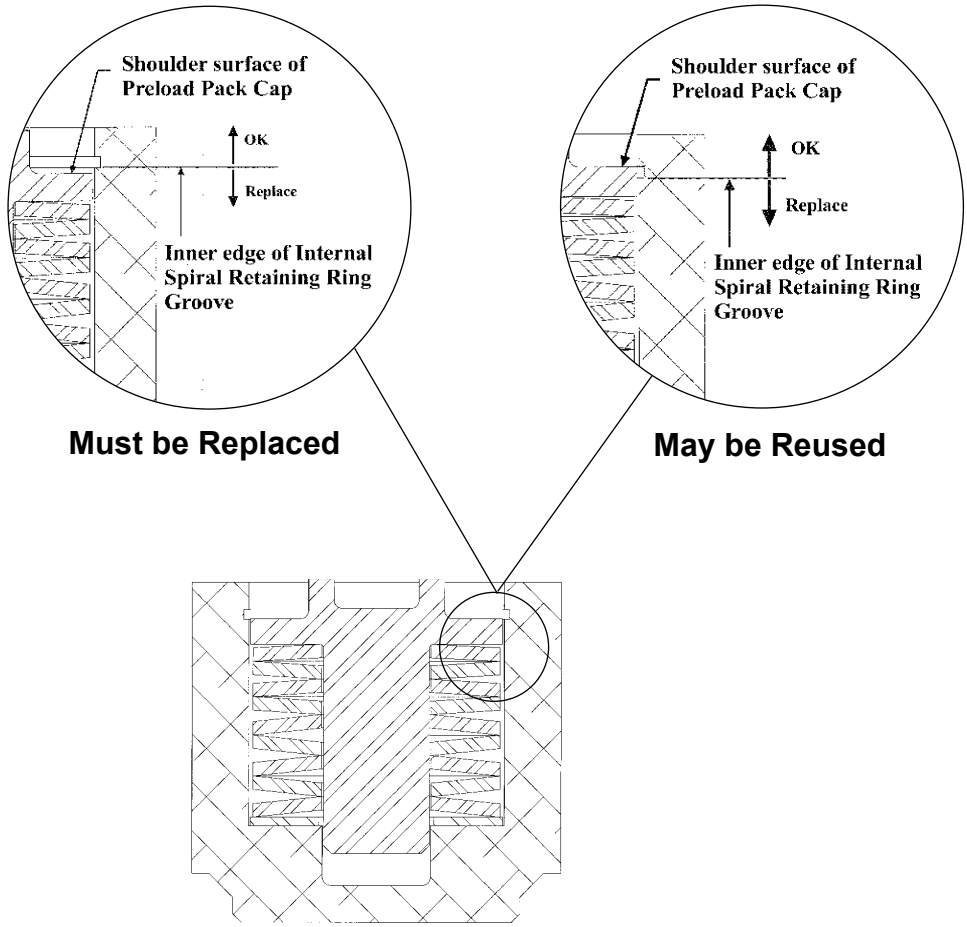
Belleville Washer Inspection Procedure

(1) Assemble the preload pack assembly (99) without the internal spiral retaining ring (1030).

(2) Visually determine the position of the preload pack cap (1020) shoulder surface relative to the inner edge of the internal spiral retaining ring groove in the preload pack housing (990).

(3) If the preload pack cap (1020) shoulder surface is above the inner edge of the spiral retaining ring groove, the nine Belleville spring washers may be reused. Refer to the figures below.

(4) If the preload pack cap (1020) shoulder surface is below the inner edge of the spiral retaining ring groove, replace the Belleville washers, as necessary. Refer to the figures below.



Belleville Washer Inspection Procedure
Figure 5-36

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AF. PRELOAD PACK ASSEMBLY, CONTINUED (Items 980 through 1030) (Refer to Figure 5-35 and 5-36)		
(6) Visually examine the preload pack cap (1020) for cadmium plate coverage.	A few light random scratches are acceptable; otherwise, cadmium plate must completely cover the preload pack cap.	If cadmium plate coverage is less than permitted serviceable limits, cadmium replate and bake in accordance with the Cadmium Replating chapter of Hartzell Standard Practices Manual 202A (61-01-02).
(7) Visually examine the wear disk (1000) for corrosion product, cracks, pitting, or damage.	Corrosion product or cracks are not permitted. The maximum depth of damage permitted is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). If the damage is greater than the permitted serviceable limits replace the wear disc.
(8) Visually examine the wear disc (1000) for cadmium plate coverage.	A few light random scratches are acceptable; otherwise, cadmium plate must completely cover the preload wear disc	If cadmium plate coverage is less than the permitted serviceable limits, cadmium replate and bake in accordance with the Cadmium Replating chapter of Hartzell Standard Practices Manual 202A (61-01-02).
(9) Visually examine the Belleville spring washers (1010) for corrosion product, pitting, or damage.	Corrosion product, pitting, or damage are not permitted.	Using an abrasive pad such as CM47, clean each Belleville spring washer. If the damage is greater than the permitted serviceable limits replace the Belleville spring washer.
(10) Inspect Belleville spring washer (1010) height.	Belleville spring washers must pass the inspection procedure titled "Belleville Washer Inspection Procedure". Refer to Figure 5-36.	If the Belleville spring washers in a preload pack assembly do not pass the "Belleville Washer Inspection Procedure", replace the Belleville spring washers.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AG. BALANCE WEIGHT (Item 1100)		
(1) Visually examine the balance weight for corrosion product, wear, or damage.	Corrosion product is not permitted. Remove corrosion product in accordance with the corrective action instructions.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the balance weight.
(2) Visually examine the balance weight for pitting, wear, or damage.	The maximum permitted depth of pitting, wear, or damage is 0.003 inch (0.07 mm).	Using an abrasive pad CM47 or equivalent, polish to a maximum depth of 0.005 inch (0.12 mm). If the depth of pitting, wear, or damage is greater than the permitted serviceable limits or the corrective action limits, replace the balance weight.
(3) For an aluminum (gray color) balance weight: Visually examine the balance weight for anodize coverage.	Except for a few scratches and corners with anodize coating missing, complete coverage is required.	If the coverage is less than the permitted serviceable limits, re-anodize the balance weight in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(4) For a steel (silver color) balance weight for Visually examine for cadmium plating coverage.	Except for a few scratches and corners with anodize coating missing, complete coverage is required.	If the coverage is less than the permitted serviceable limits, replate the balance weight in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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) 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. Specific Repair Requirements

A. Balance Weight Attachment Hole and Grease Fitting Hole Repair

(1) Balance weight attachment hole and grease fitting hole repair procedures are described in the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Manual 202A (61-01-02).

B. Cylinder Bushing Installation Procedure for a Previously Removed Bushing

(1) Apply grease CM12 to the O-ring (150).

(2) Install the O-ring (150) in the small bore of the cylinder (140), positioning the O-ring against the back wall.

(3) Apply grease CM12 to the ID of the cylinder (140) bore and the OD of the cylinder bushing (160)

CAUTION: THE INDEX MARK ON THE BUSHING MUST ALIGN WITH THE INDEX MARK ON THE CYLINDER. IF EITHER INDEX MARK IS MISSING, THE CYLINDER BUSHING MUST BE REPLACED.

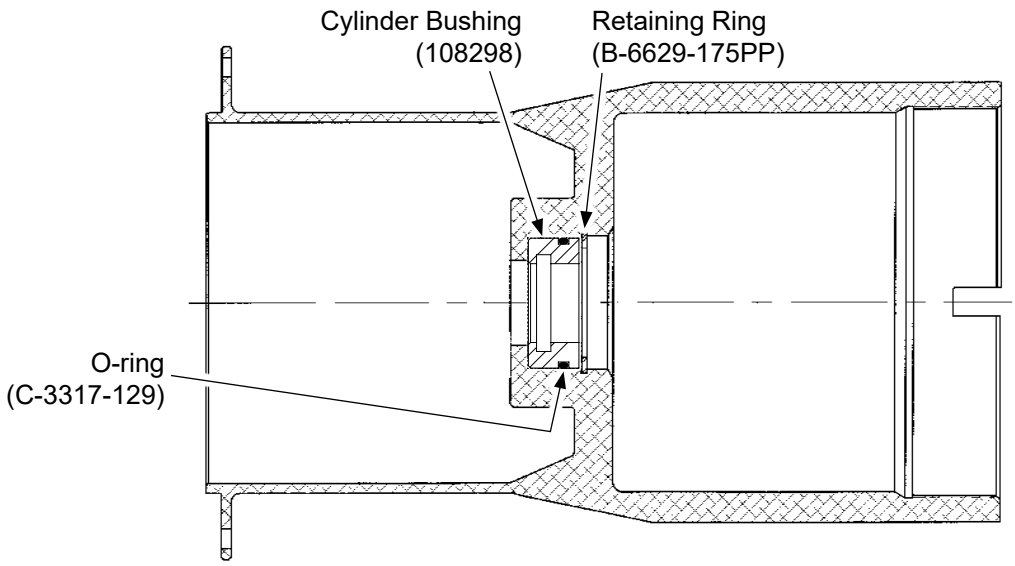
(4) Align the indexing mark on the cylinder bushing (160) with the indexing mark on the cylinder (140).

(5) Push the cylinder bushing (160) into the cylinder (140).

(6) Install the retaining ring (170) in the retaining ring groove of the cylinder (140) to retain the cylinder bushing (160).

(7) Measure the cylinder bushing ID bore and the O-ring groove OD in accordance with the serviceable limits specified for the cylinder bushing (160) in the Check chapter of this manual.

(8) If the measurements of the cylinder bushing ID bore and the O-ring groove OD is not within the serviceable limits, replace the cylinder bushing (160). Refer to the Installation of a New Cylinder Bushing section in this chapter.



Installing a New Cylinder Bushing
Figure 6-1

C. Installation of a New Cylinder Bushing

(1) General

(a) These instructions provide a procedure to install a new 108298 cylinder bushing (160) in an E-7417 cylinder (140).

NOTE: An A-3784 cylinder bushing (160) must be replaced by a new 108298 cylinder bushing in an E-7417 cylinder.

(2) Procedure

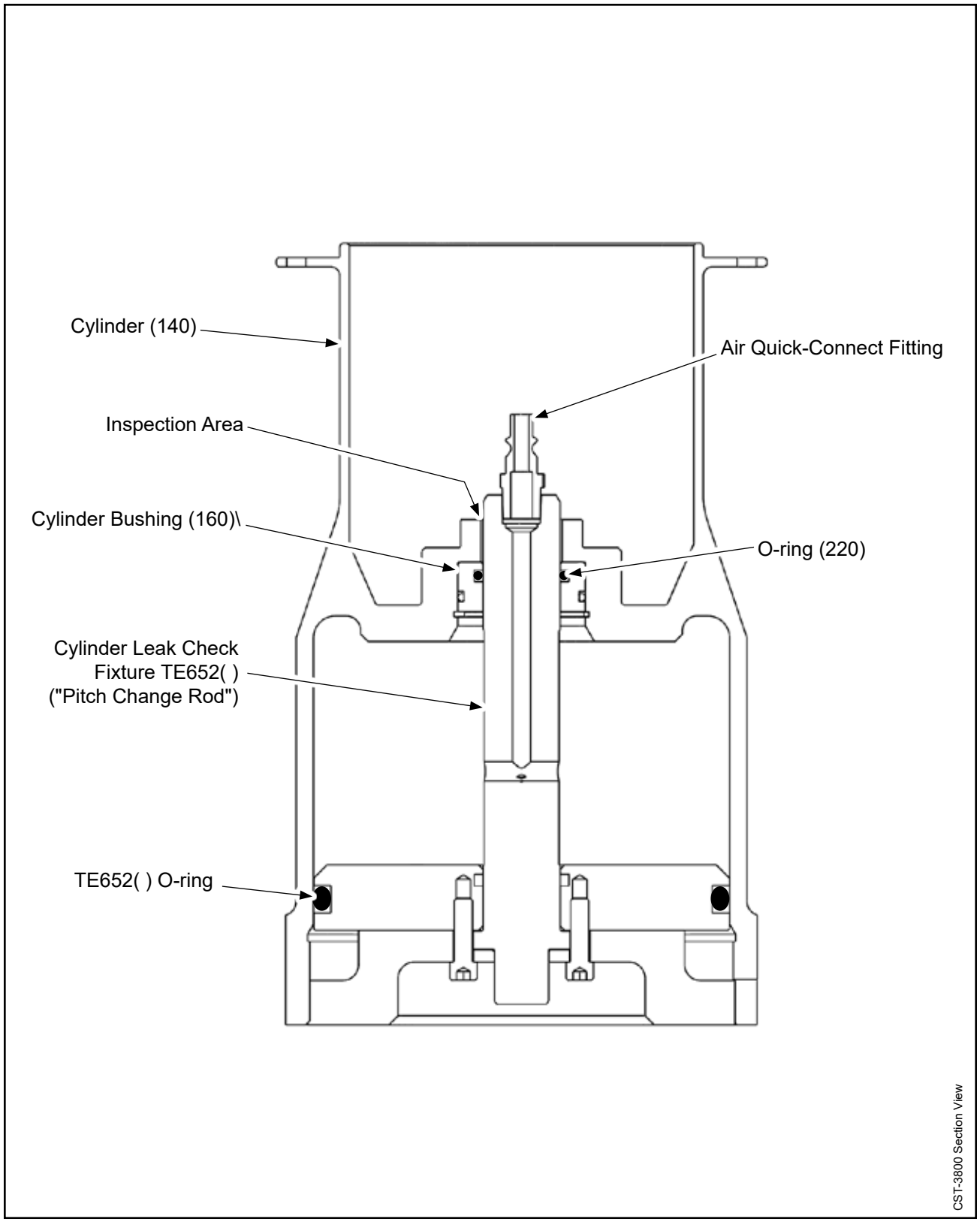
(a) Apply grease CM12 to the O-ring (150).

1 Install the O-ring (150) in the O-ring groove on the OD of the cylinder bushing (160).

(b) Apply grease CM12 to the cylinder (140) bore.

(c) Position the cylinder bushing (160) with the O-ring (150) closest to the retaining ring groove as shown in Figure 6-1, then push the cylinder bushing into the bore of the cylinder.

1 Install the retaining ring (170) in the retaining ring groove of the cylinder to retain the cylinder bushing (160).



Cylinder Leak Check Procedure
Figure 6-2

(3) Cylinder Leak Check Procedure - Refer to Figure 6-2

(a) Inspect the O-rings on the cylinder leak check fixture TE652( ).

1 Install a new or serviceable O-ring (220) in the groove on the ID of the hub bushing (160).

2 All surfaces of the fixture, including the threads must be clean and free of nicks and scratches.

(b) Apply a thin layer of grease CM12 to the O-rings, cylinder threads, and the diameter of the "pitch change rod" on the cylinder leak check fixture TE652( ).

CAUTION: DO NOT DAMAGE THE THREADS WHEN INSTALLING THE CYLINDER (140) ONTO THE CYLINDER LEAK CHECK FIXTURE TE652( ).

(c) Install the cylinder leak check fixture TE652( ) from the threaded end of the cylinder (140) as shown in Figure 6-2.

1 Turn the fixture TE652( ) until the fixture threads are fully engaged with the cylinder (140).

(d) Put the cylinder/fixture on a flat surface with the air quick-connect fitting facing up.

(e) Apply 200 psi (13.79 bars) of air pressure to the air quick-connect fitting.

(f) Check for leaks in the inspection area identified in Figure 6-2.

1 Apply leak detector CM122 to the inside of the cylinder (140) where the "pitch change rod" of the cylinder leak check fixture TE652( ) contacts the cylinder.

a Observe for approximately 10 seconds.

b A leak is indicated by continuous bubbling at the inspection area.

c A leak is not permitted.

2 If a leak is detected:

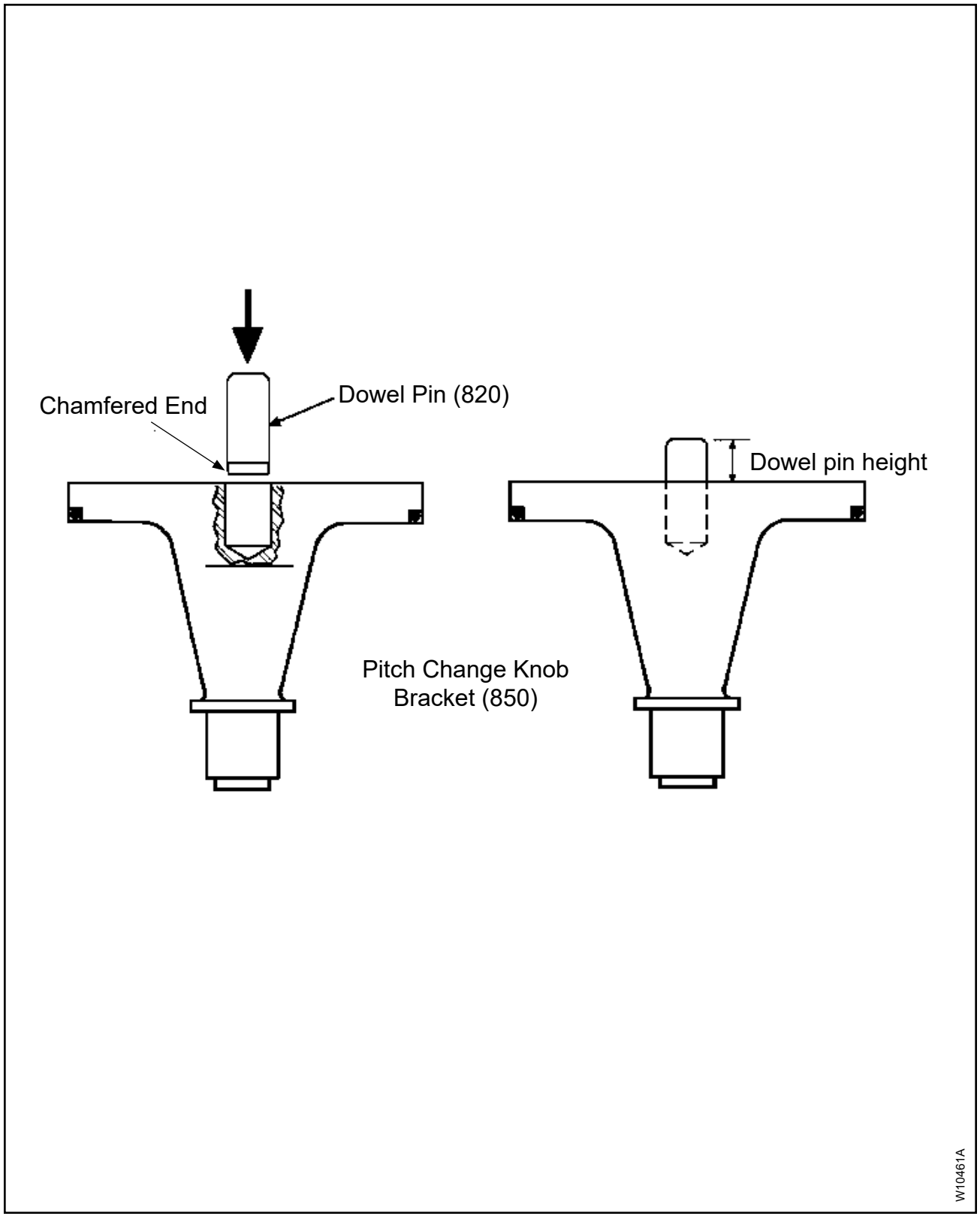
a Inspect the O-rings for damage and unwanted material.

(1) Remove unwanted material.

(2) Replace the O-ring(s).

b Repeat the leak inspection procedure.

(1) If the leak cannot be stopped, replace the cylinder bushing (160), then repeat the leak inspection procedure.



Installing the Dowel Pin into the Pitch Change Knob Bracket
Figure 6-3

(g) After the test is complete, remove the cylinder (140) from the cylinder leak check fixture TE652( ).

1 Remove and discard the O-ring (220) from the ID of the cylinder bushing (160).

2 All fixtures and tools must be cleaned and stored to prevent contamination by airborne particles (dust, paint, etc.).

D. Installation of the Pitch Change Knob Unit Dowel Pin

(1) Push the chamfered end of the dowel pin (820) into the pitch change knob bracket (850).

(2) Measure the dowel pin height. Dowel pin height must be 0.417 ± 0.023 inch (10.59 ± 0.58 mm). Refer to Figure 6-3.

E. Replacement of Nutplates and Rivets

CAUTION: DO NOT MAKE THE HOLE OVERSIZE WHEN DRILLING OUT THE RIVET.

(1) Refer to the Illustrated Parts List chapter of this manual for part numbers.

(2) Using the appropriate drill bit, drill out the rivet.

(3) Replace the nutplate and/or rivet using procedures in accordance with FAA Advisory Circular 4313-1B.

F. Feathering Compression Spring Zinc Chromate Primer Repair

(1) Cleaning

(a) For procedures for cleaning the feathering compression spring (240), refer to Cleaning of Steel Parts in the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(b) Visually examine the feathering compression spring (240) for scratches, corrosion, and zinc plate coverage in accordance with the Check chapter of this manual.

(c) Remove any loose material from the feathering compression spring (240) and feather the remaining coating with 120 to 180 grit sandpaper.

(d) Using solvent CM106, clean the entire feathering compression spring (240).

(e) Permit the solvent CM106 to air dry.

(2) Painting

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

(a) Apply a layer of zinc chromate primer CM67, or equivalent, to the entire surface of the feathering compression spring (240).

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

(c) Examine the feathering compression spring (240) for complete zinc chromate primer coverage.

G. Clearing the Bore in the 105403 Relief Valve Bolt

CAUTION: DO NOT USE TOO MUCH FORCE WHEN CLEARING THE BORE HOLE. FAILURE TO COMPLY MAY RESULT IN DAMAGE TO THE INTERNAL RELIEF VALVE OF THE RELIEF VALVE BOLT UNIT.

(1) To prevent unwanted material from falling into the internal relief valve, hold the relief valve bolt vertically with the bolt head facing down.

(2) Put the fluted end of a No. 48 drill bit (0.076 inch [1.93 mm] diameter) into the bore hole in the bolt head.

(3) Manually turn the drill bit into the bore hole until there is light contact with the internal relief valve.

(a) Remove the drill frequently to allow unwanted material to fall out of the bore hole.

(4) Apply a light machine oil or corrosion preventative oil, such as ACF-50, to the inside surface of the bore.

(5) Repeat the serviceable limit inspection in accordance with the section "105403 Relief Valve Bolt Unit" of the Component Inspection Criteria, Table 5-1 in the Check chapter of this manual.

H. Zinc Chromate Primer Repair for the 105403 Relief Valve Bolt Unit

(1) Clean the 105403 relief valve bolt unit in accordance with the section, "Cleaning of Steel Parts" in the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(2) Examine the 105403 relief valve bolt unit in accordance with the Check chapter in this manual.

(3) Remove any loose material from the surface of the 105403 relief valve bolt unit and feather the remaining coating using 120 to 180 grit sandpaper.

(4) Using solvent CM106, clean the 105403 relief valve bolt unit.

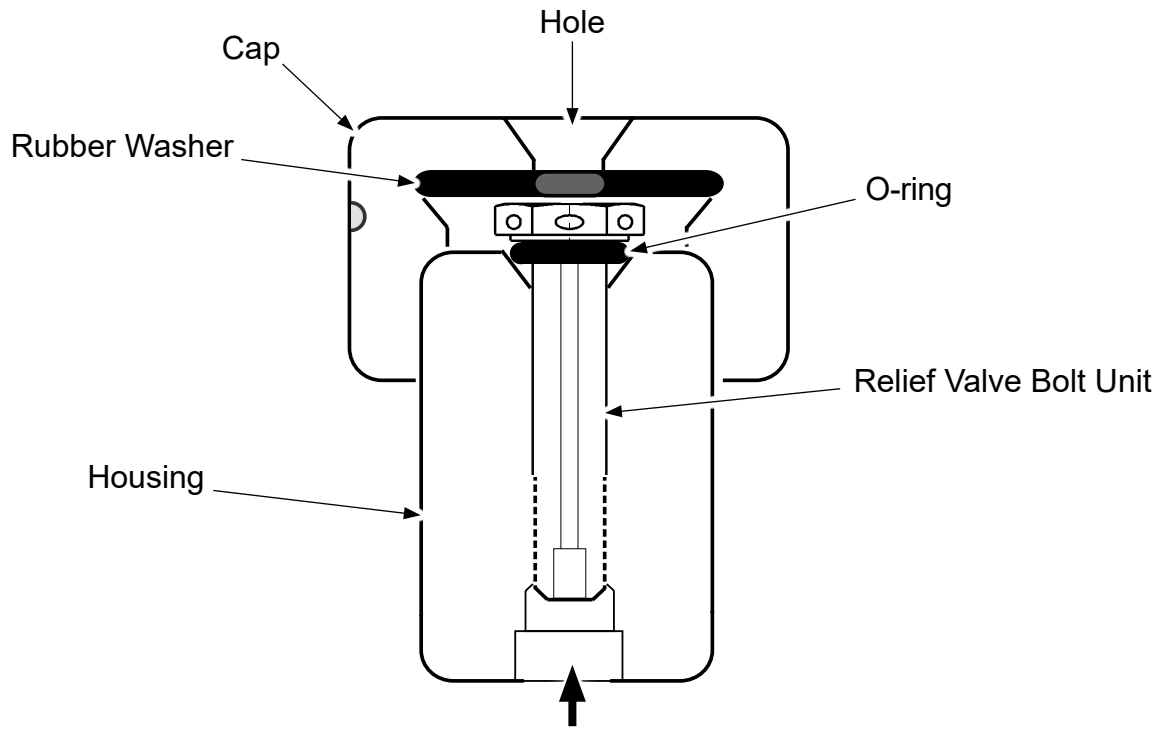
(5) Permit the solvent CM106 to air dry.

CAUTION: DO NOT APPLY ZINC CHROMATE PRIMER CM67 TO THE INSIDE DIAMETER (BORE) OF THE RELIEF VALVE BOLT OR TO THE INTERNAL RELIEF VALVE. DO NOT APPLY ZINC CHROMATE PRIMER CM67 TO THE RELIEF VALVE BOLT BEFORE PERFORMING THE WHITE LIGHT INSPECTION DURING THIS OVERHAUL INSPECTION.

(6) Apply a layer of zinc chromate primer CM67 or equivalent, to the bare metal surfaces of the 105403 relief valve bolt.

1 The zinc chromate primer CM67 is permitted to cover adjacent surfaces that still have cadmium plate coverage.

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



Using the TE547 Valve Assembly Check Tool
Figure 6-4

I. Using the TE547 Valve Assembly Check Tool - Refer to Figure 6-4

(1) Lubricate the O-ring with a light film of grease or oil.

(2) Install the O-ring onto the relief valve bolt unit.

(3) Push the relief valve bolt unit into the housing of the TE547 valve assembly check tool until the bolt head and O-ring make contact with the top of the housing.

(4) Lubricate the rubber washer with a light film of grease or oil.

(5) Install the rubber washer into the cap of the TE547 valve assembly check tool.

(6) Install the cap onto the housing and hand tighten until snug.

(7) Using a bench vise or equivalent, secure the housing so that the head of the bolt is facing up.

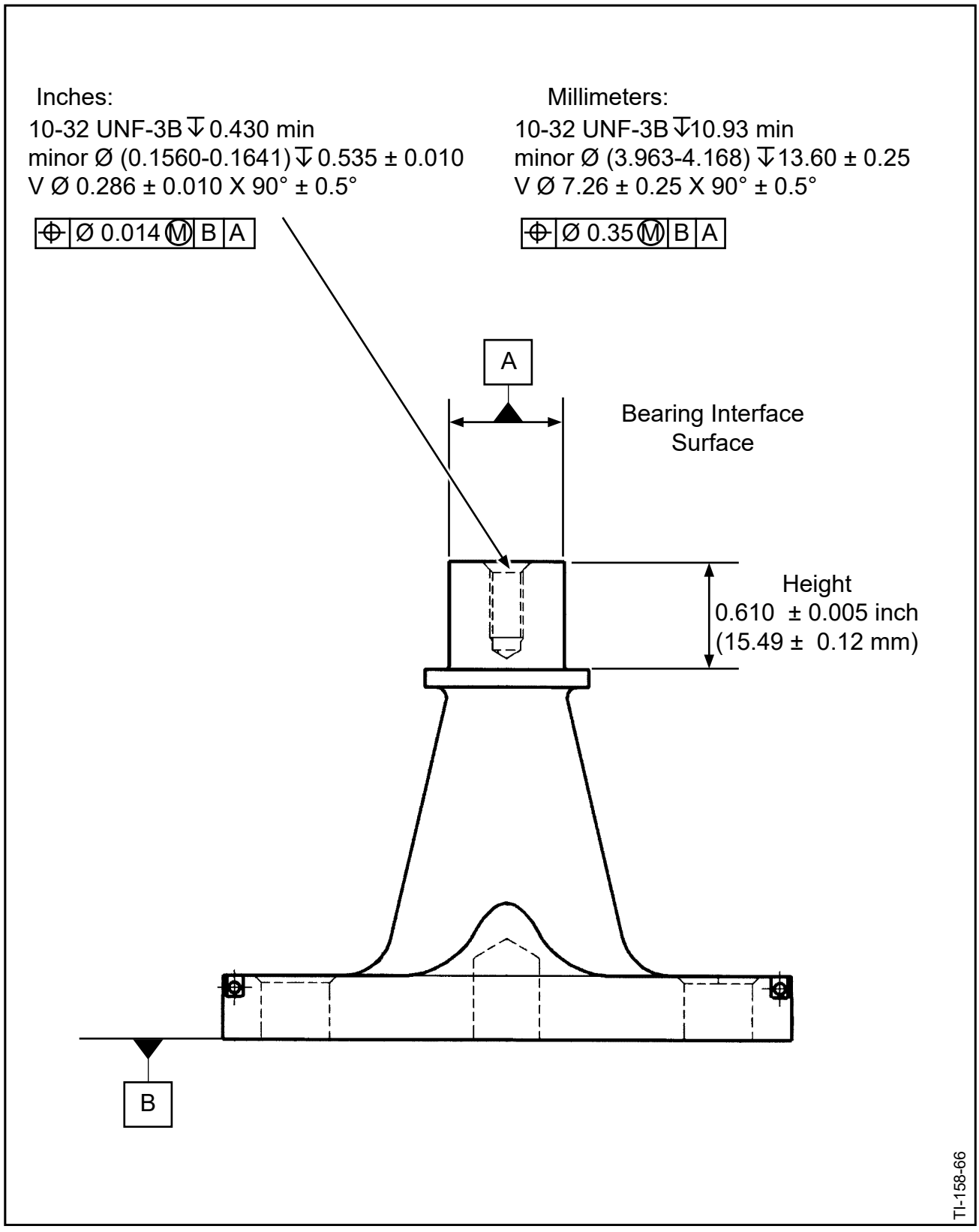
(8) Apply leak detector CM122 or equivalent to the relief valve bolt through the hole in the top of the cap.

(9) Connect a compressed air system with an inline filter, pressure regulator, and a calibrated pressure gage to the housing.

(a) Set the pressure regulator to 0 PSI (0 kPa).

(b) Using the pressure regulator, gradually increase the air pressure until air passage through the relief valve bolt is detected.

(c) Refer to the section, "105403 Relief Valve Bolt Unit" of the Component Inspection Criteria, Table 5-1 in the Check chapter of this manual for permitted serviceable limits.



Pitch Change Knob Bracket Modification
Figure 6-5

J. Pitch Change Knob Bracket Modification - Refer to Figure 6-5

(1) General

CAUTION: THE PITCH CHANGE BRACKET MUST HAVE A SATISFACTORY INSPECTION TO BE ELIGIBLE FOR THE MODIFICATION PROCEDURE.

(a) Inspect the pitch change knob bracket in accordance with the section, "Pitch Change Bracket that Uses a Swaged Washer to Retain the Cam Follower" in Table 5-1, "Component Inspection Criteria" in the Check chapter of this manual.

1 If the inspection of pitch change bracket that uses a swaged washer to retain the cam follower is not satisfactory, the bracket must not be modified.

(2) Modification Procedure

(a) Mill off the retaining washer shoulder of the pitch change knob bracket to the height given in Figure 6-5.

(b) Drill, thread, and countersink/chamfer to the dimensional and true position requirement as specified in Figure 6-5

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

(d) Apply masking material to the pitch change knob bearing interface surface.

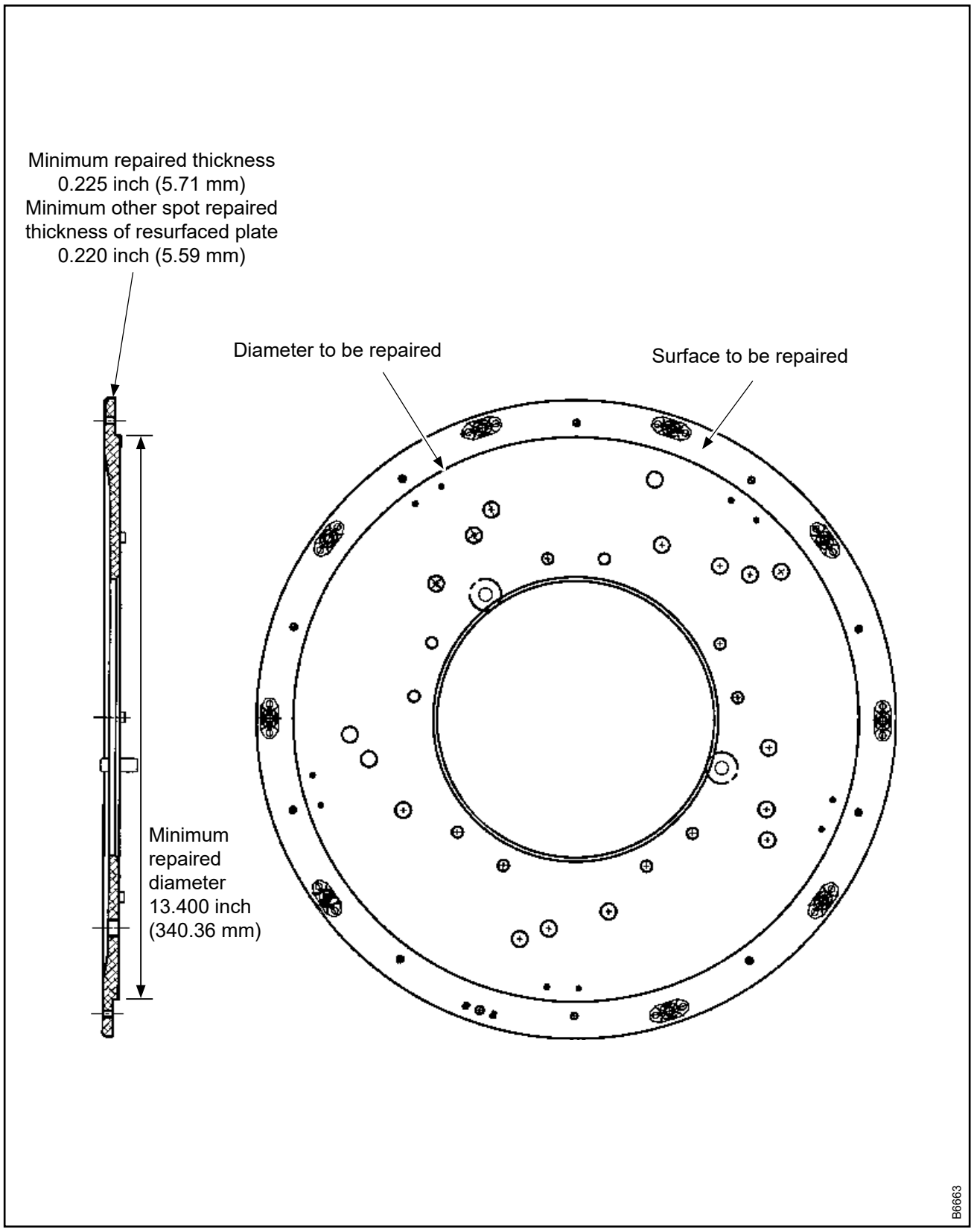
(e) Reapply cadmium plating and bake in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(f) Inspect all machined dimensions and true position requirements in Figure 6-5 to make sure that all specified modification requirements have been met.

(g) Using a go-no-go thread gauge, inspect the 10-32UNF-3B threaded hole to make sure that it meets the pitch diameter requirements for the specified thread.

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

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



Adapter Plate Unit
Figure 6-6

K. Adapter Plate Repair Procedure - Refer to Figure 6-6

(1) Remove rivets (670) and nutplates (680).

(2) Resurface the damaged surface to keep a 0.005 inch (0.12 mm) parallelism requirement with respect to the hub mounting flange.

(a) The minimum thickness of the repaired piece of the plate is 0.225 inch (5.71 mm) as measured from the resurfaced prop-side of the plate and a non-repaired area on the engine-side of the plate. Refer to Figure 6-6.

(b) When other spot repairs are done on a plate that has been resurfaced, the minimum thickness of the plate in the area of those spot repairs is 0.220 inch (5.59 mm). Refer to Figure 6-6.

(3) Machine 0.010 inch (0.25 mm) total (0.005 inch [0.12 mm] per side) from the diameter of the plate that fits against the ID of the bulkhead.

(a) The minimum repaired diameter is 13.400 inch (340.36 mm). Refer to Figure 6-6.

(4) Inspect parallelism in the constrained condition.

(a) Hold the plate to the mounting flange hub-half with ten 1/4-28x1/2 screws torqued to a maximum of 10 Ft-Lbs (13.5 N•m).

(5) Stage the mounting flange of the hub (410) on a known flat surface.

(6) Measure the repaired surface for parallelism and make sure it is within a 0.005 inch (0.12 mm) range.

(7) A parallelism inspection completed by Hartzell Propeller Inc. using a GT-3835 tool is an acceptable alternative to the parallelism inspection process outlined in section 5.K(4) through 5.K(6).

(8) Mask the dowel pins and alodine the repaired surfaces in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(9) Install new nut plates (680) and rivets (670). Refer to the Illustrated Parts List of this manual for the correct part numbers.

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ASSEMBLY - CONTENTS

ASSEMBLY - CONTENTS, CONTINUED

LIST OF FIGURES

LIST OF FIGURES, continued

LIST OF TABLES

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. Assembly of HC-E5A-2( ) Propeller Models

A. Hub Assembly Procedures

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

(2) Install the rod hub bushing (422) in the bore of the engine-side half of the hub (410). Refer to Figure 7-1.

(a) Using a clean cloth dampened with solvent MEK CM106, thoroughly clean the OD of the rod hub bushing (422) and the bore of the hub (410).

(b) Permit the solvent MEK CM106 to dry.

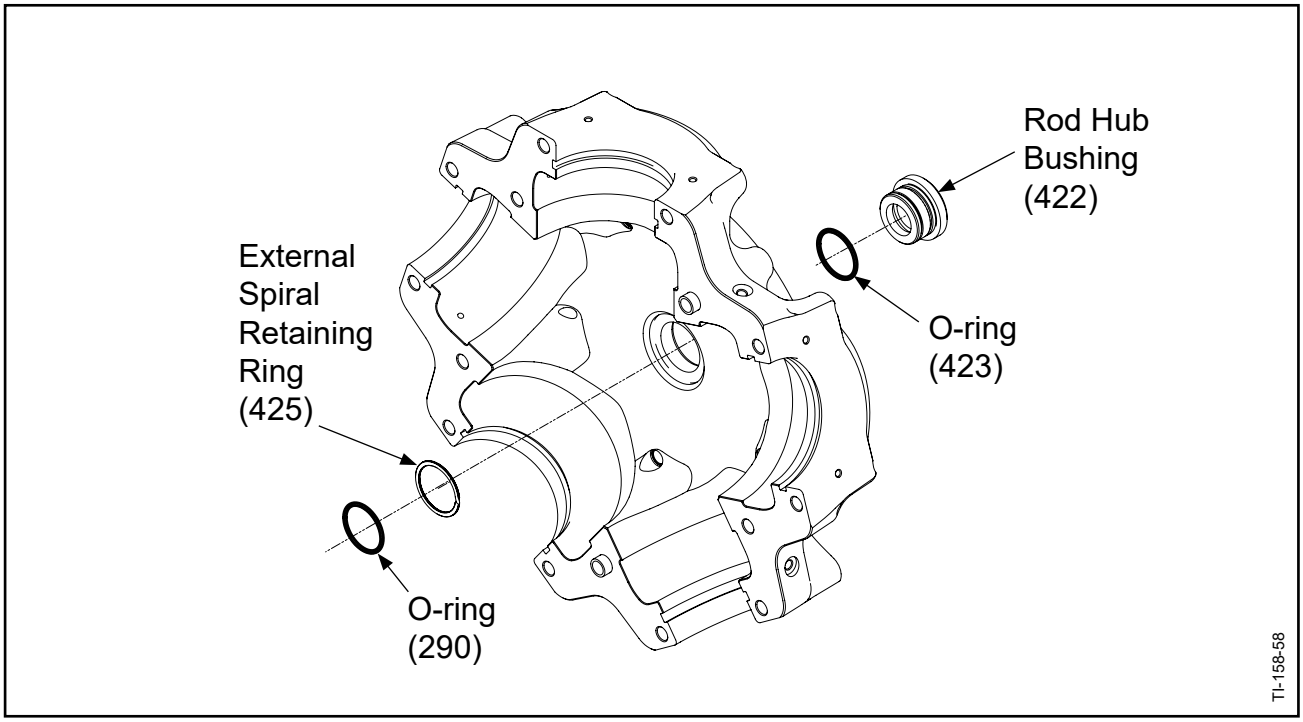
(c) Install the O-ring (423) in the groove on the OD of the rod hub bushing (422).

(d) Apply a light layer of grease CM12 in the bore of the engine-side half of the hub (410).

(e) From the outside of the engine-side half of the hub (410), install the rod hub bushing (422) in the hub bore.

(f) From the inside of the engine-side half of the hub (410), install the external spiral retaining ring (425) in the groove on the rod hub bushing (422).

(3) In the groove provided for it in the ID of the rod hub bushing (422), install an O-ring (290).



Installing the Rod Hub Bushing and O-ring in the Engine-side Hub-half Flange
Figure 7-1

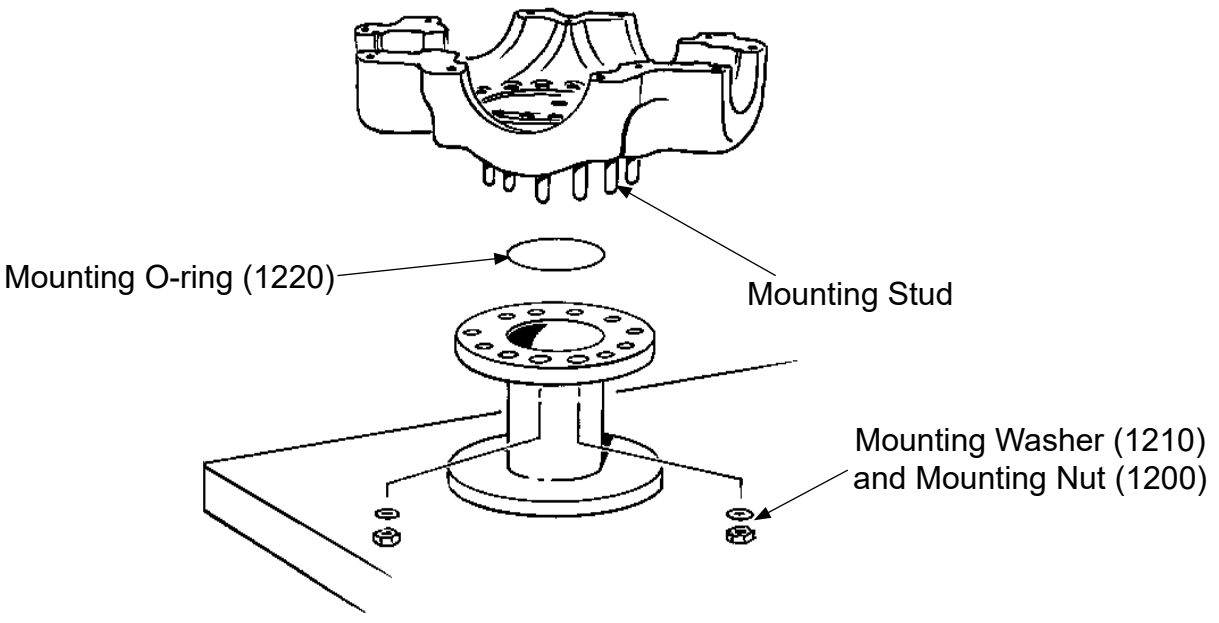
(4) Install the mounting flange O-ring (1220) on the rotatable fixture to seal between the hub (410) and the rotatable fixture. Refer to Figure 7-2.

(5) Using one washer (1210) and one hub mounting nut (1200) on each of two mounting bolts (460) that are 180 degrees apart, install the engine-side hub half (410) on the rotatable fixture on the propeller assembly table TE129 or equivalent. Refer to Figure 7-2.

(6) Tighten the hub mounting nuts (1200) until tight.

(7) Clean the hub inside surface, the parting line face and the O-ring groove with solvent CM23 or CM106.

(8) Install the two guide bushings (430).



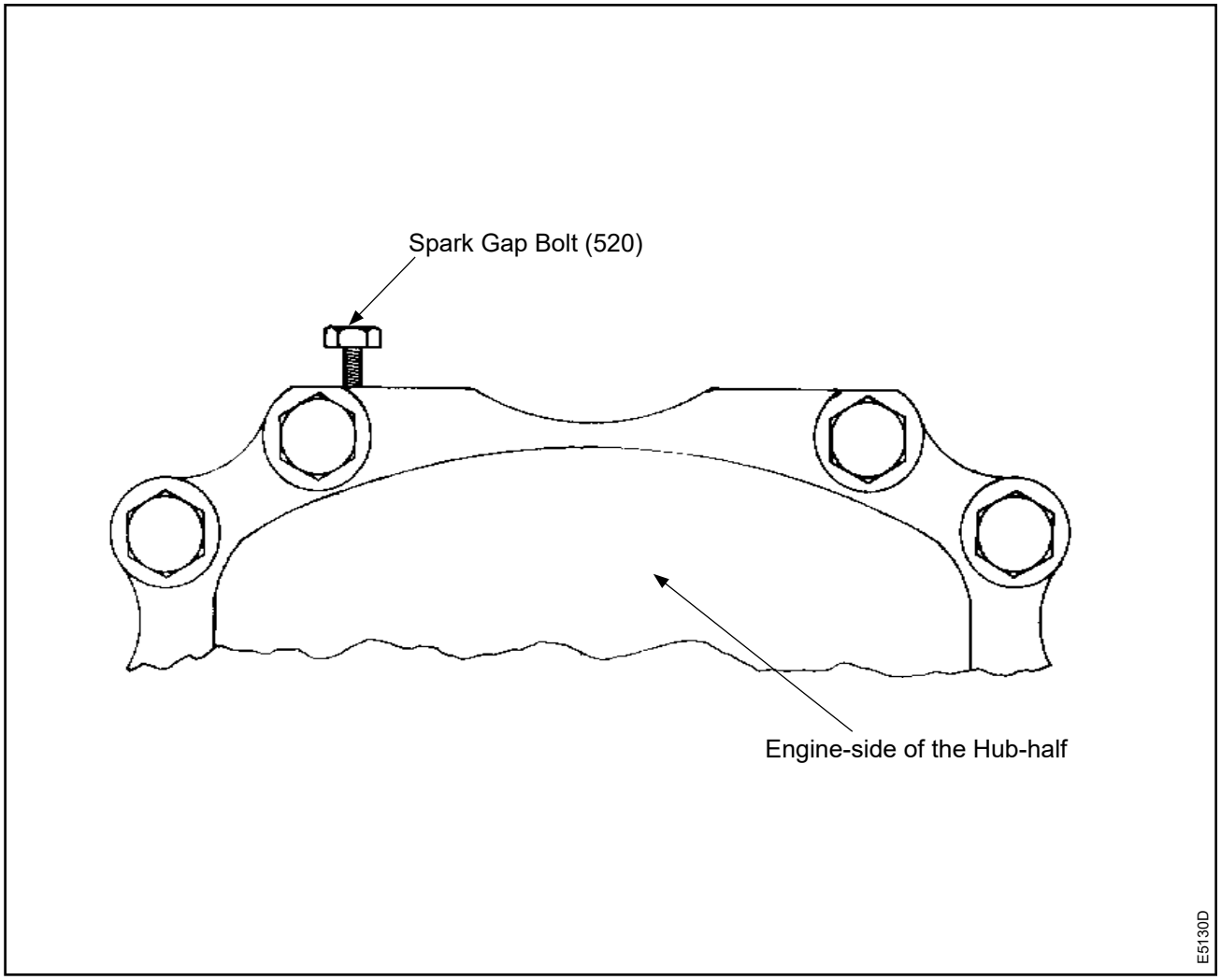
Installing the Engine-side Hub-half on the Rotatable Fixture
Figure 7-2

CAUTION 1: THE BOLT GAP IS NECESSARY FOR THE PROPER DISCHARGE OF ANY ELECTRICAL CHARGE INTO THE HUB.

CAUTION 2: IF THE SPARK GAP BOLT IS REMOVED FOR ANY REASON, IT MUST BE DISCARDED AND REPLACED WITH A NEW SPARK GAP BOLT.

(9) Install the spark gap bolt (520) into the balance weight hole that most closely aligns with the blade trailing edge on the engine-half of the hub unit (410). Refer to Figure 7-3.

(a) Insert the spark gap bolt as far as the threads permit, but do not tighten the spark gap bolt (the spark gap bolt will be adjusted after blade installation).



Installing the Spark Gap Bolt
Figure 7-3

B. Blade Assembly Procedures

NOTE: The following procedure assumes that each blade has been inspected, reworked, and repaired and that the counterweight clamp, blade-side split bearing race, and bearing retention ring are installed per Hartzell Composite Blade Manual 135F (61-13-35).

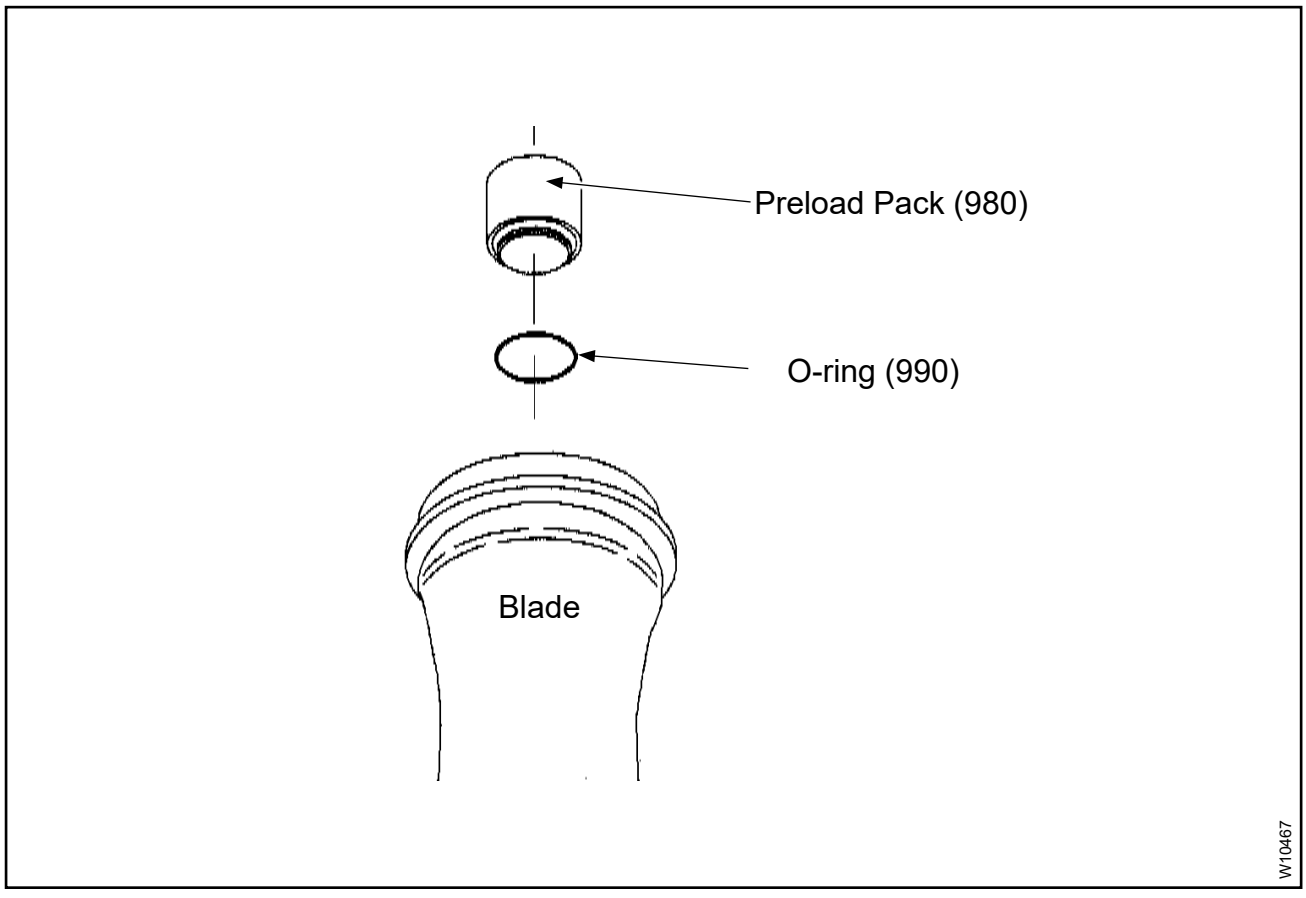
(1) Assemble the preload pack assembly. Refer to Figure 7-4.

(a) Install the wear disk (1000) in the preload pack housing (990).

(b) Stack the Belleville spring washers (1010) in the preload pack housing (990). For the correct placement of the Belleville spring washers in the preload pack housing, refer to the Belleville spring washer inspection in the Check chapter of this manual.

(c) Install the preload pack cap (1020) through the center of the stacked Belleville spring washers (1010) in the preload pack housing (990).

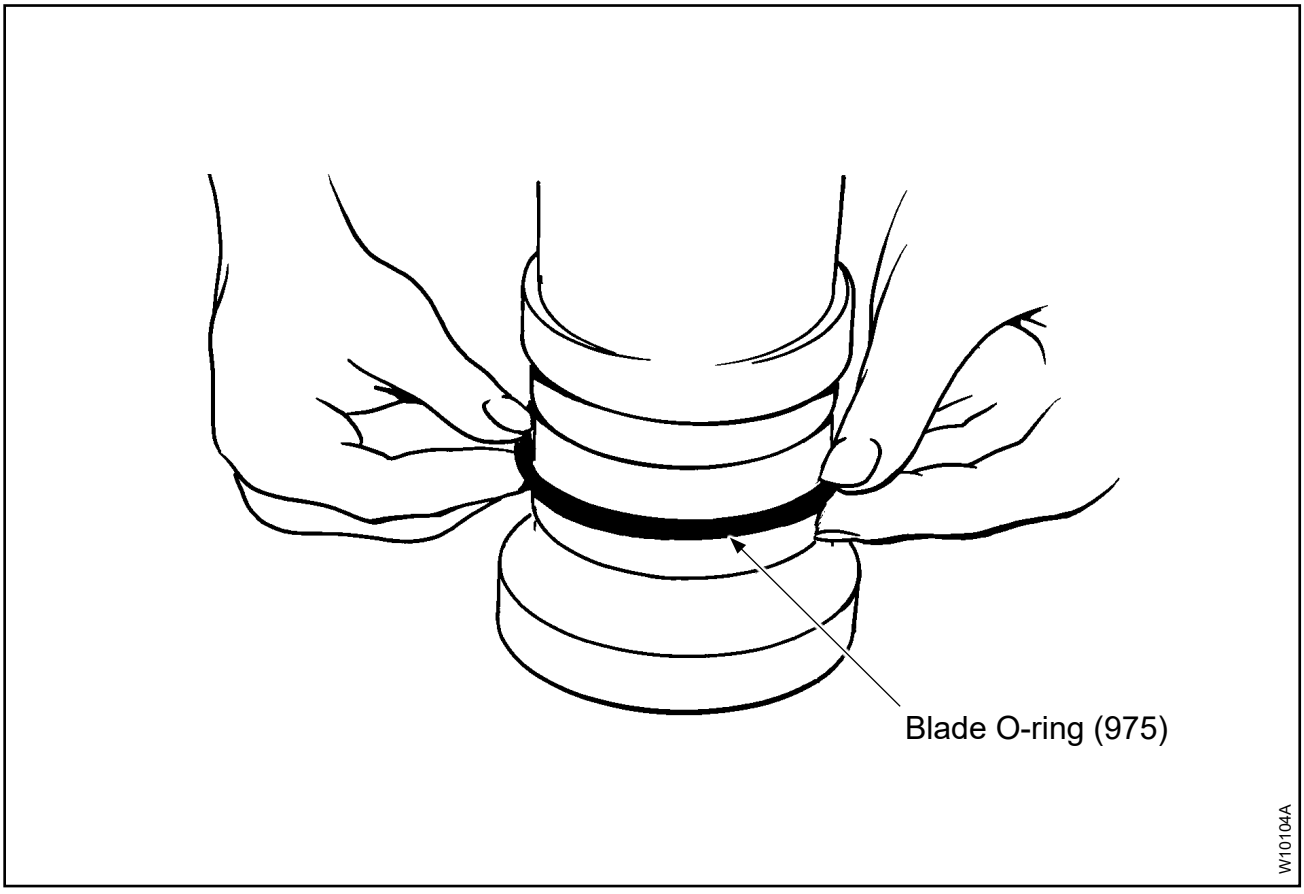
(d) Install the internal spiral retaining ring (1030) in the groove in the ID of the preload pack housing (990).



Installing the Preload Pack Assembly
Figure 7-4

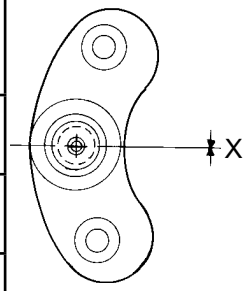
(2) Install the blade O-ring (975) over the base of the blade shank. Refer to Figure 7-5.

NOTE: The 105030 wear strip must be used. Refer to Hartzell Propeller Inc. Service Bulletin HC-SB-61-339.

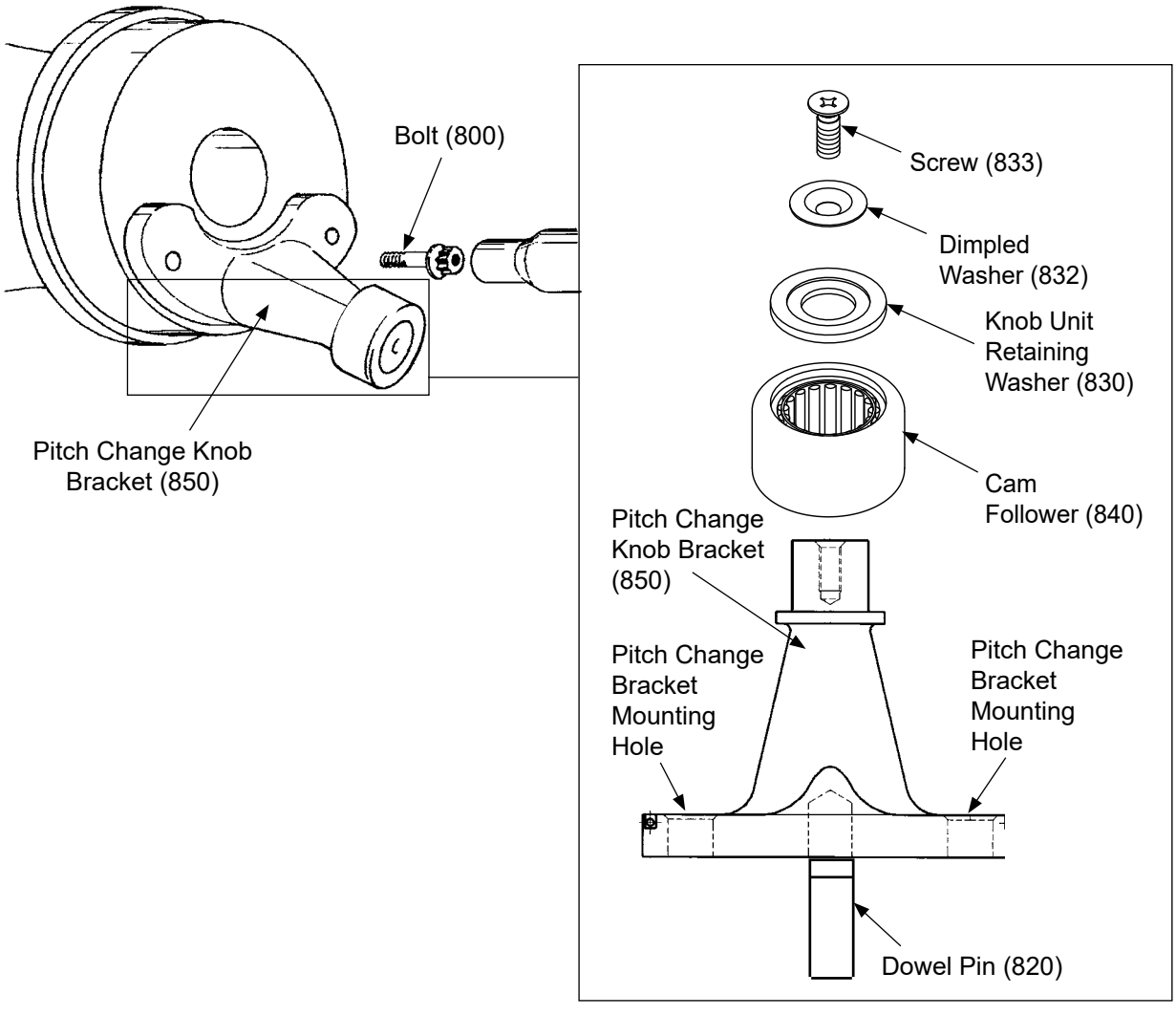


Installing the Blade O-ring on the Blade
Figure 7-5

PART NO.	DIMENSION "X" PITCH CHANGE BRACKET LOCATION FROM AXIS	CHANGE OF BLADE ANGLE
B-7627-1	-0.008 inch (0.20 mm)	-0.3 degrees
B-7627-2	0.000 inch (0.00 mm)	---
B-7627-3	+0.008 inch (0.20 mm)	+0.3 degrees



Blade Pitch Change Knob Unit Selection



Installing the Pitch Change Knob Unit
Figure 7-6

(3) Installation of the Pitch Change Knob Unit

(a) If the dowel pin (820) has been removed, refer to the Installation of the Pitch Change Knob Unit Dowel Pin section of the Repair chapter of this manual, for dowel pin installation instructions.

(b) Install the cam follower (840). Refer to Figure 7-6.

1 If the outboard end of the pitch change knob bracket (850) does not have a threaded hole, refer to the inspection criteria for the pitch change knob bracket in the Check chapter of this manual.

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2 Using solvent MEK CM106 or MPK CM219, clean the threads of the screw (833) and the threads in the top of the pitch change knob bracket (850).

3 Permit the solvent MEK CM106 or MPK CM219 to dry.

4 Apply threadlocker CM21 to the clean, dry threads in the top of the pitch change knob bracket (850).

5 Put the cam follower (840) over the pitch change knob bracket (850).

6 With the counterbored side up, put the knob unit retaining washer (830) over the pitch change knob bracket (850) to hold the cam follower (840) in position.

7 With the raised side down, put the dimpled washer (832) over the knob unit retaining washer (830).

8 Apply threadlocker CM21 to the clean, dry threads of the screw (833).

9 Insert the screw (833) through the retaining washer (830) and the dimpled washer (832) and into the threaded hole in the top of the pitch change knob bracket (850).

10 Torque the screw (833) in accordance with Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual.

11 Repeat step 2.B.(3)(b)1 through 2.B.(3)(b)10 for each of the remaining pitch change knob brackets (850).

(c) Make sure that the surfaces of the butt of the blade and of the pitch change knob bracket (850) are clean and free of oil, dirt, and other foreign materials.

1 Refer to the blade pitch change unit selection data in Figure 7-6.

2 Use the alternate pitch change knob unit choices as necessary to bring the floating pitch angle of all five blades within the specified tolerance of ± 0.1 degree.

(d) Put the pitch change knob bracket (850) with the dowel pin (820) inserted, on the butt of the blade.

(e) Line up the holes in the pitch change knob bracket (850) with the threaded holes in the butt of the blade.

(f) Insert the bolts (800) by hand in the threaded holes, but do not tighten.

CAUTION: DO NOT DAMAGE THE PARTS THAT ARE ATTACHED TO THE OUTBOARD END OF THE PITCH CHANGE KNOB BRACKET (850). IF NECESSARY, PROTECT THE PARTS FROM DAMAGE WHEN INSTALLING THE PITCH CHANGE KNOB BRACKET UNIT (810) ON THE BUTT OF THE BLADE.

(g) Using a rubber mallet, tap the pitch change knob unit (810) until the base of the unit is firmly in place against the butt of the blade, using care not to damage the pitch change knob unit.

(h) Torque each bolt (800) in accordance with Table 8-1, "Torques Values", in the Fits and Clearances chapter of this manual.

(i) Safety wire each bolt (800) to the holes in the pitch change knob bracket (850) in accordance with military standard NASM33540 using 0.020 inch (0.50 mm) safety wire.

(j) Repeat steps 2.B.(3)(b) through 2.B.(3)(i) for the remaining blades.

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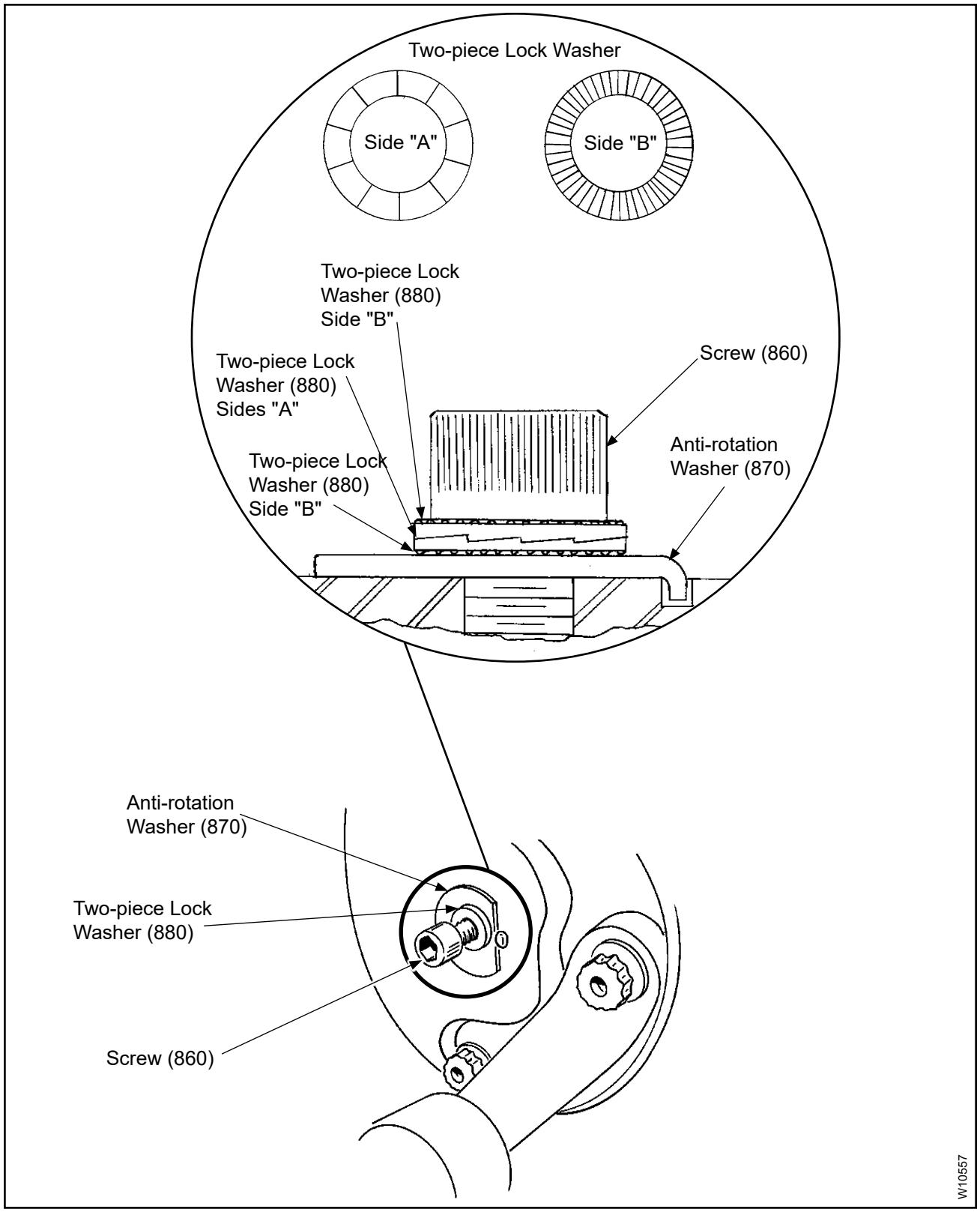


Installing the Preload Screw and Washers
Figure 7-7

(4) Installation of the preload pack assembly and preload plate

(a) Place a dry, ungreased O-ring (990) on the preload pack assembly.

(b) With the preload pack assembly (980) positioned so that the beveled end enters the blade bore hole first, insert the preload pack assembly in the blade bore hole. Refer to Figure 7-4.

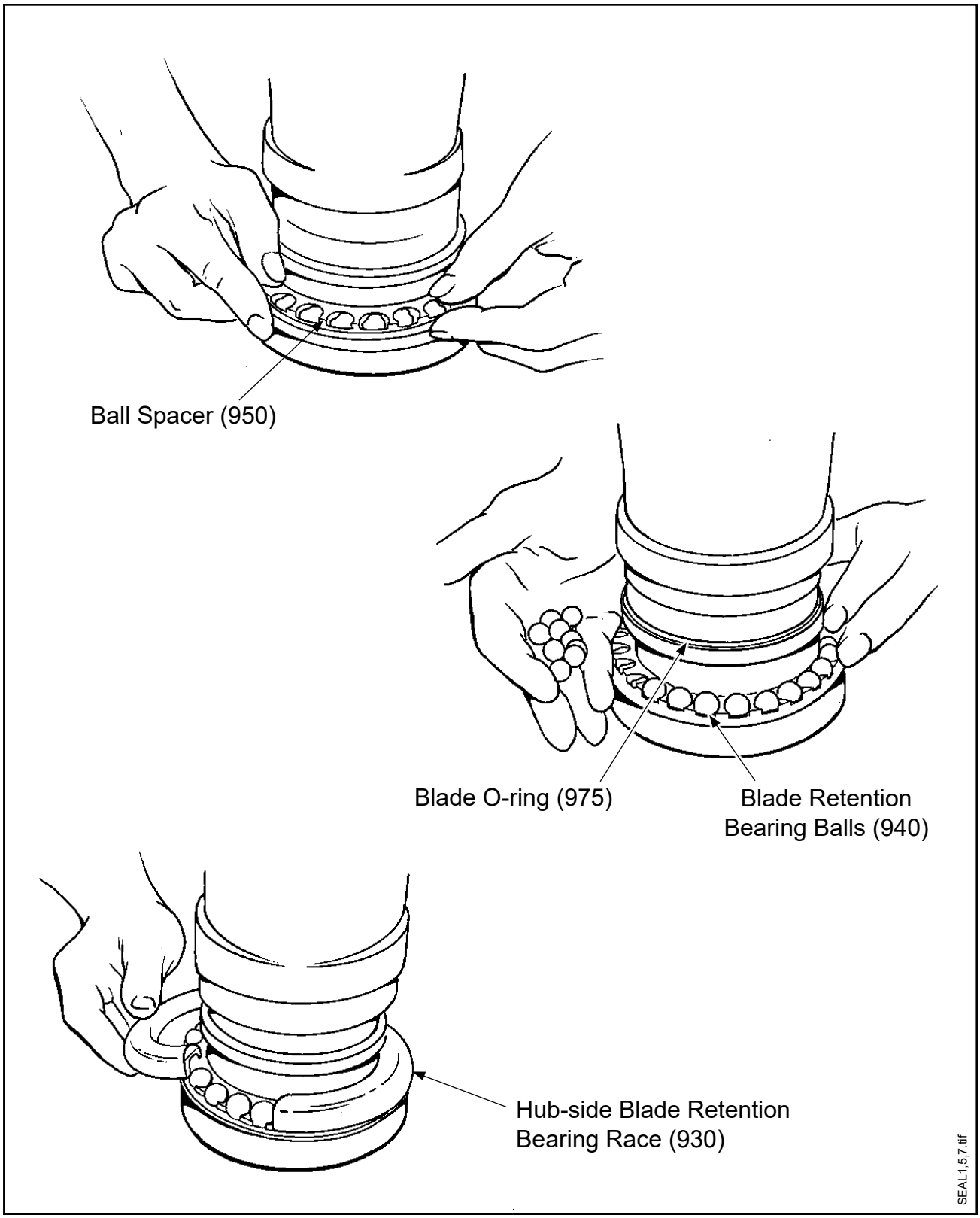
CAUTION: THE TWO-PIECE LOCK WASHER (880) MUST BE INSTALLED CORRECTLY TO PREVENT IN-SERVICE LOOSENING OF THE SCREW (860). REFER TO FIGURE 7-7 FOR THE CORRECT TWO-PIECE LOCK WASHER (880) ORIENTATION.

(c) Install the anti-rotation washer (870), 2-piece lock washer (880), and screw (860) in the threaded hole in the preload plate (890). Refer to Figure 7-7.

NOTE 1: The tab of the anti-rotation washer is inserted in the hole provided in the preload plate.

NOTE 2: Each washer of the two-piece lock washer (880) has a Side "A" and a Side "B" as identified in Figure 7-7. Side "A" has ramps and Side "B" has radial notches. Install the two-piece lock washer (880) with Side "A" of each washer facing each other. Side "B" of one washer will face the head of the screw (860) and Side "B" of second lockwasher will face the anti-rotation washer (870).

(d) Install the preload plate (890) on the butt of the blade.



Installing the Blade Bearing Balls
Figure 7-8

(5) Installation of the Hub-Side Blade Retention Bearing Race and Blade Retention Bearing Balls. Refer to Figure 7-8.

(a) Using lubricant CM12, lubricate the blade-side blade bearing race (930) and the ball spacer (950).

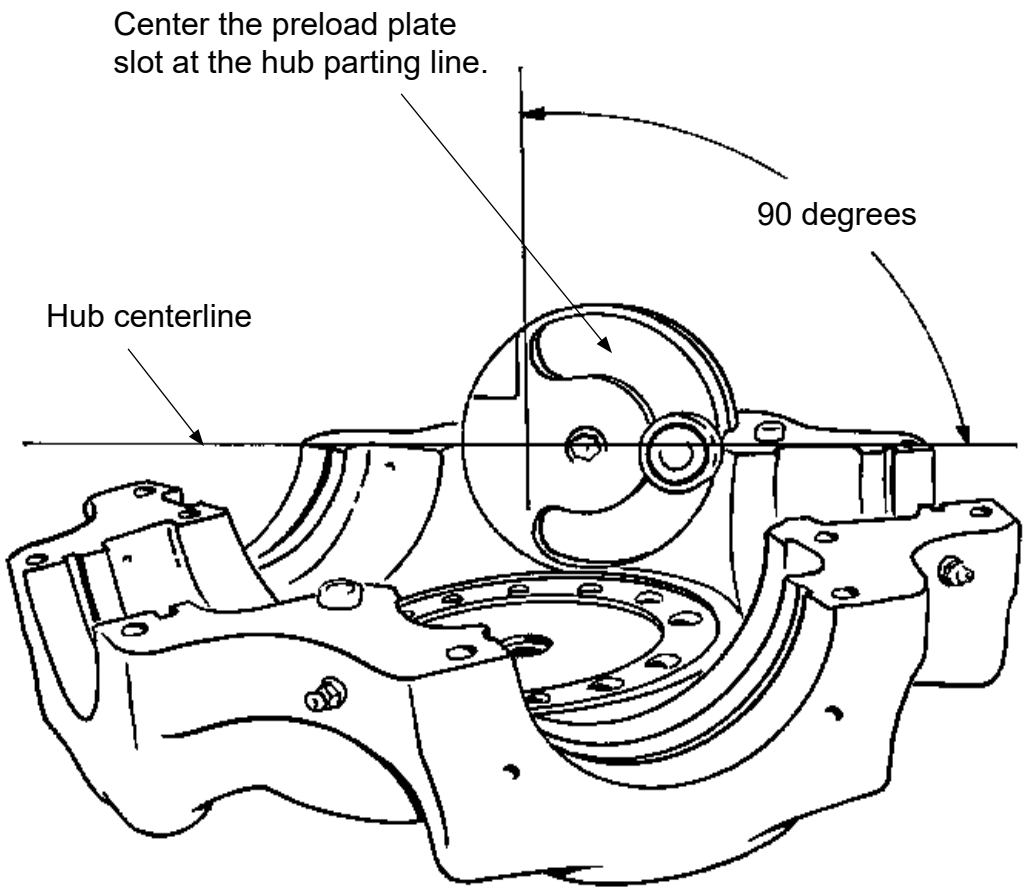
(b) Place the ball spacer (950) on the blade-side blade bearing race (920).

CAUTION: ALL BLADE RETENTION BEARING BALLS INSTALLED IN A SINGLE BLADE RETENTION BEARING MUST BE OF THE SAME GAUGE. BLADE RETENTION BEARING BALLS SUPPLIED BY HARTZELL ARE OF THE SAME GAUGE.

(c) Place the blade retention bearing balls (940) in the openings of the ball spacer (950) on the blade-side bearing race (920).

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

(d) Place the hub-side blade retention bearing race (930) on the blade retention bearing balls (940). Rotate the hub-side blade retention bearing race until the split line is located toward the blade trailing edge.



NOTE: Fork has been removed for illustration purposes.

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Installing a Blade in the Hub Socket
Figure 7-9

C. Blade Installation

(1) Using lubricant CM12, apply a thin layer of lubricant to the hub blade retention radii of the hub and hub O-ring grooves.

(2) Using the three bolts (640), attach the fork bumper (630) to the flat side of the fork (600).

(3) Torque each bolt (640) in accordance with the Torque Values table in the Fits and Clearances chapter of this manual.

(4) Place the fork (600) with the bumper-side down in the hub (410) half.

(5) Install the blade assemblies into the sockets of the engine-side hub half. Refer to Figure 7-9.

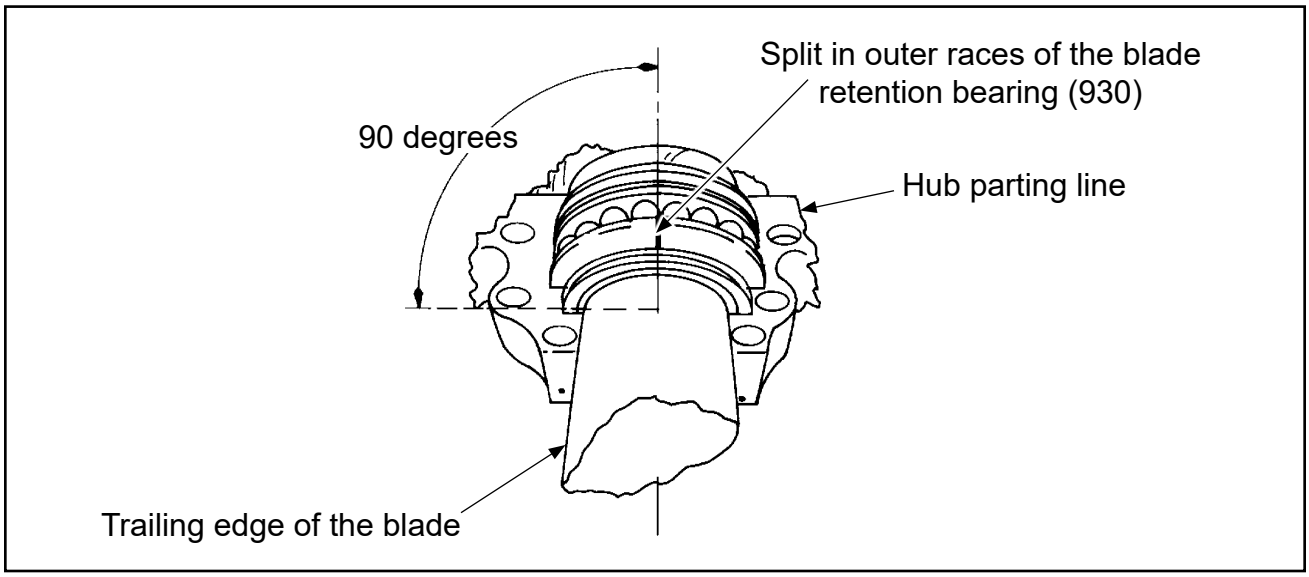
(a) Examine each blade for free rotation in the hub blade socket.

1 If the blade does not have free rotation, examine the blade O-ring (975) for correct fit in the hub groove.

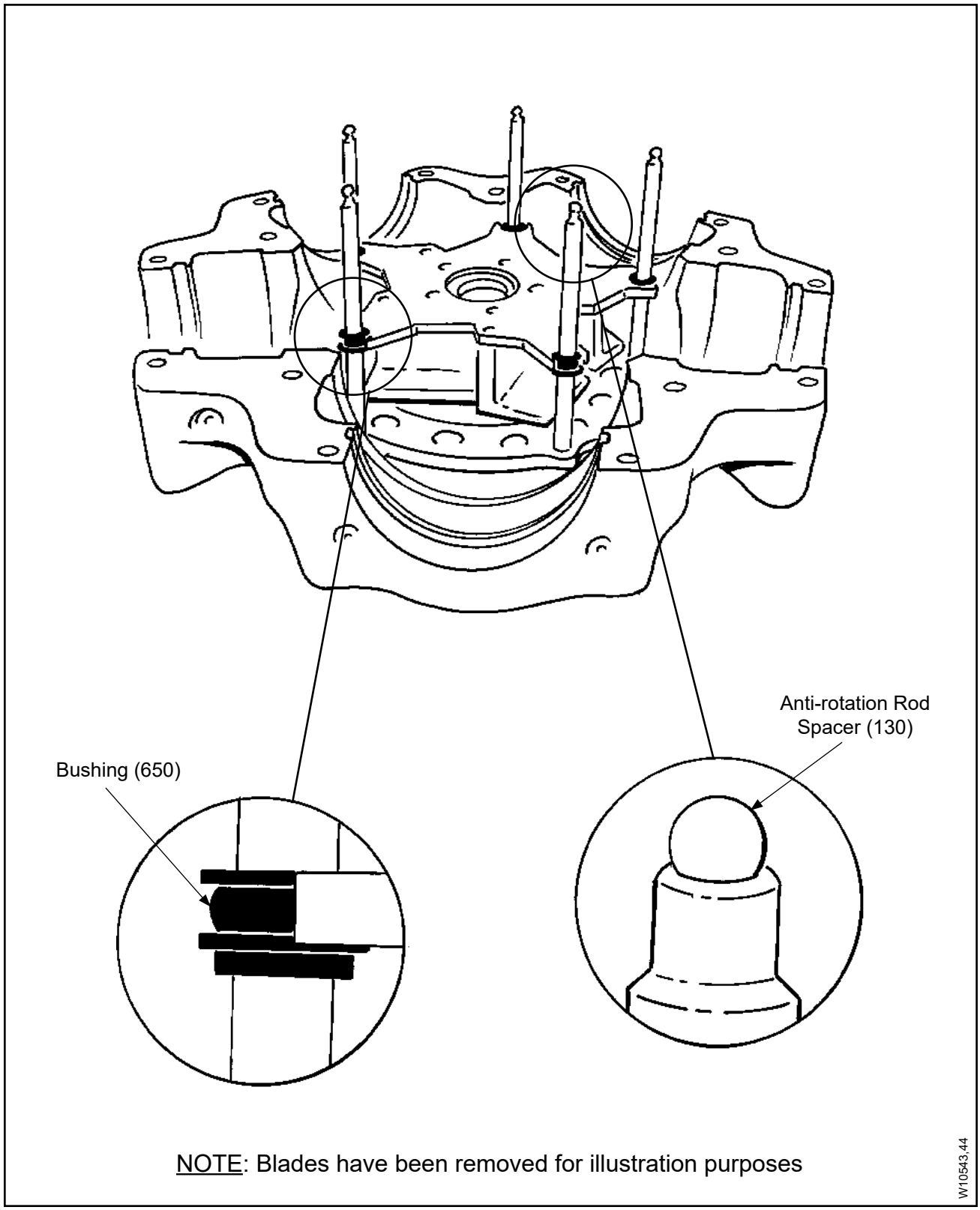
(6) Center the slot of the preload plate (890) at the hub parting line. Refer to Figure 7-9.

NOTE: The blade knob slot in the preload plate must be positioned to permit the blade to travel within the full blade angle range without restriction.

(7) Align the split in the outer races of the blade retention bearing 90 degrees from the hub parting line. Refer to Figure 7-10.



Positioning the Split in the Bearing Races
Figure 7-10



Anti-rotation Rod Installation
Figure 7-11

D. Anti-rotation Ring Installation

(1) Move the blades to feather position.

(2) Install an anti-rotation rod (120) in the hole provided for it in the hub mounting bolt ring (450). Repeat for the remainder of the anti-rotation rods.

(3) Install a bushing (650), thin end up, at the end of each fork top plate (610). Refer to Figure 7-11.

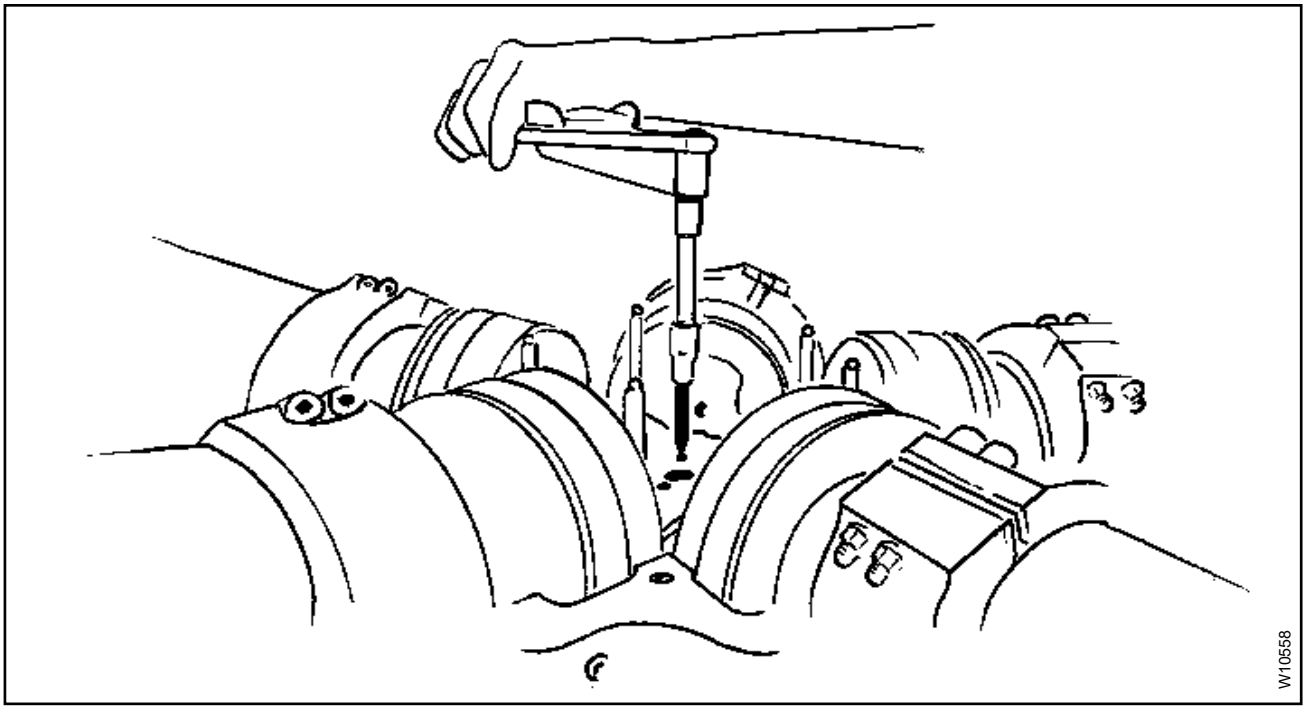
NOTE: A small amount of lubricant on the OD of the bushings helps hold the bushings in place at the ends of the fork top plate.

(4) While holding the bushings in place on the fork top plate (610), slide the anti-rotation rods (120) through the bushings (650) until the fork top plate touches the fork.

NOTE: A light coating of lubricant CM12 on the OD of the anti-rotation rods permits the bushing to slide easily on the rods.

(5) Install a screw (620) in each of the threaded holes in the fork top plate (610).

(6) Torque each screw (620) in accordance with the Torque Values table in the Fits and Clearances chapter of this manual. Refer to Figure 7-12.



Torquing the Top Plate Screws
Figure 7-12

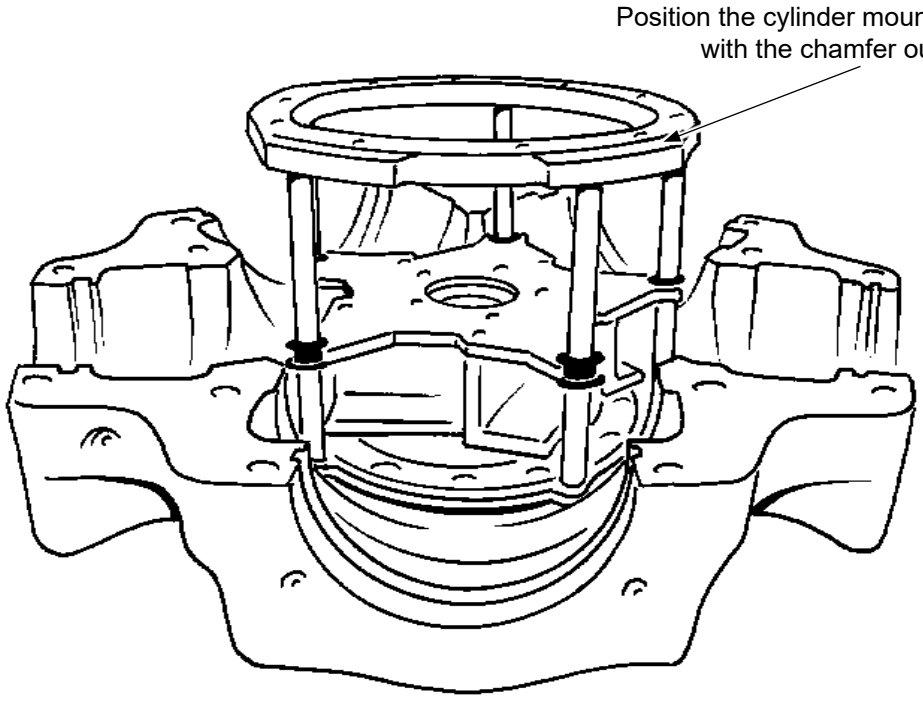
(7) Apply a small amount of lubricant CM12 on the top of each anti-rotation rod (120).

(8) Put an anti-rotation rod spacer (130) in the lubricated depression on the end of each anti-rotation rod (120). Refer to Figure 7-11.

(9) Install two threaded headless pins TE159 in the cylinder mounting ring (180).

(10) Position the cylinder mounting ring (180) on top of the anti-rotation rods (120), with each anti-rotation spacer (130) engaged in the hole provided for it in the cylinder mounting ring. Refer to Figure 7-13.

NOTE: When it is positioned correctly on the anti-rotation spacers, the cylinder mounting ring will not wobble or rock.



NOTE: Blades have been removed for illustration purposes

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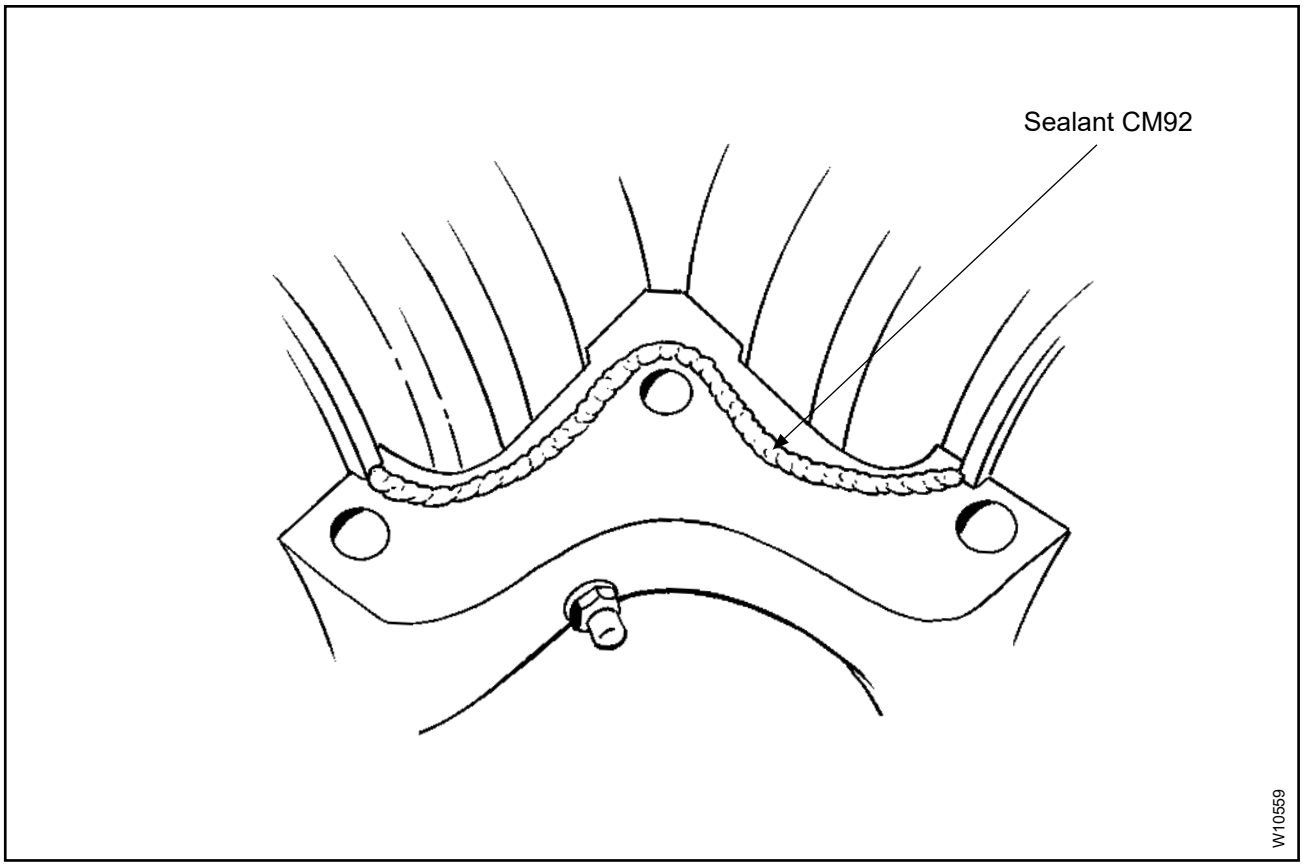
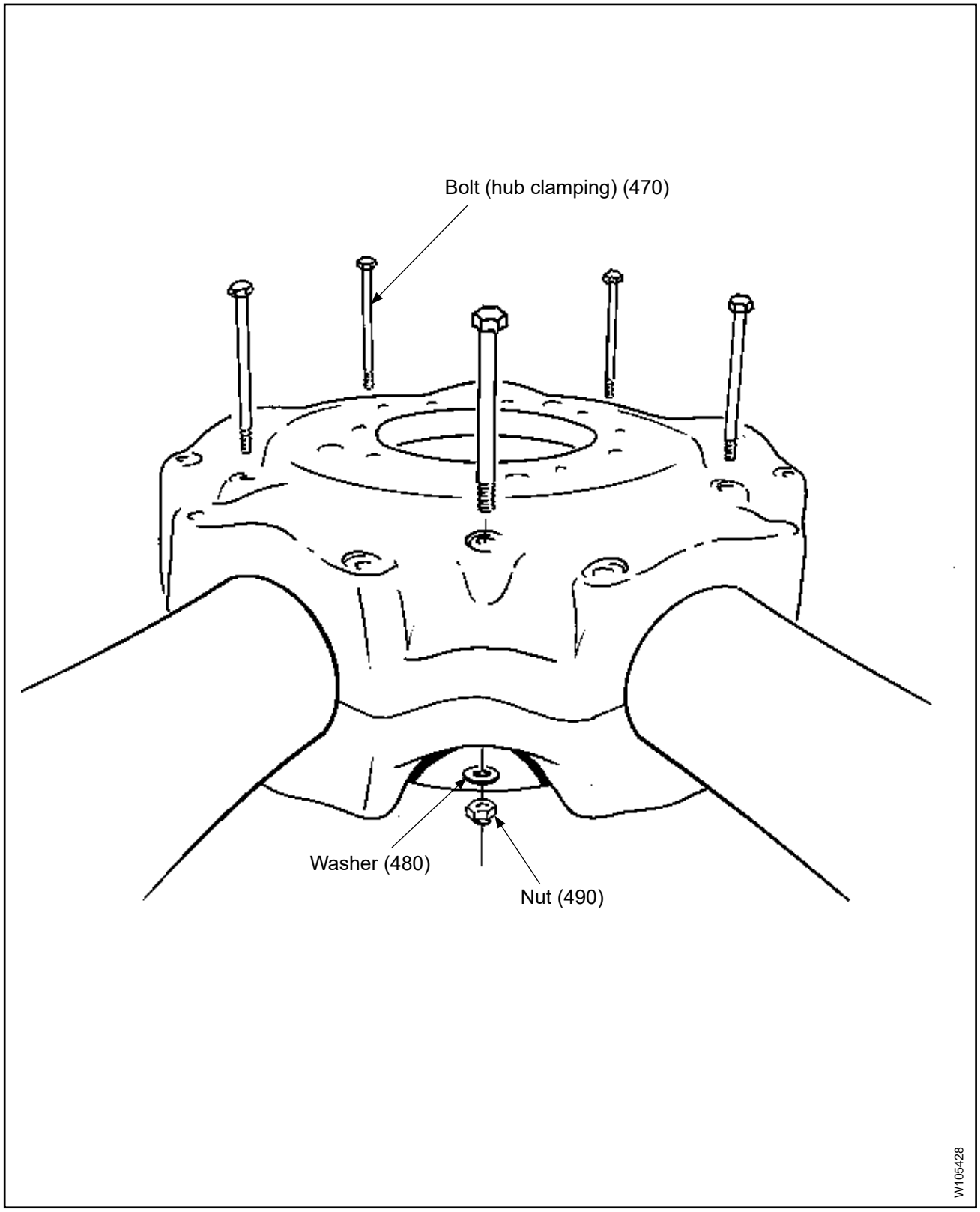
Anti-rotation Ring Installation
Figure 7-13

(11) Place a bead of sealant CM92 on the hub mating surfaces. Refer to Figure 7-14.

NOTE: Sealant should contact the blade seals. Use enough sealant on the mating surfaces so that a small amount will be squeezed out along the entire parting surface when the hub bolts are properly torqued. Avoid allowing excessive sealant to be squeezed into the blade retention sockets.



Applying Sealant Between the Hub Halves
Figure 7-14



Installing the Cylinder-Side Hub Half
Figure 7-15

(12) Align the hub halves using the hub guide bushings (430).

(13) Making sure the O-rings (975) are in the hub blade seal grooves, put the cylinder-side hub-half in place on the engine-side hub-half.

(14) Positioned midway between each of the five blade sockets, install a bolt (470), washer (480), and nut (490). Refer to Figure 7-15.

NOTE: A soft mallet may be used to help install the hub bolts into the hub halves.

(15) Using a staggered sequence, torque each nut (490) in accordance with the Torque Values table in the Fits and Clearances chapter of this manual.

(16) Rotate the blades toward low pitch until the fork (600) comes in contact with the hub (410) making sure there is full travel of the blades toward low pitch and feather. If full travel is not achieved:

(a) Position the propeller in feather position.

(b) Remove cylinder-side hub half.

(c) Realign the preload plates.

(d) Reinstall the cylinder-side hub half.

(e) Repeat the steps above, as necessary, to achieve full travel of the blades toward low pitch and feather.

E. Blade Preload Procedure

CAUTION: DO NOT TIGHTEN PRELOAD SCREW (860) WITH AIR OR ELECTRIC POWERED TOOLS. DAMAGE TO THE SELF-LOCKING FEATURE OF THE BOLT WILL RESULT.

(1) Using TE439 or equivalent, torque each preload cap screw (860) in accordance with Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual. Refer to Figure 7-16.

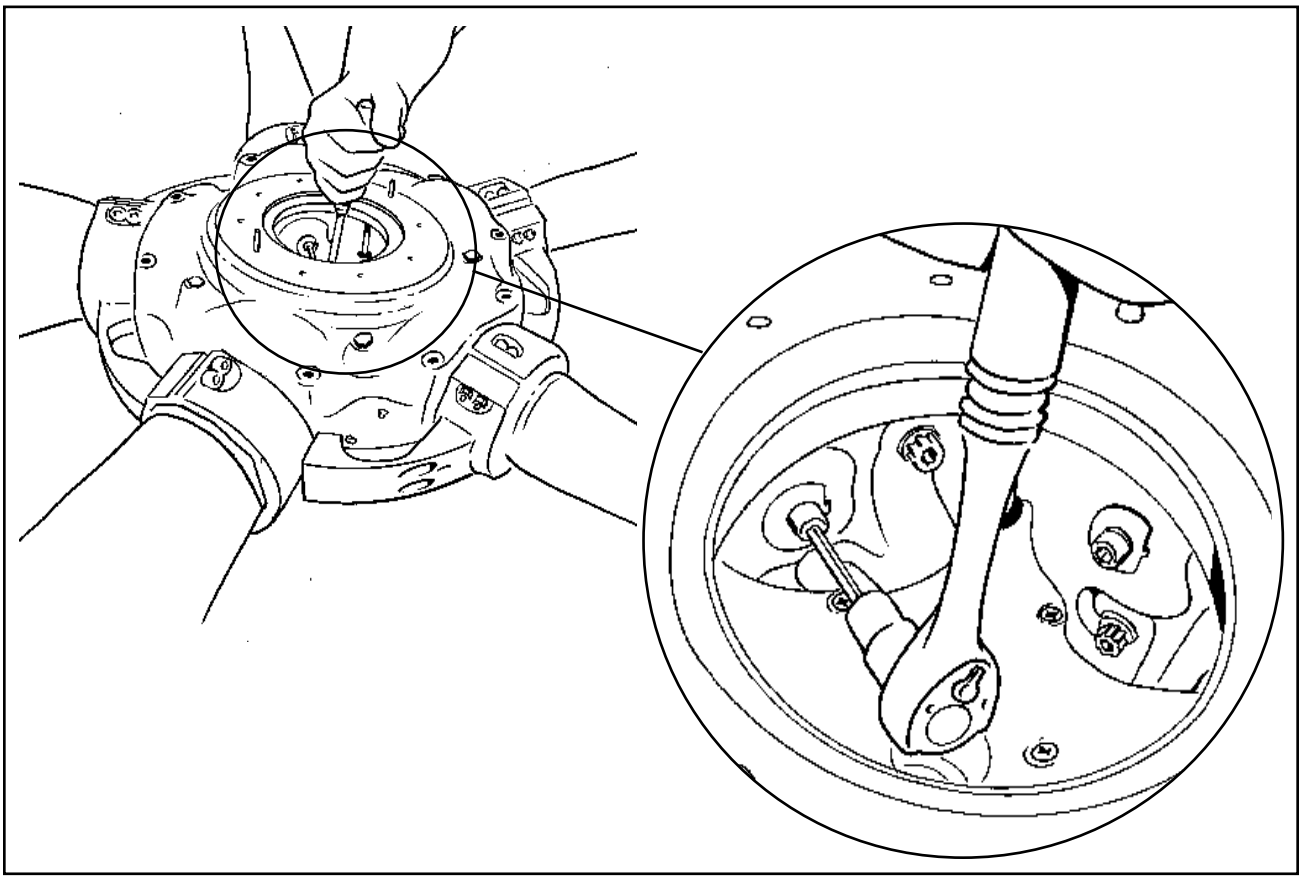
(a) The ball hex driver TE439 is designed to be used at an angle.

(b) The loose blade will become rigid in the hub as the preload bolt is tightened.

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

(3) Examine each blade for free rotation in the hub blade socket.

(a) If the blade is not free, examine the blade and blade O-ring (975) for correct fit in the hub groove.



Tightening Preload Plate Hex Head Screw and Jam Nut
Figure 7-16

F. Cylinder Unit Assembly

(1) Cylinder Assembly

NOTE: An A-3784 cylinder bushing (160) must be replaced by a new 108298 cylinder bushing in an E-7417 cylinder.

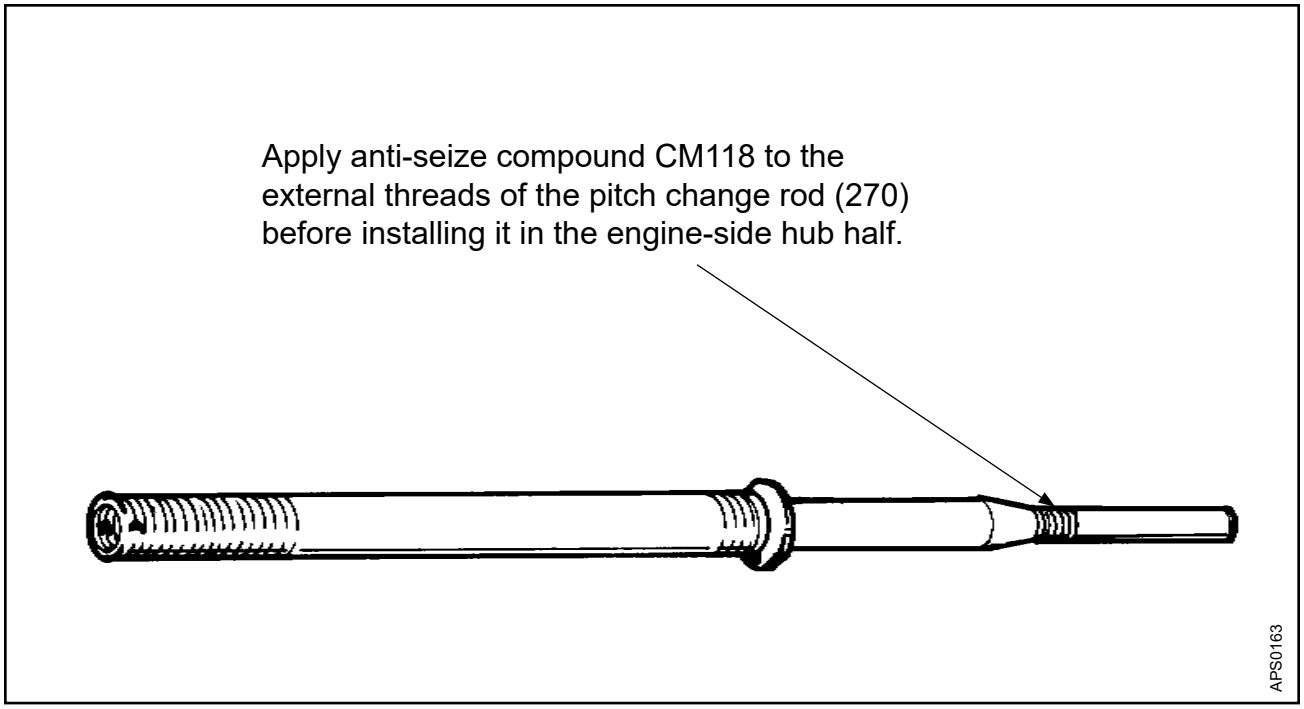
(a) If the cylinder bushing (160) has been removed, refer to the Cylinder Bushing Replacement procedure in the Repair chapter of this manual for cylinder bushing installation.

(b) Install an O-ring (220) in the ID groove cut into the bushing (160).

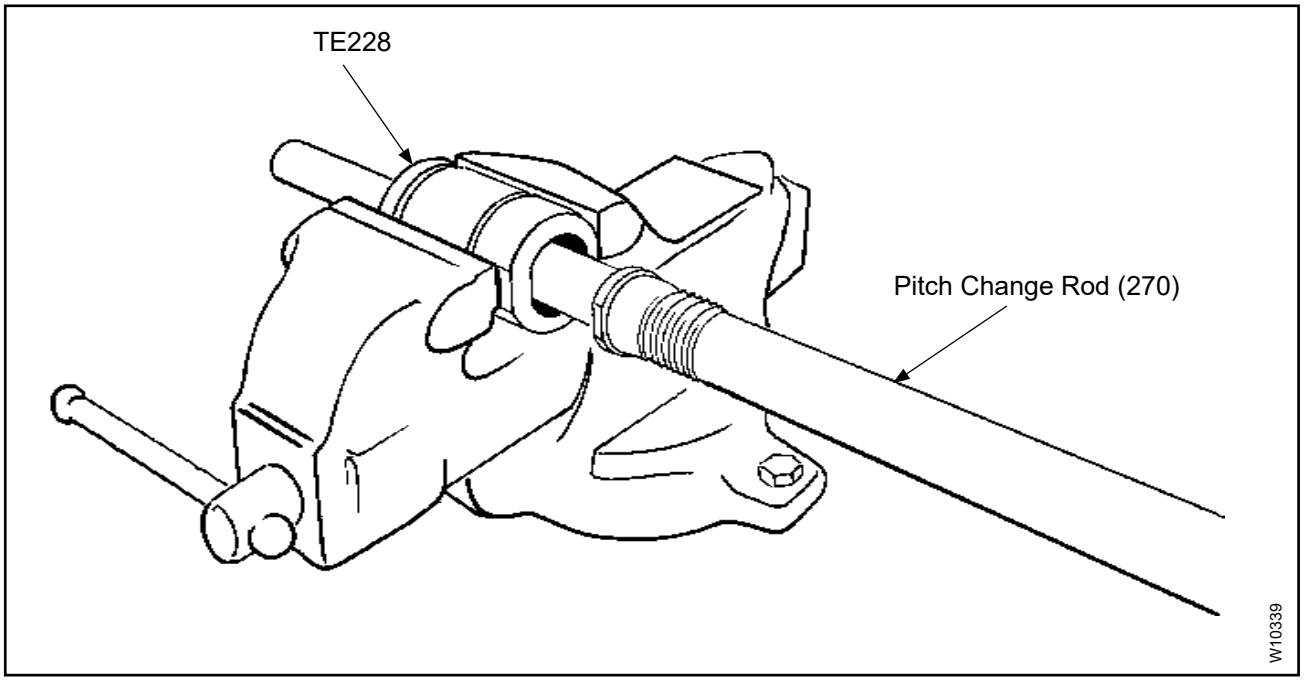
(c) Install an O-ring (90) in the ID groove of the piston (80) bore.

(2) Pitch Change Rod and Piston Assembly

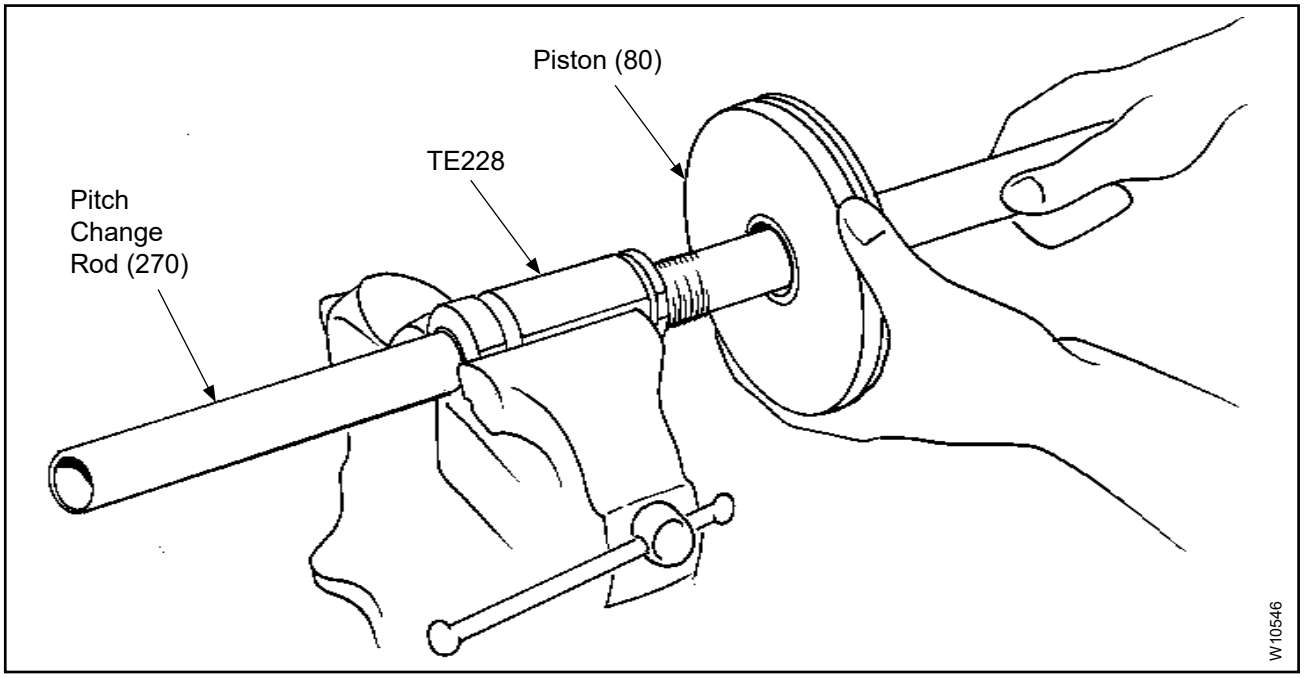
(a) Apply lubricant CM118 to the external threads of the pitch change rod (270). Refer to Figure 7-17.



Applying CM118 to the Pitch Change Rod
Figure 7-17



Using the Tool TE228
Figure 7-18



Installing the Piston
Figure 7-19

(b) Install the piston unit on the pitch change rod (270).

1 Using an appropriate method, hold the piston unit installation socket TE228 securely. Refer to Figure 7-18.

2 Insert the pitch change rod through the piston unit installation socket TE228, fitting the socket over the shoulder flats on the pitch change rod as shown in Figure 7-18.

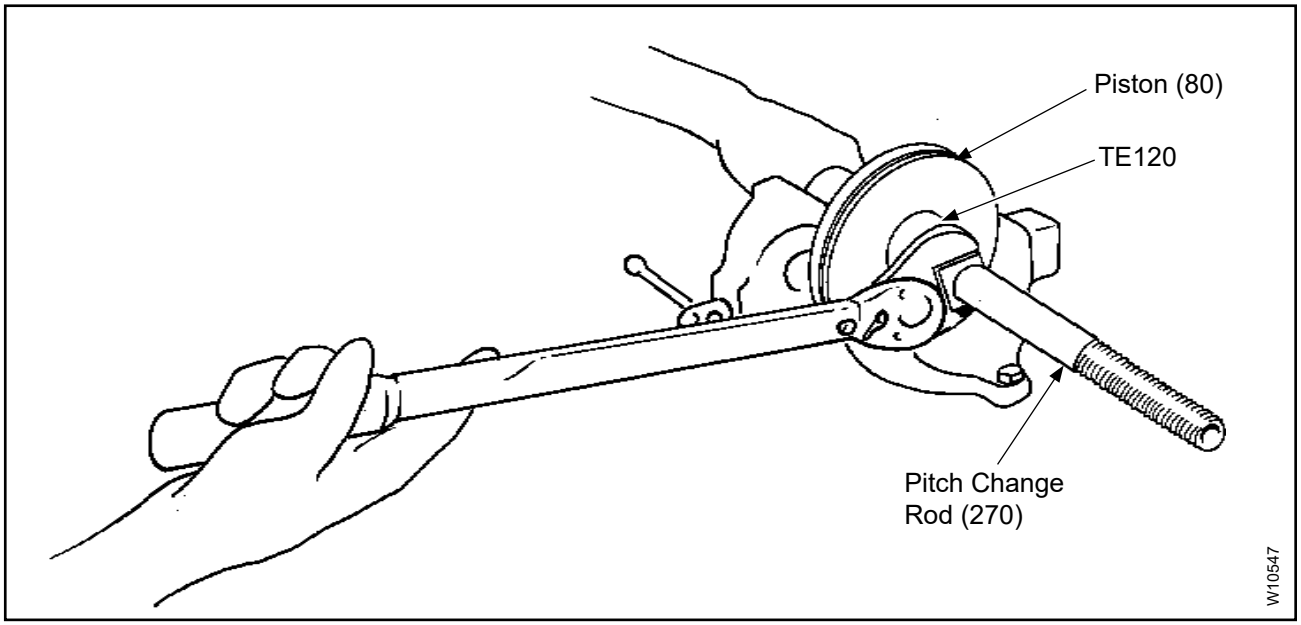
3 With the thick-wall side of the piston (80) positioned away from the flats on the pitch change rod (270), slide the piston (80) into place against the shoulder on the pitch change rod (270). Refer to Figure 7-19.

4 Thread the piston self-locking nut (70) onto the pitch change rod (270) until the self-locking nut locking mechanism engages the pitch change rod threads.

(c) Using the modified deep well socket TE120, torque the piston self-locking nut (70) against the piston (80) in accordance with Table 8-1, "Torque Values", in the Fits and Clearances chapter of this manual. Refer to Figure 7-20.

(d) Remove the pitch change rod (270) from the installation socket TE228.

(e) Install the OD O-ring (110) on the piston (80).



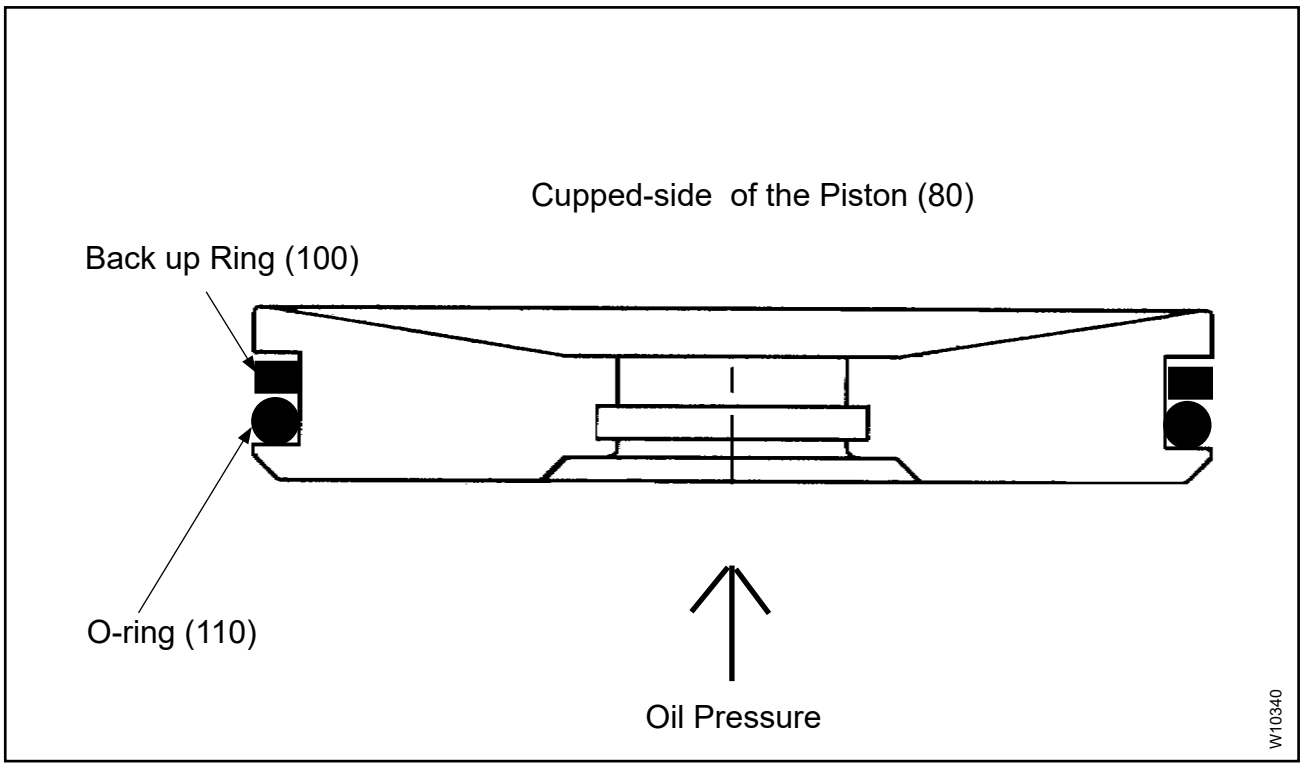
Torquing the Piston Nut
Figure 7-20

CAUTION: THE BACK UP RING (100) MUST BE POSITIONED ON THE SIDE AWAY FROM THE OIL PRESSURE OR SEVERE LEAKAGE WILL OCCUR.

(f) Install the backup ring (100) on the piston (80). Refer to Figure 7-21.

NOTE: The backup ring is on the side toward the cupped-side of the piston.

(g) Install the cylinder bushing (160) in the cylinder (140). Refer to the Repair chapter for the cylinder bushing installation procedures.



Installing the Backup Ring
Figure 7-21

CAUTION: DO NOT PERMIT THE PISTON O-RING (110) TO BECOME PINCHED BETWEEN THE CYLINDER (140) WALL AND THE PISTON (80). SEVERE LEAKAGE WILL RESULT.

(h) Apply lubricant CM12 to the inner walls of the cylinder (140).

(i) Turn the rod/piston/cylinder assembly so the cylinder mounting bolt holes are down.

(j) Insert the combined pitch change rod/piston assembly in the top of the cylinder (140).

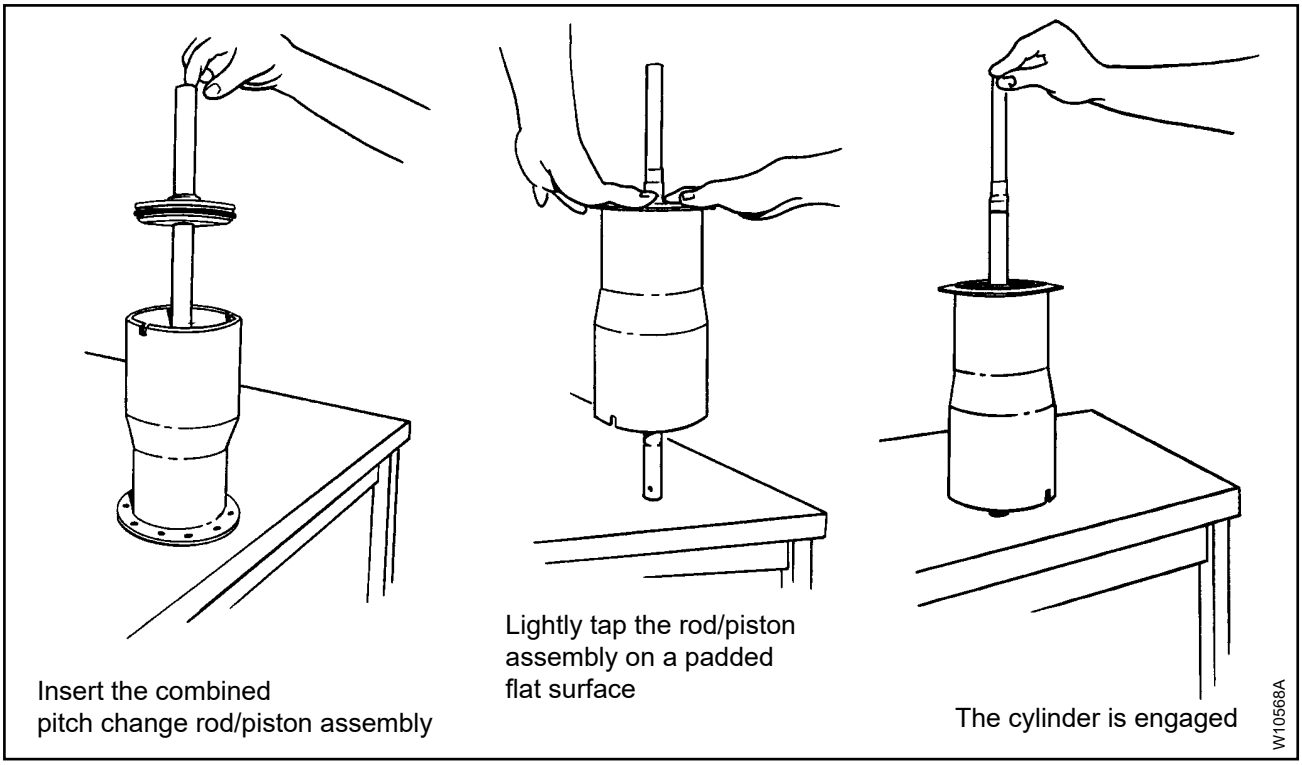
(k) Turn the rod/piston/cylinder assembly so the cylinder mounting bolt holes are up.

CAUTION: DO NOT DAMAGE THE ROD/PISTON ASSEMBLY OR THE CYLINDER WHEN ENGAGING THE ROD/PISTON ASSEMBLY.

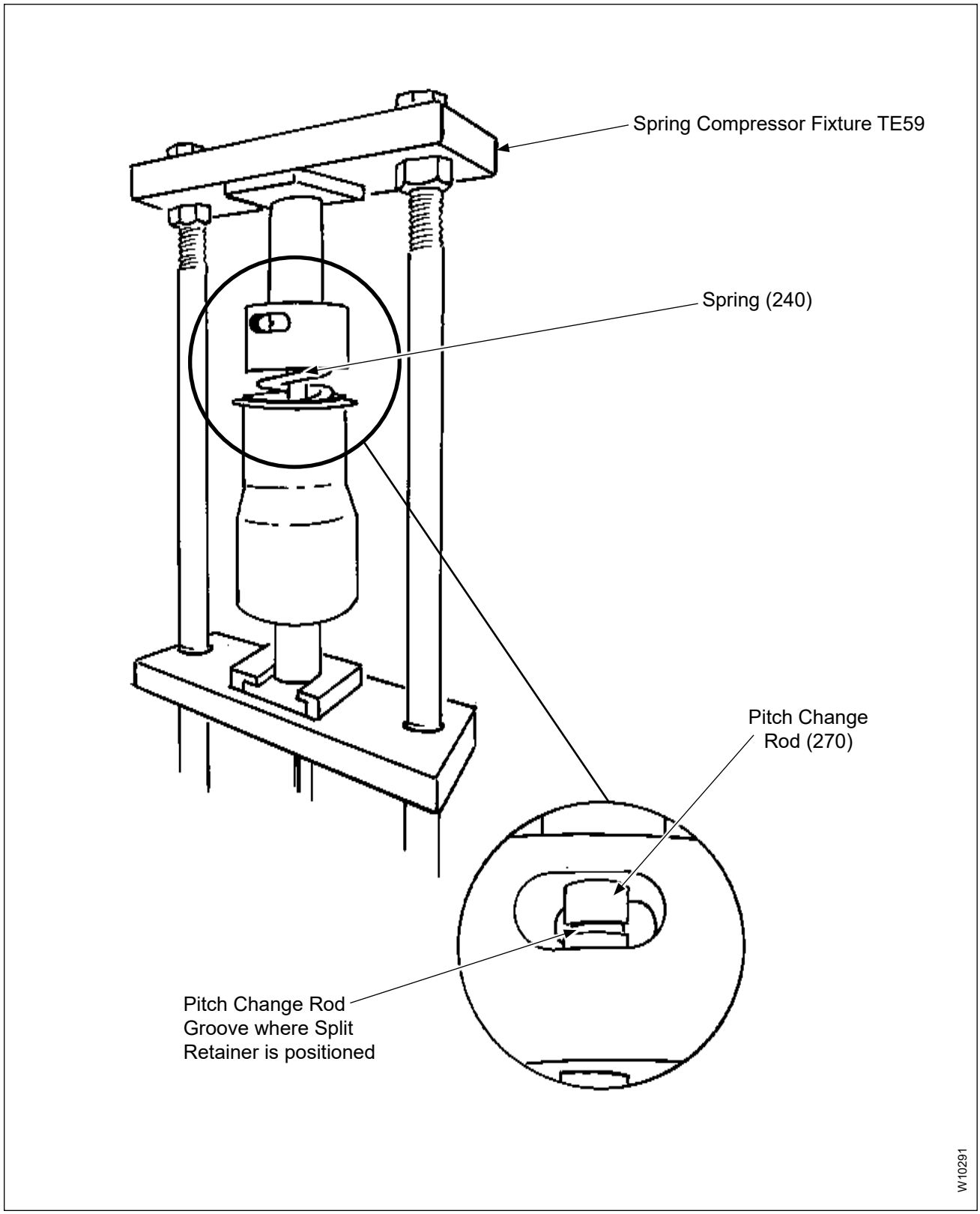
(l) Lightly tap the rod/piston assembly on a padded flat surface, as necessary, to engage the cylinder. Refer to Figure 7-22.

NOTE: There is a chamfer cut on the ID of the cylinder wall to assist in the installation of the piston.

(m) Place the spring seat (230) over the pitch change rod (270) against the cylinder (140).



Installing the Rod/Piston Assembly in the Cylinder
Figure 7-22



Compressing the Feathering Compression Spring
Figure 7-23

(n) Place the feathering spring (240) over the pitch change rod (270).

(o) Place the spring retainer (250) on the pitch change rod (270).

(p) Insert the combined pitch change rod and cylinder into the spring compressor fixture TE59 or suitable equipment. Refer to Figure 7-23.

WARNING: MAKE SURE OF THE SAFETY OF PERSONNEL IN THE VICINITY DURING THE ASSEMBLY PROCEDURE. THE FEATHERING SPRING ASSEMBLY IS PRELOADED TO APPROXIMATELY 800 LBS (362.4 KG) FORCE. HANDLE THE CYLINDER/FEATHERING SPRING PACK WITH EXTREME CARE.

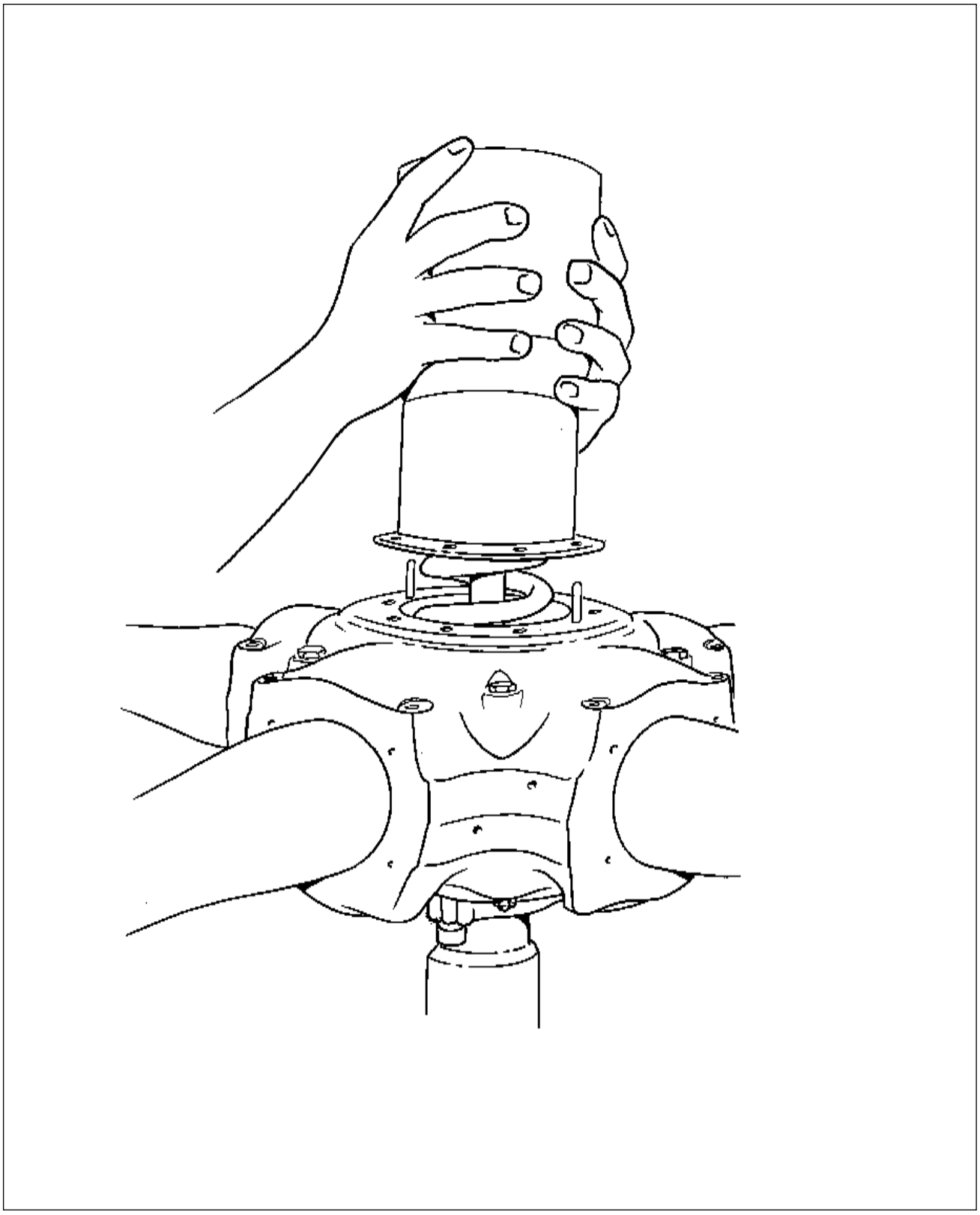
(q) Compress the spring (240) until the split retainer (260) can be installed.

CAUTION: MAKE SURE THE SPLIT RETAINER (260) IS COMPLETELY ENGAGED IN THE SPRING RETAINER AND DOES NOT DISLODGE FROM THE GROOVE IN THE PITCH CHANGE ROD (270) DURING DECOMPRESSION OF THE CYLINDER/SPRING PACK.

(r) Constantly observing split retainer to make sure that the halves remain in the proper positions in the pitch change rod groove, carefully decompress the cylinder/spring pack.

WARNING: USE CARE WHEN HANDLING A CYLINDER CONTAINING A COMPRESSED SPRING.

(s) Remove the pitch change rod/cylinder from the spring compressor fixture TE59.



Installing the Pitch Change Rod into the Fork
Figure 7-24

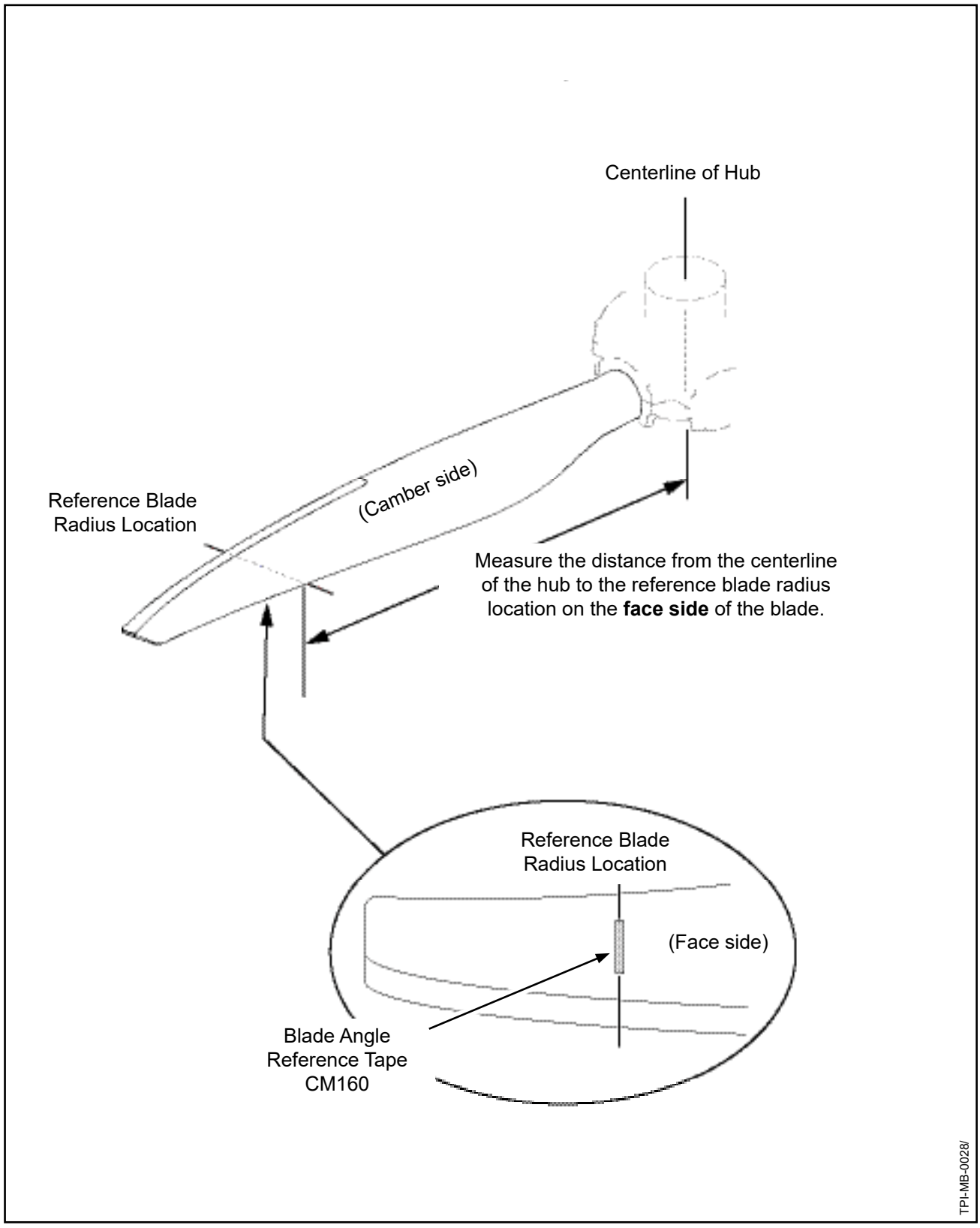
G. Installation of the Pitch Change Rod/Cylinder Unit Assembly

(1) Move the blades into low pitch position.

(2) Install the cylinder mounting O-ring (210) in the groove on the top of the cylinder-half of the hub (410).

(3) Carefully turn the pitch change rod (270) into the fork (600) by spinning the cylinder (140) as far as possible by hand. Refer to Figure 7-24.

(4) Using a crowfoot wrench and a suitable extension on the piston nut (70), tighten the pitch change rod/cylinder assembly to the fork (600). Torque the pitch change rod (270) in accordance with the Torque Values table in the Fits and Clearances chapter of this manual.



Blade Angle Reference Tape
Figure 7-25

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

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

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

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

(3) Establish a reference blade radius location

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

(b) Beginning with blade one, measure from the center of the propeller hub to the reference blade radius location specified. Refer to Figure 7-25.

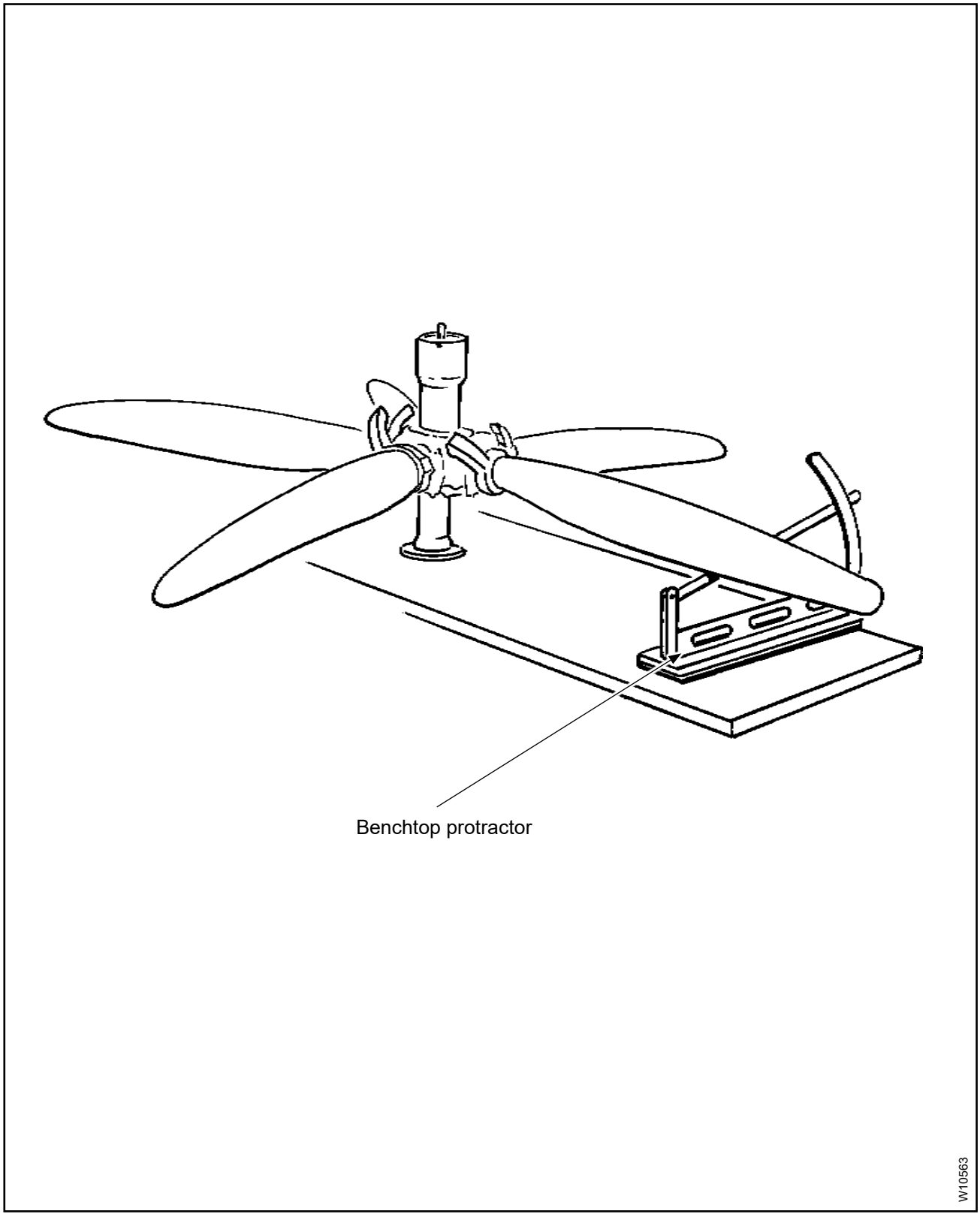
(c) Apply a piece of reference tape CM160 to the face side of the blade at the reference blade radius location, perpendicular to the blade centerline. Refer to Figure 7-25.

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

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

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

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



Checking Blade Angle Settings Using a Bench-top Protractor
Figure 7-26

I. Blade-to-Blade Angle Tolerance Checks

NOTE: The purpose of checking the blade angles is to verify that the blade angles of all five blades are within 0.2 degree of each other at the reference blade radius.

(1) Manually rotate all the blades toward feather to seat the cylinder to the hub.

NOTE: Blades must be moved by hand toward feather position to make sure that the cam followers are properly seated against the fork.

(2) Manually position the cylinder until it is aligned with the hub and the threaded headless pins TE159.

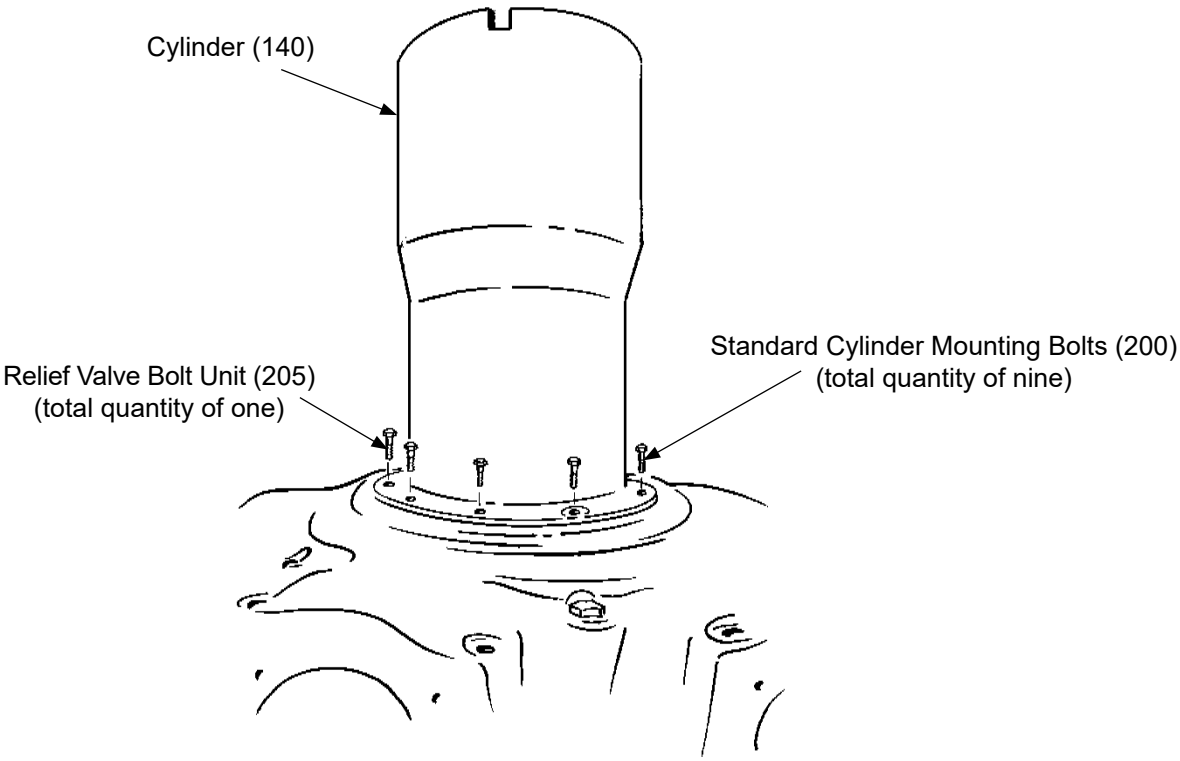
(3) Apply air pressure to move the propeller to low pitch or, optionally, use a spacer under the cylinder.

(4) Using a protractor, check to make sure that the angle of each blade varies no more than 0.2 degree from highest to lowest angle measurement. Refer to Figure 7-26.

NOTE 1: If the difference between the highest blade angle and the lowest blade angle is greater than 0.2 degree, replace the pitch change knob(s) on the blade(s) and recheck the blade-to-blade angle tolerance until the tolerance is achieved on all four blades. Refer to the chart, Blade Pitch Change Unit Selection, in Figure 7-6 to select the appropriate pitch change bracket to increase or decrease the blade angle.

NOTE 2: Each blade has tolerances for blade angles at the various blade stations. The ultimate effects of these tolerances upon vibration during operation are magnified by the blade-to-blade tolerances in the assembled propeller. Maintaining a blade-to-blade tolerance within 0.2 degree at the reference blade radius has been found to be an acceptable limit. Although not a requirement, an additional check of the blade-to-blade tolerance at the outermost blade station may be a worthwhile verification that all blades of a set are within tolerance. The difference between the highest blade angle and the lowest blade angle at the outermost station should not be greater than 0.4 degree.

(5) Remove the spacer, if applicable.



Installing the Cylinder Mounting Bolts
Figure 7-27

CAUTION 1: DO NOT TIGHTEN THE CYLINDER MOUNTING BOLTS (200) MORE THAN IS PERMITTED IN ACCORDANCE WITH THE TORQUE VALUES TABLE.

CAUTION 2: TIGHTEN THE STANDARD CYLINDER MOUNTING BOLTS (200) EVENLY TO PREVENT UNEVEN LOADING OF THE CYLINDER MOUNTING HARDWARE. DO NOT USE THE RELIEF VALVE BOLT UNIT (205) AT THIS TIME.

(6) Install every other standard cylinder mounting bolt (200) and washer (190) and tighten the bolts until snug.

NOTE 1: The relief valve bolt unit (205) has an open hole in the head of the bolt. The standard cylinder mounting bolt (200) is a solid bolt.

NOTE 2: During installation of the standard cylinder mounting bolts, some additional compression of the feathering spring is common. Tightening the cylinder mounting bolts evenly prevents uneven loading of the cylinder mounting hardware.

(7) Remove the two threaded headless pins TE159 in the cylinder mounting ring (180).

(8) Install the remaining hub half clamping bolts (470), washers (480), and nuts (490).

(9) Torque each nut (490) in accordance with the Torque Values table in the Fits and Clearances chapter of this manual.

(10) Re-check the torque for all the nuts (490) in accordance with the Torque Values table in the Fits and Clearances chapter of this manual.

(11) Install each remaining standard cylinder mounting bolt (200) and washer (190). Refer to Figure 7-27.

NOTE: Tighten the standard cylinder mounting bolts evenly to prevent uneven loading of the cylinder mounting hardware. A total of nine standard cylinder bolts are now installed.

(12) Install the relief valve bolt unit (205) and washer (190).

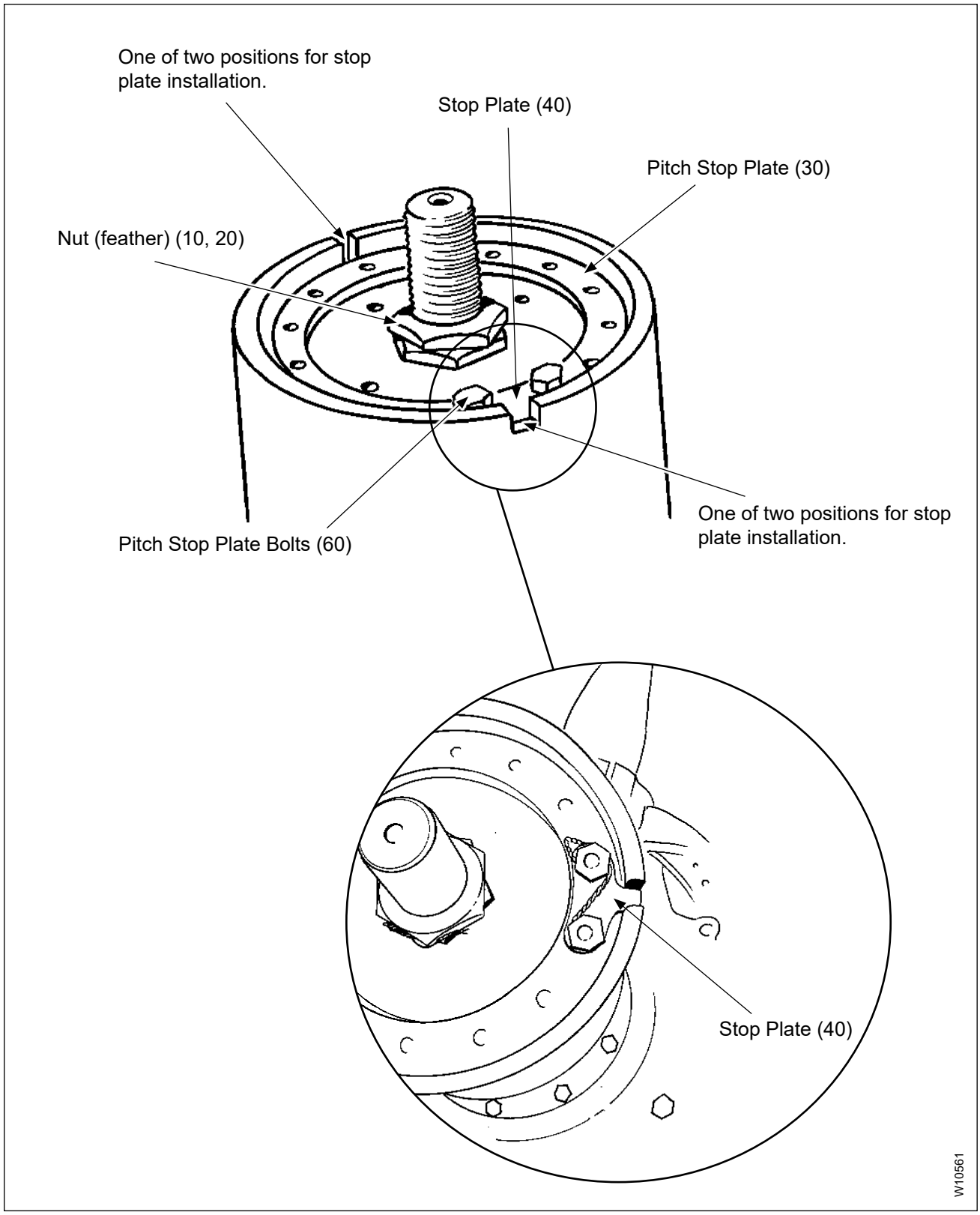
(13) Torque the standard cylinder mounting bolts (200) in accordance with the Torque Values table in the Fits and Clearances chapter of this manual.

(14) Torque the relief valve bolt unit (205) in accordance with the Torque Values table in the Fits and Clearances chapter of this manual.

(15) Safety the cylinder mounting bolts (200) and relief valve bolt unit (205).

CAUTION: DO NOT DAMAGE THE CYLINDER THREADS WHEN INSTALLING THE LOW STOP ADJUST PLATE (30).

(16) Manually turn the low stop adjust plate (30) into the top of the cylinder (140) until a few cylinder threads are showing.



Installing the Feather Nuts
Figure 7-28

J. Setting Low Pitch Angle

(1) Apply air pressure to move the propeller to the low pitch position.

(2) Using a protractor such as hand held digital protractor TE97, check the low pitch angle of each blade at the appropriate station reference.

CAUTION: DO NOT ATTEMPT TO ADJUST LOW PITCH BLADE ANGLE WITH THE PROPELLER PRESSURIZED. DAMAGE TO THE PROPELLER COULD RESULT.

(3) If the low pitch blade angle is not correct, release the pressure from the propeller, turn the pitch stop plate (30) either clockwise to increase, or counterclockwise to decrease low pitch angle. Refer to Figure 7-28.

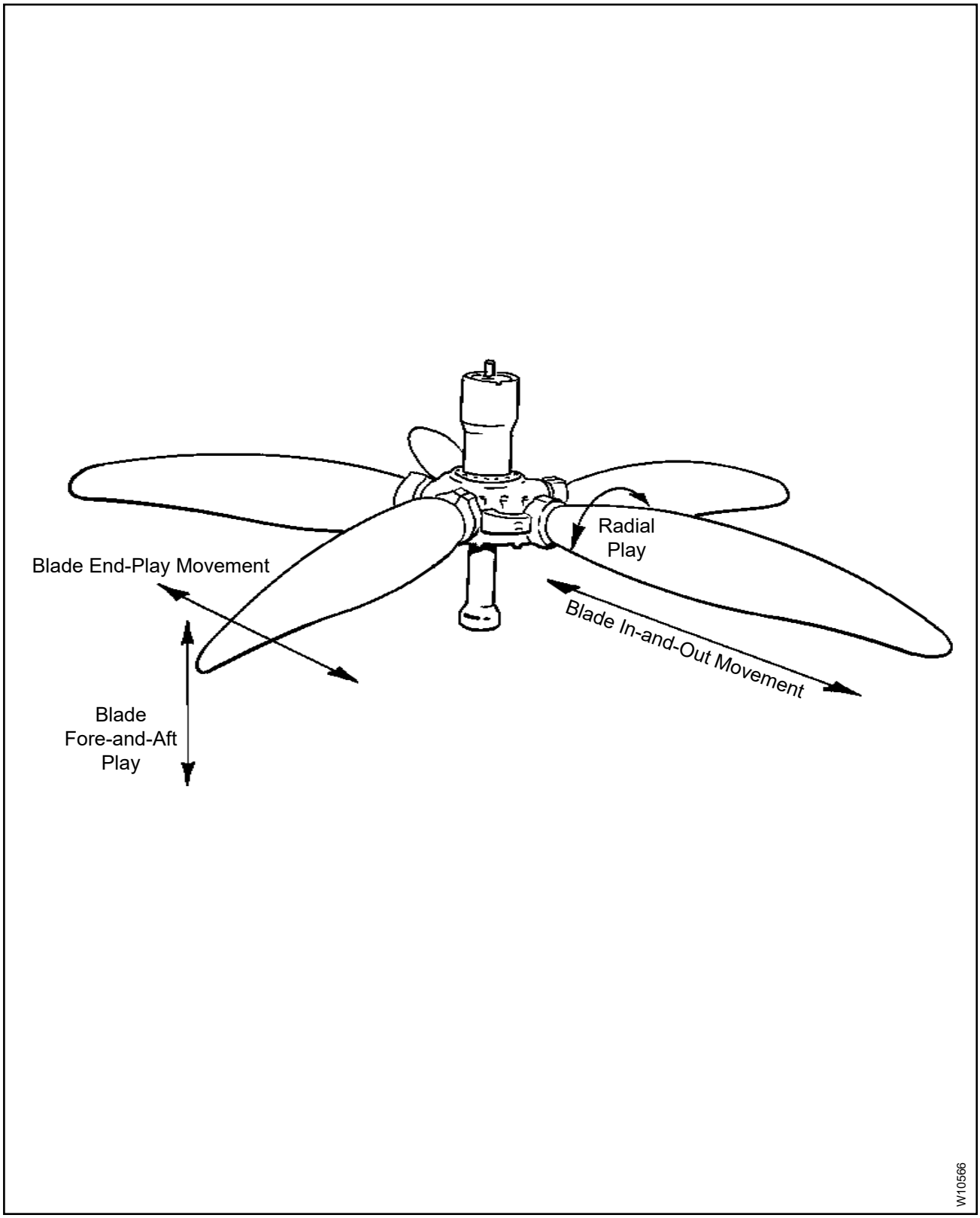
NOTE: The stop plate (40) may be installed in one of two positions. The pitch stop plate (30) may be rotated slightly for proper installation of the stop plate.

(4) After correction, pressurize the propeller, and check the low pitch angle.

(5) When the low pitch angle is correct for all blades, install the stop plate (40), washers (50), and the two pitch stop plate safety bolts (60).

(6) Torque the two pitch stop plate bolts (60) in accordance with the Torque Values table in the Fits and Clearances chapter of this manual.

(7) Safety wire the pitch stop plate bolts (60) together.



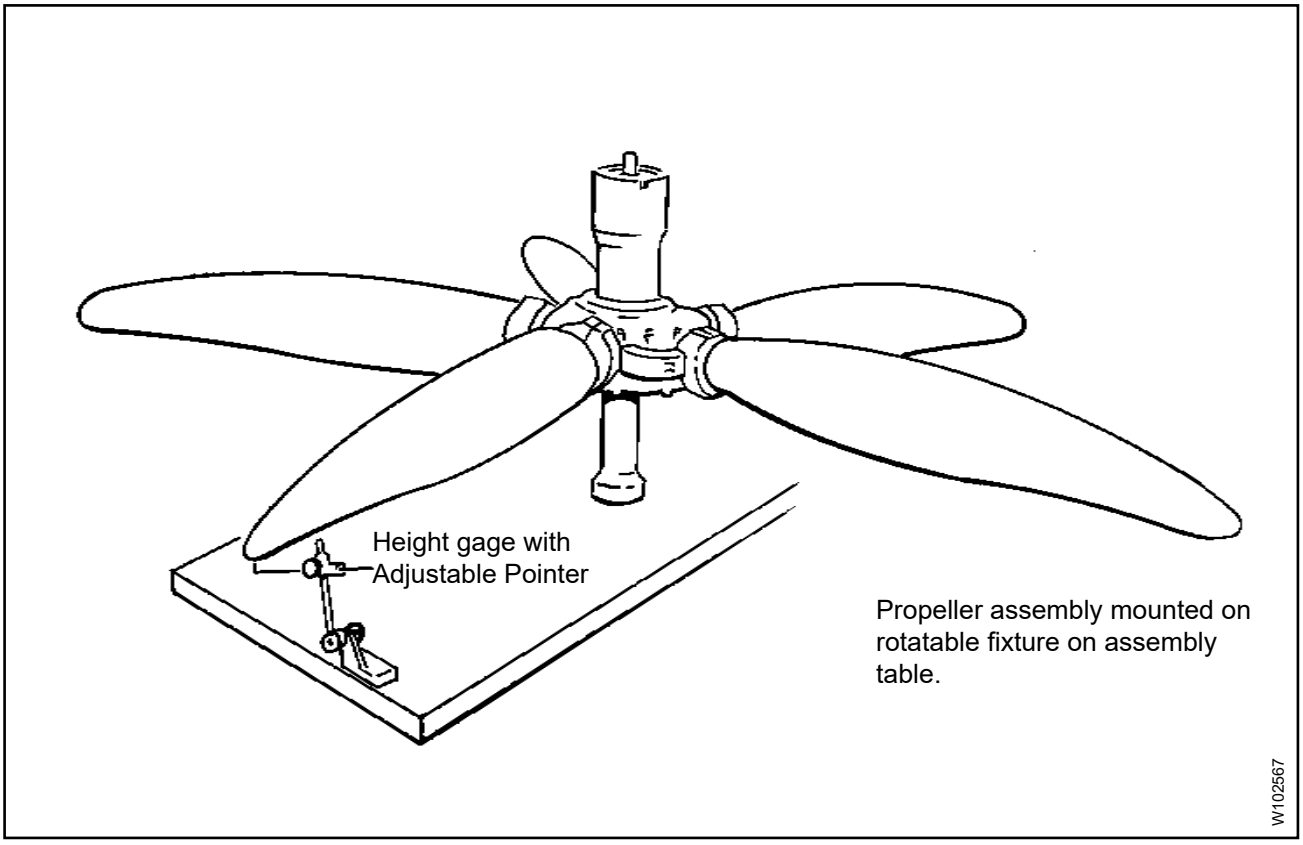
Checking Blade Movement
Figure 7-29

K. Blade Installation Checks

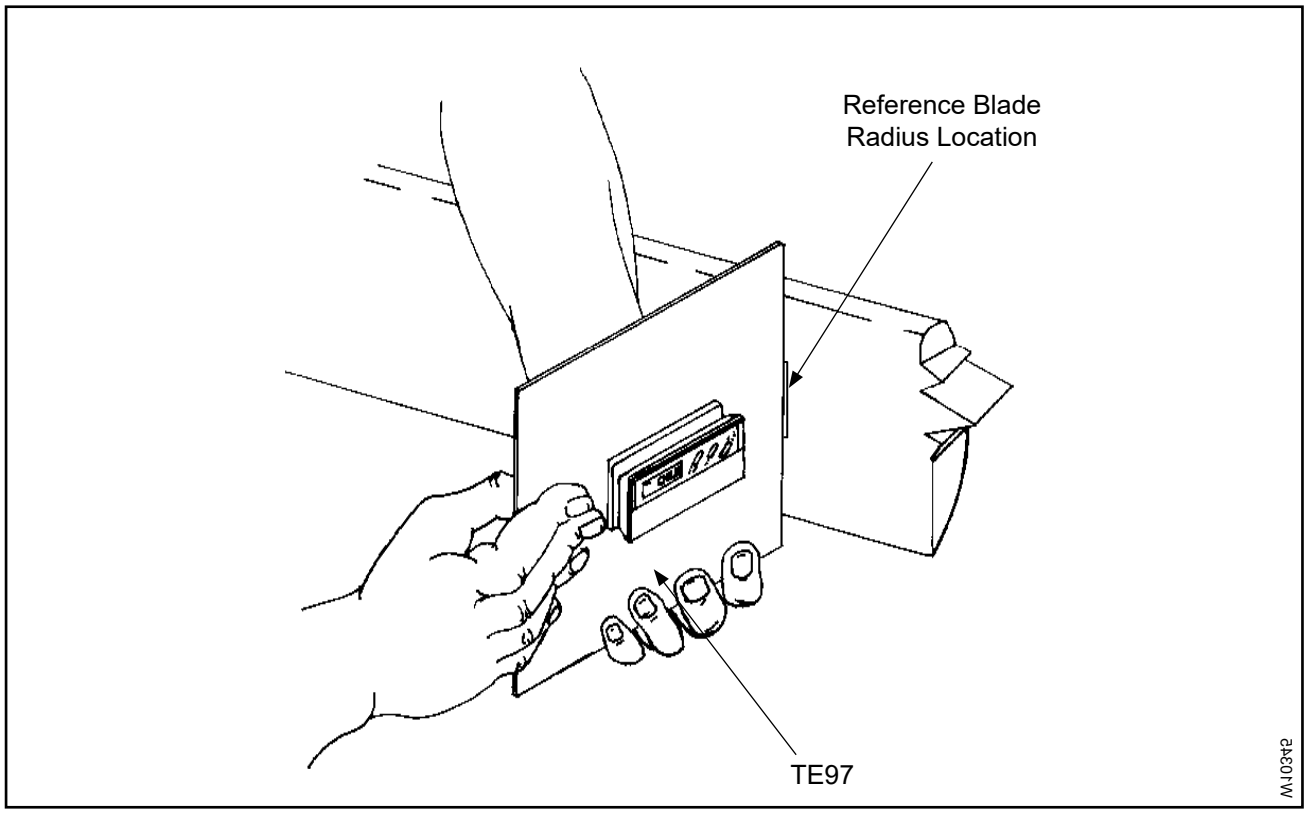
(1) Apply 200 psi air pressure to the propeller to move the blades toward low pitch until the blade tips are approximately parallel to the bench surface.

(2) Check for fore-and-aft or end play movement in each blade. Refer to the Fits and Clearances chapter of this manual for blade tolerances. Refer to Figure 7-29.

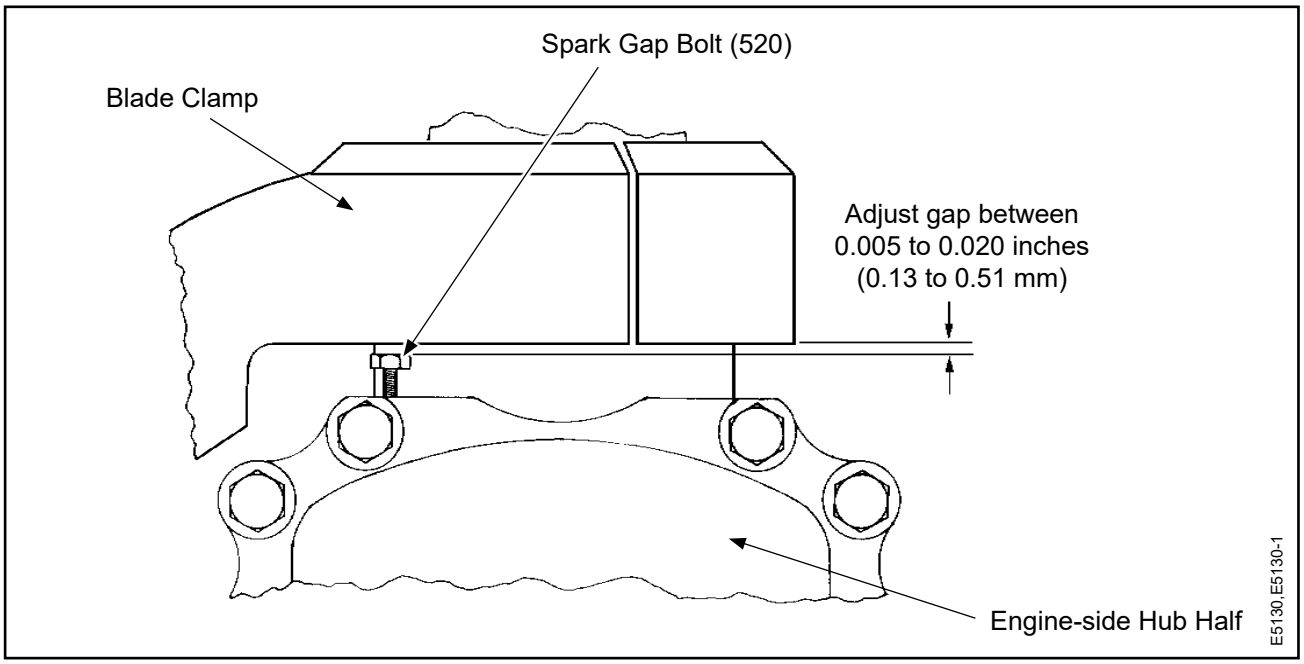
(3) Using a height gage, check the blade track at the tip/face of each blade. Refer to Figure 7-30. Refer to the Fits and Clearances chapter of this manual for blade tolerances.



Checking Blade Track
Figure 7-30



Checking Feather Angle with Protractor TE97
Figure 7-31



Location and Adjustment of Spark Gap Bolt
Figure 7-32

L. Setting Blade Feather Angle

(1) Turn the feather adjust nuts (10, 20) on pitch change rod (270).

(2) Release all pressure from the propeller.

(3) Using a protractor, measure the feather angle of blade number one at the appropriate reference station. Refer to Figure 7-31.

(4) If the blade feather angle is not correct, apply enough pressure to the propeller to move the pitch change rod (270) forward for access to the feather adjust nuts (10, 20).

CAUTION: DO NOT ATTEMPT TO ADJUST THE FEATHER ANGLE OF THE BLADES WITH THE PROPELLER DEPRESSURIZED AND THE FEATHER ADJUST NUTS RESTING ON THE PITCH STOP PLATE. DAMAGE TO THE PROPELLER COULD RESULT.

(5) Adjust the feather angle by turning the feather adjust nuts (10, 20) clockwise to decrease angle or counterclockwise to increase angle.

(6) When the correct feather angle is established for all blades, tighten the feather adjust nut (10) against the feather adjust nut (20).

CAUTION: THE FEATHER ADJUST NUT (20) MUST NOT MOVE WHEN TORQUING THE FEATHER ADJUST NUT (10) AGAINST THE FEATHER ADJUST NUT (20).

(7) Torque the feather adjust nut (10) against the first feather adjust nut (20), in accordance with the Torque Values table in the Fits and Clearances chapter of this manual.

(8) Recheck the blade for correct feather angle.

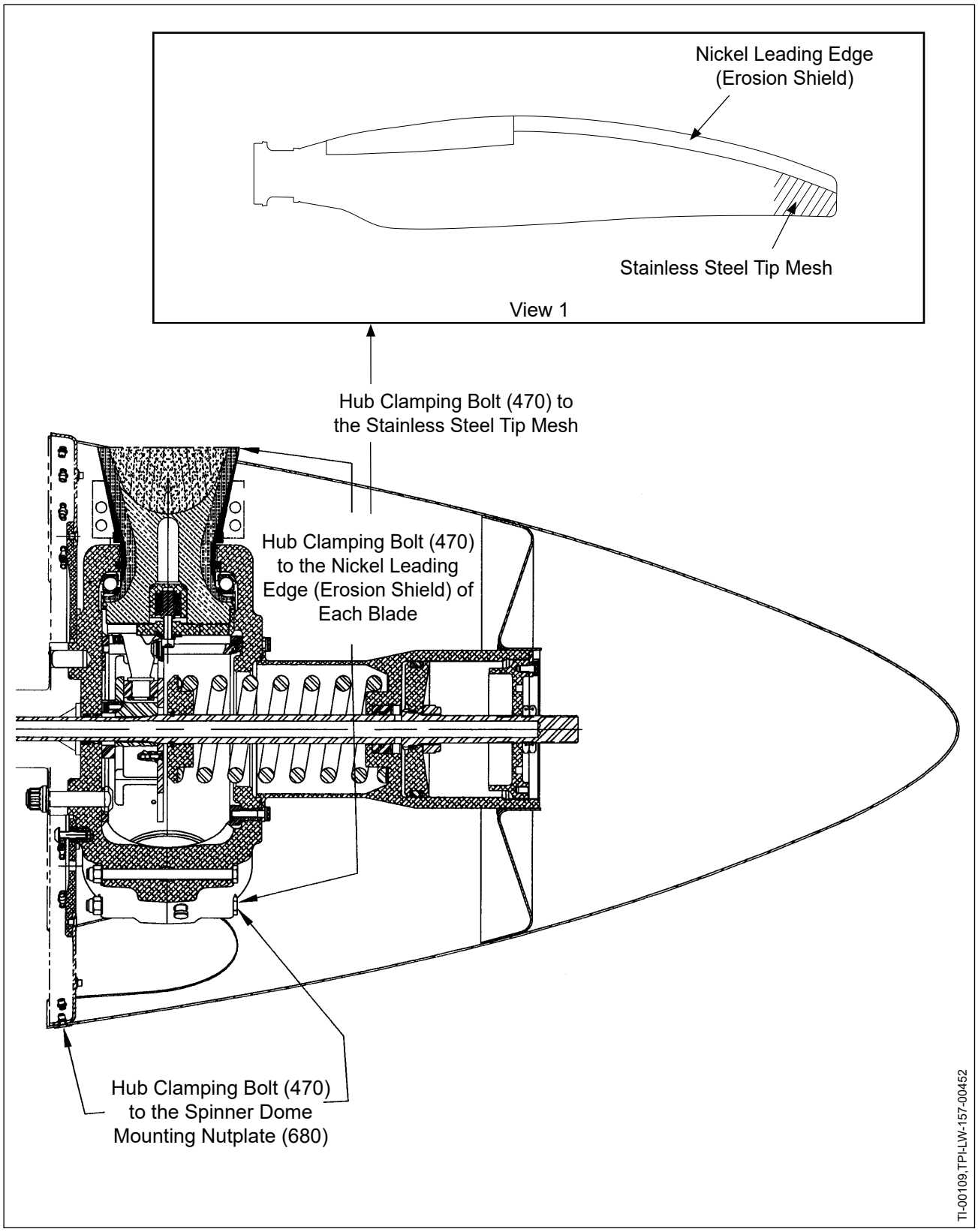
(9) If the angle has changed, readjust until correct.

(10) When the feather angle is correct, safety wire the feather adjust nuts (10, 20).

M. Spark Gap Bolt Gap Adjustment

(1) Adjust the gap between the head of the bolt (520) and the inboard surface of the blade counterweight clamp to 0.005 to 0.020 inch (0.13 to 0.51 mm). Refer to Figure 7-32.

NOTE: The gap must remain within these dimensions over the entire pitch change range of the blades.



Resistance Check Locations
Figure 7-33

N. Propeller Assembly Earthing and Bonding Check

(1) Using an ohm meter capable of accurately measuring the required resistance in accordance with Table 7-1, perform the following resistance checks.

(a) Measure the resistance from the hub clamping bolt (470) to a spinner dome mounting nutplate (680) on the bulkhead. Refer to Figure 7-33. Refer to the Resistance Checks table in this chapter for limits.

CAUTION: THERE MUST BE A SATISFACTORY MEASUREMENT FROM ONE OF THE TWO RESISTANCE MEASUREMENT PROCEDURES IN PARAGRAPH N.(1)(b).

(b) Measure the resistance from the hub clamping bolt (470) to the nickel leading edge (erosion shield) of each blade. Refer to Figure 7-33. Refer to the Resistance Checks table in this chapter for limits. If the resistance measurement is not satisfactory, do the following alternate resistance measurement procedure.

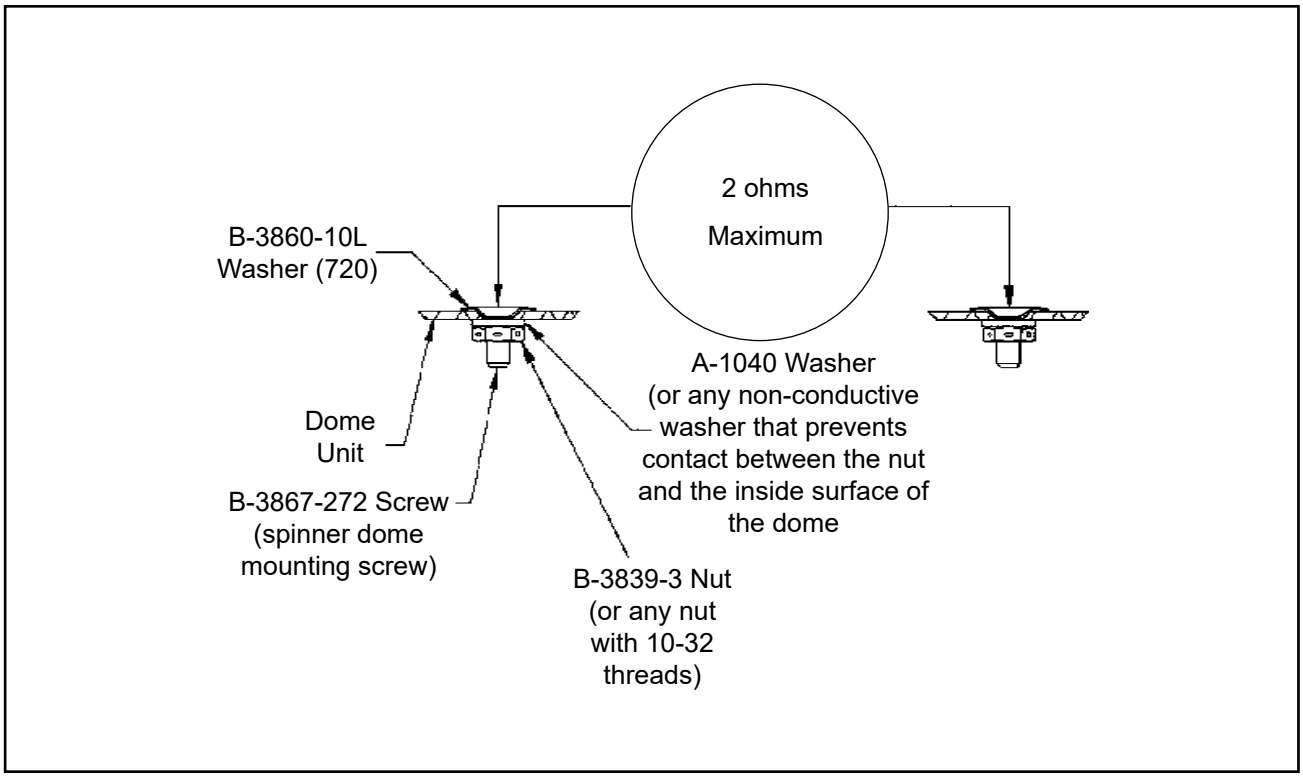
1 Do the following alternate steps 2.N.(1)(b)1 a through 2.N.(1)(b)1 c only if step 2.N.(1)(b) is not satisfactory.

a Using an ohm meter capable of 20 Megohms, measure resistance from the hub bolt (470) to the blade material, preferably on the face or camber side near the trailing edge within 4 inches (101 mm) of the tip (the area where there is stainless steel mesh, as shown in Figure 7-33 View 1).

b Push the ohm meter probe into the blade, removing as little material, i.e., blade finish, as possible. Refer to the Resistance Checks table in this chapter for limits.

NOTE: The best place to get a reading is with the ohm meter probe contacting the bare stainless steel mesh. Pushing the probe into the carbon fiber may also provide an acceptable reading, but is generally more difficult.

c Measure the resistance from the hub clamping bolt (470) to the nickel leading edge (erosion shield). Refer to the Resistance Checks table in this chapter for limits.



Resistance Check of the Dome
Figure 7-34

Nomenclature	Area to Check	Value
Earthing and Bonding	Hub Clamping Bolt to Nutplate (Refer to Figure 7-34)	2 ohms Maximum
	Hub Clamping Bolt to the Blade Nickel Leading Edge (Refer to Figure 7-34) - or alternate - Hub Clamping Bolt to the Blade Carbon Fiber or the Stainless Steel Tip Mesh and Hub Clamping Bolt to the Blade Nickel Leading Edge (Refer to Figure 7-34)	5 ohms Maximum 5 ohms Maximum 20 ohms Maximum
	Screw in One Dome Mounting Hole to the Screw in the Other Dome Mounting Hole (Refer to Figure 7-35)	2 ohms Maximum

Resistance Checks
Table 7-1

(c) Perform a resistance check of the dome unit before installation.

NOTE: The dome is not installed on the bulkhead.

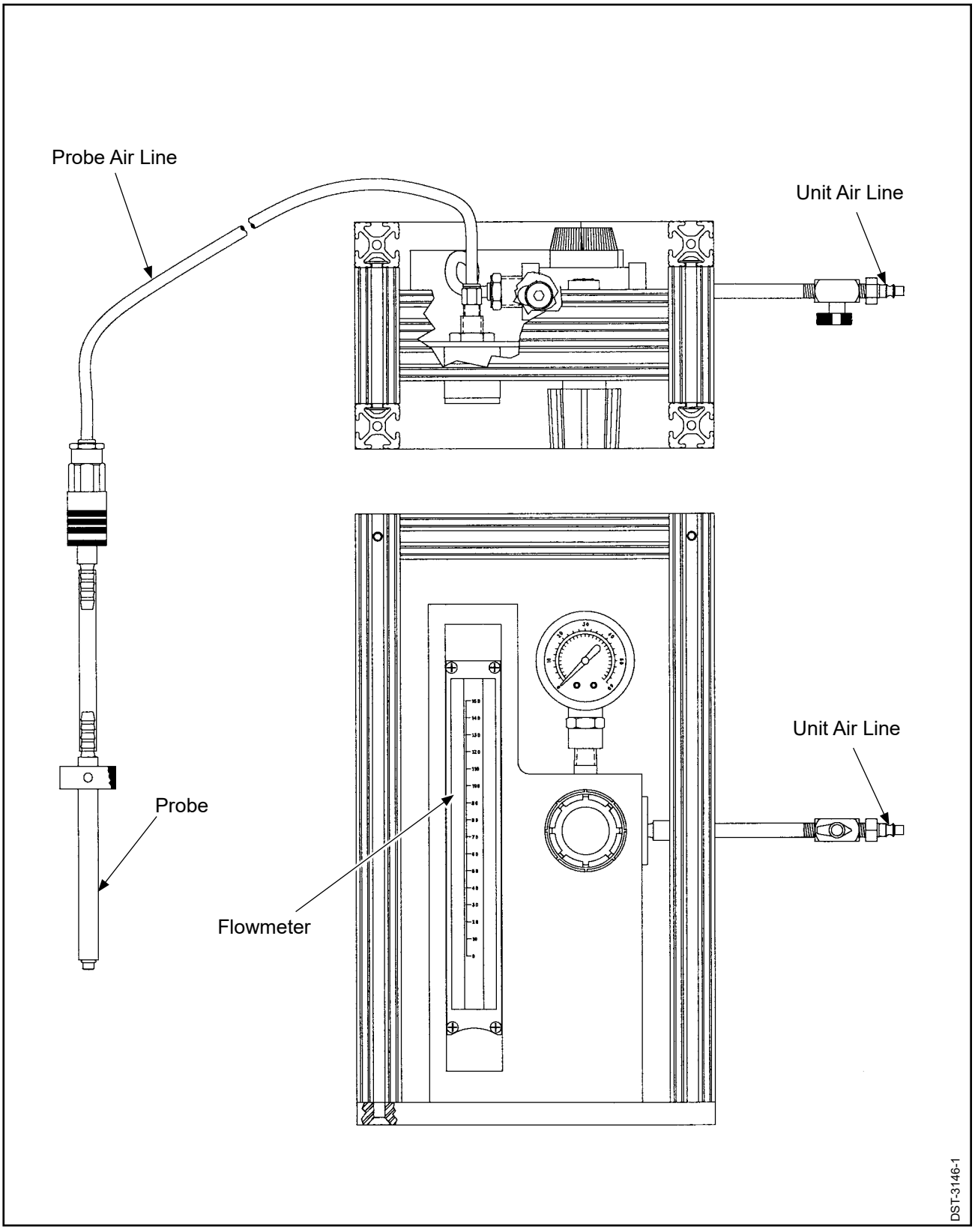
1 In each of two dome mounting holes with the maximum distance possible between them, install a screw with washers and a nut in accordance with the information in Figure 7-34.

2 Measure the resistance from the screw in one dome mounting hole to the screw in the other dome mounting hole. Refer to Figure 7-34 and the Resistance Checks table in this chapter for limits.

a If the resistance measurement is not satisfactory, clean the contact points using a solvent such as CM23 or equivalent and repeat the resistance measurement.

b If the resistance measurement is not satisfactory after cleaning for the two holes, use two different holes with the maximum distance possible between them and repeat the measurement. Repeat the measurement using different holes with the maximum distance possible between them until the resistance measurement is satisfactory.

3 Remove the hardware from the dome mounting holes that was used for the resistance check of the dome.



Blade Seal Effectiveness Check
Figure 7-35

O. Blade Seal Effectiveness Test

(1) For a propeller model that uses the blade seal (960) and the energizer ring (970), test for leaks by completing the Blade Seal Effectiveness Check in the following steps:

(a) To perform the blade seal effectiveness check, use Blade Seal Effectiveness Kit DST-3146-1 (TE382). Refer to Figure 7-35.

CAUTION: MAKE SURE THAT THE ONE LUBRICATION FITTING HOLE THAT DOES NOT HAVE AN AIRFLOW PLUG IN IT IS ACCESSIBLE PAST THE COUNTERWEIGHT WHEN THE PROPELLER IS IN FEATHER POSITION.

(b) Install an airflow plug that has a metal spacer and an O-ring in all except one lubrication fitting hole in the hub.

(c) Make a check of the flowmeter by obstructing the air flow.

1 If the flowmeter moves to the "0" position, indicating no airflow, continue to step 2.O.(1)(d).

2 If the flowmeter does not move to the "0" position, indicating no airflow, troubleshoot the leak in the flowmeter and repair.

(d) If not using the BT-3838-1 probe, install the BT-3838 fitting in the open lubrication fitting hole.

NOTE: The BT-3838-1 probe does not require an adaptor. If the BST-3117 Probe Assembly is used, adaptor BT-3838 (TE443) must be used.

(e) Connect a clean, dry air line source to the unit air line.

(f) Adjust the regulator until the gauge reads 1 bar.

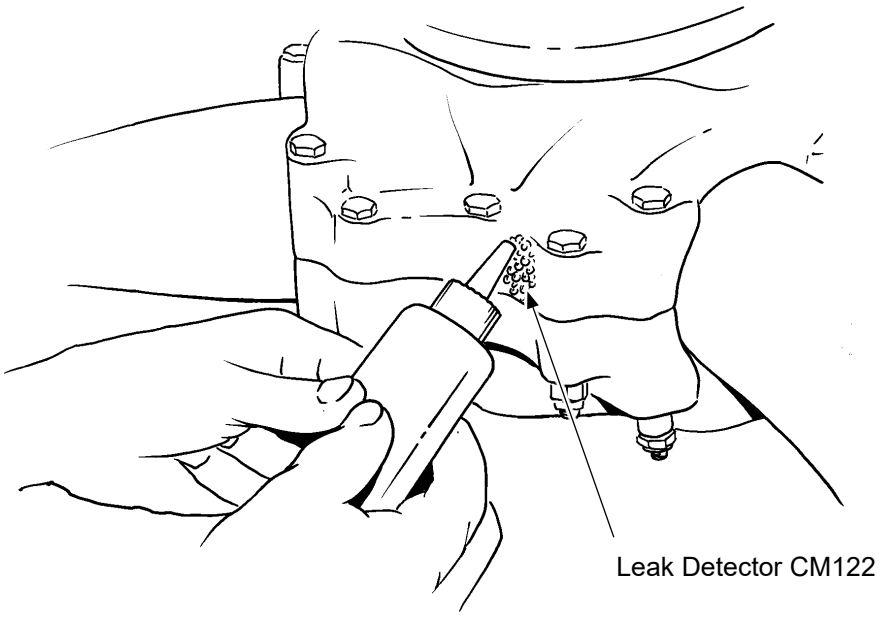
(g) Connect the probe air line to the probe.

(h) Perform the blade seal effectiveness check.

1 Initially the ball in the flowmeter will rise in the gauge and then should slowly return to the "0" position.

2 If the ball in the flowmeter returns to the "0" position, indicating no air flow, the blade seal effectiveness check has been satisfactorily completed.

3 If the ball in the flowmeter does not return to the "0" position, indicating an air flow, troubleshoot the leak, repair, and perform the blade seal effectiveness check until the check is satisfactory.



Hub Leak Test
Figure 7-36

3. Leak Test (Rev. 3)

A. Leak Test Procedure

NOTE: Refer to the Illustration Parts List chapter of this manual for the location of the lubrication fittings and lubrication plugs (engine-side/cylinder-side) for the applicable propeller model.

(1) Install the lubrication fittings (530) in the applicable side of the hub.

(a) Tighten each lubrication fitting (530) until finger-tight, then tighten one additional 360 degree turn.

(2) Install the lubrication plugs (500) in the applicable side of the hub.

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

(b) Tighten each lubrication plug (500) until finger-tight, then tighten one additional 360 degree turn.

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

(a) Move the propeller to low pitch.

(b) Apply leak detector CM122 to the open lubrication plug hole. Refer to Figure 7-36.

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 (500) in the applicable side of the hub.

(a) Tighten the lubrication plug (500) until finger-tight, then tighten one additional 360 degree turn.

4. Propeller Lubrication

   A. Install the lubrication fittings (530) in the engine-side of the hub (410).

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

   C. Install each lubrication fitting (500) in the cylinder-side of the hub (410).

   D. Tighten each lubrication fitting (500, 530) until snug.

   E. Install a lubrication fitting cap (510) on each lubrication fitting (500, 530).

5. Static Balance

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

6. Labels

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

7. 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 manuals.

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

B. Preparing Propeller for Shipping

NOTE 1: New hardware was installed during propeller assembly for shipping. When disassembling a propeller for shipping, it is not necessary to discard hardware that would require replacement at overhaul.

NOTE 2: New O-rings have been installed during propeller assembly for shipping. During propeller disassembly for shipping, it is not necessary to replace O-rings unless damaged during component installation or removal.

(1) Before removal, make a mark to indicate alignment of each blade assembly, fork unit, spinner bulkhead, and balance weight location with the hub unit. Refer to the Marking before Disassembly section in the Disassembly chapter of this manual.

(2) If the propeller will be shipped without the bulkhead installed, before removing the bulkhead from the hub put index labels AR-20 and AR-30 on the hub and bulkhead to show alignment of the bulkhead to the hub.

(3) Remove all balance weight screws (1110) and balance weights (1100).

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

(5) Disassemble the hydraulic system and pitch adjustment unit. Refer to the Cylinder Assembly Removal and Disassembly section in the Disassembly chapter of this manual.

NOTE: It is not necessary to remove the cylinder or the piston (80) and hex nut (70) from the pitch change rod (270).

(6) Propeller Reassembly with Blades Removed for Shipping

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

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

(7) Packing the Propeller and Blades for Shipping

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

(b) Pack the propeller without blades for shipping.

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

8. Reassembly of a Propeller Disassembled for Shipping

A. Unpacking the Propeller and Blades

(1) Carefully unpack the propeller and blades.

(2) Visually inspect all propeller components for shipping damage. If damage is found, refer to the Check chapter of this manual for specific inspection, serviceable limits, and corrective action criteria.

B. Preparing Propeller for Reassembly

NOTE 1: New hardware was installed during propeller assembly for shipping. When disassembling a propeller from shipping, it is not be necessary to discard hardware that would require replacement at overhaul.

NOTE 2: New O-rings have been installed during propeller assembly for shipping. During propeller disassembly from shipping, it is not necessary to replace O-rings, unless they were damaged during component installation or removal.

(1) Make sure that each blade assembly, the fork unit, the spinner bulkhead, and each balance weight has been marked for alignment with the hub unit.

(2) Remove all balance weight screws (1110) and balance weights (1100).

(3) Disassemble the hydraulic system and pitch adjustment unit. Refer to the section, "Cylinder Assembly Removal and Disassembly" in the Disassembly chapter of this manual.

NOTE: It is not necessary to remove the cylinder or the piston (80) and hex nut (70) from the pitch change rod (270).

C. Propeller Reassembly

(1) Reassemble the propeller in accordance with the section, "Assembly of HC-E5A-2( ) Propeller Models" 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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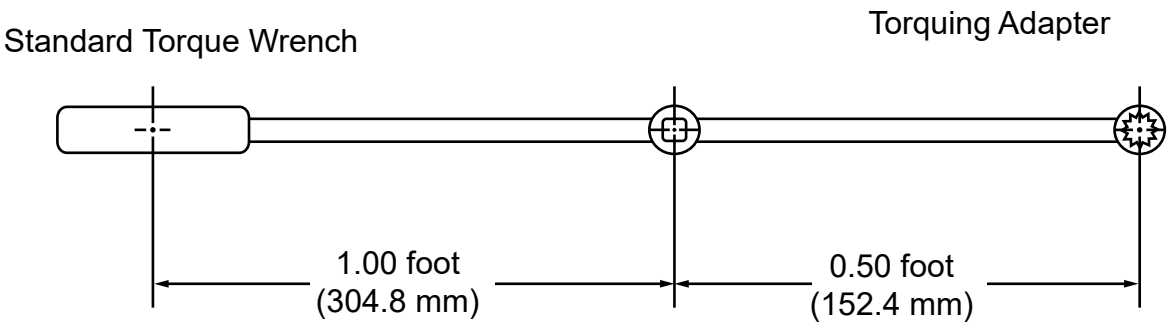


$$\frac{\text{(actual torque required) x (torque wrench length)}}{\text{(torque wrench length) + (length of adapter)}} = \text{torque wrench reading to achieve required actual torque}$$

EXAMPLE:

$$\frac{\text{100 Ft-Lb (136 N•m) x 1 ft (304.8 mm)}}{\text{1 ft (304.8 mm) + 0.50 ft (152.4 mm)}} = \text{66.7 Ft-Lb (90.4 N•m)}$$

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

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

APS212

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

1. Torque Values (Rev. 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.

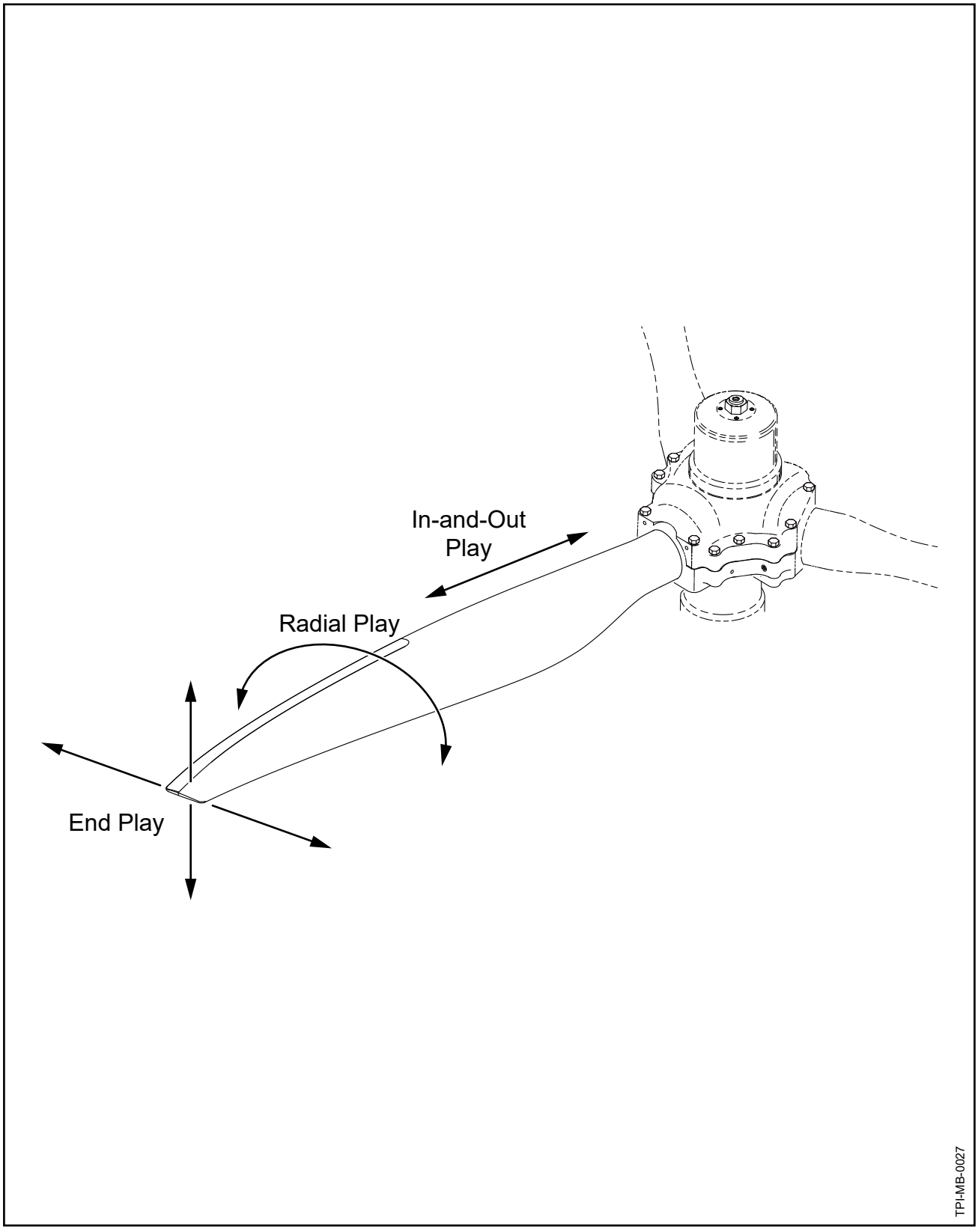
CAUTION 2: FOR TORQUE READING WHEN USING A TORQUE WRENCH ADAPTER, REFER TO FIGURE 8-1.

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

Item No.	Part Number	Description	Torque		
			Ft-Lb	In-Lb	N•m
10	B-3839-16	Nut, hex, thin, drilled (feather)	120	1440	163
60	B-3384-2H	Bolt, 1/4-28, hex head (stop plate)	--	108-132	12.3-14.9
70	B-474	Nut, 1-1/8-12, hex, self locking	100	1200	136
200	B-3384-13H	Bolt, 1/4-28 hex head, (standard cylinder mounting)	12-14	144-168	17-18
205	101029	Relief Valve Bolt Unit, (special cylinder mounting)	--	96-120	10.9-13.5
270	D-7412	Rod, pitch change	80 wet	960 wet	109 wet
490	A-2043-1	Nut, 3/8-24, hex, self-locking (hub half clamping)	34	408	46
620	B-3824	Screw, 8-32 100° head (fork plate)	--	48-60	5.5-6.7
640	A-2626-2	Screw, 10-32 (fork bumper)	--	35-41	4.0-4.6
710	B-3384-4H	Bolt, 1/4-28, hex head	--	96-120	10.9-13.5
730	B-3867-269	Screw, 10-32, 100° head, cres (adapter plate)	--	8-10	0.90-1.13
800	B-7631	Bolt, 3/8-24, 12 point	38-42	456-504	52-56
833	B-3867-272	Screw, 10-32, 100° head, cres (pitch change bracket)	--	8-10	0.90-1.13
860	B-3812-5-16P	Screw, 5/16-24, cap	18-22	216-264	25-29

NOTE: Wet torque denotes use of anti-seize compound CM118.

Torque Values
Table 8-1



Blade Play
Figure 8-2

2. Blade Tolerances (Rev. 3)

A. Blade Play

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

(a)	End Play:	
	Leading Edge to Trailing Edge	0.75 inch (19.0 mm) total
	Fore-and-Aft (face to camber)	0.75 inch (19.0 mm) total
(b)	In-and-Out Play	none permitted
(c)	Radial Play (pitch change)	±0.5 degree (1 degree total) measured at reference station

(2) Blades should be tight in the propeller; however, play that is within the allowable limits is acceptable if the blade returns to its original position when released.

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

B. Blade Track

(1)	Blade Track	0.25 inch (6.3 mm) total

C. Blade Pitch Tolerance

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

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SPECIAL TOOLS, FIXTURES, AND EQUIPMENT - CONTENTS

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1. Tooling and Facility Requirements (Rev. 1)

   A. Standard Tooling

      (1) Propeller repair stations certified by the FAA or international equivalent to overhaul Hartzell Propeller Inc. propellers are expected to possess precision fixtures, tools, and blade tables for blade inspection and repair.

         (a) Except as specifically required in this manual, locally fabricated tooling is acceptable for most repair and inspection operations.

   B. Special Tooling

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

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

         (b) It is the responsibility of the repair station or the technician performing the repair or servicing to use these special tools as required.

   C. Facilities

      (1) Grinding, plating, and painting of propeller components can create health and safety hazards beyond that of other areas of a typical workshop.

         (a) Areas where grinding, plating, and painting are performed should comply with governmental regulations for occupational safety and health, industry standards, and environmental regulations.

      (2) Workshop areas need to be segregated to prevent contamination.

         (a) Separate areas should be designated for cleaning, inspection, painting, plating, and assembly.

         (b) Propeller balancing must be performed in a draft free area.

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ILLUSTRATED PARTS LIST - CONTENTS

PROPELLER PARTS LISTS and FIGURES

SUB-ASSEMBLY PARTS LISTS AND FIGURES

1. Introduction (Rev. 1)

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

A. General

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

(1) This chapter includes the parts lists and applicable illustrations for the propeller models included in this manual.

CAUTION: THE ILLUSTRATIONS IN THIS CHAPTER ARE PROVIDED FOR PART IDENTIFICATION AND LOCATION REFERENCE ONLY. THEY SHOULD NOT BE USED FOR ASSEMBLY.

(a) The illustrations in this chapter use some general views of parts that may not exactly depict every propeller part configuration.

B. Counterweights/Slugs/Mounting Hardware

(1) Counterweights, counterweight slugs, and the applicable mounting hardware are application specific. Refer to Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

C. Spinner Assemblies/Mounting Hardware

(1) Spinner assemblies and the applicable mounting hardware are application specific. Refer to Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

D. Ice Protection System Components

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

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

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

2. Description of Columns (Rev. 1)

A. Fig./Item Number

(1) Figure Number refers to the illustration where items appear.
Item Numbers refer to the specific part callout in the applicable illustration.

(a) Item Numbers that are listed but not shown in the illustration are identified by a dash to the left of the item number. (example: "-800")

(b) Alpha variants will be used to add additional items. There are two reasons for the use of alpha variants:

1 A part may have an alternate, or may be superseded, replaced, or obsoleted by another part.

a For example, the self-locking nut (A-2043) that is item 20 was superseded by the self-locking nut (A-2043-1) that is item 20A.

2 An Illustrated Parts List may contain multiple configurations. Effectivity codes are used to distinguish different part numbers within the same list.

a For example, one propeller configuration may use a mounting bolt (B-3339-1) that is item 30, yet another propeller configuration uses a mounting bolt (B-3347) that is item 30A. Effectivity codes are very important in the determination of parts in a given configuration.

B. Part Number

(1) The Part Number is the Hartzell Propeller Inc. identification number for the part.

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

C. Description

(1) This column provides the Hartzell Propeller Inc. description of the part.

(2) Bullets and indentations are used to indicate parts that are components of a sub-assembly.

(a) For example, a Fork Assembly that is part of a HC-C2YR-1 propeller assembly will have one bullet (•) before the description. This indicates that the Fork Assembly is part of the propeller assembly.

1 A Fork Bumper that is part of the Fork Assembly will appear directly below the Fork Assembly with two bullets (• •) before the description. This indicates that the Fork Bumper is part of the Fork Assembly - that is part of the Propeller Assembly.

a Example: HC-C2YR-1
• Fork Assembly
• • Fork Bumper

(3) If the description in this column includes a "PCP:" prefix, the part is classified as a Propeller Critical Part.

(4) If applicable, information regarding part alternatives, supersedures, replacements, or obsolescence will appear in the Description column.

(a) Refer to the section, "Description of Terms" in this chapter for definitions and requirements for part "alternates", "supersedures", etc.

(b) When part alternatives, supersedures, replacements, etc. are listed, the service document number related to the change may be included for reference.

(5) If applicable, vendor CAGE codes will be listed in the Description column.

D. Effectivity Code (EFF CODE)

(1) This column is used when additional information about a part is required.

(a) Effectivity codes can be used to identify parts that are only used on a particular model, or to direct the user to additional information in the "Effectivity" box at the bottom of the page.

(b) Whenever an effectivity code is present, refer to the "Effectivity" box at the bottom of the page for the applicable information.

(2) Parts common to all assembly models on the page show no effectivity code.

E. Units Per Assembly (UPA)

(1) Designates the total quantity of an item required for the next higher assembly or subassembly.

F. Overhaul (O/H)

(1) Designates the parts to be replaced at overhaul. A “Y” identifies the parts that must be replaced at overhaul.

NOTE: An overhaul kit may not contain all the parts identified with a "Y" for a particular model propeller. An example of parts that may not be included in the overhaul kit is spinner mounting parts.

G. Propeller Critical Part (PCP)

(1) This column identifies the Propeller Critical Parts (PCP) that are contained in each propeller model.

(a) Refer to the Introduction chapter of this manual for the definition of Propeller Critical Parts (PCP).

3. Description of Terms (Rev. 1)

A. Alternate

(1) Alternate parts are identified by the term "ALTERNATE" in the Description column. Alternate items are considered airworthy for continued flight and existing stock of parts may be used for maintenance and/or repair. The new or alternate part number may be used interchangeably when ordering/stocking new parts.

B. Supersedure

(1) Part changes are identified by the terms “SUPERSEDES ITEM _____” or “SUPERSEDED BY ITEM _____” in the Description column. Superseded items are considered airworthy for continued flight and existing stock of superseded parts may be used for maintenance and/or repair. Once the superseding part has been incorporated/installed into an assembly, the original superseded part may no longer be used. Superseded parts may no longer be available, and the new part number must be used when ordering/stocking new parts.

C. Replacement

(1) Part changes identified by the terms "REPLACES ITEM _____” or “REPLACED BY ITEM _____” in the Description column are considered airworthy for continued flight, but must be replaced with a part with the new part number at overhaul. Existing stock of replaced parts may not be used for maintenance and/or repair of effected assemblies. Replaced parts may no longer be available, and the new part number must be used when ordering/stocking new parts.

D. Obsolete

(1) Obsolete parts are identified by "OBS” in the Units Per Assembly (UPA) column. Obsolete items are considered unairworthy for continued flight.

4. Vendor Supplied Hardware (Rev. 1)

A. Important Information

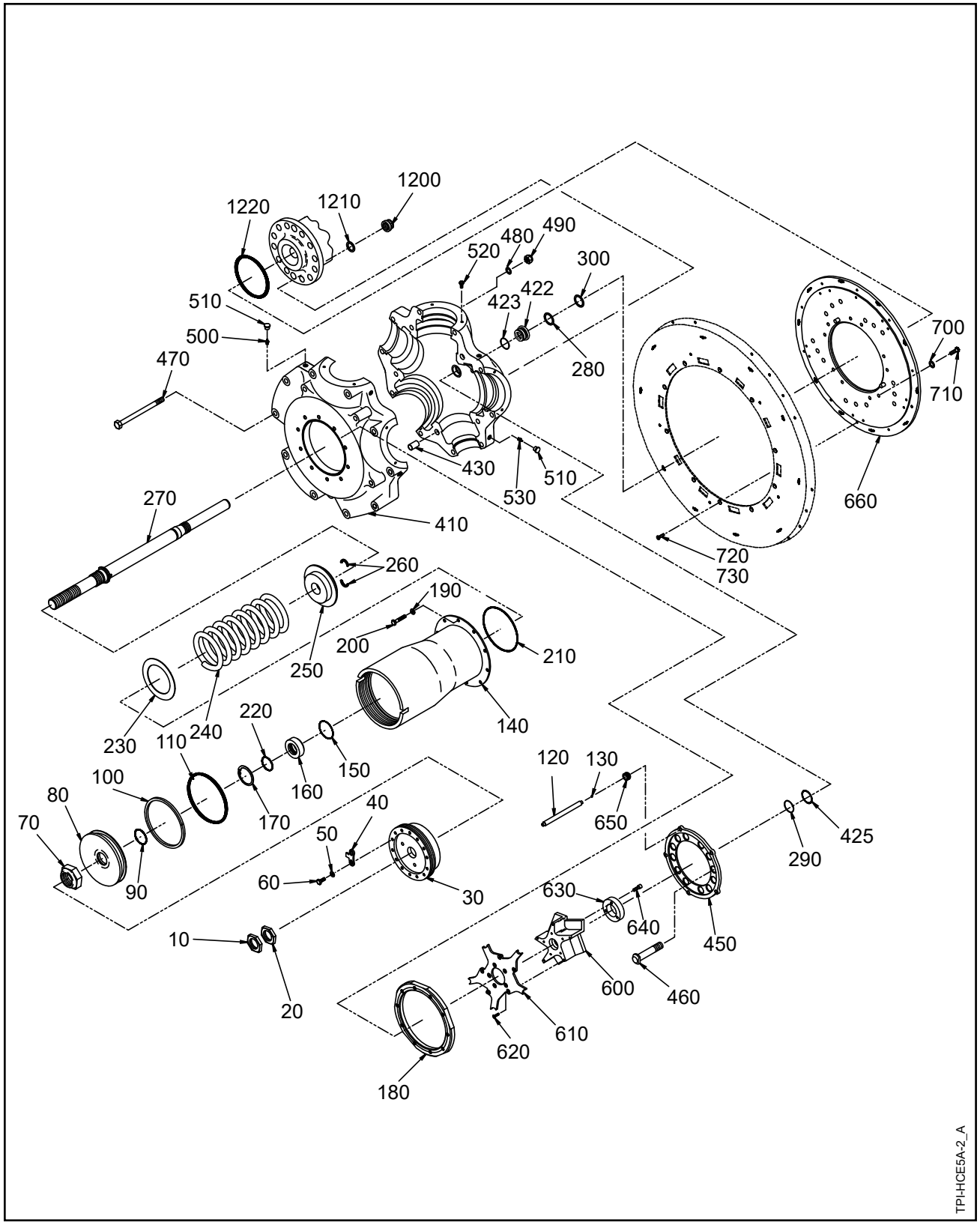
(1) Many O-rings, fasteners, and other vendor supplied hardware listed in Hartzell Propeller Inc. manuals have previously been specified with AN, MS, NAS, or vendor part number. To provide internal controls and procurement flexibility, Hartzell part numbers have been assigned to all O-rings, fasteners,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

(2) Some O-rings, fasteners, and hardware manufactured in accordance with established industry specifications (certain AN, MS, NAS items) are acceptable for use in Hartzell Propeller Inc. products without additional standards imposed by Hartzell.

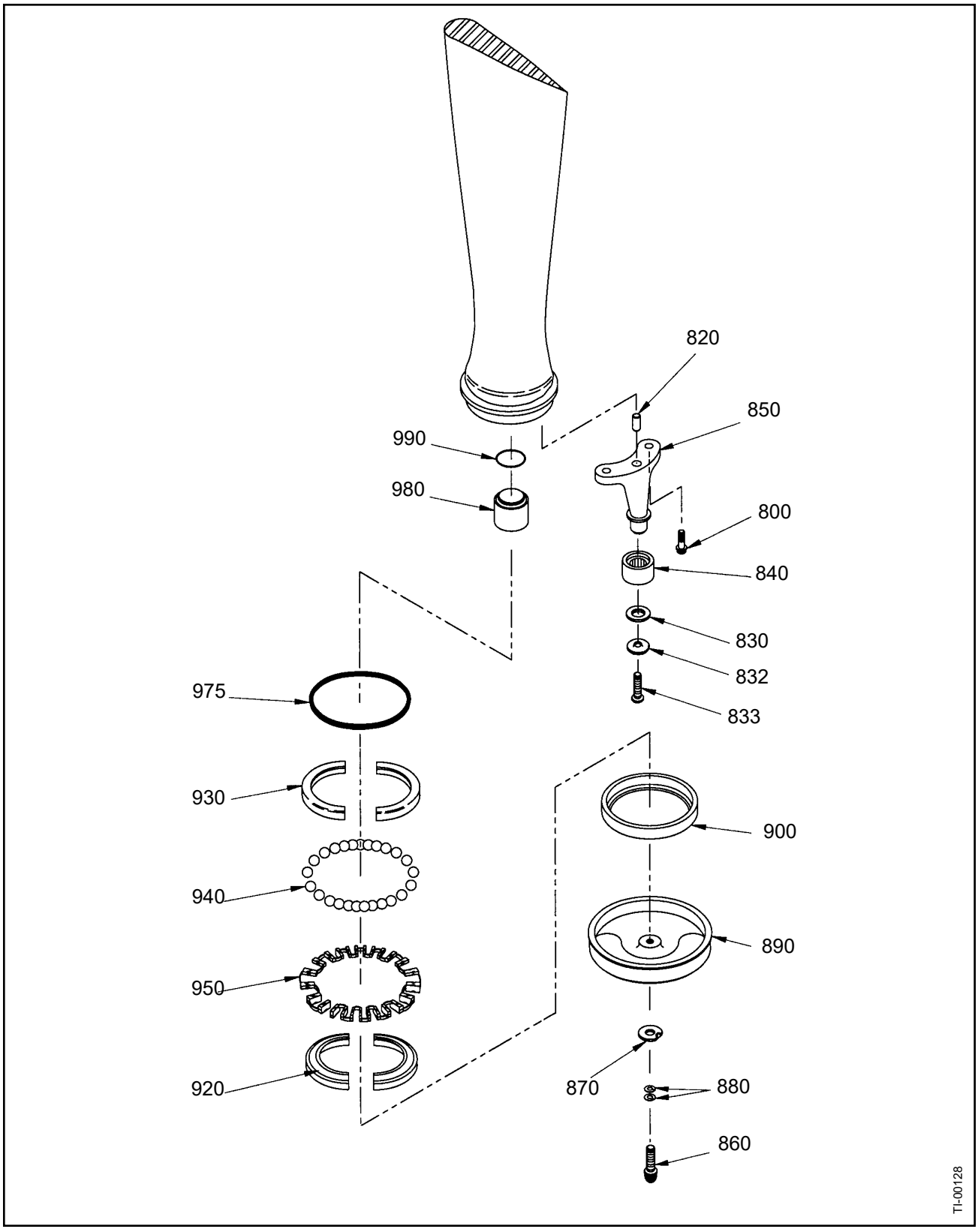
(a) For a listing of part number interchangeability, refer to the Vendor Cross Reference chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(b) Where permitted, both the Hartzell part number item and AN, MS, NAS, and other specified vendor number items can be used interchangeably.

(c) The Hartzell part number must be used when ordering these parts from Hartzell Propeller Inc.



HC-E5A-2: Propeller Parts
Figure 10-1



HC-E5A-2: Blade Retention Parts
Figure 10-2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**HC-E5A-2( ) PROPELLER ASSEMBLY PARTS**				
10	B-3839-16	• PCP: NUT, HEX, THIN, DRILLED (FEATHER)		1		PCP
20	B-3839-16	• PCP: NUT, HEX, THIN, DRILLED (FEATHER)		1		PCP
30	C-7420	• PCP: PLATE, STOP, PITCH		1		PCP
40	A-7428	• PLATE, STOP		1		
50	B-3851-0463	• WASHER		2	Y	
60	B-3384-2H	• BOLT, 1/4-28, HEX HEAD		2	Y	
70	B-474	• NUT, 1-1/8-12, HEX, SELF LOCKING		1	Y	
80	C-7616	• PISTON		1		
90	C-3317-217-2	• O-RING (PISTON ID)		1	Y	
100	B-5132-425	• RING, BACK-UP		1	Y	
110	C-3317-425-2	• O-RING (PISTON OD)		1	Y	
120	B-7370	• ROD, ANTI-ROTATION		5		
130	B-6068	• SPACER, ROD, ANTI-ROTATION		5	Y	
140	E-7417	• PCP: CYLINDER ASSEMBLY		1		PCP
150	C-3317-129	• • O-RING		1	Y	
160	A-3784	• • BUSHING, CYLINDER, REPLACED BY ITEM 160A		1		
160A	108298	• • BUSHING, CYLINDER REPLACES ITEM 160, POST HC-SB-61-392		1		
170	B-6629-175PP	• • RING, RETAINING, INTERNAL		1	Y	
180	D-7378	• • RING, CYLINDER MOUNTING		1		
190	B-3837-0463	• WASHER, CORROSION RESISTANT		10	Y	
200	B-3384-13H	• BOLT, 1/4-28, HEX HEAD (CYLINDER MOUNTING, STANDARD)		9	Y	
-205	101029	• BOLT, 1/4-28, HEX HEAD (CYLINDER MOUNTING, SPECIAL) REPLACED BY ITEM 205A, PRE HC-SB-61-350		1	Y	
-205A	105403	• BOLT, RELIEF VALVE - UNIT REPLACES ITEM 205, POST HC-SB-61-350		1		
210	C-3317-050	• O-RING (CYLINDER MOUNTING)		1	Y	
220	C-3317-215-( )	• O-RING (CYLINDER BUSHING ID)		1	Y	
230	B-3380	• SPRING SEAT USE WITH ITEMS 240 AND 250 SUPERSEDED BY ITEM 230A, PRE HC-SL-61-271		1		
230A	101558	• SPRING SEAT USE WITH ITEMS 240A AND 250A SUPERSEDES ITEM 230, POST HC-SL-61-271		1		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**HC-E5A-2( ) PROPELLER ASSEMBLY PARTS, CONTINUED**				
240	B-3361	• PCP: SPRING, COMPRESSION, FEATHERING USE WITH ITEMS 230 AND 250 SUPERSEDED BY ITEM 240A, PRE HC-SL-61-271		1		PCP
240A	102224	• PCP: SPRING, COMPRESSION, FEATHERING USE WITH ITEMS 230A AND 250A SUPERSEDES ITEM 240, POST HC-SL-61-271		1		PCP
250	B-3362	• SPRING RETAINER, REAR USE WITH ITEMS 230 AND 240 SUPERSEDED BY ITEM 250A, PRE HC-SL-61-271		1		
250A	101556	• PCP: SPRING RETAINER, FLANGED USE WITH ITEMS 230A AND 240A SUAPERSEDES ITEM 250, POST HC-SL-61-271		1		PCP
260	A-3687	• KEEPER, SPLIT		1	Y	
270	D-7412	• PCP: ROD, PITCH CHANGE		1		PCP
280	B-5129	• RING, BACK-UP, USED WITH ITEM 410 ONLY		1	Y	
290	C-3317-212-2	• O-RING (PITCH CHANGE ROD OD)		1	Y	
300	B-5129	• RING, BACK-UP, USED WITH ITEM 410 ONLY		1	Y	
-400	D-7432	• PCP: HUB ASSEMBLY, HC-E5A-2, REPLACED BY ITEM 400A		1		PCP
410	E-7369	• • PCP: HUB UNIT, HC-E5A-2 REPLACED BY ITEM 410A, PRE HC-SB-61-345	A	1		PCP
-400A	D-7432-1	• PCP: HUB ASSEMBLY, HC-E5A-2( ), REPLACES ITEM 400 (REFER TO “D-7432-1 HUB ASSEMBLY” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
410A	E-7369-1	• • PCP: HUB UNIT, HC-E5A-2( ) REPLACES ITEM 410, POST HC-SB-61-345	A	1		PCP
470	A-1037-4	• BOLT, 3/8-24, HEX HEAD (HUB HALF CLAMPING)		15		
480	B-3834-0632	• WASHER (HUB HALF CLAMPING)		15	Y	
490	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING (HUB HALF CLAMPING)		15	Y	
500	A-279	• FITTING, LUBRICATION (CYLINDER-SIDE OF HUB)		5	Y	
500A	C-6349	• FITTING, LUBRICATION, 45° (POST HC-SL-61-187) ALTERNATE FOR ITEM 500		5	Y	
-500B	106545	• PLUG, LUBRICATION - (POST HC-SL-61-354) REPLACES ITEM 500 AND 500A IN CYLINDER-SIDE OF HUB		5	Y	
510	B-6544	• CAP, FITTING, LUBRICATION USED WITH ITEMS 500, 500A, 530 AND 530A		10	Y	
520	B-7073-L1	• BOLT, 10-32, HEX HEAD (SPARK GAP)		5	Y	
530	A-279	• FITTING, LUBRICATION (ENGINE-SIDE OF HUB)		5	Y	
530A	C-6349	• FITTING, LUBRICATION, 45° (POST HC-SL-61-187) ALTERNATE FOR ITEM 530 IN ENGINE-SIDE OF HUB)		5	Y	

EFFECTIVITY	MODEL
A	THE E-7369-( ) HUB UNIT MAY BE MODIFIIED TO INCORPORATE THE 104903 ROD HUB BUSHING. REFER TO THE ALUMINUM HUB OVERHAUL CHAPTER OF HARTZELL PROPELLER INC. STANDARD PRACTICES MANUAL 202A (61-01-02).

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**HC-E5A-2( ) PROPELLER ASSEMBLY PARTS, CONTINUED**				
600	D-7415	• FORK, RIGHT HAND		1		
610	C-7416	• PLATE, FORK, FIVE BLADE		1		
620	B-3824	• SCREW, 8-32, 100° HEAD (FORK PLATE)		10	Y	
630	B-7418	• BUMPER, USED WITH ITEM 420, PRE HC-SB-61-345		1		
630A	B-7418-1	• BUMPER, USED WITH ITEM 422 AND 422A, POST HC-SB-61-345		1		
640	A-2626-2	• SCREW, 10-32, CAP (FORK BUMPER)		3	Y	
650	A-7422	• BUSHING (ANTI-ROTATION)		5		
660	D-6663	• ADAPTER PLATE UNIT, SUPERSEDED BY ITEM 660A		1		
660A	107254	• ADAPTER PLATE UNIT, SUPERSEDES ITEM 660		1		
-670	B-3847-7	• • RIVET, 100° HEAD, 0.094 DIA., AL		20		
-680	B-3849-3	• • NUTPLATE, FLOATING		10		
-690	B-6138-5-7P	• • DOWEL PIN		2		
700	B-3837-0432	• WASHER, CORROSION RESISTANT		10	Y	
710	B-3384-4H	• BOLT, 1/4-28, HEX HEAD		10	Y	
720	B-3860-10L	• WASHER, DIMPLED 100°, CRES		10	Y	
730	B-3867-269	• SCREW, 10-32, 100° HEAD, CRES		10	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-2		**HC-E5A-2( ) BLADE RETENTION PARTS**				
800	B-7631	• BOLT, 3/8-24, 12 POINT		10	Y	
-810	B-7627-( )	• BRACKET, KNOB, PITCH CHANGE - UNIT REPLACED BY ITEM 810A OR ITEM 810B PRE HC-SB-61-320		5		
-810A	B-7627-( )A	• BRACKET, KNOB, PITCH CHANGE - UNIT REPLACES ITEM 810, POST HC-SB-61-320 (REFER TO "B-7627-( ): PITCH CHANGE KNOB BRACKET UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		5		
-810B	103577-( )	• BRACKET, KNOB, PITCH CHANGE - UNIT REPLACES ITEM 810, ALTERNATE FOR 810A POST HC-SB-61-320 (REFER TO "103577-( ): PITCH CHANGE KNOB BRACKET UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		5		
890	D-7419	• PRELOAD PLATE, ASSEMBLY		5		
900	B-6441	• RING, RETENTION, BEARING		5		
-910	C-7438	• BEARING, RETENTION, BLADE		5		
920	C-7438-B	• • RACE, BLADE SIDE		1		
930	C-7438-A	• • RACE, HUB SIDE		1		
940	B-6144	• • BALL, BEARING, 0.5 INCH DIAMETER		25	Y	
	B-6144-650	• • BALL, BEARING, 0.5 INCH DIAMETER (BOX OF 650)		RF		
950	B-6041-3	• BALL SPACER		5	Y	
950A	106226	• BALL SPACER, ALTERNATE FOR ITEM 950		5	Y	
960	C-6337	• BLADE SEAL, USED WITH ITEM 970 PRE HC-SB-61-321 REPLACED BY ITEM 975, PRE HC-SB-61-330	D	5	Y	
970	B-6376-2	• SEAL ENERGIZER RING, USED WITH ITEM 960 PRE HC-SB-61-321 REPLACED BY ITEM 975, PRE HC-SB-61-330	D	5	Y	
975	C-3317-341-8	• O-RING, REPLACES ITEMS 960 AND 970 POST HC-HC-SB-61-321 PRE HC-SB-61-339	D	5	Y	
975A	C-3317-341-8	• O-RING, REPLACES ITEMS 960, 970, AND 975 POST HC-HC-SB-61-339	E	5	Y	
980	100010	• PRELOAD PACK ASSEMBLY		5		
-990	A-6800-1	• • HOUSING, PRELOAD PACK		1		
-1000	B-7617	• • DISK, WEAR		1		
-1010	B-6810	• • BELLEVILLE SPRING WASHER		9		
-1020	100011	• • CAP, PRELOAD PACK		1		
-1030	A-5839-93	• • RING, RETAINING, INTERNAL SPIRAL		1		
990	C-3317-121	• O-RING		1	Y	

EFFECTIVITY	MODEL
D	BLADES MUST HAVE 103379-1 WEAR STRIP INSTALLED IN ACCORDANCE WITH HARTZELL PROPELLER INC. COMPOSITE BLADE OVERHAUL MANUAL 135F (61-13-35).

EFFECTIVITY	MODEL
E	BLADES MUST HAVE 105030 WEAR STRIP INSTALLED IN ACCORDANCE WITH HC-SB-61-339. THE 105030 WEAR STRIP REPLACES THE A-2074-3 AND 103379-1 WEAR STRIPS.

- ITEM NOT ILLUSTRATED

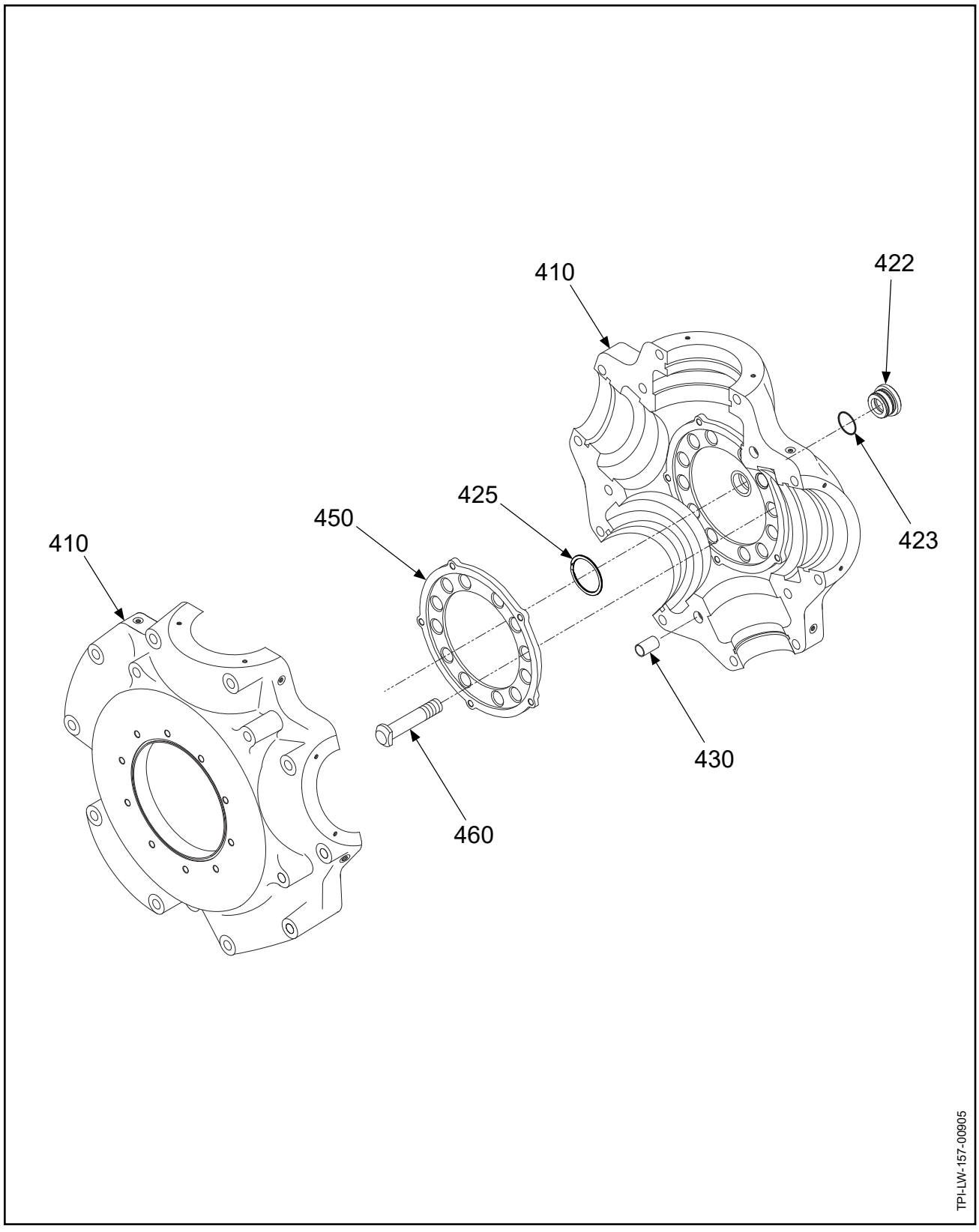
HC-E5A-2( )

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**HC-E5A-2( ) PROPELLER ASSEMBLY PARTS, CONTINUED**				
		COUNTERWEIGHTS/MOUNTING BOLTS				
		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND HARTZELL PROPELLER, INC. COMPOSITE BLADE OVERHAUL MANUAL 135F (61-13-35) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				PCP
		• COUNTERWEIGHT MOUNTING BOLTS REFER TO THE APPLICABLE HARTZELL PROPELLER INC. BLADE OVERHAUL MANUAL: MANUAL 135F (61-13-35) - COMPOSITE BLADES MANUAL 133C (61-13-33) - ALUMINUM BLADES				
		• COUNTERWEIGHT CLAMP APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND HARTZELL PROPELLER, INC. COMPOSITE BLADE OVERHAUL MANUAL 135F (61-13-35) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				PCP
		BALANCE PARTS				
-1100	A-1305	• BALANCE WEIGHT		AR		
-1110	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
		PROPELLER MOUNTING PARTS				
1200	C-6006	• NUT, MOUNTING, 9/16-18, 12 POINT		12	Y	
1210	A-2048-2	• WASHER, MOUNTING, 9/16 INCH CSK		12	Y	
1220	C-3317-239-2	• O-RING (MOUNTING FLANGE)		1	Y	
		SPINNER PARTS				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

SUB-ASSEMBLY
PARTS LISTS and FIGURES



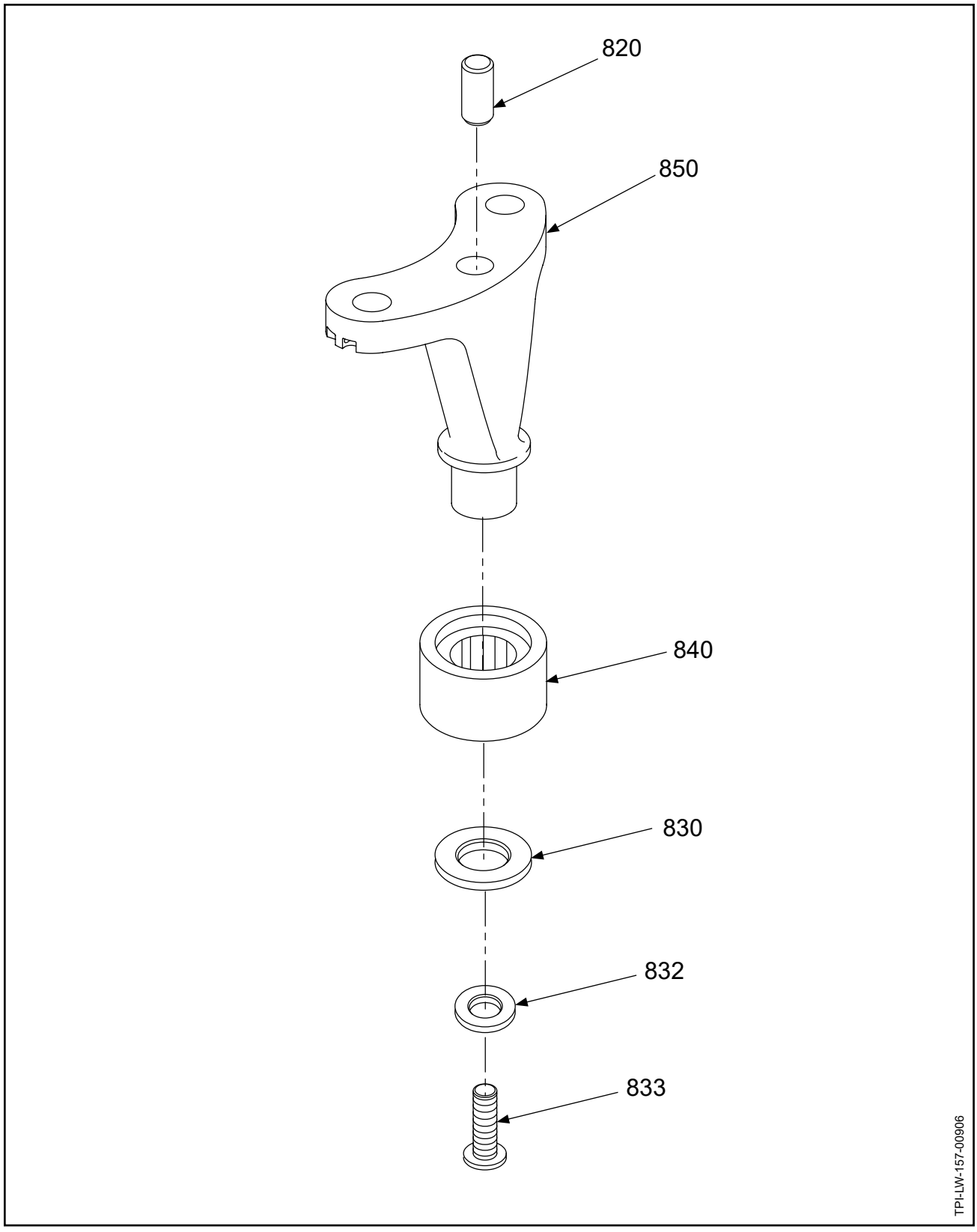
D-7432-1: Hub Assembly
Figure 10A-1

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-1		**D-7432-1: HUB ASSEMBLY PARTS**				
400	D-7432-1	PCP: HUB ASSEMBLY, HC-E5A-2( )		1		PCP
410	E-7369-1	• PCP: HUB UNIT, HC-E5A-2( )	A	1		PCP
422	104903	• • HUB BUSHING, ROD, USED WITH ITEM 630A REPLACED BY ITEM 422A		1		
422A	108346	• • HUB BUSHING, ROD, USED WITH ITEM 630A REPLACES ITEM 422, POST HC-SB-61-392		1		
423	C-3317-026-2	• • O-RING, REPLACED BY ITEM 423A		1	Y	
423A	C-3317-123	• • O-RING, REPLACES ITEM 423, POST HC-SB-61-392		1	Y	
425	A-6153-137	• • RING, RETAINING, EXTERNAL SPIRAL		1	Y	
430	A-2249	• • HUB BUSHING, GUIDE		2	Y	
-440	B-6142	• • INSERT, 1/4-28, CRES, COILED		10	Y	
450	D-7377	• RING, MOUNTING BOLT		1		
460	B-7435	• STUD, MOUNTING, 9/16-18, FLANGED		12	Y	

EFFECTIVITY	MODEL
A	THE E-7369-( ) HUB UNIT MAY BE MODIFIIED TO INCORPORATE THE 104903 ROD HUB BUSHING. REFER TO THE ALUMINUM HUB OVERHAUL CHAPTER OF HARTZELL PROPELLER INC. STANDARD PRACTICES MANUAL 202A (61-01-02).

- ITEM NOT ILLUSTRATED

D-7432-1: Hub Assembly



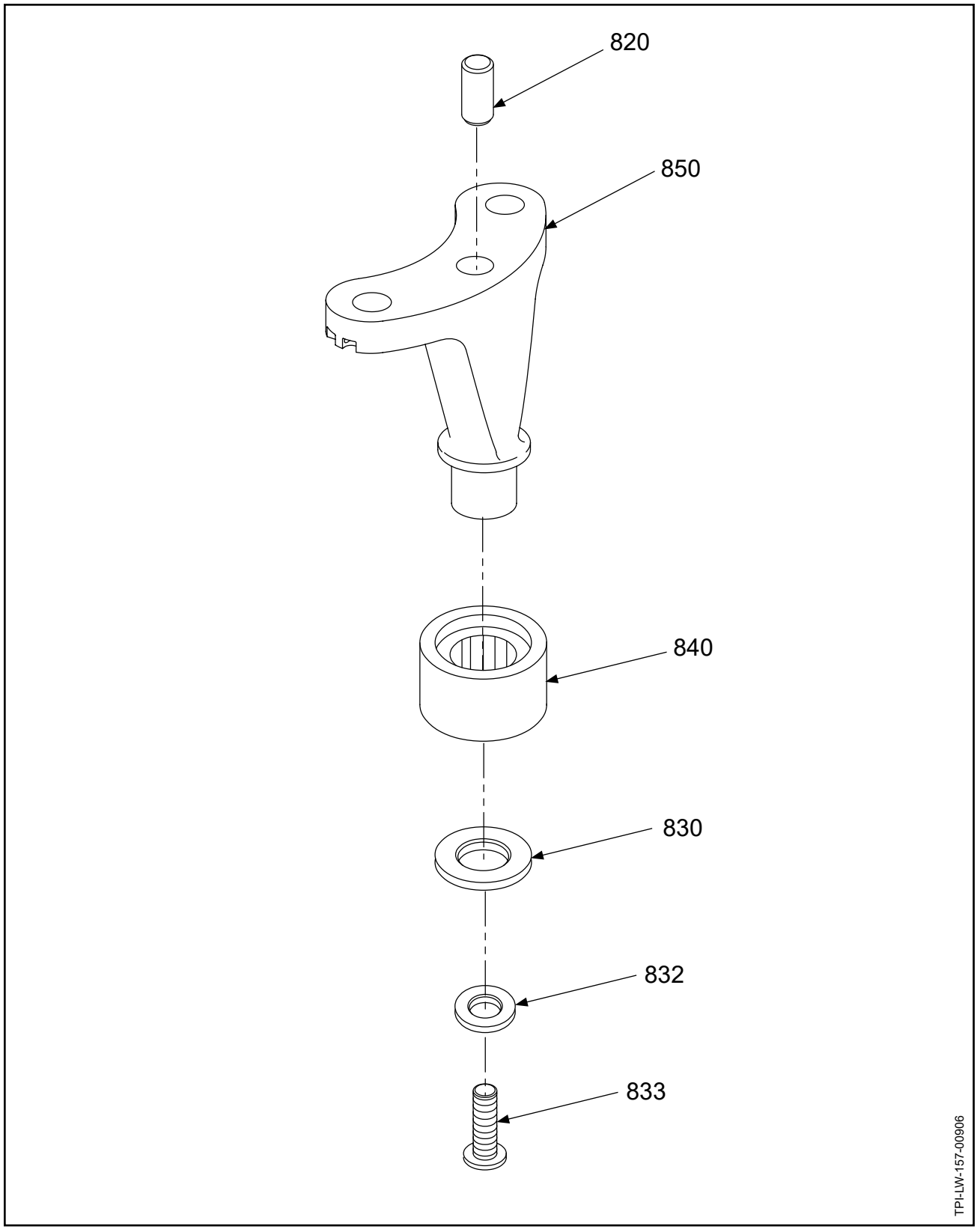
B-7627-( ): Pitch Change Knob Bracket Unit
Figure 10A-2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-2		**B-7627-( ): PITCH CHANGE KNOB BRACKET UNIT**				
-810A	B-7627-( )	BRACKET, KNOB, PITCH CHANGE - UNIT		5		
820	B-6260	• DOWEL PIN, 3/8 INCH		1		
830	103574	• WASHER, RETAINING, KNOB UNIT		1		
832	B-3860-10L	• WASHER, DIMPLED, 100°, CRES		1	Y	
833	B-3867-272	• SCREW, 10-32, 100° HEAD, CRES		1	Y	
840	B-6077-2	• CAM FOLLOWER, SELF ALIGNING		1		
850	B-7603-( )A	• BRACKET, KNOB, PITCH CHANGE		1		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

B-7627-( ): Pitch Change Knob Bracket Unit



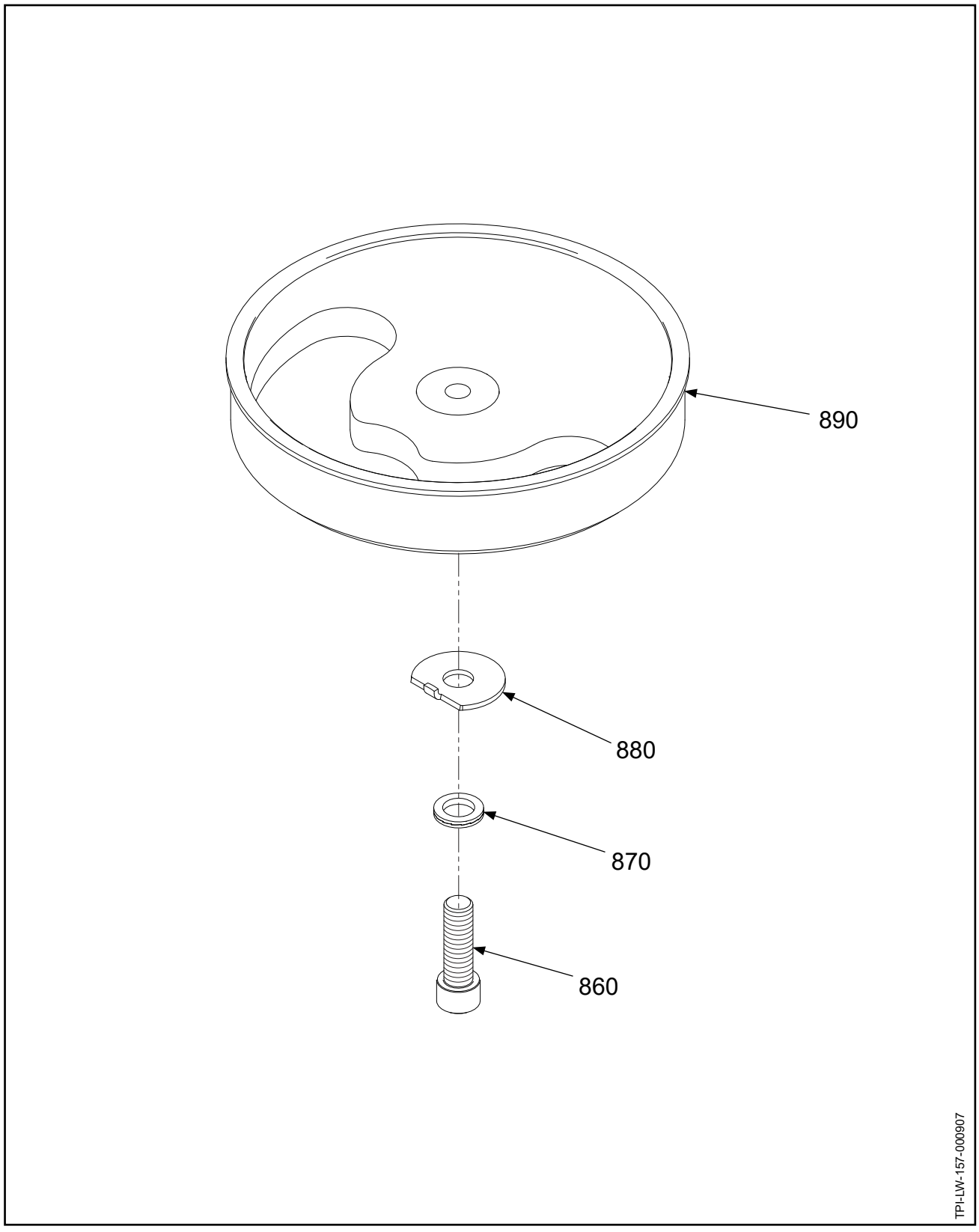
103577-( ): Pitch Change Knob Bracket Unit
Figure 10A-3

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-3		**103577-( ): PITCH CHANGE KNOB BRACKET UNIT**				
-810	103577-( )	BRACKET, KNOB, PITCH CHANGE - UNIT		5		
820	B-6260	• DOWEL PIN, 3/8 INCH		1		
830	103574	• WASHER, RETAINING, KNOB UNIT		1		
832	B-3860-10L	• WASHER, DIMPLED, 100°, CRES		1	Y	
833	B-3867-272	• SCREW, 10-32, 100° HEAD, CRES		1	Y	
840	B-6077-2	• CAM FOLLOWER, SELF ALIGNING		1		
850	103575-( )	• BRACKET, KNOB, PITCH CHANGE		1		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

103577-( ): Pitch Change Knob Bracket Unit



D-7419: Preload Plate Assembly
Figure 10A-4

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-4		**D-7419: PRELOAD PLATE ASSEMBLY**				
890	D-7419	PRELOAD PLATE ASSEMBLY		5		
880	B-7613-5	• WASHER, LOCK, RAMP (2 PIECE)		1	Y	
870	C-7544	• WASHER, ANTI-ROTATION		1		
860	B-3812-5-16P	• SCREW, 5/16-24, CAP		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

D-7419: Preload Plate Assembly

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