FAA Approved
Manual No. 175
61-00-75
Revision 1
June 2011

Propeller Owner's Manual
and Logbook

Steel Hub Reciprocating Propellers with Aluminum Blades

Two Blade	Three Blade
HC-82(X,V)(F,K,L)-1( )( )	**HC-83(X,V)20-1( )( )( )**
HC-82(X,V)(F,K,L)-2( )( )	**HC-83(X,V)20-2( )( )**
HC-82(X,V)(F,L)-6( )( )( )	**HC-83(X,V)F-2( )( )**
	HC-83(X,V)F-3( )( )

WARNING 1: THESE PROPELLER MODELS ARE OBSOLETE. THIS MANUAL IS NOT MAINTAINED BY HARTZELL PROPELLER INC. THE FAA REQUIRES THAT THIS DOCUMENT CONTINUE TO BE MADE AVAILABLE.

WARNING 2: REFER TO HARTZELL PROPELLER INC. SERVICE BULLETIN HC-SB-61-331 FOR INFORMATION ABOUT PROPELLER MODEL UPGRADE FROM “1” OR “8” STYLE HUBS TO “D” OR “A” STYLE HUBS.

WARNING 3: HARTZELL PROPELLER INC. COMMERCIAL SUPPORT FOR THE PROPELLER MODELS CONTAINED IN THIS MANUAL IS NOT AVAILABLE.

WARNING 4: USE OF OBSOLETE MAINTENANCE INFORMATION OR PARTS THAT HAVE UNKNOWN HISTORIES IS NOT APPROVED BY HARTZELL PROPELLER INC. AND MAY CREATE AN UNSAFE CONDITION THAT COULD RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE.

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Piqua, OH 45356-2634 U.S.A.
Ph: 937-778-4200 (Hartzell Propeller Inc.)
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Product Support Fax: 937-778-4391

As a fellow pilot, 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.

Jim Brown
Chairman, Hartzell Propeller Inc.

WARNING

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 Inc. 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.

Visually inspect metal blades for cracks. Inspect hubs, with particular emphasis on each blade arm for cracks. Eddy current equipment is recommended for hub inspection, since cracks are usually not apparent.

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REVISION HIGHLIGHTS:

Revision 1, dated June 2011, incorporates the following:

- Revised Cover, Revision Highlights, List of Effective Pages, and Table of Contents to reflect changes
- Service Documents List section
  - Added new Caution statements
- Added Airworthiness Limitations section
- Introduction Chapter
  - Added information to explain the use of ( ) in a propeller model designation
  - Revised information about ice-protection systems
  - Updated Reference Publications section
  - Added information about Hartzell Recommended Facilities
- Installation and Removal Chapter
  - Revised references about ice protection systems
  - Clarified use of aviation grade reciprocating engine oil for lubrication of felt dust seal
- Testing and Troubleshooting Chapter
  - Add Static RPM Check to Operational Tests section
  - Relocated previous Propeller Equipment and Settings information to the Maintenance Practices Chapter
  - Relocated Maximum RPM information from the Maintenance Practices Chapter to the Testing and Troubleshooting chapter
- Inspection and Check Chapter
  - Revised the Preflight Checks section
  - Revised the Operational Checks section
  - Revised Airworthiness Limitations section
  - Updated Long Term Storage Information
- Maintenance Practices Chapter
  - Added information about mixing Aeroshell greases 5 and 6
  - Updated the Painting After Repairs section
  - Added Caution and Warning to Blade Repairs section
  - Updated Dynamic Balance section
  - Relocated Propeller Equipment Settings information from the Testing and Troubleshooting chapter to the Maintenance Practices chapter
- Anti-Ice and De-Ice System Chapter
  - Updated reference information

REVISIONS HIGHLIGHTS

1. Introduction

   A. General

      This is a list of current revisions that have been issued against this manual. Please compare it to the RECORD OF REVISIONS page to ensure 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
Original	Dec/05	New Issue
Revision 1	Jun/11	Minor Revision

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RECORD OF REVISIONS

Rev. No.	Issue Date	Date Inserted	Inserted By
Rev. 1	Jun/11	Jun/11	HPI

RECORD OF REVISIONS

Rev. No.	Issue Date	Date Inserted	Inserted By

RECORD OF TEMPORARY REVISIONS

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

RECORD OF TEMPORARY REVISIONS

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

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
HC-SL-61-176	Original, Dec/05

SERVICE DOCUMENTS LIST

Service Document Number	Incorporation Rev/Date

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

by: John M. Jallouni for date: 30 Jun 2011

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

Rev. No.	Description of Revision

AIRWORTHINESS LIMITATIONS

1. 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.
2. 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 (that may or may not be life limited).
   A. Propeller models affected by this manual currently do not have any life limited parts.
   B. There are no new (or additional) Airworthiness Limitations associated with this equipment and/or installation.

FAA APPROVED

by: John M. Tallarico date: 30 Jun 2011

For

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

LIST OF EFFECTIVE PAGES

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Revision Highlights	7 and 8	Rev. 1	Jun/11
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1. Purpose

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

A. This manual supports the following two and three-bladed, "8" type steel hub reciprocating propellers: constant speed, nonfeathering; constant speed, feathering; constant speed, reversing; and constant speed, feathering, and reversing.

NOTE: All propeller models included in this manual use aluminum propeller blades.

B. The purpose of this manual is to enable qualified personnel to install, operate, and maintain a Hartzell propeller. Separate manuals are available concerning overhaul procedures and specifications for the propeller.

C. This manual includes several design types.

(1) Sample hub and blade model numbers within this design are included in the Description and Operation chapter of this manual.

(2) Parentheses shown in the propeller model designations in this or other Hartzell 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.

(3) Definitions of propeller model designations and further details of letters that may be present are shown in the Description and Operation chapter of this manual.

2. Airworthiness Limitations

A. Refer to the Airworthiness Limitations section of this manual for Airworthiness Limits information.

3. Airframe or Engine Modifications

   A. 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 flight maneuvers. Aircraft modifications, which can effect 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), and the addition of approved flight maneuvers (utility and aerobatic).

   B. 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 increase the maximum power output, while others improve the power available during hot and high operation (flat rating) or at off-peak conditions. Examples of such engine modifications include, but are not limited to: changes to the compressor, power turbine or hot section of a turboprop engine; and on piston engines, 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.

   C. All such modifications must be reviewed and approved by the propeller manufacturer before obtaining approval on the aircraft.

4. Restrictions and Placards

   The propellers covered by this manual may have a restricted operating range that requires a cockpit placard. The restrictions, if present, will vary depending on the propeller, blade, engine, and/or aircraft model. Review the propeller and aircraft type certificate data sheet (TCDS), Pilot Operating Handbook (POH), and any applicable Airworthiness Directives for specific information.

5. General

   A. Personnel Requirements

      Personnel performing maintenance are expected to have sufficient training and certifications (when required by the applicable Aviation Authority) to accomplish the work required in a safe and airworthy manner.

   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 place the blade paddle in the area of the de-ice boot when applying torque to a blade assembly. Place the blade paddle in the thickest area of the blade, just outside of the de-ice boot. Use one blade paddle for each 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. Overhauled propellers must be statically balanced by the overhaul facility before return to service.

NOTE: Dynamic balance is recommended, but may be accomplished at the discretion of the operator, unless specifically required by the airframe or engine manufacturer. Dynamic balancing is to be accomplished in accordance with the procedures and limitations in the Maintenance Practices chapter of this manual. 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 National Aerospace Standards Committee NASM33540 and/or the latest revision of FAA Advisory circular 43.13 for safety wire and cotter pin general practices. Use 0.032 inch (0.81 mm) diameter stainless steel safety wire unless otherwise indicated.

(9) 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.

(10) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information for the components supplied by Hartzell can be found in the following publications that are available on the Hartzell web site at www.hartzellprop.com:

(a) Manual 180 (30-61-80) - Propeller Ice Protection System Manual

(b) Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

(c) Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual

(d) Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual

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

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

(13) 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.

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

(a) For information concerning the application of corrosion protection and paint, refer to the Maintenance Practices chapter of this manual.

(b) Operation of blades without the specified coatings and finishes, i.e., "polished blades", is not permitted.

C. Continued Airworthiness

(1) Operators are urged to stay informed of airworthiness information via Hartzell Service Bulletins and Service Letters which are available from Hartzell distributors, or from the Hartzell factory by subscription. Selected information is also available on Hartzell Propeller's web site at www.hartzellprop.com.

6. Reference Publications

The following publications contain information vital to the airworthiness of the propeller models covered in this manual:

Hartzell Manual No. 114B - Overhaul Manual

Hartzell Manual No. 127 (61-16-27) - Spinner Assembly Maintenance

Hartzell Manual No. 130B (61-23-30) - Governor Overhaul Manual

Hartzell Manual No. 133C (61-13-33) - Aluminum Propeller Blade Maintenance Manual

Hartzell Manual No. 159 (61-02-59) - Application Guide - Also available on the Hartzell Propeller Inc. web site at www.hartzellprop.com.

Hartzell Manual No. 165A (61-00-65) - Illustrated Tool and Equipment Manual.

Hartzell Manual No. 180 (30-61-80) - Propeller Ice Protection System Manual (Also available on the Hartzell web site at www.hartzellprop.com.)

Hartzell Manual No. 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual (Also available on the Hartzell web site at www.hartzellprop.com.)

Hartzell Manual No. 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual (Also available on the Hartzell web site at www.hartzellprop.com.)

Hartzell Manual No. 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual (Also available on the Hartzell web site at www.hartzellprop.com.)

Hartzell Manual No. 202A (61-01-02) - Standard Practices Manual - Volumes 1 through 11

Active Hartzell Service Bulletins, Service Letters, Service instructions, and Service Advisories.

Hartzell Service Letter HC-SL-61-61Y - Overhaul Periods and Service Life Limits for Hartzell Propellers, Governors, and Propeller Damper Assemblies - Also available on the Hartzell Propeller Inc. web site at www.hartzellprop.com.

7. Definitions

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
Blade Angle	Measurement of blade airfoil location described as the angle between the blade airfoil and the surface described by propeller rotation
Brinelling	A depression caused by failure of the material in compression
Chord	A straight line distance between the leading and trailing edges of an airfoil
Cold Rolling	Compressive rolling process for the retention area of single shoulder blades that provides improved strength and resistance to fatigue
Constant Force	A force that is always present in some degree when the propeller is operating
Constant Speed	A propeller system that employs a governing device to maintain a selected engine RPM
Corrosion	Gradual material removal or deterioration due to chemical action
Crack	Irregularly shaped separation within a material, sometimes visible as a narrow opening at the surface
Depression	Surface area where the material has been compressed but not removed.
Distortion	Alteration of the original shape or size of a component

Term	Definition
Erosion	Gradual wearing away or deterioration due to action of the elements
Exposure	Leaving material open to action of the elements
Feathering	The capability of blades to be rotated parallel to the relative wind, thus reducing aerodynamic drag
Gouge	Surface area where material has been removed
Horizontal Balance	Balance between the blade tip and the center of the hub
Impact Damage	Damage that occurs when the propeller blade or hub assembly strikes, or is struck by, an object while in flight or on the ground
Nick	Removal of paint and possibly a small amount of material
Onspeed	Condition in which the RPM selected by the pilot through the propeller control lever and the actual engine (propeller) RPM are equal
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 lever

Term	Definition
Overspeed Damage	Damage that occurs when the propeller hub assembly rotates at a speed greater than the maximum limit for which it is designed
Pitch	Same as "Blade Angle"
Pitting	Formation of a number of small, irregularly shaped cavities in surface material caused by corrosion or wear
Reversing	The capability of rotating blades to a position to generate reverse thrust to slow the aircraft or back up
Scratch	Same as "Nick"
Single Acting	Hydraulically actuated propeller that utilizes a single oil supply for pitch control
Superseded	Parts that are considered airworthy for continued flight but may no longer be available
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
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

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 lever
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
Windmilling	The rotation of an aircraft propeller caused by air flowing through it while the engine is not producing power

8. Abbreviations

Abbreviation	Term
AMM	Aircraft Maintenance Manual
AN	Air Force-Navy (or Army-Navy)
AOG	Aircraft on Ground
FAA	Federal Aviation Administration
Ft-Lb	Foot-Pound
ID	Inside Diameter
In-Lb	Inch-Pound
Lbs	Pounds
MIL-X-XXX	Military Specification
MPI	Major Periodic Inspection
MS	Military Standard
NAS	National Aerospace Standards
N•m	Newton-Meters
OD	Outside Diameter
POH	Pilot Operating Handbook
PSI	Pounds per Square Inch
RPM	Revolutions per Minute
TBO	Time Between Overhaul
TSN	Time Since New
TSO	Time Since Overhaul

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

9. Hartzell Product Support

Hartzell Propeller is ready to assist you with questions concerning your propeller system. Hartzell Product Support may be reached during business hours (8:00 a.m. through 5:00 p.m., United States Eastern Time) at (937) 778-4379 or at (800) 942-7767, toll free from the United States and Canada. Hartzell Product Support can also be reached by fax at (937) 778-4391, and by e-mail at techsupport@hartzellprop.com.

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. A technical representative will contact you during normal business hours. Urgent AOG support is also available 24 hours per day, seven days per week via this message service.

Additional information is available on our web site at www.hartzellprop.com.

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

10. Warranty Service

If you believe you have a warranty claim, it is necessary to contact Hartzell's Warranty Administrator. The Hartzell Warranty Administrator will provide a blank Warranty Application form. It is necessary to complete this form and return it to the Warranty Administrator for evaluation **before proceeding with repair or inspection work**. Upon receipt of this form, the Warranty Administrator will provide instructions on how to proceed. Hartzell Warranty may be reached during business hours (8:00 a.m. through 5:00 p.m., United States Eastern Time) at (937) 778-4379, or toll free from the United States and Canada at (800) 942-7767. Hartzell Warranty Administration can also be reached by fax, at (937) 778-4391, or by e-mail at warranty@hartzellprop.com.

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

11. Hartzell Recommended Facilities

A. Hartzell Propeller Inc. recommends using Hartzell approved distributors and service facilities for the purchase, repair and overhaul of Hartzell propeller assemblies or components.

B. Information about the Hartzell worldwide network of aftermarket distributors and approved service facilities is available on the Hartzell web site at www.hartzellprop.com.

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CONTENTS Page

FIGURES Page

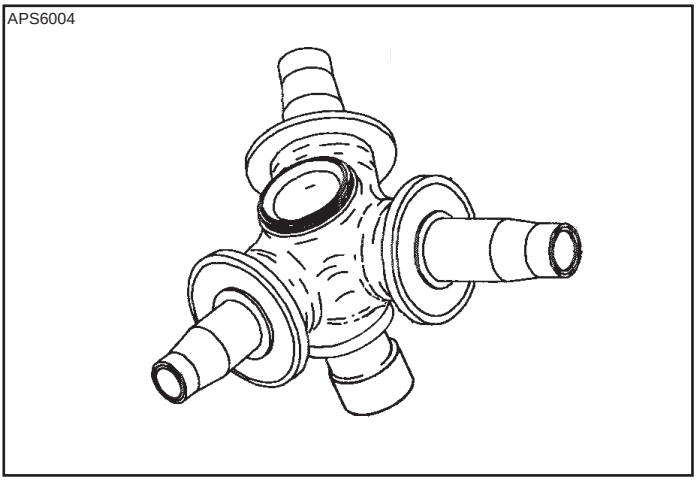
1. Description of Propeller and Systems

Hartzell steel hub propellers covered in this manual are constant speed assemblies that use a steel hub as a central component (Figure 2-1).

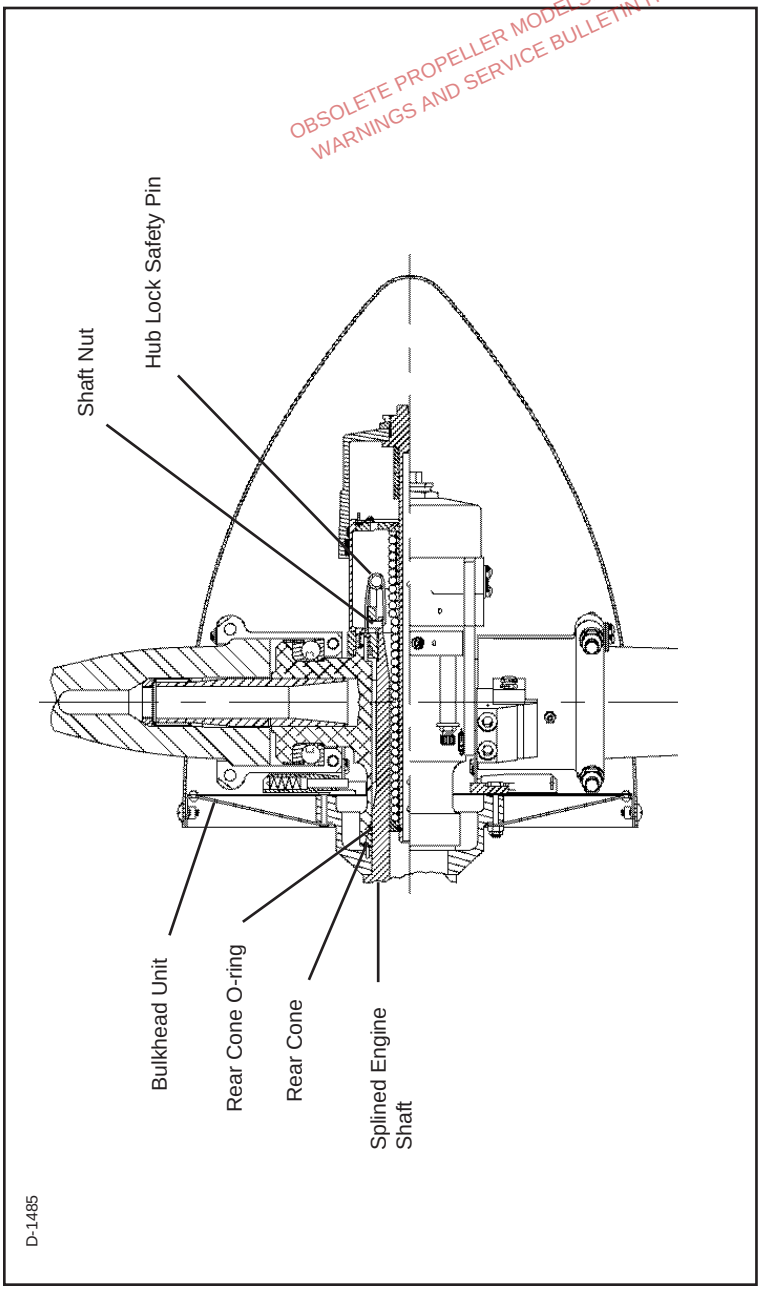
The propeller attaches to the engine through either a splined shaft or one of several flanged designs. On models covered in this manual, the spline shaft attachment uses a Society of Automotive Engineers (SAE) Number 20 spline (Figure 2-2).

NOTE: SAE Number 20 spline shaft propellers are identified simply as "20 spline shaft" propellers throughout the text of this manual.

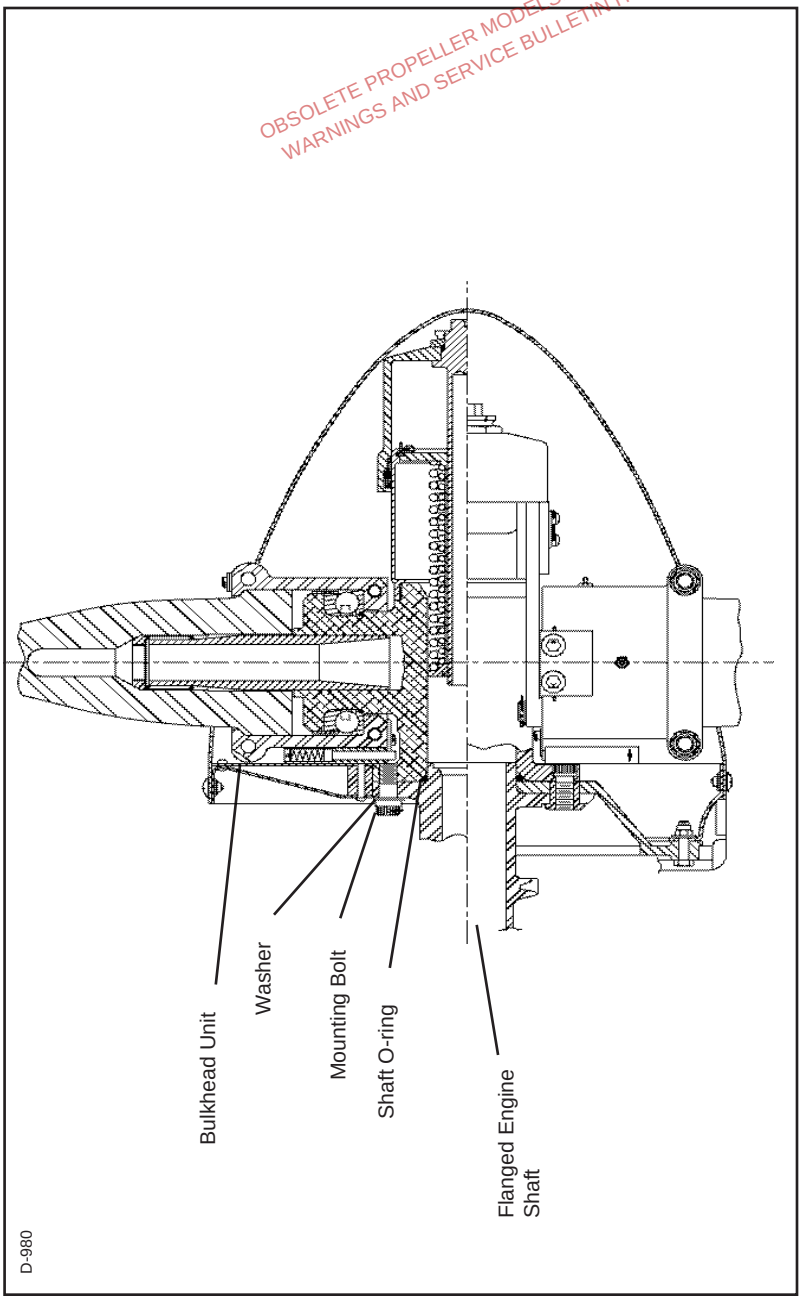
A flanged shaft attachment uses a six bolt and two dowel pin interface or a six bolt and four bushing interface between the engine and the propeller flange (Figure 2-3).



Steel Hub Unit (For Splined Shaft Mounting)
Figure 2-1



Spline Shaft Attachment
Figure 2-2



Flanged Attachment
Figure 2-3

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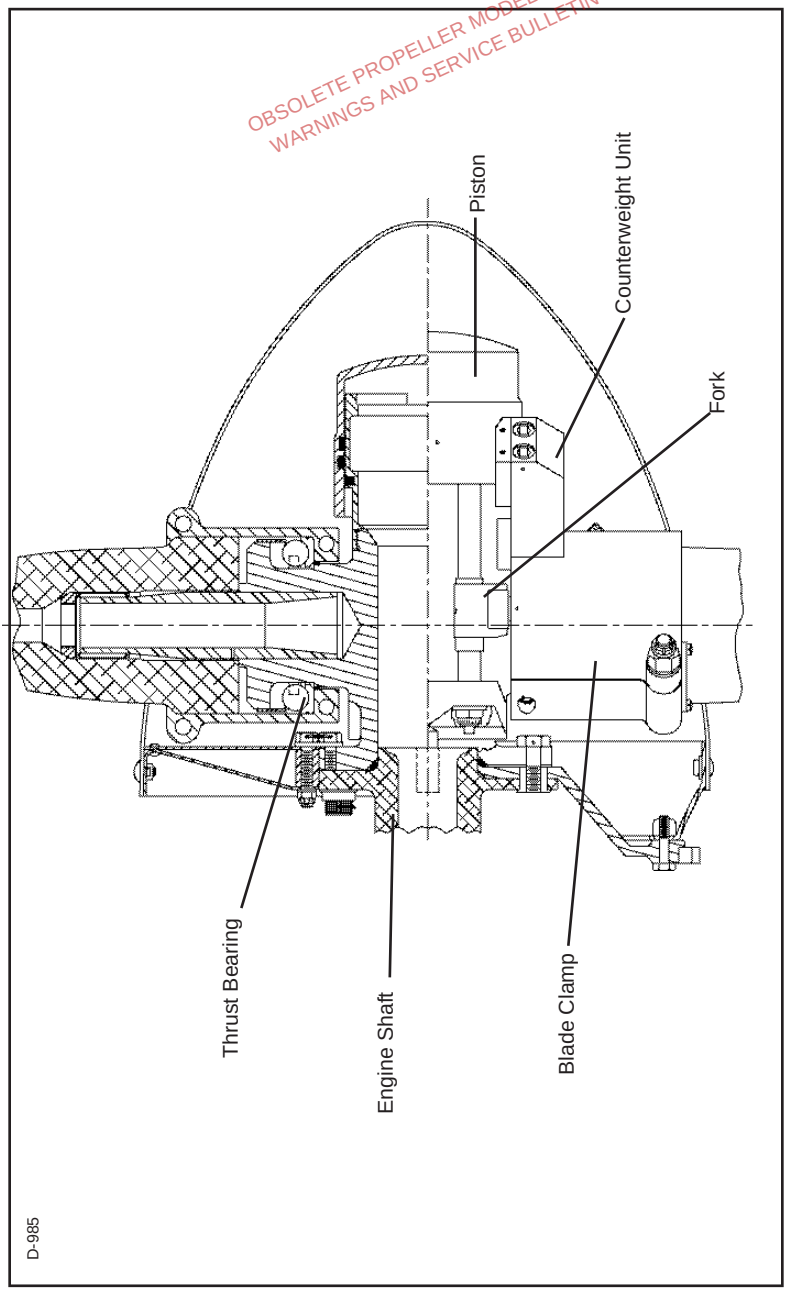
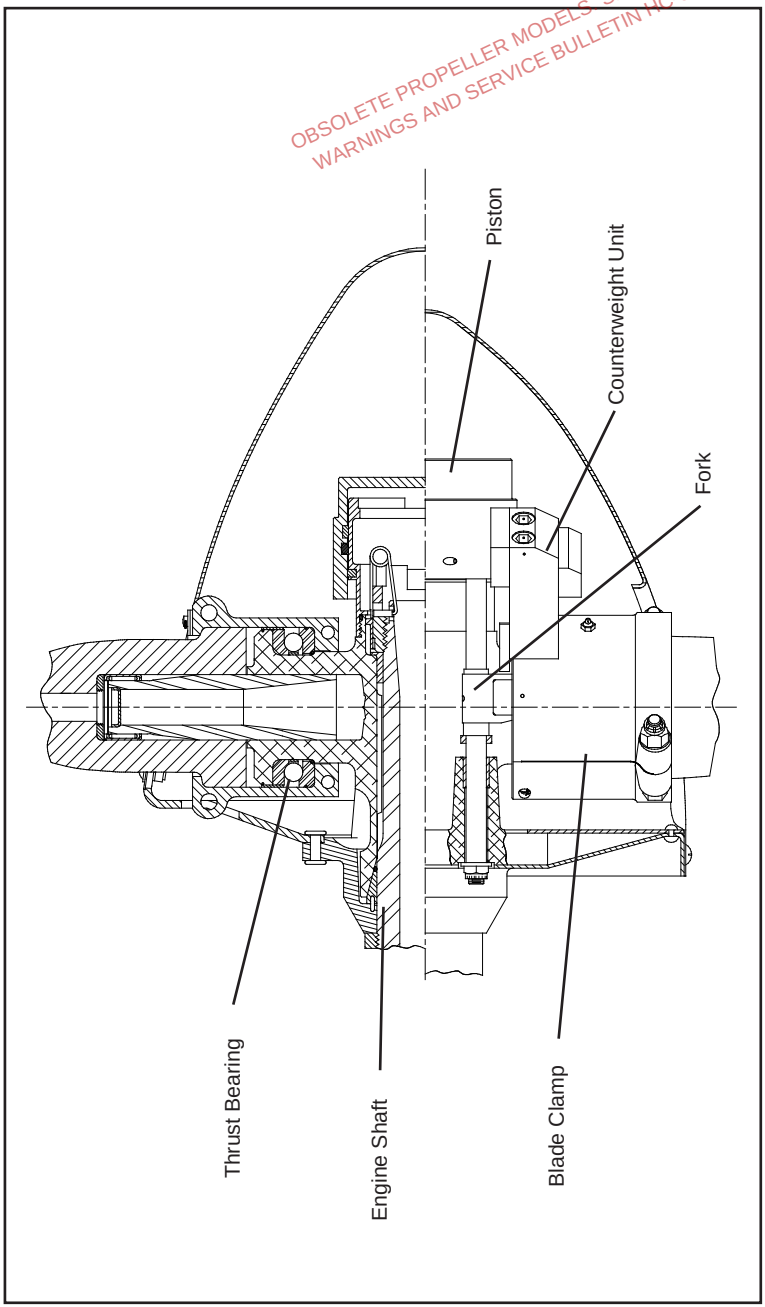


Constant Speed, Counterweighted, Nonfeathering Propeller Assembly
Figure 2-4



Constant Speed, Counterweighted, Nonfeathering Propeller Assembly
Figure 2-5

A. Constant Speed, Counterweighted, Nonfeathering Propellers

Propeller models HC-82(X,V)(F,K,L)-1( )( ) and HC-83(X,V)20-1( )( ). Refer to Figure 2-6.

Constant speed counterweighted, nonfeathering propellers are typically used on single engine aircraft.

Propeller blade angle change is actuated by 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 sliding rod and fork system, connected to a blade clamp that rotates with the blade. Each blade is retained on the propeller hub by a blade clamp and thrust bearing. The thrust bearing permits the blade to change angle with the blade under centrifugal load.

A counterweight is a weight that is attached to each blade clamp to cause the blade to rotate to a higher blade pitch. Counterweighted propellers require governor supplied oil to decrease blade pitch. If the oil supply is lost, the counterweighted propeller will go to high pitch, or low RPM.

The weight of each propeller blade when spinning, generates centrifugal force and a twisting force that attempts to rotate each blade to a lower blade angle.

Air flow around the blade generates lift and an aerodynamic twisting moment that will attempt to increase or decrease blade angle, depending on flight condition and blade design. This force is generally very small in relation to the other forces.

Propeller forces consisting of blade counterweight centrifugal twisting moment and aerodynamic twisting moment of the blades in various combinations are constantly present while the propeller is operating. The summation of these forces causes the propeller to rotate to a higher blade angle. A variable hydraulic force (oil under pressure from the engine driven governor) toward a lower blade angle opposes the summation of these forces. Oil is metered by the governor to oppose these constant forces and maintain a constant engine RPM.

A governor is an engine speed-sensing device that maintains a constant engine/propeller RPM by changing blade angle and varying load on the engine.

The governor uses an internal pump that is driven by an accessory drive from the engine. This pump uses engine lubricating oil and increases the engine oil pressure for supply to the propeller. Engine speed sensing hardware within the governor controls the supply of oil to, or drain of oil from the propeller, resulting in a change of blade pitch to maintain constant engine speed.

Oil pressure from the engine-driven governor is supplied to the propeller mounted hydraulic cylinder through the engine shaft and propeller hub. Increasing the oil volume within the hydraulic cylinder decreases blade angle to increase engine RPM. Decreasing the oil volume increases blade angle to decrease engine RPM. By changing the blade angle, the governor maintains constant engine RPM (within limits), independent of the throttle setting.

If oil pressure is lost at any time, the summation of propeller forces that is in direct opposition to the lost variable hydraulic force will increase blade angle.

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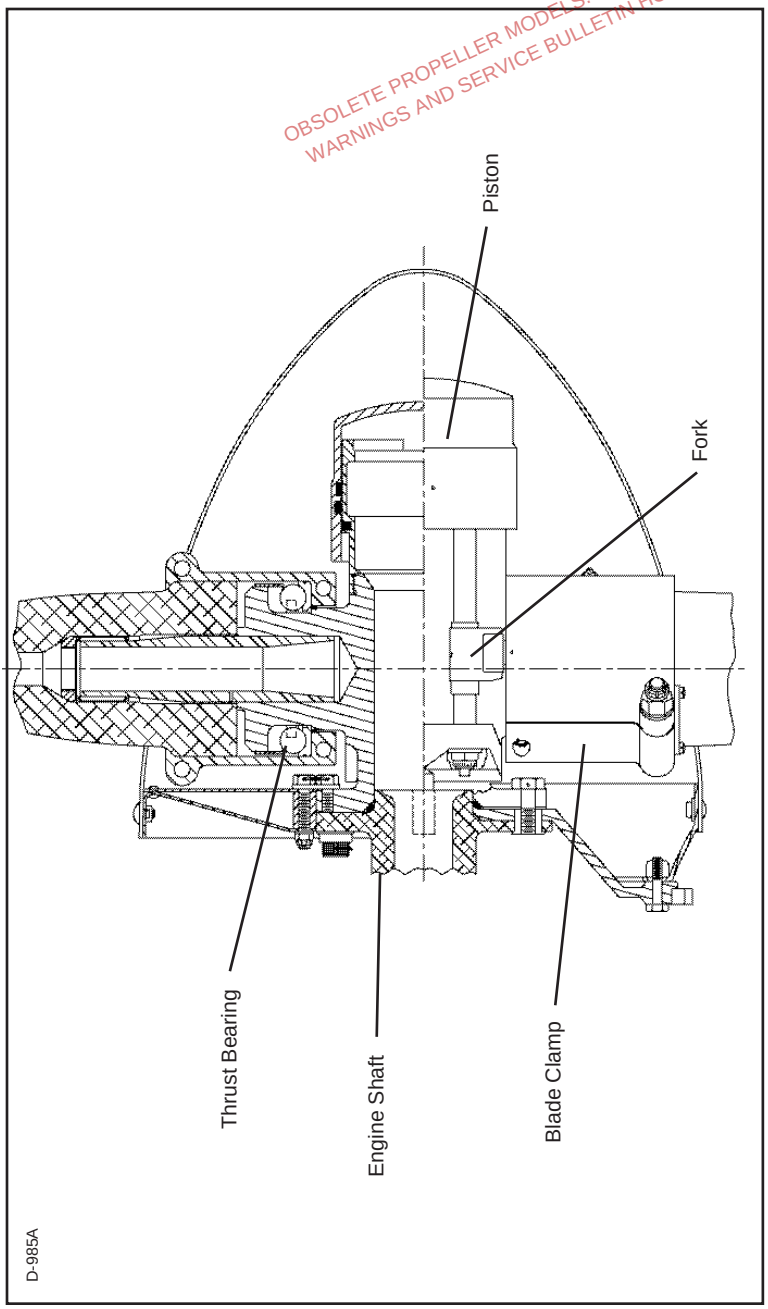


Constant Speed, Non-Counterweighted, Nonfeathering Propeller Assembly
Figure 2-6

B. Constant Speed, Non-counterweighted, Nonfeathering Propellers

Propeller models HC-82(X,V)(F,L)-6( )( ). Refer to Figure 2-6.

Constant speed, non-counterweighted, nonfeathering propellers are typically used on single engine aircraft.

Propeller blade angle change is actuated by 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 sliding rod and fork system, connected to a blade clamp that rotates with the blade. Each blade is retained on the propeller hub by a blade clamp and thrust bearing. The thrust bearing permits the blade to change angle with the blade under centrifugal load.

Propeller forces consisting of centrifugal and aerodynamic twisting moment of the blades in various combinations are constantly present while the propeller is operating. The summation of these forces causes the propeller to rotate to a lower blade angle. A variable hydraulic force (oil under pressure from the engine driven governor) toward a higher blade angle opposes the summation of these forces. Oil is metered by the governor to oppose these constant forces and maintain a constant engine RPM.

A non-counterweighted propeller requires governor supplied oil to increase blade angle. If the oil supply is lost, the non-counterweighted propeller will go to low pitch, or high RPM.

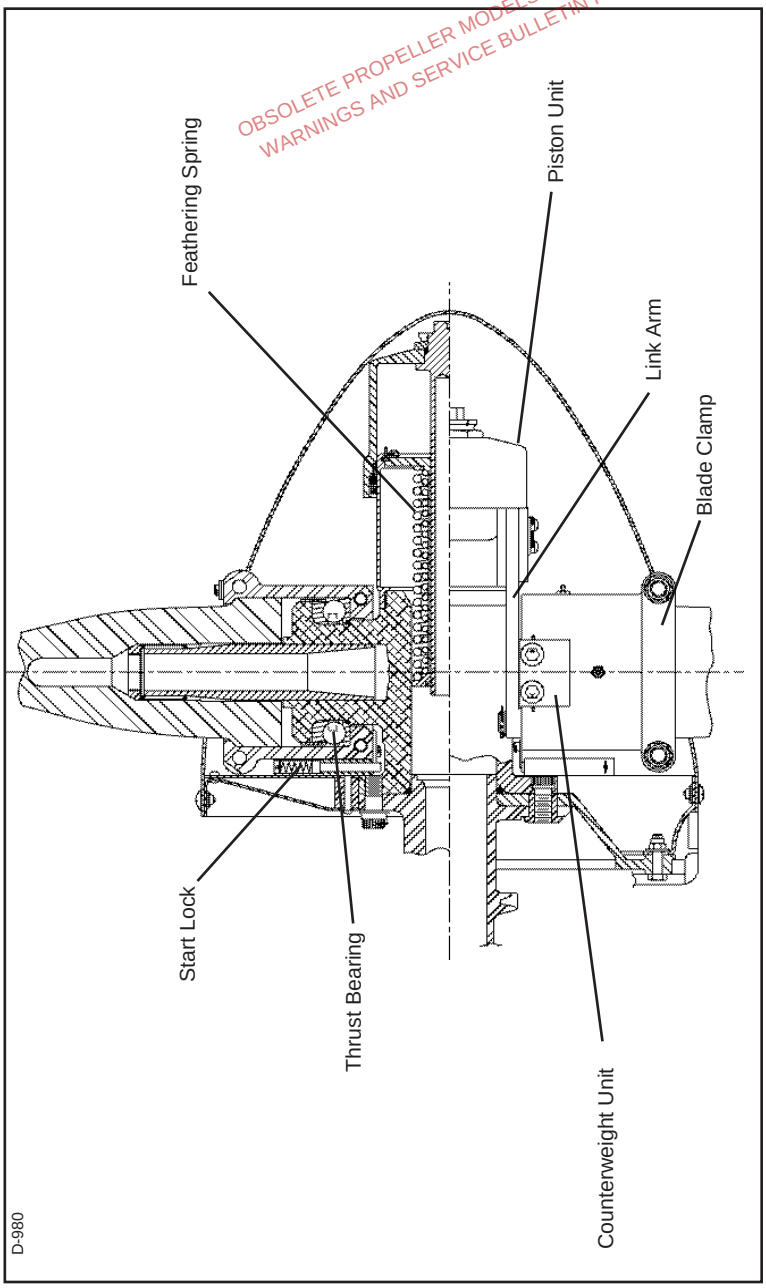
The weight of each propeller blade when spinning, generates centrifugal force and a twisting force that attempts to rotate each blade to a lower blade angle.

Air flow around the blade generates lift and an aerodynamic twisting moment that will attempt to increase or decrease blade angle, depending on flight conditions and blade design. This force is generally very small in relation to the other forces.

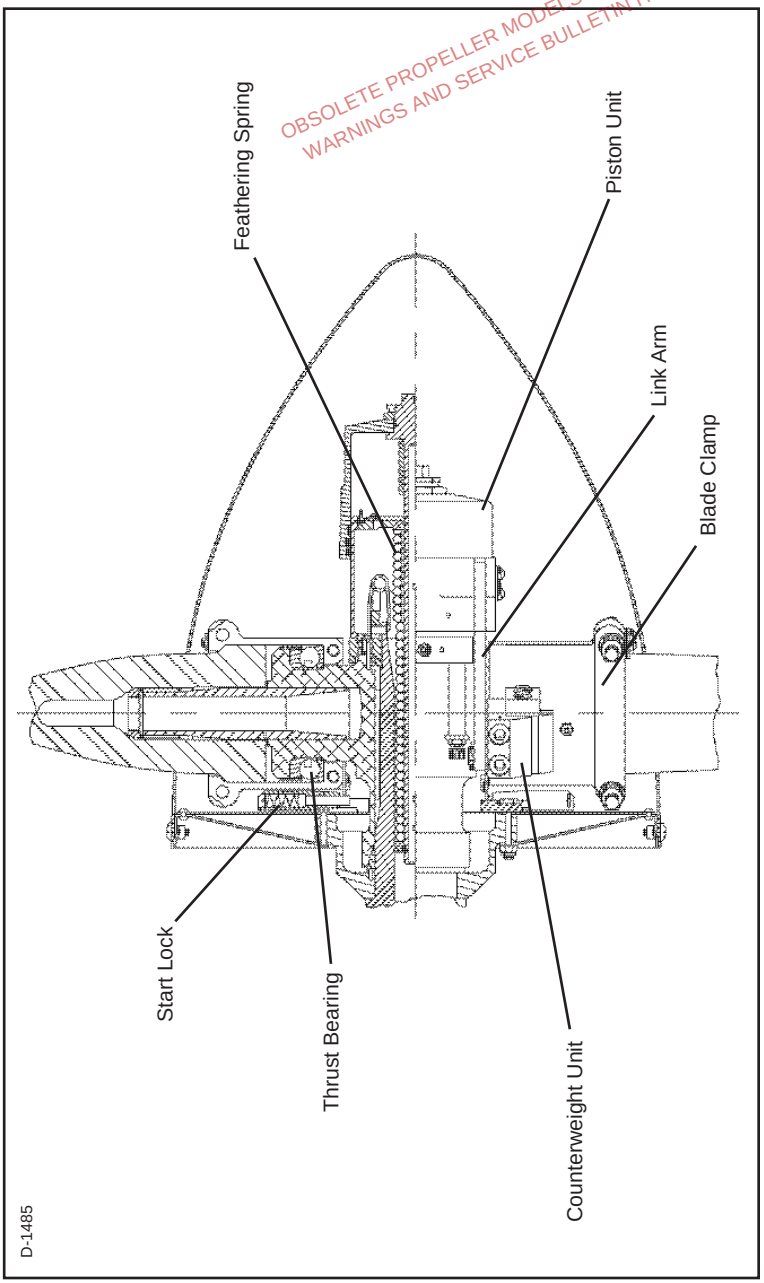
A governor is an engine speed-sensing device that maintains a constant engine/propeller RPM by changing blade angle and varying load on the engine.

The governor uses an internal pump that is driven by an accessory drive from the engine. This pump uses an engine oil supply and increases the engine oil pressure for supply to the propeller. Engine speed sensing hardware within the governor controls the supply of oil to, or drain of oil from the propeller, resulting in a change of blade pitch to maintain constant engine speed.

Oil pressure from the engine-driven governor is supplied to the propeller mounted hydraulic cylinder through the engine shaft and propeller hub. Increasing the oil volume within the hydraulic cylinder increases blade angle to decrease engine RPM. Decreasing the oil volume will decrease blade angle to increase engine RPM. By changing the blade angle, the governor maintains constant engine RPM (within limits), independent of the throttle setting.



Constant Speed, Feathering Propeller Assembly
Figure 2-7



Constant Speed, Feathering Propeller Assembly
Figure 2-8

C. Constant Speed and Feathering Propellers

Propeller models HC-82(X,V)(F,K,L)-2( )( ), HC-83(X,V)F-2( )( ) and HC-83(X,V)20-2( )( ). Refer to Figures 2-7 and 2-8.

A constant speed and feathering propeller is typically used on a twin engine aircraft. It is counterweighted, and is controlled by an engine speed-sensing device (governor) to maintain a constant engine/propeller RPM by changing blade angle and varying load on the engine.

Propeller blade angle change is actuated by 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 either a link arm system, or through a sliding rod and fork system, connected to a blade clamp that rotates with the blade. Each blade is retained on the propeller hub by a blade clamp and thrust bearing. The thrust bearing permits the blade to change angle under centrifugal load.

The counterweight is a weight that is attached to each blade clamp to cause the blade to rotate to a higher blade pitch. Counterweighted propellers require governor supplied oil to decrease blade pitch. If the oil supply is lost, the counterweighted propeller will go to feather.

The weight of each propeller blade when spinning, generates centrifugal force and a twisting force that attempts to rotate each blade to a lower blade angle.

Air flow around the blade generates lift and an aerodynamic twisting moment that attempts to increase or decrease blade angle, depending on flight condition and blade design. This force is generally very small in relation to the other forces.

Propeller forces consisting of mechanical spring action, counterweight twisting moment, and centrifugal and aerodynamic twisting moment of the blades in various combinations are constantly present while the propeller is operating. The summation of these forces causes the propeller to rotate to a higher pitch. A variable hydraulic force (oil under pressure from the engine driven governor) toward a lower blade pitch opposes the summation of these forces.

Oil is metered by the governor to oppose these constant forces and maintain a constant engine RPM.

The forces of the installed spring and counterweight attempt to rotate the blades to a higher blade angle.

A governor is an engine speed-sensing device that maintains a constant engine/propeller RPM by changing blade angle and varying load on the engine.

The governor uses an internal pump that is driven by an accessory drive from the engine. This pump uses engine lubricating oil and increases the engine oil pressure for supply to the propeller. Engine speed sensing hardware within the governor controls the supply of oil to, or drain of oil from the propeller, resulting in a change of blade pitch to maintain constant engine speed.

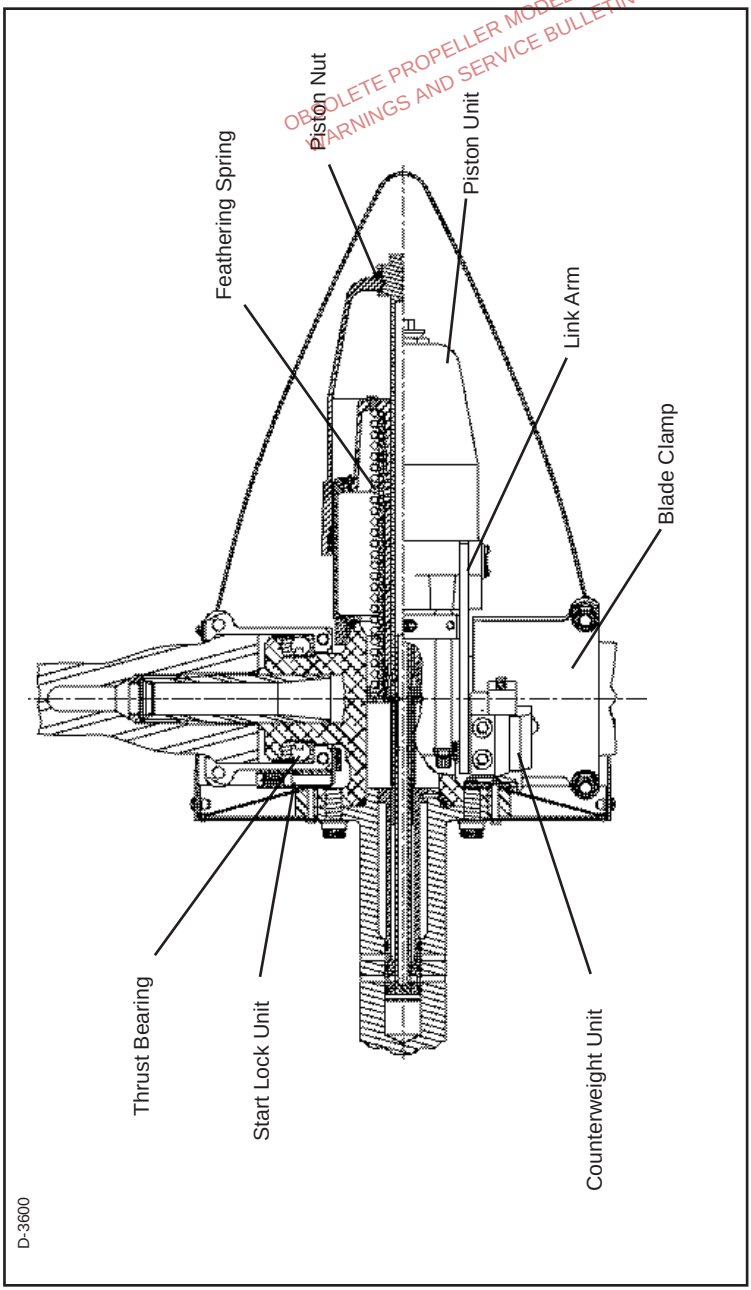
Oil pressure from the engine-driven governor is supplied to the propeller mounted hydraulic cylinder through the engine shaft and propeller hub. Increasing the oil volume within the hydraulic cylinder decreases blade angle to increase engine RPM. Decreasing the oil volume will increase the blade angle to decrease engine RPM. By changing the blade angle, the governor maintains constant engine RPM (within limits), independent of the throttle setting.

If the oil supply is lost during flight, the propeller will feather. Feathering occurs because the spring and blade clamp mounted counterweight forces are no longer opposed by hydraulic oil pressure and are free to increase blade pitch to the feathering (high pitch) stop.

Normal in-flight feathering of these propellers is accomplished when the pilot retards the propeller pitch control past the feather detent. This permits oil to drain from the propeller and return to the engine sump. Engine shutdown is normally accomplished during the feathering process.

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

It is undesirable to feather the propeller when the engine is stopped after landing. To prevent feathering during normal engine shut down, the propeller incorporates spring energized latches (start locks). If the 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 the propeller drops below 800 RPM, the springs overcome the centrifugal force acting on the latch weights and move the latches to engage the start locks, preventing blade angle movement to feather.



Constant Speed, Feathering and Reversing Propeller Assembly (Internal Beta System)
Figure 2-9

D. Constant Speed, Feathering and Reversing Propellers (Internal Beta System)

Propeller models HC-83(X,V)F-3( )( ) Refer to Figure 2-9.

A constant speed, feathering and reversing propeller is typically used on a twin engine aircraft. It is counterweighted and uses internal and external reversing control hardware.

Propeller blade angle change is actuated by 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 link arm system connected to a blade clamp that rotates with the blade. Each blade is retained on the propeller hub by a blade clamp and thrust bearing. The thrust bearing permits the blade to change angle under centrifugal load.

The forces of the installed spring and counterweight attempt to rotate the blades to a higher blade angle.

The counterweight is a weight that is attached to each blade clamp to cause the blade to rotate to a higher blade angle.

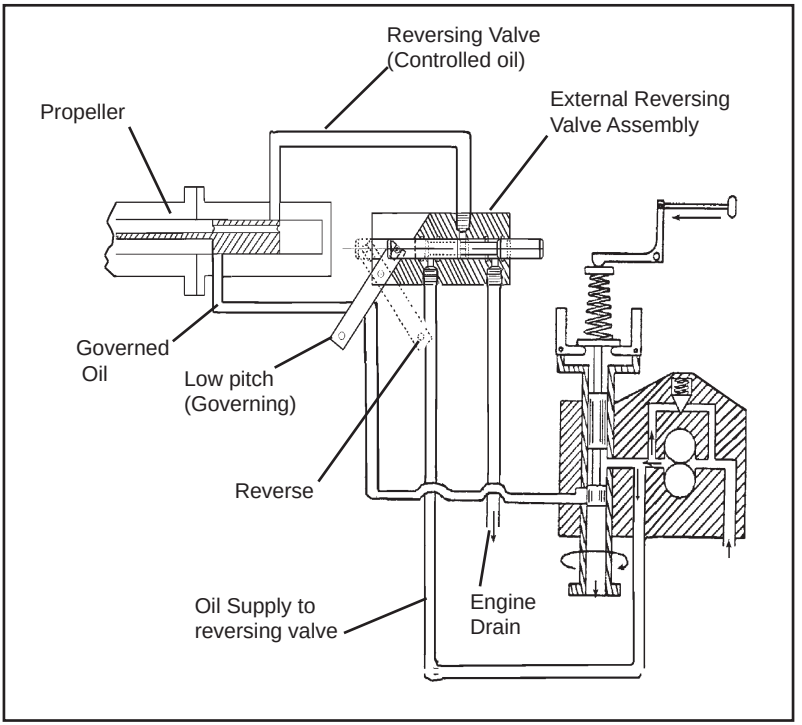
The weight of each propeller blade when spinning, generates centrifugal force and a twisting force that attempts to rotate each blade to a lower blade angle.

Air flow around the blade generates lift and an aerodynamic twisting moment that attempts to increase or decrease blade angle, depending on flight condition and blade design. This force is generally very small in relation to the other forces.

Propeller forces consisting of mechanical spring action, counterweight twisting moment, and centrifugal and aerodynamic twisting moment of the blades in various combinations are constantly present while the propeller is operating. The summation of these forces causes the propeller to rotate to a higher pitch. A variable hydraulic force (oil under pressure from the engine driven governor) toward a lower blade pitch opposes the summation of these forces. Oil is metered by the governor to oppose these constant forces and maintain a constant engine RPM.

The governor uses an internal pump that is driven by an accessory drive from the engine. This pump uses an engine oil supply and increases the engine oil pressure for supply to the propeller. Engine speed sensing hardware within the governor controls the supply of oil to, or drain of oil from the propeller, resulting in a change of blade pitch to maintain constant engine speed.

Oil from the engine-driven governor is supplied to the propeller mounted hydraulic cylinder through the engine shaft and propeller hub. Increasing the oil volume within the hydraulic cylinder decreases blade angle to increase engine RPM. Decreasing the oil volume will increase blade angle to decrease engine RPM. By changing the blade angle, the governor maintains constant engine RPM (within limits), independent of the throttle setting.



Reversing System
Figure 2-10

The lowest blade angle attainable by the governor is low pitch. An external valve and internal valve hydraulically control the low pitch stop and the blade angles between low pitch and reverse. Beta refers to the blade angle range between low pitch and full reverse blade angles.

In reverse mode of operation, the governor supplies oil, to the reversing valve. In this mode, the pilot input to the external reversing valve (through cockpit controls) will select full reverse blade angle or low pitch blade angle (governing mode).

Fundamental elements of this reversing system include an external reversing valve, cockpit control cable (to the reversing valve), internal valve (mounted inside the engine shaft, interfacing internally with the propeller) and hydraulic lines to connect between the governor, external valve, and engine. Refer to Figure 2-10.

The propeller blade angle must be positioned at the low pitch hydraulic stop, and the governor should be onspeed or underspeeding to permit reverse blade angle selection.

Propeller blade angle is moved into the beta range by manually repositioning the cockpit control to move the lever on the external valve and move the valve spool to supply oil from the governor pump to the propeller. If this lever/ cockpit control position is activated, the propeller blade angle will move to full reverse. Propeller blade angle is moved to low pitch blade angle by repositioning the cockpit control to a position opposite that used to select reverse blade angle. This will move a lever on the external valve to position a valve spool, permitting propeller oil to drain from the propeller to the engine sump and increase to low pitch. The cockpit control must remain in this position for normal governor control of blade angle above low pitch blade angle and to prevent unwanted movement of blade angle below the hydraulic low pitch stop.

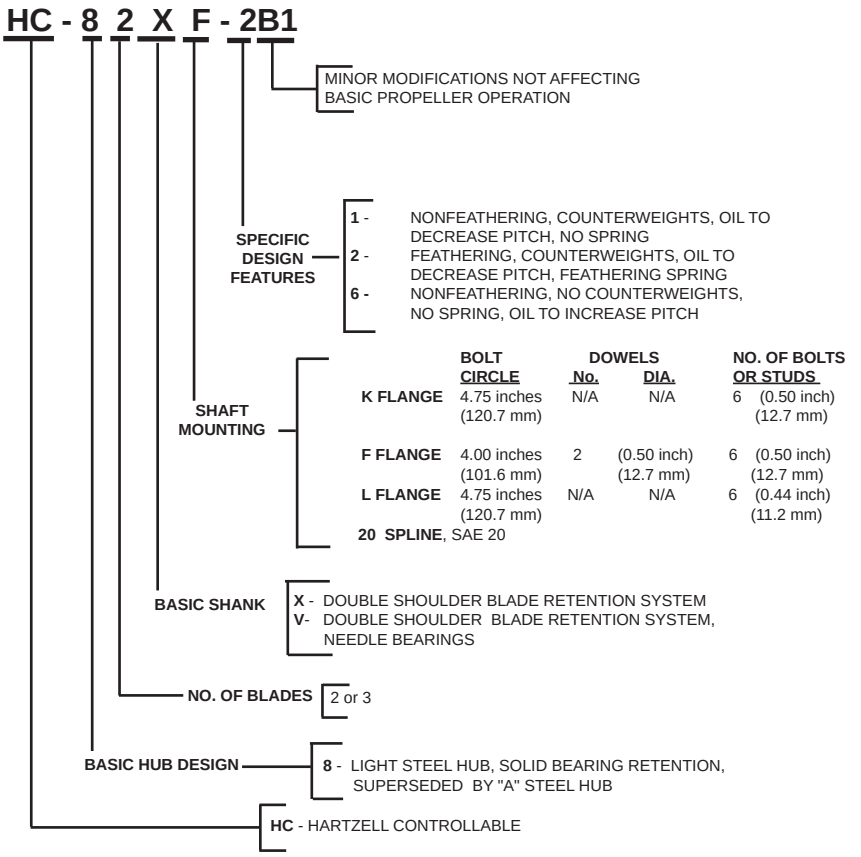
NOTE: This reversing system will only select low pitch blade angle or full reverse blade angle. Selection of intermediate blade angles is not possible, as with other reversing systems.

2. Model Designation

The following pages illustrate sample model designations for Hartzell steel hub reciprocating propeller hub assemblies and blades.

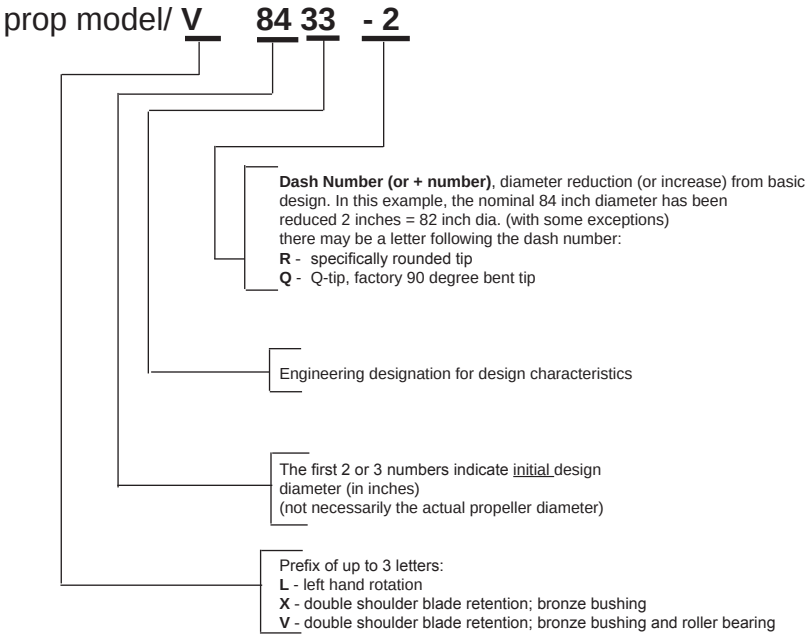
A. Steel Hub Propeller Model Identification

The propeller model number is impression stamped on the propeller hub.



B. Aluminum Blade Model Identification

Hartzell uses a model designation to identify specific blade assemblies. Example: HC-82VK-1D/**V8433-7**. A slash mark separates the propeller and blade model designations. The blade model designation is impression stamped on the blade butt end (internal) and is either on a decal or ink stamped on the blade camber side (external).



C. "X" to "V" Shank Hub Modification

(1) In addition to inspection/rework requirements stated in Hartzell Standard Practices Manual 202A (61-01-02), all "X" shank hubs must be modified to a "V" shank hub. This modification includes replacing the pilot tubes and modifying the blades from an "X" shank to a "V" shank.

NOTE: "Hartzite" blades cannot be repaired, overhauled, or converted to "V" shank blades. Replace "Hartzite" blades with aluminum blades at overhaul.

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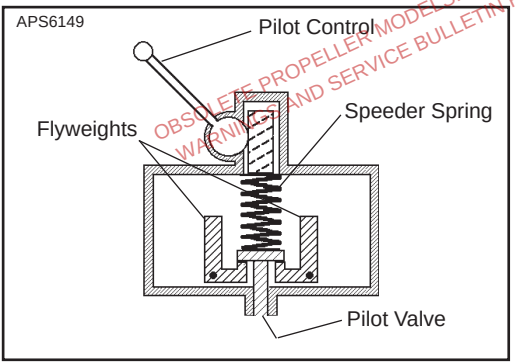
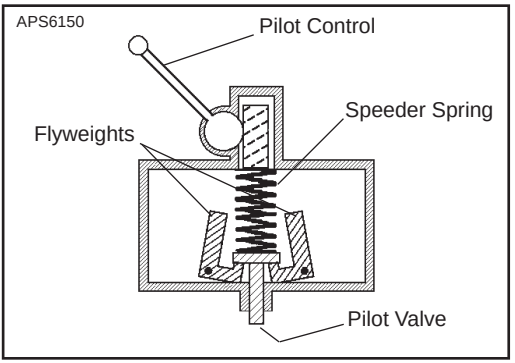
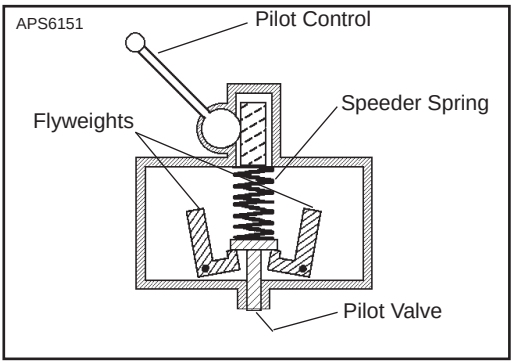


Governor in Onspeed Condition
Figure 2-11



Governor in Underspeed Condition
Figure 2-12



Governor in Overspeed Condition
Figure 2-13

3. Governors

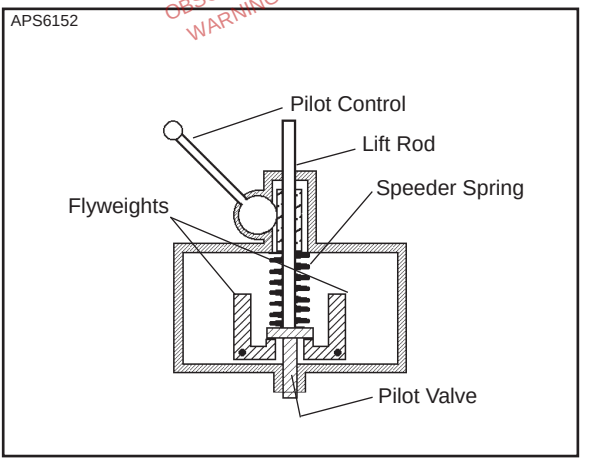
A. Theory of Operation

(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.

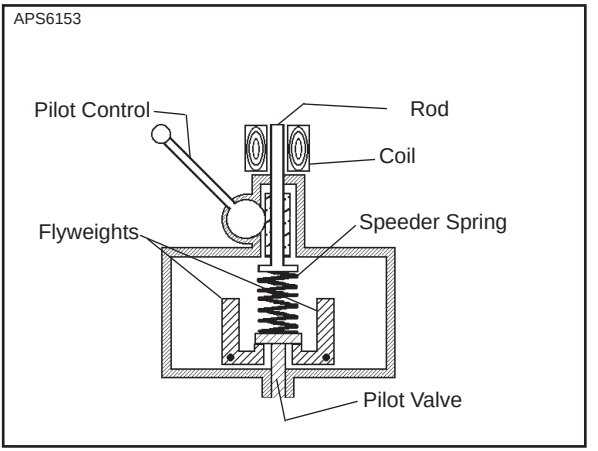
(2) When the engine is operating at the RPM set by the pilot using the cockpit control, the governor is operating **onspeed**. Refer to Figure 2-11. In an onspeed condition, the centrifugal force acting on the flyweights is balanced by the speeder spring, and the pilot valve is neither directing oil 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 2-12. 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 2-13. 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 2-14



Synchronizer/Synchrophaser Governor
Figure 2-15

(5) Refer to Figure 2-14. This figure illustrates a feathering propeller governor. This governor is similar to the constant speed governors illustrated in Figures 2-11 through 2-13, with the addition of the lift rod. When it is desired to feather the propeller, the lift rod may be moved by the cockpit control to mechanically engage the pilot valve to lift the valve. The lifted pilot valve dumps oil to increase propeller pitch until the propeller feathers.

(6) Refer to Figure 2-15. This figure illustrates a governor as a component of a synchronizing or synchrophasing system. A synchronizing system is employed in a multi-engine aircraft to keep the engines operating at the same RPM. A synchrophasing system not only keeps RPM of the engines consistent, but also keeps the propeller blades operating in phase with each other. Both synchronizing and synchrophasing systems serve to reduce noise and vibration.

(7) A Hartzell synchronizing or synchrophasing system uses one engine (the master engine) as an RPM and phase reference and adjusts 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 on the speeder spring. In this manner, engine RPM and phase of the propellers is synchronized or synchrophased.

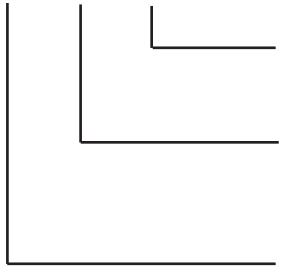
B. Governor Types

The governors used in Hartzell Constant Speed propeller systems are supplied either by Hartzell or other manufacturers. These governor types function in a similar manner.

C. Identification of Hartzell Governors

Hartzell governor may be identified by model number as follows: Example F-6-4

(X) - (X) - (X)



Minor variation of basic design. (numeric and/or alpha character)

Specific model application (numeric character) - special attributes

Basic body and major parts modification (alpha character)

NOTE: Refer to Hartzell Manual 130B (61-23-30) for maintenance and overhaul instructions for Hartzell governors.

4. Propeller Anti-Ice and De-Ice Systems

Some Hartzell propellers may be equipped with an anti-ice or de-ice system. A short description of each of these systems follows:

A. Propeller Anti-Ice System

A propeller anti-ice system prevents ice from forming on propeller surfaces. The system dispenses a liquid (usually isopropyl alcohol), which mixes with moisture on the propeller blades, reducing the freezing point of the water. This water/alcohol mixture flows off the blades before ice forms.

NOTE: This system must be in use before ice forms. It is ineffective in removing ice that has already formed.

(1) System Overview

A typical anti-ice system consists of a fluid tank, pump, and distribution tubing. The rate at which the anti-icing fluid is dispensed is controlled by a pump speed rheostat in the cockpit. The anti-icing fluid is dispensed through airframe mounted distribution tubing and into a rotating slinger ring mounted on the rear of the propeller hub. The anti-icing fluid is then directed through blade feed tubes from the slinger ring onto the blades via centrifugal force. The anti-icing fluid is directed onto feed shoes that are attached to the leading edge of the blade. These feed shoes evenly distribute and direct the fluid along the blade leading edge.

B. Propeller De-Ice System

A propeller de-ice system is a system that permits ice to form, and then removes it by electrically heating the de-ice boots. The ice partially melts and is thrown from the blade by centrifugal force.

(1) System Overview

(a) A de-ice system consists of one or more on/off switches, a timer or cycling unit, a slip ring, brush blocks, and de-ice boots. The pilot controls the operation of the de-ice system by turning on one or more switches. All de-ice systems have a master switch, and may have another toggle switch for each propeller. Some systems also have a selector switch to adjust for light or heavy icing conditions.

(b) The timer or cycling unit determines the sequence of which blades (or portion thereof) are currently being de-iced, and for what length of time. The cycling unit applies power to each de-ice boot or boot segment in a sequential order.

(c) A brush block, which is normally mounted on the engine just behind the propeller, is used to transfer electricity to the slip ring. The slip ring rotates with the propeller and provides a current path to the blade de-ice boots.

(d) De-ice boots contain internal heating elements. These boots are securely attached to the leading edge of each blade with adhesive.

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1. Tools, Consumables, and Expendables

The steel hub reciprocating propellers covered in this manual are manufactured with either a flange mounting or a spline mounting. The flange type or spline type used on a particular propeller installation is indicated in the propeller model identification number stamped on the hub. For example, HC-82V**F**-2B indicates an "F" flange. HC-83X**20**-1 indicates a "20" spline. Refer to the Steel Hub Model Identification in the Description and Operation chapter of this manual for a description of each flange type.

The flange mounted propeller is shipped completely assembled. The spline mounted propeller is shipped with the piston removed.

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

A. Tooling

NOTE: The use of torque wrench adapters for F and K flange installations will vary according to specific application.

F Flange
- Safety wire pliers
- Calibrated torque wrench
- Torque wrench adapter, Hartzell P/Ns AST-2917, AST-2805, or a locally procured torque wrench adapter of the appropriate size

K Flange
- Safety wire pliers
- Calibrated torque wrench
- Torque wrench adapter, Hartzell P/N AST-2805 or a locally procured torque wrench adapter of the appropriate size

L Flange
- Safety wire pliers
- Calibrated torque wrench
- Locally procured torque wrench adapter of the appropriate size

20 Spline
- Shaft nut wrench Hartzell P/N BST-2910
- Safety wire pliers
- Calibrated torque wrench

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

C. Expendables
   - 0.032 inch (0.81 mm) stainless steel aircraft safety wire
   - O-rings (see Table 3-1)

2. O-ring and Propeller Mounting Hardware Identification

Part	Propeller Model	Part No.	
Cone, Rear	HC-83(X,V)20-1(B,C,E)(1)	A-50-3	
	HC-83(X,V)20-1(B,C,E)(1)	A-50-3	
	HC-83(X,V)20-2( )( )	A-50-3	
Dowel Pin	HC-82(X,V)F-2(B,C)(1)	B-6138-8-8	
	HC-82(X,V)F-1( )( )( )	B-6138-8-8	
	HC-82(X,V)F-6( )( )( )	B-6138-8-8	
	HC-83(X,V)F-2( )( )	B-6138-8-8	
	HC-83(X,V)F-3( )( )	B-6138-8-8	
Felt Dust Seal	All Models	B-1843	
Mounting Bolt/Stud	HC-82(X,V)F-1( )( )( )	A-1328-1	
	HC-82(X,V)K-1( )( )( )	A-1333-( )	
	HC-82(X,V)L-1( )( )( )	A-943-1	
	or	B-322	
	HC-82(X,V)F-6( )( )( )	A-1328-1	
	HC-82(X,V)L-6( )( )( )	A-943-1	
	or	B-322	
	HC-82**X**F-2(B,C)(1)	A-1333-4	
	HC-82**V**F-2(B,C)1	A-1333-4	
	HC-82(X,V)K-2C(1)	A-1328	(4)
		A-1333-(3)	(2)
	HC-82(X,V)L-2C	B-6489-25	(4)
		B-6489-20	(2)
	HC-82(X,V)K-2B(1)	A-1328	(4)
		A-1315	(2)
	HC-82(X,V)L-2B(1)	B-6489-25	(4)
		B-6527-7	(2)
	HC-83(X,V)F-2( )( )	A-1328-1	
	HC-83(X,V)F-3( )( )	A-1328-1	

O-ring and Propeller Mounting Hardware Identification
Table 3-1

Part	Propeller Model	Part No.
Nut, Piston Rod	HC-83(X,V)F-2( )( )	B-3368
	HC-83(X,V)F-3( )( )	B-3368
	HC-83(X,V)20-2( )( )	B-3368
Nut, Fork Rod	(HC-83X20-1( )( )	A-848-2
	HC-82(X,V)(F,L,K)-1( )( )( )	A-848-2
	HC-82(X,V)(F,L)-6( )( )( )	A-848-2
Nut, Piston	HC-83(X,V)F-2A( )	A-880-2
	HC-83(X,V)F-2B( )	A-880-1
	HC-83(X,V)F-3( )	A-880-1
	HC-82(X,V)(F,K,L)-2( )( )	A-880-2
	HC-83(X,V)20-2( )( )	A-880-1
Nut, Shaft/Hub and Puller Ring	HC-83(X,V)20-1( )( )	A-63-B + A-870
	HC-83(X,V)20-2( )( )	A-63-B + A-870
O-ring, Shaft/EngineFlange	HC-82(X,V)F-1( )( )( )	C-3317-228
	HC-82(X,V)(K,I)-1( )( )( )	C-3317-329
	HC-82(X,V)F-6( )( )( )	C-3317-228
	HC-82(X,V)L-6( )( )( )	C-3317-329
	HC-82(X,V)F-2( )( )	C-3317-228
	HC-82(X,V)(K,L)-2( )( )	C-3317-329
	HC-83(X,V)F-2B( )	C-3317-228
	HC-83(X,V)F-3( )	C-3317-228
O-ring, Piston	HC-82(X,V)(F,K,L)-1( )( )( )	C-3317-343-1
	HC-82(X,V)(F,K,L)-6( )( )( )	C-3317-343-1
	HC-82(X,V)(F,K.L)-2( )( )	C-3317-343-1
	HC-83(X,V)F-2B( )	C-3317-343-1
	HC-83(X,V)F-3( )	C-3317-343-1
	HC-83(X,V)20-1( )( )	C-3317-343-1
	HC-83(X,V)20-2( )( )	C-3317-343-1
O-ring, Pitch Change Rod	HC-83(X,V)20-2( )( )	C-3317-020

O-ring and Propeller Mounting Hardware Identification
Table 3-1, Continued

Part	Propeller Model	Part No.
O-ring, Rear Cone	HC-83X20-1( )( )	C-3317-228
	HC-83(X,V)20-2( )( )	C-3317-229
O-ring, Cylinder	HC-83X20-1( )( )	C-3317-229
	HC-83(X,V)20-2( )( )	C-3317-229
Pitch Change Block	HC-83(X,V)20-1( )( )	A-95-A
	HC-82(X,V)(F,K,L)-1(D,F,L)( )	A-95-A
	HC-82XF-1C	A-95
Safety Pin, Hub Nut	HC-83(X,V)20-1(B,C,E)(1)	A-847
	HC-83(X,V)20-1A(1)	A-847
Screw, Socket Head	HC-83(X,V)F-2( )( )	A-2037
	HC-83(X,V)F-3( )( )	A-2037
	HC-83(X,V)20-2( )( )	A-2037
Shim	HC-82(X,V)L-2( )( )	A-933-1
	HC-82(X,V)K-2( )( )	B-1322
	HC-82(X,V)L-1( )	A-933-1
	HC-82(X,V)K-1D	B-1322
	HC-82(X,V)L-6( )( )	A-933-1
Spacer, High Stop	HC-83(X,V)20-1( )( )( )	A-970
Washer, Fork Rod	HC-83X20-1( )( )	A-965
	HC-82(X,V)(F,L,K)-1( )( )( )	A-965
	HC-82(X,V)(F,L)-6( )( )( )	A-965

O-ring and Propeller Mounting Hardware Identification
Table 3-1, Continued

Part	Propeller Model	Part No.	
Washer, (Mounting Bolt/Stud)	HC-82(X,V)F-1( )( )( )	A-1381	
	HC-82(X,V)F-6( )( )( )	A-1381	
	HC-82(X,V)F-2( )( )	B-6527-7	(4)
	HC-82(X,V)L-2C(1)	B-6527-7	(2)
		B-6329-7	(2)
	HC-82(X,V)L-2B(1)	B-6527-7	(4)
	HC-83(X,V)F-2( )( )	B-3851-0863	
	HC-83(X,V)F-3( )( )	A-1381	

O-ring and Propeller Mounting Hardware Identification
Table 3-1, Continued

3. Pre-Installation

A. Inspection of Shipping Package

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

B. Uncrating

(1) Put the propeller on a firm support.

(2) Remove the banding and any external wood bracing, if applicable, from the shipping container.

(3) Remove the cardboard from the hub and blades. Put the propeller on a padded surface that supports the propeller over a large area. Never stand the propeller on a blade tip.

(4) On flange mounted models, remove the plastic dust cover cup from the propeller mounting flange (if installed).

C. Inspection after Shipment

After removing the propeller from the shipping container, examine the propeller components for possible shipping damage.

D. Propeller Reassembly

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

4. Propeller Assembly Installation

A. Precautions

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE RESULTING IN AN AIRCRAFT ACCIDENT.

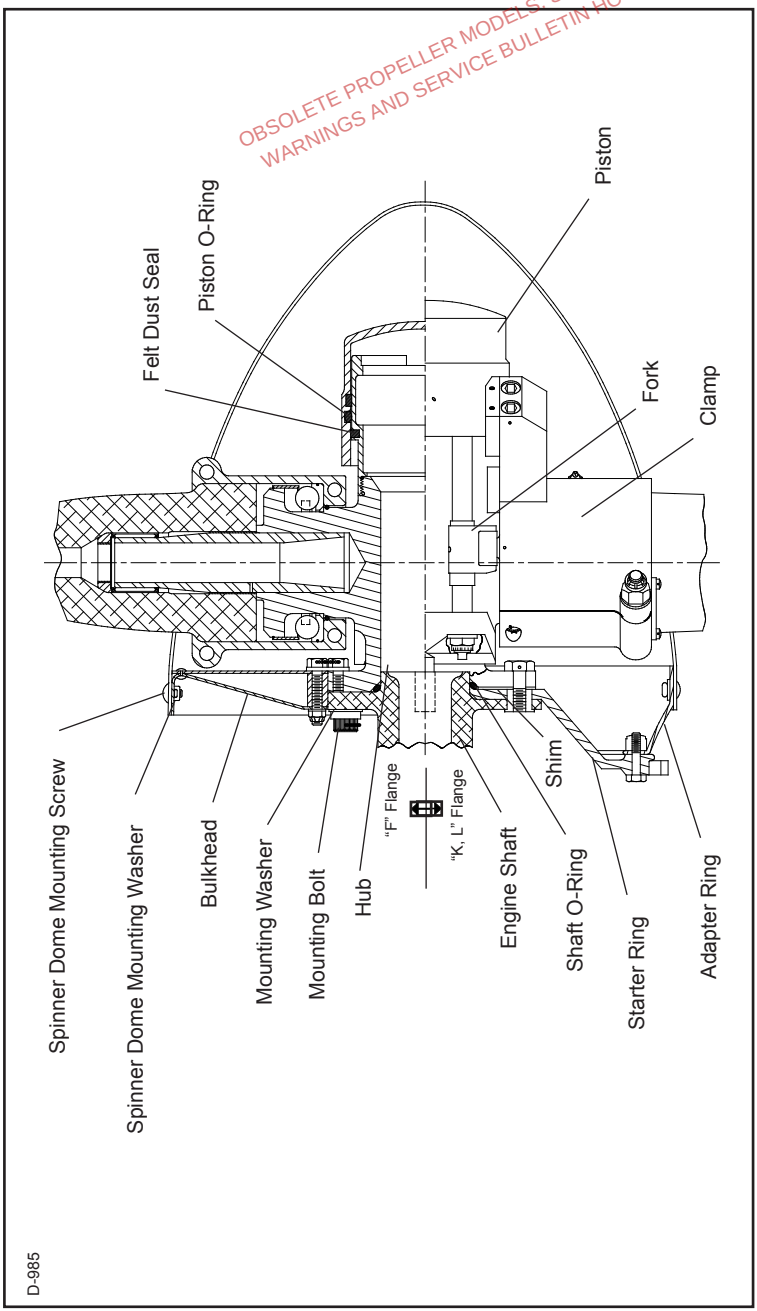
WARNING 2: WHEN INSTALLING THE PROPELLER, FOLLOW THE AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES, AS THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS OWNER'S MANUAL.

(1) Make sure the propeller is removed before the engine is removed or installed in the airframe.

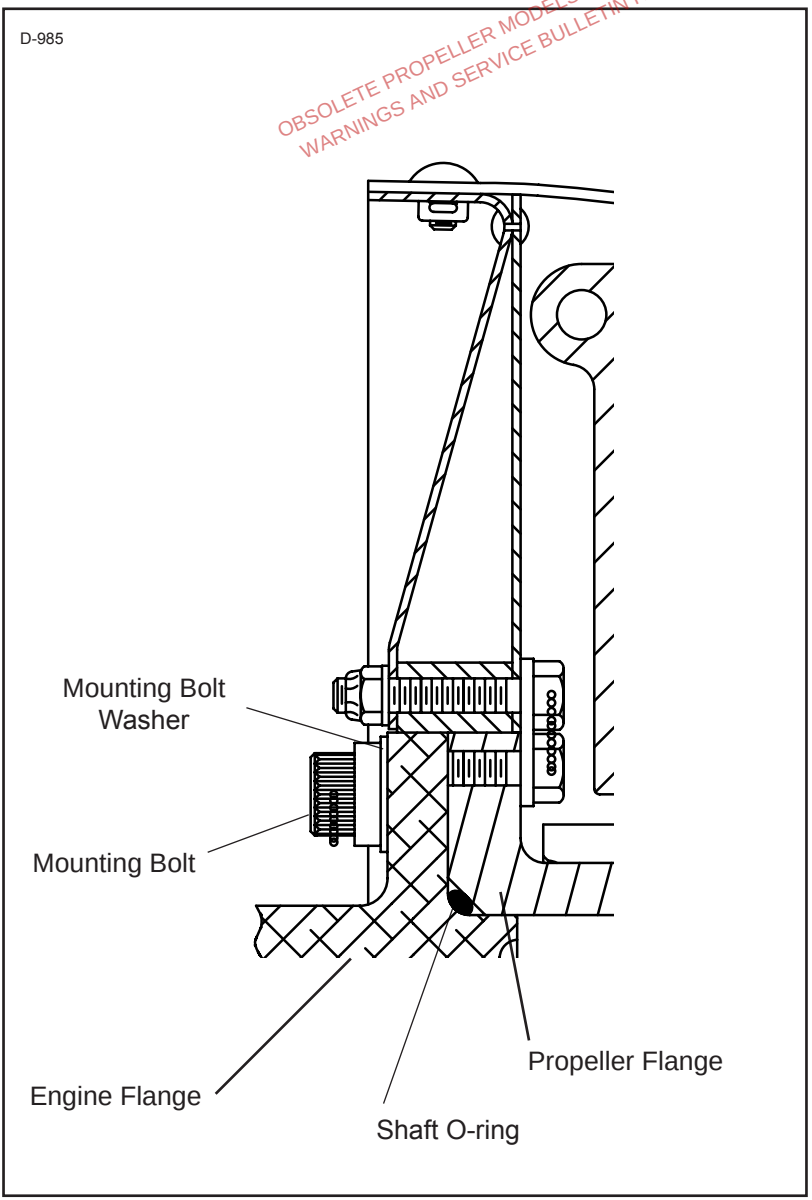
(2) Follow the airframe manufacturer's instructions for installing the propeller. If such instructions are not in the airframe manufacturer's manual, then follow the instructions in this manual; however, mechanics must consider that this owner's manual does not describe important procedures that are beyond Hartzell's control. In addition to propeller installation procedures, items such as rigging and preflight testing of flight idle blade angle, installation and adjustment of de-ice equipment, and propeller synchronization devices are normally found in the airframe manufacturer's manuals.

B. O-ring and Propeller Mounting Hardware Identification

Refer to Table 3-1 for specific part numbers of O-rings and propeller mounting hardware, and propeller model effectivity.



HC-82(X,V)(F,K,L)-1( )( )( )Propeller Assembly
Figure 3-1



F Flange Installation on -1( )( ) Propeller Models
Figure 3-2

C. Installing F Flange Propeller Models HC-82(X,V)F-1( )( )( ) and HC-82XF-6( )( )( )

Refer to Figure 3-1.

CAUTION: INSERT THE DOWEL PINS INTO THE PROPELLER FLANGE USING A BRASS HAMMER OR EQUIVALENT TOOL TO PREVENT DAMAGE TO THE DOWEL PINS. THE DOWEL PINS ARE AN INTERFERENCE FIT WITH THE PROPELLER FLANGE.

(1) Insert two dowel pins (Table 3-1) through the threadless holes in the propeller flange, flush with the propeller side of the hub flange. The dowel pins will protrude from the engine side of the hub flange to engage the engine flange.

(2) Slide the spinner bulkhead onto the propeller flange OD.

(3) Align the spinner bulkhead mounting holes with the holes in the four tabs that are bolted to the propeller hub.

(4) Install the spinner bulkhead attachment bolts, washers, and self-locking hex head nuts to hold the spinner bulkhead to the hub flange mounted tabs.

(5) Torque the spinner attachment bolts and self-locking hex head nuts in accordance with Torque Table 3-2.

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

(7) Lubricate the specified shaft O-ring (Table 3-1) with engine oil and install it on the engine shaft.

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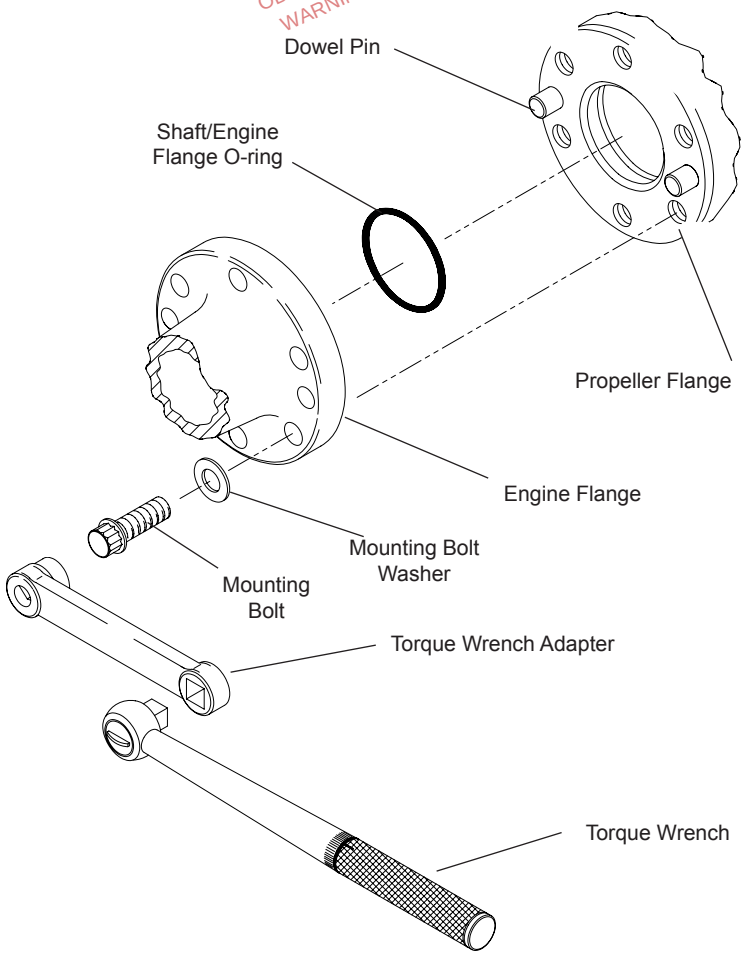
TORQUE



NOTE: If torque wrench adapter is used, use the calculation in Figure 3-4 to determine correct torque wrench setting.

Installing F Flange Propeller on the Engine Flange
Figure 3-3

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

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

(8) With a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

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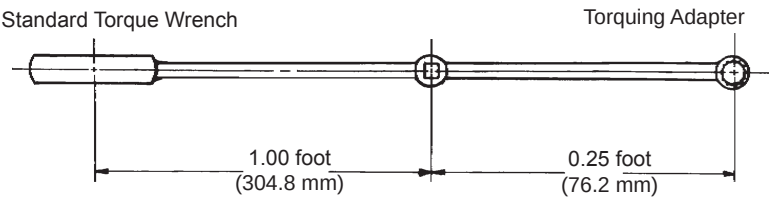

$$\frac{\text{(actual torque required) X (torque wrench length)}}{\text{(torque wrench length) + (length of adapter)}} = \text{Torque wrench reading to achieve required actual torque}$$

EXAMPLE:

$$\frac{\text{100 Ft-Lb (136 N•m) x 1 ft (304.8 mm)}}{\text{1 ft (304.8 mm) + 0.25 foot (76.2 mm)}} = \text{80 Ft-Lb (108 N•m)} < \text{reading on torque wrench with 3-inch (76.2 mm) adapter for actual torque of 100 Ft-Lb (136 N•m)}$$

Determining Torque Value When Using Torquing Adapter
Figure 3-4

F Flange propeller mounting bolts	
A-1333-( )	80-90 Ft-Lb (108-122 N•m)
A-1328-( )	80-90 Ft-Lb (108-122 N•m)
K Flange propeller mounting bolts	
A-1333-( )	60-70 Ft-Lb (81-95 N•m)
A-1333-( ) & A-1328	60-70 Ft-Lb (81-95 N•m)
A-1333-( ) & A-1315	60-70 Ft-Lb (81-95 N•m)
L Flange propeller mounting bolts	
B-322	50 Ft-Lb (68 N•m)
A-943-1	50 Ft-Lb (68 N•m)
B-6489-( )	50 Ft-Lb (68 N•m)
Shaft Nut	
A-63B	450 Ft-Lb (610 N•m)
Lubrication Fitting	
B-6588-1	Until snug
B-6686	Until snug
Piston Nut	
A-880-( )	120 Ft-Lb (163 N•m)
Low-pitch stop nut (on piston rod)	
A-848-2	20-22 Ft-Lb. (27-30 N•m)
B-3368	10 Ft-Lb (14 N•m)
Start Lock locking nut	
B-3808-4	8-10 Ft-Lb. (11-13 N•m)
Spinner attachment bolts and self-locking hex head nuts	8-12 Ft-Lb (11-16 N•m)

NOTE 1: Torque tolerance is ± 10 percent unless otherwise noted.

NOTE 2: Torque values are based on non-lubricated threads.

Torque Table
Table 3-2

WARNING: CLEANING AGENT MEK IS 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: USE CARE TO AVOID SCRAPING ALUMINUM FROM THE BORE OF THE SPINNER BULKHEAD. SCRAPINGS COULD BECOME WEDGED BETWEEN THE FLANGE SURFACES.

(9) Align the mounting holes and dowel pins in the propeller hub flange with the mounting holes and the dowel pin holes in the engine flange.

CAUTION 1: MAKE SURE THAT COMPLETE AND TRUE SURFACE CONTACT IS ESTABLISHED BETWEEN THE PROPELLER HUB FLANGE AND THE ENGINE FLANGE.

CAUTION 2: USE CARE TO AVOID SCRAPING ALUMINUM FROM THE BORE OF THE SPINNER BULKHEAD. SCRAPINGS COULD BECOME WEDGED BETWEEN THE FLANGE SURFACES.

(10) Slide the propeller flange onto the engine flange.

CAUTION: NEW PROPELLER MOUNTING BOLTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

(11) Install the mounting bolts (Table 3-1) with washers through the engine flange from the engine side and into the tapped holes in the propeller flange. Refer to Figures 3-2 and 3-3.

NOTE: For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

(12)Use a torque wrench with the appropriate torque wrench adapter to torque all mounting bolts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque in staggered sequence, beginning with any mounting bolt.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(13)Safety all mounting bolts with 0.032 inch (0.81 mm) minimum diameter stainless steel wire (two bolts for each safety).

(14)If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information for the components supplied by Hartzell can be found in the following publications available on the Hartzell web site at www.hartzellprop.com.

(a) Manual 180 (30-61-80) - Propeller Ice Protection System Manual

(b) Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

(c) Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual

(d) Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual

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

(16)Install the spinner dome as follows:

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

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, AND MAY AFFECT THE BALANCE OF THE PROPELLER.

(a) Carefully slide the spinner dome over the installed propeller.

(b) Secure the spinner dome to the spinner bulkhead with the supplied screws and washers.

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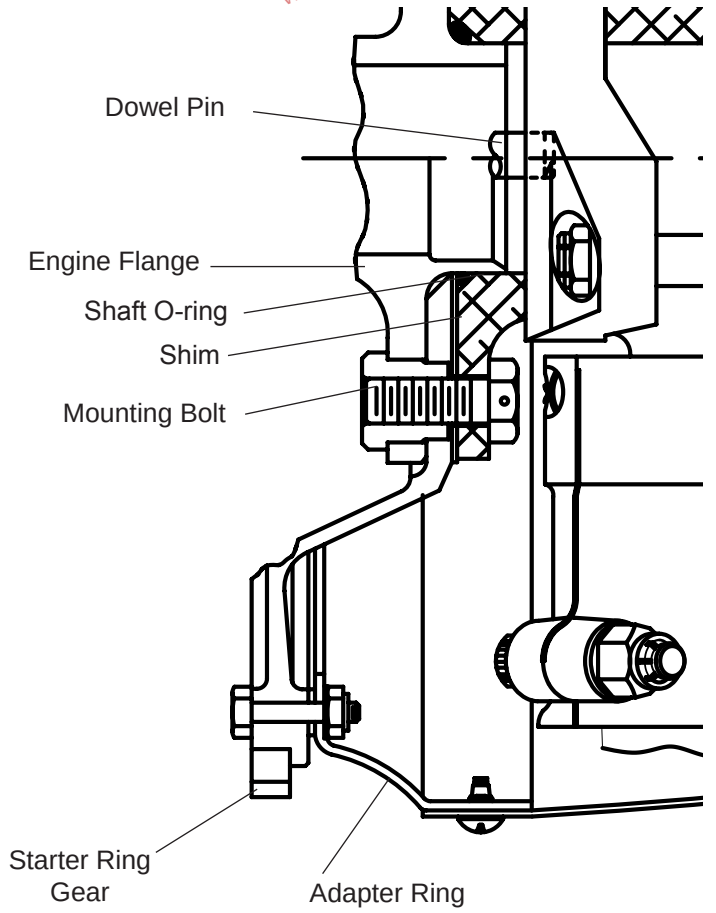


K and L Flange Installations on -1( ), and -6( ) Propeller Models
Figure 3-5

D. Installing K and L Flange Propeller Models HC-82(X,V)(K,L)-1( )( ) and HC-82VL-6( )( )

Refer to Figure 3-1.

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

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

(1) With a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

WARNING: CLEANING AGENT MEK IS 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.

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

(3) Install the spinner adapter ring on the engine starter ring gear. Refer to Figure 3-5.

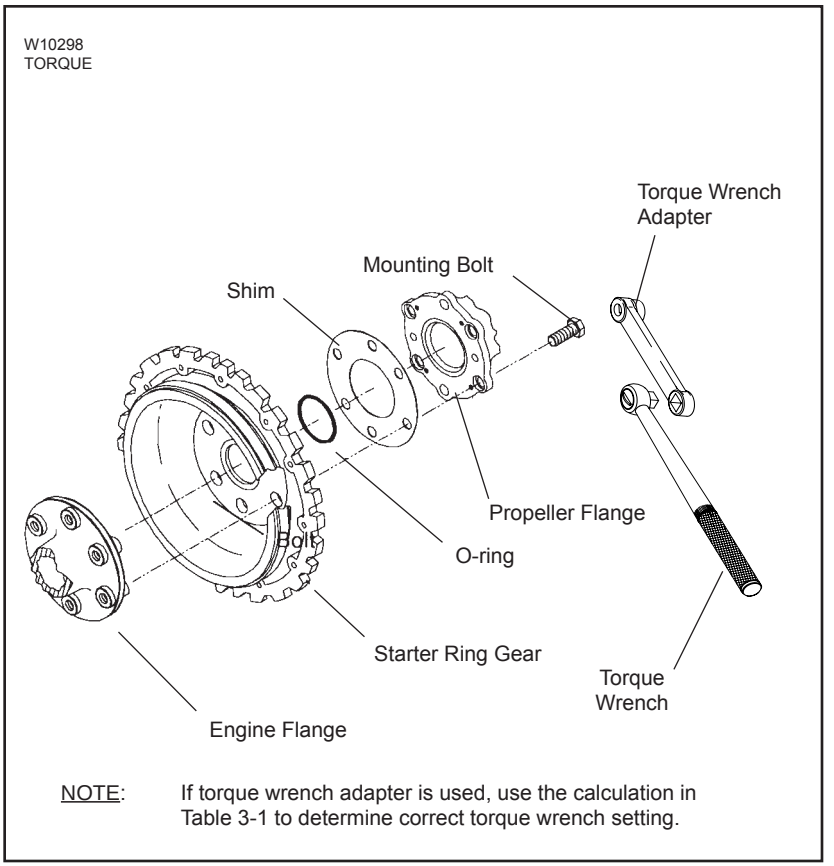
CAUTION: FAILURE TO INSTALL THE SHIM BETWEEN THE PROPELLER FLANGE AND THE STARTER RING GEAR CAN RESULT IN BOLT FAILURE.

(4) Install the shim (Table 3-1) on the engine shaft between the starter ring gear and the propeller flange. Refer to Figure 3-5.

(5) Lubricate the specified shaft O-ring (Table 3-1) with engine oil and install it on the engine flange. Refer to Figure 3-5.

(6) Align the four mounting bolts (already installed in the propeller hub flange) with the threaded bushings in the engine flange.

NOTE: Four of the propeller mounting bolts will already be installed in the propeller flange. Interference with other propeller parts requires that the bolts be installed during propeller assembly.



NOTE: If torque wrench adapter is used, use the calculation in Table 3-1 to determine correct torque wrench setting.

Installing K or L Flange Propeller on the Engine Flange
Figure 3-6

CAUTION: MAKE SURE THAT COMPLETE AND TRUE SURFACE CONTACT IS ESTABLISHED BETWEEN THE PROPELLER HUB FLANGE AND THE ENGINE FLANGE.

(7) Slide the propeller flange onto the engine flange, against the starter ring gear and shim.

NOTE: Insert the engine bushings into the counterbores that encircle the propeller mounting bolts in the propeller flange.

CAUTION: NEW PROPELLER MOUNTING BOLTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

(8) Thread the four pre installed mounting bolts (Table 3-1) through the propeller flange from the propeller side, and into the bushings in the engine flange. Refer to Figure 3-6.

NOTE: The mounting bolts are preinstalled during the assembly of the propeller. Replacement of one of these bolts between overhauls must be performed only by qualified personnel at an appropriately licensed propeller repair facility

(9) Install the remaining two mounting bolts.

(10) Use a torque wrench with the appropriate torque wrench adapter (Figure 3-6) to torque all mounting bolts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque in staggered sequence, beginning with any mounting bolt.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(11) Safety all mounting bolts with 0.032 inch (0.81 mm) minimum diameter stainless steel wire (two bolts for each safety).

(12) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information for the components supplied by Hartzell can be found in the following publications available on the Hartzell web site at www.hartzellprop.com.

- (a) Manual 180 (30-61-80) - Propeller Ice Protection System Manual
- (b) Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual
- (c) Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual
- (d) Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual

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

(14) Install the spinner dome as follows:

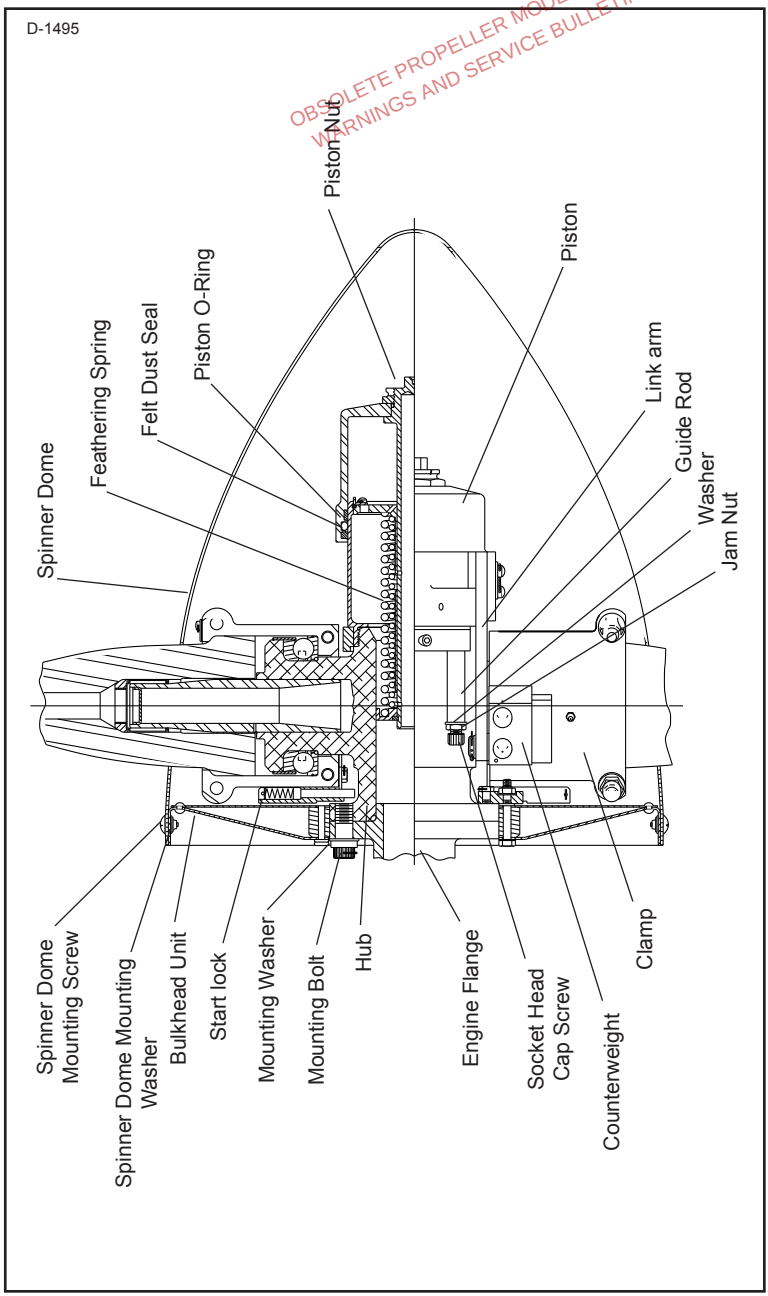
NOTE: The following instructions relate to Hartzell spinners only. In some cases, the airframe manufacturer produced the spinner assembly. In those cases, refer to the airframe manufacturer's manual for spinner installation instructions.

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, AND MAY AFFECT THE BALANCE OF THE PROPELLER.

(a) Carefully slide the spinner dome over the installed propeller.

(b) Secure the spinner dome to the spinner bulkhead with the supplied screws and washers.



HC-82(X,V)(F,K,L)-2( )( ) Propeller Assembly
Figure 3-7

E. Installing F Flange Propeller Models HC-82(X,V)F-2( )( )

Refer to Figures 3-7.

CAUTION: INSERT THE DOWEL PINS INTO THE PROPELLER FLANGE USING A BRASS HAMMER OR EQUIVALENT TOOL TO PREVENT DAMAGE TO THE DOWEL PINS. THE DOWEL PINS ARE AN INTERFERENCE FIT WITH THE PROPELLER FLANGE.

(1) Insert two dowel pins (Table 3-1) through the threadless holes in the propeller flange, flush with the propeller side of the hub flange. The dowel pins will protrude from the engine side of the hub flange to engage the engine flange.

WARNING: CLEANING AGENT MEK IS 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.

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

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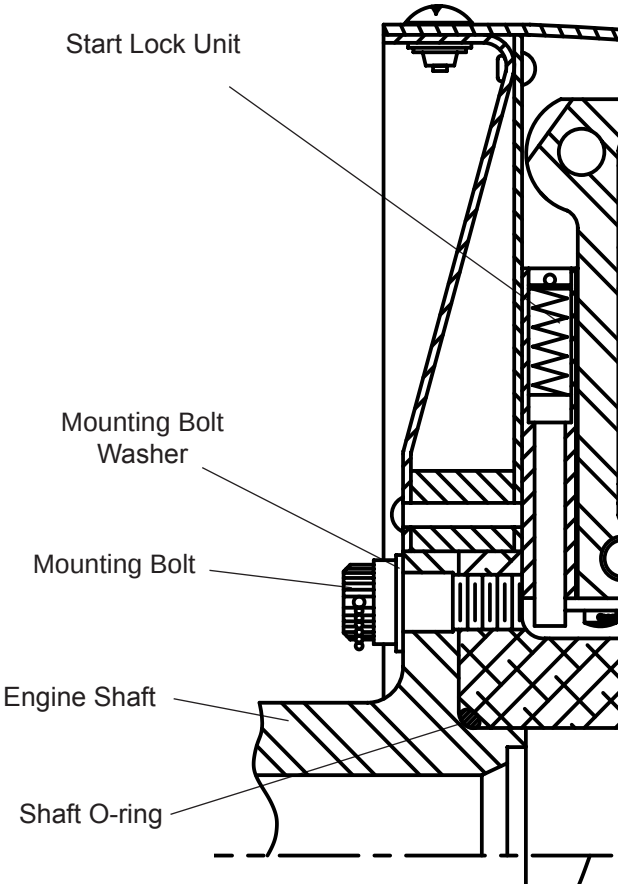


F Flange Installation on -2 Propeller Models
Figure 3-8

WARNING: USE CAUTION DURING INSTALLATION WHEN THE START LOCKS HAVE BEEN ENGAGED TO FACILITATE INSTALLATION OF THE SPINNER BULKHEAD. IF THE BLADES ARE RELEASED SUDDENLY, THE EXTREME FORCE CAN CAUSE SERIOUS INJURY AND DAMAGE TO THE PROPELLER.

(3) If the spinner bulkhead is to be installed and is not already in place, perform the following steps:

NOTE: The start locks must be engaged to provide access to the spinner bulkhead mounting bolts when installing the spinner bulkhead.

(a) Position the spinner bulkhead on the propeller.

(b) From the engine side of the bulkhead, insert the attaching bolts through the bulkhead and into the start locks.

(c) Install the washers and locking nuts (Table 3-1) on the propeller side of the start locks to secure the attaching bolts and the bulkhead.

(d) Torque the locking nuts in accordance with Torque Table 3-2.

(4) Lubricate the specified shaft O-ring (Table 3-1) with engine oil and install it on the engine flange (Figure 3-8).

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

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

(5) With a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

CAUTION: USE CARE TO AVOID SCRAPING ALUMINUM FROM THE BORE OF THE SPINNER BULKHEAD. SCRAPINGS COULD BECOME WEDGED BETWEEN THE FLANGES.

(6) Align the threaded holes of the propeller flange with the bolt holes in the engine flange, and align the dowel pins in the propeller flange with the dowel pin holes in the engine flange.

CAUTION: MAKE SURE THAT COMPLETE AND TRUE SURFACE CONTACT IS ESTABLISHED BETWEEN THE PROPELLER HUB FLANGE AND THE ENGINE FLANGE.

(7) Slide the propeller onto the engine shaft.

CAUTION: NEW PROPELLER MOUNTING BOLTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

(8) Install mounting bolts (Table 3-1) with mounting washers through the engine flange from the engine side and into the tapped holes in the propeller flange.

NOTE: For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

(9) Use a torque wrench with the appropriate torque wrench adapter (Figure 3-6) to torque all mounting bolts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque in staggered sequence, beginning with any mounting bolt.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(10) Safety all mounting bolts with 0.032 inch (0.810 mm) minimum diameter stainless steel wire (two bolts for each safety).

(11) Procedure for reinstallation of the piston nut, if applicable.

(a) Following the installation of the propeller, retract the start lock pins and hold them in place with a heavy wire inserted through the hole of each start lock housing.

(b) Carefully push the piston toward the engine, rotate the blades to feather position, and attach the piston nut to the pitch change rod.

(c) Use a breaker bar and a 5/8 inch deep well socket to hold the pitch change rod.

(d) Using a 1-13/16 inch crowfoot wrench and a torque wrench, torque the piston nut. Refer to Table 3-2 and Figure 3-4 for the proper torque value.

NOTE: The removal and subsequent reinstallation of the piston nut does not require that the propeller blade angles be rechecked.

(12) Remove the wires from the start lock brackets.

CAUTION: DO NOT PUT THE BLADE PADDLE IN THE AREA OF THE DE-ICE 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 BOOT. USE ONE BLADE PADDLE FOR EACH BLADE.

(13) Position the propeller on the start locks.

(a) Using the blade paddles, slowly rotate the blades simultaneously toward low pitch until the start lock pins engage the start lock plates.

(14) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information for the components supplied by Hartzell can be found in the following publications available on the Hartzell web site at www.hartzellprop.com.

(a) Manual 180 (30-61-80) - Propeller Ice Protection System Manual

(b) Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

(c) Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual.

(d) Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual

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

(16)Install the spinner dome as follows:

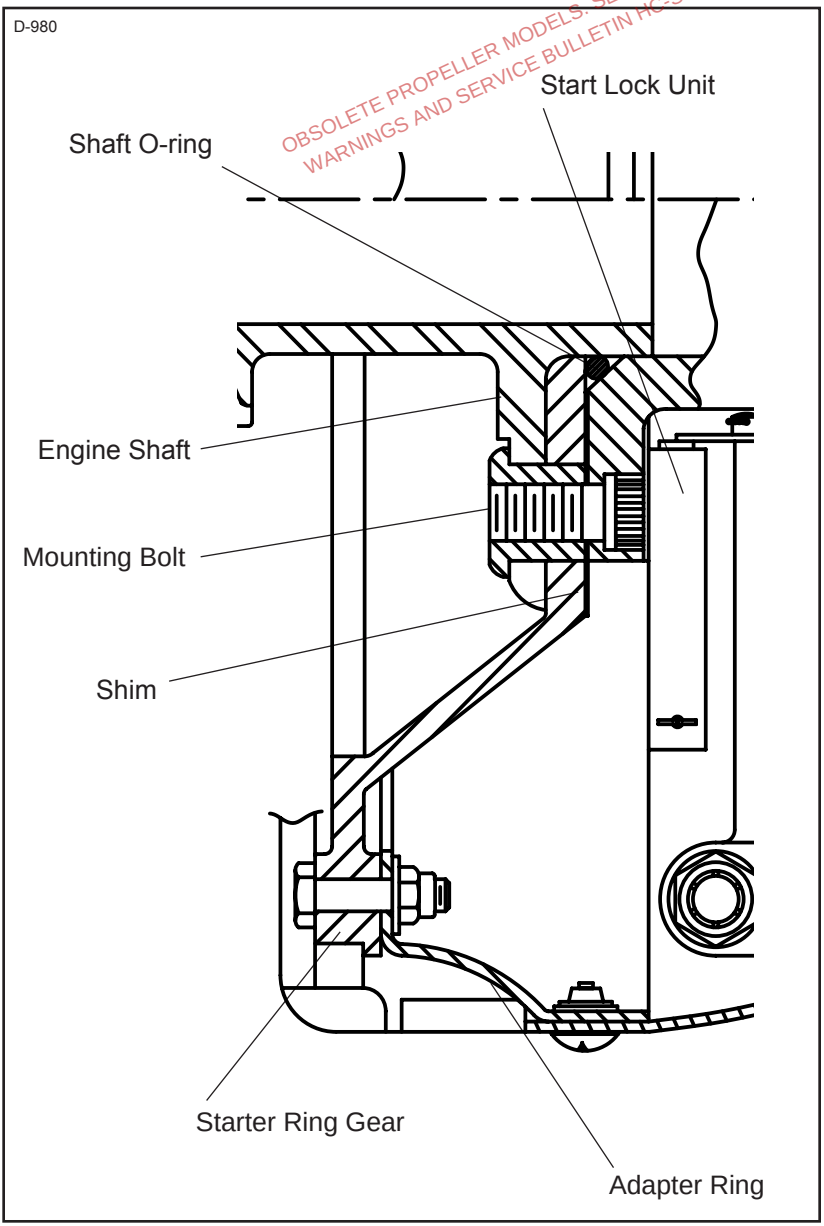
NOTE: The following instructions relate to Hartzell spinners only. In some cases, the airframe manufacturer produced the spinner assembly. In those cases, refer to the airframe manufacturer's manual for spinner installation instructions.

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, AND MAY AFFECT THE BALANCE OF THE PROPELLER.

(a) Carefully slide the spinner dome over the reinstalled propeller.

(b) Secure the spinner dome to the spinner bulkhead with the supplied screws and washers.



K and L Flange Installation on -2 Propeller Models
Figure 3-9

F. Installing K and L Flange Propeller Models HC-82(X,V)(K,L)-2( )( )

Refer to Figure 3-7.

WARNING: CLEANING AGENT MEK IS 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.

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

(2) Install the spinner adapter ring on the engine starter ring gear. Refer to Figure 3-9.

CAUTION: FAILURE TO INSTALL THE SHIM BETWEEN THE PROPELLER FLANGE AND THE STARTER RING GEAR CAN RESULT IN MOUNTING BOLT FAILURE.

(3) Install the shim (Table 3-1) on the engine shaft between the starter ring gear and the propeller flange. Refer to Figure 3-9.

(4) Lubricate the specified O-ring (Table 3-1) with engine oil and install it on the engine flange. Refer to Figure 3-9.

CAUTION: USING A FELT-TIPPED PEN, IDENTIFY EACH START LOCK AND ITS ADJACENT BLADE CLAMP WITH A CORRESPONDING LETTER. THIS WILL MAKE SURE THAT EACH START LOCK WILL BE REINSTALLED WITH THE CORRECT BLADE CLAMP TO MAINTAIN THE SAME BLADE ANGLES FOR ENGINE START.

(5) Remove each start lock to permit access to preinstalled propeller mounting bolts.

WARNING 1: TO FACILITATE BOXING AND SHIPPING OF THE PROPELLER, THE PISTON NUT MAY HAVE BEEN REMOVED TO PERMIT ROTATING OF THE BLADES BEFORE PACKAGING.

FOR SAFETY REASONS, IF THE PISTON NUT WAS NOT REMOVED, THE PROPELLER MUST BE PUT IN FEATHER POSITION BEFORE IT IS INSTALLED ON THE AIRCRAFT.

WARNING 2: MAKE SURE THE SLING IS RATED UP TO 800 POUNDS (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING REMOVAL.

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

(6) With a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

(7) Align the two mounting bolts (already installed in the propeller hub flange) with the threaded bushings in the engine flange.

NOTE: Two propeller mounting bolts will already be installed in the propeller flange. Interference with blade clamps requires that the bolts be installed during propeller assembly.

CAUTION: MAKE SURE THAT COMPLETE AND TRUE SURFACE CONTACT IS ESTABLISHED BETWEEN THE PROPELLER HUB FLANGE AND THE ENGINE FLANGE.

(8) Slide the propeller flange onto the engine flange, against the starter ring gear and shim.

(9) Insert the engine bushings into the counterbores that encircle the propeller mounting bolts in the propeller flange.

CAUTION: NEW PROPELLER MOUNTING BOLTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

(10) Thread the two preinstalled mounting bolts (Table 3-1) through the propeller flange from the propeller side, and into the bushings in the engine flange. Refer to Figure 3-9.

NOTE: Two of the mounting bolts are preinstalled during the assembly of the propeller. Replacement of one of these bolts between overhauls must be performed only by qualified personnel at an appropriately licensed propeller repair facility.

(11) Install four mounting bolts (Table 3-1) in the remaining four mounting holes and thread them through the propeller flange from the propeller side into the bushings in the engine flange. Refer to Figure 3-9.

NOTE: For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

(12)Use a torque wrench with the appropriate torque wrench adapter to torque all mounting bolts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque in staggered sequence, beginning with any mounting bolt.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(13)Reinstall each start lock adjacent to the blade clamp that has a corresponding felt-tip marked letter.

(14)Safety all mounting bolts with 0.032 inch (0.810 mm) minimum diameter stainless steel wire (two bolts for each safety).

NOTE: The mounting bolts that are adjacent to the start lock units must be safety-wired to the hex head bolts that attach the start lock brackets to the hub.

(15)Procedure for reinstallation of the piston nut, if applicable.

(a) Following the installation of the propeller, retract the start lock pins and hold them in place with a heavy wire inserted through the hole of each start lock housing.

(b) Carefully push the piston toward the engine, rotate the blades to feather position, and attach the piston nut to the pitch change rod.

(c) Use a breaker bar and a 5/8 inch deep well socket to hold the pitch change rod.

(d) Using a 1-13/16 inch crowfoot wrench and a torque wrench, torque the piston nut. Refer to Table 3-2 and Figure 3-4 for the proper torque value.

NOTE: The removal and subsequent reinstallation of the piston nut do not require that the propeller blade angles be rechecked.

(16)Remove the wires from the start lock brackets.

CAUTION: DO NOT PUT THE BLADE PADDLE IN THE AREA OF THE DE-ICE 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 BOOT. USE ONE BLADE PADDLE FOR EACH BLADE.

(17)Position the propeller on the start locks.

(a) Using the blade paddles, slowly rotate the blades simultaneously toward low pitch until the start lock pins engage the start lock plate.

(18)If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information for the components supplied by Hartzell can be found in the following publications available on the Hartzell web site at www.hartzellprop.com.

(a) Manual 180 (30-61-80) - Propeller Ice Protection System Manual

(b) Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

(c) Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual

(d) Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual

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

(20) Install the spinner dome as follows:

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

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, AND MAY AFFECT THE BALANCE OF THE PROPELLER.

(a) Carefully slide the spinner dome over the installed propeller.

(b) Secure the spinner dome to the spinner bulkhead with the supplied screws and washers.

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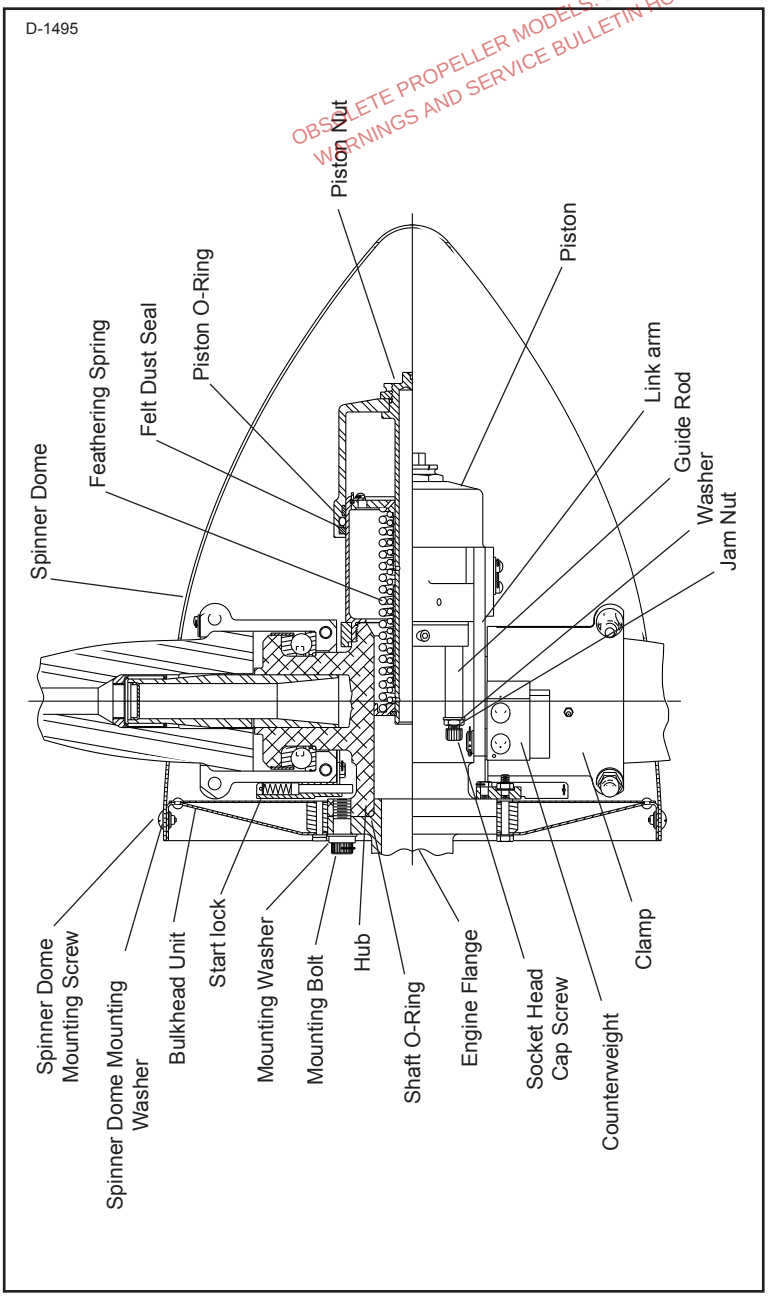


HC-83(X,V)F-2( )( ) Propeller Assembly
Figure 3-10

G. Installing F Flange Propeller Models HC-83(X,V)F-2( )( )

Refer to Figure 3-10.

CAUTION: INSERT THE DOWEL PINS INTO THE PROPELLER FLANGE USING A BRASS HAMMER OR EQUIVALENT TOOL TO PREVENT DAMAGE TO THE DOWEL PINS. THE DOWEL PINS ARE AN INTERFERENCE FIT WITH THE PROPELLER FLANGE.

(1) Insert two dowel pins (Table 3-1) through the threadless holes in the propeller flange, flush with the propeller side of the hub flange. The dowel pins will protrude from the engine side of the hub flange to engage the engine flange.

WARNING: CLEANING AGENT MEK IS 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.

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

WARNING: USE CAUTION DURING INSTALLATION IF THE START LOCKS HAVE BEEN ENGAGED TO FACILITATE INSTALLATION OF THE SPINNER BULKHEAD. IF THE BLADES ARE RELEASED SUDDENLY, THE EXTREME FORCE CAN CAUSE SERIOUS INJURY AND DAMAGE TO THE PROPELLER.

(3) If the spinner bulkhead is to be installed and is not already in place, perform the following steps:

NOTE: The start locks must be engaged to provide access to the spinner mounting bolts when installing the spinner bulkhead.

(a) Install the spinner bulkhead facing toward the engine.

(b) From the engine side of the bulkhead, insert the attaching bolts through the bulkhead and into the start lock units.

(c) Install the washers and locking nuts (Table 3-1) on the propeller side of the start lock to secure the attaching bolts and the bulkhead.

(4) Lubricate the specified shaft O-ring (Table 3-1) with engine oil and install it on the engine flange.

WARNING 1: TO FACILITATE BOXING AND SHIPPING OF THE PROPELLER, THE PISTON NUT MAY HAVE BEEN REMOVED TO PERMIT ROTATION OF THE BLADES BEFORE PACKAGING.

WARNING 2: MAKE SURE THE SLING IS RATED UP TO 800 POUNDS (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION.

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

(5) With a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

CAUTION: USE CARE TO AVOID SCRAPING ALUMINUM FROM THE BORE OF THE SPINNER BULKHEAD. SCRAPINGS COULD BECOME WEDGED BETWEEN THE FLANGES.

(6) Align the threaded holes of the propeller flange with the bolt holes in the engine flange, and align the dowel pins in the propeller flange with the dowel pin holes in the engine flange.

CAUTION: MAKE SURE THAT COMPLETE AND TRUE SURFACE CONTACT IS ESTABLISHED BETWEEN THE PROPELLER HUB FLANGE AND THE ENGINE FLANGE.

(7) Slide the propeller onto the engine shaft.

CAUTION: NEW PROPELLER MOUNTING BOLTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

(8) Install mounting bolts (Table 3-1) with mounting washers through the engine flange from the engine side and into the tapped holes in the propeller flange.

NOTE: For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

(9) Use a torque wrench with the appropriate torque wrench adapter (Figure 3-3) to torque all mounting bolts in sequence. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque in staggered sequence, beginning with any mounting bolt.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(10) Safety all mounting bolts with 0.032 inch (0.81 mm) minimum diameter stainless steel wire (two bolts for each safety).

(11) Procedure for reinstallation of the piston nut, if applicable.

(a) Following the installation of the propeller, retract the start lock pins and hold them in place with a heavy wire inserted through the hole of each start lock housing.

(b) Carefully push the piston toward the engine, rotating the blades to feather position, and attach the piston nut to the pitch change rod.

(c) Use a breaker bar and a 5/8 inch deep well socket to hold the pitch change rod.

(d) Using a 1-13/16 inch crowfoot wrench and a torque wrench, torque the piston nut. Refer to Table 3-2 and Figure 3-4 for the proper torque value.

NOTE: The removal and subsequent reinstallation of the piston nut does not require that the propeller blade angles be rechecked.

(12) Remove the wires from the start lock brackets.

CAUTION: DO NOT PUT THE BLADE PADDLE IN THE AREA OF THE DE-ICE 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 BOOT. USE ONE BLADE PADDLE FOR EACH BLADE.

(13) Position the propeller on the start locks.

(a) Using the blade paddles, slowly rotate the blades simultaneously toward low pitch until the start lock pins engage the start lock plates.

(14) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information for the components supplied by Hartzell can be found in the following publications available on the Hartzell web site at www.hartzellprop.com.

(a) Manual 180 (30-61-80) - Propeller Ice Protection System Manual

(b) Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

(c) Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual

(d) Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual

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

(16) Install the spinner dome as follows:

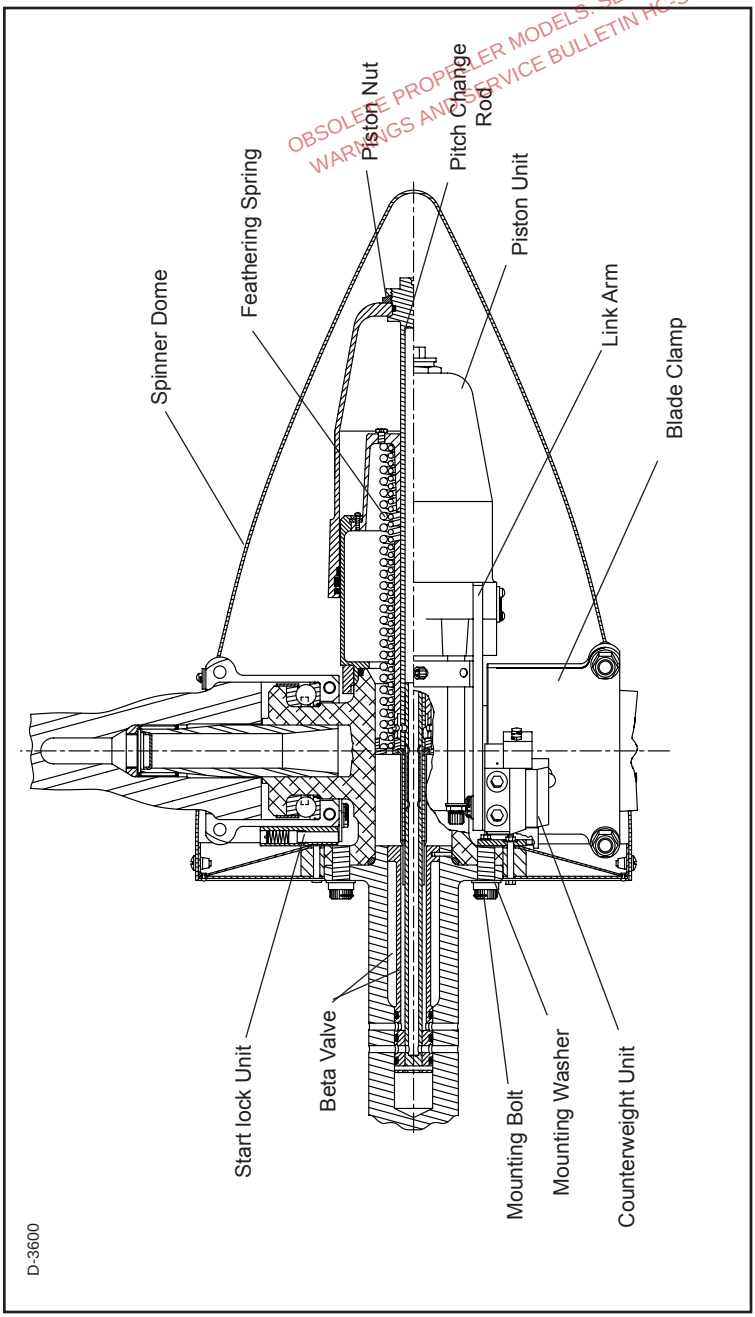
NOTE: The following instructions relate to Hartzell spinners only. In some cases, the airframe manufacturer produced the spinner assembly. In those cases, refer to the airframe manufacturer's manual for spinner installation instructions.

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, AND MAY AFFECT THE BALANCE OF THE PROPELLER.

(a) Carefully slide the spinner dome over the installed propeller.

(b) Secure the spinner dome to the spinner bulkhead with the supplied screws and washers.



HC-83(X,V)F-3( )( ) Propeller Assembly
Figure 3-11

H. Installing F Flange Propeller Models HC-83(X,V)F-3( )( )

Refer to Figure 3-11.

(1) Install the beta valve inside the engine shaft. Refer to the engine manufacturer's instructions.

WARNING: CLEANING AGENT MEK IS 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.

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

(3) Lubricate the specified O-ring with engine oil and install it on the engine flange. Refer to Table 3-1.

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

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

(4) With a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange.

(5) Align the mounting and dowel pin holes in the engine flange with the mounting holes and dowel pins in the propeller hub flange.

CAUTION 1: MAKE SURE THAT COMPLETE AND TRUE SURFACE CONTACT IS ESTABLISHED BETWEEN THE PROPELLER HUB FLANGE AND THE ENGINE FLANGE.

CAUTION 2: MAKE SURE THE PITCH CHANGE ROD ACCURATELY ALIGNS WITH THE ENGINE-MOUNTED BETA VALVE. MISALIGNMENT WILL DAMAGE THE BETA VALVE AND/OR THE PITCH CHANGE ROD.

(6) Slide the propeller onto the engine flange.

CAUTION: NEW PROPELLER MOUNTING BOLTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

(7) Install the mounting bolts with washers through the engine flange and into the propeller hub flange. Refer to Figure 3-11.

NOTE: If the propeller is removed between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

(8) Use a torque wrench with the appropriate torque wrench adapter to torque all mounting bolts in sequences and steps shown in Figure 3-3. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value.

NOTE: Refer to the Tools, Consumables, and Expendables section in this chapter for a list of applicable torque wrench adapters.

(a) Torque the mounting bolts to half of the final torque in staggered sequence, beginning with any mounting bolt.

(b) Final torque the bolts in sequence, beginning with any mounting bolt, and moving around the clock in either direction.

(9) Safety all mounting bolts with 0.032 inch (0.81 mm) minimum diameter stainless steel wire (two bolts for each safety).

(10) Install the beta tube according to the airframe and/or engine manufacturer's instructions.

NOTE 1: Follow the airframe manufacturer's instructions for adjusting the beta tube to obtain the correct low pitch (flight idle blade angle).

NOTE 2: Refer to the Aircraft Type Certificate Data Sheet for the low pitch blade angle setting.

(11) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information for the components supplied by Hartzell can be found in the following publications available on the Hartzell web site at www.hartzellprop.com.

(a) Manual 180 (30-61-80) - Propeller Ice Protection System Manual

(b) Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

(c) Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual

(d) Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual

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

(13)Install the spinner dome as follows:

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

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, AND MAY AFFECT THE BALANCE OF THE PROPELLER.

(a) Carefully slide the spinner dome over the installed propeller.

(b) Secure the spinner dome to the spinner bulkhead with the supplied screws and washers.

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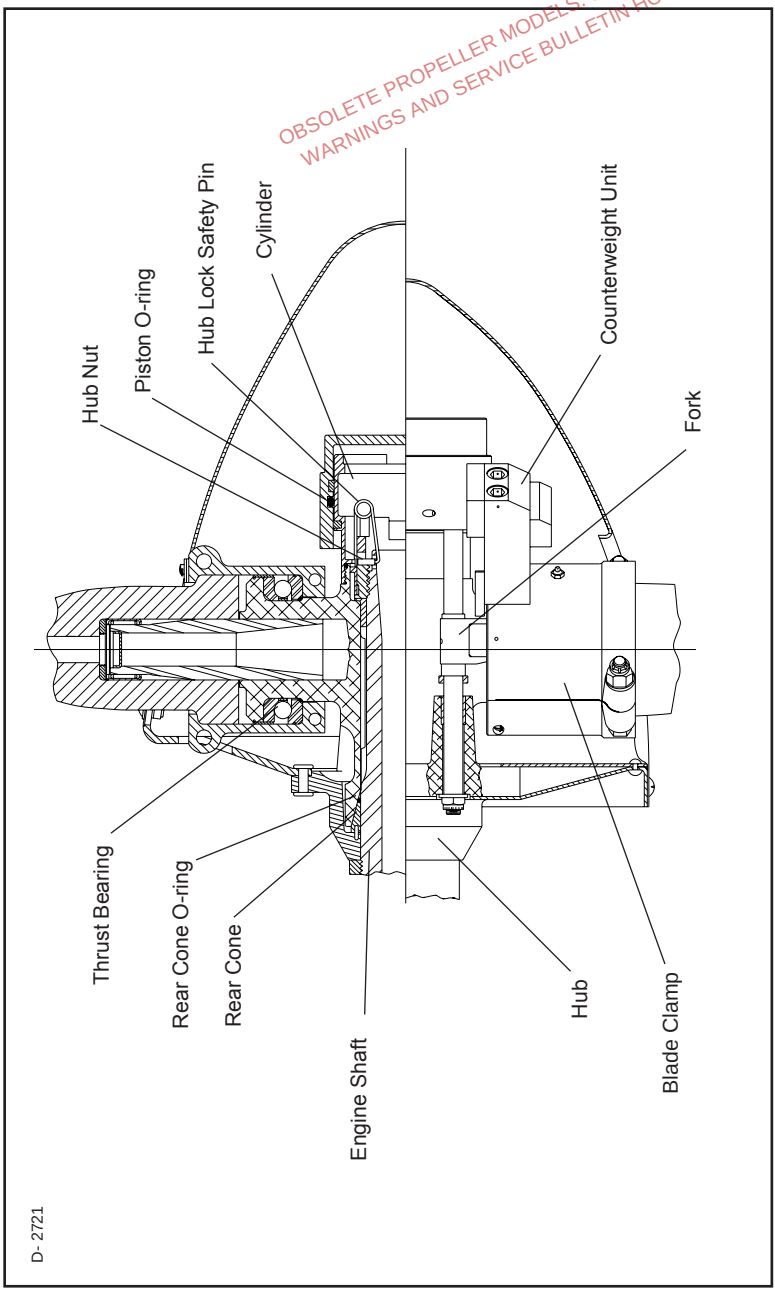


HC-83(X,V)20-1( )( )( ) Propeller Assembly
Figure 3-12

I. Installing Splined Propeller Models HC-83(X,V)20-1( )( )( )

Refer to Figure 3-12.

CAUTION: THE PISTON MUST BE REMOVED BEFORE INSTALLING THE PROPELLER ON THE AIRCRAFT. IF THE PISTON HAS ALREADY BEEN REMOVED, PROCEED TO STEP 4.I.(3).

(1) Piston removal

(a) The piston ears, forks, and counterweights should have corresponding index numbers (1, 2, and 3) impression-stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(b) Move the piston to low pitch.

(c) Loosen the set screw in each fork.

(d) Remove the self-locking nut from the end of each guide rod.

(e) Remove the washer from each guide rod.

(f) Lift the piston from the cylinder.

(g) Remove the sleeve from each bulkhead boss.

(h) Remove the high stop spacer from each sleeve.

WARNING: CLEANING AGENT MEK IS 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.

(2) Clean the propeller hub spline and engine spline surfaces with Quick Dry Stoddard Solvent or MEK.

(3) If the rear cone is not installed, install it on the bulkhead, matching the holes in the cone with the pins in the bulkhead. Push the cone against the bulkhead.

(4) Slide the rear spinner bulkhead and dome onto the engine shaft.

(5) Install the rear cone O-ring (Table 3-1) over the shaft and against the cone. Refer to Figure 3-13.

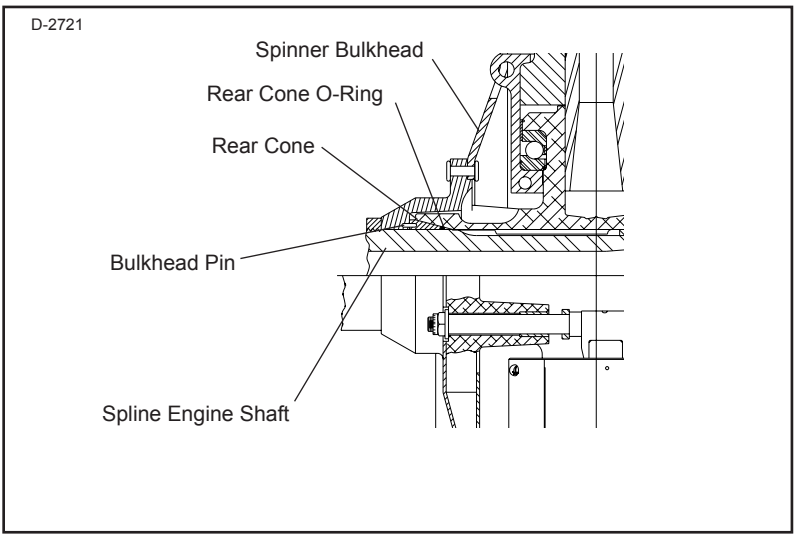
WARNING: MAKE SURE THE SLING IS RATED UP TO 800 POUNDS (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION.

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

(6) With a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting shaft.

NOTE: In most cases, the piston is not installed on the cylinder when the propeller is not installed on the engine.

(7) Slide the propeller hub onto the engine shaft and tighten the hub nut until the rear bulkhead is snug, but not tight. Do not torque the nut.



Rear Hub Mounting Parts
Figure 3-13

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.

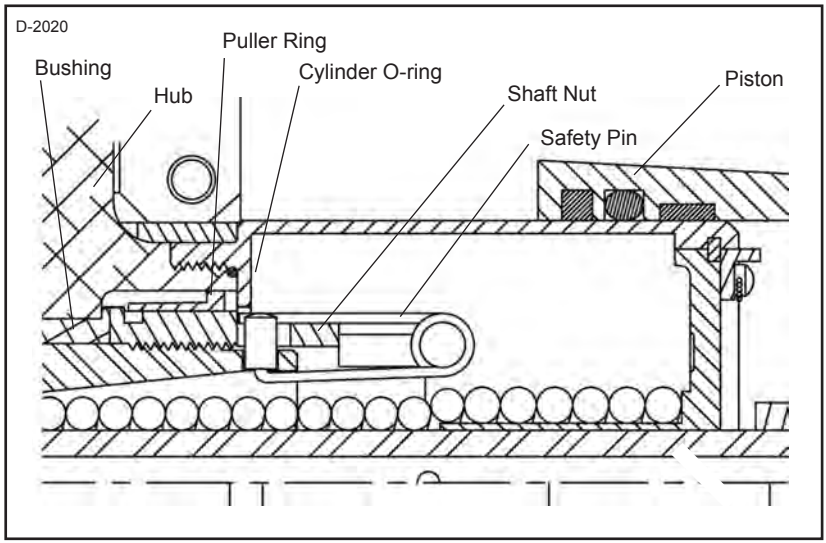
(8) Carefully slide the spinner dome over the installed propeller.

(9) To properly position the rear bulkhead, temporarily install the spinner dome with at least four screws.

(10) Adjust the spinner to equalize the clearance between the blades and the blade cutouts in the dome.

(11) Remove the spinner dome.

(12) Using tool BST-2910, torque the propeller shaft nut (Table 3-1). Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.



Safetying the Shaft Nut on the 20 Spline Shaft Propeller
Figure 3-14

(13)Safety the hub nut using the hub lock safety pin (Table 3-1). Refer to Figure 3-14.

(14)If the piston O-ring (Table 3-1) and the felt dust seal are not already installed in the piston, perform the following steps. Refer to Figure 3-15.

(a) Lubricate the piston O-ring with aviation grade reciprocating engine oil and carefully install it in the inner groove provided for it in the piston.

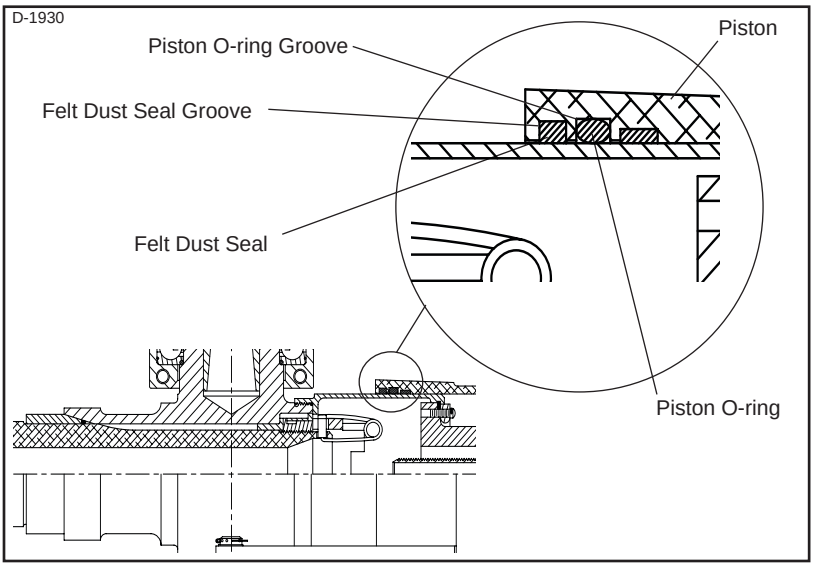
(b) Cut the felt dust seal material to the necessary length.

NOTE: Cut the felt seal material on a 30 degree diagonal so there will be an overlap with a smooth, fuzz-free surface.

(c) Soak the felt dust seal material in aviation grade reciprocating engine oil until it is completely saturated.

(d) Squeeze the excess oil from the felt dust seal.

(e) Install the felt dust seal material in the outer groove provided for it in the piston.



Installing Piston O-Ring and Felt Dust Seal
Figure 3-15

CAUTION: TO MAINTAIN PROPER BLADE ANGLES, REINSTALL THE PISTON IN THE SAME POSITION AS WHEN IT WAS ORIGINALLY ASSEMBLED. INDEX NUMBERS ON THE PISTON AND THE GUIDE COLLAR ARE PROVIDED TO MAKE SURE OF PROPER POSITIONING.

(15) Locate and match up the index numbers (1, 2, and 3) on the forks and piston ears with the corresponding index numbers on the counterweights.

NOTE: The index marks will be either impression-stamped or drawn with a felt-tipped pen.

(16) Install the high stop spacer(s) (Table 3-1) on each rod sleeve.

(17) Slide the rod sleeves with high stop spacers into each spinner bulkhead boss.

(18) Oil the entire surface of the cylinder with engine oil.

(19) Install the pitch change block on each clamp linkscrew.

CAUTION: POSITION THE THICK SIDE OF THE FORK ON THE ENGINE SIDE OF THE PITCH CHANGE BLOCK.

(20) Slide a fork onto each pitch change block.

(21) Install the piston:

(a) Engage the forks on the pitch change blocks.

(b) Slide the guide rods through the forks and rod sleeves until the piston rods protrude through the spinner bulkhead.

(22) Install the washer and self-locking nut (Table 3-1) on the end of each guide rod.

(23) Align the forks with the pitch change blocks.

(24) Torque the low pitch self-locking nut against the guide rod. Refer to Table 3-2.

(25) Tighten the set screw in each fork until snug.

(26) Safety the set screws by peening the corner of the set screw hole.

(27) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information for the components supplied by Hartzell can be found in the following publications available on the Hartzell web site at www.hartzellprop.com.

(a) Manual 180 (30-61-80) - Propeller Ice Protection System Manual

(b) Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

(c) Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual

(d) Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual

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

(29)Install the spinner dome as follows:

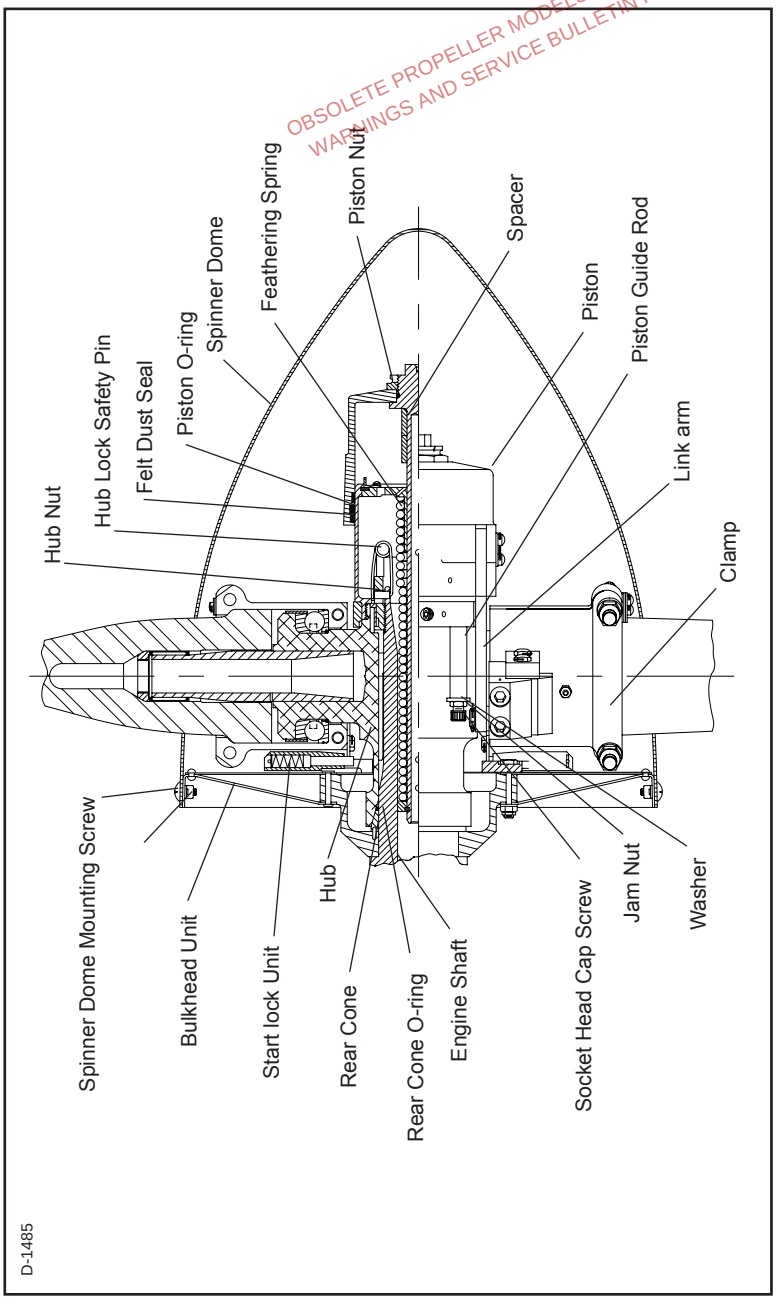
CAUTION 1: TO PREVENT DAMAGE TO THE BLADE AND BLADE PAINT, WRAP THE BLADE SHANKS IN SEVERAL LAYERS OF MASKING OR DUCT TAPE BEFORE INSTALLING THE SPINNER DOME. REMOVE THE TAPE AFTER THE SPINNER IS INSTALLED.

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

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

(a) Carefully slide the spinner dome over the installed propeller.

(b) Secure the spinner dome to the spinner bulkhead with the supplied screws and washers.



HC-83(X,V)20-2( ) ( ) Propeller Assembly
Figure 3-16

J. Installing Splined Propeller Models HC-83(X,V)20-2( )( )

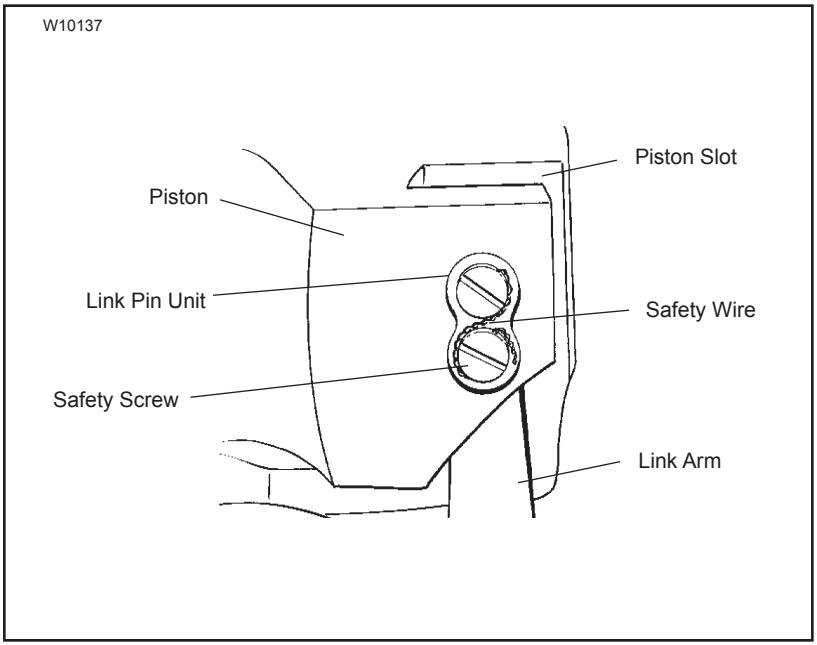
Refer to Figure 3-16.

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

CAUTION: THE PISTON MUST BE REMOVED BEFORE INSTALLING THE PROPELLER ON THE AIRCRAFT. IF THE PISTON HAS ALREADY BEEN REMOVED, PROCEED TO STEP 4.J.(2).

(1) Piston Removal (Refer to Figures 3-16 and 3-17)

(a) Remove the piston nut, if it was not previously removed to facilitate boxing and shipping of the propeller.



Piston-to-Link Arm Attachment Details
Figure 3-17

(b) Remove the safety wire (if installed) from the link pin units.

(c) Remove the safety screw from each link pin unit.

(d) Remove each link pin unit.

(e) The piston ears and guide collar should have corresponding index numbers (1 and 2 on a 2-blade propeller; 1, 2, and 3 on a 3-blade propeller) impression-stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(f) Slide the link arms out of the piston slots.

(g) Remove the socket head cap screw (Table 3-1), jam nut, and washer from each piston guide rod.

(h) Slide the piston off the cylinder.

CAUTION: THE SPRING ASSEMBLY MUST BE REMOVED BEFORE INSTALLING THE PROPELLER ON THE AIRCRAFT. IF THE SPRING ASSEMBLY HAS ALREADY BEEN REMOVED, PROCEED TO STEP 4.J.(3).

(2) Spring assembly removal:

Refer to Figure 3-18.

(a) Remove the safety wire (if installed) from the feather stop screws.

(b) Remove the two screws from each of the two feather stops on the front spring retainer.

(c) Remove the feather stops.

(d) Remove the split retainer.

(e) Remove the spring assembly from the cylinder.

WARNING: CLEANING AGENT MEK IS 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.

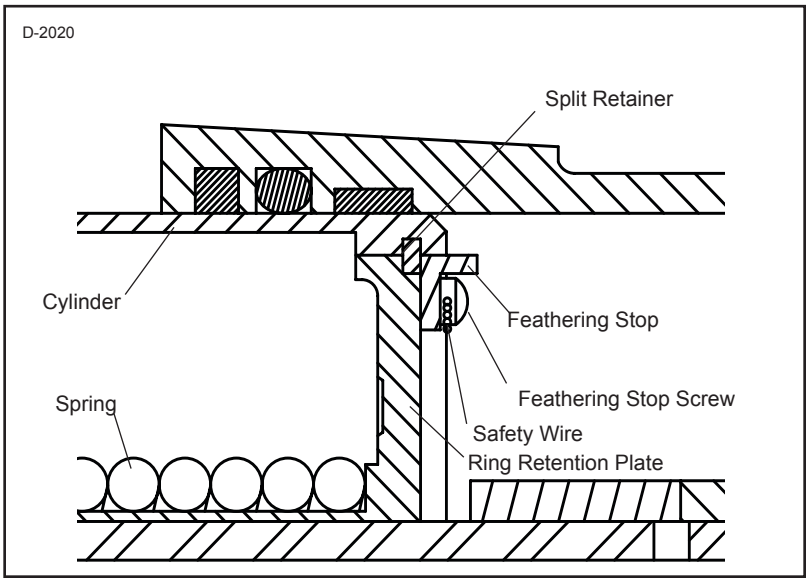
(3) Clean the propeller hub spline and engine spline surfaces with Quick Dry Stoddard Solvent or MEK.

(4) Slide the spinner bulkhead onto the shaft.

(5) Install the rear cone onto the bulkhead (Figure 3-39), matching the holes in the cone with the pins in the bulkhead.

(6) Retract the start lock pins and hold them in place with a heavy wire inserted through the hole of each start lock housing.

(7) Install the rear cone O-ring (Table 3-1) over the shaft. (Refer to Figure 3-19).



Spring Assembly-to-Cylinder Installation Details
Figure 3-18

(8) Install the rear cone and bulkhead on the shaft.

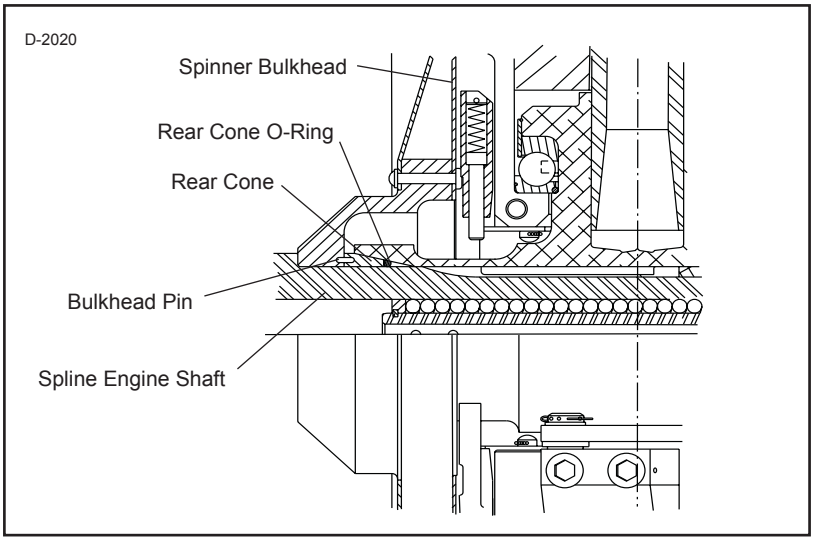
(9) With a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange in preparation for installation.

NOTE: If the propeller is equipped with an anti-ice or a de-ice system, follow the applicable manufacturer's instructions for installation of the anti-ice or de-ice system hardware.

(10) Slide the propeller hub onto the shaft and tighten the shaft nut until the rear bulkhead is snug, but not tight.

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.

(11) Carefully slide the spinner dome over the installed propeller.



Rear Hub Mounting Parts
Figure 3-19

(12)To properly position the rear bulkhead, temporarily install the spinner dome with at least four screws.

NOTE: Make sure the start lock pins are parallel with the blade axis, but offset to one side.

(13)Adjust the spinner to equalize the clearance between the blades and the blade cutouts in the dome.

(14)Remove the spinner dome.

(15)Using tool BST-2910, torque the propeller shaft nut (Table 3-1). Refer to Table 3-2 and Figure 3-4 to determine the proper torque value to which the torque wrench must be set.

(16)Safety the shaft nut to the engine shaft using a hub lock safety pin (Table 3-1). Refer to Figure 3-14.

NOTE: The hub lock safety pin is normally supplied in a separate package when the propeller is shipped new from the factory.

(17)Install the spring assembly.

(a) Put the feathering spring assembly into the engine shaft, with the front spring retainer inside the cylinder.

(b) Install the front split retainer between the cylinder and the front spring retainer, sliding the split retainer into the recess in the cylinder.

(c) Pull the spring retainer tight against the front split retainer.

(d) Install the feathering stop plate, which secures the split retainer, into place.

(e) Install the stop screws and tighten them until they are snug.

(f) Safety the stop screws with 0.032 inch (0.81 mm) minimum diameter stainless steel wire (two for each safety).

(18) If the piston O-ring (Table 3-1) and the felt dust seal are not already installed in the piston, perform the following steps. Refer to Figure 3-15.

(a) Lubricate the piston O-ring with aviation grade reciprocating engine oil and carefully install it in the inner groove provided for it in the piston.

(b) Cut the felt dust seal material to the necessary length.

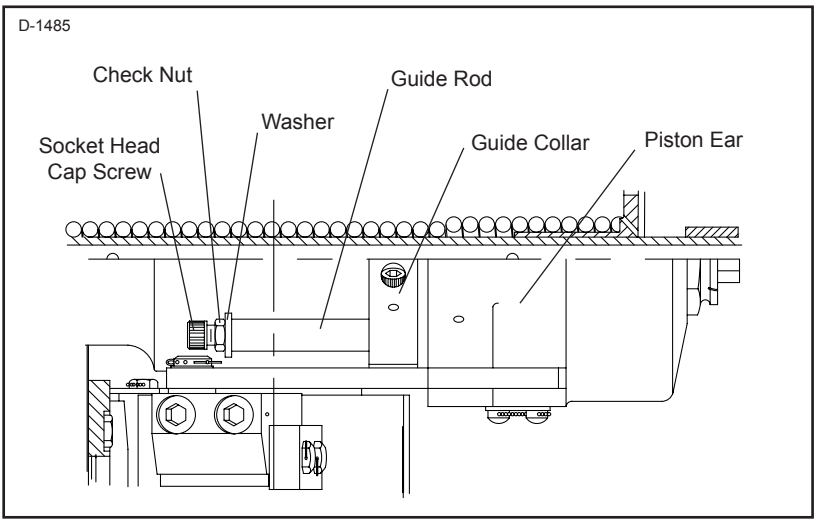
NOTE: Cut the felt seal material on a 30 degree diagonal so there will be an overlap with a smooth, fuzz-free surface.

(c) Soak the felt dust seal material in aviation grade reciprocating engine oil until it is completely saturated.

(d) Squeeze the excess oil from the felt dust seal.

(e) Install the felt dust seal material in the outer groove provided for it in the piston.

(19) Install the rod O-ring (Table 3-1) in the groove at the end of the threaded portion of the pitch change rod.



Guide Rod Installation Details
Figure 3-20

CAUTION: TO MAINTAIN PROPER BLADE ANGLES, REINSTALL THE PISTON IN THE SAME POSITION AS WHEN IT WAS ORIGINALLY ASSEMBLED. INDEX NUMBERS ON THE PISTON AND THE GUIDE COLLAR ARE PROVIDED TO MAKE SURE OF PROPER POSITIONING.

(20) Locate and match up the index numbers (1 and 2 on 2-blade propeller; 1, 2, and 3 on 3-blade propeller) on the piston ears with the corresponding index numbers on the guide collar. Refer to Figure 3-20.

NOTE: The index marks will be either impression-stamped or drawn with a felt-tipped pen.

(21) Oil the surface of the cylinder and install the piston.

(22) Slide the piston onto the cylinder and pass the guide rods through the collar bushing (Figure 3-20).

(23) Install the washer, check nut, and socket head cap screw at the end of each guide rod (Figure 3-20).

(24) Connect the link arms to the piston (Figure 3-17).

(25) Install the link pin units.

(26) Install the link pin safety screws (Figure 3-17) and tighten until snug.

(27) Safety the two screws together with 0.032 inch (0.81 mm) minimum diameter stainless steel wire (Figure 3-17).

(28) Carefully rotate the blades into feather position and fasten the piston to the pitch change rod with the piston nut (Table 3-1).

(29) Torque the piston nut. Refer to Table 3-2.

(30) Torque the low pitch stop nut against the guide rod. Refer to Table 3-2.

(31) Remove the wires from the start lock brackets.

(32) Position the propeller on the start locks.

CAUTION: DO NOT PUT THE BLADE PADDLE IN THE AREA OF THE DE-ICE 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 BOOT. USE ONE BLADE PADDLE FOR EACH BLADE.

(33) Using the paddles, simultaneously rotate the blades toward low pitch until the start lock pins engage the start lock plate.

(34) If the propeller is equipped with an ice protection system that uses components supplied by Hartzell Propeller Inc., applicable instructions and technical information for the components supplied by Hartzell can be found in the following publications available on the Hartzell web site at www.hartzellprop.com.

(a) Manual 180 (30-61-80) - Propeller Ice Protection System Manual

(b) Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

(c) Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual

(d) Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual

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

(36)Install the spinner dome as follows:

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, AND MAY AFFECT THE BALANCE OF THE PROPELLER.

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

(a) Carefully slide the spinner dome over the installed propeller.

(b) Secure the spinner dome to the spinner bulkhead with the supplied screws and washers.

5. Post-Installation Checks

A. Refer to the airframe manufacturer's instructions for post-installation checks.

B. Perform a static RPM check as outlined in the Maintenance Practices chapter of this manual.

6. Propeller Assembly Removal

A. Removing the F Flange Propeller Models HC-82(X,V)F-1( )( )( ) and HC-82XF-6( )( )( )

Refer to Figure 3-1.

NOTE: If the propeller is equipped with an anti-ice or a de-ice system, follow the manufacturer's instructions for removing the components necessary for propeller removal.

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

(1) Spinner dome removal

(a) Remove the screws and washers that secure the spinner to the spinner bulkhead.

(b) Remove the spinner dome.

(c) Remove layers of masking or duct tape from each blade shank, if applicable.

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE AND RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER OVERHAUL MANUALS.

(2) Remove the safety wire on the propeller mounting bolts.

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

(3) Support the propeller assembly with a sling.

NOTE 1: To permit rotation of the propeller for ease of bolt removal, supporting the propeller with a sling may be delayed until all but two mounting bolts and washers have been removed.

NOTE 2: 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 proper positioning of the propeller during reinstallation. This will prevent dynamic imbalance.

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

(4) Remove the propeller mounting bolts from the engine flange.

NOTE: For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(5) Using the support sling, lift the propeller from the mounting flange.

(6) Remove and discard the engine shaft O-ring.

B. Removing the K and L Flange Propeller Models HC-82(X,V)(K,L)-1( )( ) and HC-82VL-6( )( )

Refer to Figure 3-1.

NOTE: If the propeller is equipped with an anti-ice or a de-ice system, follow the manufacturer's instructions for removing the components necessary for propeller removal.

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

(1) Spinner dome removal

(a) Remove the screws and washers that secure the spinner to the spinner adapter ring.

(b) Remove the spinner dome.

(c) Remove layers of masking or duct tape from each blade shank, if applicable.

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE AND RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER OVERHAUL MANUALS.

(2) Remove the safety wire on the propeller mounting bolts.

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

(3) Support the propeller assembly with a sling.

NOTE 1: To permit rotation of the propeller for ease of bolt removal, supporting the propeller with a sling may be delayed until all but two mounting bolts and washers have been removed.

NOTE 2: 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 proper positioning of the propeller during reinstallation. This will prevent dynamic imbalance.

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

(4) Remove the propeller mounting bolts from the engine flange.

(5) Remove two propeller mounting bolts and washers.

NOTE 1: Four of the propeller mounting bolts and washers cannot be removed from the propeller hub due to interference with other propeller parts.

NOTE 2: For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(6) Using the support sling, lift the propeller from the mounting flange.

(7) Remove and discard the shaft O-ring.

(8) Remove the shim.

(9) If the spinner was manufactured by Hartzell Propeller:

(a) Do not remove the spinner adapter ring.

(b) Visually inspect the spinner adapter ring for cracks.

(c) If cracks are found in the spinner adapter ring, remove it from the engine starter ring gear and replace it.

C. Removing the F Flange Propeller Models HC-82(X,V)F-2( )( )

Refer to Figure 3-7.

NOTE: If the propeller is equipped with an anti-ice or a de-ice system, follow the manufacturer's instructions for removing the components necessary for propeller removal.

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

(1) Spinner dome removal

(a) Remove the screws and washers that secure the spinner to the spinner bulkhead.

(b) Remove the spinner dome.

(c) Remove layers of masking or duct tape from each blade shank, if applicable.

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE AND RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER OVERHAUL MANUALS.

WARNING 3: USE CAUTION DURING PROPELLER REMOVAL WHEN THE START LOCKS ARE ENGAGED. IF THE BLADES ARE RELEASED SUDDENLY, THE EXTREME FORCE CAN CAUSE SERIOUS INJURY AND DAMAGE TO THE PROPELLER.

(2) Routine propeller engine shutdown will engage the start lock units, preventing the propeller from feathering. To permit access to the of the spinner mounting bolts, the start locks should remain engaged during the removal of the propeller.

(3) Remove the safety wire on the propeller mounting bolts.

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

(4) Support the propeller assembly with a sling.

NOTE 1: To permit rotation of the propeller for ease of bolt removal, supporting the propeller with a sling may be delayed until all but two mounting bolts and washers have been removed.

NOTE 2: 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 proper positioning of the propeller during reinstallation. This will prevent dynamic imbalance.

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

(5) Remove the propeller mounting bolts and washers.

NOTE: For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(6) Using the support sling, lift the propeller from the mounting flange.

(7) Remove and discard the shaft O-ring.

(8) Put the propeller, with spinner bulkhead and start locks attached, on a suitable cart for transportation.

D. Removing the K and L Flange Propeller Models HC-82(X,V)(K,L)-2( )( )

Refer to Figure 3-7.

NOTE: If the propeller is equipped with an anti-ice or a de-ice system, follow the manufacturer's instructions for removing the components necessary for propeller removal.

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

(1) Spinner dome removal

(a) Remove the screws and washers that secure the spinner to the spinner adapter ring.

(b) Remove the spinner dome.

(c) Remove layers of masking or duct tape from each blade shank, if applicable.

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE AND RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER OVERHAUL MANUALS.

WARNING 3: FOR SAFETY REASONS, THE PROPELLER MUST BE PUT IN THE FEATHER POSITION BEFORE IT IS REMOVED FROM THE AIRCRAFT.

(2) Routine propeller engine shutdown will engage the start lock units, preventing the propeller from feathering. For purposes of propeller removal, the propeller should be put in feather position during engine shutdown. If this was not accomplished, then the propeller may be feathered as follows:

CAUTION: DO NOT PUT THE BLADE PADDLE IN THE AREA OF THE DE-ICE BOOT WHEN APPLYING TORQUE TO A BLADE ASSEMBLY. PUT THE BLADE PADDLE IN THE THICKEST AREA OF THE BLADE, JUST OUTBOARD OF THE DE-ICE BOOT. USE ONE BLADE PADDLE FOR EACH BLADE.

(a) Rotate the blades simultaneously to a slightly lower pitch to disengage the start lock plates from the start lock units.

(b) Retract the start lock pins and hold them in place with a heavy wire inserted through the hole of each start lock housing.

(c) Slowly and carefully permit the blades to rotate to high/feather pitch.

(3) Remove the safety wire on the propeller mounting bolts.

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

(4) Support the propeller assembly with a sling.

NOTE 1: To permit rotation of the propeller for ease of bolt removal, supporting the propeller with a sling may be delayed until all but two mounting bolts and washers have been removed.

NOTE 2: 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 proper positioning of the propeller during reinstallation. This will prevent dynamic imbalance.

(5) Record the position of each start lock in relation to its matching blade.

(6) Remove the start lock brackets to access the mounting bolts.

NOTE: It is not necessary to remove the wire that is holding the stop pin in place.

(7) Cut and remove the safety wire from the propeller mounting bolts.

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

(8) Remove the propeller mounting bolts from the engine flange.

(9) Remove four propeller mounting bolts and washers.

NOTE 1: Two of the propeller mounting bolts and washers cannot be removed from the propeller hub due to interference with other propeller parts.

NOTE 2: For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(10) Remove and discard the shaft O-ring.

(11) Remove the shim.

(12) Using the support sling, lift the propeller from the mounting flange.

(13) If the spinner was manufactured by Hartzell Propeller:

(a) Do not remove the spinner adapter ring.

(b) Visually inspect the spinner adapter ring for cracks.

(c) If cracks are found in the spinner adapter ring, remove it from the engine starter ring gear and replace it.

E. Removing the F Flange Propeller Models HC-83(X,V)F-2( )( )

Refer to Figure 3-10.

NOTE: If the propeller is equipped with an anti-ice or a de-ice system, follow the manufacturer's instructions for removing the components necessary for propeller removal.

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

(1) Spinner dome removal

(a) Remove the screws and washers that secure the spinner dome to the spinner bulkhead.

(b) Remove the spinner dome.

(c) Remove layers of masking or duct tape from each blade shank, if applicable.

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE AND RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER OVERHAUL MANUALS.

WARNING 3: USE CAUTION DURING PROPELLER REMOVAL WHEN THE START LOCKS ARE ENGAGED. IF THE BLADES ARE RELEASED SUDDENLY, THE EXTREME FORCE CAN CAUSE SERIOUS INJURY AND DAMAGE TO THE PROPELLER.

(2) Routine propeller engine shutdown will engage the start lock units, preventing the propeller from feathering. To permit access to the spinner mounting bolts, the start locks should remain engaged during the removal of the propeller.

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

(3) Support the propeller assembly with a sling.

NOTE 1: To permit rotation of the propeller for ease of bolt removal, supporting the propeller with a sling may be delayed until all but two mounting bolts and washers have been removed.

NOTE 2: 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 proper positioning of the propeller during reinstallation. This will prevent dynamic imbalance.

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

(4) Cut and remove the safety wire from the propeller mounting bolts.

(5) Remove the propeller mounting bolts and washers.

NOTE: For propeller removals between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(6) Using the support sling, lift the propeller from the mounting flange.

(7) Remove and discard the shaft O-ring.

(8) Put the propeller, with spinner bulkhead and start locks attached, on a suitable cart for transportation.

(9) If spinner assembly 837-16 is installed, refer to Figure 3-45 and perform the following steps for the spinner bulkhead removal.

(a) Record the position of each start lock in relation to its matching blade.

(b) Remove the bolts, nuts, and washers that attach the bulkhead to a ring and spinner mounting plate.

(c) Remove the two-piece spinner mounting plate, spinner bulkhead, and ring from the engine flange.

F. Removing F Flange Propeller Models HC-83(X,V)F-3( )( )

Refer to Figure 3-11.

NOTE: If the propeller is equipped with a de-ice system, follow the manufacturer's instructions for removing whichever components are necessary for propeller removal.

(1) Remove the spinner dome if applicable

(a) Remove the screws and washers that secure the spinner dome to the bulkhead.

(b) Remove the spinner dome.

(c) Remove layers of masking or duct tape from each blade shank, if applicable.

CAUTION: THE BETA TUBE MUST BE REMOVED BEFORE THE PROPELLER ASSEMBLY IS REMOVED FROM THE AIRCRAFT. REFER TO THE AIRCRAFT MAINTENANCE INSTRUCTION MANUAL.

(2) Remove the beta tube.

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE AND RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER OVERHAUL MANUALS.

WARNING 3: FOR SAFETY REASONS, THE PROPELLER MUST BE PUT IN FEATHER POSITION BEFORE IT IS REMOVED FROM THE AIRCRAFT.

(3) Routine propeller engine shutdown will engage the start lock units, preventing the propeller from feathering. For purposes of propeller removal, the propeller should be put in feather position during engine shutdown. If this was not accomplished, then the propeller may be feathered as follows:

CAUTION: DO NOT PUT THE BLADE PADDLE IN THE AREA OF THE DE-ICE BOOT WHEN APPLYING TORQUE TO A BLADE ASSEMBLY. PUT THE BLADE PADDLE IN THE THICKEST AREA OF THE BLADE, JUST OUTBOARD OF THE DE-ICE BOOT. USE ONE BLADE PADDLE FOR EACH BLADE.

(a) Rotate the blades simultaneously to a slightly lower pitch to disengage the start lock plates from the start lock units.

(b) Retract the start lock pins and hold them in place with a heavy wire inserted through the hole of each start lock housing.

(c) Slowly and carefully permit the blades to rotate to high/feather pitch.

(4) Remove the safety wire on the propeller mounting bolts.

WARNING: MAKE SURE THE SLING IS RATED UP TO 800 POUNDS (362.99 KG.) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING REMOVAL.

(5) Support the propeller assembly with a sling.

NOTE 1: To permit rotation of the propeller for ease of bolt removal, supporting the propeller with a sling may be delayed until all but two mounting nuts and washers have been removed.

NOTE 2: 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 proper positioning of the propeller during reinstallation. This will prevent dynamic imbalance.

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

(6) Remove the propeller mounting bolts and washers.

NOTE: If the propeller is removed between overhaul intervals, mounting bolts and washers may be reused if they are not damaged or corroded.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(7) Using the support sling, lift the propeller from the mounting flange.

(8) Remove and discard propeller mounting O-ring.

G. Removing the 20 Splined Propeller Models HC-83(X,V)20-1( )( )( )

Refer to Figure 3-12.

NOTE: If the propeller is equipped with an anti-ice or a de-ice system, follow the manufacturer's instructions for removing the components necessary for propeller removal.

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

(1) Spinner dome removal

(a) Remove the screws and washers that secure the spinner to the bulkhead.

(b) Remove the spinner dome.

(c) Remove layers of masking or duct tape from each blade shank, if applicable.

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE AND RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER OVERHAUL MANUALS.

CAUTION: OIL WILL FLOW OUT OF THE PROPELLER WHEN THE PISTON IS REMOVED. PUT A DRIP PAN UNDER THE PROPELLER TO CATCH THE EXCESS OIL.

(2) Piston Removal (Refer to Figure 3-17.)

(a) Remove the self-locking nut from each piston rod.

(b) Remove the washer from each piston rod.

(c) Loosen the set screw in each fork.

(d) Slide the piston away from the hub and to the low pitch position, until the piston rods clear the bulkhead.

(e) Rotate the piston and forks away from the clamp link screws.

(f) The piston ears and guide collar should have corresponding index numbers (1, 2, and 3) impression-stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(g) Slide the piston off the cylinder and remove it from the propeller.

(h) To prevent the loss of the sleeve, fork, and high pitch stop washers, reinstall the self-locking nut, and washer on each piston rod.

(i) The pitch change blocks should have index numbers (1, 2, and 3) marked with a felt-tipped pen to correspond to the numbers on the piston ears, forks, counterweights, and guide collar. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(j) Remove the pitch change block from each clamp linkscrew.

(3) Remove the hub lock safety pin. Refer to Figure 3-14.

(4) Using tool BST-2910, completely loosen the shaft nut from the engine shaft threads.

NOTE: Because the shaft nut is pulling the propeller hub off the tapered rear cone, there will be significant initial resistance to the loosening of the shaft nut.

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

(5) Support the propeller assembly with a sling.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(6) Using the support sling, slide the propeller from the engine splined shaft and lift the propeller from the engine.

(7) Remove and discard the rear cone O-ring (Figure 3-13).

(8) Remove the rear cone from the engine shaft (Figure 3-13).

(9) Remove the rear spinner bulkhead from the engine shaft (Figure 3-13).

H. Removing the 20 Splined Propeller Models HC-83(X,V)20-2( )( )

Refer to Figures 3-16.

NOTE: If the propeller is equipped with an anti-ice or a de-ice system, follow the manufacturer's instructions for removing the components necessary for propeller removal.

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

(1) Spinner dome removal

(a) Remove the screws and washers that secure the spinner dome to the spinner bulkhead.

(b) Remove the spinner dome.

WARNING 1: DURING ENGINE INSTALLATION OR REMOVAL, USING THE PROPELLER TO SUPPORT THE WEIGHT OF THE ENGINE IS NOT AUTHORIZED. UNAPPROVED INSTALLATION AND REMOVAL TECHNIQUES MAY CAUSE DAMAGE TO THE PROPELLER THAT MAY LEAD TO FAILURE AND RESULT IN AN AIRCRAFT ACCIDENT.

WARNING 2: DURING PROPELLER REMOVAL, AIRFRAME MANUFACTURER'S MANUALS AND PROCEDURES MUST BE FOLLOWED BECAUSE THEY MAY CONTAIN ISSUES VITAL TO AIRCRAFT SAFETY THAT ARE NOT CONTAINED IN THIS MANUAL OR IN THE HARTZELL PROPELLER OVERHAUL MANUALS.

WARNING 3: FOR SAFETY REASONS, THE PROPELLER MUST BE PUT IN THE FEATHER POSITION BEFORE IT IS REMOVED FROM THE AIRCRAFT.

(2) Routine propeller engine shutdown will engage the start lock units, preventing the propeller from feathering. For purposes of propeller removal, the propeller should be put in feather position during engine shutdown. If this was not accomplished, then the propeller may be feathered as follows:

CAUTION: DO NOT PUT THE BLADE PADDLE IN THE AREA OF THE DE-ICE BOOT WHEN APPLYING TORQUE TO A BLADE ASSEMBLY. PUT THE BLADE PADDLE IN THE THICKEST AREA OF THE BLADE, JUST OUTBOARD OF THE DE-ICE BOOT. USE ONE BLADE PADDLE FOR EACH BLADE.

(a) Rotate the blades simultaneously to a slightly lower pitch to disengage the start lock plates from the start lock units.

(b) Retract the start lock pins and hold them in place with a heavy wire inserted through the hole of each start lock housing.

(c) Slowly and carefully permit the blades to rotate to high/feather pitch.

(3) Piston removal (Refer to figure 3-17)

(a) Remove the piston nut.

(b) Remove the safety wire from the link pin units.

(c) Remove the safety screws from each link pin unit.

(d) Remove each link pin unit.

(e) The piston ears and guide collar should have corresponding index numbers (1 and 2 for a 2-blade propeller; 1, 2, and 3 for a 3-blade propeller) impression-stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

NOTE: This will make sure that the components are reassembled in their original location.

(f) Remove the socket head cap screw, jam nut, and washer from each piston guide rod.

(g) Slide the piston off the cylinder.

(4) Spring assembly removal (Refer to Figure 3-17)

(a) Remove the safety wire from the feather screws.

(b) Remove the feather stop screws.

(c) Remove the feather stop plate.

(d) Remove the split retainer.

(e) Remove the spring assembly from the cylinder.

(5) Remove the hub lock safety pin.

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

(6) Support the propeller assembly with a sling.

(7) Completely loosen the shaft nut from the engine shaft threads.

NOTE: Because the shaft nut is pulling the propeller hub off the tapered rear cone, there will be significant resistance to the loosening of the shaft nut.

CAUTION: USE ADEQUATE PRECAUTIONS TO PROTECT THE PROPELLER ASSEMBLY FROM DAMAGE WHEN IT IS REMOVED FROM THE AIRCRAFT ENGINE AND WHEN IT IS STORED.

(8) Using the support sling, slide the propeller from the engine splined shaft and lift the propeller from the engine.

(9) Remove and discard the rear cone O-ring on the engine splined shaft (Figure 3-39).

(10) If necessary, remove the rear cone (Figure 3-39).

(11) If necessary, remove the rear spinner bulkhead.

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1. Operational Tests

Following propeller installation, and before flight, the propeller hydraulic system must be purged of air and proper operation verified.

A. Initial Run-Up

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

(2) Cycle the propeller control throughout its operating pitch range from low to high (or as directed by the POH).

(3) Repeat this procedure three times, or as necessary, to purge air from the propeller hydraulic system and to introduce warmed oil to the cylinder.

NOTE: Pitch change response on the first operation from low to high blade angle may be slow, but should speed up on the second and third cycles.

(4) Verify proper operation from low pitch to high pitch and throughout operating range.

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

NOTE: Air trapped in the propeller hydraulic system will cause the pitch control to be imprecise and may result in propeller surging.

B. Static RPM Check

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 governor Maximum RPM Stop 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 maximum manifold pressure.

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

(a) If engine speed stabilizes at the maximum 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 Troubleshooting section of this chapter and perform the adjustments under Max. RPM (Static) Low Pitch Stop Adjustment.

(7) Stop the engine.

(8) Return the governor Maximum RPM Stop to the original position, or adjust the governor to the rated RPM with the Maximum RPM Stop screw.

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

C. Post-Run Check

After engine shutdown, check the propeller for signs of engine oil leakage.

2. Propeller Ice Protection Systems

A. Electric De-Ice System

(1) Consult the Pilot Operating Handbook (including all supplements) regarding flight into conditions of known icing. The aircraft may not be certificated for flight in known icing conditions, even though propeller de-ice equipment is installed.

(2) Refer to the Anti-Ice and De-Ice Systems chapter of this manual for functional tests of the de-ice system.

B. Anti-Ice System

(1) Consult the Pilot Operating Handbook (including all supplements) regarding flight into conditions of known icing. The aircraft may not be certificated for flight in known icing conditions, even though propeller anti-ice equipment is installed.

(2) Refer to the Anti-Ice and De-Ice Systems chapter of this manual for functional tests of the anti-ice system.

3. Troubleshooting

A. Incorrect Maximum RPM (on ground)

(1) Incorrect maximum RPM on the ground may be caused by low engine power, and incorrect governor maximum RPM stop setting, or an incorrect propeller low pitch stop.

(2) Perform a check as described in the Maximum RPM Check (On Ground) procedure in the Maintenances Practices chapter of this manual.

(3) If adjustment of the propeller low pitch blade angle is required, adjustment must be performed by qualified personnel at an appropriately licensed propeller service facility or by the Hartzell factory.

B. Maximum RPM is Low

(1) Engine power is low

(a) Follow aircraft POH and/or AMM recommended checks to determine if the engine power is low.

(b) If the engine power is low, refer to an appropriately licensed engine service facility or the engine manufacturer.

(c) If the engine power is within acceptable limits, examine the maximum RPM stop setting of the governor.

(2) Governor Maximum RPM Stop Setting

(a) Set the brakes and chock the wheels of the aircraft, or tie the aircraft down.

(b) Increase the maximum RPM stop screw of the governor by one turn.

(c) Advance the propeller RPM control to maximum RPM and reduce the control by 1 inch (25.4 mm).

(d) Start the engine.

(e) Slowly advance the throttle to maximum manifold pressure.

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

(g) If the engine speed stabilizes at a higher RPM than it was previously running, then the governor maximum RPM stop setting is incorrectly set.

1 Make additional fine adjustments to the governor maximum RPM stop setting until the rated maximum RPM is reached.

(h) If the engine speed does not increase from the RPM that it was previously running, then the propeller low pitch angle is probably incorrect.

C. Maximum RPM is High

(1) Engine power is high.

(a) Follow the aircraft POH and/or AMM recommended engine checks to determine if the engine power is high.

(b) If the engine power is high, refer to an appropriately licensed engine service facility or to the engine manufacturer.

(c) If the engine power is within acceptable limits, examine the maximum RPM stop setting of the governor.

(2) Governor maximum RPM stop setting

(a) When RPM is high, both the governor maximum RPM stop and the propeller low pitch blade angle are misadjusted.

(b) Adjust the governor maximum RPM stop to obtain the rated maximum RPM.

(c) Inspect the propeller low pitch stop as described in the Propeller Equipment and Setting section of the Maintenance Practices chapter of this manual.

(3) Propeller low pitch setting

(a) For low pitch verification refer to the procedures in the Propeller Equipment and Setting section of the Maintenance Practices chapter of this manual.

D. Hunting and Surging

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.

(1) If propeller is hunting, a repair facility should check:

(a) Governor

(b) Fuel control

(c) Synchrophaser, or synchronizer, if applicable.

(2) If propeller is surging:

(a) Perform the steps 1.A.(1) through 1.A.(5) under Operational Tests section in this chapter to release trapped air from the propeller. If surging reoccurs it is most likely because of a faulty governor.

(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.

NOTE: The propeller must be tested on a test bench at an appropriately licensed propeller repair facility to isolate these faults.

E. Engine Speed Varies with Airspeed

(1) Constant speed propeller models HC-8( )( )( )-1( )( ), -2( )( ), -3( )( ), and -6( )( )( ) will experience some small variances in engine speed that are normal and are no cause for concern.

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

(a) HC-82(X,V)(F,L)-6( )( )( ) propeller models:

1 Governor is not increasing oil volume in the propeller.

2 Engine oil transfer bearing is leaking excessively.

3 Excessive friction in the blade bearings, in the pitch change mechanism, or in the misalignment between the guide collar and the piston rods.

(b) HC-8( )( )( )-1( )( ), -2( )( ), and -3( )( ) propeller models:

1 Governor is not reducing oil volume in the propeller.

2 Excessive friction in the blade bearings or the pitch change mechanism

3 Excessive friction in the misalignment between the guide collar and the piston rods

(3) Decrease in engine speed while increasing airspeed:

(a) HC-82(X,V)(F,L)-6( )( )( ) propeller models:

1 Governor pilot valve is stuck and is excessively increasing oil volume.

(b) HC-8( )( )( )-1( )( ), -2( )( ), and -3( )( ) propeller models:

1 Governor pilot valve is stuck and is excessively decreasing oil volume.

2 Feathering command is engaged on the propeller pitch control -2( )( ), and -3( )( ) propeller models only.

(4) Increase in engine speed while decreasing airspeed:

(a) HC-82(X,V)(F,L)-6( )( )( ) propeller models:

1 Governor pilot valve is stuck and is excessively decreasing oil volume in the propeller.

(b) HC-8( )( )( )-1( )( ), -2( )( ), and -3( )( ) propeller models:

1 Governor pilot valve is stuck and is excessively increasing oil volume.

(5) Decrease in engine speed while decreasing airspeed:

(a) HC-82(X,V)(F,L)-6( )( )( ) propeller models:

1 Governor is not reducing oil volume in the propeller.

2 Excessive friction in the blade bearings or pitch change mechanism

(b) HC-8( )( )( )-1( )( ), -2( )( ), and -3( )( ) propeller models:

1 Governor is not increasing oil volume in the propeller.

2 Engine oil transfer bearing is leaking excessively.

3 Excessive friction in the blade bearings or the pitch change mechanism

F. Loss of Propeller Control - HC-82(X,V)(F,L)-6( )( )( ) propeller models:

(1) Propeller goes to uncommanded low pitch (high RPM)

(a) Loss of oil pressure - check:

1 Governor pressure relief valve for proper operation.

2 Governor pilot valve sticking.

3 Governor drive for damage.

4 Adequate engine oil supply.

5 Engine oil transfer bearing for excessive leakage.

(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 change mechanism.

(b) Misalignment between the guide collar and piston rods.

(c) Engine oil transfer bearing is leaking excessively.

(d) Governor is not increasing oil volume in the propeller.

G. Loss of Propeller Control - HC-8( )( )-1( )( ), -2( )( ), and -3( )( ) propeller models:

(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 oil transfer bearing for excessive leakage.

(b) Start lock not engaging - HC-8( )( )( )-1( )( ), -2( )( ), and -3( )( ) propeller models only

(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 change mechanism

(b) Excessive friction in misalignment between the guide collar and the piston rods - HC-8( )( )( )-1( )( ), -2( )( ), and -3( )( ) propeller models only.

(c) Broken spring (applies to HC-8( )( )( )-2( )( ) and -3( )( )propeller models.)

(d) Governor is not reducing oil volume in the propeller.

H. Failure to Feather or Feathers Slowly - HC-8( )( )( )-2( )( ) and -3( )( ) propeller models only:

(1) Broken feathering spring

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

(3) Check governor drain function.

(4) Propeller must be checked for misadjustment or internal corrosion (usually in blade bearings or pitch change mechanism) that results in excessive friction. This must be accomplished at an appropriately licensed propeller repair facility.

I. Failure to Unfeather - HC-8( )( )-2( )( ) and -3( )( ) propeller models only:

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

(2) Check governor function.

(3) Check for excessive oil leakage at the engine oil transfer bearing.

(4) Propeller must be checked for misadjustment or internal corrosion (usually in blade bearings or pitch change mechanism) that results in excessive friction. This must be accomplished at an appropriately licensed propeller repair facility.

J. Start Locks Fail to Engage on Shutdown - HC-8( )( )( )-2( )( ) and -3( )( ) propeller models only:

(1) Propeller was feathered before shutdown.

CAUTION: DO NOT PLACE THE BLADE PADDLE IN THE AREA OF THE DE-ICE BOOT WHEN APPLYING TORQUE TO A BLADE ASSEMBLY. PLACE THE BLADE PADDLE IN THE THICKEST AREA OF THE BLADE, JUST OUTSIDE OF THE DE-ICE BOOT. USE ONE BLADE PADDLE FOR EACH BLADE.

(a) Using the blade paddles, simultaneously rotate the blades toward low pitch until the start lock pins engage a clamp mounted stop plate.

(2) Shutdown occurred at high RPM with the propeller control set for coarse blade angle or low RPM.

CAUTION: DO NOT PLACE THE BLADE PADDLE IN THE AREA OF THE DE-ICE BOOT WHEN APPLYING TORQUE TO A BLADE ASSEMBLY. PLACE THE BLADE PADDLE IN THE THICKEST AREA OF THE BLADE, JUST OUTSIDE OF THE DE-ICE BOOT. USE ONE BLADE PADDLE FOR EACH BLADE.

(a) Using the blade paddles, simultaneously rotate the blades toward low pitch until the start lock pins engage a clamp mounted stop plate.

(3) Excessive engine oil transfer bearing leakage.

Refer to an appropriately licensed propeller repair facility.

(4) Excessive governor pump leakage.

Refer to an appropriately licensed propeller repair facility.

(5) Broken start locks.

Refer to an appropriately licensed propeller repair facility.

K. Vibration

CAUTION: ANY VIBRATION THAT CAN BE DESCRIBED AS APPEARING SUDDENLY, OR IS ACCOMPANIED BY UNEXPLAINED GREASE LEAKAGE, SHOULD BE INVESTIGATED IMMEDIATELY, BEFORE FURTHER FLIGHT.

NOTE: Vibration problems due to 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, which is potentially harmful to the propeller. Avoid operation until the propeller can be checked by qualified personnel at an appropriately licensed propeller repair facility.

(1) Check:

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

(b) Engine mounted hardware is secure.

(c) Engine mount wear.

(d) Uneven lubrication of propeller.

(e) Proper engine/propeller flange mating.

(f) Blade track. (For procedure, see the Inspection and Check chapter of this manual.)

(g) Blade angles: Blade angle must be within 0.2 degree from blade to blade.

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

(i) Static balance.

(j) Airfoil profile identical between blades (after overhaul or rework for nicks - verify at appropriately licensed propeller repair facility).

(k) Hub, blade, or blade clamp for damage or cracking.

(l) Grease or oil leakage from a seemingly solid surface of the hub, blade clamp, or blade.

(m) Blade deformation.

NOTE: Dynamic balancing is recommended after installing or performing maintenance on a propeller. While normally an optional task, it may be required by the engine or airframe manufacturer to make certain the propeller/engine combination is balanced within close tolerances before operation. Refer to the engine or airframe manuals, and the Maintenance Practices chapter of this manual.

L. Propeller Overspeed

(1) Check:

(a) Tachometer error.

(b) Low pitch stop adjustment.

(c) Governor maximum RPM set too high.

(d) Loss of oil pressure - HC-82(X,V)(F,L)-6( )( )( )

1 Governor failure

2 Excessive leakage in the governor oil supply to the propeller.

(e) Broken spring causes momentary overspeed - HC-8( )( )( )-2( )( ) and -3( )( ) propeller models.

(f) Governor pilot valve jammed, supplying high pressure only - HC-8( )( )( )-1( )( ), -2( )( ), and -3( )( ) propeller models.

M. Propeller Underspeed

(1) Check:

(a) Tachometer error.

(b) Excessive transfer bearing leakage - HC-8( )( )( )-1( )( ), -2( )( ), and -3( )( ) propeller models.

(c) Governor oil pressure low - HC-8( )( )( )-1( )( ), -2( )( ), and -3( )( ) propeller models.

(d) Governor oil passage clogged.

(e) Governor pilot valve jammed - HC-8( )( )( )-1( )( ), -2( )( ), and -3( )( ) propeller models.

N. Oil or Grease Leakage

CAUTION: GREASE LEAKAGE THAT CAN BE DESCRIBED AS EXCESSIVE AND APPEARING SUDDENLY, ESPECIALLY WHEN ACCOMPANIED BY VIBRATION, SHOULD BE INVESTIGATED IMMEDIATELY BEFORE FURTHER FLIGHT.

(1) Grease Leakage - Probable Cause:

NOTE: The blade clamp is the only source of grease leakage.

(a) Improperly torqued or loose lubrication fitting. Tighten the fitting.

(b) Defective lubrication fitting. Replace the fitting.

(c) Incorrect O-ring between the blade clamp and the propeller hub.

Refer to an appropriately licensed propeller repair facility for replacement of the O-ring.

(d) Grease leaks past the blade clamp seal gaskets. Replace the gaskets.

(e) Grease leaks from between the blade clamp and the blade.

Refer to an appropriately licensed propeller repair facility for replacement of sealant.

(f) Grease leaks from the clamp in a static condition when the blade is pointed up. - Improper application of silicone sealant on the clamp radius of the bearing-to-clamp interface.

Refer to an appropriately licensed propeller repair facility for reapplication of silicone sealant.

(2) Oil Leakage - Probable Cause

(a) Faulty O-ring seal between the hub and the cylinder.

(b) Faulty O-ring seal between the piston and the cylinder.

(c) Displaced felt seal between the piston and the cylinder

(d) Faulty O-ring between the propeller hub and the engine flange.

(e) Faulty O-ring between the piston and the pitch change rod.

(3) Beta System Oil Leakage - Probable Cause

(a) Governor leaks oil. (Refer to an appropriately licensed propeller repair facility)

(b) Faulty gasket between the governor and beta valve, or the beta valve and the engine. Replace the gasket.

(c) Faulty O-rings between the beta valve body and the beta valve spool. (Refer to an appropriately licensed propeller repair facility for replacement).

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FIGURES Page

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1. Pre-Flight Checks

Follow propeller preflight inspection procedures as specified in the Pilot Operating Handbook (POH) or this manual. In addition, perform the following inspections:

A. Blades

(1) Visually inspect the entire blade (lead, trail, face, and camber sides) for nicks, gouges, erosion, and cracks. Refer to the Maintenance Practices chapter of this manual, for blade repair information. Normal blade lead edge erosion (sand-blasted appearance) is acceptable, and does not require removal before further flight.

(2) Visually inspect the blades for lightning strike. Refer to the Lightning Strike section in this chapter for a description of damage.

B. Inspect the spinner and visible blade retention components for damage or cracks. Repair or replace components as required before further flight.

C. Check for loose/missing hardware. Retighten or reinstall as necessary.

WARNING: ABNORMAL GREASE 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.

D. Inspect for grease and oil leakage and determine its source.

WARNING: ABNORMAL VIBRATION 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. Check the blades for radial play or movement of the blade tip (in and out, fore and aft, and end play). Refer to Loose Blades, in the Periodic Inspections section of this chapter, for blade play limits.

F. Inspect de-ice boots (if installed) for damage. Refer to De-Ice System Inspections in the Anti-Ice and De-Ice Systems chapter of this manual, for inspection information.

G. Refer to the Periodic Inspections section in this chapter for additional inspection information and possible corrections to any discrepancies discovered as a result of preflight checks.

2. Operational Checks

A. Following propeller installation and before filght, perform initial run-up as outlined in Operational Tests in the Testing and Troubleshooting chapter of this manual.

B. Check the propeller speed control and operation from reverse or low pitch to high pitch, using the procedure specified in the Pilot Operating Handbook (POH) for the aircraft.

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

(2) A typical RPM drop is 300-500 RPM for feathering propellers and 100 to 300 RPM for non-feathering propellers.

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

C. Check for any abnormal vibration during this run-up. If vibration occurs, shut the engine down, determine the cause, and correct it before further flight. Refer to the Vibration section in the Testing and Troubleshooting chapter of this manual.

D. Refer to Required Periodic Inspections and Maintenance in this chapter for additional inspection information and possible corrections to any discrepancies discovered as a result of Pre-Flight Checks.

E. Refer to the airframe manufacturer's manual for additional operational checks.

3. Required Periodic Inspections and Maintenance

Perform detailed inspection procedures at 100 hour intervals, not to exceed twelve (12) calendar months. Procedures involved in these inspections are detailed below.

A. Periodic Inspection

NOTE 1: 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 interval specified. In this situation the airframe manufacturer's schedule may be applied with the exception that the calendar limit for the inspection interval may not exceed (12) calendar months.

NOTE 2: Refer to Inspection Procedures in this chapter for additional inspection information and possible corrections to any discrepancies discovered as a result of the Periodic Inspection.

(1) Remove the spinner.

(2) Visually inspect the blades for nicks, gouges, and cracks. If any damage is discovered, refer to the Blade Repairs section in the Maintenance Practices chapter of this manual for additional information. A cracked blade must be referred to an appropriately licensed propeller repair facility.

(3) Inspect all visible propeller parts for cracks, wear or unsafe conditions.

(4) Check for oil and grease leaks. Refer to Oil and Grease Leakage in the Inspection Procedures section of this chapter.

(5) Check the blade track. Refer to Blade Track in the Inspection Procedures section of this chapter.

(6) Check the accuracy of the tachometer. Refer to Tachometer Inspection in the Inspection Procedures section of this chapter.

(7) Clean or replace the anti-ice system filter (if anti-ice system is installed).

(8) Make an entry in this log book verifying this inspection.

B. Periodic Maintenance

(1) Lubricate the propeller assembly. Refer to the Lubrication section in the Maintenances Practices chapter of this manual for intervals and procedures.

C. 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 call for 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 covered in this manual. Refer to the Airworthiness Limitations section of this manual.

(3) Operators are urged to keep informed of airworthiness information via Hartzell Service Bulletins and Service Letters, which are available from Hartzell distributors or from the Hartzell factory by subscription. Selected information is also available on Hartzell Propeller's website at www.hartzellprop.com.

D. Overhaul Periods

In flight, the propeller is constantly subjected to vibration from the engine and the airstream, as well as high centrifugal forces. The propeller is also subject to corrosion, wear, and general deterioration due to aging. Under these conditions, metal fatigue or mechanical failures can occur. To protect your safety and 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 appropriate overhaul manual.

CAUTION 1: OVERHAUL PERIODS LISTED BELOW, ALTHOUGH CURRENT AT THE TIME OF PUBLICATION, ARE FOR REFERENCE PURPOSES ONLY. OVERHAUL PERIODS MAY BE INCREASED OR DECREASED AS A RESULT OF CONTINUING EVALUATION.

CAUTION 2: CHECK THE LATEST REVISION OF HARTZELL SERVICE LETTER 61( ) FOR THE MOST CURRENT INFORMATION.

(1) Hartzell "reciprocating" propellers installed on piston engine aircraft are to be overhauled at intervals as follows:

(a) Agricultural Aircraft -
Propeller models HC-8( )X,V( )-( ) - 1000 hours or 36 calendar months (whichever occurs first).

NOTE 1: Agricultural aircraft are defined as aircraft used as aerial applicators that expose the propeller to a relatively severe chemical/ corrosive environment.

NOTE 2: Once the propeller is used on agricultural aircraft, the 36 month overhaul limit is to be maintained even if propeller is later installed on other category airplanes.

(b) Aerobatic Aircraft - 1000 hours or 60 calendar months (whichever occurs first).

NOTE: Aerobatic aircraft are defined as certificated aerobatic category aircraft or other aircraft routinely exposed to aerobatic use.

(c) All Other Aircraft -

Propeller models HC-8( )X,V( )-( ) - 1000 hours or 60 calendar months (whichever occurs first).

4. Inspection Procedures

The following inspections are made on a regular basis, either before flight, during the 100 hour inspection, or if a problem is noted. Possible corrections to problems discovered during inspections, additional inspections, and limits are detailed in the following inspection procedures.

A. Blade Damage

Refer to the Blade Repairs section in the Maintenance Practices chapter of this manual for information regarding blade damage.

B. Grease or Oil Leakage

NOTE: 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. Such leakage should cease within the first ten hours of operation.

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. A determination should be made as to the source of the leak. The only leakage that is field repairable is the removal and replacement of the O-ring seal between the engine and propeller flange. All other leakage repairs should be referred to an appropriately licensed propeller repair facility. An instance of abnormal grease leakage should be inspected using the following procedure:

(1) 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.

(2) Perform a visual inspection of the hub, blade clamps and blades to locate the origin of leakage. If the origin of the grease leakage is determined to be a noncritical part, such as an O-ring, gasket or sealant, repairs can be accomplished during scheduled maintenance as long as flight safety is not compromised.

(3) If cracks are suspected, perform additional inspections before further flight (by qualified personnel at an appropriately licensed propeller repair facility) to verify the condition. Such inspections typically include disassembly of the propeller followed by inspection of parts, using nondestructive methods in accordance with published procedures.

(4) If cracks or failing components are found, these parts must be replaced before further flight. Report such occurrences to airworthiness authorities and to Hartzell Propeller Inc. Product Support.

C. Vibration

Instances of abnormal vibration should be investigated immediately. If the cause of the vibration is not readily apparent, the propeller may be inspected following the procedure below:

NOTE: It may sometimes be difficult to readily identify the cause of abnormal vibration. Vibration may originate in the engine, propeller, or airframe. Troubleshooting procedures typically begin with an 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 possibility of a failing blade or blade retention component should be considered as a potential source of the problem.

(1) Perform troubleshooting and evaluation of possible sources of vibration in accordance with engine or airframe manufacturer's instructions.

(2) Refer to the Vibration section in the Testing and Troubleshooting chapter of this manual. Perform the checks to determine the possible cause of the vibration. If no cause is found, then consider that the origin of the problem could be the propeller and proceed with steps 4.C.(3) through 4.C.(8) in this chapter.

(3) Remove the spinner dome.

(4) Perform a visual inspection for cracks in the hub, blade clamps, and blades.

NOTE: A crack may be readily visible or may be indicated by grease leaking from a seemingly solid surface.

(5) If cracks are suspected, additional inspections must be performed before further flight. These inspections must be performed by qualified personnel at an appropriately licensed propeller repair facility to verify the condition. Such inspections typically include disassembly of the propeller followed by inspection of parts, using nondestructive methods in accordance with published procedures.

(6) Check the blades and compare blade to blade differences:

(a) Inspect the propeller blades for unusual looseness or movement. Refer to Loose Blades section of this chapter.

(b) Check blade track. Refer to the Blade Track section of this chapter.

CAUTION: DO NOT USE BLADE PADDLES TO TURN BLADES.

(c) Manually (by hand) attempt to turn the blades (change pitch).

(d) Visually check for damaged blades.

(7) If abnormal blade conditions or damage are found, perform additional inspections (by qualified personnel at an appropriately licensed propeller repair facility) to evaluate the condition. Refer to Blade Repairs section in Maintenance Practices chapter of this manual.

(8) If cracks or failing components are found, these parts must be replaced before further flight. Report such occurrences to airworthiness authorities and Hartzell Propeller Inc. Product Support.

D. Tachometer Inspection

NOTE: An appropriately licensed propeller repair facility may also be able to perform a tachometer inspection.

WARNING: OPERATION WITH AN INACCURATE TACHOMETER MAY RESULT IN OPERATION AT RESTRICTED RPM AND DAMAGING HIGH STRESSES. BLADE LIFE WILL BE SHORTENED AND COULD RESULT IN CATASTROPHIC FAILURE.

(1) Verify the accuracy of the engine tachometer with a hand-held tachometer at 100 hour intervals or at annual inspection, whichever occurs first.

(2) Hartzell Propeller Inc recommends using a tachometer that is accurate within +/- 10 RPM, has NIST calibration (traceable), and has an appropriate calibration schedule.

E. Blade Track

(1) Check the blade track as follows:

(a) Chock the aircraft wheels securely.

(b) Refer to Figure 5-1. Put a fixed reference point beneath the propeller, within 0.25 inch (6 mm) of the lowest point of the propeller arc.

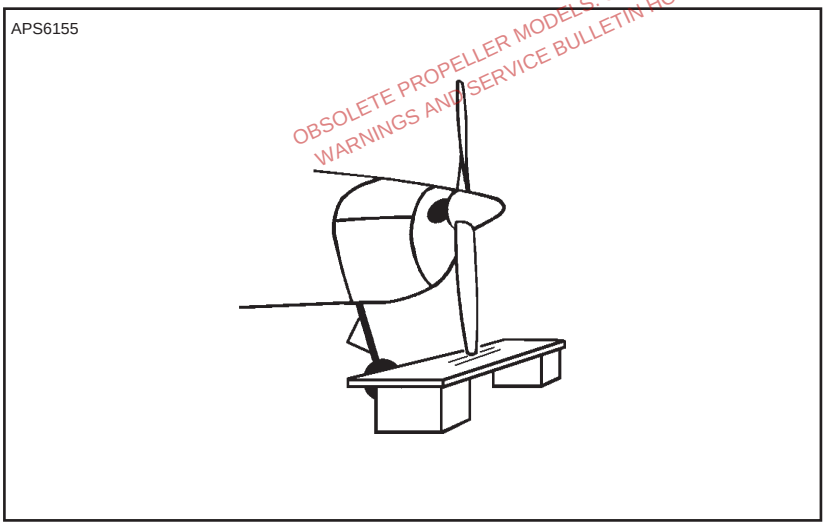
NOTE: This reference point may be a flat board with a sheet of paper attached to it. The board may then be blocked up to within 0.25 inch (6.0 mm) of the propeller arc.

WARNING: MAKE SURE THE ENGINE MAGNETO IS GROUNDED (OFF) BEFORE ROTATING THE PROPELLER.

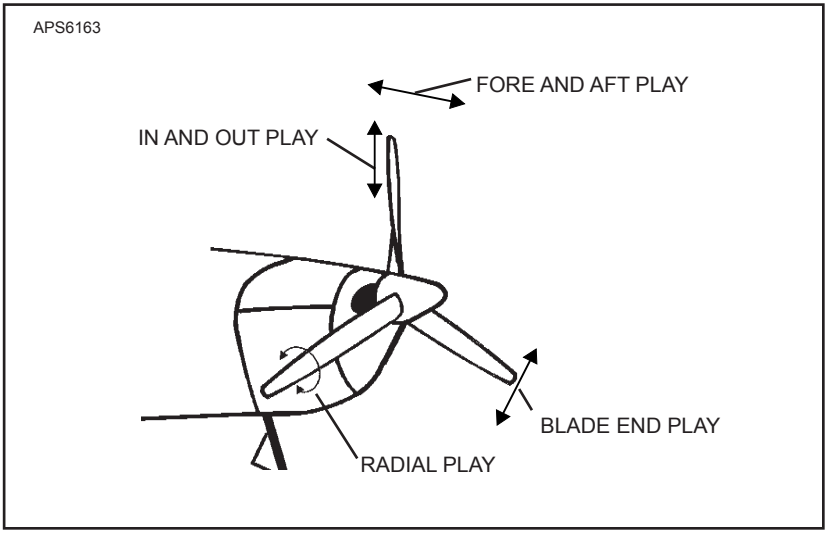
(c) Rotate the propeller by hand (the opposite direction of normal rotation) until a blade points directly at the paper. Mark the position of the blade tip in relation to the paper.

(d) Repeat this procedure with the remaining blades.

(e) Tracking tolerance is $\pm$ 0.062 inch (1.57 mm) or 0.125 inch (3.17 mm) total.



Checking Blade Track
Figure 5-1



Blade Play
Figure 5-2

(2) Possible Correction

(a) Remove foreign matter from the propeller mounting flange.

(b) If no foreign matter is present, refer to an Airworthiness agency approved propeller repair station.

F. Loose Blades

Refer to Figure 5-2. Limits for blade looseness are as follows:

End Play	± 0.062 inch (1.5 mm)
Fore & Aft Play	± 0.062 inch (1.5 mm)
In and Out Movement	0.032 inch (0.81 mm)
Radial Play (pitch change)	± 0.5 degree (1 degree total)

Blade movement beyond these limits should be referred to an appropriately licensed propeller repair facility.

G. Corrosion

WARNING: REWORK THAT INVOLVES COLD WORKING THE METAL, RESULTING IN CONCEALMENT OF A DAMAGED AREA IS NOT PERMITTED.

Light corrosion on blades may be removed by qualified personnel in accordance with the Blade Repairs section in the Maintenance Practices chapter of this manual.

Heavy corrosion that results in severe pitting must be referred to an appropriately licensed propeller repair facility.

H. Spinner Damage

Inspect the spinner for cracks, missing hardware, or other damage. Refer to an appropriately licensed propeller repair facility for spinner damage acceptance and repair information. Contact the local airworthiness authority for repair approval.

I. Electric De-ice System

Refer to the Anti-Ice and De-ice Systems chapter of this manual for inspection procedures.

J. Anti-ice System

Refer to the Anti-Ice and De-ice Systems chapter of this manual for inspection procedures.

5. Special Inspections

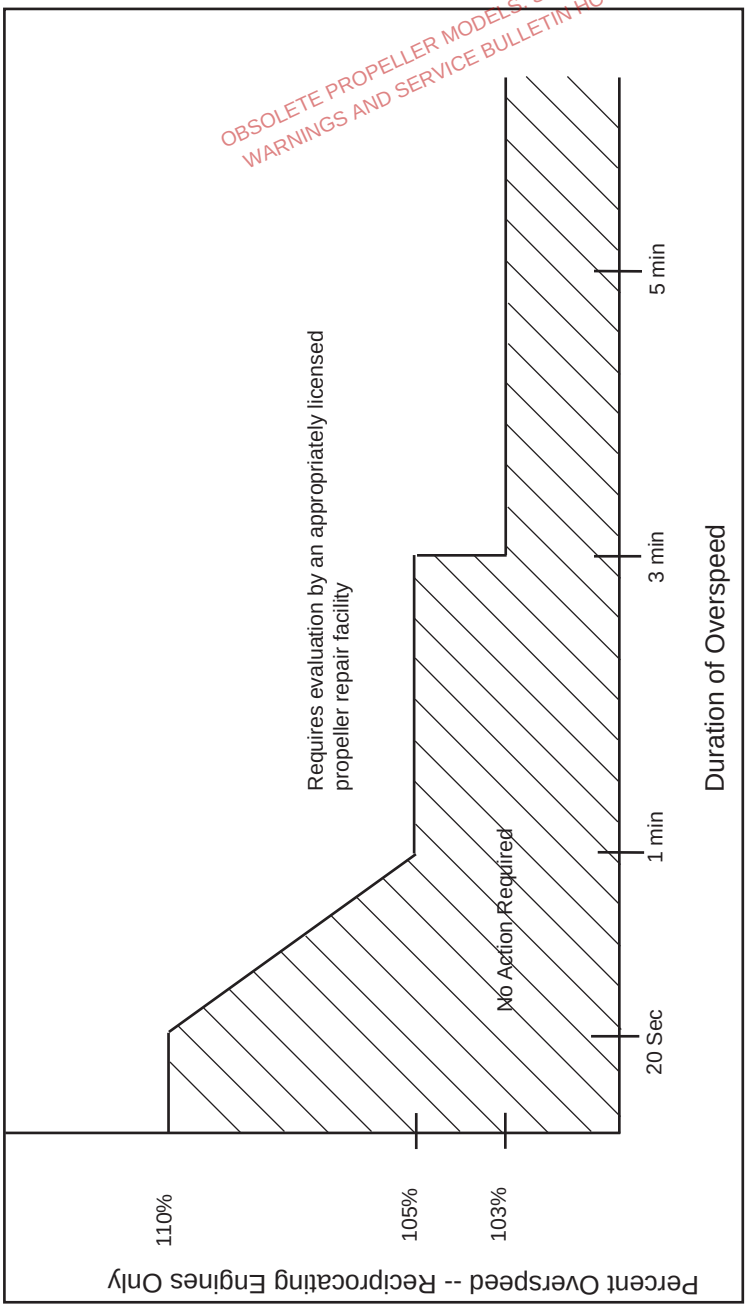
A. Overspeed

An overspeed has occurred when the propeller RPM has exceeded the maximum RPM stated in the applicable Aircraft Type Certificate Data Sheet. The duration of time and magnitude of overspeed for a single event determines the corrective action that must be taken to make sure no damage to the propeller has occurred.

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.

(1) When a propeller installed on a reciprocating engine has an overspeed event, refer to the Reciprocating Engine Overspeed Limits (Figure 5-3) to determine the corrective action to be taken.

(2) Make a log book entry to document the overspeed event.



Reciprocating Engine Overspeed Limits
Figure 5-3

B. Lightning Strike

CAUTION: ALSO CONSULT ENGINE AND AIRFRAME MANUFACTURER'S MANUALS. THERE MAY BE ADDITIONAL REQUIREMENTS SUCH AS DE-ICE AND ENGINE SYSTEM CHECKS TO PERFORM AFTER A PROPELLER LIGHTNING STRIKE.

(1) General

In the event of a propeller lightning strike, an inspection is required before further flight. It may be permissible to operate a propeller for an additional ten (10) hours of operation if the propeller is not severely damaged and meets the requirements in paragraph 5.B.(2) of this chapter. Regardless of the outcome of the initial inspection, the propeller must eventually be removed from the aircraft, disassembled, evaluated, and/or repaired by an appropriately licensed propeller repair facility.

(2) Procedure for Temporary Operation

If temporary additional operation is desired before propeller removal and disassembly:

(a) Remove the spinner dome and perform visual inspection of propeller, spinner, and de-ice system for evidence of significant damage that would require repair before flight (such as broken de-ice wires or arcing damage to propeller hub).

CAUTION: IF THE PROPELLER EXPERIENCES LIGHTNING STRIKE, THE ALUMINUM BLADES MUST BE WITHIN AIRWORTHY LIMITS FOR ANY ADDITIONAL FLIGHT.

(b) If the only evident damage is minor arcing burns to the blades, then operation for ten (10) hours is acceptable before disassembly and inspection.

(c) Perform a functional check of the propeller de-ice system (if installed) in accordance with aircraft maintenance manual procedures.

(d) Regardless of the degree of damage, make a log book entry to document the lightning strike.

(e) The propeller must be removed from the aircraft, disassembled, evaluated, and/or repaired by an appropriately licensed propeller repair facility for flight beyond the temporary operation limits granted above.

C. Foreign Object Strike

(1) General

(a) A foreign object strike can include a broad spectrum of damage, from a minor stone nick to severe ground impact damage. 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 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. Examples of foreign object 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. These cases should be handled as foreign object 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.

(2) Procedure

(a) In the event of a foreign object strike, an inspection is required before further flight. If the inspection reveals one or more of the following indications, the propeller must be removed from the aircraft, disassembled and overhauled in accordance with the applicable propeller and blade maintenance manuals.

1 A loose blade rotated in the clamp

2 Any noticeable or **suspected** damage to the pitch change mechanism

3 A bent blade (out of track or angle)

4 Any diameter reduction

5 Blade damage

6 A bent, cracked, or failed engine shaft

7 Vibration during operation that was not present before the event

(b) Nicks, gouges, and scratches on blade surfaces or the leading and trailing edges must be removed before flight. Refer to the Blade Repairs section in the Maintenance Practices chapter of this manual.

(c) For engine mounted accessories (for example, governors, pumps, and propeller control units) manufactured by Hartzell, if the foreign object strike resulted in a sudden stop of the engine, the unit must be disassembled and inspected in accordance with the applicable maintenance manual.

(d) Regardless of the degree of damage, make a log book entry to document the foreign object strike incident and any corrective action(s) taken.

D. Fire Damage or Heat Damage

WARNING: HUBS AND CLAMPS ARE MANUFACTURED FROM HEAT TREATED FORGINGS AND ARE SHOT PEENED. BLADES ARE MANUFACTURED FROM HEAT TREATED FORGINGS AND ARE COMPRESSIVELY ROLLED AND SOMETIMES SHOT PEENED. EXPOSURE TO HIGH TEMPERATURES CAN DESTROY THE FATIGUE BENEFITS OBTAINED FROM THESE PROCESSES.

On rare occasions propellers may be exposed to fire or heat damage, such as an engine or hangar fire. In the event of such an incident, an inspection by an Airworthiness agency approved propeller repair station is required before further flight.

6. Long Term Storage

A. Parts shipped from the Hartzell factory are not shipped or packaged in a container that is designed for long term storage.

B. Long term storage procedures may be obtained by contacting the Hartzell factory via the product support number listed in the Introduction chapter of this manual. Storage information is also detailed in Hartzell Manual 202A (61-01-02).

C. Information regarding the return of a propeller assembly to service after long term storage may be obtained by contacting a Hartzell distributor or the Hartzell factory via the Product Support contact number listed in the Introduction chapter of this manual. This information is also detailed in Hartzell Manual 202A (61-01-02).

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1. Cleaning

CAUTION: DO NOT USE PRESSURE WASHING EQUIPMENT TO CLEAN THE PROPELLER OR CONTROL COMPONENTS. PRESSURE WASHING CAN FORCE WATER AND/OR CLEANING SOLVENTS PAST SEALS, AND LEAD TO INTERNAL CORROSION OF PROPELLER COMPONENTS.

A. General Cleaning

CAUTION 1: WHEN CLEANING THE PROPELLER, DO NOT PERMIT 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) Wash propeller with a noncorrosive soap solution.

CAUTION: DO NOT USE ANY SOLVENT DURING CLEANING THAT COULD SOFTEN OR DESTROY THE BOND BETWEEN CHEMICALLY ATTACHED PARTS.

(2) To remove grease or oil from propeller surfaces, apply Stoddard Solvent or equivalent to a clean cloth and wipe the part clean.

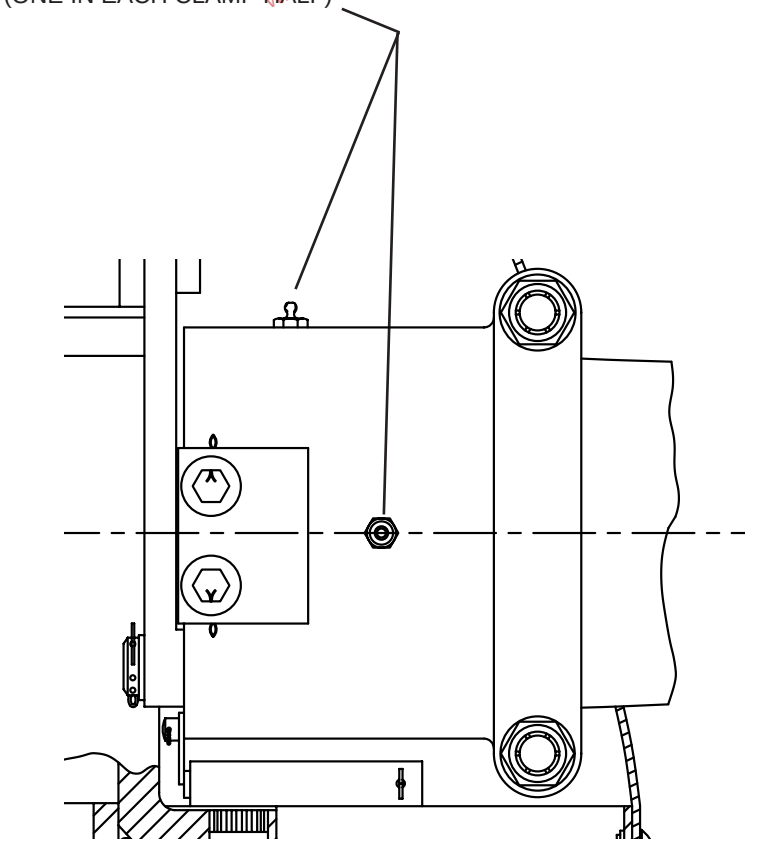
(3) Thoroughly rinse with water and permit to dry.

B. Spinner Cleaning and Polishing

(1) Clean the spinner using the General Cleaning procedures above.

(2) Polish the dome (if required) with an automotive-type aluminum polish.

D-980



Lubrication Fitting
Figure 6-1

2. Lubrication

A. Lubrication Intervals

(1) The propeller is to be lubricated at 12 months or at 100 hour intervals, whichever occurs first.

NOTE 1: If annual operation is significantly less than 100 hours, calendar lubrication intervals should be reduced to six months.

NOTE 2: 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.

(2) Owners of high use aircraft may wish to extend their lubrication intervals. Lubrication interval may be gradually extended after evaluation of previous propeller overhauls, with regard to bearing wear and internal corrosion.

(3) New or newly overhauled propellers should be lubricated after the first one or two hours of operation, because centrifugal loads will pack and redistribute grease.

(a) Purchasers of new aircraft should check the propeller logbook to verify whether the propeller was lubricated by the manufacturer during flight testing. If not, the propeller should be serviced at earliest convenience.

B. Lubrication Procedure

CAUTION: FOLLOW LUBRICATION PROCEDURES CORRECTLY TO MAINTAIN AN ACCURATE BALANCE OF THE PROPELLER ASSEMBLY.

(1) Remove the propeller spinner.

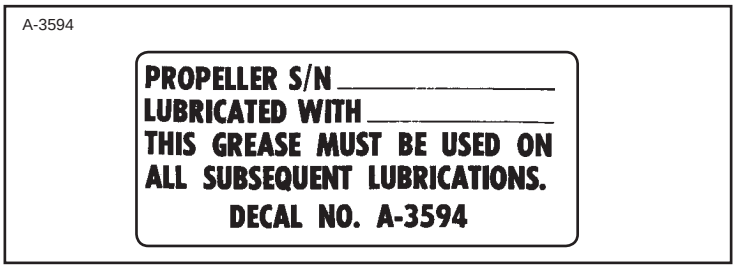
(2) Refer to Figure 6-1. Each blade clamp has two lubrication fittings. Remove both lubrication fitting caps and one of the lubrication fittings from each blade clamp.

NOTE: Certain old steel blade clamps may have only one fitting, which must be carefully re-lubricated without excessive pressure. Add a small amount (1-2 fluid ounces) of grease equally to each blade.

(3) Use a piece of safety wire to loosen any blockage or hardened grease at the threaded holes where the lubrication fitting was removed.

WARNING: WHEN MIXING AEROSHELL GREASES 5 AND 6, AEROSHELL GREASE 5 MUST BE INDICATED ON THE LABEL (HARTZELL P/N A-3594) AND THE AIRCRAFT MUST BE PLACARDED TO INDICATE THAT FLIGHT IS PROHIBITED IF THE OUTSIDE AIR TEMPERATURE IS LESS THAN -40°F (-40°C).

CAUTION 1: USE HARTZELL PROPELLER APPROVED GREASE ONLY. EXCEPT IN THE CASE OF AEROSHELL GREASES 5 AND 6, DO NOT MIX DIFFERENT SPECIFICATIONS AND/OR BRANDS OF GREASE.



Lubrication Label
Figure 6-2

(4) Aeroshell greases 5 and 6 both have a mineral oil base and have the same thickening agent; therefore, mixing of these two greases is acceptable in Hartzell propellers.

(5) A label (Hartzell P/N A-3494) is normally applied to the propeller to indicate the type of grease previously used (Figure 6-2).

(a) This grease type should be used during relubrication unless the propeller has been disassembled and the old grease removed.

(b) Purging of old grease through lubrication fittings is only about 30 percent effective.

(c) To completely replace one grease with another, the propeller must be disassembled in accordance with the applicable overhaul manual.

CAUTION 1: IF A PNEUMATIC GREASE GUN IS USED, EXTRA CARE MUST BE TAKEN TO AVOID EXCESSIVE PRESSURE BUILDUP.

CAUTION 2: OVER LUBRICATING A STEEL 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.

CAUTION 3: GREASE MUST BE APPLIED TO ALL BLADES OF A PROPELLER ASSEMBLY AT THE TIME OF LUBRICATION.

(6) Pump grease into each blade clamp lubrication fitting until grease emerges from the hole of the removed lubrication fitting.

NOTE: Lubrication is complete when grease emerges in a steady flow with no air pockets or moisture, and has the color and texture of the new grease.

(7) Reinstall the removed lubrication fitting on each clamp.

(8) Tighten the lubrication fittings until snug.

NOTE: Make sure the ball of each lubrication fitting is properly seated.

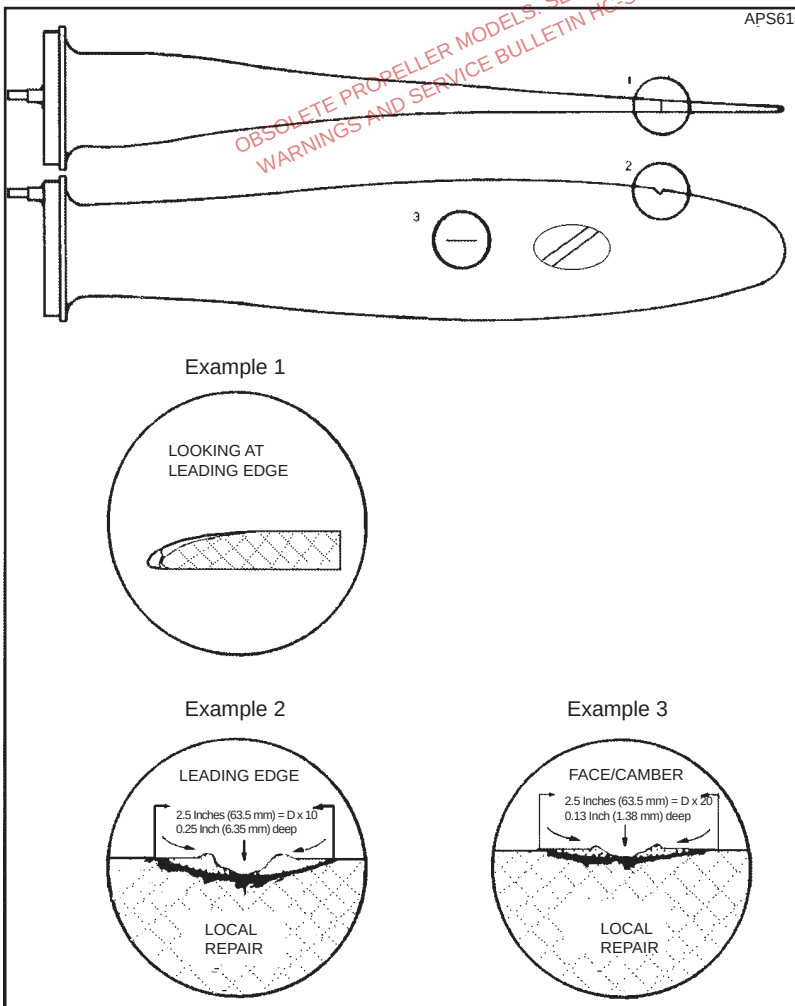
(9) Install a new lubrication fitting cap on each lubrication fitting.

C. Approved Lubricants

(1) The following lubricants are approved for use in Hartzell compact propellers:

Aeroshell 6 -	Recommended "all purpose" grease. Used in most new production propellers since 1989. Higher leakage/oil separation than Aeroshell 5 at higher temperatures (approximately 100°F [38°C]).
Aeroshell 5 -	Good high temperature qualities, very little oil separation or leakage. Cannot be used in temperatures colder than -40°F (-40°C). Aircraft serviced with this grease must be placarded to indicate that flight is prohibited if the outside air temperature is less than -40°F (-40°C).
Aeroshell 7 -	Good low temperature grease, but high leakage/oil separation at higher temperatures. This grease has been associated with sporadic problems involving seal swelling.
Aeroshell 22 -	Qualities similar to Aeroshell 7.
Royco 22CF -	Not widely used. Qualities similar to Aeroshell 22

(2) A label (Figure 6-2) indicating the type of grease used for previous lubrication (if used) is installed on the propeller piston or on the blade clamp. If the propeller is to be lubricated with a different type of grease, the propeller must be disassembled and cleaned of old grease before relubricating.



To determine amount of rework needed, use the following formula:

On the leading and trailing edge of the blade, measure the depth of the damage, and multiply this number x 10 (see Example 2, above). Rework the area surrounding the damage 10 times the depth of the damage.

On the face and camber of the blade, measure the depth of the damage, and multiply this number x 20 (see Example 3, above). Rework the area surrounding the damage 20 times the depth of the damage.

Repair Limitations
Figure 6-3

3. Blade Repairs

WARNING: ALL 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 AN APPROPRIATELY LICENSED PROPELLER SERVICE FACILITY OR THE HARTZELL PRODUCT SUPPORT DEPARTMENT FOR BLADE DIMENSIONAL LIMITS.

Nicks, gouges, and scratches on blade surfaces or on the leading or trailing edges of the blade, greater than 1/32 inch wide or deep, must be removed before flight. Field repair of small nicks and scratches may be performed by qualified personnel in accordance with FAA Advisory Circular 43.13-1B, as well as the procedures specified below. Normal blade lead edge erosion (sand-blasted appearance) is acceptable, and does not require removal before further flight..

A. Repair of Nicks or Gouges

Local repairs may be made using files, electrical or air powered equipment. Emery cloth, scotch brite, and crocus cloth are to be used for final finishing. Refer to Figure 6-3.

CAUTION 1: REWORK THAT INVOLVES COLD WORKING THE METAL, RESULTING IN CONCEALMENT OF A DAMAGED AREA, IS NOT ACCEPTABLE. A STRESS CONCENTRATION MAY EXIST, WHICH CAN RESULT IN A BLADE FAILURE

CAUTION 2: A SHOT PEENED BLADE IS IDENTIFIED WITH AN "S" FOLLOWING THE BLADE MODEL NUMBER, AS DESCRIBED IN THE DESCRIPTION AND OPERATION CHAPTER OF THIS MANUAL. A BLADE THAT HAS BEEN SHOT PEENED WILL HAVE A "PEBBLE GRAIN" SURFACE.

CAUTION 3: A SHOT PEENED BLADE THAT HAS DAMAGE IN THE 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 AN FAA APPROVED REPAIR FACILITY IN ACCORDANCE WITH HARTZELL ALUMINUM BLADE MANUAL 133C (61-13-33).

(1) Repairs to the leading or trailing edge are to be accomplished by removing material from the bottom of the damaged area. Remove material from this point out to both sides of the damage, providing a smooth, blended depression which maintains the original airfoil general shape.

(2) Repairs to the blade face or camber should be made in the same manner as above. Repairs that form a continuous line across the blade section (chordwise) are unacceptable.

(3) The area of repair should be determined as follows: Leading and trailing edge damage: Depth of nick x 10. Face and camber: Depth of nick x 20. Refer to Figure 6-3.

NOTE: Leading edge includes the first 10 percent of chord from the leading edge. The trailing edge consists of the last 20 percent of chord adjacent to the trailing edge.

(4) After filing or sanding of the damaged area, the area must then be polished, with emery cloth and finally with crocus cloth to remove any traces of filing.

(5) Inspect the repaired area with a 10X magnifying glass and dye penetrant. Ensure that no indication of the damage, file marks, or coarse surface finish remain.

(6) 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. Refer to Painting After Repair in this section.

B. Repair of Bent Blades

CAUTION: DO NOT ATTEMPT TO "PRE-STRAIGHTEN" A BLADE BEFORE DELIVERY TO AN AIRWORTHINESS AGENCY APPROVED PROPELLER REPAIR STATION. THIS WILL CAUSE THE BLADE TO BE SCRAPPED BY THE REPAIR STATION.

Repair of a bent blade or blades is considered a major repair. This type of repair must be accomplished by an Airworthiness agency approved propeller repair station, and only within approved guidelines.

4. Painting After Repair

A. General

(1) Propeller blades are painted with a durable specialized coating that is resistant to abrasion. If this coating becomes eroded, it is necessary to repaint the blades to provide proper corrosion and erosion protection. Painting should be performed by an appropriately licensed propeller service facility in accordance with Hartzell Standard Practices Manual 202A (61-01-02).

(2) It is permissible to perform a blade touch-up with aerosol paint in accordance with the procedures in Painting of Aluminum Blades, below.

(3) The following paints (Table 6-1) are approved for blade touch-up:

Paint2

Vendor	Color/Type	Vendor P/N	Hartzell P/N
Tempo	Epoxy Black	A-150	n/a
Tempo	Epoxy Gray	A-151	n/a
Tempo	Epoxy White (tip stripe)	A-152	n/a
Tempo	Epoxy Red (tip stripe)	A-153	n/a
Tempo	Epoxy Yellow (tip stripe)	A-154	n/a
Sherwin-Williams	Black	F75KXB9958-4311	A-6741-145-1
Sherwin-Williams	Gray	F75KXA10445-4311	A-6741-146-1
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	F63BXS0627-4389	A-6741-163-1

Approved Paints
Table 6-1

The paint manufacturers may be contacted as listed below:

Tempo Products Co.
A plasti-kote Company
1000 Lake Road
Medina, OH 44256
Tel: 800.321.6300
Fax: 216.349.4241
Cage Code: 07708

Sherwin Williams Co.
2390 Arbor Boulevard
Dayton, Ohio
Tel: 937.298.8691
Fax: 937.298.3820
Cage Code: 0W199

B. Painting of Aluminum Blades

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 acetone, #700 lacquer thinner, or MEK, wipe the surface of the blade to remove any contaminants.

(2) Feather the existing coatings away from the eroded or repaired area with 120 to 180 grit sandpaper.

NOTE: Paint erosion is typically very similar on all blades in a propeller assembly. If one blade has more extensive damage, e.g. in the tip area, all the blades should be sanded in the tip area to replicate the repair of the most severely damaged blade tip. This practice is essential in maintaining balance after refinishing.

(3) Use acetone, #700 lacquer thinner, or MEK to wipe the surface of the blade. Permit solvent to evaporate.

(4) Before refinishing the blades, apply a corrosion preventive coating to the bare aluminum surface. Oakite 31, Chromicote L-25, or Alodine 1201 are approved chemical conversion coatings. Apply these coatings in accordance with the directions provided by the product manufacturer.

(5) Apply masking material to the deice 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 ONLY TO THE DEGREE REQUIRED TO UNIFORMLY COVER THE REPAIR/EROSION. AVOID EXCESSIVE PAINT BUILDUP ALONG THE TRAILING EDGE TO AVOID CHANGING BLADE PROFILE.

(6) Apply sufficient finish coating to achieve 2 to 4 mils thickness when dry. Re-coat before 30 minutes, or after 48 hours. If the paint is permitted to dry longer than four (4) hours, it must be lightly sanded before another coat is applied.

(7) Remove the masking material from the tip stripes and reapply masking material for the tip stripe refinishing, if required.

(8) Apply sufficient tip stripe coating to achieve 2 to 4 mils thickness when dry. Re-coat before 30 minutes, or after 48 hours. If the paint is permitted to dry longer than four (4) hours, it must be lightly sanded before another coat is applied.

(9) Remove the masking material immediately from the de-ice boot and tip stripes, if required.

(10) Optionally, perform dynamic balancing in accordance with the procedures and limitations specified in Dynamic Balance section of this chapter.

5. Dynamic Balance

A. Overview

WARNING: WHEN USING REFLECTIVE TAPE FOR DYNAMIC BALANCING, DO NOT APPLY THE TAPE ON EXPOSED BARE METAL OF A BLADE. THIS WILL PERMIT MOISTURE TO COLLECT UNDER THE TAPE AND CAUSE CORROSION THAT CAN PERMANENTLY DAMAGE THE BLADE.

NOTE: Dynamic balance is recommended to reduce vibrations which 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.

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

B. Inspection Procedures Before Balancing

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

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

(a) Use Stoddard solvent (or equivalent) to completely remove any grease on the blades or inner surface of the spinner dome.

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

(c) Visually inspect 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. If grease leakage is evident, determine the location of the leak and correct before lubricating the propeller and dynamic balancing.

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

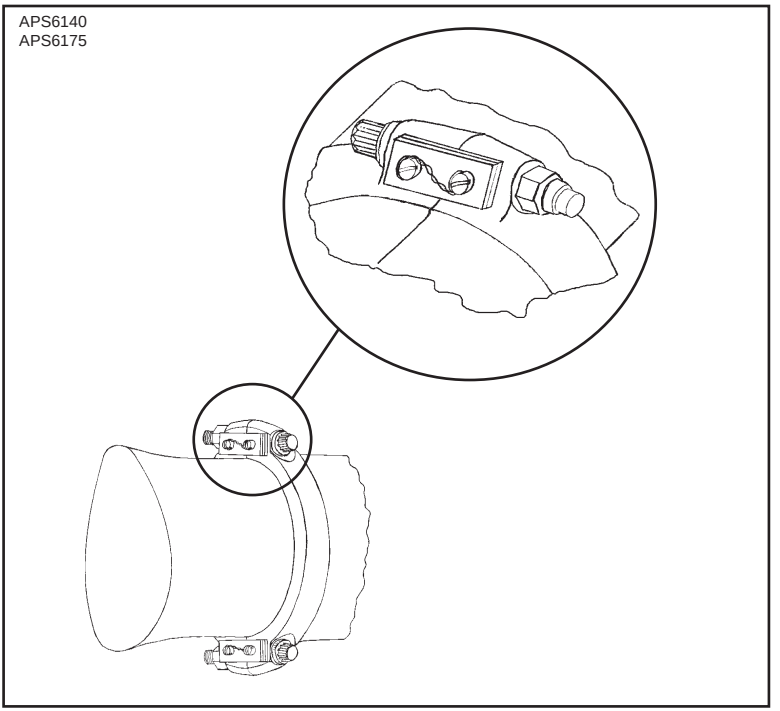
(4) Static balance is accomplished at a propeller overhaul facility when an overhaul or major repair is performed.

NOTE: If static balancing is not accomplished before dynamic balancing, the propeller may be so severely unbalanced that dynamic balance may be unachievable due to measurement equipment limitations.

C. Placement of Balance Weights for Dynamic Balance

(1) The preferred method of attachment of dynamic balance weights is to add the weights to the spinner bulkhead; however, the configuration of the spinner bulkhead on many of the propeller models covered in this manual makes it impractical to mount dynamic balance weights in this manner. Dynamic balance must be accomplished through the removal or addition and/or the relocation of the static balance weights located on the blade clamps.

(a) Each blade clamp has four balance weight locations on the outboard circular surface of the clamp (Figure 6-4).



Location of Balance Weights
Figure 6-4

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

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

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

Aircraft Mfg.	Propeller Model	Spinner Assembly	Lead**	Trail**
Aero Commander	HC-82(X,V)F-2( )/(V)8433( )-4	C-2530	3	4
Aero Commander	HC-83(X,V)20-2( )/(V)9333( )	---	0	3-See Note 1
Beech	HC-83(X,V)20-2( )/(V)9333( )-3	---	0	3
Cessna 411	HC-83(X,V)F-2( )/(V)8833( )	---	4	0
BAE Beagle	HC-83(X,V)F-2( )/(V)8833( )	---	0	3

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

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

Maximum Number of Balance Weights for Non-Standard Installations
Table 6-2

(b) Maximum number of balance weights for each location

1 For standard installations, the maximum number of balance weights for each location is four (4).

NOTE: For propellers with a de-ice system using a blade clamp-mounted lead strap restraint, a maximum of three weights may be attached to the clamp with the de-ice lead strap restraint.

2 For nonstandard installations, refer to Table 6-2 for balance weight information.

CAUTION 1: BEFORE DYNAMIC BALANCE, RECORD THE NUMBER AND LOCATION OF ALL STATIC BALANCE WEIGHTS.

CAUTION 2: USE ONLY BALANCE WEIGHTS A-48, A-48A, OR A-1419.

CAUTION 3: DO NOT EXCEED THE MAXIMUM NUMBER OF BALANCE WEIGHTS FOR EACH LOCATION.

(c) Alter the number and/or location of static balance weights as necessary to achieve dynamic balance.

(d) If reflective tape is used for dynamic balancing, remove the tape immediately upon completion of dynamic balancing.

(e) Record the number and location of static balance weights, if they have been reconfigured, in the logbook.

6. 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 CONSULTATION WITH THE APPLICABLE TYPE CERTIFICATE OR SUPPLEMENTAL TYPE CERTIFICATE HOLDERS APPROVED MAINTENANCE DATA.

A. Low Pitch Stop - All Propeller Models

(1) The propeller low pitch stop is set at the factory to the aircraft TC or STC Holder's requirements and should not require any additional adjustment. 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. 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.

B. Low pitch measurement on propeller models ( )HC-83( )( )-2( )( )

WARNING: PLACE THE PROPELLER IN FEATHER POSITION BEFORE REMOVING THE PISTON NUT FROM THE PITCH CHANGE ROD.

CAUTION: PLACE A PAN UNDER THE PROPELLER PISTON BEFORE REMOVING THE NUT AND MOVING THE PISTON, AS ENGINE OIL MAY COME OUT OF THE OPENING IN THE PISTON.

(1) Remove the piston nut from the pitch change rod.

(2) Rotate the blades by hand to move the blades and piston to low pitch.

NOTE: Low pitch is reached when a washer on the end of each piston guide rod stops against the guide collar.

(a) With the blade in a horizontal position, measure low pitch blade angle.

(b) If the blade angle requires adjustment, have the low pitch stop adjusted by an appropriately licensed service facility or by the Hartzell factory.

C. Low pitch measurement on propeller models HC-82( )( )-2( )( )

(1) Low pitch measurement must be performed at an appropriately licensed service facility or at the Hartzell factory.

D. Low pitch measurement on propeller models HC-8( )( )-1( )( )( )

(1) Rotate the blades by hand to move the blades and piston to low pitch.

(2) With the blade in a horizontal position, measure the low pitch blade angle.

(3) If the blade angle requires adjustment, have the low pitch stop adjusted by an appropriately licensed service facility or by the Hartzell factory.

E. Low pitch measurement on propeller models HC-8( )( )-3( )( )

WARNING: PLACE THE PROPELLER IN FEATHER POSITION BEFORE REMOVING THE PISTON NUT FROM THE PITCH CHANGE ROD.

CAUTION: PLACE A PAN UNDER THE PROPELLER PISTON BEFORE REMOVING THE NUT AND MOVING THE PISTON, AS ENGINE OIL MAY COME OUT OF THE OPENING IN THE PISTON.

(1) Remove the piston nut from the pitch change rod.

(2) Rotate the blades by hand to move the blades and piston to low pitch.

NOTE: Low pitch is reached when the piston ears contact the self-locking nut on each rod, and when distance "C" is zero. Refer to Figure 3-17.

(3) With the blade in a horizontal position, measure low pitch blade angle.

(4) If the blade angle requires adjustment, have the low pitch stop adjusted at an appropriately licensed service facility or at the Hartzell factory.

7. Propeller High Pitch Settings

A. High Pitch (Minimum RPM) Stop - Propeller Models HC-8( )( )( )-1( )( ) AND HC-82(X,V)(F,L)-6( )( )( )

(1) The high pitch stop is set at the factory in accordance with aircraft manufacturer's recommendations. These stops are adjustable only by qualified personnel at an appropriately licensed propeller service facility or the Hartzell factory.

8. Feathering Pitch Stop Adjustment

A. Propeller Models HC-8( )( )( )-2( )( ) and HC-83(X,V)F-3( )( )

(1) The feathering pitch stop is set at the factory in accordance with the aircraft manufacturer's recommendations. This stop is adjustable only by qualified personnel at an appropriately licensed propeller service facility or the Hartzell factory.

9. Start Lock Adjustment

A. Propeller Models HC-8( )( )( )-2( )( ) and HC-83(X,V)F-3( )( )

(1) The start locks are set at the factory in accordance with the aircraft manufacturer's recommendations. These stops are adjustable only by qualified personnel at an appropriately licensed propeller service facility or the Hartzell factory.

10. Anti-ice and De-ice Systems

A. Refer to the Anti-ice and De-ice Systems chapter of this manual for de-ice system maintenance information.

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1. Introduction

A. Propeller De-ice System

A propeller de-ice system is a system that removes ice after it forms on the propeller blades. A de-ice system uses electrical heating elements to melt the ice layer next to the blades, permitting the ice to be thrown from the blade by centrifugal force. Blades are alternately heated and permitted to cool as the current is applied and removed automatically by the de-ice system timer.

System components include a timer or cycling unit, electrical slip ring(s), brush block assembly, and blade mounted de-ice boots.

B. Propeller Anti-ice System

A propeller anti-ice system is a system that prevents formation of ice on propeller surfaces. An anti-ice system dispenses a fluid that mixes with, and reduces the freezing point of, moisture on the propeller blades. The mixture may then flow off the blades before it forms ice.

System components include a fluid tank, pump, slinger ring, and blade mounted fluid feed shoes.

2. System Description

A. De-ice System

NOTE: Because of the wide variances of various de-ice systems, the following description is general in nature. Consult the airframe manufacturer's manual for a description of your specific de-ice system and controls.

The de-ice system is controlled by the pilot via a cockpit control switch. This switch applies electrical power to the de-ice system, which will operate as long as the switch is in the ON position. Depending upon the system, another set of cockpit controls may be available. One of these controls is a mode selector, which permits the pilot to select two cycling speeds, for heavy or light icing conditions. Some systems on twin engine aircraft have a switch which provides a full de-ice mode, which permits the pilot to de-ice both propellers simultaneously. This switch may only be used for short periods and is used when ice builds up on the propeller before the system is turned on.

An ammeter, which indicates current drawn by the system, is normally located near the de-ice system switches. This meter may indicate total system load, or a separate meter may be supplied for each propeller.

A timer, which is turned off and on by the cockpit control, is used to sequence the de-ice system. This timer turns the de-ice system on and off in proper sequence, controlling the heating interval for each propeller and ensuring even de-icing.

A brush block, which is mounted on the engine immediately behind the propeller, supplies electrical current to the de-ice boot on each propeller blade via a slip ring. The slip ring is normally mounted on the spinner bulkhead.

When the pilot places the de-ice system cockpit control switch in the ON position, system timer begins to operate. As the timer sequences, power is delivered to a power relay. The power relay delivers high current to the brush block and slip ring. Each propeller is de-iced in turn by the timer.

B. Anti-ice System

The anti-ice system is controlled by the pilot via a cockpit mounted rheostat. This rheostat operates a pump that pumps anti-ice fluid from the tank at a controlled rate.

The anti-ice fluid is delivered through a filter, a check valve, and then through tubing to a slinger ring located at the rear of the spinner bulkhead. The anti-ice fluid is dispensed into the rotating slinger ring, which holds the fluid in a curved channel by centrifugal force. The fluid then flows out of the slinger ring through feed tubes, which are welded to the slinger ring, and then out onto the blade feed shoes.

The blade feed shoes are ridged rubber sheets that are glued to the leading edge of the blades. The ridges in the shoes direct the fluid out onto the blades and allow for an even distribution of the anti-ice fluid across the blades.

3. De-ice and Anti-ice System Functional Tests

A. De-ice System

(1) Functional tests of the de-ice system should be performed in accordance with the following Hartzell Manuals, which are also available on the Hartzell Propeller web site at www.hartzellprop.com.

(a) Hartzell Manual No. 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

(b) Hartzell Manual No. 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual

B. Anti-ice System

(1) Operational Checks of the anti-ice system should be performed in accordance with the following Hartzell Manuals, which are also available on the Hartzell Propeller web site at www.hartzellprop.com.

(a) Hartzell Manual No. 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

(b) Hartzell Manual No. 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual

4. De-ice and Anti-ice System Inspections

The inspections detailed below are made on a regular basis, either before flight, during the 100 hour inspection, or if a problem is noted. Possible corrections to problems discovered during inspections, additional inspections, and limits are detailed in the following inspection procedures.

A. De-ice System Inspections

(1) Perform inspections in accordance with the following Hartzell Manuals, which are also available on the Hartzell Propeller web site at www.hartzellprop.com.

(a) Hartzell Manual No. 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

(b) Hartzell Manual No. 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual

B. Anti-ice System Inspections

(1) Perform inspections in accordance with the following Hartzell Manuals, which are also available on the Hartzell Propeller web site at www.hartzellprop.com.

(a) Hartzell Manual No. 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

(b) Hartzell Manual No. 183 (61-12-83) - Propeller Anti-Icing Boot Removal and Installation Manual

5. De-ice and Anti-ice System Troubleshooting

A. De-ice System Troubleshooting

(1) Perform troubleshooting in accordance with the following Hartzell Manuals, which are also available on the Hartzell Propeller web site at www.hartzellprop.com.

(a) Hartzell Manual No. 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

(b) Hartzell Manual No. 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual

B. Anti-ice System Troubleshooting

(1) Perform troubleshooting in accordance with the following Hartzell Manuals, which are also available on the Hartzell Propeller web site at www.hartzellprop.com.

(a) Hartzell Manual No. 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual

(b) Hartzell Manual No. 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual

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1. Introduction

   Federal Aviation Regulations require that a record be kept of any repairs, adjustments, maintenance, or required inspections performed on a propeller or propeller system.

   This chapter provides a method for maintaining these records. It also provides a location for recording information that can aid the service technician in maintaining the propeller system.

2. Record Keeping

   A. Information to be Recorded

      (1) Information that is required to be recorded is listed in Part 43 of the U.S. Federal Aviation Regulations.

      (2) The log book 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)

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