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MANUAL REVISION TRANSMITTAL
Manual 401 (61-10-01)
2A1 and 3A1 Series Overhaul and Maintenance Manual
"Bantam" Models with Composite Blade

REVISION 8 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. 401
61-10-01
Revision 8
June 2023

2A1 and 3A1 Series Overhaul Manual

"Bantam" Models with Composite Blade

2A1-( )( )( )
3A1-( )( )( )

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REVISION 8 HIGHLIGHTS

Revision 8, 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.

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

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

- TESTING AND FAULT ISOLATION
  - Revised the section, "Lightning Strike on Hub or Blade"
- DISASSEMBLY
  - Revised the section, "Two and Three Blade Propeller Disassembly"
- CHECK
  - Added Figure 5-9, "Spring Guide"
  - Added the section, "Spring Guide (Item 715)"
  - Revised the section, "Compression Spring (Item 720)"
  - Added the section, "Compression Spring (Item 725)"
  - Added Figure 5-10, "Spring Seat - p/n 103881 and 103933"
  - Revised the section, "Spring Seat (103881 and 103933) (Item 730)"
  - Added Figure 5-11, "Spring Seat - p/n 109241"
  - Added the section, "Spring Seat (109241) (Item 735)"
- REPAIR
  - Added the section, "Compression Spring: Zinc Chromate Primer Repair"
- ASSEMBLY
  - Revised Figure 7-5, "Three Blade Bantam Propeller - Installation of the Fork and the Pitch Change Rod in the Hub"
  - Revised Figure 7-6, "Two and Three Blade Bantam Propellers - Fork at the Hub Parting Line"
  - Revised the section "Three Blade Bantam Propeller Fork (710), Pitch Change Rod (240), and Pitch Change Block Unit (500) Installation"

REVISION 8 HIGHLIGHTS

- FITS AND CLEARANCES
  - Revised the section, "Blade Tolerances"
  - Removed Table 8-2, "Blade Tolerances"
- ILLUSTRATED PARTS LIST
  - Revised the parts list, "2A1-HP450A1( )"
  - Revised Figure 10-4, "3A1-QP460A1: Propeller Parts"
  - Revised the parts list, "3A1-QP460A1"
  - Revised Figure 10-6, "3A1-TP724A1: Propeller Parts"
  - Revised the parts list, "3A1-TP724A1"
  - Revised the parts list, "Blade Retention Parts"

REVISION HIGHLIGHTS

1. Introduction

   A. General

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

   B. Components

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

      (2) Issue Date is the date of revision.

      (3) Comments indicates the level of the revision.

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

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

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

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

Revision No.	Issue Date	Comments
Original	Feb/14	New Issue
Revision 1	May/14	Minor Revision
Revision 2	Apr/15	Major Revision
Revision 3	Sep/16	Minor Revision
Revision 4	Jan/19	Minor Revision
Revision 5	Jun/21	Major Revision
Revision 6	Mar/22	Minor Revision
Revision 7	Oct/22	Minor Revision
Revision 8	Jun/23	Major Revision

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RECORD OF REVISIONS

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

Revision Number	Issue Date	Date Inserted	Inserted By
8	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. FAILURE TO COMPLY WITH INFORMATION CONTAINED IN A SERVICE DOCUMENT OR THE USE OF OBSOLETE INFORMATION MAY CREATE AN UNSAFE CONDITION THAT MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE.

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

Service Document Number	Incorporation Rev./Date

Service Document Number	Incorporation Rev./Date

SERVICE DOCUMENT LIST

Service Document Number	Incorporation Rev./Date

Service Document Number	Incorporation Rev./Date

AIRWORTHINESS LIMITATIONS

1. Airworthiness Limitations

   A. Life Limits

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

      (2) For airworthiness limitations information, refer to Hartzell Propeller Inc. Owner's Manual and Logbook 411 (61-00-11).

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LIST OF EFFECTIVE PAGES

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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 (104950) that is item 500 was superseded by the pitch change block unit (104950-1) that is item 500A.

(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 (104256) that is item 210, yet another configuration uses a piston (104256-1) that is item 210A. Effectivity codes are very important in the determination of parts in a given configuration.

2. Reference Publications

A. Hartzell Propeller Inc. Publications

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

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

Manual No. (ATA No.)	Available at www.hartzellprop.com	Hartzell Propeller Inc. Manual Title
n/a	Yes	Active Hartzell Propeller Inc. Service Bulletins, Service Letters, Service Instructions, and Service Advisories
Manual 127 (61-16-27)	Yes	Metal Spinner Maintenance Manual
Manual 135F (61-13-35)		Composite Blade Overhaul Manual
Manual 148 (61-16-48)	Yes	Composite Spinner Maintenance Manual
Manual 159 (61-02-59)	Yes	Application Guide
Manual 165A (61-00-65)	Yes	Illustrated Tool and Equipment Manual
Manual 180 (30-61-80)	Yes	Propeller Ice Protection System Manual
Manual 202A (61-01-02)	Vol. 7, Yes Vol. 11, Yes	Standard Practices Manual, Volumes 1 through 11
Manual 411 (61-00-11)	Yes	Propeller Owner's Manual and Logbook for Constant Speed, Non-counterweighted ( )(A,B)1 and ( )(A,B)2 Series "Bantam" Propellers with Composite Blades

B. Vendor Publications

None.

3. Personnel Requirements (Rev. 1)

A. Service and Maintenance Procedures in this Manual

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

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

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

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

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

A. Special Tooling

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

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

B. Consumable Materials

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

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

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

A. Instructions for Use

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

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

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

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

A. Calendar Limits

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

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

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

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

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

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

B. Long Term Storage

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

7. Component Life and Overhaul (Rev. 2)

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

A. Component Life

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

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

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

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

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

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

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

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

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

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

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

(b) Hub replacement

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

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

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

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

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

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

B. Overhaul

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

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

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

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

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

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

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

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

8. Damage/Repair Types (Rev. 1)

A. Airworthy/Unairworthy Damage

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

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

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

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

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

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

B. Minor/Major Repair

(1) Minor Repair

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

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

(2) Major Repair

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

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

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

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

9. Propeller Critical Parts (Rev. 1)

A. Propeller Critical Parts

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

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

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

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

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

10. Warranty Service (Rev. 1)

A. Warranty Claims

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

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

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

A. Product Support Department

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

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

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

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

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

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

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

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

B. Technical Publications Department

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

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

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

C. Recommended Facilities

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

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

12. Definitions (Rev. 4)

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

Term	Definition
Annealed	Softening of material due to overexposure to heat
Aviation Certified	Intended for FAA or international equivalent type certificated aircraft applications. A TC and PC number must be stamped on the hub, and a PC number must be stamped on blades.
Aviation Experimental	Intended for aircraft/propeller applications not certified by the FAA or international equivalent. Products marked with an “X” at or near the end of the model number or part number are not certified by the FAA or international equivalent and are not intended to use on certificated aircraft.
Beta Operation	A mode of pitch control that is directed by the pilot rather than by the propeller governor
Beta Range	Blade angles between low pitch and maximum reverse blade angle
Beta System	Parts and/or equipment related to operation (manual control) of propeller blade angle between low pitch blade angle and full reverse blade angle
Blade Angle	Measurement of blade airfoil location described as the angle between the blade airfoil and the surface described by propeller rotation
Blade Centerline	An imaginary reference line through the length of a blade around which the blade rotates
Blade Station	Refers to a location on an individual blade for blade inspection purposes. It is a measurement from the blade “zero” station to a location on a blade, used to apply blade specification data in blade overhaul manuals. Note: Do not confuse *blade station* with *reference blade radius*; they may not originate at the same location.
Blemish	An imperfection with visible attributes, but having no impact on safety or utility
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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2. Operation 3
A. Bantam Constant Speed 3

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1. General (Rev. 2)

A. Propeller/Blade Model Designation

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

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

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

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

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

(a) For additional information about the model number designation system for composite blades, refer to Hartzell Propeller Inc. Composite Blade Overhaul Manual 135F (61-13-35).

2. Operation

A. Bantam Constant Speed

(1) ( )(A)1 Series Propellers with Composite Blades

(a) These propeller model series are constant speed, non-counterweighted propellers. The propellers are capable of blade angles between a low positive pitch (low pitch) and high positive pitch (high pitch).

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

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

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

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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.
		Oil leaking past the piston, between the pitch change rod and hub (engine-side), or between the pitch change rod and shaft plug causing overspeed. Hub will fill with engine oil.	Disassemble the propeller and inspect the hub-to-pitch change rod O-rings and the piston O-rings, as applicable. Inspect the piston-to-cylinder sealing surfaces and the pitch change rod sealing surfaces, as applicable. Replace the O-ring(s).
B.	Friction	Propeller fork bumper shimming is excessive.	Disassemble the propeller and readjust the fork bumper shimming.
		Balls in the blade retention split bearing are unusually rough, corroded, or chipped.	Replace the blade retention split bearing assembly.
		Insufficient clearance between the various moving parts in the pitch change mechanism.	Check/increase the clearances between the individual parts as necessary to decrease friction in the mechanism.
C.	Abnormal Propeller Vibration	Bent, cracked, or damaged blade.	Refer to Hartzell Propeller Inc. Composite Blade Overhaul Manual 135F (61-13-35).
		Cracked or damaged hub.	Refer to the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
		Incorrect balance of the propeller.	Refer to the Static and Dynamic Balance chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Problem		Probable Cause	Remedy
D.	Blades Not Tracking	Foreign object strike damage.	Refer to the Special Inspections chapter of Hartzell Standard Practices Manual 202A (61-01-02), for inspection procedure.
E.	End-Play Movement of the Blade. Refer to Figure 8-2 and Table 8-2, Blade Tolerances	Buildup of wear or repair tolerances. Blade retention bearing is worn.	Disassemble the propeller and reset the fork bumper shimming. Inspect/Replace the blade retention bearing.
F.	In-and-Out Movement of the Blade. Refer to Figure 8-2 and Table 8-2, Blade Tolerances	Buildup of wear or repair tolerances. Blade retention bearing is worn.	Disassemble the propeller and reset the fork bumper shimming. Inspect/Replace the blade retention bearing.
G.	Fore-and-Aft Movement of the Blade. Refer to Figure 8-2 and Table 8-2, Blade Tolerances	Buildup of wear or repair tolerances. Blade retention bearing is worn.	Disassemble the propeller and reset the fork bumper shimming. Inspect/replace the blade retention bearing.
H.	Radial Play in the Blade. Refer to Figure 8-2 and Table 8-2, Blade Tolerances	Pitch change fork is worn. Pitch change block is worn.	Disassemble the propeller. Inspect and replace parts, as required. Disassemble the propeller. Inspect and replace parts, as required.

Problem		Probable Cause	Remedy
I.	Oil Leakage	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.
		Engine crankshaft seal leaking	Refer to the engine manufacturer's manual for the appropriate action.
		Faulty O-ring seal on the hub extension plug	Disassemble the propeller and inspect the O-rings and the sealing surfaces. Replace the defective O-ring(s).
		Faulty seal between the low pitch stop jam nut and the cylinder	Remove the low pitch stop jam nut and replace the seal.
		Oil leaking between the blade and the hub	Disassemble the propeller and inspect the hub-to-blade seal and sealing surfaces. Replace the defective seal.

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

A. Removing the Propeller

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

B. Record Serial Numbers/Blade Location Before Disassembly

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

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

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

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

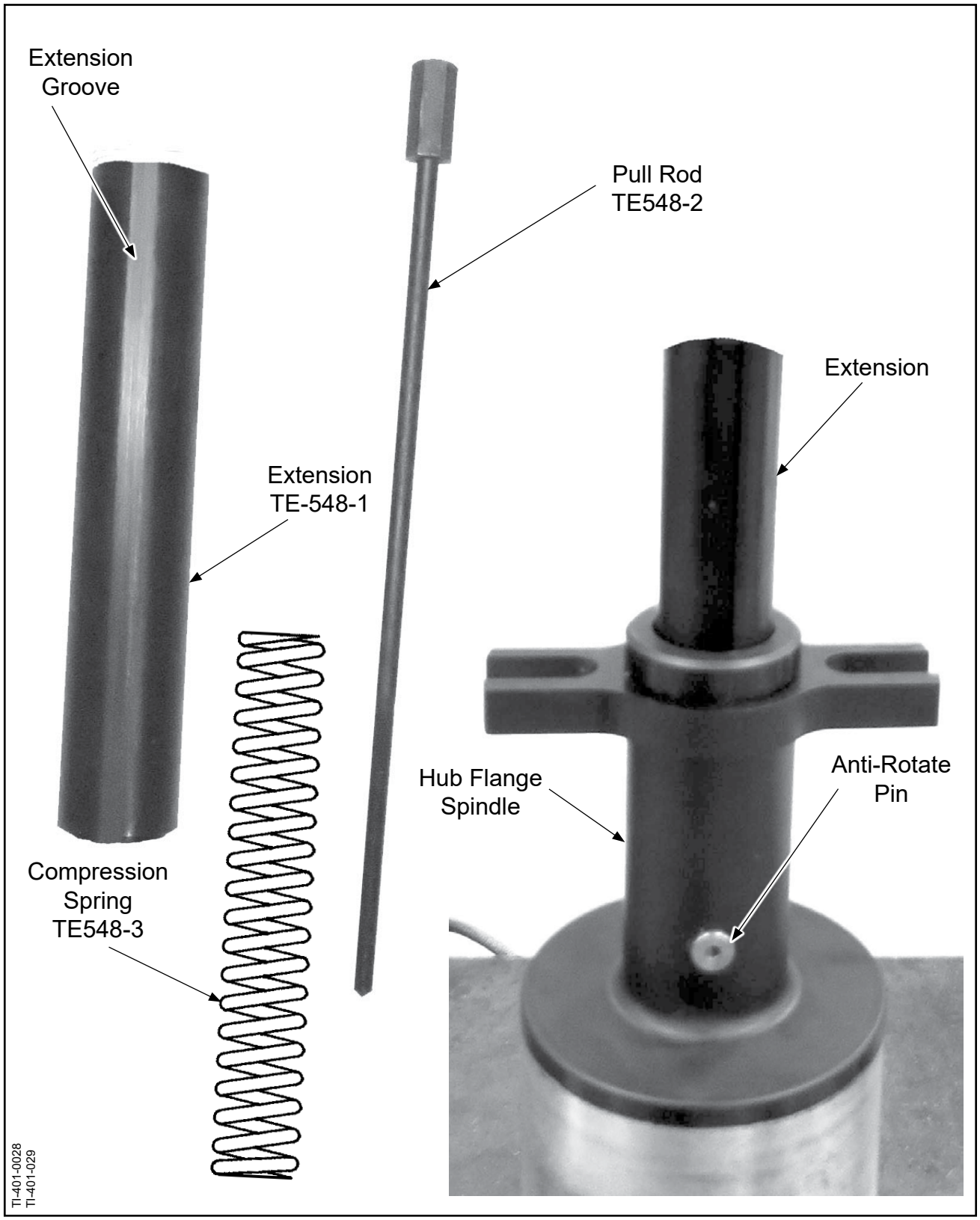
(2) Before disassembly, use a crayon or soft, non-graphite pencil such as CM162 to number the blades counterclockwise from the propeller serial number impression stamped on the propeller hub unit.

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

C. Ice Protection System (if applicable)

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

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



Spring Compressor TE548 and Spindle TE536
Figure 3-1

2. Two and Three Blade Propeller Disassembly

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

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

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

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

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

A. Disassembly of the Propeller Pitch Change Parts

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

CAUTION: TO PREVENT DAMAGE TO THE PITCH CHANGE ROD, SPINDLE TE536 AND SPRING COMPRESSOR TE548 MUST BE USED FOR ASSEMBLY AND DISASSEMBLY OF THE PROPELLER.

(2) Put the propeller assembly on the rotatable fixture TE125 on the assembly table TE129 using spindle TE536 and spring compressor TE548.

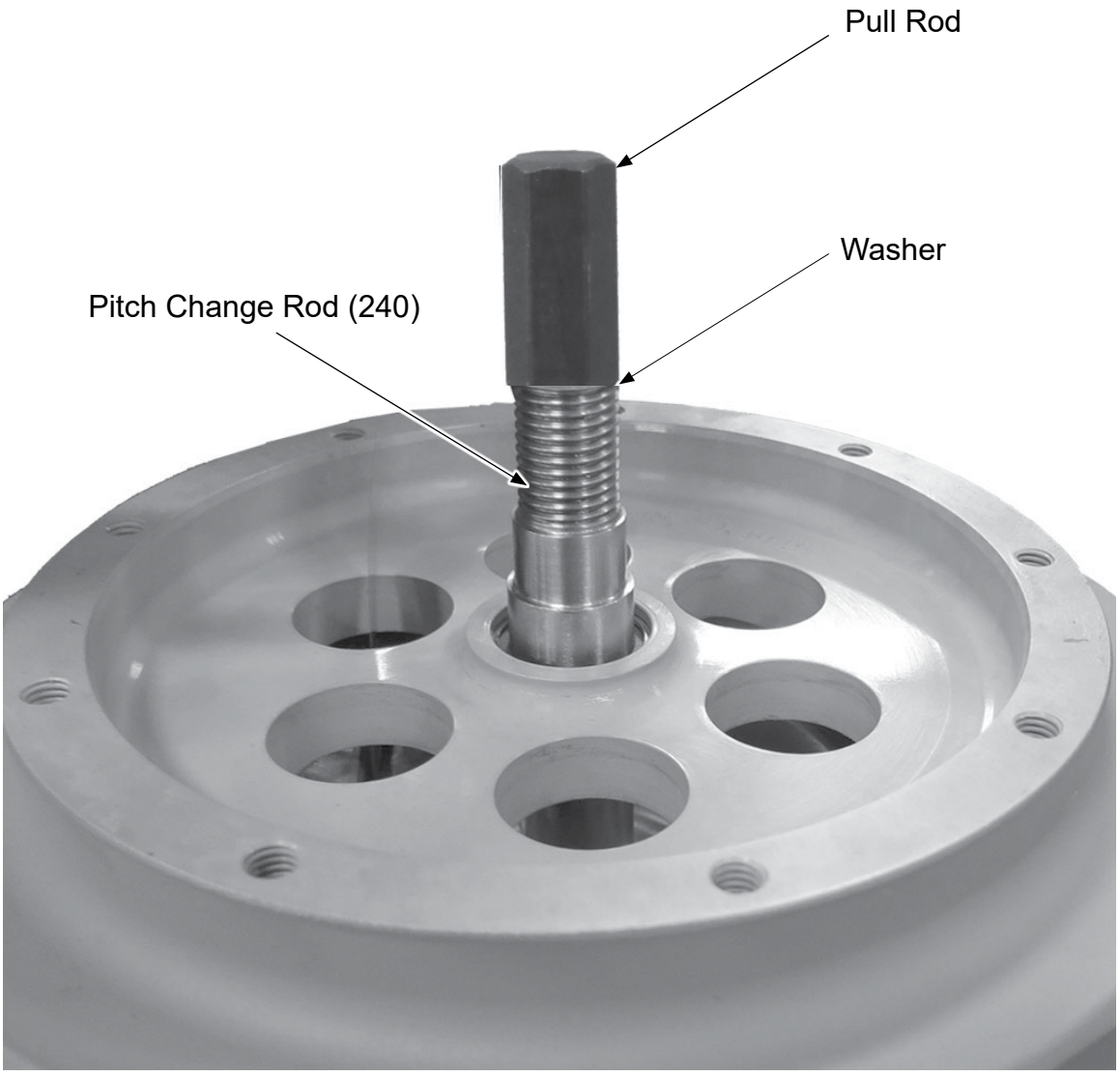
(3) Make sure that the spring compressor extension TE548-1 and anti-rotate pin are installed in the spindle TE536. The groove in the extension must align with the anti-rotate pin. Refer to Figure 3-1.

(4) Using nuts (910) and washers (920), install the engine-side hub half on the propeller assembly stand.

(5) Remove and discard the low pitch stop nut (10).

(6) Remove and discard the seal washer (20) from the low pitch stop (250).

(7) Remove the low pitch stop (250) from the cylinder.



Spring Compressor Pull Rod TE548-2 Threaded Into the Extension
Figure 3-2

(8) Remove and discard the screws (40 and 50) and O-rings (60) that attach the cylinder (70) to the hub (430).

(9) Remove the balance ring (90) and cylinder (70).

(10) Remove and discard the O-ring (80) from the cylinder (70).

(11) Remove and discard the pitch change rod nut (200).

(12) Remove the piston (210) from the pitch change rod (240).

(13) Remove and discard the O-rings (220 and 230) from the ID and OD of the piston.

(14) If applicable, remove the washer (260) from the pitch change rod (240).

(15) If applicable, remove the high pitch stop (75).

(16) Drain the red-dyed oil from the hub.

NOTE: The propeller hub is filled with a red-dyed oil. The red-dyed oil must be removed before complete disassembly of the propeller.

(a) The hub has large openings to permit the red-dyed oil to drain.

(b) Flip the propeller over a large container to permit the red-dyed oil to drain.

(c) Securely balance the propeller hub over the container.

(17) Using nuts (910) and washers (920), install the engine-side hub half on the propeller assembly stand.

(18) Put the spring compressor pull rod TE-548-2 through the pitch change rod (240). Refer to Figure 3-1 and Figure 3-2.

(19) Thread the spring compressor TE548 pull rod into the spring compressor extension TE-548-1.

(20) Thread the spring compressor pull rod TE548-2 until the pull rod bottoms in the spring compressor extension TE548-1.

(21) Remove and discard the nuts (420) and washers (410) from the hub clamping bolts (400).

(a) If the spinner bulkhead is mounted to the propeller with the hub bolts, remove the spinner bulkhead.

(22) Remove the hub clamping bolts (400).

(23) Using a non-metallic tool, loosen the cylinder-side hub half.

(24) Remove the cylinder-side hub half.

(25) Remove blades from the hub.

(a) Remove blade number one from the hub.

(b) Remove the pitch change block unit (500).

(c) Remove and discard the fork bumper (520).

(d) Remove the shim(s) (530).

(e) Remove and discard the bearing balls (610).

(f) Remove and discard the ball spacers (620).

(g) Remove the bearing races (630 and 640).

(h) Remove and discard the blade O-ring (600).

(i) Repeat steps (25)(a) through (25)(h) in this section for each blade in the hub.

(26) Remove the spring compressor TE548 pull rod and washer from the pitch change rod (240).

(27) Remove the pitch change rod (240) and fork (710).

(a) For two-blade propellers:

1 Remove the pitch change rod (240) and fork (710).

(b) For three-blade propellers:

1 Remove the pitch change rod (240) with the washer (700) and fork (710).

2 Discard the washer (700).

(28) Remove the spring guide (715) if applicable.

(29) Remove the springs (720) and (725) if applicable.

(30) Remove the spring seats (730) and (735) if applicable.

B. Washer (260), Fork (710), and Pitch Change Rod (240) Disassembly

(1) Refer to the Special Tooling, Equipment, and Fixtures chapter of this manual for instruction for the Tooling for Pitch Change Rod to Fork.

NOTE: This locally fabricated tooling is the same tooling that will be used to assemble the washer (260), fork (710), and pitch change rod (240).

(2) Put the threaded end of the pitch change rod (240) in the support with the washer (260) firmly against the support.

(3) Put the locally fabricated tool over the unthreaded end of the pitch change rod (240).

(4) Using a press, push on the tool until the pitch change rod (240) and washer (260) are released from the fork (710).

(5) Remove the pitch change rod (240) and fork (710) from the press.

3. Hub Disassembly

   A. All Propeller Models

      (1) Remove components of the hub unit (430) in accordance with Appendix C in the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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

4. Blade Disassembly

   A. All Propeller Models

      (1) For composite blade overhaul procedures, refer to Hartzell Propeller Inc. Composite Blade Manual 135F (61-13-35).

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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).

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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. 3)

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

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

B. Hubs

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

C. Blades

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

D. Ice Protection Systems

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

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

E. Spinner Assemblies

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

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

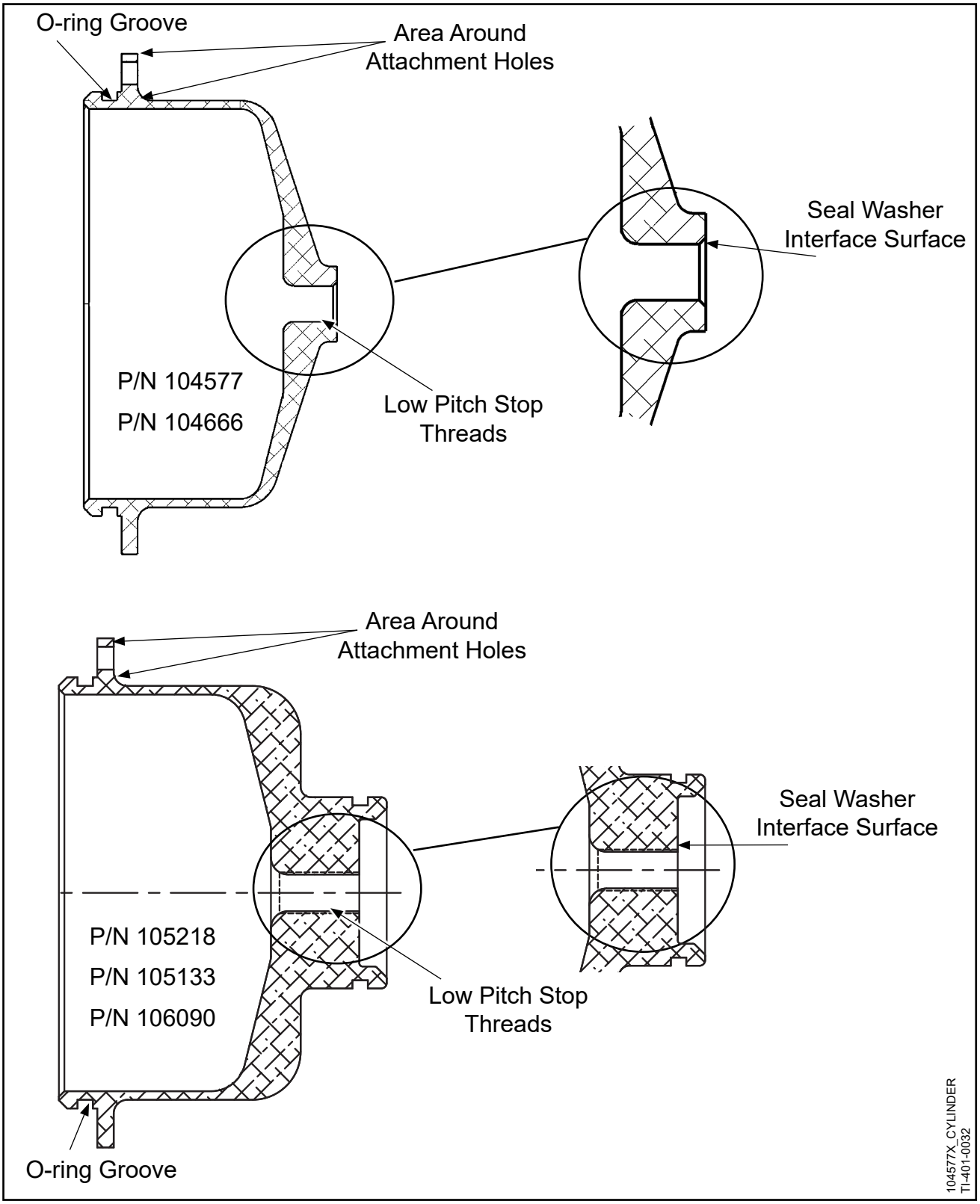
F. Special Inspections (Lightning Strike, Foreign Object Strike, etc.)

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

4. Propeller Component Checks

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

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



Cylinder
Figure 5-1

Component Inspection Criteria
Table 5-1

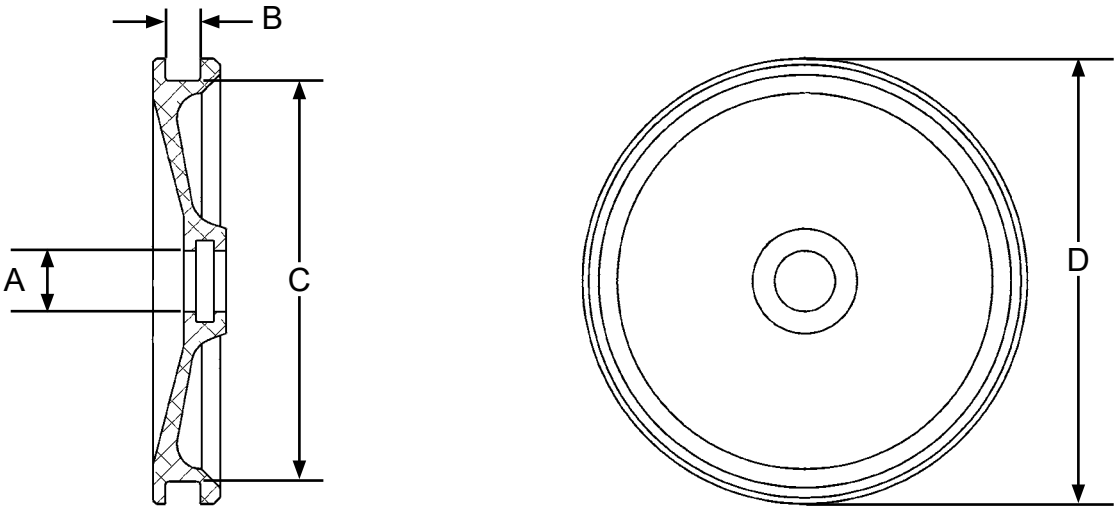
Inspect	Serviceable Limits	Corrective Action
A. CYLINDER (Item 70) Refer to Figure 5-1		
(1) Visually examine the external surfaces of the cylinder for cracks.	A crack is not permitted.	If a crack is found, replace the cylinder.
(2) Visually examine the external surfaces of the cylinder for wear, nicks, scratches, or other damage.	All external surfaces: maintain a wall thickness of 0.075 inch (1.905 mm), repaired area must be less than 0.5 inch (12.7 mm) in diameter, repairs must be separated by a minimum of 0.5 inch (12.7 mm).	Using an abrasive pad CM47 or equivalent, polish to blend out damage. High spots are not permitted. If base aluminum is exposed, chromate conversion coat. If damage is greater than the permitted serviceable limits, replace cylinder.
(3) Visually examine the threads of the low pitch stop hole for damage.	1/4 of one thread accumulated damage is permitted.	If damage is greater than the permitted serviceable limits, replace the cylinder.
(4) Visually examine the anodized coating of the cylinder for wear, nicks, scratches or other damage.	If wear, nicks, scratches, or other damage is present, measure the depth of damage. On the OD, the maximum permitted depth of damage is 0.003 inch (0.07 mm).	If damage is greater than the permitted serviceable limits, replace the cylinder.
(5) Visually examine the O-ring groove for wear.	If wear is present, measure the diameter of the O-ring groove. The minimum permitted diameter for the 104577, 104666, and 105218 cylinder is 3.7635 inches (95.593 mm). The minimum permitted diameter for the 105133 cylinder is 3.5155 inches (89.294 mm)	If the wear is greater than the maximum permitted serviceable limit, replace the cylinder.
(6) Visually examine the area encircling the through holes (for attachment to the hub) of the cylinder for scouring damage from the attaching screws or washers.	If damage is present, measure the depth of the damage. The maximum permitted depth of damage is 0.025 inch (0.63 mm).	If damage is greater than the permitted serviceable limits, replace the cylinder.
(7) Visually examine the washer seal (20) interface surface for corrosion product, pitting, scratches, gouges, or damage.	Corrosion product is not permitted. Pitting, scratches, gouges, or damage on the washer seal (20) interface surface that will permit oil to leak are not permitted.	If damage is greater than the permitted serviceable limits, replace the cylinder.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
B. HIGH PITCH STOP (Item 75)		
(1) Visually examine the surface of the high pitch stop for nicks, scratches, or other damage.	If nicks, scratches, or other damage is present, measure the depth of the nick, scratch, or damage. The maximum permitted depth of damage is 0.005 inch (0.12 mm).	If nicks, scratches, or other damage is greater than the permitted serviceable limits, replace the high pitch stop.
(2) Visually examine the high pitch stop for cracks.	A crack is not permitted.	If there is a crack, replace the high pitch stop.
(3) Visually examine the high pitch stop for flatness.	The high pitch stop must be flat. Bending is not permitted.	If the high pitch stop is not flat, replace the high pitch stop.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
C. BALANCE RING (Item 90)		
(1) Visually examine the balance ring for corrosion product, wear, or damage.	Corrosion product is not permitted. If wear or damage are present, measure the depth of wear, or damage. The maximum permitted depth of 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 corrosion product, wear, or damage is greater than the serviceable limits or the corrective action limits, replace the balance ring.



Piston Part Number	"A" Dimension	"B" Dimension	"C" Dimension	"D" Dimension
104255	0.491 inch (12.47 mm)	0.296 inch (7.51 mm)	3.200 inch (81.28 mm)	3.610 inch (91.70 mm)
106080	0.491 inch (12.47 mm)	0.296 inch (7.51 mm)	2.820 inch (71.63 mm)	3.236 inch (82.20 mm)

Piston
Figure 5-2

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
D. PISTON (Item 210) Refer to Figure 5-2.		
(1) Measure the diameter of area "A" of the piston.	Refer to Figure 5-2 for the maximum permitted diameter of area "A".	If the diameter is greater than the serviceable limits, replace the piston.
(2) Visually examine the surface of the piston for nicks, scratches, or other damage.	If nicks, scratches, or other damage is present, measure the depth of the nick, scratch, or damage. The maximum permitted depth of damage is 0.005 inch (0.12 mm). Nicks, scratches, or other damage is not permitted on the ID or the O-ring groove.	If nicks, scratches, or other damage is greater than the permitted serviceable limits, replace the piston.
(3) Visually examine the piston for wear in area "B".	If wear is present, measure the width of area "B". Refer to Figure 5-2 for the maximum permitted width of area "B".	If the width is greater than the serviceable limits, replace the piston.
(4) Visually examine the piston for wear in areas "C" and "D".	If wear is present, measure the diameter of area "C" and/or area "D". Refer to Figure 5-2 for the minimum permitted diameter of area "C". Refer to Figure 5-2 for the minimum permitted diameter of area "D".	If the diameter of area "C" or area "D" is less than the permitted serviceable limits, replace the piston.
(5) Visually examine the piston for corrosion product.	Corrosion product is not permitted.	If there is corrosion product, replace the piston.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
D. PISTON, CONTINUED (Item 210) Refer to Figure 5-2.		
(6) Penetrant inspect the piston in accordance with the Penetrant Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). Do not etch the piston. CAUTION: DO NOT REMOVE THE ANODIZE COATING BEFORE PENETRANT INSPECTION.	A relevant indication is not permitted.	If there is a relevant indication, replace the piston.

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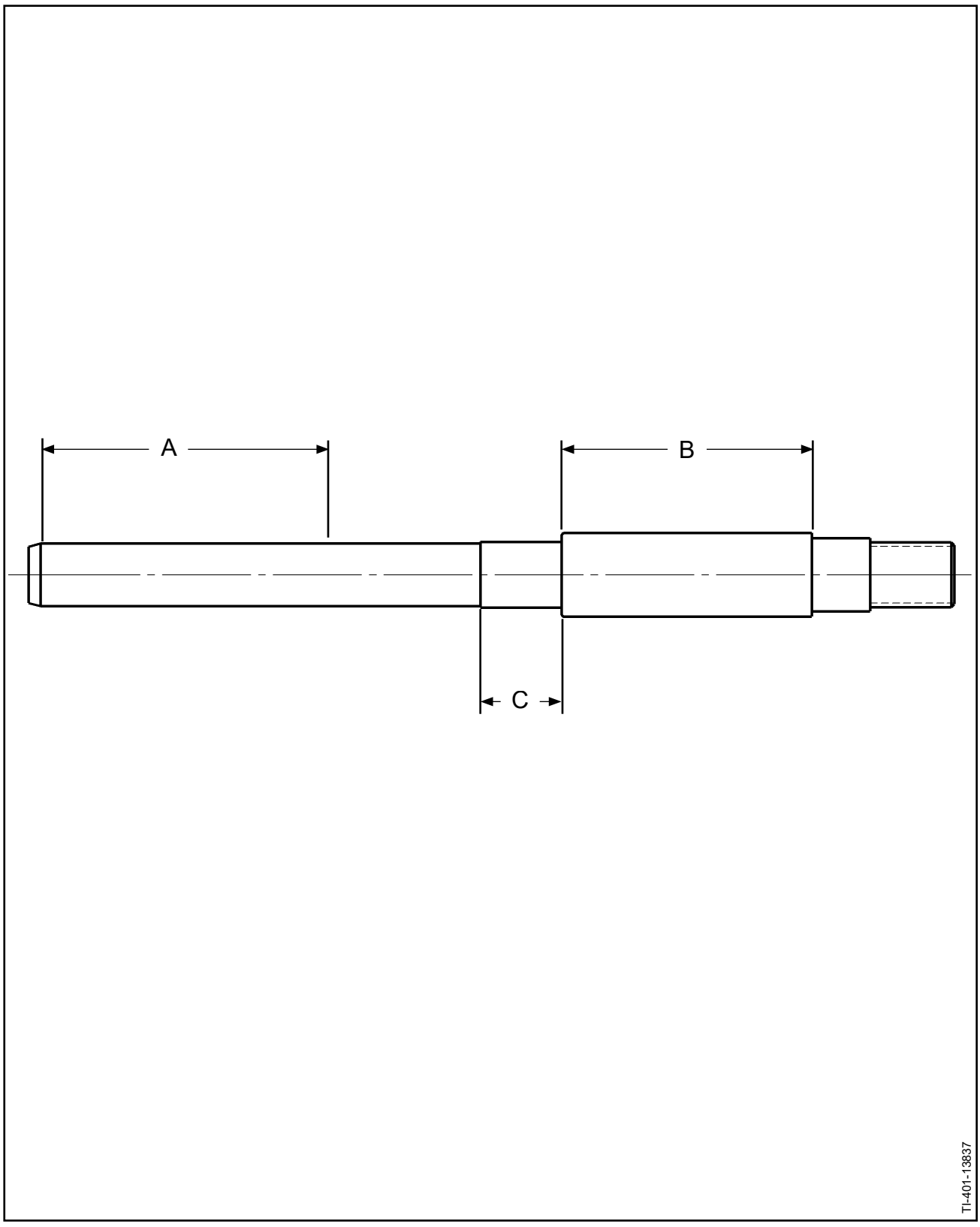


Pitch Change Rod
Figure 5-3

Component Inspection Criteria
Table 5-1

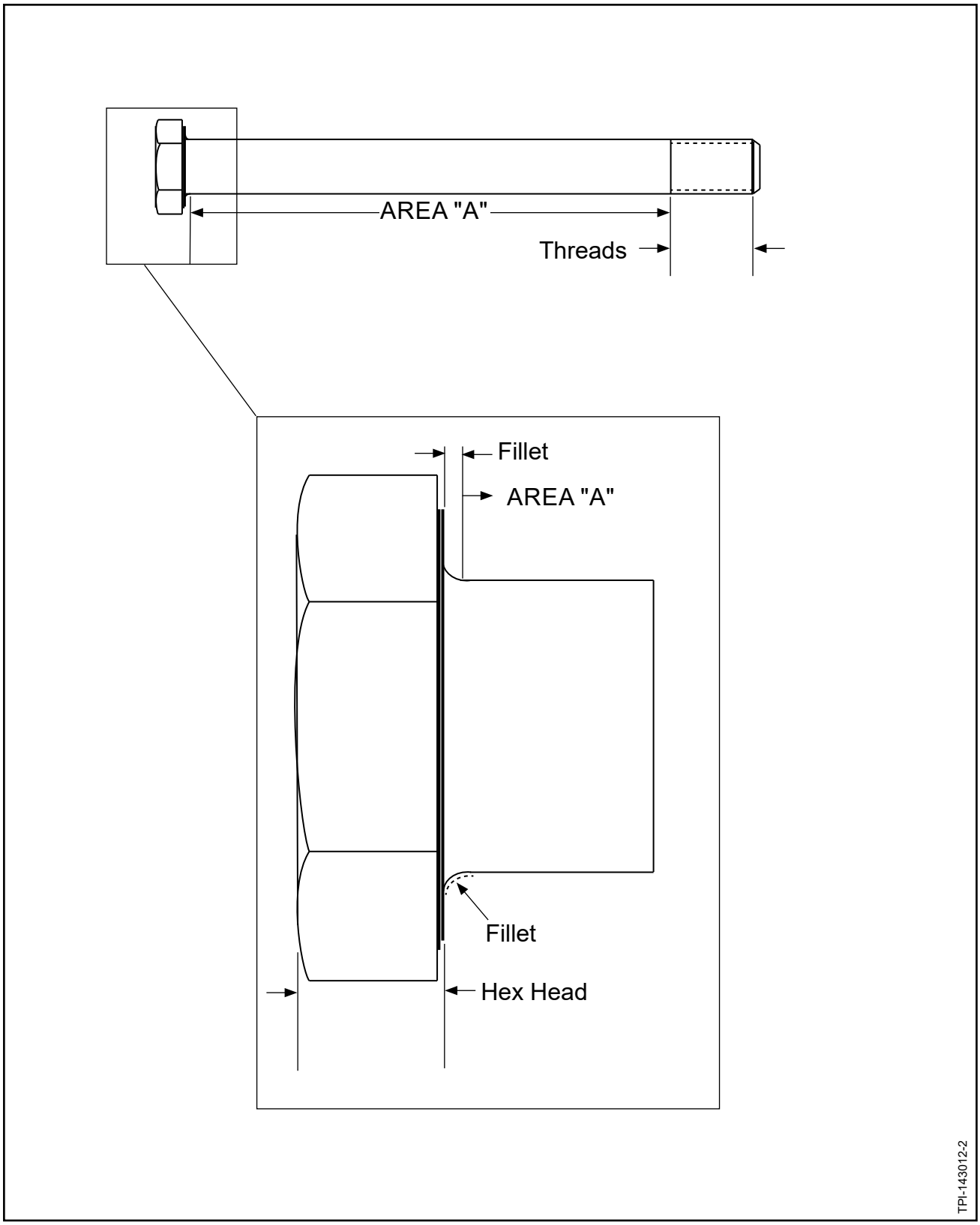
Inspect	Serviceable Limits	Corrective Action
E. PITCH CHANGE ROD (Item 240) Refer to Figure 5-3.		
(1) Visually examine the chrome plating of the pitch change rod for damage in the area of diameter "A".	Damage below the chrome plating is not permitted.	If the damage is greater than the serviceable limits, replace the pitch change rod.
(2) Measure the diameter of area "A" of the pitch change rod.	The minimum permitted diameter of area "A" is 0.413 inch (10.49 mm).	If the diameter is less than the serviceable limits, replace the pitch change rod.
(3) Measure the diameter of area "B" of the pitch change rod.	The minimum permitted diameter of area "B" is 0.557 inch (14.14 mm).	If the diameter is less than the serviceable limits, replace the pitch change rod.
(4) Measure the diameter of area "C" of the pitch change rod.	The minimum permitted diameter of area "A" is 0.4379 inch (11.122 mm).	If the diameter is less than the serviceable limits, replace the pitch change rod.
(5) Visually examine the pitch change rod for corrosion product.	Corrosion product is not permitted.	If there is corrosion product, remove it using an abrasive pad CM47 or equivalent. If the corrosion product cannot be removed, replace the pitch change rod.
(6) Visually examine the pitch change rod for pitting and damage.	Pitting or damage is not permitted.	If there is pitting or damage, replace the pitch change rod.
(7) Visually examine the pitch change rod for straightness.	The rod must be straight. Bending is not permitted.	If the rod is not straight, replace the pitch change rod.
(8) Magnetic particle inspect the pitch change rod. NOTE: Do not strip the chrome plating.	A relevant indication is not permitted.	If there is a relevant indication, replace the pitch change rod.
(9) Examine the oil supply bore for unwanted material using a borescope or fiberoptic flashlight.	Unwanted material is not permitted.	Remove all unwanted material.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
F. SET SCREW, 3/8-24 (LOW PITCH STOP) (Item 250)		
(1) Visually examine the set screw for corrosion product, wear, or damage.	Corrosion product, wear, or damage is not permitted.	If corrosion product, wear, or damage is found, replace the set screw.
(2) Visually examine the set screw through hole for wear and damage.	The hole may not break out through the end or side of the set screw.	If the hole is not within the serviceable limits, replace the set screw.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
G. WASHER (Item 260)		
(1) Visually examine the 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.	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 washer.
	The maximum permitted depth of pitting is 0.002 inch (0.05 mm). The maximum permitted total surface pitting is 5%. The maximum permitted diameter of an individual pit is 0.02 Inch (0.5 mm). Pitting must not affect the fit or function of the washer.	If the pitting is greater than the serviceable limits, replace the washer.
(2) Visually examine the 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 washer.	If scratches are greater than the serviceable limits, replace the washer.
(3) Measure the thickness of the washer.	The minimum permitted washer thickness is 0.052 inch (1.32 mm).	If the thickness of the washer is less than the serviceable limits, replace the washer.
(4) Visually examine the washer for cadmium plating coverage.	A few random scratches are permitted on the sides and inside diameter; otherwise, complete coverage is required. Cadmium plating must completely cover the outside diameter without scratches. 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, cadmium replate and bake the washer in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

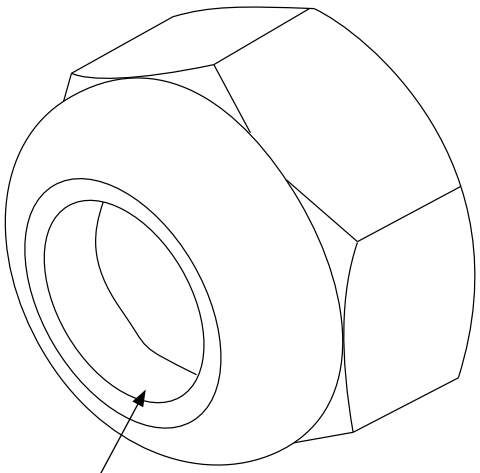


Hex Head Bolt
Figure 5-4

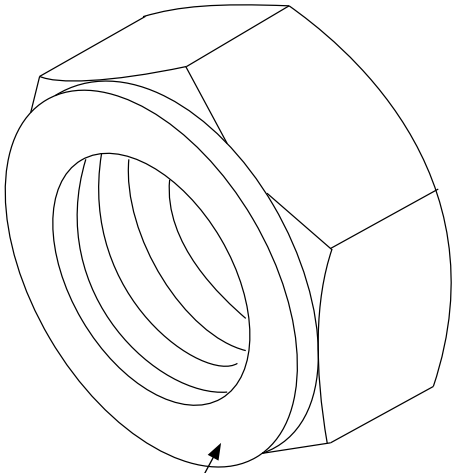
Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
H. HEX HEAD HUB BOLT (Item 400) Refer to Figure 5-4.		
(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.



Plastic Locking Element



Nut May Be Machined To Remove The Plastic Locking Element And Metal Housing Or Only The Plastic Locking Element May Be Removed

TPI-143011-1

A-2043-1 Nut Modification
Figure 5-5

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
H. HEX HEAD HUB BOLT, CONTINUED (Item 400) Refer to Figure 5-4 and Figure 5-5.		
(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 5-5.	Limited thread file repair is permitted, but must be considered as thread damage. If the damage and pitting is greater than the permitted serviceable limits, replace the hex head bolt.
(6) Magnetic particle inspect each bolt in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the hex head bolt.
(7) Visually examine the hex head bolt for cadmium plating coverage.	Cadmium plating must completely cover the bolt with the following exceptions: A few scratches and corners with cadmium plating missing, minor abrading of cadmium plating on the threads, or minor abrading of the cadmium plating on the hex head because of wrenching are permitted.	If the cadmium plating coverage is less than the permitted serviceable limits, cadmium replate and bake for a minimum of 23 hours within four hours after plating the hex head bolt in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
I. UID PLATE (Item 431)		
(1) Visually examine the UID plate for damage.	Damage to the scan code is not permitted. The scan code must be able to be scanned successfully.	If damage is greater than the permitted serviceable limits, replace the UID plate. For ordering, removal, and installation instructions, refer to the section "Installing the UID Plate" in the Assembly chapter of this manual. If the UID plate must be discarded, make the UID plate unserviceable by one of the following methods: 1) Cut the plate in half through the scan code, 2) Sand the plate to remove the scan code, 3) Use any other method identified and/or required by the military/ government authority that requires the use of the UID plate.
(2) Visually examine the serial number on the UID plate.	The serial number must match the serial number of the hub.	If the serial numbers do not match or if the hub must be retired from service, replace the UID plate. If the UID plate must be discarded, make the UID plate unserviceable by one of the following methods: 1) Cut the plate in half through the scan code, 2) Sand the plate to remove the scan code, 3) Use any other method identified and/or required by the military/ government authority that requires the use of the UID plate.

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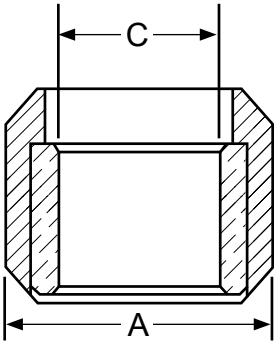
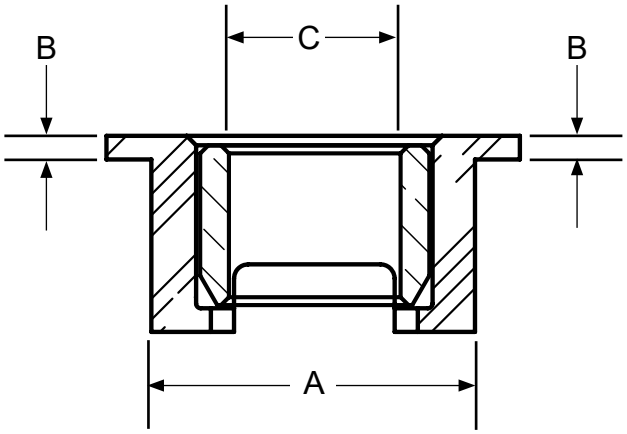


P/N 108500



P/N 108512

TI-401-106045,
TPI-LW-401-00833

Pitch Change Block Unit
Figure 5-6

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
J. PITCH CHANGE BLOCK UNIT (Item 500) Refer to Figure 5-6. (Includes Bushing [502] and Pitch Change Block [501])		
(1) Visually examine the pitch change block unit for damage.	If damage is present, measure the depth of damage. The maximum permitted depth of damage is 0.005 inch (0.12 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the pitch change block unit.
(2) Visually examine the hole in the pitch change block unit for wear.	If wear is present, measure the diameter of the hole "C". The maximum permitted diameter for 108500( ) and 108512 is 0.380 inch (9.65 mm).	If the wear is greater than the permitted serviceable limits, replace the pitch change block unit.
(3) Measure the thickness of area "A" of the 108500 pitch change block unit.	The minimum permitted thickness of area "A" is 0.702 inch (17.83 mm).	If the thickness is less than the serviceable limits, replace the pitch change block unit.
(4) Measure the thickness of area "A" of the 108512 pitch change block unit. (Area "A" applies to the edges of the pitch change block unit that touch the fork [710]).	The minimum permitted thickness of area "A" is 0.689 inch (17.50 mm).	If the thickness is less than the serviceable limits, replace the pitch change block unit.
(5) Measure the thickness of area "B" of the pitch change block unit.	The minimum permitted thickness of area "B" is 0.040 inch (1.02 mm).	If the thickness is less than the serviceable limits, replace the pitch change block unit.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
K. STAINLESS SHIM (Item 530)		
(1) Visually examine the stainless shim for tears, bending, or damage.	A torn, bent, or damaged shim is not permitted.	If a torn, bent, or damaged shim is greater than the permitted serviceable limits, replace the stainless shim.

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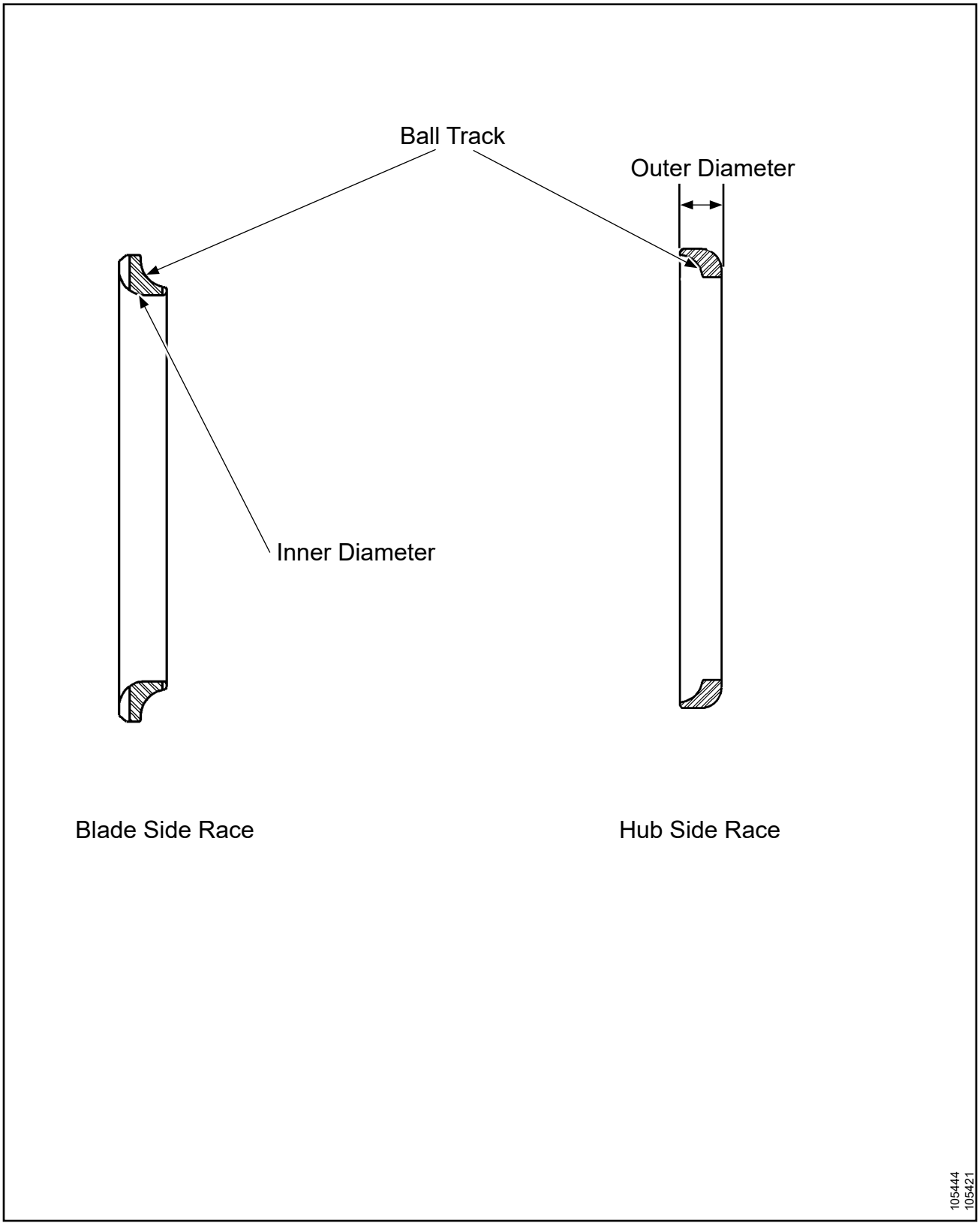
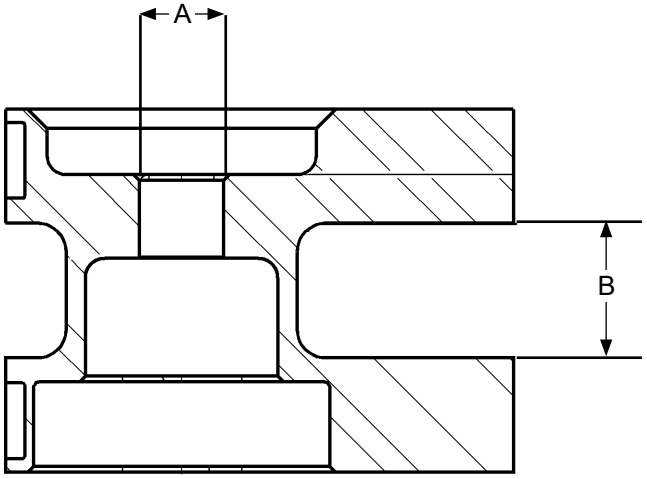


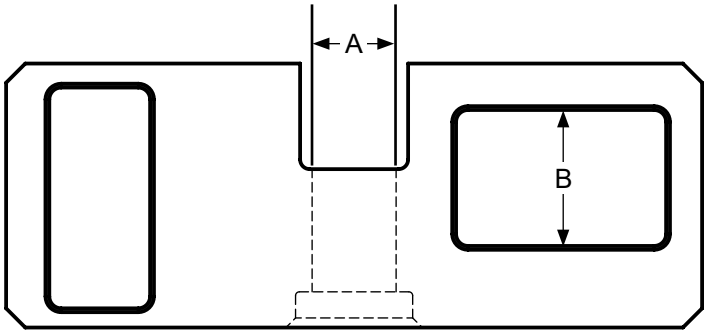
Bearing Races
Figure 5-7

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
L. BEARING RACES (Items 630 and 640) Refer to Figure 5-7.		
(1) Visually examine the ball track for damage or fretting on the bearing race.	If the ball bearing track shows wear, measure the depth of damage or fretting. The maximum permitted depth of damage or fretting is 0.005 inch (0.12 mm).	If the depth of damage is greater than the permitted serviceable limits, replace the bearing race.
(2) Visually examine the bearing race for corrosion product or pitting.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. If pitting is present measure the depth of the pitting. The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	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 or if pitting is deeper than the permitted serviceable limits, replace the bearing race.
(3) Visually examine the outer diameter of the hub side bearing race for fretting damage and the inner diameter of the blade side bearing race.	The maximum permitted depth of fretting is 0.005 inch (0.12 mm).	Using an abrasive pad CM47, or equivalent, clean the area thoroughly to minimize fretting damage. If fretting is more than the permitted serviceable limits, replace the bearing race.
(4) Magnetic particle inspect the 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.



Part Number 104919



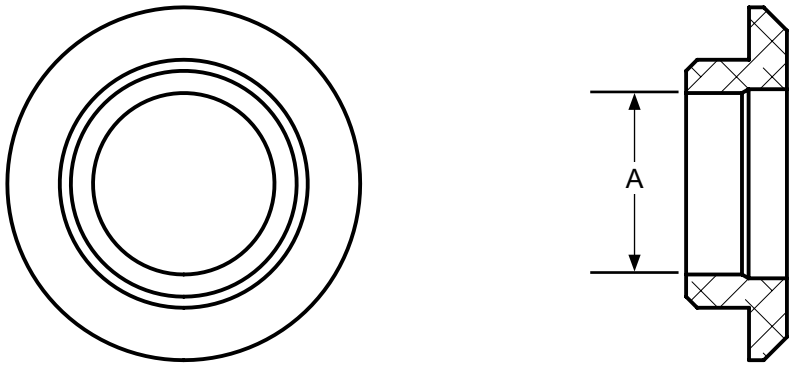
Part Number 108352

TI-401-104919
TI-401-105055

Fork
Figure 5-8

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
M. FORK (Item 710) Refer to Figure 5-8.		
(1) Visually examine the fork for corrosion product, wear, or damage.	Corrosion product is not permitted. If there is wear, or damage, measure the depth of wear, or damage. The maximum permitted depth of wear, or damage is 0.003 inch (0.07 mm). Raised material is not permitted.	Using an abrasive pad CM47 or equivalent, polish to a maximum depth of 0.005 inch (0.12 mm). If repair is beyond the permitted serviceable limits or the corrective action limits, replace the fork.
(2) Measure the diameter of area "A" of the fork.	The maximum permitted diameter of area "A" is 0.4378 inch (11.120 mm).	If the diameter is greater than the permitted serviceable limits, replace the fork.
(3) For the 104919 fork: Measure the width of area "B" of the fork.	The maximum permitted width of area "B" is 0.699 inch (17.75 mm).	If the width is greater than the permitted serviceable limits, replace the fork.
(4) For the 108352 fork: Measure the width of area "B" of the fork.	The maximum permitted width of area "B" is 0.712 inch (18.08 mm).	If the width is greater than the serviceable limits, replace the fork.
(5) Visually examine the fork for cadmium coverage.	Except for a few scratches and corners with cadmium coating missing, complete coverage is required.	Re-plate the fork in accordance with the Cadmium Re-Plating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(6) Magnetic particle inspect the fork in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted	If there is a relevant indication that cannot be removed within the permitted serviceable limits given for the fork in this section, replace the fork.



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Spring Guide
Figure 5-9

Component Inspection Criteria
Table 5-1

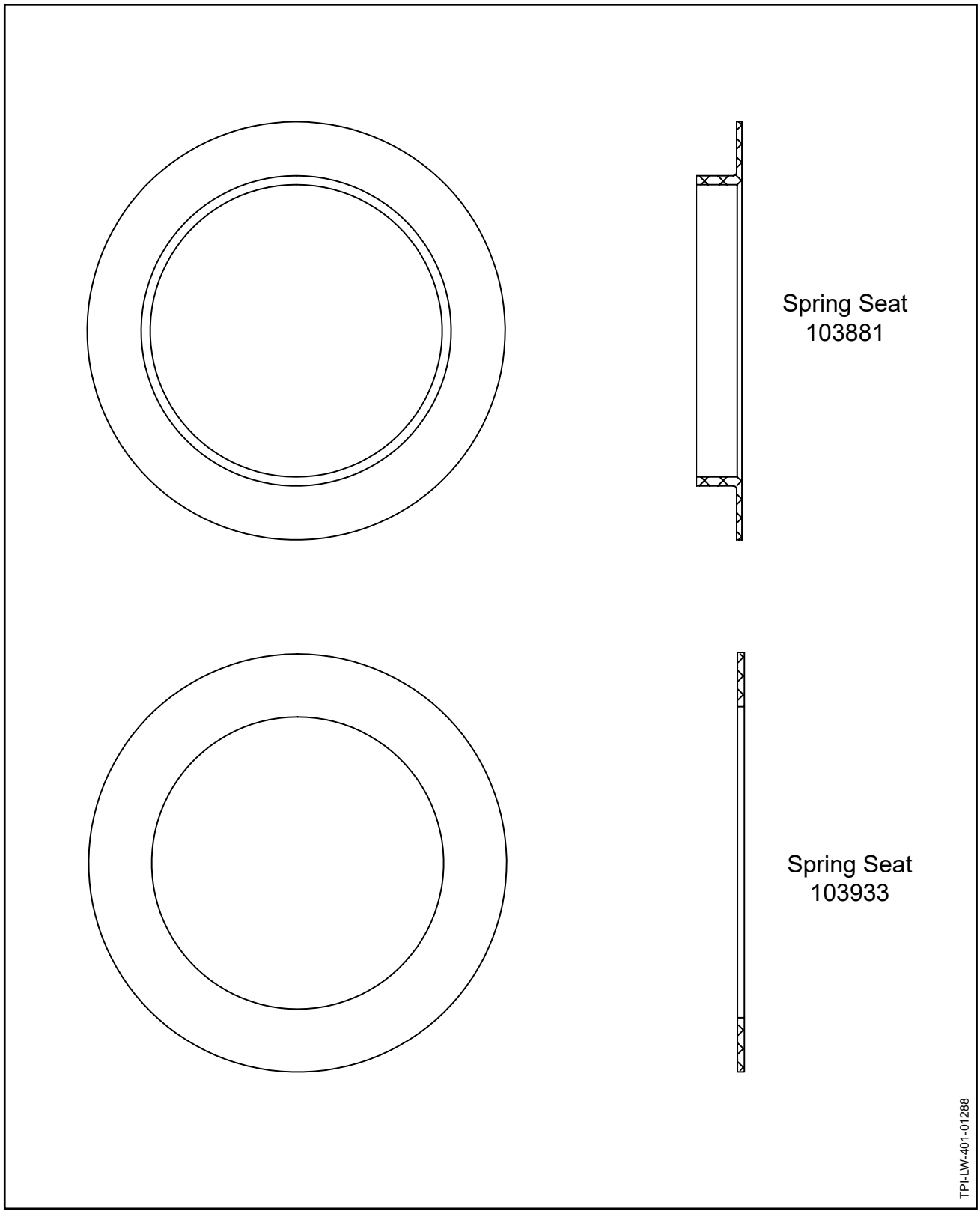
	Inspect	Serviceable Limits	Corrective Action
N.	SPRING GUIDE (Item 715)		
(1)	Visually examine each spring guide for corrosion product, damage, and pitting.	Corrosion product is not permitted. If the spring guide is damaged, meassure the damage. The maximum permitted depth of damage or pitting is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). If the corrosion product or the depth of damage or pitting is greater than the permitted serviceable limits, replace the spring guide.
(3)	Visually examine diameter "A" of the spring guide for wear. Refer to Figure 5-9.	If there is wear, measure diameter "A" of the spring guide. The maximum permitted diameter is 0.465 inch (11.81 mm).	If diameter "A" is greater than the permitted serviceable limits, replace the spring guide.
(3)	Visually examine the spring guide 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 spring guide in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(4)	Visually examine the spring guide for nicks, scratches, gouges, or other damage.	Damage that extends all the way through the spring guide is not permitted. The maximum permitted total area of accumulated damage for both sides of the spring guide is 0.5 square inch (322 square mm). Damage that could affect correct fit or function is not permitted.	If the damage is greater than the permitted serviceable limits, replace the spring guide.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
O. COMPRESSION SPRING (Item 720)		
CAUTION: DO NOT STRIP THE ZINC PLATING FROM THE COMPRESSION SPRING. IF PLATING IS REMOVED, REPLACE THE COMPRESSION SPRING.		
(1) Visually examine the compression spring for wear, corrosion product, or other damage.	Corrosion product is not permitted.	If corrosion product is present, replace the compression spring.
	If wear or damage is present, measure the depth of wear or damage. The maximum permitted depth of wear or damage is 0.003 inch (0.07 mm).	If the wear or damage is greater than the permitted serviceable limit, replace the compression spring.
(2) Visually examine the compression spring for zinc plating coverage.	Except for a few random scratches, the zinc plating must completely cover all surfaces.	Apply a layer of zinc chromate primer to the spring in accordance with the section, "Compression Spring Zinc Chromate Primer Repair" in the Repair chapter of this manual.
(3) Measure the free length of the compression spring.	The minimum permitted free length for 105282 is 2.54 inches (64.6 mm) The minimum permitted free length for the 108351 is 2.82 inches (71.6 mm).	If the free length is less than the permitted serviceable limit, replace the compression spring.
(4) Magnetic particle inspect the compression spring in accordance with the Magnetic Particle Inspect chapter of the Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). NOTE: Do not strip the zinc plating.	A crack is not permitted.	If there is a crack, replace the compression spring.

Component Inspection Criteria
Table 5-1

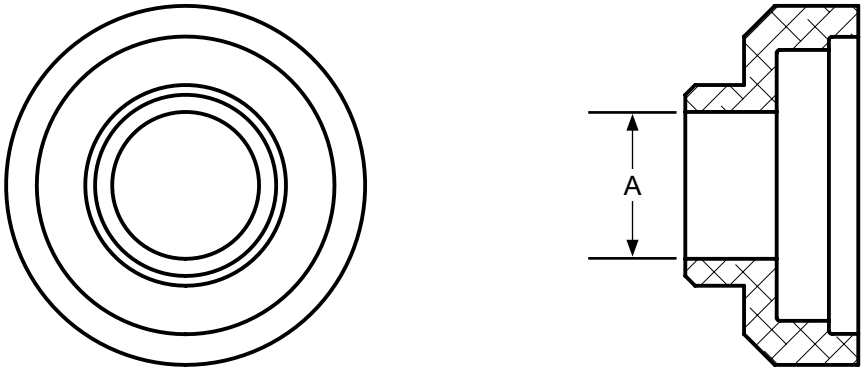
Inspect	Serviceable Limits	Corrective Action
P. COMPRESSION SPRING (Item 725)		
CAUTION: DO NOT STRIP THE ZINC PLATING FROM THE COMPRESSION SPRING. IF PLATING IS REMOVED, REPLACE THE COMPRESSION SPRING.		
(1) Visually examine the compression spring for wear, corrosion product, or other damage.	Corrosion product is not permitted.	If corrosion product is present, replace the compression spring.
	If wear or damage is present, measure the depth of wear or damage. The maximum permitted depth of wear or damage is 0.003 inch (0.07 mm).	If the wear or damage is greater than the permitted serviceable limit, replace the compression spring.
(2) Visually examine the compression spring for zinc plating or zinc chromate primer coverage.	A few random scratches are permitted; otherwise, complete coverage of zinc plating or zinc chromate primer on all surfaces is required.	Apply a layer of zinc chromate primer to the spring in accordance with the section, "Compression Spring Zinc Chromate Primer Repair" in the Repair chapter of this manual.
(3) Measure the free length of the compression spring.	The minimum permitted free length for compression spring 109252 is 2.171 inches (55.15 mm).	If the free length is less than the permitted serviceable limit, replace the compression spring.
(4) Magnetic particle inspect the compression spring in accordance with the Magnetic Particle Inspect chapter of the Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the compression spring.



Spring Seat - p/n 103881 and 103933
Figure 5-10

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Q. SPRING SEAT (103881 and 103933) (Item 730) Refer to Figure 5-10.		
(1) Visually examine the spring seat for damage, corrosion product or pitting.	Corrosion product is not permitted. If damage or pitting is present, measure the depth of the damage or pitting. The maximum permitted depth of damage or pitting is 0.005 inch (0.12 mm).	If corrosion product is present, replace the spring seat. If the damage or pitting is greater than the permitted serviceable limit, replace the spring seat.
(2) Visually examine the spring seat for wear.	If the spring seat is worn, measure the depth of wear. The maximum permitted depth of wear is 0.015 inch (0.38 mm). If there is wear on both sides of the spring seat, the total of both wear depths must not be greater than 0.015 inch (0.38 mm). Wear that could affect correct fit or function is not permitted.	If the depth of wear is greater than the permitted serviceable limits, replace the spring seat.
(3) Visually examine the spring seat for nicks, scratches, and gouges or other damage.	If nicks, scratches, gouges, or other damage is present, measure the depth of the nick, scratch, gouge, or damage. The maximum permitted depth of nicks, scratches, gouges, or other damage is 0.015 inch (0.38 mm). The maximum permitted total area of accumulated damage for all surfaces combined is 0.5 square inch (322 square mm). Damage that could affect correct fit or function is not permitted.	If nicks, scratches, gouges, or other damage is greater than the permitted serviceable limits, replace the spring seat.



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Spring Seat - p/n 109241
Figure 5-11

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
R. SPRING SEAT (109241) (Item 735)		
(1) Visually examine the spring seat for damage, corrosion product, or pitting.	Corrosion product is not permitted. If damage or pitting is present, measure the depth of the damage or pitting. The maximum permitted depth of damage or pitting is 0.005 inch (0.12 mm).	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Standard Practices Manual 202A (61-01-02). If the corrosion product or the depth of damage or pitting is greater than the permitted serviceable limits, replace the spring guide.
(2) Visually examine the spring seat for nicks, scratches, and gouges or other damage.	Damage that extends all the way through the spring guide is not permitted. The maximum permitted total area of accumulated damage for both sides of the spring guide is 0.5 square inch (322 square mm). Damage that could affect correct fit or function is not permitted.	If nicks, scratches, gouges, or other damage is greater than the permitted serviceable limits, replace the spring seat.
(3) Visually examine diameter "A" of the spring seat. Refer to Figure 5-11.	If there is wear, measure diameter "A" of the spring seat. The maximum permitted diameter is 0.465 inch (11.81 mm).	If diameter "A" is greater than the permitted serviceable limits, replace the spring seat.
(4) Visually examine the spring seat 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 springn seat in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
S. BALANCE WEIGHT (Item 840)		
(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).

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
T. FORWARD BULKHEAD MOUNT (Item 960)		
(1) Visually examine the forward bulkhead mount for cracks.	A crack is not permitted.	If there is a crack, replace the forward bulkhead mount.

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

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

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

1. General Repair Requirements (Rev. 2)

A. Shot Peening

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

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

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

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

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

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

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

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

b Contact Hartzell Propeller Inc. Product Support

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

B. Aluminum and Steel Parts

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

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

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

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

2. Repair/Modification Procedures (Rev. 3)

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

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

B. Hubs

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

C. Blades

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

D. Spinner Assemblies

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

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

E. Ice Protection Systems

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

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

3. Compression Spring: Zinc Chromate Primer Repair

A. Cleaning

(1) For procedures for cleaning the compression spring (720, 725), refer to Cleaning of Steel Parts in the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(2) Inspect the compression spring (720, 725) for scratches, corrosion, and zinc plate coverage in accordance with the Check chapter of this manual.

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

(4) Using solvent CM106, clean the entire compression spring (720, 725).

(5) Permit the solvent CM106 to air dry.

B. Painting

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

(2) Apply a layer of zinc chromate primer CM67, or equivalent, to the entire surface of the compression spring (720, 725).

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

(4) Examine the compression spring (720, 725) for complete primer coverage

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1. General (Rev. 6)

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

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

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

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

A. Important Information

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

(2) Protect all unassembled components from damage.

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

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

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

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

B. Ice Protection Systems

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

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

C. O-rings

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

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

D. Blade Bore Plug/Bearing Installation

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

E. Blade Angle Information

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

CAUTION 1: ACTUATION OF PROPELLERS IS TO BE ACCOMPLISHED USING COMPRESSED AIR THAT HAS BEEN FILTERED FOR MOISTURE, OR NITROGEN.

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

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

2. Bantam Assembly Procedures

A. General

(1) If required, make sure that the spinner and bulkhead assembly installation procedures are completed before beginning assembly of the hub. Use the alternate hub assembly nuts and bolts that are supplied with a spinner mounting kit, if applicable.

(2) If the propeller is equipped with an ice protection system, applicable instructions and technical information can be found in Hartzell Propeller Inc. Propeller Ice Protection System Manual 180 (30-61-80) for those system components supplied by Hartzell Propeller Inc. Propeller ice protection system components not supplied by Hartzell Propeller Inc. are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

CAUTION: TO PREVENT DAMAGE TO THE PITCH CHANGE ROD (240), THE HUB FLANGE SPINDLE TE536, AND SPRING COMPRESSOR TE548 MUST BE USED FOR ASSEMBLY OF THE PROPELLER.

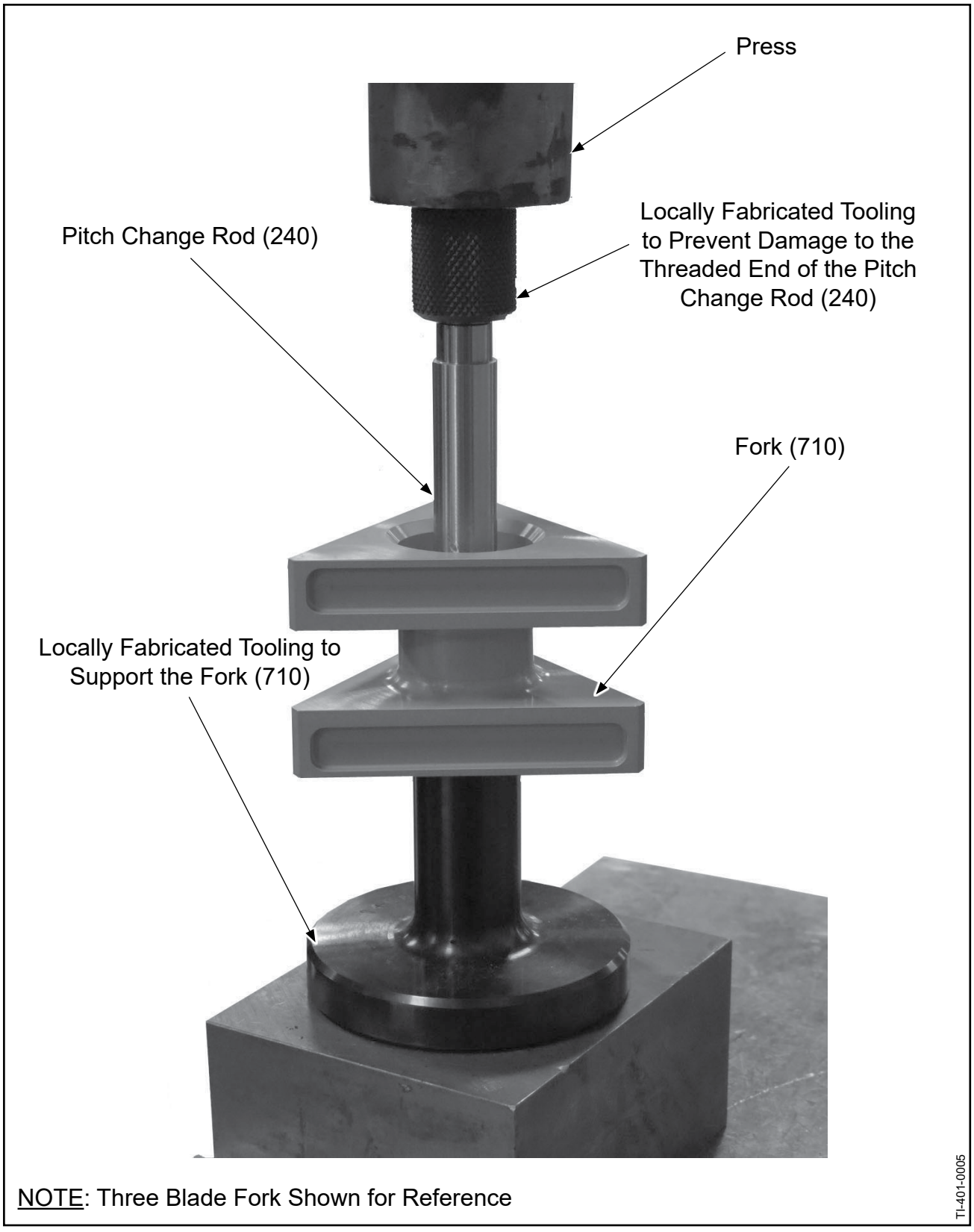
(3) Install the propeller assembly on the rotatable fixture TE125 on the assembly table TE129 using hub flange spindle TE536 and spring compressor TE548.

(4) Use protractor TE96, TE97, or equivalent when measuring a blade angle.

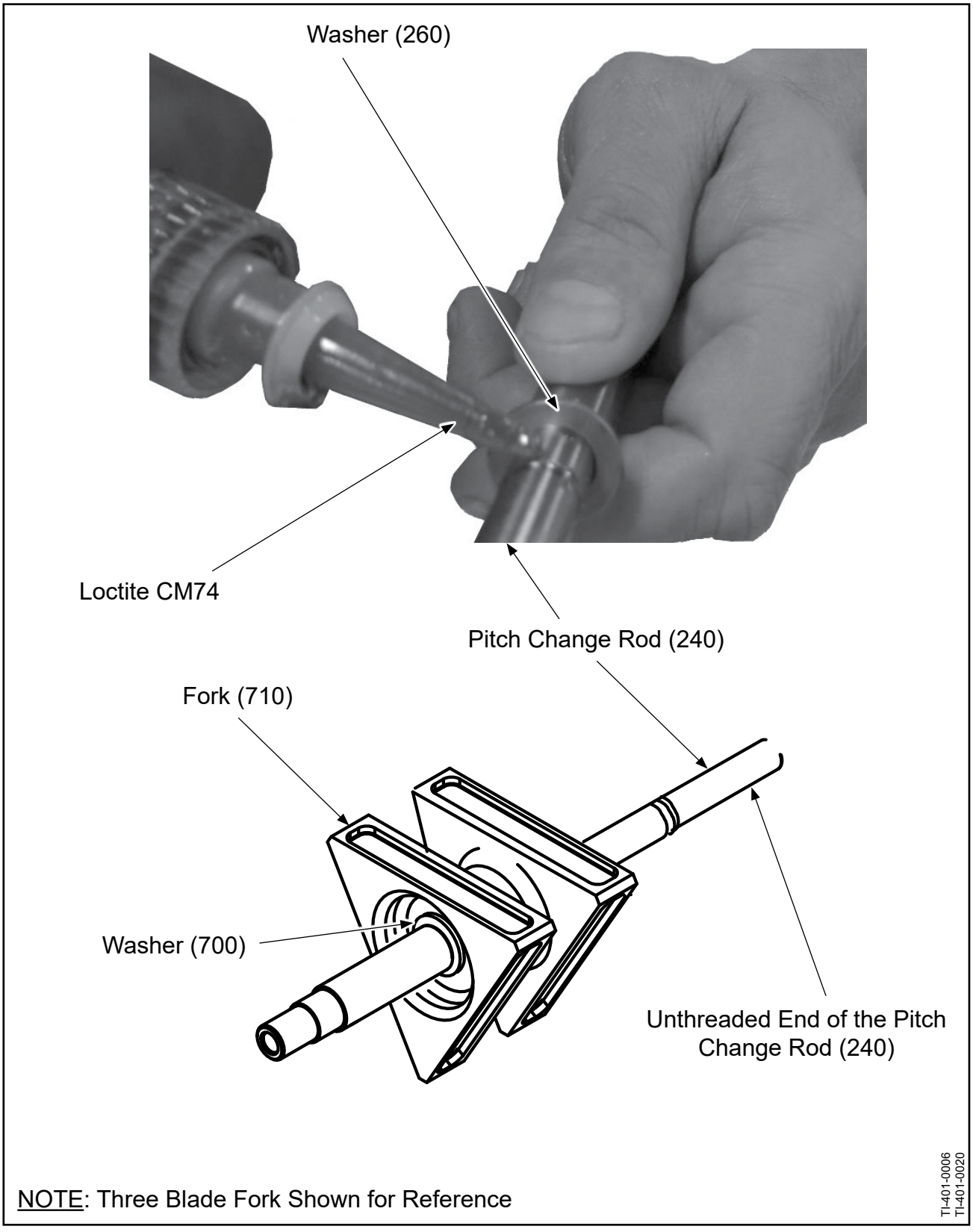
(5) If applicable, the hub assembly will have a UID plate (431).

(a) Put the UID plate (431) aside until final balance.

(b) The UID plate is installed on the balance ring (90) during the static balance procedure.



Installation of the Fork on the Pitch Change Rod
Figure 7-1



Installation of the Washer on the Pitch Change Rod
Figure 7-2

3. Two and Three Blade Bantam Assembly Procedures

A. Hub Assembly Procedures

(1) Install components of the hub unit (430) in accordance with Appendix C in the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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

(2) Install the flange mounting O-ring (930) on the engine-side hub half.

(3) Install the pitch change rod O-ring (439) in the engine-side hub half.

(4) Make sure the spring compressor spring TE-548-3 is installed in the spring compressor extension TE-548-1.

(5) Insert the spring compressor extension TE548-1 over the pitch change rod (240). Refer to Figure 3-1, Spring Compressor TE548 and Spindle TE536, in the Disassembly chapter of this manual.

(6) Make sure that the spring compressor extension TE548-1 and anti-rotate pin are installed in the spindle TE536. The groove in the extension must align with the anti-rotate pin.

(7) Using nuts (910) and washers (920), install the engine-side hub half on the propeller assembly stand.

(8) Using lubricant CM12, apply a layer on the bearing seats of the blade retention sockets.

(9) Using lubricant CM12, apply a layer in the grooves in each blade.

B. Pitch Change Rod (240) and Fork (710) Assembly

(1) Refer to the Special Tooling, Equipment, and Fixtures chapter of this manual for instructions for the Tooling for Pitch Change Rod (240) to Fork (710).

NOTE: This locally fabricated tooling is the same tooling that will be used to assemble the washer (700), fork (710), and pitch change rod (240).

(2) Put the fork (710) on the support. Refer to Figure 7-1.

(3) If applicable, install the washer (700) on the unthreaded end of the pitch change rod (240). Refer to Figure 7-2.

(4) Using solvent CM44 or CM106, clean the area of the pitch change rod (240) that will be pressed into the fork (710).

(5) Permit the solvent CM44 or CM106 to dry.

(6) Apply retaining compound CM74 to the step in the pitch change rod (240) and the bore in the fork (710) where the fork will seat. Refer to Figure 7-2.

CAUTION: DO NOT PERMIT THE UNTHREADED END OF THE PITCH CHANGE ROD (240) TO CONTACT THE PRESS. THE SUPPORT FOR THE FORK (710) MUST BE HIGH ENOUGH THAT WHEN THE PITCH CHANGE ROD IS INSTALLED IN THE FORK THE PITCH CHANGE ROD CANNOT CONTACT THE PRESS.

(7) Install the unthreaded end of the pitch change rod (240) with the washer (700) through the fork (710). Refer to Figure 7-2

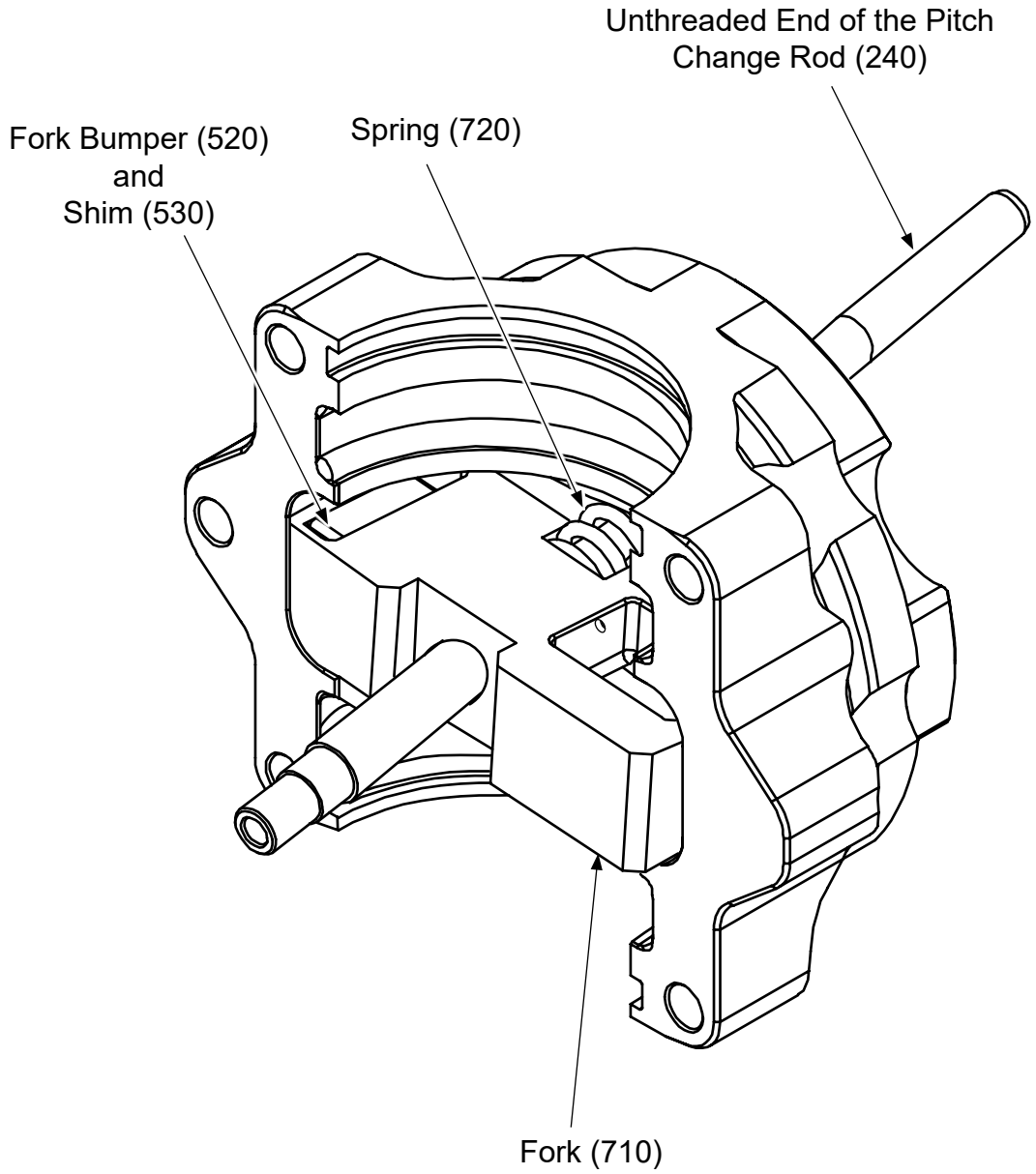
(8) Make sure that the unthreaded end of the pitch change rod (240) cannot contact the surface of the press.

(9) Put the locally fabricated tool on the threaded end of the pitch change rod (240).

(10) Using a press, push on the tool until the pitch change rod (240) and washer (700) are seated in the fork (710). Refer to Figure 7-1.

(11) Remove the pitch change rod (240) and fork (710) from the press.

(12) Make sure that the washer (700) is not distorted and is firmly seated in the fork (710).



Two Blade Propeller - Installation of the Fork and the Pitch Change Rod in the Hub
Figure 7-3

C. Two Blade Bantam Propeller Fork (710), Pitch Change Rod (240), and Pitch Change Block Unit (500) Installation

(1) Apply a thin layer of lubricant CM12 to the spring seat (730).

(2) With the chamfer side to the hub, put the spring seat (730), over the pitch change rod bore in the engine side hub half. Refer to Figure 7-3.

(3) Apply a thin layer of lubricant CM12 to the unthreaded end of the pitch change rod (240).

(4) Apply lubricant CM12 in the slots in the fork (710) for the fork bumpers (520) and shims (530).

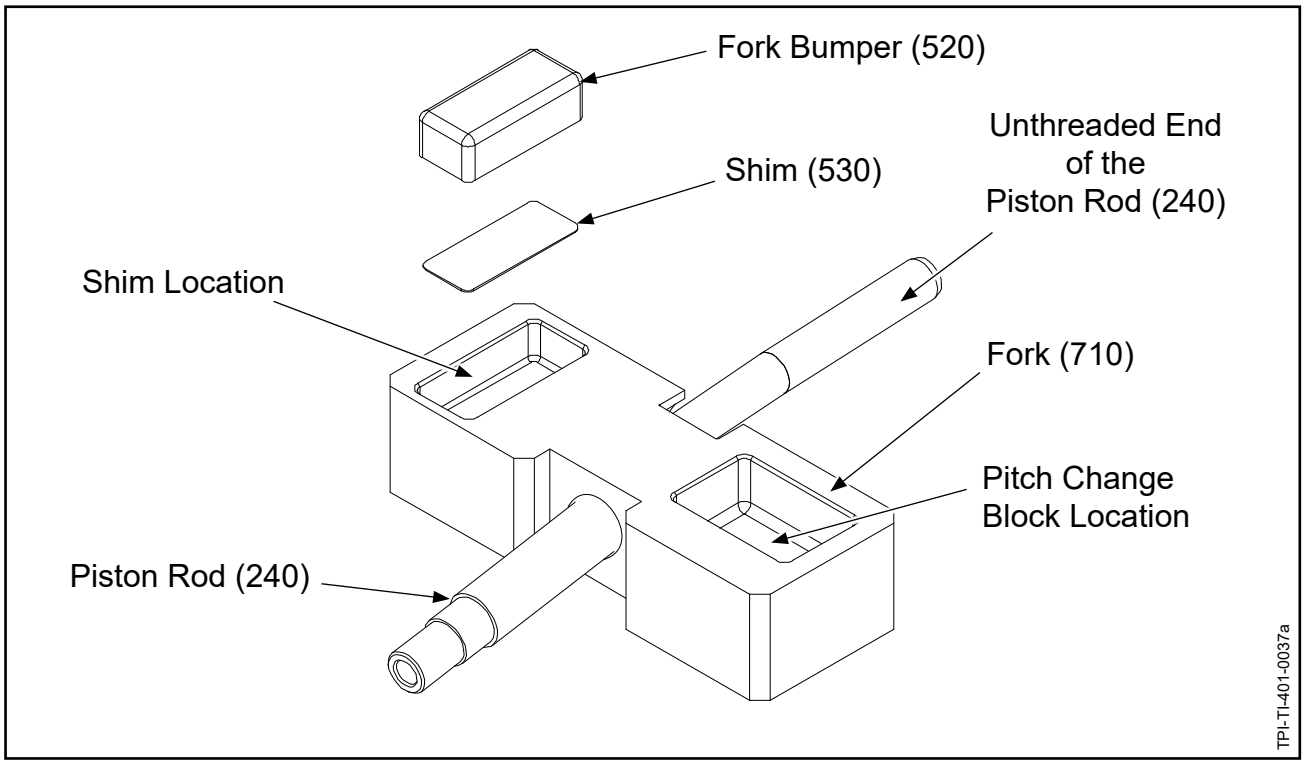
(5) Apply lubricant CM12 in the slots in the fork (710) for the pitch change block units (500).

(6) Install a shim (530) in the shim location of the fork (710) specified in Figure 7-4.

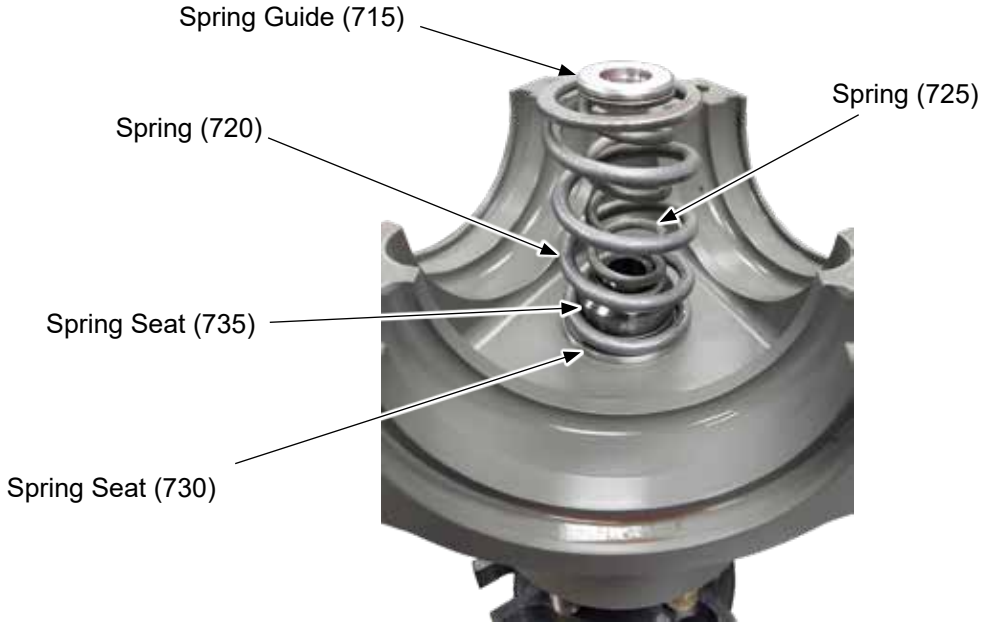
(7) Install a fork bumper (520) on top of the shim (530) in the fork (710). Refer to Figure 7-4.

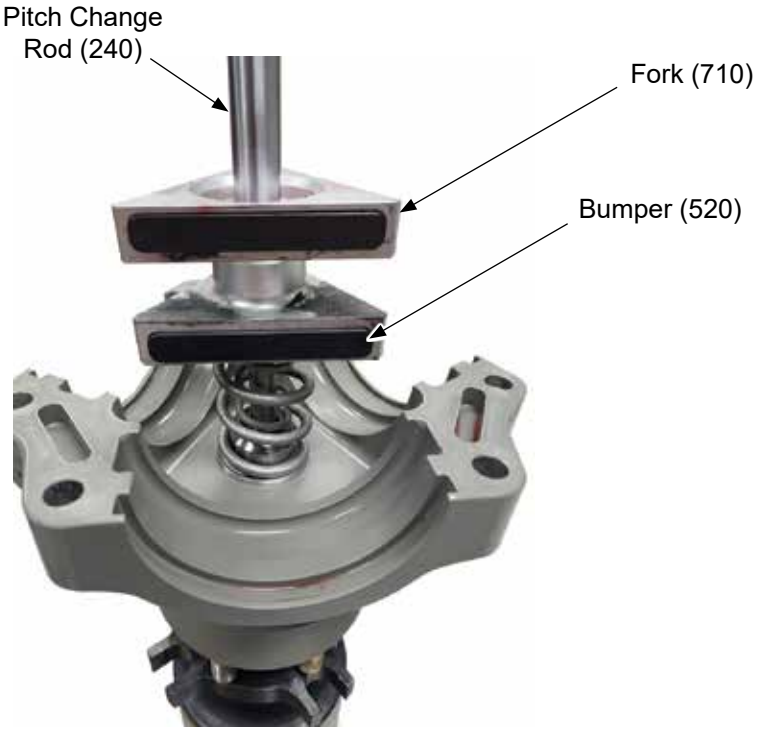
(8) Put the spring (720) on the spring seat (730) in the hub.

(9) Insert the assembled pitch change rod (240)/fork (710) through the spring (720) and the spring seat (730) into the engine side hub bushing (439). Refer to Figure 7-3.



Installation of a Shim for a Two Blade Bantam Propeller Fork
Figure 7-4





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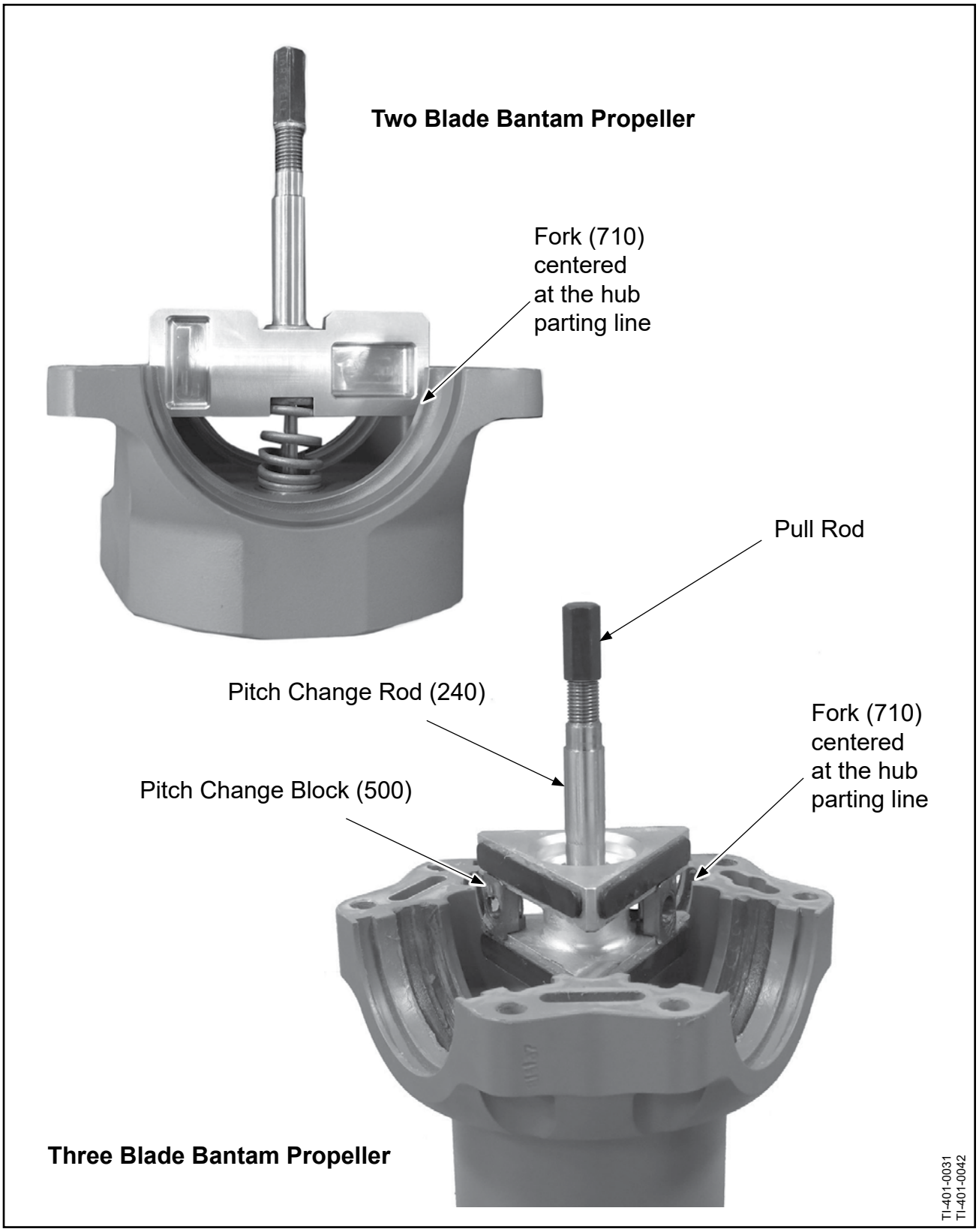
Three Blade Bantam Propeller - Installation of the Fork and the Pitch Change Rod in the Hub
Figure 7-5



Two and Three Blade Bantam Propellers - Fork at the Hub Parting Line
Figure 7-6

(10) Insert the spring compressor pull rod TE548-2 in the pitch change rod (240). Refer to Figure 3-1, Spring Compressor TE548 and Spindle TE536, in the Disassembly chapter of this manual.

(11) Turn the spring compressor pull rod TE548-2 into the spring compressor extension TE548-2.

CAUTION: DO NOT PERMIT THE CENTER OF THE PITCH CHANGE BLOCK SLOT OF THE FORK (710) TO GO BELOW THE PARTING LINE OF THE HUB. TURNING THE SPRING COMPRESSOR PULL ROD TE548-2 TOO FAR MAY DAMAGE THE SPRING (720).

(12) Turn the spring compressor pull rod TE548-2 until the center of the fork (710) is centered at the hub parting line. Refer to Figure 7-6.

(13) Installation of the pitch change block unit (500).

(a) Measure the wall thickness of the side of the pitch change block unit (500) to verify the orientation of the pitch change block unit.

CAUTION: 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.

(b) Using a crayon or soft, non-graphite pencil such as CM162, make a mark on the pitch change block unit (500) for orientation during assembly.

(c) With the thin side of the pitch change block unit (500) facing the engine side hub half, install the pitch change block unit in the fork (710).

1 Pitch change block units (500) marked for orientation during disassembly should be reassembled in accordance with those markings.

D. Three Blade Bantam Propeller Fork (710), Pitch Change Rod (240), and Pitch Change Block Unit (500) Installation

(1) Apply a thin layer of lubricant CM12 to the spring seat (730/735), if applicable.

(2) With the chamfer side to the hub, put the spring seat (730) over the pitch change rod bore in the engine side hub half. Refer to Figure 7-5.

(3) If applicable, put the spring seat (735) over the pitch change rod bore in the engine side hub half. Refer to Figure 7-5.

(4) Put the applicable springs (720/725) on the applicable spring seats (730/735).

(5) Apply a thin layer of lubricant CM12 to the spring guide (715), if applicable.

(6) Put the spring guide (715) over the spring (725), if applicable.

(7) Apply a thin layer of lubricant CM12 to the unthreaded end of the pitch change rod (240).

(8) Apply lubricant CM12 in the slots in the fork (710) for the fork bumpers (520) and shims (530).

(9) Apply lubricant CM12 in the slots in the fork (710) for the pitch change block units (500).

(10) Install a shim (530) in the shim location of the fork (710) as specified in Table 7-1.

(a) Both shims for each blade socket must have the same part number.

(b) The shims from one blade socket to another blade socket may be different part numbers.

1 Installation of a P/N 104940-015, 104940-018, or 104940-020 shim (530) is recommended at the initial assembly. The shim may require replacement after inspection for loose blades.

(11) Install a fork bumper (520) on top of the shim (530) in the fork (710). Refer to Figure 7-5.

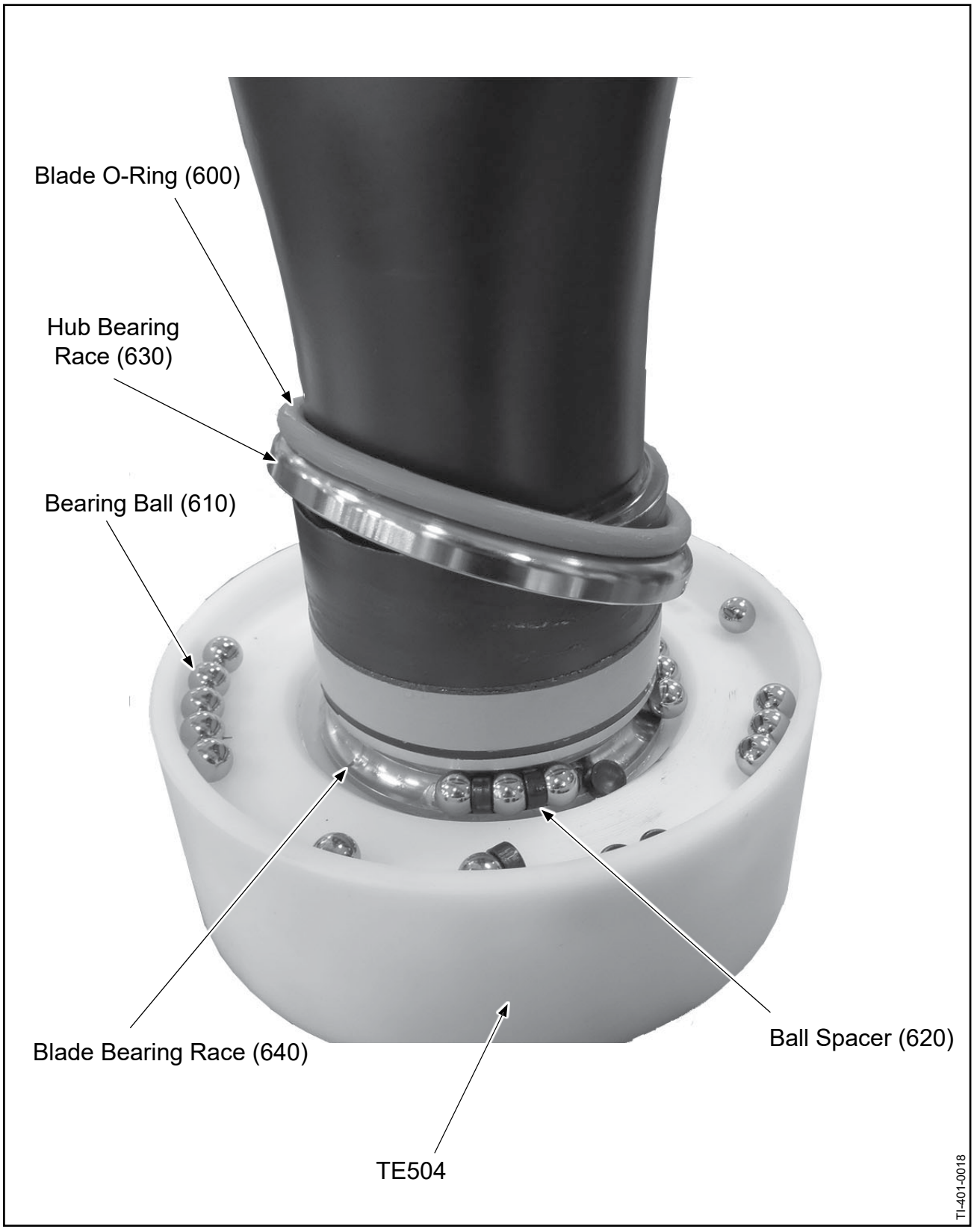
(12) Put the assembled pitch change rod (240)/fork (710) through the applicable springs (720/725), the applicable spring seats (730/735), and spring guide (715) if applicable, into the engine-side hub bushing (439). Refer to Figure 7-5.

(13) Put the spring compressor pull rod TE548-2 through the pitch change rod (240). Refer to Figure 7-6.

(14) Thread the spring compressor pull rod TE548-2 into the spring compressor extension TE548-2.

CAUTION: DO NOT PERMIT THE CENTER OF THE FORK (710) TO GO BELOW THE HUB PARTING LINE. TURNING THE SPRING COMPRESSOR PULL ROD TE548-2 TOO FAR MAY DAMAGE THE SPRING (720).

(15) Turn the spring compressor pull rod TE548-2 until the center of the fork (710) is centered at the hub parting line. Refer to Figure 7-6.



Installation of Balls, Spacers, and Races on Blade
Figure 7-7

(16) Installation of the pitch change block units (500).

(a) Measure the wall thickness of the side of the pitch change block units (500) with the tab.

(b) Mark the pitch change block units (500) for orientation during assembly.

(c) Install the pitch change block units (500) in the fork (710) with the thin side of the pitch change block units facing the engine side hub half.

1 Pitch change block units (500) marked for orientation during disassembly should be reassembled following those markings.

E. Installation of the Blade Bearing Race and Balls

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

(2) Install the blade O-ring (600) on the blade.

(3) Install the hub bearing race (630) on the blade.

(4) Apply a thin layer of lubricant CM12 to the blade retention radius and the teflon.

(5) Using bearing assembly tool TE504, install the split blade bearing races (640), ball spacers (620), and the balls (610). Refer to Figure 7-7.

CAUTION: THE SPLIT BEARING RACES (640) MUST HAVE MATCHING SERIAL NUMBERS.

(a) Install the blade split bearing race (640) on the blade retention radius. There is no specified position for the split bearing race on the blade retention radius.

(b) Hold the hub bearing race (630) inboard of the teflon.

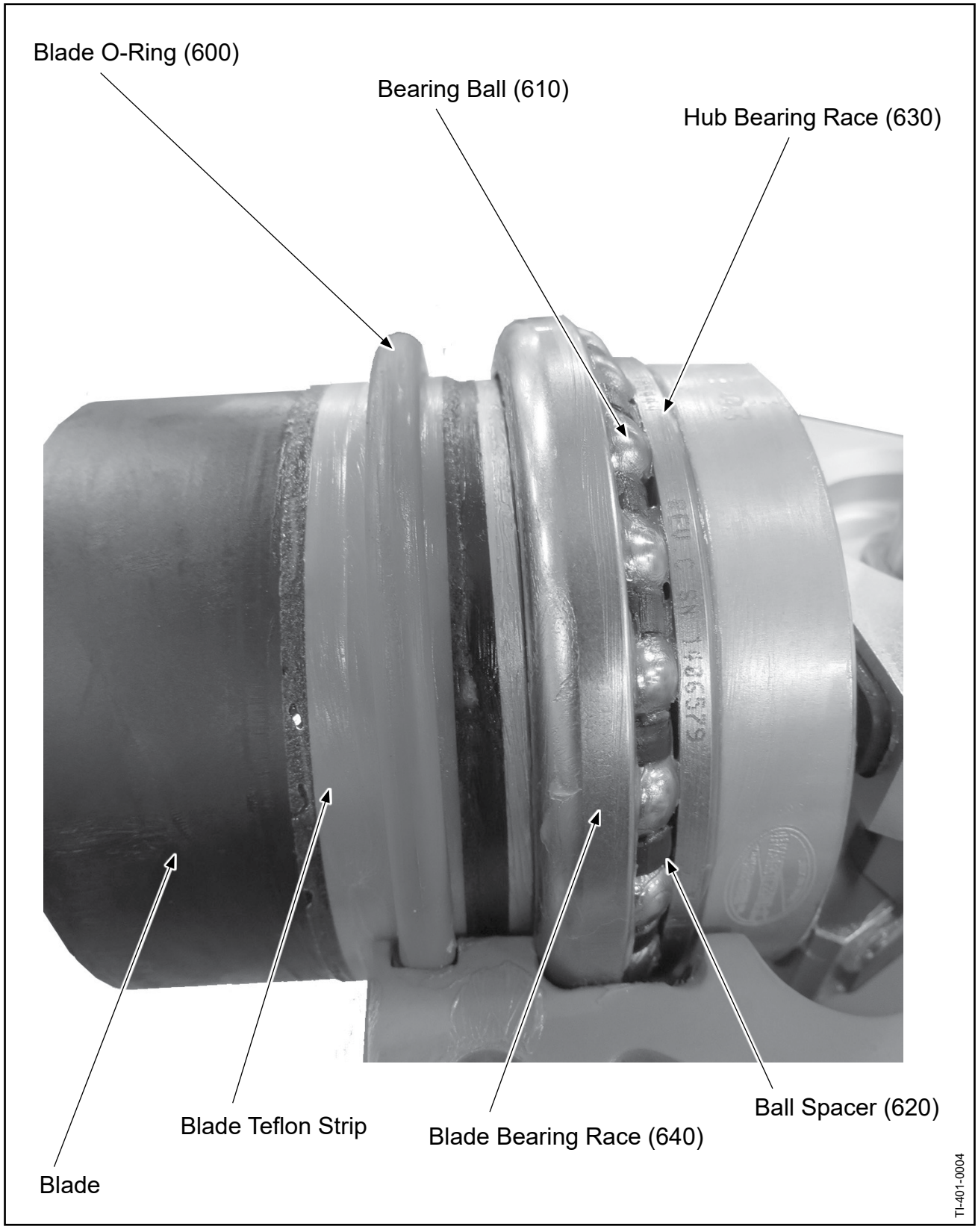
(c) Install the ball spacers (620) and bearing balls (610) on the blade bearing race (640).

CAUTION: ALL THE BEARING BALLS (610) IN A SINGLE BEARING MUST BE OF THE SAME SIZE AND GAUGE. ALL BEARING BALLS SUPPLIED BY HARTZELL PROPELLER INC. ARE THE SAME GAUGE.

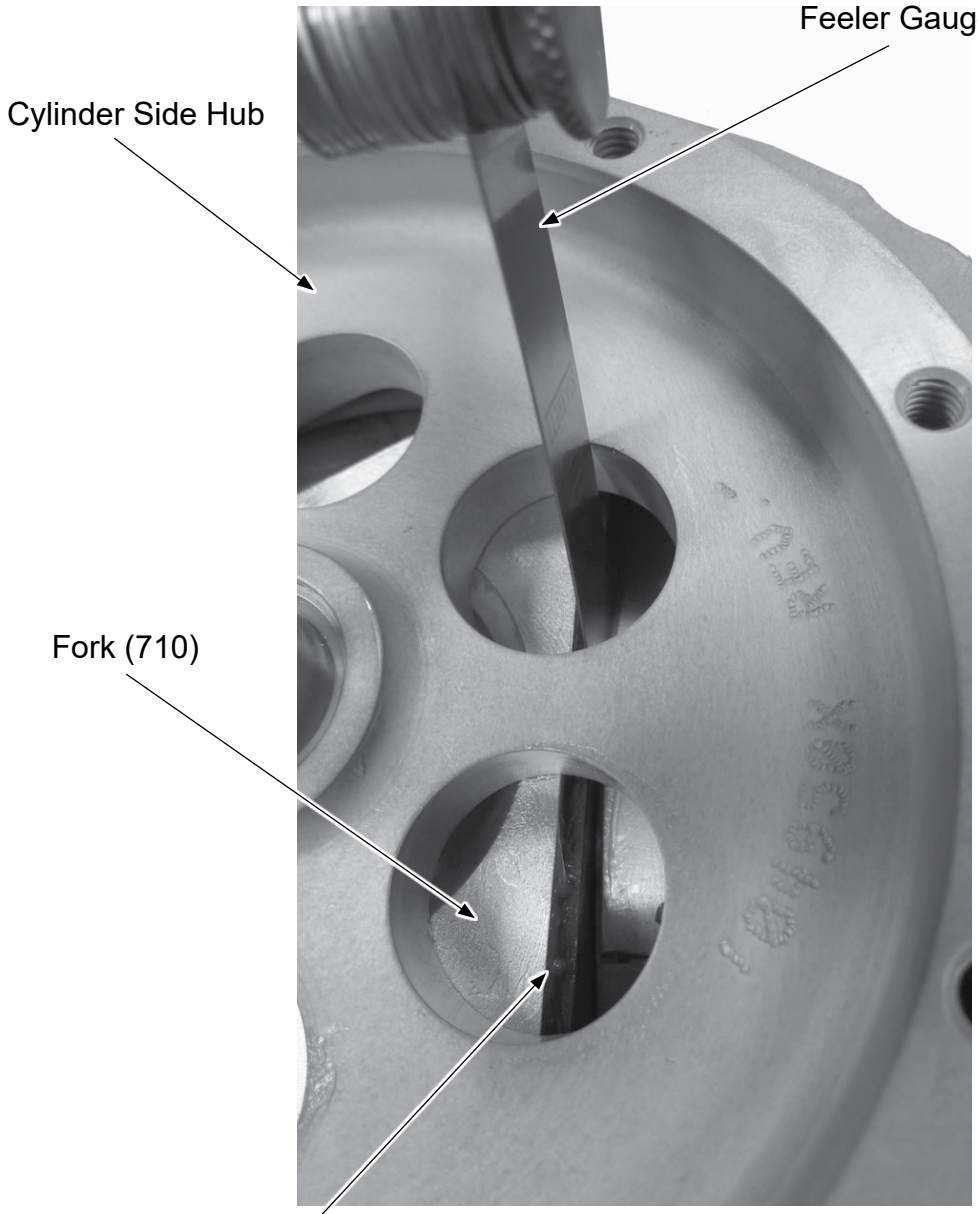
(d) Alternate the bearing balls (610) and the ball spacers (620) on the blade bearing race (640).

(e) Put the hub bearing race (630) on the balls (610).

(f) Put the blade O-ring (600) on the blade teflon.



Installation of the Blade in the Hub
Figure 7-8



Three Blade Bantam Propeller- Determining Stainless Steel Shim Thickness
Figure 7-9

(g) Install the number one blade assembly into the socket of the engine-side hub half. Refer to Figure 7-8.

1 Firmly holding the hub bearing race (630) over the balls (610) and ball spacers (620), install the blade in the hub.

2 Install the pitch change knob in the pitch change block unit (500).

3 Rotate the blade into the blade socket.

4 Make sure that the blade O-ring (600) is evenly seated around the blade and in the hub O-ring groove in the hub.

(h) Repeat section 3.E.(5), "Installation of the Blade Bearing Race and Balls" for each blade.

F. Hub Cylinder-Side Installation

(1) Put the hub guide bushing (433) in the engine side hub half, if applicable.

(2) Install the cylinder-side hub half.

(3) Make sure the blade O-ring (600) is in the O-ring groove of the hub.

(4) Install bolts (400), washers (410), and nuts (420) in the hub on opposite sides of the blade.

(a) For a two blade hub:

1 Install 2 bolts (400), 4 washers (410), and 2 nuts (420)

(b) For a three blade hub:

1 Install 3 bolts (400), 6 washers (410), and 3 nuts (420)

P/N 104940-( ) Shim (530) Sizes	Feeler Gauge Check Resulting Value
104940-012 (0.012 inch [0.304 mm])	Value between 0 and 2.5
104940-015 (0.015 inch [0.381 mm])	Value between 0 and 2.5
104940-018 (0.018 inch [0.457 mm])	Value between 2.6 and 4.5
104940-020 (0.020 inch [0.508 mm])	Value between 4.6 and 7.5
104940-023 (0.023 inch [0.584 mm])	Value between 7.6 and 9.5
104940-025 (0.025 inch [0.635 mm])	Value between 9.6 and 10.5

Three Blade Propeller P/N 104940-( ) Stainless Steel Shim Sizes
Table 7-1

P/N 104468-( ) Bumper (520) Sizes	P/N 105004-( ) Shim (530) Sizes
104468-1 (0.3550 inch [9.014 mm])	105004-013 (0.013 inch [0.330 mm])
104468-2 (0.3350 inch [8.509 mm])	105004-015 (0.015 inch [0.381 mm])
104468-3 (0.3750 inch [9.525 mm])	

Two Blade Propeller P/N 104468-( ) Stainless Steel Bumper and P/N 105004-( ) Stainless Steel Shim Sizes
Table 7-2

Space Between Fork Pocket & Shank	Bumper(s) + Shim(s)
0.3350	104468-2
0.3375	
0.3400	
0.3425	
0.3450	
0.3475	104468-2 +105004-013
0.3500	104468-2 +105004-015
0.3525	
0.3550	104468-1
0.3575	
0.3600	104468-2 +105004-013 +105004-013
0.3625	104468-2 +105004-013 +105004-015
0.3650	104468-2 +105004-015 +105004-015
0.3675	104468-1+105004-013
0.3700	104468-1+105004-015
0.3725	104468-2 +105004-013 +105004-013 +105004-013
0.3750	104468-3
0.3775	104468-2 +105004-013 +105004-015 +105004-015
0.3800	104468-1+105004-013 +105004-013
0.3825	104468-1+105004-013 +105004-015
0.3850	104468-1+105004-015 +105004-015
0.3875	104468-3 +105004-013
0.3900	104468-3 +105004-015
0.3925	104468-1+105004-013 +105004-013 +105004-013
0.3950	104468-1+105004-013 +105004-013 +105004-015
0.3975	104468-1+105004-013 +105004-015 +105004-015
0.4000	104468-3 +105004-013 +105004-013
0.4025	104468-3 +105004-013 +105004-015
0.4050	104468-3 +105004-015 +105004-015
0.4075	
0.4100	
0.4125	104468-3 +105004-013 +105004-013 +105004-013
0.4150	104468-3 +105004-013 +105004-013 +105004-015
0.4175	104468-3 +105004-013 +105004-015 +105004-015
0.4200	104468-3 +105004-015 +105004-015 +105004-015

Two Blade Propeller Bumper Plus Shim Relative Sizes
Table 7-3

(5) Tighten the nuts (420) until snug. Do not torque the nuts at this time.

(6) Three Blade Bantam Propeller Determination of Shimming of the Fork Bumpers (520) Only

(a) Using the spring compressor TE548, position the fork (710) in the center of the hub parting line.

(b) Do not apply pressure on the blades.

(c) Using a feeler gauge, insert the feeler gauge through the holes in the cylinder-side hub half and insert the feeler gauge between the fork bumper (520) and the blade butt. Refer to Figure 7-9.

(d) Make a note of the thickest feeler gauge that will fit.

(e) Shim accordingly to produce a thickness value of 0.003 inch (0.076 mm) to 0.005 inch (0.12 inch) for the proper blade response.

1 Refer to Table 7-1 for the appropriate shim (530) size.

NOTE: Table 7-1 is for reference only. Tolerances may require a dash number shim (530) that does not correspond with the tables.

(f) Blade play should meet the appropriate blade tolerances. Refer to Table 8-2, Blade Tolerances in the Fits and Clearances chapter of this manual.

(g) If blade play cannot be achieved within the permitted limits, contact the Hartzell Propeller Inc. Product Support Department

(h) Repeat the procedure to determine the correct shim (530) for each blade.

(7) Blade Angle Check

(a) Using the spring compressor TE548, turn the pull rod TE-548-2 until the blade angle is at the low pitch blade angle specified for the propeller assembly.

(b) Using blade pitch fixture TE438, measure the blade angles at the 30 inch (762 mm) radius of all of the blades.

(c) If the blade angle differs more than 0.2 degree between blades, make note of the position of the blade that does not meet the specified limits.

(d) If required, correct any blade angle split when shimming the fork bumpers (520).

(8) Shimming of the Fork Bumpers (520) and Blade Angle Correction

(a) Remove the bolts (400), washers (410), and nuts (420) that attach the cylinder-side hub half.

(b) While firmly holding the outer bearing race (640) over the balls (610) and ball spacers (620), remove each blade.

(c) Remove each fork bumper (520).

CAUTION: SHIMMING TOO TIGHT CAN CAUSE INCORRECT PITCH CHANGE OF THE PROPELLER.

(d) Install the correct shim (530) thickness in the fork bumper slot in the fork (710).

1 Refer to Table 7-1, Table 7-2, and Table 7-3 for the appropriate shim (530) size.

NOTE: Table 7-1, Table 7-2, and Table 7-3 are for reference only. Tolerances may require a dash number shim (530) that does not correspond with the tables.

2 For a three blade Bantam propeller only:

a Both shims (530) for each blade socket must be the same part number.

b The shims (530) from one blade socket to another blade socket may be different part numbers.

(e) Blade play should meet the appropriate blade tolerances. Refer to Table 8-2, Blade Tolerances in the Fits and Clearances chapter of this manual.

(f) If blade play cannot be achieved within the permitted limits, contact the Hartzell Propeller Inc. Product Support Department

(g) Repeat the procedure to determine the correct shim (530) for each blade.

(h) Install each fork bumper (520) in the fork bumper slot in the fork (710).

(i) If the blade angle differs more than 0.2 degree between blades, rotate one or more of the pitch change block units (500).

1 Pitch change block units (500) must be installed in the fork (710) with the thin wall toward the engine-side hub half during initial assembly.

2 Rotating the pitch change block unit (500) 180 degrees will decrease the pitch of the corresponding blade 0.3 to 0.4 degree on a tractor propeller.

3 Rotating the pitch change block unit (500) 180 degrees will increase the pitch of the corresponding blade 0.3 to 0.4 degree on a pusher propeller.

(j) Firmly holding the outer bearing race (630) over the balls (610) and ball spacers (620), install the blade in the hub.

1 Install the number one blade assembly into the socket of the engine-side hub half.

2 Install the pitch change knob in the pitch change block unit (500).

3 Rotate the blade into the blade socket.

4 Make sure that the blade O-ring (600) is evenly seated around the blade and in the hub O-ring groove.

(k) Install the cylinder-side hub half.

(l) Install bolts (400), washers (410), and nuts (420) in the hub on opposite sides of the blade.

1 For a two blade hub:

a Install 2 bolts (400), 4 washers (410), and 2 nuts (420)

2 For a three blade hub:

a Install 3 bolts (400), 6 washers (410), and 3 nuts (420)

(m) Tighten the nuts (420) until snug. Do not torque the nuts at this time.

(9) Make sure that the blades rotate freely.

(a) If the blades do not rotate freely, check the blade O-rings (600) for friction or binding.

(10) Repeat section 3.F.(6), "Three Blade Bantam Propeller Determination of Shimming of the Fork Bumpers (520) Only".

(11) Repeat the Blade Angle Check

(a) If there is more than 0.2 degree difference between blades that cannot be corrected, contact the Hartzell Propeller Inc. Product Support Department.

(12) Perform a Blade Play Check

(a) Using light pressure, check blade end-play. Make sure that the maximum permitted blade end-play is within the limits specified in Table 8-2, Blade Tolerances in the Fits and Clearances chapter of this manual. Refer to Figure 8-2, Blade Play in the Fits and Clearances chapter of this manual.

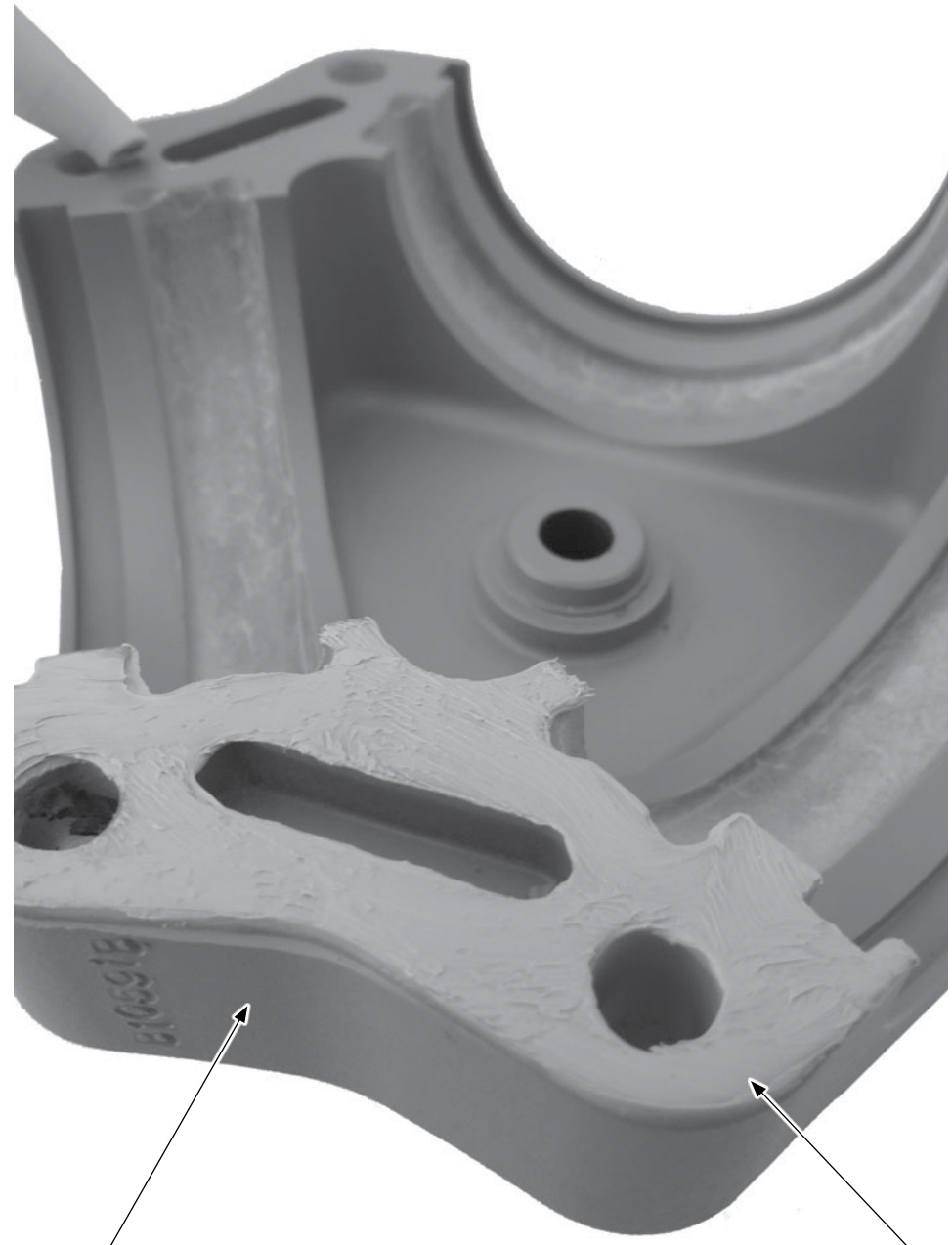
(b) Using light pressure, check blade fore-and-aft play. Make sure that the maximum permitted blade fore-and-aft play is within the limits specified in Table 8-2, Blade Tolerances in the Fits and Clearances chapter of this manual.

(c) Check the blade track. Refer to the Fits and Clearances chapter in this manual for blade track limits.

(d) If blade end-play, fore-and-aft play, or blade track is greater than the limits specified in Table 8-2, Blade Tolerances in the Fits and Clearances chapter of this manual, perform the steps in section 3.F.(8), "Shimming of the Fork Bumpers (520) and Blade Angle Correction" using the next thickest shim (530).

(e) Repeat until blade end-play, fore-and-aft play, or blade track is within the permitted limits.

(f) If blade end-play, fore-and-aft play, or blade track cannot be achieved within the permitted limits, contact the Hartzell Propeller Inc. Product Support Department.



Application of Sealant on the Cylinder-Side Hub Half
Figure 7-10

(13) Installation of the Cylinder-Side Hub Half - Refer to Figure 7-10.

CAUTION: HUB MATING SURFACES MUST BE CLEAN AND FREE OF ALL CONTAMINANTS TO PERMIT SEALING OF THE HUB PARTING LINE.

(a) Using solvent CM106 or CM11, clean the cylinder-side and engine-side hub mating surfaces.

(b) Permit the solvent CM106 or CM11 to dry.

CAUTION: SEALANT CM257 HAS A TACK TIME OF SIX (6) MINUTES.

(c) Apply sealant CM257 to the cylinder-side and engine-side hub mating surfaces.

1 Spread the sealant CM257 to achieve complete coverage of the cylinder-side and engine-side hub mating surfaces.

2 The sealant CM257 must be a smooth, thin, even layer over the entire cylinder-side and engine-side hub mating surfaces.

3 Do not permit the sealant CM257 to enter any of the hub clamping bolt holes.

4 Do not permit excess sealant CM257 to enter the blade O-ring groove.

(d) Within six minutes of applying the sealant CM257, use the hub clamping bolts (400), nuts (420), and washers (410) to attach the cylinder-side hub half to the engine-side hub half.

1 For a two blade hub:

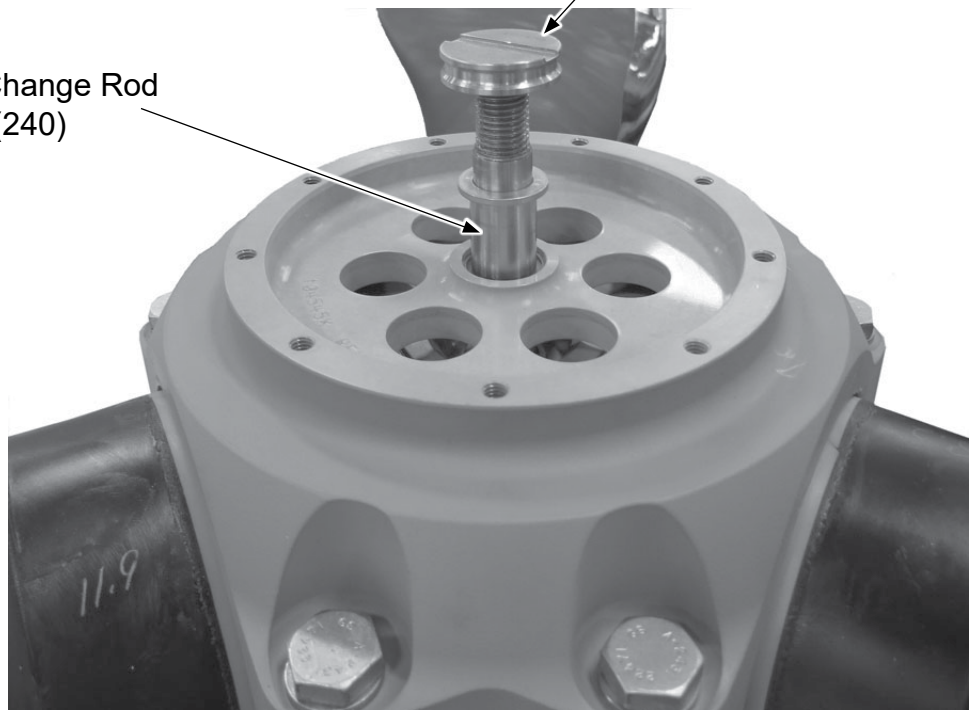
a Install four bolts (400), eight washers (410), and four nuts (420)

2 For a three blade hub:

a Install six bolts (400), 12 washers (410), and six nuts (420)

(e) Using an alternating sequence, torque the hub clamping bolts (400) in accordance with the Table 8-1, Torque Values in the Fits and Clearances chapter of this manual.

(f) Cycle the propeller from low pitch to high pitch 2 or 3 cycles to seat all O-rings.



NOTE: Three Blade Hub Shown for Reference

TI-401-0016

Installation of the 104506 Plug Assembly
Figure 7-11

G. Propeller Balance

(1) Put the cylinder (70) on the hub (430).

(2) Install the balance ring (90) on the cylinder (70).

(3) Using lubricant CM12, lightly lubricate the O-rings (60).

(4) Install an O-ring (60) on each screw (50).

(5) Using screws (50) with O-rings (60) installed in the through drilled holes, install the cylinder (70) on the cylinder-side hub half.

(6) Tighten but do not torque the screws (50)

(7) Install the set screw low pitch stop (250) in the cylinder (70).

(8) Using the set screw low pitch stop (250), set the approximate low pitch specified in Hartzell Propeller Inc. Application Guide 159 (61-00-59).

(9) Tighten the set screw low pitch stop (250) but do not torque at this time.

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

H. Sealant Cure

(1) Permit the sealant CM257 to cure for a minimum of 12 hours.

I. Leak Check the Hub

(1) Apply an index mark on the cylinder (70), balance ring (90), and hub (430).

(2) Remove the set screw low pitch stop (250) from the cylinder (70).

(3) Remove and retain the screws (50) with the O-rings (60).

(4) Remove the cylinder (70) and balance ring (90) from the hub (430).

(5) Put the spring compressor pull rod TE548-2 through the pitch change rod (240).

(6) Turn the spring compressor pull rod TE548-2 into the spring compressor extension TE548-2.

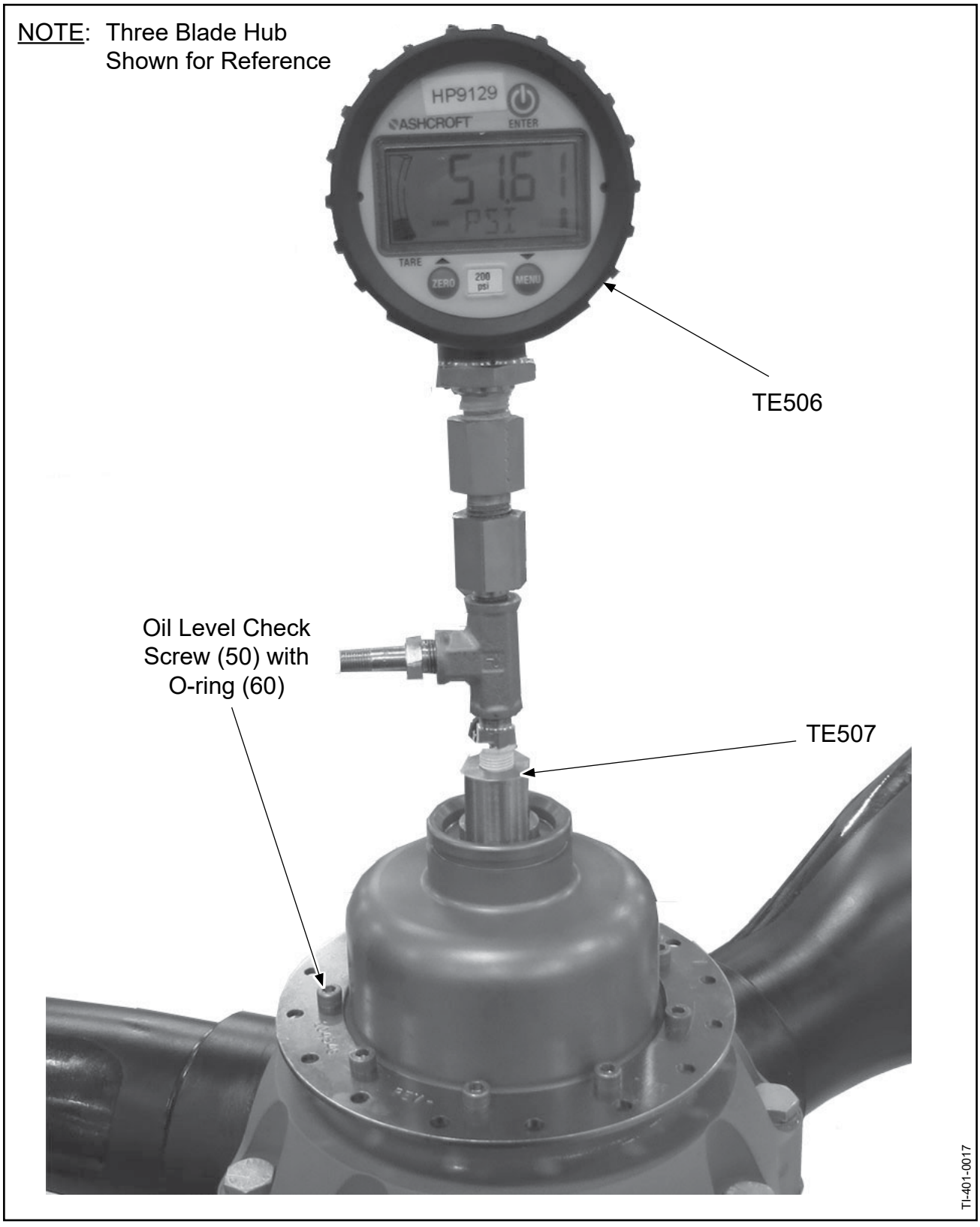
(7) Using the spring compressor pull rod TE548-2, cycle the propeller from low pitch to high pitch for two or three cycles.

(8) Remove the spring compressor pull rod TE548-2.

(9) Make sure that the O-ring C-3317-006 is installed on the plug assembly TE510.

(10) Using lubricant CM12, lightly lubricate the O-ring C-3317-006 on the plug.

(11) Install the plug assembly TE510 in the pitch change rod (240). Refer to Figure 7-11.



Leak Check
Figure 7-12

(12) Using lubricant CM12, lightly lubricate the O-ring (80).

(13) Install the O-ring (80) on the cylinder (70).

(14) Put the cylinder (70) on the hub (430).

(15) Align the index mark on the balance ring (90) to the cylinder (70) and the cylinder-side hub half.

(16) Using three screws (50) with O-rings (60) installed in the through drilled holes, install the cylinder (70) on the cylinder-side hub half.

(17) Tighten but do not torque the screws (50).

(18) Install the leak check manifold TE506 with adapter TE507 to the cylinder (70) as shown in Figure 7-12.

(19) Apply 50-55 PSI (3.44-3.79 Bar) air pressure through the leak check manifold TE506.

(20) Permit the pressure to stabilize.

(21) After air pressure has stabilized, a maximum drop of 1 PSI (0.06 Bar) is permitted in a two minute period.

(22) If the pressure drops more than 3 PSI (0.21 Bar), reapply air pressure and using leak detector CM122 troubleshoot the leak.

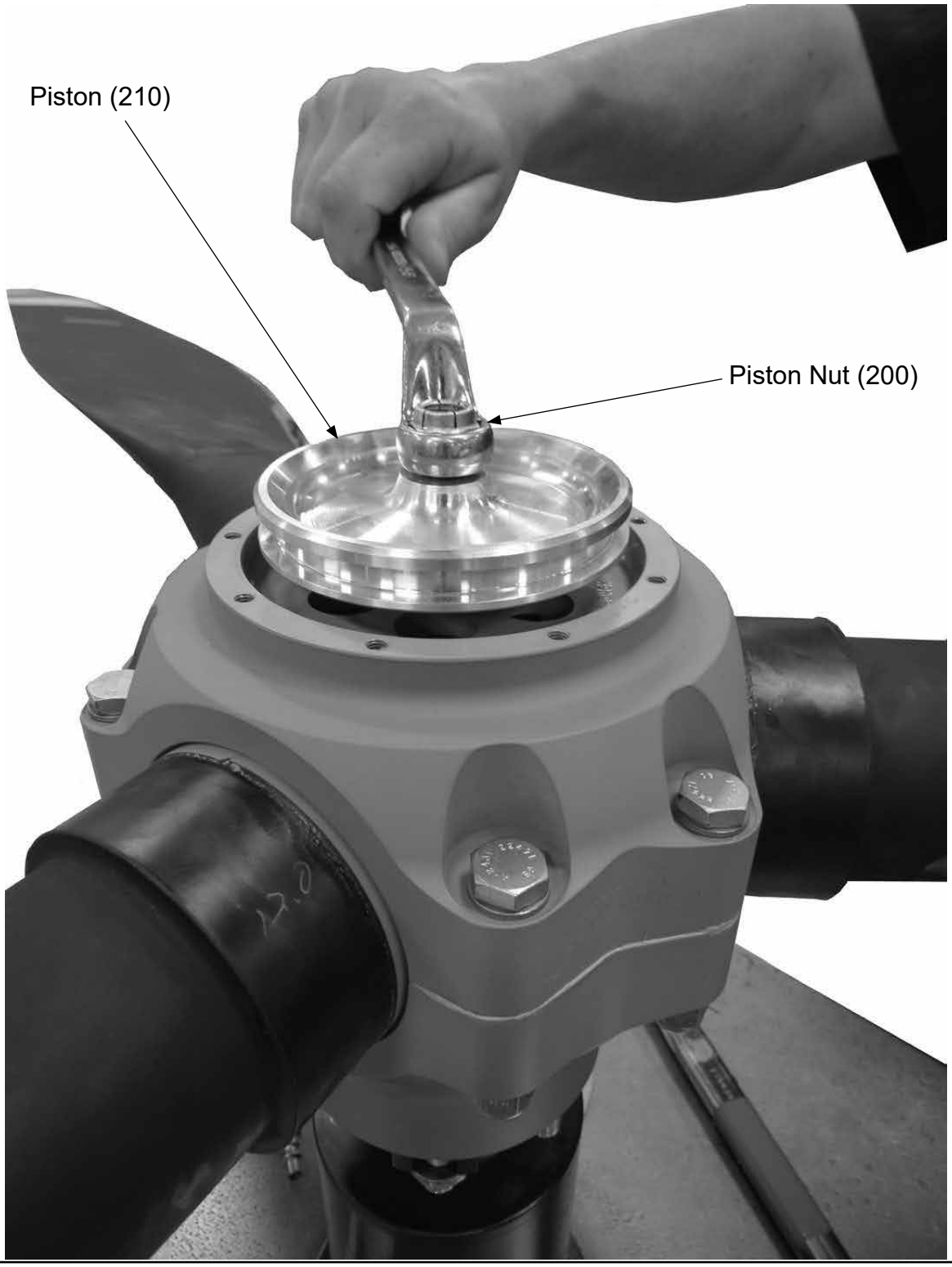
(23) If the pressure drops less than 3 PSI (0.21 Bar), remove the leak check manifold TE506 and adapter TE507.

(24) Remove and retain the screws (50) with the O-rings (60) installed.

(25) Remove the cylinder (70) with O-ring (80) and the balance ring (90).

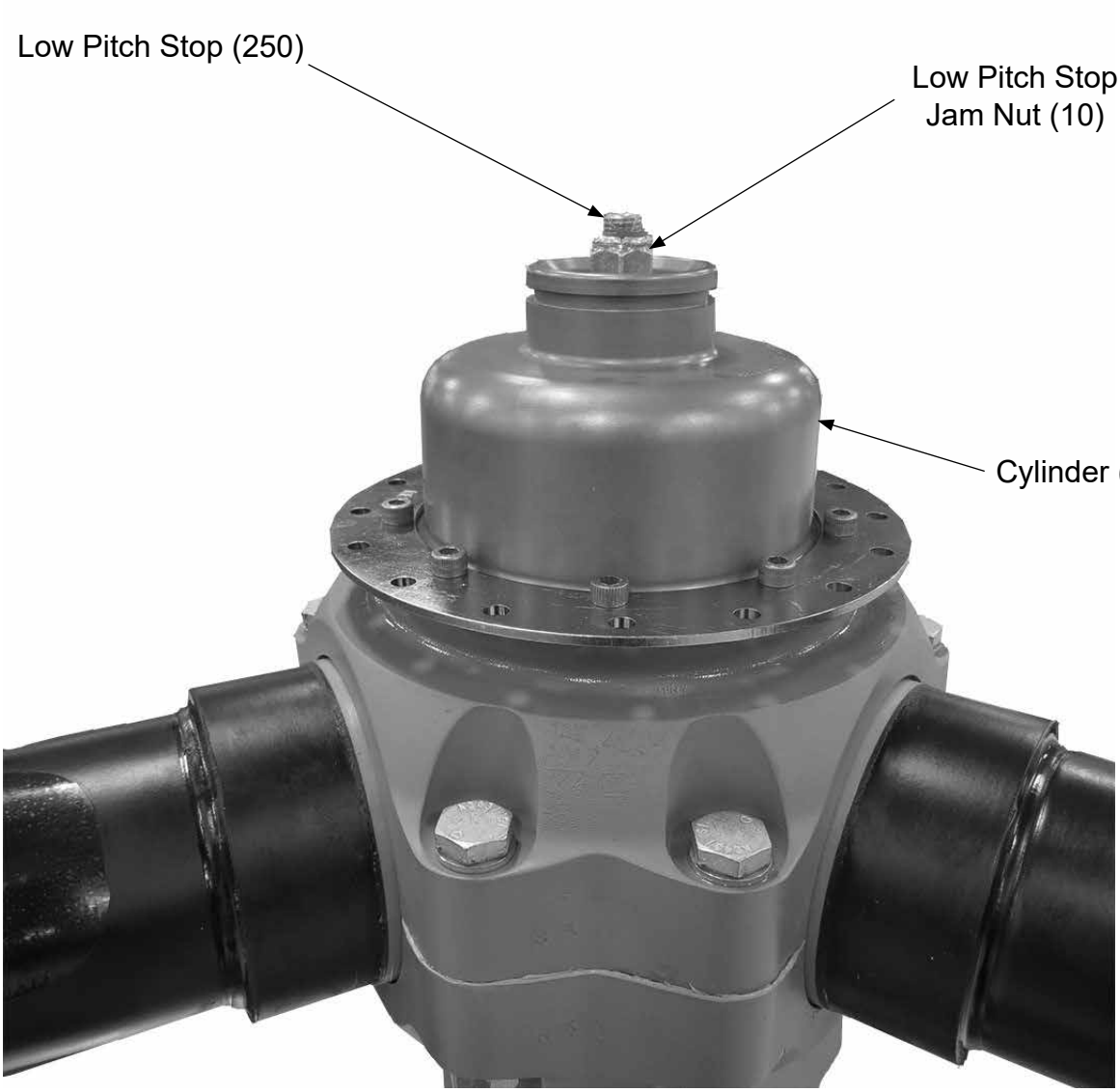
(26) Remove the plug assembly TE510 from the pitch change rod (240).

NOTE: Three Blade Hub Shown for Reference



Piston Installation
Figure 7-13

NOTE: Three Blade Hub Shown for Reference



Low Pitch Stop Installation
Figure 7-14

J. Cylinder Installation

(1) If applicable, install the high pitch stop (75) on the pitch change rod, on the cylinder-side hub half with the ID chamfer to the hub. Refer to Table 7-4.

(2) If applicable, install the washer (260) on the pitch change rod (240).

(3) The Bantam propeller is an oil-filled design. The propeller hub contains a red-dyed oil.

(a) For a two blade Bantam propeller:

(1) Mix 1.6 ml of red dye CM210 with 250 ml oil CM301.

(b) For a three blade Bantam propeller:

(1) Mix 1.6 ml of red dye CM210 with 200 ml oil CM302.

(c) Pour red-dyed oil through the holes in the cylinder-side hub half.

(4) Using lubricant CM12, lightly lubricate the ID piston O-ring (230).

(5) Install the ID piston O-ring (230) in the piston (210) O-ring groove.

(6) Using lubricant CM12, lightly lubricate the OD piston O-ring (220).

(7) Install the OD piston O-ring (230) in the piston (210) O-ring groove.

(8) Install the piston (210) on the pitch change rod (240). Refer to Figure 7-13.

(9) Install the piston nut (200) on the pitch change rod (240). Refer to Figure 7-13.

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

(11) Using lubricant CM12, lubricate the O-ring (80) that is on the cylinder (70).

(12) Install the cylinder (70) with O-ring (80) onto the cylinder-side hub half. Refer to Figure 7-14.

(13) Align the index mark on the balance ring (90) to the cylinder (70) and the cylinder-side hub half and install the balance ring on the cylinder.

High Pitch Stop Part Number	Thickness	Chamfer
105412	0.085 inch (2.15 mm)	45°
105412-030	0.030 inch (0.76 mm)	None
105412-045	0.045 inch (1.14 mm)	45°
105412-060	0.060 inch (1.52 mm)	45°
105412-075	0.075 inch (1.90 mm)	45°
105412-090	0.090 inch (2.28 mm)	45°
105412-105	0.105 inch (2.66 mm)	45°

105412-( ) High Pitch Stop Sizes
Table 7-4

(14) Apply threadlocker CM116 to the threads of the three oil level screws (50).

(15) Install the three oil level check screws (50) with O-rings (60) in the through drilled holes to attach the balance ring (90) and cylinder (70).

(16) Install six screws (40) in the blind holes to attach the balance ring (90) and cylinder (70).

(17) Torque the screws (40 and 50) in an alternating sequence in accordance with Table 8-1, Torque Values, in the Fits and Clearances chapter of this manual.

(18) Apply adhesive CM21 to the threads of the set screw low pitch stop (250).

(19) Install the set screw low pitch stop (250) in the cylinder (70).

(20) Install the seal washer (20) on the low pitch stop (250).

(21) Install the low pitch jam stop nut (10) on the set screw low pitch stop (250). Refer to Figure 7-14.

(22) Verify the low pitch stop angle.

(a) Rotate the blades to the low pitch position and set the propeller pitch in accordance with the aircraft Type Certificate Data Sheet.

(b) Adjust the low pitch blade angle with the low pitch stop screw (250).

NOTE: To increase pitch, turn the low pitch stop clockwise. To decrease pitch, turn the low pitch stop counterclockwise.

(23) Holding the low pitch stop screw (250) in place with an Allen wrench, torque the low pitch stop jam nut (10) in accordance with Table 8-1, Torque Values.

(24) Perform final check of the low pitch blade angle.

(25) If applicable, install the O-ring (950) and forward bulkhead mount (960) in accordance with the instructions in the applicable Hartzell Propeller Inc. Owner's manual. Refer to the Introduction chapter of this manual for a list of the applicable publications.

4. 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, inspected, and statically balanced before blade removal and shipping.

(2) A propeller disassembled for shipping must be assembled by properly rated personnel trained in accordance with Hartzell Propeller Inc. propeller manuals.

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

B. Preparing the Propeller for Shipping

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

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

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

(2) Before removal, make a mark to identify the position and orientation of each pitch change block unit (500) in the pitch change fork unit.

(3) Remove all balance weight screws (800), nuts (820), washers (830), and balance weights (840) from the balance ring (90).

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

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

(6) Propeller Reassembly with Blades Removed for Shipping

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

NOTE: The pitch change block units (500) may be taped in position in the pitch change fork (710).

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

(c) Perform leak check in accordance with this chapter.

(7) Packing the Propeller and Blades for Shipping

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

(b) Pack the propeller without blades for shipping.

(c) Pack the blades for shipping with the blade O-ring (600) and grease on each blade shank.

5. Reassembly of a Propeller Disassembled for Shipping

A. Unpacking the Propeller and Blades

(1) Carefully unpack the propeller and blades from shipping.

(2) Visually examine each propeller component for shipping damage.

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

(b) If damage is found to a blade, refer to Hartzell Propeller Inc. Composite Blade Manual 135F (61-13-35).

B. Preparing Propeller for Reassembly

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

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

(1) Make sure that the alignment marks have been made for each blade assembly to hub, fork unit to hub, spinner bulkhead to hub, cylinder to hub, balance ring to cylinder, and balance weight location on the balance ring.

(2) Remove all balance weight screws (800), nuts (820), washers (830), and balance weights (840).

C. Propeller Reassembly

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

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

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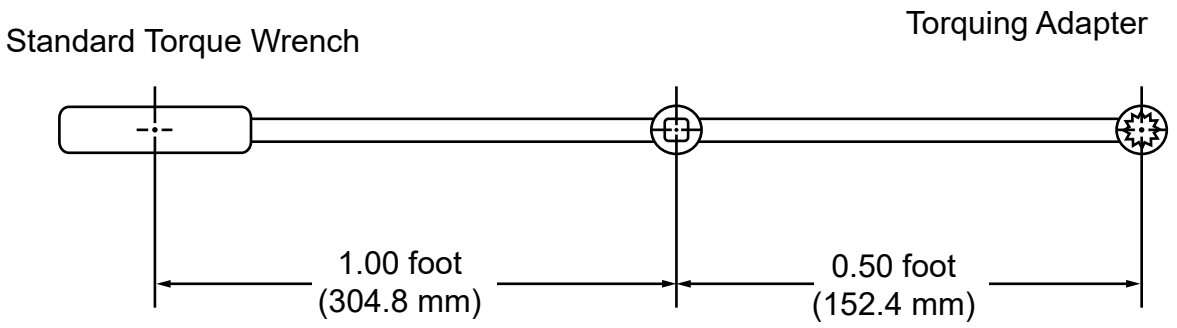


$$\frac{\text{(actual torque required) x (torque wrench length)}}{\text{(torque wrench length) + (length of adapter)}} = \text{torque wrench reading to achieve required actual torque}$$

EXAMPLE:

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

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

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

APS212

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

1. Torque Values (Rev. 2)

A. Important Information

(1) The structural integrity of joints in the propeller that are held together with threaded fasteners is dependent upon proper torque application.

(a) Vibration can cause an incorrectly tightened fastener to fail in a matter of minutes.

(b) Correct tension in a fastener depends on a variety of known load factors and can influence fastener service life.

(c) Correct tension is achieved by application of measured torque.

(2) Use accurate wrenches and professional procedures to make sure of correct tensioning.

(3) For the torque values to use when assembling a Hartzell Propeller Inc. propeller, refer to Table 8-1, "Torque Values" in this chapter.

(4) When an adapter is used with a torque wrench, use the equation in Figure 8-1 to determine the correct torque value.

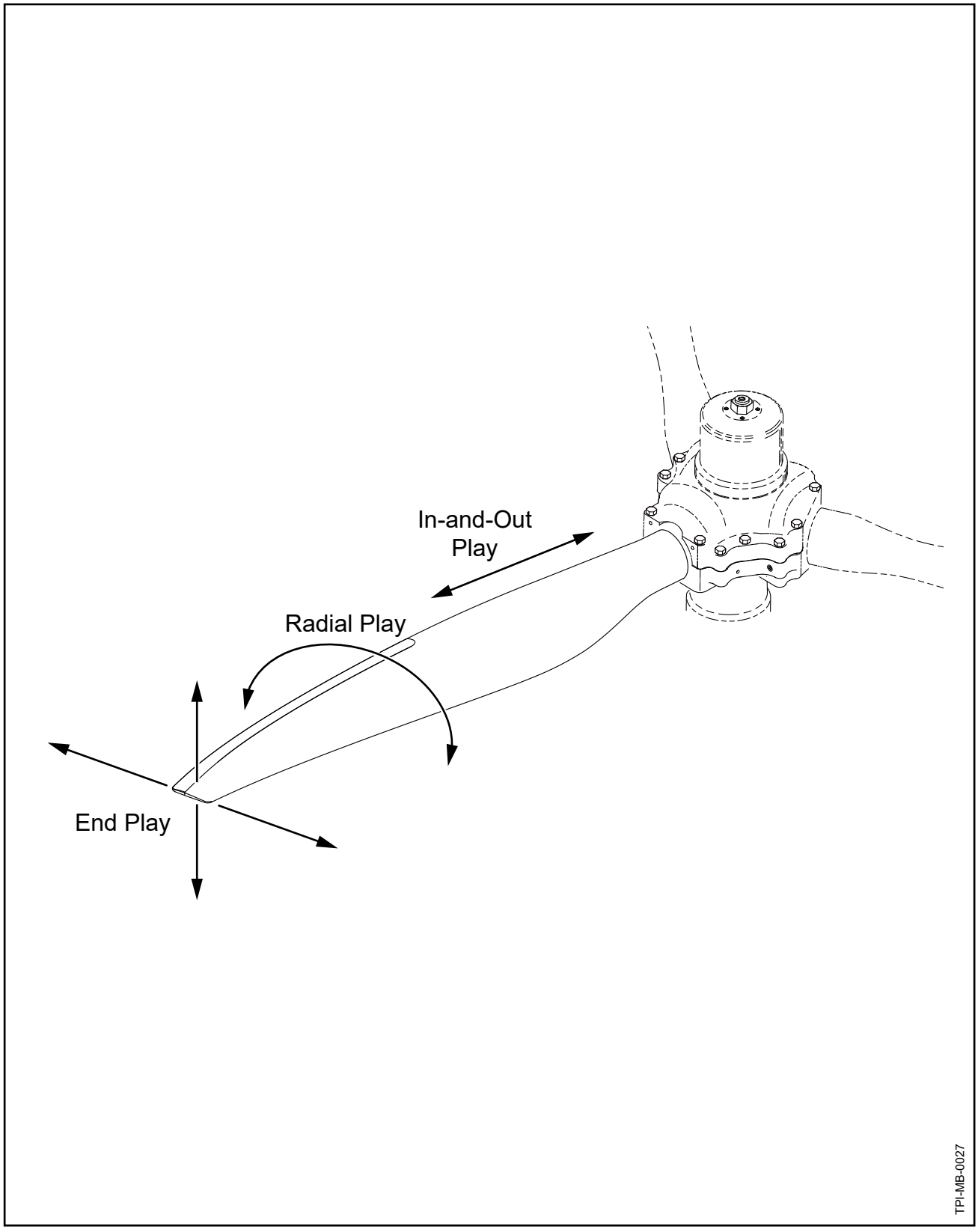
CAUTION 1: TORQUE VALUES ARE BASED ON NON-LUBRICATED THREADS, UNLESS SPECIFIED IN TABLE 8-1.

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

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

Item No.	Part Number	Description	Torque Ft-Lb	Torque In-Lb	Torque N•m
10	A-2043-1	Nut, 3/8-24, Hex, Self-Locking	15	180	21
40	A-2626-2	Screw, 10-32, Cap	5	60	6.7
50	104578	Screw, Oil Level Check	5	60	6.7
200	A-1373	Nut, 7/16-20, Hex, Self-Locking	20	240	27.11
420	A-2043-1	Nut, 3/8-24, Hex, Self-Locking	30	360	41

Torque Values
Table 8-1



Blade Play
Figure 8-2

2. Blade Tolerances (Rev. 3)

A. Blade Play

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

(a)	End Play:	
	Leading Edge to Trailing Edge	0.125 inch (3.17 mm) total
	Fore-and-Aft (face to camber)	0.125 inch (3.17 mm) total
(b)	In-and-Out Play	0.010 inch (0.25 mm)
(c)	Radial Play (pitch change)	±0.5 degree (1 degree total) measured at reference station

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

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

B. Blade Track

(1)	Blade Track	0.250 inch (6.35 mm) total

C. Blade Pitch Tolerance

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

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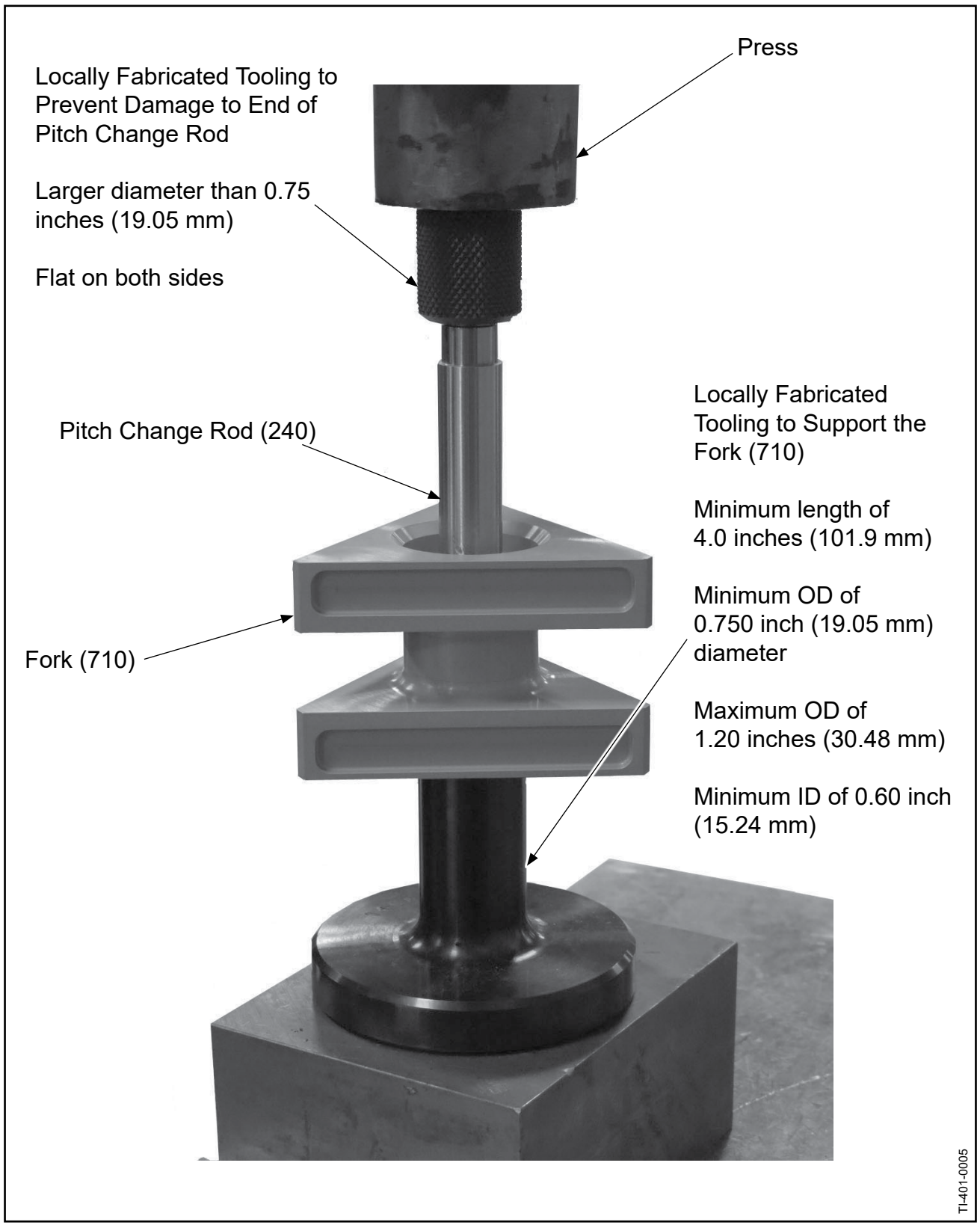

Tooling for Pitch Change Rod to Fork
Figure 9-1

1. Tooling and Facility Requirements

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. Locally Fabricated Tooling

(1) Tooling for Pitch Change Rod (240) to Fork (710) Refer to Figure 9-1.

(a) This locally fabricated tooling is the same tooling that will be used to assemble the washer (260), fork (710), and pitch change rod (240).

(b) Locally fabricate tooling to support the fork (710) and to protect the ends of the pitch change rod (240).

1 The support for the fork (710) must be a minimum length of 4.0 inches (101.9 mm).

2 The support for the fork (710) must have a minimum ID of 0.60 inch (15.24 mm) diameter.

3 The support for the fork (710) must have a minimum OD of 0.750 inch (19.05 mm) diameter and a maximum OD of 1.20 inches (30.48 mm).

4 The support for the fork (710) must be stable enough to support the fork parallel to the surface of the press.

(c) The tooling to press the pitch change rod (240) must have a diameter larger than 0.75 inch (19.05 mm) and flat on both sides.

D. 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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1. Introduction (Rev. 1)

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

A. General

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

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

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

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

B. Counterweights/Slugs/Mounting Hardware

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

C. Spinner Assemblies/Mounting Hardware

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

D. Ice Protection System Components

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

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

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

2. Description of Columns (Rev. 1)

A. Fig./Item Number

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

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

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

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

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

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

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

B. Part Number

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

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

C. Description

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

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

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

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

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

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

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

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

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

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

D. Effectivity Code (EFF CODE)

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

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

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

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

E. Units Per Assembly (UPA)

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

F. Overhaul (O/H)

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

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

G. Propeller Critical Part (PCP)

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

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

3. Description of Terms (Rev. 1)

A. Alternate

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

B. Supersedure

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

C. Replacement

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

D. Obsolete

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

4. Vendor Supplied Hardware (Rev. 1)

A. Important Information

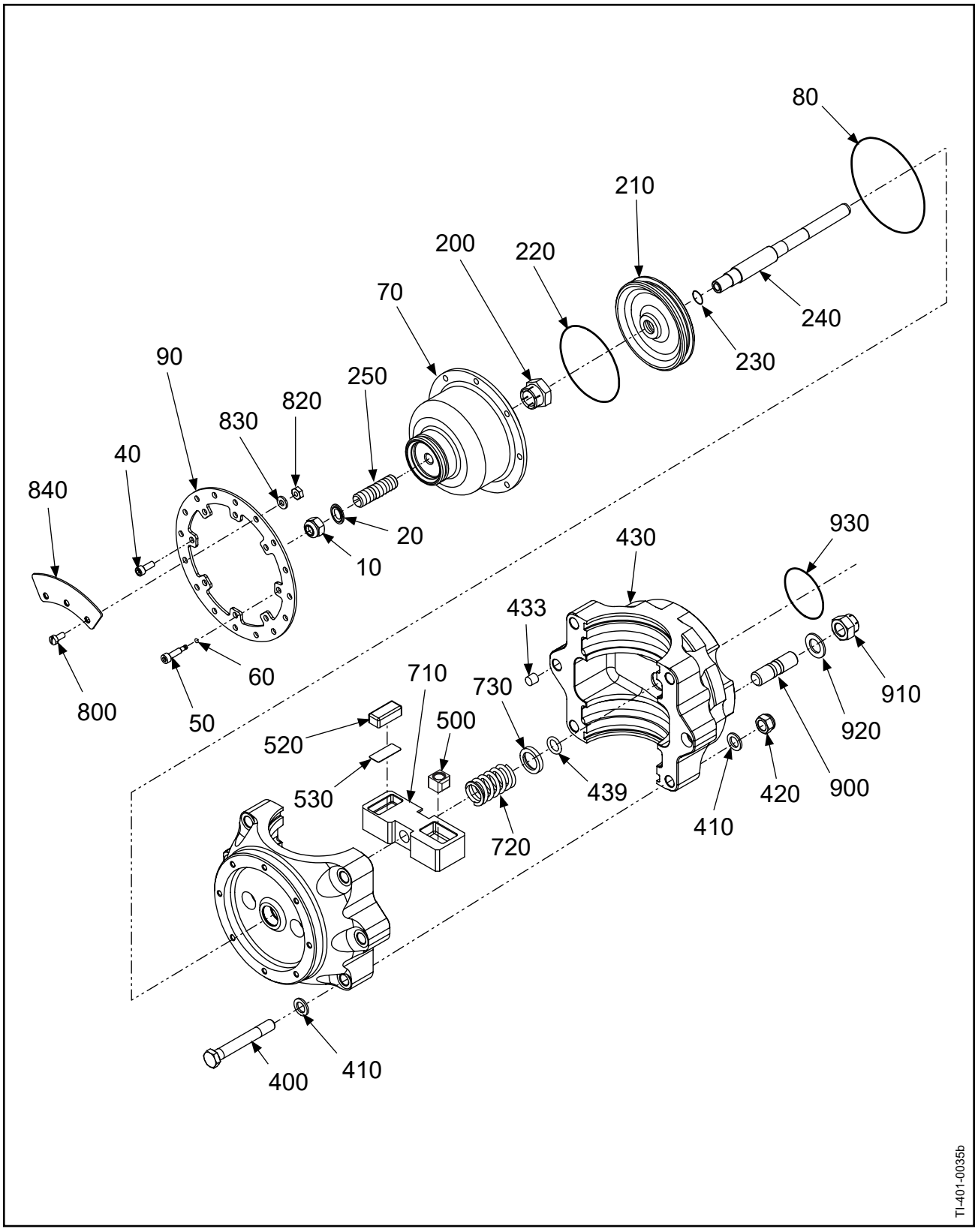
(1) Many O-rings, fasteners, and other vendor supplied hardware listed in Hartzell Propeller Inc. manuals have previously been specified with AN, MS, NAS, or vendor part number. To provide internal controls and procurement flexibility, Hartzell part numbers have been assigned to all O-rings, fasteners,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

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

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

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

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



2A1-HP275A1( ): Propeller Parts
Figure 10-1

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		2A1-HP275A1( )				
10-1		**PROPELLER PARTS**				
10	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		1	Y	
20	B-6747	• SEAL, WASHER		1	Y	
40	A-2626-2	• SCREW, 10-32, CAP		6	Y	
50	104578	• SCREW, OIL LEVEL CHECK		2	Y	
60	C-3317-002	• O-RING		2	Y	
70	105133	• CYLINDER		1		
-75	105130-( )	• STOP, HIGH PITCH		1		
80	C-3317-153	• O-RING		1	Y	
90	105132	• RING, BALANCE		1		
200	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		1	Y	
210	106080	• PISTON		1		
220	C-3317-336-1	• O-RING, PISTON OD		1	Y	
230	C-3317-112	• O-RING, PISTON ID		1	Y	
240	103837-( )	• ROD, PITCH CHANGE		1		
250	102472	• SCREW, SET, 3/8-24 (LOW PITCH STOP)		1		
400	A-2431	• BOLT, 3/8-24, HEX HEAD		6		
410	B-3834-0663	• WASHER		12	Y	
420	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		6	Y	
430	105021	• PCP:HUB UNIT, 2A1-HP275A1 (REFER TO “105021: HUB UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
439	C-3317-111-1	• O-RING, ROD TO BUSHING		1	Y	
500	108500	• PITCH CHANGE BLOCK ASSEMBLY		2		
-501	108499	• • BLOCK, PITCH CHANGE		1		
-502	104954	• • BUSHING		1		

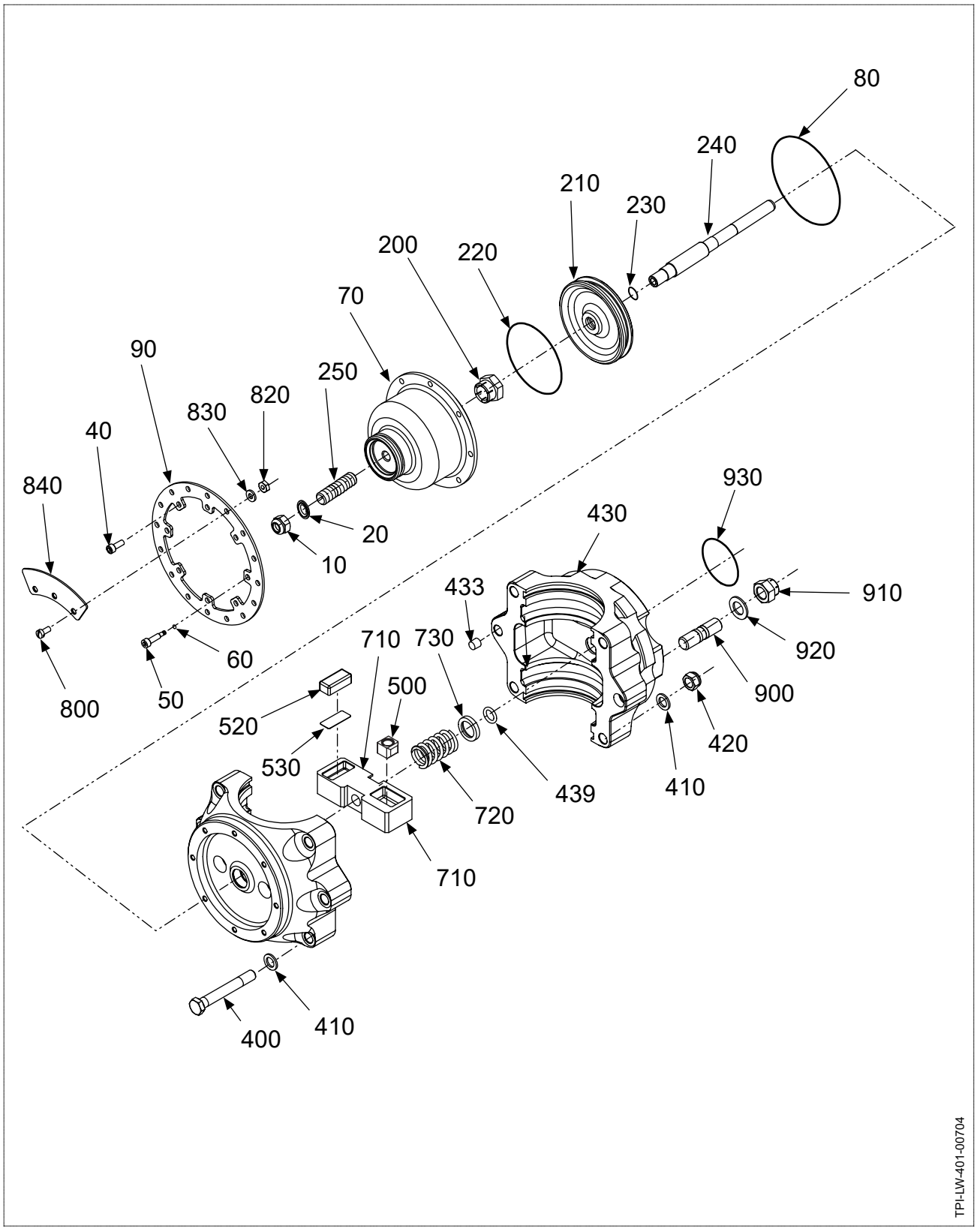
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		2A1-HP275A1( )				
10-1		**PROPELLER PARTS, CONTINUED**				
520	104468-( )	• BUMPER, FORK		2	Y	
530	105004-( )	• SHIM, STAINLESS STEEL		A/R		
700	A-965	• DELETED				
710	108352	• FORK, TWO BLADE		1		
720	108351	• SPRING, COMPRESSION		1		
730	103933	• SPRING SEAT		1		
800	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
820	B-3808-3	• NUT, HEX, SELF-LOCKING		AR	Y	
830	B-3851-0363	• WASHER		AR	Y	
840	104547	• WEIGHT, BALANCE		AR		
		PROPELLER MOUNTING PARTS				
900	A-2429-3	• STUD, MOUNTING, 1/2-20		6	Y	
910	A-2044	• NUT, 1/2-20, HEX, SELF-LOCKING, MOUNTING		6	Y	
920	A-1381	• WASHER, 1/2" CRES, MOUNTING		6	Y	
930	C-3317-225-1	• O-RING, MOUNTING		1	Y	
-950	C-3317-129	• O-RING, CYLINDER/SPINNER DOME		1	Y	
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		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



2A1-HP450A1( ): Propeller Parts
Figure 10-2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		2A1-HP450A1( )				
10-2		**PROPELLER PARTS**				
10	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		1	Y	
10A	B-3359	• NUT, 3/8-24, HEX HEAD, ALTERNATE FOR ITEM 10		1	Y	
20	B-6747	• SEAL, WASHER		1	Y	
40	A-2626-2	• SCREW, 10-32, CAP		6	Y	
50	104578	• SCREW, OIL LEVEL CHECK		2	Y	
60	C-3317-002	• O-RING		2	Y	
70	105133	• CYLINDER		1		
-75	105130-406	• STOP, HIGH PITCH		1		
80	C-3317-153	• O-RING		1	Y	
90	105132	• RING, BALANCE		1		
200	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		1	Y	
210	106080	• PISTON		1		
220	C-3317-336-1	• O-RING, PISTON OD		1	Y	
230	C-3317-112	• O-RING, PISTON ID		1	Y	
240	103837-( )	• ROD, PITCH CHANGE		1		
250	102472	• SCREW, SET, 3/8-24 (LOW PITCH STOP)		1		
400	A-2431	• BOLT, 3/8-24, HEX HEAD		6		
410	B-3834-0663	• WASHER		12	Y	
420	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		6	Y	
430	106052	• PCP:HUB UNIT, 2A1-HP450A1 (REFER TO “106052: HUB UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
439	C-3317-111-1	• O-RING, ROD TO BUSHING		1	Y	
500	108500	• PITCH CHANGE BLOCK ASSEMBLY		2		
-501	108499	• • BLOCK, PITCH CHANGE		1		
-502	104954	• • BUSHING		1		

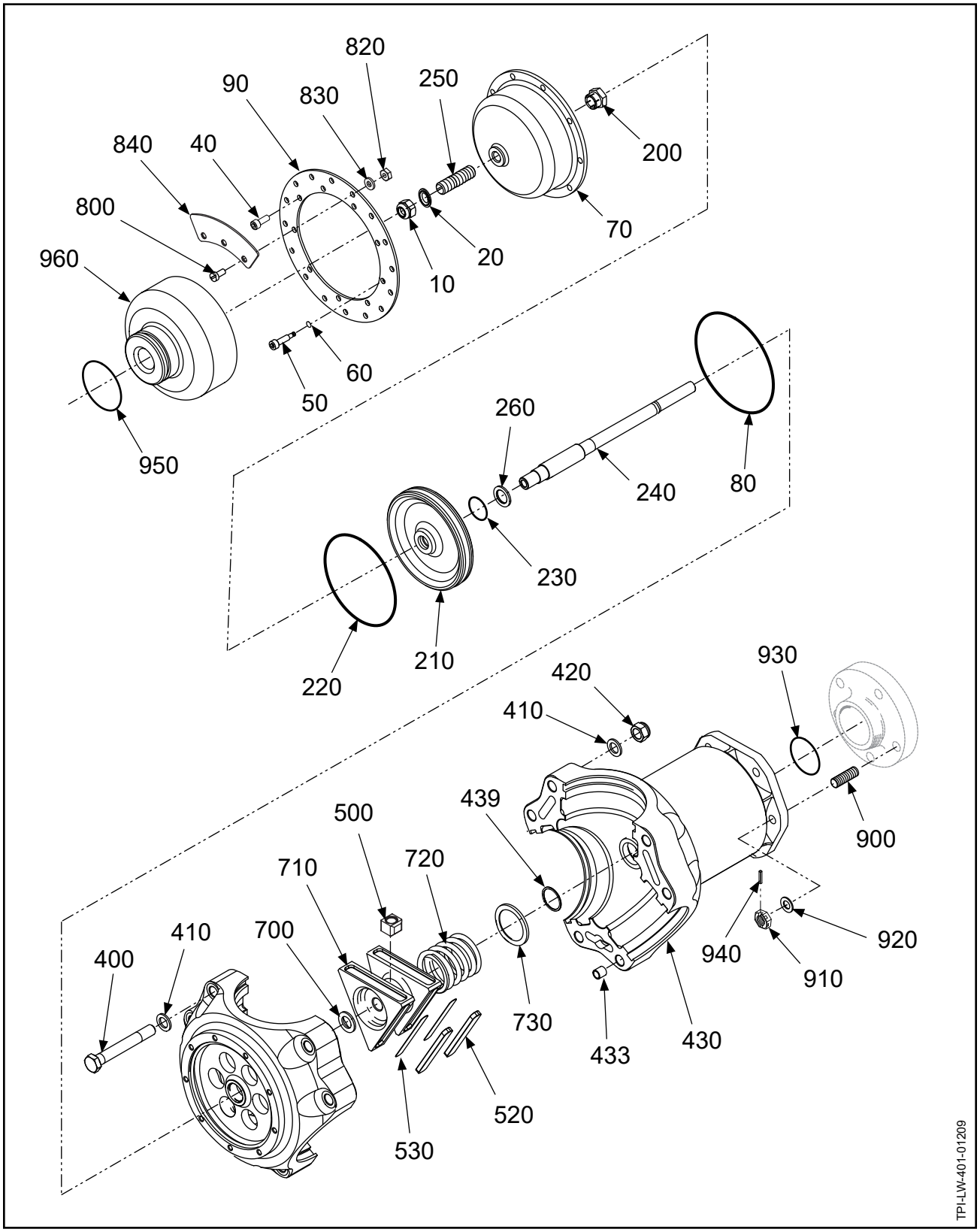
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		2A1-HP450A1( )				
10-2		**PROPELLER PARTS, CONTINUED**				
520	104468-( )	• BUMPER, FORK		2	Y	
530	105004-( )	• SHIM, STAINLESS STEEL		A/R		
710	108352	• FORK, TWO BLADE		1		
720	108351	• SPRING, COMPRESSION		1		
730	103933	• SPRING SEAT		1		
800	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
820	B-3808-3	• NUT, HEX, SELF-LOCKING		AR	Y	
830	B-3851-0363	• WASHER		AR	Y	
840	104547	• WEIGHT, BALANCE		AR		
		PROPELLER MOUNTING PARTS				
900	A-2429-5	• STUD, MOUNTING, 1/2-20		6	Y	
910	A-2044	• NUT, 1/2-20, HEX, SELF-LOCKING, MOUNTING		6	Y	
920	A-1381	• WASHER, 1/2" CRES, MOUNTING		6	Y	
930	C-3317-225-1	• O-RING, MOUNTING		1	Y	
-950	C-3317-129	• O-RING, CYLINDER/SPINNER DOME		1	Y	
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		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



3A1-G353A2(L)X( ): Propeller Parts
Figure 10-3

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3A1-G353A2(L)X( )				
10-3		**PROPELLER PARTS**				
10	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		1	Y	
10A	B-3359	• NUT, 3/8-24, HEX, SELF-LOCKING ALTERNATE FOR ITEM 10		1	Y	
20	B-6747	• SEAL, WASHER		1	Y	
40	A-2626-2	• SCREW, 10-32, CAP		6	Y	
50	104578	• SCREW, OIL LEVEL CHECK		3	Y	
60	C-3317-002	• O-RING		3	Y	
70	104666	• CYLINDER		1		
-75	106017-( )	• STOP, HIGH PITCH		1		
80	C-3317-154	• O-RING		1	Y	
90	104546	• RING, BALANCE		1		
200	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		1	Y	
210	106080	• PISTON		1		
220	C-3317-336-1	• O-RING, PISTON OD		1	Y	
230	C-3317-112	• O-RING, PISTON ID		1	Y	
240	103837	• ROD, PITCH CHANGE		1		
250	102472	• SCREW, SET, 3/8-24 (LOW PITCH STOP)		1		
260	103906	• WASHER		1		
400	A-2431	• BOLT, 3/8-24, HEX HEAD		6		
410	B-3834-0663	• WASHER		12	Y	
420	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		6	Y	
430	104661X	• PCP:HUB UNIT, 3A1-G353-A1X (REFER TO “104661X: HUB UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
439	C-3317-111-1	• O-RING, ROD TO BUSHING		1	Y	
500	108512	• PITCH CHANGE BLOCK UNIT		3		
-501	108511	• • BLOCK, PITCH CHANGE		1		
-502	104954	• • BUSHING		1		

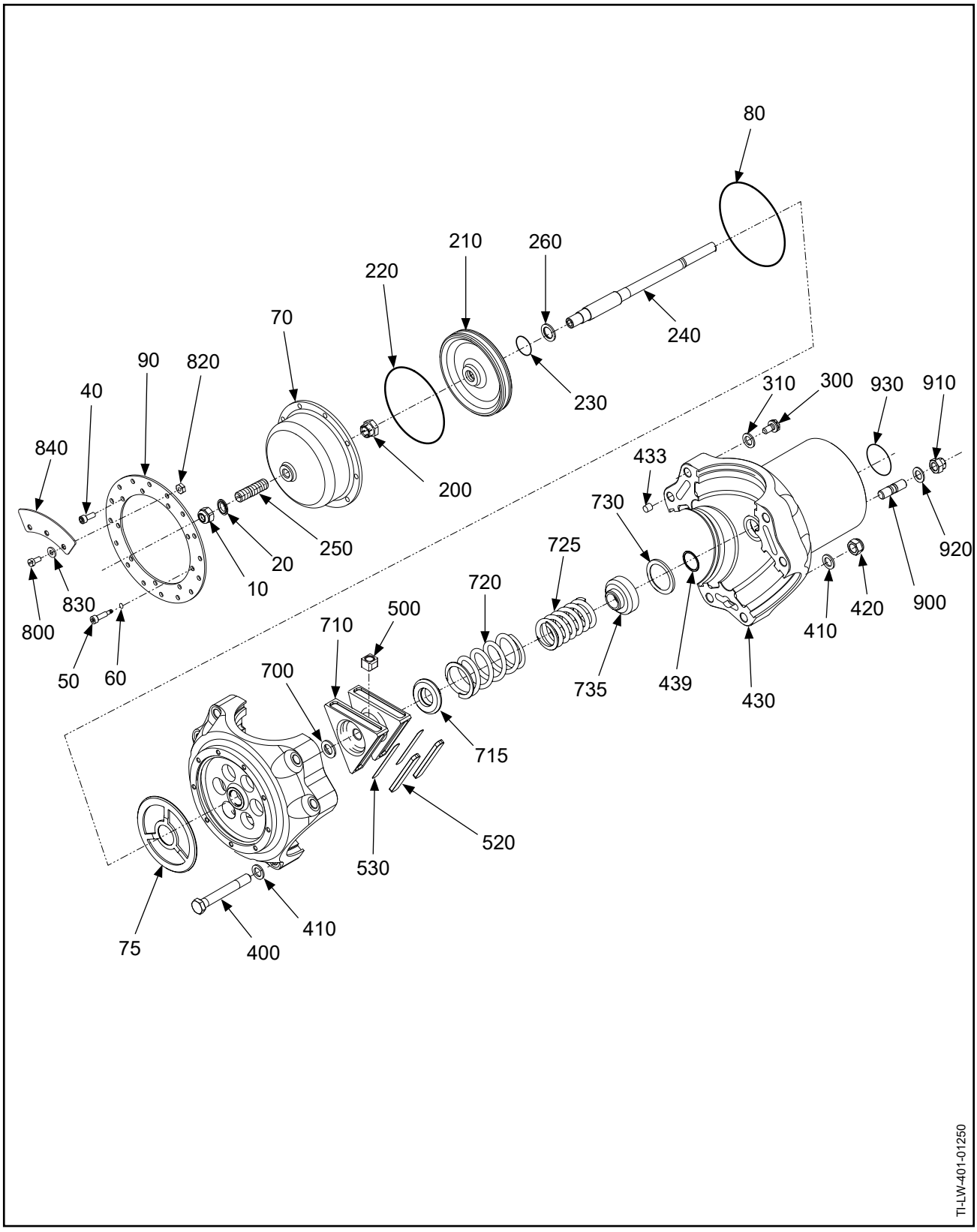
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3A1-G353A2(L)X( )				
10-3		**PROPELLER PARTS, CONTINUED**				
520	104763	• BUMPER, FORK		6	Y	
530	104940-( )	• SHIM, STAINLESS STEEL		A/R		
700	A-965	• WASHER, 7/16, CRES		1	Y	
710	104919	• FORK, THREE BLADE		1		
720	105282	• SPRING, COMPRESSION		1		
730	103881	• SEAT, SPRING		1		
800	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		6	Y	
820	B-3808-3	• NUT, HEX, SELF-LOCKING		6	Y	
840	104547	• WEIGHT, BALANCE		2		
		PROPELLER MOUNTING PARTS				
900	104606( )X	• STUD, MOUNTING, M8 - 1.25		6	Y	
910	104339X	• NUT, M8 X1.25 MTG, CASTELLATED		6	Y	
920	B-3851-0563	• WASHER, MOUNTING		6	Y	
930	C-3317-225-1	• O-RING, MOUNTING		1	Y	
940	B-3842-0500	• SPRING PIN, 3/32" CRES.		6	Y	
950	C-3317-129	• O-RING, CYLINDER/SPINNER DOME		1	Y	
960	105330	• MOUNT, FORWARD BULKHEAD		1		
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		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



3A1-QP460A1: Propeller Parts
Figure 10-4

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3A1-QP460A1				
10-4		**PROPELLER PARTS**				
10	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		1	Y	
20	B-6747	• SEAL, WASHER		1	Y	
40	A-2626-2	• SCREW, 10-32, CAP		6	Y	
50	104578	• SCREW, OIL LEVEL CHECK		3	Y	
60	C-3317-002	• O-RING		3	Y	
70	105218	• CYLINDER		1		
75	105412-( )	• STOP, HIGH PITCH		1		
80	C-3317-154	• O-RING		1	Y	
90	104546	• RING, BALANCE		1		
200	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		1	Y	
210	104255	• PISTON		1		
220	C-3317-339-1	• O-RING, PISTON OD		1	Y	
230	C-3317-112	• O-RING, PISTON ID		1	Y	
240	103837	• ROD, PITCH CHANGE		1		
250	102472	• SCREW, SET, 3/8-24 (LOW PITCH STOP)		1		
260	103906	• WASHER		1		
400	A-2431	• BOLT, 3/8-24, HEX HEAD		6		
410	B-3834-0663	• WASHER		12	Y	
420	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		6	Y	
430	104545-1	• PCP: HUB UNIT, 3A1-QP460A1 (REFER TO “104545-1: HUB UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
439	C-3317-111-1	• O-RING, ROD TO BUSHING		1	Y	
500	108512	• PITCH CHANGE BLOCK UNIT		3		
-501	108511	• • BLOCK, PITCH CHANGE		1		
-502	104954	• • BUSHING		1		

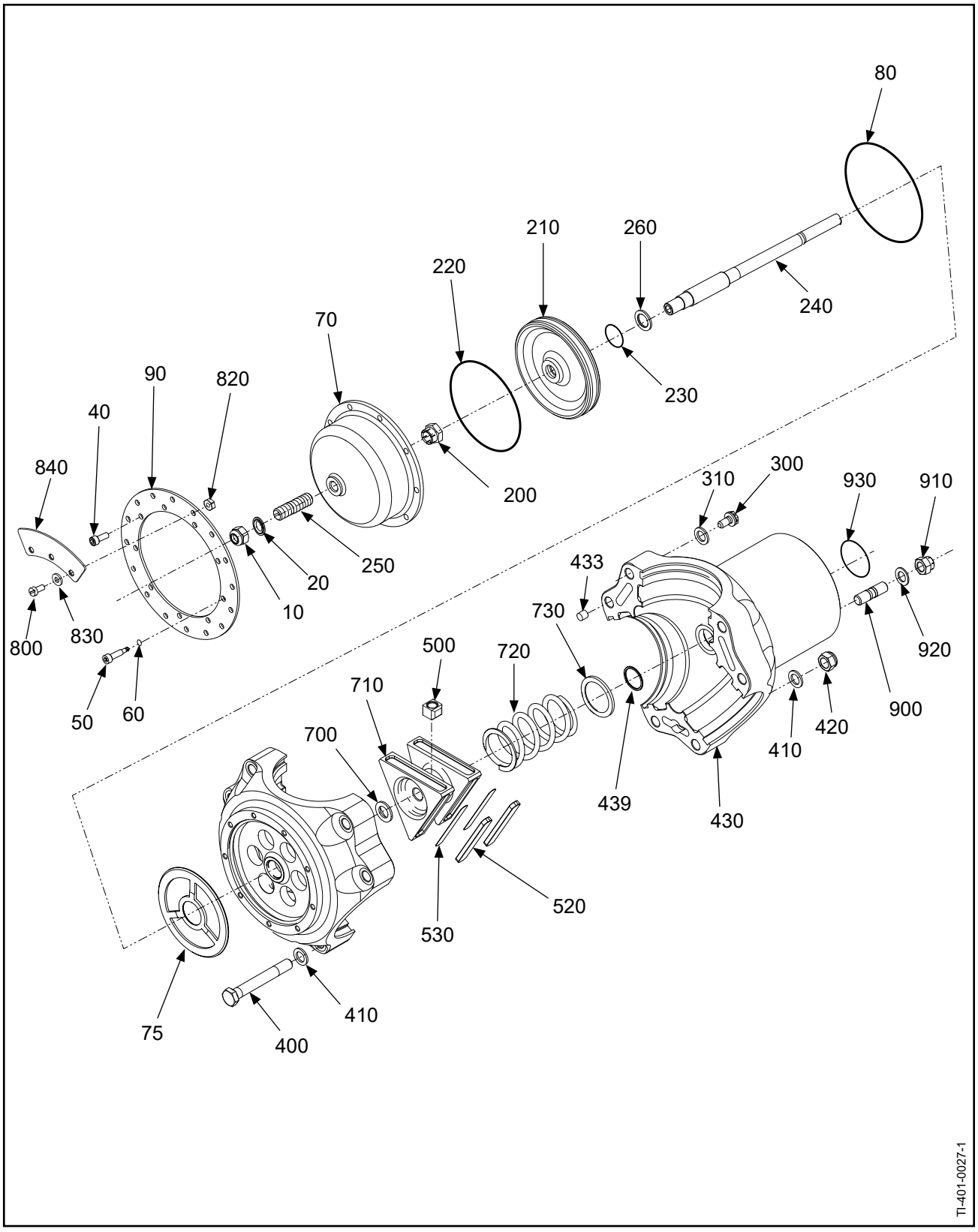
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3A1-QP460A1				
10-4		**PROPELLER PARTS, CONTINUED**				
520	104763	• BUMPER, FORK		6	Y	
530	104940-( )	• SHIM, STAINLESS		A/R		
700	A-965	• WASHER, 7/16, CRES		1	Y	
710	104919	• FORK, THREE BLADE		1		
715	109242	• GUIDE, SPRING		1		
720	105282	• SPRING, COMPRESSION		1		
725	109252	• SPRING, COMPRESSION		1		
730	103881	• SEAT, SPRING		1		
735	109241	• SPRING SEAT		1		
800	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		6	Y	
820	B-3808-3	• NUT, HEX, SELF-LOCKING		6	Y	
830	B-3851-0363	• WASHER		6	Y	
840	104547	• WEIGHT, BALANCE		A/R		
		PROPELLER MOUNTING PARTS				
900	A-2429-9	• STUD, MOUNTING, 1/2-20		6	Y	
910	A-2044	• NUT, 1/2-20, HEX, SELF-LOCKING, MOUNTING		6	Y	
920	103555	• WASHER, MOUNTING		6	Y	
930	C-3317-225-1	• O-RING, MOUNTING		1	Y	
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		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



3A1-QP460A4X( ): Propeller Parts
Figure 10-5

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3A1-QP460A4X( )				
10-5		**PROPELLER PARTS, CONTINUED**				
10	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		1	Y	
20	B-6747	• SEAL, WASHER		1	Y	
40	A-2626-2	• SCREW, 10-32, CAP		6	Y	
50	104578	• SCREW, OIL LEVEL CHECK		3	Y	
60	C-3317-002	• O-RING		3	Y	
70	104577	• CYLINDER		1		
75	105412-( )	• STOP, HIGH PITCH		1		
80	C-3317-154	• O-RING		1	Y	
90	104546	• RING, BALANCE		1		
200	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		1	Y	
210	104255	• PISTON		1		
220	C-3317-339-1	• O-RING, PISTON OD		1	Y	
230	C-3317-112	• O-RING, PISTON ID		1	Y	
240	103837	• ROD, PITCH CHANGE		1		
250	102472	• SCREW, SET, 3/8-24 (LOW PITCH STOP)		1		
260	103906	• WASHER		1		
400	A-2431	• BOLT, 3/8-24, HEX HEAD		6		
410	B-3834-0663	• WASHER		12	Y	
420	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		6	Y	
430	104545X	• PCP: HUB UNIT, 3A1-QP460-A1 (REFER TO “104545X: HUB UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
439	C-3317-111-1	• O-RING, ROD TO BUSHING		1	Y	
500	108512	• PITCH CHANGE BLOCK UNIT		3		
-501	108511	• • BLOCK, PITCH CHANGE		1		
-502	104954	• • BUSHING		1		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

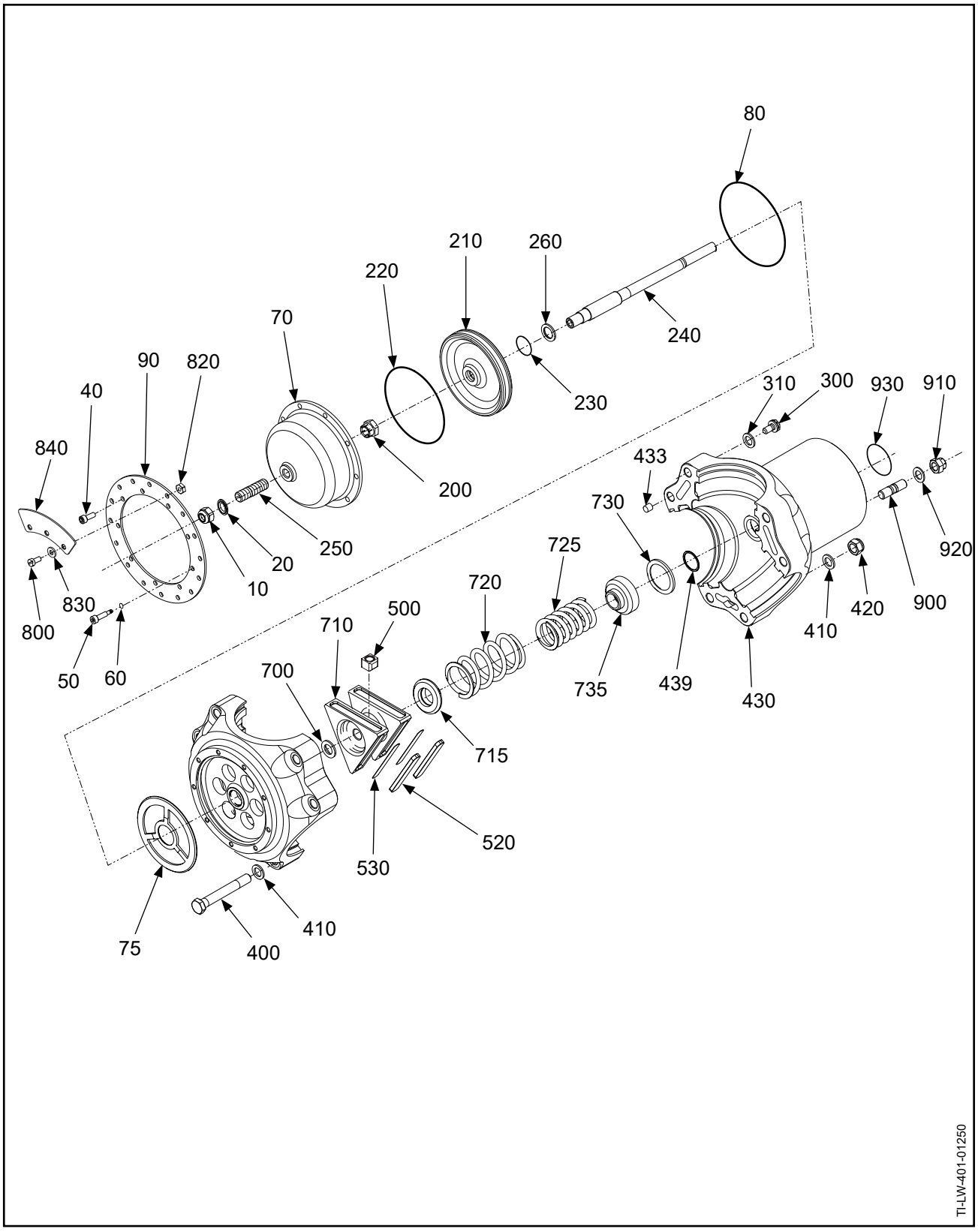
3A1-QP460A4X( )

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3A1-QP460A4X( )				
10-5		**PROPELLER PARTS, CONTINUED**				
520	104763	• BUMPER, FORK		6	Y	
530	104940-( )	• SHIM, STAINLESS		A/R		
700	A-965	• WASHER, 7/16, CRES		1	Y	
710	104919	• FORK, THREE BLADE		1		
720	105282	• SPRING, COMPRESSION		1		
730	103881	• SEAT, SPRING		1		
800	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		6	Y	
820	B-3808-3	• NUT, HEX, SELF-LOCKING		6	Y	
830	B-3851-0363	• WASHER		6	Y	
840	104547	• WEIGHT, BALANCE		A/R		
		PROPELLER MOUNTING PARTS				
900	A-2429-3	• STUD, MOUNTING, 1/2-20		6	Y	
910	A-2044	• NUT, 1/2-20, HEX, SELF-LOCKING, MOUNTING		6	Y	
920	103555	• WASHER, MOUNTING		6	Y	
930	C-3317-225-1	• O-RING, MOUNTING		1	Y	
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		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

3A1-QP460A4X( )



3A1-TP724A1: Propeller Parts
Figure 10-6

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3A1-TP724A1				
10-6		**PROPELLER PARTS, CONTINUED**				
10	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		1	Y	
20	B-6747	• SEAL, WASHER		1	Y	
40	A-2626-2	• SCREW, 10-32, CAP		6	Y	
50	104578	• SCREW, OIL LEVEL CHECK		3	Y	
60	C-3317-002	• O-RING		3	Y	
70	105218	• CYLINDER		1		
75	105412-( )	• STOP, HIGH PITCH		1		
80	C-3317-154	• O-RING		1	Y	
90	104546	• RING, BALANCE		1		
200	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		1	Y	
210	104255	• PISTON		1		
220	C-3317-339-1	• O-RING, PISTON OD		1	Y	
230	C-3317-112	• O-RING, PISTON ID		1	Y	
240	103837	• ROD, PITCH CHANGE		1		
250	102472	• SCREW, SET, 3/8-24 (LOW PITCH STOP)		1		
260	103906	• WASHER		1		
300	B-3384-1H	• BOLT, 1/4-28, HEX HEAD		6	Y	
310	B-3837-0432	• WASHER		6	Y	
400	A-2431	• BOLT, 3/8-24, HEX HEAD		6		
410	B-3837-0432	• WASHER		12	Y	
420	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		6	Y	
430	104826	• PCP:HUB UNIT, 3A1-TP724A1 (REFER TO “104826: HUB UNIT” IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		PCP
439	C-3317-111-1	• O-RING, ROD TO BUSHING		1	Y	
500	108512	• PITCH CHANGE BLOCK UNIT		3		
-501	108511	• • BLOCK, PITCH CHANGE		1		
-502	104954	• • BUSHING		1		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

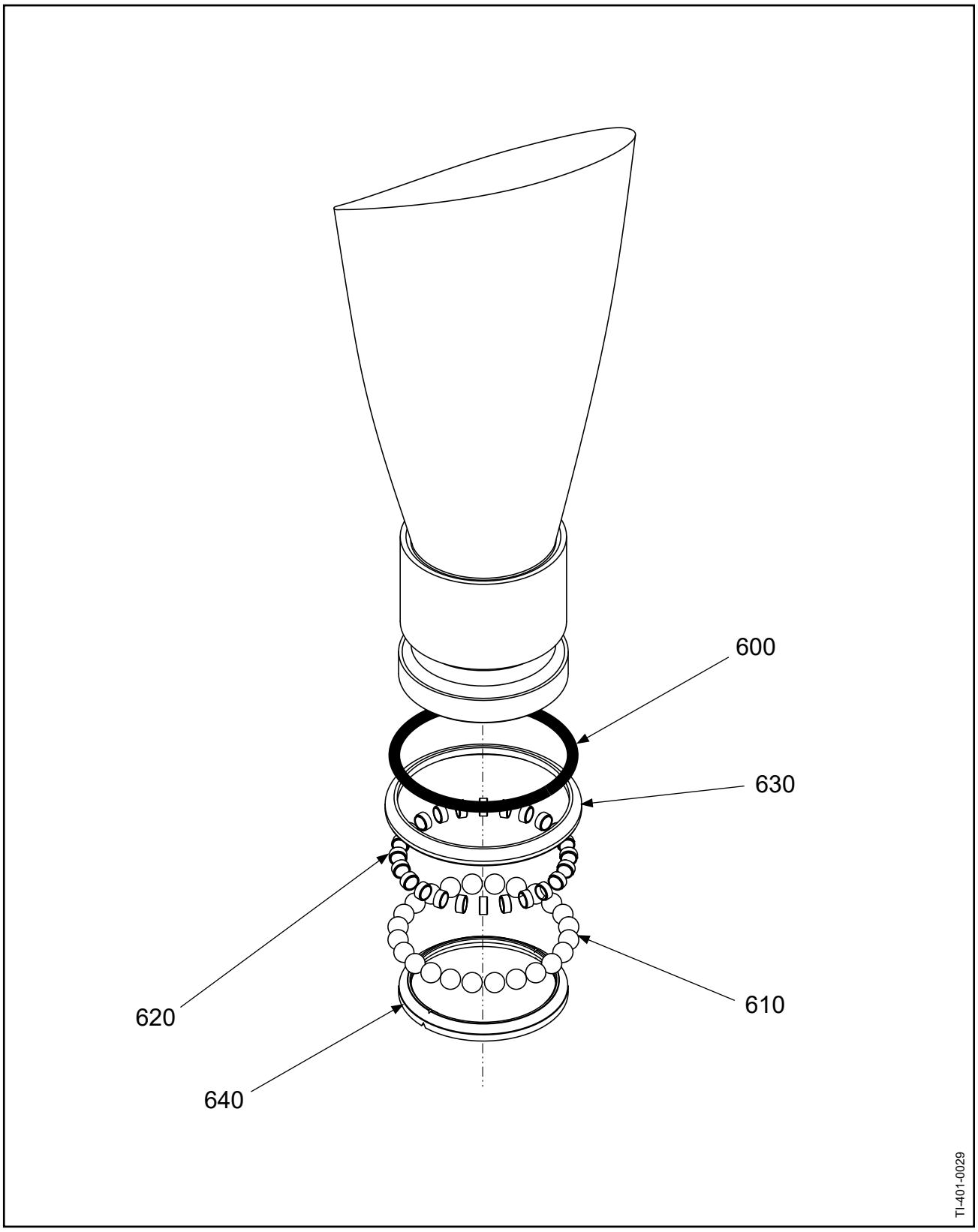
- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
		3A1-TP724A1				
10-6		**PROPELLER PARTS, CONTINUED**				
520	104763	• BUMPER, FORK		6	Y	
530	104940-( )	• SHIM, STAINLESS		A/R		
700	A-965	• WASHER, 7/16, CRES		1	Y	
710	104919	• FORK, THREE BLADE		1		
715	109242	• GUIDE, SPRING		1		
720	105282	• SPRING, COMPRESSION		1		
725	109252	• SPRING, COMPRESSION		1		
730	103881	• SEAT, SPRING		1		
735	109241	• SPRING SEAT		1		
800	B-3840-6	• SCREW, 100-32, FILLISTER HEAD		6	Y	
820	B-3808-3	• NUT, HEX, SELF-LOCKING		6	Y	
830	B-3851-0363	• WASHER		6	Y	
840	104547	• WEIGHT, BALANCE		2		
		PROPELLER MOUNTING PARTS				
900	100041	• STUD, MOUNTING, 7/16-20		6	Y	
910	A-1373	• NUT, MOUNTING		6	Y	
920	A-965	• WASHER, MOUNTING		6	Y	
930	C-3317-225-1	• O-RING, MOUNTING		1	Y	
-950	C-3317-129	• O-RING, CYLINDER/SPINNER DOME		1	Y	
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		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



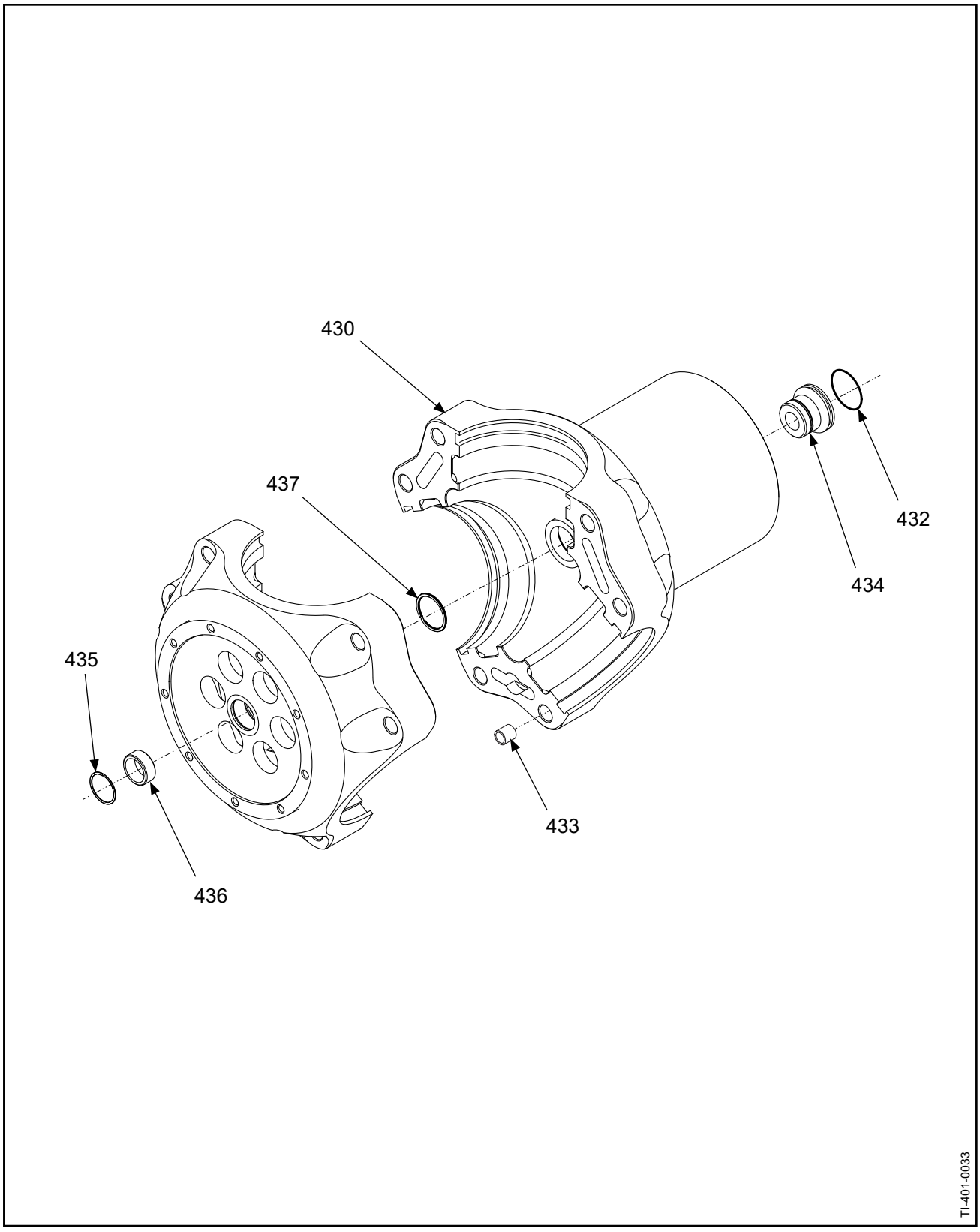
Blade Retention Parts
Figure 10A-1

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-1		**BLADE RETENTION PARTS**				
		All quantities (UPA) in this parts list are per blade assembly.				
		BLADES FOR 2A1-( ) PROPELLERS				
600	C-3317-338-8	• O-RING		1	Y	
610	B-6144-1	• BALL, BEARING, 3/8 INCH DIAMETER		24	Y	
	B-6144-1-1500	• BALL, BEARING, 3/8 INCH DIAMETER (BOX OF 1500)		RF		
620	104949	• BALL SPACER		24	Y	
630	105421	• RACE, HUB SIDE		1		
640	105444	• RACE, BEARING, BLADE SIDE		1		
		BLADES FOR 3A1-( ) PROPELLERS				
600	C-3317-337-8	• O-RING		1	Y	
600A	C-3317-338-8	• O-RING, ALTERNATE FOR ITEM 600		1	Y	
610	B-6144-1	• BALL, BEARING, 3/8 INCH DIAMETER		24	Y	
	B-6144-1-1500	• BALL, BEARING, 3/8 INCH DIAMETER (BOX OF 1500)		RF		
620	104949	• BALL SPACER		24	Y	
630	105421	• RACE, HUB SIDE		1		
640	105444	• RACE, BEARING, BLADE SIDE		1		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

Blade Retention Parts



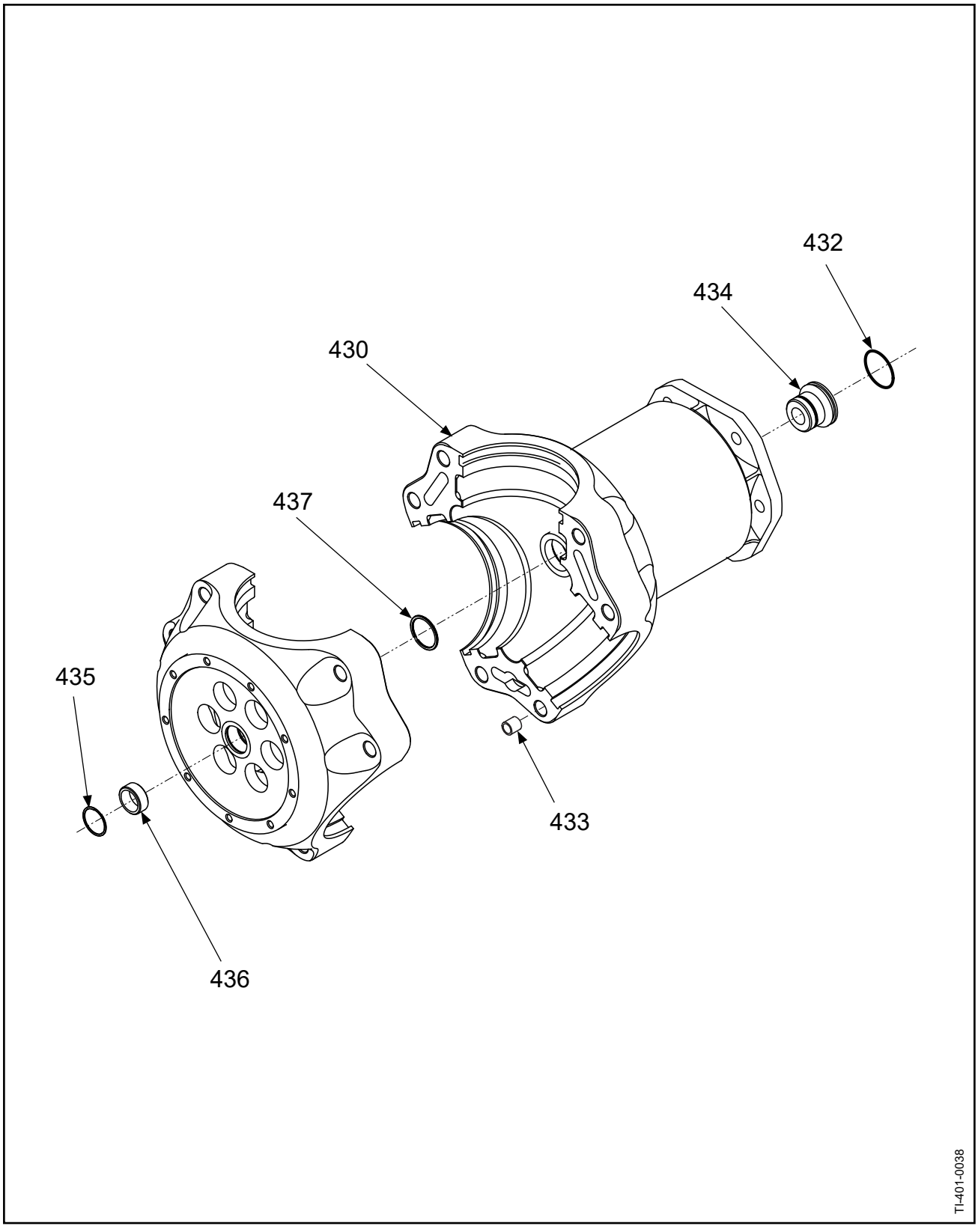
104545-( ): Hub Unit
Figure 10A-2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-2		**104545-( ) HUB UNIT PARTS**				
		104545X HUB UNIT PARTS				
430	104545X	PCP:HUB UNIT, 3A1-QP460A4X		1		PCP
-431	104582	• PLATE, UID - BLANK		1		
432	C-3317-021-1	• O-RING, BUSHING TO HUB		1	Y	
433	A-2249	• HUB BUSHING, GUIDE		1	Y	
434	103844	• HUB BUSHING, ROD ENGINE SIDE		1	Y	
435	A-6153-81	• RING, RETAINING, EXTERNAL SPIRAL		1	Y	
436	103846	• HUB BUSHING, ROD CYLINDER SIDE		1	Y	
437	A-5839-71	• RING, RETAINING, INTERNAL SPIRAL		1	Y	
-438	B-6142	• INSERT, 1/4-28, CRES, COILED		4	Y	
		104545-1 HUB UNIT PARTS				
430	104545-1	PCP: HUB UNIT, 3A1-QP460A1		1		PCP
432	C-3317-021-1	• O-RING, BUSHING TO HUB		1	Y	
433	A-2249	• HUB BUSHING, GUIDE		1	Y	
434	103844	• HUB BUSHING, ROD ENGINE SIDE		1	Y	
435	A-6153-81	• RING, RETAINING, EXTERNAL SPIRAL		1	Y	
436	103846	• HUB BUSHING, ROD CYLINDER SIDE		1	Y	
437	A-5839-71	• RING, RETAINING, INTERNAL SPIRAL		1	Y	
-438	B-6142	• INSERT, 1/4-28, CRES, COILED		4	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

104545-( ): Hub Unit



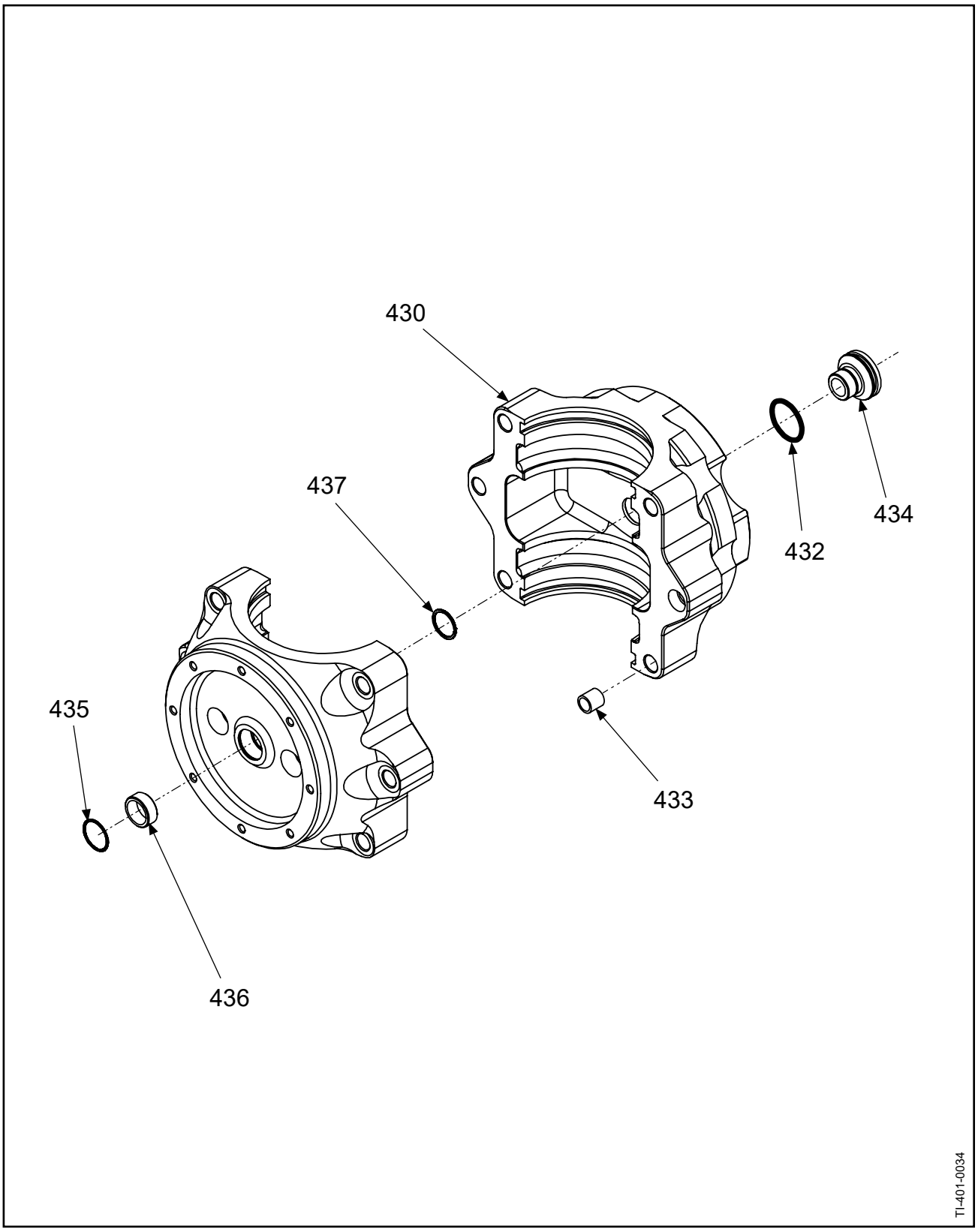
104661X: Hub Unit
Figure 10A-3

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-3		**104661X HUB UNIT PARTS**				
430	104661X	PCP:HUB UNIT, 3A1-G353-A1X		1		PCP
-431	104582	• PLATE, UID - BLANK		1		
432	C-3317-021-1	• O-RING, BUSHING TO HUB		1	Y	
433	A-2249	• HUB BUSHING, GUIDE		1	Y	
434	103844	• HUB BUSHING, ROD ENGINE SIDE		1	Y	
435	A-6153-81	• RING, RETAINING, EXTERNAL SPIRAL		1	Y	
436	103846	• HUB BUSHING, ROD CYLINDER SIDE		1	Y	
437	A-5839-71	• RING, RETAINING, INTERNAL SPIRAL		1	Y	
-438	B-6142	• INSERT, 1/4-28, CRES, COILED		6	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

104661X: Hub Unit



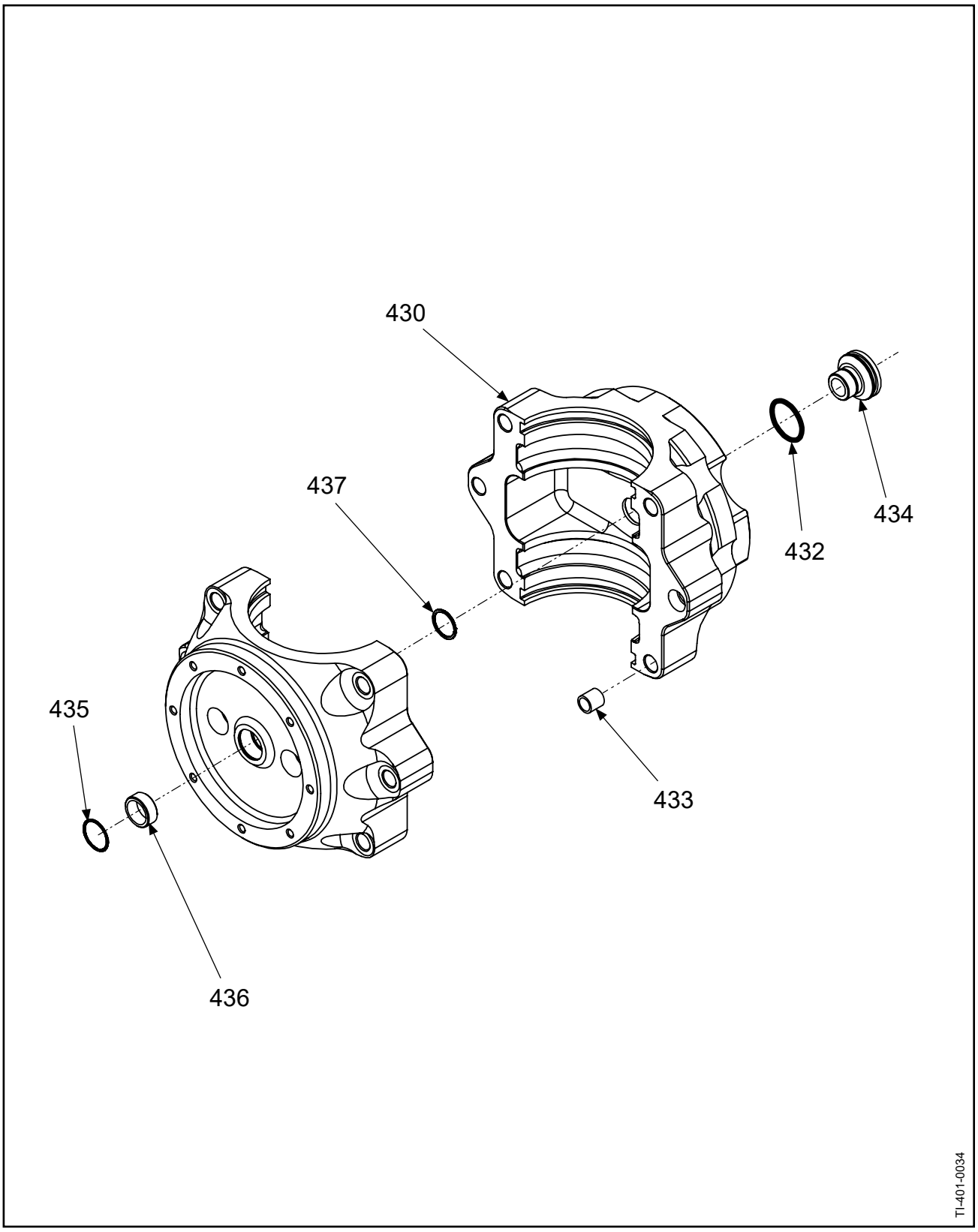
105021: Hub Unit
Figure 10A-4

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-4		**105021 HUB UNIT PARTS**				
430	105021	PCP: HUB UNIT, 2A1-HP275A1		1		PCP
432	C-3317-021-1	• O-RING, BUSHING TO HUB		1	Y	
433	A-2249	• HUB BUSHING, GUIDE		1	Y	
434	103920	• HUB BUSHING, ROD ENGINE SIDE		1	Y	
435	A-6153-62	• RING, RETAINING, EXTERNAL SPIRAL		1	Y	
436	103846	• HUB BUSHING, ROD CYLINDER SIDE		1	Y	
437	A-5839-71	• RING, RETAINING, INTERNAL SPIRAL		1	Y	
-438	B-6142	• INSERT, 1/4-28, CRES, COILED		4	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

105021: Hub Unit



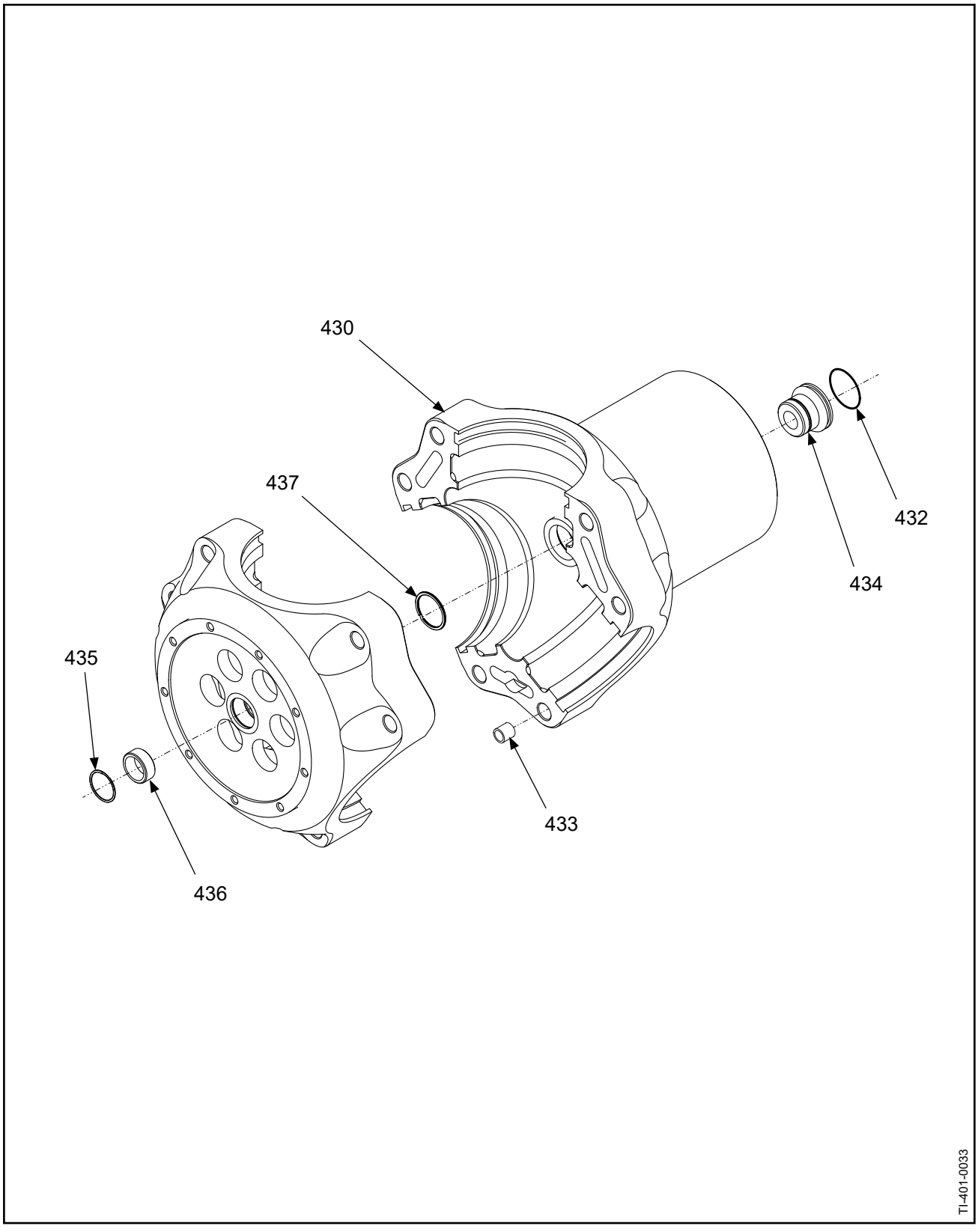
106052: Hub Unit
Figure 10A-5

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-5		**106052 HUB UNIT PARTS**				
430	106052	PCP: HUB UNIT, 2A1-HP450A1		1		PCP
432	C-3317-021-1	• O-RING, BUSHING TO HUB		1	Y	
433	A-2249	• HUB BUSHING, GUIDE		1	Y	
434	103920	• HUB BUSHING, ROD ENGINE SIDE		1	Y	
435	A-6153-62	• RING, RETAINING, EXTERNAL SPIRAL		1	Y	
436	103846	• HUB BUSHING, ROD CYLINDER SIDE		1	Y	
437	A-5839-71	• RING, RETAINING, INTERNAL SPIRAL		1	Y	
-438	B-6142	• INSERT, 1/4-28, CRES, COILED		4	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

106052: Hub Unit



104826: Hub Unit
Figure 10A-6

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-6		**104826 HUB UNIT PARTS**				
430	104545X	PCP:HUB UNIT, 3A1-TP724A1		1		PCP
432	C-3317-021-1	• O-RING, BUSHING TO HUB		1	Y	
433	A-2249	• HUB BUSHING, GUIDE		1	Y	
434	103844	• HUB BUSHING, ROD ENGINE SIDE		1	Y	
435	A-6153-81	• RING, RETAINING, EXTERNAL SPIRAL		1	Y	
436	103846	• HUB BUSHING, ROD CYLINDER SIDE		1	Y	
437	A-5839-71	• RING, RETAINING, INTERNAL SPIRAL		1	Y	
-438	B-6142	• INSERT, 1/4-28, CRES, COILED		4	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

104826: Hub Unit

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