HARTZELL PROPELLER INC.
One Propeller Place
Piqua, Ohio 45356-2634 U.S.A.
Telephone: 937.778.4200
Fax: 937.778.4215

MANUAL REVISION TRANSMITTAL

MANUAL 155 (61-10-55)
Three Blade Lightweight Turbine Propeller Overhaul Manual

REVISION 3 dated June 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. 155
61-10-55
Revision 3
June 2023

Three Blade Lightweight Turbine Propeller Overhaul Manual

HC-D3F-7H

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One Propeller Place
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Phone: 937.778.4200
Fax: 937.778.4215

REVISION 3 HIGHLIGHTS

Revision 3, dated June 2023, incorporates the following:

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

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

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

- DESCRIPTION AND OPERATION
  - Revised the section, "General"
- DISASSEMBLY
  - Revised the section, "Blade Disassembly"
- CHECK
  - Revised the section, "Hex Head Bolt"
  - Revised the section, "Preload Plate Assembly w/Inner Bearing Race"
- ASSEMBLY
  - Revised the section, "Blade Assembly Procedures
  - Revised Figure 7-6, "Installation of the Pitch Change Knob Bracket"
  - Revised Table 7-1, "Blade Pitch Change Knob Bracket Unit Selection"
- FITS AND CLEARANCES
  - Revised Table 8-1, "Torque Values"
  - Revised the section, "Blade Tolerances"
  - Removed Table 8-2, "Blade Tolerances"
- ILLUSTRATED PARTS LIST
  - Revised the Parts List for Propeller Model HC-D3F-7H
  - Revised the Parts List for HC-D3F-7H: Blade Retention Parts
  - Revised the Parts List for 100382: Hub Unit
  - Revised the Parts List for 100401-( ): Pitch Change Knob Bracket Unit

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REVISION 3 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
Original	May 2014	New
Revision 1	Oct/17	Minor
Revision 2	Nov/22	Minor
Revision 3	Jun/23	Major

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RECORD OF REVISIONS

This is a record of revisions inserted into this manual.
Revision 3 includes all prior revisions.

Revision Number	Issue Date	Date Inserted	Inserted By
3	Jun/23	Jun/23	HPI

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RECORD OF TEMPORARY REVISIONS

Update this page to show all temporary revisions inserted into this manual.

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

RECORD OF TEMPORARY REVISIONS

Update this page to show all temporary revisions inserted into this manual.

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. USE OF OBSOLETE INFORMATION MAY CREATE AN UNSAFE CONDITION THAT MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE. REFER TO THE APPLICABLE SERVICE DOCUMENT INDEX FOR THE MOST RECENT REVISION LEVEL OF THE SERVICE DOCUMENT.

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

Service Document Number	Incorporation Rev./Date
Service Bulletins:	
HC-SB-61-374	Rev. 1, Oct/17
HC-SB-61-389, R1	Rev. 3, Jun/23

Service Document Number	Incorporation Rev./Date
Service Letters:	
HC-SL-61-187	Rev. 1, Oct/17
HC-SL-61-241	Rev. 1, Oct/17
HC-SL-61-354	Rev. 1, Oct/17

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 149 (61-00-49).

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LIST OF EFFECTIVE PAGES

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TABLE OF CONTENTS

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INTRODUCTION - CONTENTS

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1. General (Rev. 1)

A. Statement of Purpose

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

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

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

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

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

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

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

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

B. Item References

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

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

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

2. Reference Publications

A. Hartzell Propeller Inc. Publications

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

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

Manual No. (ATA No.)	Available at www.hartzellprop.com	Hartzell Propeller Inc. Manual Title
n/a	Yes	Active Hartzell Propeller Inc. Service Bulletins, Service Letters, Service Instructions, and Service Advisories
Manual 127 (61-16-27)	Yes	Metal Spinner Maintenance Manual
Manual 133C (61-13-33)	-	Aluminum Blade Overhaul Manual
Manual 148 (61-16-48)	Yes	Composite Spinner Maintenance Manual
Manual 149 (61-00-49)	Yes	Propeller Owner's Manual and Logbook for Lightweight Turbine Propeller Models with Aluminum Blades
Manual 159 (61-02-59)	Yes	Application Guide
Manual 165A (61-00-65)	Yes	Illustrated Tool and Equipment Manual
Manual 180 (30-61-80)	Yes	Propeller Ice Protection System Manual
Manual 202A (61-01-02)	Vol. 7, Yes Vol. 11, Yes	Standard Practices Manual, Volumes 1 through 11

B. Vendor Publications

None.

3. Personnel Requirements (Rev. 1)

A. Service and Maintenance Procedures in this Manual

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

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

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

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

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

A. Special Tooling

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

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

B. Consumable Materials

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

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

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

A. Instructions for Use

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

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

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

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

A. Calendar Limits

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

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

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

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

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

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

B. Long Term Storage

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

7. Component Life and Overhaul (Rev. 2)

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

A. Component Life

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

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

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

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

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

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

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

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

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

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

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

(b) Hub replacement

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

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

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

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

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

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

B. Overhaul

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

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

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

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

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

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

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

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

8. Damage/Repair Types (Rev. 1)

A. Airworthy/Unairworthy Damage

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

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

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

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

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

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

B. Minor/Major Repair

(1) Minor Repair

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

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

(2) Major Repair

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

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

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

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

9. Propeller Critical Parts (Rev. 1)

A. Propeller Critical Parts

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

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

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

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

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

10. Warranty Service (Rev. 1)

A. Warranty Claims

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

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

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

A. Product Support Department

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

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

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

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

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

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

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

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

B. Technical Publications Department

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

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

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
Ticking	A series of parallel marks or scratches running circumferentially around the diameter of the blade

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

13. Abbreviations (Rev. 2)

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

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

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DESCRIPTION AND OPERATION - CONTENTS

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1. General (Rev. 1)

A. Propeller/Blade Model Designation

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

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

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

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

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

(a) For additional information about the model number designation system for composite blades, refer to Hartzell Propeller Inc. Composite 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. Lightweight Turbine Propellers HC-D3F-7( ) Series (Refer to Figure 1.)

(1) A Hartzell Propeller Inc. lightweight turbine propeller uses aluminum blades mounted in an aluminum hub. The hub is held together with bolts and contains the pitch change mechanism. The pitch change components include the piston, pitch change rod, fork, and pitch change knobs.

(2) The propellers described in this section are constant speed, feathering and reversing. They use a single oil supply from a governing device to hydraulically actuate a change in blade angle.

(3) 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 resulting in blade angle change.

(4) 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 usually very small in relation to the other forces and can attempt to increase or decrease blade angle.

(5) The 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, which 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 decreases the blade angle and increases propeller RPM. Decreasing the volume of oil increases blade angle and decreases propeller RPM. By changing 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 permit it to supply or drain oil as necessary to maintain constant engine speed (RPM). 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 feathering is accomplished when the pilot retards the propeller condition lever past the feather detent. This permits control oil to drain from the propeller and return to the engine sump. Engine shutdown is normally accomplished during the feathering process.

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

(8) In reverse mode of operation the governor operates in an underspeed condition to act strictly as a source of pressurized oil, without attempting to control RPM. Control of the propeller blade angle then becomes the responsibility of the beta valve.

NOTE: The beta valve is located inside the propeller and engine propeller shaft and protrudes from the gearbox on the side opposite from the propeller for control input connection.

(9) The propeller is reversed by manually repositioning the cockpit-control causing the beta valve to supply oil from the governor pump to the propeller. A rod that protrudes from the propeller piston communicates propeller blade angle position to the beta valve.

(10) When the propeller reaches the desired reverse position, movement of the beta rod, initiated by the propeller piston, causes the beta valve to shut off flow of oil to the propeller. Any additional unwanted movement of the propeller toward reverse or any movement of the manually positioned beta valve control toward high pitch position causes the beta valve to drain oil from the propeller to increase pitch.

TESTING AND FAULT ISOLATION - CONTENTS

LIST OF FIGURES

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1. Troubleshooting Guide

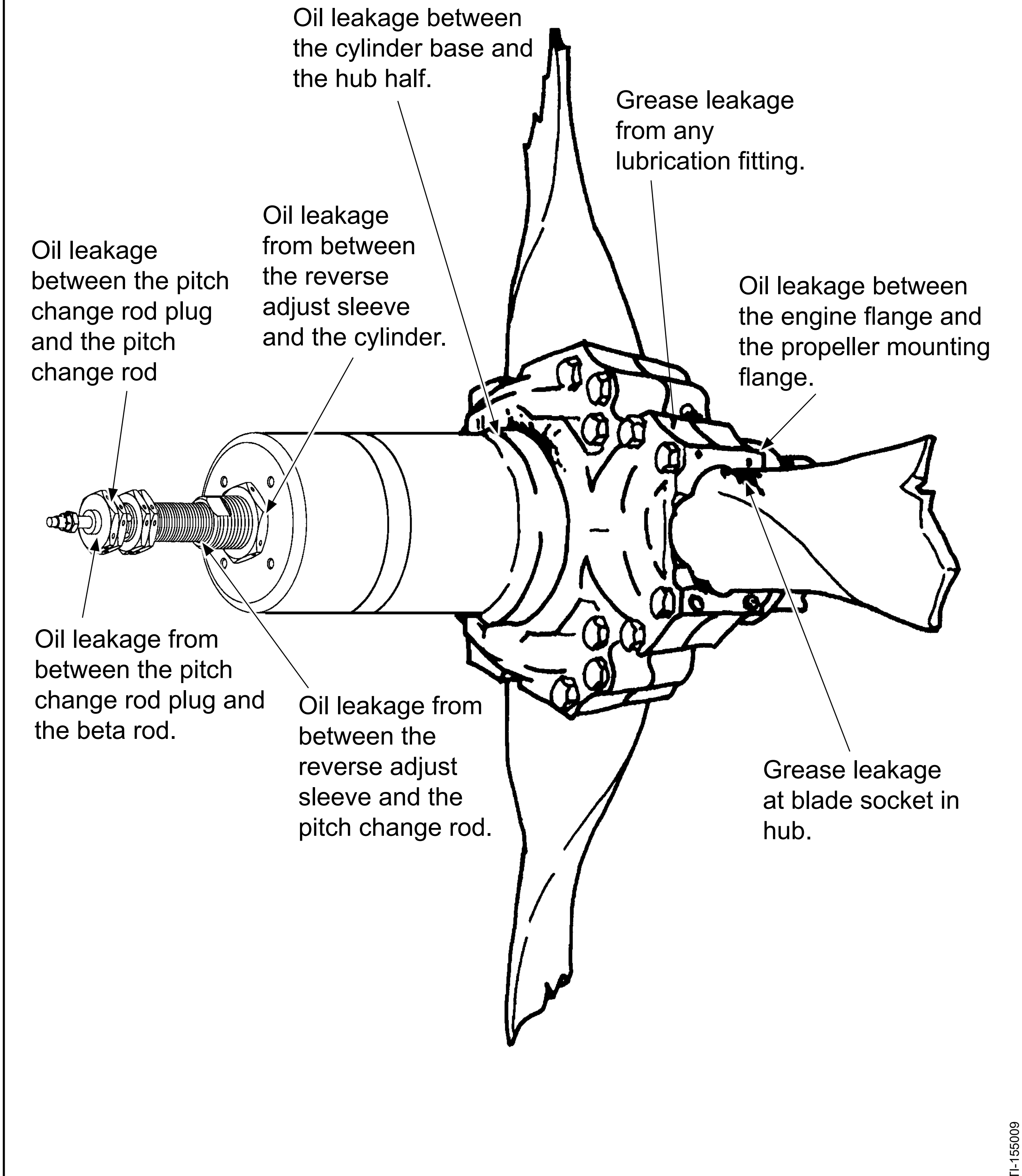
CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

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 1.B. Friction.
	or	Pitch change rod may have a plastic shipping cap installed.	Remove the plastic shipping cap.
	or	Oil passages are not clear and open.	Disassemble the propeller and inspect the O-ring and piston-to-cylinder sealing surfaces. Replace defective O-ring.
	or	Incorrect governor has been installed.	Refer to the airframe or the engine manufacturer's maintenance manual for installation instructions.
	or	Incorrect rigging of the propeller to the engine.	Re-rig the propeller to the engine in accordance with the airframe or engine manufacturer's instructions.
B. Friction.		Blade Preload is excessive.	Disassemble the propeller and readjust the blade preload.
	or	Lack of lubrication.	Add approved lubricant.
	or	Balls in the blade retention split-bearing are unusually rough, corroded, or chipped.	Replace the blade retention split-bearing assembly.
	or	Insufficient clearance between the various moving parts in the pitch change mechanism.	Check the moving parts individually. Increase the clearances between the individual parts as necessary to decrease friction in the mechanism.

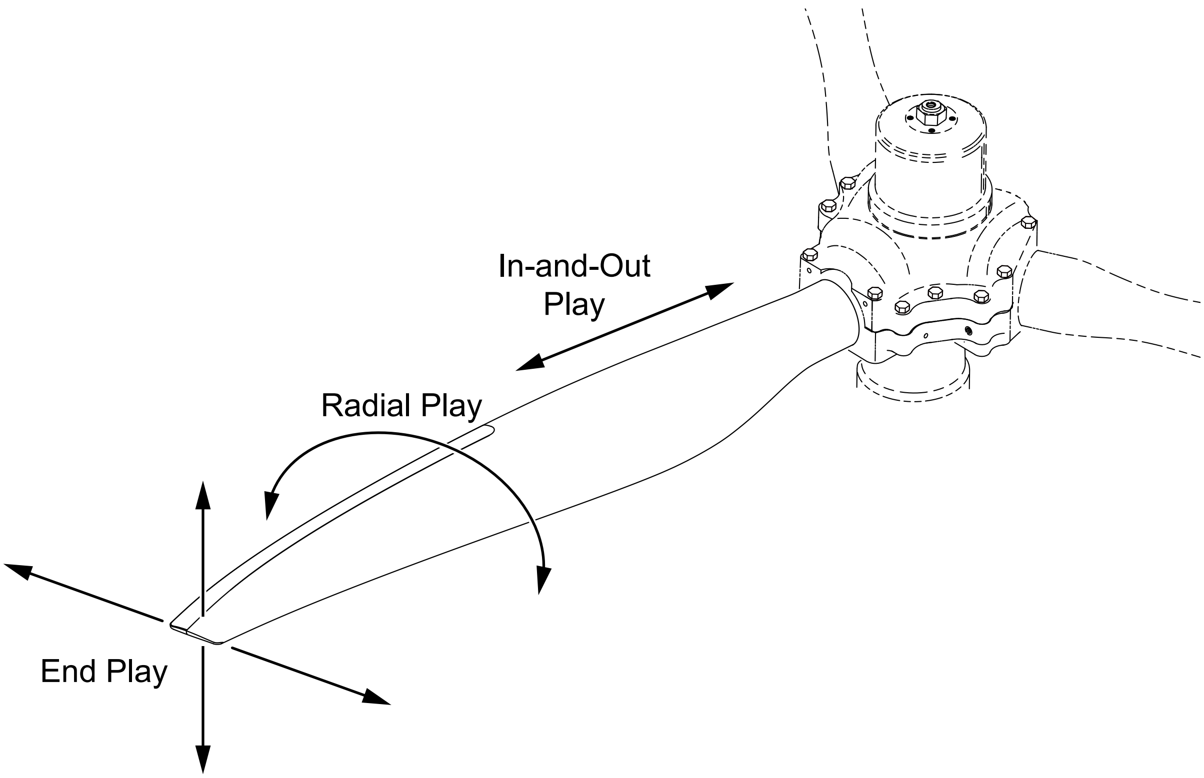
Problem		Probable Cause	Remedy
C. Abnormal Propeller Vibration		Bent, cracked, or damaged blade.	Refer to Hartzell Propeller Inc. Manual 133C (61-13-33) for aluminum blades.
	or	Cracked or damaged hub.	Refer to the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A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

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



Inspection for Leakage of Oil or Grease
Figure 1-1

Problem		Probable Cause	Remedy
F. Oil Leakage (Refer to Figure 1-1)		Faulty O-ring seal between the engine flange and the propeller mounting flange.	Remove the propeller from the engine and inspect the O-ring and the sealing surface. Replace the defective O-ring.
	or	Faulty O-ring seal between the cylinder and the hub.	Remove the cylinder and inspect the O-ring and the sealing surface. Replace the defective O-ring.
	or	Faulty O-ring seal between the pitch change rod plug and the pitch change rod.	Remove the pitch change rod plug and replace the defective O-ring on the OD of the pitch change rod plug.
	or	Faulty O-ring seal between the pitch change rod and either hub half, resulting in leakage from the hub and around the blade shanks.	Remove the lubrication fitting at the bottom of the hub and insert a wire. If oil runs out, then one or both O-rings are defective. Remove the propeller from the engine and disassemble. Inspect both O-rings and sealing surfaces. Replace the defective O-ring(s).
	or	Faulty O-ring seal in the piston groove, resulting in oil leakage from between the reverse adjust sleeve and the cylinder or from between the pitch change rod and the reverse adjust sleeve.	Remove the propeller from the engine and remove the cylinder from the propeller hub. Replace the O-ring in the piston groove.
	or	Faulty O-ring seal in the ID of the pitch change rod plug, resulting in oil leakage from between the pitch change rod plug and the beta rod.	Remove pitch change rod plug and replace the defective O-ring on the ID of the pitch change rod plug.
G. Grease Leakage (Refer to Figure 1-1) A new or newly overhauled propeller may leak slightly during the first several hours of operation. The leakage may be caused by the seating of seals and O-rings, and the slinging of lubricants used during assembly. Such leakage should cease within the first ten hours of operation.		Defective lubrication fitting.	Replace defective lubrication fittings.
	or	Faulty O-ring or blade sealing surface at the blade socket in the hub.	Disassemble the propeller and inspect the O-ring and the sealing surface. Replace defective O-ring.
	or	Too much grease was used for lubrication, resulting in leakage.	Disassemble the propeller and remove excess grease from the hubs.



NOTE: Blades are intended to be tight in the propeller; however, slight play is acceptable if the blade returns to its original position when released. Blades with too much play or blades that do not return to their original position when released may indicate internal wear or damage that should be referred to a certified propeller repair station with the appropriate rating.

TPI-MB-0027b

Checking Blade Play
Figure 1-2

Problem	Probable Cause	Remedy
H. End-Play (Leading Edge to Trailing Edge) of the Blade CAUTION: END-PLAY IS NOT PERMITTED. (REFER TO FIGURE 1-2 FOR NOTE).	Buildup of manufacturing tolerances.	Disassemble the propeller and reset the preload. Replace the preload plate unit (980), if necessary.
	or Blade retention bearing (1040) is worn.	Follow Blade Retention Split Bearing Inspection and Replacement Procedures.
	or Internal blade bearing is worn.	Disassemble the propeller, remove the blade, and inspect the bearing. Replace the worn bearing.
I. End-Play (Fore-and-Aft) of the Blade CAUTION: FORE-AND-AFT PLAY IS NOT PERMITTED. (REFER TO FIGURE 1-2 FOR NOTE).	Buildup of manufacturing tolerances.	Disassemble the propeller and reset the preload. Replace the preload plate unit (980), if necessary.
	or Blade retention bearing (1040) is worn.	Follow Blade Retention Split Bearing Inspection and Replacement Procedures.
	or Internal blade bearing is worn.	Disassemble the propeller, remove the blade, and inspect the bearing. Replace the worn bearing.
J. In-and-Out Play of the Blade CAUTION: IN-AND-OUT PLAY IS NOT PERMITTED. (REFER TO FIGURE 1-2.)	Buildup of manufacturing tolerances.	Disassemble the propeller and reset the preload. Replace the preload plate unit (980), if necessary.
	or Blade retention bearing (1040) is worn.	Follow Blade Retention Split Bearing Inspection and Replacement Procedures.
K. Excessive Radial Play of the Blade (backlash) NOTE: Radial play of ±0.5 degree (1 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 cam follower (960) is worn.	Disassemble the propeller. Inspect and replace the cam follower, as required.

Problem		Probable Cause	Remedy
L. Blades Not Tracking		Ground strike damage.	For aluminum blade repair procedure, refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).
	or	Blade twist is not correct.	For aluminum blade repair procedure, refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

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

A. Before Further Flight

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

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

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

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

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

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DISASSEMBLY - CONTENTS

LIST OF FIGURES

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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/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 <u>not</u> 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-D3F-7H 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 175 PSI (12.06 BARS) OF PRESSURE WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

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

A. Hub Plug Removal

(1) Rotate the blades by hand to move the propeller to high pitch.

(2) Turn the propeller over and put it on a support so the propeller mounting flange is accessible.

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

(3) Using puller TE98, or equivalent, remove the hub plug (610).

(a) Put the puller TE98 on the end of the pitch change rod (430), with the O-ring of the puller TE98 on the pitch change rod.

(b) Put the pulling ends of the puller TE98 firmly in the recesses of the hub plug (610).

(c) Tighten the puller TE98 until the hub plug (610) is removed from the bore of the hub.

(4) Remove and discard the hub plug OD O-ring (620).

(5) Remove and discard the hub plug ID O-ring (630).

B. Hub Balance Weight Removal

(1) Remove the safety wire from the balance weight screws (1130).

(2) Remove and discard the balance weight screws (1130).

(3) Remove the balance weights (1140).

C. Counterweight Removal

(1) Aluminum Blade Counterweight Removal

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

D. Beta Valve Disassembly

(1) Beta Valve Disassembly - Engine Side

(a) Remove and discard the set screw (1800).

(b) Remove the rod end cap unit (1790).

(c) Remove the rod end fitting (1780).

(d) Remove the beta valve bushing (1770).

(e) Remove and discard the thin hex nut (1760).

(f) Remove the engine cover (1740) that is around the beta valve.

(g) Remove and discard the OD O-ring (1720) and the ID O-ring (1730) from the engine cover (1740).

(h) Remove and discard the O-ring (1710) from the ID of the beta valve spool (1700). This O-ring (1710) also encircles the pitch indicator (1680).

(2) Beta Valve Disassembly - Propeller Side

<u>NOTE</u>: The following part removals must be accomplished before removing the propeller from the engine.

(a) Remove and discard the self locking nut (1610).

(b) Remove the beta valve spacer (1620).

<u>NOTE</u>: Steps 2.D.(2)(c) through 2.D.(2)(g) are not required for removal of the beta valve although removal of the pitch change rod plug (70) from the propeller will make it easier to remove the propeller from around the primary beta valve rod (1660).

(c) On the propeller, remove and discard the safety wire between the hex of the pitch change rod plug (70) and the adjacent drilled thin hex nut (40).

(d) Using two 1 inch wrenches, break the jam between the drilled thin hex nut (40) and the pitch change rod plug (70) hex.

(e) Rotate the drilled thin hex nut (40) up against the two jammed drilled thin hex nuts (50) so that the drilled thin hex nut (40) will remain with the propeller.

(f) Unthread the pitch change rod plug (70) from the pitch change rod (430) and slide the pitch change rod plug (70) completely out of the end of the pitch change rod (430) and off the end of the primary beta valve rod (1660).

(1) Remove and discard the O-rings (100,110) from the pitch change rod plug (70).

(2) Remove and discard the internal retaining ring (90) from the pitch change rod plug (70).

(3) Using a locally procured 8 mm x 1.00 standard tap, thread the tap in the bushing (80).

(4) Pull the bushing (80) from the pitch change rod plug (70).

(5) Discard the bushing (80).

(g) Install a pitch angle stop plug TE86 in the same location from which the pitch change rod plug (70) was removed.

(h) Remove the propeller in accordance with Hartzell Propeller Inc. Owner's Manual 149 (61-00-49).

NOTE: The propeller must be removed before removing additional beta valve parts.

(i) Remove the engine manufactured/supplied retaining ring (REF).

(j) Remove the beta spring retainer (1630).

(k) Remove the compression spring (1640) from the inside of the engine shaft.

(l) Slide the remaining beta valve sub-assembly (refer to Figure 7-31), including the beta valve spool (1700) (refer to Figure 7-32) through the engine shaft and exit the engine shaft on the propeller side of the engine shaft.

(m) Slide the beta valve spool (1700) out of the beta valve sleeve (1690) and off the end of the pitch indicator pin (1680).

NOTE: The beta valve shaft adaptor, item (1693), is a shouldered sleeve that is engine supplied and installed in the engine shaft. The purpose of item (1693) is to transfer oil from the holes in the engine shaft to the beta valve sleeve (1690). The shouldered sleeve (1693) is held by an engine manufacturer supplied retaining ring (1695). Two O-rings of the same size (1692) are installed in the inside diameter grooves and two O-rings of different sizes (1691) and (1694) are installed on the outside diameter grooves.

(n) Replace the four O-rings (1691,1692,1694) in accordance with the engine manufacturer's instructions. Refer to Figure 10-3.

(3) Disassembly of the C-1159-1 Beta Valve Sleeve Unit

(a) Drive the 3/32 inch diameter spring pin (1670) out of the beta valve sleeve (1690) using a locally procured flat bottom punch of similar diameter.

(b) Remove and discard the spring pin (1670).

NOTE: Use soft gripping tools on the primary beta valve rod (1660) and the beta valve sleeve (1690) to generate the removal torque required. Do not insert a pin into the four hole location of the beta valve sleeve (1690) as any damage, however slight, to these holes is not permitted. A pin may be inserted into the two hole location of the beta valve sleeve (1690) although material deformation past the beta valve sleeve (1690) ID or OD is not permitted.

(c) Using soft gripping tools on the primary beta valve rod (1660) and the beta valve sleeve (1690), turn the primary beta valve rod (1660) from the beta valve sleeve (1690).

(d) Push the pitch indicator (1680) pin through the beta valve sleeve (1690) and remove from the beta valve sleeve (1690) on the same side as the beta valve rod (1660) was removed.

E. Hydraulic System and Pitch Adjustment Unit Disassembly

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

(2) Remove and discard the safety wire from the drilled thin hex nuts (50) on the pitch change rod (430).

(3) Separate the drilled thin hex nuts (40,50) from each other by rotating in opposite directions.

(4) Apply 200 psi (13.8 bar) air or oil pressure to the propeller to move the pitch change rod drilled thin hex nuts (40,50) off the reverse adjust sleeve unit (280).

(5) Remove the drilled thin hex nuts (40,50) from the pitch change rod (430).

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

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

(7) Remove and discard the safety wire between the fillister head screw (130) on the cylinder (120) and the drilled thin hex nut (60) on the reverse adjust sleeve unit (280).

(8) Remove and discard the fillister head screw (130) and the corrosion resistant washer (140).

(9) Loosen and remove the drilled hex nut (60) from the reverse adjust sleeve unit (280).

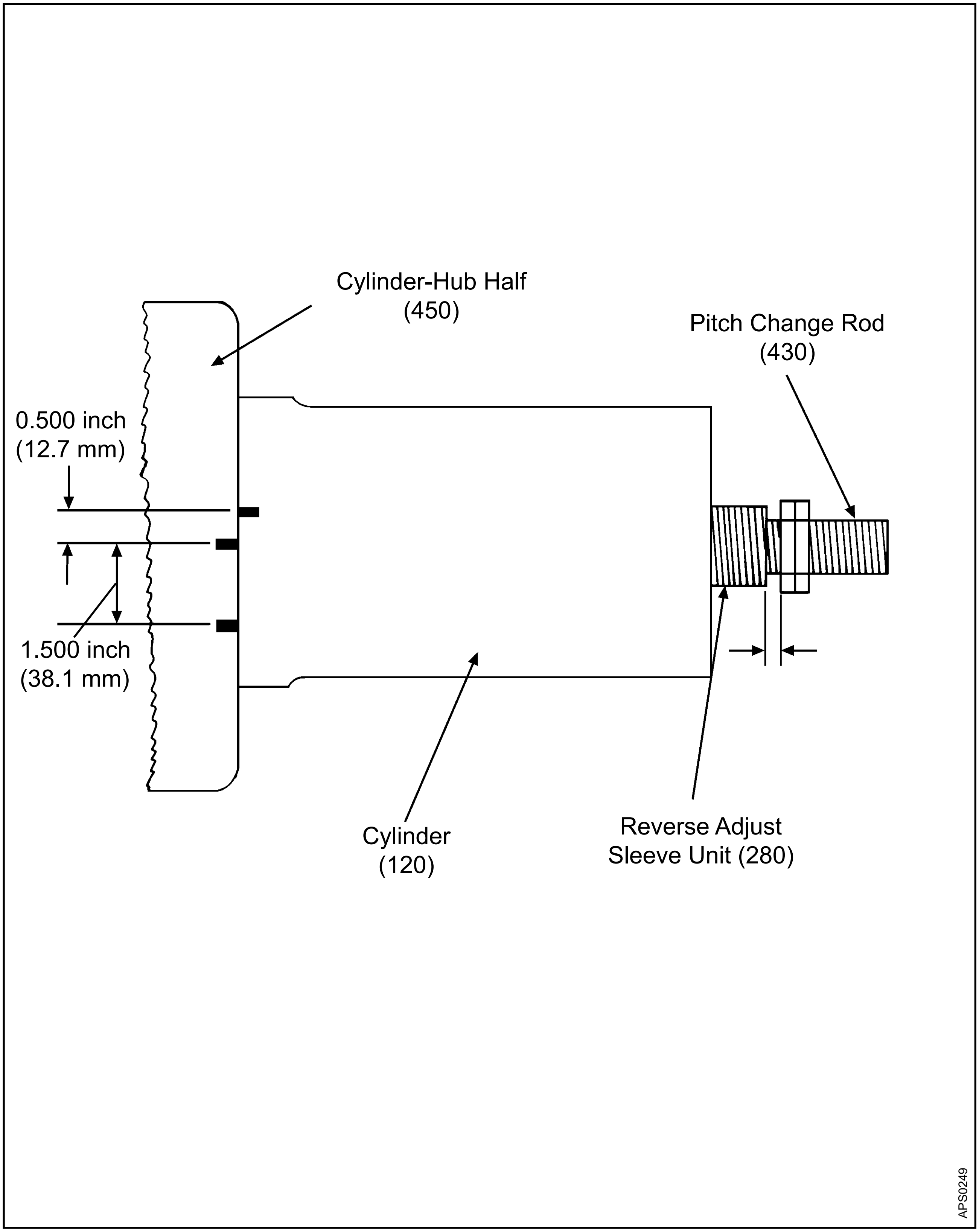
WARNING: THE FEATHERING COMPRESSION SPRING IS PRELOADED TO APPROXIMATELY 600 POUNDS (271.8 KG) OF FORCE. FAILURE TO FULLY COMPRESS THE FEATHERING COMPRESSION SPRING INTO THE CYLINDER BEFORE CYLINDER REMOVAL COULD RESULT IN INJURY OR DEATH.

(10) Using a 1-3/16 inch open-end wrench on the flats, turn the reverse adjust sleeve unit (280) counterclockwise to fully compress the feathering compression spring (260).

NOTE: The feathering compression spring (260) will compress between the cylinder or forward spring retainer (250) and the plastic spring guide (270).

(11) Attach a cylinder wrench TE153 to the top of the cylinder (120).

(a) Install four (4) 1/4-28 UNF-3B screws through the wrench TE153 into the four threaded holes provided in the cylinder (120).



Cylinder Removal
Figure 3-1

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

CAUTION: DO NOT DAMAGE THE CYLINDER THREADS WHEN REMOVING THE CYLINDER (120) FROM THE HUB (450).

(12) Removing the cylinder (120) from the hub (450).

(a) Using permanent ink, make a mark on the lower end of the cylinder (120), then make a mark on the hub (450) 0.500 inch (12.70 mm) counterclockwise from the mark on the cylinder. Make a second mark on the hub 1.500 inches (38.10 mm) counterclockwise from the first mark on the hub. Refer to Figure 3-1.

(b) Using a breaker bar, turn the cylinder (120) counterclockwise 0.500 inch (12.70 mm) until the mark on the cylinder lines up with the first mark on the hub (450).

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

CAUTION 2: MAKE SURE THAT THE TORQUE REQUIRED TO TURN THE CYLINDER THE REQUIRED 1.500 INCHES (38.10 mm) IS NOT MORE THAN 235 FT-LB (319 N•m).

(c) Using a calibrated torque wrench, apply 235 Ft-Lb (319 N•m) of corrected torque to the cylinder threads to turn the cylinder (120) counterclockwise 1.500 inches (38.1 mm) until the mark on the cylinder lines up with the second mark on the hub (450).

1 If the torque is more than 235 Ft-Lb (319 N•m), refer to the Cylinder Removal section in the Repair chapter of this manual.

(d) If the torque required to turn the cylinder (120) an additional 1.500 inches (38.1 mm) was not more than 235 Ft-Lb (319 N•m), reset the torque wrench to achieve an actual torque of 55 Ft-Lb (75 N•m).

CAUTION: MAKE SURE THAT THE TORQUE REQUIRED TO REMOVE THE CYLINDER IS NOT MORE THAN 55 FT-LB (75 N•m).

(e) Making sure that the torque is not more than 55 Ft-Lb (75 N•m), turn the cylinder (120) counterclockwise to remove the cylinder from the hub (450).

1 If the torque required to remove the cylinder is more than 55 Ft-Lb (75 N•m) actual torque, refer to the Cylinder Removal section in the Repair chapter of this manual.

(13) Lift the cylinder (120) and the retained feathering compression spring (260) off the pitch change rod (430) and put them aside for further disassembly.

(14) Remove the four (4) 1/4-28 UNF-3B screws that hold the cylinder wrench TE153 to the cylinder (120) and remove the cylinder wrench.

(15) Rotate the reverse adjust sleeve unit (280) clockwise to extend the feathering compression spring (260) and unthread the reverse adjust sleeve unit from the cylinder (120).

NOTE: The feathering compression spring (260) will fully extend before the reverse adjust sleeve unit (280) unthreads from the cylinder (120).

(16) Remove the reverse adjust sleeve unit (280), plastic spring guide (270), feathering compression spring (260), and spring seat (250) from the cylinder (120).

(17) Using a modified deep well socket TE120 on the self-locking hex nut (310) and a modified deep well socket TE120 with a 1-3/8 inch crowfoot wrench, remove the pitch change rod (430) and piston (330) from the fork (680).

(a) If the self-locking hex nut (310) comes loose from the pitch change rod (430) and piston (330) before the pitch change rod comes loose from the fork (680), perform the following procedure:

1 Remove and discard the self-locking hex nut (310) from the pitch change rod (430).

2 Remove the piston (330) from the pitch change rod (430).

3 Using a 1-5/16 inch wrench on the wrenching flats, unthread and remove the pitch change rod (430) from the fork (680).

(b) If the pitch change rod (430) comes loose from the fork (680) before the self-locking hex nut (310) comes loose, perform the following procedures:

1 Remove the pitch change rod (430) with the self-locking hex nut (310) and piston (330) from the fork (680).

2 Put the modified deep well socket TE120 on the self-locking hex nut (310).

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

4 Using a 1-5/16 inch wrench, engage the pitch change rod (430) flats under the piston (330) to loosen the self-locking hex nut.

5 Remove and discard the self-locking hex nut (310) from the pitch change rod (430).

6 Remove the piston (330) from the pitch change rod (430).

(18) Remove and discard the piston dust seal (380), piston OD O-ring (390), and piston ID O-ring (370).

(19) Remove and discard the cylinder mounting O-ring (440) from the cylinder-half hub shoulder.

(20) Remove all hex head bolts (570, 580), flat washers (590), and self-locking nuts (600) from the hub unit (450).

(21) Discard all flat washers (590) and self-locking nuts (600).

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

CAUTION 2: IF THE PROPELLER IS EQUIPPED WITH AN ICE PROTECTION SYSTEM, DO NOT TAP THE BLADE IN THE BOOT AREA.

(22) Using a soft mallet, lightly tap a blade to loosen and separate the halves of the hub unit (450).

CAUTION: DO NOT USE A SCREWDRIVER OR OTHER SHARP TOOL TO PRY THE HUB HALVES (450) APART.

(23) Using a plastic wedge TE138, or similar tool, gently pry apart the halves of the hub (450).

CAUTION: DO NOT PERMIT THE BLADE ASSEMBLIES TO FALL OUT OF THEIR SOCKETS WHEN THE CYLINDER-SIDE HALF OF THE HUB UNIT IS REMOVED.

(24) Remove the cylinder-side hub half of the hub unit (450).

(25) Remove and discard the cylinder-side hub half O-ring (560) that seals between the hub unit (450) and pitch change rod (430).

(26) Using blade clamp TE24, if desired, remove two adjacent blade assemblies from the fork (680) and hub half (450).

(27) Remove the fork unit (680).

(28) Remove the remaining blade assembly from the hub half (450).

(29) Remove the engine-side hub half (450) from the rotatable fixture.

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

F. Pitch Change Fork Disassembly

(1) Using a 3/8 inch wrench, remove the bumper extension (690) from each arm of the fork (680).

CAUTION: DO NOT DAMAGE THE BUMPER EXTENSION (690) WHEN REMOVING THE FORK BUMPER (700).

(2) Remove and discard the fork bumper (700) from each bumper extension (690).

3. Hub Disassembly

A. All Propeller Models

(1) Remove components of the hub unit/assembly (450) in accordance with the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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

4. Blade Disassembly

A. Blade Retention Parts Disassembly

(1) Remove and discard the blade O-ring (1100).

(2) Remove the hub-side blade bearing race (1080).

(3) Remove and discard the ball bearings (1070).

(4) Remove and discard the ball spacer (1090).

(5) Remove the preload plate unit (1000).

(6) Remove and discard the thin hex nut (1030) and set screw (1020) from the preload plate unit (1000).

(7) Remove the blade seal (1045) from the butt of the blade, if applicable.

(8) Remove and discard the blade seal O-ring (1046), if applicable.

(9) Remove and discard the screws/bolts (920) that attach the pitch change knob bracket (950).

(10) Remove the pitch change knob bracket (950) from the blade.

(a) If the dowel pin (940) remains in the blade, remove and discard the dowel pin.

(11) Using a suitable gear puller or brass drift, remove the bearing retaining ring (1040).

(12) Remove the blade-side blade bearing race (1060) of the blade retention bearing (1050).

B. Pitch Change Knob Bracket Unit Disassembly

(1) Remove and discard the screw (990) from the end of the pitch change knob bracket (950).

(2) Remove and discard the dimpled washer (980).

(3) Remove the knob unit retaining washer (970).

(4) Remove and discard the cam follower (960) from the pitch change knob bracket (950).

C. Propeller Blade Disassembly

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

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CLEANING - CONTENTS

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1. Cleaning Procedures (Rev. 4)

A. General Cleaning

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

B. Cleaning Steel Parts for Magnetic Particle Inspection

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

C. Cleaning Steel Parts for Cadmium Replating Procedures

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

D. Cleaning Aluminum Parts for Penetrant Inspection

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

E. Cleaning Titanium Parts for Penetrant Inspection

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

F. Cleaning Aluminum Parts for Chromic Acid Anodizing Procedures

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

G. Cleaning Cylinder Threads (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

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1. Inspection Interval Requirements (Rev. 1)

   A. General

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

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

2. Dimensional Inspection (Rev. 1)

   A. Diameter Measurements

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

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

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

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

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

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

   B. Decimal Places

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

3. Inspection Criteria/Procedures (Rev. 2)

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

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

B. Hubs

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

C. Blades

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

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

D. Ice Protection Systems

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

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

E. Spinner Assemblies (Metal and Composite)

(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)

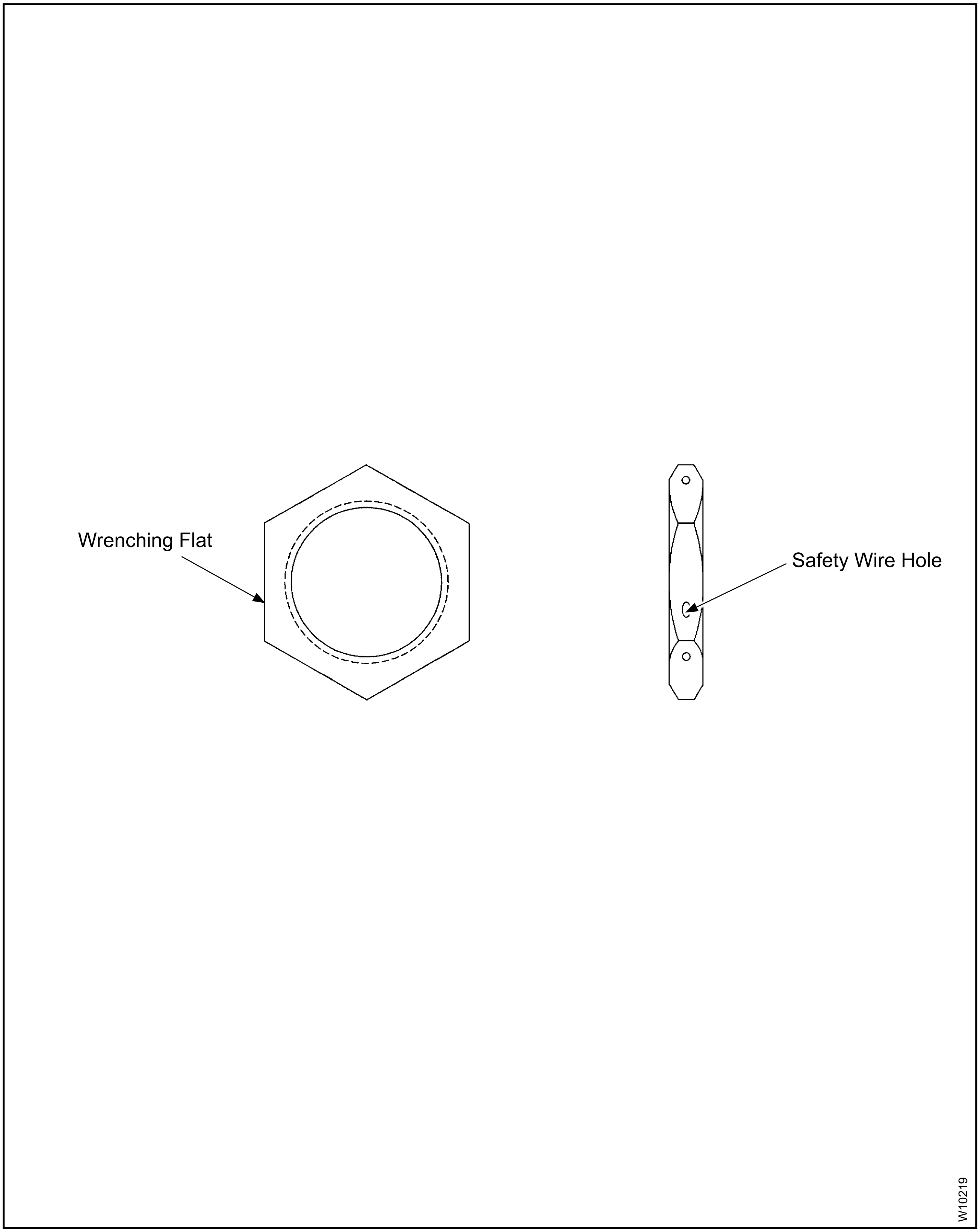
F. Special Inspections (Lightning Strike, Foreign Object Strike, etc.)

(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.

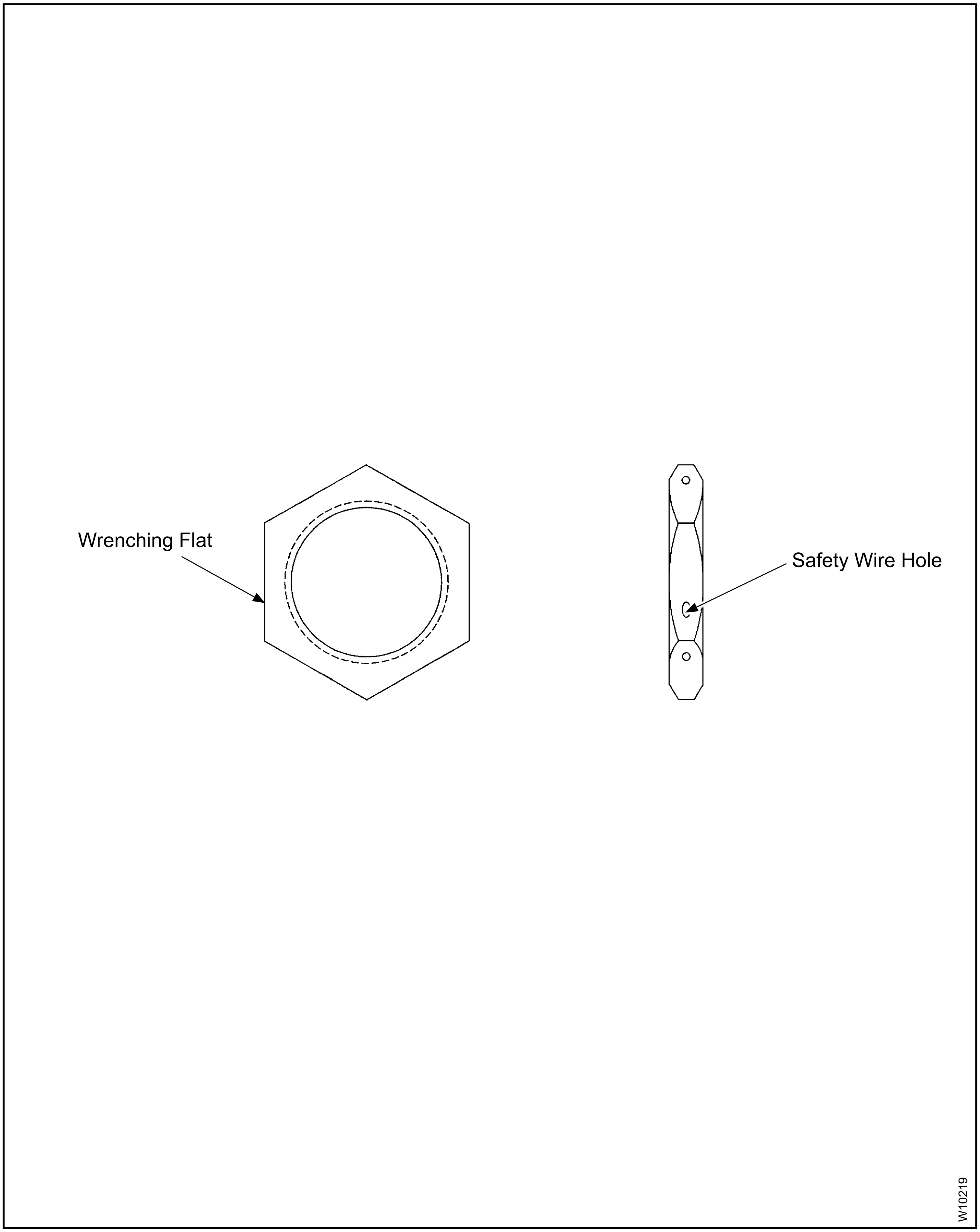
Refer to Table 5-1, "Component Inspection Criteria" in this chapter.



Drilled Thin Hex Nut
Figure 5-1

Component Inspection Criteria
Table 5-1

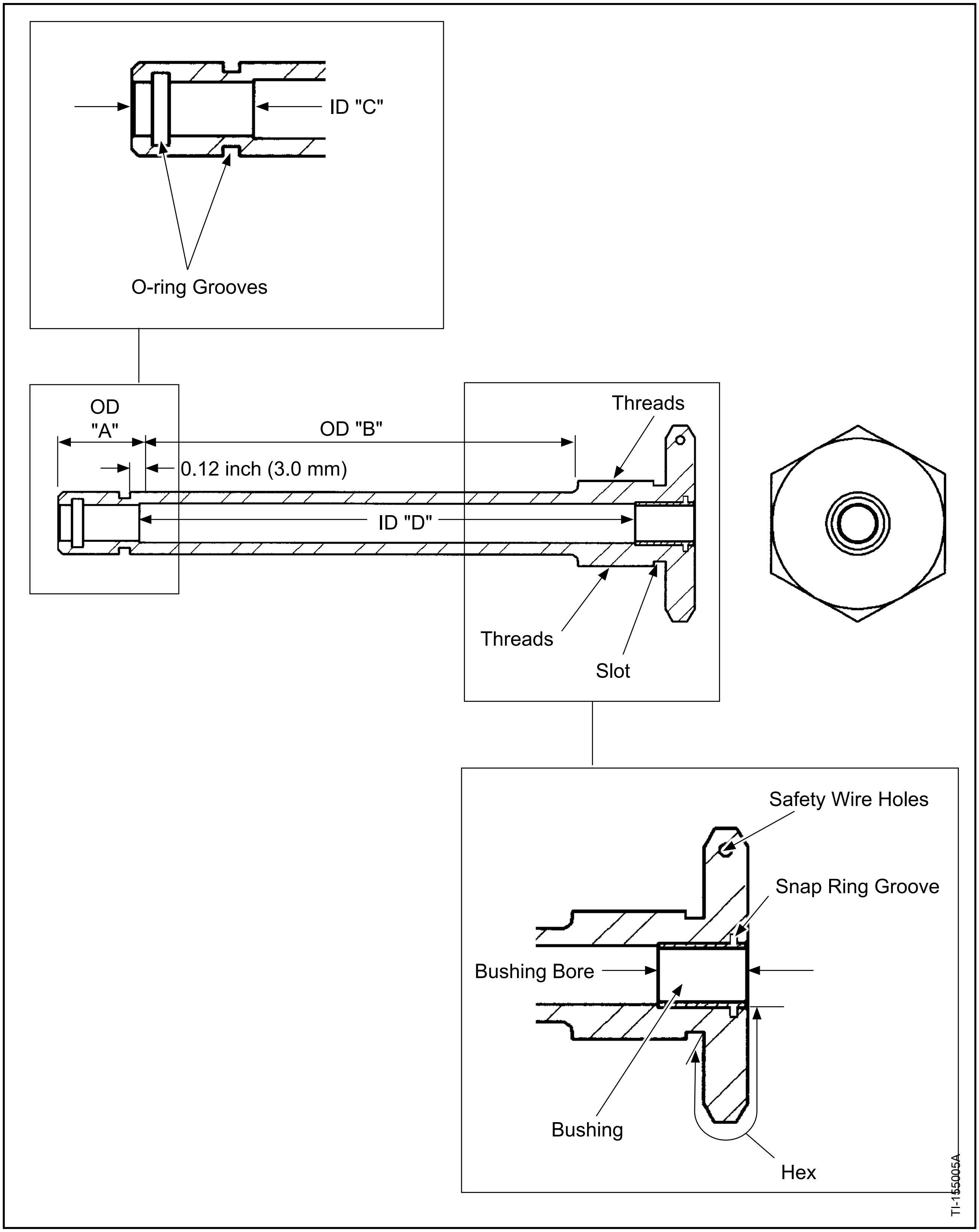
Inspect	Serviceable Limits	Corrective Action
A. DRILLED THIN HEX NUT (ITEM 40,50) (Refer to Figure 5-1)		
(1) Visually examine each drilled thin hex nut for wrench damage.	Corners between the wrenching flats may be rounded. Two (2) wrenching flats must be sufficiently undamaged to withstand installation torque. Material may not be displaced above or below the nut that could result in interference with the mating parts.	File away unwanted material displacement. If a minimum of two (2) flats will not withstand installation torque, replace the drilled thin hex nut.
(2) Visually examine each drilled thin hex nut for corrosion product and pitting on all surfaces.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the drilled thin hex nut. If pitting is greater than the permitted serviceable limits, replace the drilled thin hex nut.
(3) Visually examine each drilled thin hex nut for wear on surfaces other than the wrenching flats.	The maximum permitted depth of material loss is 0.005 inch (0.12 mm).	If the material loss is greater than the permitted serviceable limits, replace the drilled thin hex nut.
(4) Visually examine the safety wire holes.	Wrenching flat damage must not expose the holes and prevent retention of safety wire.	If the damage is greater than the permitted serviceable limits, replace the drilled thin hex nut.
(5) Visually examine the threads.	A maximum of 1/4 of one thread total accumulated damage is permitted.	If the damage is greater than the permitted serviceable limits, replace the drilled thin hex nut.
(6) Visually examine the drilled thin hex nut for cadmium plating coverage.	Cadmium plating must be on all surfaces of the drilled thin hex nut.	If the cadmium plating coverage is less than the permitted serviceable limits, replate the drilled thin hex nut in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Drilled Thin Hex Nut
Figure 5-2

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
B. <u>DRILLED THIN HEX NUT</u> (Item 60) (Refer to Figure 5-1)		
(1) Visually examine each drilled thin hex nut for wrench damage.	Corners between the wrenching flats may be rounded. Two (2) wrenching flats must be sufficiently undamaged to withstand installation torque. Material may not be displaced above or below the nut that could result in interference with the mating parts.	File away unwanted material displacement. If a minimum of two (2) flats will not withstand installation torque, replace the drilled thin hex nut.
(2) Visually examine each drilled thin hex nut for corrosion product and pitting on all surfaces.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the drilled thin hex nut. If pitting is greater than the permitted serviceable limits, replace the drilled thin hex nut.
(3) Visually examine each drilled thin hex nut for wear on surfaces other than the wrenching flats.	Maximum permitted depth of material loss is 0.005 inch (0.12 mm).	If the material loss is greater than the permitted serviceable limits, replace the drilled thin hex nut.
(4) Visually examine the safety wire holes.	Wrenching flat damage must not expose the holes and prevent retention of safety wire.	If the damage is greater than the permitted serviceable limits, replace the drilled thin hex nut.
(5) Visually examine the threads.	A maximum of 1/4 of one thread total accumulated damage is permitted.	If the damage is greater than the permitted serviceable limits, replace the drilled thin hex nut.
(6) Visually examine the drilled thin hex nut for cadmium plating coverage.	Cadmium plating must be on all surfaces of the drilled thin hex nut.	If the cadmium plating coverage is less than the serviceable limits, replate the drilled thin hex nut in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Pitch Change Rod Plug
Figure 5-3

Component Inspection Criteria
Table 5-1

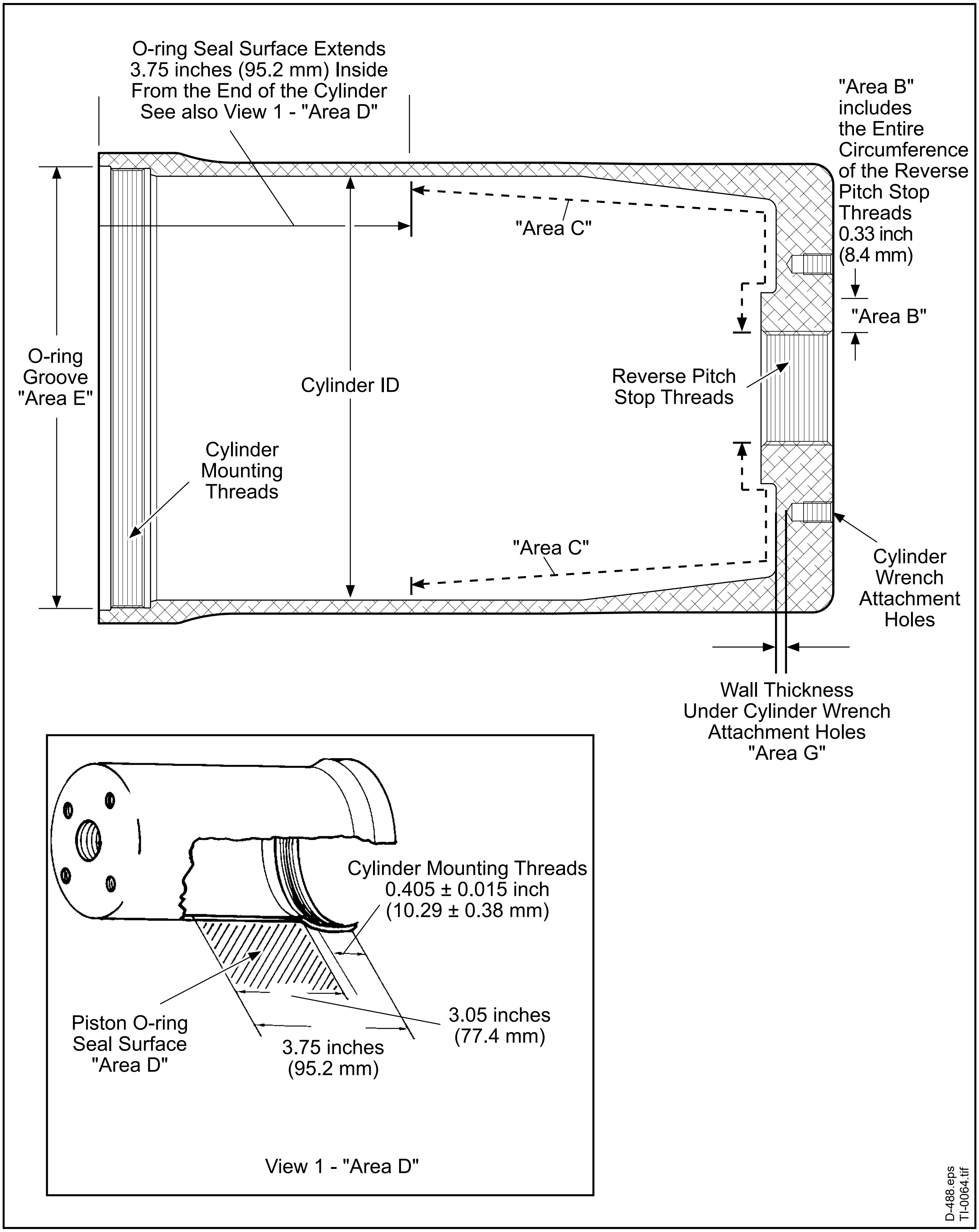
Inspect	Serviceable Limits	Corrective Action
C. PITCH CHANGE ROD PLUG (Item 70) (Refer to Figure 5-3)		
(1) Visually examine the hex of the pitch change rod plug for damage.	Corners between the wrenching flats may be rounded. Two wrenching flats must be sufficiently undamaged to withstand installation torque. Material may not be displaced above or below the hex that could result in interference with the mating parts.	File away unwanted material displacement. If a minimum of two flats will not withstand installation torque, replace the pitch change rod plug.
(2) Visually examine the pitch change rod plug for corrosion product and pitting on all surfaces.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. For ID "C", O-ring grooves, snap ring groove, and bushing bore, pitting is not permitted. For OD "A "and ID "D", the maximum permitted depth of pitting is 0.005 inch (0.12 mm). For OD "B", hex, slot, and threads, the maximum permitted depth of pitting is 0.010 inch (0.25 mm).	For the O-ring grooves, snap ring groove, ID "C", ID "D", or bushing bore, repair is not permitted for corrosion product or pitting. If there is corrosion product or pitting, replace the pitch change rod plug. For OD "A", OD "B", hex, slot, and threads, corrosion product may be removed using glass bead cleaning. Mask adjacent areas in which corrosion product removal is not permitted. 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 pitch change rod plug. If the corrosion product or pitting is greater than the permitted serviceable limits or does not meet the corrective action limits, replace the pitch change rod plug.
(3) Visually examine the threads of the pitch change rod plug for damage.	A maximum of two threads of total accumulated damage is permitted. Damage must not prevent correct threading into the pitch change rod.	If damage is greater than the permitted serviceable limits, replace the pitch change rod plug.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
C. PITCH CHANGE ROD PLUG, CONTINUED (Item 70) (Refer to Figure 5-3)		
(4) Visually examine all surfaces of the pitch change rod plug for damage.	For ID "C", O-ring grooves, snap ring groove, or bushing bore, damage is not permitted. For OD "A" and ID "D", the maximum permitted depth of damage is 0.005 inch (0.12 mm). For OD "B", hex, and slot, the maximum permitted depth of damage is 0.010 inch (0.25 mm).	If damage is greater than the permitted serviceable limits, replace the pitch change rod plug.
(5) Visually examine the bushing bore for wear.	Some abrasion of the cadmium plating is permitted. Apparent wear of the base material is not permitted.	If wear is greater than the permitted serviceable limits, strip the cadmium plating and measure the bushing bore in accordance with the serviceable limits for dimensional inspection of the bushing bore with the cadmium plating removed in this section.
	With the cadmium plating removed, the maximum permitted measurement of the bore is 0.3769 inch (9.573 mm).	If bore measurement is greater than the permitted serviceable limits, replace the pitch change rod plug.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
C. PITCH CHANGE ROD PLUG, CONTINUED (Item 70) (Refer to Figure 5-3)		
(6) Visually examine the snap ring groove for damage.	Pushed-up material that interferes with installation of the bushing is not permitted. Any damage must not interfere with the retention of the snap ring.	Pushed-up material may be lightly filed or polished using an abrasive pad CM47 or equivalent, back to the level of the surrounding undamaged material. If the damage interferes with the retention of the snap ring or if pushed-up material is not removable without additional damage, replace the pitch change rod plug.
(7) Visually examine all surfaces of the pitch change rod plug for cadmium plating coverage.	A few random scratches and edges with cadmium plating missing are permitted; otherwise, cadmium plating must cover the pitch change rod plug.	If the cadmium plating coverage is less than the permitted serviceable limits, cadmium replate the pitch change rod plug in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



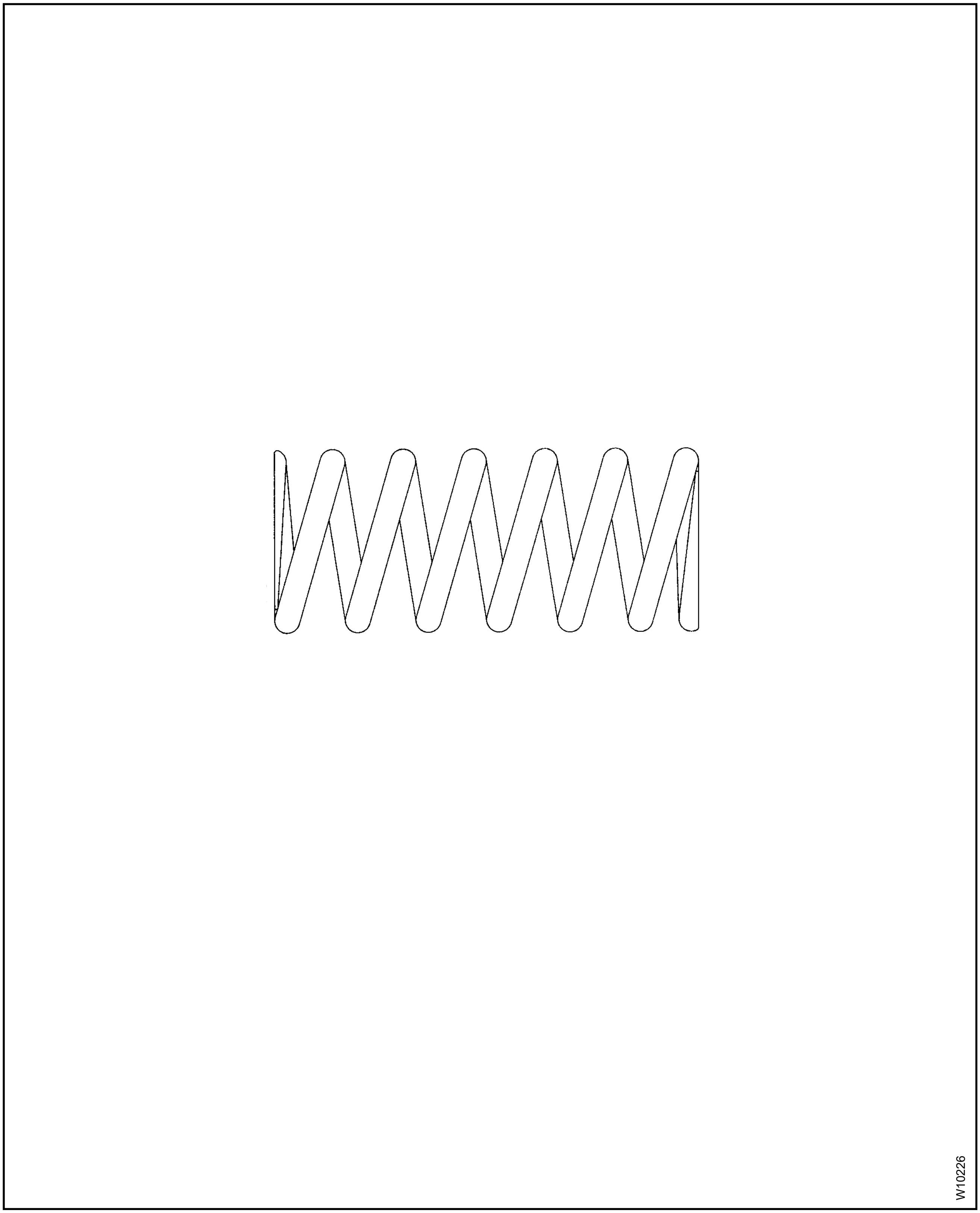
Cylinder
Figure 5-4

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
D. CYLINDER (Item 120) (Refer to Figure 5-4)		
(1) Except "Area B", visually examine the external surfaces of the cylinder for wear, nicks, scratches, or other damage.	The maximum permitted damage (including linear corrosion pitting) is: 0.5 inch (12 mm) length, 0.05 inch (1.2 mm) width, and 0.005 inch (0.12 mm) depth. Two damage marks closer than 0.5 inch (12 mm) at the nearest point are not permitted. Raised material is not permitted.	Using an abrasive pad CM47 or equivalent, lightly polish to blend out damage. If base aluminum is exposed, apply a chemical conversion coating in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If damage is greater than the permitted serviceable limits, replace the cylinder.
(2) Visually examine "Area B" for damage.	The maximum permitted depth of damage in "Area B" (around the entire circumference of the reverse pitch stop threads) is 0.020 inch (0.50 mm). Sufficient flat surface must remain to support the drilled thin hex nut.	If damage is greater than the permitted serviceable limits, replace the cylinder.
(3) Visually examine the cylinder wrench attachment holes for thread damage.	If there is damage, install a 1/4-28UNF-3B screw and verify that it will tighten to secure the cylinder wrench for installation and removal.	If damage is greater than the permitted serviceable limits, repair the cylinder wrench attachment holes in accordance with the Standard Repairs and Instructions chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If a previously repaired hole has damage that is greater than the permitted serviceable limits, replace the cylinder.
(4) If the cylinder wrench attachment holes are repaired with a Slimsert®, measure the depth of the cylinder wrench attachment holes ("Area G").	The minimum permitted wall thickness between the center point of the hole and the inner surface is 0.080 inch (2.03 mm).	If the wall thickness is less than the permitted serviceable limits, replace the cylinder.
(5) Visually examine the reverse pitch stop threads for damage.	A maximum of 1/2 of one thread total accumulated damage is permitted.	If damage is greater than the permitted serviceable limits, replace the cylinder.

Component Inspection Criteria
Table 5-1

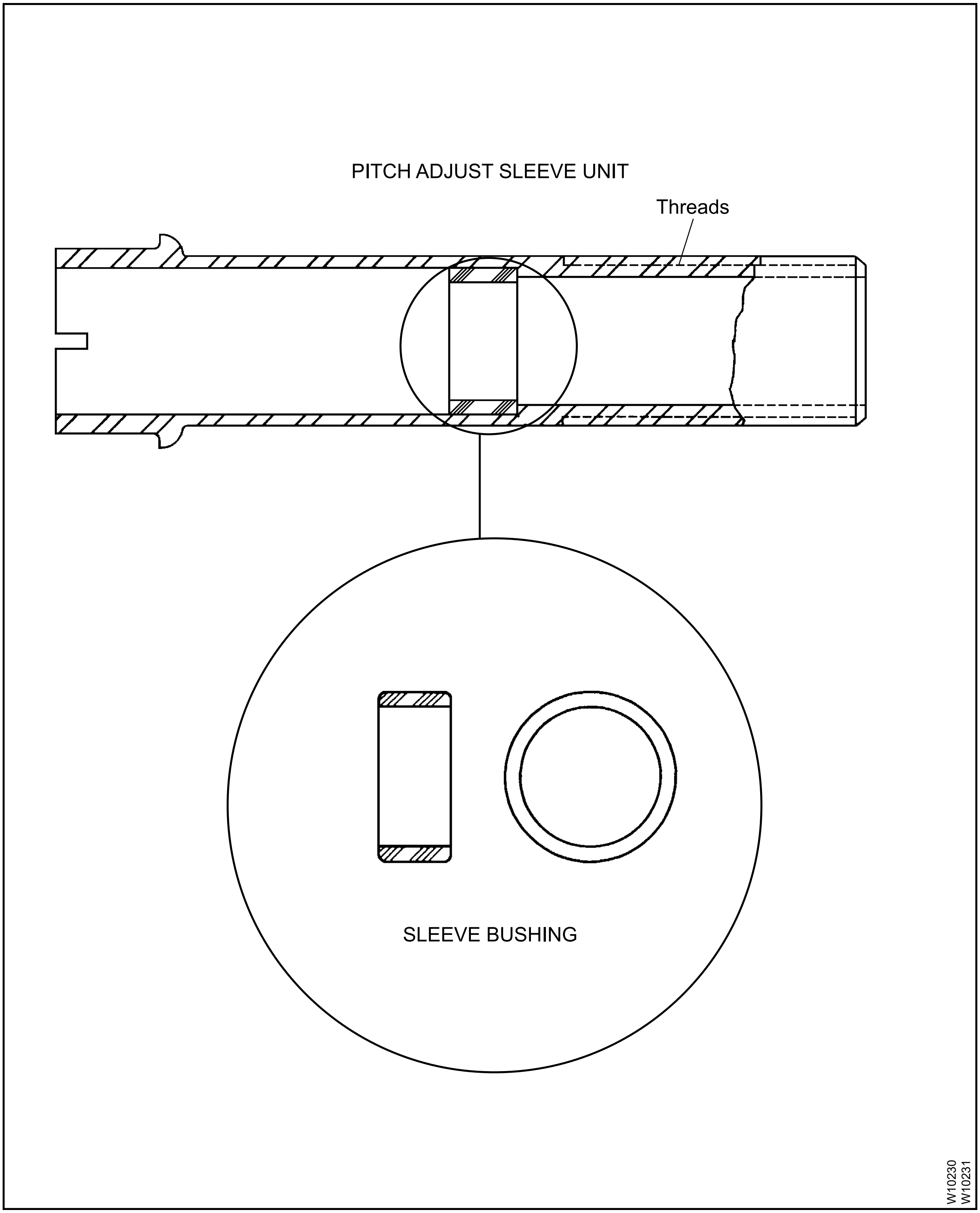
	Inspect	Serviceable Limits	Corrective Action
D.	CYLINDER, CONTINUED (Item 120) (Refer to Figure 5-4)		
(6)	Visually examine the cylinder-to-hub O-ring groove for wear ("Area E").	If the cylinder-to-hub O-ring groove shows wear, measure the ID. The maximum permitted O-ring groove ID is 4.745 inches (120.52 mm).	If the ID is greater than the permitted serviceable limits, replace the cylinder.
(7)	Visually examine the cylinder mounting threads for damage.	A maximum of 1/4 of one thread total accumulated damage is permitted.	If damage is greater than the permitted serviceable limits, replace the cylinder.
(8)	Visually inspect the internal surfaces, between the piston O-ring seal surface and the reverse pitch stop threads, for nicks, scratches, or other damage (Area "C").	The maximum permitted damage (including linear corrosion pitting) is: 0.5 inch (12 mm) length, 0.05 inch (1.2 mm) width and 0.005 inch (0.12 mm) depth. Two damage marks closer than 0.5 inch (12.7 mm) at the nearest point are not permitted. Raised material is not permitted.	Using an abrasive pad CM47 or equivalent, lightly polish to blend out damage. If base aluminum is exposed, chemical conversion coat in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If damage is greater than the permitted serviceable limits, replace the cylinder.
(9)	Measure the cylinder mounting thread ID within the 0.405 ± 0.015 inch (10.29 ± 0.38 mm) dimension from the end of the cylinder at six positions, 30 degrees apart.	The maximum permitted cylinder thread ID is 4.5688 inches (116.047 mm).	If thread ID is greater than the permitted serviceable limits, replace the cylinder.
(10)	Measure the cylinder ID where the piston O-ring seals (Area "D").	The maximum permitted cylinder ID is 4.372 inches (111.04 mm).	If the cylinder ID is greater than the permitted serviceable limits, replace the cylinder.



Feathering Compression Spring
Figure 5-5

Component Inspection Criteria
Table 5-1

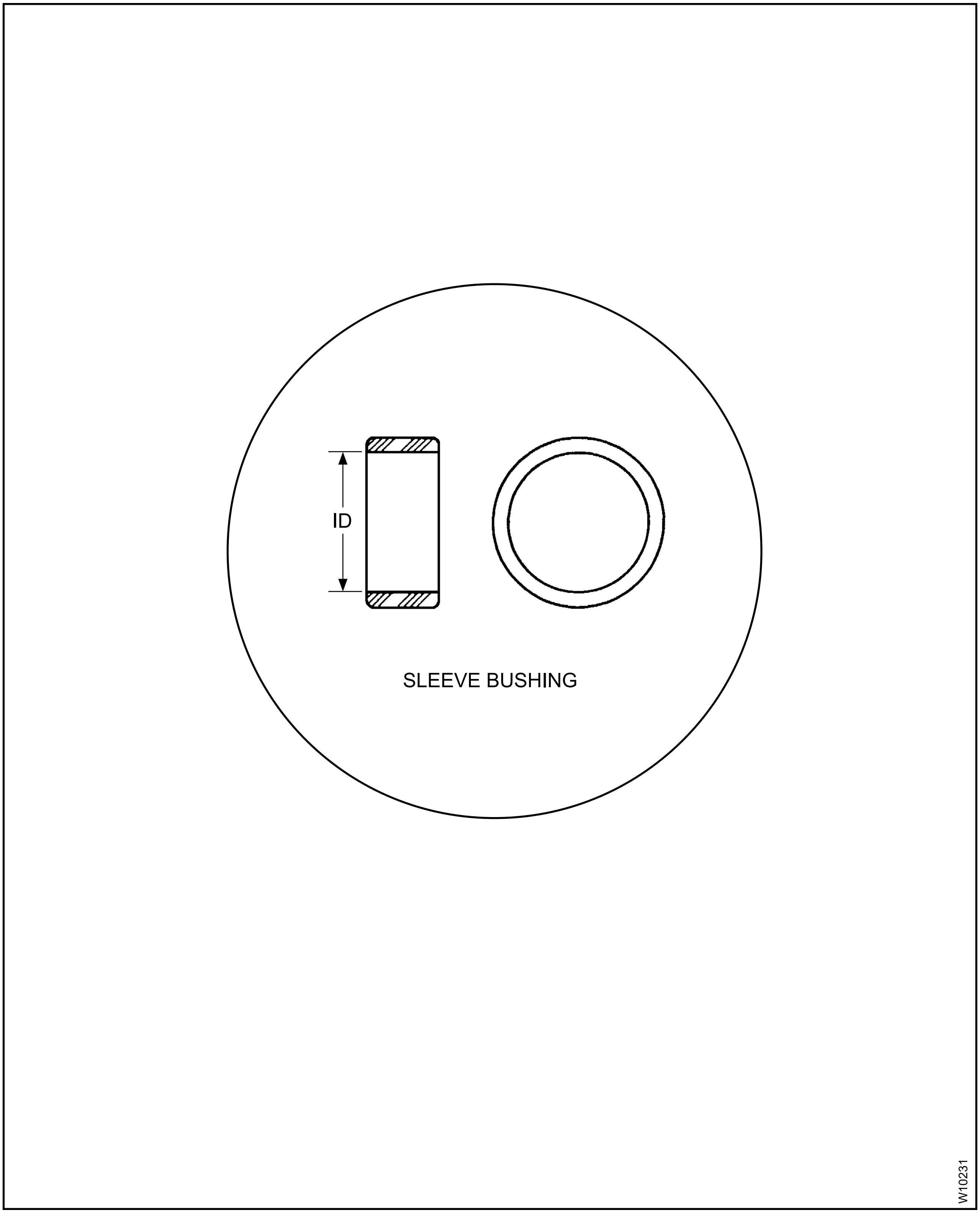
	Inspect	Serviceable Limits	Corrective Action
E.	FEATHERING COMPRESSION SPRING (Item 260) (Refer to Figure 5-5)		
(1)	Visually examine the feathering compression spring for corrosion product and pitting.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the feathering compression spring. If the pitting is greater than the permitted serviceable limits, replace the feathering compression spring.
(2)	Visually examine the feathering compression spring for wear, nicks, or other damage.	The maximum permitted depth of wear, nicks, or other damage is 0.005 inch (0.12 mm).	If damage is greater than the permitted serviceable limits, replace the feathering compression spring.
(3)	Magnetic particle inspect the feathering compression spring in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). Do not strip the original zinc plating or zinc chromate primer.	A relevant indication is not permitted.	If there is a relevant indication, replace the feathering compression spring.
(4)	After magnetic particle inspection, visually examine the feathering compression spring for zinc plating or zinc chromate primer coverage.	A few random scratches are permitted; otherwise, complete coverage of zinc plating or zinc chromate primer on all surfaces of the feathering compression spring is required.	Apply a layer of zinc chromate primer CM67, or equivalent, to the feathering compression spring in accordance with the Repair chapter of this manual. Do not apply zinc chromate primer before magnetic particle inspection.



Pitch Adjust Sleeve Unit and Sleeve Bushing
Figure 5-6

Component Inspection Criteria
Table 5-1

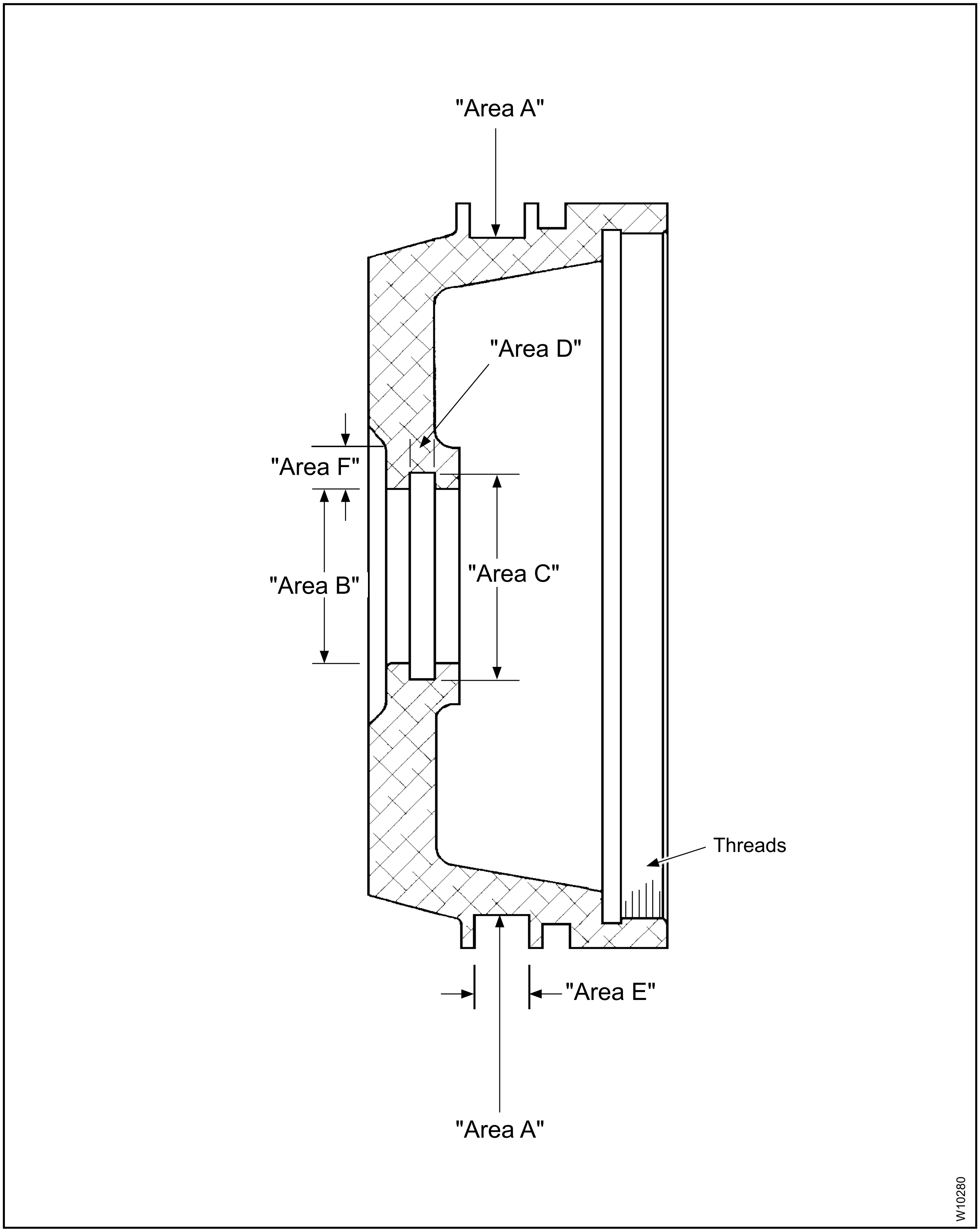
Inspect	Serviceable Limits	Corrective Action
F. PITCH ADJUST SLEEVE UNIT (Item 280) (Refer to Figure 5-6)		
(1) Visually examine the pitch adjust sleeve threads for damage.	A total of one thread accumulated damage is permitted. Thread damage must not interfere with the movement of the mating jam nut or movement of the pitch adjust sleeve in the cylinder.	If damage is greater than the permitted serviceable limits, replace the pitch adjust sleeve unit.
(2) Magnetic particle inspect the pitch adjust sleeve unit in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). NOTE: It is not necessary to remove the sleeve bushing.	A relevant indication is not permitted.	If there is a relevant indication, replace the pitch adjust sleeve unit.
(3) Visually examine the pitch adjust sleeve unit for cadmium plating coverage.	A few scratches, corners with plating missing, and light wear of the plating from the threads because of nut installation is permitted; otherwise, complete cadmium plating coverage is required.	If the cadmium plating coverage is less than the permitted serviceable limits, remove the sleeve bushing (300) and replate the pitch adjust sleeve in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). For sleeve bushing removal procedures, refer to the Repair chapter of this manual.



Sleeve Bushing, Pitch Adjust Sleeve Unit
Figure 5-7

Component Inspection Criteria
Table 5-1

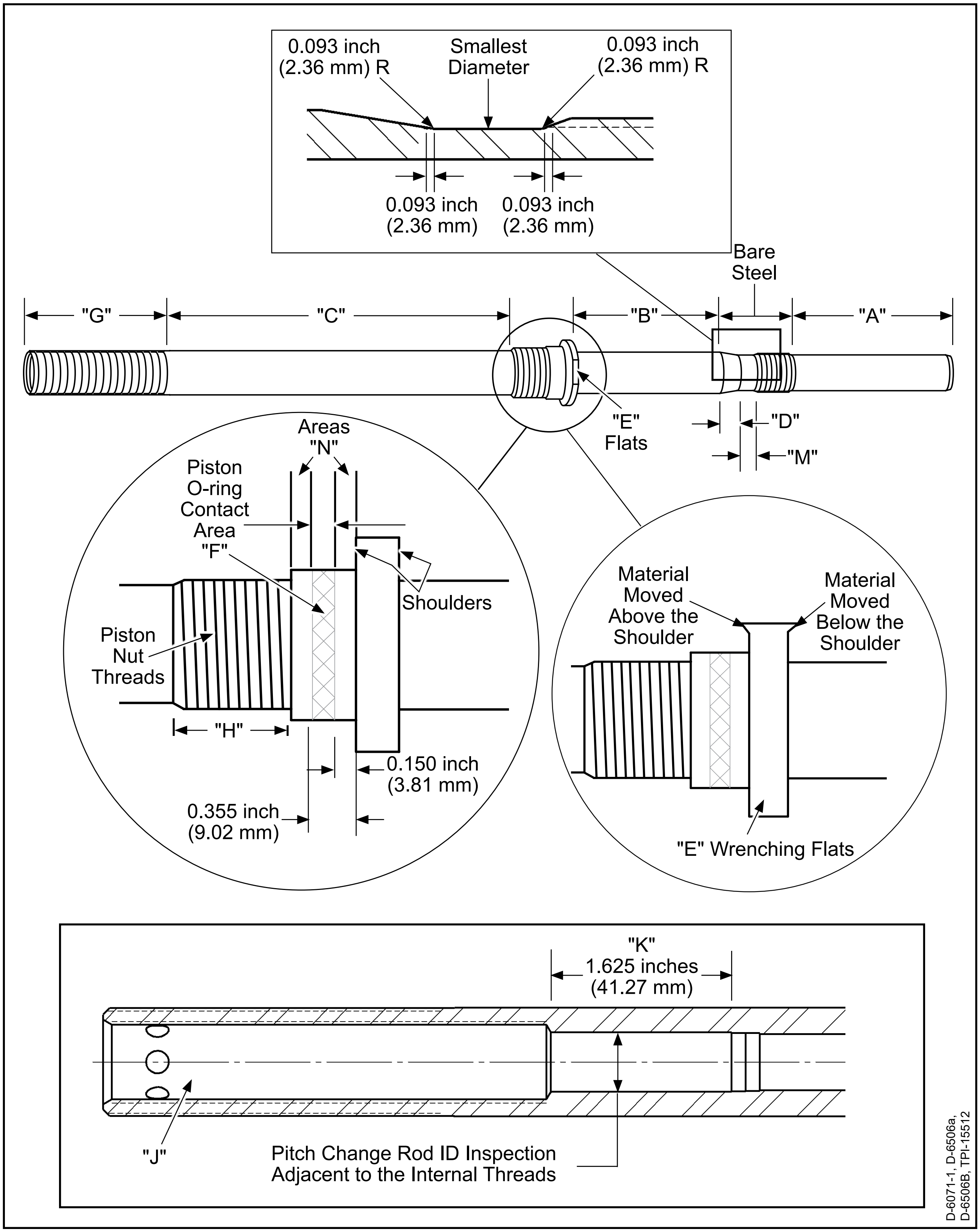
Inspect	Serviceable Limits	Corrective Action
G. <u>SLEEVE BUSHING</u> (Item 300) (Refer to Figure 5-7)		
(1) Visually examine the sleeve bushing ID for damage.	The maximum permitted depth of damage is 0.010 inch (0.25 mm). The maximum permitted total accumulated damage to the ID surface is 10%.	If damage is greater than the permitted serviceable limits, remove and replace the sleeve bushing in accordance with the Repair chapter of this manual. <u>NOTE</u>: If the pitch adjust sleeve unit (280) must be replated, install the sleeve bushing after plating.
(2) Measure the ID of the sleeve bushing.	The maximum permitted ID is 1.006 inch (25.55 mm).	If the ID is greater than the permitted serviceable limits, remove and replace the sleeve bushing in accordance with the Repair section of this manual. <u>NOTE</u>: If the pitch adjust sleeve unit (280) must be replated, install the sleeve bushing after plating.



Piston
Figure 5-8

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
H. PISTON (Item 330) (Refer to Figure 5-8)		
(1) Excluding the O-ring grooves, visually examine the anodized surfaces of the piston for wear, nicks, scratches, or other damage.	The maximum permitted depth of wear, nicks, scratches, or other damage is 0.005 inch (0.12 mm).	If damage is greater than the permitted serviceable limits, replace the piston.
(2) Visually examine the piston bore recessed area around the entire circumference of the center hole for scoring or gouging caused by pitch change rod wrenching flats (Area "F").	The maximum permitted depth of damage is 0.030 inch (0.76 mm). Sufficient flat surface must remain in Area "F" to support the piston correctly on the pitch change rod shoulder.	If damage is greater than the permitted serviceable limits, replace the piston.
(3) Measure the piston O-ring groove OD (Area "A").	The minimum permitted O-ring groove OD is 3.990 inches (101.35 mm).	If the OD is less than the permitted serviceable limits, replace the piston.
(4) Measure the piston bore ID (Area "B").	The maximum permitted bore ID is 1.191 inch (30.25 mm).	If the ID is greater than the permitted serviceable limits, replace the piston.
(5) Measure the piston O-ring groove ID (Area "C").	The maximum permitted O-ring groove ID is 1.416 inch (35.96 mm).	If the ID is greater than the permitted serviceable limits, replace the piston.
(6) Measure the piston O-ring groove width (Area "D").	The maximum permitted O-ring groove width in area "D" is 0.180 inch (4.57 mm). The minimum permitted O-ring groove width in area "D" is 0.163 inch (4.15 mm).	If the width is greater than the permitted serviceable limits, replace the piston.
(7) Measure the piston O-ring groove width (Area "E").	The maximum permitted O-ring groove width in area "E" is 0.296 inch (7.51 mm).	If the width is greater than the permitted serviceable limits, replace the piston.



Pitch Change Rod
Figure 5-9

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
I. <u>PITCH CHANGE ROD</u> (Item 430) (Refer to Figure 5-9)		
(1) Visually examine the pitch change rod for corrosion product and pitting.	Except where specifically permitted in this section, corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. Pitting is not permitted.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the pitch change rod. If there is pitting, replace the pitch change rod.
(2) Visually examine the pitch change rod for chrome plating coverage (Areas "A", "B", and "C")	Minor wear on corners and random light scratches are permitted, otherwise, complete coverage is required.	If the chrome plating coverage is less than the permitted serviceable limits, return the pitch change rod to Hartzell Propeller Inc.
(3) Visually examine the pitch change rod threads for cadmium plating coverage (Areas "G" and "H").	Minor wear on corners and random light scratches are permitted; otherwise, complete cadmium plating coverage is required.	If the cadmium plating coverage is less than the permitted serviceable limits, cadmium replate the threaded areas of the pitch change rod in accordance with the Cadmium Replating chapter of the Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(4) Visually examine the pitch change rod threads for cadmium plating coverage in Area "J".	Minor wear on corners and random light scratches are permitted; otherwise complete cadmium plating coverage to 0.37 inch (9.4 mm) depth from the opening is required.	If the cadmium plating coverage is less than the permitted serviceable limits, cadmium replate the threaded areas of the pitch change rod in accordance with the Cadmium Replating chapter of the Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(5) Visually examine the pitch change rod for straightness.	The pitch change rod must be straight.	If the pitch change rod is not straight, replace the pitch change rod.

Component Inspection Criteria
Table 5-1

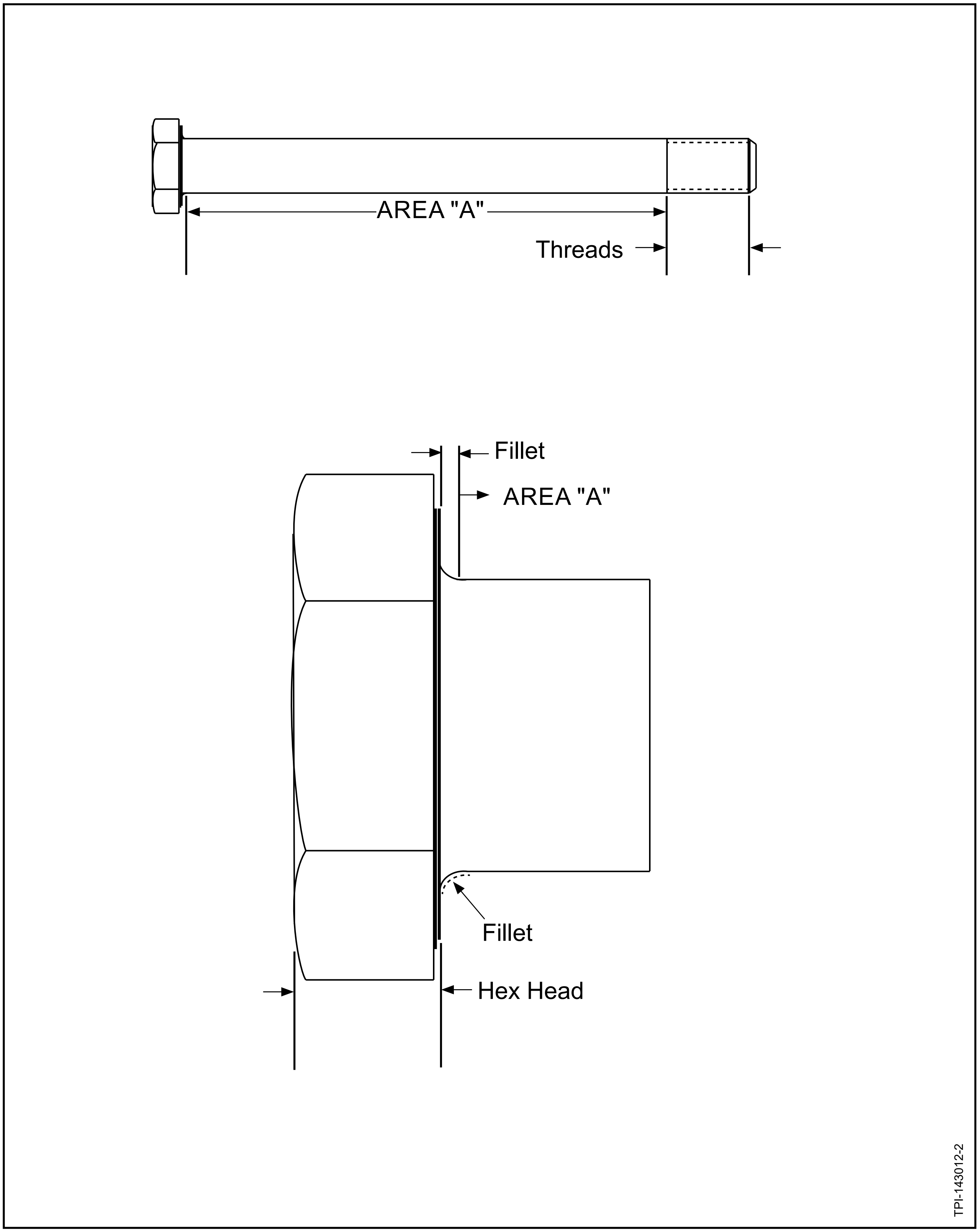
Inspect	Serviceable Limits	Corrective Action
I. PITCH CHANGE ROD, CONTINUED (Item 430) (Refer to Figure 5-9)		
(6) Visually examine the pitch change rod external threads for damage.	A maximum of 1/2 of one thread total accumulated damage in each threaded area is permitted. A damaged thread must not interfere with mating part threads.	If thread damage is greater than the permitted serviceable limits, replace the pitch change rod.
(7) Visually and dimensionally examine the pitch change rod OD between the fork taper and the fork thread for pitting, wear, or damage (Area "M").	Pitting, wear, or damage is not permitted at the smallest diameter or within 0.093 inch (2.36 mm) of the smallest diameter on both the taper side and threaded side. The minimum permitted diameter is 0.795 inch (20.20 mm).	If damage is greater than the permitted serviceable limits, replace the pitch change rod.
(8) Visually examine the pitch change rod fork taper for pitting, wear, or damage (Area "D).	Except for the 0.093 inch (2.36 mm) width adjacent to the smallest OD in Area "M", the remaining taper surface may have a maximum damage depth of 0.004 inch (0.10 mm) over 10% of the surface area. Raised material is not permitted.	If damage causes raised material above the existing surface, remove only the raised material. If damage is greater than the permitted serviceable limits, replace the pitch change rod.
(9) Visually examine the pitch change rod wrenching flats for moved material (Area "E").	Moved material caused by wrench engagement must not be above or below the pitch change rod shoulder surfaces. Sufficient flat surfaces must remain to support applied open-end wrench torque.	Remove the moved material flush with the pitch change rod shoulder thickness. If damage is greater than the permitted serviceable limits, replace the pitch change rod.
(10) Visually examine the pitch change rod-to-piston contact area of Area "F" between the shoulder and threads for damage or pitting.	Pitting or damage is not permitted in the area between 0.150 inch (3.81 mm) and 0.355 inch (9.01 mm) from the shoulder.	If there is pitting, or damage, replace the pitch change rod.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
I. PITCH CHANGE ROD, CONTINUED (Item 430) (Refer to Figure 5-9)		
(11) Visually examine the pitch change rod-to-piston contact Areas "N" between the shoulder and threads outside of the piston O-ring contact Area "F" for corrosion product, pitting, damage, or pushed-up material.	The maximum permitted depth of pitting or damage is 0.007 inch (0.178 mm). Corrosion product is not permitted. Pitting, damage, or pushed-up material must not interfere with the fit of the piston.	Using an abrasive pad CM47 or equivalent, polish to remove corrosion product or pushed-up material. If the corrosion product cannot be removed, replace the pitch change rod. If pitting or damage is greater than the permitted serviceable limits, replace the pitch change rod.
(12) Visually examine the oil supply bore for unwanted material.	Unwanted material is not permitted.	Remove all unwanted material. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(13) Visually examine the pitch change rod internal threads for damage.	A maximum of one thread total accumulated damage is permitted. A damaged thread must not interfere with mating part threads.	If damage is greater than the permitted serviceable limits, replace the pitch change rod.
(14) Visually examine the pitch change rod ID adjacent to the internal threads, in the 1.625 inch (41.27 mm), area for wear or damage. (Area "K")	If there is wear or damage, dimensionally inspect. Damage is not permitted. The maximum permitted ID is 0.550 inch (13.97 mm).	If wear or damage is greater than the permitted serviceable limits, replace the pitch change rod.
(15) Measure the pitch change rod OD in areas "A", "B", and "C".	The minimum permitted OD in area "A" is 0.807 inch (20.50 mm). The minimum permitted OD in area "B" is 0.932 inch (23.67 mm). The minimum permitted OD in area "C" is 0.994 inch (25.25 mm).	If the OD is less than the permitted serviceable limits, replace the pitch change rod.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
I. PITCH CHANGE ROD, CONTINUED (Item 430) (Refer to Figure 5-9)		
(16) Magnetic particle inspect the pitch change rod in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) Do not strip the chrome.	A relevant indication is not permitted.	If there is a relevant indication, replace the pitch change rod.

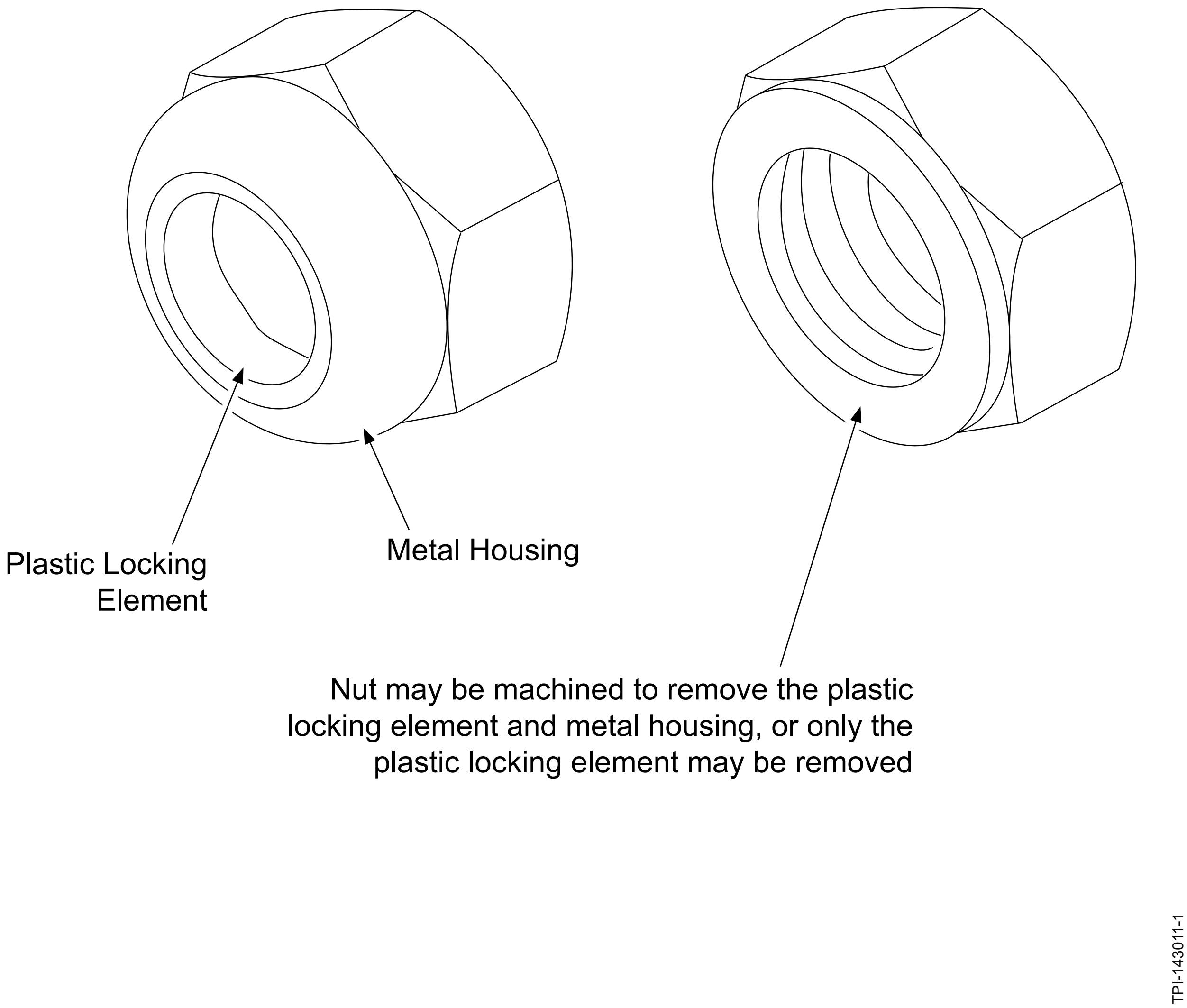


Hex Head Bolt
Figure 5-10

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
J. HEX HEAD BOLT (Items 570, 580) (Refer to Figures 5-10 and 5-11)		
(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.

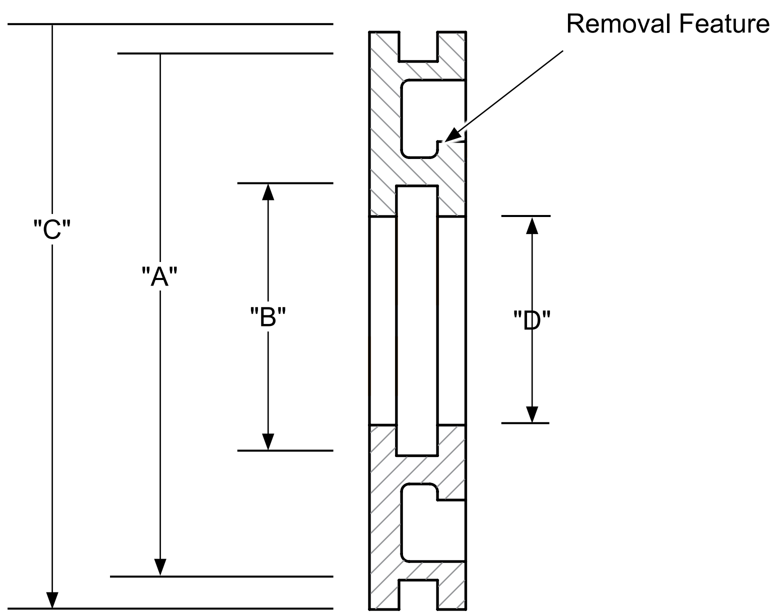
CAUTION: DO NOT USE MODIFIED A-2043-1 NUTS ON THE PROPELLER ASSEMBLY. A-2043-1 NUTS THAT HAVE BEEN MODIFIED ARE TO BE USED ONLY FOR THE HEX HEAD BOLT THREAD CHECK.



A-2043-1 Nut Modification
Figure 5-11

Component Inspection Criteria
Table 5-1

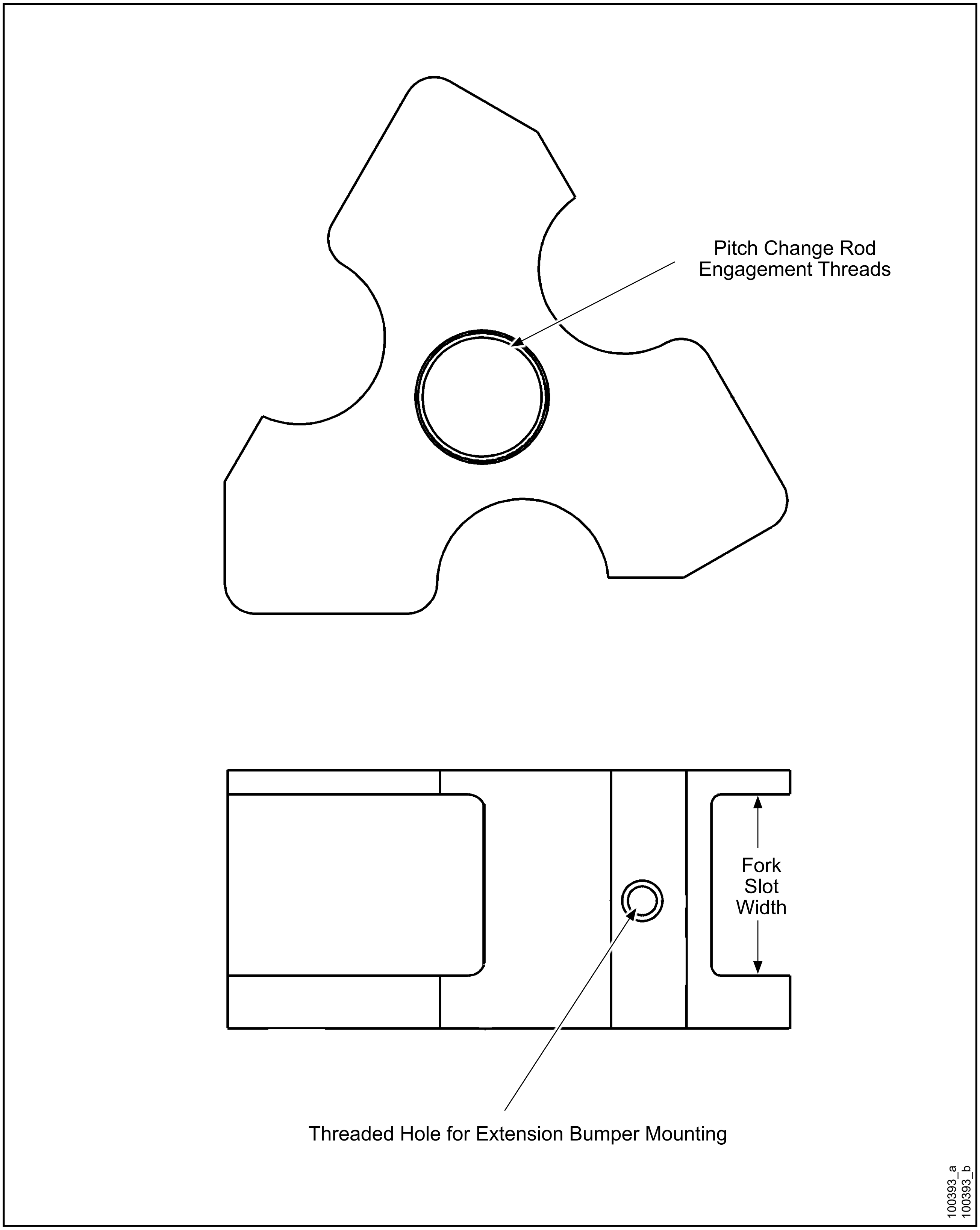
Inspect	Serviceable Limits	Corrective Action
J. HEX HEAD BOLT, CONTINUED (Items 570, 580) (Refer to Figures 5-10 and 5-11)		
(5) Visually examine the threads of the hex head bolt for damage and pitting.	A maximum total accumulation of 3/4 thread of damage and pitting is permitted. Thread damage must 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 5-11.	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 hex head 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 hex head 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 the hex head bolt in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Hub Plug
Figure 5-12

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
K.	HUB PLUG (Item 610) (Refer to Figure 5-12)		
(1)	Visually examine the hub plug for corrosion product.	Corrosion product is not permitted.	If there is corrosion product, replace the hub plug.
(2)	Visually examine the hub plug O-ring groove for wear or damage (Area "A").	If the hub plug outside O-ring groove is worn or damaged, measure the OD. The minimum permitted OD is 2.015 inch (51.18 mm).	If the OD is less than the permitted serviceable limits, replace the hub plug.
(3)	Visually examine the hub plug O-ring groove for wear or damage (Area "B").	If the hub plug O-ring groove is worn or damaged, measure the ID. The maximum permitted ID is 1.054 inch (26.77 mm).	If the ID is greater than the permitted serviceable limits, replace the hub plug.
(4)	Visually examine the hub plug OD for wear or damage (Area "C").	If the hub plug OD is worn or damaged, measure the OD. The minimum permitted OD is 2.246 inch (57.05 mm).	If the OD is less than the permitted serviceable limits, replace the hub plug.
(5)	Visually examine the hub plug bore for wear or damage (Area "D") .	If the hub plug bore is worn or damaged, measure the ID. The maximum permitted ID is 0.815 inch (20.70 mm).	If the ID is greater than the permitted serviceable limits, replace the hub plug.
(6)	Visually examine the hub plug removal feature for damage.	Slight damage is permitted. Damage must not interfere with the ability to remove the hub plug from the hub.	If the damage is greater than the permitted serviceable limits, replace the hub plug.



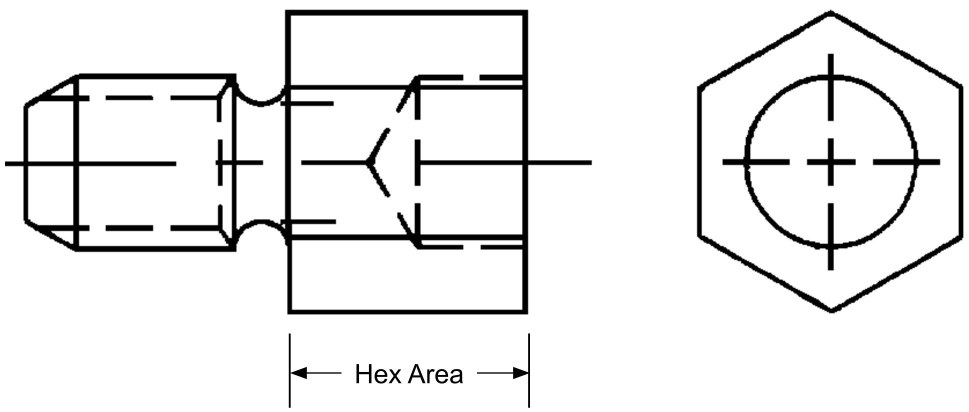
Fork
Figure 5-13

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
L. FORK (Item 680) (Refer to Figure 5-13)		
(1) Visually examine the pitch change rod engagement threads of the fork bore for damage.	One thread total accumulated damage is permitted.	If damage is greater than the permitted serviceable limits, replace the fork.
(2) Visually examine the extension bumper threaded mounting holes for thread damage.	One thread total accumulated damage is permitted.	If damage is greater than the permitted serviceable limits, replace the fork.
(3) Visually examine the tapered portion of the fork bore for wear, nicks, fretting or other damage.	The maximum permitted depth of damage is 0.003 inch (0.07 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the fork.
(4) Visually examine the fork slots for damage.	The maximum permitted depth of damage is 0.006 inch (0.15 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the fork.
(5) Measure the fork slot.	The maximum permitted width of the fork slot is 1.266 inches (32.15 mm).	If the slot width is greater than the permitted serviceable limits, replace the fork.
(6) Magnetic particle inspect the fork in accordance with the Magnetic Particle Inspection chapter of the Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the fork.

Component Inspection Criteria
Table 5-1

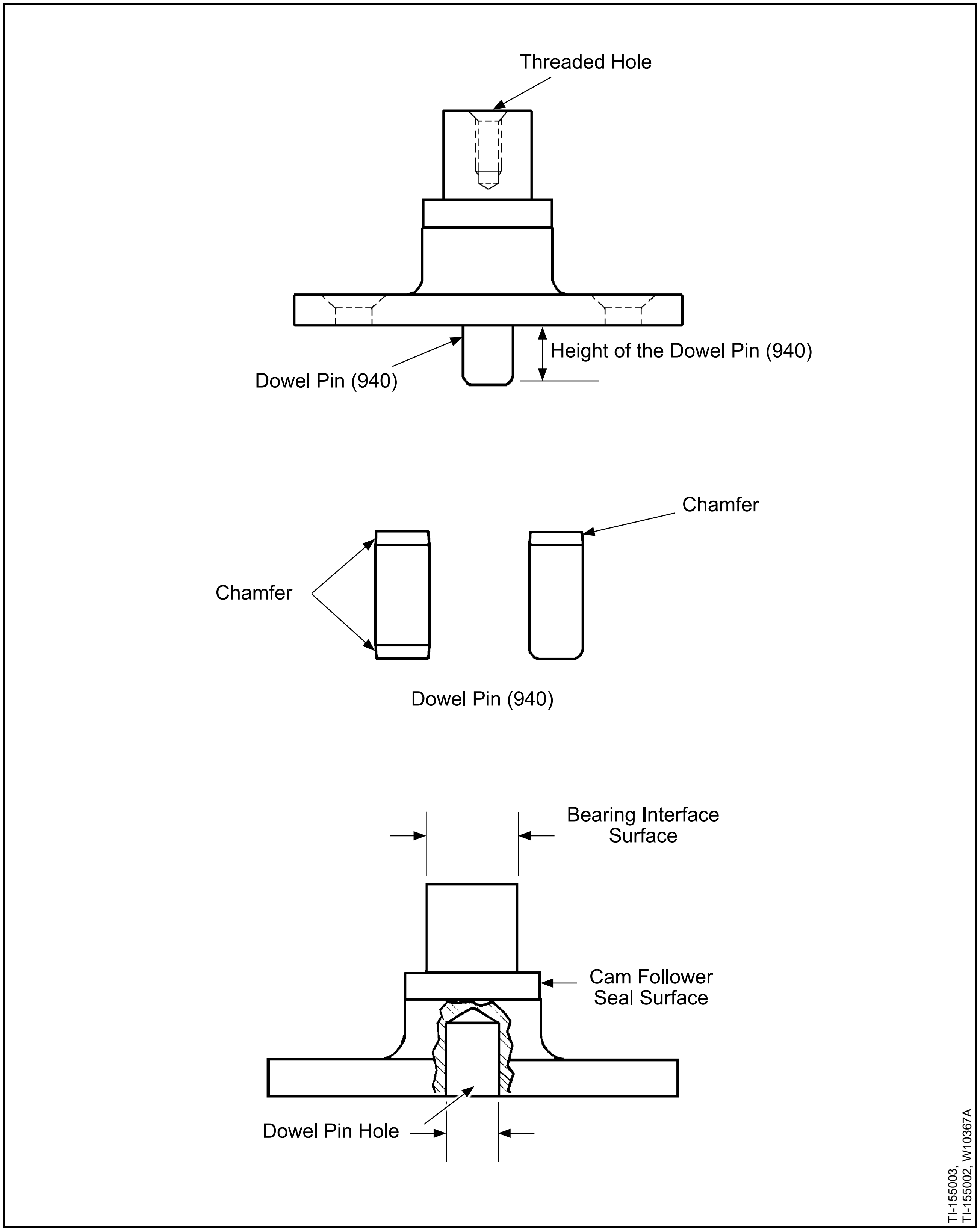
Inspect	Serviceable Limits	Corrective Action
L. FORK, CONTINUED (Item 680) (Refer to Figure 5-13)		
(7) Visually examine the cadmium plated surface of the fork (excluding the slots, threaded bore and tapered section of the bore) for wear, scratches, or other damage.	The maximum permitted depth of damage is 0.003 inch (0.07 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the fork.
(8) Visually examine the fork for cadmium plating coverage.	A few random scratches, corners with plating missing, normal wear of the plating from the threads, internal taper, and fork slots are permitted; otherwise, cadmium plating must cover the fork.	If the cadmium plating coverage is less than the permitted serviceable limits, replate the fork in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Extension Bumper
Figure 5-14

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
M. EXTENSION BUMPER (Item 690) (Refer to Figure 5-14)		
(1) Visually examine the extension bumper for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Corrosion product may be removed with 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 extension bumper. Replate the extension bumper in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02)
(2) Visually examine the extension bumper for damage.	A slight wrenching depression on the outer hex area of the spacer is permitted.	If damage is greater than the permitted serviceable limits, replace the extension bumper.
(3) Visually examine the threads of the extension bumper for damage.	A maximum of 1/2 of one thread total accumulated damage is permitted.	If the damage is greater than the permitted serviceable limits, replace the extension bumper.
(4) Visually examine the extension bumper for cadmium plating coverage.	A few random scratches and slight wear on the threads are permitted; otherwise, cadmium plating must completely cover the extension bumper.	If the cadmium plating coverage is less than the permitted serviceable limits, replate the extension bumper in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Pitch Change Knob Bracket and Dowel Pin
Figure 5-15

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
N.	PITCH CHANGE KNOB BRACKET (Item 950) (Refer to Figure 5-15)		
(1)	Before inspection, remove cadmium plating in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).		
(2)	If dowel pin removal is not required, apply masking material to protect the dowel pin from stripping materials. Dowel pin extension from the pitch change knob bracket base must meet the permitted Serviceable Limits for the dowel pin specified in this section.		
(3)	Visually examine the bearing interface surface for damage, corrosion product, or pitting.	Bearing roller impressions of any depth are not permitted. Minor scratches less than 0.001 inch (0.02 mm) deep are permitted. Sharp edges or pushed up edges from scratches are not permitted. Corrosion product or pitting is not permitted.	If the damage, corrosion product, or pitting is greater than the permitted serviceable limits, replace the pitch change knob bracket.
(4)	Measure the OD of the unplated bearing interface surface.	The minimum permitted OD of the unplated bearing interface surface is 0.653 inch (16.59 mm).	If the OD of the unplated bearing interface surface is less than the serviceable limits, replace the pitch change knob bracket.
(5)	Visually examine the cam follower seal surface for scratches, corrosion product, or pitting.	Minor scratches less than 0.001 inch (0.02 mm) deep are permitted. Sharp or pushed up edges from scratches are not permitted. Corrosion product or pitting is not permitted.	If the scratches, corrosion product, or pitting is greater than the permitted serviceable limits, replace the pitch change knob bracket.
(6)	Measure the OD of the cam follower seal surface.	The minimum permitted unplated OD of the cam follower seal surface is 0.948 inch (24.89 mm).	If the OD of the cam follower seal surface is less than the permitted serviceable limits, replace the pitch change knob bracket.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
N. PITCH CHANGE KNOB BRACKET, CONTINUED (Item 950) (Refer to Figure 5-15)		
(7) Visually examine the pitch change knob bracket for corrosion product and pitting. NOTE: This inspection and repair does not include the bearing interface surface, the cam follower seal surface, or the threaded hole.	Corrosion product is not permitted. If the pitch change knob bracket has pitting, dimensionally inspect. The maximum permitted depth of pitting is 0.003 inch (0.07 mm). The maximum permitted total area of pitting is 0.500 square inch (322 square mm) area. The maximum permitted diameter of an individual pit is 0.032 inch (0.81 mm). A maximum of 10 non-linear pits within 1 square inch (645 square mm) area are permitted. Linear pitting is not permitted.	Do not glass bead clean the bearing interface surface, the cam follower seal surface, or the threaded hole. For all surfaces of the pitch change knob bracket other than those listed above, remove corrosion product using glass bead cleaning or local polishing using emery cloth. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). The maximum permitted depth for repair is 0.005 inch (0.12 mm). The maximum permitted total area of repair is 1 square inch (645 square mm). For each hole used to attach the pitch change bracket to the blade, the maximum permitted repair is 25% of the surface area of the hole. Using an emery cloth or abrasive pad CM47, lightly polish to remove raised material or pushed up edge and blend into machined surfaces. If pitting or repair is greater than the permitted serviceable limits or Corrective Action repair limits, replace the pitch change knob bracket.

Component Inspection Criteria
Table 5-1

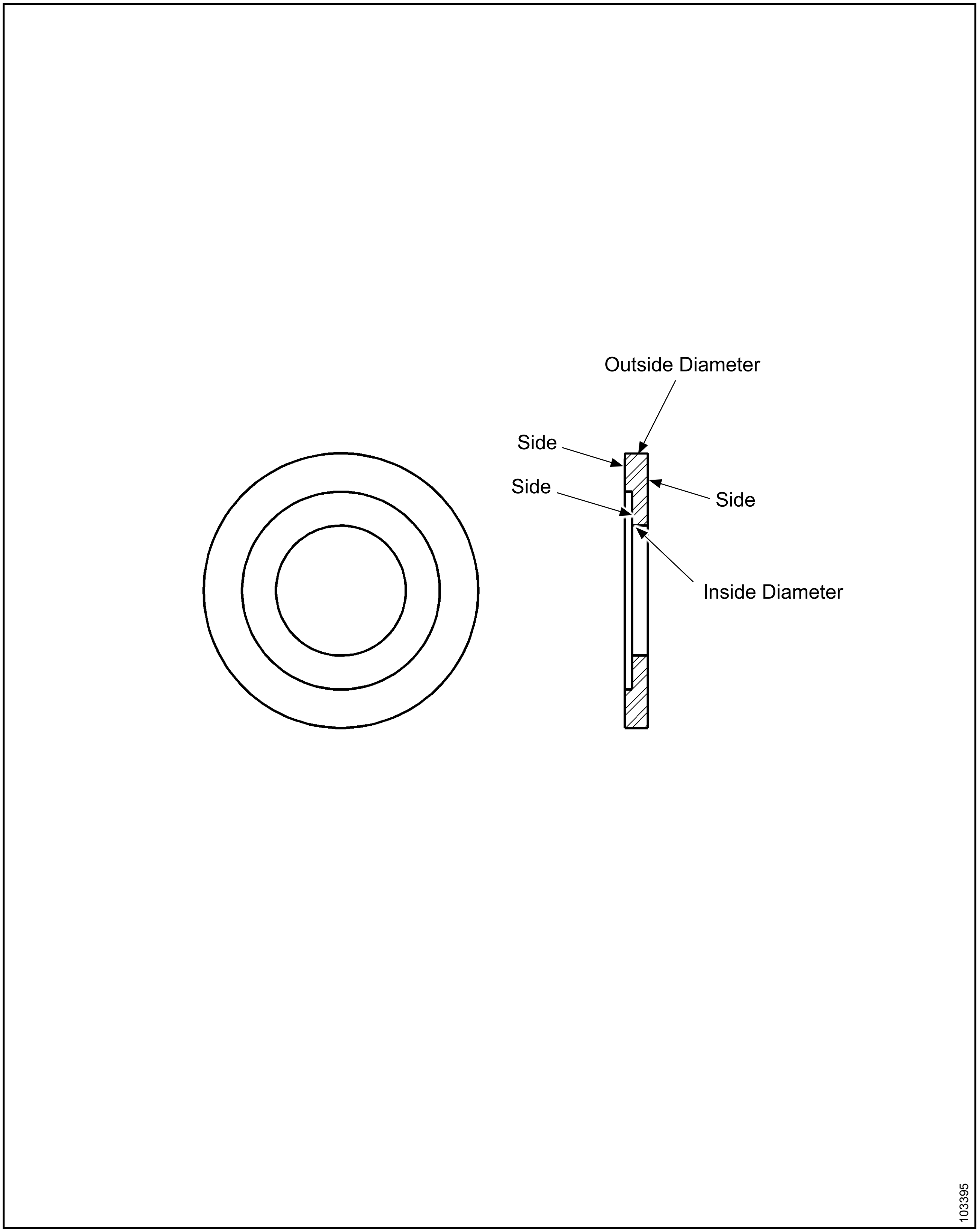
Inspect	Serviceable Limits	Corrective Action
N. PITCH CHANGE KNOB BRACKET, CONTINUED (Item 950) (Refer to Figure 5-15)		
(8) Visually examine the pitch change knob bracket for nicks, scratches, or other damage. NOTE: This inspection and repair does not include the bearing interface surface, the threaded hole, or the cam follower seal surface.	If the pitch change knob bracket is damaged, 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 square inch (322 square mm) area. Raised material or edges of pushed up material on the surfaces that interface with other components are not permitted.	The maximum permitted depth of repair is 0.005 inch (0.12 mm). The maximum permitted total area of repair is 1 square inch (645 square mm). For each hole used to attach the pitch change bracket to the blade, the maximum permitted repair is 25% of the surface area of the hole. Using an emery cloth or abrasive pad CM47, lightly polish to remove raised material or pushed up 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.
(9) Examine the dowel pin for movement in the pitch change knob bracket.	Using firm hand pressure, try to move the dowel pin. Movement is not permitted.	If there is movement of the dowel pin, replace the dowel pin.
(10) Measure the height of the dowel pin from the pitch change knob bracket base.	The maximum permitted height is 0.440 inch (11.17 mm).	If the height of the dowel pin is greater than the permitted height, press the pin into the bracket to the correct height.
	The minimum permitted height is 0.390 inch (9.91 mm).	If height of the dowel pin is less than the permitted serviceable limits, replace the pin. The replacement pin must fit tightly.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
N. PITCH CHANGE KNOB BRACKET, CONTINUED (Item 950) (Refer to Figure 5-15)		
(11) Visually examine the OD of the exposed portion of the dowel pin for damage or corrosion product.	Damage or corrosion product is not permitted.	If there is damage or corrosion product, replace the dowel pin.
(12) If the dowel pin is removed, visually examine the dowel pin hole.	Corrosion product or pitting is not permitted.	If there is corrosion product or pitting, replace the pitch change knob bracket.
(13) Visually examine the pitch change knob bracket threaded hole for corrosion product or damage.	Corrosion product is not permitted. A maximum of 3/4 of one thread total accumulated damage is permitted.	If damage is greater than the permitted serviceable limits, replace the pitch change knob bracket.
(14) Perform magnetic particle inspection of the pitch change knob bracket in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. 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 Bearing 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).



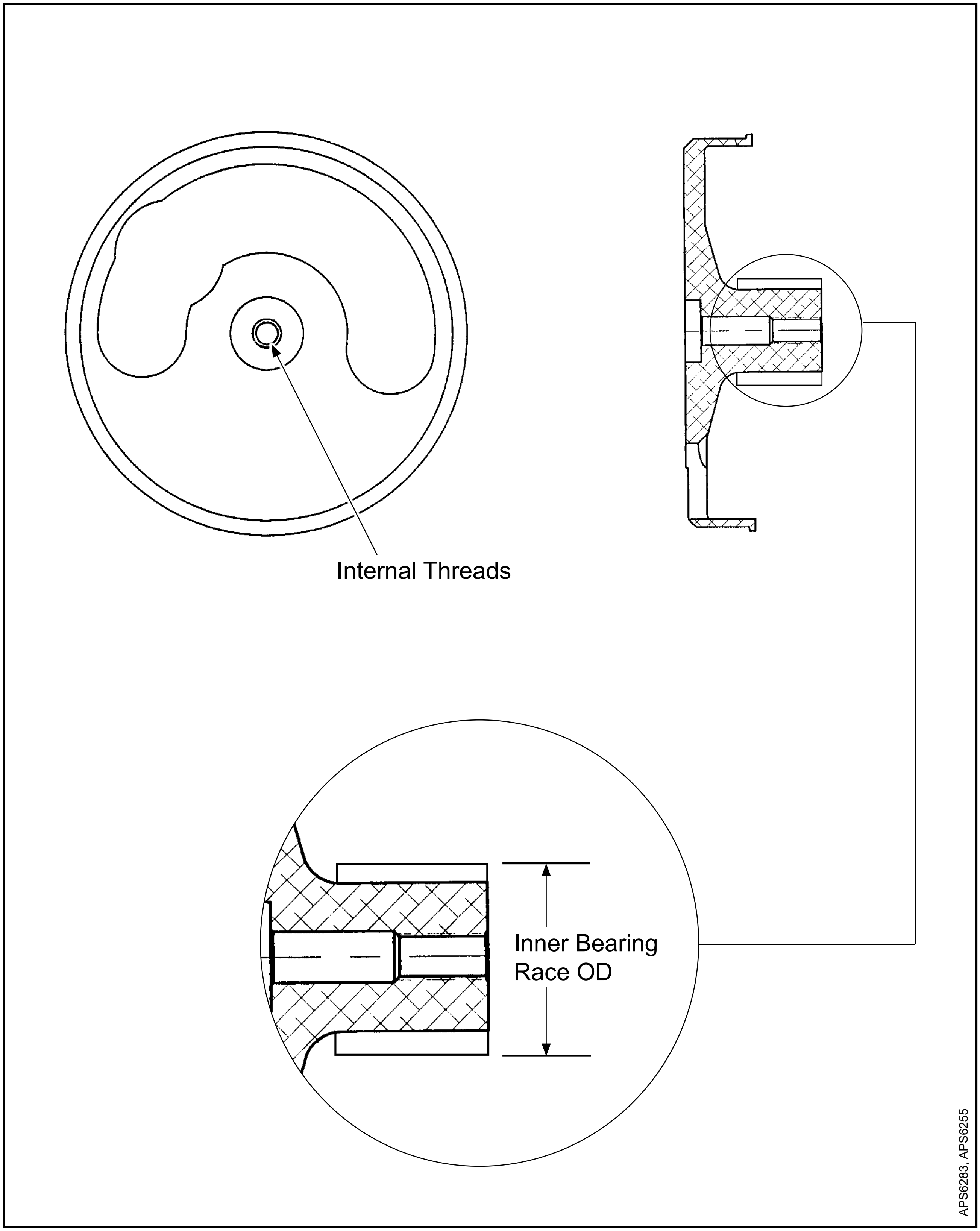
Retaining Washer
Figure 5-16

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
O.	RETAINING WASHER, PART NUMBER 103395 (Item 970) (Refer to Figure 5-16)		
(1)	Visually examine the sides and inside diameter of the retaining washer for corrosion product and pitting.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting is 0.002 inch (0.05 mm). The maximum permitted total surface area that may have pitting is 5%. The maximum permitted diameter of an individual pit is 0.062 inch (1.57 mm). Pitting must not affect the fit or function of the retaining washer.	After applying masking material to the outside diameter of the retaining washer, corrosion product may be removed by 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 retaining washer. If pitting is greater than the permitted serviceable limits, replace the retaining washer.
(2)	Visually examine the sides and inside diameter of the 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 retaining washer.	If scratches are greater than the permitted serviceable limits, replace the retaining washer.
(3)	Visually examine the retaining washer for wear or damage.	Wear or damage is not permitted.	If there is wear or damage, replace the retaining washer.
(4)	Visually examine the outside diameter of the retaining washer for corrosion product and pitting.	Corrosion product or pitting is not permitted.	If there is corrosion product or pitting, replace the retaining washer.
(5)	Visually inspect the outside diameter of the retaining washer for scratches.	A scratch is not permitted.	If there is a scratch, replace the retaining washer.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
O.	RETAINING WASHER, PART NUMBER 103395, CONTINUED (Item 970) (Refer to Figure 5-16)		
(6)	Visually examine the outside diameter of the retaining washer for wear or damage.	Wear or damage is not permitted in the base metal. If the sides or inside diameter were glass bead cleaned to remove corrosion product, examine the outside diameter for a rough surface from the glass bead cleaning. The maximum permitted surface finish is 16 Ra.	If wear or damage is greater than the permitted serviceable limits, replace the retaining washer.
(7)	Measure the outside diameter of the retaining washer.	The minimum permitted diameter after or over cadmium plating is 0.950 inch (24.13 mm).	If the diameter is less than the permitted serviceable limits, replace the retaining washer.
(8)	Visually examine the retaining washer for cadmium plating coverage.	A few random scratches are acceptable on the sides and inside diameter; otherwise, cadmium plating must completely cover the sides and inside diameter of the retaining washer. Cadmium plating must completely cover the outside diameter without scratches although slight cadmium plating loss on the corners between sides and outside diameter is permitted.	If the cadmium plating coverage is less than the permitted serviceable limits, replate and bake the retaining washer in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Preload Plate Assembly with Inner Bearing Race
Figure 5-17

Component Inspection Criteria
Table 5-1

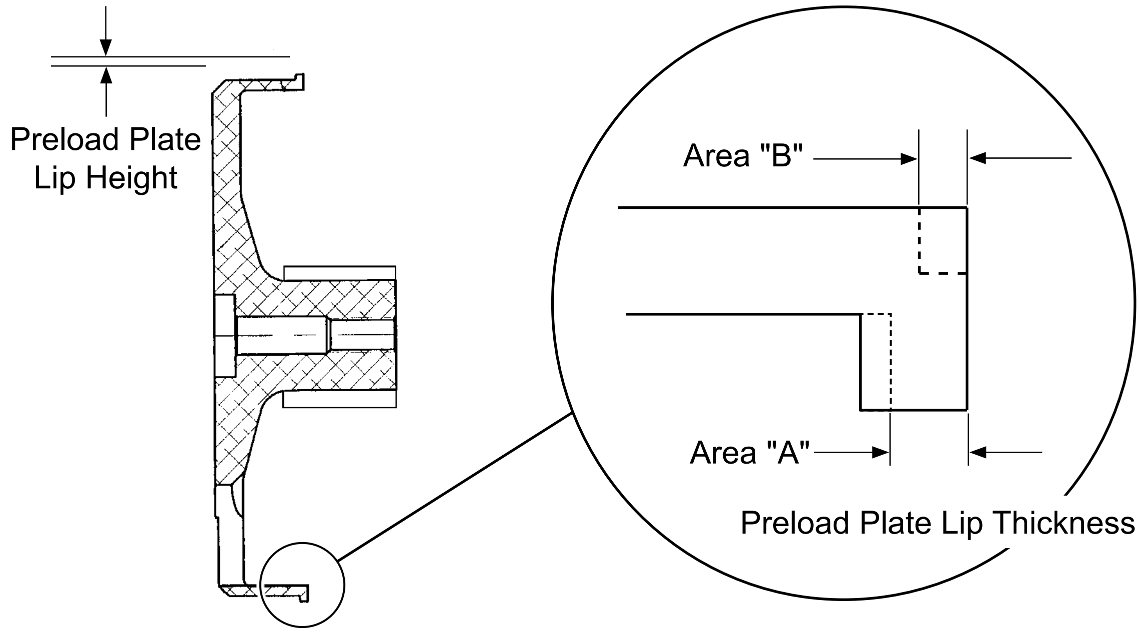
	Inspect	Serviceable Limits	Corrective Action
P.	PRELOAD PLATE ASSEMBLY w/INNER BEARING RACE (Item 1000) (Refer to Figure 5-17 and Figure 5-18)		
(1)	Visually examine the aluminum part of the preload plate assembly for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Mask the internal threads then remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the preload plate assembly.
(2)	Visually examine the aluminum part of the preload plate assembly for pitting.	The maximum permitted depth of pitting is 0.004 inch (0.10 mm).	Pitting may be removed by polishing using an abrasive pad CM47 or equivalent, up to 0.007 inch (0.17 mm) deep. If the depth of pitting or polishing is greater than the permitted serviceable limits, replace the preload plate assembly.
(3)	Visually examine the internal threads for damage.	A maximum of two threads of total accumulated damage are permitted.	If the damage is greater than the permitted serviceable limits, replace the preload plate assembly.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
P. PRELOAD PLATE ASSEMBLY w/INNER BEARING RACE, CONTINUED (Item 1000) (Refer to Figure 5-17 and Figure 5-18)		
(4) Visually examine the OD of the inner bearing race (1010) for corrosion product, brinelling, pitting, and damage.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. Raised material is not permitted. The maximum permitted depth of brinelling is 0.003 inch (0.07 mm). The maximum permitted depth of pitting and damage is 0.005 inch (0.12 mm). The maximum permitted total area of brinelling, pitting, and damage is 5%.	Mask the internal threads then remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). Polish raised material using abrasive pad CM47 or equivalent. If corrosion product cannot be removed, or if raised material, brinelling, pitting, or damage of the inner bearing race is greater than the permitted serviceable limits, remove the inner bearing race in accordance with the Repair chapter of this manual, then examine the preload plate spindle in accordance with the applicable step in this Preload Plate Assembly inspection criteria.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
P.	PRELOAD PLATE ASSEMBLY w/INNER BEARING RACE, CONTINUED (Item 1000) (Refer to Figure 5-17 and Figure 5-18)		
(5)	Measure the OD of the inner bearing race (1010).	The minimum permitted OD is 1.249 inch (31.73 mm).	If the OD is less than the permitted serviceable limits, remove the inner bearing race in accordance with the Repair chapter of this manual, then examine the preload plate spindle in accordance with the applicable step in this Preload Plate Assembly inspection criteria
(6)	If the inner bearing race (1010) is removed, visually examine the preload plate spindle for corrosion product, raised material, and damage.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Mask the internal threads then remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
		Raised material is not permitted.	Polish raised material using abrasive pad CM47 or equivalent.
		The maximum permitted depth of damage is 0.004 inch (0.10 mm).	If corrosion product cannot be removed, or if raised material or damage to the preload plate spindle is greater than the permitted serviceable limits, replace the preload plate assembly.



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

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

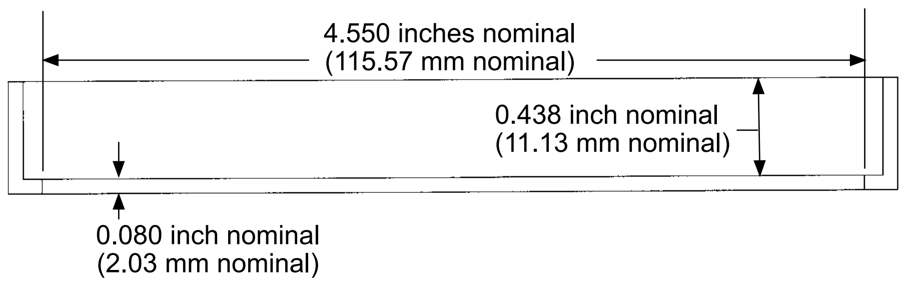
<u>Example 2</u>: Lip thickness in Area "A" is less than 0.063 inch (1.61 mm)
Depth of damage in Area "B" is 0.018 inch (0.45 mm)
Damage is greater than permitted serviceable limits,
replace the preload plate.

APS6283, APS6284

Preload Plate Lip Measurement
Figure 5-18

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
P.	PRELOAD PLATE ASSEMBLY w/INNER BEARING RACE, CONTINUED (Item 1000) (Refer to Figure 5-17 and Figure 5-18)		
(7)	Visually examine the preload plate lip for damage. If the lip is damaged, measure the height.	The minimum permitted lip height is 0.040 inch (1.02 mm).	Remove any rough edges or evidence of fretting. If damage or repair is greater than the permitted serviceable limits, or the lip height is less than the permitted serviceable limits, replace the preload plate assembly.
(8)	Visually examine the preload plate lip for damage. If the lip is damaged, measure the lip thickness.	The minimum lip thickness in Area "A" is 0.060 inch (1.53 mm). The maximum permitted depth of damage in Area "B" of the lip of the preload plate is dependent on the thickness in Area "A" of the lip of the preload plate. Use the information and examples in Figure 5-18 to find the maximum permitted depth of damage in Area "B" when lip thickness in Area "A" is equal to or greater than the dimension specified in Figure 5-18.	If the lip thickness in Area "A" is less than the permitted serviceable limits, replace the preload plate. If the depth of damage in Area "B" is greater than the permitted serviceable limits, replace the preload plate assembly.
(9)	Penetrant inspect the preload plate in accordance with the Penetrant Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). Pre-penetrant etch is not required.	A relevant indication is not permitted.	If there is a relevant indication, replace the preload plate assembly.



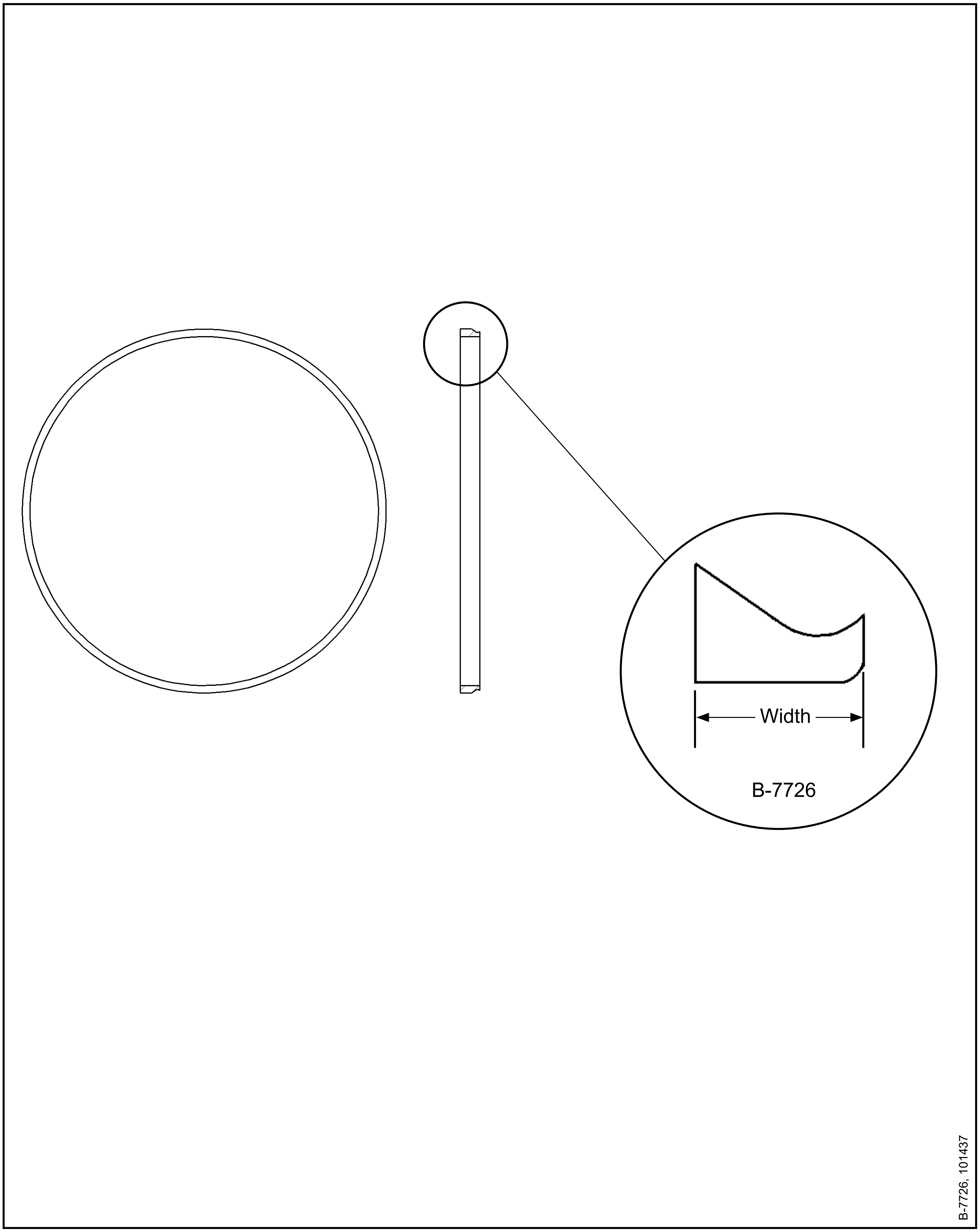
NOTE: Dimensions are for identification purposes only

B-1041

Bearing Retaining Ring
Figure 5-19

Component Inspection Criteria
Table 5-1

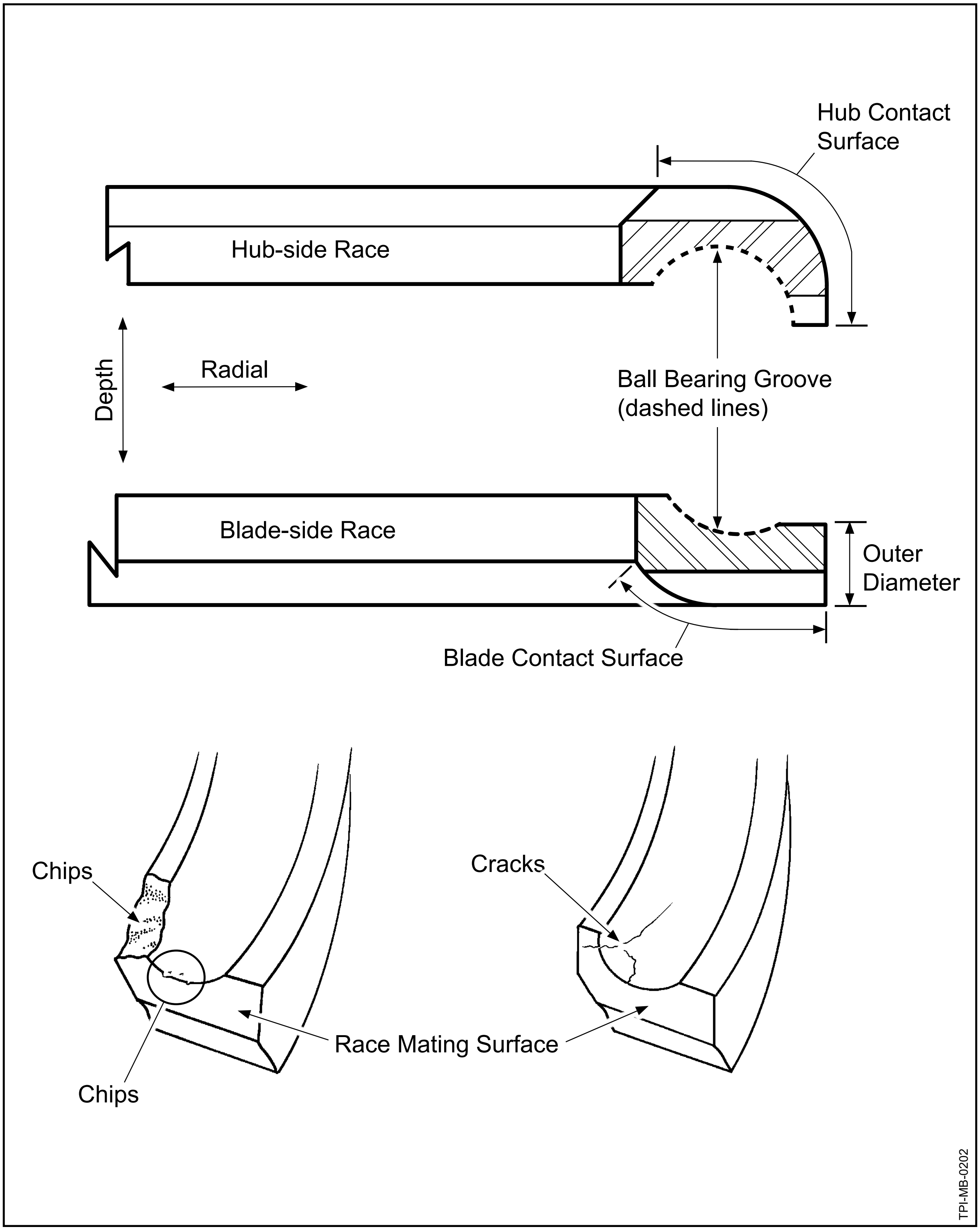
Inspect	Serviceable Limits	Corrective Action
Q. BEARING RETAINING RING (Item 1040) (Refer to Figure 5-19)		
(1) Visually examine the bearing retaining ring for corrosion product and pitting.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting is 0.005 inch (0.12 mm). Pitting must not interfere with the ability of the bearing retaining ring to fit tight to the blade and the bearing race.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the bearing retaining ring. If damage is greater than the permitted serviceable limits, replace the bearing retaining ring.
(2) Visually examine the bearing retaining ring for wear, damage, or fretting.	The bearing retaining ring must fit tight to the blade and the bearing race when installed over the blade and bearing race.	If wear, damage, or fretting is greater than the permitted serviceable limits, replace the bearing retaining ring.
(3) Visually examine the entire bearing retaining ring for cadmium plating coverage.	A few random scratches and corners with cadmium plating missing are permitted; otherwise, complete coverage is required.	If cadmium plating is less than the permitted serviceable limits, replate the bearing retaining ring in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Blade Seal
Figure 5-20

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
R. BLADE SEAL (Item 1045) Refer to Figure 5-20.		
(1) Using 10X magnification and an appropriate light source, visually examine the blade seal for damage, missing material, separation, or form irregularities of the continuous ring.	Damage, missing material, separation, or irregularities are not permitted.	If the damage or other conditions are greater than the permitted serviceable limits, replace the blade seal.
(2) Visually examine the width of the blade seal for wear.	If there is wear, measure the width of the blade seal. The minimum permitted width of the blade seal is: B-7726 - 0.090 inch (2.29 mm).	If the width is less than the permitted serviceable limits, replace the blade seal.



Bearing Race
Figure 5-21

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
S. BEARING RACE (Items 1060, 1080) (Refer to Figure 5-21)		
(1) Visually examine the ball bearing groove in each bearing race for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Remove corrosion product using glass bead cleaning. For glass bead cleaning refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the bearing race.
(2) Visually examine the ball bearing groove in each bearing race for pitting, wear, fretting, and damage.	The maximum permitted depth of pitting is 0.003 inch (0.076 mm) in the ball bearing groove. The maximum permitted diameter of a pit is 0.032 inch (0.81 mm). The maximum permitted total area of pitting in the ball bearing groove on a complete bearing race is 0.12 square inch (77.4 square mm) (two bearing races for each bearing set). Pitting must not interfere with bearing ball movement or support.	If the pitting is greater than the permitted serviceable limits, replace the bearing race.
	If the ball bearing groove has wear, measure the wear. The maximum permitted depth of wear is 0.005 inch (0.12 mm).	If the wear is greater than the permitted serviceable limits, replace the bearing race.
	Fretting damage is not permitted.	If there is fretting damage, replace the bearing race.
	For damage other than pitting or fretting, the maximum permitted depth of damage is 0.003 inch (0.076 mm) and must not interfere with bearing ball movement or support.	If damage is greater than the permitted serviceable limits, replace the bearing race.

Component Inspection Criteria
Table 5-1

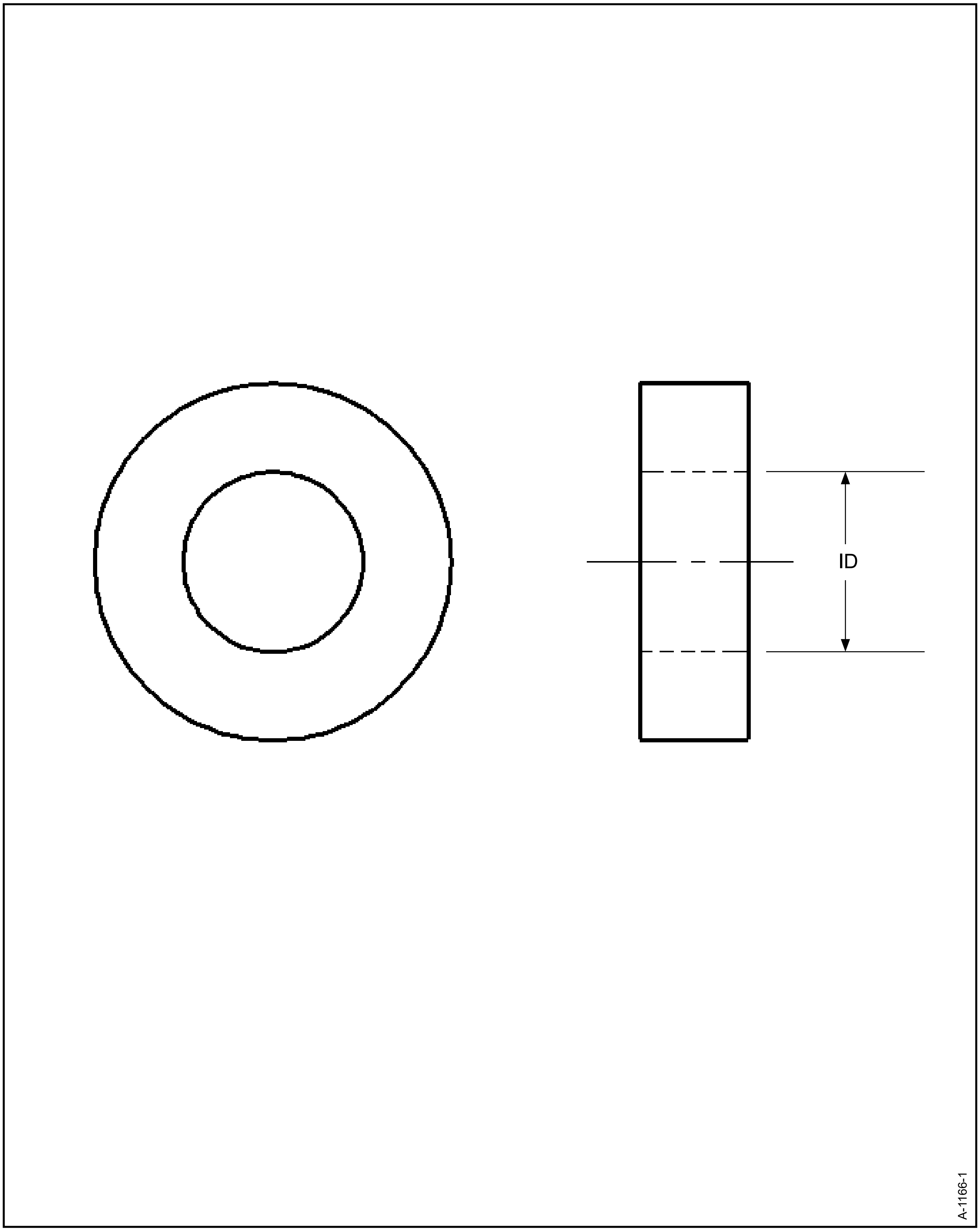
Inspect	Serviceable Limits	Corrective Action
S. BEARING RACE, CONTINUED (Items 1060, 1080) (Refer to Figure 5-21)		
(3) Except for the ball bearing groove, visually examine all other surfaces of each bearing race for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Remove corrosion product using glass bead cleaning. For glass bead cleaning refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the bearing race.
(4) Except for the ball bearing groove, visually examine all other surfaces of each bearing race for pitting, wear, fretting, and damage.	The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	If the pitting is greater than the permitted serviceable limits, replace the bearing race.
	The maximum permitted diameter of a pit is 0.062 inch (1.57 mm).	
	The maximum permitted total area of pitting on all surfaces except the ball bearing groove of a complete bearing race is 0.25 square inch (161.2 square mm) (two bearing races for each bearing set).	
	Fretting damage is permitted on the outer diameter of the bearing races that interface with the bearing retaining ring (1040). Fretting must not loosen the tight fit with the bearing retaining ring (1040).	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 (1040) to the bearing race is not tight, replace the bearing race.
	Wear is not permitted.	If there is wear, replace the bearing race.
	For damage other than pitting, the maximum permitted depth of damage is 0.005 inch (0.12 mm) and must not interfere with the mating surfaces.	If the damage is greater than the permitted serviceable limits, replace the bearing race.

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
S.	BEARING RACE, CONTINUED (Items 1060, 1080) (Refer to Figure 5-21)		
(5)	Visually examine the bearing race for chips or cracks that are adjacent to the mating surfaces of the bearing race.	Chips or cracks that are adjacent to the mating surfaces of the bearing race are not permitted.	If there are chips or cracks adjacent to the mating surfaces of the bearing race, replace the bearing race.
(6)	Magnetic particle inspect each bearing race in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the bearing race.

Component Inspection Criteria
Table 5-1

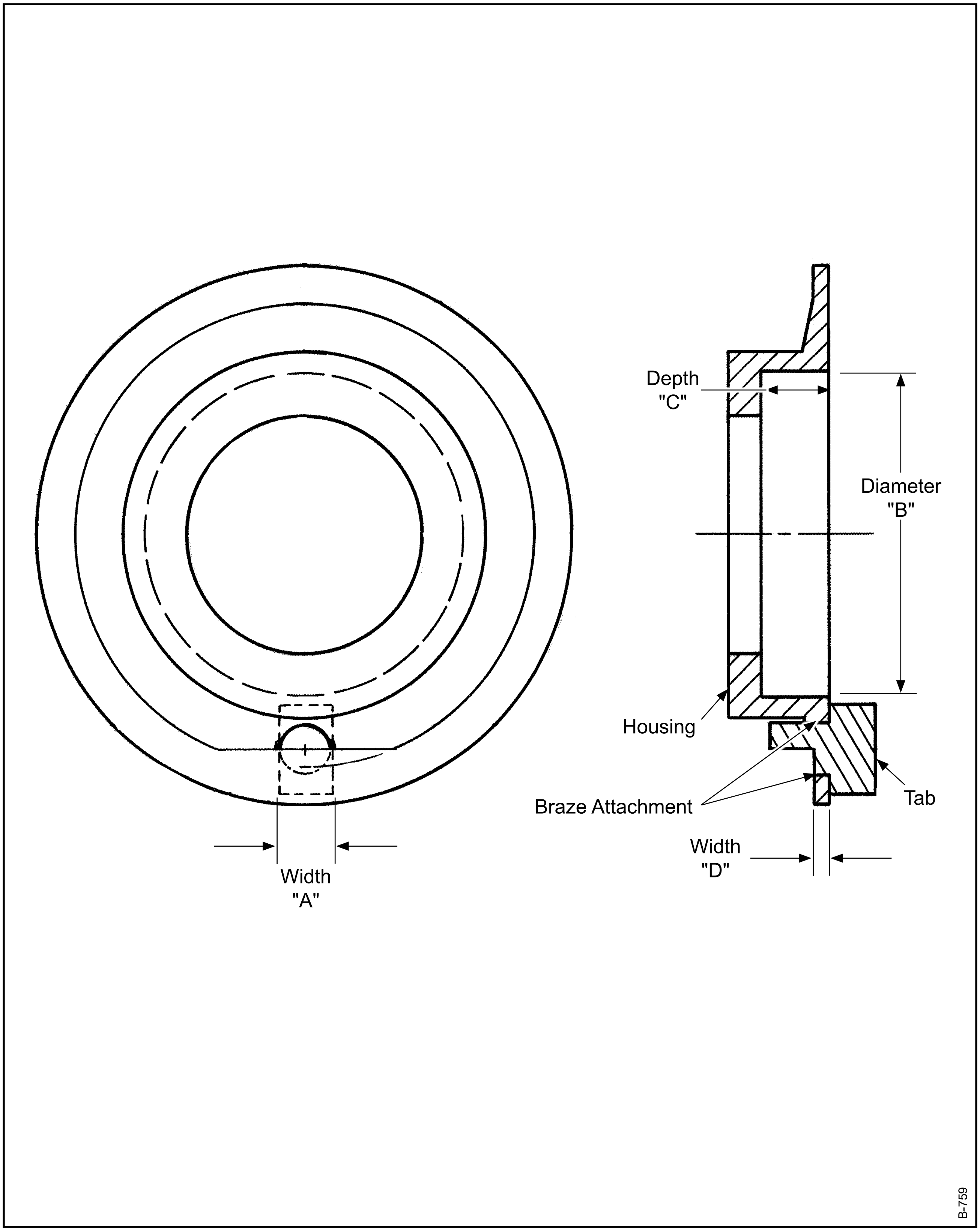
Inspect	Serviceable Limits	Corrective Action
T. BALANCE WEIGHT (Item 1140)		
(1) Visually examine the balance weight for corrosion product.	Corrosion product is not permitted. Remove corrosion product in accordance with the corrective action instructions.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the balance weight.
(2) Visually examine the balance weight for pitting, wear, or damage.	The maximum permitted depth of pitting, wear, or damage is 0.003 inch (0.07 mm).	Using an abrasive pad CM47 or equivalent, polish to a maximum depth of 0.005 inch (0.12 mm). If the depth of pitting, wear, or damage is greater than the permitted serviceable limits or the corrective action limits, replace the balance weight.
(3) For an aluminum (gray color) balance weight: Visually examine the balance weight for anodize coverage.	Except for a few scratches and corners with anodize coating missing, complete coverage is required.	If the coverage is less than the permitted serviceable limits, re-anodize the balance weight in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(4) For a steel (silver color) balance weight: Visually examine for cadmium plating coverage.	Except for a few scratches and corners with cadmium plating missing, complete coverage is required.	If the coverage is less than the permitted serviceable limits, replate the balance weight in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Beta Valve Spacer
Figure 5-22

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
U. BETA VALVE SPACER (Item 1620) (Refer to Figure 5-22)		
(1) Visually examine the beta valve spacer 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 (0.13 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the beta valve spacer. If the damage is greater than the permitted serviceable limits, replace the beta valve spacer.
(2) Visually examine the beta valve spacer for wear or damage.	Wear or damage is not permitted.	If there is wear or damage, replace the beta valve spacer.
(3) Visually examine the beta valve spacer for anodize coverage.	A few random scratches and corners with anodize missing are permitted. The minimum permitted anodize coverage is 90% of the total surface area.	Apply chemical conversion coating to the 0% to 10% of bare surface in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If anodize coverage is less than the permitted serviceable limits, replace the beta valve spacer
(4) Measure the ID of the beta valve spacer.	The maximum permitted ID is 0.327 inch (8.30 mm).	If the ID is greater than the permitted serviceable limits, replace the beta valve spacer.



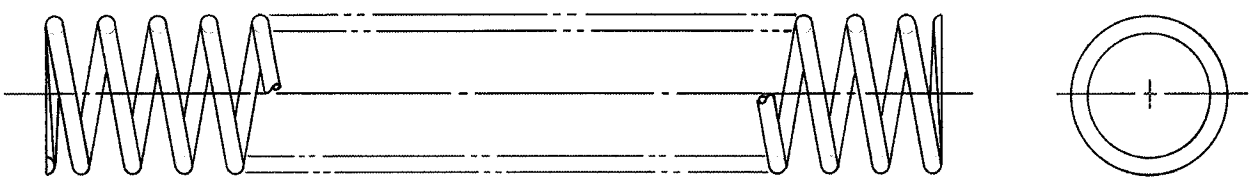
Beta Spring Retainer
Figure 5-23

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
V. <u>BETA SPRING RETAINER</u> (Item 1630) (Refer to Figure 5-23)		
(1) Visually examine the beta 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 0.004 inch (0.10 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the beta spring retainer. If damage is greater than the permitted serviceable limits, replace the beta spring retainer.
(2) Visually examine the beta spring retainer tab for wear (Width "A").	If there is wear, measure the width of the beta spring retainer tab. The minimum permitted width is 0.200 inch (5.08 mm).	If the width is less than the permitted serviceable limits, replace the beta spring retainer.
(3) Visually examine the beta spring retainer tab for tightness to the housing or cracks in the braze attachment.	A tab that is not tight is not permitted. A crack in the braze attachment is not permitted.	If the tab is not tight or there is a crack in the braze attachment, replace the beta spring retainer.
(4) Visually examine the beta spring retainer ID for wear (Diameter "B").	If there is wear, measure the ID of the beta spring retainer. The maximum permitted ID is 1.200 inches (30.48 mm).	If the ID is greater than the permitted serviceable limits, replace the beta spring retainer.
(5) Visually examine the depth of the beta spring retainer ID for wear (Depth "C").	If there is wear, measure the depth of the beta spring retainer ID. The maximum permitted ID depth is 0.270 inch (6.85 mm).	If the depth of the beta spring retainer ID is greater than the permitted serviceable limits, replace the beta spring retainer.
(6) Visually examine the width of the beta spring retainer flange for wear (Width "D").	If there is wear, measure the width of the beta spring retainer flange. The minimum permitted width is 0.043 inch (1.10 mm).	If the width is less than the permitted serviceable limits, replace the beta spring retainer.

Component Inspection Criteria
Table 5-1

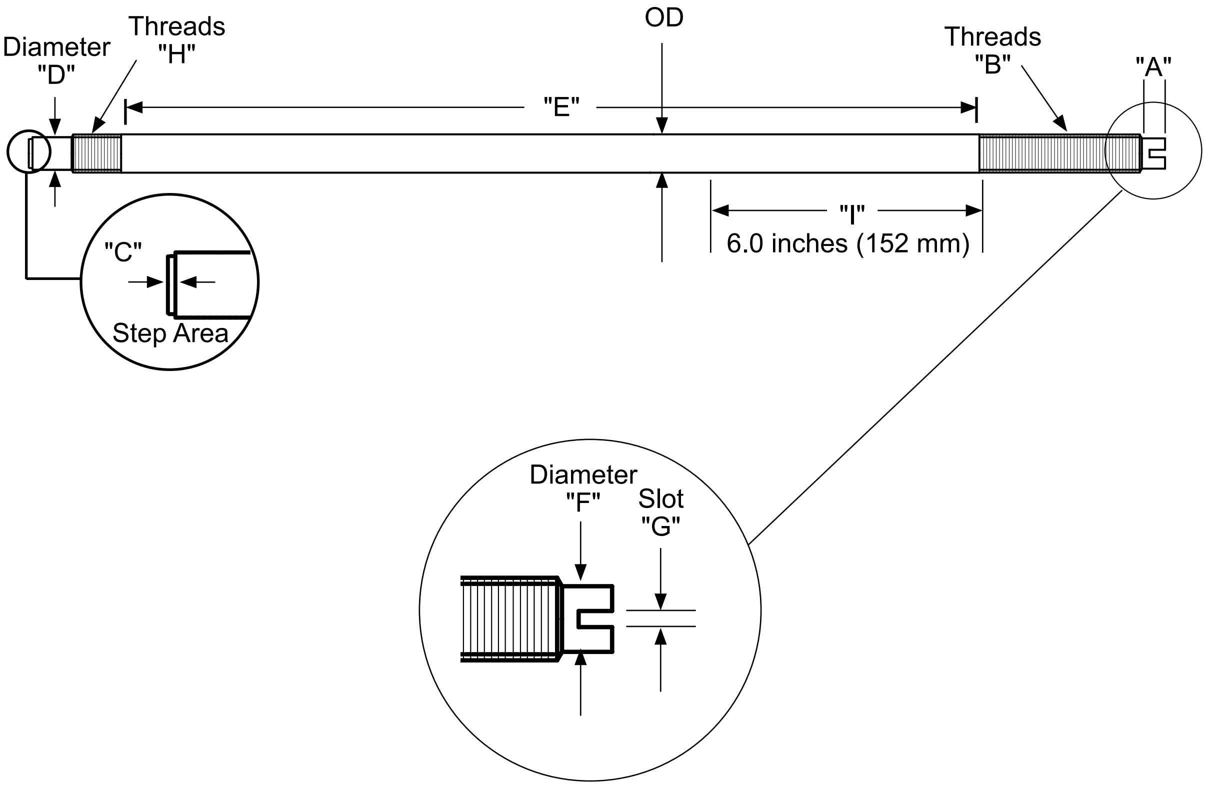
	Inspect	Serviceable Limits	Corrective Action
V.	BETA SPRING RETAINER, CONTINUED (Item 1630) (Refer to Figure 5-23)		
(7)	Magnetic particle inspect the beta spring retainer in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the beta spring retainer.
(8)	Visually examine the beta spring retainer for cadmium plating coverage.	A few random scratches and corners with cadmium plating missing is permitted; otherwise, cadmium plating must completely cover the beta spring retainer.	If the cadmium plating coverage is less than the permitted serviceable limits, replate and bake the beta spring retainer in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Compression Spring
Figure 5-24

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
W.	COMPRESSION SPRING (Item 1640) (Refer to Figure 5-24)		
(1)	Visually examine the compression spring for corrosion product and pitting.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting is 0.002 inch (0.050 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the compression spring. If the pitting is greater than the permitted serviceable limits, replace the compression spring.
(2)	Visually examine the compression spring for gouges, seams, or missing material.	A gouge, seam, or missing material is not permitted.	If there is a gouge, seam, or missing material, replace the compression spring.
(3)	Measure the free length of the compression spring.	The minimum permitted free length of the compression spring is 5.75 inch (146.05 mm).	If the free length is less than the permitted serviceable limits, replace the compression spring.
(4)	Magnetic particle inspect the compression spring in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the compression spring.



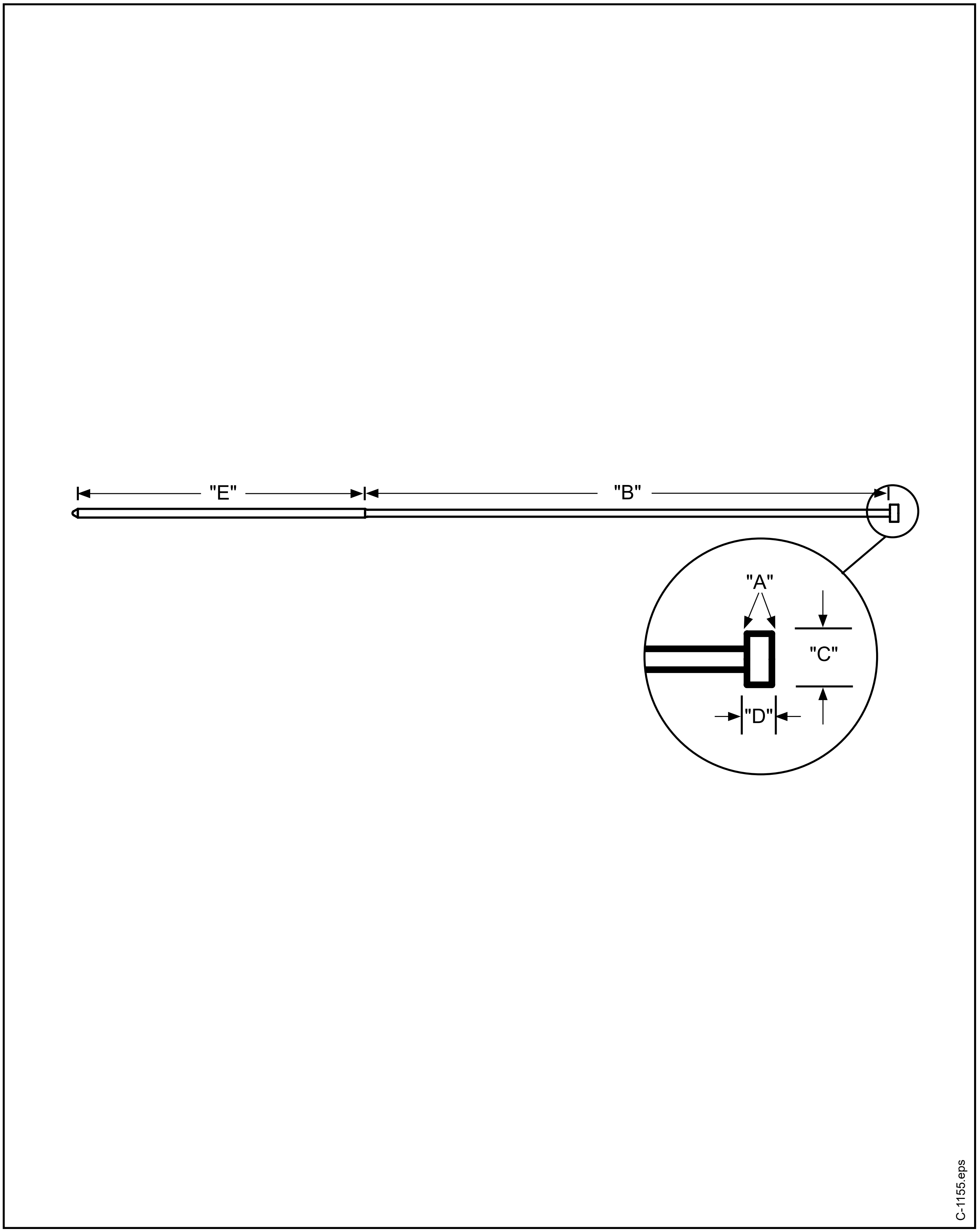
Primary Beta Valve Rod
Figure 5-25

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
X.	PRIMARY BETA VALVE ROD (Item 1660) (Refer to Figure 5-25)		
(1)	Visually examine the primary beta valve rod for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	In Area "A", Threads "B", or Threads "H" only, 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 primary beta valve rod. If damage is greater than the permitted serviceable limits, replace the primary beta valve rod.
(2)	Visually examine the outboard end of the primary beta valve rod for localized damage (Area "A").	There must be enough of slot "G" to permit a screwdriver to be used to prevent rotation of the primary beta valve rod when installing a lock nut on "B" threads. The diameter of "F" must not prevent installation of a lock nut on "B" threads.	File "F" diameter to permit lock nut installation on "B" threads. If damage is greater than the permitted serviceable limits or the corrective action limits, replace the primary beta valve rod.
(3)	Visually examine the threads of the primary beta valve rod for damage (Threads "B").	The maximum permitted thread damage is 1 thread total accumulated damage.	If damage is greater than the permitted serviceable limit, replace the primary beta valve rod.
(4)	Visually examine the threads of the primary beta valve rod for damage (Threads "H").	The maximum permitted thread damage is 1 thread total accumulated damage. A drilled hole for spring pin installation is not considered to be damage.	If damage is greater than the permitted serviceable limit, replace the primary beta valve rod.
(5)	Visually examine the end of the primary beta valve rod for a step (Area "C").	If the end has a step, measure the depth of the step. The maximum permitted depth is 0.001 inch (0.025 mm).	If the depth of the step is greater than the permitted serviceable limits, replace the primary beta valve rod.
(6)	Measure the OD of the end of the primary beta valve rod (Area "D").	The minimum permitted OD is 0.262 inch (6.66 mm).	If the OD is less than the permitted serviceable limits, replace the primary beta valve rod.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
X. PRIMARY BETA VALVE ROD, CONTINUED (Item 1660) (Refer to Figure 5-25)		
(7) Measure the OD of the primary beta valve rod (Area "E").	The minimum permitted OD is 0.307 inch (7.79 mm).	If the OD is less than the permitted serviceable limits, replace the primary beta valve rod.
(8) With a microfinish comparator sample or profilometer, examine the surface finish of the primary beta valve rod (Area "I").	The maximum permitted surface finish is 16 Ra.	If the finish is greater than the permitted serviceable limits, replace the primary beta valve rod.
(9) Magnetic particle inspect the primary beta valve rod 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 primary beta valve rod.



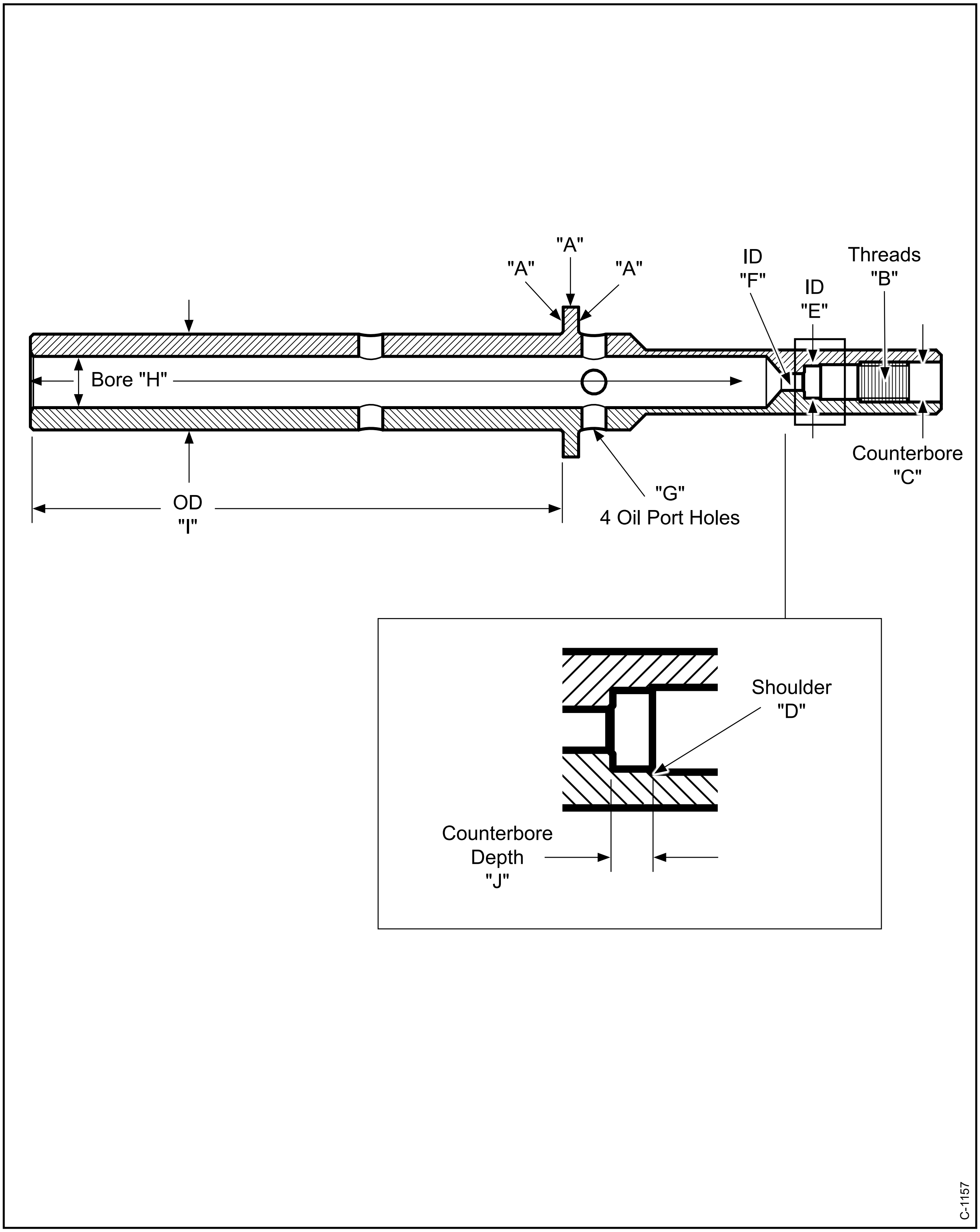
Beta Valve Pitch Indicator Pin
Figure 5-26

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Y. <u>PITCH INDICATOR PIN UNIT</u> (Item 1680) (Refer to Figure 5-26)		
(1) Visually examine the head of the pitch indicator pin unit for wear or damage on the edges (Area "A").	Wear or damage is not permitted.	If there is wear or damage, replace the pitch indicator pin unit.
(2) Visually examine the OD shaft of the pitch indicator pin unit in Area "B" for damage.	Damage is not permitted.	If there is damage, replace the pitch indicator pin unit.
(3) Visually examine the OD shaft of the pitch indicator pin unit in Area "B" for wear. If there is wear measure the OD.	The minimum permitted OD in Area "B" of the pitch indicator pin unit is 0.097 inch (2.47 mm).	If the OD is less than the permitted serviceable limits, replace the pitch indicator pin unit.
(4) Visually examine the OD shaft of the pitch indicator pin unit in Area "E" for damage.	Damage is not permitted.	If there is damage, replace the pitch indicator pin unit.
(5) Visually examine the OD shaft of the pitch indicator pin unit in Area "E" for wear. If there is wear measure the OD.	The minimum permitted OD in Area "E" of the pitch indicator pin unit is 0.122 inch (3.09 mm).	If the OD is less than the permitted serviceable limits, replace the pitch indicator pin unit.
(6) Measure the OD of the head of the pitch indicator pin unit (Area "C").	The minimum permitted OD of the head of the pitch indicator pin unit is 0.242 inch (6.15 mm).	If the OD is less than the permitted serviceable limits, replace the pitch indicator pin unit.
(7) Measure the width of the head of the reverse pitch indicator pin unit (Area "D").	The minimum permitted width is 0.116 inch (2.94 mm).	If the width is less than the permitted serviceable limits, replace the pitch indicator pin unit.

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
Y.	PITCH INDICATOR PIN UNIT, CONTINUED (Item 1680) (Refer to Figure 5-26)		
	(8) Visually examine the pin for a bend from straight.	From end to end, the maximum permitted bend of the pin from straight is 0.015 inch (0.38 mm). For each 1.00 inch (25.4 mm) of length the maximum permitted bend from straight is 0.001 inch (0.025 mm).	If there is a bend from straight that is greater than the permitted serviceable limits, replace the reverse indicator pin unit.
	(9) Magnetic particle inspect the pitch indicator pin unit in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the pitch indicator pin unit.



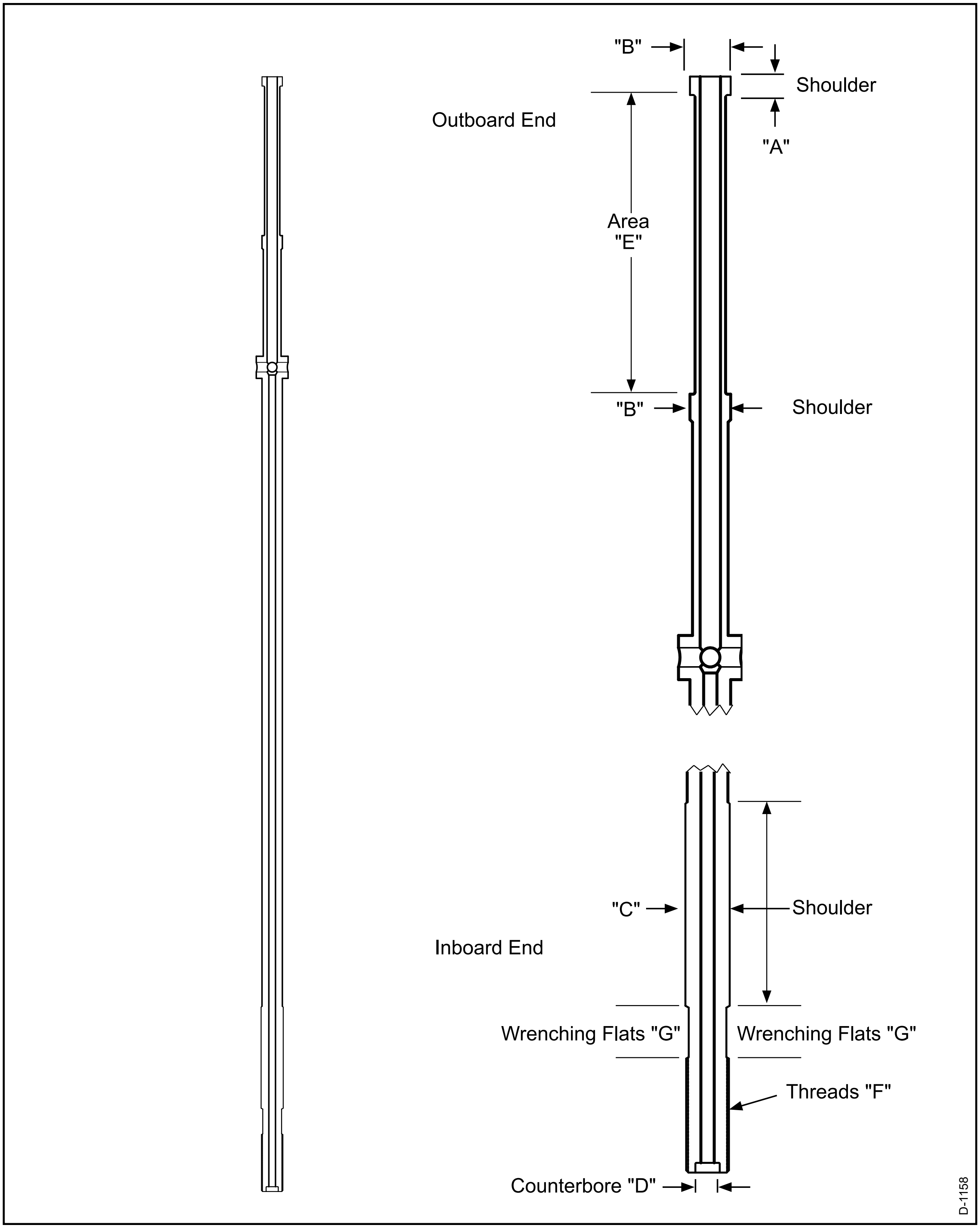
Beta Valve Sleeve
Figure 5-27

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
Z.	BETA VALVE SLEEVE (Item 1690) (Refer to Figure 5-27)		
(1)	Visually examine the beta valve sleeve for corrosion product or pitting.	Corrosion product or pitting is not permitted.	If there is corrosion product or pitting, replace the beta valve sleeve.
(2)	Visually examine the surfaces of the flange for damage (Areas "A").	Damage, such as a gouge, is not permitted.	If damage is greater than the permitted serviceable limits, replace the beta valve sleeve.
(3)	Visually examine the internal threads of the beta valve sleeve for damage (Area "B").	One thread total accumulated damage is permitted. The drilled hole for spring pin installation is not considered to be thread damage.	If damage is greater than the permitted serviceable limits, replace the beta valve sleeve.
(4)	Visually examine the beta valve counterbore "C" for wear or damage. If there is wear, measure the ID.	Damage is not permitted. The maximum permitted ID is 0.3145 inch (7.988 mm).	If the wear or damage is greater than the permitted serviceable limits, replace the beta valve sleeve.
(5)	Measure ID "E".	The maximum permitted ID is 0.255 inch (6.47 mm).	If the ID is greater than the permitted serviceable limits, replace the beta valve sleeve.
(6)	Visually examine shoulder "D" for wear or damage. If there is wear, measure counterbore depth "J".	The maximum permitted counterbore depth is 0.130 inch (3.30 mm). The minimum permitted counterbore depth is 0.125 inch (3.18 mm).	If the counterbore depth "J" is greater than or less than the permitted serviceable limits, replace the beta valve sleeve.
(7)	Measure ID "F".	The maximum permitted ID is 0.134 inch (3.40 mm).	If the ID is greater than the permitted serviceable limits, replace the beta valve sleeve.
(8)	Measure the ID of the four beta valve sleeve oil port holes (Area "G").	The maximum permitted ID is 0.1875 inch (4.752 mm).	If the ID is greater than the permitted serviceable limits, replace the beta valve sleeve.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Z. BETA VALVE SLEEVE, CONTINUED (Item 1690) (Refer to Figure 5-27)		
(9) Measure the ID of the beta valve sleeve bore "H".	The maximum permitted bore ID is 0.001 inch (0.0254 mm) larger than the OD of the of the mating part, beta valve spool item 1700.	If the ID is not within the permitted serviceable limits, replace the beta valve sleeve.
(10) Measure beta valve sleeve OD "I".	The minimum permitted OD is 0.745 inch (18.93 mm).	If the OD is less than the permitted serviceable limits, replace the beta valve sleeve.
(11) With a microfinish comparator sample or profilometer, inspect the beta valve rod surface finish. (Area "H" and "I")	The maximum permitted surface finish is 16 Ra.	If the surface finish is greater than the permitted serviceable limits, replace the beta valve sleeve.
(12) Magnetic particle inspect the beta valve sleeve 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 beta valve sleeve.



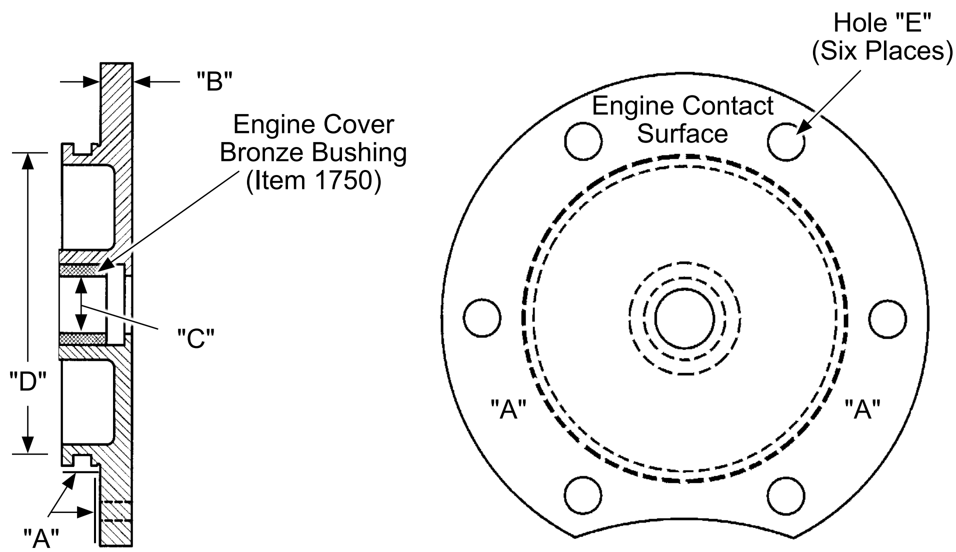
Beta Valve Spool
Figure 5-28

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AA. BETA VALVE SPOOL (Item 1700) (Refer to Figure 5-28)		
(1) Visually examine the beta valve spool for corrosion product or pitting.	Corrosion product or pitting is not permitted.	If there is corrosion product or pitting, replace the beta valve sleeve spool.
(2) Visually examine the beta valve spool between the shoulders for damage (Area "E").	The maximum permitted damage depth is 0.002 inch (0.05 mm).	Using an abrasive pad CM47 or equivalent, lightly polish to remove damage. If damage is greater than the permitted serviceable limits, replace the beta valve spool.
(3) Visually examine the beta valve spool shoulders for damage.	Damage is not permitted.	If there is damage, replace the beta valve spool.
(4) Visually examine the threads of the beta valve spool for damage.	The maximum permitted thread damage is 1 thread total accumulated damage.	If damage is greater than the permitted serviceable limits, replace the beta valve spool.
(5) With a microfinish comparator sample or profilometer, examine the surface finish of the beta valve spool shoulder OD.	The maximum permitted surface finish is 16 Ra.	If the surface finish is greater than the permitted serviceable limits, replace the beta spool.
(6) Measure the outboard shoulder width of the beta valve spool (Area "A").	The minimum permitted width is 0.180 inch (5.47 mm).	If the width is less than the permitted serviceable limits, replace the beta valve spool.
(7) Measure the OD of the beta valve spool shoulders, two places. (Area "B").	The minimum permitted OD is 0.3993 inch (10.143 mm).	If the OD is less than the permitted serviceable limits, replace the beta valve spool.
(8) Measure the OD of the beta valve spool inboard shoulder (Area "C").	The minimum permitted OD is 0.433 inch (10.99 mm).	If the OD is less than the permitted serviceable limits, replace the beta valve spool.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AA. BETA VALVE SPOOL, CONTINUED (Item 1700) (Refer to Figure 5-28)		
(9) With a microfinish comparator sample or profilometer, examine the surface finish of the valve shoulder OD (Area "C").	The maximum permitted surface finish is 16 Ra.	If the surface finish is greater than the permitted serviceable limits, replace the beta valve spool.
(10) Measure the ID of the beta valve spool counterbore "D".	The maximum permitted ID is 0.243 inch (6.17 mm).	If the ID is greater than the permitted serviceable limits, replace the beta valve spool.
(11) Visually examine threads "F" for damage.	One thread total accumulated damage is permitted. Continuous damage must not be greater than 1/2 thread in length. Damage must not interfere with installed parts.	If damage is greater than the permitted serviceable limits, replace the beta valve spool.
(12) Visually examine the two wrenching flats "G" for damage.	Damage to the flats must not prevent the use of an open end wrench.	If damage is greater than the permitted serviceable limits, replace the beta valve spool.
(13) Magnetic particle inspect the beta valve spool 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 beta valve spool.



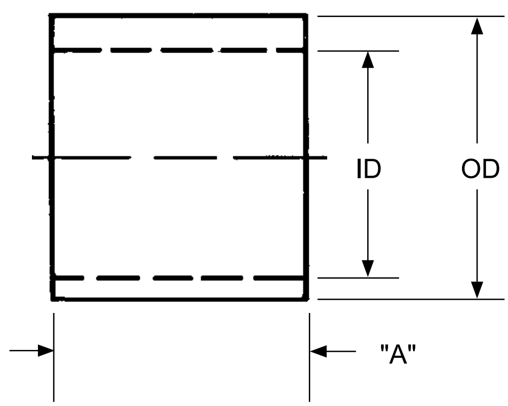
Engine Cover
Figure 5-29

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AB. <u>ENGINE COVER</u> (Item 1740) (Refer to Figure 5-29)		
(1) Visually examine the engine cover for damage on the engine contact surfaces (Surface "A").	Damage that interferes with the fit on the engine is not permitted.	If damage is greater than the permitted serviceable limits, replace the engine cover.
(2) Measure the width of the engine cover flange (Area "B").	The minimum permitted width is 0.230 inch (5.84 mm).	If the width is less than the permitted serviceable limits, replace the engine cover.
(3) Measure the ID of the engine cover bronze bushing (Item 1750) (Area "C").	The maximum permitted bushing ID is 0.440 inch (11.17 mm).	If the ID is greater than the permitted serviceable limits, replace the bushing in accordance with the section "Replacing the Beta Valve Engine Cover Bushing B-6985" in the Repair chapter of this manual.
(4) Measure the OD of the O-ring groove (Area "D").	The minimum permitted OD is 2.314 inches (58.77 mm).	If the OD is less than the permitted serviceable limits, replace the engine cover.
(5) Measure the ID of each hole (Hole "E").	The maximum permitted ID is 0.288 inch (7.31 mm).	If the ID is greater than the permitted serviceable limits, replace the engine cover.
(6) Penetrant inspect the engine cover in accordance with the Penetrant Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). <u>NOTE</u>: Pre-penetrant etch is not required. Do not remove the anodize. Do not remove the bushing.	A relevant indication is not permitted.	If there is a relevant indication, replace the engine cover.

Component Inspection Criteria
Table 5-1

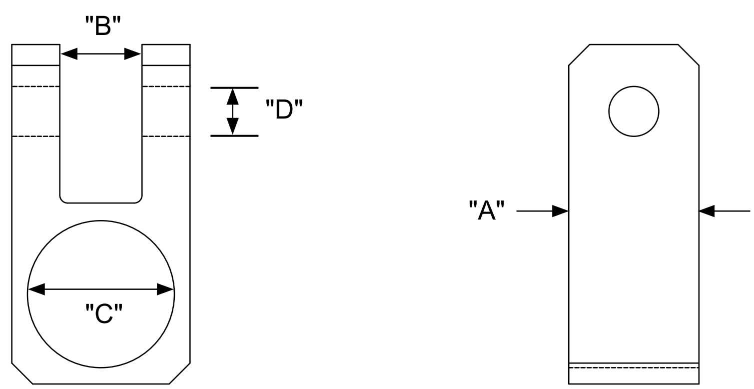
Inspect	Serviceable Limits	Corrective Action
AB. ENGINE COVER, CONTINUED (Item 1740) (Refer to Figure 5-29)		
(7) Visually examine the engine covers for anodize coverage.	Except for a few scratches and corners with anodize coating missing, complete coverage is required.	If the anodize coverage is less than the permitted serviceable limits, re-anodize the engine cover in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). The bronze bushing must be removed before anodize and then reinstalled after anodize. Refer to the section "Replacing the Beta Valve Engine Cover Bushing B-6985" in the Repair chapter of this manual.



Beta Valve Bushing
Figure 5-30

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AC. <u>BETA VALVE BUSHING</u> (Item 1770) (Refer to Figure 5-30)		
(1) Visually examine all surfaces of the beta valve bushing for wear, grooves, gouges, or other damage.	Wear, grooves, gouges, or other damage is not permitted.	If there is a groove, gouge, wear or damage, replace the beta valve bushing
(2) Measure the length of the beta valve bushing "A".	The minimum permitted length is 0.502 inch (12.75 mm).	If the length of the beta valve bushing is less than the permitted serviceable limits, replace the beta valve bushing.
(3) Measure the ID of the beta valve bushing.	The maximum permitted ID is 0.443 inch (11.25 mm).	If the ID of the beta valve bushing is greater than the permitted serviceable limits, replace the beta valve bushing.
(4) Measure the OD of the beta valve bushing.	The minimum permitted OD is 0.559 inch (14.20 mm).	If the OD of the beta valve bushing is less than the permitted serviceable limits, replace the beta valve bushing.
(5) Magnetic particle inspect the beta valve bushing 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 beta valve bushing.



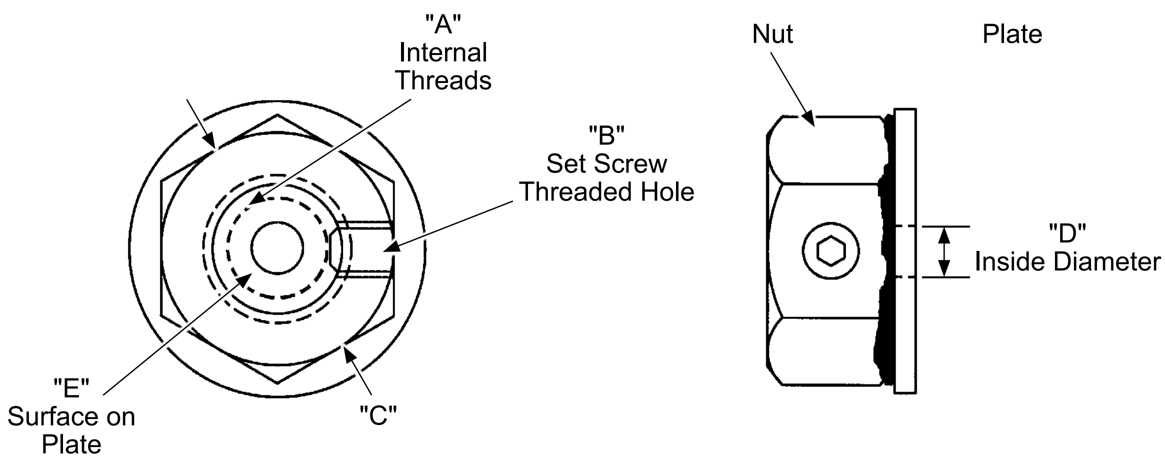
Rod End Fitting
Figure 5-31

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AD. ROD END FITTING (Item 1780) (Refer to Figure 5-31)		
(1) Visually examine the rod end fitting for corrosion product, pitting, or damage.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. Except for bore "C", the maximum permitted depth of pitting or damage is 0.003 inch (0.08 mm). In bore "C", pitting or damage is not permitted.	Using an abrasive pad CM47 or equivalent, lightly polish to remove corrosion product. If the corrosion product cannot be removed, replace the rod end fitting. If the pitting or damage is greater than the permitted serviceable limits or the corrective action limits, replace the rod end fitting.
(2) Measure the width of the rod end fitting (Area "A").	The minimum permitted width is 0.496 inch (12.60 mm).	If the width is less than the permitted serviceable limits, replace the rod end fitting.
(3) Measure the width of the groove (Area "B").	The maximum permitted width is 0.318 inch (8.07 mm).	If the width is greater than the permitted serviceable limits, replace the rod end fitting.
(4) Measure the ID of the bushing passage (Area "C").	The maximum permitted ID is 0.565 inch (14.35 mm).	If the ID is greater than the permitted serviceable limits, replace the rod end fitting.
(5) Measure the ID of each hole (Area "D")	The maximum permitted ID is 0.193 inch (4.90 mm).	If the ID is greater than the permitted serviceable limits, replace the rod end fitting.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
AD.	ROD END FITTING, CONTINUED (Item 1780) (Refer to Figure 5-31)		
(6)	Magnetic particle inspect the rod end fitting in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). NOTE: It is not necessary to remove the sleeve bushing.	A relevant indication is not permitted.	If there is a relevant indication, replace the rod end fitting.
(7)	Visually examine the rod end fitting for cadmium plating coverage.	Except for a few scratches and corners with cadmium plating missing, complete coverage is required.	If the cadmium plating coverage is less than the permitted serviceable limits, replate the rod end fitting in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Rod End Cap Unit
Figure 5-32

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
AE.	ROD END CAP UNIT (Item 1790) (Refer to Figure 5-32)		
(1)	Except for surface "E", visually examine the rod end cap unit for corrosion product, pitting, or damage.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. The maximum permitted depth of pitting or damage is 0.003 inch (0.08 mm).	Using an abrasive pad CM47 or equivalent, lightly polish to remove corrosion product. If the corrosion product cannot be removed, replace the rod end cap unit. If the damage or pitting is greater than the permitted serviceable limits, replace the rod end cap unit.
(2)	Visually examine the rod end cap unit surface "E" for corrosion product, pitting, or damage.	Corrosion product, pitting, or damage is not permitted.	If there is corrosion product, pitting, or damage, replace the rod end cap unit.
(3)	Visually examine the internal threads of the rod end cap unit for damage (Area "A").	A maximum of one thread total accumulated damage is permitted.	If damage is greater than the permitted serviceable limits, replace the rod end cap unit.
(4)	Visually examine the set screw hole threads of the rod end cap unit for damage (Area "B").	A maximum of 1/2 of one thread total accumulated thread damage is permitted.	If damage is greater than the permitted serviceable limits, replace the rod end cap unit.
(5)	Visually examine the wrench flat of the rod end cap unit for damage (Area "C").	Sufficient wrench flat must remain to permit installation and removal.	If damage is greater than the permitted serviceable limits, replace the rod end cap unit.
(6)	Measure the washer ID of the rod end cap unit (Area "D").	The maximum permitted ID is 0.144 inch (3.65 mm).	If the ID is greater than the permitted serviceable limits, replace the rod end cap unit.
(7)	Visually examine the rod end cap unit for cadmium plating coverage.	Except for a few scratches and corners with cadmium plating missing, complete coverage is required.	If the cadmium plating coverage is less than the permitted serviceable limits, replate the rod end cap unit in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AE. ROD END CAP UNIT, CONTINUED (Item 1790) (Refer to Figure 5-32)		
(8) Penetrant inspect the rod end cap unit in accordance with the Penetrant Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). NOTE: It is not necessary to remove the cadmium plating.	A relevant indication is not permitted.	If there is a relevant indication, replace the rod end cap unit.

REPAIR - CONTENTS

LIST OF FIGURES

(This page is intentionally blank.)

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

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

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

1. General Repair Requirements (Rev. 2)

A. Shot Peening

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

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

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

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

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

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

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

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

b Contact Hartzell Propeller Inc. Product Support

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

B. Aluminum and Steel Parts

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

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

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

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

2. Repair/Modification Procedures (Rev. 2)

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

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

B. Hubs

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

C. Blades

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

D. Spinner Assemblies

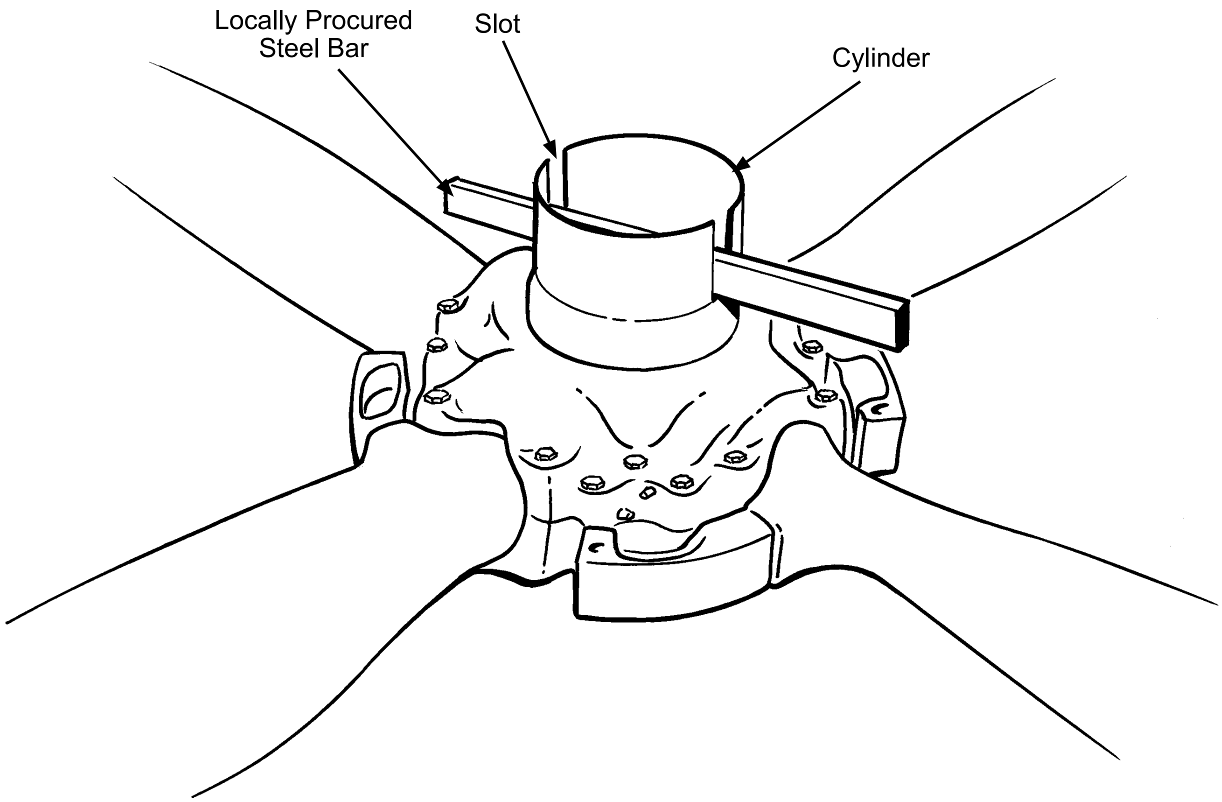
(1) Metal Spinners: Refer to Hartzell Propeller Inc. Metal Spinner Maintenance Manual 127 (61-16-27).

(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).



Cylinder Removal
Figure 6-1

3. Specific Repair Requirements

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

A. Repair of Damaged Balance Weight Attachment Holes

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

B. Repair of Damaged Cylinder Wrench Attachment Holes

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

C. Cylinder Removal

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

(1) General

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

(2) Removal Procedure

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

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

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

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

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

CAUTION: DO NOT DAMAGE THE HUB THREADS WHEN CUTTING THE SLOTS IN THE CYLINDER.

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

1 The slots must be 180 degrees from each other.

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

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

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

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

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

(a) The locally procured bar must:

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

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

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

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

(a) The cylinder will either turn off the hub or break at the chiseled notches.

D. Feather Compression Spring Zinc Chromate Primer Repair

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

(1) Cleaning

(a) For procedures for cleaning the feather spring (260), refer to Cleaning of Steel Parts in the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(b) Inspect the feather compression spring (260) for scratches, corrosion, and zinc plate coverage in accordance with the Check chapter of this manual.

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

(d) Using solvent CM106, clean the entire feather spring (260).

(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 feather compression spring (260).

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

(c) Examine the feather compression spring (260) for complete primer coverage.

E. Reverse Adjust Sleeve Bushing Removal and Installation

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

(1) Removal Procedure

(a) Put a customer supplied 1.187 inch (30.14 mm) diameter reamer in a vise.

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

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

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

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

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

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

(2) Installation Procedure

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

F. Replacing the Beta Valve Engine Cover Bushing B-6985

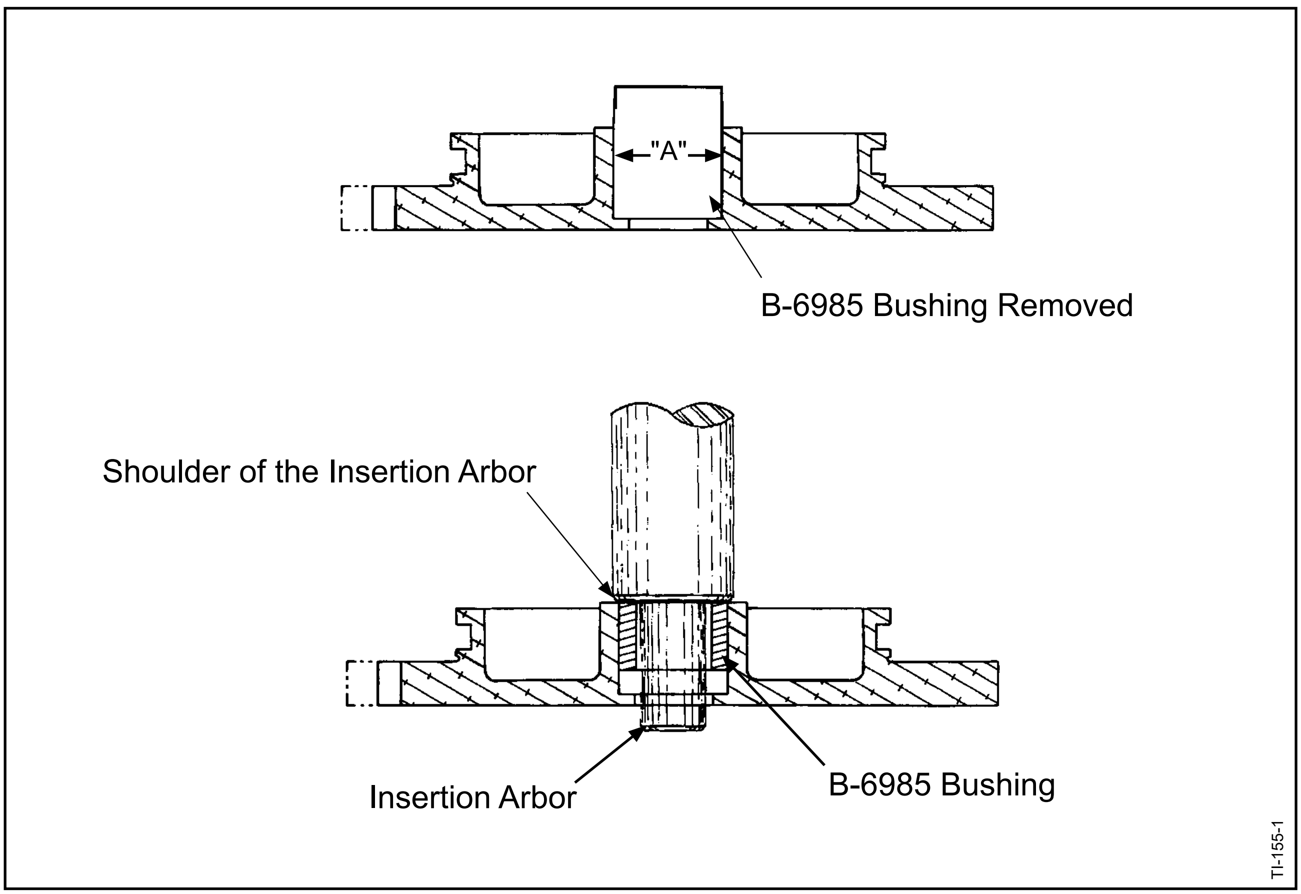
CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

(1) Remove the bushing.

(2) With the bushing removed, measure dimension "A" shown in Figure 6-2.

(a) If dimension "A" is greater than 0.625 inch (15.87 mm), replace the engine cover and the bushing.

(3) Using a locally procured insertion arbor of appropriate size, press fit the new B-6985 bushing into the engine cover. Refer to Figure 6-2.



Replacing the Beta Valve Engine Cover Bushing B-6985
Figure 6-2

G. B-755-1 Pitch Change Rod Plug Bushing Replacement

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

(1) General

(a) Remove the internal retaining ring (90) using either "Procedure 1, Removal of the Internal Retaining Ring (90) Using Needle Nose Pliers" or "Procedure 2, Removal Using A Slotted Screwdriver" in this section.

1 The "Procedure 1, Removal of the Internal Retaining Ring (90) Using Needle Nose Pliers" is preferred because the needle nose pliers will not damage the housing of the pitch change rod plug (70) as easily as the slotted screwdriver.

(b) Tools Required

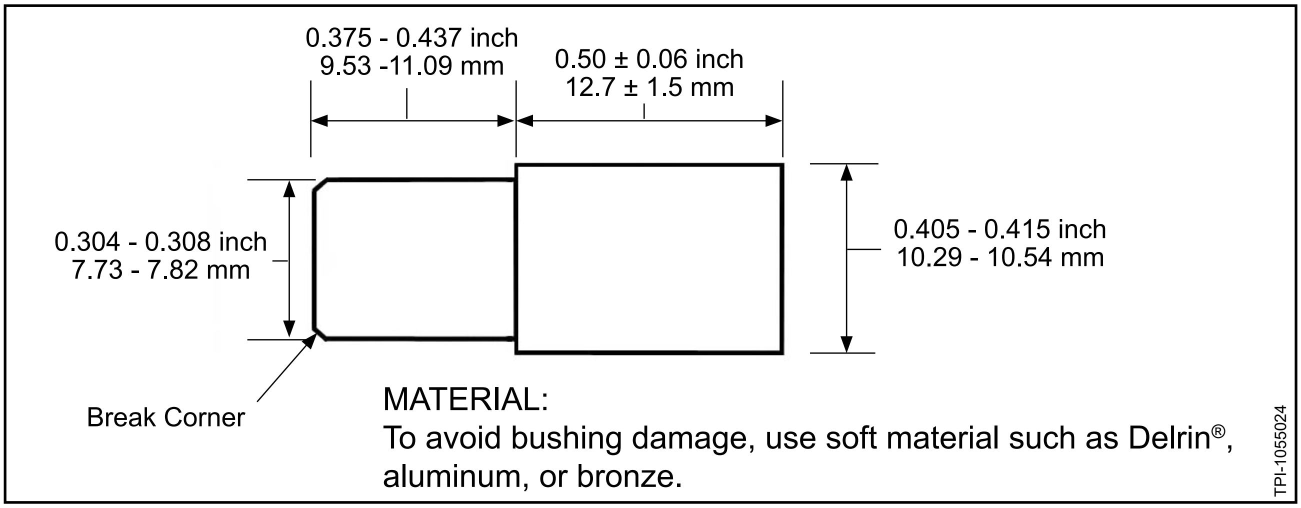
1 Locally procured needle nose pliers (used with Procedure 1 and bushing installation)

2 Locally procured slotted screwdriver (used with Procedure 2)

3 Locally procured M8 x 1.25 or M8 x 1.00 thread tap

4 Locally procured/manufactured pilot, refer to Figure 6-3.

5 Locally procured hand arbor press or soft mallet



Dimensions of the Pilot
Figure 6-3

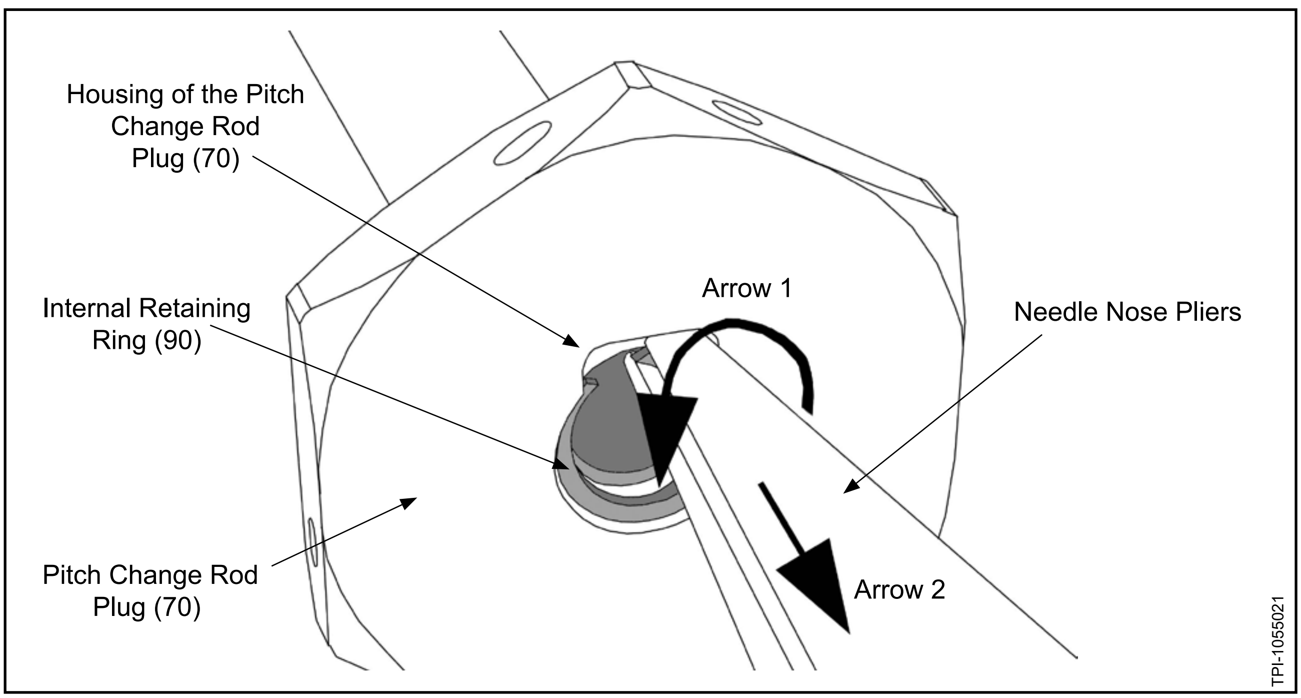
(2) Removing the Internal Retaining Ring (90)

(a) Procedure 1, Removing the Internal Retaining Ring (90) Using Needle Nose Pliers - Refer to Figure 6-4

1 Using needle nose pliers, grip one of the two ends of the internal retaining ring (90) as shown in Figure 6-4.

2 While gripping the internal retaining ring (90), rotate the needle nose pliers (Arrow 1) to lift the internal retaining ring (90) toward the center of the opening and to lift the internal retaining ring (90) out of the groove provided for it in the housing of the pitch change rod plug (70).

3 As the internal retaining ring (90) lifts out of the groove, pull the needle nose pliers and the internal retaining ring (90) (Arrow 2) out of the housing of the pitch change rod plug (70).



Using Needle Nose Pliers
Figure 6-4

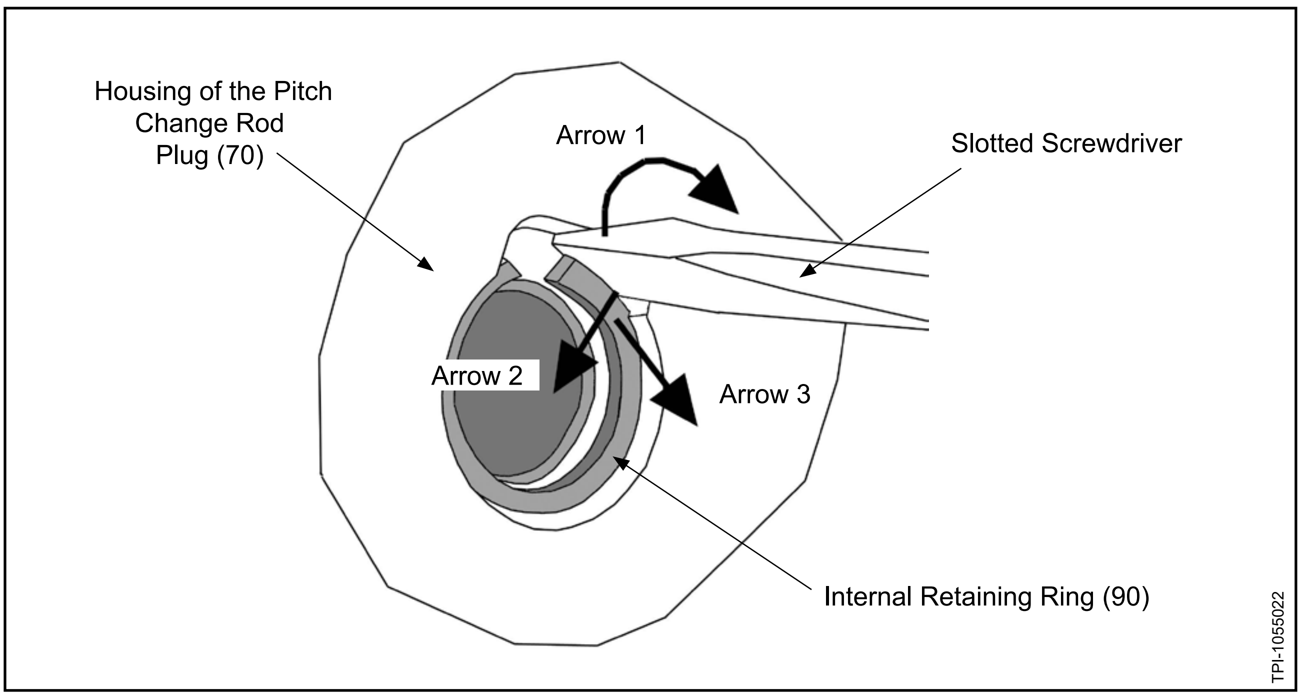
(b) Procedure 2, Removing the Internal Retaining Ring (90) Using a Slotted Screwdriver - Refer to Figure 6-5

CAUTION: THE HOUSING OF THE PITCH CHANGE ROD PLUG (70) AND THE INTERNAL RETAINING RING (90) ARE VERY EASILY DAMAGED BY THIS PROCESS.

1 Put the slotted screwdriver in place as shown in Figure 6-5.

2 Rotate the slotted screwdriver (Arrow 1) to lever against the housing of the pitch change rod plug (70) and to lift the internal retaining ring (90) toward the center of the hole (Arrow 2).

3 As a portion of the internal retaining ring (90) is lifted out of the slot in the housing of the pitch change rod plug (70), lift the screwdriver to force the internal retaining ring (90) out of the housing of the pitch change rod plug (70) (Arrow 3).



Using a Slotted Screwdriver
Figure 6-5

(3) Removing the Pitch Change Rod Plug Bushing

(a) From the retaining ring end of the pitch change rod plug bushing (80), thread the locally procured M8 x 1.25 or M8 x 1.00 thread tap into the pitch change rod plug bushing (80).

(b) Hold the housing of the pitch change rod plug (70) and pull on the locally procured M8 x 1.25 or M8 x 1.00 thread tap to remove the pitch change rod plug bushing (80).

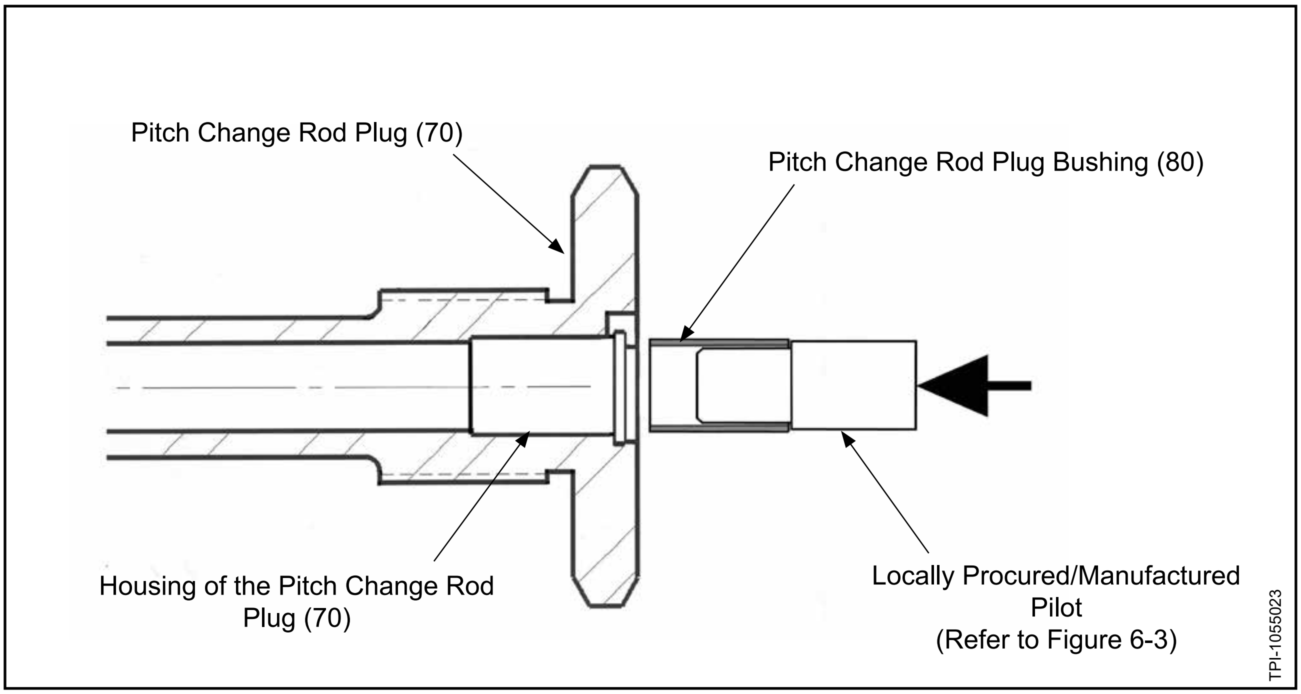
(4) Installing the Pitch Change Rod Plug Bushing

(a) When installing the pitch change rod plug bushing (80) in the housing of the pitch change rod plug (70), use a locally procured/manufactured pilot to support the pitch change rod bushing (80), Refer to Figure 6-3 and Figure 6-6.

(b) Using a hand arbor press, press the pitch change rod bushing (80) into the housing of the pitch change rod plug (70).

1 Alternately, use a soft mallet and lightly tap the pitch change rod bushing (80) to push it into the housing of the pitch change rod plug (70).

(c) Make sure that the pitch change rod bushing (80) is installed completely to the bottom of the counterbore in the housing of the pitch change rod plug (70).



Installing the Pitch Change Rod Bushing
Figure 6-6

(d) Measure the ID of the pitch change rod bushing (80).

1 The minimum permitted ID of the pitch change rod bushing (80) is 0.31115 inch (7.9033 mm).

2 The maximum permitted ID of the pitch change rod bushing (80) is as given in the Check chapter in this manual.

3 If the ID of the pitch change rod bushing (80) is smaller than the permitted limits, ream the pitch change rod bushing (80) ID to 0.3112 +/-0.0005 inch (7.905 +/-0.0127 mm).

(e) Using locally procured needle nose pliers, install a new internal retaining ring (90). Refer to Figure 6-4.

NOTE: The internal retaining ring (90) is required to make sure that the pitch change rod bushing (80) is not able to slide out of the pitch change rod plug (80) during operation.

1 With the end of the needle nose pliers flush with the surface of the internal retaining ring (90) away from the needle nose pliers, grip the end of the internal retaining ring (90).

2 Put the free end of the internal retaining ring (90) in the groove provided for it in the housing of the pitch change rod plug (70).

3 Rotate the needle nose pliers as shown in Figure 6-4 (Arrow 1) to compress the internal retaining ring (90) toward the center of the housing of the pitch change rod plug (70) and to permit the internal retaining ring (90) to slide into the groove provided for it in the housing of the pitch change rod plug (70).

H. Preload Plate Assembly Inner Bearing Race Replacement

CAUTION: ONLY DO THIS PROCEDURE IF THERE IS ENOUGH SPACE BETWEEN THE BOTTOM OF THE INNER BEARING RACE (1010) AND THE SURFACE OF THE PRELOAD PLATE (1000). DO NOT DO THIS PROCEDURE IF THE BOTTOM OF THE INNER BEARING RACE IS TOUCHING THE PRELOAD PLATE.

(1) Removing and Installing the Preload Plate Inner Bearing Race (1010) to the Preload Plate Spindle

CAUTION: WHEN REMOVING THE INNER BEARING RACE (1010), USE CARE TO NOT DAMAGE THE PRELOAD PLATE (1000) THREADS.

(a) Remove the inner bearing race (1010) using the puller TE98 or a locally procured tool.

1 If using puller TE98, put a spacer below the collar of the puller TE98 to keep the puller TE98 from touching the preload plate (1000) threads.

(b) Discard the inner blade bore bearing race (1010).

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

(d) Using number 4 oil CM80, lubricate the inside diameter of the new inner bearing race (1010).

(e) Put the preload plate (1000) in a locally procured fixture.

CAUTION 1: WHEN PUSHING THE INNER BEARING RACE (1010) ONTO THE PRELOAD PLATE (1000), THE FORCE MUST NOT BE GREATER THAN 5000 POUNDS.

CAUTION 2: WHEN PUSHING THE INNER BEARING RACE (1010) ONTO THE PRELOAD PLATE SPINDLE, USE CARE TO NOT DAMAGE THE PRELOAD PLATE (1000) THREADS.

(f) Push the inner bearing race (1010) over the preload plate spindle. Refer to Figure 6.7.

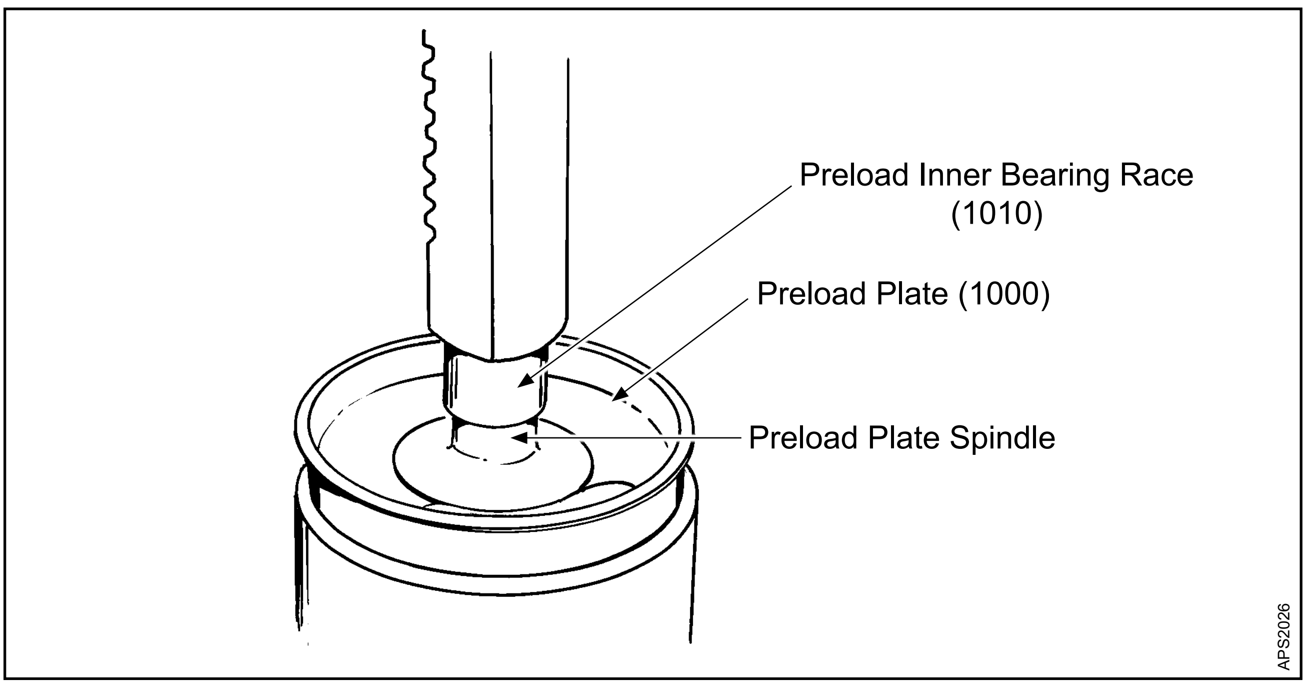
1 The top of the inner bearing race (1010) must be flush to 0.005 inch (0.12 mm) below the top surface of the preload plate spindle.

(g) Turn the set screw (1020) into the preload plate (1000) to test the preload plate threads.

1 If the set screw (1020) does not turn smoothly into the preload plate (1000), replace the preload plate.

(h) Twist, turn, and pull by hand the inner bearing race (1010) to make sure it holds a press fit on the preload plate (1000).

1 If the inner bearing race (1010) does not hold a press fit on the preload plate (1000), replace the preload plate.



Pushing the Preload Bearing onto the Preload Plate Spindle
Figure 6-7

ASSEMBLY - CONTENTS

LIST OF FIGURES

LIST OF FIGURES, CONTINUED

LIST OF TABLES

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1. General (Rev. 5)

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

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

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

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

A. Important Information

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

(2) Protect all unassembled components from damage.

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

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

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

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

B. Ice Protection Systems

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

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

C. O-rings

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

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

D. Blade Bore Plug/Bearing Installation

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

E. Blade Angle Information

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

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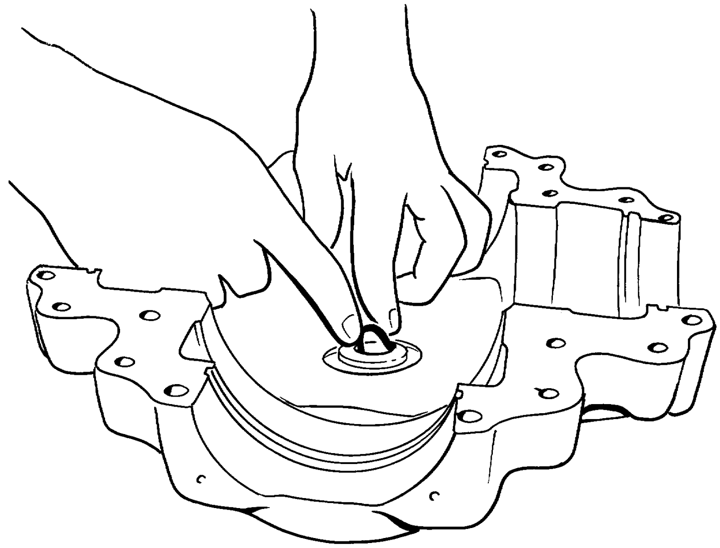
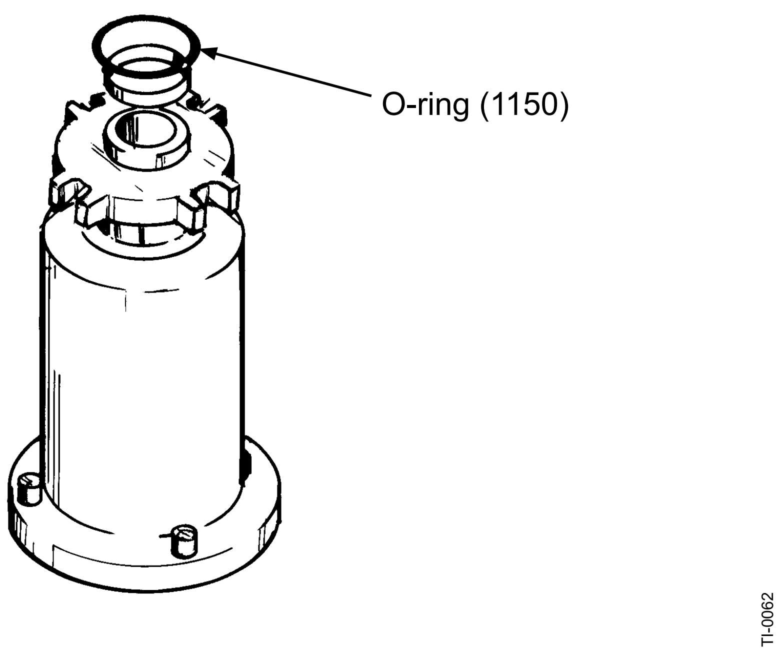


NOTE: For illustration pruposes only a four-bladed propeller hub is shown.

Installing the Pitch Change Rod O-Ring in the Hub Half
Figure 7-1



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

2. Assembly of HC-D3F-7H Propeller Models

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

CAUTION 2: ACTUATION OF PROPELLERS IS TO BE ACCOMPLISHED USING COMPRESSED AIR THAT HAS BEEN FILTERED FOR MOISTURE, OR NITROGEN.

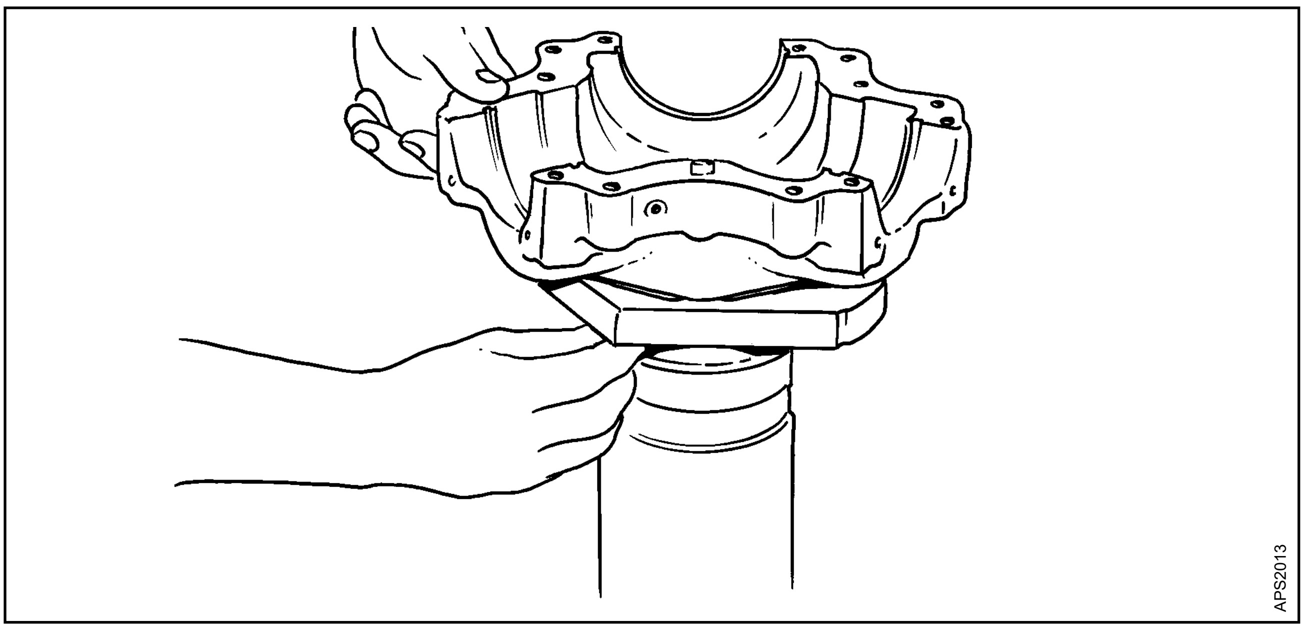
CAUTION 3: DO NOT EXCEED A PRESSURE OF 200 PSI (13.78 BARS) WHEN ACTUATING PROPELLERS COVERED IN THIS MANUAL.

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

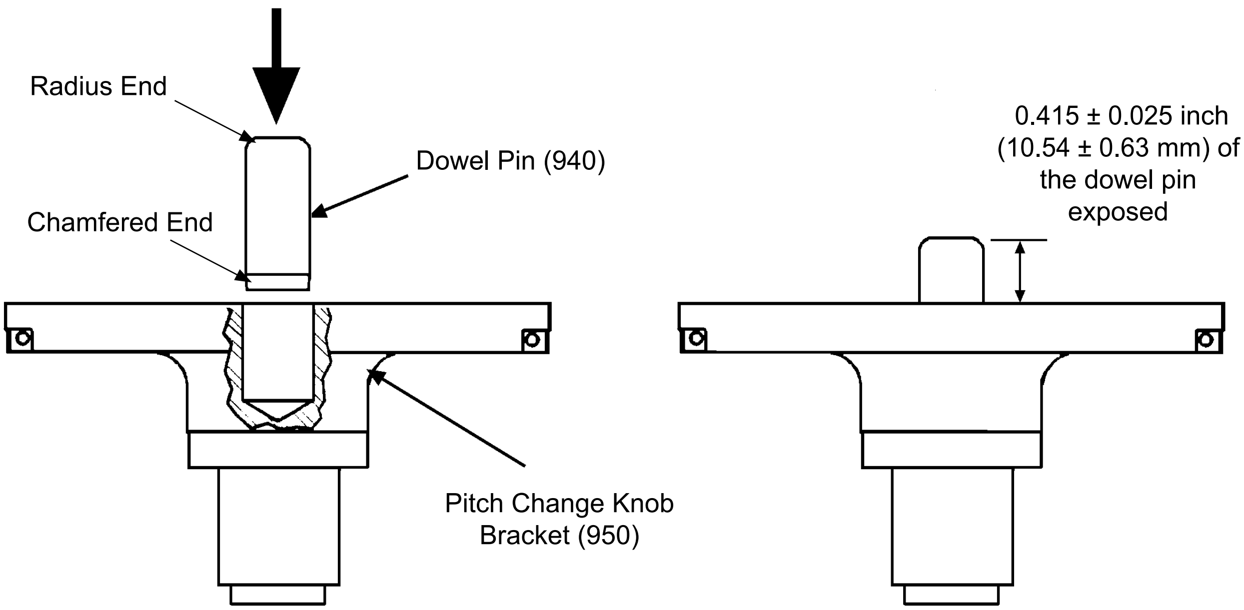
A. Hub Assembly Procedures

(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 a new pitch change rod O-ring (460) in the cylinder-side hub half (450). Refer to Figure 7-1.



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



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

(3) Install the flange O-ring (1150) on the rotatable fixture to seal between the hub and rotatable fixture. Refer to Figure 7-2.

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

B. Blade Assembly Procedures

(1) General

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

(2) Installing the Dowel Pin

(a) If the dowel pin has been removed, press the chamfered end of the dowel pin (940) into the pitch change knob bracket (950) leaving 0.415 ± 0.025 inch (10.54 ± 0.63 mm) of the dowel pin exposed. Refer to Figure 7-4.

(3) Lubricating the cam follower (960).

NOTE: The cam followers (960) are shipped from Hartzell Propeller Inc. greased with approved lubricant.

(a) Lubricating of the cam follower (960) is not necessary if one of the following two criteria are met:

1 It has been less than two (2) years from the date marked on the packaging by Hartzell Propeller Inc.

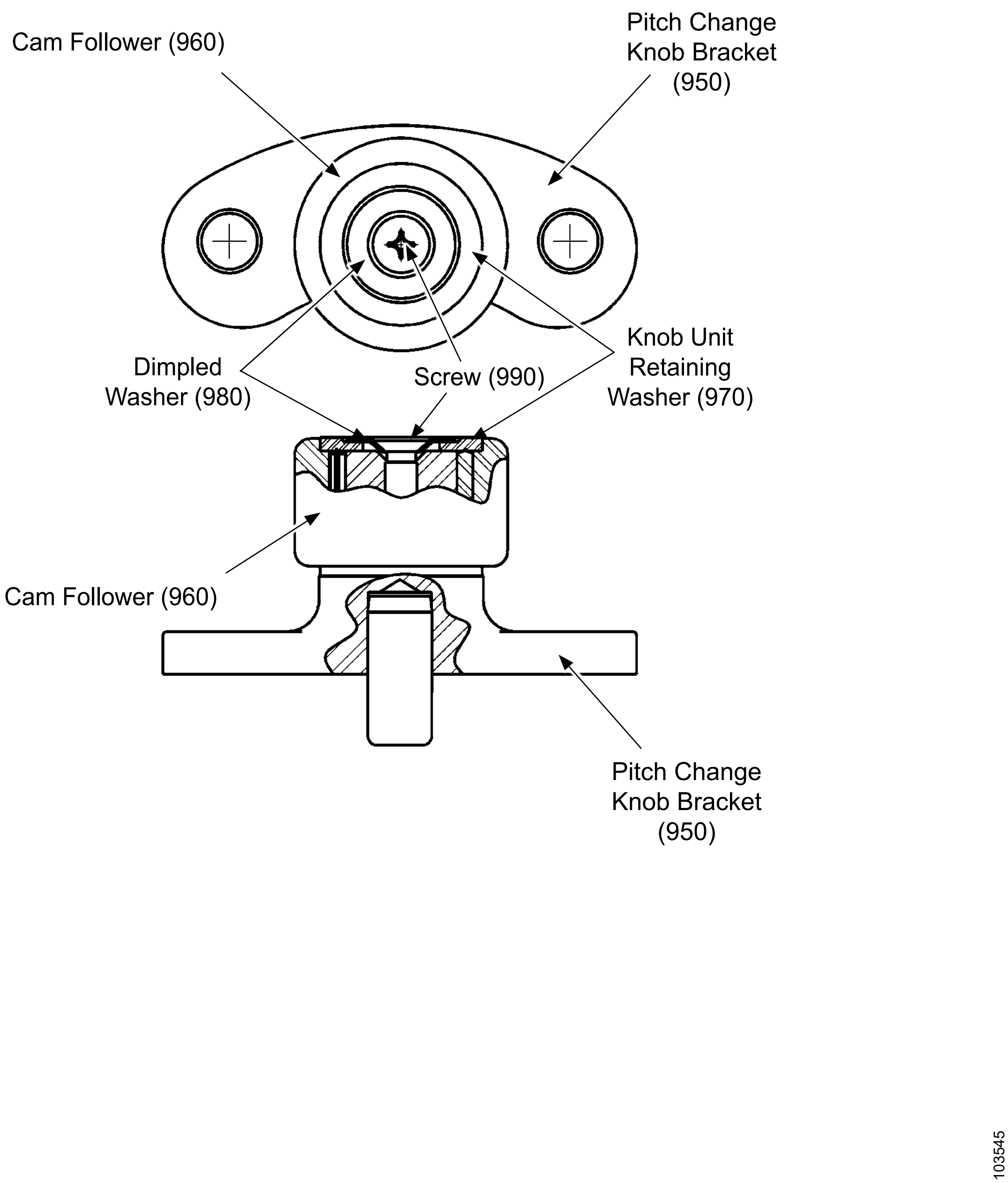
2 It has been less than one (1) year from the date of receipt if there is no date marked on the packaging.

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

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.

1 Using solvent CM23, flush the grease from the cam follower (960).

2 Using lubricant CM12, lubricate the cam follower (960).



Assembling the Pitch Change Knob Unit
Figure 7-5

(4) Assembling the Pitch Change Knob Unit - Refer to Figure 7-5

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

(a) Using solvent CM106 MEK or CM219 MPK, clean the threads in the top of the pitch change knob bracket (950) and the threads of the screw (990).

(b) Permit the threads to dry.

(c) Apply threadlocker CM21 to the clean, dry threads in the top of the pitch change knob bracket (950).

(d) Put the cam follower (960) on the pitch change knob bracket (950).

(e) With the counterbored side up, put the knob unit retaining washer (970) on the end of the pitch change knob bracket (950).

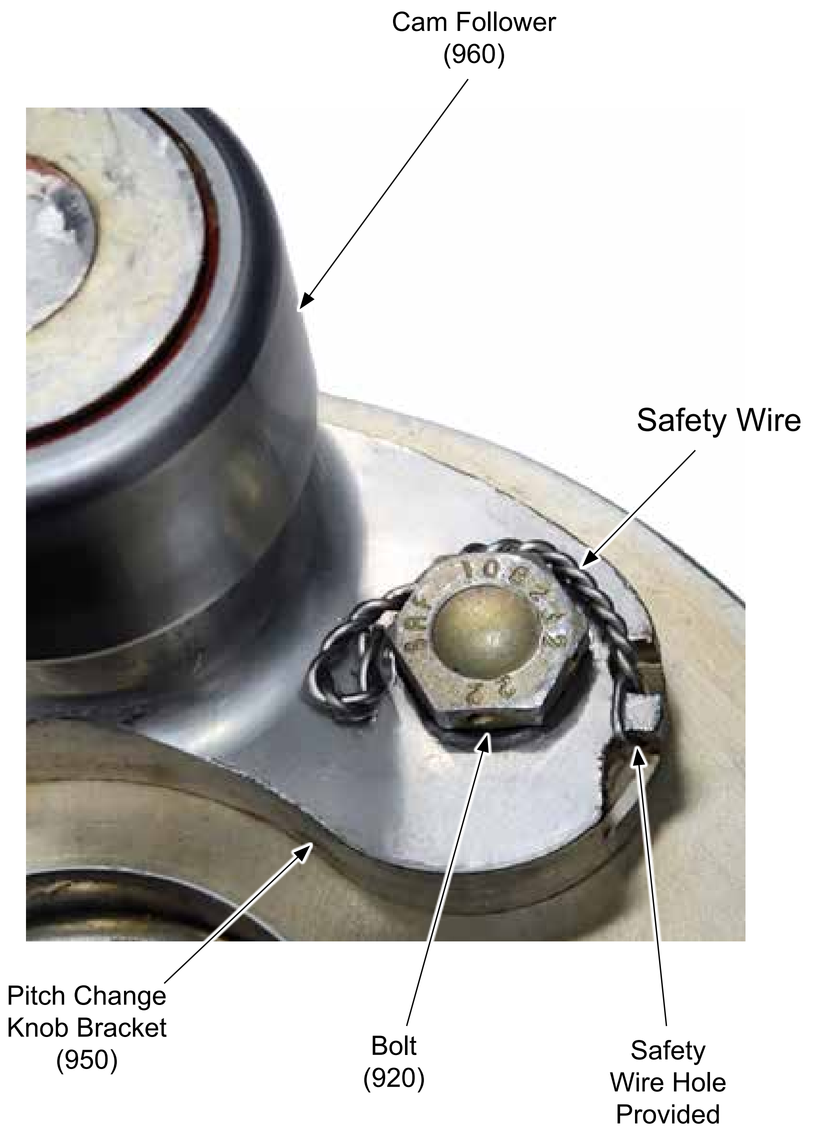
(f) With the raised side down, put the dimpled washer (980) on the knob unit retaining washer (970).

(g) Examine the knob unit retaining washer (970) and the dimpled washer (980) on the pitch change knob bracket (950) to make sure that the parts are seated correctly.

(h) Apply threadlocker CM21 to the clean, dry threads of the screw (990).

(i) Using the screw (990), attach the knob unit retaining washer (970) and the dimpled washer (980) to the pitch change knob bracket (950).

(j) Torque the screw (990) in accordance with the Torque Values Table 8-1 in the Fits and Clearances chapter of this manual.



Installation of the Pitch Change Knob Bracket
Figure 7-6

PITCH CHANGE KNOB BRACKET UNIT PART NUMBER	CHANGE OF BLADE ANGLE
108306-1	-0.3°
108306-2	---
108306-3	+0.3°

Blade Pitch Change Knob Bracket Unit Selection
Table 7-1

(5) Installation of the Pitch Change Knob Unit - Refer to Figure 7-6

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

(b) Put the pitch change knob bracket unit (930) onto the butt of the blade.

(c) Line up the holes in the pitch change knob bracket unit (930) with the threaded holes in the butt of the blade.

(d) Using a mallet, tap the pitch change knob bracket (950) until it is firmly against the butt of the blade.

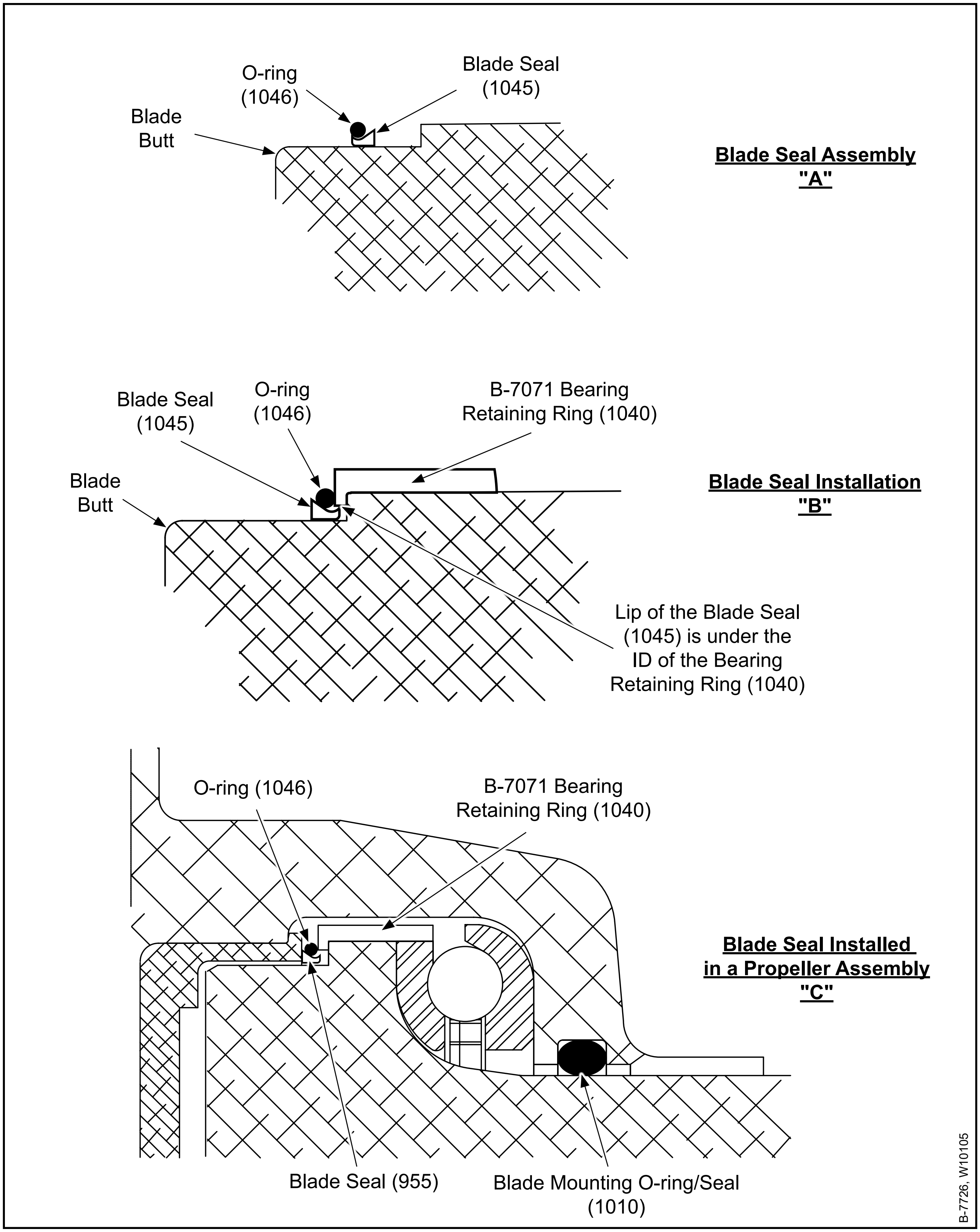
1 Use the alternate pitch change knob unit choices as necessary to bring the floating pitch angle of all four blades within the specified tolerance of ± 0.1 degree. Refer to the pitch change knob bracket unit selection data in Table 7-1.

(e) Install the bolts (920) in the holes of the pitch change knob bracket (930).

(f) Torque the bolts (920) in accordance with Table 8-1, "Torque Values" in the Fits and Clearances chapter of this manual.

(g) Safety wire the bolts (920) to the hole in the pitch change knob bracket (530) in accordance with NASM33540.

(h) Repeat the applicable steps 2.B.(3)(a) through 3.B.(5)(g) for the remaining blades.



O-ring and Blade Seal Installation
Figure 7-6.1

(6) Blade Seal Assembly Installation - Refer to Figure 7-6.1 "C"

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

(a) Assemble the blade seal (1045) and O-ring (1046). Refer to Figure 7-6.1, "A".

CAUTION: DO NOT OVER STRETCH OR TWIST THE BLADE SEAL (1045) DURING INSTALLATION.

1 Install the blade seal (1045) on the butt of the blade with the recessed area of the blade seal facing away from the bearing retaining ring (1040). If the blade seal stretches, replace the blade seal.

NOTE: Initially installing the blade seal (1045) with the recessed area facing away from the bearing retaining ring (1040) will make it easier to install the O-ring (1046) onto the blade seal. An optional method may be to pre-assemble the blade seal assembly on an unserviceable blade butt, or equivalent fixture.

2 Install the O-ring (1046) into the recessed area of the blade seal (1045).

3 If the O-ring (1046) does not remain in position, replace the blade seal (1045).

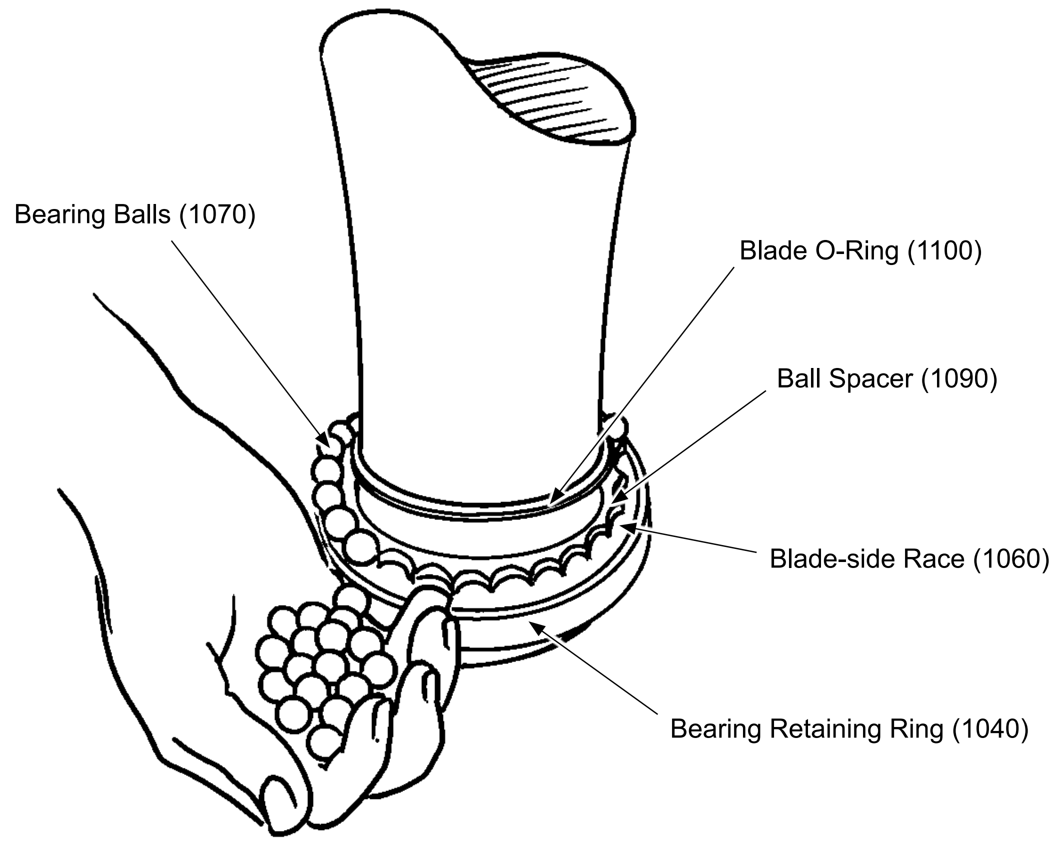
4 Remove the blade seal assembly from the butt of the blade.

CAUTION 1: DO NOT DEFORM THE BLADE SEAL ASSEMBLY WHEN INSTALLING THE BLADE SEAL (1045) AND O-RING (1046) ASSEMBLY ONTO THE BLADE.

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

(b) Reinstall the blade seal assembly onto the butt of the blade with the recessed area facing the bearing retaining ring (1040). Refer to Figure 7-6.1, "B".

1 The seal assembly must slide easily into position on the blade butt.



Installation of Blade O-ring, Ball Spacer, Bearing Race, and Bearing Balls
Figure 7-7

(7) Installation of the blade O-ring (1100) - Refer to Figure 7-7.

(a) Using lubricant CM12, lubricate the blade O-ring (1100).

(b) Install the blade O-ring (1100) over the base of the blade shank.

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

(a) Using lubricant CM12, lubricate the blade-side race (1060).

(b) Place the ball spacer (1090) on the blade-side race (1060).

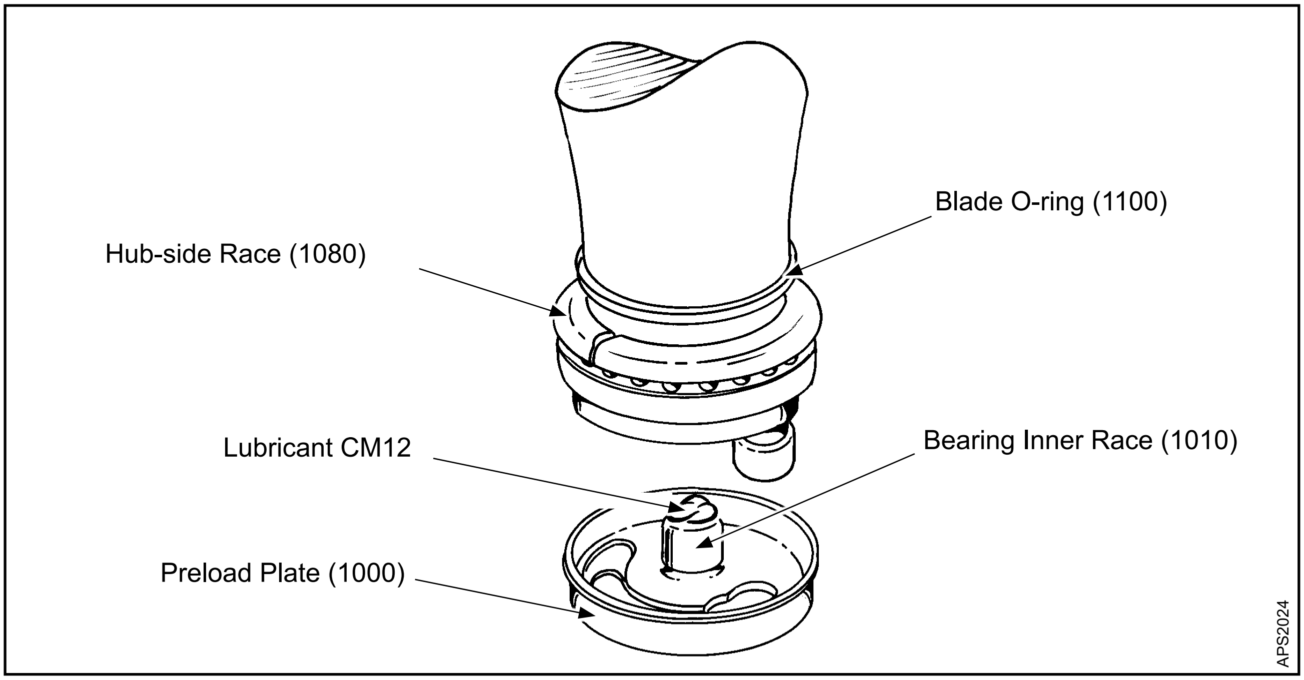
CAUTION: ALL BEARING BALLS INSTALLED IN A SINGLE BEARING MUST BE OF THE SAME GAUGE. BEARING BALLS SUPPLIED BY HARTZELL PROPELLER INC. ARE OF THE SAME GAUGE.

(c) Put the bearing balls (1070) in the openings of the ball spacer (1090) on the blade-side race (1060).

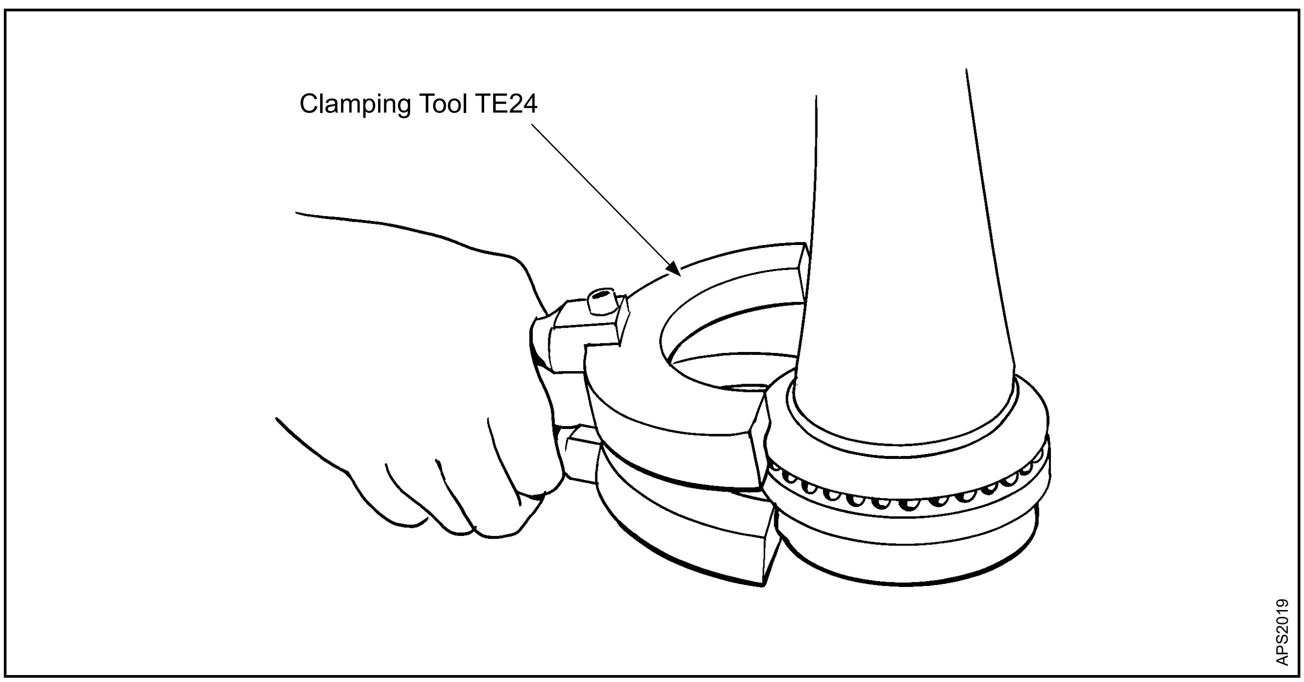
CAUTION: THE BEARING RACE HALVES MUST HAVE MATCHING SERIAL NUMBERS.

(d) Put the hub-side race (1080) on the bearing balls (1070). Refer to Figure 7-8.

1 Install the hub-side race (1080) race with the parting line perpendicular to the hub parting line when installed in the hub.



Installing the Preload Plate on the Blade Shank
Figure 7-8



Applying the Clamping Tool TE24 to the Blade Assembly
Figure 7-9

C. Preload Plate Assembly

(1) Install the set screw (1020) in the preload plate (1000) so the end of the set screw protruding toward the blade butt is flush with the preload plate.

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

(2) Install the nut (1030) on the set screw (1020) and position the nut a short distance from the preload plate (1000).

NOTE: Thread locking compound will be applied to the set screw (1020) between the nut (1030) and the preload plate (1000) later in the build process.

(3) Put approximately one tablespoon of lubricant CM12 on top of the preload plate bearing inner race (1010) to lubricate the blade bore bearing. Refer to Figure 7-8.

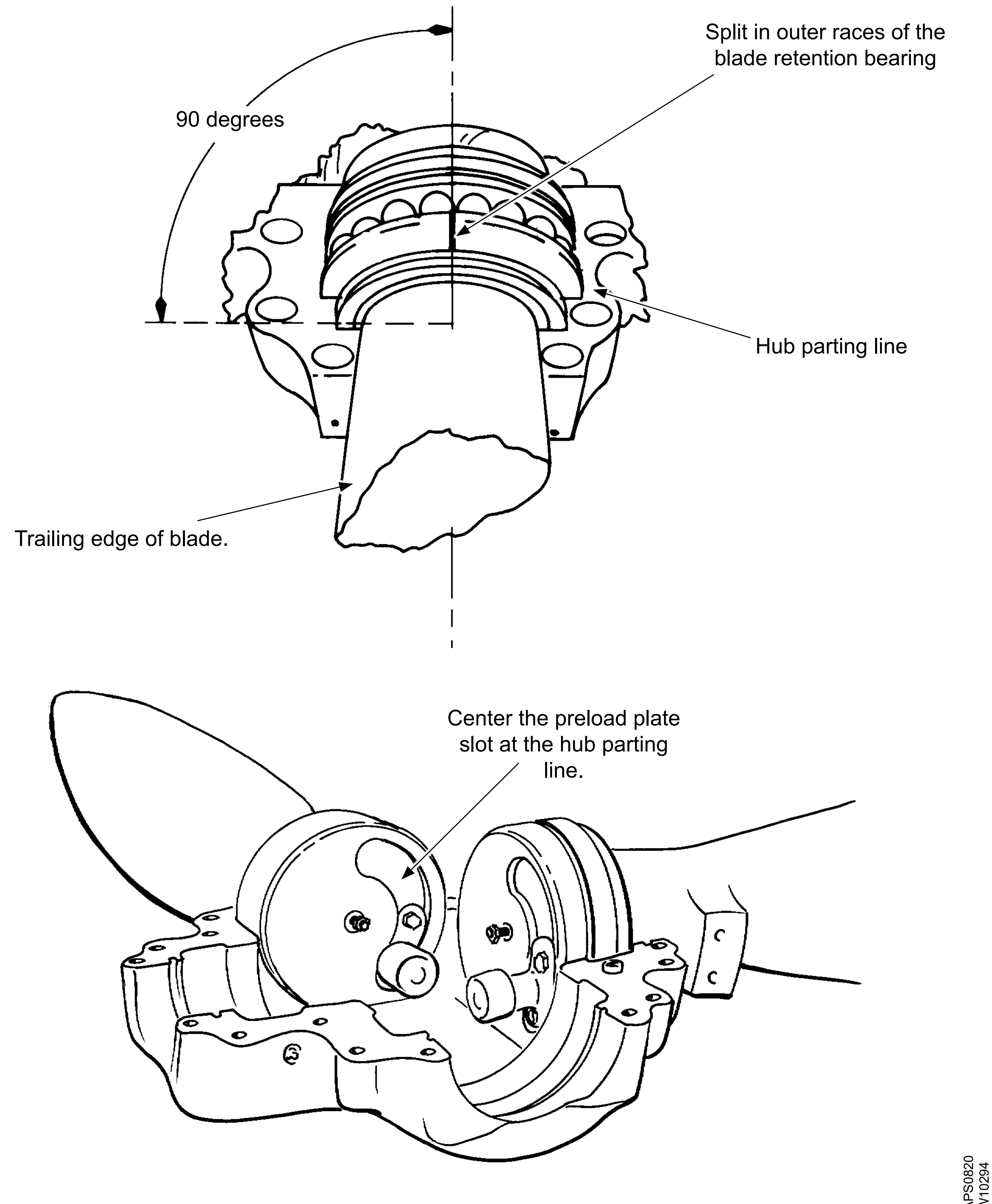
NOTE: Using this amount of lubricant will force lubrication into the blade bore bearing when the preload plate is installed on the blade.

CAUTION: THE SPLIT-BEARING RACE PARTING LINE MUST BE PERPENDICULAR TO THE HUB PARTING LINE WHEN INSTALLED IN THE HUB. REFER TO FIGURE 7-16.

(4) Install the preload plate assembly (1000) on the butt of the blade. Refer to Figure 7-8.

NOTE: To ease installation of the blade into the hub, hold the split bearing and preload plate assembly to the blade butt with the clamping tool TE24. Refer to Figure 7-9.

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



NOTE: A four-bladed propeller is shown for illustration purposes only

Installing a Blade in the Hub Socket
Figure 7-10

D. Blade Installation

(1) Apply a thin film of lubricant CM12 to the hub blade retention radii of the hub and the O-ring grooves of the hub (450).

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

(2) Install blade number one assembly into the socket of the engine-side hub half. Refer to Figure 7-10.

(3) Center the slot of the preload plate assembly (1000) at the hub parting line.

(a) Position the blade knob slot in the preload plate assembly (1000) to permit the blade to travel within the full blade angle range without restriction.

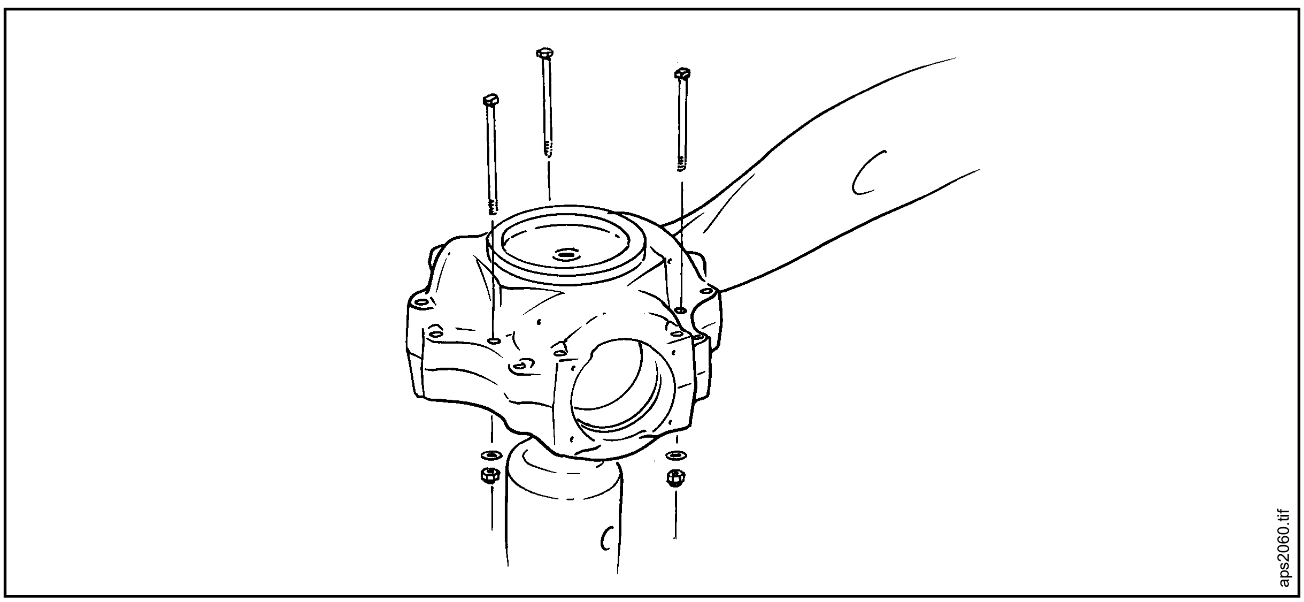
CAUTION: INCORRECT PRELOAD CAN CAUSE THE BLADES TO BE LOOSE IN THE HUB OR MAY APPLY EXCESSIVE PRESSURE THAT CAN INTERFERE WITH PITCH CHANGE MOVEMENT.

(4) Setting the blade preload.

(a) Install the cylinder-side hub half. Refer to Figure 7-11.

(b) Bolt the hub halves together using three bolts (570), three washers (590), and three self-locking nuts (600) located midway between the blades. Refer to Figure 7-11.

(c) Torque the self-locking nuts (600) in accordance with Table 8-1 in the Fits and Clearances chapter of this manual.



Installing Hub Half in Preparation for Tightening Preload Plate
Figure 7-11

(d) On blade number one, tighten the preload set screw (1020) through the open end of the hub. Refer to Figure 7-12.

NOTE: The loose blade will become rigid in the hub as the set screw is tightened.

(e) Tighten the preload set screw (1020) until the tip of the blade stops moving vertically.

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

(g) Loosen the set screw (1020) and retighten. When the blade tip stops moving, turn the set screw an additional 1/4 turn into the preload plate (1000).

(h) Turn the blade to make sure that the blade turns freely in the blade socket of the hub (450).

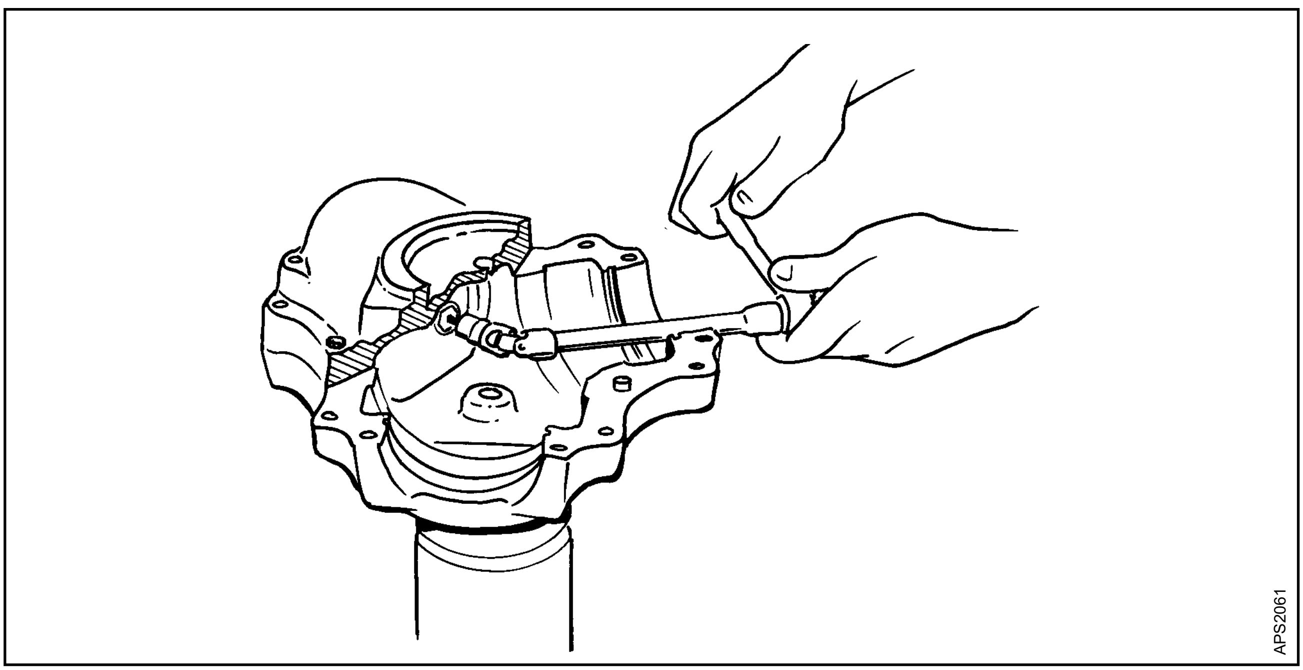
1 If the blade does not turn freely, examine the following:

a The blade O-ring (1100) must fit correctly in the O-ring groove of the hub (450).

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

c Blade preload may be too tight.

2 If the blade turns freely, continue to the next step.



Tightening Preload Plate Set Screw and Hex Nut
Figure 7-12

(i) Remove the three bolts (570), three washers (590), and three nuts (600).

(j) Remove the cylinder-side hub half (450).

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.

(k) Apply one drop of thread locking compound CM21 on the threads of the preload set screw (1020) between the thin hex nut (1030) and the preload plate (1000).

CAUTION: MAKE SURE TO PREVENT THE SET SCREW (1020) FROM ROTATING WHEN TORQUING THE THIN HEX NUT (1030).

(l) Torque the thin hex nut (1030) against the preload plate (1000) in accordance with Table 8-1 in the Fits and Clearances chapter of this manual.

(5) Using clamping tool TE24, if desired, remove blade number one from the hub (450).

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

(6) Install blades number two and number three in the hub (450) and set the blade preload.

(a) When setting blade preload, put each blade in the hub socket that it will occupy when assembled.

(b) Set the preload for blades number two and number three following the steps 4.D.(1) through 4.D.(4)(l).

(7) Reinstalling blade number one.

(a) Move the blades into full reverse position.

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(b) Apply thread lock CM74 to the threads of each bumper extension (690).

(c) Install the bumper extensions (690) onto the fork (680).

(d) Torque each bumper extension(690) in accordance with Table 8-1 in the Fits and Clearances chapter of this manual.

(e) Install a fork bumper (700) on each bumper extension (690).

1 Using a plastic mallet, drive the fork bumper (700) into the hole in the bumper extension.

NOTE: The nipple of the fork bumper (700) is an interference fit with the hole in the bumper extension (690).

(f) Apply anti-seize compound CM118 to the threads in the fork (680).

CAUTION: MAKE SURE THAT THE TAPER IN THE CENTER THREADED HOLE OF THE FORK (680) IS FACING TOWARD THE CYLINDER HUB HALF TO CORRECTLY FIT ONTO THE PITCH CHANGE ROD (430) THAT WILL BE INSTALLED LATER.

(g) Install the fork (680) by positioning the slots in the fork around the cam followers (960) on the pitch change knob bracket unit (930).

(h) Reinstall blade number one.

1 Insert the cam follower in the fork (680) slot, then lower the blade and blade retention bearing (1080) into the hub (450).

(i) Position the center of the slot in the preload plate assembly (1000) on the plane of the parting line of the hub (450). Refer to Figure 7-10

1 Position the blade knob slot in the preload plate assembly (1000) to permit the blade to travel within the blade angle range without restriction.

CAUTION: MAKE SURE THAT THE BLADE O-RING IS CORRECTLY ALIGNED IN THE HUB GROOVE WHEN INSTALLING THE CYLINDER-SIDE HUB HALF.

(j) Using the guide hub bushing (530), line up the halves of the hub and fit the cylinder half of the hub unit onto the engine half of the hub unit.

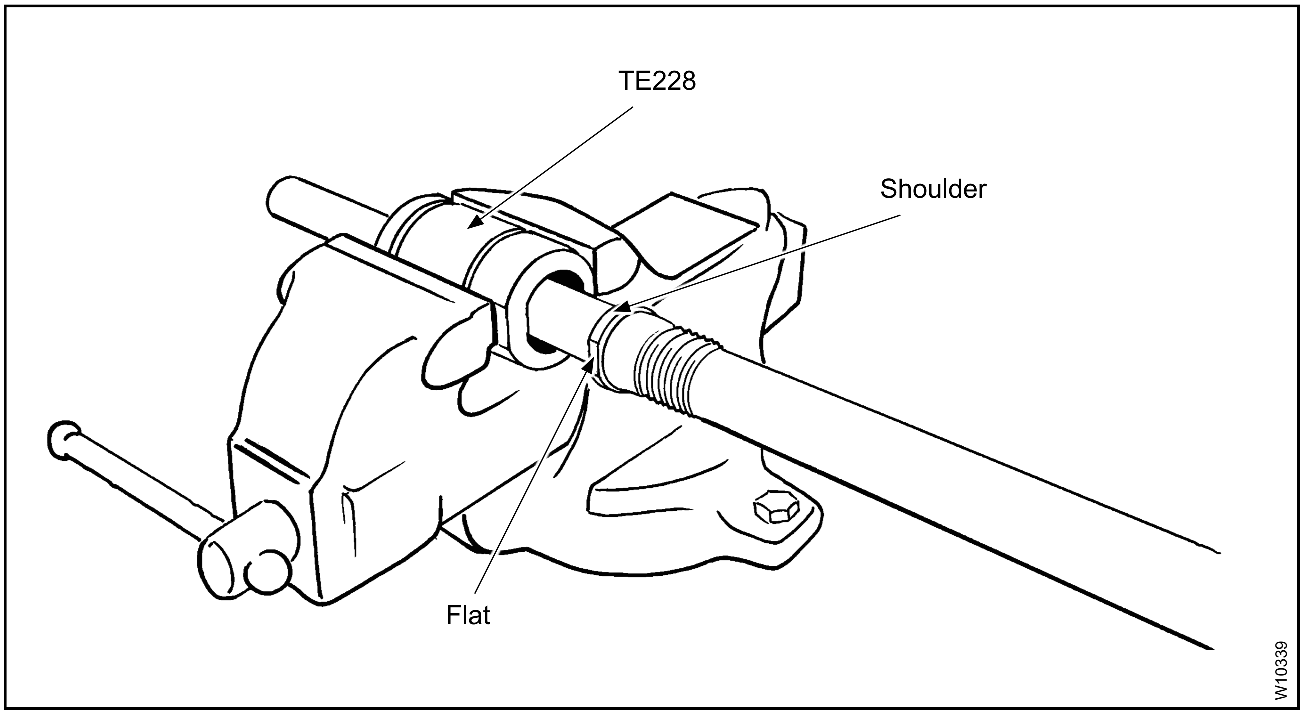
CAUTION: EXAMINE THE BLADE O-RING FOR BINDING OR PINCHING WHEN THE CYLINDER-SIDE HUB HALF IS INSTALLED.

(k) Install the cylinder-side hub half.

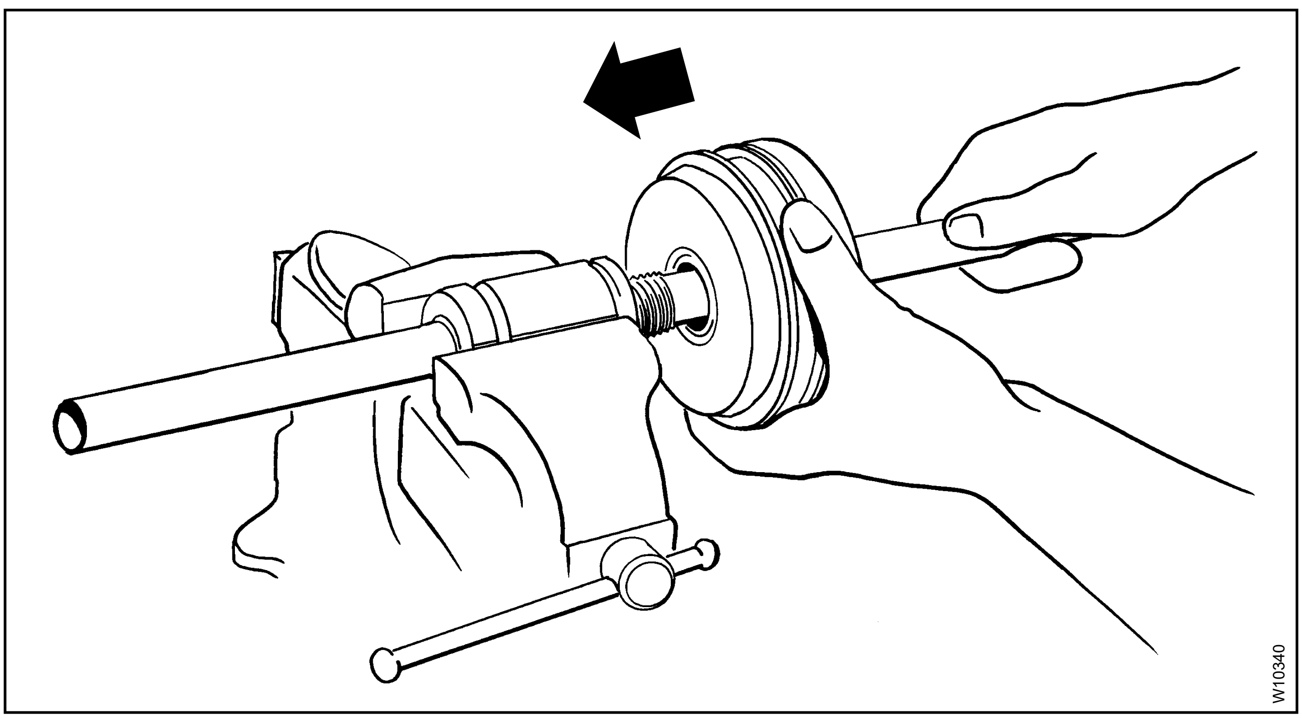
1 Position the hub half, using a rubber mallet if necessary.

(l) Midway between each of the three blade sockets, install a bolt (570), washer (590), and self-locking nut (600). Refer to Figure 7-11.

(m) Torque the self-locking nuts (600) in accordance with Table 8-1 in the Fits and Clearances chapter of this manual.



Using the TE228 Tool on the Pitch Change Rod
Figure 7-13



Installing the Piston
Figure 7-14

E. Hydraulic System Assembly

(1) Install the small piston O-ring (370) in the piston (330).

(2) Install the piston (330) on the pitch change rod (430).

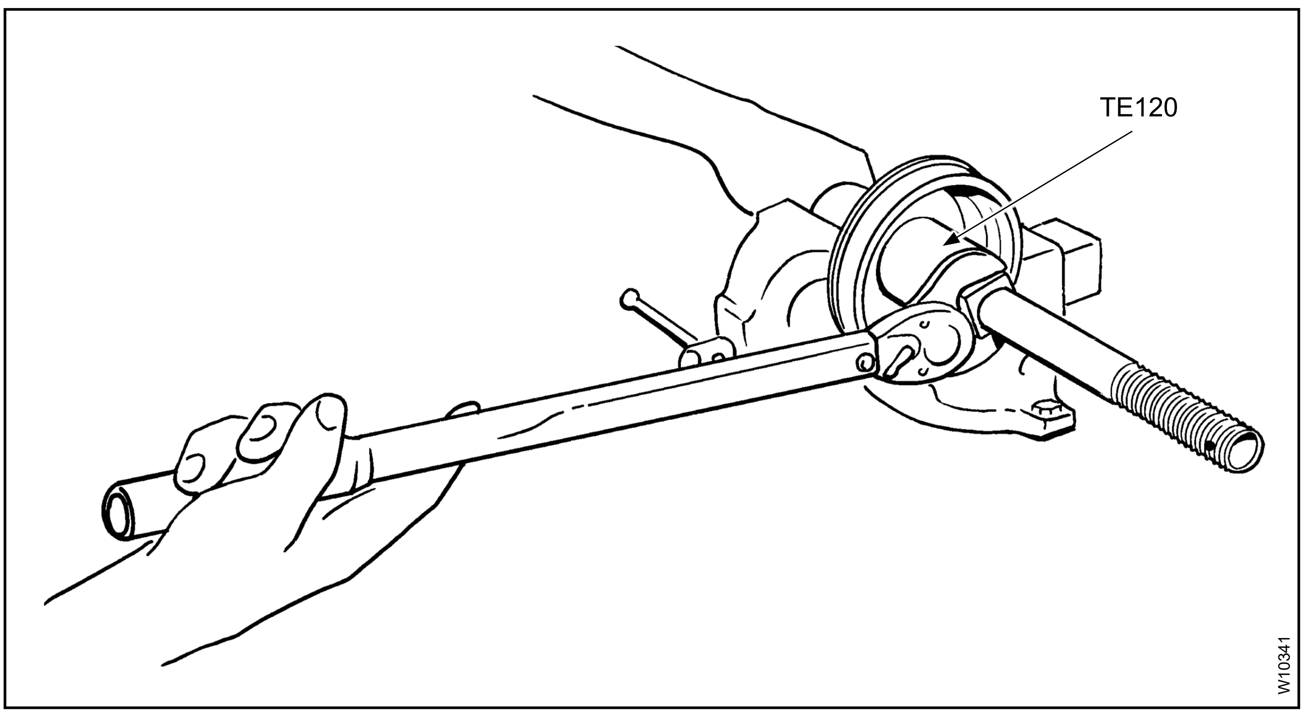
(a) Put the piston installation socket TE228 in a vise. Refer to Figure 7-13.

(b) Insert the pitch change rod (430) through the piston installation socket TE228, fitting the socket over the shoulder flats on the pitch change rod as shown in Figure 7-13.

(c) Slide the piston (330) into place against the shoulder on the pitch change rod (430). Refer to Figure 7-14.

(d) Turn the piston self-locking nut (310) onto the pitch change rod (430) until the self-locking nut locking mechanism engages the pitch change rod threads.

(3) Using the modified deep well socket TE120, torque the piston self-locking nut (310) against the piston (330) in accordance with Table 8-1 in the Fits and Clearances chapter of this manual. Refer to Figure 7-15.



Torquing the Piston Nut
Figure 7-15

(4) Apply anti-seize compound CM118 to the external threads adjacent to the tapered section of the pitch change rod (430). Refer to Figure 7-16.

(5) Insert the small diameter end of the pitch change rod (430) into the cylinder-side hub (450) half and through the fork (680) and engine-side hub half.

CAUTION: WHEN INSTALLING THE PITCH CHANGE ROD (430) INTO THE FORK (680), DO NOT EXCEED THE MAXIMUM TORQUE IN ACCORDANCE WITH TABLE 8-1 IN THE FITS AND CLEARANCES CHAPTER OF THIS MANUAL.

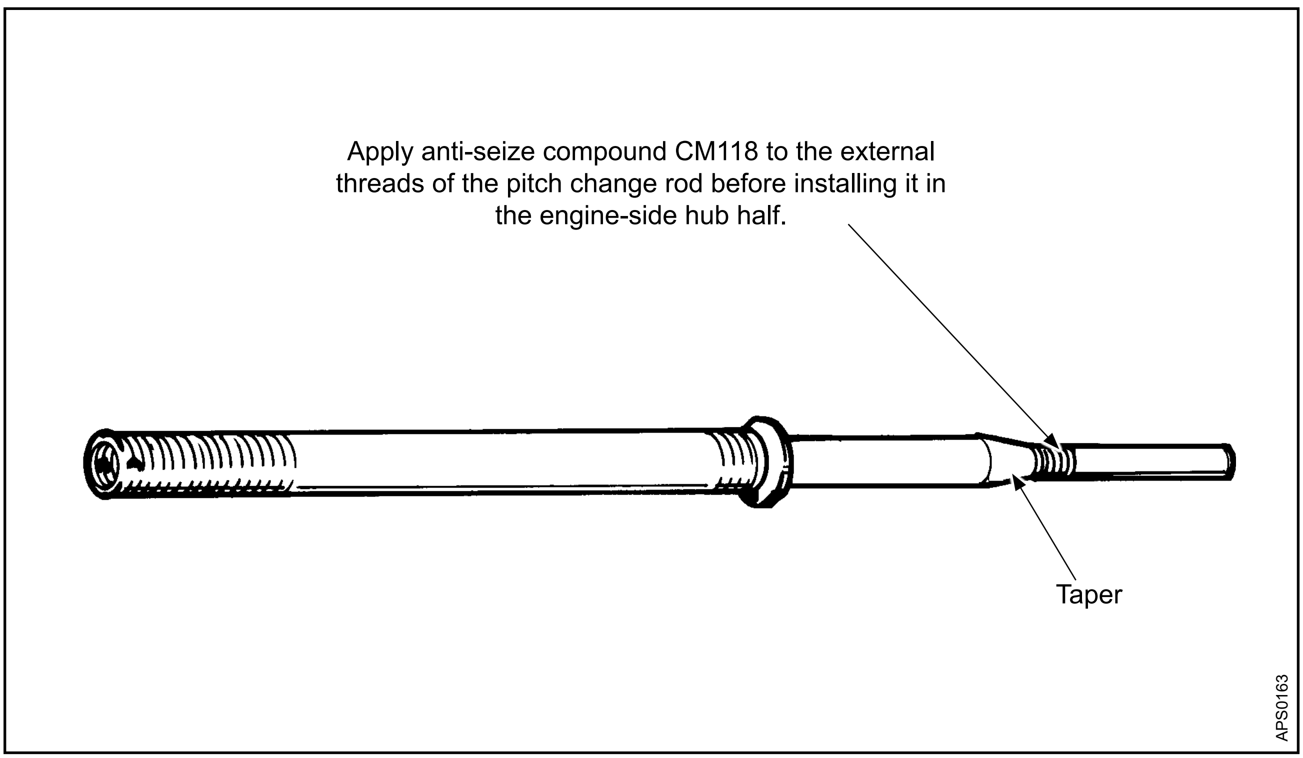
(6) Turn the pitch change rod (430) into the fork (680).

(7) Using the modified deep well socket TE120 on the self-locking hex nut (310), torque the pitch change rod (430) in accordance with Table 8-1 in the Fits and Clearances chapter of this manual.

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

(a) If there is not full blade angle movement, remove the hub-clamping bolts (570) and nuts (600) and slightly separate the halves of the hub (450) to permit preload plate (980) rotation.

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



Applying CM118 to the Pitch Change Rod
Figure 7-16

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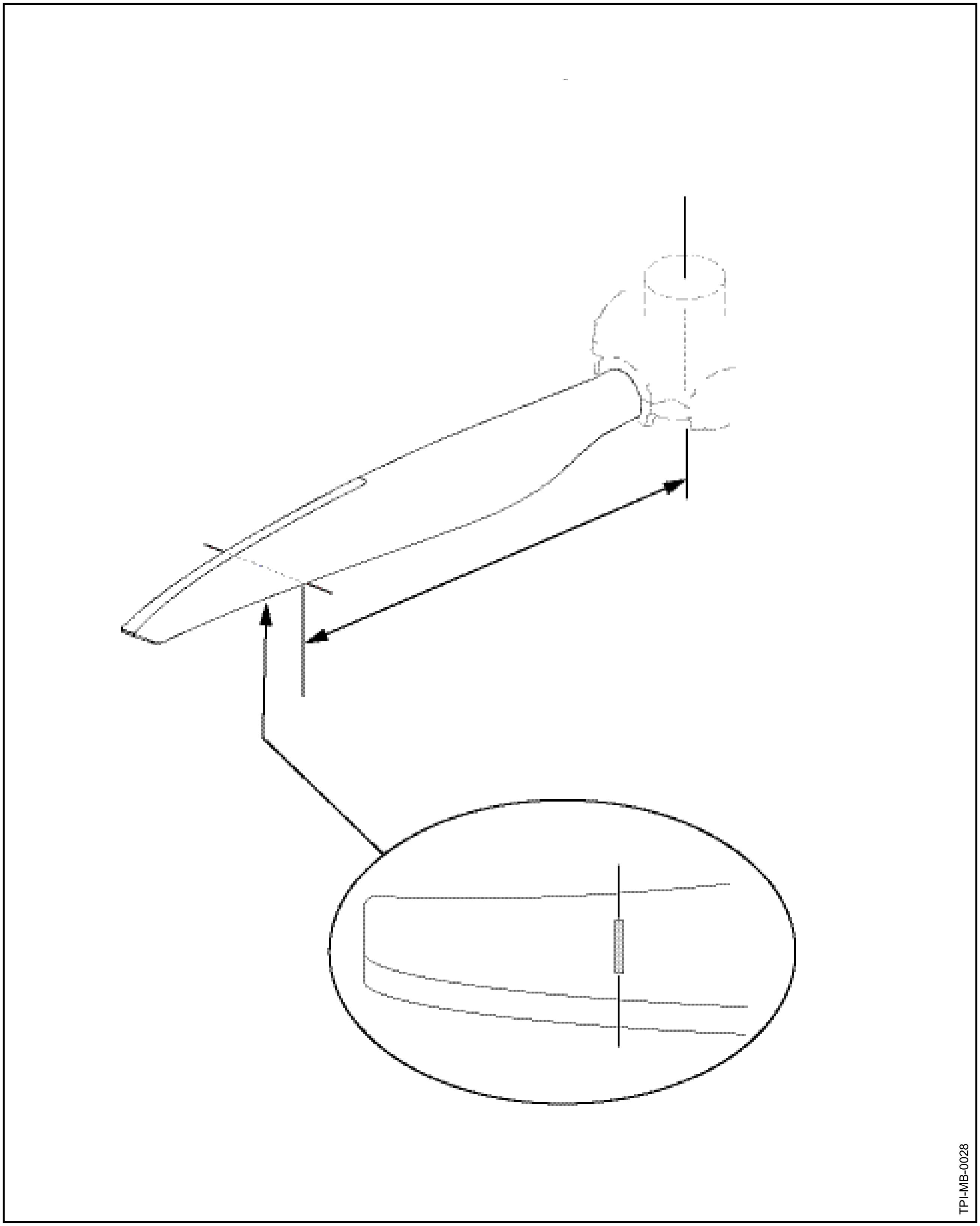


Reference Blade Radius
Figure 7-17

F. 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 7-17.

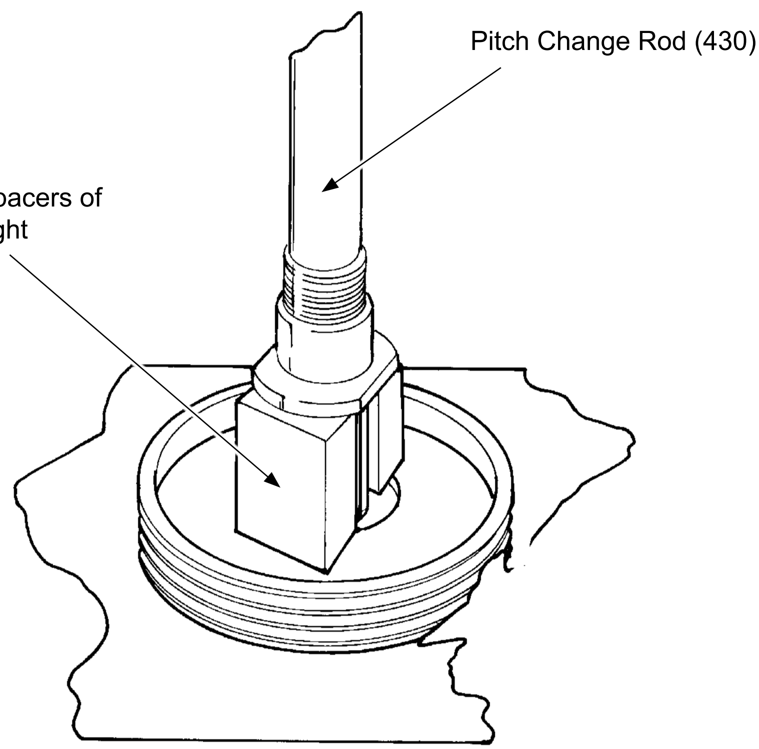
(c) Apply a piece of reference tape CM160 to the face side of the blade at the reference blade radius location, perpendicular to the blade centerline as shown in Figure 7-17.

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 (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.



NOTE: The piston was removed for illustration purposes.

APS0150

Checking Blade-to-Blade Angle Tolerance
Figure 7-18

G. Checking Blade-to-Blade Angle Tolerance

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

(1) As shown in Figure 7-18, put two blocks or spacers of equal height under the piston and on opposite sides of the pitch change rod to hold the propeller in a low blade angle position.

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

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

(b) Move the blades by hand toward the high pitch position to make sure that the cam followers (960) are correctly seated against the fork (680).

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

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

1 Replace the pitch change knob bracket unit(s) on the blade(s).

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

2 Recheck the blade-to-blade angle tolerance until the tolerance is achieved on all four blades.

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

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

NOTE: When assembling a propeller that will be disassembled for shipping, it is not necessary to remove the pitch change rod and the cylinder-side hub half, to install the remaining hex head bolts (570, 580), washers (590) and self-locking nuts (600), or to apply CM92 to the hub mating surfaces.

(5) Remove the pitch change rod and the cylinder-side hub half.

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CAUTION: DO NOT PERMIT EXCESSIVE SEALANT TO BE SQUEEZED INTO THE BLADE RETENTION SOCKETS.

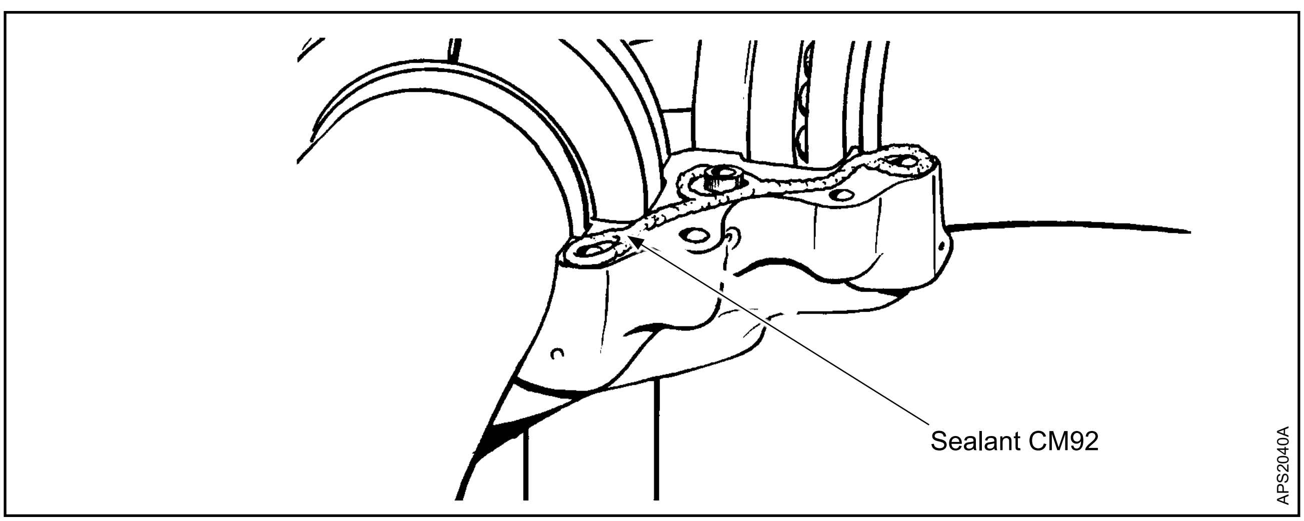
(6) Put a bead of sealant CM92 on the hub mating surfaces. Refer to Figure 7-19.

   (a) Sealant must contact the blade O-rings (1100).

   (b) Use only enough sealant on the mating surfaces so that a small amount will be squeezed out along the entire parting surface when the hub hex head bolts (570, 580) are correctly torqued.

(7) Install the hex head bolts (570, 580), washers (590), and self-locking nuts (600).

(8) Torque the self-locking nuts (600) on the hex head bolts (570, 580) in accordance with Table 8-1 in the Fits and Clearances chapter of this manual.



Applying Sealant Between the Hub Halves
Figure 7-19

H. Pitch Adjustment Unit Assembly (Rev. 2)

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

(1) Install the piston OD O-ring (390) in the groove closest to the hub (450). Refer to Figure 7-20.

(2) Cut the necessary length of piston dust seal material (380).

(a) Cut the piston dust seal material (380) on a 30 degree diagonal so there will be an overlap at the parting line with a smooth surface, free of fuzz. Refer to Figure 7-20, View A-A.

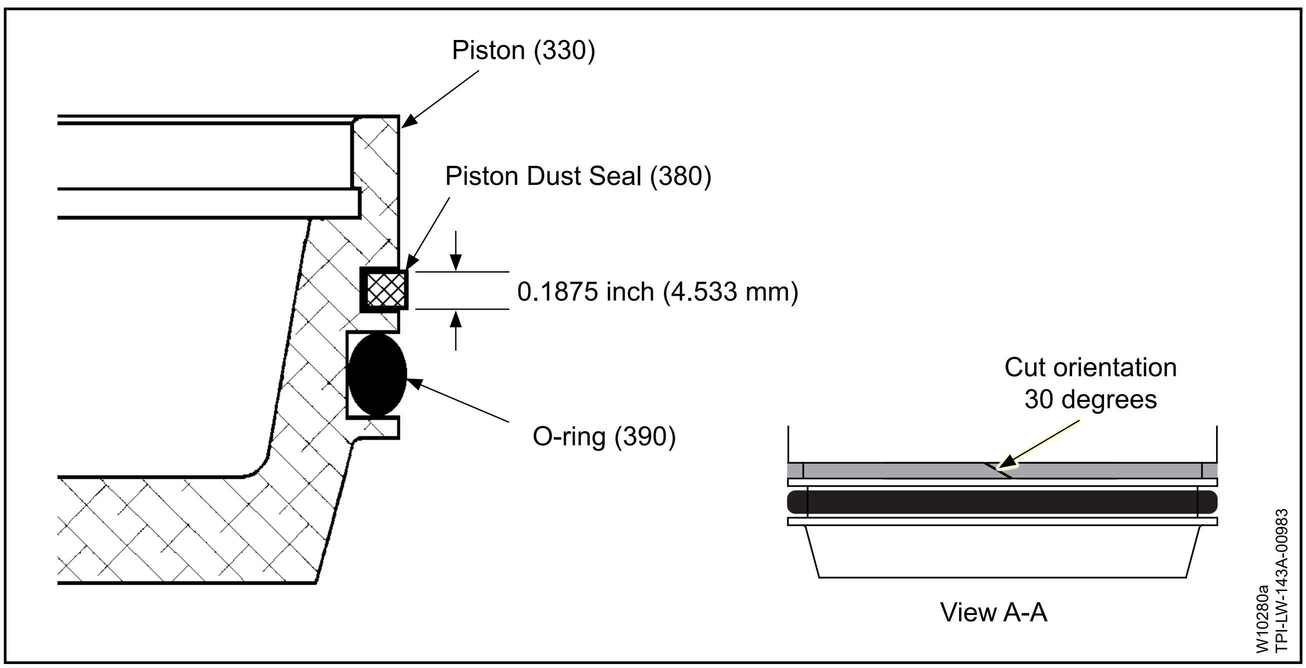
(3) Soak the piston dust seal (380) in aviation grade turbine engine oil until the piston dust seal is completely saturated.

(4) Squeeze the excess oil from the piston dust seal (380).

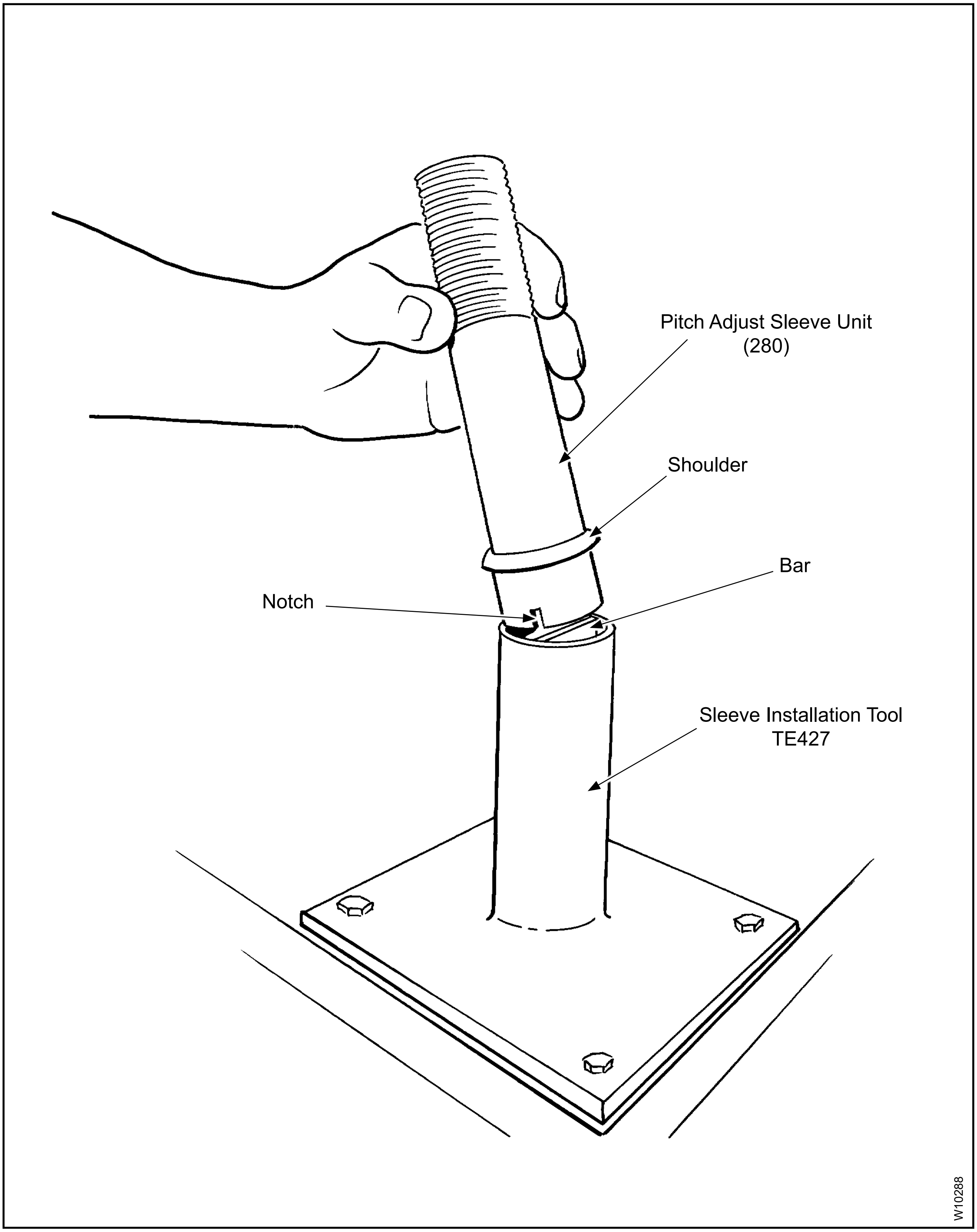
CAUTION: MAKE SURE THAT THE PISTON DUST SEAL (380) IS FREE OF FUZZ.

(5) If the piston dust seal (380) has fuzz or long strands that could interfere with O-ring operation, replace the piston dust seal.

(6) Install the thinnest section of the piston dust seal (380) in the remaining piston OD groove. Refer to Figure 7-20.



Locations of the Piston O-ring and Piston Dust Seal
Figure 7-20



Putting the Pitch Adjustment Sleeve Unit on the Sleeve Installation Tool TE427
Figure 7-21

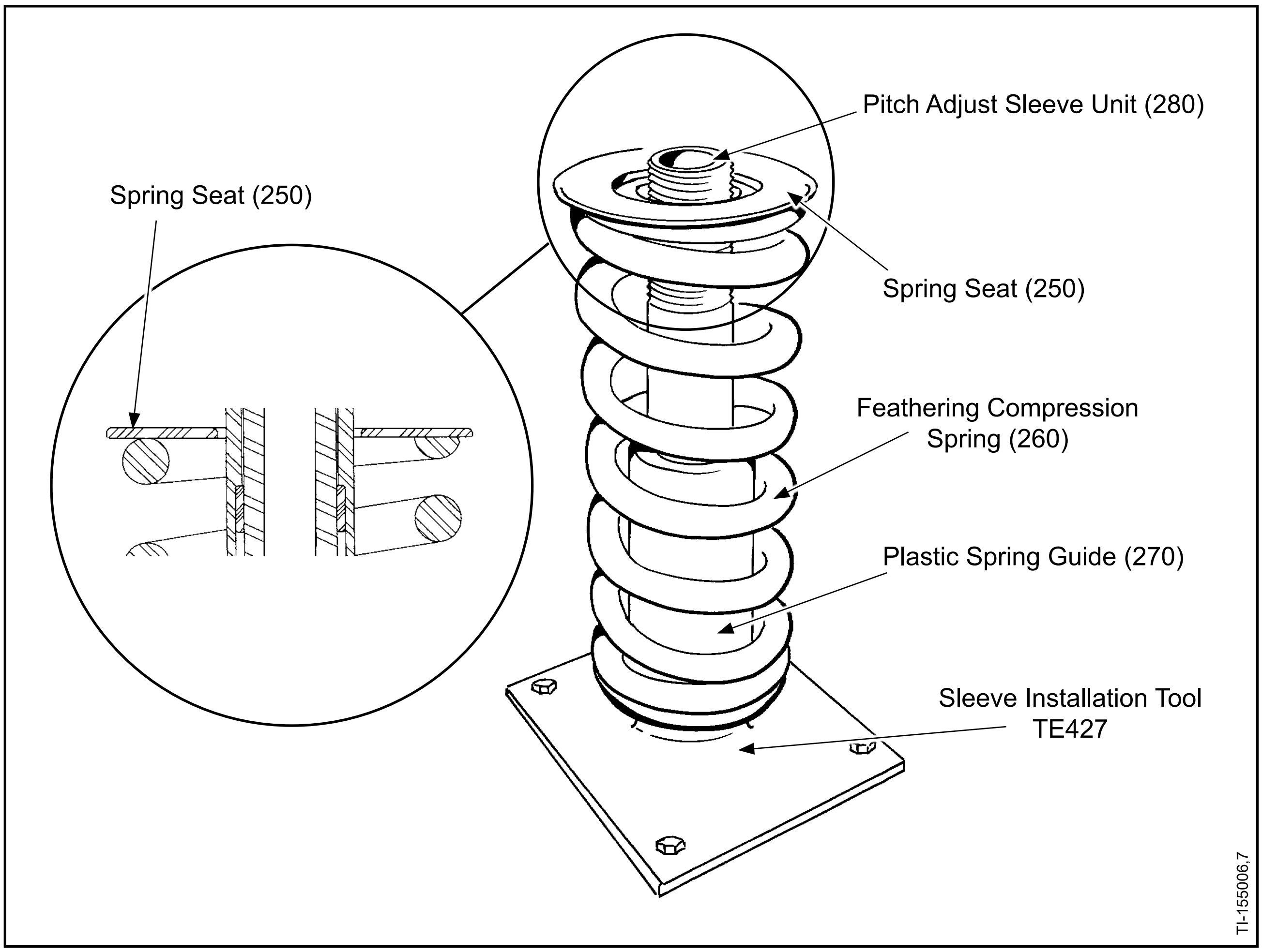
(7) Installing the cylinder.

(a) Installing the pitch adjust sleeve unit (280) into the cylinder (120) using the sleeve installation tool TE427, or equivalent.

1 Fit the notches of the pitch adjust sleeve unit (280) into place on the bar of the sleeve installation tool TE427, or equivalent. Refer to Figure 7-21.

2 Slide the plastic spring guide (270) over the pitch adjust sleeve unit (280) on the sleeve installation tool TE427, or equivalent until the spring guide is resting on the pitch adjust sleeve unit shoulder. Refer to Figure 7-21 and Figure 7-22.

3 Apply anti-seize compound CM118 or CM151 to both end coils of the spring (260) and the first two threads of the pitch adjust sleeve unit (280).



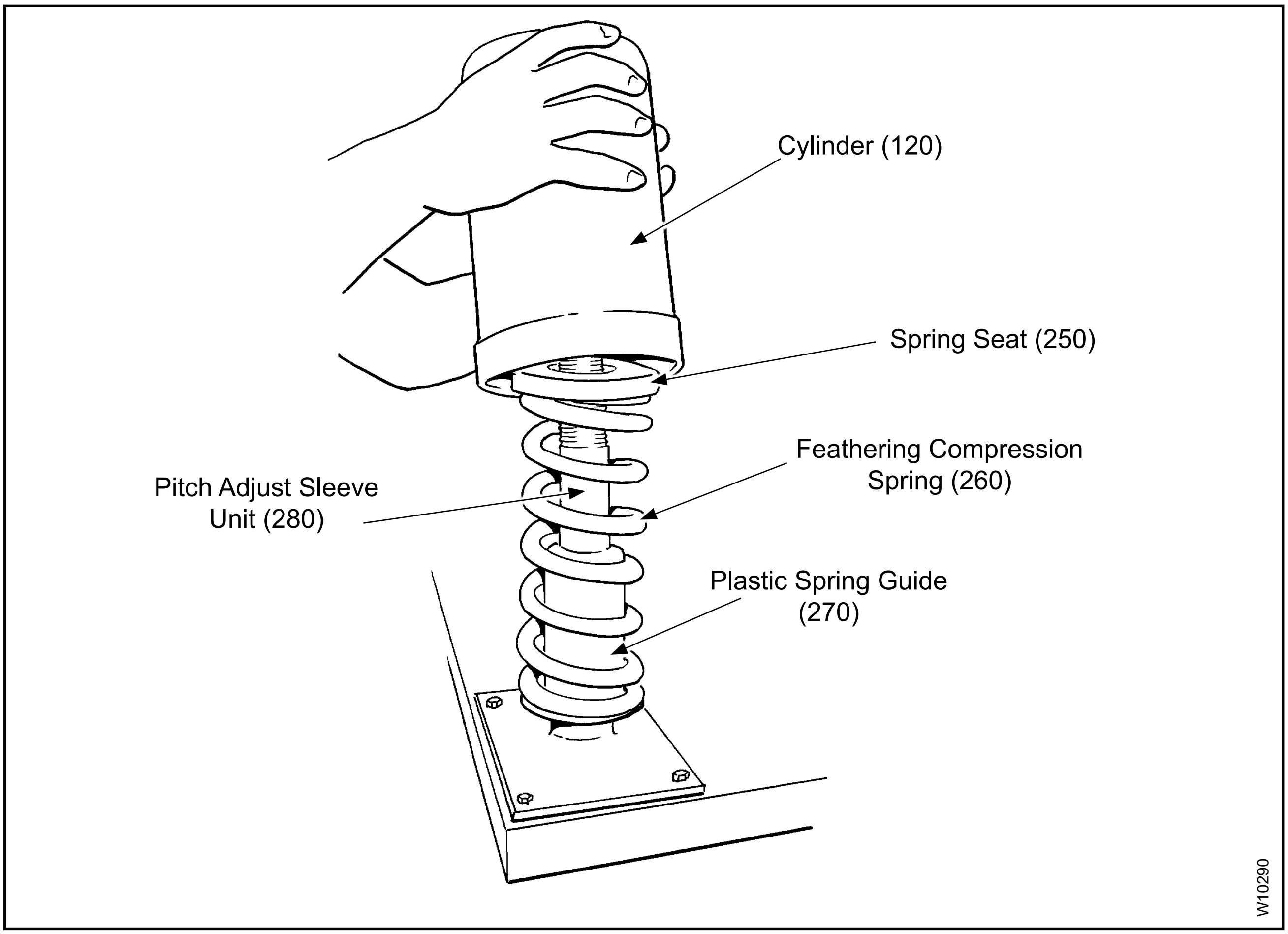
Installing the Feathering Compression Spring on the Pitch Adjust Sleeve Unit
Figure 7-22

4 Put the feathering compression spring (260) over the pitch adjust sleeve unit (280) and plastic spring guide (270) on the sleeve installation tool TE427, or equivalent, with the feathering compression spring resting on the lip of the plastic spring guide (270). Refer to Figure 7-23.

5 With the raised shoulder toward the feathering compression spring (260), install the spring seat (250) over the pitch adjust sleeve unit (280) on the sleeve installation tool TE427, or equivalent. Refer to Figure 7-22.

CAUTION: DO NOT DAMAGE THE PITCH ADJUST SLEEVE UNIT (280) OR THE THREADS OF THE CYLINDER (120) WHEN INSTALLING THE CYLINDER.

6 Put the cylinder (120) over the parts on the sleeve installation tool TE427, or equivalent, and turn the cylinder onto the pitch adjust sleeve unit (280). Refer to Figure 7-23.



Starting the Cylinder on the Reverse Adjust Sleeve
Figure 7-23

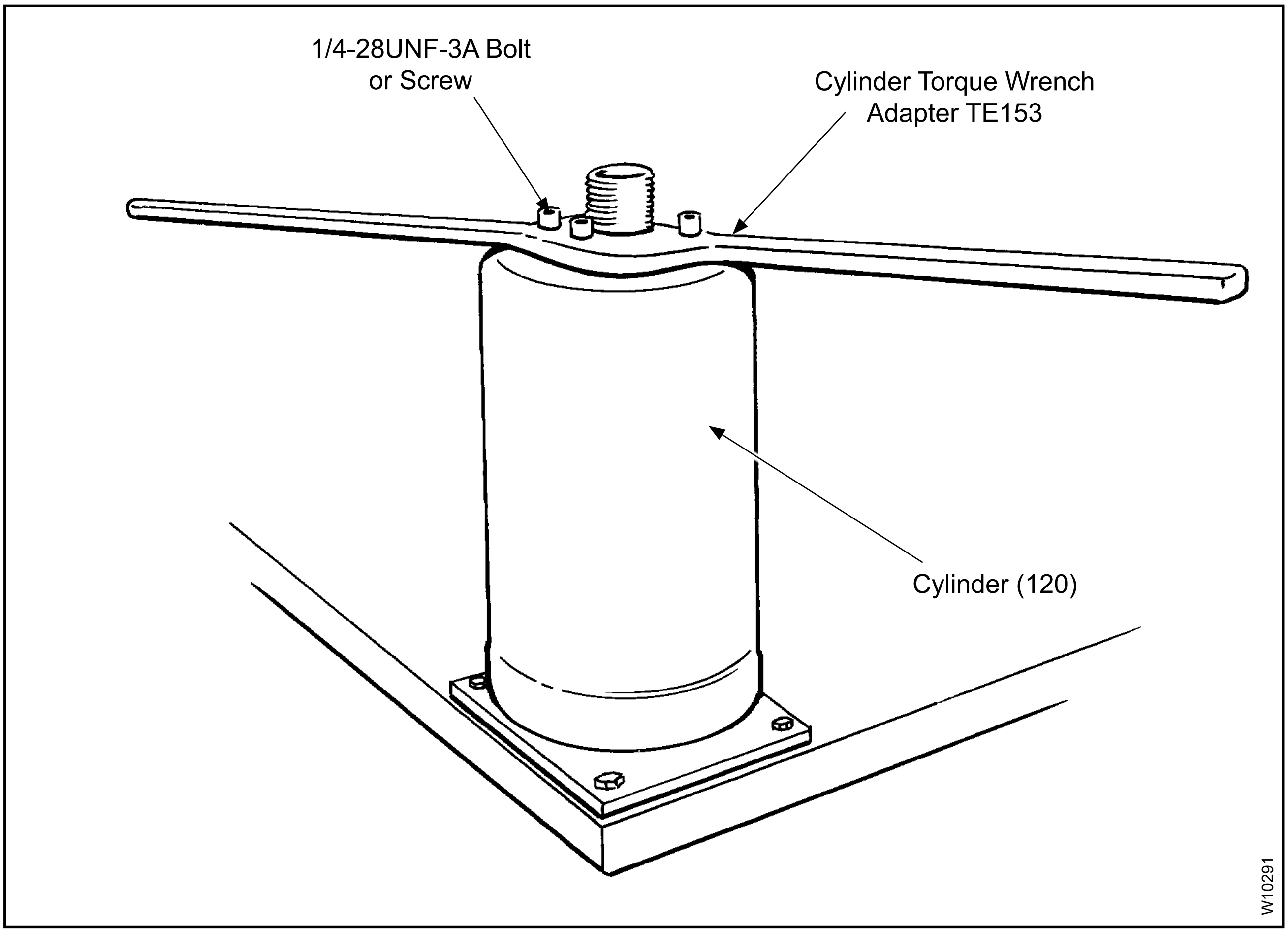
7 Using four 1/4-28UNF-3A bolts or screws, attach the cylinder torque wrench adapter TE153, or equivalent, to the cylinder (120). Refer to Figure 7-24.

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

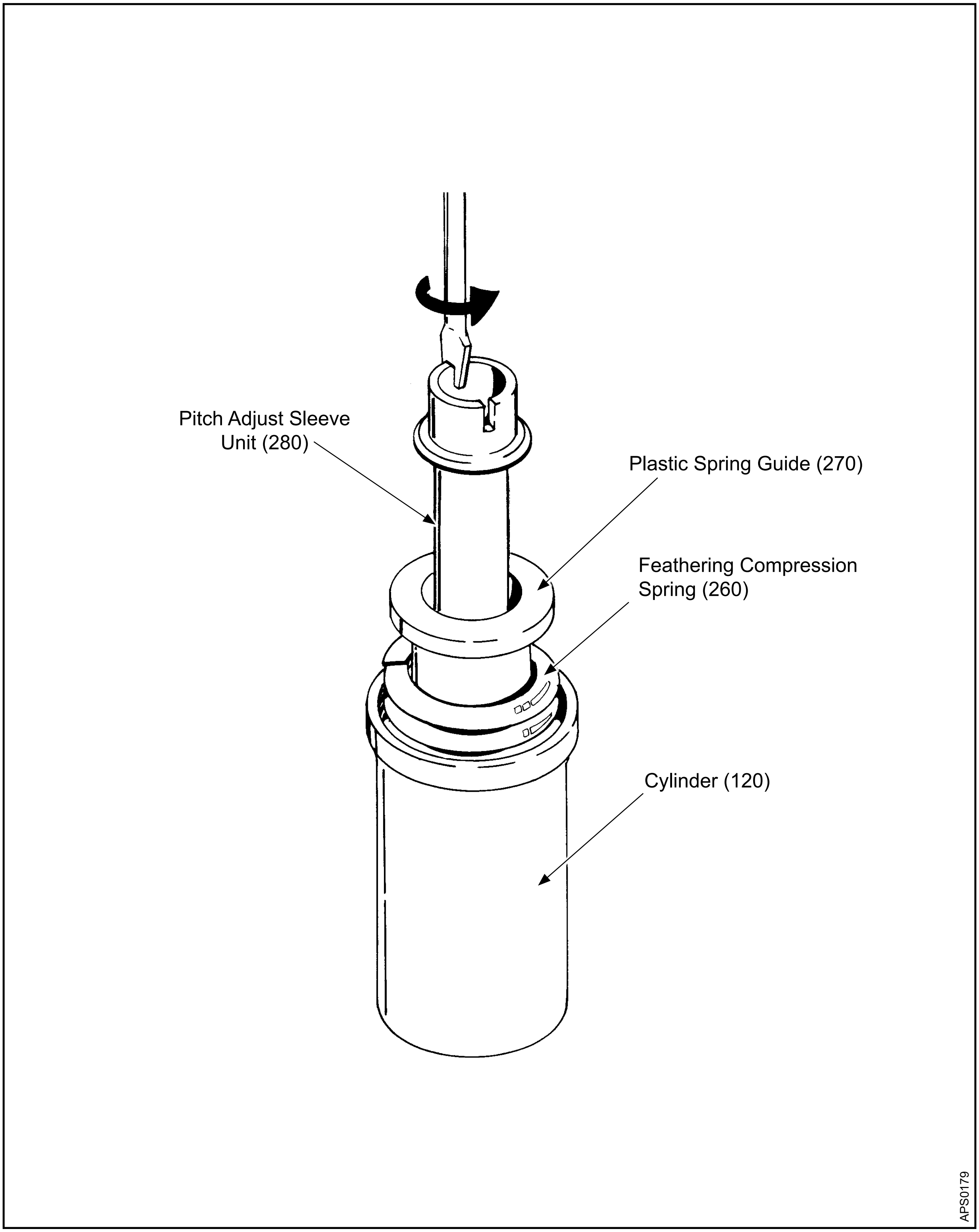
8 Turn the cylinder torque wrench adapter TE153, or equivalent, until the feathering compression spring (260) is fully compressed. Refer to Figure 7-24.

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

9 With the cylinder torque wrench adapter TE153 attached, remove the cylinder (120) from the sleeve installation tool TE427, or equivalent.



Compressing the Feathering Compression Spring
Figure 7-24



Using a Screwdriver to Thread the Pitch Adjust Sleeve Unit Through the Cylinder
Figure 7-25

(b) Installing the pitch adjust sleeve unit (280) into the cylinder (120) without the sleeve installation tool TE427, or equivalent.

<u>1</u> Apply anti-seize compound CM118 or CM151 to both end coils of the spring (260) and the first two threads of the pitch adjust sleeve unit (280).

<u>2</u> Install the pitch adjust sleeve unit (280) through the plastic spring guide (270), feathering compression spring (260), and the spring seat (250).

<u>3</u> As shown in Figure 7-25, use a screwdriver in the slot in the pitch adjust sleeve unit (280) to thread the sleeve through the cylinder (120) far enough that a wrench can be applied to the flat surface on the end of the sleeve to continue screwing it into the cylinder until the feathering compression spring (260) is fully compressed.

<u>4</u> Using four 1/4-28UNF-3A bolts or screws, attach the cylinder torque wrench adapter TE153, or equivalent, to the cylinder (120).

(c) Install the cylinder-half hub shoulder O-ring (440). Refer to Figure 7-26.

CAUTION: DO NOT APPLY ANTI-SEIZE COMPOUND CM118 TO THE MOUNTING THREADS ON THE CYLINDER.

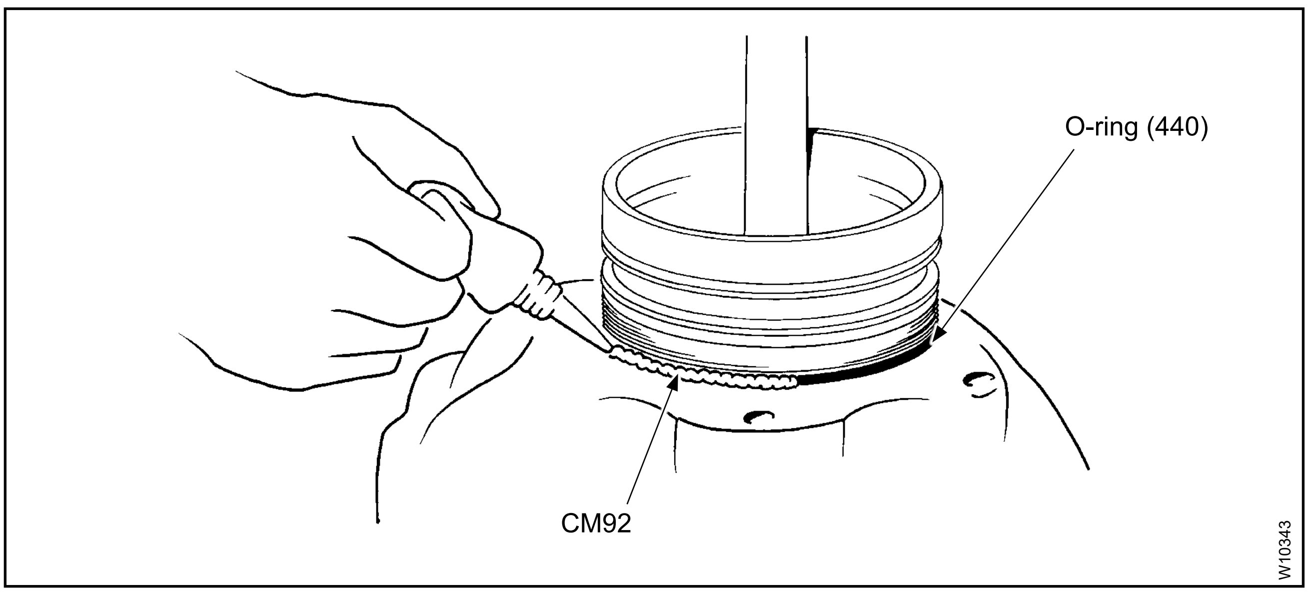
(d) Apply anti-seize compound CM118 to the cylinder mounting threads on the hub only.

1 Using a clean cloth, remove any excess anti-seize compound CM118 from the area above the cylinder mounting threads on the hub.

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

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.

(e) Apply a bead of sealant CM92 around the shoulder of the cylinder half of the hub next to the O-ring (440). Refer to Figure 7-26.



Applying a Bead of Sealant to the Hub Shoulder
Figure 7-26

CAUTION 1: DO NOT DAMAGE THE THREADS OF THE CYLINDER (120) WHEN INSTALLING THE CYLINDER.

CAUTION 2: DO NOT DAMAGE THE PISTON O-RING (390) WHEN INSTALLING THE CYLINDER (120).

(f) Carefully slide the cylinder (120) over the piston (330) onto the hub (450) threads.

CAUTION: MAKE SURE THAT THE CYLINDER THREADS ARE ALIGNED WITH THE HUB THREADS.

(g) Turn the cylinder (120) counterclockwise until the threads align.

(h) Turn the cylinder (120) onto the hub threads by hand.

(i) Using the torque wrench adapter TE153, or equivalent, torque the cylinder (120) onto the hub (450) in accordance with the Torque Values Table 8-1 in the Fits and Clearances chapter of this manual.

(j) Remove the four 1/4-28UNF-3A bolts or screws from the torque wrench adapter TE153 and cylinder (120).

(k) Remove the torque wrench adapter TE153 from the cylinder (120).

CAUTION: IF THE FEATHERING COMPRESSION SPRING (260) IS NOT IN CONTACT WITH THE PISTON (330), THE PISTON WILL HIT WITH FORCE UP ONTO THE BOTTOM OF THE FEATHERING COMPRESSION SPRING WHEN 200 PSI IS APPLIED.

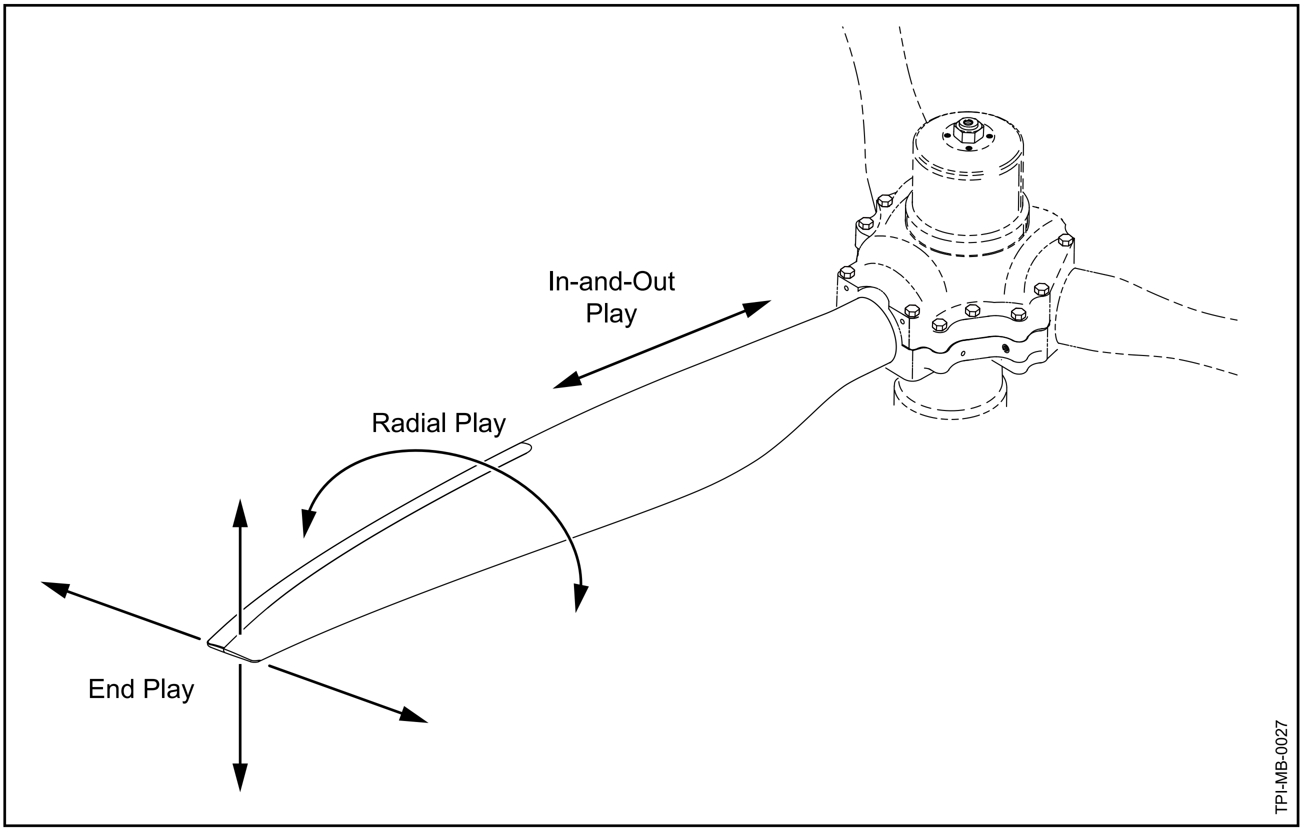
(8) Using a 1-3/16 inch open end wrench, engage two of the flats on the pitch adjust sleeve unit (280) and turn it approximately 3 turns clockwise or until all resistance is eliminated to permit the feathering compression spring (260) to make contact with the piston (330).

(9) Install the drilled hex nut (60) on the pitch adjust sleeve unit (280).

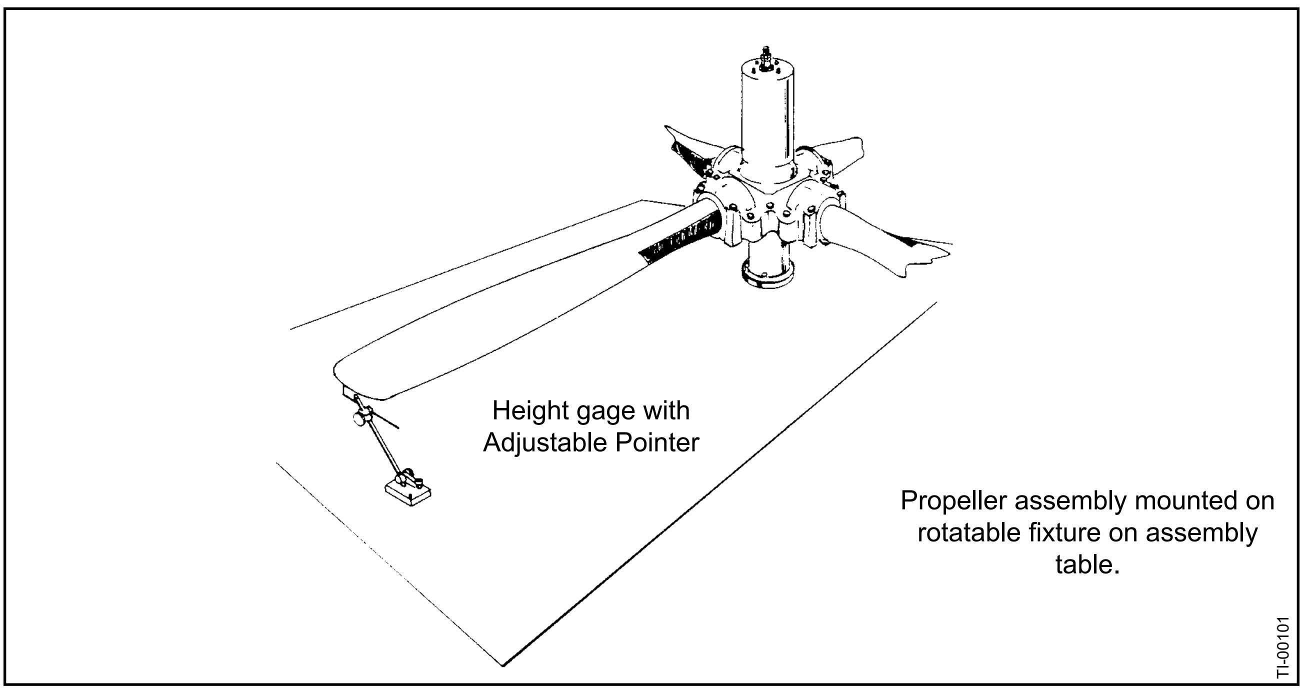
(10) Using lubricant CM12, lubricate the O-ring (100) and install in the OD groove of the pitch change rod plug (70).

(11) Using lubricant CM12, lubricate the O-ring (110) and install in the ID groove of the pitch change rod plug (70).

(12) Turn the pitch change rod plug (70) in the pitch change rod (430) until the end of the pitch change rod plug is flush or slightly below flush with the end of the pitch change rod.



Checking Blade Play
Figure 7-27



Checking Blade Track
Figure 7-28

I. Blade Installation Checks

(1) Apply 200 psi (13.78 bars) air pressure to the propeller to move the blades toward low pitch until the blade tips are approximately parallel to the bench surface.

(2) Check for fore-and-aft or end play movement in each blade. Refer to the Fits and Clearances chapter of this manual for blade tolerances. Refer to Figure 7-27.

(a) If there is fore-and-aft movement in a blade, it may indicate that the blade preload is set too loose. Refer to the Setting Blade Preload section in this chapter.

CAUTION: BLADE TRACK MUST NOT VARY MORE THAN 0.12 INCH (3.0 MM) FROM HIGHEST BLADE HEIGHT TO LOWEST BLADE HEIGHT.

(3) Using a height gage, check the blade track at the tip/face of each blade. Refer to Figure 7-28. Refer to the Fits and Clearances chapter of this manual for blade tolerances.

J. Setting the Reverse Angle of the Blades

NOTE: Refer to the applicable Aircraft Type Certificate Data Sheet or Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59) for the specific reverse blade angle and reference blade radius requirements.

(1) Apply 200 PSI (13.78 bars) air pressure to the propeller to move the propeller pitch change components against the pitch adjust sleeve unit (280).

(2) Remove play from the blades by pushing the counterweight or counterweight clamp of each blade toward feather.

(3) Using a protractor TE96, TE97, or equivalent, measure the reverse angle of each blade at the appropriate blade radius location. Refer to Figure 7-29.

(4) If the reverse blade angle is not correct:

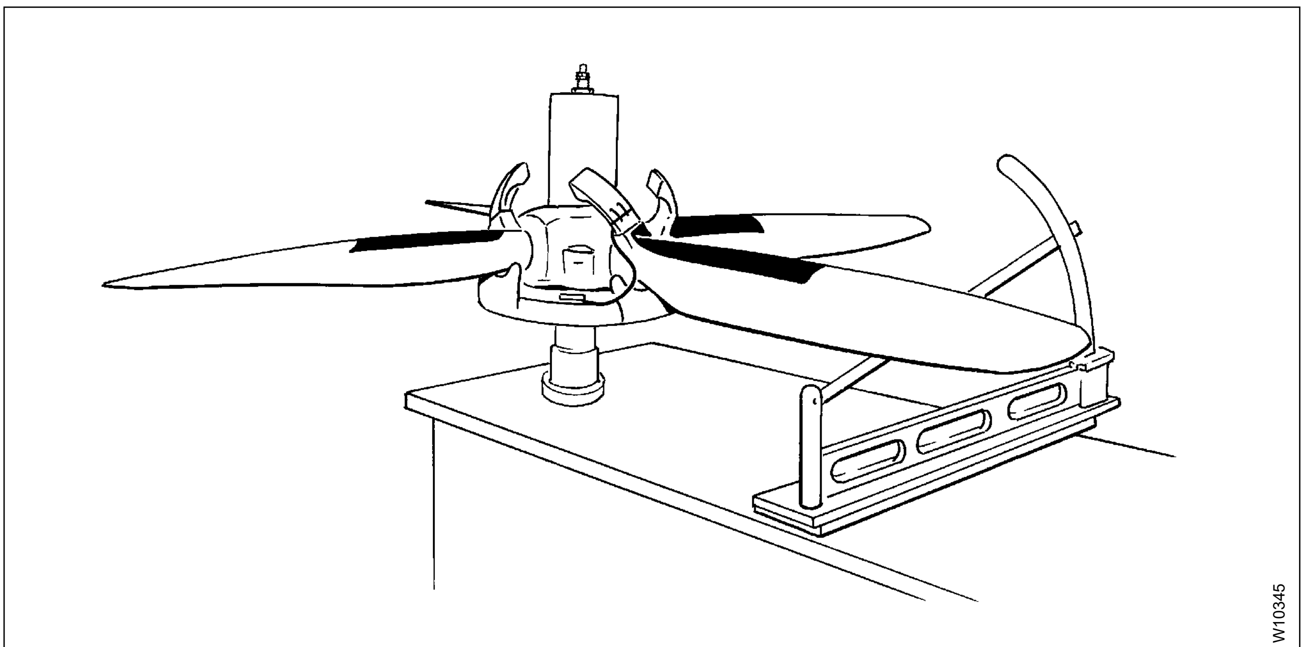
(a) Relieve the pressure from the propeller.

(b) Turn the pitch adjust sleeve unit (280) clockwise to decrease the amount of negative pitch or counterclockwise to increase the amount of negative pitch.

NOTE: One full turn of the pitch adjust sleeve unit equals approximately five degrees.

(5) After adjustment, repressurize the propeller, and measure the reverse angle.

(6) When the correct reverse angle has been established in all three blades, turn the drilled hex nut (60) on the pitch adjust sleeve unit (280) against the cylinder (120).



Checking Blade Angles with the Bench Top Protractor TE96
Figure 7-29

CAUTION: DO NOT PERMIT THE PITCH ADJUST SLEEVE UNIT (280) TO ROTATE WHEN TORQUING THE DRILLED THIN HEX NUT (60).

(7) While holding the pitch adjust sleeve unit (280), torque the drilled thin hex nut (60) against the cylinder (120) in accordance with Table 8-1 in the Fits and Clearances chapter of this manual.

(8) Cycle the propeller to feather and back to reverse.

(9) Measure the reverse blade angle.

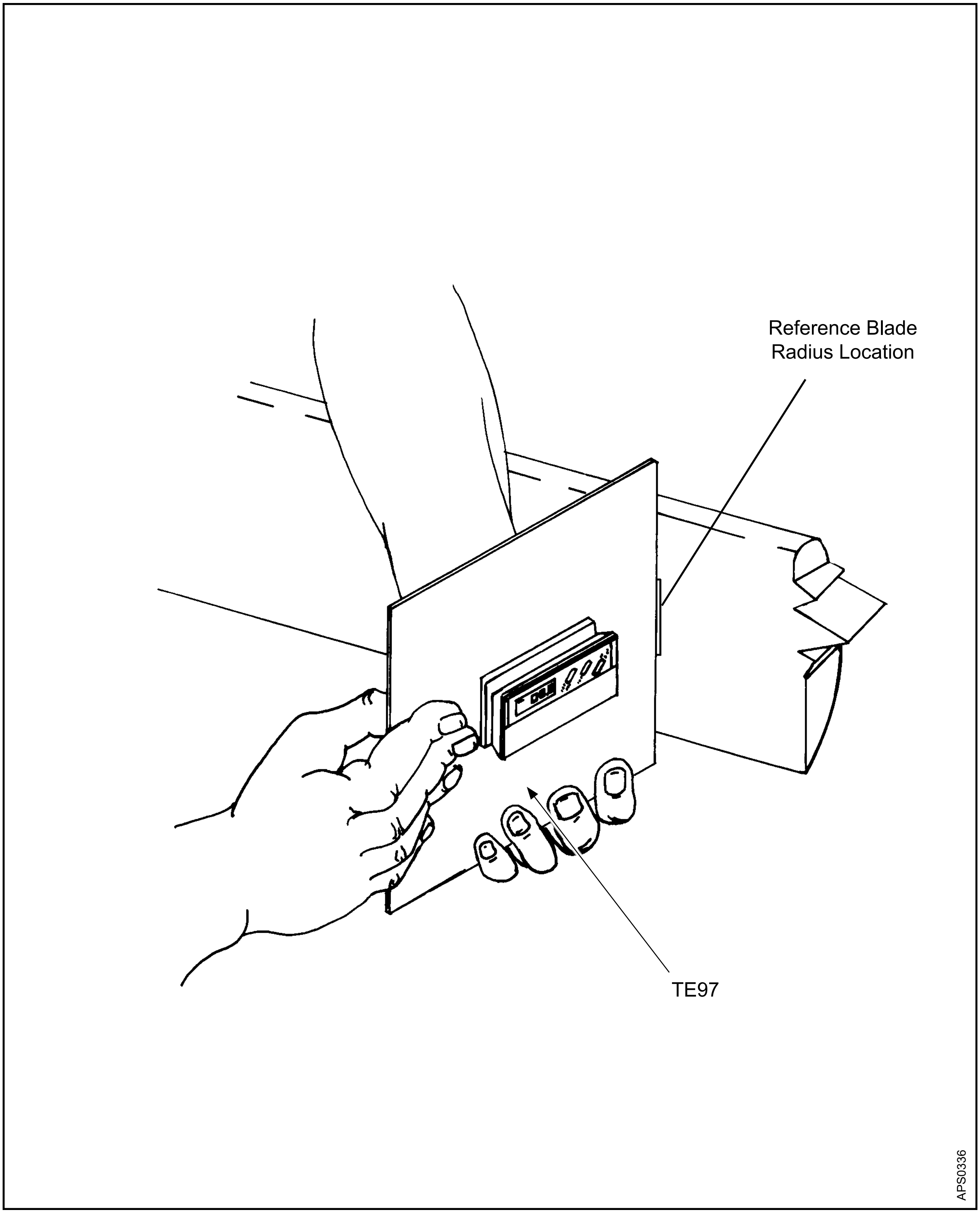
(a) If the angle is incorrect, loosen the drilled hex nut and repeat steps 3.J.(4) through 3.J.(9) in this chapter.

(b) When the reverse blade angle is correct, continue to the next step.

(10) Install the corrosion resistant washer (140) and fillister head screw (130) in one of the holes provided in the cylinder (120) and tighten.

NOTE: When assembling a propeller that will be disassembled for shipping, it is not necessary to install safety wire to the drilled thin hex nut (60) and the fillister head screw (130).

(11) Using 0.032 inch (0.81 mm) minimum diameter stainless steel wire, safety wire the drilled thin hex nut (60) to the fillister head screw (130).



Checking Feathering Angle with Protractor TE97
Figure 7-30

K. Setting the Feather Blade Angle

(1) Refer to the applicable Aircraft Type Certificate Data Sheet or Hartzell Propeller Inc,. Application Guide Manual 159 (61-02-59) for the specific feather blade angle and blade radius required.

CAUTION: TO GET THE CORRECT FEATHER BLADE ANGLE, THE THIN HEX NUT (50) MUST CONTACT THE SHOULDER OF THE PITCH ADJUST SLEEVE UNIT (280).

(2) Release all air (or oil) pressure from the propeller.

(3) Install the drilled thin hex nut (50) on the pitch change rod (430) and turn it until it bottoms against the pitch adjust sleeve unit (280).

(4) Apply air pressure to the propeller to move the pitch change rod (430) and the drilled thin hex nut (50) off of the pitch adjust sleeve unit (280).

(5) Turn the drilled thin hex nut (50) clockwise approximately five (5) turns to provide a starting point for feather blade angle adjustment.

(6) Release the air pressure from the propeller and permit the drilled thin hex nut (50) to rest on the pitch adjust sleeve unit (280).

(7) Remove play from blades by pushing the counterweight of each blade toward feather blade angle.

(8) Using a protractor TE96, TE97, or equivalent, check the feather angle of blade number one at the appropriate blade radius. Refer to Figure 7-30.

(9) If the feather blade angle is not correct, apply enough air pressure to the propeller to move the pitch change rod (430) and drilled thin hex nut (50) off of the pitch adjust sleeve unit (280).

(10) Adjust the feather blade angle by turning the drilled thin hex nut (50) on the pitch change rod.

NOTE: One full turn of the drilled thin hex nut equals approximately five (5) degrees.

(a) To decrease the angle, turn the drilled thin hex nut (50) clockwise.

(b) To increase the angle, turn the drilled thin hex nut (50) counterclockwise.

(11) When the correct feather blade angle is established for all four blades, install a second drilled thin hex nut (50).

CAUTION: THE FIRST THIN HEX NUT (50) MUST NOT MOVE WHEN TORQUING THE SECOND DRILLED THIN HEX NUT (50) AGAINST THE FIRST DRILLED THIN HEX NUT (50).

(12) Torque the second drilled thin hex nut (50) against the first drilled thin hex nut (50), in accordance with Table 8-1 in the Fits and Clearances chapter of this manual.

(13) Cycle the propeller to reverse and then back to feather.

(14) Measure the feather blade angle.

(a) If the angle is incorrect, loosen the thin drilled hex nut (500) and repeat steps 3.K.(8) through 3.K.(13) in this chapter.

(b) When the feather blade angle is correct, continue to the next step.

NOTE: When assembling a propeller that will be disassembled for shipping, it is not necessary to install safety wire to the thin hex nuts (50).

(15) Using 0.032 inch (0.81 mm) minimum diameter stainless steel wire, safety wire the two thin hex nuts (50) together.

(16) Remove the pitch change rod plug (70) from the end of the pitch change rod (430).

(17) Install the drilled thin hex nut (40) on the pitch change rod (430) and turn it until there is enough space on the end of the pitch change rod (430) to install the pitch change rod plug (70).

(18) Using lubricant CM12, lubricate the O-ring (100) and install in the OD groove of the pitch change rod plug (70).

(19) Using lubricant CM12, lubricate the O-ring (110) and install in the ID groove of the pitch change rod plug (70).

(20) Turn the pitch change rod plug (70) in the end of the pitch change rod (430).

(21) Torque the pitch change rod plug (70) in accordance with Table 8-1 in the Fits and Clearances chapter of this manual.

(22) Turn the drilled thin hex nut (40) until it touches the pitch change rod plug (70).

CAUTION: THE PITCH CHANGE ROD PLUG (70) MUST NOT MOVE WHEN TORQUING THE DRILLED THIN HEX NUT (40) AGAINST THE PITCH CHANGE ROD PLUG.

(23) Torque the drilled thin hex nut (40) against the pitch change rod plug (70), in accordance with Table 8-1 in the Fits and Clearances chapter of this manual.

NOTE: When assembling a propeller that will be disassembled for shipping, it is not necessary to install safety wire to the drilled thin hex nut (40) and the pitch change rod plug (70).

(24) Using 0.032 inch (0.81 mm) minimum diameter stainless steel wire, safety wire the drilled thin hex nut (40) and the pitch change rod plug (70) together.

L. Beta Valve Assembly Procedures

(1) General

(a) Complete assembly of the D-751-2 Beta Valve is not possible before installation on the engine or before propeller installation.

(b) The D-751-2 beta valve is assembled around the engine and propeller. Subassembly C-1159-1 is able to be assembled before installation on the engine and is addressed first.

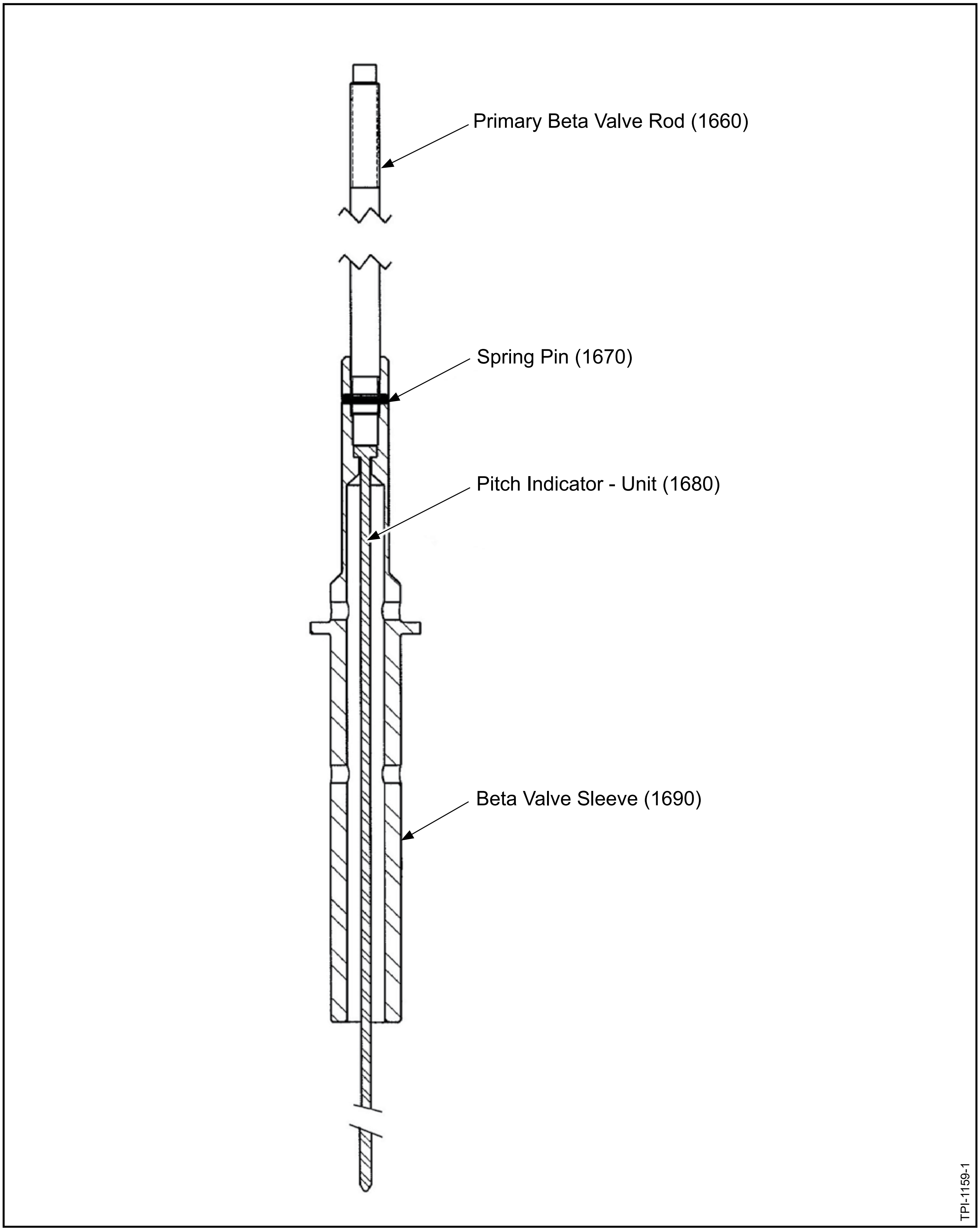
(c) Other parts of the beta valve assembly will be addressed in the sequence in which they are assembled together during the propeller installation on the engine.

Item Number	Description	Check Inspection Results			
		"A"	"B"	"C"	"D"
1660	Primary Beta Valve Rod	OK	Replace 1	OK	OK
1690	Beta Valve Sleeve	OK	OK	Replace 2	OK
1680	Pitch Indicator	OK	OK	OK	Replace 3
Replace 1	Replacement of the primary beta valve rod (1660). A beta valve sleeve (1690) can be reused with a new primary beta valve rod (1660) only if the beta valve sleeve (1690) has only one set of holes for spring pin (1670) installation. If the beta valve sleeve (1690) has two sets of holes (4 holes) for spring pin (1670) installation, the beta valve sleeve (1690) must be replaced. Refer to Figure 7-33.				
Replace 2	Replacement of beta valve sleeve (1690) requires replacement of the primary beta valve rod (1660) even though it may have been acceptable in accordance with Table 5-1 in the Check chapter of this manual. Drilling the primary beta valve rod (1660) a second time to attach it to the new beta valve sleeve (1690) with a spring pin (1670) is not permitted.				
Replace 3	Replacement of the pitch indicator (1680) does not require replacement of any other part.				

C-1159-1 Sub-assembly Reusable Parts
Table 7-2, Page 1 of 2

C-1159-1 Sub-assembly Reassembly Selection
NOTE: The C-1159-1 Sub-assembly was created to represent a subassembly of parts in the D-751-2 Beta Valve Assembly. For definition of the C-1159-1 Sub-assembly with an exploded view and parts listing refer to Figure 10-3 in the Illustrated Parts List Chapter of this manual. For subassembly parts assembled together refer to Figure 7-31. (1) The spring pin (1670) of the C-1159-1 Sub-assembly is replaced at overhaul. The remaining three parts are inspected in accordance with Table 5-1 Component Inspection Criteria in the check chapter of this manual. All three parts could be determined to be reusable or some of them may have to be replaced. Replacement of some parts will force replacement of other parts within the C-1159-1 Sub-assembly, even though the other parts passed the Component Inspection Criteria in Table 5-1 in accordance with the Check chapter of this manual. (2) Table 7-2 identifies several possibilities for part replacement of component parts in the C-1159-1 Sub-assembly. The impact of replaced parts on adjacent component parts is described. Several reassembly procedures of the C-1159-1 Sub-assembly are described and are included in this section as C-1159-1 Sub-assembly, Assembly Procedure 1, C-1159-1 Sub-assembly, Assembly Procedure 2, and C-1159-1 Sub-assembly Assembly Procedure 3. (3) In Table 7-2 there are combinations of a possible four "Check" inspection results represented as inspection results "A", "B", "C" and "D". NOTE: During overhaul the spring pin (1670) is removed and discarded. A new replacement must be obtained before reassembly.

C-1159-1 Sub-assembly Reusable Parts
Table 7-2, Page 2 of 2



C-1159-1 Beta Valve Sleeve Unit, Sub-assembly
Figure 7-31

(2) Inspection Results and Associated Reassembly Procedures

(a) With inspection result “A”, Table 7-2, all parts are reusable.

1 Assemble in accordance with "C-1159-1 Sub-assembly, Reassembly Procedure 1" in this chapter.

(b) With inspection result “B” Table 7-2, the primary beta valve rod (1660) is replaced.

1 Assemble in accordance with "C-1159-1 Sub-assembly, Reassembly Procedure 2" in this chapter.

(c) With inspection result “C” Table 7-2, the beta valve sleeve (1690) is replaced and requires replacement of the primary beta valve rod (1660).

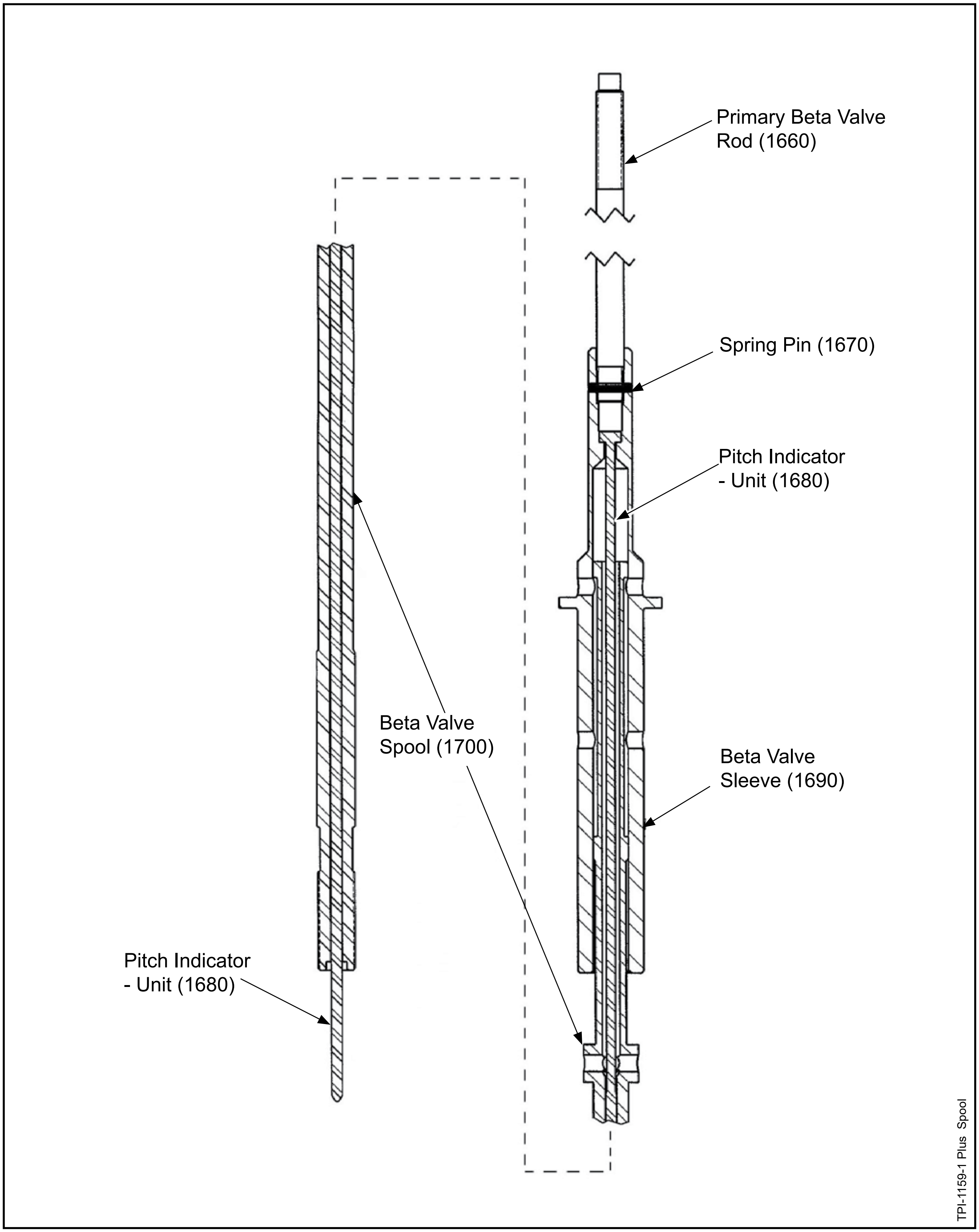
1 Assemble in accordance with "C-1159-1 Sub-assembly Reassembly Procedure 3" in this chapter.

(d) With inspection result “D” Table 7-2, only the pitch indicator (1680) will need to be replaced in addition to the normally replaced spring pin (1670).

1 Assemble in accordance with “C-1159-1 Sub-assembly, Reassembly Procedure 1" in this chapter.

(3) Reassembly of the C-1159-1 Sub-assembly

(a) To reassemble the C-1159-1 Sub-assembly, use one of the three C-1159-1 Sub-assembly, reassembly procedures that follow in this chapter.



C-1159-1 Beta Valve Sleeve Unit, Sub-assembly Plus Spool
Figure 7-32

(b) C-1159-1 Sub-assembly, Reassembly Procedure 1

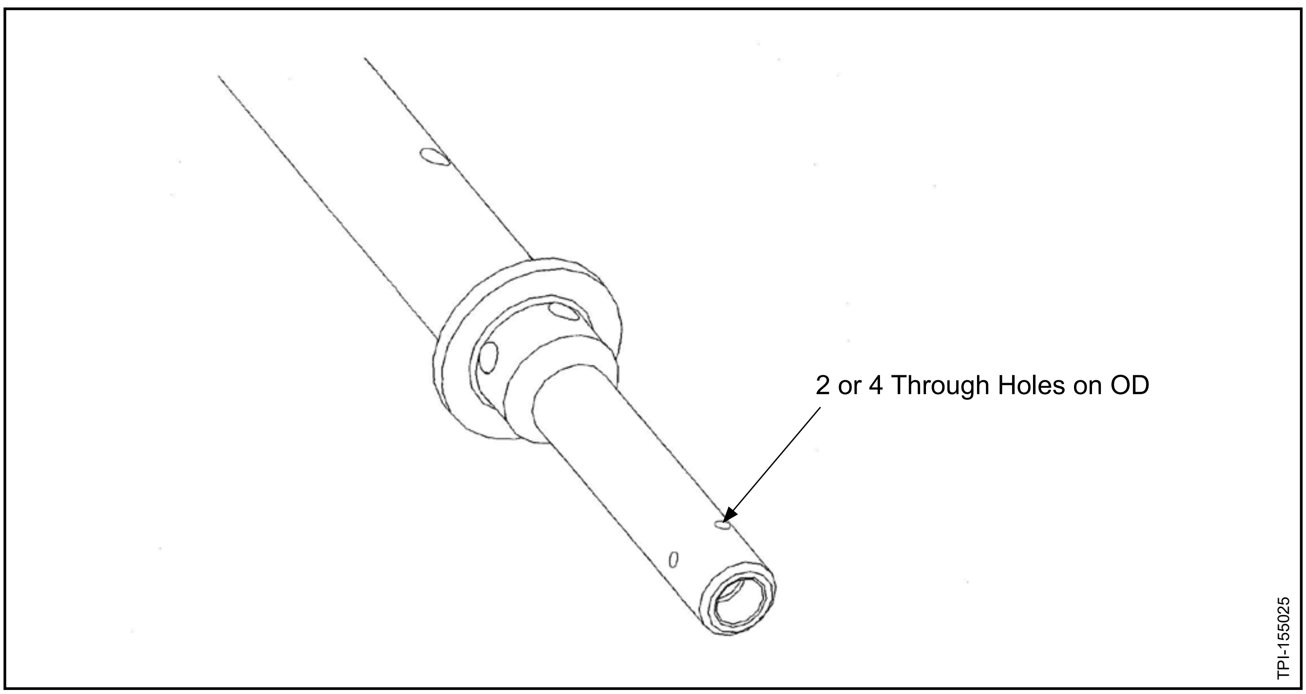
NOTE: The following procedure assumes that the beta valve rod (1660) and beta valve sleeve (1690) have passed the overhaul check inspection in accordance with Table 5-1, Component Inspection Criteria in the Check chapter of this manual. Only the spring pin (1670) has been replaced or possibly the pitch indicator (1680) in addition to the spring pin (1670). Refer to the C-1159-1 Sub Assembly in Figure 7-32 and the exploded view in Figure 10-3 in the Illustrated Parts List chapter of this manual to identify the referenced parts.

1 Lubricate the pitch indicator (1680) with turbine oil CM60.

2 Lubricate the bottom of the counterbored hole past the threads in the beta valve sleeve (1690) with CM60.

3 Slide the small end of the pitch indicator (1680) through the beta valve sleeve (1690) threaded end. The larger diameter head of the pitch indicator (1680) is to contact the bottom of the counterbored hole past the threads in the beta valve sleeve (1690).

4 Identify the end of the primary beta valve rod (1660) that has a 5/16-24UNF-3A thread with a drilled hole through it (from previous joining to the beta valve sleeve [1690]).



Spring Pin Through Holes
Figure 7-33

5 Lubricate the identified end of the primary beta valve rod (1660) (threads and adjacent end with no threads) with CM60.

6 Thread the identified end of the primary beta valve rod (1660) into the threaded end of the beta valve sleeve (1690) until rotation is stopped.

7 Slightly adjust the rotational location of the primary beta valve rod (1660) in the beta valve sleeve (1690) to make the drilled hole in the threaded area of the primary beta valve rod (1660) align with the hole in the beta valve sleeve (1690).

NOTE: The beta valve sleeve (1690) is permitted to have 2 or 4 holes in the area where the spring pin (1670) installs. The single hole in the primary beta valve rod (1660) will not align with two holes in the beta valve sleeve (1690) when there are four holes are in the beta valve sleeve (1690). A single through hole in the primary beta valve rod (1660) and only two holes in beta valve sleeve (1690) will align.

CAUTION: THE SPRING PIN IS TO BE FLUSH TO BELOW FLUSH WITH THE OUTSIDE DIAMETER OF THE BETA VALVE SLEEVE (1690).

8 Press the new spring pin (1670) into the interfacing hole between the primary beta valve rod (1660) and the beta valve sleeve (1690).

(c) C-1159-1 Sub-assembly, Reassembly Procedure 2

1 A beta valve sleeve (1690) can be reused with a new primary beta valve rod (1660) only if the beta valve sleeve (1690) has only one set of holes for spring pin (1670) installation. If the beta valve sleeve (1690) has two sets of holes (4 holes) for spring pin (1670) installation, the beta valve sleeve (1690) must be replaced. This is because a new hole must be drilled through the beta valve sleeve (1690) in the same location but rotated 90 degrees from the previous through hole.

NOTE: When the hole is drilled for installation of the new spring pin (1670) it will not travel in a straight line through the beta valve sleeve (1690) and the primary beta valve rod (1660); therefore, the spring pin (1670) hole previously drilled at the factory is not in a straight line either. It is not possible to drill through existing holes in the beta valve sleeve (1690) and a new (undrilled) primary beta valve rod (1660) and have the drill pass precisely through the two existing holes in the beta valve sleeve (1690).

2 Lubricate the pitch indicator (1680) with turbine oil CM60.

3 Lubricate the bottom of the counterbored hole past the threads in the beta valve sleeve (1690) with CM60.

4 Slide the small end of the pitch indicator (1680) through the beta valve sleeve (1690) threaded end. The larger diameter head of the pitch indicator (1680) is to contact the bottom of the counterbored hole past the threads in the beta valve sleeve (1690).

5 Identify the end of the primary beta valve rod (1660) that is flat with a smooth OD adjacent to the shorter 5/16-24UNF-3A thread.

6 Lubricate the identified end of the primary beta valve rod (1660) (end with no threads and adjacent threads) with CM60.

7 Thread the identified end of the primary beta valve rod (1660) into the threaded end of the beta valve sleeve (1690) until rotation is stopped.

8 Slightly torque the primary beta valve rod (1660) and beta valve sleeve (1690) to make sure that they are firmly together.

9 While holding the beta valve sleeve (1690) rotate the pitch indicator (1680) to verify that it rotates freely.

a If the pitch indicator does not rotate freely, slightly reduce the torque between the primary beta valve rod (1660) and the beta valve sleeve (1690).

10 Center punch the hole start location located 0.450 +/-0.015 inch (11.43 +/-0.38 mm) from the end of the beta valve sleeve (1690) facing the primary beta valve rod (1660) to prevent “skating” of the drill before it begins to penetrate the beta valve sleeve (1690). Using a drill and a No. 42 (0.0935 inch diameter) size drill bit, drill a hole completely through the beta valve sleeve (1690) and the new primary beta valve rod (1660).

a The beta valve sleeve (1690) is either new or was drilled approximately 90 degrees to the previous set of holes for spring pin (1670) installation.

CAUTION: THE SPRING PIN IS TO BE FLUSH TO BELOW FLUSH WITH THE OUTSIDE DIAMETER OF THE BETA VALVE SLEEVE (1690).

11 Press the new spring pin (1670) into the interfacing hole between the primary beta valve rod (1660) and the beta valve sleeve (1690).

(d) C-1159-1 Sub-assembly, Reassembly Procedure 3

1 The replacement of beta valve sleeve (1690) requires replacement of the primary beta valve rod (1660) even though it may have been acceptable in accordance with Table 5-1 in the Check chapter of this manual. Drilling the primary beta valve rod (1660) a second time to attach it to the new beta valve sleeve (1690) with a spring pin (1670) is not permitted.

NOTE: It is not possible to drill new holes in the beta valve sleeve (1690) and align with the existing holes in the previously used primary beta valve rod (1660).

2 Lubricate the pitch indicator (1680) with turbine oil CM60.

3 Lubricate the bottom of the counterbored hole past the threads in the beta valve sleeve (1690) with CM60.

4 Slide the small end of the pitch indicator (1680) through the beta valve sleeve (1690) threaded end. The larger diameter head of the pitch indicator (1680) is to contact the bottom of the counterbored hole past the threads in the beta valve sleeve (1690).

5 Identify the end of the primary beta valve rod (1660) that is flat with a smooth OD adjacent to the shorter 5/16-24UNF-3A thread.

6 Lubricate the identified end of the primary beta valve rod (1660) (end with no threads and adjacent threads) with CM60.

7 Thread the identified end of the primary beta valve rod (1660) into the threaded end of the beta valve sleeve (1690) until rotation is stopped.

8 Slightly torque the primary beta valve rod (1660) and beta valve sleeve (1690) to make sure that they are firmly together.

9 While holding the beta valve sleeve (1690) rotate the pitch indicator(1680) to verify that it rotates freely.

a If the pitch indicator does not rotate freely, slightly reduce the torque between the primary beta valve rod (1660) and the beta valve sleeve (1690).

10 Center punch the hole start location located .450 +/-.015 inch (11.43 +/-.38 mm) from the end of the beta valve sleeve (1690) facing the primary beta valve rod (1660) to prevent “skating” of the drill before it begins to penetrate the beta valve sleeve (1690). Using a drill and a No. 42 (0.0935 inch diameter) size drill bit, drill a hole completely through the beta valve sleeve (1690) and the new primary beta valve rod (1660).

CAUTION: THE SPRING PIN IS TO BE FLUSH TO BELOW FLUSH WITH THE OUTSIDE DIAMETER OF THE BETA VALVE SLEEVE (1690).

11 Press the new spring pin (1670) into the interfacing hole between the primary beta valve rod (1660) and the beta valve sleeve (1690).

(4) D-751-2 Beta Valve Installation into the Engine

(a) Lubricate the beta valve spool (1700) with turbine oil CM60 on the two outside diameter shoulders, that interface with the beta valve sleeve (1690), and the inside diameter that rubs against the pitch indicator (1680).

(b) Install the beta valve spool (1700) two outside diameter shoulders into the open beta valve sleeve (1690) inside diameter.

(c) Install the Engine Manufacturer supplied beta valve shaft adapter with four O-rings installed in accordance with the Engine Manufacturer installation instructions. A retaining ring supplied by the Engine Manufacturer is used to retain the beta valve shaft adapter in place. Refer to the Engine Manufacturer overhaul and installation instructions.

(d) Slide the C-1159-1 Sub-assembly with the installed beta valve spool (1700) into the engine shaft and through the Engine Manufacturer supplied beta valve shaft adapter.

1 The beta valve spool (1700) is to enter the engine first with the primary beta valve rod (1660) protruding from the engine shaft on the propeller side.

2 A shoulder on the beta valve sleeve (1690) will contact the Engine Manufacturer supplied beta valve shaft adapter and stop further movement into the engine.

(e) Lubricate the O-ring (1710) with turbine oil CM60.

(f) Install the O-ring (1710) into a counterbore on the inside diameter, of the threaded end of the beta valve spool (1700), and around the pitch indicator (1680).

(5) Beta Valve Spring Assembly Installation into the Engine

(a) Slide the compression spring (1640) over the primary beta valve rod (1660), into the inside diameter of the engine shaft, and around the beta valve sleeve (1690). The compression spring (1640) will stop against a shoulder on the beta valve sleeve (1690).

(b) Slide the beta spring retainer (1630) over the primary beta valve rod (1660) with the recessed center section facing toward the compression spring (1640).

(c) Position the compression spring (1640) inside the center section of the beta spring retainer (1630).

(d) Rotate the beta spring retainer (1630) until the indexing block on the beta spring retainer (1630) aligns with a recess in the engine shaft provided for it.

(e) Secure the beta spring retainer (1630) in place on the front of the engine flange/shaft with an Engine Manufacturer supplied Retaining Ring that installs inside an inside groove in the engine flange/shaft.

(6) Beta Valve Assembly on the Engine Side of the Gearbox (away from the propeller)

(a) Lubricate the O-ring (1730) with turbine engine oil CM60.

(b) Install the O-ring (1730) into the inside O-ring groove of the engine cover (1740) adjacent to the installed bushing.

(c) Lubricate the O-ring (1720) with turbine engine oil CM60.

(d) Install the O-ring (1720) onto the outside diameter O-ring groove, on the outside diameter shoulder of the engine cover (1740).

(e) Turn the engine cover (1740) so that the shoulder that supports the external O-ring (1720) is facing toward the engine gearbox. Slide the engine cover (1740) over the pitch indicator (1680) but stop short of the threads on the beta valve spool (1700).

(f) Lubricate the beta valve spool (1700) from the threads to the gearbox with turbine engine oil CM60. Lubrication will reduce abrasion to the engine cover (1740) inside diameter O-ring (1730) when sliding over these threads.

(g) Gently slide and rotate the engine cover (1740), with the installed inside diameter O-ring (1730), over the beta valve spool (1700) threads and ground surface until the engine cover (1740) contacts the engine gear box.

(h) Attach the engine cover (1740) to the engine gearbox with the Engine Manufacturer supplied fasteners and in accordance with the Engine Manufacturer instructions.

(i) Thread the thin hex nut (1760) onto the threads of the threaded end of the beta valve spool (1700).

(j) Slide the beta valve bushing (1770) over the threaded end of the beta valve spool (1700) until it rests against the installed thin hex nut (1760).

(k) Slide the rod end fitting (1780) over the beta valve bushing (1770) until it rests against the thin hex nut (1760).

CAUTION: INSPECT THE COUNTERBORE AT THE INSIDE DIAMETER IN THE THREADED END OF THE BETA VALVE SPOOL (1700) AND MAKE SURE THAT THE O-RING (1710) HAS BEEN INSTALLED BEFORE INSTALLATION OF THE ROD END CAP UNIT (1790).

(l) Thread the rod end cap unit (1790) onto the threaded end of the beta valve spool (1700) until it contacts the end of the beta valve spool (1700).

1 If the rod end cap unit (1790) does not contact the end of the beta valve spool (1700), thread the thin hex nut (1760) further on the beta valve spool (1700) threads toward the engine gearbox to permit clearance for the rod end cap unit (1790) to contact the end of the beta valve spool (1700).

(m) If the beta valve spool (1700) is a replacement, a flat will need to be filed into the threads of the beta valve spool (1700). If the beta valve spool (1700) was reused, go to step 2.L.(6)(r).

(n) Turn the rod end cap unit (1790) against the end of the beta valve spool (1700) until tight.

(o) Identify the circumferential location of the set screw (1800) in the rod end cap unit (1790).

NOTE: A flat must be filed into the threads of the beta valve spool (1700) under the set screw location of the rod end cap unit (1790). The flat will permit the set screw (1800) to press against the flat for improved anti-rotation of the rod end cap unit (1790), will prevent the set screw (1800) from damaging the beta valve spool (1700) threads, and will make part removal from the beta valve spool (1700) easy or possible at next overhaul.

(p) Remove the rod end cap unit (1790) and file a flat into the noted circumferential location to engage the set screw (1800). File close but not lower than the minor diameter of the thread. The O-ring (1710) inside the end of the beta valve spool (1700) must be shielded to prevent filings from contaminating or bonding to the O-ring (1710).

(q) Thread the rod end cap unit (1790) onto the threaded end of the beta valve spool (1700) until it contacts the end of the beta valve spool (1700).

(r) Turn the rod end cap unit (1790) against the end of the beta valve spool (1700) until tight.

(s) Apply thread locking fluid CM21 to the set screw (1800).

(t) Turn the set screw (1800) into the rod end cap unit (1790).

(u) Tighten the set screw (1800) by hand, against the filed flat on the beta valve spool (1700).

(v) Thread the thin hex nut (1760) toward the engine gear box, away from the beta valve bushing (1770) and the rod end fitting (1780), to permit access to the threads under the thin hex nut (1760) final location.

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.

(w) Apply a small quantity of thread locking fluid CM21 to several threads adjacent to the beta valve bushing (1770).

(x) Thread the thin hex nut (1760) away from the gear box and against the beta valve bushing (1770). The beta valve bushing (1770) is slightly wider than the rod end fitting (1780). This will permit the rod end fitting (1780) to rotate freely on the beta valve bushing (1770).

(y) Torque the thin hex nut (1760) against the beta valve bushing (1770) in accordance with Torque Table 8-1 in the Fits and Clearances chapter of this manual.

(z) Check the rod end fitting (1780) to make sure that it will rotate freely on the beta valve bushing (1770).

(7) Installation of D-751-2 Beta Valve Parts that Interface with the Propeller

NOTE: The propeller must first be installed onto the engine before further assembly/installation of the D-751-2 Beta Valve can proceed.

(a) Install the O-ring (1150) onto the engine flange.

NOTE 1: This O-ring will seal between the engine flange and the soon to be installed propeller hub.

NOTE 2: Steps 2.L.(7)(b) through 2.L.(7)(e) are not required for installation of the D-751-2 Beta Valve although removal of the pitch change rod plug (70) from the propeller will make it easier to install the propeller around the primary beta valve rod (1660). It will also permit verification and inspection of two O-rings on the pitch change rod plug (70) that interface with the D-751-2 Beta Valve.

(b) Remove the safety wire between the hex of the pitch change rod plug (70) and the adjacent drilled thin hex nut (40) if installed.

(c) Use two 1 inch wrenches to break the jam between the drilled thin hex nut (40) and the pitch change rod plug (70) hex.

(d) Rotate the drilled thin hex nut (40) up against the two jammed drilled thin hex nuts (50) so that the drilled thin hex nut (40) will remain with the propeller.

(e) Unthread the pitch change rod plug (70) from the pitch change rod (430) and slide the pitch change rod plug (70) completely out of the end of the pitch change rod (430).

(f) Support the propeller by a sling for installation onto the engine over the primary beta rod (1660) that is protruding from the engine flange.

(g) Carefully slide the propeller over the primary beta rod (1660) toward the engine flange.

(h) Attach the propeller to the engine in accordance with Hartzell Propeller Inc. Propeller Owner's Manual 149 (61-00-49).

(i) Inspect the pitch change rod plug (70) to make sure that an O-ring (100) in good condition is installed on the OD and that a second O-ring (110) in good condition is installed in the ID.

(j) Lubricate the primary beta valve rod (1660) OD and the OD of the pitch change rod plug (70) with turbine engine oil CM60

(k) Slide the pitch change rod plug (70) around the primary beta valve rod (1660) and into the pitch change rod (430) and thread into the pitch change rod (430) until the hex of the pitch change rod plug (70) touches the end of the pitch change rod (430).

(l) Torque the pitch change rod plug (70) into the pitch change rod (430) in accordance with the Torque Table 8-1 in the Fits and Clearances chapter of this manual.

(m) Rotate the drilled thin hex nut (40) from against the two drilled thin hex nuts (50) to the hex of the pitch change rod plug (70).

(n) Torque the drilled thin hex nut (40) and the hex of the pitch change rod plug (70) in accordance with the Torque Table 8-1 in the Fits and Clearances chapter of this manual.

(o) Safety wire the hex of the pitch change rod plug (70) to the thin hex nut (40).

(p) Slide the beta valve spacer (1620) onto the primary beta rod (1660) protruding through the pitch change rod plug (70).

(q) Thread the self locking nut (1610) onto the threads of the primary beta rod (1660). The location of this nut will be relocated based on a low pitch blade angle setting that will be completed at a later time, during propeller control system rigging.

M. Propeller Lubrication

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

N. Static Balance

NOTE: When assembling a propeller that will be disassembled for shipping, it is not necessary to install safety wire to the static balance weight drilled screws (1130).

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

O. Label Placement

(1) For information about label use, refer to the Parts Identification and Marking chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

3. Propeller Disassembled for Shipping

A. General

(1) A propeller disassembled for shipping has had one or more blades removed from the propeller after assembly. The propeller was fully assembled, tested, inspected, lubricated and statically balanced before blade removal and shipping.

(2) A propeller disassembled for shipping must be assembled by trained personnel in accordance with Hartzell Propeller Inc. manuals.

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

B. Preparing 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, put index labels AR-20 and AR-30 on the hub and bulkhead to show alignment of the bulkhead to the hub, before removing the bulkhead from the hub.

(3) Remove all balance weight screws (1130) and balance weights (1140).

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

(5) Disassemble the beta system. Refer to the Beta System Disassembly section in the Disassembly chapter of this manual.

(6) Disassemble the hydraulic system and pitch adjustment unit. Refer to the Hydraulic System and Pitch Adjustment Unit Disassembly section in the Disassembly chapter of this manual.

NOTE: It is not necessary to remove the pitch adjust sleeve unit (280) from the cylinder (120) or the piston (330) and hex nut (310) from the pitch change rod.

(7) 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.

(8) Packing the Propeller and Blades for Shipping

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

(b) Pack the propeller without blades for shipping.

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

4. Reassembly of a Propeller Disassembled for Shipping

A. Unpacking the Propeller and Blades

(1) Carefully unpack the propeller and blades from shipping.

(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 have been marked for alignment with the hub unit.

(2) Remove all balance weight screws (1130) and balance weights (1140).

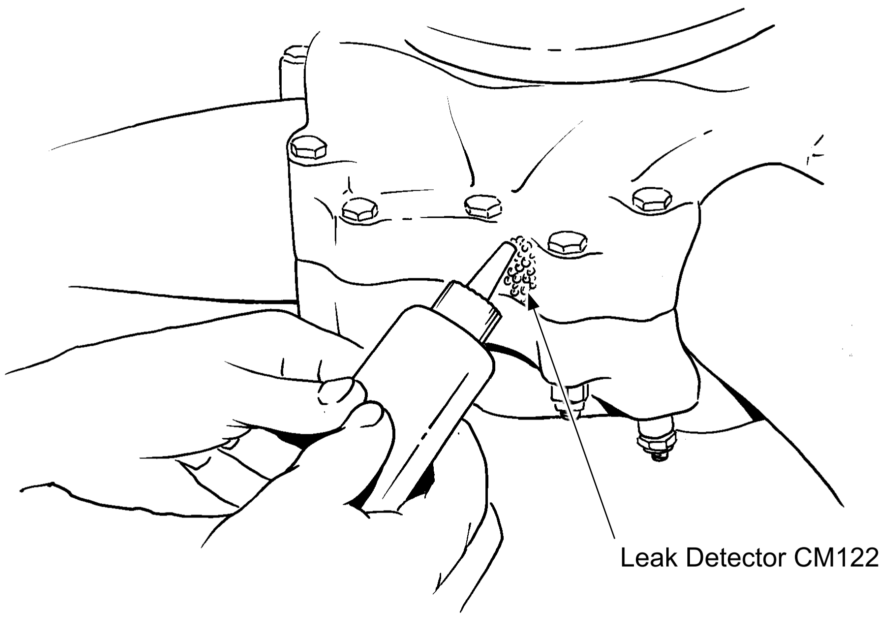
(3) Disassemble the hydraulic system and pitch adjustment unit. Refer to the Hydraulic System and Pitch Adjustment Unit Disassembly section in the Disassembly chapter of this manual.

NOTE: It is not necessary to remove the pitch adjust sleeve unit (280) from the cylinder (120) or the piston (330) and hex nut (310) from the pitch change rod.

C. Propeller Reassembly

(1) Reassemble HC-D3F-7H propellers in accordance with the Assembly of HC-D3F-7H Propeller Models in this chapter.

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



Hub Leak Test
Figure 7-34

5. Leak Test (Rev.3)

A. Leak Test Procedure

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

(1) Install the lubrication fittings (640) in the applicable side of the hub.

(a) Tighten each lubrication fitting (640) until finger-tight, then tighten one additional 360 degree turn.

(2) Install the lubrication plugs (641) in the applicable side of the hub.

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

(b) Tighten each lubrication plug (641) 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 7-34.

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 (641) in the applicable side of the hub.

(a) Tighten the lubrication plug (641) until finger-tight, then tighten one additional 360 degree turn.

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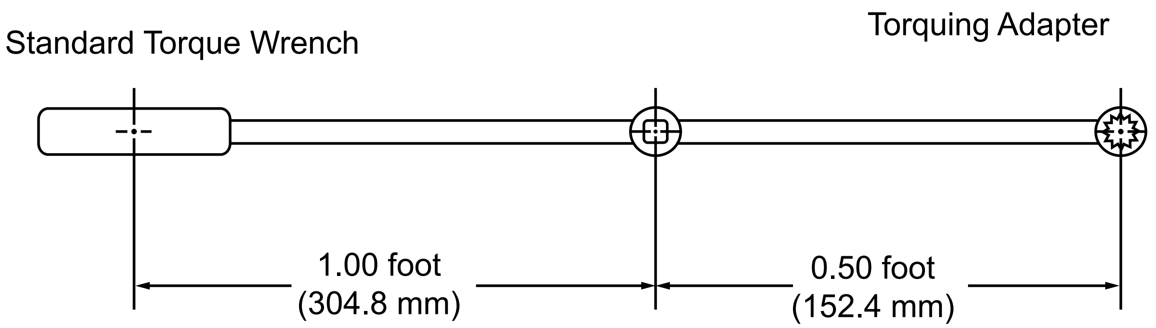
FITS AND CLEARANCES - CONTENTS

LIST OF FIGURES

LIST OF TABLES



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

EXAMPLE:

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

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

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

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.

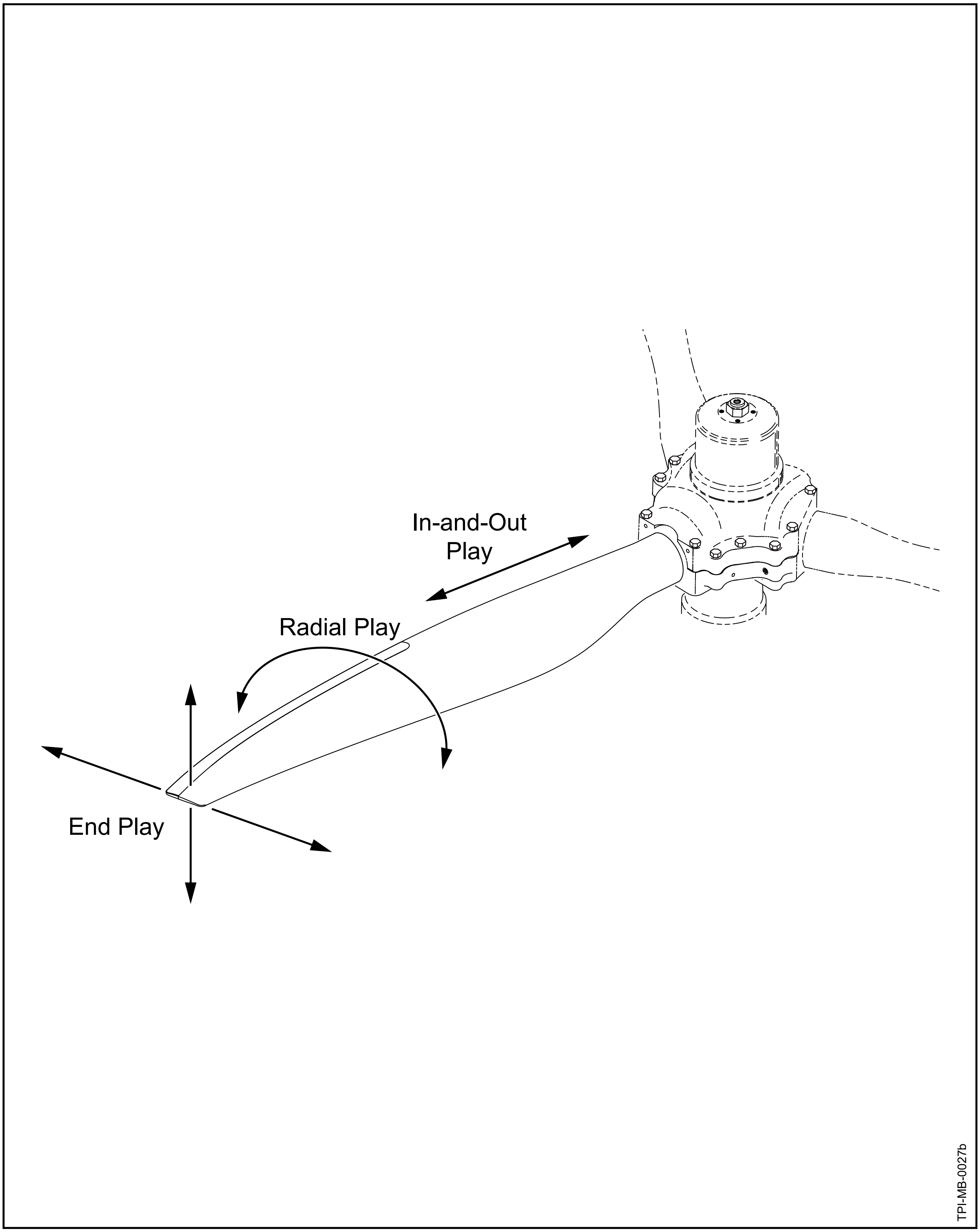
CAUTION 1: TORQUE VALUES ARE BASED ON NON-LUBRICATED THREADS, UNLESS OTHERWISE SPECIFIED IN TABLE 8-1.

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

Item No.	Part Number	Nomenclature / Location	Torque		
			Ft-Lb	In-Lb	N•m
40	B-3839-16	Nut, Hex, Thin, Drilled (Cylinder)	120	1440	163
50	B-3839-16	Nut, Hex, Thin, Drilled (Cylinder)	120	1440	163
60	B-3375	Nut, 103/8-12 Hex, Thin, Drilled (Cylinder)	165	1980	224
70	B-755	Plug, Rod, Pitch Change - Unit	15	180	20
120	100392	Cylinder	200 wet	2400 wet	271 wet
130	B-3841-5	Screw, 1/4-28, Fillister Head (Cylinder)	- -	41	4.6
310	B-474	Nut, 1 1/8-12, Hex, Self-locking (Piston)	100	1200	136
430	D-494-2	Pitch Change Rod	80 +-wet	960 wet	109 wet
600	A-2043-1	Nut, 3/8-24, Hex Self-locking (Hub, Clamping)	22	264	30
690	B-468-1	Extension, Bumper (Pitch Change Fork)	- -	60-72	6.8-8.1
920	108232	Bolt, 1/4-28, 12 Point	16-18	192-216	22-24
990	B-3867-272	Screw, 10-32 100°, Head, Cres	- -	8-10	0.9 - 1.1
1030	B-3368	Nut, 5/16-24, Hex, Thin (Preload Plate)	- -	120	13.5
1760	B-3397	Nut, 7/16-20 Hex, Thin (Beta)	25	300	34
-	B-3384-( )	Bolt, 1/4-28, Hex Head (Bulkhead)	- -	96-120	10.9-13.5
-	A-2070-( )	Screw, 1/4-28, Button Head (Bulkhead)	- -	96-120	10.9-13.5

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	Refer to section A.(2)
Fore-and-Aft (face to camber)	Refer to section A.(2)

(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 — ± 0.063 inch (1.60 mm) or 0.125 inch (3.3 mm) total

C. Blade Pitch Tolerance

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

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 <u>not</u> 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-asssembly.

(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

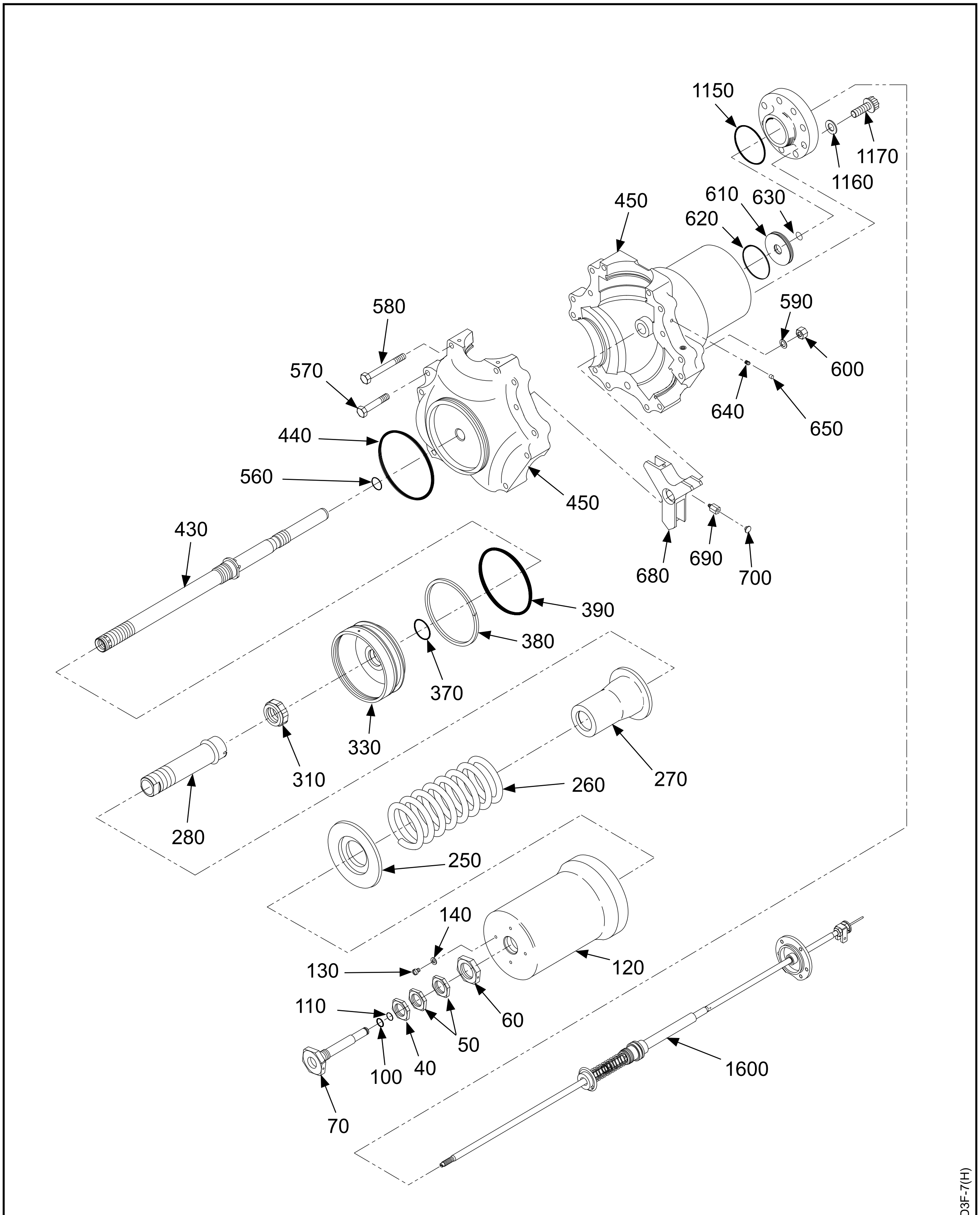
(1) Many O-rings, fasteners, and other vendor supplied hardware listed in Hartzell Propeller Inc. manuals have previously been specified with AN, MS, NAS, or vendor part number. To provide internal controls and procurement flexibility, Hartzell part numbers have been assigned to all O-rings, fasteners, 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-D3F-7H: Propeller Parts
Figure 10-1

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		HC-D3F-7H: PROPELLER ASSEMBLY PARTS				
40	B-3839-16	• NUT, HEX, THIN, DRILLED		1		
50	B-3839-16	• NUT, HEX, THIN, DRILLED		2		
60	B-3375	• PCP: NUT, 1 3/8-12, HEX, THIN, DRILLED		1		PCP
70	B-755	• PCP: PLUG, ROD, PITCH CHANGE - UNIT REPLACED BY ITEMS 70A, 80A, AND 90		1		PCP
-80	B-6045-5-8	• • BUSHING, METAL-POLYMER COMP (PITCH CHANGE ROD PLUG) REPLACED BY ITEM 80A		1		
70A	B-755-1	• PCP: PLUG, ROD, PITCH CHANGE - UNIT REPLACES ITEM 70		1		PCP
-80A	B-6045-5-8	• • BUSHING, METAL-POLYMER COMP (PITCH CHANGE ROD PLUG) REPLACES ITEM 80		1		
-90	105182-011	• • RING, RETAINING, INTERNAL		1		
100	C-3317-013	• O-RING, (PITCH CHANGE ROD PLUG)		1	Y	
110	C-3317-011	• O-RING		1	Y	
120	100392	• PCP: CYLINDER		1		PCP
130	B-3841-5	• SCREW, 1/4-28 SCREW, FILLISTER HEAD		1	Y	
140	B-3837-0463	• WASHER, CORROSION RESISTANT		1	Y	
250	B-3380-1	• SEAT, SPRING		1	Y	
260	C-447	• PCP: SPRING, COMPRESSION, FEATHERING		1		PCP
270	B-442	• GUIDE, SPRING, PLASTIC		1	Y	
280	B-6758-1	• PCP: SLEEVE, PITCH ADJUST - UNIT		1		PCP
-300	A-441	• • BUSHING, SLEEVE		1		
310	B-474	• NUT, 1 1/8-12, HEX, SELF-LOCKING		1	Y	
330	C-437	• PISTON		1		
370	C-3317-217-2	• O-RING (PISTON ID)		1	Y	
380	B-1843	• SEAL, DUST, PISTON		1	Y	
390	C-3317-345-2	• O-RING (PISTON OD)		1	Y	
430	D-494-2	• PCP: ROD, PITCH CHANGE		1		PCP
440	C-3317-245	• O-RING (CYLINDER MOUNTING)		1	Y	
450	100382	• PCP: HUB UNIT, ( )HC-D3F-7( ) (REFER TO “100382 HUB UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
560	C-3317-213-2	• O-RING		1	Y	
570	A-2431	• BOLT, 3/8-24 HEX HEAD		9		
580	A-2432	• BOLT, 3/8-24 HEX HEAD		6		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**HC-D3F-7H: PROPELLER ASSEMBLY PARTS, CONTINUED**				
590	B-3834-0632	• WASHER		15	Y	
600	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		15	Y	
610	101270	• PLUG, HUB		1		
620	C-3317-226	• O-RING, HUB PLUG OD		1	Y	
630	C-3317-211-2	• O-RING, HUB PLUG ID		1	Y	
640	A-279	• FITTING, LUBRICATION, PRE HC-SL-61-187 REPLACED BY ITEMS 640A AND 640B		6	Y	
640A	A-279	• FITTING, LUBRICATION REPLACES ITEM 640 IN ENGINE-SIDE OF HUB		3	Y	
640B	C-6349	• FITTING, LUBRICATION, 45° (POST HC-SL-61-187) ALTERNATE FOR ITEM 640A		3	Y	
-641	106545	• PLUG, LUBRICATION (POST HC-SL-61-354) REPLACES ITEMS 640 IN CYLINDER-SIDE OF HUB	B	3	Y	
650	B-6544	• CAP, FITTING, LUBRICATION, USED WITH ITEMS 640, 640A, AND 640B)		3	Y	
680	100393	• FORK, THREE BLADE		1		
690	B-468-1	• EXTENSION, BUMPER		3		
700	A-3256	• BUMPER, FORK		3	Y	
1600	D-751-2	• PCP: BETA VALVE ASSEMBLY (REFER TO “D-751-2 BETA VALVE ASSEMBLY” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		RF		PCP
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
B	REFER TO THE PROPELLER LUBRICATION CHAPTER OF HARTZELL PROPELLER INC. STANDARD PRACTICES MANUAL 202A (61-01-02).		

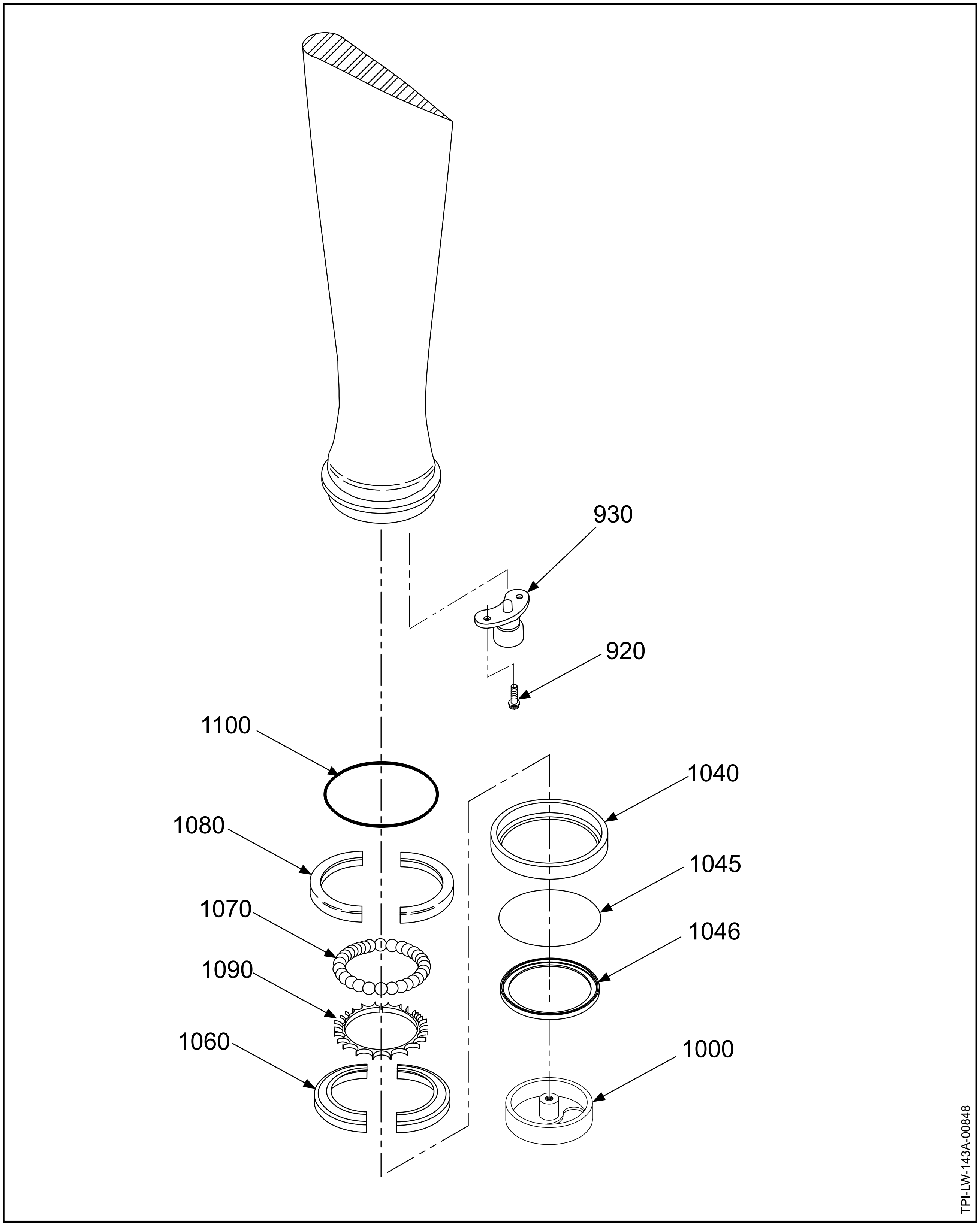
- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**HC-D3F-7H: PROPELLER ASSEMBLY PARTS, CONTINUED**				
		BALANCE PARTS				
-1130	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
-1140	A-2424( )	• BALANCE WEIGHT		AR		
		PROPELLER MOUNTING PARTS				
1150	C-3317-228	• O-RING (FLANGE)		1	Y	
1160	A-1381	• WASHER, MOUNTING, 1/2", CRES		6	Y	
1170	A-1328	• BOLT, MOUNTING, 1/2-20, 12 POINT		6	Y	
-1180	B-6138-8-8	• DOWEL PIN		2	Y	
		COUNTERWEIGHTS/MOUNTING BOLTS				
		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				PCP
		• COUNTERWEIGHT MOUNTING BOLTS REFER TO THE APPLICABLE HARTZELL PROPELLER INC. BLADE OVERHAUL MANUAL: MANUAL 135F (61-13-35) - COMPOSITE BLADES MANUAL 133C (61-13-33) - ALUMINUM BLADES				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

SUB-ASSEMBLY
PARTS LISTS and FIGURES



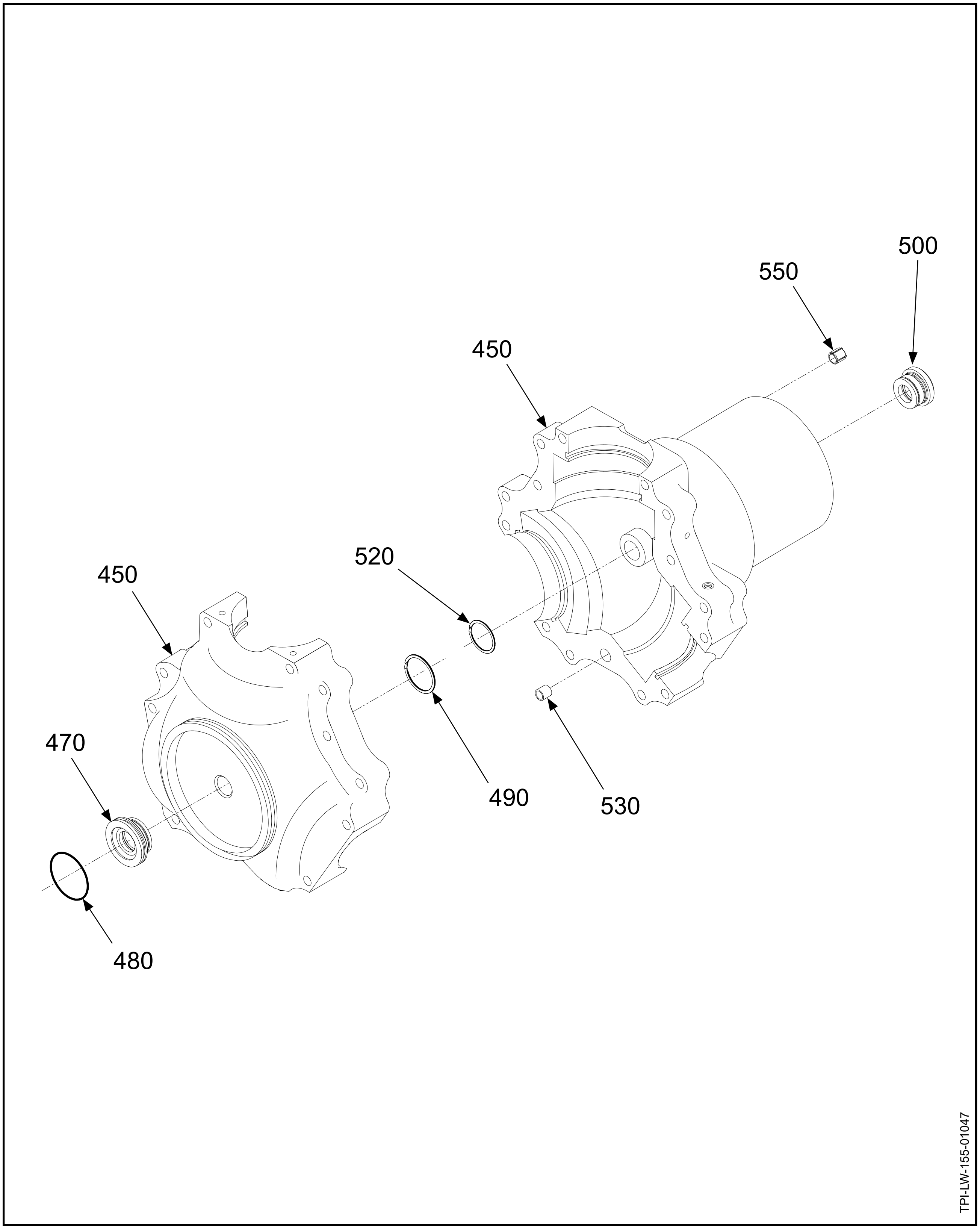
HC-D3F-7H: Blade Retention Parts
Figure 10A-1

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-1		**HC-D3F-7H: BLADE RETENTION PARTS** **All quantities (UPA) in this parts list are per blade assembly.**				
920	B-3825	• SCREW, 1/4-28, 100° HEAD, REPLACED BY ITEM 920A USE ONLY WITH ITEM 930		2	Y	
920A	108232	• BOLT, 1/4-28, HEX HEAD, USE ONLY WITH ITEM 930A REPLACES ITEM 920, POST HC-SB-61-389, R1		2	Y	
930	100401-( )	• BRACKET, KNOB, PITCH CHANGE - UNIT (REFER TO “100401-( ): PITCH CHANGE KNOB BRACKET UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST) REPLACED BY ITEM 930A		1		
930A	108306-( )	• BRACKET, KNOB, PITCH CHANGE - UNIT (REFER TO “108306-( ): PITCH CHANGE KNOB BRACKET UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST) REPLACES ITEM 930, POST HC-SB-61-389, R1		1		
1000	101004	• PRELOAD PLATE ASSEMBLY (REFER TO “101004 PRELOAD PLATE ASSEMBLY” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
1040	A-2204	• RING, RETAINING, BEARING PRE HC-SL-61-241, R3 SUPERSEDED BY ITEM 1040A		1		
1040A	102158	• RING, RETAINING, BEARING POST HC-SL-61-241, R3 SUPERSEDES ITEM 1040 USE WITH ITEMS 1045 AND 1046		1		
1045	B-7726	• SEAL, BLADE, POST HC-SL-61-241, R3 USE WITH ITEMS 1040A AND 1046		1		
1046	C-3317-045	• O-RING, POST HC-SL-61-241, R3 USE WITH ITEMS 1040A AND 1045		1	Y	
-1050	A-2202	• BEARING, RETENTION, BLADE		1		
1060	A-2202-B	• • RACE, BLADE SIDE		1		
1070	B-6144	• • BALL, BEARING, 1/2" DIA		25	Y	
	B-6144-650	• • BALL, BEARING, 1/2 INCH DIA.(BOX OF 650)		RF		
1080	A-2202-A	• • RACE, HUB SIDE		1		
1090	B-3211	• BALL SPACER		1	Y	
1100	C-3317-340-8	• O-RING (BLADE MOUNTING)	E	1	Y	

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

- ITEM NOT ILLUSTRATED

HC-D3F-7H: Blade Retention Parts



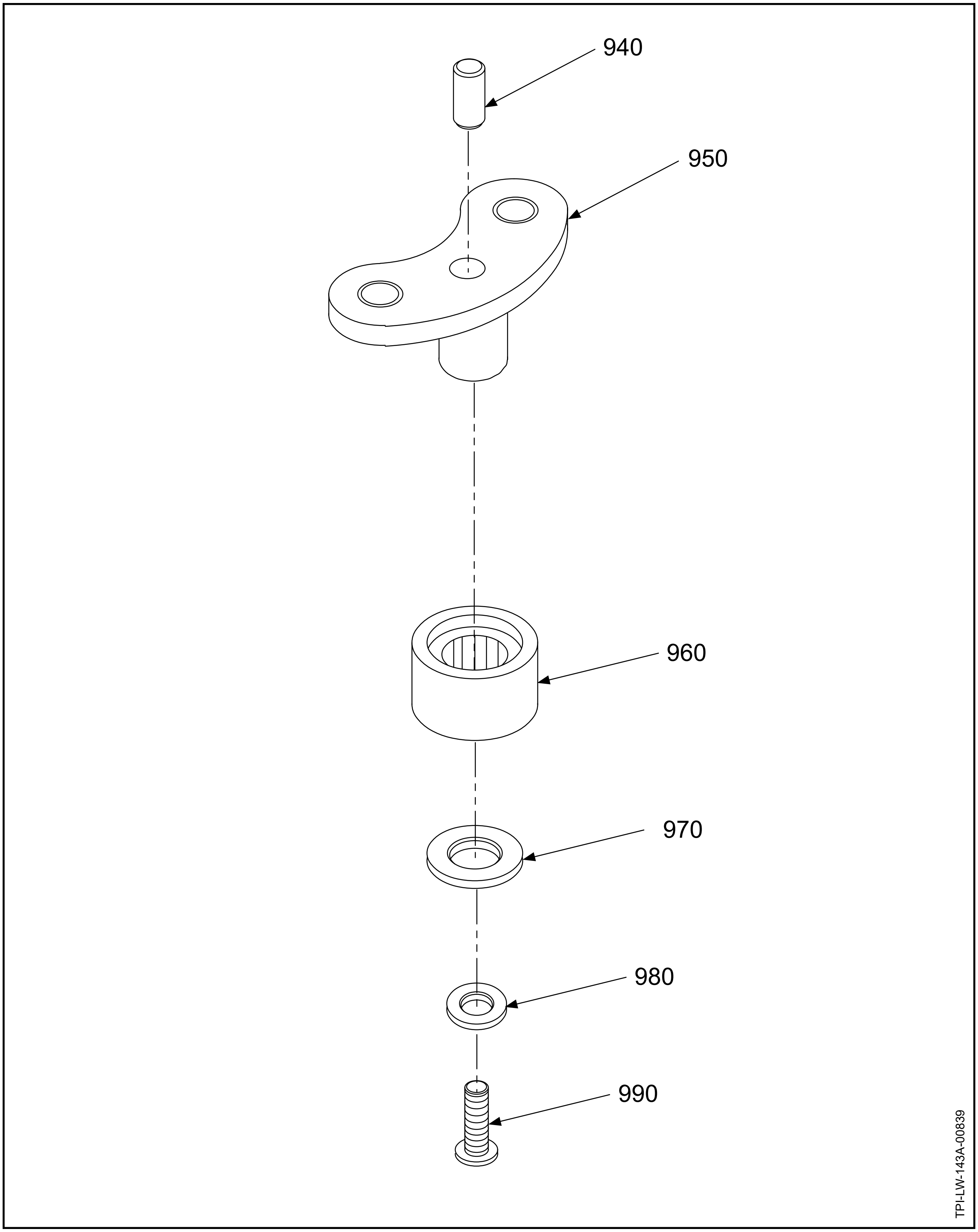
100382: Hub Unit
Figure 10A-2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-2		**100382: HUB UNIT**				
450	100382	PCP: HUB UNIT, ( )HC-D3F-7( )		1		PCP
470	B-5952-2	• HUB BUSHING, ROD		1		
480	C-3317-135-2	• O-RING		1	Y	
490	A-6153-162	• RING, RETAINING, EXTERNAL, SPIRAL (CYLINDER-SIDE)		1	Y	
500	101277	• HUB BUSHING, ROD		1		
520	A-6153-137	• RING, RETAINING, EXTERNAL, SPIRAL (ENGINE-SIDE)		1	Y	
530	A-2249	• HUB BUSHING, GUIDE		1	Y	
550	B-6143-8	• INSERT, THREAD, CRES, STAKED		6	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

100382: Hub Unit



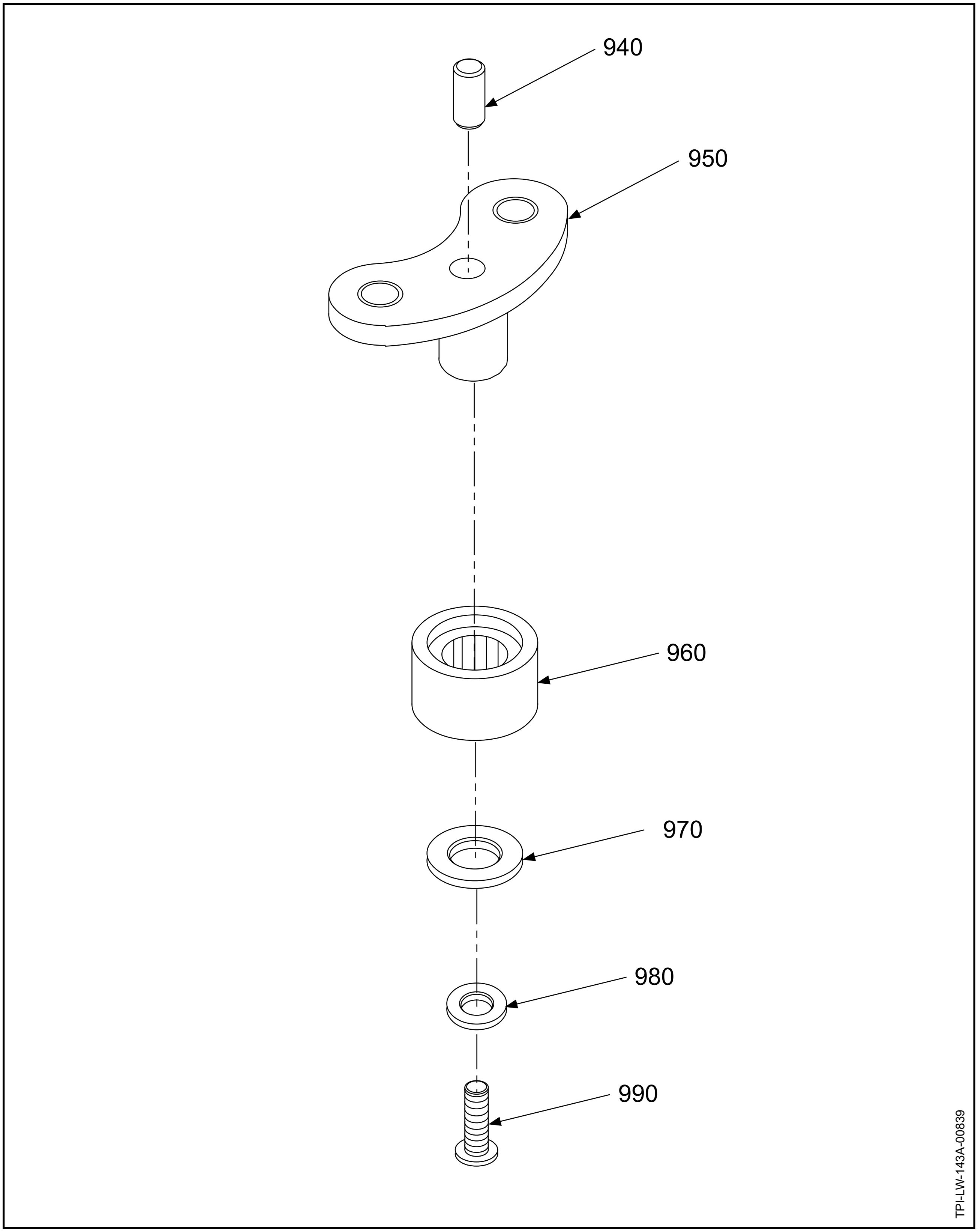
100401-( ): Pitch Change Knob Bracket Unit
Figure 10A-3

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-3		**100401-( ): PITCH CHANGE KNOB BRACKET UNIT**				
-930	100401-( )	BRACKET, KNOB, PITCH CHANGE - UNIT		1		
940	B-6260-1	• DOWEL PIN, 3/8 INCH		1		
950	100492-( )	• BRACKET, KNOB, PITCH CHANGE, REPLACED BY ITEM 950A		1		
950A	108305-( )	• BRACKET, KNOB, PITCH CHANGE, REPLACES ITEM 950 POST HC-SB-61-389, R1		1		
960	B-6545	• CAM FOLLOWER		1	Y	
970	103395	• WASHER, RETAINING, KNOB UNIT		1		
980	B-3860-10L	• WASHER, DIMPLED, 100° CRES		1	Y	
990	B-3867-272	• SCREW, 10-32, 100° HEAD, CRES		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

100401-( ): Pitch Change Knob Bracket Unit



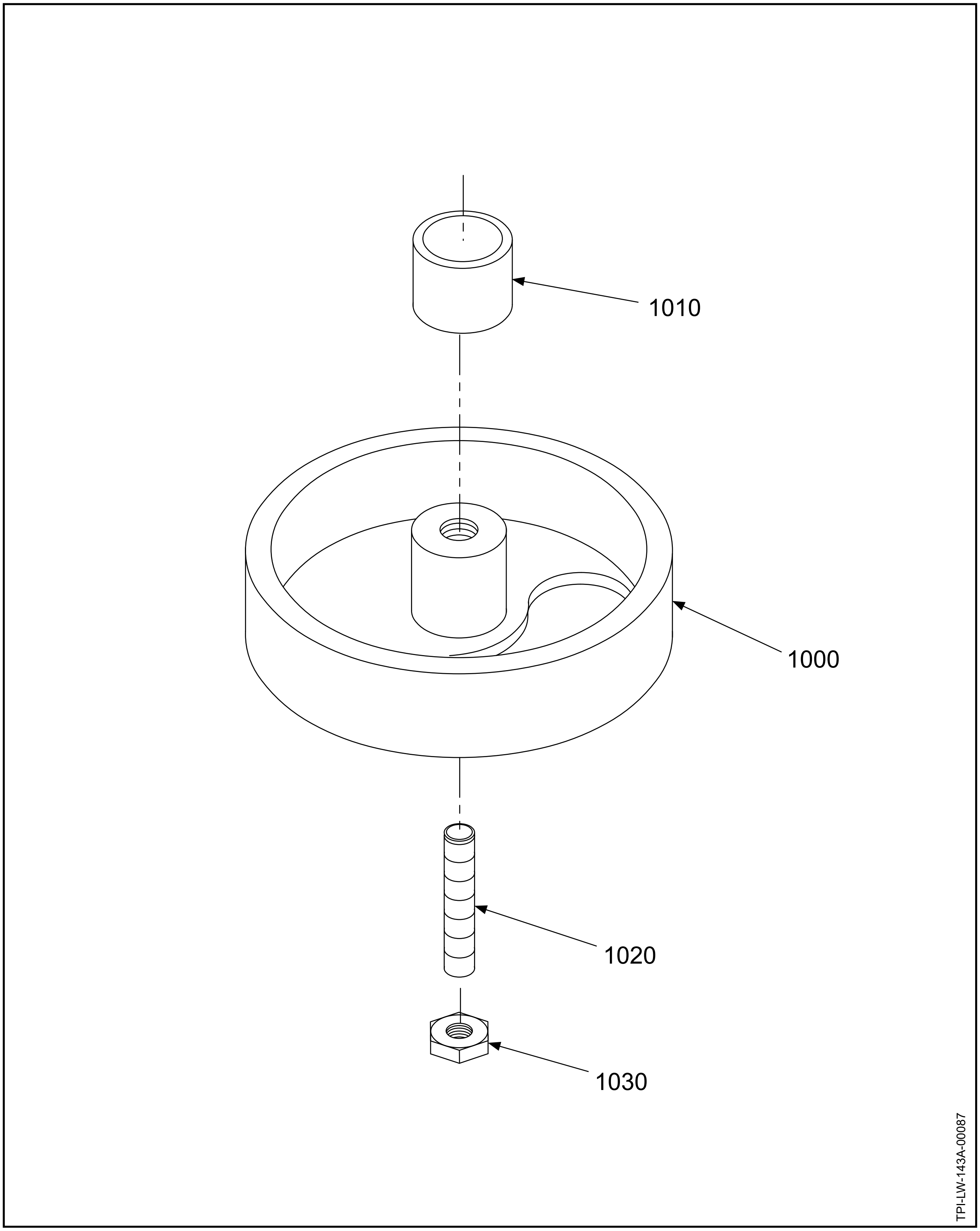
108306-( ): Pitch Change Knob Bracket Unit
Figure 10A-4

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-4		**108306-( ): PITCH CHANGE KNOB BRACKET UNIT**				
-930	108306-( )	BRACKET, KNOB, PITCH CHANGE - UNIT		1		
940	B-6260-1	• DOWEL PIN, 3/8 INCH		1		
950	108305-( )	• BRACKET, KNOB, PITCH CHANGE		1		
960	B-6545	• CAM FOLLOWER		1	Y	
970	103395	• WASHER, RETAINING, KNOB UNIT		1		
980	B-3860-10L	• WASHER, DIMPLED, 100° CRES		1	Y	
990	B-3867-272	• SCREW, 10-32, 100° HEAD, CRES		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

108306-( ): Pitch Change Knob Bracket Unit



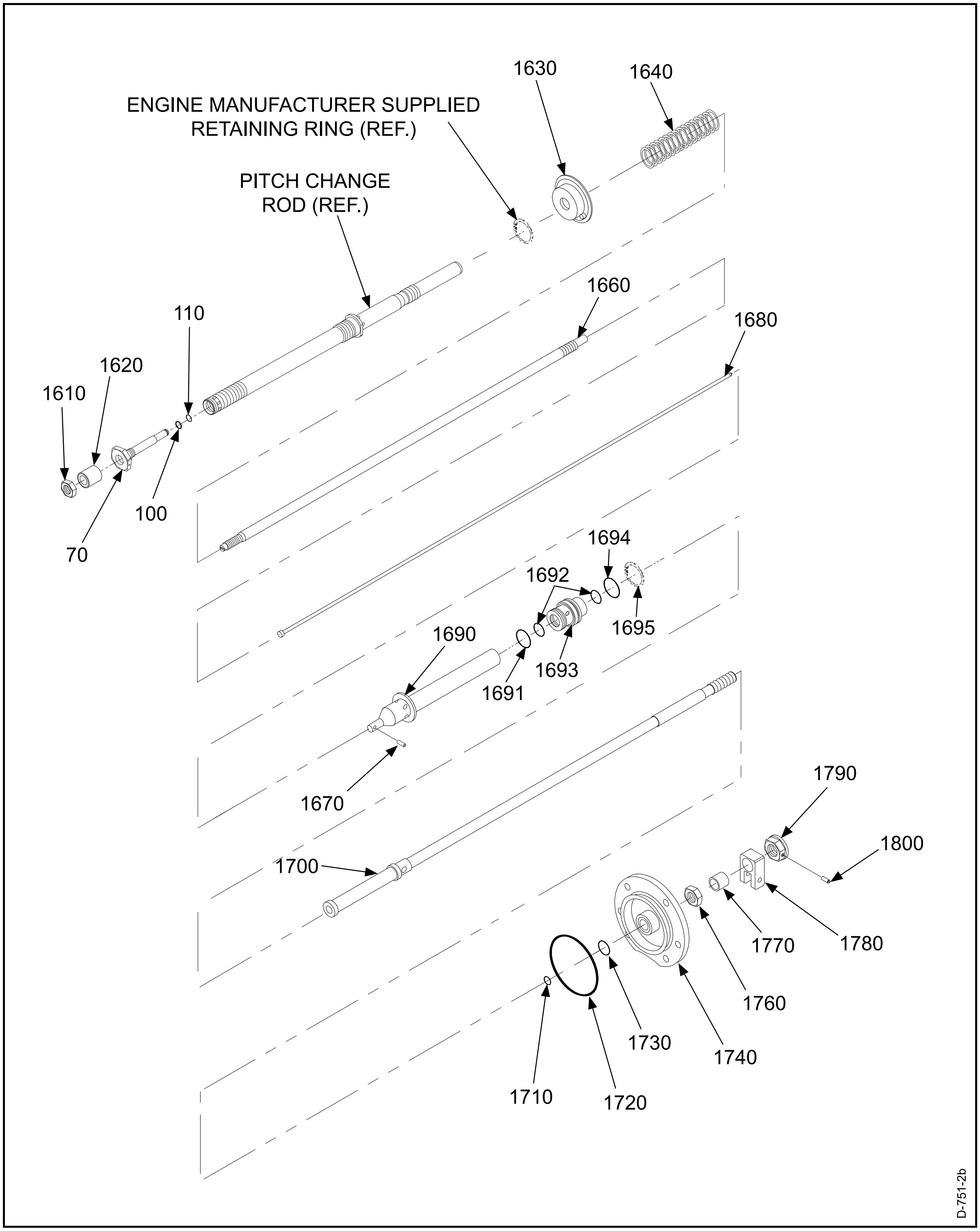
101004: Preload Plate Assembly
Figure 10A-5

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-5		**101004: PRELOAD PLATE ASSEMBLY**				
-1000	101004	PRELOAD PLATE ASSEMBLY		3		
1010	B-6679	• RACE, INNER, BEARING		1		
1020	A-3204-2	• SCREW, SET, 5/16-24		1	Y	
1030	B-3368	• NUT, 5/16-24, HEX, THIN		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

101004: Preload Plate Assembly



D-751-2: Beta Valve Assembly
Figure 10A-6

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-6		**D-751-2: BETA VALVE ASSEMBLY**				
-1600	D-751-2	PCP: BETA VALVE ASSEMBLY		RF		PCP
1610	A-2678	• PCP: NUT, 5/16-24, SELF-LOCKING		1	Y	PCP
1620	A-1166-1	• SPACER, BETA VALVE		1		
1630	B-759	• SPRING RETAINER, BETA		1		
1640	B-760	• SPRING, COMPRESSION		1		
-1650	C-1159-1	• BETA VALVE SLEEVE UNIT		1		
1660	C-1156-2	• • ROD, BETA VALVE, PRIMARY		1		
1670	B-3842-0500	• • SPRING PIN, 3/32", CRES		1	Y	
1680	C-1155	• • PCP: PITCH INDICATOR - UNIT		1		PCP
1690	D-1157	• • PCP: SLEEVE, BETA VALVE		1		PCP
1700	D-1158	• • PCP: SPOOL, BETA VALVE		1		PCP
1691	SUPPLIED BY ENGINE MANUFACTURER	• O-RING		1	Y	
1692	C-3317-116	• O-RING		2	Y	
1693	SUPPLIED BY ENGINE MANUFACTURER	• BETA VALVE SHAFT ADAPTOR		1		
1694	SUPPLIED BY ENGINE MANUFACTURER	• O-RING		1	Y	
1695	SUPPLIED BY ENGINE MANUFACTURER	• RETAINING RING		1	Y	
1710	C-3317-006	• O-RING		1	Y	
1720	C-3317-141	• O-RING		1	Y	
1730	C-3317-111	• O-RING		1	Y	
1740	B-2692	• COVER, ENGINE		1		
-1750	B-6985	• • BUSHING, BRONZE, OIL IMPREGNATED		1		
1760	B-3397	• NUT, 7/16-20 HEX, THIN		1	Y	
1770	A-3634	• BUSHING, BETA VALVE		1		
1780	A-3621-2	• PCP: FITTING, ROD END		1		PCP
1790	A-3622	• CAP UNIT, ROD END		1		
1800	B-6635-34	• • SCREW, SET, 8-32		1		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

D-751-2: Beta Valve Assembly

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