Manual No. 115N
61-00-15
Revision 28
September 2024

Propeller Owner's Manual
and Logbook

"Compact" Models with Aluminum Blades

Constant Speed, Non-Counterweighted
( )HC-( )( )Y( )-1( )

Constant Speed, Counterweighted
( )HC-( )( )Y( )-4( )

Constant Speed and Feathering
( )HC-( )( )Y( )-2( )

Constant Speed and Feathering, Turbine
( )HC-( )( )Y( )-5( )

Hartzell Propeller LLC
One Propeller Place
Piqua, OH 45356-2634 U.S.A.
Ph: 937-778-4200 (Hartzell Propeller LLC)
Ph: 937-778-4379 (Product Support)
Product Support Fax: 937-778-4215

Fellow aviation enthusiasts, I urge you to read this Manual thoroughly. It contains a wealth of information about your new propeller.

The propeller is among the most reliable components of your airplane. It is also among the most critical to flight safety. It therefore deserves the care and maintenance called for in this Manual. Please give it your attention, especially the section dealing with Inspections and Checks.

Thank you for choosing a Hartzell propeller. Properly maintained it will give you many years of reliable service.

JJ Frigge
President, Hartzell Propeller LLC

WARNING (Rev. 5)

People who fly should recognize that various types of risks are involved; and they should take all precautions to minimize them, since they cannot be eliminated entirely. The propeller is a vital component of the aircraft. A mechanical failure of the propeller could cause a forced landing or create vibrations sufficiently severe to damage the aircraft, possibly causing it to become uncontrollable.

Propellers are subject to constant vibration stresses from the engine and airstream, which are added to high bending and centrifugal stresses.

Before a propeller is certified as being safe to operate on an airplane, an adequate margin of safety must be demonstrated. Even though every precaution is taken in the design and manufacture of a propeller, history has revealed rare instances of failures, particularly of the fatigue type.

It is essential that the propeller is properly maintained according to the recommended service procedures and a close watch is exercised to detect impending problems before they become serious. Any grease or oil leakage, loss of air pressure, unusual vibration, or unusual operation should be investigated and repaired, as it could be a warning that something serious is wrong.

For operators of uncertified or experimental aircraft an even greater level of vigilance is required in the maintenance and inspection of the propeller. Experimental installations often use propeller-engine combinations that have not been tested and approved. In these cases, the stress on the propeller and, therefore, its safety margin is unknown. Failure could be as severe as loss of propeller or propeller blades and cause loss of propeller control and/or loss of aircraft control.

Hartzell Propeller LLC follows FAA regulations for propeller certification on certificated aircraft. Experimental aircraft may operate with unapproved engines or propellers or engine modifications to increase horsepower, such as unapproved crankshaft damper configurations or high compression pistons. These issues affect the vibration output of the engine and the stress levels on the propeller. Significant propeller life reduction and failure are real possibilities.

Frequent inspections are strongly recommended if operating with a non-certificated installation; however, these inspections may not guarantee propeller reliability, as a failing device may be hidden from the view of the inspector. Propeller overhaul is strongly recommended to accomplish periodic internal inspection.

Inspect the propeller/blades in accordance with the applicable operation/maintenance documents.

(Blank Page)

REVISION 28 HIGHLIGHTS

Revision 28, dated September 2024, incorporates the following:

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

Removed references to “Hartzell Propeller Inc.”. Revised to “Hartzell Propeller LLC” where applicable.

Minor language/format changes and renumbering will be marked with a revision bar but not listed in this section.

- INSTALLATION AND REMOVAL
  - Revised the section, "Tools, Consumables, and Expendables"
- INSPECTION AND CHECK
  - Revised the section, "Blade Tolerances"
- RECORDS
  - Revised the section, "Record Keeping"

(Blank Page)

REVISION 28 HIGHLIGHTS

1. Introduction
   A. General
      (1) This is a list of current revisions that have been issued against this manual. Please compare it to the RECORD OF REVISIONS page to make sure that all revisions have been added to the manual.
   B. Components
      (1) Revision No. indicates the revisions incorporated in this manual.
      (2) Issue Date is the date of the revision.
      (3) Comments indicates the level of the revision.
         (a) New Issue is a new manual distribution. The manual is distributed in its entirety. All the page 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 page 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 content changes over a large portion of the manual. The manual is distributed in its entirety. All the page 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
Rev. 2	May/92	Minor Revision
Rev. 3	Jan/94	Major Revision
Rev. 4	Oct/97	Major Revision
Rev. 5	Jan/99	Major Revision
Rev. 6	Sep/00	Minor Revision
Rev. 7	Oct/02	Major Revision
Rev. 8	Jun/03	Minor Revision
Rev. 9	Aug/03	Minor Revision
Rev. 10	Nov/03	Minor Revision
Rev. 11	Dec/04	Minor Revision
Rev. 12	Apr/05	Minor Revision
Rev. 13	Aug/06	Minor Revision
Rev. 14	Jan/09	Minor Revision
Rev. 15	Jul/09	Minor Revision
Rev. 16	Oct/09	Minor Revision
Rev. 17	Jul/12	Minor Revision
Rev. 18	Feb/13	Minor Revision
Rev. 19	Nov/13	Minor Revision
Rev. 20	Mar/14	Minor Revision
Rev. 21	Mar/15	Minor Revision
Rev. 22	Jul/16	Minor Revision
Rev. 23	Feb/18	Minor Revision
Rev. 24	Dec/20	Major Revision
Rev. 25	Feb/22	Minor Revision
Rev. 26	Aug/23	Major Revision
Rev. 27	Mar/24	Minor Revision
Rev. 28	Sep/24	Minor Revision

RECORD OF REVISIONS

This is a record of revisions inserted into this manual.
Revision 26 includes all prior revisions.

Revision Number	Issue Date	Date Inserted	Inserted By
26	Aug/23	Aug/23	HPI
27	Mar/24	Mar/24	HP
28	Sep/24	Sep/24	HP

(Blank Page)

RECORD OF TEMPORARY REVISIONS

TR No.	Issue Date	Date Inserted	Inserted By	Date Removed	Removed By

(Blank Page)

SERVICE DOCUMENTS LIST

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

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

Service Document Number	Incorporation Rev/Date
Service Bulletins:	
HC-SB-61-286	Rev. 11, Dec/04
HC-SB-61-244	Rev. 17, Jul/12
HC-SB-61-267	Rev. 21, Mar/15
HC-SB-61-325	Rev. 17, Jul/12
HC-SB-61-353	Rev. 21, Mar/15

SERVICE DOCUMENTS LIST

Service Document Number	Incorporation Rev/Date
Service Letters:	
HC-SL-61-185, R3	Rev. 23, Feb/18
HC-SL-61-187, R3	Rev. 21, Mar/15
HC-SL-61-217	Rev. 17, Jul/12
HC-SL-61-230	Rev. 21, Mar/15
HC-SL-61-324	Rev. 17, Jul/12
HC-SL-61-354	Rev. 22, Jul/16
HC-SL-61-364	Rev. 24, Dec/20

AIRWORTHINESS LIMITATIONS

The Airworthiness Limitations section is FAA approved and specifies maintenance required under 14 CFR § 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

FAA APPROVED

5/3/16.

Manager, Chicago Aircraft Certification Office,
ACE-115C
Federal Aviation Administration

Rev. No.	Description of Revision
15	Adds airworthiness limitation information from Hartzell Overhaul Manual 113B (61-10-13) and Hartzell Overhaul Manual 117D (61-10-17)
16	Added cylinder life limits for propeller model HC-C(2,3)YR-4(B,C)F/FC8477-4R and corrected the engine model number for Aviatt Pitts S-2S,S-2B
19	Added blade life limits for propeller models HC-(C,F,M)2YR-1BFP/F7499 and HC-C2YR-1BF/F7666A-2
22	Corrected the engine model number for propeller model HC-(C,F,M)2YR-1BFP/F7499

AIRWORTHINESS LIMITATIONS

1. Replacement Time (Life Limits)
   A. The FAA establishes specific life limits for certain component parts, as well as the entire propeller. Such limits require replacement of the identified parts after a specified number of hours of use.
   B. The following data summarizes all current information concerning Hartzell life limited parts as related to propeller models affected by this manual. These parts are not life limited on other installations; however, time accumulated toward life limit accrues when first operated on aircraft/ engine/propeller combinations listed, and continues regardless of subsequent installations (which may or may not be life limited).

FAA APPROVED

by: _____ date: 8/3/16

Manager, Chicago Aircraft Certification Office,
ACE-115C
Federal Aviation Administration

AIRWORTHINESS LIMITATIONS

(1) The following list specifies life limits for blades only. Associated hub parts are not affected. Blade models shown are life limited only on the specified applications.

Aircraft/Engine/Propeller	Blade Life Limit
Aircraft: Aviat Pitts S-2S Engine: Lycoming AEIO-540-D4A5 Propeller: HC-C2YR-4CF/FC8477A-4	2,000 hours
Aircraft: Aviat Pitts S-2B Engine: Lycoming AEIO-540-D4A5 Propeller: HC-C2YR-4CF/FC8477A-4	2,000 hours
Aircraft: SOCATA TB-30 Engine: Lycoming AEIO-540-L1B5D Propeller: HC-C2YR-4CF/FC8475-6	4,000 hours
Aircraft: Twin Commander Aircraft Models 500(B,S,U) as modified by Merlyn Products, Inc. Engine: Lycoming Models TIO-540-J2B and -J2BD Propeller: HC-C4YR-2/FC6660(K)	10,500 hours
Aircraft: Aerostar aircraft Models PA60-601(P), 602P as modified by Machen Engine: Lycoming (T)IO-540Series Models Propeller: HC-C4YR-2(L)/F(J)C6660(B,K)	10,500 hours

FAA APPROVED

by: _____ date: _____

Manager, Chicago Aircraft Certification Office,
ACE-115C
Federal Aviation Administration

AIRWORTHINESS LIMITATIONS

(2) The following list specifies life limits for blades only. Associated hub parts are not affected. Blade models shown are life limited only on the specified engine.

Propeller/Engine	Blade Life Limit
Propeller: HC-(C,F,M)2YR-1BFP/F7499 Engine: Engine Components, Inc. (ECI) (I)OX-360-( ) 8.5:1 to 10.2:1 Compression Ratio Max Diameter 74 inches Min. Diameter 72 inches Operating Restriction: "Do not operate above 24" manifold pressure below 2450 RPM"	10,000 hours
Propeller: HC-(C,F,M)2YR-1BFP/F7499 Engine: Engine Components, Inc. (ECI) (I)OX-370-( ) 8.5:1 Compression Ratio Max Diameter 74 inches Min. Diameter 72 inches Operating Restriction: "Do not operate above 24" manifold pressure below 2450 RPM"	10,000 hours

FAA APPROVED

by: _____ date: 8/3/16

Manager, Chicago Aircraft Certification Office,
ACE-115C
Federal Aviation Administration

AIRWORTHINESS LIMITATIONS

Propeller/Engine		Blade Life Limit
Propeller:	HC-C2YR-1BF/F7666A-2	8,700 hours
Engine:	Lycoming O-360-A1A rated at 180hp at 2700 RPM equipped with Lightspeed Plasma II electronic ignition Max. Diameter 74 inches Min. Diameter 72 inches	
Operating Restriction:	"Avoid continuous operation between 2000 and 2250 RPM. Operation above 2600 RPM is limited to takeoff. As soon as practical after takoff, the RPM should be reduced to 2600 RPM or less."	

FAA APPROVED

by: _____ date: 8/3/16

Manager, Chicago Aircraft Certification Office,
ACE-115C
Federal Aviation Administration

AIRWORTHINESS LIMITATIONS

(3) The following list specifies life limits for propeller hubs only. Hubs listed are life limited only on the specified applications.

Aircraft/Engine/Propeller	Hub Unit Life Limit
Aircraft: Aviatt Pitts S-2S Engine: Lycoming AEIO-540-D4A5 Propeller: HC-C2YR-4CF/FC8477A-4	2,000 hours
Aircraft: Aviatt Pitts S-2B Engine: Lycoming AEIO-540-D4A5 Propeller: HC-C2YR-4CF/FC8477A-4	2,000 hours
Aircraft: SOCATA TB-30 Engine: Lycoming AEIO-540-L1B5D Propeller: HC-C2YR-4CF/FC8475-6	4,000 hours ("A" suffix serial numbers)
Aircraft: SOCATA TB-30 Engine: Lycoming AEIO-540-L1B5D Propeller: HC-C2YR-4CF/FC8475-6	16,000 hours ("B" suffix serial numbers)

(4) The following list specifies life limits for cylinder part number 101746 only. Cylinders listed are life limited only on the specified applications.

Aircraft/Engine/Propeller	Cylinder Life Limit
Aircraft: Hindustan HPT-32 Engine: Lycoming AEIO-540-D4B5 Propeller: HC-C(2,3)YR-4(B,C)F/FC8477-4R	2,000 hours

FAA APPROVED

by: _____ date: 8/3/16

Manager, Chicago Aircraft Certification Office,
ACE-115C
Federal Aviation Administration

LIST OF EFFECTIVE PAGES

Chapter	Page	Revision	Date
Cover	Cover/Inside Cover	Rev. 28	Sep/24
Message	1 thru 4	Rev. 27	Mar/24
Revision Highlights	1 thru 4	Rev. 28	Sep/24
Record of Revisions	1 thru 2	Rev. 26	Aug/23
Record of Temporary Revisions	1 thru 2	Rev. 26	Aug/23
Service Documents List	1 thru 2	Rev. 26	Aug/23
Airworthiness Limitations	1 thru 6	Rev. 26	Aug/23
List of Effective Pages	1 thru 4	Rev. 28	Sep/24
Table of Contents	1 thru 2	Rev. 26	Aug/23
Introduction	1-1 thru 1-32	Rev. 28	Sep/24
Description and Operation	2-1	Rev. 28	Sep/23
	2-2 thru 2-14	Rev. 26	Aug/23
	2-15	Rev. 28	Sep/24
	2-16 thru 2-19	Rev. 26	Aug/23
	2-20	Rev. 28	Sep/24
	2-21 thru 2-22	Rev. 26	Aug/23
	2-23	Rev. 28	Sep/24
	2-24	Rev. 26	Aug/23
	2-25 thru 2-27	Rev. 28	Sep/24
	2-28 thru 2-32	Rev. 26	Aug/23
Installation and Removal	3-1	Rev. 28	Sep/24
	3-2	Rev. 26	Aug/23
	3-2.1 thru 3-2.2	Rev. 26	Aug/23
	3-3 thru 3-7	Rev. 28	Sep/24
	3-8 thru 3-13	Rev. 26	Aug/23
	3-14	Rev. 27	Mar/24
	3-15	Rev. 28	Sep/24
	3-16 thru 3-20	Rev. 26	Aug/23
	3-21	Rev. 27	Mar/24
	3-22	Rev. 28	Sep/24
	3-23 thru 3-24	Rev. 26	Aug/23
	3-25	Rev. 27	Mar/24

LIST OF EFFECTIVE PAGES

Chapter	Page	Revision	Date
Installation and Removal	3-26 thru 3-28	Rev. 26	Aug/23
	3-29	Rev. 28	Sep/24
	3-30 thru 3-31	Rev. 26	Aug/23
	3-32 thru 3-33	Rev. 28	Sep/24
	3-34 thru 3-35	Rev. 26	Aug/23
	3-36	Rev. 28	Sep/24
	3-37 thru 3-38	Rev. 26	Aug/23
	3-39 thru 3-40	Rev. 28	Sep/24
	3-41 thru 3-42	Rev. 26	Aug/23
	3-43 thru 3-44	Rev. 28	Sep/24
	3-45	Rev. 26	Aug/23
	3-46	Rev. 28	Sep/24
	3-47 thru 3-48	Rev. 26	Aug/23
	3-49 thru 3-50	Rev. 28	Sep/24
	3-51	Rev. 27	Mar/24
	3-52	Rev. 28	Sep/24
	3-53	Rev. 27	Mar/24
	3-54 thru 3-55	Rev. 26	Aug/23
	3-56 thru 3-57	Rev. 27	Mar/24
	3-58 thru 3-59	Rev. 26	Aug/23
	3-60	Rev. 28	Sep/24
	3-61	Rev. 27	Mar/24
	3-62	Rev. 26	Aug/23
	3-63 thru 3-64	Rev. 28	Sep/24
	3-65	Rev. 27	Mar/24
	3-66 thru 3-67	Rev. 26	Aug/23
	3-68	Rev. 28	Sep/24
	3-69	Rev. 27	Mar/24
	3-70 thru 3-72	Rev. 26	Aug/23
	3-73	Rev. 28	Sep/24
	3-74	Rev. 26	Aug/23
	3-75 thru 3-77	Rev. 28	Sep/24

LIST OF EFFECTIVE PAGES

Chapter	Page	Revision	Date
Installation and Removal	3-78	Rev. 26	Aug/23
	3-79 thru 3-85	Rev. 28	Sep/24
	3-86	Rev. 26	Aug/23
Testing and Troubleshooting	4-1 thru 4-2	Rev. 26	Aug/23
	4-3	Rev. 28	Sep/24
	4-4 thru 4-14	Rev. 26	Aug/23
Inspection and Check	5-1 thru 5-40	Rev. 28	Sep/24
Maintenance Practices	6-1 thru 6-2	Rev. 28	Sep/24
	6-2.1 thru 6-2.2	Rev. 28	Sep/24
	6-3	Rev. 28	Sep/24
	6-4 thru 6-6	Rev. 26	Aug/23
	6-7	Rev. 28	Sep/24
	6-8	Rev. 26	Aug/23
	6-9 thru 6-10	Rev. 28	Sep/24
	6-11 thru 6-12	Rev. 26	Aug/23
	6-13 thru 6-14	Rev. 28	Sep/24
	6-15	Rev. 26	Aug/23
	6-16 thru 6-50	Rev. 28	Sep/24
Anti-Ice and De-Ice Systems	7-1 thru 7-5	Rev. 26	Aug/23
	7-6	Rev. 28	Sep/24
Records	8-1 thru 8-2	Rev. 26	Aug/23
	8-3 thru 8-4	Rev. 28	Sep/24

(Blank Page)

TABLE OF CONTENTS

(Blank Page)

INTRODUCTION - CONTENTS

INTRODUCTION - CONTENTS, CONTINUED

1. General (Rev. 2)

   A. Statement of Purpose

      (1) This manual has been reviewed and accepted by the FAA. Additionally, the Airworthiness Limitations section of this manual has been approved by the FAA.

      CAUTION: KEEP THIS MANUAL WITH THE PROPELLER OR THE AIRCRAFT ON WHICH IT IS INSTALLED AT ALL TIMES. THE LOGBOOK RECORD WITHIN THIS MANUAL MUST BE MAINTAINED, RETAINED CONCURRENTLY, AND BECOME A PART OF THE AIRCRAFT AND ENGINE SERVICE RECORDS.

      (2) The information in this manual can be used by qualified personnel to install, operate, and maintain the applicable Hartzell propeller assemblies.

         (a) Additional manuals are available that include overhaul procedures and specifications for the propeller.

      (3) This manual may include several design types.

         (a) Parentheses shown in the propeller model designations in this or other Hartzell Propeller publications indicate letter(s) and/or number(s) that may or may not be present because of different configurations permitted on the various aircraft installations.

            1 Refer to the Description and Operation chapter of this manual for propeller and blade model designation information.

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

B. Maintenance Practices

(1) The propeller and its components are highly vulnerable to damage while they are removed from the engine. Properly protect all components until they are reinstalled on the engine.

(2) Never attempt to move the aircraft by pulling on the propeller.

(3) Avoid the use of blade paddles. Do not put the blade paddle in the area of the de-ice or anti-icing boot when applying torque to a blade assembly. Put the blade paddle in the thickest area of the blade, just outside of the de-ice or anti-icing boot. Use one blade paddle per blade.

(4) Use only the approved consumables, e.g., cleaning agents, lubricants, etc.

(5) Observe applicable torque values during maintenance.

(6) Before installing the propeller on the engine, the propeller must be statically balanced. New propellers are statically balanced at Hartzell Propeller. Overhauled propellers must be statically balanced by a certified propeller repair station with the appropriate rating before return to service.

(a) Dynamic balance is recommended, but may be accomplished at the discretion of the operator, unless specifically required by the airframe or engine manufacturer.

1 Perform dynamic balancing in accordance with the Maintenance Practices chapter of this manual.

2 Additional procedures may be found in the aircraft maintenance manual.

(7) As necessary, use a soft, non-graphite pencil or crayon to make identifying marks on components.

(8) As applicable, follow military standard NASM33540 for safety wire, safety cable, and cotter pin general practices. Use 0.032 inch (0.81 mm) diameter stainless steel safety wire unless otherwise indicated.

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

(10) The airframe manufacturer's manuals should be used in addition to the information in this manual due to possible special requirements for specific aircraft applications.

(11) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller, applicable instructions and technical information for the components can be found in Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(12) Propeller ice protection system components not supplied by Hartzell Propeller are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(13) Approved corrosion protection followed by approved paint must be applied to all aluminum blades.

(a) For information about the application of corrosion protection and paint, refer to the Maintenance Practices chapter of this manual. Operation of blades without the specified coatings and finishes, i.e., "polished blades", is not permitted.

2. Airframe or Engine Modifications (Rev. 2)

A. Propeller Stress Levels

(1) Propellers are approved vibrationwise on airframe and engine combinations based on tests or analysis of similar installations. This data has demonstrated that propeller stress levels are affected by airframe configuration, airspeed, weight, power, engine configuration and approved flight maneuvers. Aircraft modifications that can affect propeller stress include, but are not limited to: aerodynamic changes ahead of or behind the propeller, realignment of the thrust axis, increasing or decreasing airspeed limits, increasing or decreasing weight limits (less significant on piston engines), the addition of approved flight maneuvers (utility and aerobatic).

B. Engine Modifications

(1) Engine modifications can also affect the propeller. The two primary categories of engine modifications are those that affect structure and those that affect power. An example of a structural engine modification is the alteration of the crankshaft or damper of a piston engine. Any change to the weight, stiffness, or tuning of rotating components could result in a potentially dangerous resonant condition that is not detectable by the pilot. Most common engine modifications affect the power during some phase of operation. Some modifications increase the maximum power output, while others improve the power available during hot and high operation (flat rating) or at off-peak conditions.

(a) Examples of turbine engine modifications include, but are not limited to: changes to the compressor, power turbine or hot section of a turboprop engine.

(b) Examples of reciprocating engine modifications include, but are not limited to: the addition or alteration of a turbocharger or turbonormalizer, increased compression ratio, increased RPM, altered ignition timing, electronic ignition, full authority digital electronic controls (FADEC), or tuned induction or exhaust.

(2) All such modifications must be reviewed and approved by the propeller manufacturer prior to obtaining approval on the aircraft.

3. Restrictions and Placards (Rev. 1)

A. Important Information

(1) The propellers included in this manual may have a restricted operating range that requires a cockpit placard.

(a) The restrictions, if present, will vary depending on the propeller, blade, engine, and/or aircraft model.

(b) Review the propeller and aircraft type certificate data sheet (TCDS), Pilot Operating Handbook (POH), and any applicable Airworthiness Directives for specific information.

4. Reference Publications (Rev. 8)

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

(3) 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 113B (61-10-13)	Compact and Lightweight Compact Non-Feathering (-1) and Aerobatic (-4) Propeller Overhaul and Maintenance Manual
Manual 117D (61-10-17)	Compact Constant Speed and Feathering Propeller Overhaul and Maintenance Manual
Manual 127 (61-16-27)	Metal Spinner Maintenance Manual
Manual 130B (61-23-30)	Mechanically Actuated Governors and Accessories Maintenance Manual
Manual 133C (61-13-33)	Aluminum Blade Overhaul Manual
Manual 148 (61-16-48)	Composite Spinner Maintenance Manual

Manual No. (ATA No.)	Hartzell Propeller Manual Title
Manual 159 (61-02-59)	Application Guide
Manual 165A (61-00-65)	Illustrated Tool and Equipment Manual
Manual 180 (30-61-80)	Propeller Ice Protection System Manual
Manual 202A (61-01-02)	Standard Practices Manual, Volumes 1 through 11

B. Vendor Publications
None.

5. Personnel Requirements (Rev. 3)

A. Service and Maintenance Procedures in this Manual

(1) Personnel performing the service and maintenance procedures 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 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 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.

6. 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.

7. 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 physical properties, health, and physical hazards of any paint or chemical.

8. Calendar Limits and Long Term Storage (Rev. 3)

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 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 Standard Practices Manual 202A (61-01-02).

9. 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.

(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.

10. 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.

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).

11. 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.

12. Warranty Service (Rev. 2)
    A. Warranty Claims
        (1) If you believe you have a warranty claim, contact Hartzell Propeller Product Support Department to request a *Warranty Application* form. Complete this form and return it to Hartzell Product 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 section, "Hartzell Propeller Contact Information" in this chapter.

13. Hartzell Propeller Contact Information (Rev. 3)

A. Product Support Department

(1) Contact 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 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 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 worldwide network of aftermarket distributors and approved repair facilities is available on the Hartzell website at www.hartzellprop.com.

14. 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

Term	Definition
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
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

Term	Definition
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.
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.

Term	Definition
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

Term	Definition
Erosion	Gradual wearing away or deterioration due to action of the elements
Exposure	Leaving material open to action of the elements
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

Term	Definition
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
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

Term	Definition
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"

Term	Definition
Pitting	Formation of a number of small, irregularly shaped cavities in surface material caused by corrosion or wear
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

Term	Definition
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
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

Term	Definition
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

15. 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

Abbreviation	Term
MPI	Major Periodic Inspection (Overhaul)
MS	Military Standard
MSDS	Material Safety Data Sheet
N	Newtons
N/A	Not Applicable
NAS	National Aerospace Standards
NASM	National Aerospace Standards, Military
NDT	Nondestructive Testing
NIST	National Institute of Standards and Technology
N•m	Newton-Meters
OD	Outside Diameter
OPT	Optional
PC	Production Certificate
PCP	Propeller Critical Part
PLC	Programmable Logic Controller
PMB	Plastic Media Blasting (Cleaning)
POH	Pilot's Operating Handbook
PSI	Pounds per Square Inch
RF	Reference
RPM	Revolutions per Minute
SAE	Society of Automotive Engineers
STC	Supplemental Type Certificate
TBO	Time Between Overhaul

Abbreviation	Term
TC	Type Certificate
TSI	Time Since Inspection
TSN	Time Since New
TSO	Time Since Overhaul
UID	Unique Identification
WIG	Wing-In-Ground-Effect

(Blank Page)

DESCRIPTION AND OPERATION - CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. Description of Propeller and Systems

   A. System Overview

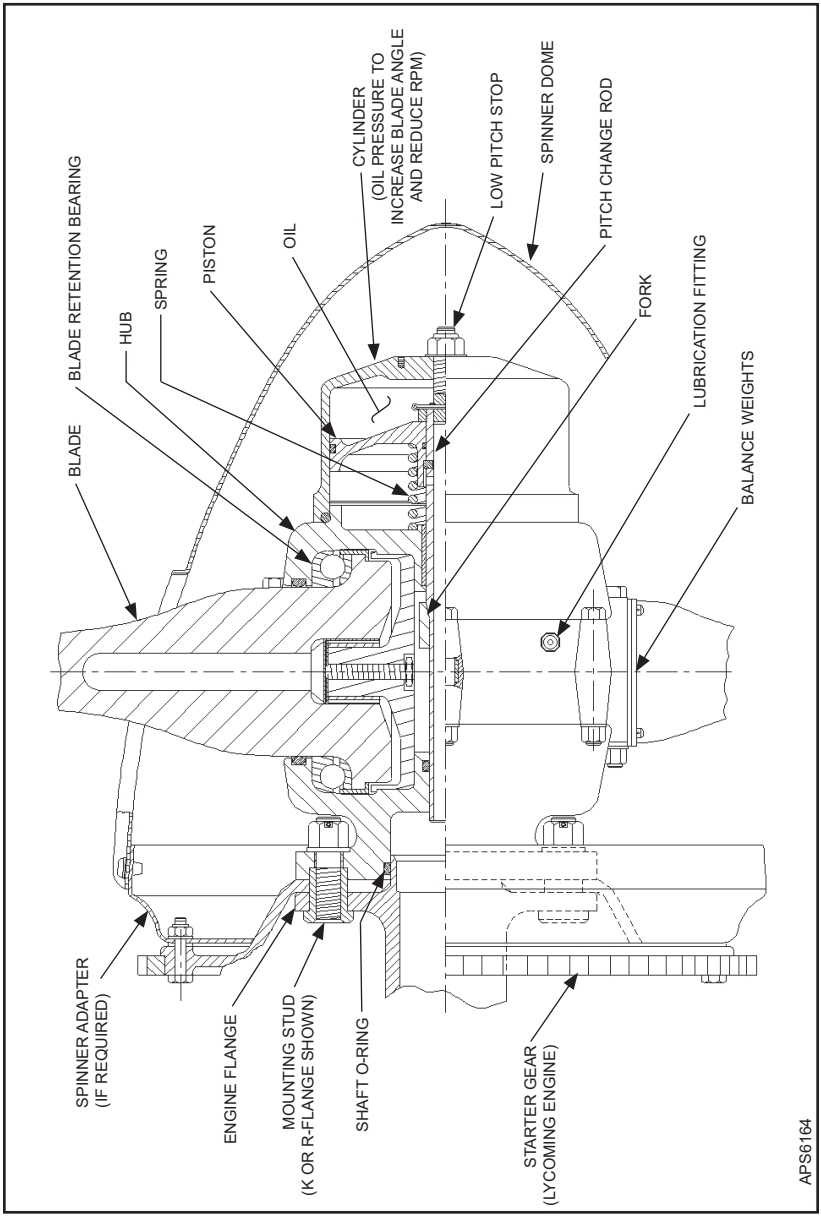
      (1) The propellers covered in this manual are constant speed, single-acting, hydraulically actuated propellers. Some of the propellers have feathering capability. These propellers are designed primarily for use with reciprocating engines, but there are some turbine applications.

      (2) A constant speed propeller system is controlled by an engine speed sensing device (governor) to maintain a constant engine/propeller RPM by changing blade angle.

      (3) The governor uses an internal pump that is driven by the engine. This pump increases engine oil pressure for supply to the propeller. Engine speed sensing hardware within the governor controls the supply of oil to the propeller, supplying or draining oil as appropriate to maintain constant engine speed.

      (4) Propeller blade angle change is accomplished via a hydraulic piston/cylinder combination mounted on the forward end of the propeller hub. The linear motion of the hydraulic piston is transmitted to each blade through a pitch change rod and a fork. A pitch change knob, located at the base of each blade, is in contact with the fork. Each blade root is supported in the hub by a retention bearing. The retention bearing holds the blade firmly in the hub, but also allows the blade angle to change.

      (5) Propeller forces, consisting of: 1) mechanical spring action, 2) cylinder air charge, 3) counterweights, 4) and centrifugal twisting moment on the blades, in a variety of combinations, are constantly present while the propeller is operating. The summation of these forces is opposed by a variable hydraulic force (oil pressure from the engine driven governor). Oil pressure is metered by the governor to oppose this constant force. The propeller forces, opposed by the variable hydraulic force cause the propeller blade angle to increase, decrease, or maintain current setting.



**Cutaway of -1 Series Constant Speed,
Non-Counterweighted Propeller ( )HC-( )( )Y( )-1( )
Figure 2-1**

(6) Oil under pressure from the engine-driven governor is supplied to the hydraulic cylinder through the pitch change rod. Increasing or decreasing the oil volume within the hydraulic cylinder either increases blade angle to reduce engine RPM, or reduces blade angle to increase engine RPM. By changing the blade angle, the governor maintains constant engine RPM (within limits), independent of the throttle setting.

(7) If oil pressure is lost at any time, the summation of propeller forces, which is in direct opposition to the lost variable hydraulic force, either increases or reduces blade angle, depending upon propeller model.

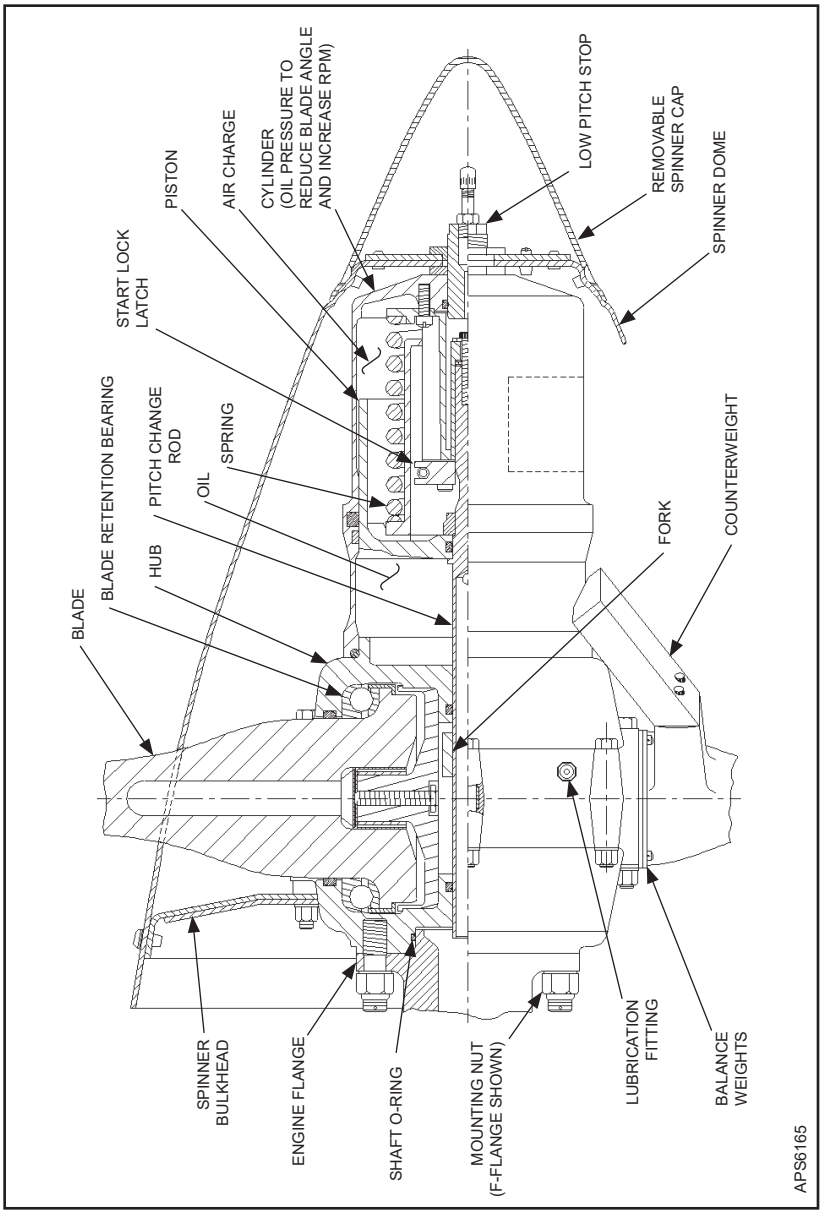
B. Constant Speed, Non-Counterweighted Propellers ( )HC-( )( )Y( )-1( )

(1) Refer to Figure 2-1. The -1 Series propellers 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). This model series is not equipped with an air charge and does not feather.

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

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

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



Cutaway of -2 Series Constant Speed, Feathering Propeller ( )HC-( )( )Y( )-2
Figure 2-2

C. Constant Speed, Feathering Propellers ( )HC-( )( )Y( )-2

(1) Refer to Figure 2-2. The -2 Series propellers are constant speed propellers that use an air charge, spring, and counterweights (if installed) to move the blades to high pitch/feather position. Blade centrifugal twisting moment acts to move the blades to low pitch, but the air charge, spring, and counterweights overcome this force. Oil pressure against a propeller mounted hydraulic piston opposes the counterweight, spring, and air charge forces to move the blades to low blade angle (low pitch).

(2) The action of the air charge, spring, and counterweights tends to move the blades to a higher blade angle (high pitch), reducing engine RPM. Oil pressure toward low pitch increases engine RPM.

(3) If oil pressure is lost during operation, the propeller will feather. Feathering occurs because the air charge, spring, and blade counterweights are no longer opposed by hydraulic oil pressure. The air charge, spring and blade counterweights are then free to increase blade pitch to the feathering (high pitch) stop.

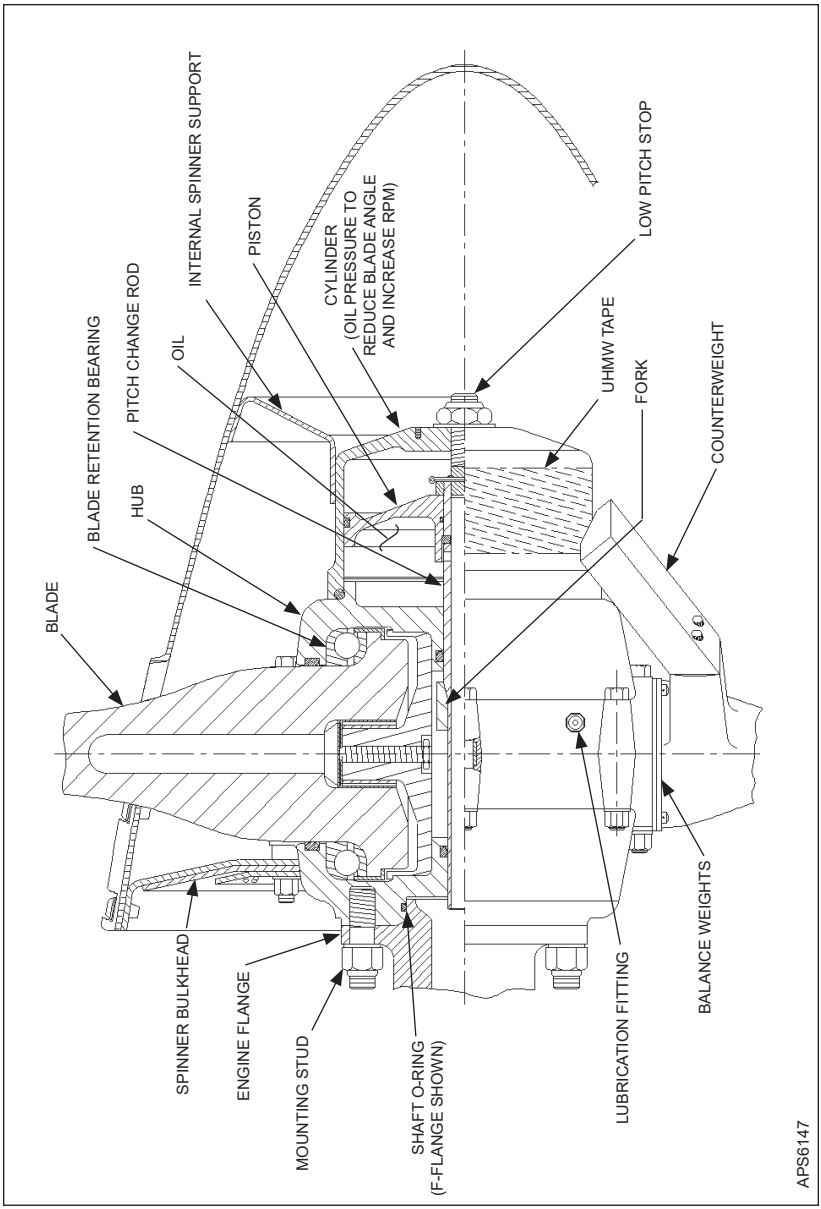
(4) Normal in-flight feathering of these propellers is accomplished when the pilot retards the propeller pitch control past the feather detent. This allows control oil to drain from the cylinder and return to the engine sump. The engine can then be shut down.

(5) Normal in-flight unfeathering is accomplished when the pilot positions the propeller pitch control into the normal flight (governing) range and an engine restart is attempted.

(6) Some aircraft are equipped with a hydraulic accumulator, which stores a supply of oil under pressure. This oil supply is released to unfeather the propeller during an in-flight engine restart. Pressurized oil is directed to the propeller, resulting in blade angle decrease. The propeller begins to windmill, and engine restart is possible.

(7) When the engine is stopped on the ground, it is undesirable to feather the propeller, as the high blade angle inhibits engine starting. To prevent feathering during normal engine shutdown on the ground, the propeller incorporates spring energized latches. If propeller rotation is approximately 800 RPM or above, the latches are disengaged by centrifugal force acting on the latches to compress the springs. When RPM drops below 800 RPM (and blade angle is typically within 7 degrees of the low pitch stop), the springs overcome the latch weight centrifugal force and move the latches to engage the high pitch stops, preventing blade angle movement to feather during normal engine shutdown.

(Blank Page)



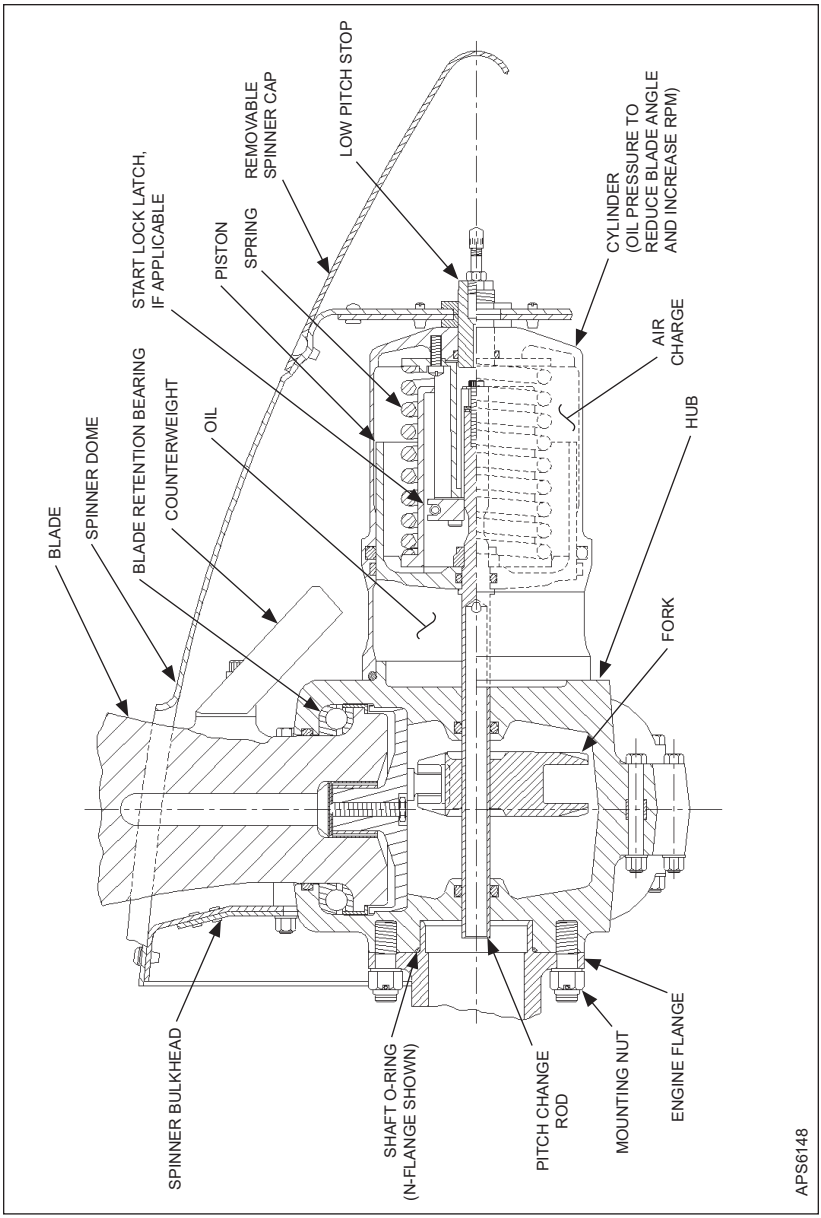
**Cutaway of -4 Series Constant Speed,
Counterweighted (Aerobatic) Propeller ( )HC-( )( )Y( )-4( )
Figure 2-3**

D. Constant Speed, Counterweighted (Aerobatic) Propellers ( )HC-( )( )Y( )-4( )

(1) Refer to Figure 2-3. The -4 Series propellers are constant speed propellers in which blade mounted counterweight forces act to move the blades to high pitch. This model series is not equipped with an air charge and does not feather. The blade centrifugal twisting moment acts to move the blades to low blade angle (low pitch), but the counterweights are large enough to neutralize this force and produce a net increase in blade angle. Oil pressure against a propeller mounted hydraulic piston opposes the counterweight forces to move the blades to low pitch.

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

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



Cutaway of -5 Series Constant Speed, Feathering, Turbine Propeller ( )HC-( )( )Y( )-5( )
Figure 2-4

E. Constant Speed, Feathering, Turbine Propellers
( )HC-( )( )Y( )-5( )

(1) Refer to Figure 2-4. The -5 Series propellers are constant speed propellers that use an air charge, spring, and blade mounted counterweights to move the blades to high pitch/feather position. Blade centrifugal twisting moment acts to move the blades to low pitch, but the air charge, spring, and counterweights overcome this force. Oil pressure against a propeller mounted hydraulic piston opposes the counterweight, spring, and air charge forces to move the blades to low blade angle (low pitch).

(2) The action of the air charge, spring, and counterweights tends to move the blades to a higher blade angle (high pitch), reducing engine RPM. Oil pressure toward low pitch increases engine RPM.

(3) If oil pressure is lost during operation, the propeller will feather. Feathering occurs because the air charge, spring, and counterweights are no longer opposed by hydraulic oil pressure. The air charge, spring, and blade counterweights are then free to increase blade pitch to the feathering (high pitch) stop.

(4) Normal in-flight feathering of these propellers is accomplished when the pilot retards the propeller pitch control past the feather detent. This allows control oil to drain from the cylinder and return to the engine sump. The engine may then be shut down.

(5) Normal in-flight unfeathering occurs when the pilot positions the propeller pitch control into the normal flight (governing) range and restarts the engine. As engine speed increases, oil is directed to the propeller, and blade angle decreases.

(6) In some cases, particularly in seaplane applications, it is undesirable to feather the propeller when the engine is stopped after landing. To prevent feathering during normal engine shutdown, the propeller incorporates spring energized latches. If propeller rotation is approximately 800 RPM or above, the latches are disengaged by centrifugal force acting on the latch weights to compress the springs. When RPM drops below 800 RPM (and blade angle is typically within 7 degrees of the low pitch stop), the springs overcome the centrifugal force and move the latches to engage the high pitch stops, preventing blade angle movement to feather.

(7) Start lock latches are not employed on all -5 propellers. Propellers without start lock latches will feather during normal engine shutdown.

F. Propeller Model Designation

(1) Hartzell Propeller 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.

(3) Refer to Table 2-1 for a description of the characters used in the propeller model number.

B HC - C 2 Y F - 1 B F

SEE NEXT PAGE

HUB MTG FLANGE	BOLT CIRCLE	DOWELS NO.	DOWELS DIA.	NO. OF BOLTS OR STUDS	TYP. ENGINE
D	4.00 in.	N/A	N/A	8 (1/2")	CONT.
F	4.00 in.	2	1/2	6 (1/2")	CONT.
L	4.75 in.	N/A	N/A	6 (7/16")	LYC.
K	4.75 in.	N/A	N/A	6 (1/2")	LYC.
R	4.75 in.	N/A	N/A	6 (1/2")	LYC.
N	4.25 in.	2	1/2	8 (9/16")	GTSI0520

BLADE SHANK OR RETENTION SYSTEM — Y SHANK, ALUMINUM BLADE, INTEGRAL PITCH CHANGE ARM

NO. OF BLADES — **2, 3, 4**

BASIC DESIGN CHARACTERISTIC

		FLANGE DESIGNATION	DISTANCE FROM HUB PARTING LINE TO FLANGE FACE
C -	STANDARD HUB	F	3.250
		K,R,L	4.187 (HC-C4YR-( ) 4.312
		N	3.375
E -	EXTENDED HUB	F,K,R,L	9.187
		N	8.375
F -	EXTENDED HUB	R,L	7.187
G -	EXTENDED HUB	F	4.250
		R	5.187
H -	EXTENDED HUB	F,N	7.500
I -	EXTENDED HUB	R	6.187
		F	5.250
J -	EXTENDED HUB	F	6.500
L -	EXTENDED HUB	F	3.750
M -	EXTENDED HUB	R	6.750

HC — HARTZELL CONTROLLABLE

FLANGE ANGULAR INDEX

with respect to # 1 blade, viewed clockwise facing propeller flange:

PREFIX	ANGULAR INDEX	CLOCKING FEATURE	FLANGE
BLANK -	90 AND 270 DEGREES	DOWEL PINS	F, N
BLANK	0 AND 180 DEGREES	NON-COUNTER BORED HOLES	K, R, L
B -	30 AND 210 DEGREES	DOWEL PINS	F
B -	120 AND 300 DEGREES	NON-COUNTER BORED HOLES	K, R
C -	150 AND 330 DEGREES	DOWEL PINS	F
D -	60 AND 240 DEGREES	NON-COUNTER BORED HOLES	K, R
D -	60 AND 240 DEGREES	DOWEL PINS	F
E, P	0 AND 180 DEGREES	DOWEL PINS	F, D

Propeller Model Designations
Table 2-1

B HC - C 2 Y F - 1 BF

MINOR MODIFICATIONS
(up to 5 characters)

-1 PROPS
- **A** - C2YF: DIFFERENT SPINNER MOUNTING PARTS; C2YK: DIFFERENT P.C.ROD, FORK
- **A** - F3YR-1: INTEGRAL HUB EXTENSION (NO "A": BOLT ON EXTENSION)
- **B** - 2 BLADE: DIFFERENT CYLINDER, P.C.ROD, SPRING, LOW PITCH STOP
- **C** - BHC-J2YF-1C: COMPOSITE BLADE
- **D** - A-2476-3 SPINNER MOUNTING KIT
- **E** - C4YF: B-2984 SPACER with B-1738 STUDS
- **F** - LARGE PITCH CHANGE KNOB, FORK
- **H** - A-2476-8 SPINNER MOUNTING KIT
- **L** - LEFT HAND ROTATION
- **M** - 3 BLADE: DIFFERENT CYLINDER, P.C. ROD, SPRING, LOW PITCH STOP
- N - ALUMINUM HUB WITH COMPOSITE BLADE
- **P** - 2 BLADE: HUB WITH A B-SUFFIX SERIAL NUMBER
- **R** - 3 BLADE: LARGE CYLINDER AND PISTON
- **J** - LEFT HAND TRACTOR
- **S** - HUB EXTENSION

-2 PROPS - SEE NEXT PAGE

-4 PROPS
- **A** - 2 BLADE: A-2476-8 SPINNER KIT (attaches to hub)
- **B** - 2 BLADE: -2 CYLINDER, LOW STOP SCREW
- **B** - 3 BLADE: -2 CYLINDER, LOW STOP SCREW
- **C** - 2 BLADE: -2 CYLINDER, LOW STOP SCREW
- **F** - LARGE PITCH CHANGE KNOB, FORK
- **L** - LEFT HAND ROTATION
- **P** - 2 BLADE: HUB WITH A B-SUFFIX SERIAL NUMBER

-5 PROPS
- **A** - C3YN: START LOCKS
- **F** - C3YF: NO START LOCKS

SPECIFIC DESIGN FEATURES

- **1** - CONSTANT SPEED, NO COUNTERWEIGHT OIL PRESSURE TO HIGH PITCH, BLADE CENTRIFUGAL FORCE TO LOW
- **2** - CONSTANT SPEED, FEATHERING, OIL PRESSURE TO LOW PITCH, AIR CHARGE AND SPRING TO HIGH PITCH/FEATHER (SOME EXCEPTIONS), MAY OR MAY NOT HAVE COUNTERWEIGHTS TO HIGH PITCH/FEATHER
- **4** - CONSTANT SPEED, OIL PRESSURE TO LOW PITCH, COUNTERWEIGHTS TO HIGH PITCH
- **5** - CONSTANT SPEED, FEATHERING, OIL PRESSURE TO LOW PITCH, AIR CHARGE, SPRING, AND COUNTERWEIGHTS TO HIGH PITCH/FEATHER (EXCEPT SOLOY PROP, SAME AS -2 EXCEPT TURBINE O-RING)

Propeller Model Designations, Continued
Table 2-1

B HC - C 2 Y F - 1 BF

MINOR MODIFICATIONS, up to five characters

-2 PROPS:

( )HC-(C,I,L,M)2Y(F,K,L,R)-2__ PROPS
- **B** - 830-21 STOP UNITS
- **C** - COUNTERWEIGHTS, 830-30 STOP UNITS
- **D** - A-2476-14 SPINNER MOUNTING KIT
- **E** - A-2476-4 SPINNER MOUNTING KIT
- **F** - LARGE PITCH CHANGE KNOB, FORK
- **G** - DAMPER INSTALLED & A-2476-16 SPINNER MTG KIT
- **H** - A-2476-8 SPINNER MOUNTING KIT
- **K** - SPECIAL AIR CHARGE DECAL, -3 MOUNTING STUDS
- **L** - LEFT HAND ROTATION
- **P** - HUB WITH A B-SUFFIX SERIAL NUMBER
- **R** - 2 & 3 BLADE: LARGE DIA. CYLINDER AND PISTON

( )HC-(C,I,L,M)2Y(F,K,L,R)-2C_U_ PROPS
- **C** - COUNTERWEIGHTS
- **D** - A-2476-14 SPINNER MOUNTING KIT
- **E** - A-2476-4 SPINNER MOUNTING KIT
- **F** - LARGE PITCH CHANGE KNOB, FORK
- **G** - DAMPER INSTALLED & A-2476-16 SPINNER MTG KIT
- **H** - A-2476-8 SPINNER MOUNTING KIT
- **K** - SPECIAL AIR CHARGE DECAL, -3 MOUNTING STUDS
- **L** - LEFT HAND ROTATION
- **P** - HUB WITH A B-SUFFIX SERIAL NUMBER
- **U** - FEATHER ASSIST SPRING KIT IN CYLINDER

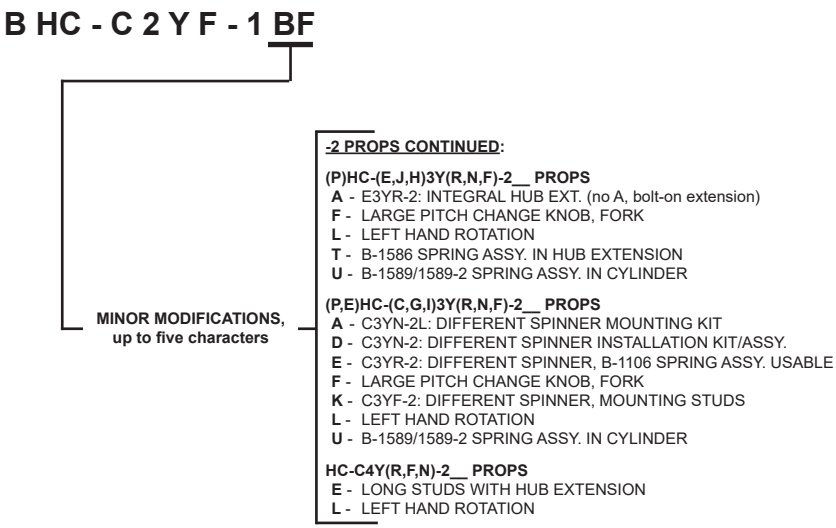
HC-E2Y(R,K,L)-2(R)B( ) PROPS
- **B** - 830-21 STOP UNITS (NON-COUNTERWEIGHTED PROPS)
- **F** - LARGE PITCH CHANGE KNOB, FORK
- **L** - LEFT HAND ROTATION
- **P** - HUB WITH A B-SUFFIX SERIAL NUMBER
- **R** - 2 & 3 BLADE: LARGE DIA. CYLINDER AND PISTON
- **S** - A-2273 SPRING ASSY. IN HUB EXTENSION
- **T** - B-1586 SPRING ASSY. IN HUB EXTENSION
- **U** - FEATHER ASSIST SPRING KIT IN CYLINDER

HC-(E,F)2Y(R,L)-2__ PROPS
- **A** - F3YR-2: INTEGRAL HUB EXTENSION (NO "A": BOLT ON EXTENSION)
- **F** - LARGE PITCH CHANGE KNOB, FORK
- **L** - LEFT HAND ROTATION
- **P** - HUB WITH A B-SUFFIX SERIAL NUMBER
- **T** - B-1586 SPRING ASSY. IN HUB EXTENSION
- **U** - B-1589/1589-2 SPRING ASSY. IN CYLINDER

BHC-J2YF-2C__ PROPS
- **C** - COUNTERWEIGHTS
- **F** - LARGE PITCH CHANGE KNOB, FORK
- **P** - HUB WITH A B-SUFFIX SERIAL NUMBER
- **U** - B-1589/1589-2 SPRING ASSY. IN CYLINDER

HC-F3YR-2__ PROPS
- **F** - LARGE PITCH CHANGE KNOB, FORK
- **H** - INCLUDES A HIGH PITCH STOP
- **U** - B-1589/1589-2 SPRING ASSY. IN CYLINDER

Propeller Model Designations, Continued
Table 2-1



Propeller Model Designations, Continued
Table 2-1

2. Propeller Blades

A. Description of Aluminum Blades

(1) Aluminum propeller blades are manufactured from one solid piece of aluminum that has been forged and heat-treated prior to manufacture.

(2) Aluminum blades are identified by shank design, propeller diameter, tip configurations, and other blade characteristics.

(a) Refer to the section, "Blade Model Designation" in this chapter.

B. Blade Model Designation

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

(3) Refer to Table 2-2 for a description of the characters used in the blade model number.

prop model/F 8475 A-3R

Dash Number: change from basic propeller diameter. In this example, the nominal 84 inch diameter has been reduced 3 inches = 81 inch diameter (with some exceptions) there may be a letter following the dash number. (Note: This basic diameter may not reflect the actual prop diameter, depending on the hub model used.)

- **A** - slightly thinner and narrower tip fairing
- **E** - elliptical tip
- **Q** - Q-tip, factory 90 degree bent tip
- **R** - specifically rounded tip
- **S** - square tip
- **T** - specifically rounded tip

Suffix letters:

- **A** - dimensional change to basic blade or Y shank pitch knob location
- **B** - anti-icing or de-ice boot
- **C** - modified blade, dimensional or blade twist modification from initial blade design
- - modified blade, blade twist or thickness change
- **E** - de-ice boot , elliptical tip, or alternate life limit
- **F** - modified blade, dimensional modification (width/thickness)
- **H** - hard alloy (7076)
- **K** - de-ice boot
- N - shank modification (pilot tube hole), thickness added to certain blade shanks
- **Q** - Q-tip, factory 90 degree formed tip
- **R** - specifically rounded tips
- **S** - shot peening of blade surface, or square tip (Exception: Blade model M10476 was manufactured with a shot peened surface; however, the "S" shot peen designator was not included in the model number. The "S" designator will be added to M10476 blades at overhaul.)
- **T** - twist

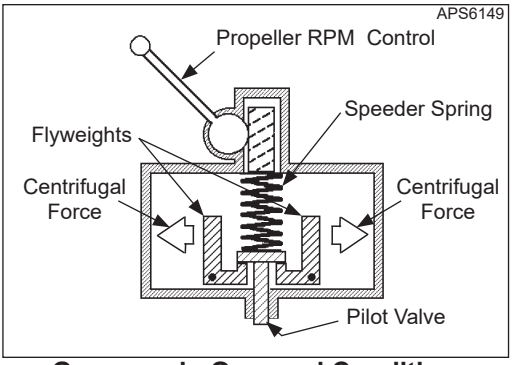
blank - original design, no changes
other letters - location of pitch change knob (Y shank), twist

The first 2 or 3 numbers indicate basic design diameter (in inches), the last 2 numbers indicate a specific model

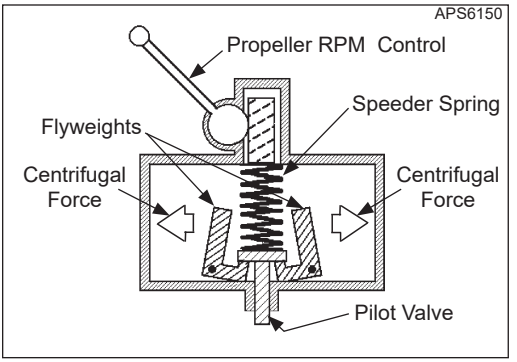
Prefix of up to 3 letters:

- **C** - counterweighted Y shank
- **F** - large pitch change knob Y shank
- **H** - right hand rotation, pusher
- **J** - left hand rotation, tractor
- **L** - left hand rotation, pusher
- **D,E,M,MV,P,R,T,V,W** - shank design
- **blank** - standard blade, right hand rotation, tractor (X,Y, and Z shanks + few others)

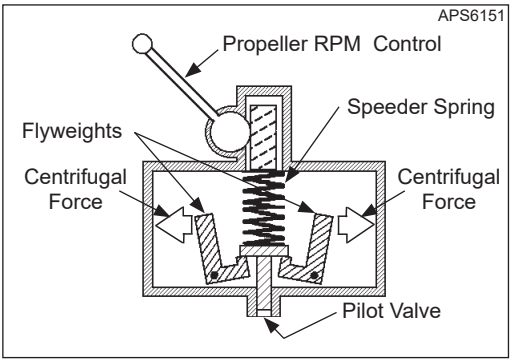
Aluminum Blade Model Designation
Table 2-2



Governor in Onspeed Condition
Figure 2-5



Governor in Underspeed Condition
Figure 2-6



Governor in Overspeed Condition
Figure 2-7

3. Governors (Rev. 3)

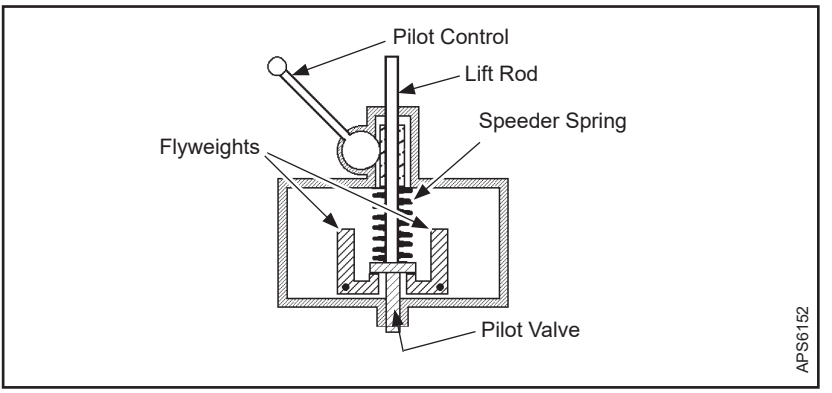
A. Theory of Operation

(1) A governor is an engine RPM sensing device and high pressure oil pump. In a constant speed propeller system, the governor responds to a change in engine RPM by directing oil under pressure to the propeller hydraulic cylinder or by releasing oil from the hydraulic cylinder. The change in oil volume in the hydraulic cylinder changes the blade angle and maintains the propeller system RPM to the set value. The governor is set for a specific RPM via the cockpit propeller control, that compresses or releases the governor speeder spring.

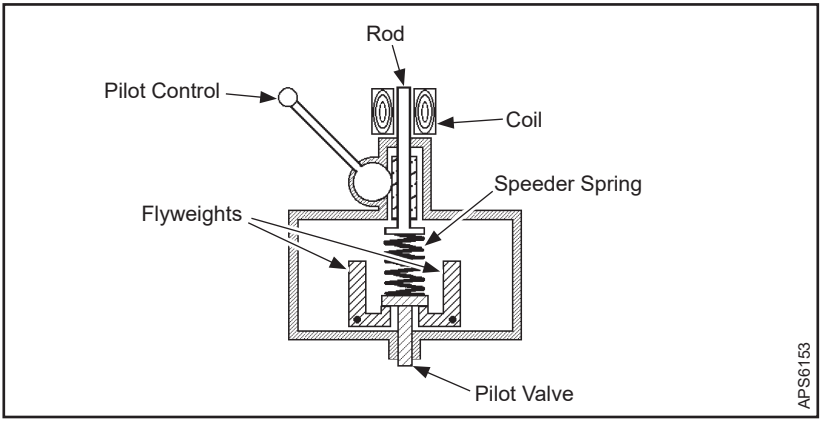
(2) When the engine is operating at the RPM set by the pilot using the cockpit control, the governor is operating **onspeed**. Refer to Figure 2-5. In an onspeed condition, the centrifugal force acting on the flyweights is balanced by the speeder spring, and the pilot valve is neither directing oil to nor from the propeller hydraulic cylinder.

(3) When the engine is operating below the RPM set by the pilot using the cockpit control, the governor is operating **underspeed**. Refer to Figure 2-6. In an underspeed condition, the flyweights tilt inward because there is not enough centrifugal force on the flyweights to overcome the force of the speeder spring. The pilot valve, forced down by the speeder spring, meters oil flow to decrease propeller pitch and raise engine RPM.

(4) When the engine is operating above the RPM set by the pilot using the cockpit control, the governor is operating **overspeed**. Refer to Figure 2-7. In an overspeed condition, the centrifugal force acting on the flyweights is greater than the speeder spring force. The flyweights tilt outward, and raise the pilot valve. The pilot valve then meters oil flow to increase propeller pitch and lower engine RPM.



Feathering Governor
Figure 2-8



Synchronizer/Synchrophaser Governor
Figure 2-9

(5) Feathering governors allow oil to be pushed from the propeller to the engine drain to increase propeller pitch to feather.

(a) Some governors will move the propeller to feather by electrically or mechanically actuating a valve that opens to drain the oil supply between the propeller and governor to increase propeller pitch and allow the propeller to feather.

(b) Figure 2-8 illustrates another feathering propeller governor system. When it is desired to feather the propeller, the lift rod may be moved by the cockpit control to mechanically engage the valve. The lifted valve dumps oil to increase propeller pitch until the propeller feathers.

(6) A synchronizing system can be employed in a multi-engine aircraft to keep the engines operating at the same RPM. A synchrophasing system not only keeps the RPM of the engines consistent, but also keeps the propeller blades in phase with each other. Both synchronizing and synchrophasing systems serve to reduce noise and vibration. Figure 2-9 illustrates a governor as a component of a synchronizing or synchrophasing system.

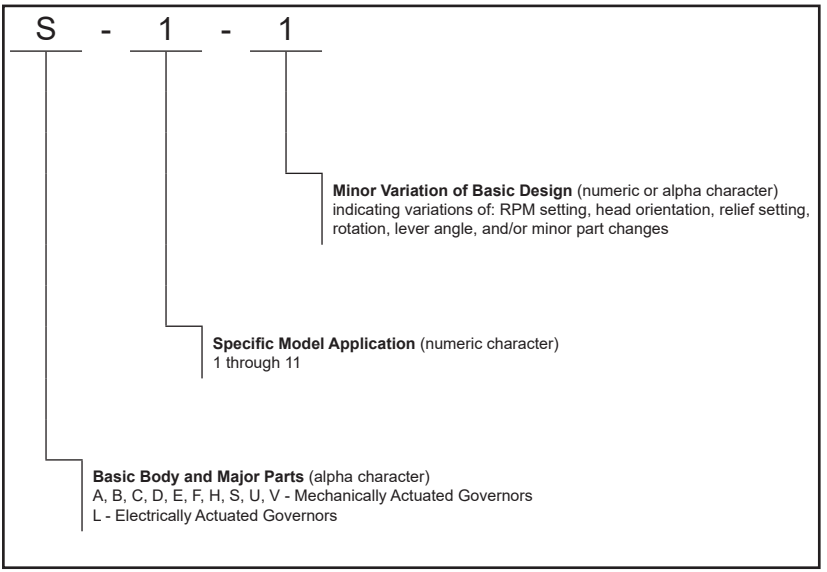
(a) Hartzell Propeller synchronizing or synchrophasing system uses one engine (the master engine) as an RPM and phase reference and adjust the RPM of the remaining engine(s) [slave engine(s)] to match it. The RPM of the master engine is monitored electronically, and this information is used to adjust the voltage applied to the electrical coil on the slave governor(s). The voltage to the coil either raises or lowers a rod which changes the force of the speeder spring. In this manner, engine RPM and phase of the propellers is synchronized or synchrophased.

B. Governor Model Designation

(1) Hartzell Propeller uses a model number designation system to identify specific governor models.

(2) The governor model number is stamped on the base and/or body of the governor assembly.

(3) Refer to Table 2-3 for a description of the characters used in the governor model number.



Governor Model Designations
Table 2-3

4. Unfeathering Accumulators (Rev. 3)

A. System Overview

(1) An unfeathering accumulator is a device that stores a volume of oil at a pressure and supplies it to the propeller when commanded. This supplied pressure will lower blade angle which will cause the propeller to windmill and make the engine easier to start.

(2) Hartzell Propeller manufactures an accumulator that is a cylinder with a moveable internal piston. One end of the cylinder and piston is filled with engine oil, and the other end of the cylinder and piston is filled with air or nitrogen to a designated pressure through an air valve. The accumulator is a self-contained unit and is usually installed at some remote location in the engine compartment. An oil supply hose is connected between the accumulator and the governor.

(3) Hartzell Propeller manufactures governors that have unfeathering and feathering capability, although some governors are able to feather a propeller they are not automatically capable of unfeathering the propeller.

B. Mechanical Models

(1) The governor has a fitting or threaded hole to attach with an oil supply hose that is connected to the accumulator on the other end. During operation of the engine and propeller, the governor supplies oil to the accumulator and maintains oil in the accumulator during engine operation.

(2) The pilot commands feather of the propeller by moving the RPM control of the governor toward lower RPM to reach the feather command location. The governor disconnects the oil supply to the accumulator and seals a volume of oil under pressure in the accumulator. The governor then connects the oil supply line from the propeller piston and permits the propeller blades to move to a feather stop in the propeller.

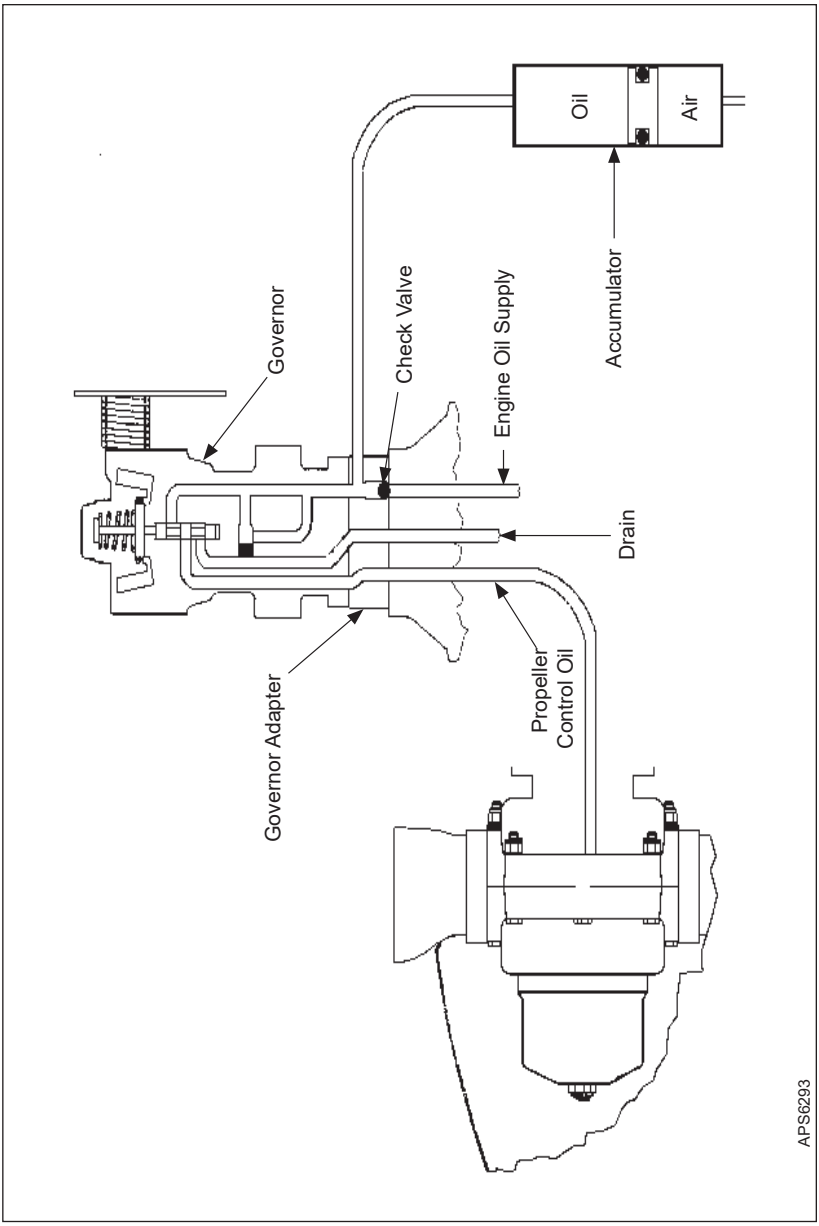
(3) Unfeathering occurs when the governor RPM control is moved by the pilot from the feather location to a higher RPM selection for governing. The governor disconnects the propeller oil supply from the drain and reconnects it to the governor oil supply line from the governor. At that point there is no oil available from the engine oil pump to the governor; therefore, no governed oil is available from the governor for controlling the propeller blade angle and RPM. Further movement of the governor RPM control toward higher RPM will cause the governor to connect the accumulator to the oil supply line from governor to the propeller. The air or nitrogen pressure in one side of the accumulator will push a piston to force oil from the other side of the accumulator through the governor to the propeller piston to move the propeller blades from feather to a lower blade angle. The propeller will then begin to windmill and will permit the engine to start.

C. Electrical Models

(1) In an electrical model a switch activates a solenoid coil allowing oil to reverse out of a valve resulting in a lower blade angle for the purpose of starting the associated engine.

(2) The governor has a fitting or threaded hole to attach with an oil supply hose that is connected on the other side to the accumulator solenoid valve that is connected to the oil side of the accumulator. During operation of the engine and propeller, the governor supplies oil to the accumulator through the solenoid valve's check valve until equal pressure is reached allowing the check valve to then close and maintain oil pressure at engine shutdown.

(3) When the engine has shut down or failed, no oil is available from the engine oil pump to the governor; therefore, no governed oil is available from the governor for controlling the propeller blade angle and RPM. Unfeathering occurs when a switch is activated energizing the coil on the accumulator solenoid valve. The activated coil changes the valve from a one-way valve to an open passage allowing reverse flow back out of the accumulator and to the governor. The air or nitrogen pressure in one side of the accumulator will push a piston to force oil from the other side of the accumulator through the governor to the propeller piston to move the propeller blades from feather to a lower blade angle. The propeller will then begin to windmill and permit the engine to start.



Governor/Accumulator System
Figure 2-10

5. Aerobatic Accumulators (Rev. 1)

CAUTION: THE EFFECTIVENESS OF THE ACCUMULATOR SYSTEM CANNOT BE ACCURATELY SPECIFIED DUE TO VARIABLES IN THE ENGINE AND GOVERNOR INTERNAL LEAKAGE RATES, AS WELL AS THE EXTENT AND DURATION OF OIL STARVATION. THE SYSTEM CANNOT ENSURE 100% PROTECTION FROM OVERSPEED IN ALL OPERATING CONDITIONS.

A. System Overview - Refer to Figure 2-10

(1) The fundamental purpose of the accumulator is to supply oil to the governor during brief circumstances of engine oil starvation, not prolonged periods of this condition. The accumulator's oil supply helps to avoid loss of propeller control and overspeed.

(2) The accumulator has a one (1) quart capacity for the oil and the volume required for an air charge. A piston or diaphragm separates the oil and air.

(3) When the engine is operating, the engine oil system supplies oil to the input side of the governor gear pump. The oil supply also charges the accumulator at any time the engine oil system is developing a pressure greater than the accumulator air charge pressure. The accumulator is filled with oil until the air charge pressure of the compressed air volume is equal to the engine oil pressure.

(4) In the event that the engine oil pressure drops below the accumulator air pressure, the oil in the accumulator is discharged to supply the governor gear pump. A check valve in an adapter located between the engine and governor will prevent the accumulator from discharging oil into the engine. The loss of propeller control and overspeed are avoided while an oil supply to the governor is maintained.

6. Propeller Ice Protection Systems (Rev. 1)

   A. System Description

      (1) For detailed descriptions of propeller ice protection systems, refer to the Anti-ice and De-ice Systems chapter in this manual.

INSTALLATION AND REMOVAL - CONTENTS

INSTALLATION AND REMOVAL - CONTENTS, CONTINUED

LIST OF FIGURES

LIST OF TABLES

1. Tools, Consumables, and Expendables

The following tools, consumables, and expendables will be required for propeller removal or installation:

NOTE: Compact propellers are manufactured with six basic hub mounting flange designs. The flange types are D, F, K, L, N, or R. The flange type used on a particular propeller installation is indicated in the propeller model number stamped on the hub. For example, HC-C2Y**F**-4A indicates an F-flange. Refer to Aluminum Hub Propeller Model Identification in the Description and Operation chapter of this manual for a description of each flange.

A. Tooling

CAUTION: USE CARE WHEN USING TOOLS. INCORRECT USE OF TOOLS COULD CAUSE DAMAGE TO THE HUB THAT CANNOT BE REPAIRED AND WOULD REQUIRE THAT THE HUB BE REPLACED.

(1) Tools for Bulkhead Mounting

CAUTION 1: IT IS REQUIRED TO USE TORQUE WRENCH ADAPTER TE457 WHEN TORQUING HUB CLAMPING NUTS ON SMOOTH FORGED HUBS. DO NOT USE AN OPEN END WRENCH WHEN TORQUING HUB CLAMPING NUTS ON A SMOOTH FORGED HUB.

CAUTION 2: WHEN USING THE TORQUE WRENCH ADAPTER TE457, MAKE SURE THAT IT IS CORRECTLY ENGAGED ON THE NUT BEFORE APPLYING TORQUE.

- Torque wrench adapter TE457

(2) Tools for Propeller Removal or Installation:

NOTE: Using a torque wrench adapter other than a Hartzell Propeller torque wrench adapter increases the risk of the wrench causing damage to the hub in the areas around the mounting fasteners.

D-flange and F-flange Propellers

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench (1/2 inch drive)
- Torque wrench adapter TE150
- 3/4 inch open end wrench

L-flange Propellers

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench (1/2 inch drive)
- Torque wrench adapter TE150 or 5/8 inch crowfoot wrench
- 5/8 inch open end wrench

N-flange Propellers

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench (1/2 inch drive)
- 7/8 inch crowfoot torque wrench adapter
- 7/8 inch open end wrench

K-flange and R-flange Propellers

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench (1/2 inch drive)
- Torque wrench adapter TE150 or 3/4 inch crowfoot wrench
- 3/4 inch open end wrench

B. Consumables

- Quick Dry Stoddard Solvent or Methyl-Ethyl-Ketone (MEK)

C. Expendables

- 0.032 inch stainless steel aircraft safety wire (Alternate: 0.032 inch [0.81 mm] aircraft safety cable, and associated hardware)
- O-ring - propeller to engine seal (see Table 3-1)

2. Pre-Installation (Rev. 4)

A. Inspection of Shipping Package

(1) Examine the exterior of the shipping container, especially the box ends around each blade, for signs of shipping damage.

(a) If the box is damaged, contact the freight company for a freight claim.

(b) A hole, tear or crushed appearance at the end of the box (blade tips) may indicate that the propeller was dropped during shipment, possibly damaging the blades.

1 If the propeller is damaged, contact Hartzell Propeller. Refer to the section, "Hartzell Propeller Contact Information" in the Introduction chapter of this manual.

B. Uncrating

(1) Put the propeller on a firm support.

(2) Remove the banding and any external wood bracing from the cardboard shipping container.

(3) Remove the cardboard from the hub and blades.

CAUTION: DO NOT STAND THE PROPELLER ON A BLADE TIP.

(4) Put the propeller on a padded surface that supports the entire length of the propeller.

(5) Remove the plastic dust cover cup from the propeller mounting flange, if installed.

C. Inspection After Shipment

(1) After removing the propeller from the shipping container, examine the propeller components for shipping damage.

D. Reassembly of a Propeller Disassembled for Shipment

(1) If a propeller was received disassembled for shipment, it must be reassembled by trained personnel in accordance with the applicable propeller maintenance manual.

(2) For installation of ice protection systems manufactured by Hartzell, refer to Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

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

E. Air Charge Pressure Check (-2 and -5 Propellers)

(1) Perform an air charge pressure check before propeller installation. Refer to the section, "Air Charge" in the Maintenance Practices chapter of this manual.

(a) If the air pressure loss is not within the specified limits, refer to the section, "Failure to Feather" in the Testing and Troubleshooting chapter of this manual.

(Blank Page)

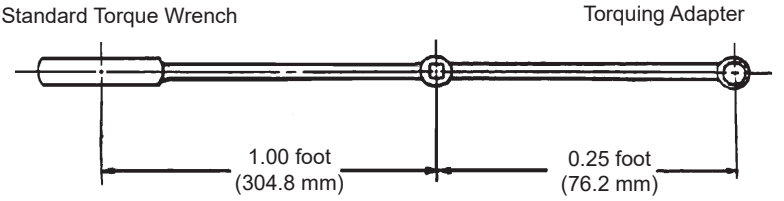
Flange	O-ring	Stud/Bolt	Nut	Washer/ Spacer	Spring Pin
"D"	C-3317-228	n/a	A-2044	A-7752	n/a
"F"	C-3317-228	n/a	A-2044	A-1381*	n/a
"K" and "R"	C-3317-228	A-2067	A-2069	A-1381	B-3842-0750
"L" except E2YL	C-3317-228	A-2247-1	A-2498	A-2482	B-3842-0625
E2YL	C-3317-228	A-2247-1 (qty 2) B-6489-25 (qty 4)	A-2498 (qty 2)	A-2482 (qty 2) B-6526-7 (qty 4)	B-3842-0625
"N" (turbine)	C-3317-230	n/a	A-3257	A-2048-2	n/a
"N" (recip)	C-3317-145	n/a	A-3257	A-2048-2	n/a

* Note: Do not install the A-1381 washer on installations that use Goodrich Corp. part number 4E1881 or 4E2058 split mounting plate.

Propeller/Engine Flange O-rings and Mounting Hardware
Table 3-1

Installation Torques	
CAUTION 1: MOUNTING HARDWARE MUST BE CLEAN AND DRY TO PREVENT EXCESSIVE PRELOAD OF THE MOUNTING FLANGE. CAUTION 2: ALL TORQUES LISTED ARE DRY TORQUE. CAUTION 3: REFER TO FIGURE 3-1 FOR TORQUE READING WHEN USING A TORQUE WRENCH ADAPTER.	
Hub clamping bolts/spinner mtg. nuts	20-22 ft-lbs (28-29 N•m)
D-flange propeller mtg. nuts	75-80 ft-lbs (102-108 N•m)
F-flange propeller mtg. nuts, except ( )HC-C3YF-5	70-80 ft-lbs (95-108 N•m)
F-flange propeller mtg. nuts for ( )HC-C3YF-5	80-90 ft-lbs (108-122 N•m)
N-flange propeller mtg. nuts	90-100 ft-lbs (123-136 N•m)
L-flange propeller mtg. nuts	45-55 ft-lbs (62-74 N•m)
K and R-flange propeller mtg. studs	60-70 ft-lbs (82-95 N•m)
Damper assembly mtg. nuts	28-30 ft-lbs (38-40 N•m)
Low pitch stop jam nut -1 Application (Refer to Figure 6-7)	14-16 ft-lbs (19-21 N•m)
Low pitch stop jam nut for -2 and -5 applications that use a one-piece spinner dome (Refer to Figure 6-9)	25-30 ft-lbs (34-40 N•m)
Low pitch stop jam nut/Spinner locknut "A" and "B" for -2 and -5 applications that use a two-piece spinner dome (Refer to Figure 6-8, Figure 3-14, and Figure 3-15)	25-30 ft-lbs (34-40 N•m)
Low pitch stop jam nut -4 Application (Refer to Figure 6-7)	27-33 ft-lbs (37-44 N•m)
Governor Max. RPM Stop locking nut	30-36 in-lbs (3.4-4.0 N•m)

Torque Table
Table 3-2



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

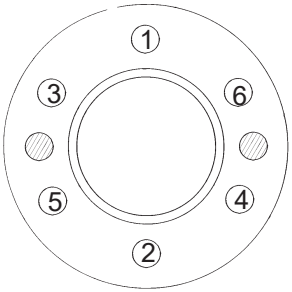
EXAMPLE:

$$\frac{\text{100 Ft-Lb (136 N•m) x 1.00 ft (304.8 mm)}}{\text{1.00 ft (304.8 mm) + 0.25 ft (76.2 mm)}} = \text{80 Ft-Lb (108 N•m)} < \text{reading on torque wrench with 3-inch (76.2 mm) adapter for actual torque of 100 Ft-Lb (136 N•m)}$$

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.

APS0212A

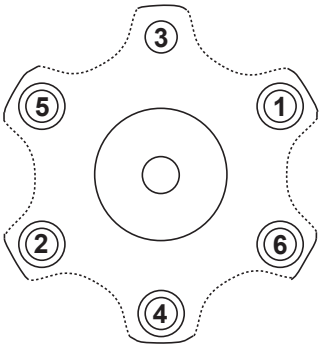
Calculating Torque When Using a Torque Wrench Adapter
Figure 3-1



F-flange

Step 1 - Torque all mounting bolts/nuts to 40 Ft-Lbs (54 N•m)

Step 2 - Torque all mounting bolts/nuts to the final torque value in accordance with Table 3-2 and Figure 3-1 in the sequence shown



R-flange

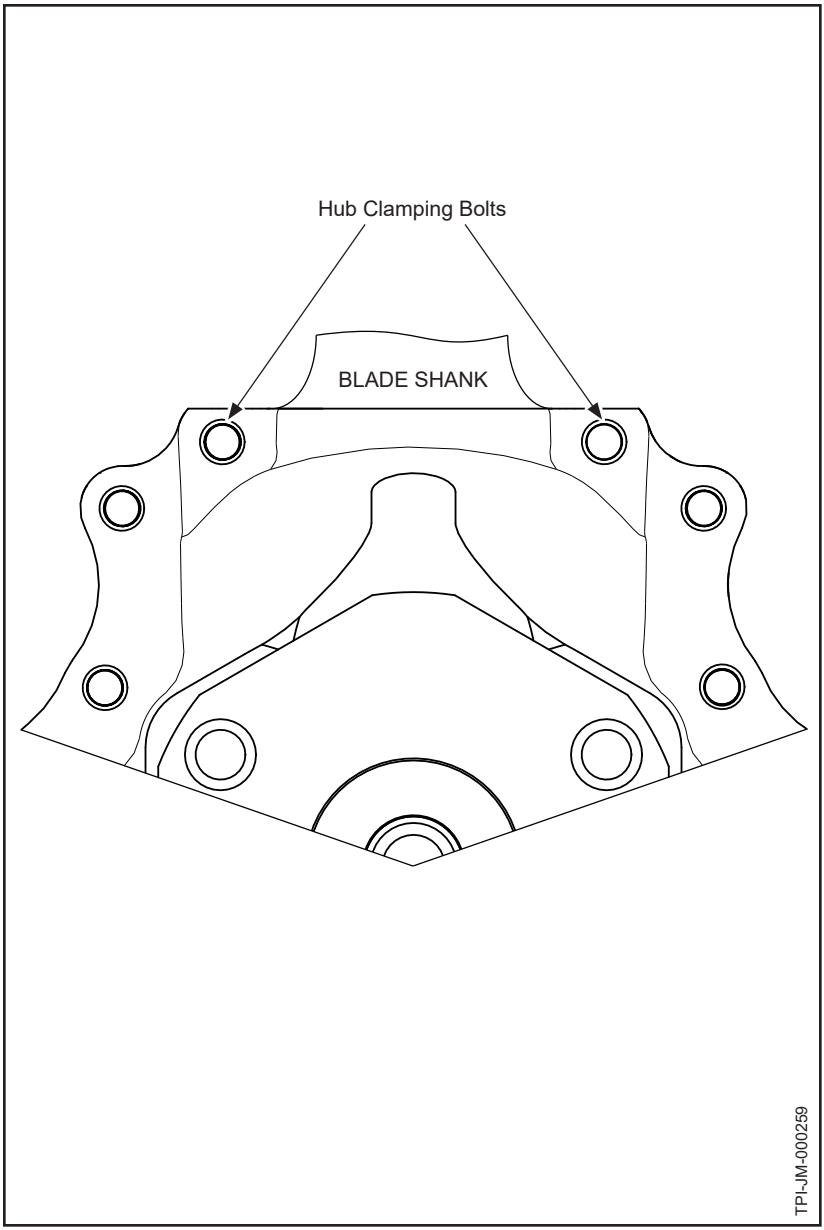
Step 1 - Torque all mounting bolts/nuts to 40 Ft-Lbs (54 N•m)

Step 2 - Torque all mounting bolts/nuts to the final torque value in accordance with Table 3-2 and Figure 3-1 in the sequence shown

TI-0050
TI-411-008

Torquing Sequence for Propeller Mounting Bolts/Nuts
Figure 3-2

3. Propeller Mounting Hardware and Torque Information (Rev. 1)
   A. Propeller Mounting Hardware
      (1) Refer to Table 3-1 for part numbers of the propeller mounting hardware and O-rings.
   B. Torque 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) Refer to Figure 3-2 for the initial torque value to use when installing a Hartzell propeller.
      (4) Refer to Table 3-2 for the final torque values to use when installing a Hartzell propeller.
      (5) When an adapter is used with a torque wrench, use the equation in Figure 3-1 to determine the correct torque value.
      (6) Refer to Figure 3-2 for the proper torquing sequence of the propeller mounting bolts/nuts.



Hub Clamping Bolt Location
Figure 3-3

4. Bulkhead Installation (Rev. 4)

A. General

(1) The spinner support must be mounted to the hub before the propeller can be installed on the aircraft.

(2) The spinner assembly may be supplied with spinner mounting hardware, including long hub clamping bolts, washers, and nuts.

(a) If the propeller is shipped with longer hub clamping bolts, spinner mounting hardware will not be supplied with the spinner assembly. Refer to Hartzell Propeller Application Guide Manual 159 (61-02-59) for the applicable installation.

(b) On some installations, it may be necessary to install spacers and/or washers under the head of the hub clamping bolt to avoid interference with the aircraft cowling.

1 If the installation of the spinner mounting kit requires removal of hub clamping bolts, the propeller must be sent to certified propeller repair station with the appropriate rating.

B. Installation of a Metal Bulkhead

CAUTION: REMOVE THE NUTS AND WASHERS FROM THE HUB CLAMPING BOLTS ON THE LEFT/RIGHT SIDE OF THE BLADE SHANK ONLY. DO NOT REMOVE THE HUB CLAMPING BOLTS.

(1) Remove the nuts and washers from the hub clamping bolts located on the left/right side of the blade shank. Refer to Figure 3-3.

NOTE: Additional washers/spacers may have been used during assembly of the propeller for hub clamping purposes. These additional washers/spacers may not be components of the applicable spinner mounting kit.

CAUTION 1: USE ONLY WASHERS/SPACERS FROM THE APPLICABLE SPINNER MOUNTING KIT TO INSTALL THE SPINNER BULKHEAD.

CAUTION 2: THE STACK-UP SEQUENCE FOR EACH HUB CLAMPING BOLT MUST BE THE SAME. VARIANCES BETWEEN STACK-UPS CAN CAUSE CRACKING OF THE SPINNER BULKHEAD. EXCEPTIONS MAY BE REQUIRED IF PROPELLER APPLICATIONS HAVE DE-ICE OR ANTI-ICE APPLICATIONS. REFER TO HARTZELL PROPELLER ICE PROTECTION SYSTEM MANUAL 180 (30-61-80) FOR INSTALLATION INSTRUCTIONS.

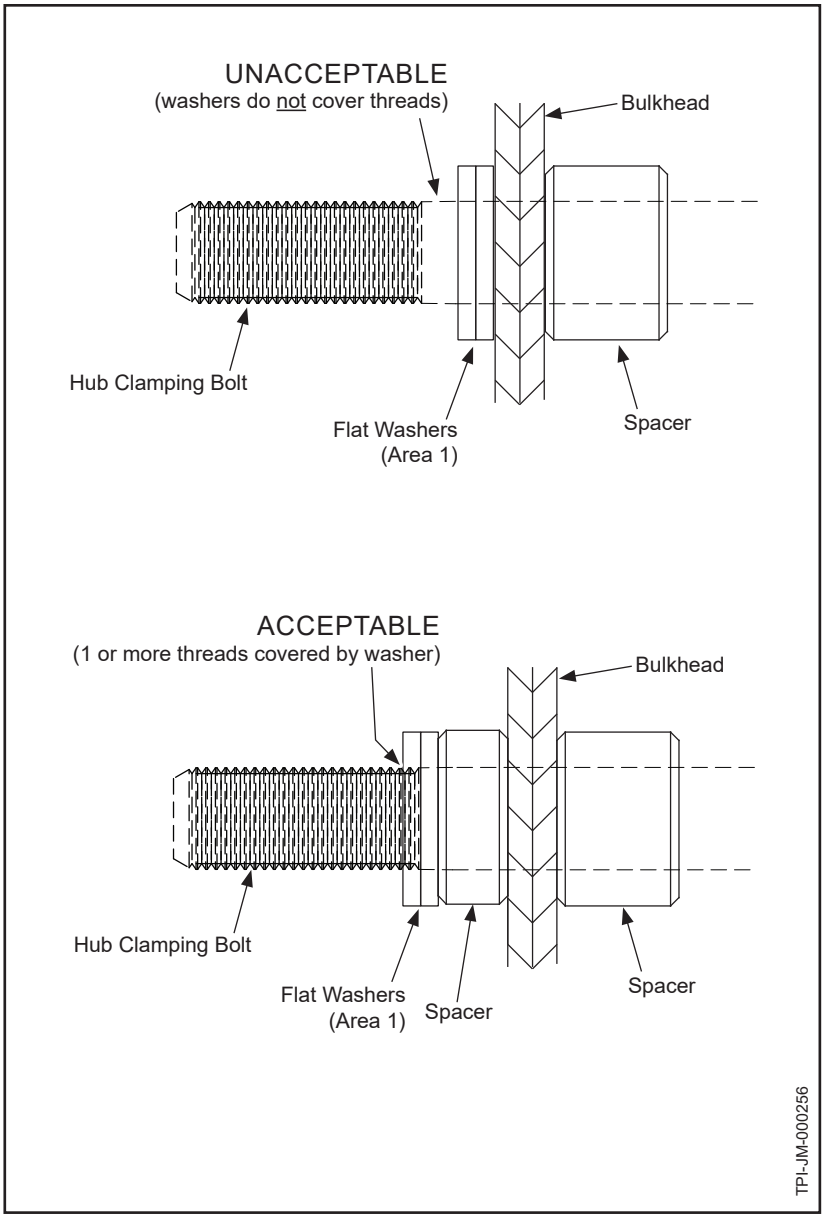
CAUTION 3: DO NOT LET THE SPINNER BULKHEAD TOUCH THE HUB. TO MAINTAIN BULKHEAD TO HUB CLEARANCE, ADDITIONAL FLAT WASHER(S) OR SPACER(S) MAY BE REQUIRED.

(2) If applicable, install the spacer(s) onto the hub clamping bolts, then install the spinner bulkhead onto the hub clamping bolts.

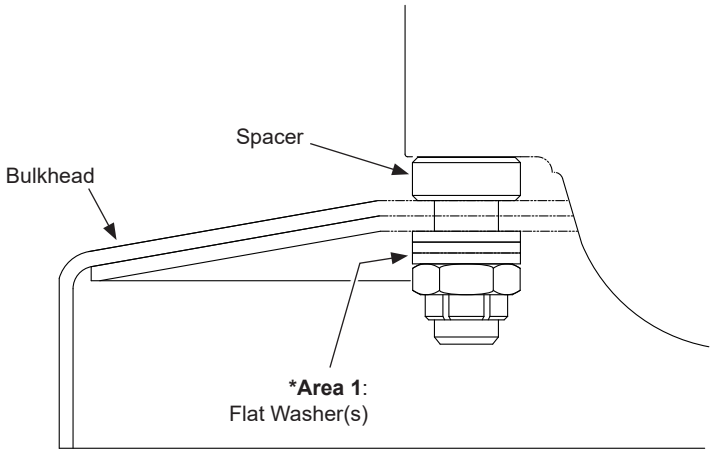
(a) For applications that do not use spacers, install a minimum of two flat washers between the spinner bulkhead and the propeller hub.

(b) Refer to Hartzell Propeller Application Guide 159 (61-02-59) for the applicable spinner mounting kit.

(c) Refer to Hartzell Propeller Metal Spinner Maintenance Manual 127 (61-27-16) for the parts list of the spinner mounting kit.



Thread Coverage: Metal Bulkhead
Figure 3-4



* Up to three flat washers can be installed in **Area 1** to get proper thread engagement.

TPI-MB-0459

Metal Bulkhead Mounting
Figure 3-5

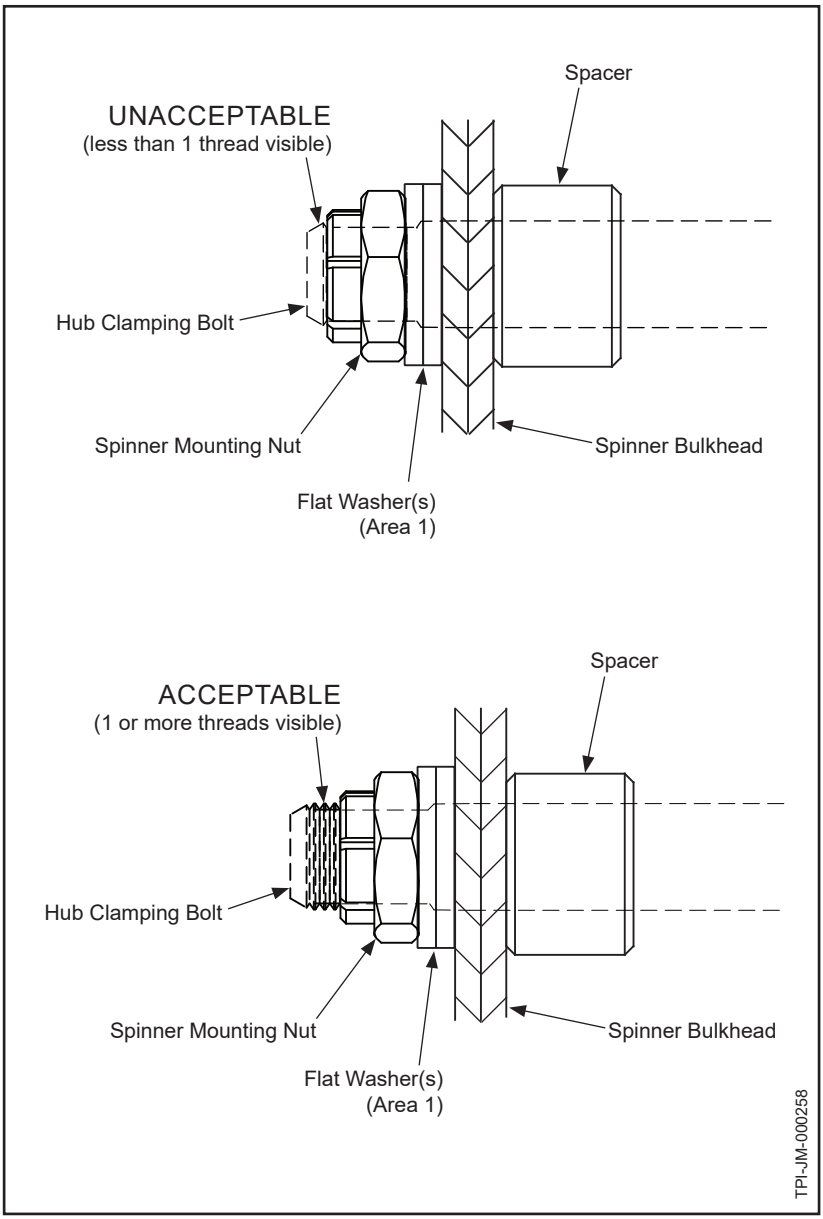
CAUTION: A MINIMUM OF ONE THREAD MUST BE COVERED BY FLAT WASHER(S) TO MAKE SURE THE SPINNER MOUNTING NUT WILL NOT BOTTOM OUT ON THE NON-THREADED AREA OF THE HUB CLAMPING BOLT. REFER TO FIGURE 3-5 FOR ILLUSTRATIONS OF ACCEPTABLE/UNACCEPTABLE THREAD COVERAGE.

(3) Install one flat washer and/or spacer (if applicable) onto the hub clamping bolts, then check the thread coverage on the hub clamping bolts in accordance with Figure 3-4.

(a) If the washer/spacer covers a minimum of one thread on the hub clamping bolt, go to step (4) of this procedure.

(b) If the washer/spacer does not cover at least one thread on the hub clamping bolt, install additional flat washer(s) from the spinner mounting kit in accordance with Figure 3-5.

1 Up to three flat washers can be installed in Area 1 to get proper thread coverage. Refer to Figure 3-4 and Figure 3-5.



Thread Exposure: Metal Bulkhead
Figure 3-6

CAUTION: AT LEAST ONE THREAD OF THE HUB CLAMPING BOLT MUST BE VISIBLE BELOW THE SPINNER MOUNTING NUT. REFER TO FIGURE 3-6 FOR ILLUSTRATIONS OF ACCEPTABLE AND UNACCEPTABLE THREAD EXPOSURE.

(4) Install a spinner mounting nut on each of the hub clamping bolts used to mount the spinner bulkhead.

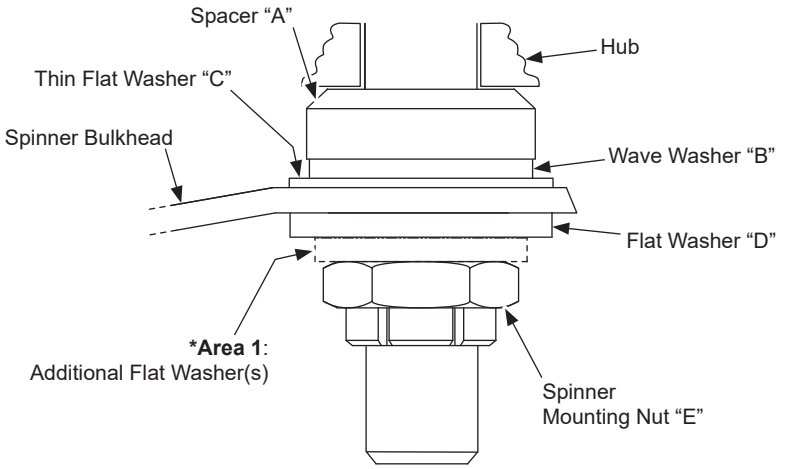
   (a) Torque each spinner mounting nut in accordance with the section, "Propeller Mounting Hardware and Torque Information" in this chapter.

   (b) If there is less than one hub clamping bolt thread visible below the spinner mounting nut, remove one of the additional washers added in Area 1, then reinstall/torque the spinner mounting nut and check the thread exposure.

      1 A minimum of one washer is required in Area 1.

(5) Refer to the section, "Spinner Assembly Clearance Checks" in this chapter.

(6) To adjust the position/spacing of the spinner bulkhead, refer to the section, "Metal Bulkhead Spacing Adjustments" in this chapter.



* Up to three washers can be installed in **Area 1** to get proper thread engagement.

TPI-LW-01310

Composite Bulkhead Mounting
Figure 3-7

C. Installation of a Composite Bulkhead

CAUTION: REMOVE THE NUTS AND WASHERS FROM THE HUB CLAMPING BOLTS ON THE LEFT/RIGHT SIDE OF THE BLADE SHANK ONLY. DO NOT REMOVE THE HUB CLAMPING BOLTS.

(1) Remove spinner mounting nuts "E" and flat washers "D" from the hub clamping bolts located on the left/right side of the blade shank. Refer to Figure 3-3 and Figure 3-7.

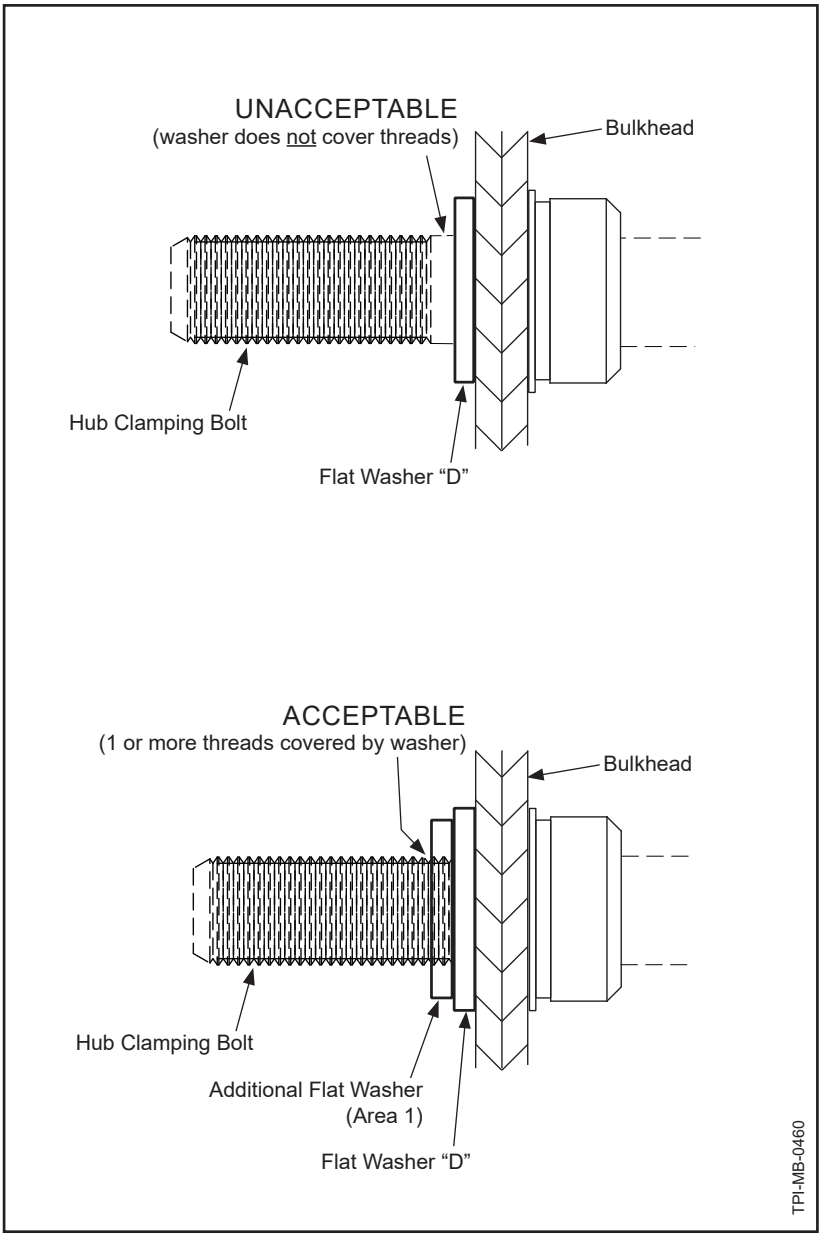
CAUTION 1: THE STACK-UP SEQUENCE FOR EACH HUB CLAMPING BOLT MUST BE THE SAME. VARIANCES BETWEEN STACK-UPS CAN CAUSE CRACKING OF THE SPINNER BULKHEAD. EXCEPTIONS MAY BE REQUIRED IF PROPELLER APPLICATIONS HAVE DE-ICE OR ANTI-ICE APPLICATIONS. REFER TO HARTZELL PROPELLER ICE PROTECTION SYSTEM MANUAL 180 (30-61-80) FOR INSTALLATION INSTRUCTIONS.

CAUTION 2: DO NOT LET THE SPINNER BULKHEAD TOUCH THE HUB. TO MAINTAIN BULKHEAD TO HUB CLEARANCE, ADDITIONAL FLAT WASHER(S) OR SPACER(S) MAY BE REQUIRED.

(2) Install spacer "A", wave washer "B", and thin flat washer "C" onto the hub clamping bolts in accordance with Figure 3-7, then install the spinner bulkhead onto the hub clamping bolts.

(a) Refer to Hartzell Propeller Application Guide 159 (61-02-59) for the applicable spinner mounting kit.

(b) Refer to Hartzell Propeller Composite Spinner Maintenance Manual 148 (61-16-48) for the parts list of the spinner mounting kit.



Thread Coverage: Composite Bulkhead
Figure 3-8

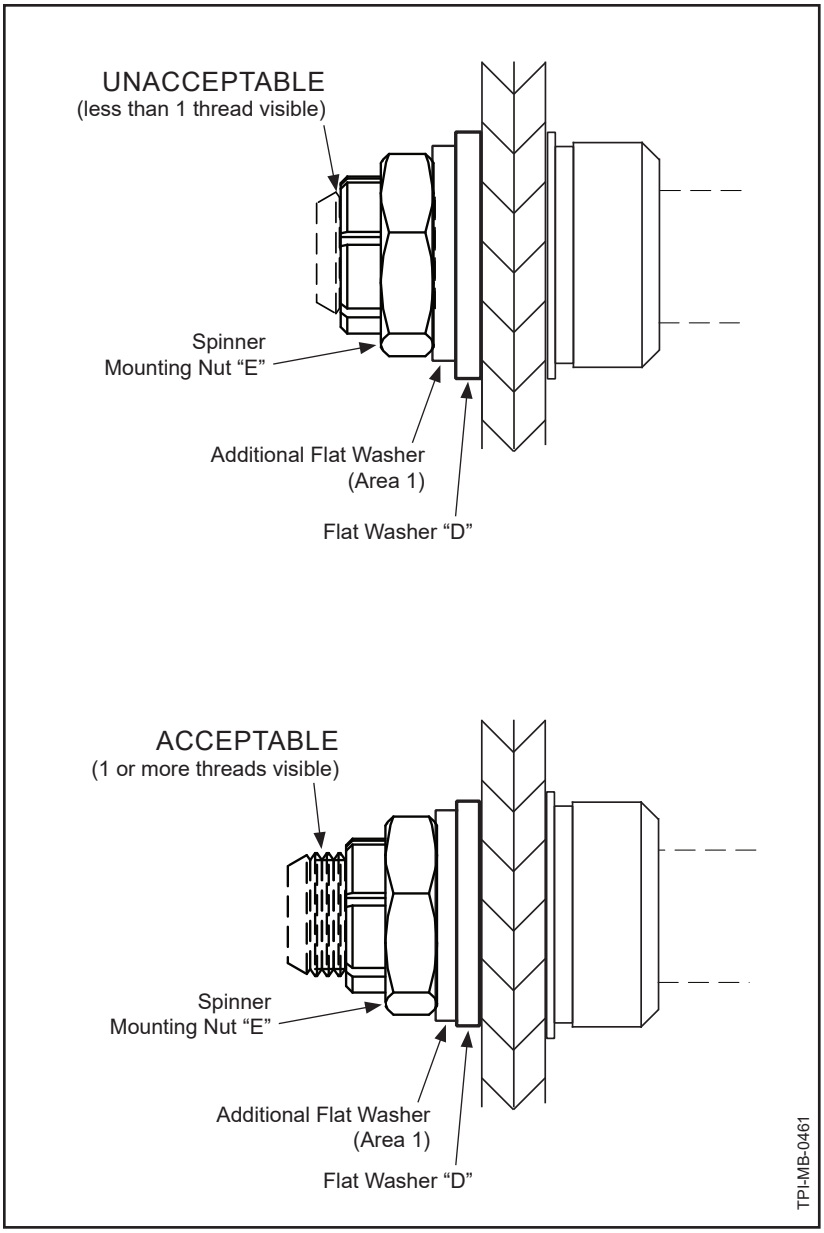
CAUTION: A MINIMUM OF ONE THREAD MUST BE COVERED BY FLAT WASHER "D" AND/OR ADDITIONAL FLAT WASHER(S) TO MAKE SURE THE SPINNER MOUNTING NUT "E" DOES NOT BOTTOM OUT ON THE NON-THREADED AREA OF THE HUB CLAMPING BOLT. REFER TO FIGURE 3-8 FOR ILLUSTRATIONS OF ACCEPTABLE/ UNACCEPTABLE THREAD COVERAGE.

(3) Install one flat washer "D" onto the hub clamping bolts, then check the thread coverage on the hub clamping bolts in accordance with Figure 3-8.

(a) If washer "D" covers a minimum of one thread on the hub clamping bolt, go to step (4) of this procedure.

(b) If washer "D" does not cover at least one thread on the hub clamping bolt, install additional flat washer(s) in accordance with Figure 3-7.

1 Up to three flat washers may be installed in Area 1 to get proper thread coverage Refer to Figure 3-7 and Figure 3-8.



Thread Exposure: Composite Bulkhead
Figure 3-9

CAUTION: AT LEAST ONE THREAD OF THE HUB CLAMPING BOLT MUST BE VISIBLE BELOW THE SPINNER MOUNTING NUT. REFER TO FIGURE 3-9 FOR ILLUSTRATIONS OF ACCEPTABLE AND UNACCEPTABLE THREAD EXPOSURE.

(4) Install a spinner mounting nut "E" on each of the hub clamping bolts used to mount the spinner bulkhead.

   (a) Torque each spinner mounting nut in accordance with the section, "Propeller Mounting Hardware and Torque Information" in this chapter.

   (b) If there is less than one hub clamping bolt thread visible below the spinner mounting nut "E", remove one of the additional washers added in Area 1, then reinstall/torque the spinner mounting nut and check the thread exposure. Refer to Figure 3-9.

      1 Flat washer "D" is required in Area 1.

(5) Refer to the section, "Spinner Assembly Clearance Checks" in this chapter.

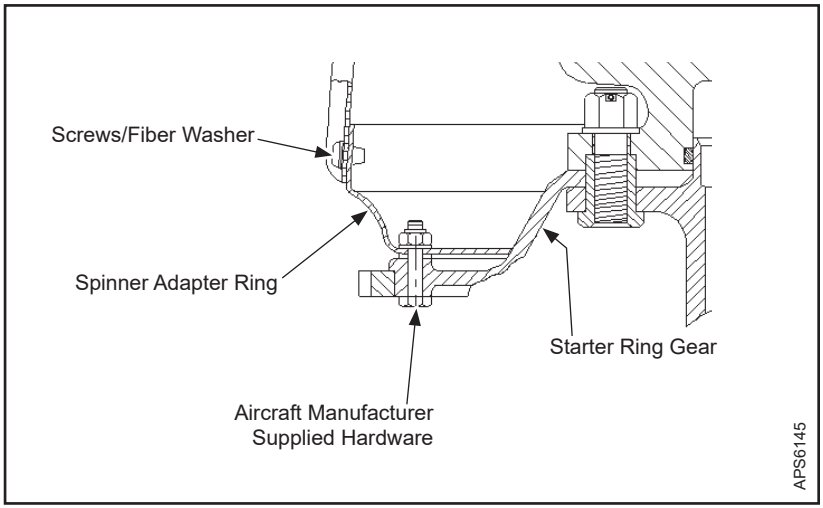
(6) To adjust the position/spacing of the spinner bulkhead, refer to the section, "Composite Bulkhead Spacing Adjustments" in this chapter.

5. Spinner Adapter Ring Installation (if applicable) (Rev. 1)
   A. Installation
      (1) Install the spinner adapter ring to the starter ring gear using the hardware supplied by the airframe manufacturer. Refer to Figure 3-10.

          CAUTION: BOLTS INSTALLED INCORRECTLY CAN DAMAGE ENGINE COMPONENTS.

          (a) Install spinner adapter bolts so that the bolt heads are at the rear of the starter ring gear. Refer to Figure 3-10.

      (2) Torque the bolts as specified by the airframe manufacturer.



Spinner Adapter Ring
Figure 3-10

WARNING: FAILURE TO FOLLOW THESE INSTALLATION INSTRUCTIONS MAY LEAD TO PROPELLER DAMAGE, ENGINE DAMAGE, OR PROPELLER FAILURE, WHICH MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/ OR SUBSTANTIAL PROPERTY DAMAGE. UNUSUAL OR ABNORMAL VIBRATION DEMANDS IMMEDIATE INSPECTION FOR IMPROPER PROPELLER INSTALLATION. PROPELLER SEPARATION MAY OR MAY NOT BE PROCEEDED BY VIBRATION.

6. Propeller Installation

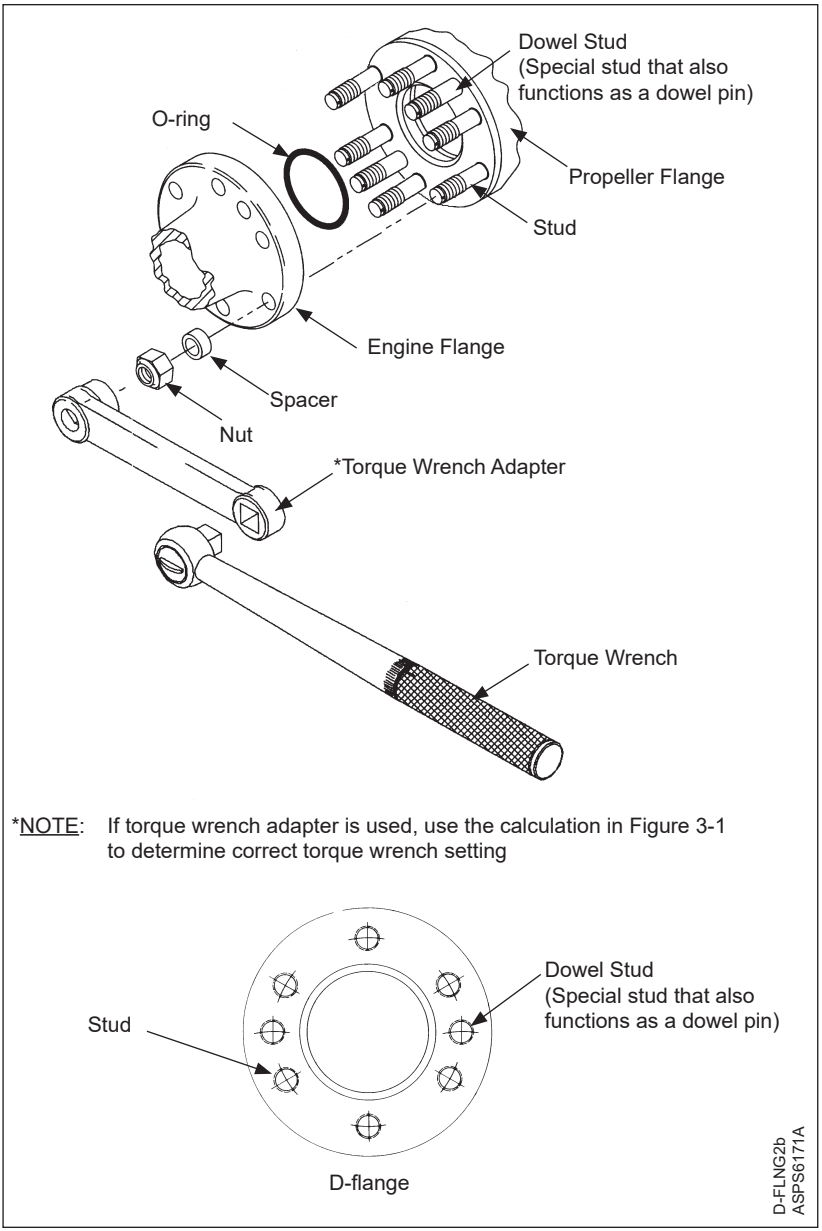
CAUTION: SOME STEEL HUB PROPELLERS INCORPORATE A PHENOLIC SPACER BETWEEN THE PROPELLER AND ENGINE MOUNTING FLANGE. WHEN INSTALLING AN ALUMINUM HUB PROPELLER, THIS SPACER IS TO BE DISCARDED. THE ALUMINUM HUB PROPELLER MOUNTING O-RING IS LOCATED ON THE INSIDE DIAMETER OF THE PROPELLER HUB. THERE SHOULD NOT BE AN O-RING ON THE ENGINE FLANGE WHEN INSTALLING AN ALUMINUM HUB PROPELLER.

A. Flange Description

(1) Compact propellers are manufactured with six basic hub mounting flange designs. The flange type designators are D, F, K, L, N, or R.

(2) The flange type used on a particular propeller installation is indicated in the propeller model stamped on the hub. For example, HC-C2Y**F**-4A indicates an F-flange.

(3) Refer to Aluminum Hub Propeller Model Identification in the Description and Operation Chapter of this manual for description of each flange type. Sample flanges are also shown in Figures 3-11 and 3-12.



D-flange Propeller Mounting
Figure 3-11

B. Installation of D-flange Propellers

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

(1) General

(a) A "D" flange propeller has six 1/2 inch studs configured in a four inch circle.

(b) Two special studs that also function as dowel pins, i.e., dowel studs, are also provided to transfer torque and index the propeller with respect to the engine crankshaft. Refer to Figure 3-11.

(c) The dowel pin locations used on a particular propeller installation are indicated in the propeller model stamped on the hub. Refer to Aluminum Hub Propeller Model Identification in the Description and Operation Chapter of this manual.

(2) Perform the applicable steps under Bulkhead Installation within this chapter.

WARNING: CLEANING AGENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION IS REQUIRED. AVOID PROLONGED CONTACT. USE IN WELL VENTILATED AREA.

(3) Clean the engine flange and propeller flange with Quick Dry Stoddard Solvent or MEK.

(4) Refer to Figure 3-11. Install the O-ring in the O-ring groove in the hub bore. Refer to Table 3-1 for the applicable O-ring and mounting hardware.

NOTE: When the propeller is received from the factory, the O-ring has been installed.

WARNING: MAKE SURE THAT ANY EQUIPMENT USED TO INSTALL THE PROPELLER IS RATED UP TO 800 LBS. (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION. ONE PERSON MUST NEVER ATTEMPT TO INSTALL AN UNSUPPORTED PROPELLER BY HIMSELF, REGARDLESS OF THE SIZE OR WEIGHT OF THE PROPELLER. MANUALLY LIFTING THE PROPELLER ONTO THE ENGINE CAN RESULT IN PERSONAL INJURY.

CAUTION 1: A PROPELLER MUST BE CORRECTLY SUPPORTED DURING INSTALLATION ON THE ENGINE. AVOID ANY ROCKING OR SHIFTING OF THE PROPELLER WHEN IT IS PARTIALLY ENGAGED WITH THE ENGINE. ROCKING OF THE PROPELLER DURING PROPELLER INSTALLATION CAN DAMAGE THE PROPELLER HUB MOUNTING FACE, CAUSING ACTUATION OIL LEAKAGE OR DAMAGE THAT MAY SCRAP THE HUB. HUB DAMAGE CAN ALSO INTRODUCE METAL INTO THE PROPELLER OIL ACTUATION SYSTEM, WHICH COULD POSSIBLY DAMAGE THE ENGINE.

CAUTION 2: WHEN INSTALLING THE PROPELLER ON THE AIRCRAFT, DO NOT DAMAGE THE ICE PROTECTION SYSTEM COMPONENTS, IF APPLICABLE.

(5) With a suitable support, such as a crane hoist or similar equipment, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

(6) Install the propeller on the engine flange. Make certain to align the dowel studs in the propeller flange with the corresponding holes in the engine mounting flange.

(a) The propeller may be installed on the engine flange in a given position, or 180 degrees from that position. Check the engine and airframe manuals to determine if either manual specifies a propeller mounting position.

CAUTION 1: MOUNTING HARDWARE MUST BE CLEAN AND DRY TO PREVENT EXCESSIVE PRELOAD OF THE MOUNTING FLANGE.

CAUTION 2: TIGHTEN NUTS EVENLY TO AVOID HUB DAMAGE.

(7) Install the 1/2 inch propeller mounting nuts (dry) with spacers. Refer to Table 3-1.

(a) If the propeller is removed between overhaul intervals, mounting nuts may be reused if they are not damaged or corroded.

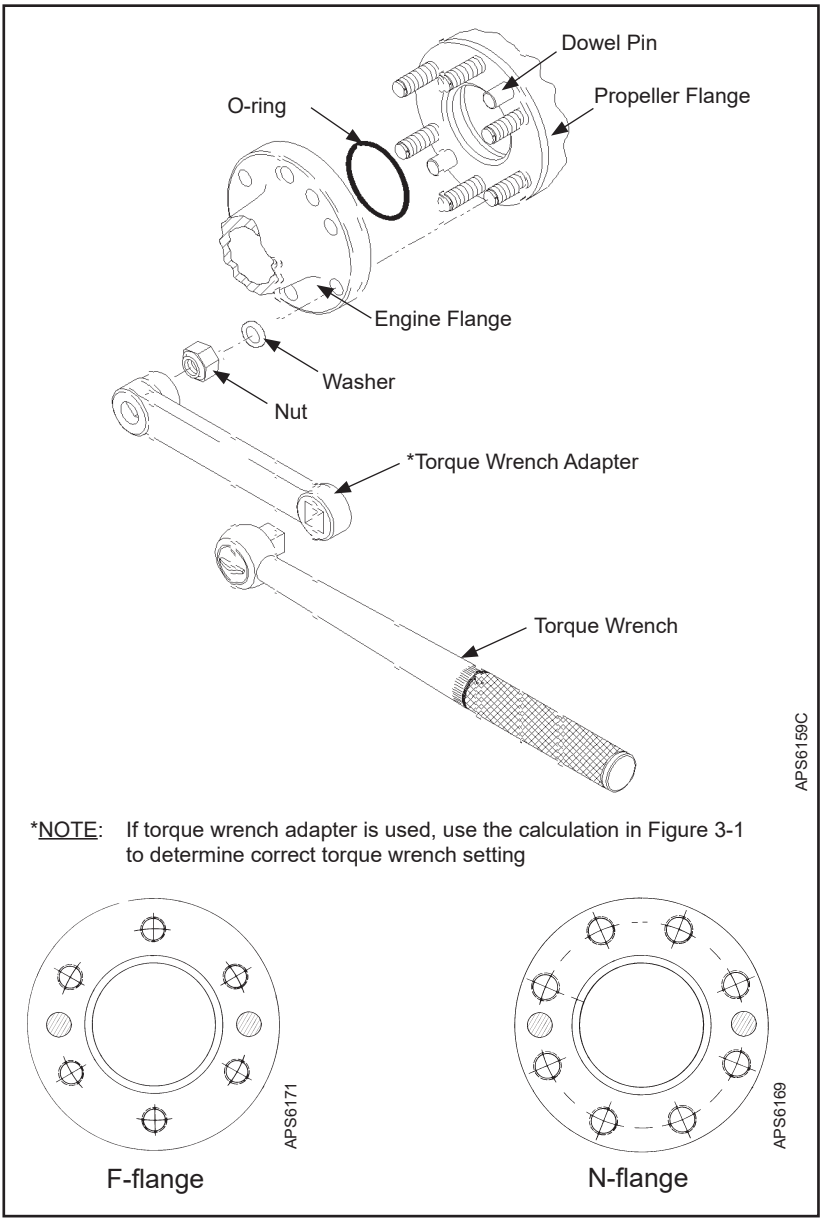
(8) Torque the 1/2 inch propeller mounting nuts (dry) in accordance with Table 3-2 and Figure 3-1.

(9) If required by the aircraft maintenance manual, safety all mounting studs with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware (two studs for each safety).

(10) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller, applicable instructions and technical information can be found in Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(11) Propeller ice protection system components not supplied by Hartzell Propeller are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(12) Install the propeller spinner dome in accordance with the section "Spinner Installation" in this chapter.



F-flange and N-flange Propeller Mounting
Figure 3-12

C. Installation of F-flange Propellers

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

(1) General

(a) An F-flange propeller has six 1/2 inch studs configured in a four inch circle.

(b) Two dowel pins are also provided to transfer torque and index the propeller with respect to the engine crankshaft. Refer to Figure 3-12.

(c) The dowel pin locations used on a particular propeller installation are indicated in the propeller model stamped on the hub. Refer to Aluminum Hub Propeller Model Identification in the Description and Operation Chapter of this manual.

(2) Perform the applicable steps under Bulkhead Installation within this chapter.

WARNING: CLEANING AGENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION IS REQUIRED. AVOID PROLONGED CONTACT. USE IN WELL VENTILATED AREA.

(3) Clean the engine flange and propeller flange with Quick Dry Stoddard Solvent or MEK.

(4) Refer to Figure 3-12. Install the O-ring in the O-ring groove in the hub bore. Refer to Table 3-1 for the applicable O-ring and mounting hardware.

NOTE: When the propeller is received from the factory, the O-ring has been installed.

WARNING: MAKE SURE THAT ANY EQUIPMENT USED TO INSTALL THE PROPELLER IS RATED UP TO 800 LBS. (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION. ONE PERSON MUST NEVER ATTEMPT TO INSTALL AN UNSUPPORTED PROPELLER BY HIMSELF, REGARDLESS OF THE SIZE OR WEIGHT OF THE PROPELLER. MANUALLY LIFTING THE PROPELLER ONTO THE ENGINE CAN RESULT IN PERSONAL INJURY.

CAUTION 1: A PROPELLER MUST BE CORRECTLY SUPPORTED DURING INSTALLATION ON THE ENGINE. AVOID ANY ROCKING OR SHIFTING OF THE PROPELLER WHEN IT IS PARTIALLY ENGAGED WITH THE ENGINE. ROCKING OF THE PROPELLER DURING PROPELLER INSTALLATION CAN DAMAGE THE PROPELLER HUB MOUNTING FACE, CAUSING ACTUATION OIL LEAKAGE OR DAMAGE THAT MAY SCRAP THE HUB. HUB DAMAGE CAN ALSO INTRODUCE METAL INTO THE PROPELLER OIL ACTUATION SYSTEM, WHICH COULD POSSIBLY DAMAGE THE ENGINE.

CAUTION 2: WHEN INSTALLING THE PROPELLER ON THE AIRCRAFT, DO NOT DAMAGE THE ICE PROTECTION SYSTEM COMPONENTS, IF APPLICABLE.

(5) With a suitable support, such as a crane hoist or similar equipment, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

(6) Install the propeller on the engine flange. Make certain to align the dowel pins in the propeller flange with the corresponding holes in the engine mounting flange.

(a) The propeller may be installed on the engine flange in a given position, or 180 degrees from that position. Check the engine and airframe manuals to determine if either manual specifies a propeller mounting position.

CAUTION 1: MOUNTING HARDWARE MUST BE CLEAN AND DRY TO PREVENT EXCESSIVE PRELOAD OF THE MOUNTING FLANGE.

CAUTION 2: TIGHTEN NUTS EVENLY TO AVOID HUB DAMAGE.

(7) Install the 1/2 inch propeller mounting nuts (dry) with washers. Refer to Table 3-1.

(a) If the propeller is removed between overhaul intervals, mounting nuts may be reused if they are not damaged or corroded.

(8) Torque the 1/2 inch propeller mounting nuts (dry) in accordance with Table 3-2, Figure 3-1 and Figure 3-2.

(9) If required by the aircraft maintenance manual, safety all mounting studs with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware (two studs for each safety).

(10) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller, applicable instructions and technical information can be found in Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(11) Propeller ice protection system components not supplied by Hartzell Propeller are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(12) Install the propeller spinner dome in accordance with the section "Spinner Installation" in this chapter.

D. Installation of N-flange Propellers

(1) General

(a) An N-flange propeller has eight 9/16 inch studs configured in a 4.25 inch circle.

(b) Two dowel pins are also provided to transfer torque and index the propeller with respect to the engine crankshaft. Refer to Figure 3-12.

(c) The dowel pin locations used on a particular propeller installation are indicated in the propeller model stamped on the hub. Refer to Aluminum Hub Propeller Model Identification in the Description and Operation Chapter of this manual.

(2) Perform the applicable steps under Bulkhead Installation within this chapter.

WARNING: CLEANING AGENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION IS REQUIRED. AVOID PROLONGED CONTACT. USE IN WELL VENTILATED AREA.

(3) Clean the engine flange and propeller flange with Quick Dry Stoddard Solvent or MEK.

(4) Refer to Figure 3-12. Install the O-ring on the engine flange. Refer to Table 3-1 for the applicable O-ring and mounting hardware.

NOTE: When the propeller is received from the factory, the O-ring has been installed.

WARNING: MAKE SURE THAT ANY EQUIPMENT USED TO INSTALL THE PROPELLER IS RATED UP TO 800 LBS. (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION. ONE PERSON MUST NEVER ATTEMPT TO INSTALL AN UNSUPPORTED PROPELLER BY HIMSELF, REGARDLESS OF THE SIZE OR WEIGHT OF THE PROPELLER. MANUALLY LIFTING THE PROPELLER ONTO THE ENGINE CAN RESULT IN PERSONAL INJURY.

CAUTION 1: A PROPELLER MUST BE CORRECTLY SUPPORTED DURING INSTALLATION ON THE ENGINE. AVOID ANY ROCKING OR SHIFTING OF THE PROPELLER WHEN IT IS PARTIALLY ENGAGED WITH THE ENGINE. ROCKING OF THE PROPELLER DURING PROPELLER INSTALLATION CAN DAMAGE THE PROPELLER HUB MOUNTING FACE, CAUSING ACTUATION OIL LEAKAGE OR DAMAGE THAT MAY SCRAP THE HUB. HUB DAMAGE CAN ALSO INTRODUCE METAL INTO THE PROPELLER OIL ACTUATION SYSTEM, WHICH COULD POSSIBLY DAMAGE THE ENGINE.

CAUTION 2: WHEN INSTALLING THE PROPELLER ON THE AIRCRAFT, DO NOT DAMAGE THE ICE PROTECTION SYSTEM COMPONENTS, IF APPLICABLE.

(5) With a suitable support, such as a crane hoist or similar equipment, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

(6) Install the propeller on the engine flange. Make certain to align the dowel pins in the propeller flange with the corresponding holes in the engine mounting flange.

(a) The propeller may be installed on the engine flange in a given position, or 180 degrees from that position. Check the engine and airframe manuals to determine if either manual specifies a propeller mounting position.

CAUTION 1: MOUNTING HARDWARE MUST BE CLEAN AND DRY TO PREVENT EXCESSIVE PRELOAD OF THE MOUNTING FLANGE.

CAUTION 2: TIGHTEN NUTS EVENLY TO AVOID HUB DAMAGE.

(7) Install the 9/16 inch propeller mounting nuts (dry) with washers. Refer to Table 3-1.

(a) If the propeller is removed between overhaul intervals, mounting nuts may be reused if they are not damaged or corroded.

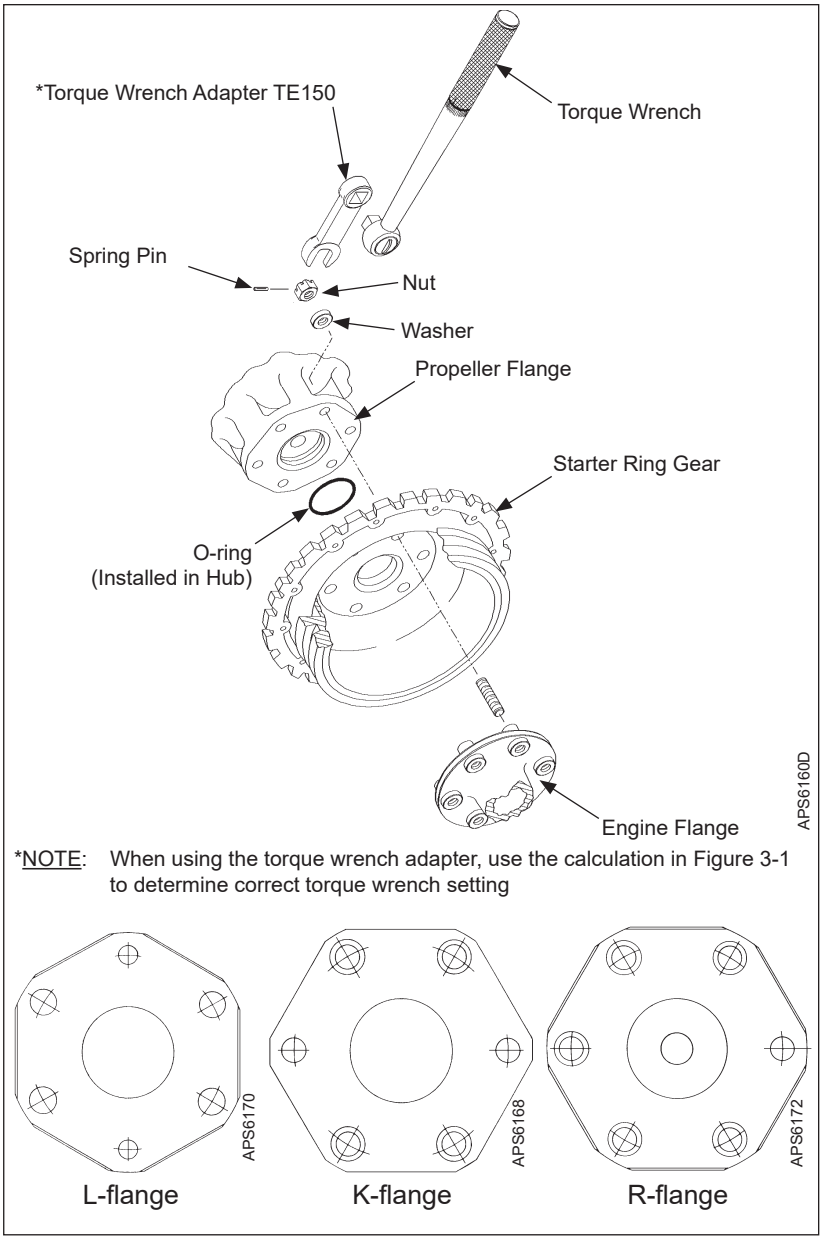
(8) Torque the 9/16 inch propeller mounting nuts (dry) in accordance with Table 3-2 and Figure 3-1.

(9) If required by the aircraft maintenance manual, safety all mounting studs with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware (two studs for each safety).

(10) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller, applicable instructions and technical information can be found in Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(11) Propeller ice protection system components not supplied by Hartzell Propeller are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(12) Install the propeller spinner dome in accordance with the section "Spinner Installation" in this chapter.



L, K, and R-flange Propeller Mounting
Figure 3-13

E. Installation of L-flange Propellers, Except Model HC-E2YL-( )

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

(1) General

(a) An L-flange is an SAE No. 2 flange with six 7/16 inch studs configured in a 4.75 inch circle.

(b) Four drive bushings transfer torque and index the propeller with respect to the engine crankshaft. The bushings are located on the engine flange and fit into openings on the propeller flange. Refer to Figure 3-13.

(c) The bushing locations used on a particular propeller installation are indicated in the propeller model stamped on the hub. Refer to Aluminum Hub Propeller Model Identification in the Description and Operation chapter of this manual.

(2) Perform the appropriate steps in the Bulkhead Installation section in this chapter.

WARNING: CLEANING AGENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT. USE IN WELL VENTILATED AREA.

(3) Clean the engine flange and propeller flange with Quick Dry Stoddard Solvent or MEK.

(4) Refer to Figure 3-13. Install the O-ring in the O-ring groove in the rear of the hub. Refer to Table 3-1 for the applicable O-ring and mounting hardware.

NOTE: When the propeller is received from the factory, the O-ring has been installed.

WARNING: MAKE SURE THAT ANY EQUIPMENT USED TO INSTALL THE PROPELLER IS RATED UP TO 800 LBS. (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION. ONE PERSON MUST NEVER ATTEMPT TO INSTALL AN UNSUPPORTED PROPELLER BY HIMSELF, REGARDLESS OF THE SIZE OR WEIGHT OF THE PROPELLER. MANUALLY LIFTING THE PROPELLER ONTO THE ENGINE CAN RESULT IN PERSONAL INJURY.

CAUTION 1: A PROPELLER MUST BE CORRECTLY SUPPORTED DURING INSTALLATION ON THE ENGINE. AVOID ANY ROCKING OR SHIFTING OF THE PROPELLER WHEN IT IS PARTIALLY ENGAGED WITH THE ENGINE. ROCKING OF THE PROPELLER DURING PROPELLER INSTALLATION CAN DAMAGE THE PROPELLER HUB MOUNTING FACE, CAUSING ACTUATION OIL LEAKAGE OR DAMAGE THAT MAY SCRAP THE HUB. HUB DAMAGE CAN ALSO INTRODUCE METAL INTO THE PROPELLER OIL ACTUATION SYSTEM, WHICH COULD POSSIBLY DAMAGE THE ENGINE.

CAUTION 2: WHEN INSTALLING THE PROPELLER ON THE AIRCRAFT, DO NOT DAMAGE THE ICE PROTECTION SYSTEM COMPONENTS, IF APPLICABLE.

(5) With a suitable support, such as a crane hoist or similar equipment, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

(6) Install the propeller on the engine flange. Align the engine flange bushings with the corresponding holes in the propeller flange.

(a) The propeller may be installed on the engine flange in a given position, or 180 degrees from that position. Check the engine and airframe manuals to determine if either manual specifies a propeller mounting position.

CAUTION 1: MOUNTING HARDWARE MUST BE CLEAN AND DRY TO PREVENT EXCESSIVE PRELOAD OF THE MOUNTING FLANGE.

CAUTION 2: TIGHTEN NUTS EVENLY TO AVOID HUB DAMAGE.

(7) Torque the 7/16 inch propeller mounting studs (dry) in accordance with Table 3-2 and Figure 3-1.

(8) If required by the aircraft maintenance manual, safety all mounting studs with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware (two studs for each safety).

(a) If the propeller is removed between overhaul intervals, mounting studs may be reused if they are not damaged or corroded.

(9) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller, applicable instructions and technical information can be found in Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(10) Propeller ice protection system components not supplied by Hartzell Propeller are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(11) Install the propeller spinner dome in accordance with the section "Spinner Installation" in this chapter.

F. Installation of HC-E2YL-( ) Propellers

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

(1) General

(a) An E2YL flange has four 7/16 inch bolts and two 7/16 inch studs configured in a 4.75 inch circle.

(b) Four drive bushings transfer torque and index the propeller with respect to the engine crankshaft. The bushings are located on the engine flange and fit into openings on the propeller flange. Refer to Figure 3-11.

(c) The bushing location used on this propeller installation is indicated in the propeller model. Refer to Aluminum Hub Propeller Model Identification in the Description and Operation chapter of this manual.

(2) Perform the applicable steps in the Bulkhead Installation section in this chapter.

WARNING: CLEANING AGENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT. USE IN WELL VENTILATED AREA.

(3) Clean the engine flange and propeller flange with Quick Dry Stoddard Solvent or MEK.

(4) Refer to Figure 3-13. Install the O-ring in the O-ring groove in the rear of the hub. Refer to Table 3-1 for the applicable O-ring and mounting hardware.

NOTE: When the propeller is received from the factory, the O-ring has been installed.

WARNING: MAKE SURE THAT ANY EQUIPMENT USED TO INSTALL THE PROPELLER IS RATED UP TO 800 LBS. (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION. ONE PERSON MUST NEVER ATTEMPT TO INSTALL AN UNSUPPORTED PROPELLER BY HIMSELF, REGARDLESS OF THE SIZE OR WEIGHT OF THE PROPELLER. MANUALLY LIFTING THE PROPELLER ONTO THE ENGINE CAN RESULT IN PERSONAL INJURY.

CAUTION 1: A PROPELLER MUST BE CORRECTLY SUPPORTED DURING INSTALLATION ON THE ENGINE. AVOID ANY ROCKING OR SHIFTING OF THE PROPELLER WHEN IT IS PARTIALLY ENGAGED WITH THE ENGINE. ROCKING OF THE PROPELLER DURING PROPELLER INSTALLATION CAN DAMAGE THE PROPELLER HUB MOUNTING FACE, CAUSING ACTUATION OIL LEAKAGE OR DAMAGE THAT MAY SCRAP THE HUB. HUB DAMAGE CAN ALSO INTRODUCE METAL INTO THE PROPELLER OIL ACTUATION SYSTEM, WHICH COULD POSSIBLY DAMAGE THE ENGINE.

CAUTION 2: WHEN INSTALLING THE PROPELLER ON THE AIRCRAFT, DO NOT DAMAGE THE ICE PROTECTION SYSTEM COMPONENTS, IF APPLICABLE.

(5) With a suitable support, such as a crane hoist or similar equipment, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

(6) Install the propeller on the engine flange. Align the engine flange bushings with the corresponding holes in the propeller flange.

(a) The propeller may be installed on the engine flange in a given position, or 180 degrees from that position. Refer to the engine and airframe manuals to determine if either manual specifies a propeller mounting position.

CAUTION 1: MOUNTING HARDWARE MUST BE CLEAN AND DRY TO PREVENT EXCESSIVE PRELOAD OF THE MOUNTING FLANGE.

CAUTION 2: TIGHTEN NUTS EVENLY TO AVOID HUB DAMAGE.

(7) Install the 7/16 inch propeller mounting bolts (dry) with washers. Refer to Table 3-1.

(a) If the propeller is removed between overhaul intervals, mounting bolts and studs may be reused if they are not damaged or corroded.

(8) Torque the 7/16 inch nuts on the propeller mounting studs (dry) and the 7/16 inch bolts (dry) in accordance with Table 3-2 and Figure 3-1.

(9) If required by the aircraft maintenance manual, safety all mounting studs with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware (two studs for each safety).

(10) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller, applicable instructions and technical information can be found in Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(11) Propeller ice protection system components not supplied by Hartzell Propeller are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(12) Install the propeller spinner dome in accordance with the section "Spinner Installation" in this chapter.

G. Installation of K-flange and R-flange Propellers

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

(1) General

(a) A K-flange or an R-flange is an SAE No. 2 flange that has six 1/2 inch studs configured in a 4.75 inch circle.

(b) Four (K-flange) or five (R-flange) drive bushings transfer torque and index the propeller with respect to the engine crankshaft. The bushings are located on the engine flange and fit into counter bored holes on the propeller flange. Refer to Figure 3-13.

(c) An R-flange propeller may be installed on a K-flange engine flange. A K-flange propeller cannot be installed on an R-flange engine flange.

(d) The bushing locations used on a particular propeller installation are indicated in the propeller model stamped on the hub. Refer to Aluminum Hub Propeller Model Identification in the Description and Operation chapter of this manual.

(2) Perform the applicable steps under Bulkhead Installation within this chapter.

WARNING: CLEANING AGENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION IS REQUIRED. AVOID PROLONGED CONTACT. USE IN WELL VENTILATED AREA.

(3) Clean the engine flange and propeller flange with Quick Dry Stoddard Solvent or MEK.

(4) See Figure 3-13. Install the O-ring in the O-ring groove in the rear of the hub. See Table 3-1 for the applicable O-ring and mounting hardware.

NOTE: When the propeller is received from the factory, the O-ring has been installed.

WARNING: MAKE SURE THAT ANY EQUIPMENT USED TO INSTALL THE PROPELLER IS RATED UP TO 800 LBS. (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION. ONE PERSON MUST NEVER ATTEMPT TO INSTALL AN UNSUPPORTED PROPELLER BY HIMSELF, REGARDLESS OF THE SIZE OR WEIGHT OF THE PROPELLER. MANUALLY LIFTING THE PROPELLER ONTO THE ENGINE CAN RESULT IN PERSONAL INJURY.

CAUTION 1: A PROPELLER MUST BE CORRECTLY SUPPORTED DURING INSTALLATION ON THE ENGINE. AVOID ANY ROCKING OR SHIFTING OF THE PROPELLER WHEN IT IS PARTIALLY ENGAGED WITH THE ENGINE. ROCKING OF THE PROPELLER DURING PROPELLER INSTALLATION CAN DAMAGE THE PROPELLER HUB MOUNTING FACE, CAUSING ACTUATION OIL LEAKAGE OR DAMAGE THAT MAY SCRAP THE HUB. HUB DAMAGE CAN ALSO INTRODUCE METAL INTO THE PROPELLER OIL ACTUATION SYSTEM, WHICH COULD POSSIBLY DAMAGE THE ENGINE.

CAUTION 2: WHEN INSTALLING THE PROPELLER ON THE AIRCRAFT, DO NOT DAMAGE THE ICE PROTECTION SYSTEM COMPONENTS, IF APPLICABLE.

(5) With a suitable support, such as a crane hoist or similar equipment, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

(6) Install the propeller on the engine flange. Align the engine flange bushings with the corresponding holes in the propeller flange.

(a) An R-flange propeller may be installed on a K-flange engine flange in a given position, or 180 degrees from that position.

(b) An R-flange propeller may be installed on an R-flange engine flange in one position only.

(c) A K-flange propeller may be installed only on a K-flange engine flange, but may be installed in a given position or 180 degrees from that position.

(d) Check the engine and airframe manuals to determine if either manual specifies a propeller mounting position.

CAUTION 1: MOUNTING HARDWARE MUST BE CLEAN AND DRY TO PREVENT EXCESSIVE PRELOAD OF THE MOUNTING FLANGE.

CAUTION 2: TIGHTEN NUTS EVENLY TO AVOID HUB DAMAGE.

(7) Torque the 1/2 inch propeller mounting studs (dry) in accordance with Table 3-2, Figure 3-1, and Figure 3-2.

(8) If required by the aircraft maintenance manual, safety all mounting studs with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable and associated hardware (two studs for each safety).

(a) If the propeller is removed between overhaul intervals, mounting studs may be reused if they are not damaged or corroded.

(9) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller, applicable instructions and technical information can be found in Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(10) Propeller ice protection system components not supplied by Hartzell Propeller are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(11) Install the propeller spinner dome in accordance with the section "Spinner Installation" in this chapter.

7. Damper Installation

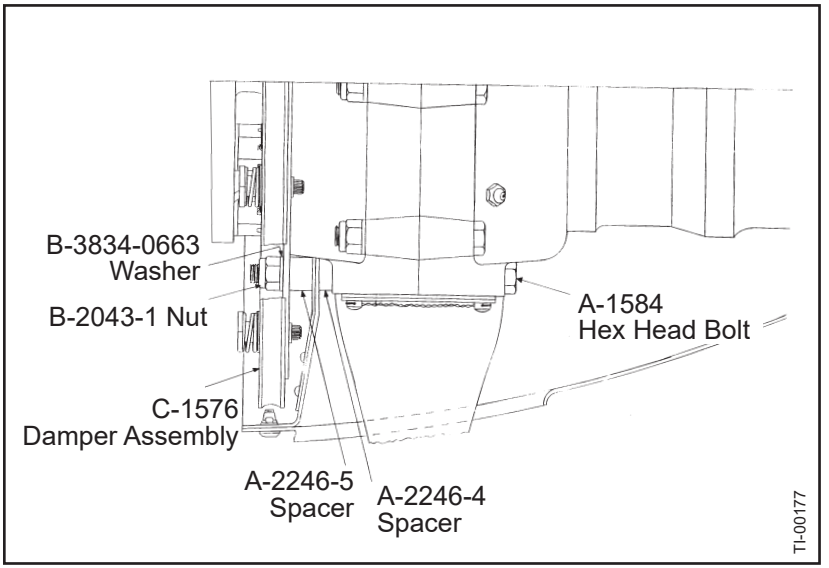
A. Installation of C-1576 Damper (Hartzell Propeller Kit A-1583)

CAUTION: USE WITH A-2476-16 SPINNER MOUNTING KIT ONLY.

(1) Use the A-2476-16 spinner mounting kit when installing the C-1576 damper assembly (Figure 3-14).

(a) Remove four of the B-3834-0663 washers from the A-2476-16 spinner mounting kit when installing the C-1576 damper assembly.

(2) Install the propeller spinner dome and cap in accordance with the section "Spinner Installation" in this chapter.



Damper Installation
Figure 3-14

8. One-Piece Spinner Dome Installation (Rev. 2)

CAUTION 1: TO PREVENT DAMAGE TO THE BLADE AND BLADE PAINT, WRAP THE BLADE SHANKS IN SEVERAL LAYERS OF MASKING OR DUCT TAPE BEFORE INSTALLING THE SPINNER DOME. REMOVE THE TAPE AFTER THE SPINNER IS INSTALLED.

CAUTION 2: THE SPINNER DOME WILL WOBBLE IF NOT ALIGNED PROPERLY. THIS MAY AFFECT THE DYNAMIC BALANCE OF THE PROPELLER.

NOTE 1: The following instructions relate to Hartzell Propeller spinners only. In some cases, the airframe manufacturer produced the spinner assembly. If so, refer to the airframe manufacturer's manual for spinner installation instructions.

NOTE 2: There are three types of one-piece spinner domes used on Hartzell Propeller Compact-series propellers:

- Spinner Dome without a Forward Bulkhead
- Spinner Dome with a Bonded Forward Bulkhead
- Spinner Dome with a Removable Forward Bulkhead

NOTE 3: A forward bulkhead is an internal support that encircles the propeller cylinder.

NOTE 4: Refer to the applicable installation instructions for the type of dome/forward bulkhead being installed.

NOTE 5: The B-3845-8 screws supplied with metal spinner assemblies are 0.500 inch (12.70 mm) in length. If correct thread engagement cannot be achieved when installing the spinner dome, B-3845-9 screws may be used. The B-3845-9 screws are 0.562 inch (14.27 mm) in length.

A. Installation of a One-Piece Spinner Dome without a Forward Bulkhead

(1) Examine the low pitch stop hardware configuration.

(a) If the visual examination shows that the hardware configuration is one hex nut safety wired to a set screw, no further action is required.

(b) If the visual examination shows that the hardware configuration is not one hex nut safety wired to a set screw, modify the propeller assembly to the hardware configuration of one hex nut safety wired to a set screw in accordance with the section "Modification of the Low Pitch Stop Hardware" in the Maintenance Practices chapter of this manual.

(2) Install the spinner dome.

(a) If anti-ice travel tubes are installed:

CAUTION: THE TRAVEL TUBES MUST NOT TOUCH THE SPINNER DOME BLADE CUTOUT.

1 Make sure there is clearance between the travel tubes and the spinner dome blade cutouts.

2 Make adjustments to the position of the travel tubes in accordance to Hartzell Propeller Manual 180 (30-61-80).

Spinner Dome/Cap	Washer	Screw
Metal Dome	A-1020 Washer, Fiber	B-3845-8 10-32, Truss Head
Metal Cap	n/a	B-3866-50 8-32, 100° Head, Cres.
Composite Dome	B-3860-10L Dimpled, 100°, Cres.	B-3867-272 10-32, 100° Head, Cres.

Spinner Dome and Spinner Cap Mounting Hardware
Table 3-3

CAUTION: MAKE SURE OF PROPER THREAD ENGAGEMENT FOR THE SCREWS IN THE NUTPLATES. APPROXIMATELY 1 TO 1 1/2 THREADS MUST EXTEND PAST THE BULKHEAD NUTPLATES. TO AVOID DAMAGING THE AIRCRAFT COWLING, THE SCREWS MUST NOT EXTEND MORE THAN THREE THREADS PAST THE BULKHEAD NUTPLATES.

(3) Attach the spinner dome to the spinner bulkhead with the supplied screws and washers. Refer to Table 3-3.

(a) Install a screw in the hole(s) centered between each two adjacent blade cutouts.

1 If the centerline between the adjacent blade cutouts does not align with a mounting hole, install screws in the two holes closest to the centerline.

CAUTION: BE SURE THE SCREWS DRAW THE SPINNER DOME TIGHT TO THE BULKHEAD.

(b) Tighten the screws until snug, then turn an additional 1/8 rotation.

CAUTION: IN THE FOLLOWING STEP, TIGHTEN EACH SCREW BEFORE INSTALLING THE NEXT SCREW.

(c) Working from the screw(s) previously installed at the centerline toward the blade cutouts, install the remaining screws one at a time.

1 Tighten each screw until snug, then turn an additional 1/8 rotation before installing the next screw.

B. Installation of a One-Piece Spinner Dome with a Bonded Forward Bulkhead

(1) Examine the low pitch stop hardware configuration.

(a) If the visual examination shows that the hardware configuration is one hex nut safety wired to a set screw, no further action is required.

(b) If the visual examination shows that the hardware configuration is not one hex nut safety wired to a set screw, modify the propeller assembly to the hardware configuration of one hex nut safety wired to a set screw in accordance with the section "Modification of the Low Pitch Stop Hardware" in the Maintenance Practices chapter of this manual.

(2) Install the spinner dome.

CAUTION: THE FORWARD BULKHEAD MUST FIT SNUGLY ON THE CYLINDER. AN IMPROPERLY SUPPORTED DOME COULD CAUSE CYLINDER DAMAGE OR A CRACK IN THE DOME OR BULKHEAD.

(3) Using both hands, grasp the spinner dome in the approximate location of the forward bulkhead and apply lateral force (side-to-side).

(a) If there is no lateral movement: Go to step (4) of this procedure.

(b) If there is lateral movement: Apply UHMW tape CM137 in accordance with the following steps.

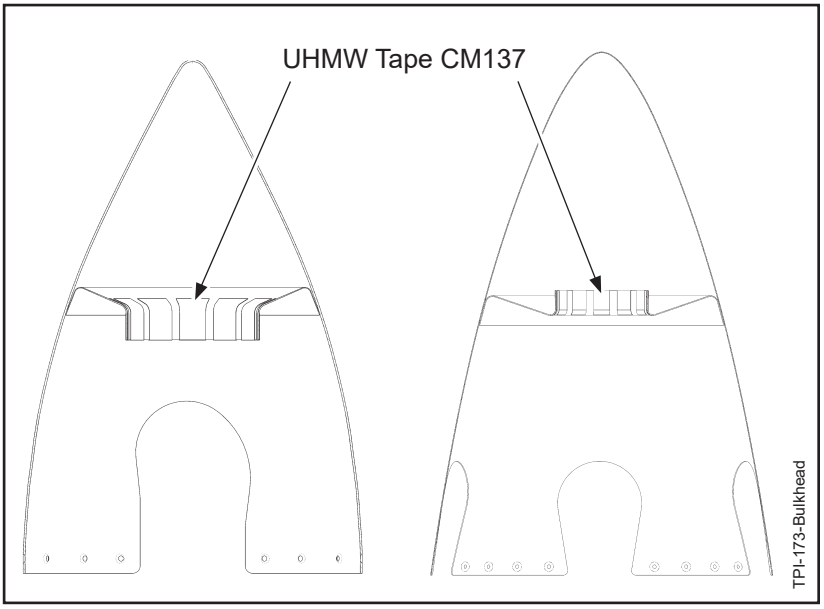
1 Option 1: Apply UHMW tape CM137 around the cylinder.

a Wrap one or more layers of UHMW tape CM137 around the cylinder until the forward bulkhead fits snugly on the cylinder.

2 Option 2: Apply UHMW tape CM137 to the forward bulkhead.

a Install 2.5 inch (63 mm) strips of UHMW tape CM137 in equally spaced locations around the ID of the forward bulkhead as shown in Figure 3-15.

b If necessary, install additional layers of UHMW tape CM137 until the forward bulkhead fits snugly on the cylinder.



UHMW Tape - For Bonded Forward Bulkhead
Figure 3-15

(c) If anti-ice travel tubes are installed:

CAUTION: THE TRAVEL TUBES MUST NOT TOUCH THE SPINNER DOME BLADE CUTOUT.

1 Make sure there is clearance between the travel tubes and the spinner dome blade cutouts.

2 Make adjustments to the position of the travel tubes in accordance to Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

CAUTION: MAKE SURE OF PROPER THREAD ENGAGEMENT FOR THE SCREWS IN THE NUTPLATES. APPROXIMATELY 1 TO 1 1/2 THREADS MUST EXTEND PAST THE BULKHEAD NUTPLATES. TO AVOID DAMAGING THE AIRCRAFT COWLING, THE SCREWS MUST NOT EXTEND MORE THAN THREE THREADS PAST THE BULKHEAD NUTPLATES.

(4) Attach the spinner to the spinner bulkhead with the supplied screws and washers. Refer to Table 3-3.

(a) Install a screw in the hole(s) centered between each two adjacent blade cutouts.

1 If the centerline between the adjacent blade cutouts does not align with a mounting hole, install screws in the two holes closest to the centerline.

CAUTION: BE SURE THE SCREWS DRAW THE SPINNER DOME TIGHT TO THE BULKHEAD.

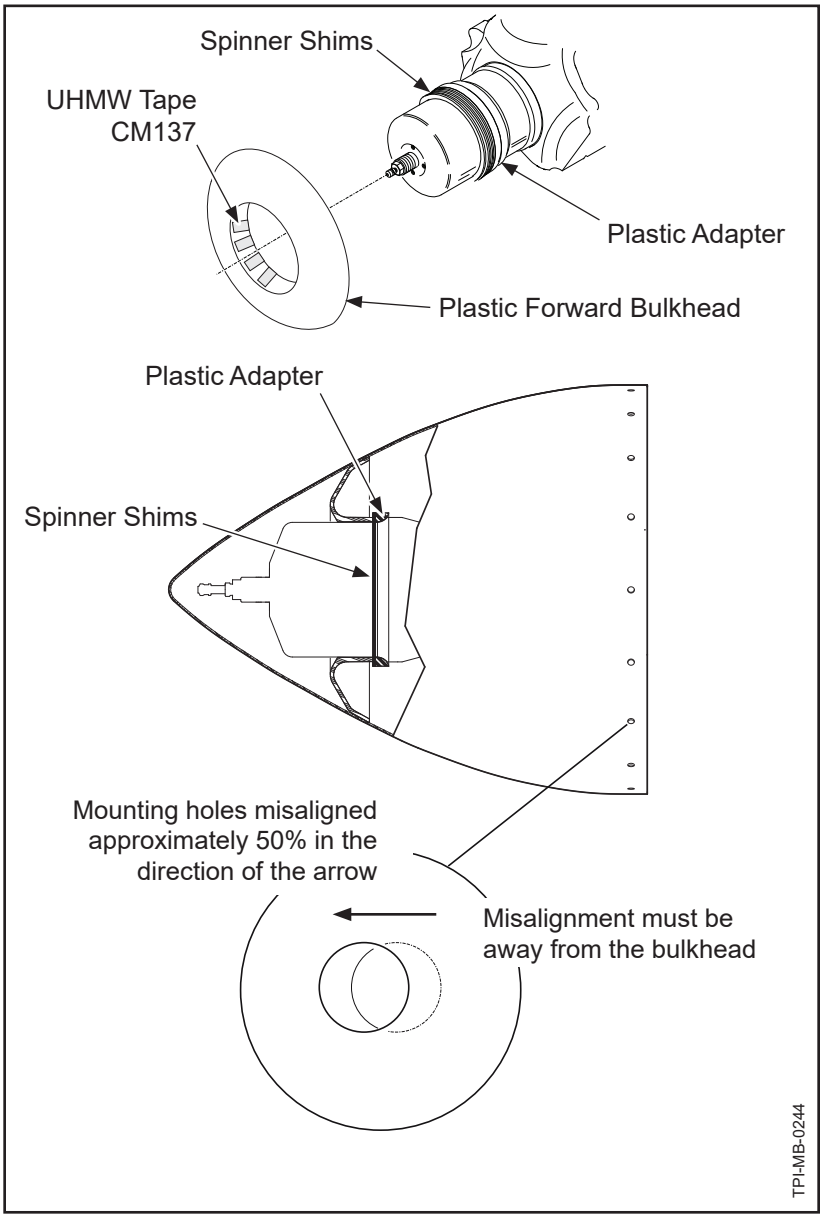
(b) Tighten the screws until snug, then turn an additional 1/8 rotation.

CAUTION: IN THE FOLLOWING STEP, TIGHTEN EACH SCREW BEFORE INSTALLING THE NEXT SCREW.

(c) Working from the screw(s) previously installed at the centerline toward the blade cutouts, install the remaining screws one at a time.

1 Tighten each screw until snug, then turn an additional 1/8 rotation before installing the next screw.

(5) If the spinner loosens in service, add one or more layers of UHMW tape to the cylinder until the spinner fits snugly.



One-Piece Spinner Dome Installation with Removable Plastic Forward Bulkhead
Figure 3-16

C. Installation of a One-Piece Spinner Dome with a Removable Plastic Forward Bulkhead

(1) Put the plastic adapter on the cylinder with the radiused side of the adapter against the raised surface on the cylinder as shown in Figure 3-16.

(2) Put ten spinner shims on top of the plastic adapter.

NOTE: The spinner shims are used to adjust the spinner dome preload. Shims can be added or removed after pre-fitting the spinner dome later in this procedure.

(3) Put the forward bulkhead over the cylinder on top of the spinner shims.

CAUTION: THE FORWARD BULKHEAD MUST FIT SNUGLY ON THE CYLINDER. AN IMPROPERLY SUPPORTED DOME COULD CAUSE CYLINDER DAMAGE OR A CRACK IN THE DOME OR BULKHEAD.

(4) Using both hands, grasp the forward bulkhead and apply lateral force (side-to-side).

(a) If there is no lateral movement: Go to step (5) of this procedure.

(b) If there is lateral movement: Apply UHMW tape CM137 in accordance with the following steps.

1 Option 1: Apply UHMW tape CM137 around the ID of the forward bulkhead that fits over the cylinder.

a Install 2.5 inch (63 mm) strips of UHMW tape CM137 in equally spaced locations around the ID of the forward bulkhead as shown in Figure 3-16.

b If necessary, install additional layers of UHMW tape CM137 until the forward bulkhead fits snugly on the cylinder.

2 Option 2: Apply UHMW tape CM137 around the cylinder.

a Wrap one or more layers of UHMW tape CM137 around the cylinder until the forward bulkhead fits snugly on the cylinder.

(5) Install the spinner dome and gently push the dome as far as it will go onto the bulkhead.

(a) If anti-ice travel tubes are installed:

CAUTION: THE TRAVEL TUBES MUST NOT TOUCH THE SPINNER DOME BLADE CUTOUT.

1 Make sure there is clearance between the travel tubes and the spinner dome blade cutouts.

2 Make adjustments to the position of the travel tubes in accordance to Hartzell Propeller Manual 180 (30-61-80).

(6) Examine the alignment of the mounting holes in the spinner dome and the bulkhead.

(a) Approximately 50% of the diameter of each bulkhead mounting hole must be visible through the spinner dome mounting holes.

NOTE: The temporary misalignment of the mounting holes is necessary to get the proper preload of the spinner dome.

(b) If the mounting hole position is correct, go to step (7) of this procedure.

(c) If the mounting hole position is incorrect, add/remove spinner shims to get proper alignment.

CAUTION: MAKE SURE OF PROPER THREAD ENGAGEMENT FOR THE SCREWS IN THE NUTPLATES. APPROXIMATELY 1 TO 1 1/2 THREADS MUST EXTEND PAST THE BULKHEAD NUTPLATES. TO AVOID DAMAGING THE AIRCRAFT COWLING, THE SCREWS MUST NOT EXTEND MORE THAN 3 THREADS PAST THE BULKHEAD NUTPLATES.

(7) Attach the spinner dome to the spinner bulkhead with the supplied screws and washers. Refer to Table 3-3.

(a) Install a screw in the hole(s) centered between each two adjacent blade cutouts.

1 If the centerline between the adjacent blade cutouts does not align with a mounting hole, install screws in the two holes closest to the centerline.

CAUTION: BE SURE THE SCREWS DRAW THE SPINNER DOME TIGHT TO THE BULKHEAD.

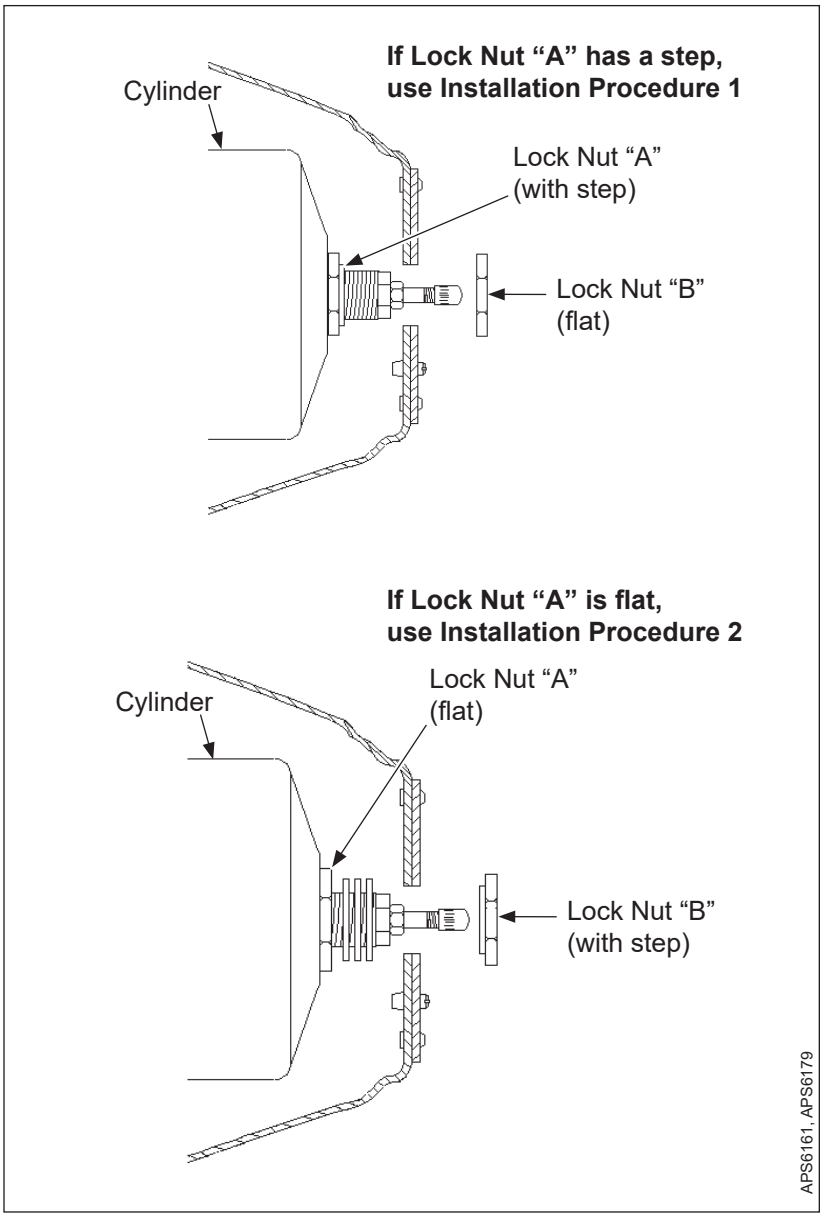
(b) Tighten the screws until snug, then turn an additional 1/8 rotation.

CAUTION: IN THE FOLLOWING STEP, TIGHTEN EACH SCREW BEFORE INSTALLING THE NEXT SCREW.

(c) Working from the screw(s) previously installed at the centerline toward the blade cutouts, install the remaining screws one at a time.

1 Tighten each screw until snug, then turn an additional 1/8 rotation before installing the next screw.

(8) If the spinner loosens in service, add one or more layers of UHMW tape to the forward bulkhead or cylinder until the spinner fits snugly.



Lock Nut "A" Identification
Figure 3-17

9. Two-Piece Spinner Dome Installation

CAUTION: TO PREVENT DAMAGE TO THE BLADE AND BLADE PAINT, WRAP THE BLADE SHANKS IN SEVERAL LAYERS OF MASKING OR DUCT TAPE BEFORE INSTALLING THE SPINNER DOME. REMOVE THE TAPE AFTER THE SPINNER IS INSTALLED.

CAUTION 2: THE SPINNER DOME WILL WOBBLE IF NOT ALIGNED PROPERLY. THIS MAY AFFECT THE DYNAMIC BALANCE OF THE PROPELLER.

NOTE 1: The following instructions relate to Hartzell Propeller spinners only. In some cases, the airframe manufacturer produced the spinner assembly. If so, refer to the airframe manufacturer's manual for spinner installation instructions.

NOTE 2: There are two different procedures for installing two-piece spinner domes used on Compact-series propellers. Examine the lock nut "A" at the top of the cylinder, then refer to Figure 3-17 to determine the applicable installation procedure for the two-piece spinner dome.

NOTE 3: The B-3845-8 screws supplied with metal spinner assemblies are 0.500 inch (12.70 mm) in length. If correct thread engagement cannot be achieved when installing the spinner dome, B-3845-9 screws may be used. The B-3845-9 screws are 0.562 inch (14.27 mm) in length.

A. Installation Procedure 1

(1) General

(a) A spinner dome that is installed using Procedure 1 can be identified by the lock nut "A" at the top of the cylinder. The lock nut "A" will have a "step" facing away from the cylinder as shown in Figure 3-17.

1 Lock nut "A" may have drilled holes for safety wire, but safety wire is not required in this location.

(2) Install the spinner dome.

(a) Push the spinner dome toward the bulkhead to align the spinner mounting holes with those of the bulkhead.

(b) If anti-ice travel tubes are installed:

CAUTION: THE TRAVEL TUBES MUST NOT TOUCH THE SPINNER DOME BLADE CUTOUT.

1 Make sure there is clearance between the travel tubes and the spinner dome blade cutouts.

2 Make adjustments to the position of the travel tubes in accordance to Hartzell Propeller Manual 180 (30-61-80).

CAUTION: MAKE SURE OF PROPER THREAD ENGAGEMENT FOR THE SCREWS IN THE NUTPLATES. APPROXIMATELY 1 TO 1 1/2 THREADS MUST EXTEND PAST THE BULKHEAD NUTPLATES. TO AVOID DAMAGING THE AIRCRAFT COWLING, THE SCREWS MUST NOT EXTEND MORE THAN THREE THREADS PAST THE BULKHEAD NUTPLATES.

(3) Attach the spinner dome to the spinner bulkhead with the supplied screws and washers. Refer to Table 3-3.

(a) Install a screw in the hole(s) centered between each two adjacent blade cutouts.

1 If the centerline between the adjacent blade cutouts does not align with a mounting hole, install screws in the two holes closest to the centerline.

CAUTION: BE SURE THE SCREWS DRAW THE SPINNER DOME TIGHT TO THE BULKHEAD.

(b) Tighten the screws until snug, then turn an additional 1/8 rotation.

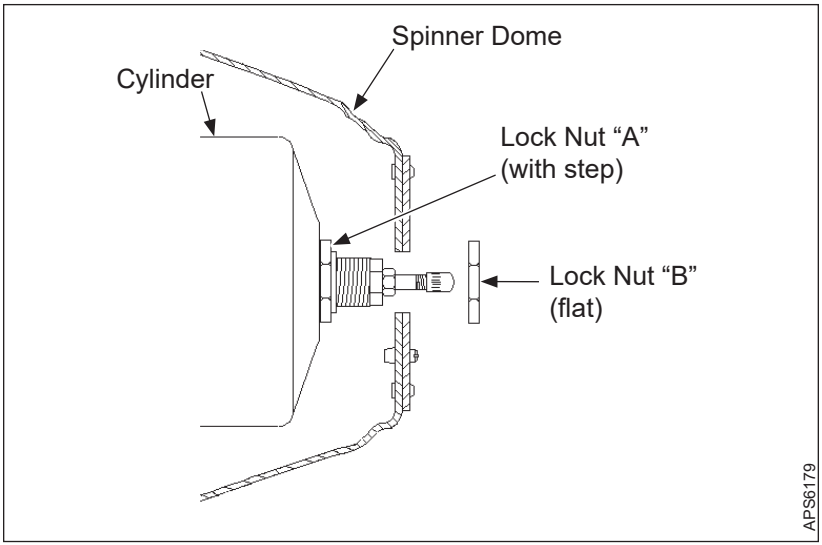
CAUTION: IN THE FOLLOWING STEP, TIGHTEN EACH SCREW BEFORE INSTALLING THE NEXT SCREW.

(c) Working from the screw(s) previously installed at the centerline toward the blade cutouts, install the remaining screws one at a time.

1 Tighten each screw until snug, then turn an additional 1/8 rotation before installing the next screw.

(4) Install the lock nut "B" on the low pitch stop in accordance with Figure 3-18.

(a) Torque lock nut "B" in accordance with Table 3-2 and Figure 3-1.

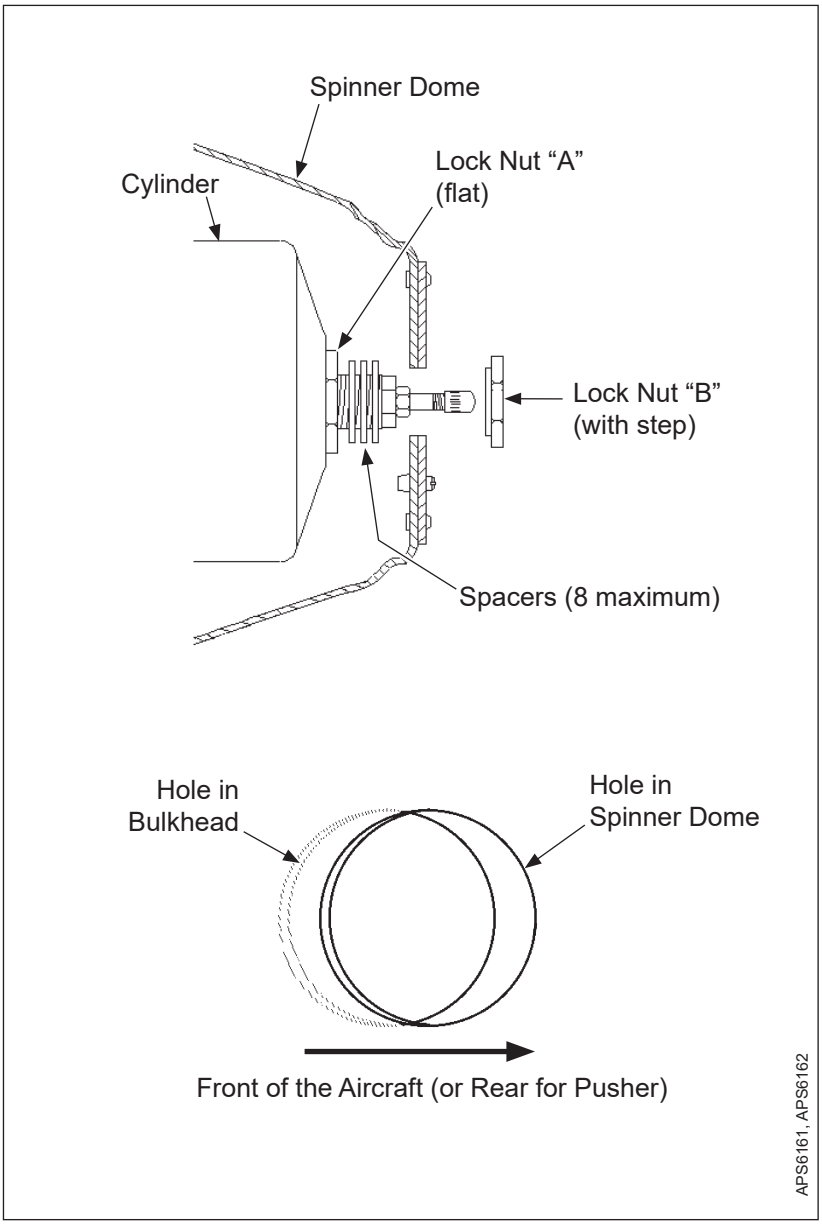


Two-Piece Spinner Dome Installation - Procedure 1
Figure 3-18

(5) Safety wire the lock nut "B" to each of the two screws on the flat face of the spinner dome surrounding the lock nut "B".

CAUTION: MAKE SURE THAT THE SCREWS DO NOT EXTEND MORE THAN THREE THREADS PAST THE BULKHEAD NUTPLATES. IF THE SCREWS EXTEND MORE THAN THREE THREADS, THIS CAN CAUSE DAMAGE TO THE AIRCRAFT COWLING.

(6) Using flat head screws, attach the spinner dome cap to the spinner dome. Refer to Table 3-3.



Two-Piece Spinner Dome Installation - Procedure 2
Figure 3-19

B. Installation Procedure 2

(1) General

(a) A spinner dome that is installed using Procedure 2 can identified by the lock nut "A" at the top of the cylinder. The lock nut "A" will be flat as shown in Figure 3-19.

1 Lock nut "A" may have drilled holes for safety wire, but safety wire is not required in this location.

(2) Put A-169-7 spacers on the low pitch stop lock nut "A" in accordance with Figure 3-19.

(a) Up to eight spacers may be used.

(3) Install spacers, then examine the spinner fit. The spinner is correctly spaced when the holes in the spinner dome are misaligned 1/4 -1/3 of their diameter toward the front of the aircraft, or rear in a pusher installation. Refer to Figure 3-19.

(a) Add or remove spacers to achieve this alignment.

(4) Install spinner dome.

(5) Push the spinner dome aft to align the spinner mounting holes with those of the bulkhead or adapter ring.

(a) If anti-ice travel tubes are installed:

CAUTION: THE TRAVEL TUBES MUST NOT TOUCH THE SPINNER DOME BLADE CUTOUT.

1 Make sure there is clearance between the travel tubes and the spinner dome blade cutouts.

2 Make adjustments to the position of the travel tubes in accordance to Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

CAUTION: MAKE SURE THAT THE SCREWS DO NOT EXTEND MORE THAN THREE THREADS PAST THE BULKHEAD NUTPLATES. IF THE SCREWS EXTEND MORE THAN THREE THREADS, THIS CAN CAUSE DAMAGE TO THE AIRCRAFT COWLING.

(6) Attach the spinner dome to the spinner bulkhead with the supplied screws and washers. Refer to Table 3-3.

(a) Install a screw in the hole(s) centered between each two adjacent blade cutouts.

1 If the centerline between the adjacent blade cutouts does not align with a mounting hole, install screws in the two holes closest to the centerline.

CAUTION: BE SURE THE SCREWS DRAW THE SPINNER DOME TIGHT TO THE BULKHEAD.

(b) Tighten the screws until snug, then turn an additional 1/8 rotation.

CAUTION: IN THE FOLLOWING STEP, TIGHTEN EACH SCREW BEFORE INSTALLING THE NEXT SCREW.

(c) Working from the screw(s) previously installed at the centerline toward the blade cutouts, install the remaining screws one at a time.

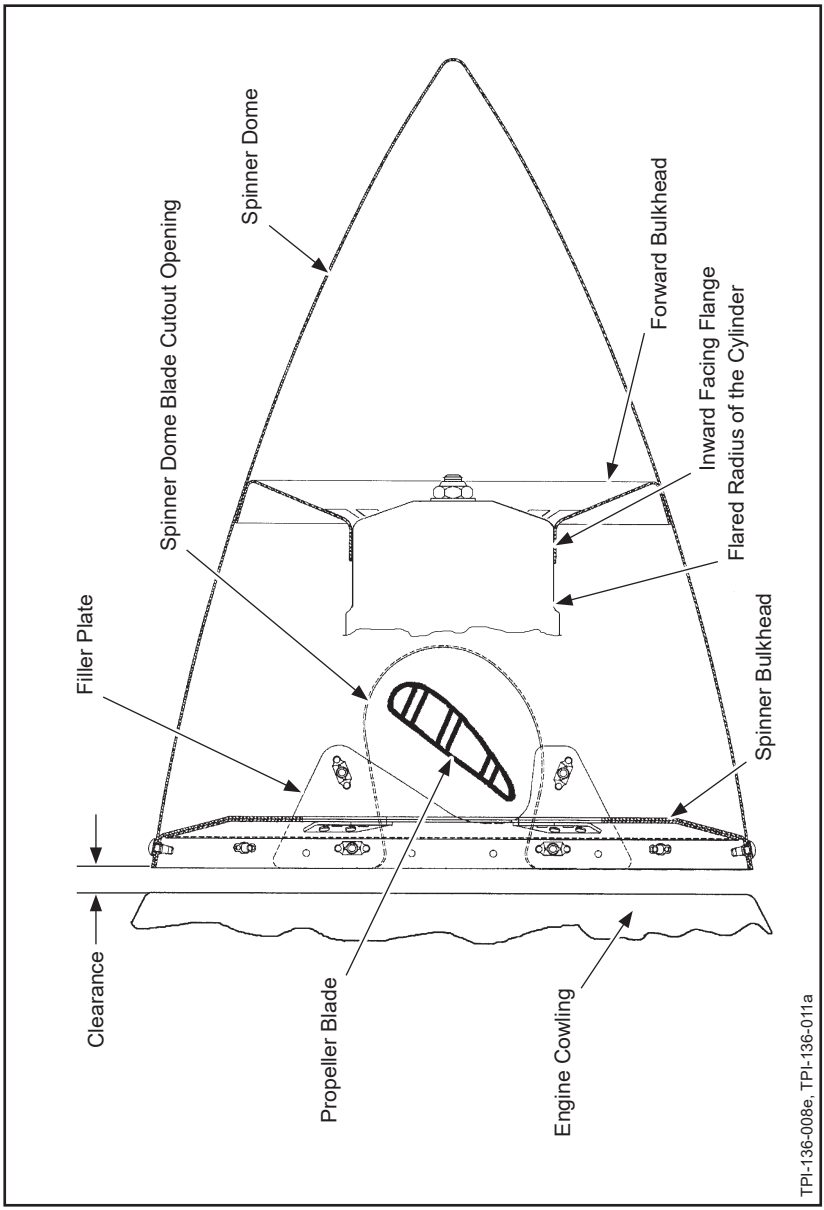
1 Tighten each screw until snug, then turn an additional 1/8 rotation before installing the next screw.

(7) Install the lock nut "B" on the low pitch stop with the step facing the cylinder as shown in Figure 3-19.

(a) Torque lock nut "B" in accordance with Table 3-2 and Figure 3-1.

(8) Safety wire the lock nut to each of the two screws on the flat face of the spinner dome surrounding the lock nut "B".

(9) Using flat head screws, attach the spinner dome cap to the spinner dome.



Spinner Assembly Clearance
Figure 3-20

10. Spinner Assembly Clearance Checks (Rev. 2)

CAUTION: CLEARANCE BETWEEN THE BULKHEAD AND THE ENGINE COWLING MAY CHANGE DURING AIRCRAFT OPERATION

A. Clearance Checks - Refer to Figure 3-20.

(1) The spinner bulkhead must be spaced between the hub and the engine cowling to prevent contact between the spinner assembly and the propeller blades throughout the full range of blade travel.

(2) The spinner assembly and the hub clamping bolts must not touch any of the following components/areas or cause interference during propeller/engine operation:

(a) Engine cowling

(b) Any non-rotating part of the aircraft

(c) Ice protection system components (wire harnesses, anti-ice tubes, etc.)

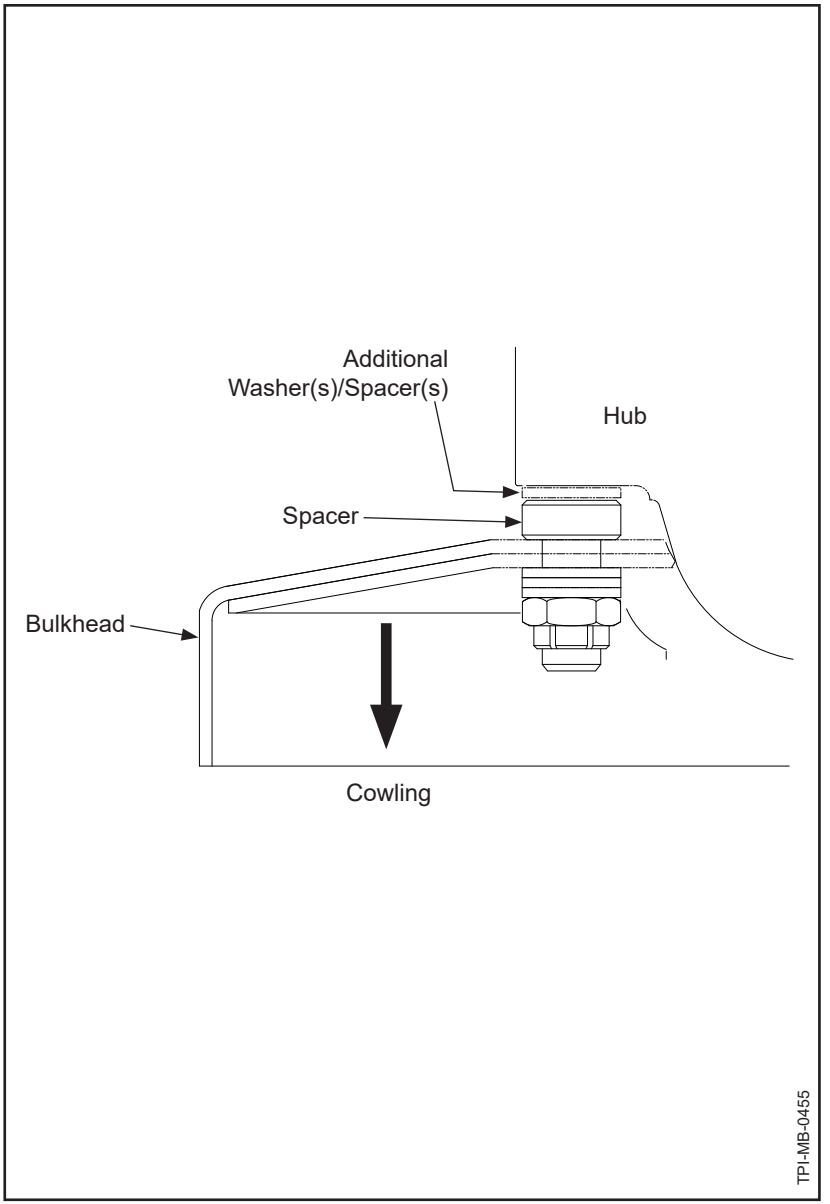
(d) Counterweights/mounting hardware

(3) For spinner domes with a bonded forward bulkhead, make sure the flange on the forward bulkhead does not bottom out on the flared radius of the cylinder.

(a) Using both hands, grasp the spinner dome in the approximate location of the forward bulkhead and apply lateral force (side-to-side).

1 If there is lateral movement: Refer to the applicable Spinner Dome Installation section in this chapter.

(4) If there is any spinner assembly interference, refer to the applicable section, "Metal/Composite Bulkhead Spacing Adjustment" in this chapter.



Metal Bulkhead Toward the Cowling
Figure 3-21

11. Metal Bulkhead Spacing Adjustments (Rev. 2)

A. To Move the Bulkhead Toward the Cowling

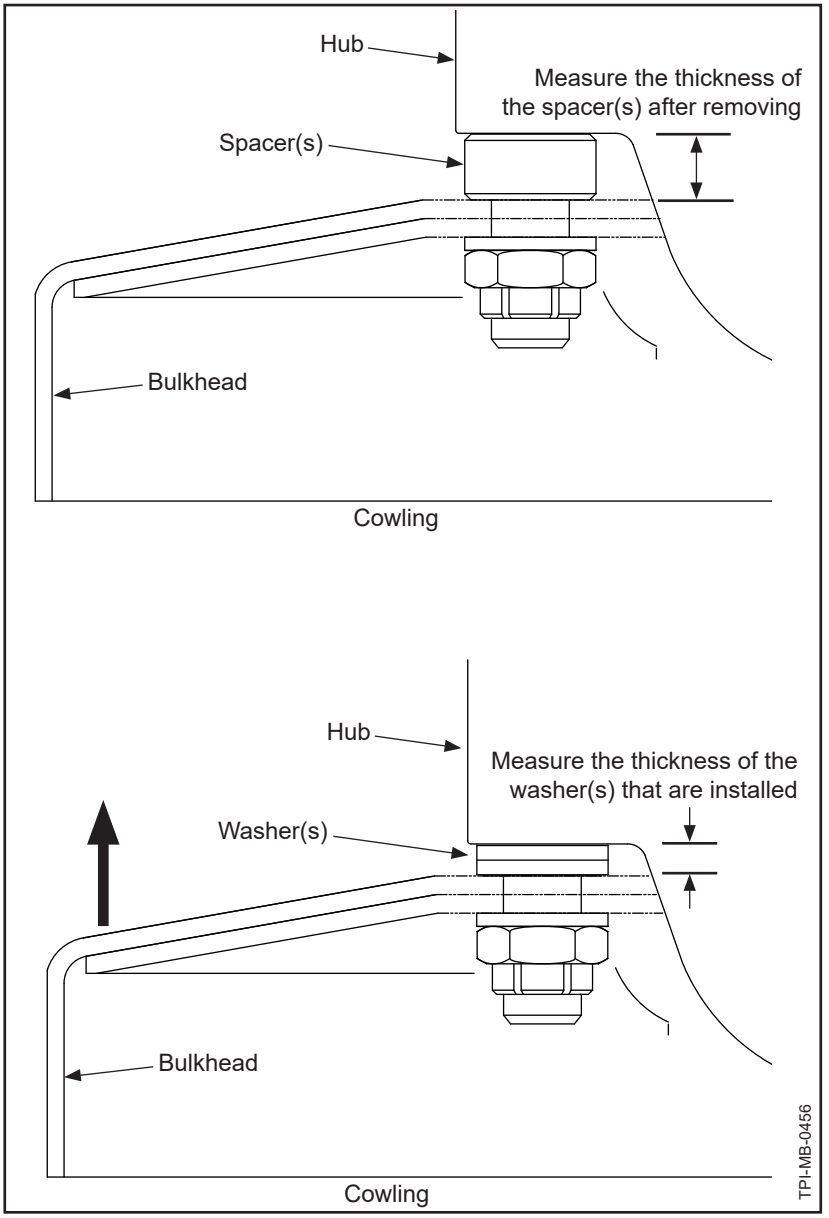
CAUTION 1: THE STACK-UP SEQUENCE FOR EACH HUB CLAMPING BOLT MUST BE THE SAME. VARIANCES BETWEEN STACK-UPS CAN CAUSE CRACKING OF THE SPINNER BULKHEAD. EXCEPTIONS MAY BE REQUIRED IF PROPELLER APPLICATIONS HAVE DE-ICE OR ANTI-ICE APPLICATIONS. REFER TO HARTZELL PROPELLER ICE PROTECTION SYSTEM MANUAL 180 (30-61-80) FOR INSTALLATION INSTRUCTIONS.

CAUTION 2: THE COMBINED THICKNESS OF ADDITIONAL WASHERS/SPACERS MUST BE LESS THAN OR EQUAL TO 0.125 INCH (3.17 MM). IF MORE ADJUSTMENT IS NEEDED, CONTACT THE HARTZELL PRODUCT SUPPORT DEPARTMENT.

(1) Put additional washer(s)/spacer(s) between the spacer and the hub as shown in Figure 3-21 to get the desired bulkhead spacing.

CAUTION: THREAD COVERAGE/ENGAGEMENT REQUIREMENTS SPECIFIED IN THE "BULKHEAD INSTALLATION" SECTION MUST BE MET.

(2) Complete the spinner bulkhead/dome installation in accordance with the applicable sections in this chapter.



Metal Bulkhead Away From the Cowling
Figure 3-22

B. To Move the Bulkhead Away From the Cowling

CAUTION 1: THE STACK-UP SEQUENCE FOR EACH HUB CLAMPING BOLT MUST BE THE SAME. VARIANCES BETWEEN STACK-UPS CAN CAUSE CRACKING OF THE SPINNER BULKHEAD. EXCEPTIONS MAY BE REQUIRED IF PROPELLER APPLICATIONS HAVE DE-ICE OR ANTI-ICE APPLICATIONS. REFER TO HARTZELL PROPELLER ICE PROTECTION SYSTEM MANUAL 180 (30-61-80) FOR INSTALLATION INSTRUCTIONS.

CAUTION 2: THE MAXIMUM PERMITTED BULKHEAD ADJUSTMENT AWAY FROM THE COWLING IS 0.125 INCH (3.17 MM). IF MORE ADJUSTMENT IS NEEDED, CONTACT THE HARTZELL PRODUCT SUPPORT DEPARTMENT.

(1) Remove the spacer(s)/washer(s) between the bulkhead and the hub. Refer to Figure 3-22.

(a) Measure the combined thickness of the spacer(s)/washer(s) that were removed.

(2) Install washer(s) and/or spacer(s) between the bulkhead and the hub to get the desired bulkhead spacing.

(a) Measure the combined thickness of the washer(s)/spacers that were installed.

(b) The difference between the thickness of the washer(s)/spacer(s) that were removed, and the thickness of the washer(s)/spacer(s) that were installed must be 0.125 inch (3.17 mm) or less.

CAUTION: THREAD COVERAGE/ENGAGEMENT REQUIREMENTS SPECIFIED IN THE "BULKHEAD INSTALLATION" SECTION MUST BE MET.

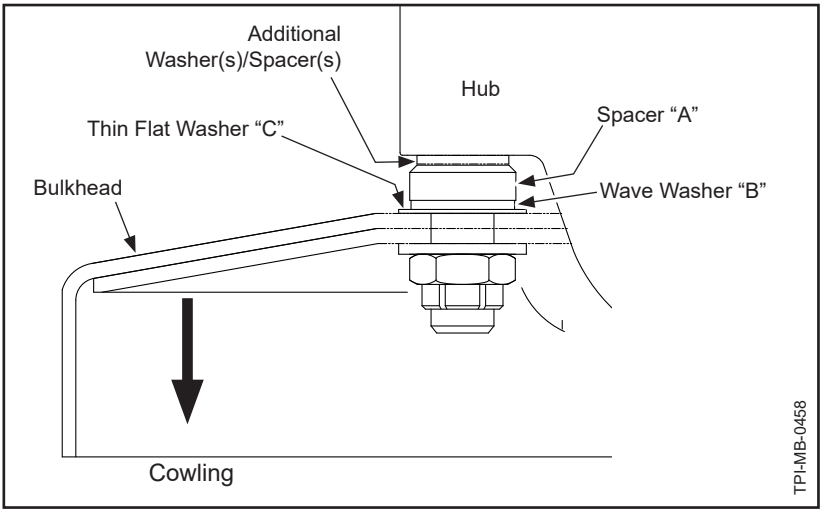
(3) Complete the spinner bulkhead/dome installation in accordance with the applicable sections in this chapter.

12. Composite Bulkhead Spacing Adjustments (Rev. 1)

A. To Move the Bulkhead Toward the Cowling

CAUTION 1: THE STACK-UP SEQUENCE FOR EACH HUB CLAMPING BOLT MUST BE THE SAME. VARIANCES BETWEEN STACK-UPS CAN CAUSE CRACKING OF THE SPINNER BULKHEAD. EXCEPTIONS MAY BE REQUIRED IF PROPELLER APPLICATIONS HAVE DE-ICE OR ANTI-ICE APPLICATIONS. REFER TO HARTZELL PROPELLER ICE PROTECTION SYSTEM MANUAL 180 (30-61-80) FOR INSTALLATION INSTRUCTIONS.

CAUTION 2: THE COMBINED THICKNESS OF ADDITIONAL WASHERS/SPACERS MUST BE LESS THAN OR EQUAL TO 0.125 INCH (3.17 MM). IF MORE ADJUSTMENT IS NEEDED, CONTACT HARTZELL PROPELLER PRODUCT SUPPORT DEPARTMENT.



Composite Bulkhead Toward the Cowling
Figure 3-23

(1) Put additional washer(s)/spacer(s) between the spacer "A" and the hub as shown in Figure 3-23 to get the desired bulkhead spacing.

CAUTION: THREAD COVERAGE/ENGAGEMENT REQUIREMENTS SPECIFIED IN THE "BULKHEAD INSTALLATION" SECTION MUST BE MET.

(2) Complete the spinner bulkhead/dome installation in accordance with the applicable sections in this chapter.

B. To Move the Bulkhead Away From the Cowling

(1) If the bulkhead is too close to the cowling, contact Hartzell Propeller.

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

13. Post-Installation Checks
    A. Perform Static RPM Check as outlined in the Testing and Troubleshooting chapter in this manual.

14. Spinner Assembly Component Removal

    CAUTION: WRAP THE BLADE SHANKS IN SEVERAL LAYERS OF MASKING OR DUCT TAPE BEFORE REMOVING THE SPINNER DOME TO PREVENT DAMAGING THE BLADE AND BLADE PAINT.

    A. Removal of One-Piece Spinner Dome
        (1) Remove the screws and washers that attach the spinner dome to the spinner bulkhead or adapter ring.
        (2) Remove the spinner dome.
    B. Removal of Two-Piece Spinner Dome
        (1) Remove the flat head screws that attach the spinner dome cap to the spinner dome.
        (2) Cut and remove the lock nut safety wire.
        (3) Remove the lock nut.
        (4) Remove the screws and washers that attach the spinner dome to the spinner bulkhead.
        (5) Remove the spinner dome.
    C. Hub Mounted Spinner Bulkhead Removal
        (1) Remove propeller. Refer to Propeller Removal in this chapter.
        (2) Remove the flat washers and self-locking nuts that attach the spinner bulkhead to the propeller hub. Remove the spinner bulkhead.
        (3) Reinstall the flat washers and self-locking nuts that were removed during the spinner bulkhead removal.
    D. Starter Ring Gear Spinner Adapter Removal
        (1) Remove propeller. Refer to Propeller Removal in this chapter.
        (2) Remove the spinner adapter by removing the hardware that attaches the spinner adapter to the starter ring gear.

15. Propeller Removal

A. Removal of D-flange Propellers

(1) Remove the spinner dome in accordance with the Spinner Removal procedures in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller, applicable instructions and technical information can be found in Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(4) If installed, cut and remove the safety wire or safety cable on the propeller mounting studs.

WARNING: MAKE SURE THE SLING IS RATED UP TO 800 LBS. (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING REMOVAL.

(5) Support the propeller assembly with a sling.

NOTE: Supporting the propeller with the sling may be delayed until all but two mounting nuts and spacers have been removed.

(6) If the propeller will be reinstalled and it has been dynamically balanced, make an identifying mark (with a felt-tipped pen only) on the propeller hub and a matching mark on the engine flange to make sure of correct positioning of the propeller during re-installation.

NOTE: This will prevent dynamic imbalance.

CAUTION: DISCARD THE PROPELLER MOUNTING NUTS AND SPACERS IF THEY ARE DAMAGED OR CORRODED, OR WHEN THE PROPELLER IS REMOVED FOR OVERHAUL.

(7) Remove the eight 1/2 inch mounting nuts.

(a) If the propeller is removed between overhaul intervals, mounting studs, nuts, and spacers may be reused if they are not damaged or corroded.

CAUTION: REMOVE THE PROPELLER FROM THE MOUNTING FLANGE WITH CARE TO PREVENT DAMAGING THE PROPELLER MOUNTING STUDS.

(8) Using the support sling, remove the propeller from the mounting flange.

(9) Put the propeller on a cart for transport.

B. Removal of F-flange Propellers

(1) Remove the spinner dome in accordance with the Spinner Removal procedures in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller, applicable instructions and technical information can be found in Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(4) If installed, cut and remove the safety wire or safety cable on the propeller mounting studs.

WARNING: MAKE SURE THE SLING IS RATED UP TO 800 LBS. (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING REMOVAL.

(5) Support the propeller assembly with a sling.

NOTE: Supporting the propeller with the sling may be delayed until all but two mounting nuts and washers have been removed.

(6) If the propeller will be reinstalled and it has been dynamically balanced, make an identifying mark (with a felt-tipped pen only) on the propeller hub and a matching mark on the engine flange to make sure of correct positioning of the propeller during re-installation.

NOTE: This will prevent dynamic imbalance.

CAUTION: DISCARD THE PROPELLER MOUNTING NUTS AND WASHERS IF THEY ARE DAMAGED OR CORRODED, OR WHEN THE PROPELLER IS REMOVED FOR OVERHAUL.

(7) Remove the six 1/2 inch mounting nuts.

(a) If the propeller is removed between overhaul intervals, mounting studs, nuts and washers may be reused if they are not damaged or corroded.

CAUTION: REMOVE THE PROPELLER FROM THE MOUNTING FLANGE WITH CARE TO PREVENT DAMAGING THE PROPELLER MOUNTING STUDS.

(8) Using the support sling, remove the propeller from the mounting flange.

(9) Put the propeller on a cart for transport.

C. Removal of N-flange Propellers

(1) Remove the spinner dome in accordance with the Spinner Removal procedures in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller, applicable instructions and technical information can be found in Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(4) If installed, cut and remove the safety wire or safety cable on the propeller mounting studs.

WARNING: MAKE SURE THE SLING IS RATED UP TO 800 LBS. (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING REMOVAL.

(5) Support the propeller assembly with a sling.

NOTE: Supporting the propeller with the sling may be delayed until all but two mounting studs and washers have been removed.

(6) If the propeller will be reinstalled and it has been dynamically balanced, make an identifying mark (with a felt-tipped pen only) on the propeller hub and a matching mark on the engine flange to make sure of correct positioning of the propeller during re-installation.

NOTE: This will prevent dynamic imbalance.

CAUTION: DISCARD THE PROPELLER MOUNTING NUTS AND WASHERS IF THEY ARE DAMAGED OR CORRODED, OR WHEN THE PROPELLER IS REMOVED FOR OVERHAUL.

(7) Remove the eight 9/16 inch mounting nuts.

(a) If the propeller is removed between overhaul intervals, mounting studs, nuts and washers may be reused if they are not damaged or corroded.

CAUTION: REMOVE THE PROPELLER FROM THE ENGINE MOUNTING FLANGE WITH CARE TO PREVENT DAMAGING THE PROPELLER MOUNTING STUDS.

(8) Using the support sling, remove the propeller from the mounting flange.

(9) Put the propeller on a cart for transport.

D. Removal of L-flange Propellers, Except Model HC-E2YL-( )

(1) Remove the spinner dome in accordance with the Spinner Removal procedures in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller, applicable instructions and technical information can be found in Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(4) If installed, cut and remove the safety wire or safety cable on the propeller mounting stud nuts.

WARNING: MAKE SURE THE SLING IS RATED UP TO 800 LBS. (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING REMOVAL.

(5) Support the propeller assembly with a sling.

(6) If the propeller will be reinstalled and it has been dynamically balanced, make an identifying mark (with a felt-tipped pen only) on the propeller hub and a matching mark on the engine flange to make sure of correct positioning of the propeller during re-installation.

NOTE: This will prevent dynamic imbalance.

CAUTION: DISCARD THE PROPELLER MOUNTING STUDS, NUTS, AND WASHERS IF THEY ARE DAMAGED OR CORRODED, OR WHEN THE PROPELLER IS REMOVED FOR OVERHAUL.

(7) Unscrew the six 7/16 inch mounting studs from the engine bushings.

(a) If the propeller is removed between overhaul intervals, mounting studs, nuts and washers may be reused if they are not damaged or corroded.

CAUTION: REMOVE THE PROPELLER FROM THE ENGINE MOUNTING FLANGE WITH CARE TO PREVENT DAMAGING THE PROPELLER MOUNTING STUDS.

(8) Using the support sling, remove the propeller from the mounting flange.

(9) Put the propeller on a cart for transport.

E. Removal of HC-E2YL-( ) Propellers

(1) Remove the spinner dome in accordance with the Spinner Removal procedures in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller, applicable instructions and technical information can be found in Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(4) If installed, cut and remove the safety wire or safety cable on the propeller mounting stud nuts.

WARNING: MAKE SURE THE SLING IS RATED UP TO 800 LBS. (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING REMOVAL.

(5) Support the propeller assembly with a sling.

(6) If the propeller will be reinstalled and it has been dynamically balanced, make an identifying mark (with a felt-tipped pen only) on the propeller hub and a matching mark on the engine flange to make sure of correct positioning of the propeller during re-installation.

NOTE: This will prevent dynamic imbalance.

CAUTION: DISCARD THE PROPELLER MOUNTING STUDS, NUTS, OR BOLTS IF THEY ARE DAMAGED OR CORRODED, OR WHEN THE PROPELLER IS REMOVED FOR OVERHAUL.

(7) Unscrew the four 7/16 inch mounting bolts from the engine bushings.

(8) Unscrew the two 7/16 inch mounting nuts and the attached studs from the engine bushings.

(a) If the propeller is removed between overhaul intervals, mounting studs, nuts and washers may be reused if they are not damaged or corroded.

CAUTION: REMOVE THE PROPELLER FROM THE MOUNTING FLANGE WITH CARE TO PREVENT DAMAGING THE PROPELLER MOUNTING STUDS.

(9) Using the support sling, remove the propeller from the mounting flange.

(10) Put the propeller on a cart for transport.

F. Removal of K-flange and R-flange Propellers

(1) Remove the spinner dome in accordance with the Spinner Removal procedures in this chapter.

(2) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller, applicable instructions and technical information can be found in Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

(3) Propeller ice protection system components not supplied by Hartzell Propeller are controlled by the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

(4) If installed, cut and remove the safety wire or safety cable on the propeller mounting stud nuts.

WARNING: MAKE SURE THE SLING IS RATED UP TO 800 LBS. (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING REMOVAL.

(5) Support the propeller assembly with a sling.

(6) If the propeller will be reinstalled and it has been dynamically balanced, make an identifying mark (with a felt-tipped pen only) on the propeller hub and a matching mark on the engine flange to make sure of correct positioning of the propeller during re-installation.

NOTE: This will prevent dynamic imbalance.

CAUTION: DISCARD THE PROPELLER MOUNTING STUDS, NUTS, AND WASHERS IF THEY ARE DAMAGED OR CORRODED, OR WHEN THE PROPELLER IS REMOVED FOR OVERHAUL.

(7) Unscrew the six 1/2 inch mounting studs from the engine bushings.

(a) If the propeller is removed between overhaul intervals, mounting studs, nuts and washers may be reused if they are not damaged or corroded.

CAUTION: REMOVE THE PROPELLER FROM THE MOUNTING FLANGE WITH CARE TO PREVENT DAMAGING THE PROPELLER MOUNTING STUDS.

(8) Using the support sling, remove the propeller from the mounting flange.

(9) Put the propeller on a cart for transport.

TESTING AND TROUBLESHOOTING - CONTENTS

(Blank Page)

1. Operational Checks (Rev. 1)

   A. Operational Checks

      (1) Refer to the Inspection and Check chapter of this manual for operational checks including pre-flight, initial run-up, and post-run checks.

2. Propeller Ice Protection Systems (Rev. 2)

   WARNING: CONSULT THE PILOT OPERATING HANDBOOK (INCLUDING ALL SUPPLEMENTS) REGARDING FLIGHT INTO CONDITIONS OF KNOWN ICING. THE AIRCRAFT MAY NOT BE CERTIFICATED FOR FLIGHT INTO KNOWN ICING CONDITIONS, EVEN THOUGH AN ICE PROTECTION SYSTEM IS INSTALLED.

   A. Operational Checks and Troubleshooting

      (1) Refer to the Anti-ice and De-ice Systems chapter of this manual for operational checks and troubleshooting information for Hartzell Propeller ice protection systems.

3. Troubleshooting

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

A. Hunting and Surging (Rev. 2)

(1) General

(a) Hunting is characterized by a cyclic variation in engine speed above and below desired speed. Surging is characterized by a large increase/decrease in engine speed, followed by a return to set speed after one or two occurrences.

(b) If propeller is hunting, a certified airframe and powerplant mechanic with the appropriate rating or a certified propeller repair station with the appropriate rating should check:

1 Governor

2 Fuel control

3 Synchrophaser or synchronizer

(2) If the propeller is surging:

(a) Perform the “Initial Run-Up” in accordance with the Inspection and Check chapter of this manual to release trapped air from the propeller.

1 If surging reoccurs it is most likely due to a faulty governor.

a Have the governor tested by a certified propeller repair station with the appropriate rating.

(b) Hunting and/or surging may also be caused by friction or binding within the governor control, or internal propeller corrosion, which causes the propeller to react slower to governor commands.

1 To isolate these faults, the propeller must be tested on a test bench at a certified propeller repair station with the appropriate rating.

B. Engine Speed Varies with Flight Attitude (Airspeed)

(1) Small variances in engine speed are normal and are no cause for concern.

(2) Increase in engine speed while descending or increasing airspeed:

(a) Non-feathering (-1) propeller:

1 Governor is not increasing oil volume in the propeller.

2 Engine transfer bearing is leaking excessively.

3 Excessive friction in blade bearings or pitch changing mechanism.

(b) Feathering (-2, -5) or Aerobatic (-4) propeller:

1 Governor is not reducing oil volume in propeller.

2 Air charge (-2, -5) too low. Refer to Air Charge in the Maintenance Practices chapter of this manual.

3 Excessive friction in blade bearings or pitch changing mechanism.

(3) Decrease in engine speed while increasing airspeed:
  (a) Non-feathering (-1) propeller:
    1 Governor pilot valve is stuck and is excessively increasing oil volume.
  (b) Feathering (-2, -5) or Aerobatic (-4) propeller:
    1 Governor pilot valve is stuck and is excessively decreasing oil volume.
    2 Feathering command engaged on propeller pitch control (-2, -5 propeller only).

(4) Increase in engine speed while decreasing airspeed:
  (a) Non-feathering (-1) propeller:
    1 Governor pilot valve is stuck and is excessively decreasing oil volume.
  (b) Feathering (-2, -5) or Aerobatic (-4) propeller:
    1 Governor pilot valve is stuck and is excessively increasing oil volume.

(5) Decrease in engine speed while decreasing airspeed:
  (a) Non-feathering (-1) propeller:
    1 Governor is not reducing oil volume in propeller.
    2 Excessive friction in blade bearings or pitch changing mechanism.
  (b) Feathering (-2, -5) or Aerobatic (-4) propeller:
    1 Governor is not increasing oil volume in propeller.
    2 Air charge (-2, -5) too high. Refer to Air Charge in the Maintenance Practices chapter of this manual.
    3 Engine transfer bearing leaking excessively.
    4 Excessive friction in blade bearings or pitch changing mechanism.

C. Loss of Propeller Control (-1 propellers only)
   (1) Propeller goes to uncommanded Low Pitch (High RPM)
      (a) Loss of propeller oil pressure - Check:
         1 Governor pressure relief valve for proper operation
         2 Governor drive for damage
         3 Adequate engine oil supply
         4 Engine transfer bearing leaking excessively
   (2) Propeller goes to uncommanded High Pitch (Low RPM)
      (a) Governor pilot valve sticking
   (3) RPM Increases with Power and Airspeed, Propeller RPM Control has Little or No Effect
      (a) Excessive friction in blade bearings or pitch changing mechanism
      (b) Internal oil leakage to opposite side of piston and into hub

D. Loss of Propeller Control (-2, -4 or -5 propellers)

(1) Propeller goes to uncommanded High Pitch (or Feather)

(a) Loss of propeller oil pressure - Check:

1 Governor pressure relief valve for proper operation

2 Governor drive for damage

3 Adequate engine oil supply

4 Engine transfer bearing leaking excessively

(b) Start locks not engaging (-2 and some -5 feathering propellers only)

(c) Air charge pressure too high (-2, -5). Refer to Air Charge in the Maintenance Practices chapter of this manual.

(2) Propeller goes to uncommanded Low Pitch (High RPM)

(a) Governor pilot valve sticking

(3) RPM Increases with Power and Airspeed, Propeller RPM Control has Little or No Effect

(a) Excessive friction in blade bearings or pitch changing mechanism.

(b) Air charge lost or low. (-2, -5). Refer to the Air Charge section in the Maintenance Practices chapter of this manual.

(c) Broken feathering spring (-2, -5).

(4) RPM Control Sluggish

(a) Air charge lost or low (-2, -5). Refer to the Air Charge section in the Maintenance Practices chapter of this manual.

E. Failure to Feather (or feathers slowly)
(-2 or -5 propellers only) (Rev. 1)

(1) Air charge lost or low. Refer to the section, "Air Charge" in the Maintenance Practices chapter of this manual.

(2) Broken feathering spring (if applicable).

(3) Check for proper function and rigging of propeller/governor control linkage.

(4) Check the governor function.

(5) The propeller must be inspected for misadjustment or internal corrosion (usually in blade bearings or pitch change mechanism) that results in excessive friction.

(a) This inspection must be performed by a certified propeller repair station with the appropriate rating.

F. Failure to Unfeather (-2 or -5 propellers only) (Rev. 1)

(1) Check for proper function and rigging of propeller control linkage.

(2) Perform a check of the governor function, including the unfeathering accumulator, if applicable.

(3) Check for excessive oil leakage at engine transfer bearing (-2 propellers only).

(4) The propeller must be inspected for misadjustment or internal corrosion (usually in blade bearings or pitch change mechanism) that results in excessive friction.

(a) This inspection must be accomplished by a certified propeller repair station with the appropriate rating.

G. Start Locks (Anti-feather Latches) Fail to Latch on Shutdown (-2 and some -5 feathering propellers only)

(1) Propeller was feathered before shutdown.

NOTE: May be solved by restarting the engine, placing the propeller control in the proper shutdown position, and then shutting down the engine.

(2) Shutdown occurred at high RPM with prop control off the low pitch stop.

NOTE: May be solved by restarting the engine, placing the propeller control in the proper shutdown position, and then shutting down the engine.

(3) Air charge too high (-2, -5). Refer to the section, "Air Charge" in the Maintenance Practices chapter of this manual.

(4) Excessive engine transfer bearing oil leakage.

NOTE: Refer to a certified propeller repair station with the appropriate rating.

(5) Excessive governor pump leakage.

NOTE: Refer to a certified propeller repair station with the appropriate rating.

(6) Broken start locks.

NOTE: Refer to a certified propeller repair station with the appropriate rating.

H. Vibration (Rev. 1)

CAUTION 1: ANY VIBRATION THAT OCCURS SUDDENLY, OR IS ACCOMPANIED BY UNEXPLAINED OIL LEAKAGE SHOULD BE INVESTIGATED IMMEDIATELY BEFORE FURTHER FLIGHT.

CAUTION 2: VIBRATION PROBLEMS BECAUSE OF PROPELLER SYSTEM IMBALANCE ARE NORMALLY FELT THROUGHOUT THE RPM RANGE, WITH THE INTENSITY OF VIBRATION INCREASING WITH RPM. VIBRATION PROBLEMS THAT OCCUR IN A NARROW RPM RANGE ARE A SYMPTOM OF RESONANCE THAT IS POTENTIALLY HARMFUL TO THE PROPELLER. AVOID OPERATION UNTIL THE PROPELLER CAN BE CHECKED BY A CERTIFIED PROPELLER REPAIR STATION WITH THE APPROPRIATE RATING.

(1) Check:

(a) Control surfaces, cowl flaps, exhaust system, landing gear doors, etc. for excessive play that may be causing vibration that is unrelated to the propeller

(b) Isolation of engine controls and lines

(c) Engine mount wear

(d) Uneven or over-lubrication of the propeller

(e) Proper engine/propeller flange mating

(f) Blade track:

1 Refer to the section, "Blade Track" in the Inspection and Check chapter of this manual.

(g) Blade angles:

1 Blade angles must be within specified tolerance between blades.

a Refer to a certified propeller repair station with the appropriate rating to check/adjust blade angles.

(h) Spinner for cracks, improper installation, or "wobble" during operation

(i) Static balance

(j) Propeller installation (-1, -2, -4 propellers only)

1 Remove and reinstall the propeller 180 degrees from the original installation position.

a R-flange propellers installed on an engine that has an R-flange cannot be reinstalled 180 degrees from the original installation position.

(k) Hub damage or cracking

(l) Grease or oil leakage

(m) Blade deformation

(2) Dynamic Balance

(a) Dynamic balancing is recommended after installing or performing maintenance on a propeller. While this is normally an optional task, it may be required by the engine or airframe manufacturer to make certain the propeller/engine combination is balanced properly before operation.

1 Refer to the engine or airframe manuals, and the Maintenance Practices chapter of this manual.

I. Propeller Overspeed
   (1) Check:
      (a) Tachometer error
      (b) Low pitch stop adjustment
      (c) Governor maximum RPM set too high
      (d) Loss of oil pressure (-1 propellers)
         1 Oil starvation
         2 Governor failure
      (e) Loss or lowered air charge (-2 or -5 propellers - results in momentary overspeed). Refer to the Air Charge section in the Maintenance Practices chapter of this manual.
      (f) Governor pilot valve jammed to supply high pressure only (-2, -4 or -5 propellers)
      (g) Oil leaking past piston causing hydraulic lock of piston in cylinder (-1 propellers)

J. Propeller Underspeed
   (1) Check:
      (a) Tachometer error.
      (b) Excessive transfer bearing oil leakage (-2, -4, or -5 propellers).
      (c) Governor oil pressure low (-2, -4, or -5 propellers).
      (d) Governor oil passage clogged.
      (e) Oil leaking past piston causing hydraulic lock in cylinder (-2, -4, or -5 propellers).

(Blank Page)

INSPECTION AND CHECK - CONTENTS

INSPECTION AND CHECK - CONTENTS, CONTINUED

LIST OF FIGURES

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.

1. Pre-Flight Checks (Rev. 5)
   A. Important Information
      (1) Follow propeller pre-flight inspection procedures specified in the Pilot Operating Handbook (POH) in addition to the inspections specified in this section.
      (2) Defects or damage found during the pre-flight inspection must be evaluated in accordance with the applicable section in the Testing and Troubleshooting chapter and/or the Maintenance Practices chapter of this manual.
   B. Propeller Blades
      (1) Visually examine the entire blade (leading edge, trailing edge, face, and camber sides) for nicks, gouges, erosion, and cracks.
         (a) Normal erosion (sand-blasted appearance) on the leading edge of the blade is permitted and does not require removal before further flight.
      (2) Visually examine the blades for lightning strike indications in accordance with the section, "Lightning Strike" in this chapter.
      (3) Check the blades for radial play or movement of the blade tip (in-and-out, fore-and-aft, and end play).
         (a) Refer to the section, “Blade Tolerances” in this chapter for blade play limits.

(4) If an ice protection system is installed, visually examine the anti-icing or de-ice boot for damage.

(a) Refer to the Anti-ice and De-ice Systems chapter in this manual for operational checks and troubleshooting information for Hartzell Propeller ice protection systems.

C. Spinner Assembly and Blade Retention Components

(1) Inspect the spinner and visible blade retention components for damage and/or cracks.

(a) Repair or replace components as required before further flight.

D. Hardware

(1) Check for loose or missing hardware.

(a) Retighten or reinstall as necessary.

WARNING: ABNORMAL GREASE/OIL LEAKAGE CAN BE AN INDICATION OF A FAILING PROPELLER BLADE OR BLADE RETENTION COMPONENT. AN IN-FLIGHT BLADE SEPARATION CAN RESULT IN A CATASTROPHIC AIRCRAFT ACCIDENT.

E. Grease/Oil Leakage

(1) Examine the face and camber-sides of the blades for evidence of grease/oil leakage.

(2) Using an appropriate light source, examine the propeller through the blade cut-outs in the spinner for signs of grease/oil leakage.

(a) Spinner removal is not required for this inspection.

(b) If grease/oil leakage is found, refer to the section, “Inspection Procedures” in this chapter.

F. Initial Run-Up

(1) Perform the Initial Run-Up procedure in accordance with the section, “Operational Checks” in this chapter.

G. Additional Information

(1) Refer to the airframe manufacturer’s manual for additional pre-flight checks.

(2) Refer to the section, “Inspection Procedures” in this chapter for additional inspection/repair information.

2. Post-Flight Checks

A. HC-C2YR-2CLUF/FLC7666A-4 Propellers Installed on OMA SUD Skycar Aircraft

(1) As a result of the “pusher” configuration, propeller blades on affected aircraft are exposed to hot exhaust gasses, which makes them more susceptible to erosion and corrosion, additional inspections and corrosion preventative measures are required.

(a) Perform blade cleaning within three days after any flight.

NOTE: It is recommended to perform blade cleaning after the last flight of each day.

(b) Blade Cleaning

WARNING: CLEANING AGENTS (ACETONE, #700 LACQUER THINNER, AND MEK), ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT. USE IN WELL VENTILATED AREA.

1 Using a cloth dampened with actetone, MEK, or MPK, thoroughly clean each blade shank where exposed to engine exhaust and remove all foreign matter/exhaust residue.

2 Visually inspect for corrosion indications and paint condition.

3 Paint must be in good condition in the area exposed to exhaust gasses. Repair and repaint in accordance with the Maintenance Practices chapter of this manual or by an appropriately licensed propeller repair facility if:

a Any of the underlying aluminum blade is exposed.

b There are any indications of corrosion, such as pitting or any other unusual conditions.

3. Operational Checks (Rev. 3)

A. Initial Run-Up

(1) Following propeller installation and before flight, perform the Initial Run-Up procedure in accordance with the instructions on this section.

WARNING: REFER TO THE AIRCRAFT MAINTENANCE MANUAL FOR ADDITIONAL PROCEDURES THAT MAY BE REQUIRED AFTER PROPELLER INSTALLATION.

(2) Perform engine start and warm-up in accordance with the Pilot's Operating Handbook (POH).

CAUTION: AIR TRAPPED IN THE PROPELLER HYDRAULIC CYLINDER WILL CAUSE PITCH CONTROL TO BE IMPRECISE AND CAN CAUSE PROPELLER SURGING.

(3) Cycle the propeller control through the operating blade range from low pitch to high pitch (or as specified in the POH).

(a) Repeat this step at least three times.

NOTE: Cycling the propeller control purges air from the propeller hydraulic system and introduces warm oil to the cylinder.

(4) Check the propeller speed control and operation from low pitch to high pitch using the procedure specified in the POH.

(a) Perform all ground functional, feathering, and cycling checks with a minimum propeller RPM drop required to demonstrate function.

WARNING: ABNORMAL VIBRATION CAN BE AN INDICATION OF A FAILING PROPELLER BLADE OR BLADE RETENTION COMPONENT. AN IN-FLIGHT BLADE SEPARATION CAN RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE.

(5) Check for any abnormal vibration during this run-up.

(a) If vibration occurs, shut the engine down, determine the cause, and correct it before further flight.

1 Refer to the section, "Vibration" in the Testing and Troubleshooting chapter of this manual to determine the cause/correction for the vibration.

(6) Shut down the engine in accordance with the POH.

(7) For additional inspection information (including possible corrections), refer to the section, "Inspection Procedures" in this chapter, and/or the Testing and Troubleshooting chapter of this manual.

(8) Refer to the POH and the airframe manufacturer's manual for additional operational checks.

B. Static RPM Check - for Reciprocating Applications ONLY

NOTE: This operational check should be performed after installation, maintenance, or propeller adjustment.

CAUTION: A CALIBRATED TACHOMETER MUST BE USED TO MAKE SURE OF THE ACCURACY OF THE RPM CHECK.

(1) Set the brakes and chock the aircraft or tie aircraft down.

(2) Back the Maximum RPM Stop on the governor out one turn.

(3) Start the engine.

(4) Advance the propeller control lever to MAX (max RPM), then retard the control lever one inch (25.4 mm).

(5) SLOWLY advance the throttle to the maximum manifold pressure.

(6) Slowly advance the propeller control lever until the engine speed stabilizes.

(a) If engine speed stabilizes at the maximum power static RPM specified by the TC or STC holder, then the low pitch stop is set correctly.

(b) If engine speed stabilizes above or below the rated RPM, the low pitch stop may require adjustment. Refer to the Maintenance Practices chapter of this manual.

(7) Stop the engine.

(8) Return the Maximum RPM Stop on the governor to the original position.

(9) Test fly the aircraft to confirm the maximum rated RPM specified in the aircraft TC or STC is achieved.

(a) Adjust the governor to the rated RPM with the Maximum RPM Stop screw.

1 If the governor is adjusted to the rated RPM with the maximum RPM stop screw, hold the maximum RPM stop screw in place and torque the maximum RPM stop locking nut in accordance with Table 3-2, Torque Table.

(10) Refer to the Aircraft Maintenance Manual for additional procedures that may be required after propeller installation.

C. Propeller Ground Idle RPM Check - for Turbine Applications ONLY

WARNING: STABILIZED GROUND OPERATION WITHIN THE PROPELLER RESTRICTED RPM RANGE CAN GENERATE HIGH PROPELLER STRESSES AND RESULT IN FATIGUE DAMAGE TO THE PROPELLER. THIS DAMAGE CAN LEAD TO A REDUCED PROPELLER FATIGUE LIFE, PROPELLER FAILURE, AND LOSS OF CONTROL OF THE AIRCRAFT. THE PROPELLER RESTRICTED RPM RANGE IS DEFINED IN THE AIRPLANE FLIGHT MANUAL.

(1) General

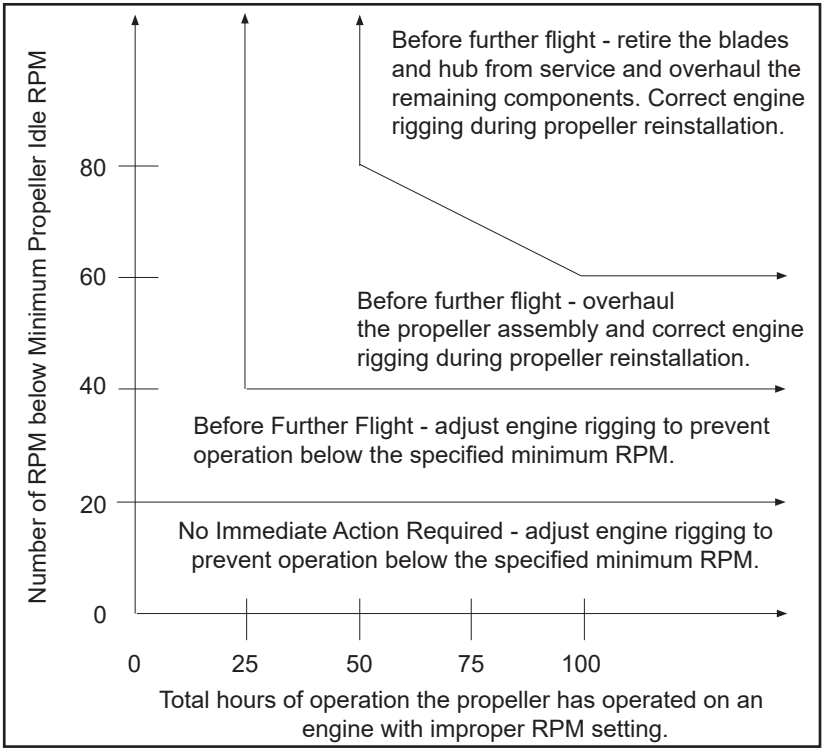
(a) Propellers with four or more blades operating on turbine engines can be sensitive to operation within restricted RPM ranges. These restricted ranges are usually in the lower RPM ranges, requiring that ground idle RPM be set above a critical minimum value.

(b) This minimum propeller idle RPM operating restriction is the result of a specific vibratory resonant condition known as “reactionless mode”. During operation in these conditions the flight crew cannot feel the resulting high propeller vibration. Ground operation at or near an RPM that can create a reactionless mode vibratory resonance can cause very high stresses in the propeller blades and the hub. These high stresses are more severe when operating in a quartering tail wind condition.

(c) If the propeller is operated within a restricted RPM range or below a minimum idle RPM restriction for an extended period of time, the propeller blades and hub can become unairworthy because of fatigue. A failed blade or hub has the potential to cause a catastrophic blade separation.

(d) Use the “Periodic Ground Idle RPM Check” steps in this section to determine if the propeller is operating within the specified RPM limits.

(e) Refer to the “Corrective Action” steps in this section for maintenance information about propellers operating outside of the specified RPM range.



Corrective Action Required
Figure 5-1

Example:

Minimum propeller idle RPM listed in the AMM is 1180 RPM

Propeller idle is set at 1120 RPM

Propeller has operated with a RPM deviation of **60 RPM**

Engine was rigged 2 months ago and has operated **75 hours** since it was rigged

Figure 5-1 shows that with an RPM deviation of 60 RPM for 75 hours - the propeller assembly must be overhauled and engine rigging corrected before further flight.

Example of a Ground Idle RPM Check Evaluation
Figure 5-2

(2) Periodic Ground Idle RPM Check

NOTE: The accuracy of the tachometer is critical to the safe operation of the aircraft. Refer to the section, “Tachometer Calibration” in the Maintenance Practices chapter of this manual for important information.

(a) Perform the RPM check in accordance with the Airplane Flight Manual or Airplane Flight Manual Supplement.

1 Refer to the Airplane Flight Manual or Airplane Flight Manual Supplement to determine if there are any propeller RPM restrictions or limitations.

(b) Perform an engine run up and determine if the engine and/or propeller rigging permits operation of the propeller below the minimum specified propeller idle RPM.

(c) If the propeller cannot be operated below the minimum specified propeller idle RPM, no further action is required.

(d) If the propeller can be operated below the minimum specified propeller idle RPM:

1 Refer to Figure 5-1 for corrective action requirements, and Figure 5-2 for an example of a ground idle RPM check evaluation.

2 The corrective action is based on the amount the RPM is below the minimum propeller idle RPM and the total hours of operation the propeller has accumulated.

a Figure 5-1 applies to an aircraft that is operated in conventional service. “Hours of Operation” refers to the total number of hours the propeller is operated on an engine that has an improper RPM setting. It is not the number of hours the propeller is operated in a restricted range, which will be less than the total hours of operation.

(3) Corrective Action

(a) The required corrective action is determined by both the amount and duration of RPM deviation.

1 A turboprop propeller with four or more blades may have a variety of operating restrictions and these different restrictions may have different operating margins.

2 The greater the amount of the RPM deviation and the longer it is permitted to exist, the more severe the required corrective action.

3 The corrective action may vary from no action required, to retirement of the blades and the hub.

4 The chart in Figure 5-1 specifies the required corrective action for operation below the minimum idle RPM.

a The chart in Figure 5-1 does not apply to other propeller restrictions that are above the minimum idle RPM.

5 If the corrective action requires a propeller overhaul, overhaul the propeller in accordance with the applicable propeller overhaul manuals.

6 If the corrective action requires that the blades and the hub be retired from service, retire these components in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02) before further flight.

a A propeller hub or blade that has been retired from service because of a violation of the operating restrictions as specified in this section must not be reused on another aircraft application.

7 If the corrective action requires the correction of the propeller RPM setting, refer to the applicable installation and rigging instructions for the adjustment of engine torque, engine idle speed, and propeller RPM setting.

(b) Contact Hartzell Propeller Product Support Department to report the findings, or if a propeller restriction other than those described in Figure 5-1 has been violated.

1 Refer to the section, “Hartzell Propeller Contact Information” in the Introduction chapter of this manual.

D. Post-Run Check

(1) After engine shutdown, check propeller for signs of grease/oil leakage.

E. Propeller Ice Protection System

(1) Refer to the Anti-ice and De-ice Systems chapter in this manual for operational checks and troubleshooting information for Hartzell Propeller ice protection systems.

4. Required Periodic Inspections and Maintenance (Rev. 2)

A. Periodic Inspections

(1) Perform the following inspection procedures at 100 hour intervals for reciprocating applications and 400 hour intervals for turbine applications, not to exceed twelve (12) calendar months. Procedures involved in these inspections are detailed below.

(a) Inspection and maintenance specified by an airframe manufacturer's maintenance program and approved by the applicable airworthiness agency may not coincide with the inspection time intervals specified.

1 In this situation, the airframe manufacturer's schedule may be applied as long as the calendar limit for the inspection interval does not exceed twelve (12) months.

2 For additional inspection information (including possible corrections), refer to the section, "Inspection Procedures" in this chapter, and/or the Testing and Troubleshooting chapter of this manual.

(2) Remove the spinner dome.

(3) Visually examine the propeller blades (leading edge, trailing edge, face, and camber sides) for nicks, gouges, erosion, cracks, etc.

(a) Refer to the section, "Aluminum Blades" in the Maintenance Practices chapter of this manual for damage evaluation and repair information.

CAUTION: DO NOT ATTEMPT TO REPAIR A CRACKED HUB.

(4) Visually inspect the hub parts for cracks, or wear. Refer to Grease and Oil Leaks in the Inspection Procedures section of this chapter for procedure.

(a) If a hub is cracked, refer to a certified propeller repair station with the appropriate rating.

(5) Inspect all visible propeller parts for cracks, wear or unsafe conditions.

(6) Check for oil and grease leaks.

(a) Refer to the section, "Inspection Procedures" in this chapter for grease or oil leakage procedures.

(7) If a blade track problem is suspected, check the blade track.

(a) Refer to Blade Track in the Inspection Procedures section of this chapter.

(8) For (-2 and -5) feathering propellers which incorporate an air charge in the cylinder, check pressure every 100 hours or once a month, whichever comes first.

(a) Refer to Maintenance Practices chapter of this manual for procedures.

1 If the propeller air pressure is routinely low, or there is engine oil leaking from the air valve, a faulty seal in the propeller should be considered.

a A qualified technician at a certified propeller repair station with the appropriate rating should inspect and verify the condition of the seal.

(9) For an unfeathering accumulator, check the air pressure.

(a) For a Hartzell Propeller unfeathering accumulator, check the air pressure every 100 hours or once a month, whichever comes first.

1 For the correct air pressure, refer to Table 6-11.

2 For procedures to recharge the unfeathering accumulator, refer to the section "Unfeathering Accumulator Air Charge" in the Maintenance Practices chapter of this manual.

3 If the accumulator air pressure is routinely low, or there is engine oil leaking from the air valve, a faulty seal in the accumulator should be considered. An inspection to verify the condition should be performed by qualified personnel at an appropriately licensed propeller repair facility.

(b) For a non-Hartzell Propeller unfeathering accumulator, refer to the manufacturer's published data for inspection and check requirements.

(10) For a Hartzell Propeller HC( )Y( )-1 propeller accumulator, check the accumulator air charge every 50 flight hours or six months, whichever comes first.

(a) Using dry air or nitrogen, charge the accumulator at 15 to 25 psi (103.4 to 172.4 kPa).

(11) Hartzell Propeller recommends that propeller owners/operators calibrate the engine tachometer in accordance with the National Institute of Standards and Technology (NIST) or similar national standard (traceable). Refer to the section, “Tachometer Calibration” in the Maintenance Practices chapter of this manual.

(12) If an anti-ice system is installed, clean or replace the anti-ice system filter.

(13) Make an entry in the propeller logbook about completion of these inspections.

B. Blade Inspection for an HC-C2YR-2CLUF/FLC7666A-4 Propeller Installed on OMA SUD Skycar Aircraft

CAUTION: ESTABLISH MORE FREQUENT INTERVALS FOR INSPECTION IF SERVICE EXPERIENCE INDICATES THAT SEVERE CORROSION IS FOUND DURING INSPECTIONS.

(1) Visually examine each blade for paint erosion and corrosion at intervals not exceeding 200 hours of operation or every 12 calendar months, whichever occurs first.

WARNING: CLEANING AGENTS (ACETONE, #700 LACQUER THINNER, AND MEK), ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT. USE IN WELL VENTILATED AREA.

(a) Using a cloth dampened with acetone, MEK, or MPK, thoroughly clean each blade shank where exposed to engine exhaust and remove all foreign matter/exhaust residue.

(b) Paint must be in good condition in the area exposed to exhaust gasses. Repair and repainting is required if:

1 Any of the underlying aluminum blade is exposed.

2 There are any indications of corrosion, such as pitting or any other unusual conditions.

(c) All corrosion indications require repair and subsequent repainting by an appropriately licensed propeller repair facility.

1 Refer to FAA Advisory Circular AC 43.4A (or subsequent revision) for additional information about corrosion. This circular provides definitions, repair procedures, safety precautions, etc.

(2) If repair and repainting are required, refer to the Blade Repairs section in the Maintenance Practices chapter of this manual for additional information.

1 Qualified personnel must make the determination if repairs can be made locally or must be sent to an appropriately licensed propeller repair facility. Hartzell Propeller recommends that in “borderline” or questionable situations it is preferable to send the propeller to an appropriately licensed propeller repair facility.

C. Spinner Bulkhead Inspection for an HC-E3YR-1RF Propeller Installed on S.N.A. Inc. Seawind Aircraft.

(1) Inspect the spinner bulkhead (P/N D-4877-[ ]) for cracks every 50 flight hours.

(2) Visually inspect the spinner bulkhead for cracks around the bulkhead attachment bolts.

(3) If a crack is found, the spinner bulkhead must be removed and replaced or referred to an appropriately licensed repair facility for repair.

D. Low Pitch Stop Hardware Inspection for a PHC-C3YF-2UF/FC7693DFB Propeller

(1) Propellers installed on the following aircraft in accordance with Ram Aircraft STC SA09971SC and with a one piece spinner dome assembly are affected:

(a) Cessna T310 (P,Q,R)

(b) Cessna 320 (D,E,F)

(c) Cessna 340 (A)

(d) Cessna 402C

(e) Cessna 414 (A)

(2) Examine the logbook or visually examine the low pitch stop hardware configuration.

(a) If there is an entry that indicates compliance with Hartzell Propeller Service Bulletin HC-SB-61-267 or compliance with the low pitch stop hardware modification in this manual, or if a visual examination shows that the hardware configuration is one hex nut safety wired to a set screw, no further action is required.

(b) If there is not an entry that indicates compliance with Hartzell Propeller Service Bulletin HC-SB-61-267 or compliance with the low pitch stop hardware modification in this manual, or if visual examination shows that the hardware configuration is not one hex nut safety wired to a set screw, modify the propeller assembly to the hardware configuration of one hex nut safety wired to a set screw in accordance with the section "Modification of the Low Pitch Stop Hardware" in the Maintenance Practices chapter of this manual.

E. Periodic Maintenance

(1) Lubricate the propeller assembly.

(a) Refer to the section, "Lubrication" in the Maintenance Practices chapter of this manual for intervals and procedures.

F. Airworthiness Limitations

(1) Certain components, as well as the entire propeller may have specific life limits established as part of the certification by the FAA. Such limits require mandatory replacement of specified parts after a defined number of hours and/or cycles of use.

(2) Life limited component times may exist for the propeller models included in this manual. Refer to the Airworthiness Limitations chapter of this manual.

(3) Operators are urged to keep informed of airworthiness information via Hartzell Propeller Service Bulletins and Service Letters, which are available from Hartzell distributors or from Hartzell by subscription. Selected information is also available on Hartzell Propeller's website at www.hartzellprop.com.

G. Overhaul Periods

(1) In flight, the propeller is constantly subjected to vibration from the engine and the airstream, as well as high centrifugal forces.

(2) The propeller is also subject to corrosion, wear, and general deterioration due to aging. Under these conditions, metal fatigue or mechanical failures can occur.

(3) To protect your safety, your investment, and to maximize the safe operating lifetime of your propeller, it is essential that a propeller be properly maintained and overhauled according to the recommended service procedures.

(a) For Hartzell propeller overhaul periods, refer to Hartzell Propeller Service Letter HC-SL-61-61Y

5. Inspection Procedures

A. Blade Damage (Rev. 2)

(1) Refer to the section, "Aluminum Blades" in the Maintenance Practices chapter of this manual for damage evaluation and repair information.

B. Grease/Oil Leakage (Rev. 1)

WARNING: UNUSUAL OR ABNORMAL GREASE LEAKAGE OR VIBRATION, WHERE THE CONDITION STARTED SUDDENLY, CAN BE AN INDICATION OF A FAILING PROPELLER BLADE OR BLADE RETENTION COMPONENT. AN INFLIGHT BLADE SEPARATION CAN RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE. UNUSUAL OR ABNORMAL GREASE LEAKAGE OR VIBRATION DEMANDS IMMEDIATE INSPECTION.

(1) Important Information

(a) A new or newly overhauled propeller may leak slightly during the first several hours of operation. This leakage may be caused by the seating of seals and O-rings, and the slinging of lubricants used during assembly. Leakage should cease within the first ten hours of operation.

(b) Leakage that persists beyond the first ten hours of operation on a new or newly overhauled propeller, or occurs on a propeller that has been in service for some time will require repair.

1 A determination should be made as to the source of the leak. If the source of the leak is the O-ring seal between the engine and the propeller flange or a lubrication fitting, field repair is permitted.

2 All other leakage repairs should be referred to a certified propeller repair station with the appropriate rating.

3 If abnormal grease leakage is detected, inspect the propeller assembly using the Inspection Procedure steps in this section.

(c) Grease Leakage - Probable Causes (-1, -2, -4 propellers only):

1 Loose/defective lubrication fitting

2 Damaged blade shank to hub O-ring seal

3 Damaged hub seal (at hub parting line)

4 Damaged hub/engine flange interface O-ring

5 Cracked hub

(d) Grease Leakage - Probable Causes (-5 propellers only)

1 Loose/defective lubrication fitting

2 Faulty seal at the blade socket between the blade and the hub

a Refer to a certified propeller repair station with the appropriate rating for seal replacement.

3 Leakage from the hub and beta rod interface (if applicable)

a Over-greased hub

(1) Refer to a certified propeller repair station with the appropriate rating for grease removal.

b Faulty seal

(1) Refer to a certified propeller repair station with the appropriate rating for seal replacement.

4 Cracked hub

(e) Oil Leakage - Probable Causes

1 Leaks between the hub and cylinder

a Faulty or missing seal between the hub and the cylinder

(1) Refer to a certified propeller repair station with the appropriate rating for seal replacement.

2 Leaks between the hub halves

a Faulty seal(s) between the hub and the pitch change rod

(1) Refer to a certified propeller repair station with the appropriate rating for seal replacement.

3 Leaks from the front of the cylinder or through the start lock units

a Faulty seal(s) between the piston and cylinder, or piston and pitch change rod

(1) Refer to a certified propeller repair station with the appropriate rating for seal replacement.

4 Leaks between the hub and the engine

a Faulty or missing seal between the propeller hub and the engine flange

(2) Inspection Procedure

(a) Remove the spinner dome.

CAUTION: PERFORM A VISUAL INSPECTION WITHOUT CLEANING THE PARTS. A TIGHT CRACK IS OFTEN EVIDENT DUE TO TRACES OF GREASE EMANATING FROM THE CRACK. CLEANING CAN REMOVE SUCH EVIDENCE AND MAKE A CRACK VIRTUALLY IMPOSSIBLE TO SEE.

(b) Perform a visual inspection of the hub, blades, and blade retention areas to locate the source of the grease leak.

1 If the source of the grease leak is a lubrication fitting, blade O-ring, or the hub parting line, repairs can be accomplished during scheduled maintenance as long as flight safety is not compromised.

a To repair a grease leak from a lubrication fitting, blade O-ring, or hub parting line, the propeller must be disassembled and inspected at a certified propeller repair station with the appropriate rating.

2 If the source of the grease leak is a component or location other than a lubrication fitting, blade O-ring, or the hub parting line, the propeller must be disassembled and inspected at a certified propeller repair station with the appropriate rating before further flight.

(c) Perform a visual inspection for cracks in the hub.

1 Extra attention should be given to the blade retention area of the hub.

2 A crack may be visible or may be indicated by grease leaking from a seemingly solid surface.

(d) If cracks are suspected, additional inspections to verify the condition must be performed before further flight.

1 Inspections typically include disassembly of the propeller followed by inspection of parts, using nondestructive methods in accordance with published procedures.

a These inspections must be performed by a certified propeller repair station with the appropriate rating.

(e) If cracks or failing components are found, these parts must be replaced before further flight.

1 Report such incidents to the appropriate airworthiness authorities and Hartzell Propeller Product Support Department.

C. Vibration (Rev. 3)

NOTE: Vibration may originate in the engine, propeller, or airframe. Troubleshooting procedures typically begin with investigation of the engine. Airframe components, such as engine mounts or loose landing gear doors, can also be the source of vibration. When investigating an abnormal vibration, the blades and the blade retention components should be considered as potential sources of the vibration.

(1) Important Information

(a) Instances of abnormal vibration should be investigated immediately. If the cause of the vibration is not readily apparent, examine the propeller in accordance with the instructions in this section.

(b) Perform troubleshooting and evaluation of possible sources of vibration in accordance with engine or airframe manufacturer's instructions.

(c) Refer to the section, "Vibration" in the Testing and Troubleshooting chapter of this manual.

1 Perform the checks to determine possible cause of the vibration.

a If no cause is found, the propeller could be the source of the vibration. Examine the propeller in accordance with the Inspection steps in this section.

(2) Inspection

(a) Remove the spinner dome.

(b) Visually examine the hub, blades, and blade clamps (if applicable) for cracks.

1 Pay particular attention to the blade retention areas of the hub.

2 A crack may be readily visible, or may be indicated by grease leaking from a seemingly solid surface.

(c) If cracks are suspected, additional inspections must be performed to evaluate the condition before further flight.

1 These inspections, typically include disassembly of the propeller, followed by inspection of parts, using nondestructive methods in accordance with published procedures.

2 These inspections must be performed at a certified propeller repair station with the appropriate rating.

(d) Inspect the play of the propeller blades in accordance with the section, "Blade Tolerances" in this chapter.

(e) Inspect blade track in accordance with the section, "Blade Track" in this chapter.

CAUTION: DO NOT USE BLADE PADDLES TO TURN THE BLADES.

1 Manually (by hand) attempt to turn the blades (change pitch).

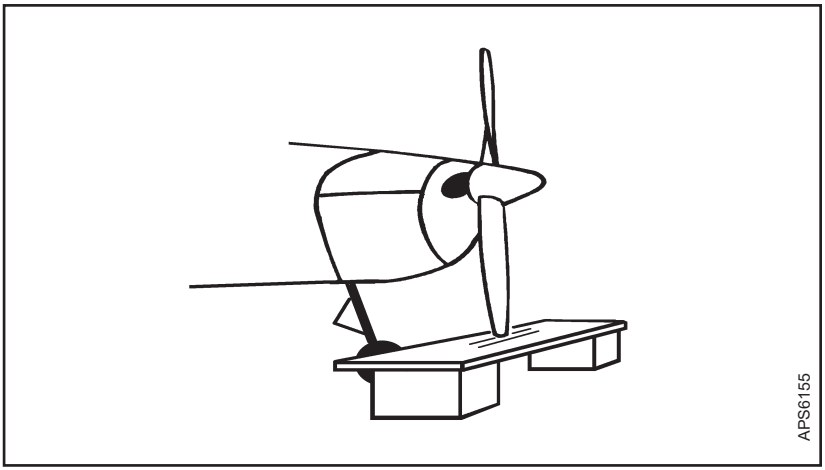
2 Visually check for damaged blades.

(f) If abnormal blade conditions or damage are found, additional inspections must be performed to evaluate the condition before further flight.

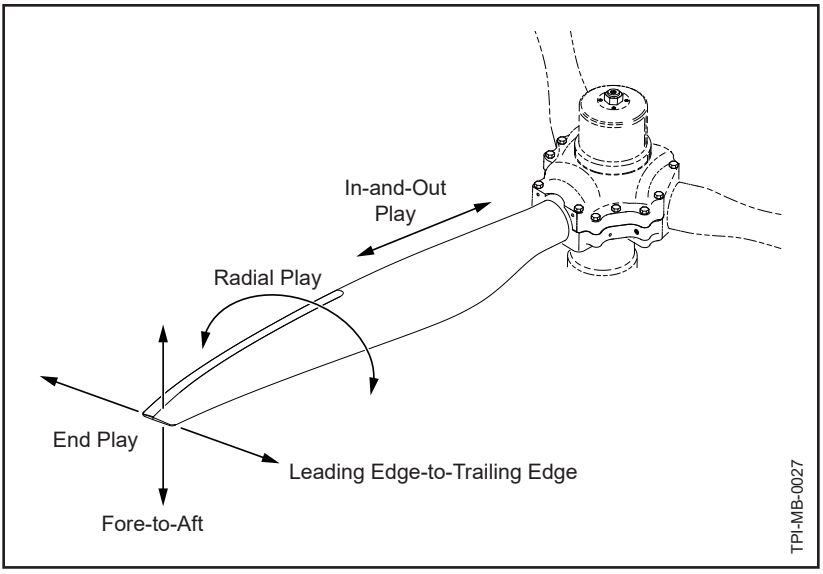
1 These inspections must be performed at a certified propeller repair station with the appropriate rating.

(g) If cracks or failing components are found, these parts must be replaced before further flight.

1 Report such incidents to airworthiness authorities and Hartzell Propeller Product Support.



Checking Blade Track
Figure 5-3



Blade Play
Figure 5-4

D. Blade Track

(1) Check blade track as follows:

(a) Chock the aircraft wheels securely.

(b) Refer to Figure 5-3. Place a fixed reference point beneath the propeller, within 0.25 inch (6.0 mm) of the lowest point of the propeller arc.

NOTE: This reference point may be a flat board with a sheet of paper attached to it. The board may then be blocked up to within 0.25 inch (6.0 mm) of the propeller arc.

WARNING: MAKE SURE THE ENGINE MAGNETO IS GROUNDED (OFF) BEFORE ROTATING THE PROPELLER.

(c) Rotate the propeller by hand (opposite the direction of normal rotation) until a blade points directly at the reference surface (paper).

1 If the propeller does not have a start lock and blade track must be checked when the propeller is in feather position:

a Put a spirit level or blade protractor against the flat side of the blade counterweight.

b Slightly rotate the propeller blade until the level or protractor indicates the blade counterweight is perpendicular with the reference surface (paper).

(d) Mark the position of the blade tip in relation to the reference surface (paper).

(e) Repeat this procedure with the remaining blades.

(f) Tracking tolerance is ±0.0625 inch (1.58 mm) or 0.125 inch (3.17 mm) total.

(2) Possible Correction

(a) Remove foreign matter from the propeller mounting flange.

(b) If no foreign matter is present, refer to a certified propeller repair station with the appropriate rating.

E. Blade Tolerances (Rev. 5)

(1) Limits for blade play are specified below. Refer to Figure 5-4.

(a) End Play: Leading Edge-to-Trailing Edge	±0.0625 inch (1.58 mm) Total: 0.125 inch (3.17 mm)
Fore-to-Aft (face to camber)	±0.0625 inch (1.58 mm) Total: 0.125 inch (3.17 mm)
(b) In and Out Play	none permitted
(c) Radial Play (pitch change)	±0.5 degree (1 degree total) measured at reference station

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

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

F. Corrosion (Rev. 1)

WARNING: REWORK THAT INVOLVES COLD WORKING THE METAL, RESULTING IN CONCEALMENT OF A DAMAGED AREA IS NOT PERMITTED.

(1) Corrosion of any type on the hub or heavy corrosion on other parts that results in severe pitting must be referred to a certified propeller repair station with the appropriate rating.

G. Spinner Damage (Rev. 3)

(1) Inspect the spinner for cracks, missing hardware, or other damage.

(a) Metal Spinners

1 For damage evaluation and repair information, refer to Hartzell Propeller Metal Spinner Maintenance Manual 127 (61-16-27) or a certified propeller repair station with the appropriate rating.

2 Contact the local airworthiness authority for repair approval.

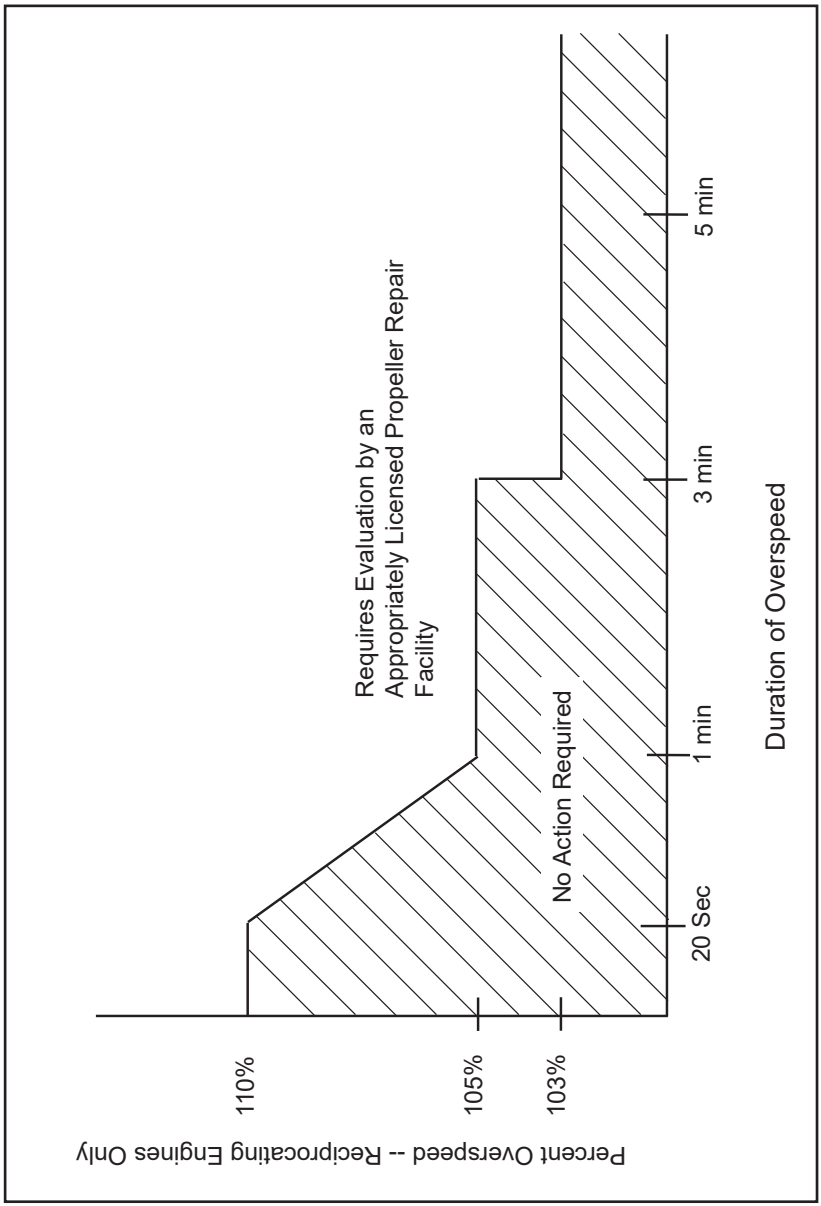
(b) Composite Spinners

1 For damage evaluation and repair information, refer to Hartzell Propeller Composite Spinner Maintenance Manual 148 (61-10-73) or a certified propeller repair station with the appropriate rating.

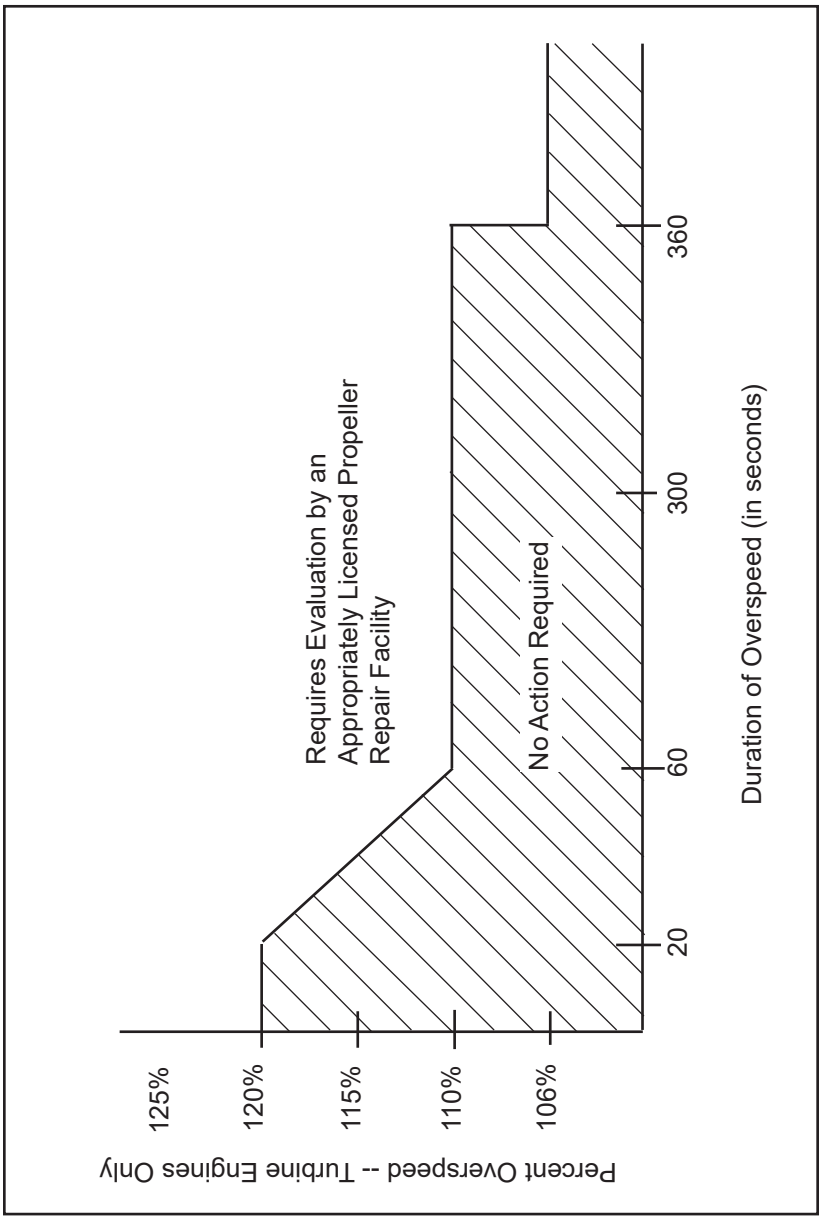
2 Contact the local airworthiness authority for repair approval.

H. Propeller Ice Protection System (Rev. 1)

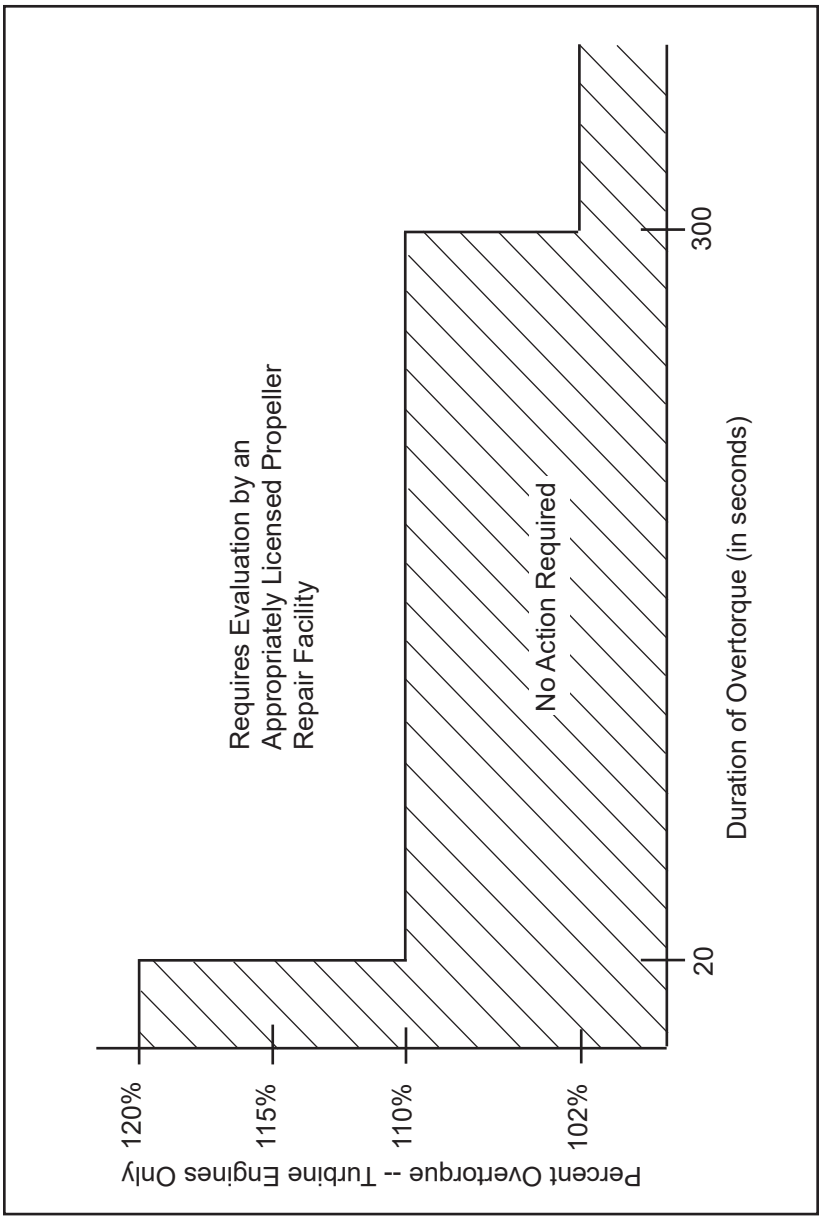
(1) Refer to the Anti-ice and De-ice Systems chapter of this manual for operational checks and troubleshooting information.



Reciprocating Engine Overspeed Limits
Figure 5-5



Turbine Engine Overspeed Limits
Figure 5-6



Turbine Engine Overtorque Limits
Figure 5-7

6. Special Inspections

A. Overspeed/Overtorque (Rev. 2)

(1) An overspeed occurs when the propeller RPM exceeds the maximum RPM stated in the applicable Aircraft Type Certificate Data Sheet. An overtorque condition occurs when the engine load exceeds the limits established by the engine, propeller, or airframe manufacturer. The duration of time at overspeed/overtorque for a single event determines the corrective action that must be taken to make sure no damage to the propeller has occurred.

(2) The criteria for determining the required action after an overspeed are based on many factors. The additional centrifugal forces that occur during overspeed are not the only concern. Some applications have sharp increases in vibratory stresses at RPMs above the maximum rated for the airframe/engine/propeller combination.

(a) When a propeller installed on a reciprocating engine has an overspeed event, refer to the Reciprocating Engine Overspeed Limits (Figure 5-5) to determine the corrective action to be taken.

(b) When a propeller installed on a turbine engine has an overspeed event, refer to the Turbine Engine Overspeed Limits (Figure 5-6) to determine the corrective action to be taken.

(c) When a propeller installed on a turbine engine has an overtorque event, refer to the Turbine Engine Overtorque Limits (Figure 5-7) to determine the corrective action to be taken.

(d) Make an entry in the propeller logbook about the overspeed/overtorque event.

NOTE: Some aircraft installations have torque indicator values indicating 100% torque that are less than the maximum certified torque for the specific propeller model as listed in the propeller type certificate data sheet. If an overtorque occurs that requires propeller repair station evaluation, contact Hartzell Propeller Product Support Department to confirm actual overtorque percentage.

B. Lightning Strike (Rev. 1)

CAUTION: REFER TO THE ENGINE AND AIRFRAME MANUFACTURER'S MANUALS FOR ADDITIONAL INSPECTIONS TO PERFORM AFTER A PROPELLER LIGHTNING STRIKE.

(1) General

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

(b) If the propeller meets the requirements of the "Temporary Operation Inspection" in this section, 10 hours of operation is permitted before propeller disassembly/inspection must be performed.

(2) Temporary Operation Inspection

(a) Remove the spinner dome and perform a visual inspection of the propeller, blades, spinner, and ice protection system for evidence of damage that would require repair before flight (such as broken wires or arcing damage to the propeller hub).

CAUTION: IF THE PROPELLER EXPERIENCES A LIGHTNING STRIKE, REFER TO THE "ALUMINUM BLADES" SECTION IN THE MAINTENANCE PRACTICES CHAPTER OF THIS MANUAL TO EVALUATE THE DAMAGE BEFORE FURTHER FLIGHT.

1 If the only evident damage is minor arcing burns to the blades, temporary operation for up to 10 flight hours is permitted before propeller disassembly and inspection.

2 If there is evidence of additional damage, beyond minor arcing burns to the blades, temporary operation is not permitted. The propeller must be removed from the aircraft, disassembled, evaluated, and/or repaired by a certified propeller repair station with the appropriate rating before further flight.

(b) Perform an operational check of the propeller ice protection system (if installed) in accordance with the Anti-ice and De-ice Systems chapter of this manual.

(c) Make a record of the lightning strike in the propeller logbook, indicating any corrective action(s) taken.

(3) For flight beyond the 10-hour temporary operation limit:

(a) The propeller must be removed from the aircraft, disassembled, evaluated, and/or repaired by a certified propeller repair station with the appropriate rating.

C. Foreign Object/Ground Strike (Rev. 3)

(1) General

(a) A foreign object/ground strike can include a broad spectrum of damage, from a minor stone nick to severe ground impact damage.

1 A conservative approach in evaluating the damage is required because there may be hidden damage that is not readily apparent during an on-wing, visual inspection.

(b) A foreign object/ground strike is defined as:

1 Any incident, whether or not the engine is operating, that requires repair to the propeller other than minor dressing of the blades.

a Examples of foreign object/ground strike include situations where an aircraft is stationary and the landing gear collapses causing one or more blades to be significantly damaged, or where a hangar door (or other object) strikes the propeller blade(s).

b These cases should be handled as foreign object/ground strikes because of potentially severe side loading on the propeller hub, blades, and retention bearings.

2 Any incident during engine operation in which the propeller impacts a solid object that causes a drop in revolutions per minute (RPM) and also requires structural repair of the propeller (incidents requiring only paint touch-up are not included). This is not restricted to propeller strikes against the ground.

3 A sudden RPM drop while impacting water, tall grass, or similar yielding medium, where propeller blade damage is not normally incurred.

(c) In the event of a foreign object/ground strike, an inspection is required before further flight.

(2) Inspection Procedure

(a) Examine the propeller assembly for damage related to the foreign object/ground strike.

(b) If any of the following indications are found, the propeller must be removed from the aircraft, disassembled, and overhauled by a certified propeller repair station with the appropriate rating.

1 Blade(s) damaged, bent, or out of track/angle

2 Blade(s) loose in the hub (if applicable)

a Refer to the section, “Blade Tolerances” in this chapter for the permitted limits of blade play.

3 Blade(s) rotated in the clamp (if applicable)

4 Any noticeable or **suspected** damage to the pitch change mechanism

5 Any blade diameter reduction

6 Bent, cracked, or failed engine shaft

7 Vibration during operation (that was not present before the event)

(c) Nicks, gouges, and scratches on blade surfaces or the leading and trailing edges must be removed before flight.

1 Refer to the section, “Aluminum Blades” in the Maintenance Practices chapter of this manual for damage evaluation and repair information.

(d) Engine mounted components - such as governors, pumps, etc. may be damaged by a foreign object strike, especially if the strike resulted in a sudden stoppage of the engine.

1 These components must be inspected and repaired in accordance with the applicable component maintenance manual.

(e) Make a record of the foreign object/ground strike event in the propeller logbook, indicating any corrective action(s) taken.

D. Fire/Heat Damage (Rev. 1)

WARNING: HIGH TEMPERATURES CAN CAUSE SERIOUS DAMAGE TO PROPELLER HUBS, CLAMPS, AND BLADES (ALUMINUM AND COMPOSITE). THIS DAMAGE CAN RESULT IN CATASTROPHIC FAILURE CAUSING DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE.

(1) A propeller that has been exposed to fire or heat temperatures, such as an engine or hangar fire, must be inspected by a certified propeller repair station with the appropriate rating before further flight.

E. Sudden Stoppage (Rev. 1)

(1) When there is a propeller sudden stoppage because of catastrophic engine failure or seizure, the propeller and any engine driven/powered accessory must be inspected and repaired in accordance with the applicable component maintenance manual.

(2) If the sudden stoppage was caused by a foreign object strike, refer to the section, “Foreign Object/Ground Strike” in this chapter.

F. Engine Oil Contamination (Rev. 1)

(1) Following an incident of oil contamination, the components of the propeller that were exposed to oil contamination must be removed, cleaned, and inspected.

(a) A propeller that was exposed to oil contamination must be removed and sent to a certified propeller repair station with the appropriate rating for disassembly, cleaning, and inspection.

(b) A governor that was exposed to oil contamination must be inspected and repaired in accordance with the applicable component maintenance manual.

7. Long Term Storage (Rev. 1)

A. Important Information

(1) Parts shipped from Hartzell Propeller are not shipped or packaged in a container that is designed for long term storage.

(2) Long term storage procedures are detailed in Hartzell Propeller Standard Practices Manual 202A (61-01-02).

(3) Information regarding the return of a propeller assembly to service after long term storage is detailed in Hartzell Propeller Standard Practices Manual 202A (61-01-02).

MAINTENANCE PRACTICES - CONTENTS

MAINTENANCE PRACTICES - CONTENTS, CONTINUED

LIST OF FIGURES

LIST OF TABLES

(Blank Page)

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.

1. Cleaning (Rev. 2)

CAUTION 1: BEFORE CLEANING THE PROPELLER, BE SURE THE PROPELLER HAS BEEN INSPECTED IN ACCORDANCE WITH THE REQUIRED PERIODIC INSPECTIONS SPECIFIED IN THIS MANUAL. CLEANING THE PROPELLER PRIOR TO INSPECTION MAY REMOVE EVIDENCE OF A CONDITION THAT REQUIRES CORRECTIVE ACTION.

CAUTION 2: DO NOT USE PRESSURE WASHING EQUIPMENT TO CLEAN THE PROPELLER OR CONTROL COMPONENTS. PRESSURE WASHING CAN FORCE WATER AND/OR CLEANING FLUIDS PAST SEALS AND LEAD TO INTERNAL CORROSION OF PROPELLER COMPONENTS.

A. General Cleaning

CAUTION 1: WHEN CLEANING THE PROPELLER, DO NOT ALLOW SOAP OR SOLVENT SOLUTIONS TO RUN OR SPLASH INTO THE HUB AREA.

CAUTION 2: DO NOT CLEAN PROPELLER WITH CAUSTIC OR ACIDIC SOAP SOLUTIONS. IRREPARABLE CORROSION OF PROPELLER COMPONENTS MAY OCCUR.

(1) Remove the spinner dome in accordance with the Installation and Removal chapter in this manual.

WARNING: ADHESIVES AND SOLVENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT. USE IN WELL VENTILATED AREA.

CAUTION: DO NOT USE ANY SOLVENT DURING CLEANING THAT COULD SOFTEN OR DESTROY THE BOND BETWEEN CHEMICALLY ATTACHED PARTS.

(2) Using a clean cloth dampened with Stoddard solvent CM23 or equivalent, wipe the inside of the spinner dome to remove grease, oil, and other residue.

   (a) Immediately dry the inside of the spinner dome using a clean dry cloth.

(3) Using a clean cloth dampened with Stoddard solvent CM23 or equivalent, wipe the accessible surfaces of the hub, counterweight clamps, slip ring, and bulkhead to remove grease, oil, and other residue.

(4) Fill a tank sprayer with a non-caustic/non-acidic soap solution.

IMPORTANT: WHEN PERFORMING STEPS 5 THRU 7, THE BLADE(S) TO BE CLEANED MUST POINT DOWNWARD. THIS WILL PREVENT THE SOAP SOLUTION AND/OR CONTAMINANTS FROM FLOWING INTO THE HUB/BLADE SEAL AREA.

CAUTION: DO NOT LET THE SOAP SOLUTION DRY ON THE SURFACES OF THE HUB, BULKHEAD, OR SLIP RING.

(5) Using the tank sprayer, apply a fine mist of the soap solution to the surfaces of the downward facing blades, and the hub, bulkhead, and slip ring around the downward facing blades.

   (a) Use a cloth or soft nylon brush to loosen dirt and unwanted material on the surfaces where the soap solution was applied, particularly on the inboard surface of the counterweight clamp.

(6) Using clean potable water at low pressure, rinse the surfaces where the soap solution was applied to remove dirt, unwanted material, and soap residue.

(7) Use a clean dry cloth to dry the surfaces cleaned in the previous steps.

(8) Rotate the propeller so that the next blade(s) to be cleaned are pointing downward, then repeat steps 5 thru 7.

(a) Repeat steps 5 thru 8 until all blades have been cleaned and dried.

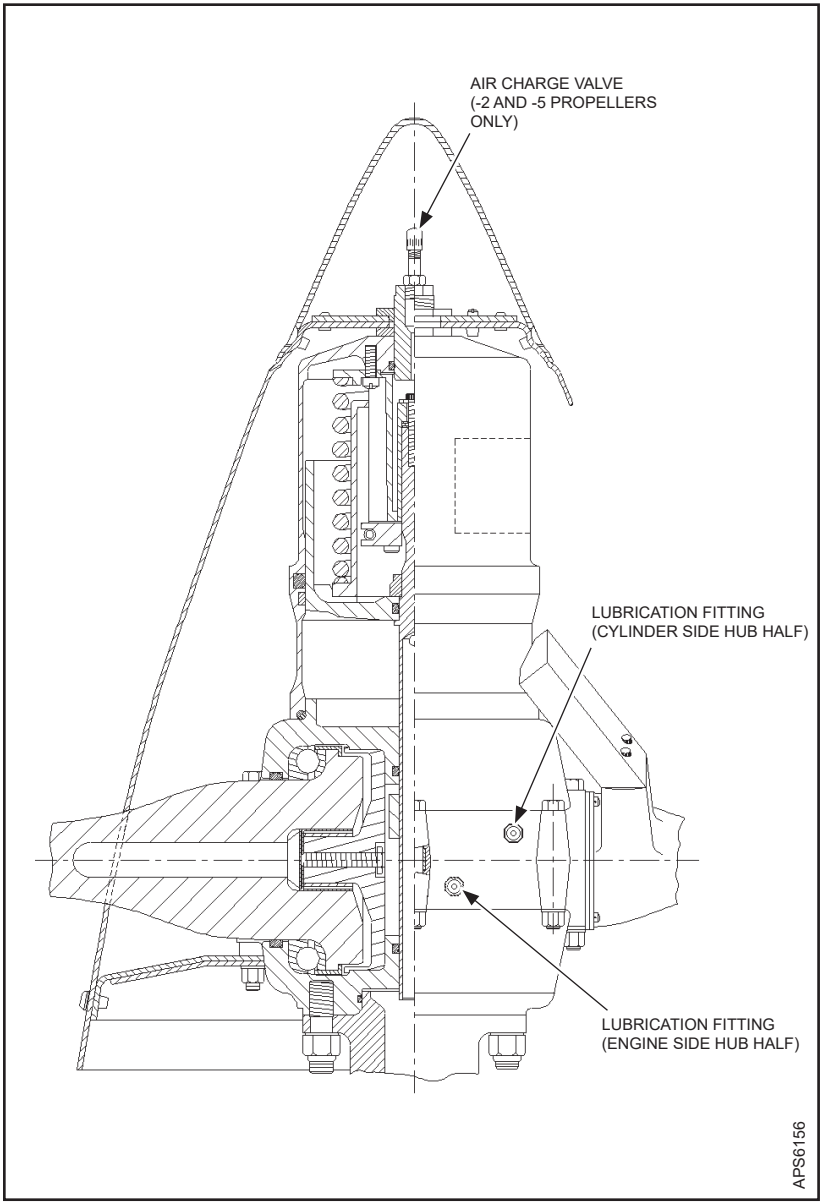
(9) Let the propeller dry.

(10) Install the spinner dome in accordance with the Installation and Removal chapter in this manual.

B. Spinner Cleaning and Polishing

(1) Clean spinner using the General Cleaning procedures in this section.

(2) If an aluminum spinner dome is installed, polish the dome (if required) with an automotive-type aluminum polish.



Lubrication Fitting and Air Charge Valve Location
Figure 6-1

2. Lubrication (Rev. 7)

A. Lubrication Intervals

(1) The propeller must be lubricated at intervals not to exceed 400 hours or 12 calendar months, whichever occurs first.

(a) Inspection and maintenance specified by an airframe manufacturer's maintenance program and approved by the applicable airworthiness agency may not coincide with the lubrication interval specified.

1 In this situation, the airframe manufacturer's schedule may be applied as long as the calendar limit for the lubrication interval does not exceed twelve (12) months.

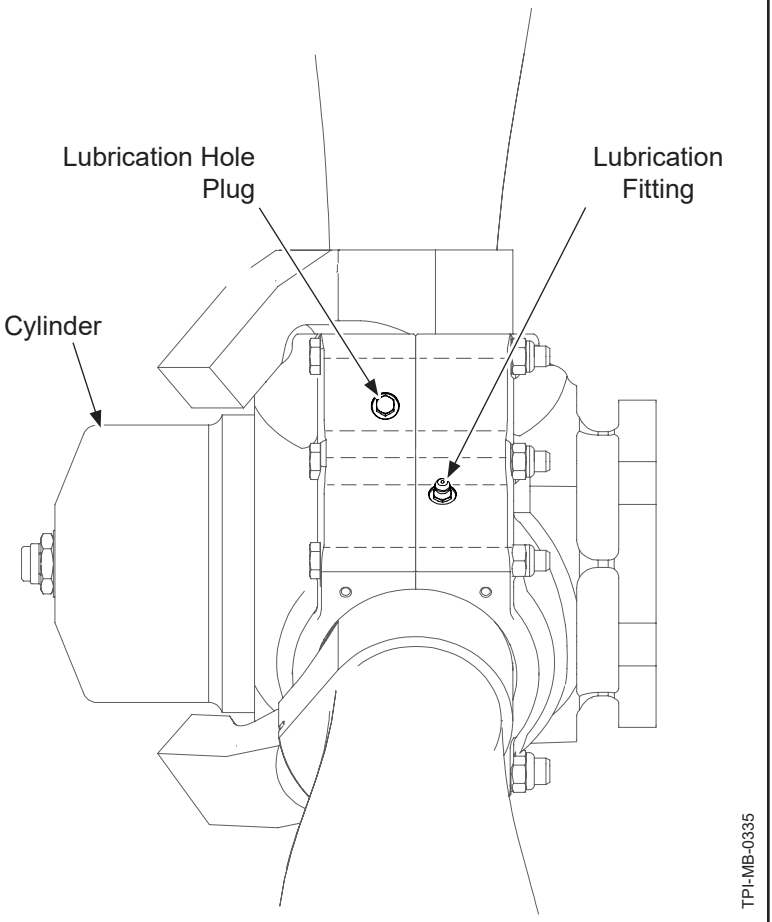
(b) If the aircraft is operated or stored under adverse atmospheric conditions, e.g., high humidity, salt air, calendar lubrication intervals should be reduced to six months.

(c) If the propeller is leaking grease, the lubrication interval should be reduced to 100 hours until the grease leak issue is resolved.

(2) Owners of high use aircraft may wish to extend their lubrication interval. The lubrication interval may be gradually extended after evaluating bearing wear and internal corrosion when the propeller is overhauled.

(3) Hartzell Propeller recommends that new or newly overhauled propellers be lubricated after approximately the first 10 hours of operation because centrifugal loads will pack and redistribute grease, which can result in a propeller imbalance. Redistribution of grease may also result in voids in the blade bearing area where moisture can collect.

(a) Purchasers of new aircraft should check the propeller logbook to verify whether the propeller was lubricated by the manufacturer during flight testing. If it was not lubricated, the propeller should be serviced at the earliest convenience.



NOTE: A tractor/pusher propeller with clockwise (standard) rotation is shown in this illustration.

Lubrication Fitting
Figure 6-2

B. Lubrication Procedure

WARNING 1: FOLLOW LUBRICATION PROCEDURES CORRECTLY TO MAINTAIN AN ACCURATE BALANCE OF THE PROPELLER ASSEMBLY.

WARNING 2: PITCH CONTROL DIFFICULTY COULD RESULT IF THE PROPELLER IS NOT CORRECTLY LUBRICATED.

(1) Remove the propeller spinner.

(2) Each blade socket has two lubrication fittings or one lubrication hole plug. Refer to Figure 6-2.

(3) Remove the caps from the lubrication fittings.

(4) Remove the lubrication fittings or hole plugs as applicable.

(a) For all tractor or pusher propellers with clockwise (standard) rotation when viewed from BEHIND the aircraft, remove the lubrication fittings (p/n A-279 or C-6349) or lubrication hole plugs (p/n 106545) from the CYLINDER-SIDE hub half.

(b) For all tractor or pusher propellers with counter-clockwise (backward) rotation when viewed from BEHIND the aircraft, remove the lubrication fittings (p/n A-279 or C-6349) or lubrication hole plugs (p/n 106545) from the ENGINE-SIDE hub half.

CAUTION: USE CARE NOT TO DAMAGE THE THREADED HOLE WHEN REMOVING A BLOCKAGE.

(5) If there is a blockage in the threaded hole where the lubrication plug was removed (ex. hardened grease), bend a piece of safety wire and use the bent end to loosen the blockage.

CAUTION: USE ONLY HARTZELL PROPELLER APPROVED GREASE. DO NOT MIX DIFFERENT SPECIFICATIONS AND/OR BRANDS OF GREASE EXCEPT AS NOTED IN THIS SECTION.

(6) A label is normally applied to the propeller to indicate the type of grease previously used. Refer to Figure 6-3.

(a) The same grease type should be used during re-lubrication unless the propeller has been disassembled and the old grease removed.

1 It is not possible to purge old grease through lubrication fittings.

2 To completely replace one grease with another, the propeller must be disassembled and cleaned in accordance with the applicable overhaul manual.

Lubrication Label
Figure 6-3

(7) If different grease types are accidentally mixed, the propeller must be disassembled and cleaned in accordance with the applicable overhaul/maintenance manual within three months or 30 flights whichever occurs first.

(a) EXCEPTION: Aeroshell 5 and Aeroshell 6 greases both have a mineral oil base and the same thickening agent; therefore, mixing of these two greases is permitted in Hartzell propellers.

WARNING: WHEN MIXING AEROSHELL 5 AND AEROSHELL 6 GREASES, THE AIRCRAFT MUST BE PLACARDED TO INDICATE THAT FLIGHT IS PROHIBITED IF THE OUTSIDE AIR TEMPERATURE IS LESS THAN -40° F (-40° C). AEROSHELL 5 GREASE MUST BE INDICATED ON THE LABEL

CAUTION 1: IF A PNEUMATIC GREASE GUN IS USED, EXTRA CARE MUST BE TAKEN TO AVOID EXCESSIVE PRESSURE BUILDUP.

CAUTION 2: GREASE MUST BE APPLIED TO ALL BLADES OF A PROPELLER ASSEMBLY AT THE TIME OF LUBRICATION.

CAUTION 3: DO NOT ATTEMPT TO PUMP MORE THAN 1 FL. OZ. (30 ML) OF GREASE INTO THE LUBRICATION FITTING. USING MORE THAN 1 FL. OZ. (30 ML) OF GREASE COULD RESULT IN OVER SERVICING OF THE PROPELLER. VERIFY THE OUTPUT OF THE GREASE GUN BEFORE SERVICING THE PROPELLER.

CAUTION 4: OVER LUBRICATING AN ALUMINUM HUB PROPELLER MAY CAUSE THE GREASE TO ENTER THE HUB CAVITY, LEADING TO EXCESSIVE VIBRATION AND/OR SLUGGISH OPERATION. THE PROPELLER MUST THEN BE DISASSEMBLED TO REMOVE THIS GREASE.

(8) Pump a maximum of 1 fl. oz. (30 ml) grease into the lubrication fitting, or until grease emerges from the hole where the lubrication fitting or lubrication hole plug was removed, whichever occurs first.

NOTE: It may be necessary to use a right angle coupler such as TE559 or equivalent, on the grease gun to access the lubrication fittings. Refer to Figure 6-4.

(a) For all tractor or pusher propellers with clockwise (standard) rotation when viewed from BEHIND the aircraft, the lubrication fitting is in the ENGINE-SIDE hub half.

(b) For all tractor or pusher propellers with counter-clockwise (backward) rotation when viewed from BEHIND the aircraft, the lubrication fitting is in the CYLINDER-SIDE hub half.

(9) If a lubrication fitting (p/n A-279 or C-6349) was removed at the beginning of this procedure, it may be reinstalled or replaced with a lubrication hole plug (p/n 106545).

(a) Reinstall the lubrication fitting or hole plug that was removed at the beginning of this procedure.

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

Right Angle Coupler for Grease Gun
Figure 6-4

(10) Make sure that the ball of each lubrication fitting is correctly seated.

(11) Reinstall a lubrication fitting cap on each lubrication fitting.

C. 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).

3. Corrosion Inhibitor (Rev. 2)

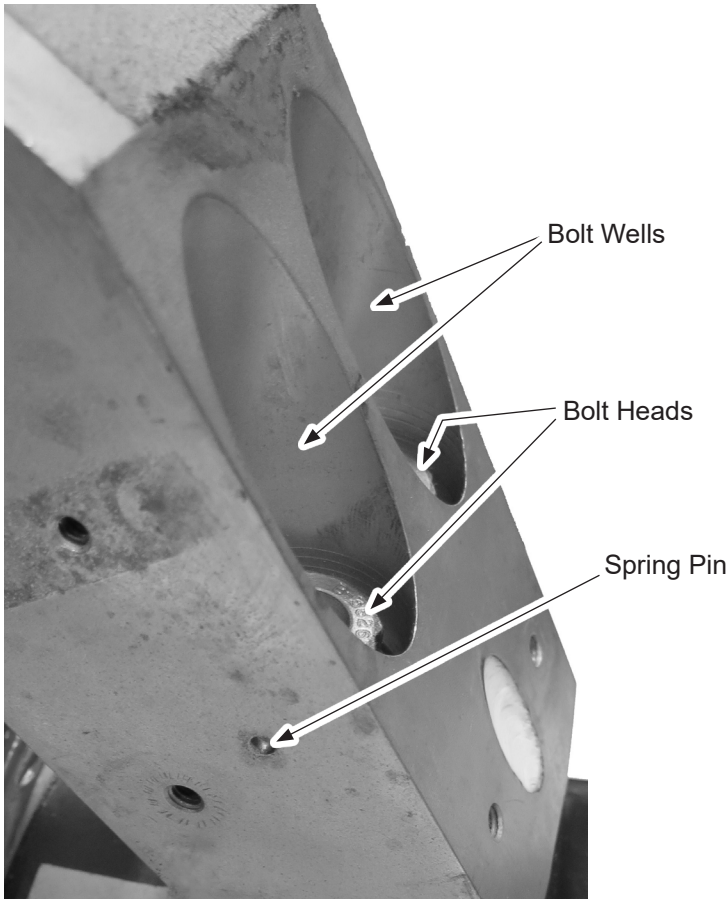
A. Application Intervals

(1) The bolt-on, steel counterweights on propellers manufactured after the release date of Service Letter HC-SL-61-364 dated April, 3, 2020 will be coated with corrosion inhibitor CM352 by Hartzell Propeller during the assembly process.

(a) Corrosion inhibitor CM352 is applied to prevent corrosion on the counterweight.

(b) Periodic re-application of the corrosion inhibitor CM352 will provide extended protection from corrosion.

1 Hartzell Propeller recommends re-application of the corrosion inhibitor CM352 at regularly scheduled intervals, similar to the lubrication interval specified in this propeller owner's manual.



Applying Corrosion Inhibitor CM352
Figure 6-5

B. Application Procedure

(1) Remove the spinner dome in accordance with the Installation and Removal chapter of this manual.

CAUTION: DO NOT APPLY CORROSION INHIBITOR CM352 ONTO ICE PROTECTION SYSTEM COMPONENTS (TERMINAL STRIPS, BOOTS, HARNESSES, ETC.).

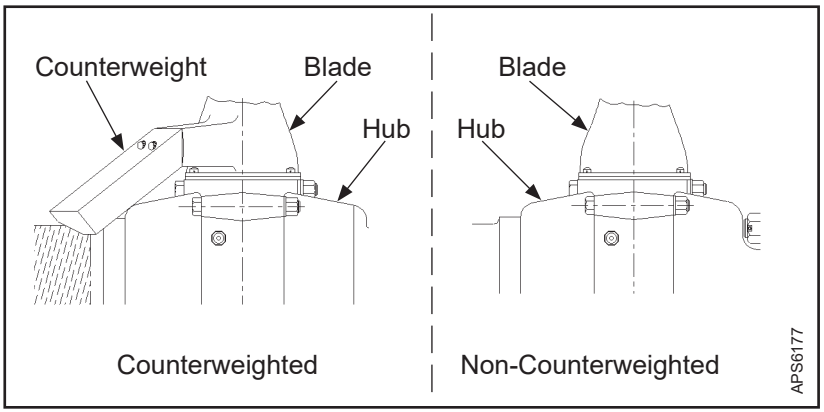
(2) Spray the corrosion inhibitor CM352 into a cup or container, then use a soft bristled brush to apply the corrosion inhibitor CM352 to the bolt heads, spring pins, and bolt wells of the counterweight. Refer to Figure 6-5.

(a) Use caution when applying the corrosion inhibitor CM352 around ice protection system components (terminal strips, boots, harnesses, etc.).

(b) Make sure the bolt heads, spring pins, and bolt wells are completely covered by the corrosion inhibitor CM352.

(c) Optionally, corrosion inhibitor CM352 can be applied to all exposed surfaces of the counterweight.

(3) Let the corrosion inhibitor CM352 cure for a minimum of three hours before flight.



Counterweighted vs Non-Counterweighted Blades
Figure 6-6

°F	°C	P.S.I	Bar
100	38	188 ±2	12.96 ±0.13
90	32	185 ±2	12.75 ±0.13
80	27	182 ±2	12.54 ±0.13
70	21	178 ±2	12.27 ±0.13
60	16	175 ±2	12.06 ±0.13
50	10	172 ±2	11.85 ±0.13
40	4	168 ±2	11.58 ±0.13
30	1	165 ±2	11.37 ±0.13
20	-7	162 ±2	11.16 ±0.13
10	-12	159 ±2	10.96 ±0.13
0	-18	154 ±2	10.61 ±0.13
-10	-23	152 ±2	10.48 ±0.13
-20	-29	149 ±2	10.27 ±0.13
-30	-34	146 ±2	10.06 ±0.13

Table 6-1
Air Charge Pressure

°F	°C	P.S.I	Bar
100	38	53 ±2	3.65 ±0.13
70	21	50 ±2	3.44 ±0.13
40	4	47 ±2	3.24 ±0.13
10	-12	44 ±2	3.03 ±0.13
-20	-29	42 ±2	2.89 ±0.13

Table 6-2
Air Charge Pressure

°F	°C	P.S.I	Bar
100	38	74 ±2	5.10 ±0.13
70	21	70 ±2	4.82 ±0.13
40	4	66 ±2	4.55 ±0.13
10	-12	62 ±2	4.27 ±0.13
-20	-29	58 ±2	3.99 ±0.13

Table 6-3
Air Charge Pressure

°F	°C	P.S.I	Bar
100	38	86 ±2	5.92 ±0.13
90	32	84 ±2	5.79 ±0.13
80	27	82 ±2	5.65 ±0.13
70	21	80 ±2	5.51 ±0.13
60	16	78 ±2	5.37 ±0.13
50	10	76 ±2	5.24 ±0.13
40	4	74 ±2	5.10 ±0.13
30	1	72 ±2	4.96 ±0.13
20	-7	70 ±2	4.82 ±0.13
10	-12	68 ±2	4.68 ±0.13
0	-18	66 ±2	4.55 ±0.13
-10	-23	64 ±2	4.41 ±0.13
-20	-29	62 ±2	4.27 ±0.13
-30	-34	60 ±2	4.13 ±0.13

Table 6-4
Air Charge Pressure

°F	°C	P.S.I	Bar
100 to 70	38 to 21	41 ±2	2.82 ±0.13
40 to 70	4 to 21	38 ±2	2.62 ±0.13
0 to 40	-18 to 4	36 ±2	2.48 ±0.13
-30 to 0	-34 to -18	33 ±2	2.27 ±0.13

Table 6-5
Air Charge Pressure

°F	°C	P.S.I	kPa
100 to 70	38 to 21	22 ±2	152 ±13
40 to 70	4 to 21	17 ±2	118 ±13
0 to 40	-18 to 4	14 ±2	97 ±13
-30 to 0	-34 to -18	9 ±2	62 ±13

Table 6-6
Air Charge Pressure

°F	°C	P.S.I	Bar
100 to 70	38 to 21	66 ±2	4.55 ±0.13
40 to 70	4 to 21	62 ±2	4.27 ±0.13
0 to 40	-18 to 4	58 ±2	3.99 ±0.13
-30 to 0	-34 to -18	53 ±2	3.65 ±0.13

Table 6-7
Air Charge Pressure

°F	°C	P.S.I	kPa
100 to 70	38 to 21	27 ±2	187 ±13
40 to 70	4 to 21	25 ±2	173 ±13
0 to 40	-18 to 4	24 ±2	166 ±13
-30 to 0	-34 to -18	22 ±2	152 ±13

Table 6-8
Air Charge Pressure

°F	°C	P.S.I	Bar
100	38	104 ±2	7.17 ±0.13
70	21	98 ±2	6.75 ±0.13
40	4	92 ±2	6.34 ±0.13
10	-12	87 ±2	5.99 ±0.13
-20	-29	81 ±2	5.58 ±0.13

Table 6-9
Air Charge Pressure

°F	°C	P.S.I	kPa
100 to 70	38 to 21	62 ±2	428 ±13
40 to 70	4 to 21	57 ±2	394 ±13
0 to 40	-18 to 4	54 ±2	373 ±13
-30 to 0	-34 to -18	49 ±2	338 ±13

Table 6-10
Air Charge Pressure

4. Air Charge (-2 and -5 Propellers)

A. Charging the Propeller

WARNING: EXCEPT FOR THE HC-C3YF-5F PROPELLER, DO NOT AIR CHARGE THE CYLINDER OR MEASURE THE AIR CHARGE ON A PROPELLER THAT IS IN FEATHER POSITION.

(1) Examine the propeller to make sure that it is positioned on the start locks.

(2) Using proper control, charge the cylinder with dry air or nitrogen.

(a) The air charge valve is located on the cylinder as indicated in Figure 6-1.

(b) Nitrogen is the preferred charging medium.

CAUTION: MAKE SURE THAT THE GAUGE IS CALIBRATED BEFORE CHARGING THE CYLINDER OR MEASURING THE AIR PRESSURE.

(c) Use an appropriate tool that has a calibrated gauge to charge the cylinder or measure air pressure in the propeller.

(d) The correct charge pressure is identified in Table 6-1 through Table 6-10 in this chapter.

(3) The following instructions may be used to determine the correct pressure.

(a) To use these instructions, the propeller model number must be known, and it must be determined if the propeller blades are counterweighted.

(b) The propeller model number is recorded in the log book, and is also stamped on the propeller hub. The propeller model number indicates the presence of a spring kit by an "S," "U," or "T" after the dash number. For example: HC-C3YR-2LUF indicates a "U" spring kit.

(c) To determine if the blades are counterweighted, remove the spinner dome and examine the base of the blade. Compare the blades to those shown in the Figure 6-6.

B. Basic pressures:

NOTE: Propellers on certain aircraft and engine combinations have experienced instances of inadvertent feathering. These events occurred either at the time of shut down or at low engine RPM. Hartzell Propeller has determined that this tendency to feather may be reduced or eliminated by lowering the air charge within the propeller cylinder. Those propellers authorized for operation with a reduced air charge are listed in this section.

(1) All four-blade compact propellers - Table 6-5

Except: HC-C4YR-2(L)/F(J)C7663DB-6Q - Table 6-6

(2) All propellers with no counterweights and no spring - Table 6-1

(3) All propellers with no counterweights and an “S” spring - Table 6-2

Except: HC-E2Y(K,R)-2RBS( ) - Table 6-3

(4) All propellers with counterweights and no spring - Table 6-4

Except: BHC-C2YF-2CKF/FC8459-8R(B) or BHC-C2YF-2CLKF/FJC8459-8R(B) when installed on the Piper PA-34-200T with Continental TSIO-360-E(B) or LTSIO-360-(B) engines - Refer to Table 6-10.

NOTE: For BHC-C2YF-2CKF/FC8459-8R(B) or BHC-C2YF-2CLKF/FJC8459-8R(B) model propellers that have been upgraded with the installation of a feather assist spring - Refer to Table 6-6.

NOTE: Propeller models indicated by * in the exceptions below have a "U" spring installed, which is not indicated in the part number.

Except: HC-C3YF-5F* - Table 6-8
HC-C3YN-5A* - Table 6-5
PHC-I3YF-2AL* - Table 6-5
PHC-J3YF-2(F) - Table 6-9

(5) All propellers with counterweights and a “T” spring - Table 6-5

Except: HC-E3YR-2ATF on Fuji Model 700 Commander - Table 6-7

(6) All propellers with counterweights and a “U” spring - Table 6-5

Except: See Note under (4), above.
(B)HC-C2YF-2(C)(L)(K)U( ) - Table 6-6
PHC-C3YF-2(L)KUF - Table 6-6

PHC-H3YF-2KUF when installed on the Avia Accord - Refer to Table 6-6.

PHC-C3YF-2UF/FC7663( )-2R when installed on the Beech 95-(A,B)55(A,B) Baron with IO-470-L engines - Refer to Table 6-6.

HC-C2YL-2CUF/FC7663-4 when installed on the Piper PA-23, PA-23-160 with O-320 engines - Refer to Table 6-6.

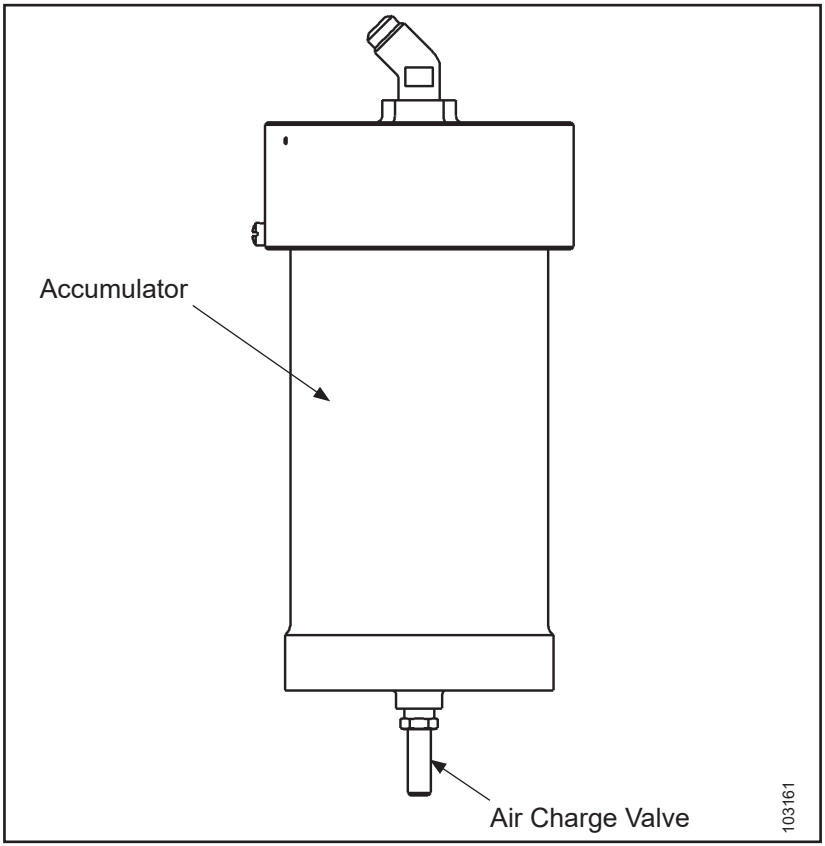
HC-C3YR-2UF/FC8468( )-6R when installed on the Aero Commander 500B, 500S, 500U with Lycoming IO-540-B1(A,C)5, IO-540-E1(A,B)5, or TIO-540-J2B(D) engines - Refer to Table 6-6.

HC-C2YF-2CUF/FC8468( )-3 when installed on the Cessna 310(A,B,C,D,E,F,G,H), or E310H, with O-470-M or IO-470-D engines- Refer to Table 6-6.

HC-C2YK-2CUF/FC7666C(B)-4 when installed on the Beech 95, B95, B95A, D95A, or E95 Travel Air with O-360 or IO-360 engines - Refer to Table 6-6.

HC-C4YR-2(L)/F(J)C7663DB-6Q propellers on PA-31 aircraft (Colemill Panther). Refer to Table 6-6.

HC-M2YR-2C(L)EUF/F(J)C7666A when installed on the Beech 76 Duchess with (L)O-360-A1G6D engines - Refer to Table 6-6.



Unfeathering Accumulator
Figure 6-7

Temperature ° F	Temperature ° C	PSI ±3 PSI	Kpa ±21 Kpa
70 to 100	21 to 38	75	517
40 to 70	4 to 21	71	490
0 to 40	-18 to 4	66	455
-30 to 0	-34 to -18	61	421

Table 6-11
Accumulator Air Charge Pressure

5. Unfeathering Accumulator Air Charge

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

NOTE: For a non-Hartzell Propeller accumulator, refer to the manufacturer's published data for charging procedures.

A. Charging a Hartzell Propeller Accumulator

WARNING: DO NOT CHARGE THE ACCUMULATOR OR MEASURE THE AIR CHARGE ON A PROPELLER THAT IS IN FEATHER POSITION.

(1) Examine the propeller to make sure that it is positioned on the start locks.

(2) Move the propeller control lever to the high RPM position.

(3) Using proper control, charge the accumulator with dry air or nitrogen.

(a) The air charge valve is located on the accumulator as indicated in Figure 6-7.

(b) Nitrogen is the preferred charging medium.

CAUTION: MAKE SURE THAT THE GAUGE IS CALIBRATED BEFORE CHARGING THE CYLINDER OR MEASURING THE AIR PRESSURE.

(c) Use an appropriate tool that has a calibrated gauge to charge the cylinder or measure air pressure in the propeller.

(d) For the correct accumulator charge pressure, refer to Table 6-11 in this chapter.

6. Aluminum Blades (Rev. 6)

WARNING: NICKS, GOUGES, OR SCRATCHES OF ANY SIZE CAN CREATE A STRESS RISER THAT COULD POTENTIALLY LEAD TO BLADE CRACKING. ALL DAMAGE SHOULD BE VISUALLY EXAMINED CAREFULLY BEFORE FLIGHT FOR THE PRESENCE OF CRACKS OR OTHER ABNORMALITIES.

CAUTION: BLADES THAT HAVE BEEN PREVIOUSLY REPAIRED OR OVERHAULED MAY HAVE BEEN DIMENSIONALLY REDUCED. BEFORE REPAIRING SIGNIFICANT DAMAGE OR MAKING REPAIRS ON BLADES THAT ARE APPROACHING SERVICEABLE LIMITS, CONTACT A CERTIFIED PROPELLER REPAIR STATION OR THE HARTZELL PRODUCT SUPPORT DEPARTMENT FOR BLADE DIMENSIONAL LIMITS.

A. Important Information

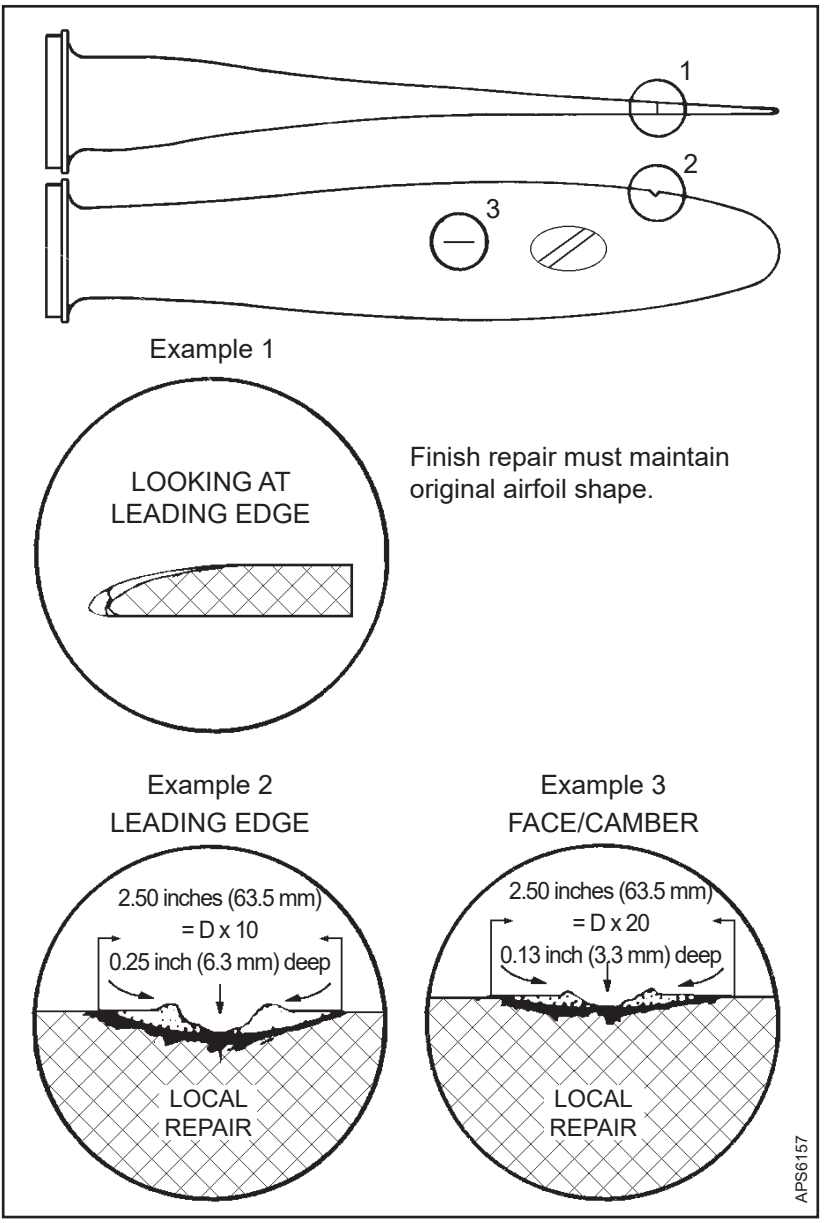
(1) Nicks, gouges, and scratches on blade surfaces or on the leading or trailing edges of the blade, that are greater than 0.031 inch (0.79 mm) wide or deep, must be repaired before flight.

(2) Field repair of small nicks and scratches may be performed by qualified personnel in accordance with FAA Advisory Circular 43.13-1B, and the procedures specified in this section.

(3) Normal erosion (sand-blasted appearance) on the leading edge of the blade is acceptable, and does not require removal before further flight.

B. Repair of Nicks and Gouges

(1) Local repairs may be made using files, electrical or air powered equipment. Use emery cloth, scotch brite, and crocus cloth for final finishing.



Repair Limitations
Figure 6-8

CAUTION 1: ANY REPAIR THAT INVOLVES COLD WORKING THE METAL, RESULTING IN CONCEALMENT OF A DAMAGED AREA, IS NOT PERMITTED. A STRESS CONCENTRATION MAY EXIST THAT CAN RESULT IN A BLADE FAILURE.

CAUTION 2: SHOT PEENED BLADES ARE IDENTIFIED WITH AN "S" IMMEDIATELY FOLLOWING THE BLADE MODEL NUMBER, AS DESCRIBED IN THE DESCRIPTION AND OPERATION CHAPTER OF THIS MANUAL. BLADES THAT HAVE DAMAGE IN SHOT PEENED AREAS IN EXCESS OF 0.015 INCH (0.38 mm) DEEP ON THE FACE OR CAMBER OR 0.250 INCH (6.35 mm) ON THE LEADING OR TRAILING EDGES MUST BE REMOVED FROM SERVICE, AND THE REWORKED AREA SHOT PEENED BEFORE FURTHER FLIGHT. SHOT PEENING OF AN ALUMINUM BLADE MUST BE ACCOMPLISHED BY A CERTIFIED PROPELLER REPAIR STATION WITH THE APPROPRIATE RATING IN ACCORDANCE WITH HARTZELL PROPELLER ALUMINUM BLADE OVERHAUL MANUAL 133C (61-13-33).

(2) Calculate the area of repair using Figure 6-8 and the following formulas:

(a) For leading and trailing edge damage:
Depth of the damage x 10. Refer to Example 1 and 2.

NOTE: The leading edge includes the first 10% of chord from the leading edge. The trailing edge consists of the last 20% of chord adjacent to the trailing edge.

(b) For face and camber side damage:
Depth of damage x 20. Refer to Example 3.

(3) Repair damage to the leading or trailing edge of the blade by removing material from the bottom of the damaged area.
   (a) Remove material from this point out to both sides of the damage to form a smooth, blended depression that maintains the original shape of the blade airfoil.

(4) Repair damage to the blade face or camber side by removing material from the bottom of the damaged area.
   (a) Remove material from this point out to both sides of the damage to form a smooth, blended depression that maintains the original shape of the blade airfoil.
   (b) Repairs that form a continuous line across the blade section (chordwise) are not permitted.

(5) After filing or sanding of the damaged area, use emery cloth to polish the area, then remove any file marks using crocus cloth.

(6) Inspect the repaired area with a 10X magnifying glass.
   (a) Be sure that no indication of the damage, file marks, or coarse surface finish remain.

(7) If inspections show any remaining blade damage, repeat steps (5) and (6) of this procedure until no damage remains.

(8) After repair, Hartzell Propeller recommends penetrant inspection of the blade in accordance with Hartzell Propeller Standard practices Manual 202A (61-01-02).

(9) Treat the repaired area to prevent corrosion. Properly apply chemical conversion coating and approved paint to the repaired area before returning the blade to service.
   (a) Refer to the section, "Blade Paint Touch-Up" in this chapter.

C. Repair of Bent Blades

CAUTION: DO NOT ATTEMPT TO "PRE-STRAIGHTEN" A BLADE BEFORE DELIVERY TO A CERTIFIED PROPELLER REPAIR STATION WITH THE APPROPRIATE RATING. THIS WILL CAUSE THE BLADE TO BE REPLACED BY THE REPAIR FACILITY.

(1) Repair of a bent blade or blades is considered a major repair. This type of repair must be accomplished by a certified propeller repair station with the appropriate rating, and only within approved guidelines.

Vendor	Color/Type	Vendor P/N	Hartzell Propeller P/N
Tempo	Epoxy Black	A-150	A-6741-145-2
Tempo	Epoxy Gray	A-151	A-6741-146-2
Tempo	Epoxy White (tip stripe)	A-152	A-6741-147-2
Tempo	Epoxy Red (tip stripe)	A-153	A-6741-149-2
Tempo	Epoxy Yellow (tip stripe)	A-154	A-6741-150-2
Sherwin-Williams	Black	F75KXB9958-4311	A-6741-145-1
Sherwin-Williams	Gray	F75KXA10445-4311	A-6741-146-1
Sherwin-Williams	Gray Metallic	F75KXM9754-4311	A-6741-148-1
Sherwin-Williams	White (tip stripe)	F75KXW10309-4311	A-6741-147-1
Sherwin-Williams	Red (tip stripe)	F75KXR12320-4311	A-6741-149-1
Sherwin-Williams	Yellow (tip stripe)	F75KXY11841-4311	A-6741-150-1
Sherwin-Williams	Silver Metallic	F63TXS30880-4311	A-6741-163-1
Sherwin-Williams	Silver	F75KXS13564-4311	A-6741-190-1
Sherwin-Williams	Bright Red	1326305 or F63TXR16285-4311	A-6741-200-5
Sherwin-Williams	Bright Yellow	1326313 or F63TXY16286-4311	A-6741-201-5
Sherwin-Williams	Bright Silver	1334259	A-6741-203-5
Sherwin-Williams	Prop Gold	F63TXS17221-4311	A-6741-204-5

Touch-Up Paints
Table 6-12

7. Blade Paint Touch-Up (Rev. 3)

A. Important Information

(1) Blade paint touch-up on Hartzell propeller blades may be permitted when performed in accordance with the instructions in this section.

(a) Aluminum Blades Only:

1 Blade paint touch-up is permitted for any size area on an aluminum blade.

B. Paint

(1) The paints listed in Table 6-12 have been tested by Hartzell Propeller and are recommended for blade touch-up.

(a) Alternate paints may be used for blade touch-up, but Hartzell Propeller accepts no responsibility for wear or adhesion-related issues.

(2) Touch-up paint manufacturer's contact information:

(a) **Tempo Products Company**
A Plasti-kote Company
1000 Lake Road
Medina, OH 44256
Tel: 800.321.6300
Fax: 216.349.4241
Cage Code: 07708

(b) **Sherwin-Williams Company**
Refer to the Sherwin-Williams
Product Finishes Global Finishes Group website at:
http://oem.sherwin-williams.com

C. Procedure

WARNING: CLEANING AGENTS (ACETONE, #700 LACQUER THINNER, AND MEK), ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT. USE IN A WELL VENTILATED AREA.

CAUTION: ANY REFINISHING PROCEDURE CAN ALTER PROPELLER BALANCE. PROPELLERS THAT ARE OUT OF BALANCE MAY EXPERIENCE EXCESSIVE VIBRATIONS WHILE IN OPERATION.

(1) Using a clean cloth moistened with acetone, #700 lacquer thinner, or MEK, wipe the surface of the blade to remove any contaminants.

(2) Permit the solvent to dry.

CAUTION 1: EXCESSIVE SANDING ON COMPOSITE BLADES WILL CAUSE “FUZZING” OF THE KEVLAR® MATERIAL. THIS CAN RESULT IN A ROUGH FINISH AND/OR DAMAGE TO THE BLADE.

CAUTION 2: BE SURE TO SAND/FEATHER THE EXISTING COATINGS TO PREVENT EXCESSIVE PAINT BUILDUP.

(3) Using 120 to 180 grit sandpaper, sand to feather the existing coatings away from the eroded or repaired area.

(a) Erosion damage is typically very similar on all blades in a propeller assembly. If one blade has more extensive damage, e.g., in the tip area, sand all the blades in the tip area to replicate the repair of the most severely damaged blade tip. This practice is essential in maintaining balance after refinishing.

(4) Using acetone, #700 lacquer thinner, or MEK, wipe the surface of the blade.

(5) Permit the solvent to evaporate.

(6) Apply an approved corrosion preventive coating to the bare aluminum surface of the blade in accordance with the manufacturer's instructions.

(a) Oakite 31, Chromicote L-25, or Alodine 1201 are approved chemical conversion coatings.

(7) Apply masking material to the erosion shield, anti-icing or de-ice boot, and tip stripes, as needed.

WARNING: FINISH COATINGS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT. USE IN A WELL VENTILATED AREA.

CAUTION: APPLY FINISH COATING TO UNIFORMLY COVER THE REPAIR/ EROSION. AVOID EXCESSIVE PAINT BUILD-UP ALONG THE TRAILING EDGE TO AVOID CHANGING THE BLADE PROFILE AND/OR P-STATIC CHARACTERISTICS.

(8) Apply a sufficient amount of finish coating to achieve 2 to 4 mils thickness when dry.

(a) Re-coat before 30 minutes, or after 48 hours.

(b) If the paint is permitted to dry longer than four hours, it must be lightly sanded before another coat is applied.

(9) Remove the masking material from the tip stripes and re-apply masking material for the tip stripe refinishing, if required.

(10) Apply sufficient tip stripe coating to achieve 2 to 4 mils thickness when dry.

(a) Re-coat before 30 minutes, or after 48 hours.

(b) If the paint is permitted to dry longer than four hours, it must be lightly sanded before another coat is applied.

(11) Remove the masking material immediately from the anti-icing or de-ice boot and tip stripes, if applicable.

(12) Optionally, perform dynamic balancing in accordance with the procedures and limitations specified in the section, "Dynamic Balance" of this chapter.

8. Dynamic Balance

A. Overview

CAUTION: IF REFLECTIVE TAPE IS USED FOR DYNAMIC BALANCING, DO NOT APPLY THE TAPE ON EXPOSED BARE METAL OF THE BLADE. THIS WILL ALLOW MOISTURE TO COLLECT UNDER THE TAPE AND CAUSE CORROSION THAT CAN PERMANENTLY DAMAGE THE BLADE. REFLECTIVE TAPE MUST BE REMOVED AFTER DYNAMIC BALANCING IS COMPLETED.

NOTE: Dynamic balance is recommended to reduce vibrations that may be caused by a rotating system (propeller and engine) imbalance. Dynamic balancing can help prolong the life of the propeller, engine, airframe, and avionics.

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

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

(3) Follow the dynamic balance equipment manufacturer's instructions for dynamic balance in addition to the specifications of this section.

NOTE: Some engine manufacturers' instructions also contain information on dynamic balance limits.

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.

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

(a) Use Stoddard solvent (or equivalent) to 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 Maintenance Practices chapter in this manual.

(3) If grease leakage is evident, determine the location of the leak and correct before re-lubricating the propeller and dynamic balancing.

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

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

NOTE: If static balancing is not accomplished before dynamic balancing, the propeller may be so severely unbalanced that dynamic balance may be unachievable because of measurement equipment limitations.

C. Modifying Spinner Bulkhead to Accommodate Dynamic Balance Weights

CAUTION 1: ALL HOLE/BALANCE WEIGHT LOCATIONS MUST TAKE INTO CONSIDERATION, AND MUST AVOID, ANY POSSIBILITY OF INTERFERING WITH PROPELLER COMPONENTS, THE ADJACENT AIRFRAME, PROPELLER ICE PROTECTION SYSTEM, AND ENGINE COMPONENTS.

CAUTION 2: DO NOT MODIFY A COMPOSITE SPINNER BULKHEAD TO ACCOMMODATE DYNAMIC BALANCE WEIGHTS.

(1) It is recommended that the placement of balance weights be in a radial location on aluminum spinner bulkheads that have not been previously drilled.

(2) The radial location should be outboard of the de-ice slip ring or bulkhead doubler and inboard of the bend where the bulkhead creates the flange surface to attach the spinner dome.

(3) Twelve equally spaced locations are recommended for weight attachment.

(4) Installing nut plates (10-32 thread) of the type used to attach the spinner dome will permit convenient balance weight attachment on the engine side of the bulkhead.

(5) Alternatively, drilling holes for use with the AN3-( ) type bolts with self-locking nuts is permitted.

(6) Chadwick-Helmuth Manual AW-9511-2, “The Smooth Propeller”, specifies several generic bulkhead repair procedures. These are permitted if they comply with the conditions specified herein.

D. Placement of Balance Weights for Dynamic Balance

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

(1) The preferred method of attachment of dynamic balance weights is to add the weights to the spinner bulkhead.

NOTE: Many spinner bulkheads have factory installed self-locking nut plates provided for this purpose.

(2) If the location of static balance weights has not been altered, 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.

(4) 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 washer are: ID 0.203 inch (5.16 mm), OD 0.875 inch (22.23 mm), and thickness 0.063 inch (1.59 mm).

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

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

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

CAUTION: IF REFLECTIVE TAPE IS USED FOR DYNAMIC BALANCING, REMOVE THE TAPE IMMEDIATELY UPON COMPLETION. TAPE THAT REMAINS ON THE BLADE WILL PERMIT MOISTURE TO COLLECT UNDER THE TAPE AND CAUSE CORROSION THAT CAN PERMANENTLY DAMAGE THE BLADE.

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

(8) If reflective tape is used for dynamic balancing, remove the tape immediately after balancing is completed.

(9) Make a record in the propeller logbook of the number and location of dynamic balance weights, and static balance weights if they have been reconfigured.

9. Propeller Low Pitch Setting

WARNING 1: RPM ADJUSTMENTS MUST BE MADE WITH REFERENCE TO A CALIBRATED TACHOMETER. AIRCRAFT MECHANICAL TACHOMETERS DEVELOP ERRORS OVER TIME, AND SHOULD BE PERIODICALLY RECALIBRATED TO MAKE SURE THE PROPER RPM IS DISPLAYED.

WARNING 2: LOW PITCH BLADE ANGLE ADJUSTMENTS MUST BE MADE IN ACCORDANCE WITH THE APPLICABLE TYPE CERTIFICATE OR SUPPLEMENTAL TYPE CERTIFICATE HOLDER'S MAINTENANCE DATA.

A. Low Pitch Stop - All Propeller Models

(1) The propeller low pitch stop is set at Hartzell Propeller in accordance with the aircraft TC or STC Holder's requirements and should not require any additional adjustment.

(2) The TC or STC Holder provides the required low pitch stop blade angle and may also provide the acceptable RPM range for a maximum power static condition.

(a) Be aware that the aircraft TC or STC holder may specify the static RPM to be less than the RPM to which the engine is rated.

(3) An overspeed at the maximum power static condition may indicate that the propeller low-pitch blade angle is set too low or that the governor is improperly adjusted.

(4) An underspeed during the maximum power static condition may be caused by any one or a combination of the following:

(a) The propeller low pitch blade angle is too high

(b) The governor is improperly adjusted

(c) The engine is not producing rated power

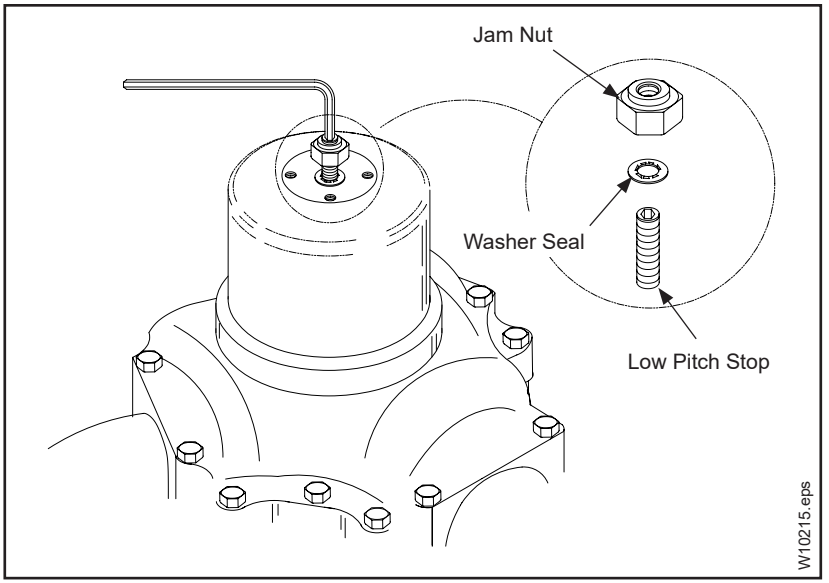
B. Maximum RPM (Static) Low Pitch Stop Adjustment

WARNING: SIGNIFICANT ADJUSTMENT OF THE LOW PITCH STOP TO ACHIEVE THE SPECIFIED STATIC RPM MAY MASK AN ENGINE POWER PROBLEM.

(1) Refer to the following applicable procedure for accomplishing an adjustment to the low pitch angle:

(a) Non-Feathering (-1, -4) Low Pitch Stop Adjustment

1 Loosen the jam nut while holding the low pitch stop with an allen wrench to prevent the low pitch stop from turning. Refer to Figure 6-9.



Low Pitch Stop Adjustment (-1, -4)
Figure 6-9

2 Turning the low pitch stop in will increase blade pitch to reduce RPM, and turning the low pitch stop out will lower blade pitch and increase RPM. The low pitch stop has 24 threads per inch.

a Turning the low pitch stop 3/4 of a turn equals 0.030 inch (0.76 mm) of linear travel, and will change the blade pitch by approximately one degree. One degree of blade pitch will change the engine RPM by approximately 140-150 RPM.

b Turning the low pitch stop screw one revolution equals 0.042 inch (1.06 mm) of linear travel, and results in approximately 1.4 degree blade angle change. A 1.4 degree blade angle change results in an RPM increase/decrease of approximately 200 RPM.

WARNING: A MINIMUM OF FIVE THREADS IN THE CYLINDER MUST ENGAGE THE LOW PITCH STOP AFTER ADJUSTMENT IS COMPLETED.

3 When the low pitch stop is adjusted, torque the low pitch stop jam nut in accordance with Torque Table 3-2.

4 Repeat the Static RPM Check in the Testing and Troubleshooting Chapter of this manual.

(b) Feathering (-2, -5) Low Pitch Stop Adjustment for Propellers that use a Two-piece Spinner Dome

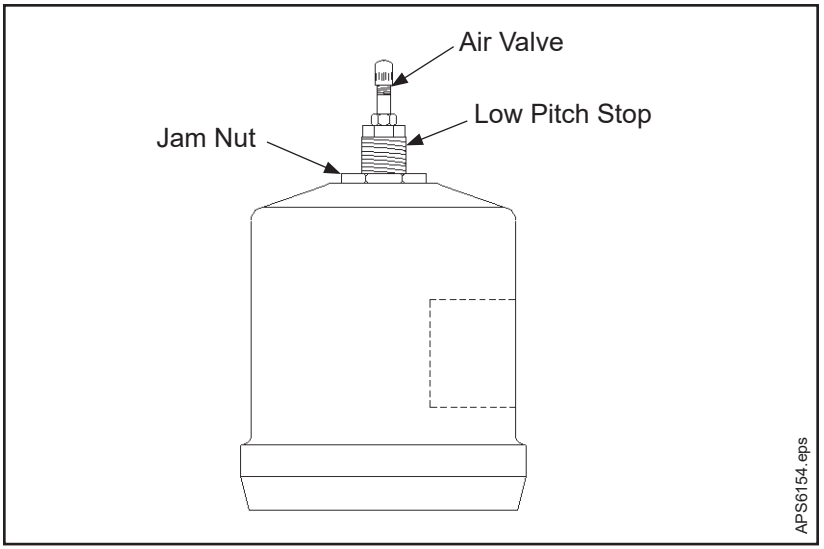
WARNING: AIR PRESSURE (-2, -5 PROPELLERS) MUST BE REDUCED TO 0 PSI BEFORE ANY LOW PITCH ADJUSTMENT MAY BE MADE.

1 Loosen the jam nut while holding the low pitch stop with a wrench to prevent the low pitch stop from turning.

2 Turning the low pitch stop into the cylinder will increase blade pitch and reduce RPM, and turning the low pitch stop out of the cylinder will lower blade pitch and increase RPM. The low pitch stop has 20 threads per inch. Refer to Figure 6-10.

a Turning the low pitch stop 2/3 of a turn equals 0.030 inch (0.76 mm) of linear travel, and will change the blade pitch by approximately one degree. One degree of blade pitch will change the engine RPM by approximately 140-150 RPM.

b Turning the low pitch stop screw one full turn equals 0.050 inch (1.27 mm) of linear travel, and results in approximately 1.7 degree blade angle change. A 1.7 degree blade angle change results in an RPM increase/decrease of approximately 250 RPM.



Low Pitch Stop Adjustment (-2, -5) for Propellers that use a Two-piece Spinner Dome
Figure 6-10

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.

3 Using a clean cloth moistened with MEK CM106 or MPK CM219, carefully remove any sealant from the exposed threads of the low pitch stop.

WARNING: A MINIMUM OF FIVE THREADS IN THE CYLINDER MUST ENGAGE THE LOW PITCH STOP AFTER ADJUSTMENT IS COMPLETED.

4 When the low pitch stop is adjusted, apply threadlocker CM21 to the threads of the jam nut.

5 Torque the low pitch stop jam nut in accordance with Torque Table 3-2.

6 Repeat the Static RPM Check in the Testing and Troubleshooting chapter of this manual.

(c) Feathering (-2, -5) Low Pitch Stop Adjustment, for Propellers that use a One-piece Spinner Dome

WARNING: AIR PRESSURE (-2 PROPELLERS) MUST BE REDUCED TO 0 PSI BEFORE ANY LOW PITCH ADJUSTMENT MAY BE MADE.

1 If a visual examination shows that the hardware configuration is not one hex nut safety wired to a set screw, the propeller assembly may be modified to the hardware configuration of one hex nut safety wired to a set screw in accordance with the section, "Modification of the Low Pitch Stop Hardware" in the Maintenance Practices chapter of this manual.

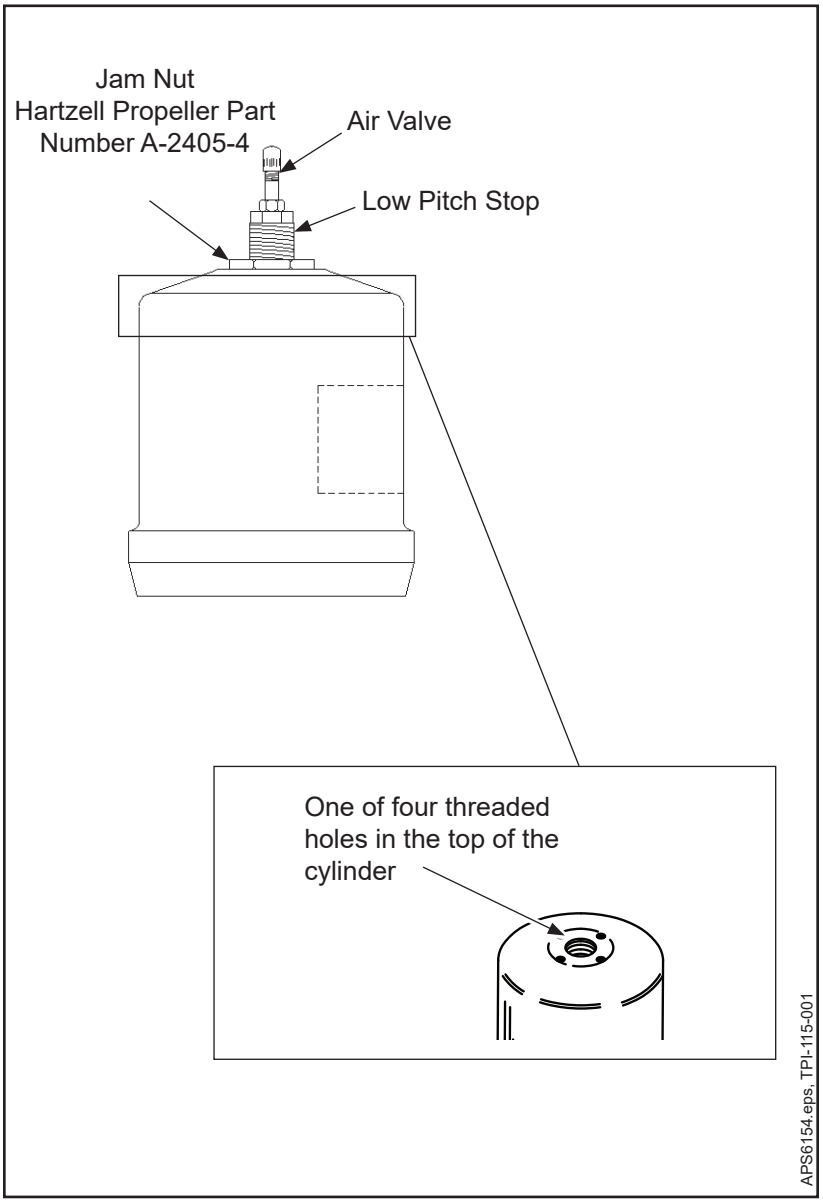
a Some propellers models are required to be modified to the new configuration. For the affected propeller models, refer to the section, "Required Periodic Inspections and Maintenance" in the Inspection and Check chapter of this manual.

2 While holding the low pitch stop with a wrench to prevent the low pitch stop from turning, use a second wrench to loosen the jam nut.

3 Turning the low pitch stop into the cylinder will increase blade pitch and reduce RPM, and turning the low pitch stop out of the cylinder will lower blade pitch and increase RPM. The low pitch stop has 20 threads per inch. Refer to Figure 6-11.

a Turning the low pitch stop 2/3 of a turn equals 0.030 inch (0.76 mm) of linear travel, and will change the blade pitch by approximately one degree. One degree of blade pitch will change the engine RPM by approximately 140-150 RPM.

b Turning the low pitch stop screw one full turn equals 0.050 inch (1.27 mm) of linear travel, and results in approximately 1.7 degree blade angle change. A 1.7 degree blade angle change results in an RPM increase/decrease of approximately 250 RPM.



Low Pitch Stop Adjustment (-2, -5) for Propellers that use a One-piece Spinner Dome
Figure 6-11

4 Using a clean cloth moistened with MEK CM106 or MPK CM219, carefully remove any sealant from the exposed threads of the low pitch stop.

WARNING: A MINIMUM OF FIVE THREADS IN THE CYLINDER MUST ENGAGE THE LOW PITCH STOP AFTER ADJUSTMENT IS COMPLETED.

5 When the low pitch stop is adjusted, apply threadlocker CM21 to the threads of the jam nut.

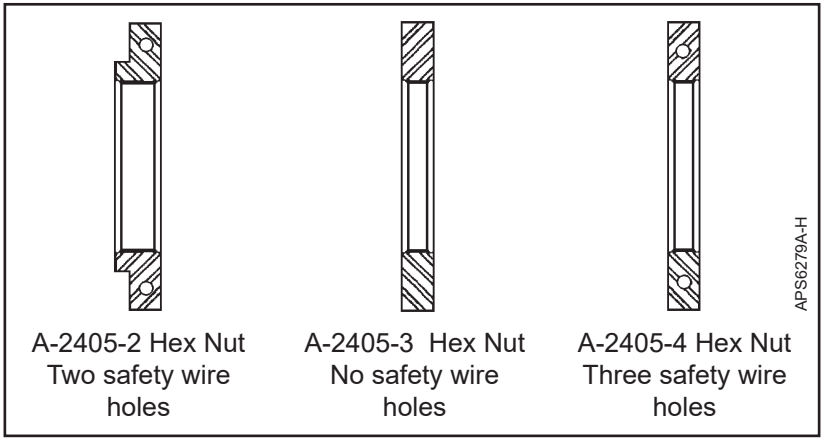
6 Torque the low pitch stop jam nut in accordance with Torque Table 3-2.

7 Install a B-7589 set screw in one of the four threaded holes in the top of the cylinder. Refer to Figure 6-11.

a The top of the set screw must be below the surface of the hex nut.

8 Safety the hex nut and the set screw in accordance with military standard MS33540 using 0.032 inch (0.81 mm) stainless steel safety wire unless specified differently.

9 Repeat the Static RPM Check in the Testing and Troubleshooting Chapter of this manual.



Hex Nut Configuration
Figure 6-12

C. Modification of the Low Pitch Stop Hardware

(1) General

(a) The instructions in this section are applicable to -2 and -5 propeller assemblies that use a one piece spinner dome.

(b) This section provides the instructions to change from the configuration of two hex nuts securing the low pitch stop to the new hardware of one hex nut safety wired to a set screw.

(2) Material Requirements

(a) For lock nut identification, refer to Figure 6-12 in this chapter.

Old Part Number	New Part Number	Description	Qty per Assembly
A-2405-2	--	Hex Nut	0
A-2405-3	--	Hex Nut	0
A-169-7	--	Spacer	0
--	A-2405-4	Hex Nut	1
--	B-7589	Set Screw	1

NOTE: Only one hex nut is used on low pitch stop for each propeller assembly.

(b) Consumables

CM21 A-6741-21 Loctite 222 Threadlocker

(3) Procedure

CAUTION: WRAP THE BLADE SHANKS IN SEVERAL LAYERS OF MASKING OR DUCT TAPE BEFORE REMOVING THE SPINNER DOME TO PREVENT DAMAGING THE BLADE AND BLADE PAINT.

(a) Remove the screws and washers that secure the spinner dome to the spinner bulkhead.

(b) Remove the spinner dome.

CAUTION: SECURE THE LOW PITCH STOP BEFORE REMOVING THE HEX NUTS.

(c) While holding the low pitch stop with a wrench to prevent the low pitch stop from turning, use a second wrench to remove the jam nuts.

(d) Discard the hex nuts and any spacers from the low pitch stop.

WARNING: DO NOT REMOVE THE LOW PITCH STOP WITHOUT RELIEVING THE AIR PRESSURE.

(e) Using a clean cloth moistened with MEK CM106 or MPK CM219, carefully remove any sealant from the exposed threads of the low pitch stop.

(f) Apply threadlocker CM21 to the threads of a new A-2405-4 hex nut.

(g) Install the A-2405-4 hex nut on the low pitch stop.

(h) Torque the low pitch stop jam nut in accordance with Torque Table 3-2.

(i) Install B-7589 set screw in one of the four threaded holes in the top of the cylinder. Refer to Figure 6-11.

1 The top of the set screw must be below the surface of the hex nut.

(j) Safety the hex nut and the set screw in accordance with military standard MS33540 using 0.032 inch (0.81 mm) stainless steel safety wire unless specified differently.

(k) Install the spinner dome in accordance with the applicable section in the Installation and Removal chapter of this manual.

(l) Repeat the Static RPM Check in the Testing and Troubleshooting Chapter of this manual.

(m) Make a logbook entry indicating compliance with this section "Modification of the Low Pitch Stop Hardware".

10. Propeller High Pitch Settings (Rev. 2)
    A. High Pitch (Min. RPM) Stop Adjustment
        (1) The high pitch stop is set by Hartzell Propeller in accordance with the aircraft manufacturer's recommendations.
        (2) The high pitch stop can only be adjusted by Hartzell or by a certified propeller repair station with the appropriate rating.
11. Start Lock Settings (Rev. 2)
    A. Start Lock Adjustment
        (1) The start locks are set by Hartzell Propeller in accordance with the aircraft manufacturer's recommendations.
        (2) The start locks can only be adjusted by Hartzell or by a certified propeller repair station with the appropriate rating.
12. Propeller Ice Protection Systems (Rev. 1)
    A. Maintenance Information
        (1) Refer to the Anti-ice and De-ice Systems chapter of this manual for ice protection system maintenance information.
13. Tachometer Calibration (Rev. 2)

    WARNING: OPERATION WITH AN INACCURATE TACHOMETER CAN CAUSE RESTRICTED RPM OPERATION AND DAMAGING HIGH STRESSES. PROPELLER LIFE WILL BE SHORTENED AND COULD CAUSE CATASTROPHIC FAILURE.

    A. Important Information
        (1) All engine/propeller combinations have operating conditions at which the propeller blade stresses begin to reach design limits.
            (a) In most cases, these conditions occur above the maximum rated RPM of the engine.

(b) Some engine/propeller combinations have certain ranges of RPM that are less than maximum engine speed, where stresses are at a level considered too high for continuous operation. This results in a restricted operating range where continuous operation is not permitted. A placard on the instrument panel or yellow arc on the tachometer will inform the pilot to avoid operation in this range.

(c) In other cases, the limiting condition occurs at an RPM only slightly above the maximum engine RPM.

(d) For these reasons, it is very important to accurately monitor engine speed.

(2) The accuracy of the tachometer is critical to the safe operation of the aircraft.

(a) Some tachometers have been found to be in error by as much as 200 RPM.

(b) Operating the aircraft with an inaccurate tachometer could cause continued operation at unacceptably high stresses, including repeatedly exceeding the maximum engine RPM.

(c) Continuous operation in a restricted RPM range subjects the propeller to stresses that are higher than the design limits.

(d) Stresses that are higher than the design limits will shorten the life of the propeller and could cause a catastrophic failure.

B. Tachometer Calibration

(1) Hartzell Propeller recommends that propeller owners/operators calibrate the engine tachometer in accordance with the National Institute of Standards and Technology (NIST) or similar national standard (traceable).

(2) Contact Hartzell Propeller if the propeller was operated in a restricted RPM range because of a tachometer error.

ANTI-ICE AND DE-ICE SYSTEM - CONTENTS

(Blank Page)

1. Anti-ice System Description (Rev. 1)

WARNING: CONSULT THE PILOT OPERATING HANDBOOK (INCLUDING ALL SUPPLEMENTS) REGARDING FLIGHT INTO CONDITIONS OF KNOWN ICING. THE AIRCRAFT MAY NOT BE CERTIFICATED FOR FLIGHT INTO KNOWN ICING CONDITIONS, EVEN THOUGH AN ICE PROTECTION SYSTEM IS INSTALLED.

NOTE: There are many configurations of anti-ice systems. This section provides a general overview of system operation. Consult the airframe manufacturer's manual for a description of your specific anti-ice system and controls.

A. Overview of an Anti-ice System

(1) A propeller anti-ice system prevents formation of ice on the propeller blades. The system dispenses a liquid (usually isopropyl alcohol) onto the propeller blades. This liquid mixes with moisture on the blades and lowers the freezing point of the water, allowing the water/alcohol mixture to flow off the blades before ice forms.

(a) Anti-ice systems must be in use before ice forms. This system is not effective for removing ice after it has formed.

B. Components of an Anti-ice System

(1) A typical anti-ice system includes the following components:

(a) Fluid tank, pump, slinger ring, blade mounted anti-icing boots, and fluid dispensing tubes located at each blade mounted anti-icing boot.

C. Anti-ice System Operation

(1) The anti-ice system is typically controlled by the pilot using a cockpit mounted rheostat. This rheostat controls the pump and the flow of anti-ice fluid from the fluid tank.

(2) The anti-ice fluid is pumped through airframe mounted distribution tubing and into a rotating slinger ring that is mounted on the rear of the propeller hub.

(3) From the slinger ring, centrifugal force pushes the anti-icing fluid through the fluid dispensing tubes onto the blade mounted anti-icing boots.

(4) The anti-icing boots evenly distribute the fluid along the leading edge of the propeller blade to prevent ice from forming.

2. De-ice System Description (Rev. 1)

WARNING: CONSULT THE PILOT OPERATING HANDBOOK (INCLUDING ALL SUPPLEMENTS) REGARDING FLIGHT INTO CONDITIONS OF KNOWN ICING. THE AIRCRAFT MAY NOT BE CERTIFICATED FOR FLIGHT INTO KNOWN ICING CONDITIONS, EVEN THOUGH AN ICE PROTECTION SYSTEM IS INSTALLED.

NOTE: There are many configurations of de-ice systems. This section provides a general overview of system operation. Consult the airframe manufacturer's manual for a description of your specific de-ice system and controls.

A. Overview of a De-ice System

(1) A propeller de-ice system removes ice after it forms on the propeller blades. The system uses electrical heating elements to melt the ice layer next to the blade permitting the ice to be thrown from the blade by centrifugal force.

B. Components of a De-ice System

(1) A typical de-ice system includes the following components:

(a) ON/OFF switch(es), ammeter, timer or cycling unit, slip ring, brush blocks, and blade mounted de-ice boots.

C. De-ice System Operation

(1) The de-ice system is controlled by the pilot using a cockpit control switch. When this switch is ON, electrical power is supplied to the de-ice system.

(a) Some systems may have additional controls to adjust for different icing conditions.

1 A mode selector switch lets the pilot set the cycling speed for heavy or light icing conditions.

2 For twin engine aircraft, a full de-ice mode switch lets the pilot de-ice both propellers simultaneously. This switch is used when ice builds up on the propeller before the system is turned on and may only be used for short periods.

(2) The ammeter indicates current drawn by the system. It is typically located near the de-ice system switches. The ammeter may indicate total system load, or in a twin engine aircraft, a separate ammeter may be supplied for each propeller.

(3) The timer or cycling unit is controlled by the pilot using a cockpit control switch. When the timer/cycling unit is ON, power is applied to each de-ice boot (or boot segment) in a sequential order for a preset amount of time. This heating interval evenly de-ices the propeller.

(4) The brush block supplies electrical current to the de-ice boot on each propeller blade via a slip ring. The brush block is typically mounted on the engine just aft of the propeller. The slip ring rotates with the propeller and is typically mounted on the spinner bulkhead.

(5) The de-ice boots contain internal heating elements that melt the ice layer from the blades when electrical current is applied. De-ice boots are attached to the leading edge of each blade using adhesive.

3. Operational Checks (Rev. 2)
   A. De-ice and Anti-ice Systems
      (1) Perform the applicable Operational Check procedure(s) in accordance with the Check chapter in Hartzell Propeller Ice Protection System Manual 180 (30-61-80) and/or the Aircraft Maintenance Manual.

4. Troubleshooting (Rev. 2)
   A. De-ice and Anti-ice Systems
      (1) Refer to the applicable chapter(s) in Hartzell Propeller Ice Protection System Manual 180 (30-61-80) to troubleshoot malfunctions in Hartzell de-ice and anti-ice systems.
         (a) Part numbers for components used in Hartzell de-ice and anti-ice systems are found in Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

5. Periodic Inspections (Rev. 2)
   A. De-ice and Anti-ice Systems
      (1) Refer to the Check chapter in Hartzell Propeller Ice Protection System Manual 180 (30-61-80) for detailed information about inspection intervals and procedures.

RECORDS - CONTENTS

(Blank Page)

1. Record Keeping (Rev. 2)
   A. General
      (1) Federal Aviation Regulations require that a record be kept of any repairs, adjustments, maintenance, or required inspections performed on a propeller or propeller system.
   B. Information to be Recorded
      (1) Refer to Title 14 Code of Federal Regulations (CFR) Part 43 for a list of information that must be recorded.
      (2) The logbook may also be used to record:
         (a) Propeller position (on aircraft)
         (b) Propeller model
         (c) Propeller serial number
         (d) Blade design number
         (e) Blade serial numbers
         (f) Spinner assembly part number
         (g) Propeller pitch range
         (h) Aircraft information (aircraft type, model, serial number and registration number)

(Blank Page)