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MANUAL REVISION TRANSMITTAL

MANUAL 202A, VOLUME 11 (61-01-02)
Standard Practices Manual

REVISION 39 dated JUNE 2024

Remove Pages:	**Insert Pages:**
COVER cover and inside cover	**COVER** cover and inside cover
REVISION HIGHLIGHTS pages 1 thru 4	**REVISION HIGHLIGHTS** pages 1 thru 4
RECORD OF REVISIONS pages 1 and 2	**RECORD OF REVISIONS** pages 1 and 2
LIST OF EFFECTIVE PAGES pages 1 and 2	**LIST OF EFFECTIVE PAGES** pages 1 and 2
INTRODUCTION pages 1 thru 12	**INTRODUCTION** pages 1 thru 12
PROPELLER LUBRICATION pages 1-3 and 1-4	**PROPELLER LUBRICATION** pages 1-3 and 1-4
STATIC AND DYNAMIC BALANCE pages 2-3 thru 2-8 pages 2-11 and 2-12	**STATIC AND DYNAMIC BALANCE** pages 2-3 thru 2-8 pages 2-11 and 2-12

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

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

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

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

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Manual No. 202A, Volume 11
61-01-02
Revision 39
June 2024

Standard Practices Manual
Volume 11

Chapter 1: Propeller Lubrication
Chapter 2: Static and Dynamic Balance

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REVISION 39 HIGHLIGHTS

Revision 39, dated June 2024, incorporates the following:

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

Updated Hartzell Propeller Inc. to Hartzell Propeller LLC where applicable.

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

- INTRODUCTION
  - Revised the section, "Reference Publications"
  - Revised the section, "Personnel Requirements"
- STATIC AND DYNAMIC BALANCE
  - Revised Table 2-1, "Maximum Number of Balance Weights for Standard Installations"

REVISION 39 HIGHLIGHTS

1. Introduction

   A. General

      (1) This is a list of current revisions that have been issued against this manual. Please compare to 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	Mar/93	New
Revision 1	Jun/94	Minor Revision
Revision 2	Apr/95	Minor Revision
Revision 3	Jun/95	Minor Revision
Revision 4	Apr/96	Minor Revision
Revision 5	Nov/96	Minor Revision
Revision 6	Mar/97	Minor Revision
Revision 7	Oct/97	Minor Revision
Revision 8	Jan/98	Minor Revision
Revision 9	Jun/98	Minor Revision
Revision 10	Dec/98	Minor Revision
Revision 11	Sep/99	Minor Revision
Revision 12	Nov/00	Minor Revision
Revision 13	Sep/01	Minor Revision
Revision 14	Feb/02	Minor Revision
Revision 15	May/02	Minor Revision
Revision 16	Sep/02	Minor Revision
Revision 17	Dec/02	Minor Revision
Revision 18	Aug/03	Minor Revision
Revision 19	Sep/03	Minor Revision
Revision 20	Oct/03	Minor Revision
Revision 21	Nov/03	Minor Revision
Revision 22	Dec/03	Minor Revision
Revision 23	Feb/04	Minor Revision
Revision 24	Apr/04	Minor Revision
Revision 25	Jun/04	Minor Revision
Revision 26	Aug/04	Minor Revision
Revision 27	Oct/04	Major Revision - Volume 11
Revision 28	Dec/04	Minor Revision
Revision 29	Aug/05	Minor Revision
Revision 30	Apr/09	Minor Revision
Revision 31	Jul/10	Minor Revision
Revision 32	Sep/10	Minor Revision
Revision 33	Oct/12	Minor Revision
Revision 34	Apr/13	Minor Revision
Revision 35	Aug/13	Minor Revision
Revision 36	Nov/15	Minor Revision
Revision 37	Feb/22	Minor Revision
Revision 38	Jan/23	Major Revision
Revision 39	Jun/24	Minor Revision

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RECORD OF REVISIONS

This is a record of revisions inserted into this manual.
Revision 39 includes all prior revisions.

Revision Number	Issue Date	Date Inserted	Inserted By
39	Jun/24	Jun/24	Hartzell

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RECORD OF TEMPORARY REVISIONS

Update this page to show all Temporary Revisions inserted into this manual.
Revision 38 includes all prior temporary revisions, up to and including TR-003.

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

RECORD OF TEMPORARY REVISIONS

Update this page to show all Temporary Revisions inserted into this manual.
Revision 38 includes all prior temporary revisions, up to and including TR-003.

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 Letters:	
SL 53	Orig., Mar/93
SL 102	Rev. 30, Apr/09
HC-SL-61-184	Rev. 11, Sep/99
HC-SL-61-187	Rev. 30, Apr/09
HC-SL-61-343	Rev. 37, Feb/22

Service Document Number	Incorporation Rev./Date
Service Instructions:	
SI104	Orig., Mar/93
SI148B	Orig., Mar/93

SERVICE DOCUMENT LIST

Service Document Number	Incorporation Rev./Date	Service Document Number	Incorporation Rev./Date

LIST OF EFFECTIVE PAGES

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Service Document List	11	1 and 2	Rev. 38	Jan/23
List of Effective Pages	11	1 and 2	Rev. 39	Jun/24
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Propeller Lubrication	11	1-1 and 1-2	Rev. 38	Jan/23
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Static and Dynamic Balance	11	2-1 and 2-2	Rev. 38	Jan/23
Static and Dynamic Balance	11	2-3	Rev. 39	Jun/24
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Packaging and Storage ..... Relocated

Packaging and storage information has been relocated to Hartzell Propeller Inc. Standard Practices Manual 202A, Volume 7 (61-01-02).

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1. General

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 should be used in propeller repair stations by personnel that are trained and experienced with Hartzell Propeller LLC products.

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

(3) Propeller models 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 Product Support.

(4) 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.

WARNING: DO NOT USE OBSOLETE OR OUTDATED INFORMATION. PERFORM ALL INSPECTIONS OR WORK IN ACCORDANCE WITH THE MOST RECENT REVISION OF THIS MANUAL. INFORMATION CONTAINED IN THIS MANUAL MAY BE SIGNIFICANTLY CHANGED FROM EARLIER REVISIONS. FAILURE TO COMPLY WITH THIS MANUAL OR THE USE OF OBSOLETE INFORMATION MAY CREATE AN UNSAFE CONDITION THAT MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE. FOR THE MOST RECENT REVISION LEVEL OF THIS MANUAL, REFER TO THE HARTZELL WEBSITE AT WWW.HARTZELLPROP.COM.

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

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

2. Reference Publications

A. Hartzell Propeller 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) The Hartzell Propeller Standard Practices Manual 202A has several volumes. A complete set consists of the following:

Volume Number	Chapter Number	Chapter Name
Volume 1	1	Cleaning
	2	Paint and Finish (Available on the Hartzell Propeller website at www.hartzellprop.com)
Volume 2	1	Eddy Current Inspection
	2	Magnetic Particle Inspection
	3	Penetrant Inspection
Volume 3	1	Aluminum Hub Overhaul
Volume 4	1	Steel Hub Overhaul
Volume 5	1	Blade Clamp Overhaul
Volume 6	1	Special Inspections
	2	Parts Identification and Marking
	3	Part Retirement Procedures
	4	Vendor Cross Reference
Volume 7	1	Consumable Materials
	3	Packaging and Storage (Available on the Hartzell Propeller website at www.hartzellprop.com)
Volume 8	1	Standard Repairs and Instructions
	2	Special Adhesive and Bonding Procedures
Volume 9	1	Shot Peening
	2	Approved Facilities
Volume 10	1	Hard Chrome Re-plating
	2	Cadmium Replating
	3	Chromic Acid Anodizing
Volume 11	1	Propeller Lubrication
	2	Static and Dynamic Balance (Available on the Hartzell Propeller website at www.hartzellprop.com)

(3) Some manuals are available on the Hartzell Propeller website at www.hartzellprop.com. The complete Hartzell Propeller Technical Library is available by subscription.

(4) 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.)	Hartzell Propeller Manual Title
n/a	Active Hartzell Propeller Service Bulletins, Service Letters, Service Instructions, and Service Advisories
Manual 159 (61-02-59)	Application Guide
Manual 165A (61-00-65)	Illustrated Tool and Equipment Manual
Manual 180 (30-61-80)	Ice Protection System Manual

B. Vendor Publications

None.

3. Personnel Requirements (Rev. 3)

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 LLC 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 Title 14 Code of Federal Regulations (CFR) Part 43 for additional information about general aviation maintenance requirements.

4. Special Tooling and Consumable Materials (Rev. 2)

A. Special Tooling

(1) Special tooling may be required for procedures in this manual. For further tooling information, refer to Hartzell Propeller 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 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. Component Life and Overhaul (Rev. 3)

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 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 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 LLC.

(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 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 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 component maintenance manual.

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

7. Damage/Repair Types (Rev. 2)

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 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 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 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 LLC.

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

8. Propeller Critical Parts (Rev. 2)

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 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.

9. Warranty Service (Rev. 2)

A. Warranty Claims

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

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

10. Hartzell Propeller Contact Information (Rev. 3)

A. Product Support Department

(1) Contact the Hartzell Propeller Product Support Department 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) The Product Support Department 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) The Product Support Department 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 website at www.hartzellprop.com.

B. Technical Publications Department

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

Hartzell Propeller LLC
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 LLC 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 LLC worldwide network of aftermarket distributors and approved repair facilities is available on the Hartzell website at www.hartzellprop.com.

11. Definitions (Rev. 5)

A basic understanding of the following terms will assist in maintaining and operating Hartzell 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

12. 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

PROPELLER LUBRICATION - CONTENTS

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1. Lubrication

A. Lubrication Intervals

(1) Refer to the applicable Hartzell Propeller owner's manual for lubrication intervals.

B. Lubrication Procedures: In-Service Propellers

(1) Refer to the applicable Hartzell Propeller owner's manual for lubrication procedures for in-service propellers.

C. Lubrication Procedures: Initial Lubrication After Assembly or Overhaul

(1) Lubricate the propeller in accordance with the instructions in the applicable Hartzell Propeller owner's manual - **except**:

(a) Apply grease to each lubrication fitting until grease emerges from the hole where the lubrication hole plug was removed.

D. Approved Lubricants

(1) For a list of lubricants approved for use in Hartzell propellers, refer to the Consumable Materials chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

E. Aluminum Hub Lubrication Fittings/Plugs Location

(1) For all tractor or pusher propellers except HC-A6( )-3( )( ) and HD-E6C-3( )( ) with clockwise (standard) rotation when viewed from BEHIND the aircraft:

(a) Install the lubrication fittings (p/n: A-279 or C-6349) in the ENGINE-SIDE hub half.

(b) Install lubrication hole plugs (p/n: 106545) in the CYLINDER-SIDE hub half.

(2) For all tractor or pusher propellers with counter-clockwise (backward) rotation when viewed from BEHIND the aircraft:

(a) Install the lubrication fittings (p/n: A-279 or C-6349) in the CYLINDER-SIDE hub half.

(b) Install lubrication hole plugs (p/n: 106545) in the ENGINE-SIDE hub half.

(3) For HC-A6( )-3( )( ) and HD-E6C-3( )( ) propellers:

(a) Install the lubrication fittings (p/n: A-279 or C-6349) in the CYLINDER-SIDE hub half.

(b) Install lubrication hole plugs (p/n: 106545) in the ENGINE-SIDE hub half.

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STATIC AND DYNAMIC BALANCE - CONTENTS

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1. Overview

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 CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. Balance Weight Locations

(1) For other than a Bantam propeller or a Hovercraft propeller, the location of balance weights is dependent on three factors: hub type, blade type, and if there is a counterweight.

(2) For a Bantam propeller or a Hovercraft propeller, the location of the balance weight is on the balance ring.

(3) Refer to the figures at the end of this section for samples of locations.

Propeller Assembly Description	Balance Weight Location
Steel Hub\Aluminum Blade	Blade Clamp Assembly
Steel Hub\Composite Blade	Blade Clamp Assembly
Aluminum Hub\Aluminum Blade	Blade Socket Shoulder
Aluminum Hub\Composite Blade	Blade Socket Shoulder
Aluminum Hub\Composite Blade\ Counterweight Clamp	Blade Socket Shoulder\ Counterweight Clamp
Aluminum Hub\Composite Blade\ Blade Counterweight	Blade Counterweight Boss

(4) Refer to Tables 2-1 and 2-2 for the maximum number of balance weights that may be used.

(5) The following screws are used for attaching balance weights:

Hartzell Propeller Part Number	Thread Length
B-3840-4	0.250 in. (6.35 mm)
B-3840-5	0.313 in (7.95 mm)
B-3840-6	0.375 in. (9.53 mm)
B-3840-7	0.438 in. (11.11 mm)
B-3840-8	0.500 in. (12.70 mm)
B-3840-9	0.563 in. (14.30 mm)
B-3840-10	0.625 in. (15.88 mm)
B-3840-12	0.750 in. (19.05 mm)

B. Balance Weight Attachment

(1) For a steel hub propeller, the balance weight attachment screw must be long enough to have a minimum of 1/8 inch (3.175 mm) engagement into the clamp threads.

(2) For an aluminum hub propeller other than a Bantam propeller or a Hovercraft propeller, the balance weight attachment screw must be long enough to have a minimum of 5/16 inch (7.937 mm) engagement into the hub threads.

(3) For a Bantam propeller, the balance weight attachment screw must be long enough to have a minimum of two threads showing through the nut.

(4) For a Hovercraft propeller, the balance weight attachment bolt must be long enough to have a minimum of two threads showing through the nut.

(5) For an aluminum counterweight clamp or blade counterweight on a composite blade, the balance weight attachment screw must be long enough to have a minimum of 5/16 inch (7.937 mm) engagement into the counterweight clamp or blade counterweight threads.

(6) It is recommended that the number and location of all static balance weights be recorded in the propeller logbook.

(7) Static balance is achieved when the placement of one balance weight in a weight location takes the propeller out of balance and the removal of this same weight places the propeller back in its original static balance condition.

(8) The preferred method of safety wiring the A-2424(A)-( ) balance weights is to loop the wire over the weight tabs, if provided.

(a) The balance weights may be turned over in the stack so the tabs are staggered and the wire can be easily looped around the tab.

CAUTION: DO NOT PERMIT THE SAFETY WIRE TO TOUCH THE BLADE SHANK BECAUSE THE SAFETY WIRE MAY CAUSE DAMAGE TO THE BLADE SHANK.

(b) When this method is not possible, make sure that the safety wire does not touch the blade shank during complete range of travel.

1 To prevent the safety wire from touching the blade shank, pull the safety wire away from the blade shank.

2 Optionally, slide a plastic tube over the wire to insulate it from the blade shank as a secondary precaution.

(9) If both aluminum and steel balance weights are being used, it is recommended that the steel weight be on top (under the head of the screw).

(a) If only two weights are used, the aluminum weight may be on top, if necessary.

CAUTION: REFER TO TABLE 2-2 FOR EXCEPTIONS.		
Propeller Assembly Description	Maximum Number of Balance Weights for Each Location	Hartzell Part Number
Steel Hub\Aluminum Blade (for C-3 and D-6831-( ) clamps) (See Note 1 and Note 5)	4	A-48
Steel Hub\Aluminum Blade (for C-1977-( ) and C-1301-( ) clamps) (See Note 1 and Note 5)	4	A-1305
Steel Hub\Composite Blade (See Note 3 and Note 5)	4	A-1305
Aluminum Hub\Aluminum Blade (See Note 5)	6	A-2424(A)-( )
Aluminum Hub\Composite Blade (Not applicable to HC-A6A-3[ ], Bantam propellers or Hovercraft propellers) (See Note 5)	6	A-2424(A)-( )
Aluminum Hub\Aluminum Blade\Counterweight (See Note 2 and Note 5)	(See Note 4)	A-2424(A)-( )
Aluminum Hub\Composite Blade\Counterweight Clamp (Not applicable to HC-C3YR-4A propellers) (See Note 5)	4	A-1305
Aluminum Hub\Composite Blade\Counterweight Clamp For HC-C3YR-4A only (See Note 5)	4	A-1929
Aluminum Hub\Composite Blade\Blade Counterweight (Not applicable to Bantam propellers or Hovercraft propellers) (See Note 5)	3	102578
For Bantam Propellers	6	104547
For Hovercraft Propellers	(See Note 6)	(See Note 6)
For HC-A6A-3( ) only - (See Note 5)	4	A-1929

NOTE 1: For steel hub propellers with a de-ice system, a maximum of three weights may be attached to the de-ice terminal block mounted on the blade clamp.

NOTE 2: For aluminum hub propellers with an alcohol anti-ice system, a maximum of three A-2424 or A-2424A weights (in any combination) may be used between the anti-ice system bracket and the hub.

NOTE 3: For propeller model HC-B4MN-5AL/LM10585( )+4 installed on a Casa C-212-CC and -CF aircraft, use A-80-( ) bolts to hold the weight slugs on the clamp instead of B-3840-( ) screws to avoid interference with composite blade windings.

NOTE 4: A maximum of six balance weights may be used per location where the counterweight does not move across the balance weight site. In the areas where the counterweight does move across the balance weight site a maximum of two balance weights may be used per location.

NOTE 5: For fine balance in any location, B-3851-0363 washers may be used under the head of the attaching hardware within the maximum permitted number of balance weights.

NOTE 6: Use A-5711 washer or a washer with the equivalent ID, B-3384-( ) bolt, and B-3808-3 self-locking hex nut. The maximum permitted stack height of the washers on each side of the balance weight ring is 0.400 inches (101.60 mm). For each hole, the maximum permitted weight of the washers, bolt, and nut is 4 ounces (113 grams).

Maximum Number of Balance Weights for Standard Installations
Table 2-1

A-48 Weight Slug Limits on C-3-( ) and D-6831-( ) Clamps

A. C-3-( ) and D-6831-( ) clamps have only two locations for the A-48, A-48A or A-1419 weight slugs (Figure 6-5). Clamps may have tapped holes on the inboard side of the clamp outboard bolt lugs providing an alternate mounting location if it is necessary to move the weight slugs to clear the spinner.

B. A-48 (steel) weight slugs may be replaced with A-48A (brass) weight slugs although the most outboard slug must be an A-48 (steel) weight slug. The number limits for slugs still applies.

NOTE: The previous A-48A weight slug was made of lead and has a dull, gray color. The A-48A weight slug material is now made of brass and has a dull, silver color. The A-48 that is made of steel with a cadmium outside and has a bright, silver color.

Aircraft Mfg./ Modifier	Propeller Model	Spinner Assembly	Lead**	Trail**
Aero Commander	HC-A2(V,MV)F-2( )/(V,MV)8433( )-4	C-2530	3-See Note 8	4-See Note 8
Aero Commander	HC-A3(V,MV)20-2( )/(V,MV)9333( )	---	0	3-See Notes 1 and 8
Beech	HC-A3(V,MV)20-2( )/(V,MV)9333( )-3	---	0	3-See Note 8
Riley	HC-A3(V,MV)K-2( )/(V,MV)7636( )	A-835-( )	4-See Note 8	2-See Notes 2 and 8
Cessna/Riley	HC-A3(V,MV)K-2( )/(V,MV)7636( )	C-2513-( )	4-See Notes 3 and 8	4-See Note 8
Beech	PHC-A3(V,MV)F-2( )/(V,MV)7636( )	A-836-36, -37	0	4-See Notes 4 and 8
Beech /Colemill	EHC-A3(V,MV)F-2( )/(V,MV)7636( )	A-836-36	0	4-See Notes 4 and 8
Aero Commander/ Colemill	EHC-A3(V,MV)F-2( )/(V,MV)7636( )	A-836-25	0	4-See Note 8
Beech/Excaliber	HC-A3(V,MV)K-2( )/(V,MV)8433( )-2R	---	0	4-See Note 8
Beech	HC-A3(V,MV)K-2( )/(V,MV)9333( )-3	---	0	3-See Notes 1 and 8
Cessna	HC-A3(V,MV)F-2( )/(V,MV)8833( )	---	4-See Note 8	0
Scottish Aviation/ Beagle	HC-A3(V,MV)F-2( )/(V,MV)8833( )	---	0	3-See Note 8
Beech	HC-A3(V,MV)F-4/(V,MV)8433( )-4R	---	See Notes 5 and 8	
Piper	HC-A3(V,MV)F-4/(V,MV)8433( )-7	---	See Notes 5 and 8	
DeHavilland (STC SA11685WE)	EHC-A3(V,MV)F-2( )/(V,MV)7636( )	---	See Notes 6 and 8	
Beech	HC-A2(V,MV)20-4( )/(V,MV)8833( )-4	---	See Notes 6 and 8	
Beech	HC-A2(V,MV)20-4( )/(V,MV)8433( )	---	See Notes 6 and 8	
Navion	HC-A2(V,MV)20-4( )/(V,MV)8433( )	---	See Notes 6 and 8	

** "Lead" and "Trail" refer to the weight location on the outboard bolt lugs of the C-3-( ) and the D-6831-( ) clamps as referenced to the blade lead and trail edges.

Maximum Number of Balance Weights for Non-Standard Installations
Table 2-2, page 1 of 2

A-1305 Weight Slug Limits on C-1977-( ) Clamp

The C-1977-( ) clamp has four A-1305 balance weight locations on the outboard circular surface of the clamp (Figure 6-2).

Propeller Model	Spinner Assembly	Slugs
HC-B3(P,R)30-2E/(P,R)10152( )-5.5	All	See Notes 7 and 8

Note 1: Three A-48 weight slugs or two A-1419 weight slugs.

Note 2: Two A-48 weight slugs or one A-1419 weight slugs.

Note 3: Four A-48 weight slugs or two A-1419 weight slugs.

Note 4: Four A-48 weight slugs or two A-1419 weight slugs and one A-48 weight slug.

Note 5: Four A-48 weight slugs on counterweight and five A-48 weight slugs on clamp on inboard side of outboard clamp bolt shoulder of clamp.

Note 6: A-48 weight slugs are only attached to the nut plates mounted on the spinner bulkhead. Maximum of (4) per location.

Note 7: Two A-1305 weight slugs per stack may be installed on the clamp per position, four positions are possible on the outboard of the clamp.

Note 8: For fine balance in any location, B-3851-0363 washers may used under the head of the attaching hardware within the maximum permitted number of balance weights.

Maximum Number of Balance Weights for Non-Standard Installations
Table 2-2, page 2 of 2

2. Static Balance of Propeller Assemblies

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 CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. General

(1) All 2-way propellers are balanced both in the horizontal and vertical positions.

(2) Propellers with three or more blades are balanced in the horizontal position.

CAUTION: AVOID DISLODGING THE BLADE SEALS WITH EXCESSIVE PRESSURE WHEN LUBRICATING THE PROPELLER.

(3) Lubricate the propeller in accordance with the Propeller Lubrication chapter of this manual.

(4) Set the blade angle at the proper pitch for balancing as follows:

(a) All non-feathering compact models: Blades resting against the low pitch stop.

(b) All feathering compact models: Blades resting against the start locks as assembled.

(c) Turbine models (lightweight and steel) with external beta system: Blades resting against the low pitch stops.

(d) Turbine models (lightweight and steel) with an internal beta system: Blade angle is visually determined to be at low pitch or flight idle.

(e) Turbine models (lightweight and steel) non-reversing: Blades resting against low pitch stop.

(f) All steel reciprocating flange models: Blades resting against the start locks as assembled.

(g) All splined models: Blade angle is visually determined to be at low pitch.

(h) Dual Acting: Blade angle is visually determined to be at approximately flat pitch.

(5) Balance the propeller in a draft-free area.

B. Equipment

(1) The following equipment may be used for balancing:

(a) A balance arbor mounted on knife edges

(b) A suspension system

1 For a suspension system, it is essential that the center of gravity of the propeller be located at or slightly below the pivot of the balance equipment. Inaccuracies may result otherwise. Refer to manufacturer's instructions.

(c) A stiff pivot balancing machine

NOTE: Examples of a stiff pivot balancer are Micro Poise Stiff Pivot Machine Model 320SP or Model 3867HD.

C. Procedures

(1) Attach the propeller to the balance equipment.

(2) When using a balance arbor mounted on knife edges for balancing a two-bladed propeller, check the vertical balance with the horizontally heavy blade in the upright position.

CAUTION: DO NOT EXCEED THE BALANCE WEIGHT LIMITS SPECIFIED IN THIS CHAPTER.

(3) Distribute the balance weights to maintain horizontal and vertical balance, if applicable.

(a) Refer to Table 2-1 and Table 2-2 for balance weight limitations.

1 A two-bladed propeller hub may have locations for balance weights on the hub halfway between the blades. These locations may be used for balance, if present.

(4) Balance the propeller in accordance with the balance equipment manufacturer's instructions.

(5) For a propeller with counterweights, it may be necessary to feather the propeller to move the counterweights out of the way when installing the balance weights.

CAUTION: MAKE SURE THAT THE BALANCE WEIGHT ATTACHING SCREWS DO NOT TOUCH THE COUNTERWEIGHT BOSS.

(6) Using screws of appropriate length to make sure of minimum required thread engagement, attach the balance weights.

(7) Using 0.032 inch (0.81 mm) minimum diameter wire, safety the balance weight attaching screws.

(a) Optionally, for a propeller that uses composite blade models 7890( ) or ( )7690( ) and where no balance weight is required, 0.020 inch (0.50 mm) minimum diameter wire may be used to safety the screw-to-screw configuration.

(8) Make a record of the number and location of the balance weights required for balance.

3. Dynamic Balance

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 CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. Overview

(1) Dynamic balance is accomplished by using an accurate means of measuring the amount and location of the dynamic imbalance.

(2) Unless otherwise specified by the engine or airframe manufacturer, Hartzell Propeller LLC recommends that the propeller be dynamically balanced to a reading of 0.2 IPS, or less.

(3) The number of balance weights installed must not exceed the limits specified in this chapter.

(4) Follow the dynamic balance equipment manufacturer’s instructions for dynamic balance.

B. Inspection Procedures Before Balancing

(1) Visually inspect the propeller assembly before dynamic balancing.

NOTE: The first run-up of a new or overhauled propeller assembly may leave a small amount of grease on the blades and inner surface of the spinner dome.

(a) Using a mild solvent, completely remove any grease on the blades or inner surface of the spinner dome.

(b) Visually examine each propeller blade assembly for evidence of grease leakage.

(c) Visually examine the inner surface of the spinner dome for evidence of grease leakage.

(2) If there is no evidence of grease leakage, lubricate the propeller in accordance with the Propeller Lubrication chapter in this manual.

(3) For steel hub propellers, examine the position of the red slippage tape on the each blade and clamp.

(a) If the tape halves are not aligned, blade slippage may have occurred. Refer to the applicable propeller overhaul manual before proceeding.

(4) Before dynamic balance, make a record of the number and location of all balance weights.

(5) Static balance is required when an overhaul or major repair is performed at a propeller overhaul facility.

NOTE: If static balancing is not accomplished before dynamic balancing, the propeller may be so severely unbalanced that dynamic balance may not be achieved.

C. Modifying Spinner Bulkhead to Accommodate Dynamic Balance Weights

CAUTION 1: DO NOT MODIFY A COMPOSITE SPINNER BULKHEAD TO ACCOMMODATE DYNAMIC BALANCE WEIGHTS.

CAUTION 2: ALL HOLE/BALANCE WEIGHT LOCATIONS MUST TAKE INTO CONSIDERATION, AND MUST AVOID, ANY POSSIBILITY OF INTERFERING WITH THE ADJACENT AIRFRAME, ICE PROTECTION SYSTEM COMPONENTS, AND ENGINE COMPONENTS.

(1) It is recommended that balance weights on an aluminum spinner bulkhead that has not been previously drilled be placed in a radial location.

(a) The radial location should be outboard of the de-ice slip ring or bulkhead doubler and inboard of the bend that creates a flange on the bulkhead to which the spinner dome attaches.

(3) It is recommended that twelve equally spaced locations be established for weight attachment.

(4) Install nut plates (10-32 thread) of the type used to attach the spinner dome.

NOTE: This will permit convenient balance weight attachment on the engine side of the bulkhead.

(a) Optionally, drilling holes and using the B-3840-( ) bolts with self-locking nuts is permitted.

NOTE: Chadwick-Helmuth Manual AW-9511-2, “The Smooth Propeller”, specifies several generic bulkhead rework procedures. These are permitted providing they comply with the conditions specified herein.

D. Placement of Balance Weights for Dynamic Balance

(1) Many spinner bulkheads have factory installed self-locking nut plates provided for the installation of balance weights.

(2) Subsequent removal of the dynamic balance weights will return the propeller to its original static balance condition.

(3) Use only stainless or plated steel washers as dynamic balance weights on the spinner bulkhead.

(a) For 105819(P) or 104154(P) spinner bulkheads only, up to ten AN970 style washers weighing up to approximately 1.6 oz (45.0 g) may be installed at any one location.

NOTE: The dimensions of an AN970 style washer are: ID 0.203 inch (5.16 mm), OD 0.875 inch (22.23 mm), and thickness 0.063 inch (1.59 mm).

(b) For all other spinner bulkheads, a maximum of six AN970 style washers weighing up to approximately 1.0 oz (28.0 g) may be installed at any one location.

NOTE: The dimensions of an AN970 style washer are: ID 0.203 inch (5.16 mm), OD 0.875 inch (22.23 mm), and thickness 0.063 inch (1.59 mm).

(4) Install weights using aircraft quality #10-32 or AN-3( ) type screws or bolts.

(5) Torque each screw or bolt to 30-36 In-Lbs (3.4-4.0 N•m).

(6) Balance weight screws attached to the spinner bulkheads must protrude through the self-locking nuts or nut plates a minimum of one thread and a maximum of four threads.

(a) Make sure the screw or bolt grip length is short enough to prevent interference with the nut or nut plate when the correct torque is applied.

(b) It may be necessary to alter the number and/or location of the static balance weights in order to achieve dynamic balance.

(7) Make a record of the number and location of the dynamic balance weights in the propeller logbook.

4. Balance Weight Requirements for Specific Propeller Applications

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 CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. For Propeller Model HC-C3YF-1R( )F

(1) Section 4.A. is applicable to propeller model HC-C3YF-1R( )F that uses blade model F9684-1 and spinner assembly A-4203-1 and is installed on a Piper PA-36-285 aircraft.

(2) If it is necessary to change the bulkhead, perform the following steps:

(a) Make a note of the placement of the balance weights on the existing bulkhead.

(b) Remove the weights from the existing bulkhead.

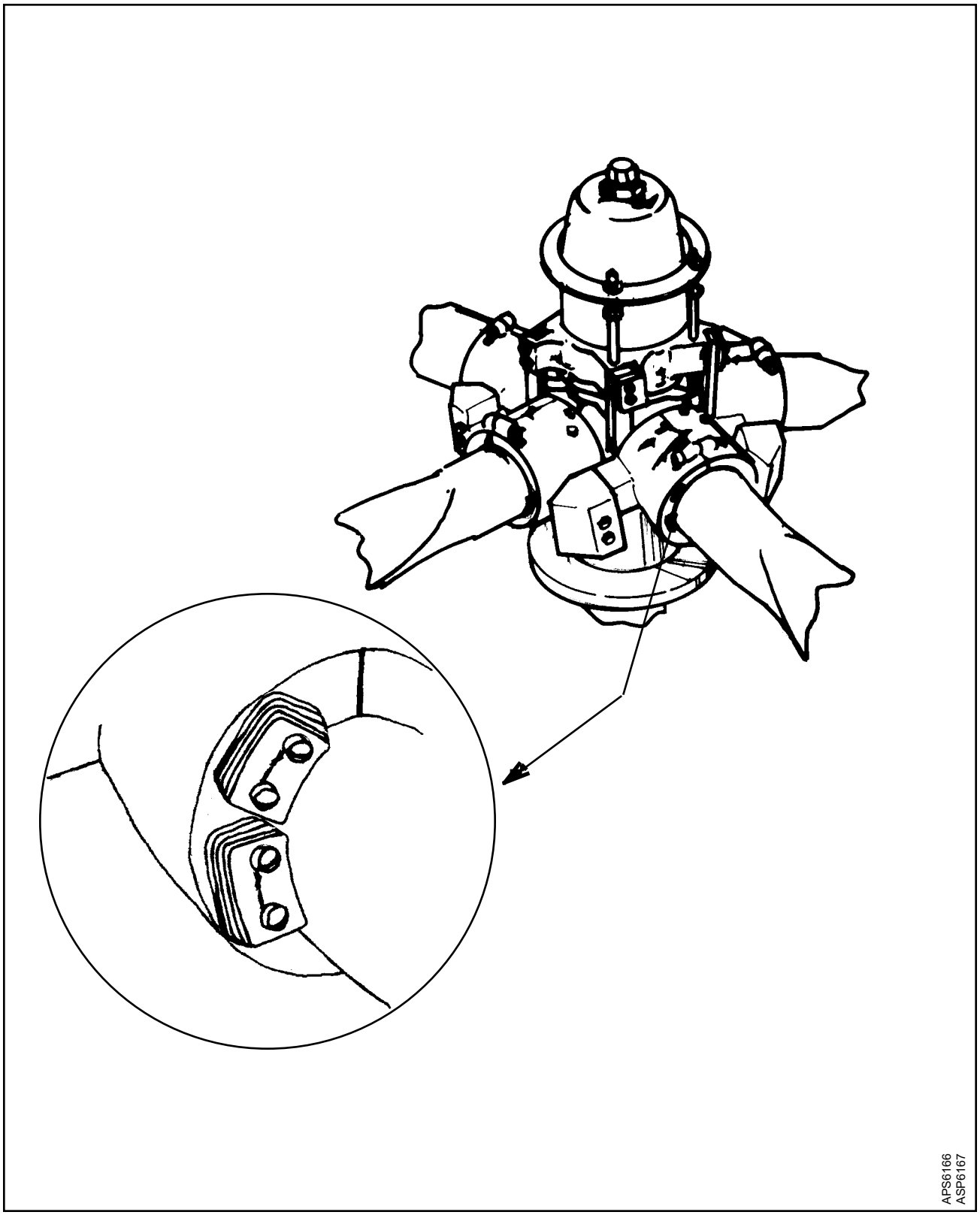
(c) Install the balance weights on the new bulkhead in the same position relative to the blade location.

1 Using B-3840-( ) screws, attach the A-48(-) weights to the rear of the C-3283-( ) bulkhead.

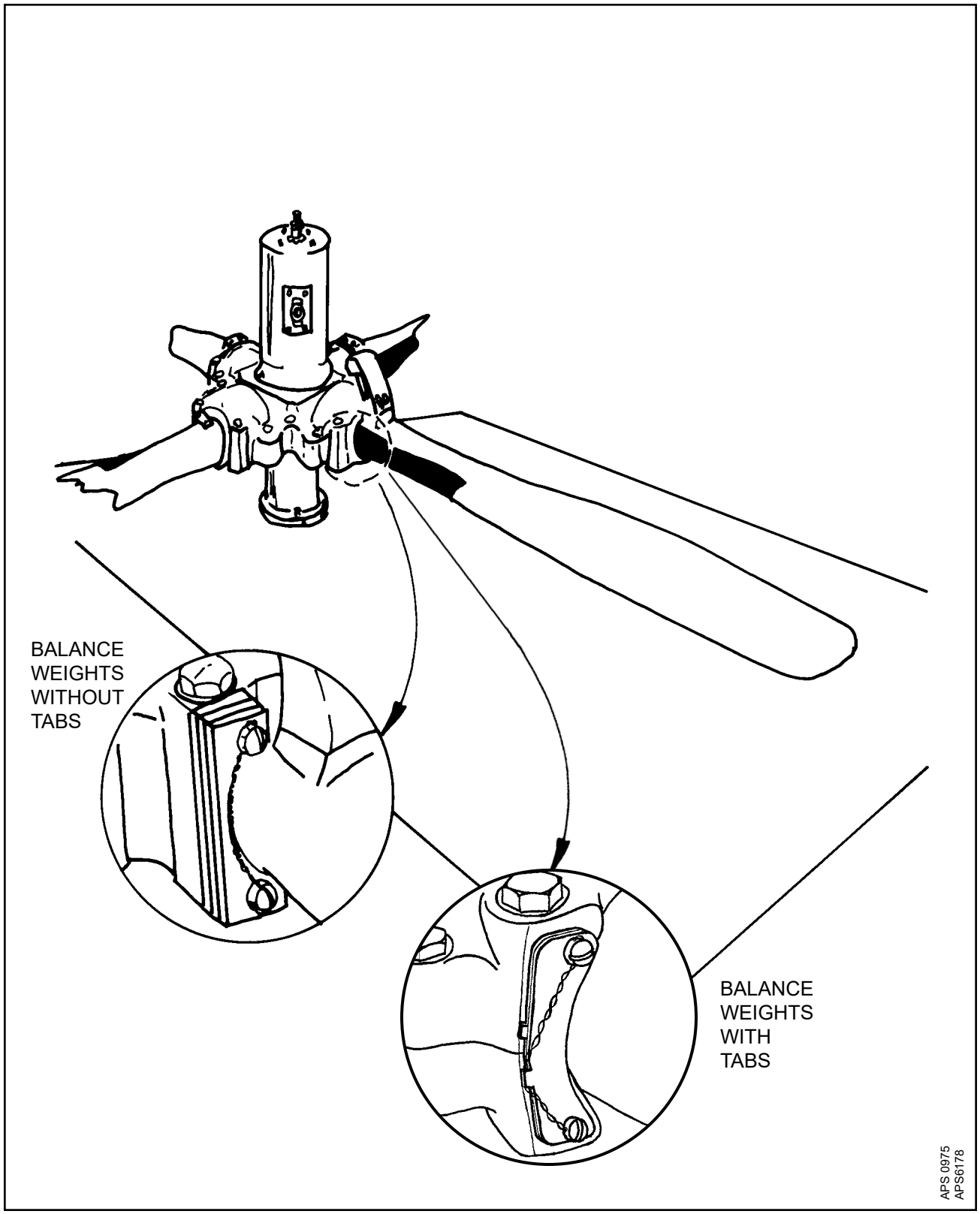
a The B-3840-( ) screw must protrude one to three threads through the nut plate on the bulkhead

2 A maximum of two stacks of weights for each blade is permitted.

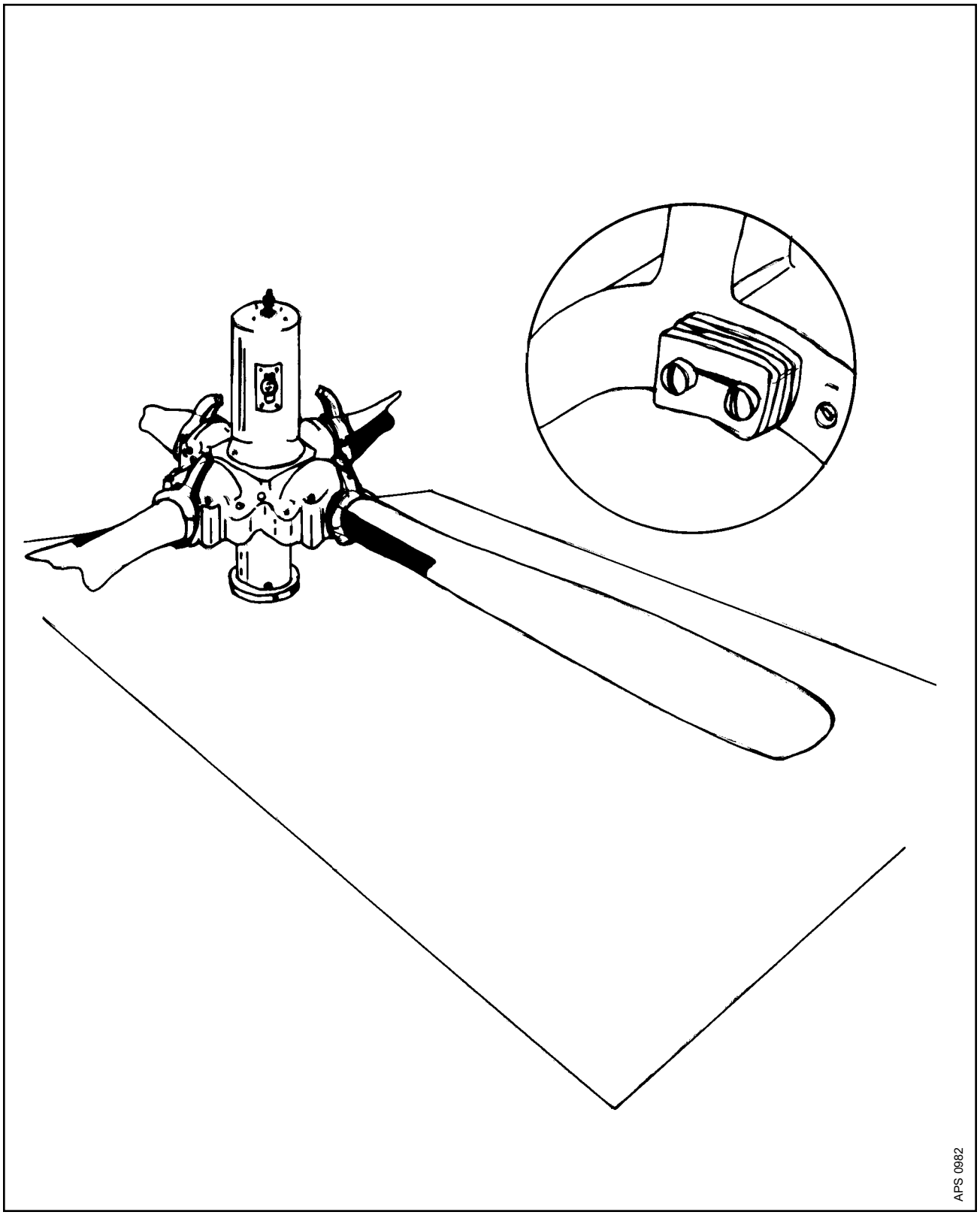
a A maximum of seven A-48-A weights with one A-48 weight are permitted for each stack.



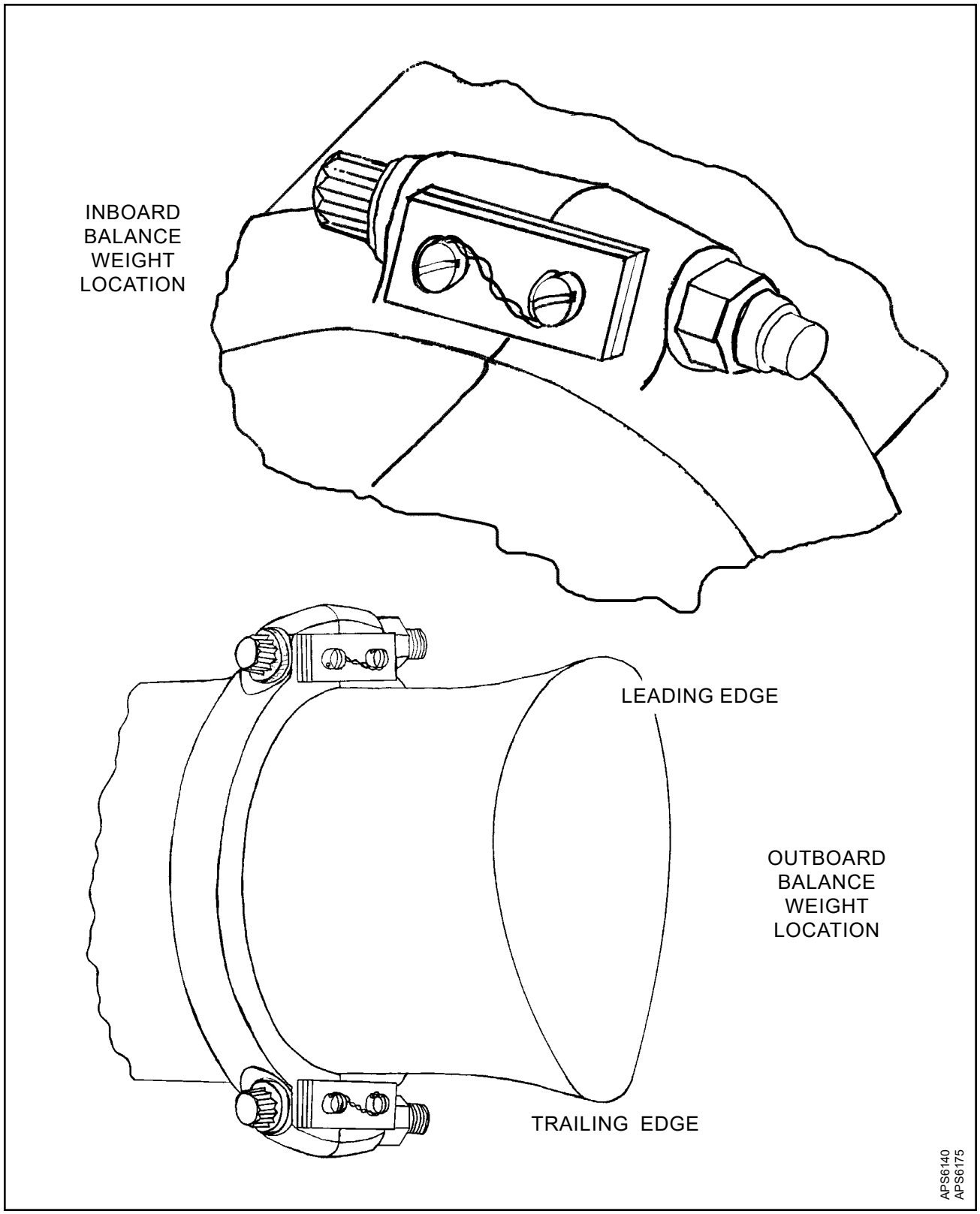
Location of Balance Weights on C-1977-( ) and C-1301-( ) Blade Clamps
Figure 2-2



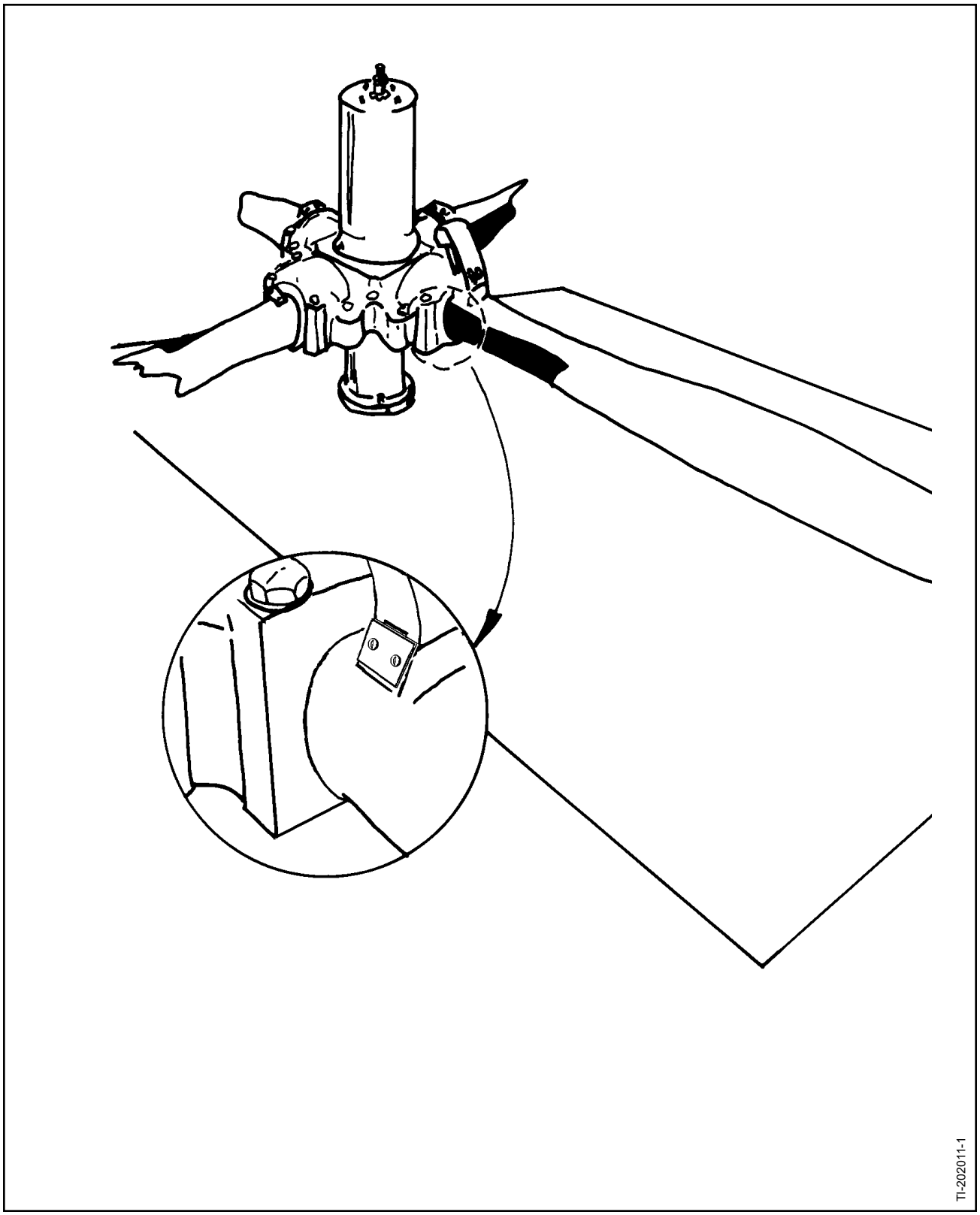
Location of Balance Weights on Blade Socket Shoulder
Figure 2-3



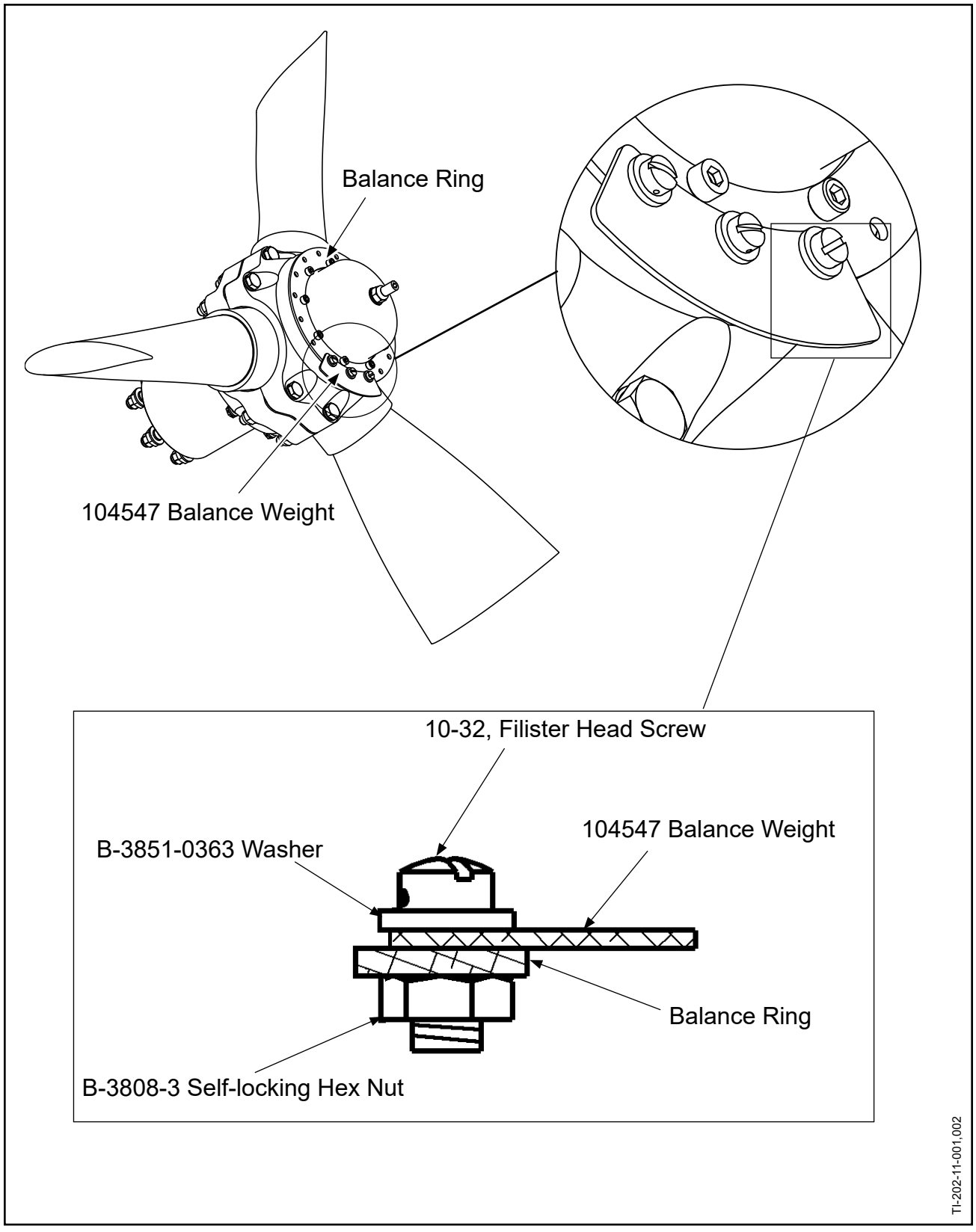
Location of Balance Weights on Composite Blade Counterweight
Figure 2-4



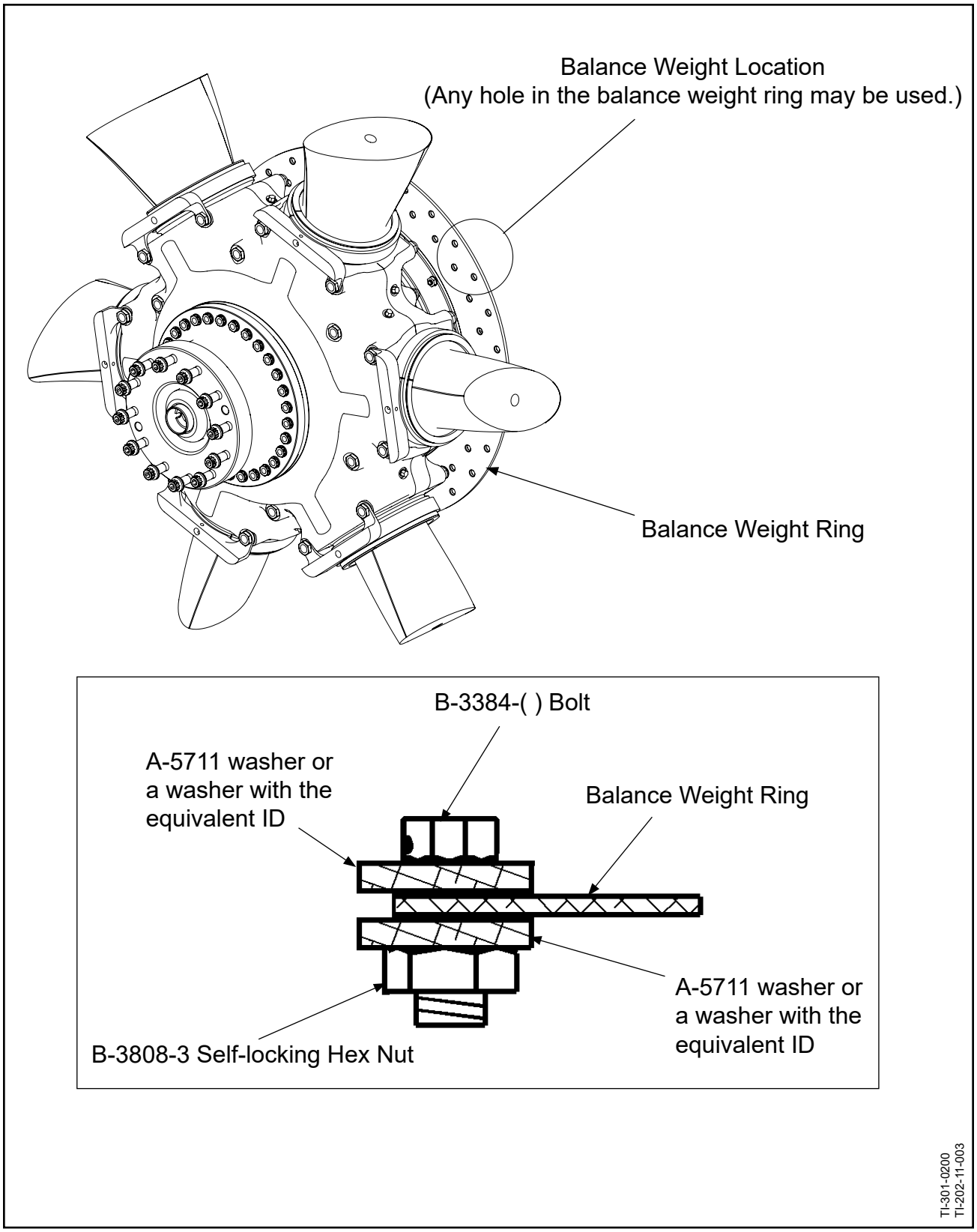
Locations of Balance Weights on D-6831-( ) and C-3-( ) Blade Clamps
Figure 2-5



Location of Balance Weights on Composite Blade Counterweight Boss
Figure 2-6



Location of Balance Weights on the Bantam Propeller Balance Ring
Figure 2-7



Location of Balance Weights on the Hovercraft Propeller Balance Weight Ring
Figure 2-8

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