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HARTZELL

MANUAL REVISION TRANSMITTAL
Manual 147 (61-00-47)
Propeller Owner's Manual and Logbook
REVISION 9 dated December 2015

Attached is a copy of Revision 9 to Hartzell Manual 147.

Page Control Chart for Revision 9:

REMOVE

Page No.

COVER/INSIDE COVER

REVISION HIGHLIGHTS

pages 5 thru 8

LIST OF EFFECTIVE PAGES

pages 21 and 22

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pages 23 thru 30

INTRODUCTION

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pages 1-5 thru 1-12

DESCRIPTION AND OPERATION

pages 2-1 and 2-2
pages 2-5 and 2-6

pages 2-7 and 2-8
pages 2-19 and 2-20

INSTALLATION AND REMOVAL

pages 3-1 thru 3-4
pages 3-7 thru 3-14
pages 3-17 and 3-18

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REVISION HIGHLIGHTS

pages 5 thru 8

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pages 1-5 thru 1-12

DESCRIPTION AND OPERATION

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(CONTINUED)**

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pages 3-35 thru 3-38

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MAINTENANCE PRACTICES

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pages 6-9 thru 6-12

RECORDS

pages 8-1 and 8-2
pages 8-41 and 8-42

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MAINTENANCE PRACTICES

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pages 6-9 thru 6-12

RECORDS

pages 8-1 and 8-2
pages 8-41 thru 8-46

NOTE 1: When the manual revision has been inserted in the manual, record the information required on the Record of Revisions pages in this manual.

NOTE 2: Pages distributed in this revision may include pages from previous revisions if they are on the opposite side of revised pages. This is done as a convenience to those users who wish to print a two-sided copy of the new revision.

Manual No. 147

61-00-47

Revision 9

December 2015

Propeller Owner's Manual and Logbook

Models: HC-E4A-3()
HC-E4N-3()
HC-E4P-5()
HC-E5N-3()
HC-E5A-2()
HC-E5A-3()
HC-E5B-5()
HC-E5P-3()

Lightweight Turbine Propellers with Composite Blades

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REVISION 9 HIGHLIGHTS

Revision 9, dated December 2015, incorporates the following:

- COVER
 - Revised to match the revision
- REVISION HIGHLIGHTS
 - Revised to match the revision
- LIST OF EFFECTIVE PAGES
 - Revised to match the revision
- TABLE OF CONTENTS
 - Revised to match the revision
- INTRODUCTION
 - Revised the section "Personnel Requirements"
 - Revised the section "Referenced Publications"
- DESCRIPTION AND OPERATION
 - Added Figure 2-3.1, "HC-E5A-3() Series Propeller"
 - Added Figure 2-3.2, "HC-E5P-3() Series Propeller"
 - Revised the section "Functional Description of Constant Speed Propeller Types"
 - Revised the section "Aluminum Hub Propeller Model Identification"
- INSTALLATION AND REMOVAL
 - Revised the section "Tools, Consumables, and Expendables"
 - Revised Figure 3-1, "Tool for Decompressing External Beta System" HC-E(4,5)()-3() Series"
 - Revised Table 3-1, "Propeller/Engine Flange O-rings and Mounting Hardware"
 - Revised Table 3-2, "Torque Table"
 - Added the section "Installing the HC-E5P-3 Propeller on the Aircraft Engine"
 - Added the section "Removal of HC-E5P-3() Propellers"
- MAINTENANCE PRACTICES
 - Revised the section "Lubrication Procedure"
- RECORDS
 - Added blade charts for the NC10120() blade

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REVISION HIGHLIGHTS1. 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.

<u>Revision No.</u>	<u>Issue Date</u>	<u>Comments</u>
Original	Nov/99	New Issue
Revision 1	Nov/02	Minor Revision
Revision 2	Apr/05	Minor Revision
Revision 3	Nov/09	Minor Revision
Revision 4	Sep/10	Minor Revision
Revision 5	Aug/13	Minor Revision
Revision 6	Oct/14	Minor Revision
Revision 7	Apr/15	Minor Revision
Revision 8	Jun/15	Minor Revision
Revision 9	Dec/15	Minor Revision

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Record of Temporary Revisions	11 and 12	Orig.	Nov/99
Service Documents List	13 and 14	Rev. 5	Aug/13
Airworthiness Limitations	15 thru 20	Rev. 8	Jun/15
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4. Restrictions and Placards

- I** A. The propellers included in 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**

- (1) Inspection, Repair, and Overhaul
 - (a) Compliance to the applicable regulatory requirements established by the Federal Aviation Administration (FAA) or foreign equivalent is mandatory for anyone performing or accepting responsibility for any inspection and/or repair and/or overhaul of any Hartzell Propeller Inc. product.
 - (b) Personnel performing maintenance on aluminum hub propellers 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 when 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. If blade paddles must be used, use at least two paddles. 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 per blade.
- (4) Use only the approved consumables, e.g., cleaning agents, lubricants, etc.
- (5) Safe Handling of Paints and Chemicals
 - (a) Always use caution when handling or being exposed to paints and/or chemicals during propeller overhaul and maintenance procedures.
 - (b) Before using paint or chemicals, always read the manufacturer's label on the container and follow specified instructions and procedures for storage, preparation, mixing, and application.

- (c) Refer to the product's Material Safety Data Sheet (MSDS) for detailed information about physical properties, health, and physical hazards of any chemical.
- (6) Observe applicable torque values during maintenance.
- (7) Before installing the propeller on the engine, the propeller must be statically balanced. New propellers are statically balanced at Hartzell Propeller Inc. Overhauled propellers must be statically balanced by a certified propeller repair station with the appropriate rating 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 Maintenance Practices chapter of this manual. Additional procedures may be found in the aircraft maintenance manual.

- (8) As necessary, use a soft, non-graphite pencil, crayon, or felt-tipped pen to make identifying marks on components.
- (9) As applicable, follow military standard NASM33540 for safety-wire, safety cable, and cotter pin general practices. Use 0.032 inch (0.81 mm) stainless steel safety wire unless otherwise indicated.

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

- (10)The information in this manual revision supersedes data in all previously published revisions of this manual.
- (11)Refer to the airframe manufacturer's manuals in addition to the information in this manual because of possible special requirements for specific aircraft applications.
- (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 Propeller Inc. can be found in the following publications available on the Hartzell Propeller Inc. website at www.hartzellprop.com:
 - (a) Hartzell Propeller Inc. Manual 180 (30-61-80) - Propeller Ice Protection System Manual
 - (b) Hartzell Propeller Inc. Manual 181 (30-60-81) - Propeller Ice Protection System Component Maintenance Manual
 - (c) Hartzell Propeller Inc. Manual 182 (61-12-82) - Propeller Electrical De-Ice Boot Removal and Installation Manual

- (d) Hartzell Propeller Inc. 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).
- C. Continued Airworthiness
 - (1) Operators are urged to keep informed of Airworthiness information via Hartzell Propeller Inc. Service Bulletins and Service Letters, which are available from Hartzell distributors or from the Hartzell Propeller Inc. by subscription. Selected information is also available on the Hartzell Propeller Inc website at www.hartzellprop.com.
- D. Propeller Critical Parts
 - (1) The following maintenance procedures may involve propeller critical parts. These procedures have been substantiated based on Engineering analysis that expects this product will be operated and maintained using the procedures and inspections provided in the Instructions for Continued Airworthiness (ICA) for this product. Refer to the Illustrated Parts List chapter of the applicable maintenance manual for the applicable propeller model for the identification of specific Critical Parts.
 - (2) Numerous propeller system parts can produce a propeller Major or Hazardous effect, even though those parts may not be considered as Critical Parts. The operating and maintenance procedures and inspections provided in the ICA for this product are, therefore, expected to be accomplished for all propeller system parts.

6. Reference Publications

Active Hartzell Propeller Inc. Service Bulletins, Letters, Instructions, and Advisories

Hartzell Propeller Inc. Manual No. 127 (61-16-27) - Metal Spinner Assembly Maintenance Manual - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual No. 130B (61-23-30) - Mechanically Actuated Governor Maintenance Manual

Hartzell Propeller Inc. Manual No. 135F (61-13-35) - Composite Propeller Blade Maintenance Manual

Hartzell Propeller Inc. Manual No. 143A (61-10-43) - Four-Blade Lightweight Turbine Propeller Maintenance Manual

Hartzell Propeller Inc. Manual No. 148 (61-16-48) - Composite Spinner Maintenance Manual

Hartzell Propeller Inc. Manual No. 157 (61-10-57) - Five-Blade Lightweight Turbine Propeller Maintenance Manual

Hartzell Propeller Inc. Manual No. 158A (61-10-58) - Five Blade Lightweight Turbine Propeller Maintenance Manual

Hartzell Propeller Inc. Manual No. 159 (61-02-59) - Application Guide - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual No. 165A (61-00-65) - Illustrated Tool and Equipment Manual - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual No. 170 (61-13-70) - Composite Propeller Blade Field Maintenance and Minor Repair Manual - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual No. 173 (61-10-73) - Composite Spinner Field Maintenance and Minor Repair Manual - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual No. 180 (30-61-80) - Propeller Ice Protection System Manual - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual No. 181 (30-60-81) - Propeller Ice Protection System Component Maintenance Manual - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual No. 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual No. 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual No. 202A (61-01-02) - Standard Practices Manual, Volumes 1 through 11- Volume 7 - Consumable Materials is available on the Hartzell Propeller Inc. website at www.hartzellprop.com.

Hartzell Propeller Inc. Service Letter HC-SL-61-61Y - Overhaul Periods and Service Life Limits for Hartzell Propeller Inc. Aviation Components - Propellers, Governors, Accumulators, and Propeller Damper Assemblies - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

7. Definitions

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

<u>Term</u>	<u>Definition</u>
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.
Composite Material	Kevlar® (yellow) or graphite (black) fibers bound together with or encapsulated within an epoxy resin.

<u>Term</u>	<u>Definition</u>
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.
Debond	Separation of two materials that were originally bonded together in a separate operation.
Delamination	Internal separation between the layers of composite material.
Depression	Surface area where the material has been compressed but not removed.
Distortion	Alteration of the original shape or size of a component.
Erosion	Gradual wearing away or deterioration due to action of the elements.
Exposure	Material open to action of the elements.
Feathering	The capability of blades to be rotated parallel to the relative wind, thus reducing aerodynamic drag.
Fretting	Damage that develops when relative motion of small displacement takes place between contacting parts, wearing away the surface.
Gouge	Surface area where material has been removed.

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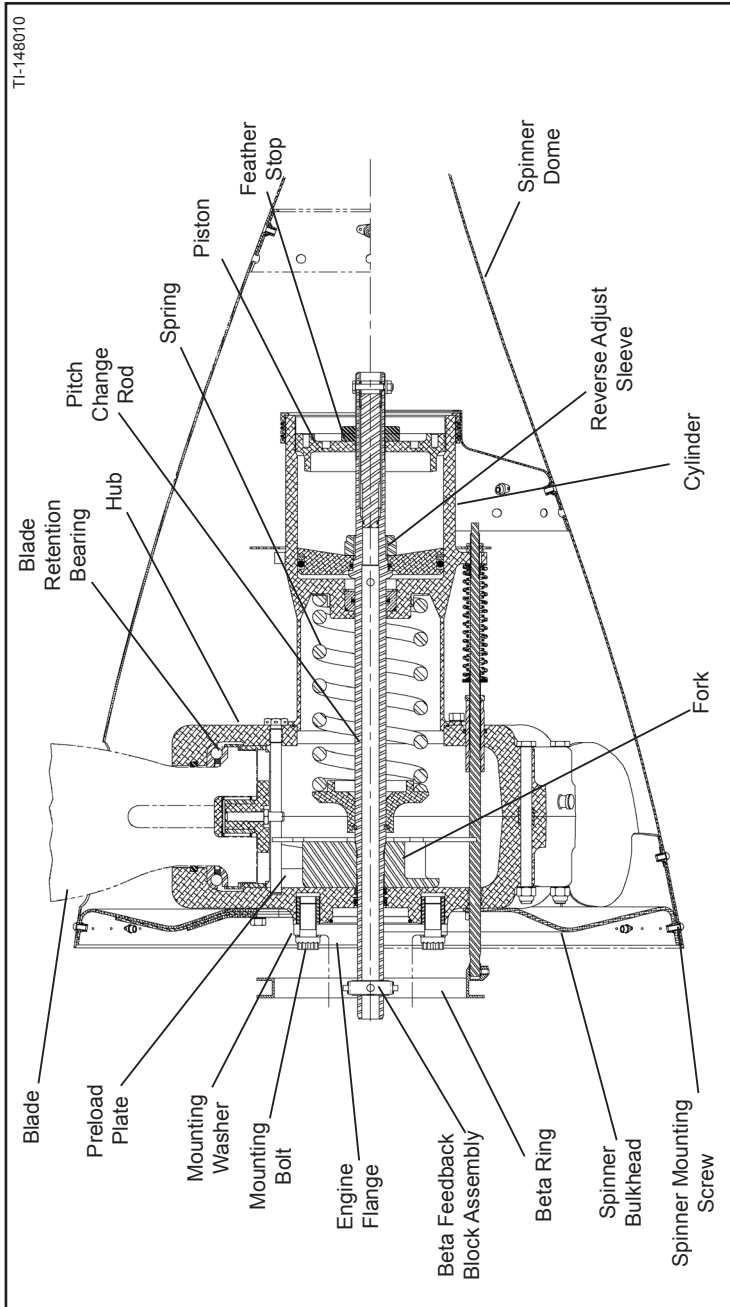
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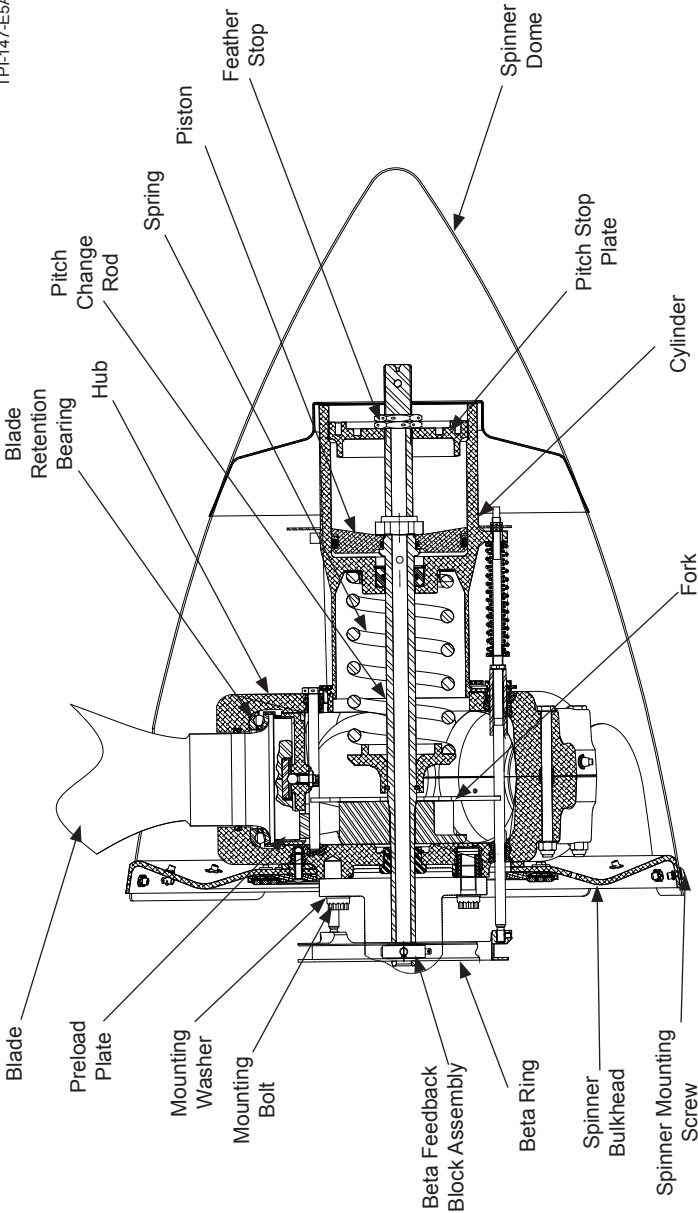
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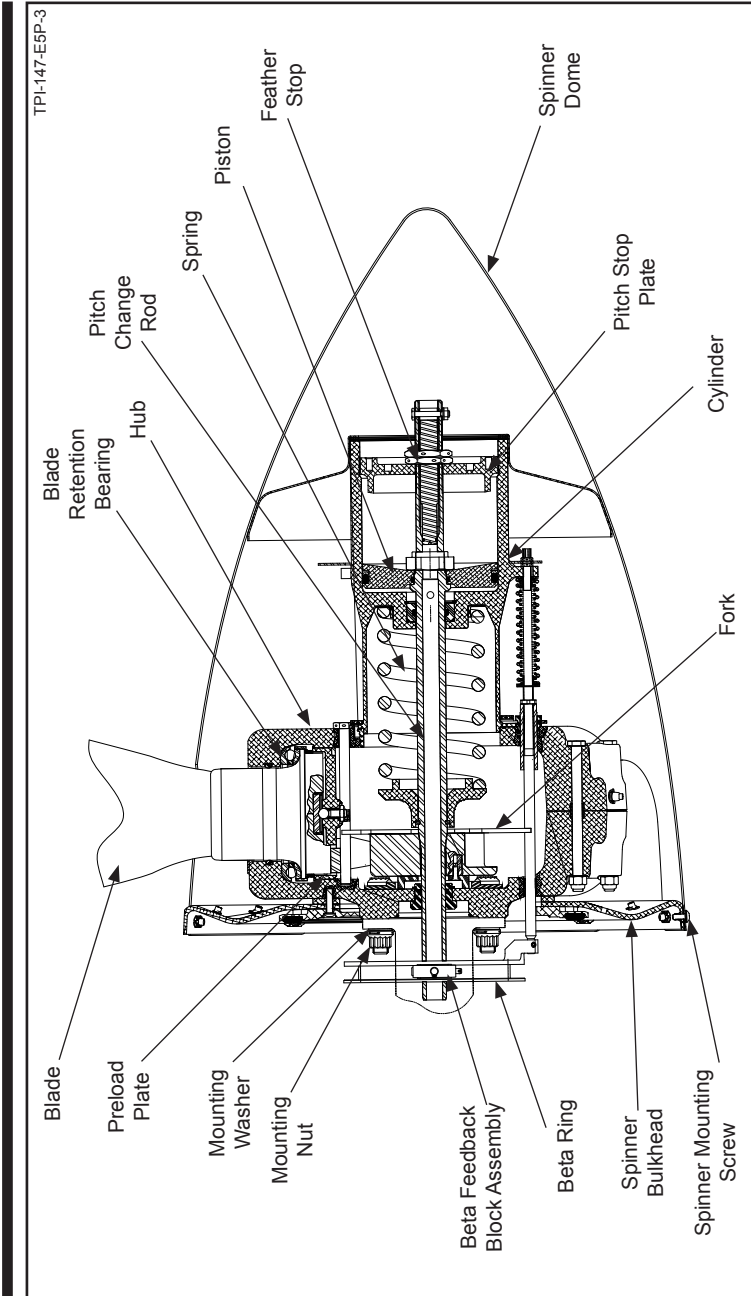


HC-E5N-3 () Series Propeller
Figure 2-3

TPI-147-E5A-3



HC-E5A-3 () Series Propeller
Figure 2-3.1



HC-E5P-3 () Series Propeller
Figure 2-3.2

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1. Functional Description of Constant Speed Propeller Types**A. Feathering and Reversing Propellers HC-E(4,5)()-3() Series**

Refer to Figure 2-1, Figure 2-2, Figure 2-3.1, Figure 2-3.2, and Figure 2-3. The propellers described in this section are constant speed, feathering and reversing. They use a single oil supply from a governing device to hydraulically actuate a change in blade angle. The propellers have four blades and are used primarily on Pratt & Whitney turbine engines.

A two piece aluminum hub retains each propeller blade on a thrust bearing. A cylinder is attached to the hub and contains a feathering spring and piston. The hydraulically actuated piston transmits linear motion through a pitch change rod and fork to each blade to result in blade angle change.

While the propeller is operating the following forces are constantly present: 1) spring force, 2) counterweight force, 3) centrifugal twisting moment of each blade and 4) blade aerodynamic twisting forces. The spring and counterweight forces attempt to rotate the blades to higher blade angle while the centrifugal twisting moment of each blade is generally toward lower blade angle. Blade aerodynamic twisting force is generally very small in relation to the other forces and can attempt to increase or decrease blade angle.

Summation of the propeller forces is toward higher pitch (low RPM) and is opposed by a variable force toward lower pitch (high RPM). The variable force is oil under pressure from a governor with an internal pump that is mounted on and driven by the engine. The oil from the governor is supplied to the propeller and hydraulic piston through a hollow engine shaft. Increasing the volume of oil within the piston and cylinder will decrease the blade angle and increase propeller RPM. Decreasing the volume of oil will increase blade angle and decrease propeller RPM. By changing the blade angle, the governor can vary the load on the engine and maintain constant engine RPM (within limits), independent of where the power lever is set. The governor uses engine speed sensing mechanisms that permit it to supply or drain oil as necessary to maintain constant engine speed (RPM).

If governor supplied oil is lost during operation, the propeller will increase pitch and feather. Feathering occurs because the summation of internal propeller forces causes the oil to drain out of the propeller until the feather stop position is reached.

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

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

In reverse mode of operation the governor operates in an underspeed condition to act strictly as a source of pressurized oil, without attempting to control RPM. Control of the propeller blade angle in reverse is accomplished with the beta valve.

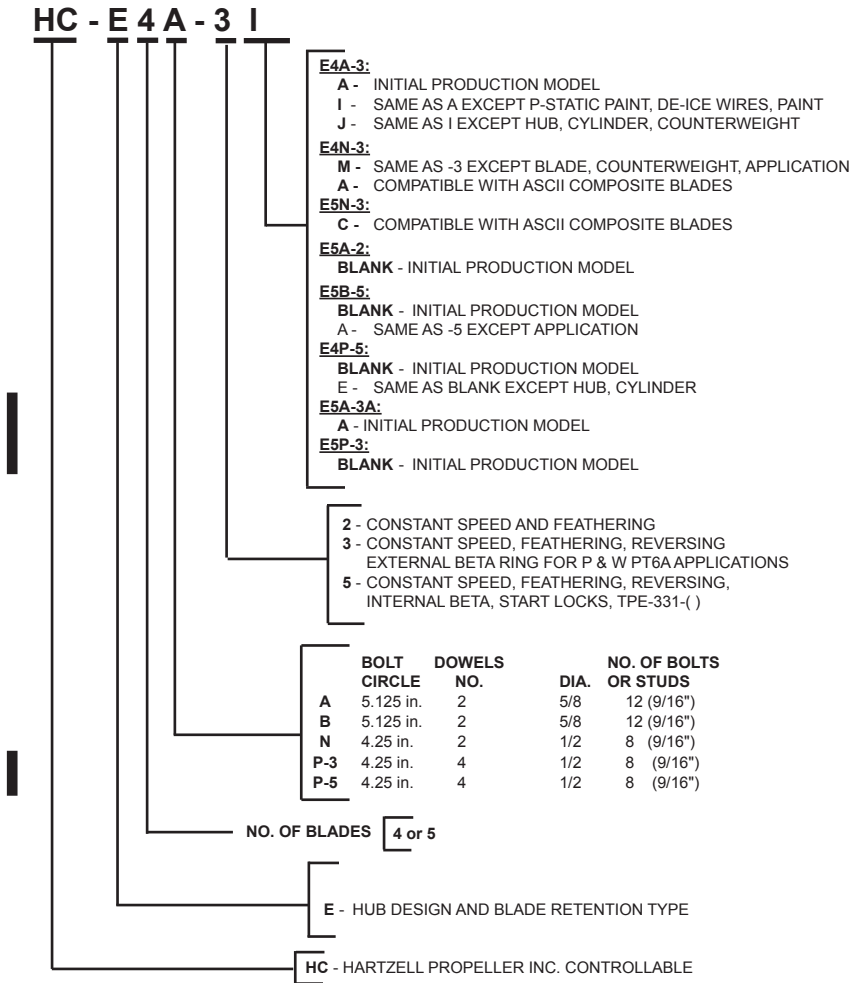
NOTE: The beta valve is normally built into the base of the governor.

The propeller is reversed by manually repositioning the cockpit-control to cause the beta valve to supply oil from the governor pump to the propeller. Several external propeller mechanisms, which include a beta ring and beta feedback block assembly, communicate propeller blade angle position to the beta valve.

When the propeller reaches the desired reverse position, movement of the beta ring and beta feedbackblock assembly initiated by the propeller piston, causes the beta valve to shut off the flow of oil to the propeller. Any additional unwanted movement of the propeller toward reverse, or any movement of the manually positioned beta valve control toward high pitch position will cause the beta valve to drain oil from the propeller to increase pitch.

A. Aluminum Hub Propeller Model Identification

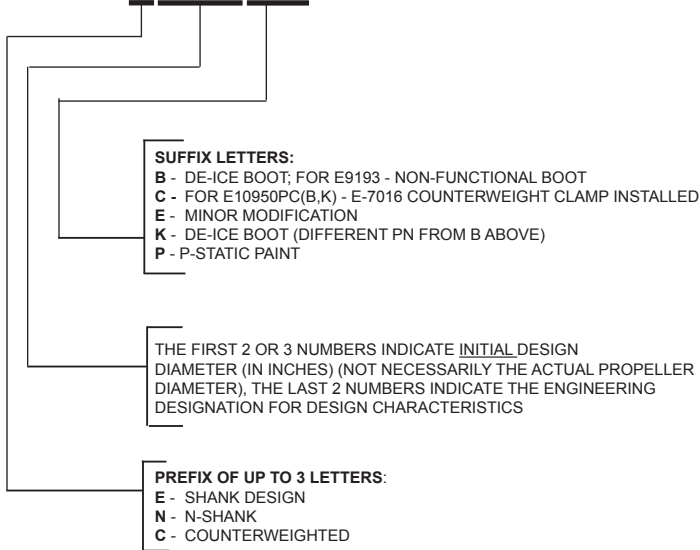
The propeller model designation is impression stamped on the propeller hub.



B. Composite Blade Model Identification

(1) Refer to the Maintenance Practices chapter in this manual for description of the legacy and N-shank composite blades.

prop model/E10950PCK



BLADE TYPE	Blade Model Designation
Legacy Kevlar®	E8190K
	E10950P(C)(B,K)
	E11990K
	E12902K
Legacy Carbon	E9193(B,K)
N-shank Carbon With only Trailing Edge Foam	NC9208()
	NC10120() NC10245()
With Both Trailing Edge Foam and Leading Edge Foam	NC8834()

Blade Type and Blade Model Designations
Table 2-1

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1. Tools, Consumables, and Expendables

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

A. Tooling**A Flange**

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench
- Torque wrench adapter
(Hartzell Propeller Inc. P/N AST-2877 that use bolt)
(Hartzell Propeller Inc. P/N AST-2877-1 that use nut)

B Flange

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench
- Torque wrench adapter
(Hartzell Propeller Inc. P/N AST-2877)

N Flange

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench
- Torque wrench adapter
(Hartzell Propeller Inc. P/N AST-2877 or P/N AST-2877-1
as applicable)

P Flange

- Safety wire pliers (Alternate: Safety cable tool)
- Torque wrench
- Torque wrench adapter
(Hartzell Propeller Inc. P/N AST-2877-2 for HC-E5P-3)
(Hartzell Propeller Inc. P/N AST-2877-1 that use nut)

B. Consumables

- Quick Dry Stoddard Solvent or Methyl-Ethyl-Ketone (MEK)
- Loctite 222 low strength threadlocker

C. Expendables

- 0.032 inch (0.81 mm) stainless steel aircraft safety wire
(Alternate: 0.032 inch [0.81 mm] aircraft safety cable and
associated washers and ferrules)
- O-ring, Propeller-to-Engine Seal (see Table 3-1)

2. Pre-Installation**A. Inspection of Shipping Package**

- (1) Examine the exterior of the shipping container for signs of shipping damage, especially at the box ends around each blade. A hole, tear or crushed appearance at the end of the box (blade tips) may indicate 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 from the shipping container.
- (3) Remove the cardboard from the hub and blades.

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

- (4) Put the propeller on a padded surface that supports the propeller over a large area.
- (5) Remove the plastic dust cover cup from the propeller mounting flange (if installed).

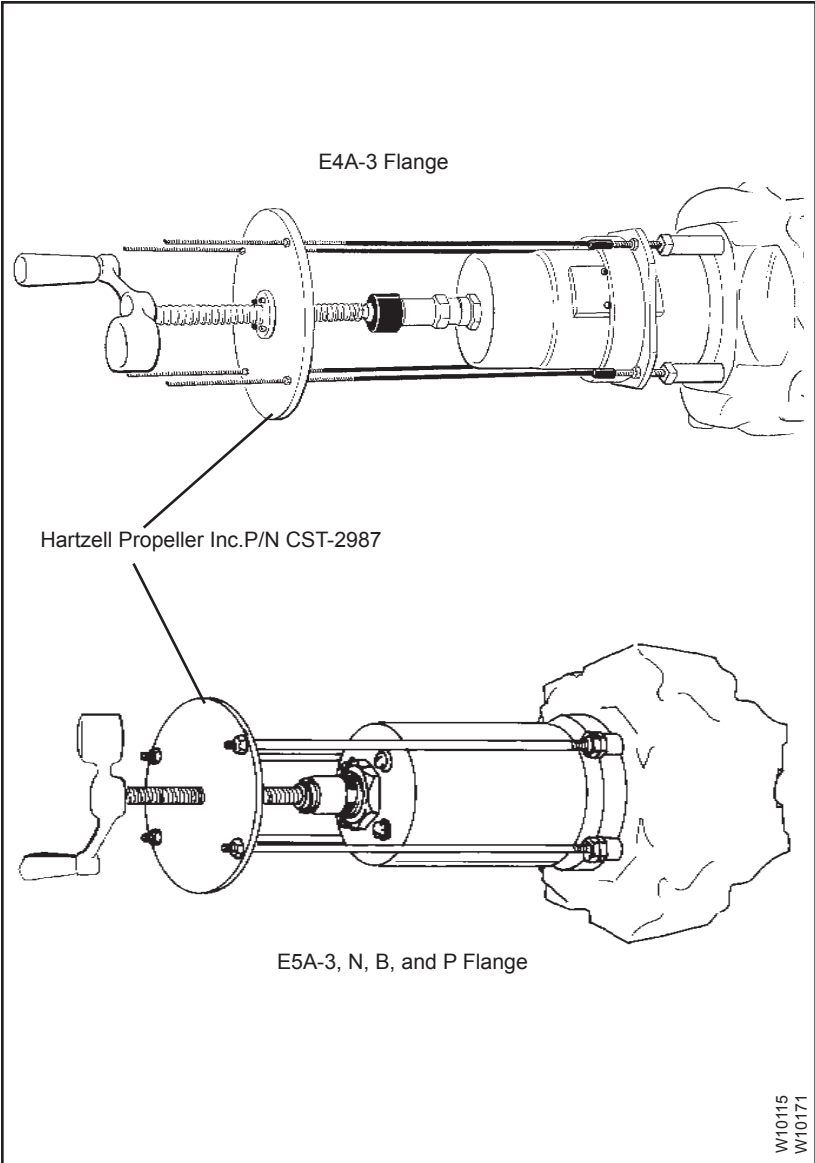
C. Inspection after Shipment

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

D. Reassembly of a Propeller Disassembled for Shipment

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

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W10115
W10171

**Tool for Decompressing HC-E(4,5)()-3() Series
External Beta System
Figure 3-1**

B. Installing HC-E(4,5)()-3() except HC-E5P-3 Propeller on the Aircraft Engine

- (1) Use a beta system puller CST-2987 to compress the beta system and pull the beta ring forward to permit installation of the double hex head propeller mounting bolts. Refer to Figure 3-1.

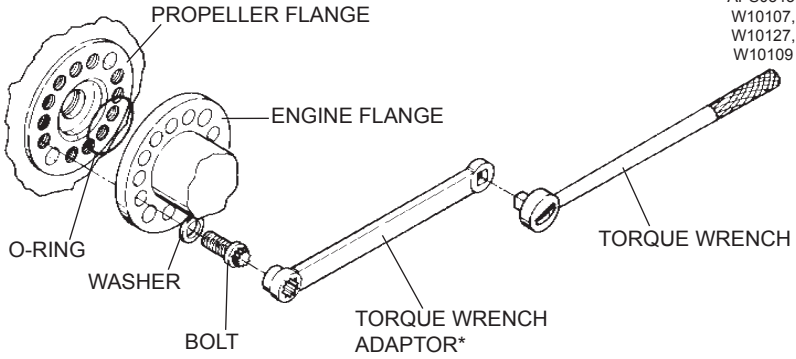
WARNING: MAKE SURE THE SLING IS RATED UP TO 800 LBS (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING INSTALLATION.

CAUTION 1: WHEN INSTALLING THE PROPELLER ON THE AIRCRAFT, DO NOT DAMAGE THE ICE PROTECTION SYSTEM COMPONENTS, IF APPLICABLE.

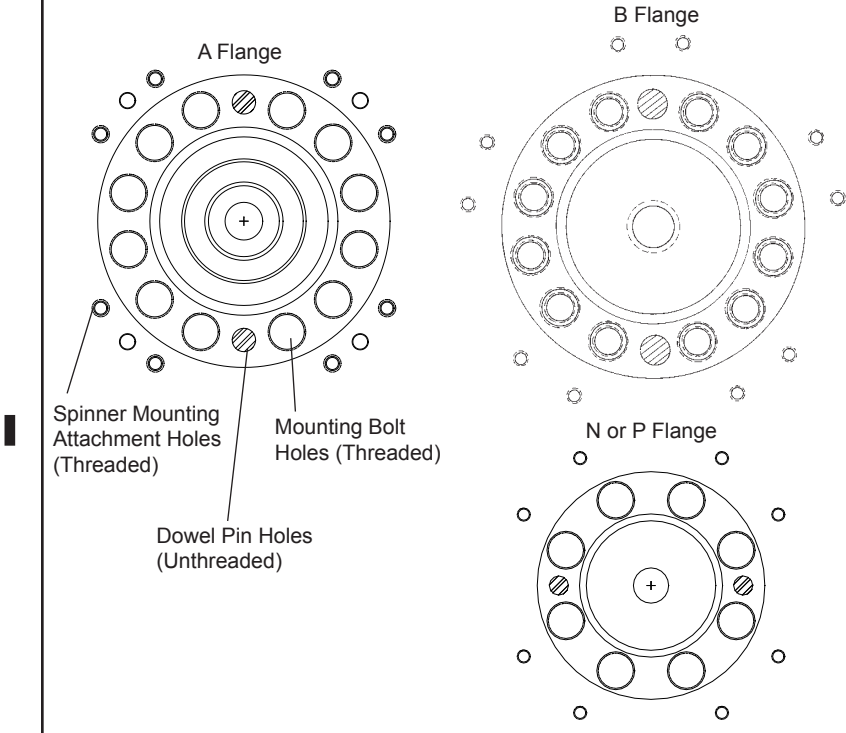
CAUTION 2: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

- (2) With a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange.
- (a) Some propellers may require installation of an accessory drive pulley. If installation procedures are not in this manual, refer to the aircraft manufacturer's instructions.

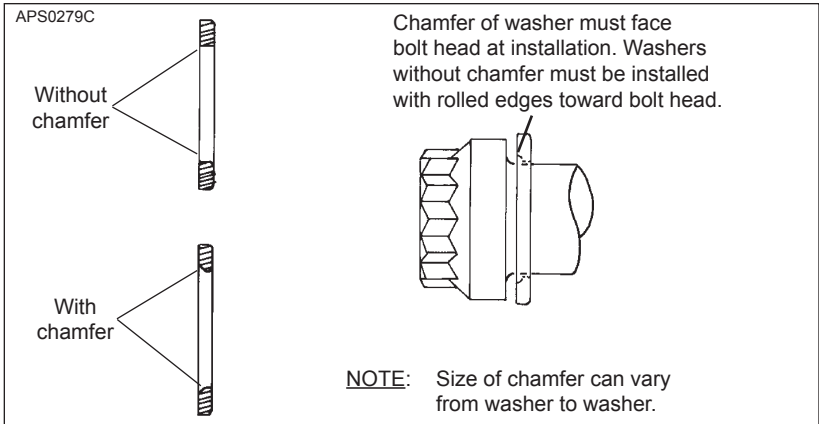
APS0543,
W10107,
W10127,
W10109



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



**Installing Propeller on Engine Flange
Figure 3-2**

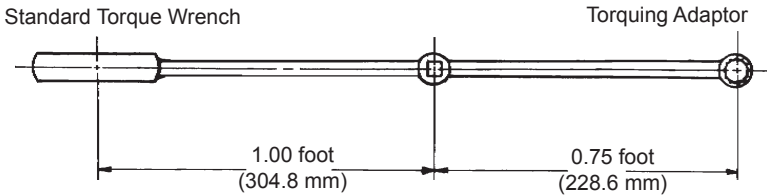


**Mounting Bolt and Washer
Figure 3-3**

Flange	O-ring	Bolt/Stud	Washer	Nut
A (except E5A-2)	C-3317-239-2	B-3347	A-2048-2	n/a
E5A-2	C-3317-239-2	B-7435	A-2048-2	C-6006
B	C-3317-239-2	B-3347	A-2048-2	n/a
N	C-3317-230	B-3339-1	A-2048-2	n/a
P except E5P-3	C-3317-230	B-3347	A-2048-2	n/a
E5P-3	C-3317-230	103560	A-2048-2	C-6006

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

APS0212A



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

EXAMPLE:

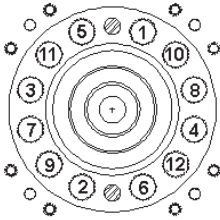
$$\frac{100 \text{ Ft-Lb (136 N}\cdot\text{m)} \times 1 \text{ ft (308.4 mm)}}{1 \text{ ft (308.4 mm)} + 0.75 \text{ ft (228.6 mm)}} = 57.1 \text{ Ft-Lb (77.4 N}\cdot\text{m)} < \text{reading on torque wrench with 9-inch (228.6 mm) adaptor for actual torque of 100 Ft-Lb (136 N}\cdot\text{m)}$$

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

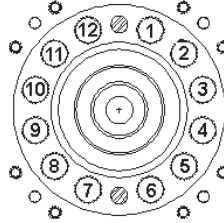
Determining Torque Value When Using Torquing Adaptor
Figure 3-4

W10107C,
W10107B,
W10108C,
W10109C,
W10109B

A or B Flange



SEQUENCE A



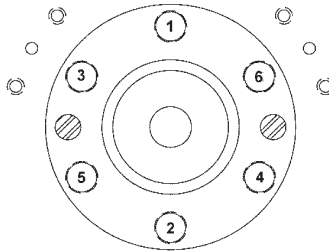
SEQUENCE B

Use Sequence A for steps one and two.

Use Sequence B for step three.

Step 1 - Torque all bolts to 40 Ft-Lbs (54 N•m). **Step 3** - Torque all bolts to Table 3-2.
Step 2 - Torque all bolts to 80 Ft-Lbs (108 N•m).

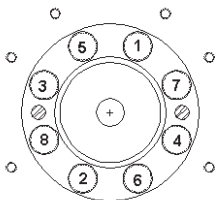
F Flange



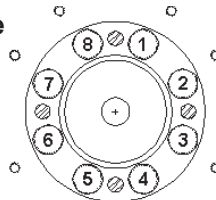
Step 1 - Torque all bolts to 40 Ft-Lbs (54 N•m).

Step 2 - Torque all bolts to Table 3-2.

N or P Flange



SEQUENCE A



SEQUENCE B

Use Sequence A for steps one and two.

Use Sequence B for step three.

Step 1 - Torque all bolts to 40 Ft-Lbs (54 N•m). **Step 3** - Torque all bolts to Table 3-2.
Step 2 - Torque all bolts to 80 Ft-Lbs (108 N•m).

Diagram of Torquing Sequence for Propeller Mounting Bolts
Figure 3-5

CAUTION 1: FOR A PROPELLER THAT DOES NOT USE A LUBRICATED (WET) TORQUE, THE MOUNTING HARDWARE MUST BE CLEAN AND DRY TO PREVENT EXCESSIVE PRELOAD OF THE MOUNTING FLANGE.

CAUTION 2: TORQUE VALUES WITH "WET" NOTED AFTER THEM ARE BASED ON LUBRICATED THREADS WITH APPROVED ANTI-SEIZE COMPOUND MIL-PRF-83483().

CAUTION 3: REFER TO FIGURE 3-4 FOR TORQUE READING WHEN USING A TORQUE WRENCH ADAPTER.

A flange propeller mounting bolts (except E5A-2)	100-105 Ft-Lbs (136-142 N•m) Wet
E5A-2 flange propeller mounting nuts	120-130 Ft-Lbs (163-176 N•m) Wet
B flange propeller mounting bolts	100-105 Ft-Lbs (136-142 N•m) Wet
N flange propeller mounting bolts	100-105 Ft-Lbs (136-142 N•m) Wet
P flange propeller mounting bolts except HC-E5P-3	100-105 Ft-Lbs (136-142 N•m) Wet
HC-E5P-3 propeller mounting nuts	120-130 Ft-Lbs (163-176 N•m) Wet
Adapter Plate to Hub bolts - B-3384-4H	8-10 Ft-Lbs (10.8-13.5 N•m)
Slip Ring and adapter Plate Unit to Hub screws - A-2070-7	8-10 Ft-Lbs (10.8-13.5 N•m)
Bulkhead to Adapter Plate screws -B-3867-269	Until snug
Pulley to Adapter Ring - Pilatus fastener	48 In-Lbs (5.4 N•m)
Balance weight screws or bolts- Aircraft quality #10-32 or AN-3()	30-36 In-Lbs (3.4-4.0 N•m)

**Torque Table
Table 3-2**

- (10) Using a torque wrench and a torque wrench adapter Hartzell Propeller Inc. P/N AST-2877, torque all mounting bolts in sequences and steps shown in Figure 3-5. Refer to Table 3-2 and Figure 3-4 to determine the correct torque value.
- (11) Safety all mounting bolts with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable. (Two bolts per safety.)
- (12) Decompress the external beta system and remove the beta system puller.

CAUTION: THE BETA RING MUST NOT CONTACT ANY ENGINE COMPONENT OR MOUNTING BOLT SAFETY WIRE. THE BETA MECHANISM FEEDBACK COULD BE DAMAGED IF IT CONTACTED ANY STATIC ENGINE COMPONENT WHILE ROTATING.

- (13) Examine the beta ring to make sure that it is not in contact with any engine components or mounting bolt safety wire.
 - (a) If there is contact between the beta ring and any engine components or mounting bolt safety wire, consult a certified propeller repair station with the appropriate rating.
- (14) Install the beta feedback block assembly into the beta linkage lever, in accordance with the airframe manufacturer's instructions.
 - (a) If the beta linkage lever is not installed correctly, there could be interference between the beta linkage lever and Fillet A, as shown in Figure 3-6. Refer to Figure 3-6 and Figure 3-7.
 - 1** If there is interference at Fillet A, make a chamfer in the beta linkage lever to clear Fillet A, as shown in Figure 3-6. The maximum radius in Fillet A as manufactured is 0.015 inch (0.38 mm).

CAUTION: FIT THE BETA FEEDBACK BLOCK ASSEMBLY IN THE BETA RING WITH A MINIMUM SIDE CLEARANCE OF 0.001 INCH (0.03 mm). REFER TO FIGURE 3-6.

- (15) Install the beta feedback block assembly into the beta ring. Refer to Figure 3-7.
- (16) Install, adjust, and safety the beta linkage per the airframe manufacturer's instructions.
- (17) If the propeller is equipped with an accessory drive pulley, follow the applicable manufacturer's instructions for installation of the accessory drive pulley hardware.
- (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 Propeller Inc. can be found in the following publications available on the Hartzell Propeller Inc. website 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 propeller spinner dome in accordance with the section "Spinner Dome Installation" in this chapter.

B1. Installing the HC-E5P-3 Propeller on the Aircraft Engine

- (1) Using a beta system puller CST-2987 (Figure 3-1), compress the beta system and pull the beta ring forward to permit access to the propeller mounting flange.

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

CAUTION 1: WHEN INSTALLING THE PROPELLER ON THE AIRCRAFT, DO NOT DAMAGE THE ICE PROTECTION SYSTEM COMPONENTS, IF APPLICABLE.

CAUTION 2: INSTRUCTIONS AND PROCEDURES IN THIS SECTION MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST CHAPTER OF THE APPLICABLE OVERHAUL MANUAL(S) FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

- (2) With a suitable crane hoist and sling, carefully move the propeller assembly to the aircraft engine mounting flange.
- (3) Using Quick Dry Stoddard Solvent or MEK, clean the engine flange and the propeller flange.
- (4) Install the specified O-ring on the engine flange. Refer to Table 3-1.
- (5) Put the propeller onto the engine flange.

CAUTION 1: NEW PROPELLER MOUNTING NUTS MUST BE USED WHEN INITIALLY INSTALLING A NEW OR OVERHAULED PROPELLER.

CAUTION 2: THE SIDE OF THE WASHER WITH THE OD CHAMFER MUST BE AGAINST THE ENGINE FLANGE. REFER TO FIGURE 3-10.

(6) Install self locking mounting nuts with washers onto the propeller mounting bolts with the chamfer on the washer against the engine flange. Refer to Table 3-1 for applicable mounting hardware. Refer to Figure 3-3.

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

(7) Using a torque wrench and the specified torque wrench adapter (refer to the Tooling section in this chapter), torque all mounting nuts in the sequences and steps shown in Figure 3-5. Refer to Table 3-2 and Figure 3-4 to determine the proper torque value.

(8) Safety all propeller mounting nuts with 0.032 inch (0.81 mm) minimum diameter stainless steel wire or equivalent aircraft safety cable. (Two nuts per safety.)

(9) Decompress the external beta system and remove the beta system puller.

CAUTION: THE BETA FEEDBACK COLLAR MUST NOT CONTACT ANY ENGINE COMPONENT OR MOUNTING BOLT SAFETY WIRE. THE BETA FEEDBACK MECHANISM COULD BE DAMAGED IF IT CONTACTED ANY STATIC ENGINE COMPONENT WHILE ROTATING.

(10) Examine the beta feedback collar to make sure that it is not in contact with any engine components or mounting bolt safety wire.

(a) If there is contact between the beta feedback collar and any engine components or mounting bolt safety wire, contact qualified personnel at a certified propeller repair station with the appropriate rating.

- (11) Install the carbon block into the beta linkage lever, in accordance with the airframe manufacturer's instructions.
- (a) If the beta linkage lever is not installed correctly, there may be interference between the beta linkage lever and Fillet A, as shown in Figure 3-6. Refer to Figure 3-6 and Figure 3-7.
- 1 If there is interference at Fillet A, make a chamfer in the beta linkage lever to clear Fillet A, as shown in Figure 3-6. The maximum radius in Fillet A as manufactured is 0.015 inch (0.38 mm).

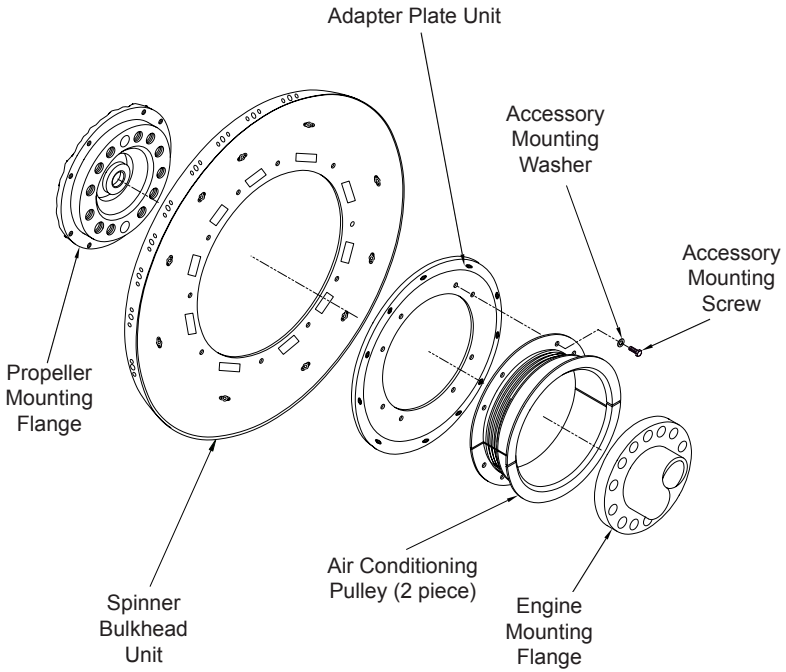
CAUTION: FIT THE BLOCK IN THE BETA RING WITH A SIDE CLEARANCE OF 0.001 TO 0.002 INCH (0.03 TO 0.05 mm). REFER TO FIGURE 3-7.

- (12) Install the carbon block assembly into the beta ring. Refer to Figure 3-7.
- (13) Install, adjust, and safety the beta linkage in accordance with the airframe manufacturer's instructions.
- (14) If the propeller is equipped with an accessory drive pulley, follow the applicable manufacturer's instructions for installation of the accessory drive pulley hardware.
- (15) 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 Propeller Inc. can be found in the following publications available on the Hartzell Propeller Inc. website at www.hartzellprop.com:
- (a) Hartzell Propeller Inc. Manual 180 (30-61-80) - Propeller Ice Protection System Manual
- (b) Hartzell Propeller Inc. Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual
- (c) Hartzell Propeller Inc. Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual
- (d) Hartzell Propeller Inc. Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual

- (16) 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).
- (17) Install the propeller spinner dome in accordance with the section "Spinner Dome Installation" in this chapter.

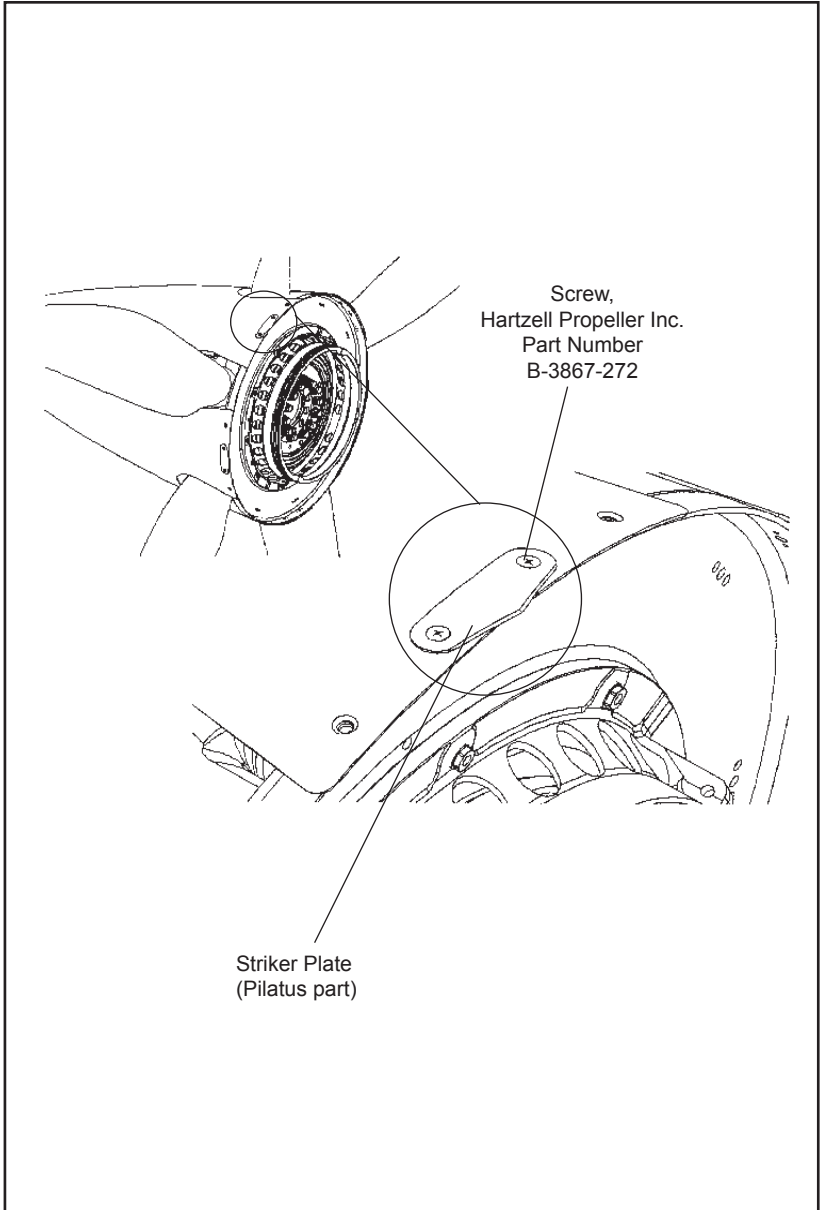
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Part Description	Part Number
Air Conditioning Pulley	Pilatus Part
Adapter Plate Unit	Hartzell Propeller Inc. Part Number D-6663
Accessory Mounting Screw	Pilatus Part
Accessory Mounting Washer	Pilatus Part

**Air Conditioning Drive Accessories
Table 3-3**



Striker Plate
Figure 3-9

4. Spinner Dome Installation

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

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

A. For Propeller model HC-E5A-2, install the striker plates (Pilatus part). Refer to Figure 3-9.

(1) The striker plates must have a curvature to match that of the dome and must have a weight of not more than 0.458 ounces (13 grams).

(2) Using screws, part number B-3867-272, install the striker plates centered between the blades, using the mounting holes provided.

NOTE: Washers, part number B-3860-10L, are not used at the striker plate attachment points.

- (2) For the HC-E5A-2 propeller apply one or more layers of fluoroglas or UHMW tape (Hartzell Propeller Inc. P/N B-6654-100) to the forward bulkhead where the bulkhead touches the cylinder. Apply a layer of tape, check, and repeat until the forward bulkhead unit fits snugly on the cylinder.
 - (3) For the HC-E4P-5() propeller with spinner assembly D-5362:
 - 1 Verify that the hoop unit is installed on the spinner bulkhead and installed on the propeller.
 - 2 Install one or more spinner mounting spacers between the cylinder and the forward bulkhead.
 - D. Carefully slide the spinner dome over the propeller and forward bulkhead to check for proper positioning of the spinner dome mounting holes. Add or remove spacers, if applicable, to obtain the spinner dome mounting hole and spinner bulkhead hole misalignment. Refer to Figure 3-12.
 - E. Push the spinner dome with firm pressure toward the spinner bulkhead unit to make sure that the spinner dome mounting holes will fully align with the spinner bulkhead holes. Remove a minimum quantity of spacers to obtain hole alignment while maintaining preload.
 - F. Attach the spinner dome to the spinner bulkhead or hoop unit 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 Maximum RPM (Static) Hydraulic Low Pitch Stop Check as outlined in the Testing and Troubleshooting chapter of this manual.

6. Spinner Dome Removal

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

- A. Remove the screws and washers that secure the spinner dome to the spinner bulkhead.
- B. Remove the spinner dome.

7. Propeller Removal**A. Removal of HC-E(4,5)()-3() except HC-E5P-3 Propellers**

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

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

- (1) Remove the spinner dome in accordance with the section "Spinner Dome Removal" in this chapter.
- (2) 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 Propeller Inc. can be found in the following publications available on the Hartzell Propeller Inc. website 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
- (3) 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).

- (4) Disconnect the engine beta linkage and beta feedback block assembly from the beta ring in accordance with the airframe manufacturer's instructions.
 - (a) Remove the snap ring that retains the beta feedback block assembly to the beta linkage. Refer to Figure 3-7.
 - (b) Remove the beta feedback block assembly. Refer to Figure 3-6.
- (5) Use the beta system puller CST-2987 to compress the beta system spring and pull the beta ring toward the propeller to expose the propeller mounting bolts and washers. Refer to Figure 3-1.

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 THE HARTZELL PROPELLER INC. OVERHAUL MANUALS 143A (61-10-43), 156A (61-10-56), 157 (61-10-57), OR 158A (61-10-58).

WARNING 3: MAKE SURE THE SLING IS RATED UP TO 800 LBS (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING REMOVAL.

- (6) Cut and remove the safety wire on the propeller mounting bolts.

- (7) Support the propeller assembly with a sling.
 - (a) Supporting the propeller with a sling may be delayed until all but two mounting bolts and washers have been removed to permit rotating the propeller for ease of bolt removal.
 - (b) If the propeller will be reinstalled and it has been dynamically balanced, make an identifying mark on the propeller hub and a matching mark on the engine flange to make sure of proper orientation during re-installation to prevent dynamic imbalance.

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

- (8) Remove the propeller mounting bolts and washers.
 - (a) 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.

- (9) Using the support sling, lift the propeller from the mounting flange.
- (10) Remove and discard propeller mounting O-ring.
- (11) Install suitable covers on the pitch change rod opening, propeller mounting flange, and engine flange to prevent the introduction of contamination.
- (12) Decompress and remove beta system puller.
- (13) Put the propeller on a suitable cart for transportation.

A1. Removal of HC-E5P-3 Propellers

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

- (1) Remove the spinner dome in accordance with the procedure in the Spinner Dome Removal section of this chapter.
- (2) 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 Propeller Inc. can be found in the following publications available on the Hartzell Propeller Inc. website 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
- (3) 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).

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 THE HARTZELL PROPELLER INC. OVERHAUL MANUAL 157 (61-10-57).

WARNING 3: MAKE SURE THE SLING IS RATED UP TO 800 LBS (363 KG) TO SUPPORT THE WEIGHT OF THE PROPELLER ASSEMBLY DURING REMOVAL.

- (4) Cut and remove the safety wire on the propeller mounting nuts.
- (5) Support the propeller assembly with a sling.

NOTE 1: Supporting the propeller with a sling may be delayed until all but two mounting bolts and washers have been removed to permit rotating the propeller for ease of nut removal.

NOTE 2: If the propeller will be reinstalled and it has been dynamically balanced, make an identifying mark on the propeller hub and a matching mark on the engine flange to make sure of proper orientation during re-installation to prevent dynamic imbalance.

CAUTION: USE CARE WHEN HANDLING THE PROPELLER TO AVOID CONTACTING THE PROPELLER MOUNTING BOLTS. IF THE BOLTS ARE LOOSENED, THEY MAY BE PUSHED TOWARD THE INSIDE OF THE HUB, WHICH WILL REQUIRE PARTIAL DISASSEMBLY OF THE PROPELLER BY A CERTIFIED PROPELLER REPAIR STATION WITH THE APPROPRIATE RATING TO REINSTALL THE MOUNTING BOLTS.

- (6) Remove the propeller mounting nuts and washers.
 - (a) If the propeller is removed between overhaul intervals, mounting nuts 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 the propeller mounting O-ring.
- (9) Install suitable covers on the pitch change rod opening, propeller mounting flange, and engine flange to prevent the introduction of contamination.
- (10) Put the propeller on a suitable cart for transportation.

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B. Removal of HC-E5A-2 Propellers

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

- (1) Remove the spinner dome in accordance with the procedure in the Spinner Dome Removal section of this chapter.
- (2) 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 Propeller Inc. can be found in the following publications available on the Hartzell Propeller Inc. website at www.hartzellprop.com:
 - (a) Hartzell Propeller Inc. Manual 180 (30-61-80) - Propeller Ice Protection System Manual
 - (b) Hartzell Propeller Inc. Manual 181 (30-60-81) - Propeller Ice Protection Component Maintenance Manual
 - (c) Hartzell Propeller Inc. Manual 182 (61-12-82) - Propeller Electrical De-ice Boot Removal and Installation Manual
 - (d) Hartzell Propeller Inc. Manual 183 (61-12-83) - Propeller Anti-icing Boot Removal and Installation Manual
- (3) 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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- (5) A label (Hartzell Propeller Inc. P/N A-3494) is normally applied to the propeller to indicate the type of grease previously used. Refer to Figure 6-2.
- (a) This grease type should be used during re-lubrication unless the propeller has been disassembled and the old grease removed.
 - (b) It is not possible to purge old grease through lubrication fittings.
 - (c) To completely replace one grease with another, the propeller must be disassembled in accordance with the applicable overhaul manual.

CAUTION 1: OVER LUBRICATING AN ALUMINUM HUB PROPELLER MAY CAUSE THE GREASE TO ENTER THE HUB CAVITY, LEADING TO EXCESSIVE VIBRATION AND/OR SLUGGISH OPERATION. THE PROPELLER MUST THEN BE DISASSEMBLED TO REMOVE THIS GREASE.

CAUTION 2: IF A PNEUMATIC GREASE GUN IS USED, EXTRA CARE MUST BE TAKEN TO AVOID EXCESSIVE PRESSURE BUILDUP.

CAUTION 3: GREASE MUST BE APPLIED TO ALL BLADES OF A PROPELLER ASSEMBLY AT THE TIME OF LUBRICATION.

- (6) Pump 1 fl. oz. (30 ml) grease into each engine-side lubrication fitting, or until grease emerges from the hole where the lubrication fitting was removed - whichever occurs first.

NOTE: 1 fl. oz. (30 ml) is approximately 6 pumps with a hand-operated grease gun.

- (7) Reinstall the removed lubrication fittings. Tighten until snug.
 - (a) A 45 degree lubrication fitting, Hartzell Propeller Inc. part number C-6349, may be installed on the engine-side or cylinder-side of the aluminum hub in any location where a straight lubrication fitting, Hartzell Propeller Inc. part number A-279, was originally installed.
 - 1 The lubrication fittings installed on the engine-side of the aluminum hub must be either all straight, Hartzell Propeller Inc. part number A-279, or all 45 degree, Hartzell Propeller Inc. part number C-6349.
 - 2 The lubrication fittings installed on the cylinder-side of the aluminum hub must be either all straight, Hartzell Propeller Inc. part number A-279, or all 45 degree, Hartzell Propeller Inc. part number C-6349.
 - (b) Tighten the fittings until snug.
 - (c) Make sure that the ball of each lubrication fitting is properly seated.
 - (8) Reinstall a lubrication fitting cap on each lubrication fitting.
- C. Approved Lubricants
- (1) The following lubricants are approved for use in Hartzell Propeller Inc. aluminum hub 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.
 - 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. Used in Piaggio P-180 and the Grob Egret applications

Royco 22CF - Not widely used. Qualities similar to Aeroshell 22.

NOTE: A label (Refer to Figure 6-2) indicating the type of grease used for previous lubrication is installed on the propeller cylinder. If the propeller must be lubricated with another type of grease, the propeller must be disassembled and cleaned of old grease before lubricating.

3. Beta Feedback Block Assemblies

A. Inspection

The clearance between the yoke pin and the corresponding linkage (beta lever bushing) can become too close because of a buildup of plating and foreign particles between the two pieces. This can cause a binding action, resulting in excessive wear to the carbon block unit, beta ring, and beta linkage.

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

- (1) Inspect the beta lever and beta feedback block assembly interface for free movement. If there is binding, do the following:
 - (a) Disconnect the beta linkage and remove the beta feedback block assemblies from the beta ring.

- (b) Using abrasive pad, lightly polish the yoke pin to provide adequate clearance and eliminate binding.
- (c) Reinstall the beta feedback block assembly into the beta ring.
- (d) Install, adjust and safety the beta linkage per the airframe manufacturer's instructions.

B. Replacement of the A-3026 Carbon Block Unit in the Beta Feedback Block Assembly

Replace an A-3026 carbon block unit if the side clearance between the beta ring and carbon block unit is greater than 0.010 inch (0.25 mm).

- (1) Remove the cotter pin from the end of the clevis pin.
- (2) Slide the pin from the assembly and remove and discard the carbon block unit.
- (3) Inspect the yoke for wear or cracks. Replace the yoke if necessary.
- (4) Install a new carbon block unit and slide a new clevis pin into place.
- (5) Secure the clevis pin with a T-head cotter pin. Refer to Figure 3-7.
- (6) Refit the beta feedback block assembly. Refer to Figure 3-6.
 - (a) Establish the required clearance by sanding the sides of the carbon block as needed.

C. Installation of the Beta Feedback Block Assembly

Refer to the Installation and Removal Chapter of this manual for installation instructions.

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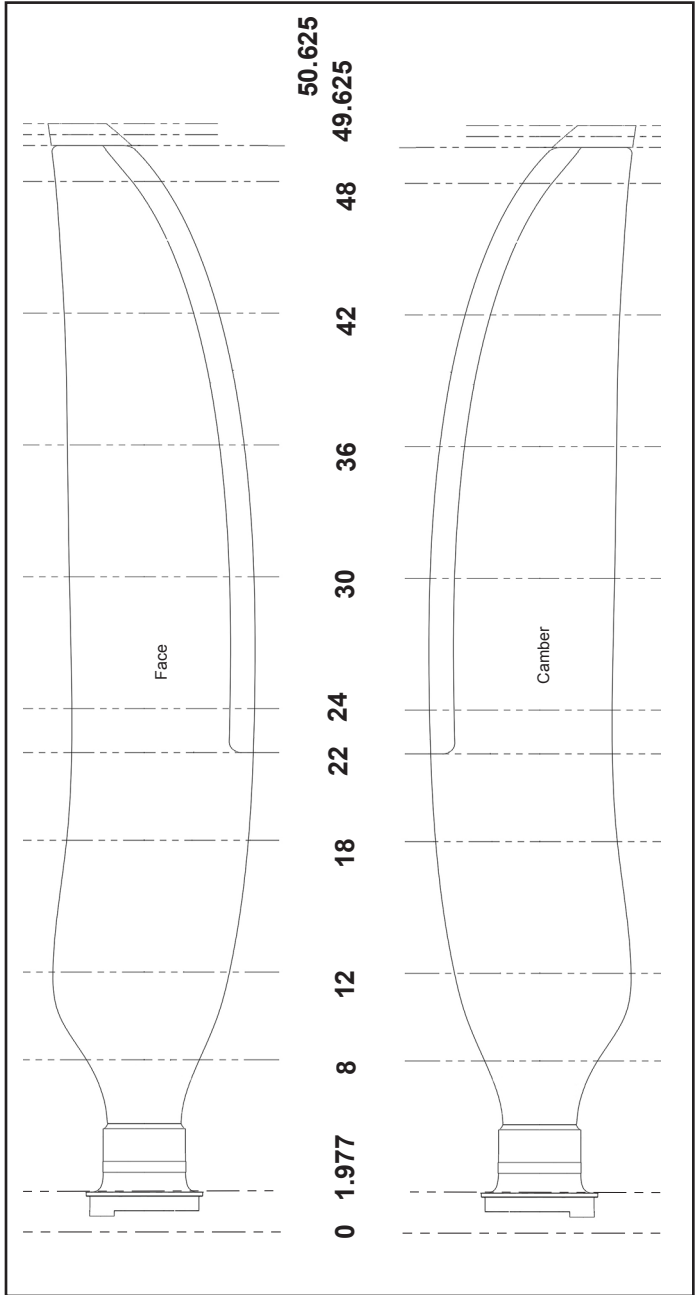
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NC8834()	8-27
E11990K	8-33
NC10245()	8-37
NC10120()	8-42



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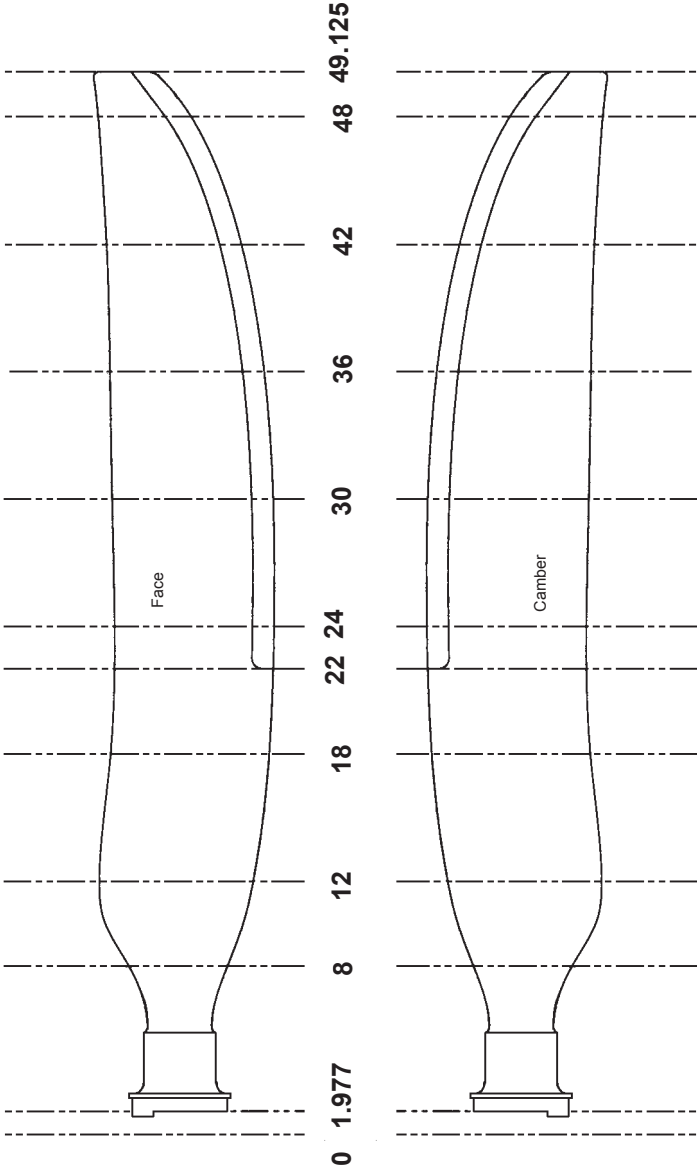
Record of NC10245() Composite Blade Damage Repair

Blade Serial No. _____



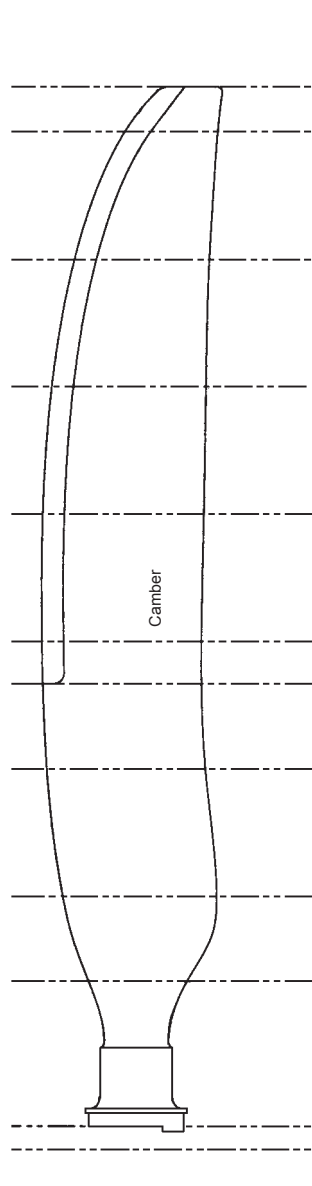
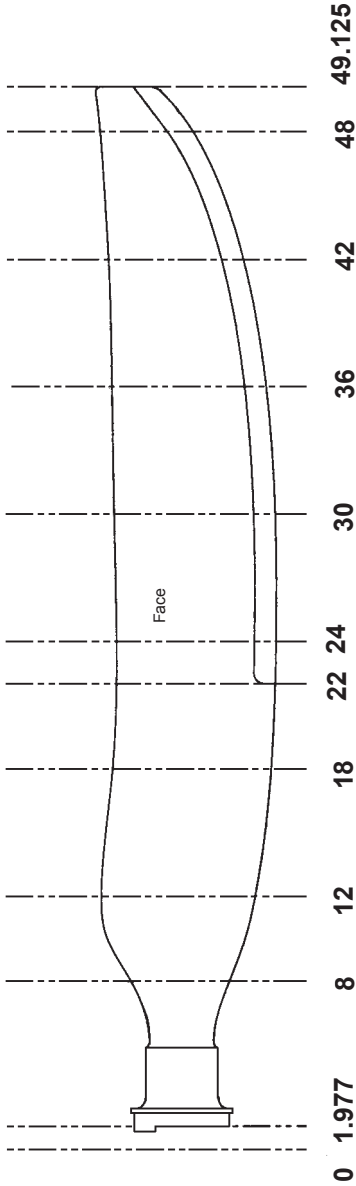
Record of NC10120() Composite Blade Damage Repair

Blade Serial No. _____



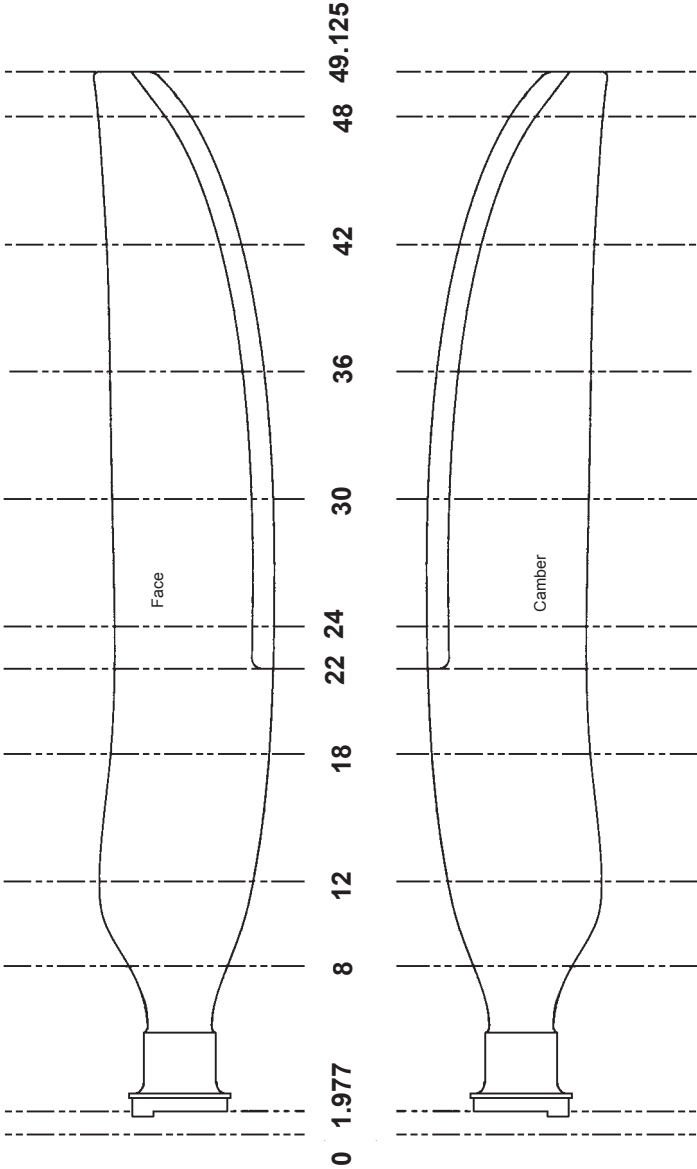
Record of NC10120() Composite Blade Damage Repair

Blade Serial No. _____



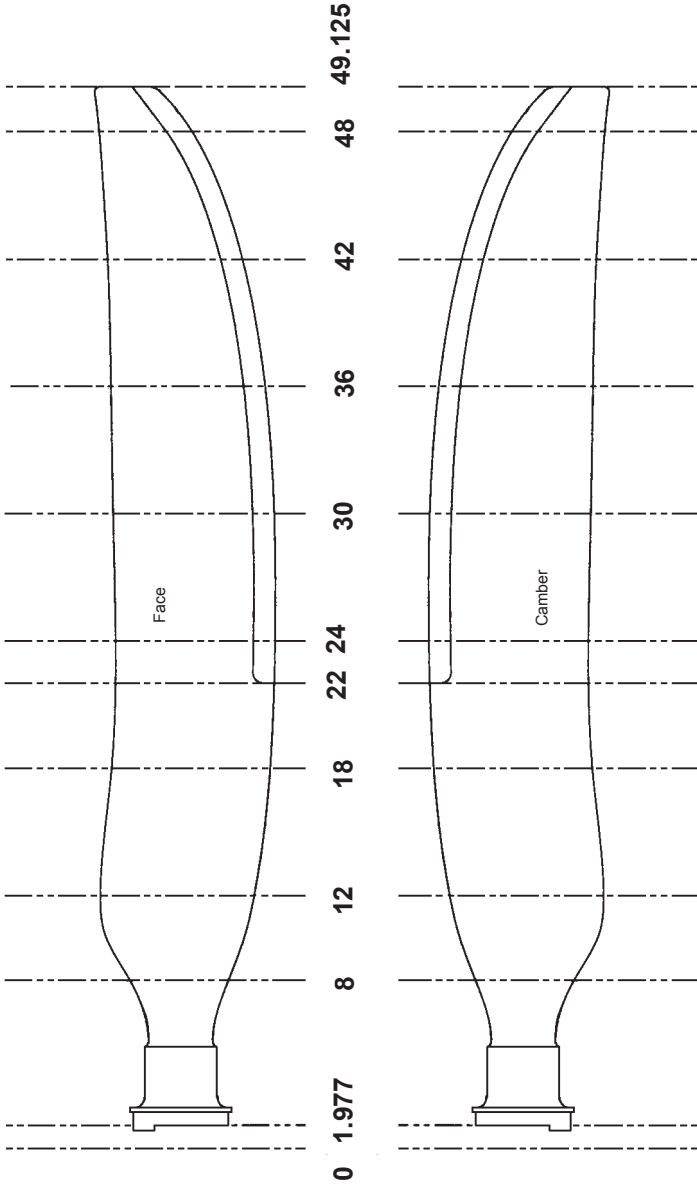
Record of NC10120() Composite Blade Damage Repair

Blade Serial No. _____



Record of NC10120() Composite Blade Damage Repair

Blade Serial No. _____



Record of NC10120() Composite Blade Damage Repair

Blade Serial No. _____

