HARTZELL PROPELLER INC.
One Propeller Place
Piqua, Ohio 45356-2634 U.S.A.
Telephone: 937.778.4200
Fax: 937.778.4215

HARTZELL

MANUAL REVISION TRANSMITTAL

MANUAL 170 (61-13-70)
Composite Propeller Blade Field Maintenance and Minor Repair Manual

REVISION 19 dated November 2022

Remove Pages:	**Insert Pages:**
COVER Cover and Inside Cover	**COVER** Cover and Inside Cover
REVISION HIGHLIGHTS pages 1 thru 4	**REVISION HIGHLIGHTS** pages 1 thru 4
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DAMAGE TYPES and REPAIR REGIONS pages 2-11 thru 2-12 pages 2-17 thru 2-18	**DAMAGE TYPES and REPAIR REGIONS** pages 2-11 thru 2-12 pages 2-17 thru 2-18
REPAIR LIMITS pages 3-37 thru 3-48 pages 3-51 thru 3-54 pages 3-57 thru 3-60	**REPAIR LIMITS** pages 3-37 thru 3-48 pages 3-51 thru 3-54 pages 3-57 thru 3-60

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

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

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

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

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Manual No. 170
61-13-70
Revision 19
November 2022

HARTZELL

Composite Propeller Blade Field Maintenance and Minor Repair Manual

Legacy Composite

B7421(K)
( )7690( )
7890K
E8190K
E9193(B,K)
M10083(K)
A10460(E)(K)
LM10585(A)(N)(B,K)+4
M10877K
E10950P(C)(B,K)
E11990K
E12902K
E12903( )
E13890K
108MH92
138MH91

N-shank Composite

N7605(B,K)( )
N7605C( )
N76M05C( )X
N7893( )
N( )8301( )
N( )8302( )
N( )8304( )
NM8410( )
NC8834( )
NC9208( )
NC9405( )
NC10244( )
NC10245( )
NC10320( )
NC10445( )
(J)NC10904( )

Bantam Composite

( )75A01( )
L76A01( )X( )
( )79A06X( )

Raptor Composite

75C( )08( )
76C( )03( )
76C04( )
78D01( )
( )79C03( )
80C( )01( )
84DB26( )
86DB01( )
91D1(5,7)( )
100DD44( )

G-shank Composite

GC1111(4,5)( )

Hartzell Propeller Inc.
One Propeller Place
Piqua, Ohio 45356-2634 U.S.A.
Phone: 937.778.4200
Fax: 937.778.4215

REVISION 19 HIGHLIGHTS

Revision 19, dated November 2022, incorporates the following:

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

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

DAMAGE TYPES and REPAIR REGIONS

- Revised Table 2-1, "Blade Type/Blade Model Identification"
- Figure 2-14, "Raptor Blades with Trailing Edge Foam Only: Repair Regions"

REPAIR LIMITS

- Added blade model 91D17( ) to the Damage Type tables where applicable

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REVISION 19 HIGHLIGHTS

1. Introduction

   A. General

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

      (3) Comments indicates the level of the revision.

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

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

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

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

Revision No.	Issue Date	Comments
New Issue	Oct/13	New Issue
Rev. 1	Oct/14	Major Revision
Rev. 2	Feb/15	Minor Revision
Rev. 3	May/15	Minor Revision
Rev. 4	Dec/15	Minor Revision
Rev. 5	Aug/16	Minor Revision
Rev. 6	Nov/16	Minor Revision
Rev. 7	Jun/17	Minor Revision
Rev. 8	Feb/18	Minor Revision
Rev. 9	Dec/18	Reissue
Rev. 10	May/19	Minor Revision
Rev. 11	Sep/19	Minor Revision
Rev. 12	Nov/19	Minor Revision
Rev. 13	Apr/20	Minor Revision
Rev. 14	Sep/20	Minor Revision
Rev. 15	Nov/20	Minor Revision
Rev. 16	May/21	Minor Revision
Rev. 17	Jul/21	Minor Revision
Rev. 18	Sep/22	Minor Revision
Rev. 19	Nov/22	Minor Revision

RECORD OF REVISIONS

This is a permanent historical record of revisions inserted into this manual.

Revision Number	Issue Date	Date Inserted	Inserted By
Original	Oct/13	Oct/13	HPI
1	Oct/14	Oct/14	HPI
2	Feb/15	Feb/15	HPI
3	May/15	May/15	HPI
4	Dec/15	Dec/15	HPI
5	Aug/16	Aug/16	HPI
6	Nov/16	Nov/16	HPI
7	Jun/17	Jun/17	HPI
8	Feb/18	Feb/18	HPI
9	Dec/18	Dec/18	HPI
10	May/19	May/19	HPI
11	Sep/19	Sep/19	HPI
12	Nov/19	Nov/19	HPI
13	Apr/20	Apr/20	HPI
14	Sep/20	Sep/20	HPI
15	Nov/20	Nov/20	HPI
16	May/21	May/21	HPI
17	Jul/21	Jul/21	HPI
18	Sep/22	Sep/22	HPI
19	Nov/22	Nov/22	HPI

Revision Number	Issue Date	Date Inserted	Inserted By

RECORD OF REVISIONS

This is a permanent historical record of revisions inserted into this manual.

Revision Number	Issue Date	Date Inserted	Inserted By

Revision Number	Issue Date	Date Inserted	Inserted By

RECORD OF TEMPORARY REVISIONS

Update this page to show all Temporary Revisions inserted into this manual.
Revision 9 includes all prior temporary revisions, up to and including TR-004.

Temporary Revision No.	Section/ Page	Issue Date	Date Inserted	Inserted By	Date Removed	Removed By
TR-005	2-18	Dec/19	Dec/19	HPI	Apr/20	HPI

RECORD OF TEMPORARY REVISIONS

Update this page to show all Temporary Revisions inserted into this manual.
Revision 9 includes all prior temporary revisions, up to and including TR-004.

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

SERVICE DOCUMENT LIST

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

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

Service Document Number	Incorporation Rev./Date

Service Document Number	Incorporation Rev./Date

SERVICE DOCUMENT LIST

Service Document Number	Incorporation Rev./Date

Service Document Number	Incorporation Rev./Date

AIRWORTHINESS LIMITATIONS

1. Airworthiness Limitations

   A. Life Limits

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

      (2) For airworthiness limitations information, refer to the applicable Hartzell Propeller Inc. Owner's Manual.

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Record of Temporary Revisions	1 thru 2	Rev. 9	Dec/18
Service Documents List	1 thru 2	Rev. 9	Dec/18
Airworthiness Limitations	1 thru 2	Rev. 9	Dec/18
List of Effective Pages	1 thru 2	Rev. 19	Nov/22
Table of Contents	1 thru 2	Rev. 9	Dec/18
Introduction	1 thru 20	Rev. 10	May/19
Inspection Procedures	1-1 thru 1-6	Rev. 9	Dec/18
Damage Types and Repair Regions	2-1	Rev. 11	Sep/19
	2-2	Rev. 17	Jul/21
	2-3 thru 2-11	Rev. 9	Dec/18
	2-12	Rev. 19	Nov/22
	2-13	Rev. 12	Nov/19
	2-14	Rev. 9	Dec/18
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	2-16	Rev. 9	Dec/18
	2-17	Rev. 18	Sep/22
	2-18	Rev. 19	Nov/22
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	2-20	Rev. 17	Jul/21
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	3-38 thru 3-41	Rev. 19	Nov/22
	3-42 thru 3-43	Rev. 9	Dec/18
	3-44 thru 3-45	Rev. 19	Nov/22
	3-46	Rev. 9	Dec/18
	3-47 thru 3-48	Rev. 19	Nov/22
	3-49 thru 3-50	Rev. 9	Dec/18
	3-51 thru 3-53	Rev. 19	Nov/22
	3-54 thru 3-56	Rev. 18	Sep/22
	3-57	Rev. 19	Nov/22
	3-58	Rev. 9	Dec/18
	3-59	Rev. 19	Nov/22
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Minor Repair	4-1 thru 4-53	Rev. 9	Dec/18
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TABLE OF CONTENTS

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INTRODUCTION - CONTENTS

INTRODUCTION - CONTENTS, continued

1. General

A. Statement of Purpose

(1) This manual has been reviewed and accepted by the FAA. Additionally, this manual contains data that has been approved in a manner acceptable to the FAA Administrator.

(2) This manual provides field maintenance and minor repair procedures for Hartzell Propeller Inc. composite propeller blades.

(a) The propeller blade models addressed in this manual may be Type Certificated by the FAA, or may be experimental. Experimental parts must not be installed on a type certified propeller. Always refer to the aircraft Type Certificate (TC) or Supplemental Type Certificates (STC) to determine installation eligibility of any propeller. If installation eligibility is not identifiable, an additional installation approval, such as FAA form 337 field approval or Supplemental Type Certificate may be required. If in doubt, contact Hartzell Propeller Inc. Product Support.

(3) This manual is intended to be the primary source for composite blade damage evaluation and minor repair information.

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

2. Reference Publications

A. Hartzell Propeller Inc. Publications

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

(2) In addition to this manual, one or more of the following publications are required for information regarding specific recommendations and procedures to maintain composite blades.

Manual No. (ATA No.)	Available at www.hartzellprop.com	Hartzell Propeller Inc. Manual Title
n/a	Yes	Active Hartzell Propeller Inc. Service Bulletins, Service Letters, Service Instructions, and Service Advisories
Manual 135F (61-13-35)	Yes	Hartzell Propeller Inc. Composite Blade Maintenance Manual
Manual 159 (61-02-59)	Yes	Hartzell Propeller Inc. Application Guide
Manual 165A (61-00-65)	Yes	Hartzell Propeller Inc. Illustrated Tool and Equipment Manual
Manual 180 (30-61-80)	Yes	Hartzell Propeller Inc. Propeller Ice Protection System Manual
Manual 202A (61-01-02)	Vol. 7, Yes	Hartzell Propeller Inc. Standard Practices Manual, Volumes 1 through 11

B. Vendor Publications

None.

3. Personnel Requirements

A. General

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

(2) Any person signing for or performing inspections and/or repairs to Hartzell Propeller Inc. composite parts should be familiar with the objectives and procedures associated with the inspection and/or repair of composite parts.

B. Minor Repair

(1) Minor repair limits are defined in the Repair Limits chapter of this manual.

(2) Minor repair work may be performed by a certified airframe and powerplant mechanic, or international equivalent in accordance with the Minor Repair chapter in this manual.

C. Major Repair

(1) Major repair limits are defined in the Repair Limits chapter of this manual.

(2) Major repair work must be performed by personnel/repair stations with valid Hartzell Propeller Inc. Composite Blade Major Repair Certification.

(a) Refer to the Introduction chapter in Hartzell Propeller Inc. Composite Propeller Blade Maintenance Manual 135F (61-13-35) for detailed information about the certifications required to perform major repairs to Hartzell composite blades.

(3) For a current list of facilities authorized to perform major repairs on Hartzell composite blades, contact the Hartzell Propeller Inc. Product Support Department or refer to the Hartzell Propeller Inc. website at www.hartzellprop.com.

D. Overhaul

(1) Overhaul is the periodic disassembly, inspection, repair, refinish and reassembly of the composite blade assembly.

(a) Overhaul does not include major repair of the blade or erosion shield replacement.

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

(a) Additionally, Hartzell Propeller Inc. training classes are highly recommended for repair stations that overhaul Hartzell composite blades.

(3) For a current list of Hartzell Propeller Inc. Recommended Service Facilities, contact the Hartzell Propeller Inc. Product Support Department or refer to the Hartzell Propeller Inc. website at www.hartzellprop.com.

E. Factory Only Repair

(1) Damage that is beyond the minor/major repair limits and/or listed as "factory only repair" in the Repair Limits chapter may be returned to Hartzell Propeller Inc. for evaluation and possible repair.

(a) Hartzell Propeller Inc. must acquire and provide FAA-approved documentation before blades with damage as specified in 3.E.(1) can be returned to service.

4. Safe Handling of Paints and Chemicals

A. Important Information

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

(2) 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.

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

5. Calendar Limits and Long Term Storage (Rev. 1)

A. Calendar Limits

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

(2) A calendar limit between overhauls is specified in Hartzell Propeller Inc. Service Letter HC-SL-61-61Y and in the propeller owner's manual.

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

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

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

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

B. Long Term Storage

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

6. Component Life and Overhaul (Rev. 1)

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

A. Component Life

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

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

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

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

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

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

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

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

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

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

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

(b) Hub replacement

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

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

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

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

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

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

B. Overhaul

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

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

(a) Overhaul intervals are specified in the applicable Hartzell Propeller Inc. propeller owner's manual and Hartzell Service Letter HC-SL-61-61Y.

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

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

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

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

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

7. Documenting Damage and Repairs

A. Damage and Repairs

(1) Maintaining a good logbook record is very important for composite propeller blades because damage and/or repairs can degrade with continued use.

(a) Damage and/or repairs that degrade can be easily overlooked; therefore, it is important for inspectors to have access to accurate historical data when performing subsequent inspections.

(2) Complete the Blade Damage Repair Sheet from the applicable Hartzell Propeller Inc. propeller owner's manual.

(3) Make an entry in the propeller logbook indicating that a repair has been made in accordance with the applicable service manual.

8. Propeller Critical Parts

A. Important Information

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

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

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

9. Warranty Service (Rev. 1)

A. Warranty Claims

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

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

10. Manual Arrangement

A. Introduction

(1) The Introduction chapter gives general instructions for using this manual including.

(a) A list of required publications

(b) Personnel and repair station requirements

(c) A description of chapters in this manual

(d) Definitions of terms used in this manual

B. Inspection Procedures

(1) The Inspection Procedures chapter provides instructions for procedures that are required for damage evaluation.

C. Damage Types and Repair Regions

(1) The Damage Types and Repair Regions chapter provides descriptions of specific damage types and identifies the different repair regions for blade models affected by this service manual.

D. Repair Limits

(1) The Repair Limits chapter lists each damage type, and gives dimensional limits for Airworthy Damage and Minor/Major Repair.

E. Minor Repair

(1) The Minor Repair chapter specifies minor repair procedures.

F. Tooling and Materials

(1) The Tooling and Materials chapter gives information about tooling and materials referenced in this manual.

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

A. Product Support Department

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

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

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

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

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

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

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

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

B. Technical Publications Department

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

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

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

C. Recommended Facilities

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

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

12. Definitions (Rev. 2)

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

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

Term	Definition
Camber	The surface of the blade that is directed toward the front of the aircraft. It is the low pressure, or suction, side of the blade. The camber side is convex in shape over the entire length of the blade.
Chord	A straight line distance between the leading and trailing edges of an airfoil
Chordwise	A direction that is generally from the leading edge to the trailing edge of an airfoil
Co-bonded	The act of bonding a composite laminate and simultaneously curing it to some other prepared surface
Composite Material	Kevlar®, carbon, or fiberglass fibers bound together with, or encapsulated within an epoxy resin
Compression Rolling	A process that provides improved strength and resistance to fatigue
Constant Force	A force that is always present in some degree when the propeller is operating
Constant Speed	A propeller system that employs a governing device to maintain a selected engine RPM
Corrosion (Aluminum)	The chemical or electrochemical attack by an acid or alkaline that reacts with the protective oxide layer and results in damage of the base aluminum. Part failure can occur from corrosion due to loss of structural aluminum converted to corrosion product, pitting, a rough etched surface finish, and other strength reduction damage caused by corrosion.
Corrosion (Steel)	Typically, an electrochemical process that requires the simultaneous presence of iron (component of steel), moisture and oxygen. The iron is the reducing agent (gives up electrons) while the oxygen is the oxidizing agent (gains electrons). Iron or an iron alloy such as steel is oxidized in the presence of moisture and oxygen to produce rust. Corrosion is accelerated in the presence of salty water or acid rain. Part failure can occur from corrosion due to loss of structural steel converted to corrosion product, pitting, a rough etched surface finish and other strength reduction damage caused by corrosion.

Term	Definition
Corrosion Product (Aluminum)	A white or dull gray powdery material that has an increased volume appearance (compared to non-corroded aluminum). Corrosion product is not to be confused with damage left in the base aluminum such as pits, worm holes, and etched surface finish.
Corrosion Product (Steel)	When iron or an iron alloy such as steel corrode, a corrosion product known as rust is formed. Rust is an iron oxide which is reddish in appearance and occupies approximately six times the volume of the original material. Rust is flakey and crumbly and has no structural integrity. Rust is permeable to air and water, therefore the interior metallic iron (steel) beneath a rust layer continues to corrode. Corrosion product is not to be confused with damage left in the base steel such as pits and etched surface finish.
Crack	Irregularly shaped separation within a material, sometimes visible as a narrow opening at the surface
Debond	Separation of two materials that were originally bonded together in a separate operation
Defect	An imperfection that affects safety or utility
Delamination	Internal separation of the layers of composite material
Dent	The permanent deflection of the cross section that is visible on both sides with no visible change in cross sectional thickness
Depression	Surface area where the material has been compressed but not removed
Distortion	Alteration of the original shape or size of a component
Edge Alignment	Distance from the blade centerline to the leading edge of the blade
Erosion	Gradual wearing away or deterioration due to action of the elements
Exposure	Leaving material open to action of the elements
Face	The surface of the blade that is directed toward the rear of the aircraft. The face side is the high pressure, or thrusting, side of the blade. The blade airfoil sections are normally cambered or curved such that the face side of the blade may be flat or even concave in the midblade and tip region.
Face Alignment	Distance from the blade centerline to the highest point on the face side perpendicular to the chord line

Term	Definition
Feathering	The capability of blades to be rotated parallel to the relative wind, thus reducing aerodynamic drag
Fraying	A raveling or shredding of material
Fretting	Damage that develops when relative motion of small displacement takes place between contacting parts, wearing away the surface
Galling	To fret or wear away by friction
Gouge	Surface area where material has been removed
Hazardous Propeller Effect	The hazardous propeller effects are defined in Title 14 CFR section 35.15(g)(1)
Horizontal Balance	Balance between the blade tip and the center of the hub
Impact Damage	Damage that occurs when the propeller blade or hub assembly strikes, or is struck by, an object while in flight or on the ground
Inboard	Toward the butt of the blade
Intergranular Corrosion	Corrosion that attacks along the grain boundaries of metal alloys
Jog	A term used to describe movement up/down, left/right, or on/off in short incremental motions
Laminate	To unite composite material by using a bonding material, usually with pressure and heat
Lengthwise	A direction that is generally parallel to the pitch axis
Loose Material	Material that is no longer fixed or fully attached
Low Pitch	The lowest blade angle attainable by the governor for constant speed operation
Major Propeller Effect	The major propeller effects are defined in Title 14 CFR section 35.15(g)(2)
Minor Deformation	Deformed material not associated with a crack or missing material
Monocoque	A type of construction in which the outer skin carries all or a major part of the load
Nick	Removal of paint and possibly a small amount of material

Term	Definition
Non-Aviation Certified	Intended for non-aircraft application, such as Hovercraft or Wing in Ground Effect (WIG) applications. These products are certificated by an authority other than FAA. The hub and blades will be stamped with an identification that is different from, but comparable to TC and PC.
Non-Aviation Experimental	Intended for non-aircraft application, such as Hovercraft or Wing-In-Ground effect (WIG) applications. Products marked with an “X” at or near the end of the model number or part number are not certified by any authority and are not intended for use on certificated craft.
Onspeed	Condition in which the RPM selected by the pilot through the propeller control/condition lever and the actual engine (propeller) RPM are equal
Open Circuit	Connection of high or infinite resistance between points in a circuit which are normally lower
Outboard	Toward the tip of the blade
Overhaul	The periodic disassembly, inspection, repair, refinish, and reassembly of a propeller assembly to maintain airworthiness
Overspeed	Condition in which the RPM of the propeller or engine exceeds predetermined maximum limits; the condition in which the engine (propeller) RPM is higher than the RPM selected by the pilot through the propeller control/condition lever
Parting Line	The Parting line is formed where the face and camber composite materials meet at the leading and trailing edges of the blade. They are most visible in the shank area of the blade
Pitch	Same as “Blade Angle”
Pitting	Formation of a number of small, irregularly shaped cavities in surface material caused by corrosion or wear
Pitting (Linear)	The configuration of the majority of pits forming a pattern in the shape of a line
Porosity	An aggregation of microvoids. See “voids”.
Propeller Critical Parts	A part on the propeller whose primary failure can result in a hazardous propeller effect, as determined by the safety analysis required by Title 14 CFR section 35.15

Term	Definition
Reference Blade Radius	Refers to the propeller reference blade radius in an assembled propeller, e.g., 30-inch radius. A measurement from the propeller hub centerline to a point on a blade, used for blade angle measurement in an assembled propeller. A yellow adhesive stripe (blade angle reference tape CM160) is usually located at the reference blade radius location. Note: Do not confuse *reference blade radius* with *blade station*; they may not originate at the same point.
Reversing	The capability of rotating blades to a position to generate reverse thrust to slow the aircraft or back up
Scratch	Same as “Nick”
Short	Connection of low resistance between points on a circuit between which the resistance is normally much greater
Shot Peening	Process where steel shot is impinged on a surface to create compressive surface stress, that provides improved strength and resistance to fatigue
Single Acting	Hydraulically actuated propeller that utilizes a single oil supply for pitch control
Split	Delamination of blade extending to the blade surface, normally found near the trailing edge or tip
Station Line	See "Blade Station"
Synchronizing	Adjusting the RPM of all the propellers of a multi-engine aircraft to the same RPM
Synchrophasing	A form of propeller sychronization in which not only the RPM of the engines (propellers) are held constant, but also the position of the propellers in relation to each other
Ticking	A series of parallel marks or scratches running circumferentially around the diameter of the blade
Track	In an assembled propeller, a measurement of the location of the blade tip with respect to the plane of rotation, used to verify face alignment and to compare blade tip location with respect to the locations of the other blades in the assembly
Trailing Edge	The aft edge of an airfoil over which the air passes last
Trimline	Factory terminology referring to where the part was trimmed to length

Term	Definition
Underspeed	The condition in which the actual engine (propeller) RPM is lower than the RPM selected by the pilot through the propeller control/condition lever
Unidirectional Material	A composite material in which the fiber are substantially oriented in the same direction
Variable Force	A force that may be applied or removed during propeller operation
Vertical Balance	Balance between the leading and trailing edges of a two-blade propeller with the blades positioned vertically
Voids	Air or gas that has been trapped and cured into a laminate
Windmilling	The rotation of an aircraft propeller caused by air flowing through it while the engine is not producing power
Woven Fabric	A material constructed by interlacing fiber to form a fabric pattern
Wrinkle (aluminum blade)	A wavy appearance caused by high and low material displacement
Wrinkle (composite blade)	Overlap or fold within the material

13. Abbreviations (Rev.1)

Abbreviation	Term
AD	Airworthiness Directives
AMM	Aircraft Maintenance Manual
AN	Air Force-Navy (or Army-Navy)
AOG	Aircraft on Ground
AR	As Required
ATA	Air Transport Association
CSU	Constant Speed Unit
FAA	Federal Aviation Administration
FH	Flight Hour
FM	Flight Manual
FMS	Flight Manual Supplement
Ft-Lb	Foot-Pound
HMI	Human Machine Interface
ICA	Instructions for Continued Airworthiness
ID	Inside Diameter
In-Lb	Inch-Pound
IPL	Illustrated Parts List
IPS	Inches Per Second
ITAR	International Traffic in Arms Regulations
kPa	Kilopascals
Lb(s)	Pound(s)
Max.	Maximum
Min.	Minimum
MIL-X-XXX	Military Specification
MPI	Major Periodic Inspection (Overhaul)
MS	Military Standard

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

INSPECTION PROCEDURES - CONTENTS

LIST OF FIGURES

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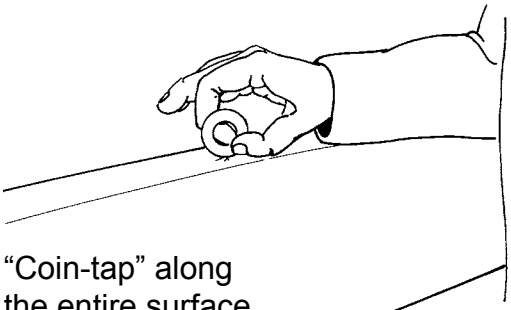
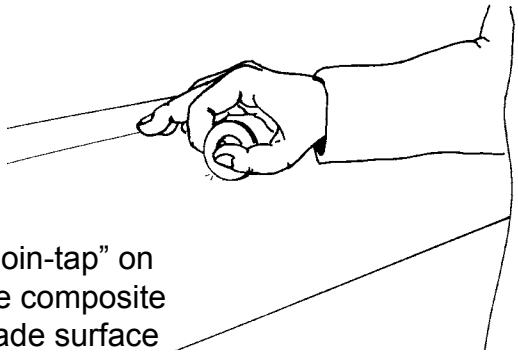
Example of a "Coin"



“Coin-tap” along
the entire surface
of the erosion shield
to check for a debond



“Coin-tap” on
the composite
blade surface
to check for a
delamination

APS0325, 0319

Coin-Tap Inspection
Figure 1-1

1. Coin-Tap Inspection

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

A. General

(1) Composite blades are inspected for delaminations and debonds by tapping the entire surface of the blade, or cuff (if applicable) with a washer-shaped metal tapper or "coin". Refer to Figure 1-1.

B. Inspection

(1) Using a washer-shaped metal tapper, approximately 2.5 inches (64 mm) OD x 1.25 inches (32 mm) ID x 0.25 inch (6.4 mm) thick, and weighing no less than 3 oz. (85.05 g), tap the entire surface of the blade.

(a) If an audible change is apparent, sounding hollow or dead, a debond or delamination is likely.

(b) Blades that incorporate a “cuff” have a different tone when coin-tapped in the cuff area.

1 To avoid confusing sounds, coin tap the cuff area and the transition area between the cuff and the blade separately from the blade area.

(c) All N-shank blades have a separate foam trailing edge that makes a different tone when coin-tapped in that area.

1 To avoid confusing sounds, coin tap the foam trailing edge area and the transition area between the foam trailing edge and the blade separately from the blade area.

a Refer to the Damage Types and Repair Regions chapter of this manual for illustrations of the repair regions for the applicable blade.

(d) Some N-shank blades also have a separate foam leading edge that makes a different tone when coin-tapped in that area. Refer to Table 2-1 in the Damage Types and Repair Regions chapter of this manual for a list of N-shank blades that have a foam leading edge.

1 To avoid confusing sounds, coin tap the foam leading edge area and the transition area between the foam leading edge and the blade separately from the blade area.

a Refer to the Damage Types and Repair Regions chapter of this manual for illustrations of the repair regions for the applicable blade.

(3) "Mapping" of the area to be coin-tapped is desirable to make sure that the entire surface is sufficiently inspected.

(a) Make a coin-tap inspection within an imaginary grid or matrix consisting of 2 inch (51 mm) squares on the composite blade surface.

(b) A careful coin-tapping of the erosion shield is necessary because of its size and shape.

1 Tap in a smaller grid pattern up and down the length of the erosion shield.

2 Look and feel for any slight deformation of the erosion shield that may indicate a debonded area.

3 If a deformation is found, use more care in that area when doing the coin-tap inspection.

(c) If a suspected delamination or debond is discovered, a localized, careful coin-tap inspection is required to define the precise area of delamination or debond.

(d) Using a pencil, outline the suspected area to determine the approximate size of the damage.

(4) Make a record of the damage and the repair in the propeller logbook.

2. Erosion Tape Removal

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

NOTE: Depending on the location of the damage, it may be necessary to remove the erosion tape CM158 before inspection and/or repair.
Blades with ice-protection boots do not have erosion tape installed.

A. Procedure

(1) If erosion tape CM158 is installed in the damage/inspection area, remove as follows:

CAUTION: USE EXTREME CARE NOT TO DAMAGE THE BLADE WHILE REMOVING THE EROSION TAPE.

(a) Carefully lift one edge of the erosion tape CM158.

(b) Work around the perimeter of the erosion tape CM158, lifting the edge of the tape from the blade.

(c) After the edge of the erosion tape CM158 is pulled up from the blade, pull the erosion tape off one side of the blade toward the leading edge.

(d) With the erosion tape CM158 stuck to only one side of the blade, grasp one end of the erosion tape and pull toward the other end.

(e) Discard the removed erosion tape CM158.

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

(f) Using a clean cloth dampened with solvent CM106 (MEK), CM219 (MPK), or CM41 (Toluene) remove all visible adhesive from the blade.

DAMAGE TYPES and REPAIR REGIONS - CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. Damage Type Identification

   A. Erosion Shield: Minor Deformation

      (1) Definition: A dent on the erosion shield that does not include any exposed composite material or missing areas of the erosion shield.

      (2) Refer to the example shown in Figure 2-1.

Erosion Shield: Minor Deformation
Figure 2-1

B. Erosion Shield: Gouge

(1) Definition: Impact damage on the erosion shield where metal has been removed.

(2) Refer to the example shown in Figure 2-2.

NOTE: The paint on the erosion shield has been removed for clarity.

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Erosion Shield: Gouge
Figure 2-2

C. Erosion Shield: Debond

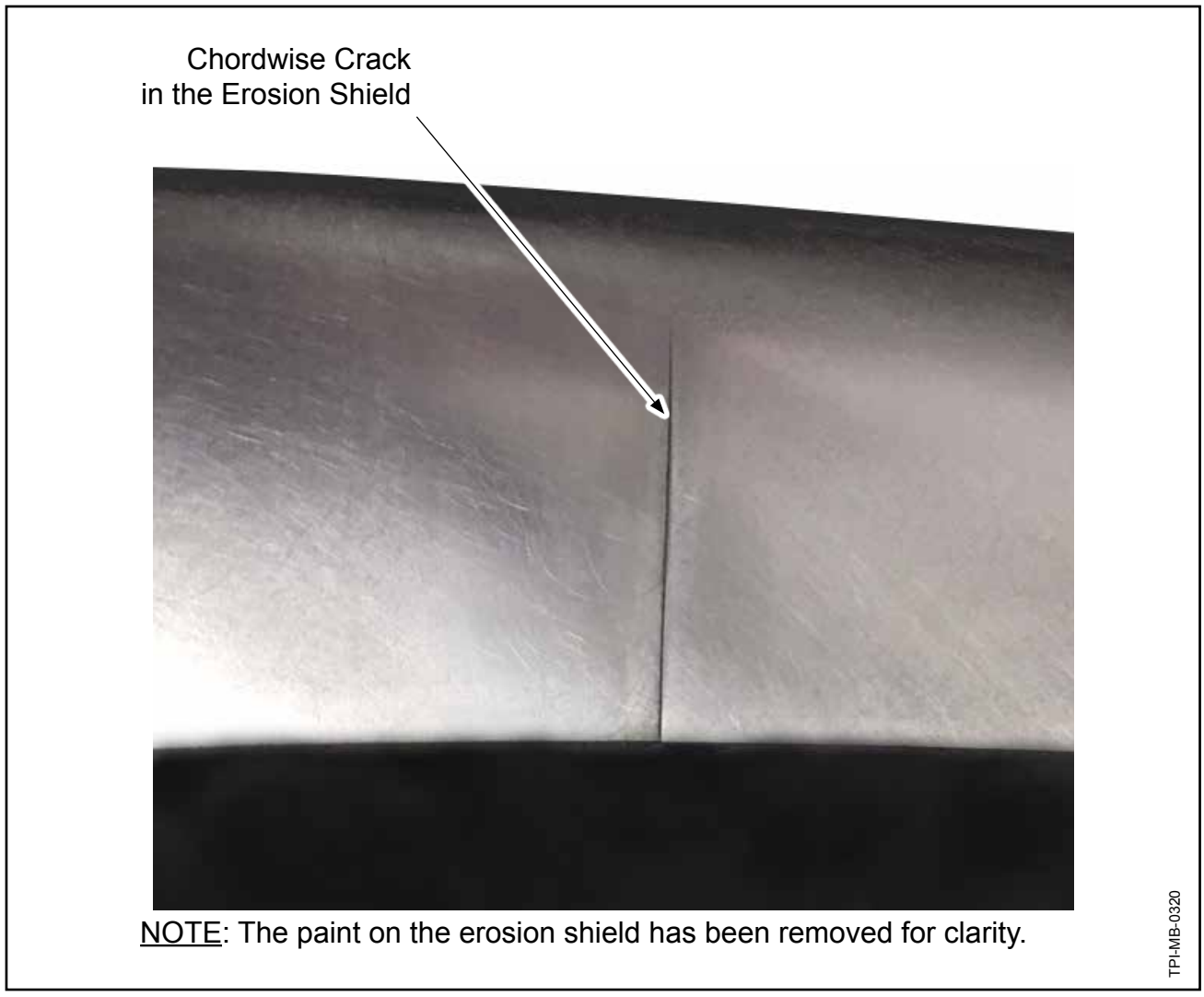
(1) Definition: Separation of two materials that were originally bonded in a separate operation.

(a) A debond may not be visible. To determine if there is a debond, perform the Coin-Tap Inspection in accordance with the section, "Coin Tap Inspection" in the Inspection Procedures chapter of this manual.

D. Erosion Shield: Chordwise Crack

(1) Definition: A separation within a material, usually visible as a narrow opening at the surface that is approximately perpendicular to the leading edge of the blade.

(2) Refer to the example shown in Figure 2-3.



NOTE: The paint on the erosion shield has been removed for clarity.

Erosion Shield: Chordwise Crack
Figure 2-3

E. Erosion Shield: Lengthwise Crack

(1) Definition: Irregularly shaped separation within a material, usually visible as a narrow opening at the surface that runs approximately parallel to the leading edge of the blade.

(2) Refer to the example shown in Figure 2-4.

NOTE: The paint on the erosion shield has been removed for clarity.

TPI-MB-0321

Erosion Shield: Lengthwise Crack
Figure 2-4

F. Erosion Shield: Loss of Paint/Filler Material

(1) Definition: Missing paint/filler material that exposes the metal erosion shield.

(2) Refer to the example shown in Figure 2-5.

Erosion Shield: Loss of Paint/Filler Material
Figure 2-5

G. Blade Surfaces (except Erosion Shield): Gouge or Loss of Composite Material

(1) Definition: Impact damage to the blade surface area where composite material has been removed.

(2) Refer to the example shown in Figure 2-6.

Blade Surfaces (except the Erosion Shield): Gouge or Loss of Composite Material
Figure 2-6

H. All Blade Surfaces: Delamination

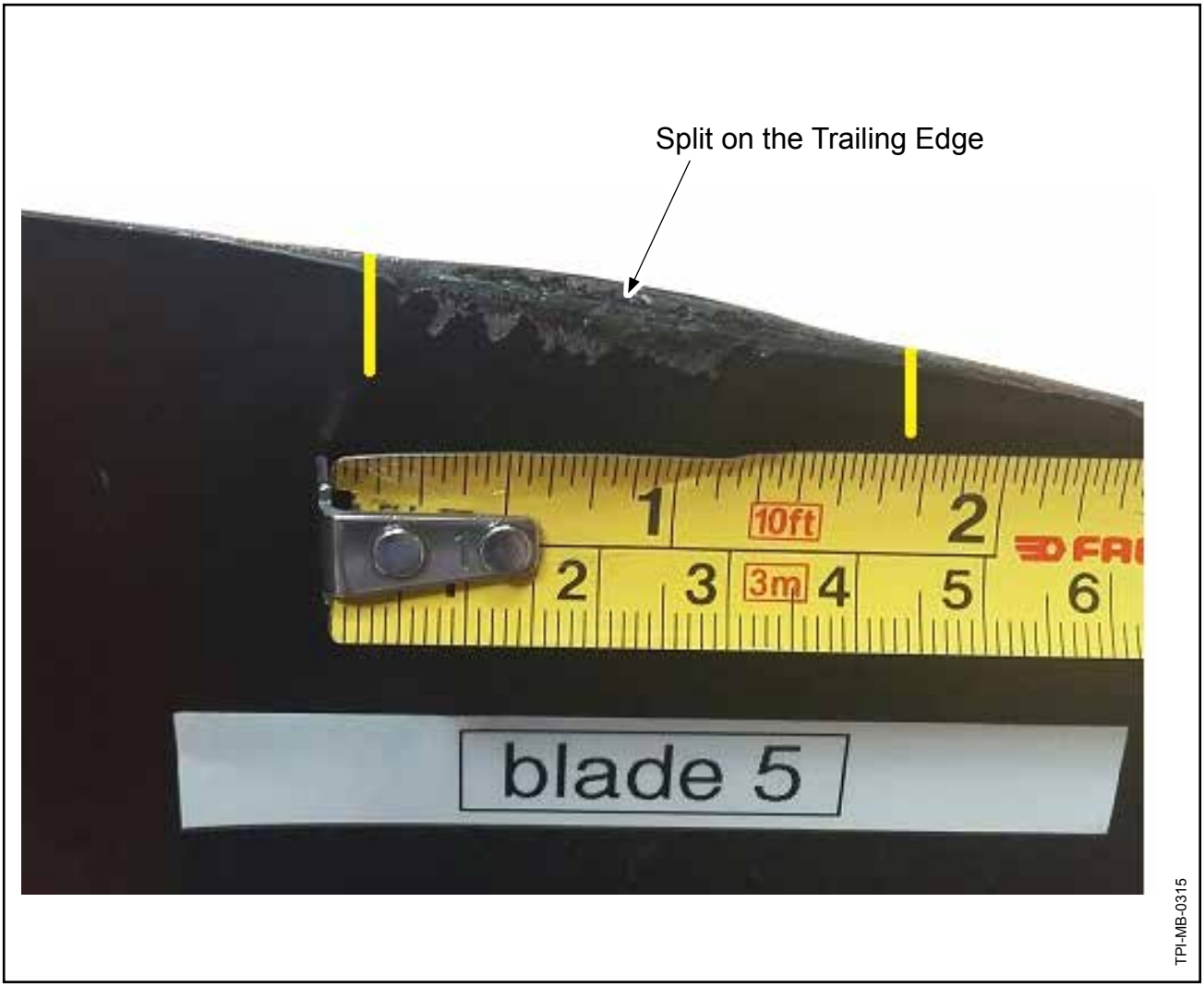
(1) Definition: Internal separation of the layers of a composite material.

(a) A delamination may not be visible. To determine if there is a delamination, perform the Coin-Tap Inspection in accordance with the section, "Coin Tap Inspection" in the Inspection Procedures chapter of this manual.

I. Trailing Edge: Split

(1) Definition: Delamination of a composite blade extending to the blade surface, normally found near the trailing edge or tip of the blade.

(2) Refer to the example shown in Figure 2-7.

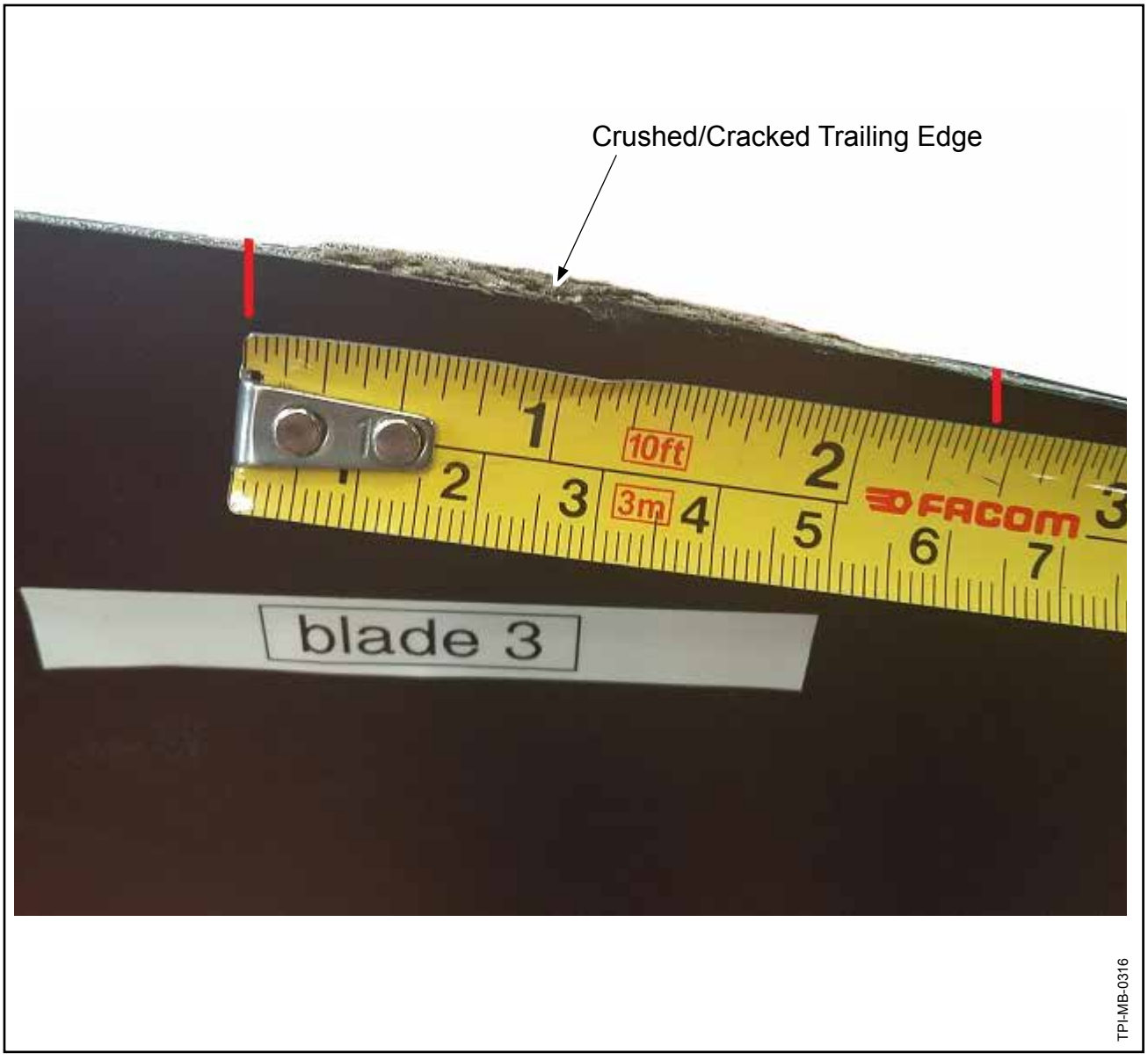


Trailing Edge: Split
Figure 2-7

J. Trailing Edge: Crushed/Cracked

(1) Definition: A trailing edge that has been crushed/cracked due to impact.

(2) Refer to the example shown in Figure 2-8.



Trailing Edge: Crushed/Cracked
Figure 2-8

K. Paint Erosion

(1) Definition: Gradual wearing away or deterioration of the paint caused by action of the elements.

(2) Refer to the example shown in Figure 2-9.

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Paint Erosion
Figure 2-9

2. Blade Repair Regions

A. General

(1) Some of the damage types described in this chapter refer to specific regions of the blade. Use the figures in this section to determine the specific location of the region for the applicable blade model.

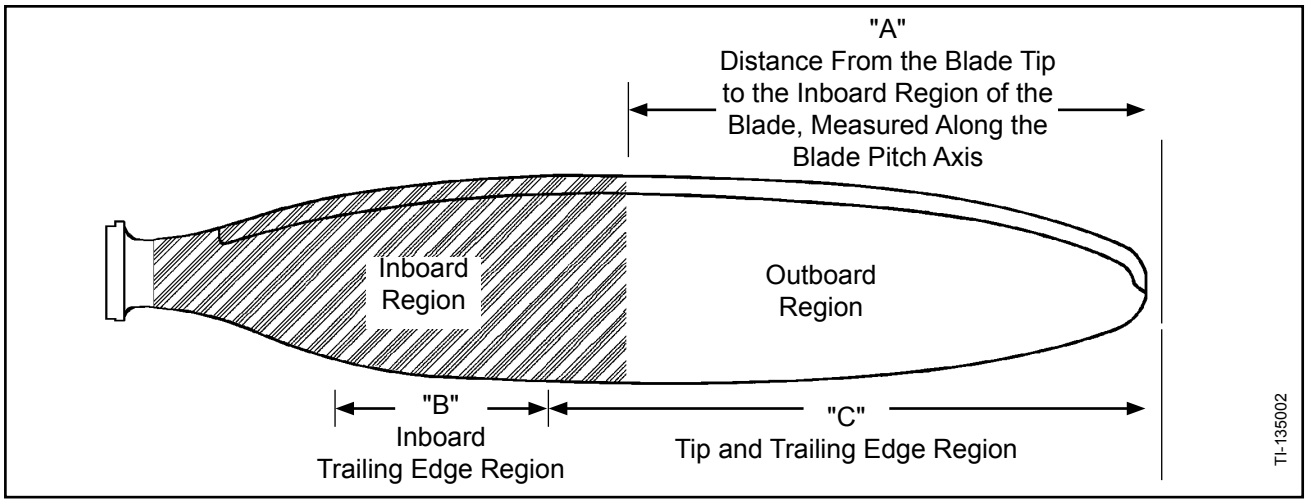
(2) Refer to Table 2-1 to determine the blade type and the applicable Figure for the blade model.

BLADE TYPE	Refer To:	BLADE MODELS (Refer to NOTE 1)		
Legacy Blades (Kevlar®)	Figure 2-10	( )7690( )	7890K	B7421( )
		E8190K	M10083( )	A10460( )
		LM10585( )	M10877K	E10950P( )
		E11990K	E12902K	E12903( )
Legacy Blades (Carbon)	Figure 2-10	E13890K	E9193( )	108MH92 (Refer to NOTE 2)
		138MH91 (Refer to NOTE 2)	-	-
N-shank Blades with Trailing Edge Foam Only (Kevlar® Carbon Hybrid)	Figure 2-11	N7605(B,K)-( )	N( )7893-( )	-
N-shank Blades with Trailing Edge Foam Only (Carbon)	Figure 2-11	N7605C( )	N76M05CX	N76M05C-2X
		N( )8301( )-( )	N( )8302( )-( )	N( )8304( )-( )
		NM8410( )	NC9208( )	NC9405( )
		NC10244( )	NC10245( )	NC10320( )
		NC10445( )	-	-
N-shank Blades with Trailing Edge Foam and Leading Edge Foam (Carbon)	Figure 2-12	NC8834( )	(J)NC10904( )	(J)NC10905( )
		-	-	-
Bantam Blades	Figure 2-13	( )75A01( )	L76A01( )X( )	( )79A06X( )
		-	-	-
Raptor Blades with Trailing Edge Foam Only	Figure 2-14	75C( )08( )	76C( )03( )	76C04( )
		78D01( )	( )79C03( )-( )	80C( )01( )
		91D1(5,7)( )	100DD44( )	-
Raptor Blades with Trailing Edge Foam and Leading Edge Foam	Figure 2-15	84DB26( )	86DB01( )	-
		-	-	-
G-shank Blades	Figure 2-16	GC1111(4,5)( )	-	-

NOTE 1: An "X" stamped at the end of a blade model indicates the blade is experimental.

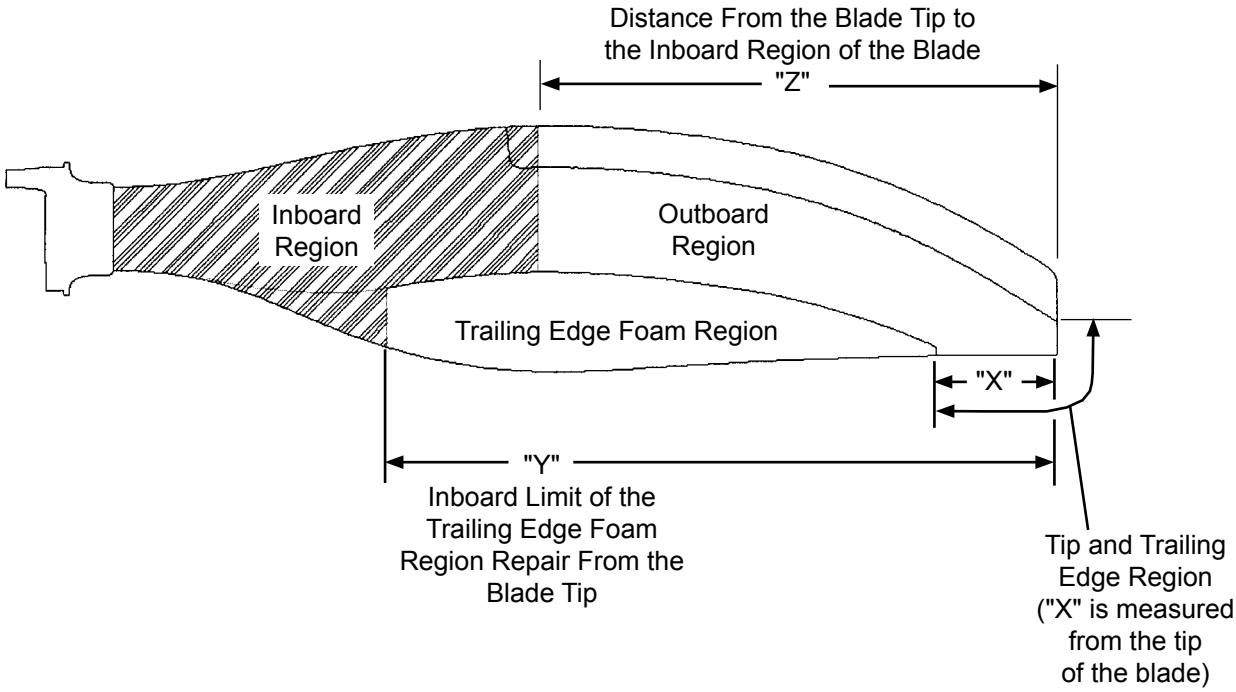
NOTE 2: This blade is an experimental, non-aviation blade.

Blade Type/Blade Model Identification
Table 2-1



Blade Model	"A"	"B"	"C"
B7421(K)	18.00 inches (457.2 mm)	An Inboard Trailing Edge Region has not been defined for this blade	18.00 inches (457.2 mm)
( )7690( )	18.50 inches (469.9 mm)	An Inboard Trailing Edge Region has not been defined for this blade	18.50 inches (469.9 mm)
7890K	19.00 inches (482.6 mm)	An Inboard Trailing Edge Region has not been defined for this blade	19.00 inches (482.6 mm)
E8190K	19.00 inches (482.6 mm)	An Inboard Trailing Edge Region has not been defined for this blade	19.00 inches (482.6 mm)
E9193(B,K)	21.56 inches (547.6 mm)	An Inboard Trailing Edge Region has not been defined for this blade	21.56 inches (547.6 mm)
M10083(K)	22.61 inches (574.2 mm)	An Inboard Trailing Edge Region has not been defined for this blade	22.61 inches (574.2 mm)
A10460(E)(K)	24.65 inches (626.1 mm)	An Inboard Trailing Edge Region has not been defined for this blade	24.65 inches (626.1 mm)
LM10585(A)(N)(B,K)+4	24.86 inches (631.4 mm)	An Inboard Trailing Edge Region has not been defined for this blade	24.86 inches (631.4 mm)
M10877K	24.74 inches (628.3 mm)	An Inboard Trailing Edge Region has not been defined for this blade	24.74 inches (628.3 mm)
E10950P(C)(B,K)	26.06 inches (661.9 mm)	5.00 inches (127.0 mm)	33.12 inch (841.2 mm)
E11990	28.56 inches (725.4 mm)	An Inboard Trailing Edge Region has not been defined for this blade	28.56 inches (725.4 mm)
E12902K	31.06 inches (788.9 mm)	An Inboard Trailing Edge Region has not been defined for this blade	31.06 inches (788.9 mm)
E12903A(K)	31.06 inches (788.9 mm)	An Inboard Trailing Edge Region has not been defined for this blade	31.06 inches (788.9 mm)
E13890K	33.12 inches (841.2 mm)	An Inboard Trailing Edge Region has not been defined for this blade	33.12 inches (841.2 mm)
108MH92	19.00 inches (482.6 mm)	An Inboard Trailing Edge Region has not been defined for this blade	19.00 inches (482.6 mm)
138MH91	33.16 inches (842.2 mm)	An Inboard Trailing Edge Region has not been defined for this blade	33.16 inches (842.2 mm)

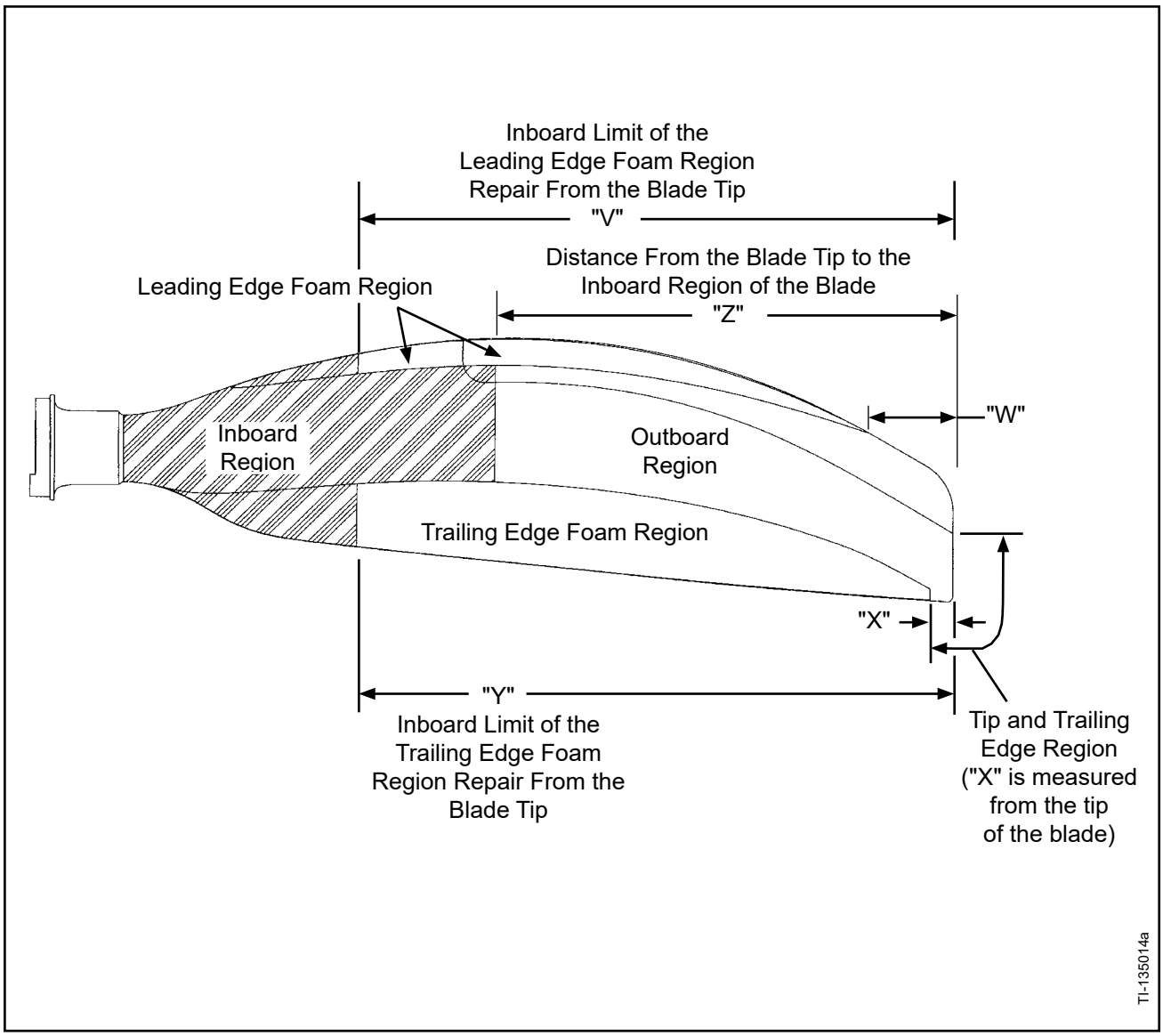
Legacy Blades: Repair Regions
Figure 2-10



N-shank Blades with Trailing Edge Foam Only: Repair Regions
Figure 2-11, page 1 of 2

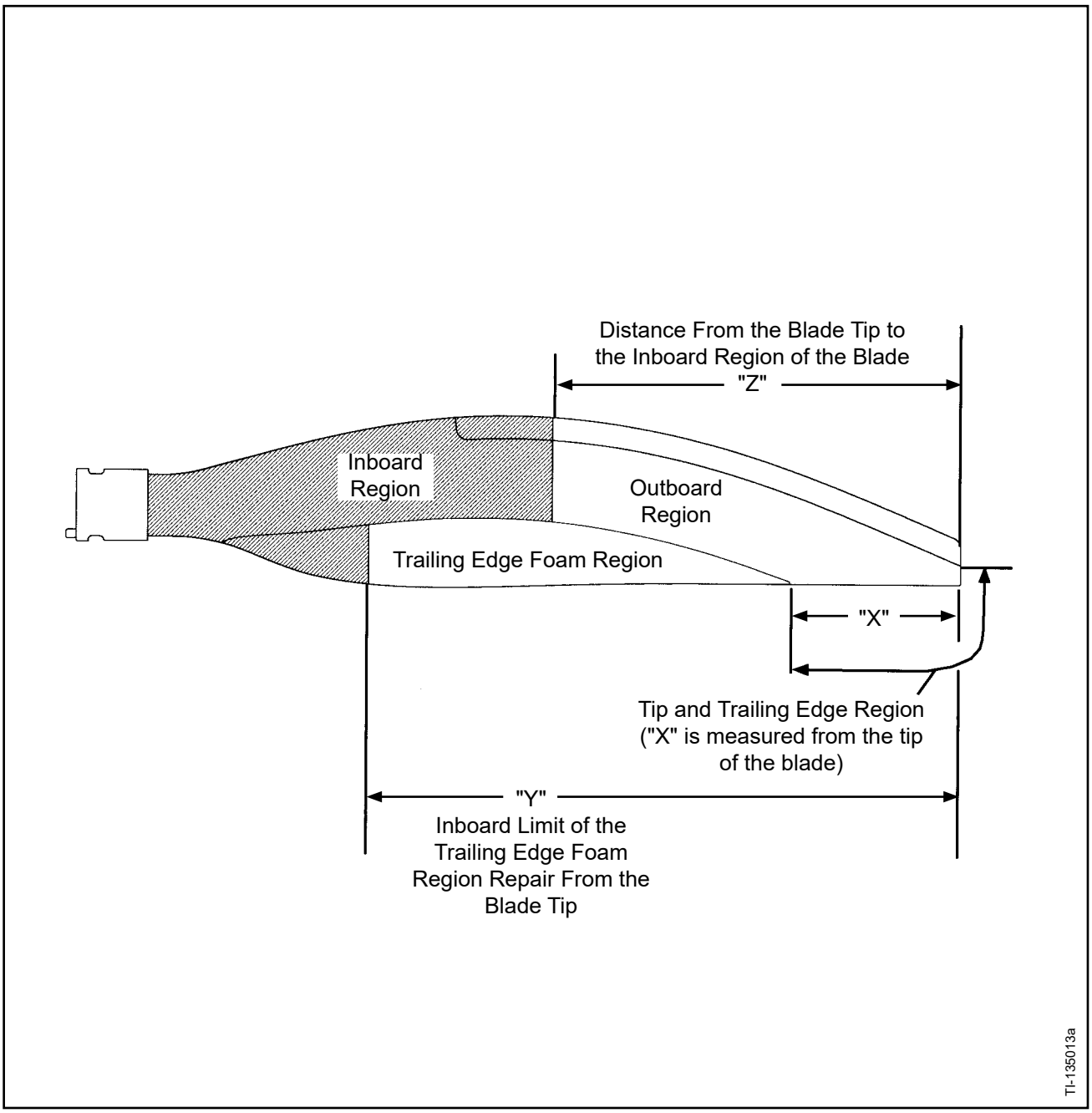
Blade Model	"X"	"Y"	"Z"
N7605(B,K)-4	2.67 inches (67.8 mm)	22.00 inches (558.8 mm)	17.43 inches (442.7 mm)
N7605(B,K)-2	3.67 inches (93.2 mm)	23.00 inches (584.2 mm)	17.93 inches (455.42 mm)
N7605(B,K)	4.67 inches (118.6 mm)	24.00 inches (609.6 mm)	18.43 Inches (468.1 mm)
N7605(B,K)+2	5.67 inches (144.0 mm)	25.00 inches (635.0 mm)	18.93 inches (480.8 mm)
N7605C( )	4.67 inches (118.6 mm)	24.00 inches (609.6 mm)	18.43 Inches (468.1 mm)
N76M05CX	4.67 inches (118.6 mm)	24.00 inches (609.6 mm)	18.43 Inches (468.1 mm)
N76M05C-2X	3.67 inches (93.21 mm)	23.00 inches (584.2 mm)	17.43 Inches (437.6 mm)
N( )7893-( )	4.50 inches (114.3 mm)	25.00 inches (635.0 mm)	18.93 inches (480.8 mm)
N( )8301( )	10.53 inches (267.4 mm)	26.24 inches (666.4 mm)	20.17 inches (512.3 mm)
N( )8301( )-7	7.03 inches (178.5 mm)	22.74 inches (577.5 mm)	18.42 inches (467.8 mm)
N( )8301( )-3	9.03 inches (229.3 mm)	24.74 inches (628.3 mm)	19.42 inches (493.2 mm)
N( )8302( )	10.53 inches (267.4 mm)	26.24 inches (666.4 mm)	20.17 inches (512.3 mm)
N( )8302( )-7	7.03 inches (178.5 mm)	22.74 inches (577.5 mm)	18.42 inches (467.8 mm)
N( )8304( )	10.53 inches (267.4 mm)	26.24 inches (666.4 mm)	20.17 inches (512.3 mm)
N( )8304( )-1	10.03 inches (254.7 mm)	25.74 inches (653.7 mm)	19.92 inches (505.9 mm)
N( )8304( )-3	9.03 inches (229.3 mm)	24.74 inches (628.3 mm)	19.42 inches (493.2 mm)
N( )8304( )-5	8.03 inches (203.9 mm)	23.74 inches (602.9 mm)	18.92 inches (480.5 mm)
N( )8304( )-7	7.03 inches (178.5 mm)	22.74 inches (577.5 mm)	18.42 inches (467.8 mm)
NM8410( )	10.72 inches (272.2 mm)	27.61 inches (701.2 mm)	20.42 inches (518.6 mm)
NM8410( )-4	8.72 inches (221.4 mm)	25.61 inches (650.4 mm)	19.42 inches (493.2 mm)
NC9208( )	3.63 inches (92.2 mm)	28.31 inches (719.0 mm)	21.74 inches (552.1 mm)
NC9405( )	4.63 inches (117.6 mm)	29.30 inches (744.2 mm)	22.24 inches (564.8 mm)
NC10244( )-3	3.70 inches (93.9 mm)	32.19 inches (817.6 mm)	23.49 inches (596.6 mm)
NC10245( )	5.20 inches (132.0 mm)	34.00 inches (863.6 mm)	24.24 inches (615.6 mm)
NC10320( )	5.70 inches (144.7 mm)	34.19 inches (868.4 mm)	24.49 inches (622.0 mm)
NC10445( )-2	5.20 inches (132.0 mm)	34.00 inches (863.6 mm)	24.24 inches (615.6 mm)

N-shank Blades with Trailing Edge Foam Only: Repair Regions
Figure 2-11, page 2 of 2



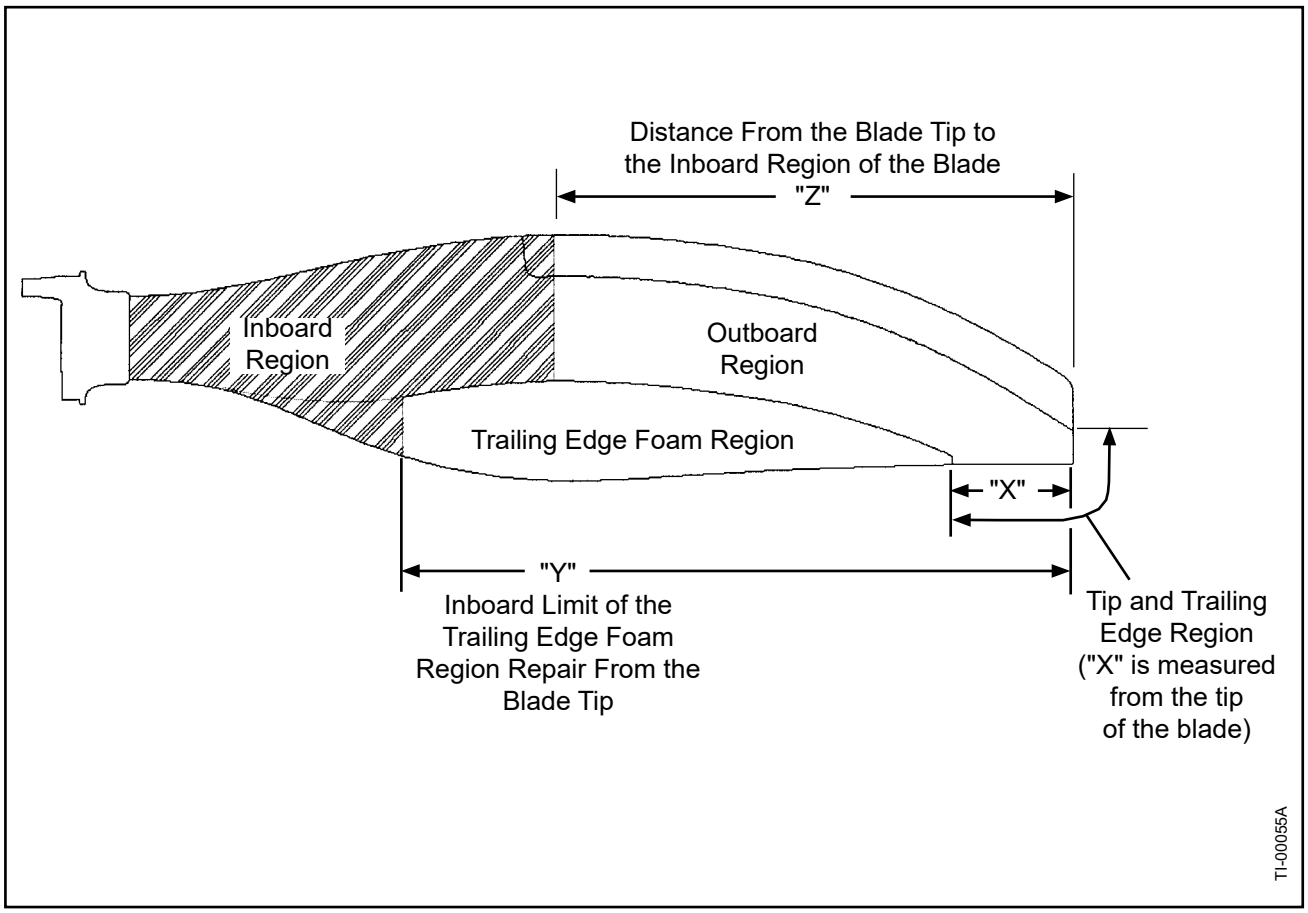
Blade Model	"V"	"W"	"X"	"Y"	"Z"
NC8834( )	27.47 inches (697.7 mm)	5.63 inches (143.0 mm)	1.03 inches (26.1 mm)	27.47 inches (697.7 mm)	20.74 inches (526.7 mm)
(J)NC10904( )	35.60 inches (904.2 mm)	6.62 inches (168.2 mm)	3.13 inches (79.5 mm)	35.60 inches (904.2 mm)	25.99 inches (660.1 mm)
JNC10905( )	35.60 inches (904.2 mm)	6.62 inches (168.2 mm)	3.13 inches (79.5 mm)	35.60 inches (904.2 mm)	25.99 inches (660.1 mm)

N-shank Blades with Trailing Edge and Leading Edge Foam: Repair Regions
Figure 2-12



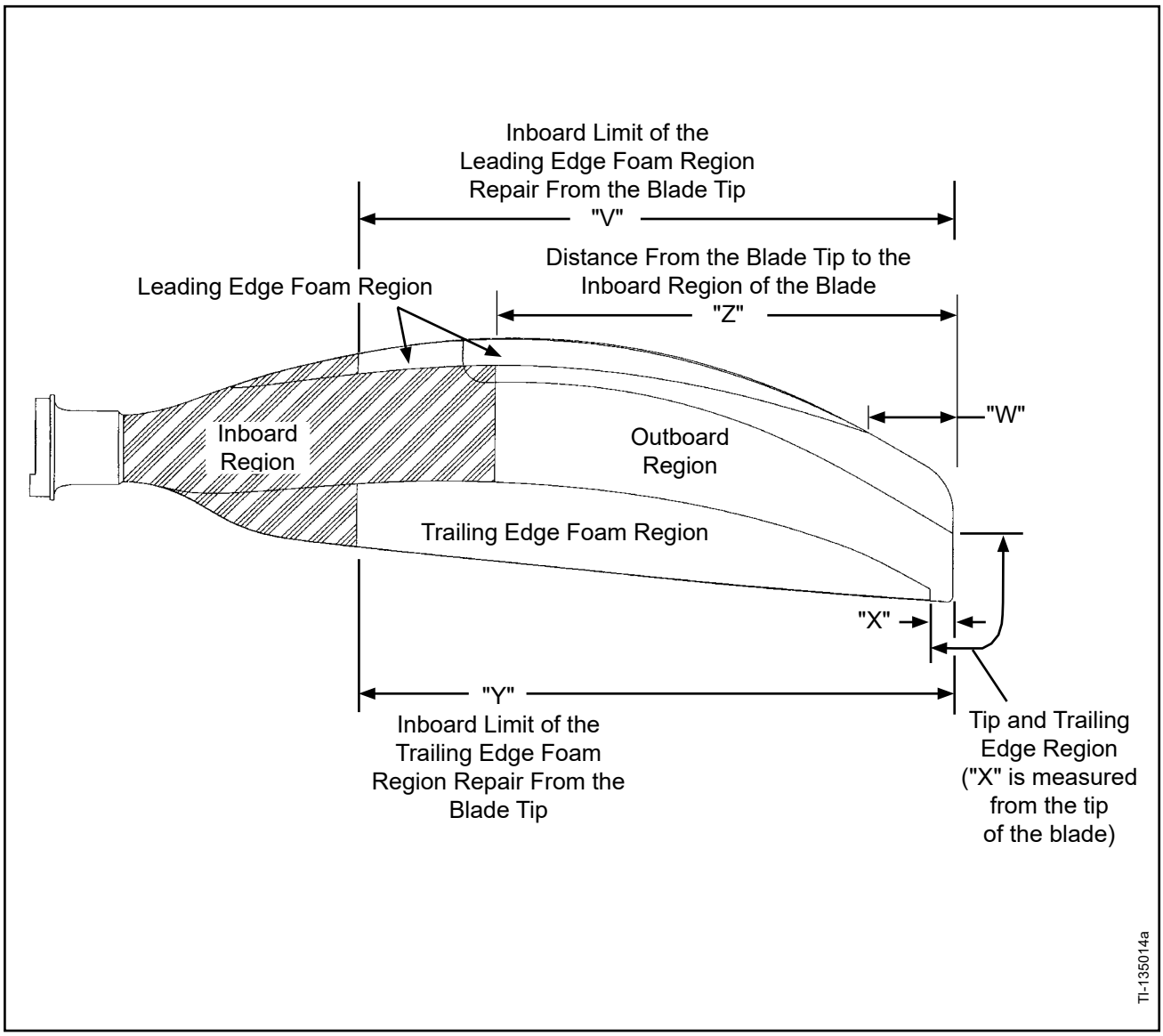
Blade Model	"X"	"Y"	"Z"
( )75A01-2( )	5.75 inches (146.0 mm)	21.94 inches (557.2 mm)	18.00 inches (457.5 mm)
(C)75A01( )	6.75 inches (171.4 mm)	22.94 inches (582.6 mm)	18.50 inches (469.9 mm)
L76A01( )X	13.85 inches (351.7 mm)	26.22 inches (665.9 mm)	18.88 inches (479.5 mm)
( )79A06X	7.50 inch (190.5 mm)	24.17 inches (613.9 mm)	19.50 inches (495.3 mm)

Bantam Blades: Repair Regions
Figure 2-13



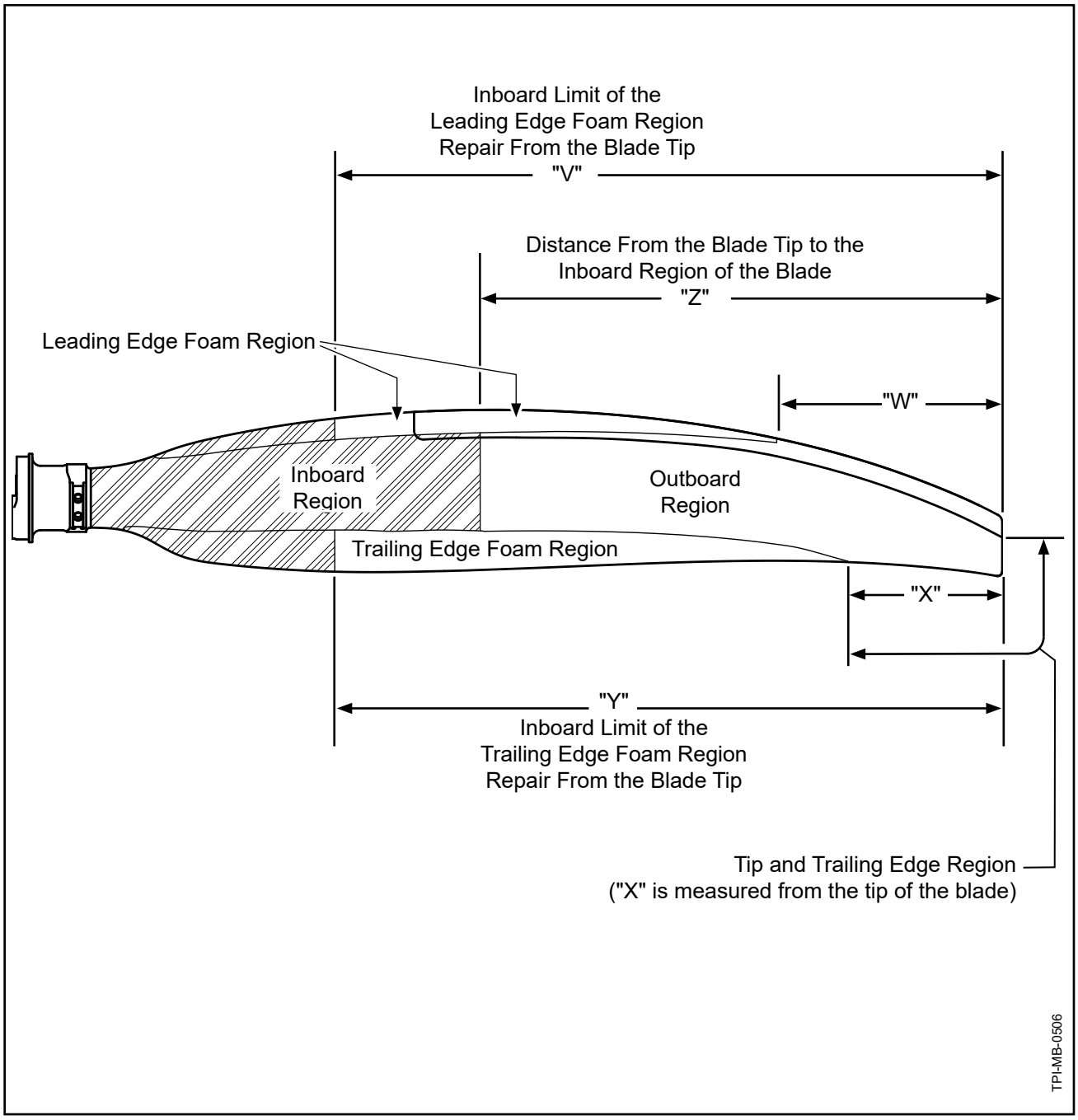
Blade Model	"X"	"Y"	"Z"
75C( )08	5.99 inches (152.1 mm)	22.26 inches (565.4 mm)	17.95 inches (455.9 mm)
76C( )03( )-2	6.85 inches (173.9 mm)	22.25 inches (565.1 mm)	17.70 inches (449.5 mm)
76C( )03( )-7	4.35 inches (110.4 mm)	19.75 inches (501.6 mm)	16.45 inches (417.8 mm)
76C04-0.6	7.55 inches (191.7 mm)	22.95 inches (582.9 mm)	18.05 inches (458.4 mm)
78D01( )	2.95 inches (74.9 mm)	25.25 inches (641.3 mm)	18.93 inches (480.8 mm)
( )79C03( )-2	6.85 inches (173.9 mm)	22.25 inches (565.1 mm)	18.45 inches (468.6 mm)
( )79C03( )-7	4.35 inches (110.4 mm)	19.75 inches (501.6 mm)	17.20 inches (436.8 mm)
80C( )01( )	12.69 inches (322.3 mm)	26.21 inches (665.7 mm)	19.20 inches (487.6 mm)
80C( )01( )-2	11.69 inches (296.9 mm)	25.21 inches (640.3 mm)	18.70 inches (474.9 mm)
80C( )01( )-4	10.69 inches (271.5 mm)	24.21 inches (614.9 mm)	18.20 inches (462.2 mm)
91D1(5,7)( )	4.24 inches (107.6 mm)	29.70 inches (754.3 mm)	22.30 inches (566.4 mm)
100DD44-1.28	5.20 inches (132.0 mm)	33.69 inches (855.7 mm)	24.24 inches (615.6 mm)

Raptor Blades with Trailing Edge Foam Only: Repair Regions
Figure 2-14



Blade Model	"V"	"W"	"X"	"Y"	"Z"
84DB26	27.60 inches (701.0 mm)	3.26 inches (82.8 mm)	3.76 inches (95.5 mm)	27.60 inches (701.0 mm)	20.55 inches (521.97 mm)
86DB01( )	28.10 inches (713.7 mm)	6.26 inches (159.0 mm)	1.67 inches (42.4 mm)	28.10 inches (713.7 mm)	21.05 inches (534.6 mm)

Raptor Blades with Trailing Edge and Leading Edge Foam: Repair Regions
Figure 2-15



Blade Model	"V"	"W"	"X"	"Y"	"Z"
GC1111(4,5)-2	36.50 inches (927.1 mm)	11.13 inches (282.7 mm)	7.29 inches (185.1 mm)	36.50 inches (927.1 mm)	25.99 inches (660.1 mm)

G-shank Blades: Repair Regions
Figure 2-16

REPAIR LIMITS - CONTENTS

LIST OF DAMAGE TYPE TABLES

LIST OF DAMAGE TYPE TABLES, continued

LIST OF DAMAGE TYPE TABLES, continued

LIST OF FIGURES

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1. Damage/Repair Evaluation (Refer to Figure 3-1)

   A. General

      (1) In this manual, damage and repair are treated separately. The type of repair is not dictated by the type of damage received.

         (a) Example: A blade that has airworthy damage may require a major repair.

      (2) Refer to the section, "Definitions" in this chapter for descriptions of the following terms:

         (a) Airworthy/Unairworthy Damage

         (b) Operable/Inoperable Damage

         (c) Minor/Major Repair

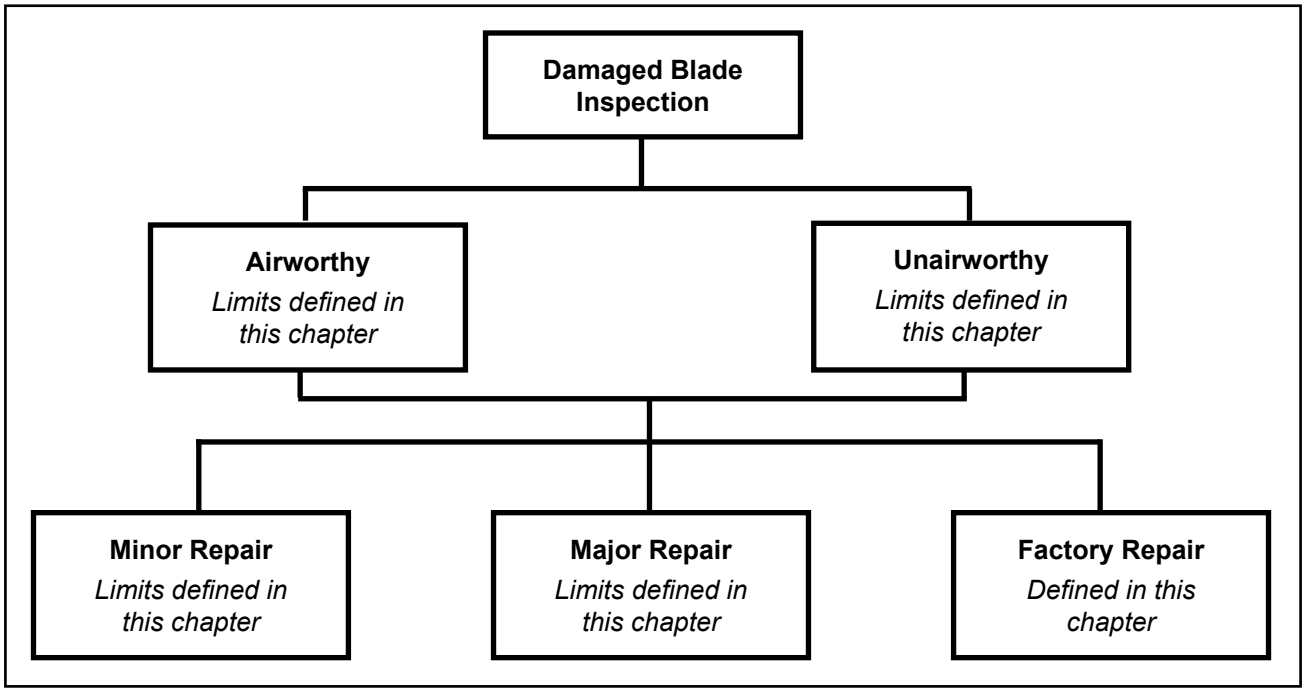
         (d) Factory Only Repair

   B. Inspection

      (1) Inspection identifies the type of damage and the location on the blade.

         (a) Refer to the Damage Type and Repair Regions chapter of this manual for descriptions of specific damage types and illustrations showing the repair regions of each blade type.

         (b) If there is blade damage that does not match one of the damage types identified in this manual, contact Hartzell Propeller Inc. to determine the airworthiness of the blade.



Damage/Repair Evaluation
Figure 3-1

C. Damage Determination: Airworthy or Unairworthy

(1) Refer to the applicable Damage Type Table(s) in this chapter based on the location and the type of damage identified in the inspection.

(a) Use the Damage Type Table(s) to determine the Limits Designation and the Airworthy Damage Limits for the applicable blade model.

1 If the damage is within the Airworthiness Damage Limits, the propeller blade can remain in service.

2 If the damage is greater than the permitted Airworthiness Damage Limits, the propeller blade must be removed from service until the required repair is complete.

D. Repair Determination: Minor or Major

(1) Refer to the applicable Damage Type Table(s) in this chapter based on the location and the type of damage identified in the inspection.

(a) Use the Damage Type Table(s) to determine the Limits Designation and the Minor/Major Repair Limits for the applicable blade model.

1 Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual for information about the certifications required to perform Minor and Major Repairs.

2. Definitions

A. Airworthy/Unairworthy Damage

(1) Airworthy damage is a specific condition to a blade installed on an aviation product that is within the airworthy damage limits specified in this chapter.

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

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

(2) Unairworthy damage is a specific condition to a blade installed on an aviation product that exceeds the airworthy damage limits specified in this chapter.

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

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

B. Operable/Inoperable Damage

(1) Operable damage is a specific condition to a blade installed on a non-aviation product that is within the airworthy damage limits specified in this chapter.

(a) Operable damage is the non-aviation equivalent of airworthy damage.

1 All references in this manual to "airworthy damage" apply to "operable damage".

(2) Inoperable damage is a specific condition to a blade installed on a non-aviation product that exceeds the airworthy damage limits specified in this chapter.

(a) Inoperable damage is the non-aviation equivalent of unairworthy damage.

1 All references in this manual to "unairworthy damage" apply to "inoperable damage".

C. Minor/Major Repair

(1) Minor repair limits are defined in the Damage Type Tables in this chapter.

(a) Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual for information about the certifications required to perform minor repairs.

(2) Major repair limits are defined in the Damage Type Tables in this chapter.

(a) Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual for information about the certifications required to perform major repairs.

D. Factory Only Repair

(1) Damage that is beyond the minor/major repair limits and/or listed as "factory only repair" in this chapter must be returned to Hartzell Propeller Inc. for evaluation and possible repair.

(a) Hartzell Propeller Inc. must acquire and provide FAA-approved documentation before blades with damage as specified in 3.E.(1) can be returned to service.

DAMAGE TYPE 1	
1. NICKEL EROSION SHIELD - MINOR DEFORMATION - FOR THE ENTIRE EROSION SHIELD	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except**: LM10585(A)(B,K)+4,

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	Erosion shield deformations caused by impact damage or erosion that does not penetrate through the shield is permitted. Erosion shield deformations caused by impact or erosion that have penetrated the erosion shield are airworthy if any related crack, gouge, and debond does not exceed the airworthy limits specified for each condition in this table.	Minor repair is not authorized. Refer to Major Repair Limits.	Major repair is not authorized. If the deformation is greater than the airworthy damage limits, overhaul the blade and replace the erosion shield in accordance with Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

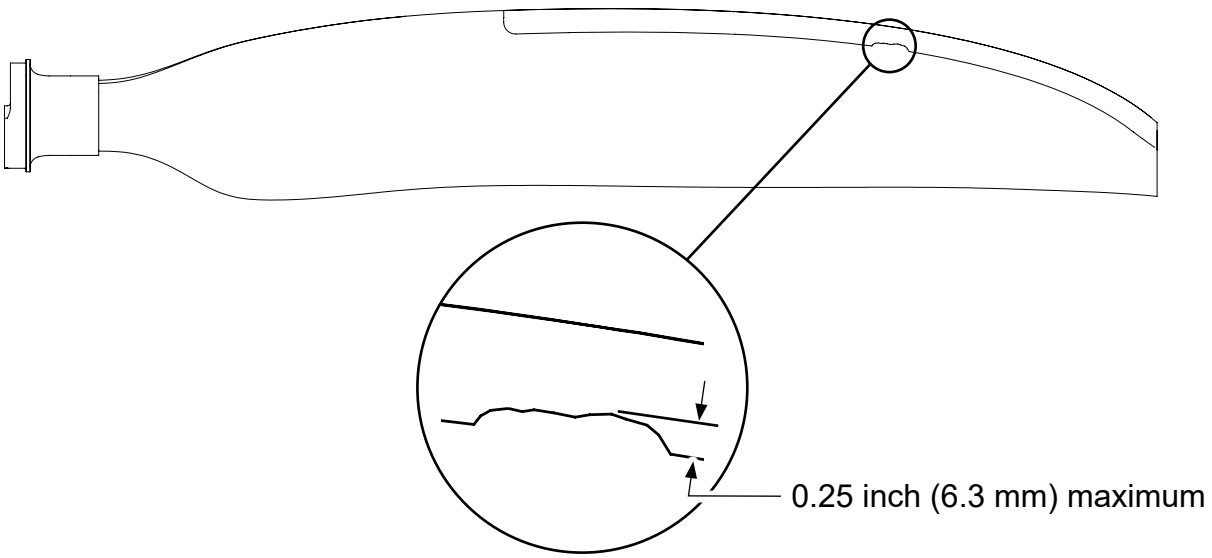
Damage Type 1: Nickel Erosion Shield - Minor Deformation
Table 3-1

DAMAGE TYPE 2	
2. NICKEL EROSION SHIELD - GOUGE - FOR THE ENTIRE EROSION SHIELD	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except**: LM10585(A)(B,K)+4, NC8834, (J)NC10904( ), JNC10905( ), 86DB01( ), GC1111(4,5)( ), 84DB26( )
(b) Limits 2	NC8834, (J)NC10904( ), JNC10905( ), 86DB01( ), GC1111(4,5)( ), 84DB26( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	Exposed foam is not permitted. The maximum permitted total accumulated area of gouges through the erosion shield is 0.25 sq. inch (161.2 sq. mm). The maximum permitted depth of damage to the blade surface below the erosion shield is 0.020 inch (0.50 mm). NOTE: This is two layers of composite material. Damage cannot be permanently repaired without replacement of the erosion shield, but within these limits, does not make the blade unairworthy.	The maximum permitted total accumulated area of gouges through the erosion shield is 0.25 sq. inch (161.2 sq. mm). The maximum permitted depth of damage to the blade surface below the erosion shield is 0.020 inch (0.50 mm). Repair in accordance with the section, "Gouge" in the Minor Repair chapter of this manual. An erosion shield repaired within this limit must be replaced at overhaul.	Major repair is not authorized. If the damage is greater than the Minor Repair Limits, overhaul the blade and replace the erosion shield in accordance with Hartzell Propeller Inc. Manual 135F (61-13-35).
(b) LIMITS 2	A gouge through the erosion shield to the blade surface below the erosion shield is not permitted.	Minor repair is not authorized. Refer to Major Repair Limits.	Major repair is not authorized. If the damage is greater than the Minor Repair Limits, overhaul the blade and replace the erosion shield in accordance with Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 2: Nickel Erosion Shield - Gouge
Table 3-2



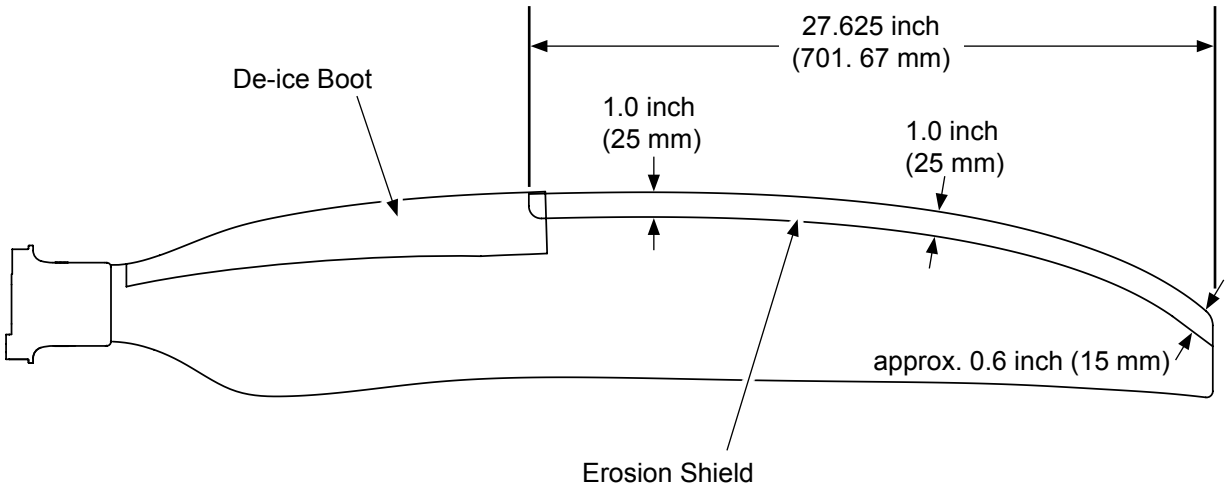
Nickel Erosion Shield: Area Missing Along Trailing Edge
Figure 3-2

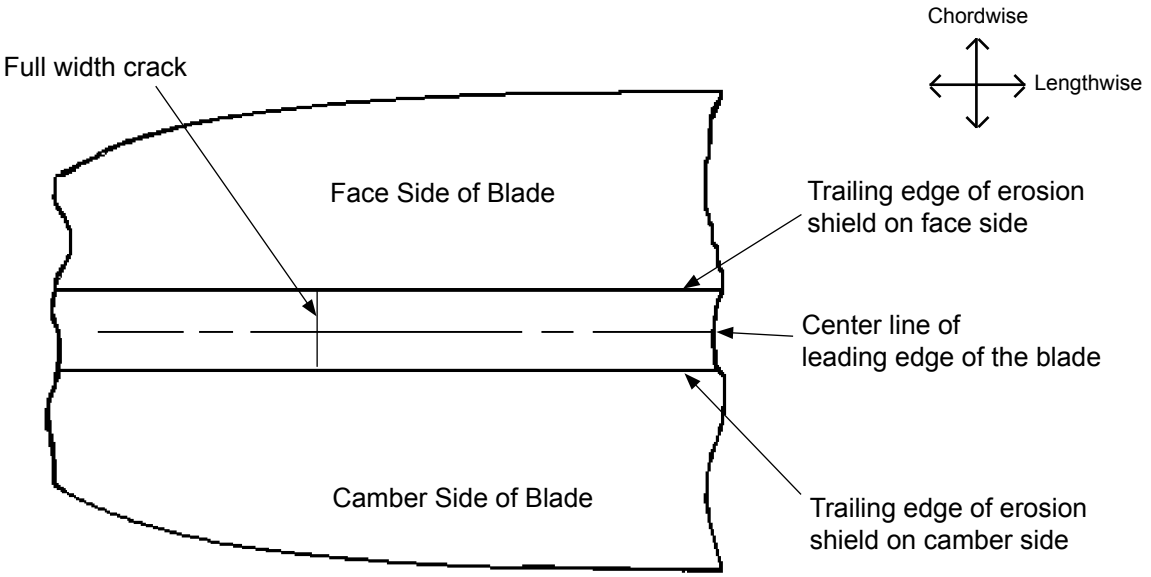
DAMAGE TYPE 3	
3. NICKEL EROSION SHIELD - AREA MISSING ALONG THE TRAILING EDGE - FOR THE ENTIRE EROSION SHIELD	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except**: LM10585(A)(B,K)+4,

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-2)	Pieces of material from the trailing edge of the erosion shield may be missing because of erosion or sanding performed during the erosion shield installation procedure. The missing area must be no farther than 0.25 inch (6.3 mm) from the trailing edge of the erosion shield. Refer to Figure 3-2 for an example of permitted missing material. Damage cannot be permanently repaired without replacement of the erosion shield, but within these limits, does not make the blade unairworthy.	An area missing along the trailing edge of the erosion shield that is within the airworthy damage limits may be repaired in accordance with the section, "Missing Area of Trail Side or Inboard End" in the Minor Repair chapter of this manual.	Major repair is not authorized. If the damage is greater than the Minor Repair Limits, overhaul the blade and replace the erosion shield in accordance with Hartzell Propeller Inc. Manual 135F (61-13-35)..

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 3: Nickel Erosion Shield - Area Missing on Trailing Edge
Table 3-3





When calculating the area of damage and the proximity to other damage, look at the erosion shield as a two dimensional shape, as if it were unfolded and spread flat where the face and camber sides of the blade could be viewed at the same time.

APS6041

Interpretation of Erosion Shield Damage
Figure 3-3

DAMAGE TYPE 4	
4. NICKEL EROSION SHIELD - DEBOND - FOR ALL AREAS THAT ARE NOT COVERED BY A DE-ICE/ANTI-ICING BOOT	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except**: LM10585(A)(B,K)+4,

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-3)	A maximum of 20% of the erosion shield may be debonded in any 6 inch (153 mm) length of the erosion shield.	A debond that is within the airworthy damage limits and is no farther than 0.25 inch (6.3 mm) from the trailing edge may be repaired in accordance with the section, "Debond Extending to the Trailing Edge and/or a Crack" in the Minor Repair chapter of this manual.	A debond that is within the airworthy damage limits and is farther than 0.25 inch (6.3 mm) from the trailing edge may be repaired in accordance with the section, "Repair of a Debond That is Farther Than 0.25 Inch from the Trailing Edge" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

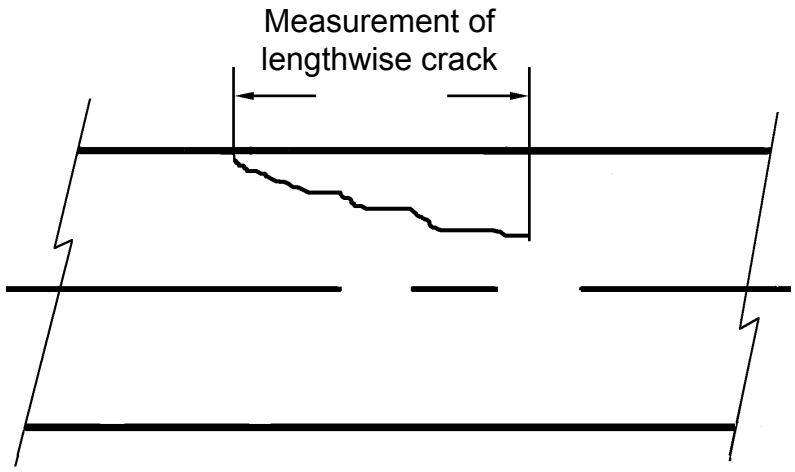
Damage Type 4: Nickel Erosion Shield - Debond - Areas Not Covered by De-ice/Anti-Icing Boot
Table 3-4

DAMAGE TYPE 5	
5. NICKEL EROSION SHIELD - CHORDWISE CRACK - FOR ALL AREAS THAT ARE NOT COVERED BY A DE-ICE/ANTI-ICING BOOT	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except**: LM10585(A)(B,K)+4,

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-3)	Two full width, chordwise cracks may not be within 6.0 inches (153 mm) of each other. A full width, chordwise crack may not be within 6.0 inches (153 mm) of the blade tip. **Blades with a de-ice or anti-icing boot:** A full width, chordwise crack may not be within 1.0 inch (25 mm) of the outboard end of the de-ice/anti-icing boot. For a full width, chordwise crack that is in an area from 1.0 inch (25 mm) to 6.0 inches (153 mm) outboard of the end of the de-ice/anti-icing boot, the maximum permitted area of debond between the outboard end of the de-ice/anti-icing boot and the full width crack is 20%. The debond must not extend under the de-ice/anti-icing boot. **Blades without a de-ice or anti-icing boot:** A full width, chordwise crack may not be within 6.0 inches (153 mm) of the inboard end of the erosion shield.	Minor repair is not authorized. Refer to Major Repair Limits.	Major repair is not authorized. If the crack is greater than the airworthy damage limits, overhaul the blade and replace the erosion shield in accordance with Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 5: Nickel Erosion Shield - Chordwise Crack - Areas Not Covered by De-ice/Anti-Icing Boot
Table 3-5



"Lengthwise crack" refers only to the length of the crack. To determine the length, measure parallel to the pitch axis of the blade from the most inboard location to the most outboard location.

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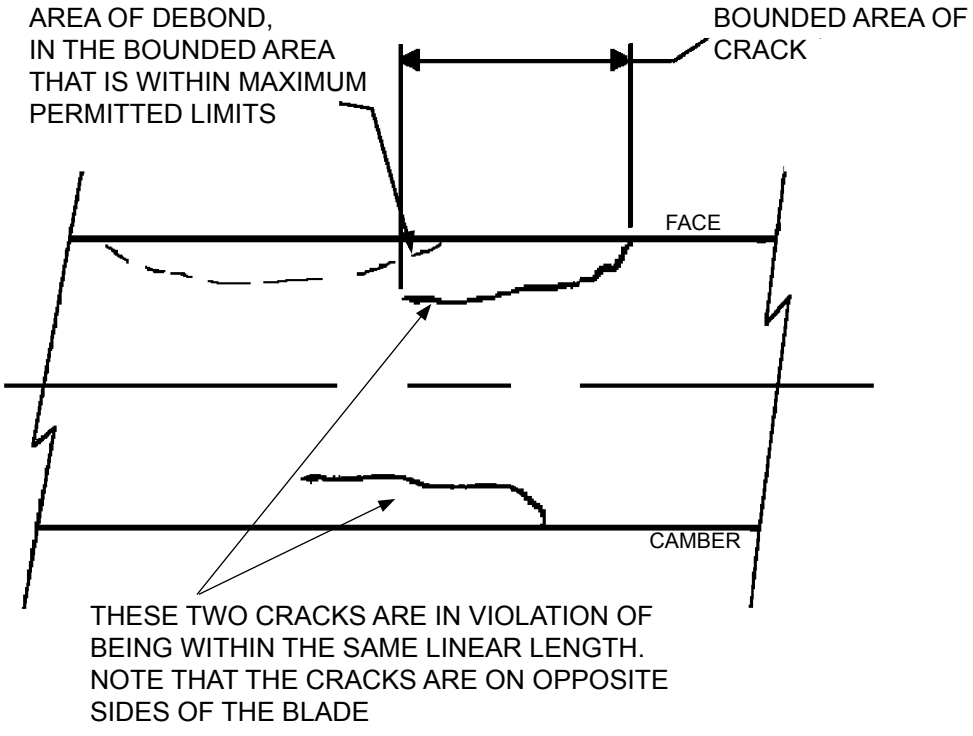
Measuring Lengthwise Crack
Figure 3-4



NOTE: The bounded area of a crack extends to both edges of the erosion shield.

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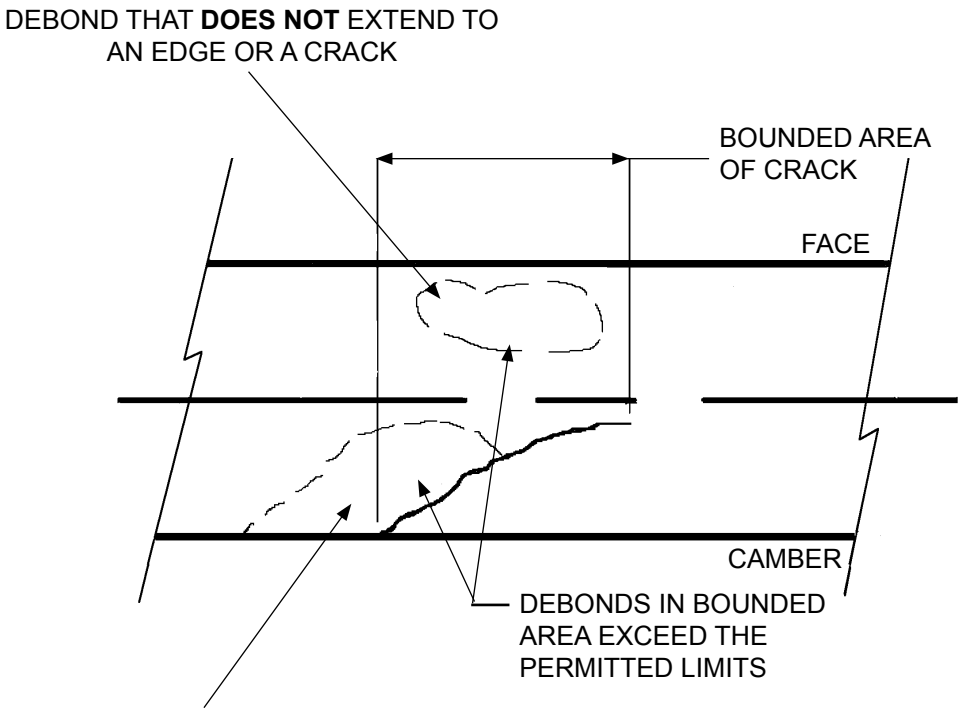
Acceptable Erosion Shield Debond, Non-acceptable Crack Location
Figure 3-5

DAMAGE TYPE 6	
6. NICKEL EROSION SHIELD - LENGTHWISE CRACK - FOR ALL AREAS THAT ARE NOT COVERED BY A DE-ICE/ANTI-ICING BOOT	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except**: LM10585(A)(B,K)+4,

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-3 thru Figure 3-5)	The maximum permitted length of a crack is 2.0 inches (50 mm). Two lengthwise cracks may not be within the same linear length on the erosion shield. This includes cracks on opposite sides of the blade. Refer to Figure 3-5 for an example of violation of this limit.	Minor repair is not authorized. Refer to Major Repair Limits.	Major repair is not authorized. If the crack is greater than the airworthy damage limits, overhaul the blade and replace the erosion shield in accordance with Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 6: Nickel Erosion Shield - Lengthwise Crack - Areas Not Covered by De-ice/Anti-Icing Boot
Table 3-6



Debonds in Excess of Allowable Limits
Figure 3-6

DAMAGE TYPE 7	
7. NICKEL EROSION SHIELD - DEBOND BOUNDED BY A LENGTHWISE CRACK - FOR ALL AREAS THAT ARE COVERED BY A DE-ICE/ANTI-ICING BOOT	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except**: LM10585(A)(B,K)+4,

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-3, Figure 3-5, and Figure 3-6)	In the area bounded by a lengthwise crack and the trailing edge of the erosion shield, the maximum permitted area that may be debonded is 40%. Refer to Figure 3-5 for an example of a debond that is within the permitted limits. Refer to Figure 3-6 for an example of a debond that is greater than the permitted limits. NOTE: For crack limits, refer to the applicable section in this table.	For a debond that extends to the edge of a crack, there is no limit to the size of the repair attempted. Repair in accordance with the section, "Debond Extending to the Trailing Edge and/or a Crack" in the Minor Repair chapter of this manual.	For a debond that does not extend to the edge or a crack, there is no limit to the size of the repair attempted. Repair in accordance with the section, "Repair of a Debond That is Farther Than 0.25 Inch from the Trailing Edge" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 7: Nickel Erosion Shield - Debond Bounded by a Lengthwise Crack - Areas That Are Covered by a De-ice/Anti-Icing Boot
Table 3-7

DAMAGE TYPE 8	
8. NICKEL EROSION SHIELD - DEBONDS - FOR ALL AREAS THAT ARE COVERED BY A DE-ICE/ANTI-ICING BOOT	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except**: LM10585(A)(B,K)+4,

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-3)	A maximum of 40% of the erosion shield may be debonded in any 6 inch length (153 mm) section of the erosion shield.	For a debond that extends to the edge or a crack, there is no limit to the size of the repair attempted. Repair in accordance with the section, "Debond Extending to the Trailing Edge and/or a Crack" in the Minor Repair chapter of this manual.	For a debond that does not extend to the edge or a crack, there is no limit to the size of the repair attempted. Repair in accordance with the section, "Repair of a Debond That is Farther Than 0.25 Inch from the Trailing Edge" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 8: Nickel Erosion Shield - Debonds - Areas That Are Covered by a De-ice/Anti-Icing Boot
Table 3-8

DAMAGE TYPE 9	
9. NICKEL EROSION SHIELD - DEBONDS BOUNDED BY TWO CHORDWISE CRACKS - FOR ALL AREAS THAT ARE COVERED BY A DE-ICE/ANTI-ICING BOOT	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except**: LM10585(A)(B,K)+4,

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-3)	Any number of chordwise cracks are permitted, even full width, but in each area, bounded by chordwise cracks, the maximum total area of debond is 40%. NOTE: For crack limits, refer to the applicable damage type in this section.	For a debond that extends to the edge or a crack, there is no limit to the size of the repair attempted. Repair in accordance with the section, "Debond Extending to the Trailing Edge and/or a Crack" in the Minor Repair chapter of this manual.	For a debond that does not extend to the edge or a crack, there is no limit to the size of the repair attempted. Repair in accordance with the section, "Repair of a Debond That is Farther Than 0.25 Inch from the Trailing Edge" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 9: Nickel Erosion Shield - Debonds Bounded by Two Chordwise Cracks - Areas That Are Covered by a De-ice/Anti-Icing Boot
Table 3-9

DAMAGE TYPE 10	
10. STAINLESS STEEL EROSION SHIELD - CHORDWISE CRACK - FOR THE ENTIRE EROSION SHIELD	
Limits Designation	**Blade Models**
(a) Limits 1	LM10585(A)(B,K)+4 **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	A screw hole or rivet hole with a chordwise crack extending from it may not also have a lengthwise crack extending from it. A chordwise crack must be separated from any other chordwise crack by a minimum of 6.0 inches (153 mm). The maximum permitted length of a lengthwise crack is 2.0 inches (50 mm) and must not connect two rivet or screw holes.	Minor repair is not authorized. Refer to Major Repair Limits.	Major repair is not authorized. If the crack is greater than the airworthy damage limits, overhaul the blade and replace the stainless steel erosion shield with a nickel erosion shield in accordance with Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 10: Stainless Steel Erosion Shield - Chordwise Crack
Table 3-10

DAMAGE TYPE 11	
11. STAINLESS STEEL EROSION SHIELD - MINOR DEFORMATION - FOR THE ENTIRE EROSION SHIELD	
Limits Designation	**Blade Models**
(a) Limits 1	LM10585(A)(B,K)+4 **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	Deformed material not associated with a crack or missing material less than 10% of the leading edge radius or no more than 0.080 inch (2.03 mm) deep because of impact damage or erosion.	Minor repair is not authorized. Refer to Major Repair Limits.	Major repair is not authorized. If the deformation is greater than the airworthy damage limits, overhaul the blade and replace the stainless steel erosion shield with a nickel erosion shield in accordance with Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 11: Stainless Steel Erosion Shield - Minor Deformation
Table 3-11

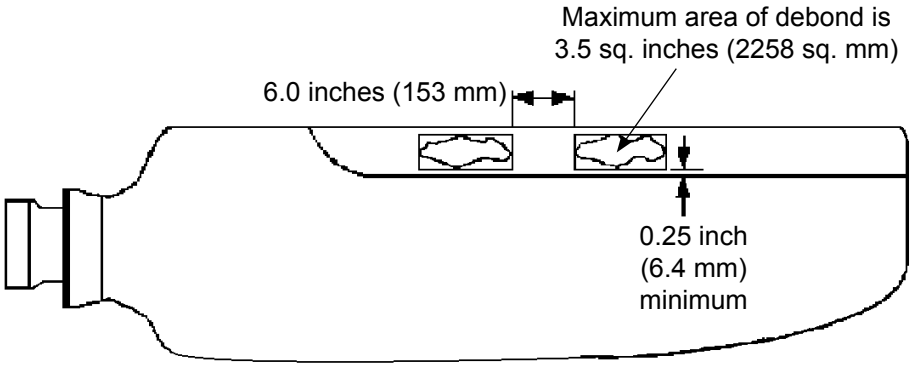
DAMAGE TYPE 12	
12. STAINLESS STEEL EROSION SHIELD - GOUGE - FOR THE ENTIRE EROSION SHIELD	
Limits Designation	**Blade Models**
(a) Limits 1	LM10585(A)(B,K)+4 **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-3)	The maximum permitted depth of a gouge is 0.125 inch (3.17 mm). The maximum permitted length of a gouge is 0.5 inches (12 mm). The maximum permitted area of a gouge is 0.25 sq. inch (161.2 sq. mm).	Repair within the Airworthy Damage Limits in accordance with the section, "Gouge" in the Minor Repair chapter of this manual.	Major repair is not authorized. If the crack is greater than the Minor Repair Limits, overhaul the blade and replace the stainless steel erosion shield with a nickel erosion shield in accordance with Hartzell Propeller Inc. Manual 135F (61-13-35).

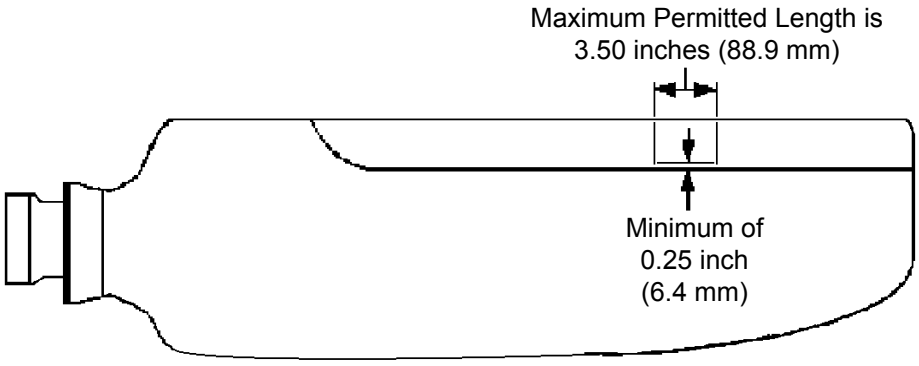
* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 12: Stainless Steel Erosion Shield - Gouge
Table 3-12

Limits for a Debond Not Extending to the Leading Edge



Additional Limits for a Debond on the Trailing Edge of the Erosion Shield



BPS-015

Airworthy Debond Limits for Stainless Steel Erosion Shields
Figure 3-7

DAMAGE TYPE 13	
13. STAINLESS STEEL EROSION SHIELD - DEBOND- FOR AREAS OF THE EROSION SHIELD THAT ARE NOT FASTENED WITH SCREWS/RIVETS	
Limits Designation	**Blade Models**
(a) Limits 1	LM10585(A)(B,K)+4 **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-3 and Figure 3-7)	For a debond not extending to the leading edge, the maximum length of a debond that is on the trailing edge is 3.50 inches (88.9 mm). A debond must be a minimum of 0.25 inch (6.4 mm) from the trailing edge. The maximum permitted area of a debond is 3.5 square inches (2258 sq. mm). A debond must be separated from any other debond area on the same blade surface by a minimum of 6.0 inches (153 mm). The maximum permitted total accumulated area of all debonds is 10.0 sq. inches (6451 sq. mm).	If the debond is within the Airworthy Damage Limits, repair in accordance with the section, "Debond" in the Minor Repair chapter of this manual. If the debond is greater than the airworthy damage limits, refer to the Major Repair Limits.	Major repair is not authorized. If the debond is greater than the Minor Repair Limits, overhaul the blade and replace the stainless steel erosion shield with a nickel erosion shield in accordance with Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

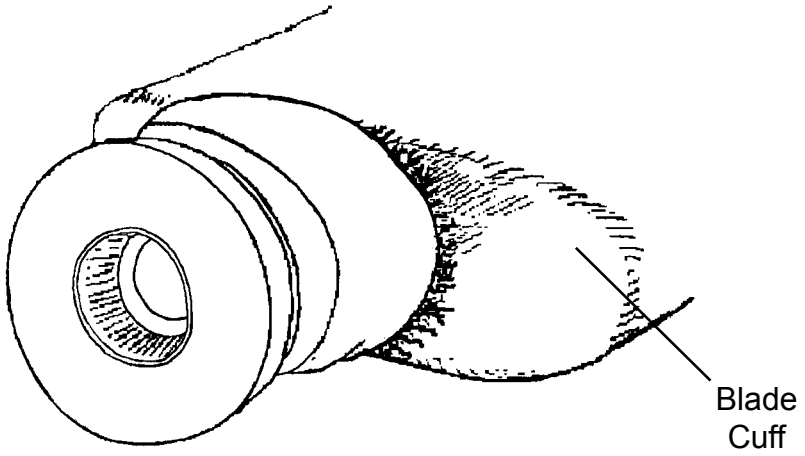
Damage Type 13: Stainless Steel Erosion Shield - Debond - For Areas of the Erosion Shield That Are Not Fastened with Screws/Rivets
Table 3-13

DAMAGE TYPE 14	
14. STAINLESS STEEL EROSION SHIELD - CADMIUM SCREW CORROSION- FOR AREAS OF THE EROSION SHIELD THAT ARE FASTENED WITH SCREWS/RIVETS	
Limits Designation	**Blade Models**
(a) Limits 1	LM10585(A)(B,K)+4 **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-3)	The maximum permitted depth of pitting is 0.010 inch (0.25 mm).	Repair within the Airworthy Damage Limits in accordance with the section, "Corroded Cadmium-Plated Screw" in the Minor Repair chapter of this manual.	Major repair is not authorized. If the pitting is greater than the Minor Repair Limits, overhaul the blade and replace the stainless steel erosion shield with a nickel erosion shield in accordance with Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 14: Stainless Steel Erosion Shield - Cadmium Screw Corrosion- For Areas of the Erosion Shield That Are Fastened with Screws/Rivets
Table 3-14



Blade Cuff
Figure 3-8

DAMAGE TYPE 15	
15. BLADE CUFF - NICKS, SCRATCHES, AND GOUGES - FOR THE ENTIRE BLADE CUFF	
Limits Designation	**Blade Models**
(a) Limits 1	LM10585(A)(B,K)+4, LM10585(A)N(B,K)+4 **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-8)	A nick, scratch, or gouge that is not associated with a debond and does not expose the foam is permitted.	Repair within the limits given for the repair procedure in accordance with the section, "Nick, Scratch, Gouge, Crack, or Delamination" in the Minor Repair chapter of this manual.	Repair within the limits given for the repair procedure in accordance with the section, "Nick, Scratch, Gouge, Crack, or Delamination" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 15: Blade Cuff - Nicks, Scratches, and Gouges
Table 3-15

DAMAGE TYPE 16	
16. BLADE CUFF - DEPRESSION - FOR THE ENTIRE BLADE CUFF	
Limits Designation	**Blade Models**
(a) Limits 1	LM10585(A)(B,K)+4, LM10585(A)N(B,K)+4 **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-8)	The maximum permitted area of a depression is 1.0 sq. inch (645 sq. mm). The maximum permitted depth of a depression is 0.25 inch (6.3 mm). A depression that is associated with a delamination is not permitted.	Minor repair is not authorized. Refer to Major Repair Limits.	Major repair is not authorized. If the depression is greater than the Airworthy Damage Limits, return the blade to Hartzell Propeller Inc. for factory only repair.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

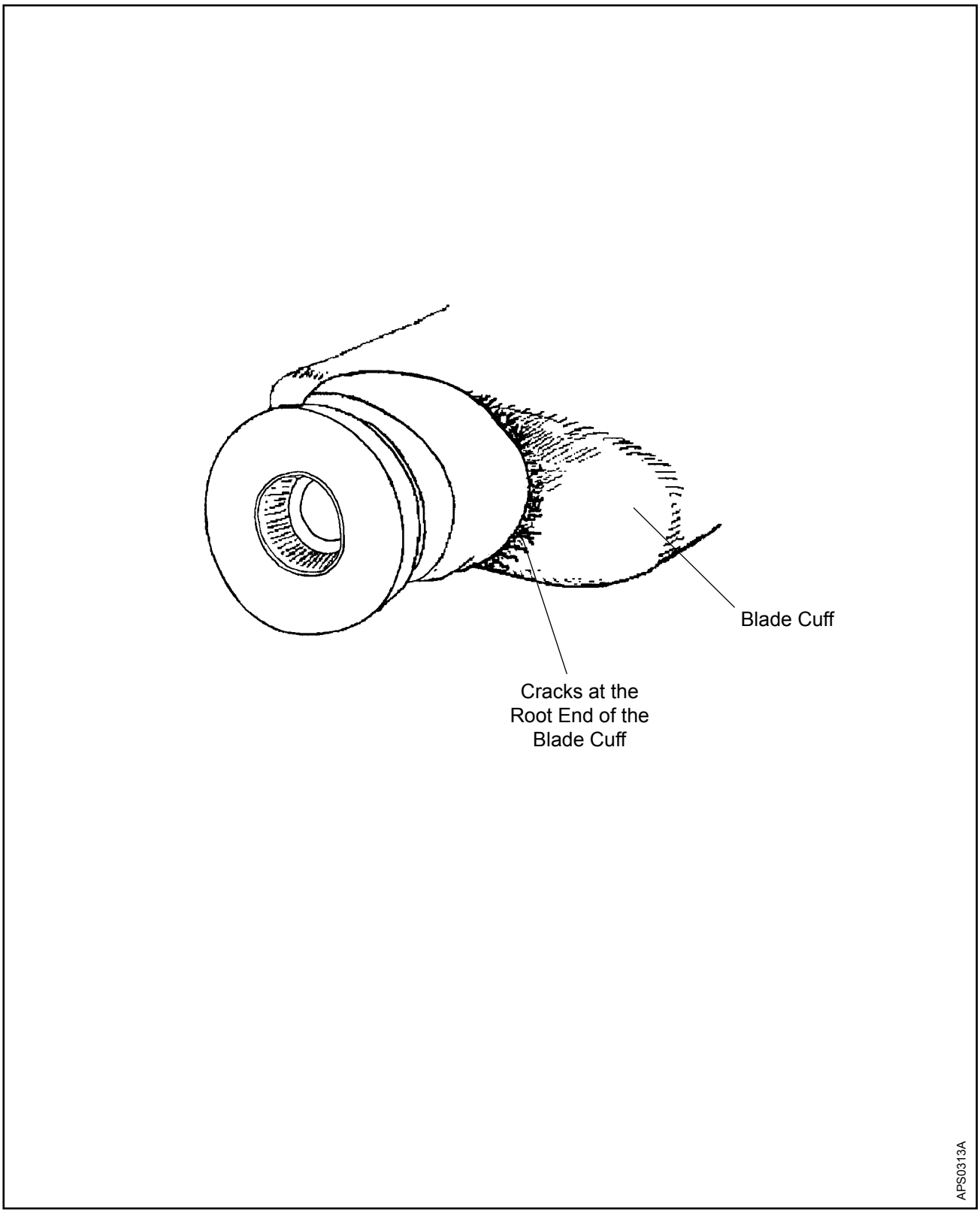
Damage Type 16: Blade Cuff - Depression
Table 3-16

DAMAGE TYPE 17	
17. BLADE CUFF - DELAMINATION - FOR THE ENTIRE BLADE CUFF	
Limits Designation	**Blade Models**
(a) Limits 1	LM10585(A)(B,K)+4, LM10585(A)N(B,K)+4 **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-8)	The maximum permitted area of a delamination is 2.0 sq. inches (1290 sq. mm).	Repair within the limits given for the repair procedure in accordance with the section, "Nick, Scratch, Gouge, Crack, or Delamination" in the Minor Repair chapter of this manual.	Repair within the limits given for the repair procedure in accordance with the section, "Nick, Scratch, Gouge, Crack, or Delamination" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 17: Blade Cuff - Delamination
Table 3-17



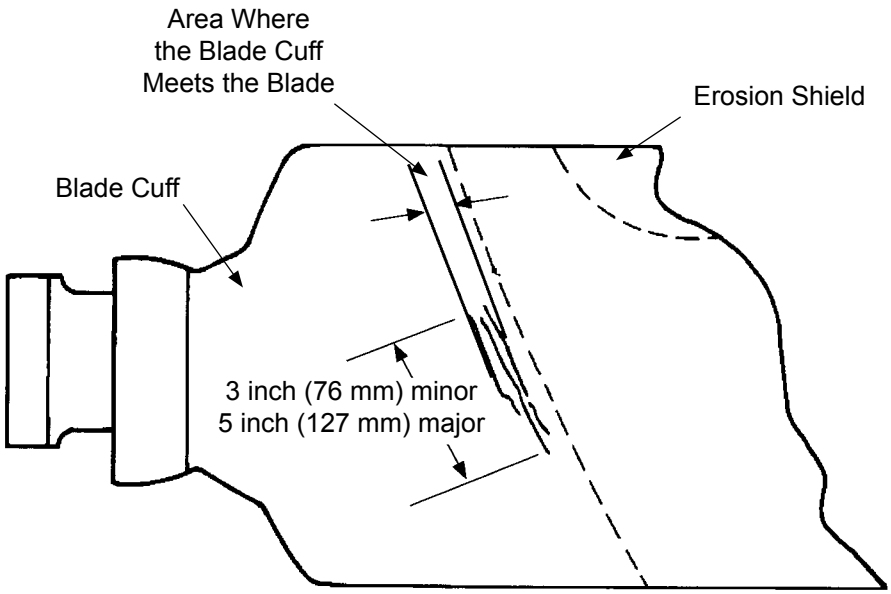
Cracks at the Root End of the Blade Cuff
Figure 3-9

DAMAGE TYPE 18	
18. BLADE CUFF - CRACKS - FOR THE AREA AT THE ROOT END BLADE CUFF	
Limits Designation	**Blade Models**
(a) Limits 1	LM10585(A)(B,K)+4, LM10585(A)N(B,K)+4 **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-9)	Cracks at the root end of the blade cuff are airworthy, but should be sealed to protect the foam from contamination until time of overhaul when the crack is permanently repaired.	For repair procedures, refer to the section, "Cracks at the Root End of the Blade Cuff" in the Minor Repair chapter of this manual.	For repair procedures, refer to the section, "Cracks at the Root End of the Blade Cuff" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 18: Blade Cuff - Cracks -
For the Area at the Root End of the Blade Cuff
Table 3-18



Cracks in the Area Where the Cuff Meets the Blade
Figure 3-10

DAMAGE TYPE 19	
19. BLADE CUFF - CRACKS - FOR THE OUTBOARD AREA WHERE THE BLADE CUFF MEETS THE BLADE	
Limits Designation	**Blade Models**
(a) Limits 1	LM10585(A)(B,K)+4, LM10585(A)N(B,K)+4 **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-9 and Figure 3-10)	Cracks in the cuff where the blade cuff meets the blade must be within the limits shown in Figure 3-10.	Cracks where the blade cuff meets the blade that are within the limits for minor repair shown in Figure 3-10 may be repaired in accordance with the section, "Nick, Scratch, Gouge, Crack, or Delamination" in the Minor Repair chapter of this manual.	Cracks where the blade cuff meets the blade that are within the limits for major repair shown in Figure 3-10 may be repaired in accordance with the section, "Nick, Scratch, Gouge, Crack, or Delamination" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35). If a crack is larger than the permitted area around where the cuff meets the blade, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 19: Blade Cuff - Cracks -
For the Outboard Area Where the Blade Cuff Meets the Blade
Table 3-19

DAMAGE TYPE 20	
20. BLADE CUFF - CRACKS - FOR AREAS OTHER THAN THE ROOT END AND WHERE THE BLADE CUFF MEETS THE BLADE	
Limits Designation	**Blade Models**
(a) Limits 1	LM10585(A)(B,K)+4, LM10585(A)N(B,K)+4 **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 (Refer to Figure 3-8)	The maximum number of cracks permitted is two. The maximum permitted length of a crack is 3.0 inches (76 mm) For a blade cuff that does not have a de-ice boot, there may not be a crack within 2.0 inches (50 mm) of the leading edge. A crack must not expose the foam. Cracks parallel to the leading edge totaling less than 6.0 inches (152 mm) in length and that do not extend beyond the inboard edge of the de-ice boot are airworthy, but must be repaired at overhaul.	A crack that is within the airworthy damage limits may be repaired in accordance with the section, "Nick, Scratch, Gouge, Crack, or Delamination" in the Minor Repair chapter of this manual.	A crack that is within the airworthy damage limits, including cracks parallel to the leading edge totaling less than 6.0 inches (152 mm) in length and that do not extend beyond the inboard edge of the de-ice boot, may be repaired in accordance with the section, "Nick, Scratch, Gouge, Crack, or Delamination" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

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Damage Type 20: Blade Cuff - Cracks -
For Areas Other than the Root End and Where the Blade Cuff Meets the Blade
Table 3-20

DAMAGE TYPE 21, page 1 of 2	
21. GOUGE OR LOSS OF COMPOSITE MATERIAL- OUTBOARD REGION OF THE BLADE	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except**: N7605(B,K)( ) and N( )7893( )
(b) Limits 2	N7605(B,K)( ) and N( )7893( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	The maximum permitted diameter or equivalent area (0.20 sq. inch or 129 sq. mm) of a gouge or loss of material is 0.500 inch (12.70 mm). The maximum permitted length of a gouge or loss of material is 2.5 inches (63 mm). The maximum permitted depth of a gouge or loss of material is 0.020 inch (0.50 mm).	The maximum permitted area of a gouge or loss of composite material is 2.0 sq. inches (1290 sq. mm). The maximum permitted depth of a gouge or loss of composite material is 0.020 inch (0.50 mm). Repair in accordance with the section, "Gouge, Delamination, or Loss of Composite Material" (For All Except N-shank Kevlar®/Carbon Hybrid Blades) in the Minor Repair chapter of this manual.	For a gouge or loss of composite material that has a maximum permitted depth of 0.020 inch (0.50 mm), the maximum permitted area is 6.0 sq. inch (3870 sq. mm). Repair in accordance with the section, "Delaminations, Gouge, or Loss of Composite Material" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35). For a gouge or loss of composite material under the erosion shield, repair in accordance with the section, "Delaminations, Gouge, or Loss of Composite Material Under the Erosion Shield" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35). If the gouge or loss of composite material is greater than the Major Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 21: Gouge or Loss of Composite Material - Outboard Region
Table 3-21, page 1 of 2

DAMAGE TYPE 21, page 2 of 2	
21. GOUGE OR LOSS OF COMPOSITE MATERIAL- OUTBOARD REGION OF THE BLADE - continued	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except**: N7605(B,K)( ) and N( )7893( )
(b) Limits 2	N7605(B,K)( ) and N( )7893( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(b) LIMITS 2	The maximum permitted diameter or equivalent area (0.20 sq. inch or 129 sq. mm) of a gouge or loss of material is 0.500 inch (12.70 mm). The maximum permitted length of a gouge or loss of material is 2.5 inches (63 mm). The maximum permitted depth of a gouge or loss of material is 0.020 inch (0.50 mm).	For a gouge or loss of composite material that does not expose the carbon layer and does not exceed the airworthy damage limits, repair in accordance with the section, "Gouges, Delaminations, or Loss of Composite Material" (For N-shank Kevlar®/Carbon Hybrid Blades Only) in the Minor Repair chapter of this manual. For a gouge or loss of composite material that does expose the carbon layer, send the blade to Hartzell Propeller Inc. for evaluation.	Major repair is not authorized. If the gouge or loss of composite material is greater than the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 21: Gouge or Loss of Composite Material - Outboard Region
Table 3-21, page 2 of 2

DAMAGE TYPE 22, page 1 of 2

**22. GOUGE OR LOSS OF COMPOSITE MATERIAL-
TRAILING EDGE FOAM AND LEADING EDGE FOAM REGIONS OF THE BLADE**

Limits Designation	Blade Models
(a) Limits 1	N7605(B,K)( ) and N( )7893( ) **only**
(b) Limits 2	N7605C(B,K)( ), NC9208( ), N( )8301( ), N( )8302( ), N( )8304( ), NC8834( ), ( )75A01( ), L76A01( )X( ), ( )79A06X( ), N76M05CX( ), NC10244( ), NC10245( ), NC10320( ), 78D01( ), 76C( )03( ), (J)NC10904( ), JNC10905( ), 91D1(5,7)( ), 86DB01( ), 76C04( ), 80C( )01( ), NC9405( ), NM8410( ), NC10445( ), GC1111(4,5)( ), 75C( )08( ), 84DB26( ), 100DD44( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 NOTE: Do not include paint when measuring the depth of a gouge or loss of composite material.	The maximum permitted diameter or equivalent area of a gouge or loss of composite material is 0.500 inch (12.70 mm). The maximum permitted length is 2.5 inch (63 mm). The maximum permitted depth is 0.020 inch (0.50 mm). Exposed foam or a delamination is not permitted.	Repair within the limits given for the repair procedure in accordance with the section, "Gouges, Delaminations, or Loss of Composite Material" (For N-shank Kevlar®/Carbon Hybrid Blades Only) in the Minor Repair chapter of this manual.	Major repair is not authorized. If the gouge or loss of composite material is greater than the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

**Damage Type 22: Gouge or Loss of Composite Material -
Trailing Edge Foam and Leading Edge Foam Regions
Table 3-22, page 1 of 2**

DAMAGE TYPE 22, page 2 of 2	
22. GOUGE OR LOSS OF COMPOSITE MATERIAL- TRAILING EDGE FOAM AND LEADING EDGE FOAM REGIONS OF THE BLADE - continued	
Limits Designation	**Blade Models**
(a) Limits 1	N7605(B,K)( ) and N( )7893( ) **only**
(b) Limits 2	N7605C(B,K)( ), NC9208( ), N( )8301( ), N( )8302( ), N( )8304( ), NC8834( ), ( )75A01( ), L76A01( )X( ), ( )79A06X( ), N76M05CX( ), NC10244( ), NC10245( ), NC10320( ), 78D01( ), 76C( )03( ), (J)NC10904( ), JNC10905( ), 91D1(5,7)( ), 86DB01( ), 76C04( ), 80C( )01( ), NC9405( ), NM8410( ), NC10445( ), GC1111(4,5)( ), 75C( )08( ), 84DB26( ), 100DD44( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(b) LIMITS 2 NOTE: Do not include paint when measuring the depth of a gouge or loss of composite material.	The maximum permitted diameter or equivalent area of a gouge or loss of composite material is 0.500 inch (12.70 mm). The maximum permitted length is 2.5 inch (63 mm). The maximum permitted depth is 0.020 inch (0.50 mm). Exposed foam or a delamination is not permitted.	Repair within the repair limits given for the repair procedure in accordance with the section, "Gouge, Delamination, or Loss of Composite Material in the Trailing Edge Foam and Leading Edge Foam Regions" (For All Except N-shank Kevlar®/Carbon Hybrid Blades) in the Minor Repair chapter of this manual.	The maximum permitted area of a gouge is 6.0 sq. inches (3870 sq. mm). The maximum permitted depth of a gouge is 0.020 inch (0.50 mm). Repair in accordance with the section,"Gouge, Delamination, or Loss of Composite Material" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35). If the gouge or loss of composite material is greater than the Major Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 22: Gouge or Loss of Composite Material - Trailing Edge Foam and Leading Edge Foam Regions
Table 3-22, page 2 of 2

DAMAGE TYPE 23, page 1 of 2	
23. GOUGE OR LOSS OF COMPOSITE MATERIAL- INBOARD REGION OF THE BLADE	
Limits Designation	**Blade Models**
(a) Limits 1	N7605(B,K)( ), N7605C(B,K)( ), N( )7893( ), E9193(B,K), NC9208( ), E13890K, N( )8301( ), N( )8302( ), N( )8304( ), NC8834( ), ( )75A01( ), L76A01( )X( ), ( )79A06X( ), N76M05CX( ), 108MH92, 138MH91, NC10244( ), NC10245( ), NC10320( ), 78D01( ), 76C( )03( ), (J)NC10904( ), JNC10905( ), 91D1(5,7)( ), 86DB01( ), 76C04( ), 80C( )01( ), NC9405( ), NM8410( ), NC10445( ), GC1111(4,5)( ), 75C( )08( ), 84DB26( ), 100DD44( ) **only**
(b) Limits 2	( )7690( ), 7890K, B7421( ), E8190K, M10083(K), A10460(E)(K), LM10585(A)(B,K)+4, LM10585(A)N(B,K)+4, M10877K, E10950P(C)(B,K), E11990K, E12902K, E12903( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1 NOTE: Do not include paint when measuring the depth of a gouge or loss of composite material.	A gouge or loss of composite material on the inboard region of the blade is unairworthy.	Minor repair is not authorized. If the gouge or loss of composite material is greater than the airworthy damage limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.	Major repair is not authorized. If the gouge or loss of composite material is greater than the airworthy damage limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 23: Gouge or Loss of Composite Material - Inboard Region
Table 3-23, page 1 of 2

DAMAGE TYPE 23, page 2 of 2	
23. GOUGE OR LOSS OF COMPOSITE MATERIAL- INBOARD REGION OF THE BLADE	
Limits Designation	**Blade Models**
(a) Limits 1	N7605(B,K)( ), N7605C(B,K)( ), N( )7893( ), E9193(B,K), NC9208( ), E13890K, N( )8301( ), N( )8302( ), N( )8304( ), NC8834( ), ( )75A01( ), L76A01( )X( ), ( )79A06X( ), N76M05CX( ), 108MH92, 138MH91, NC10244( ), NC10245( ), NC10320( ), 78D01( ), 76C( )03( ), (J)NC10904( ), JNC10905( ), 91D1(5,7)( ), 86DB01( ), 76C04( ), 80C( )01( ), NC9405( ), NM8410( ), NC10445( ), GC1111(4,5)( ), 75C( )08( ), 84DB26( ), 100DD44( ) **only**
(b) Limits 2	( )7690( ), 7890K, B7421( ), E8190K, M10083(K), A10460(E)(K), LM10585(A)(B,K)+4, LM10585(A)N(B,K)+4, M10877K, E10950P(C)(B,K), E11990K, E12902K, E12903( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(b) LIMITS 2 NOTE: Do not include paint when measuring the depth of a gouge or loss of composite material.	A gouge or loss of composite material on the inboard region of the blade is unairworthy.	The only repair permitted is for damage caused by removal of the erosion shield. Refer to the Major Repair Limits.	The maximum permitted depth of a delamination, gouge, or loss of composite material is 0.020 inch (0.50 mm). The maximum permitted area of delamination, gouge, or loss of composite material is 6.0 sq. inches (3870 sq. mm), on the inboard region of the blade that will be covered by the erosion shield. Repair in accordance with the section, "Delaminations, Gouge, or Loss of Composite Material Under the Erosion Shield" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 23: Gouge or Loss of Composite Material - Inboard Region
Table 3-23, page 2 of 2

DAMAGE TYPE 24, page 1 of 2	
24. DELAMINATION- OUTBOARD REGION OF THE BLADE THAT IS NOT COVERED BY EROSION SCREEN	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except**: N7605(B,K)( ), N( )7893( ), 138MH91
(b) Limits 2	N7605(B,K)( ), N( )7893( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	The maximum permitted area of delamination is 2.0 square inches (1290 sq. mm). On a Kevlar® blade, a dark brown stain or black stain is not permitted.	Repair within the airworthy damage limits in accordance with the section, "Gouge, Delamination, or Loss of Composite Material" (For All Except N-shank Kevlar®/Carbon Hybrid Blades) in the Minor Repair chapter of this manual.	The maximum permitted area of a delamination is 6.0 sq. inches (3870 sq. mm). The maximum permitted depth of a delamination is 0.020 inch (0.50 mm). Repair in accordance with the section, "Gouge, Delamination, or Loss of Composite Material" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35). If the damage is greater than the Major Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 24: Delamination - Outboard Region Not Covered By Erosion Screen
Table 3-24, page 1 of 2

DAMAGE TYPE 24, page 2 of 2	
24. DELAMINATION- OUTBOARD REGION OF THE BLADE THAT IS NOT COVERED BY EROSION SCREEN	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except**: N7605(B,K)( ), N( )7893( ), 138MH91
(b) Limits 2	N7605(B,K)( ), N( )7893( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(b) LIMITS 2	The maximum permitted area of delamination is 1.0 square inch (645 sq. mm)	Repair within the limits given for the repair procedure in accordance with the section, "Gouges, Delaminations, or Loss of Composite Material" (For N-shank Kevlar®/Carbon Hybrid Blades Only) in the Minor Repair chapter of this manual.	Major repair is not authorized. If the damage is greater than the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 24: Delamination - Outboard Region Not Covered By Erosion Screen
Table 3-24, page 2 of 2

DAMAGE TYPE 25	
25. DELAMINATION- OUTBOARD REGION OF THE BLADE THAT IS COVERED BY EROSION SCREEN	
Limits Designation	**Blade Models**
(a) Limits 1	M10083(K), E10950P(C)(B,K), N( )8304( ), NC8834( ), 108MH92, 138MH91, NC10244( ), NC10245( ), NC10320( ), 78D01( ), (J)NC10904( ), JNC10905( ), 91D1(5,7)( ), 86DB01( ), 76C04( ), NC10445( ), GC1111(4,5)( ), 75C( )08( ), 84DB26( ), 100DD44( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	The maximum permitted area of delamination is 2.0 square inches (1290 sq. mm). On a Kevlar® blade, a dark brown stain or black stain is not permitted.	The maximum permitted area of repair is 0.5 square inch (322 sq. mm). Repair in accordance with the section, "Erosion Screen Repair" in the Minor Repair chapter of this manual.	Major repair is not authorized. If the damage is greater than the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 25: Delamination - Outboard Region Covered By Erosion Screen
Table 3-25

DAMAGE TYPE 26	
26. DELAMINATION- TRAILING EDGE FOAM AND LEADING EDGE FOAM REGIONS OF THE BLADE	
Limits Designation	**Blade Models**
(a) Limits 1	N7605(B,K)( ), N( )7893( ) **only**
(b) Limits 2	N7605C(B,K)( ), NC9208( ), N( )8301( ), N( )8302( ), N( )8304( ), NC8834( ), ( )75A01( ), L76A01( )X( ), ( )79A06X( ), N76M05CX( ), NC10244( ), NC10245( ), NC10320( ), 78D01( ), 76C( )03( ), (J)NC10904( ), JNC10905( ), 91D1(5,7)( ), 86DB01( ), 76C04( ), 80C( )01( ), NC9405( ), NM8410( ), NC10445( ), GC1111(4,5)( ), 75C( )08( ), 84DB26( ), 100DD44( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	The maximum permitted area of delamination is 2.0 square inch (1290 sq. mm). A dark brown stain or a black stain is not permitted. The delamination must not be associated with a crack, gouge, or other damage to the composite material.	Repair within the repair limits given for the repair procedure in accordance with the section,"Gouge, Delamination, or Loss of Composite Material in the Trailing Edge Foam Region" (For N-shank Kevlar®/Carbon Hybrid Blades Only) in the Minor Repair chapter of this manual.	Major repair is not authorized. If the damage is greater than the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.
(b) LIMITS 2	The maximum permitted area of delamination is 2.0 square inch (1290 sq. mm).	Within the Airworthy Damage Limits, repair in accordance with the section, "Gouge, Delamination, or Loss of Composite Material in the Trailing Edge Foam Region" (For All Except N-shank Kevlar®/Carbon Hybrid Blades) in the Minor Repair chapter of this manual.	Major repair is not authorized. If the damage is greater than the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 26: Delamination - Trailing Edge and Leading Edge Foam Regions
Table 3-26

DAMAGE TYPE 27	
27. DELAMINATION - INBOARD REGION OF THE BLADE	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	A delamination on the inboard region of the blade is unairworthy.	Minor repair is not authorized. Retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.	Major repair is not authorized. Retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 27: Delamination - Inboard Region
Table 3-27

DAMAGE TYPE 28, page 1 of 2

**28. SPLIT TRAILING EDGE-
TIP AND TRAILING EDGE REGION OF THE BLADE**

Limits Designation	Blade Models
(a) Limits 1	N7605C(B,K)( ), ( )7690( ), 7890K, B7421( ), E8190K, NC9208( ), M10083(K), A10460(E)(K), LM10585(A)(B,K)+4, LM10585(A)N(B,K)+4, M10877K, E11990K, E12902K, E12903( ), NC8834( ), N76M05CX( ), 108MH92,138MH91, NC10244( ), NC10245( ), NC10320( ), (J)NC10904( ), JNC10905( ), 86DB01( ), NC9405( ), NC10445( ), GC1111(4,5)( ), 84DB26( ), 100DD44( ) **only**
(b) Limits 2	E10950P(C)(B,K) **only**
(c) Limits 3	E13890K, N( )8301( ), N( )8302( ), N( )8304( ), ( )75A01( ), L76A01( )X( ), ( )79A06X( ), 78D01( ), 76C( )03( ), 91D1(5,7)( ), 76C04( ), 80C( )01( ), NM8410( ), 75C( )08( ) **only**
(d) Limits 4	N7605(B,K)( ), N( )7893( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	The maximum permitted depth of a split area is 0.5 inch (12 mm). The maximum permitted length is 6.0 inches (152 mm). Damaged fibers or exposed foam are not permitted.	Damage within the Airworthy Damage Limits may be repaired in accordance with the section, "Split Trailing Edge" (For All Except N-shank Kevlar®/Carbon Hybrid Blades) in the Minor Repair chapter of this manual.	Major repair is not authorized. If the damage is greater than the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.
(b) LIMITS 2	The maximum permitted depth of a split area is 0.75 inch (19 mm). The maximum permitted length of a split area is 8.0 inches (203 mm). Damaged fibers or exposed foam is not permitted.	Damage within the Airworthy Damage Limits may be repaired in accordance with the section, "Split Trailing Edge" (For All Except N-shank Kevlar®/Carbon Hybrid Blades) in the Minor Repair chapter of this manual.	Major repair is not authorized. If the damage is greater than the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

**Damage Type 28: Split Trailing Edge - Tip and Trailing Edge Regions
Table 3-28, page 1 of 2**

DAMAGE TYPE 28, page 2 of 2

**28. SPLIT TRAILING EDGE-
TIP AND TRAILING EDGE REGION OF THE BLADE**

Limits Designation	Blade Models
(a) Limits 1	N7605C(B,K)( ), ( )7690( ), 7890K, B7421( ), E8190K, NC9208( ), M10083(K), A10460(E)(K), LM10585(A)(B,K)+4, LM10585(A)N(B,K)+4, M10877K, E11990K, E12902K, E12903( ), NC8834( ), N76M05CX( ), 108MH92,138MH91, NC10244( ), NC10245( ), NC10320( ), (J)NC10904( ), JNC10905( ), 86DB01( ), NC9405( ), NC10445( ), GC1111(4,5)( ), 84DB26( ), 100DD44( ) **only**
(b) Limits 2	E10950P(C)(B,K) **only**
(c) Limits 3	E13890K, N( )8301( ), N( )8302( ), N( )8304( ), ( )75A01( ), L76A01( )X( ), ( )79A06X( ), 78D01( ), 76C( )03( ), 91D1(5,7)( ), 76C04( ), 80C( )01( ), NM8410( ), 75C( )08( ) **only**
(d) Limits 4	N7605(B,K)( ), N( )7893( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(c) LIMITS 3	The maximum permitted depth of a split area is 0.25 inch (6.3 mm). The maximum permitted length of a split trailing edge is 2.0 inches (50 mm).Damaged fibers or exposed foam is not permitted.	Damage within the airworthy damage limits may be repaired in accordance with the section, "Split Trailing Edge" (For All Except N-shank Kevlar®/Carbon Hybrid Blades) in the Minor Repair chapter of this manual.	Major repair is not authorized. If the damage is greater than the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.
(d) LIMITS 4	The maximum permitted depth of a split area is 0.5 inch (12 mm). The maximum permitted length is 6.0 inches (152 mm). Damaged fibers or exposed foam are not permitted.	Within the Airworthy Damage Limits, repair in accordance with the section,"Split Trailing Edge" (For N-shank Kevlar®/Carbon Hybrid Blades Only) in the Minor Repair chapter of this manual.	Major repair is not authorized. If the damage is greater than the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

**Damage Type 28: Split Trailing Edge - Tip and Trailing Edge Regions
Table 3-28, page 2 of 2**

DAMAGE TYPE 29	
29. SPLIT TRAILING EDGE- INBOARD REGION OF THE BLADE	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except:** E10950P(C)(B,K)
(b) Limits 2	E10950P(C)(B,K) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	A split trailing edge on the inboard region of the blade is unairworthy.	Minor repair is not authorized. Retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.	Major repair is not authorized. Retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.
(b) LIMITS 2	The maximum permitted depth of a split area is 0.5 inch (12 mm). The maximum permitted length of a split area is 6.0 inch (152 mm). Damaged fibers or exposed foam is not permitted.	Damage within the airworthy damage limits may be repaired in accordance with the section, "Split Trailing Edge" (For All Except N-shank Kevlar®/Carbon Hybrid Blades) in the Minor Repair chapter of this manual.	Major repair is not authorized. If the damage is greater than the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.
* Special certification/licensing is required to perform major repairs. Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.			

Damage Type 29: Split Trailing Edge - Inboard Region
Table 3-29

DAMAGE TYPE 30	
30. CRUSHED OR CRACKED TRAILING EDGE- INBOARD REGION OF THE BLADE	
Limits Designation	**Blade Models**
(a) Limits 1	E10950P(C)(B,K) **only**
(b) Limits 2	ALL HARTZELL COMPOSITE BLADES **except:** E10950P(C)(B,K)

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	The maximum permitted depth of a crushed or cracked area is 0.125 inch (3.17 mm). The maximum permitted length of a crushed or cracked area is 1.0 inch (25 mm).	Within the Airworthy Damage Limits, repair in accordance with the section, "Crushed or Cracked Trailing Edge" (For All Except N-shank Kevlar®/Carbon Hybrid Blades) in the Minor Repair chapter of this manual.	The maximum permitted depth of a crushed or cracked area is 0.60 inch (15.2 mm) The maximum permitted length of a crushed or cracked area is 3.0 inches (76 mm). Repair in accordance with the section, "Crushed or Cracked Trailing Edge" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).
(b) LIMITS 2	A crushed or cracked trailing edge on the inboard region of the blade is unairworthy.	Minor repair is not authorized. Retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.	Major repair is not authorized. Retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 30: Crushed/Cracked Trailing Edge - Inboard Region
Table 3-30

DAMAGE TYPE 31, page 1 of 2

**31. CRUSHED OR CRACKED TRAILING EDGE-
OUTBOARD AND TIP REGIONS OF THE BLADE**

Limits Designation	Blade Models
(a) Limits 1	N7605(B,K)( ), ( )7690( ), 7890K, N( )7893( ),B7421( ), E8190K, , M10083(K), A10460(E)(K), LM10585(A)(B,K)+4, LM10585(A)N(B,K)+4, M10877K, E11990K, E12902K, E12903( ) **only**
(b) Limits 2	E10950P(C)(B,K) **only**
(c) Limits 3	N7605C(B,K)( ), NC9208( ), E13890K, NC8834( ), N76M05CX( ), 108MH92, 138MH91, NC10244( ), NC10245( ), NC10320( ), (J)NC10904( ), JNC10905( ), 86DB01( ), NC9405( ), NC10445( ), GC1111(4,5)( ), 84DB26( ), 100DD44( ) **only**
(d) Limits 4	N( )8301( ), N( )8302( ), N( )8304( ), ( )75A01( ), L76A01( )X( ), ( )79A06X( ), 78D01( ), 76C( )03( ), 91D1(5,7)( ), 76C04( ), 80C( )01( ), NM8410( ), 75C( )08( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	The maximum permitted depth of a crushed or cracked area is 0.25 inch (6.3 mm). The maximum permitted length of a crushed or cracked area is 2.0 inches (50 mm).	Within the Airworthy Damage Limits, repair in accordance with the section, "Crushed or Cracked Trailing Edge - Tip Region of the Blade" (For N-shank Kevlar®/Carbon Hybrid Blades Only) in the Minor Repair chapter of this manual.	The maximum permitted depth of a crushed or cracked area is 0.60 inch (15.2 mm) The maximum permitted length of a crushed or cracked area is 2.0 inches (50 mm). Repair in accordance with the section, "Crushed or Cracked Trailing Edge" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).
(b) LIMITS 2	The maximum permitted depth of a crushed or cracked area is 0.25 inch (6.3 mm). The maximum permitted length of a crushed or cracked area is 3.0 inches (76 mm).	Within the Airworthy Damage Limits, repair in accordance with the section, "Crushed or Cracked Trailing Edge" (For All Except N-shank Kevlar®/Carbon Hybrid Blades) in the Minor Repair chapter of this manual.	The maximum permitted depth of a crushed or cracked area is 0.60 inch (15.2 mm) The maximum permitted length of a crushed or cracked area is 3.0 inches (76 mm). Repair in accordance with the section, "Crushed or Cracked Trailing Edge" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

**Damage Type 31:Crushed/Cracked Trailing Edge - Outboard and Tip Regions
Table 3-31, page 1 of 2**

DAMAGE TYPE 31, page 2 of 2

**31. CRUSHED OR CRACKED TRAILING EDGE-
OUTBOARD AND TIP REGIONS OF THE BLADE**

Limits Designation	Blade Models
(a) Limits 1	N7605(B,K)( ), ( )7690( ), 7890K, N( )7893( ),B7421( ), E8190K, , M10083(K), A10460(E)(K), LM10585(A)(B,K)+4, LM10585(A)N(B,K)+4, M10877K, E11990K, E12902K, E12903( ) **only**
(b) Limits 2	E10950P(C)(B,K) **only**
(c) Limits 3	N7605C(B,K)( ), NC9208( ), E13890K, NC8834( ), N76M05CX( ), 108MH92, 138MH91, NC10244( ), NC10245( ), NC10320( ), (J)NC10904( ), JNC10905( ), 86DB01( ), NC9405( ), NC10445( ), GC1111(4,5)( ), 84DB26( ), 100DD44( ) **only**
(d) Limits 4	N( )8301( ), N( )8302( ), N( )8304( ), ( )75A01( ), L76A01( )X( ), ( )79A06X( ), 78D01( ), 76C( )03( ), 91D1(5,7)( ), 76C04( ), 80C( )01( ), NM8410( ), 75C( )08( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(c) LIMITS 3	The maximum permitted depth of a crushed or cracked area is 0.25 inch (6.3 mm). The maximum permitted length of a crushed or cracked area is 2.0 inches (50 mm).	Within the Airworthy Damage Limits, repair in accordance with the section, "Crushed or Cracked Trailing Edge" (For All Except N-shank Kevlar®/Carbon Hybrid Blades) in the Minor Repair chapter of this manual.	The maximum permitted depth of a crushed or cracked area is 0.60 inch (15.2 mm). The maximum permitted length of a crushed or cracked area is 2.0 inches (50 mm). Repair in accordance with the section, "Crushed or Cracked Trailing Edge" in the Major Repair chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).
(d) LIMITS 4	The maximum permitted depth of a crushed or cracked area is 0.25 inch (6.3 mm). The maximum permitted length of a crushed or cracked area is 2.0 inches (50 mm).	Repair within the Airworthy Damage Limits in accordance with the section,"Crushed or Cracked Trailing Edge" (For All Except N-shank Kevlar®/Carbon Hybrid Blades) in the Minor Repair chapter of this manual.	Major repair is not authorized. Retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

**Damage Type 31:Crushed/Cracked Trailing Edge - Outboard and Tip Regions
Table 3-31, page 2 of 2**

DAMAGE TYPE 32	
32. CRUSHED OR CRACKED TRAILING EDGE- TRAILING EDGE FOAM REGION OF THE BLADE	
Limits Designation	**Blade Models**
(a) Limits 1	N7605(B,K)( ), N( )7893( ) **only**
(b) Limits 2	N7605C(B,K)( ), NC9208( ), N( )8301( ), N( )8302( ), N( )8304( ), NC8834( ), ( )75A01( ), L76A01( )X( ), ( )79A06X( ), N76M05CX( ), NC10244( ), NC10245( ), NC10320( ), 78D01( ), 76C( )03( ), (J)NC10904( ), JNC10905( ), 91D1(5,7)( ), 86DB01( ), 76C04( ), 80C( )01( ), NC9405( ), NM8410( ), NC10445( ), GC1111(4,5)( ), 75C( )08( ), 84DB26( ), 100DD44( ) **only**

I

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	The maximum permitted depth of a crushed or cracked area is 0.25 inch (6.3 mm). The maximum permitted length of a crushed or cracked area is 2.0 inches (50 mm).	The maximum permitted depth of a crushed or cracked area is 0.375 inch (9.52 mm). The maximum permitted length of a crushed or cracked area is 2.0 inches (50 mm). Repair in accordance with the section, "Cracked or Crushed Trailing Edge - Foam Region of the Blade" (For N-shank Kevlar®/Carbon Hybrid Blades Only) in the Minor Repair chapter of this manual.	Major repair is not authorized. If the damage is greater than the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.
(b) LIMITS 2	The maximum permitted depth of a crushed or cracked area is 0.25 inch (6.3 mm). The maximum permitted length of a crushed or cracked area is 2.0 inches (50 mm).	The maximum permitted depth of a crushed or cracked area is 0.375 inch (9.52 mm). The maximum permitted length of a crushed or cracked area is 2.0 inches (50 mm). Repair in accordance with the section, "Cracked or Crushed Trailing Edge - Foam Region of the Blade" (For All Except N-shank Kevlar®/Carbon Hybrid Blades) in the Minor Repair chapter of this manual.	Major repair is not authorized. If the damage is greater than the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 32: Crushed/Cracked Trailing Edge - Trailing Edge Foam Region
Table 3-32

DAMAGE TYPE 33, page 1 of 3	
33. PAINT EROSION- ENTIRE BLADE	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTELL COMPOSITE BLADES **except:** ( )79A06X( ), 108MH92, 138MH91
(b) Limits 2	( )79A06X( ) **only**
(c) Limits 3	108MH92, 138MH91 **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	For the areas of the blade where there is composite material, the maximum permitted exposure of the composite material and/or of the primer filler is 5.0 square inches (3225 sq. mm). NOTE: This limit does not refer to the primer sealer (gray layer). For the areas of the blade where there is an erosion shield, paint may be missing from the entire area of the erosion shield and the blade is airworthy. For maintenance scheduling purposes, propellers with blades that show more than 5.0 square inches (3225 sq. mm) of paint erosion, may continue operation for an additional 250 hours or 30 days, whichever occurs first.	Refer to the section "Finish Procedures" in the Minor Repair chapter of this manual.	Refer to the section "Refinishing After Repair" in the Finish Procedures chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 33: Paint Erosion
Table 3-33, page 1 of 3

DAMAGE TYPE 33, page 2 of 3	
33. PAINT EROSION- ENTIRE BLADE	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTELL COMPOSITE BLADES **except:** ( )79A06X( ), 108MH92, 138MH91
(b) Limits 2	( )79A06X( ) **only**
(c) Limits 3	108MH92, 138MH91 **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(b) LIMITS 2	For the areas of the blade where there is composite material, the maximum permitted exposure of the composite material and/or of the primer filler is 5.0 square inches (3225 sq. mm). NOTE: This limit does not refer to the primer sealer (gray layer). For the areas of the blade where there is an erosion shield, paint may be missing from the entire area of the erosion shield and the blade is airworthy. For maintenance scheduling purposes, propellers with blades that show more than 5.0 square inches (3225 sq. mm) of paint erosion may continue operation for an additional 250 hours or 30 days, whichever occurs first.	Contact the airframe manufacturer for blade repair information or return the blade to Hartzell Propeller Inc.	Contact the airframe manufacturer for blade repair information or return the blade to Hartzell Propeller Inc.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 33: Paint Erosion
Table 3-33, page 2 of 3

DAMAGE TYPE 33, page 3 of 3	
33. PAINT EROSION- ENTIRE BLADE	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTELL COMPOSITE BLADES **except:** ( )79A06X( ), 108MH92, 138MH91
(b) Limits 2	( )79A06X( ) **only**
(c) Limits 3	108MH92, 138MH91 **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(c) LIMITS 3	For all areas of the blade that are protected by either an erosion shield or erosion screen, paint may be missing from the entire area and the blade is airworthy. For all other areas of the blade where there is composite material, the maximum permitted exposure of the composite material and/or of the primer filler is 5.0 sq. inches. For maintenance scheduling purposes, propellers with blades that have more than 5.0 square inches (3225 sq. mm) of paint erosion may continue operation for an additional 250 hours or 30 days, whichever occurs first.	Refer to the section "Finish Procedures" in the Minor Repair chapter of this manual.	Refer to the section "Refinishing After Repair" in the Finish Procedures chapter of Hartzell Propeller Inc. Manual 135F (61-13-35).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 33: Paint Erosion
Table 3-33, page 3 of 3

DAMAGE TYPE 34	
34. LOSS OF PAINT AND/OR FILLER MATERIAL - EROSION SHIELD ONLY	
Limits Designation	**Blade Models**
(a) Limits 1	N7605(B,K)( ),N7605C(B,K)( ), N( )7893( ), NC9208( ), N( )8301( ), N( )8302( ), N( )8304( ), NC8834( ), ( )75A01( ), L76A01( )X( ), N76M05CX( ), NC10244( ), NC10245( ), NC10320( ), 78D01( ), 76C( )03( ), (J)NC10904( ), JNC10905( ), 91D1(5,7)( ), 86DB01( ), 76C04( ), 80C( )01( ), NC9405( ), NM8410( ), NC10445( ), GC1111(4,5)( ), 75C( )08( ), 84DB26( ), 100DD44( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	Paint and/or filler material may be missing from the entire area of the erosion shield and the blade is airworthy.	Repairs may be made in accordance with the procedures for loss of paint and/or filler material in the section, "Loss of Paint and/or Filler Material" in the Minor Repair chapter of this manual.	Refer to the Minor Repair Limits.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 34: Loss of Paint/Filler Material - Erosion Shield Only
Table 3-34

DAMAGE TYPE 35	
35. MISSING EXPANDED FOIL MESH	
Limits Designation	**Blade Models**
(a) Limits 1	E13890K **only**
(b) Limits 2	N7605(B,K)( ), N( )7893( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	The expanded foil mesh may be completely missing, but the expanded foil mesh is there to minimize damage from a lightning strike. If a blade without expanded foil mesh is struck by lightning, damage will be more extensive.	Minor repair is not authorized. Refer to the Major Repair Limits.	Major repair is not authorized. Overhaul the blade and replace the expanded foil mesh in accordance with Hartzell Propeller Inc. Manual 135F (61-13-35).
(b) LIMITS 2	The expanded foil mesh may be missing because of other repairs completed in accordance with the minor repair procedures in this manual. Refer to Figures 4-16 through 4-19 in the Minor Repair chapter of this manual.	Minor repair of the foil mesh is not authorized. Send the blade to Hartzell Propeller Inc. for factory only repair.	Major repair is not authorized. Send the blade to Hartzell Propeller Inc. for factory only repair.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 35: Missing Expanded Foil Mesh
Table 3-35

DAMAGE TYPE 36	
36. MISSING EROSION SCREEN	
Limits Designation	**Blade Models**
(a) Limits 1	M10083(K), E10950P(C)(B,K), N( )8304( ), NC8834( ), 108MH92, 138MH91, NC10244( ), NC10245( ), NC10320( ), 78D01( ), (J)NC10904( ), JNC10905( ), 91D1(5,7)( ), 86DB01( ), 76C04( ), 80C( )01( ), NC9405( ), NM8410( ), NC10445( ), GC1111(4,5)( ), 75C( )08( ), 84DB26( ), 100DD44( ) **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	There are no specific airworthy damage limits for missing erosion screen. The gouge limits for the specific blade model apply in the erosion screen area.	Individual areas damaged within a 0.50 inch (12 mm) diameter, that do not exceed more than one layer of composite material in depth may be repaired in accordance with the section, "Erosion Screen Repair" in the Minor Repair chapter of this manual.	Major repair is not authorized. If the damage is greater than the limits defined in the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 36: Missing Erosion Screen
Table 3-36

DAMAGE TYPE 37	
37. DE-ICE OR ANTI-ICNG BOOT - DAMAGE, WEAR, DEBOND	
Limits Designation	**Blade Models**
(a) Limits 1	ALL HARTZELL COMPOSITE BLADES **except**: 108MH92 and 138MH91

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	Refer to Hartzell Propeller Ice Protection System Manual 180 (30-61-80).	Refer to Hartzell Propeller Ice Protection System Manual 180 (30-61-80).	Refer to Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 37: De-ice/Anti-icing Boot - Damage, Wear, Debond
Table 3-37

DAMAGE TYPE 38	
38. TERMINAL MOUNT STRAP - DEBOND AND WRINKLE	
Limits Designation	**Blade Models**
(a) Limits 1	E13890K **only**

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS	MAJOR REPAIR* LIMITS
(a) LIMITS 1	Refer to Hartzell Propeller Ice Protection System Manual 180 (30-61-80).	Refer to the section, "Repair of a Terminal Mount Strap" in the De-ice Boot chapter of Hartzell Propeller Ice Protection System Manual 180 (30-61-80).	Refer to the section, "Repair of a Terminal Mount Strap" in the De-ice Boot chapter of Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

* Special certification/licensing is required to perform major repairs.
Refer to the section, "Personnel Requirements" in the Introduction chapter of this manual.

Damage Type 38: Terminal Mount Strap - Debond and Wrinkle
Table 3-38

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MINOR REPAIR - CONTENTS

MINOR REPAIR - CONTENTS, CONTINUED

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LIST OF TABLES

MINOR REPAIR

1. General

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

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION 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 THIS MANUAL FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

NOTE: Specific Hartzell Propeller Inc. manuals and service documents are available on the Hartzell Propeller Inc. website at www.hartzellprop.com. Refer to the section, "Required Publications" in the Introduction chapter of this manual for the identification of these publications.

A. Personnel Requirements for Minor Repair

(1) For definition and personnel requirements of minor repair, refer to the Introduction chapter of this manual.

B. De-ice or Anti-icing Boot replacement

(1) De-ice or Anti-icing Boot replacement is considered minor repair.

(a) For de-ice/anti-icing boot removal and installation, refer to Hartzell Propeller Ice Protection System Manual 180 (30-61-80)

C. Cure Time, Pot Life, Storage Temperature and Shelf Life

(1) For cure time, pot life, storage temperature and shelf life of adhesives, refer to the Consumable Materials chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

D. Adhesive Used for Repairs

(1) Adhesive CM14 is used for many repairs throughout this manual.

(a) For customer convenience, CM14 is available in smaller amounts suitable for one-time use in a minor repair.

(b) For the sizes and the correct part number, refer to the Consumable Materials chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

E. Composite Blade Repair Training Videos

(1) Hartzell Propeller Inc. has created a series of instructional videos demonstrating procedures and techniques used for composite propeller blade repair.

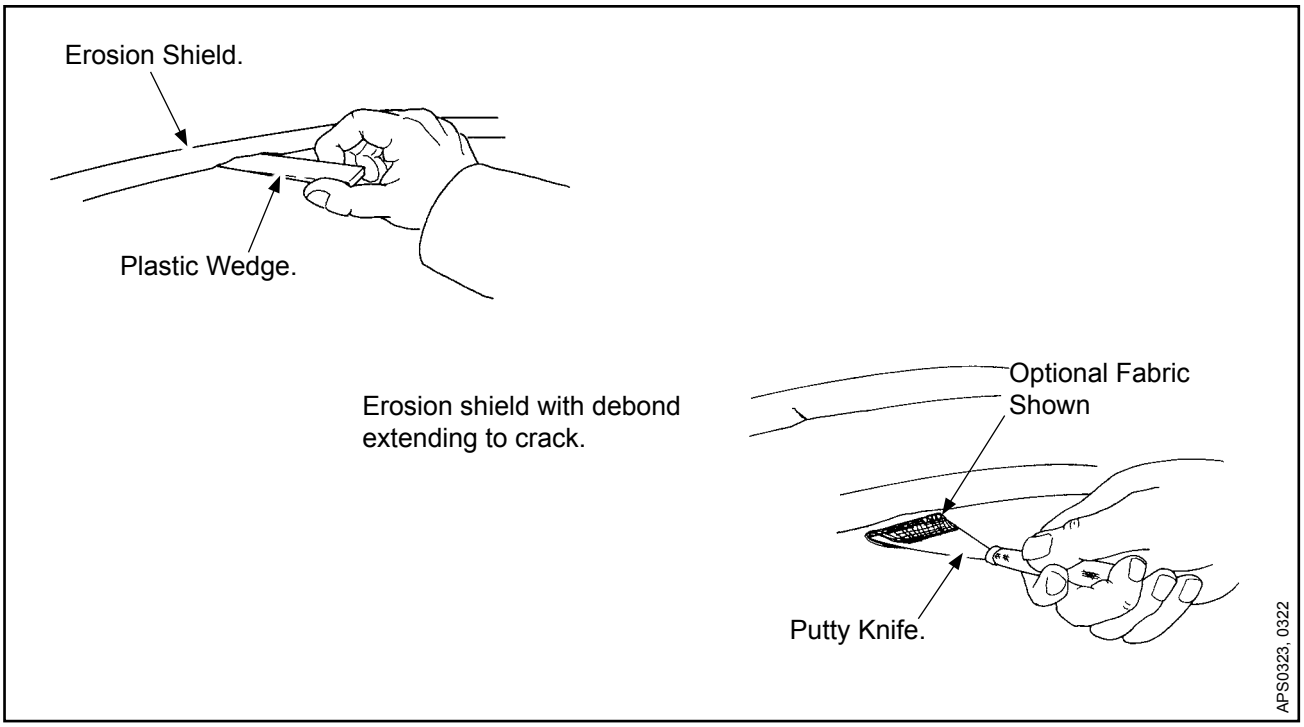
(a) These videos are available on the Hartzell Propeller Inc. website at www.hartzellprop.com.

1 The hyperlinks for the training videos listed below require an internet connection to access the Hartzell Propeller Inc. website.

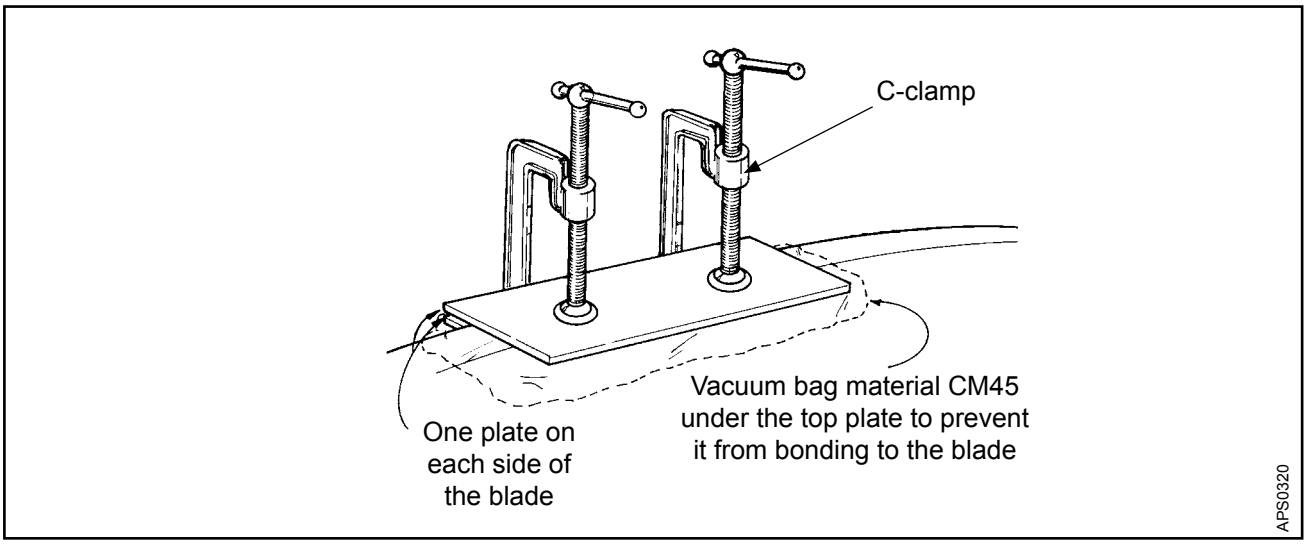
2 The QR codes can be scanned from any mobile device equipped with a QR reader application.

Training Video Description	QR Code
Carbon Gouge Repair	
Carbon Tip Repair	
Carbon Trailing Edge Foam Repair	
Kevlar Gouge Repair	
Kevlar Tip Repair	
Kevlar Trailing Edge Foam Repair	

TPI-QR



Repair of Debond at Edge of Nickel Erosion Shield
Figure 4-1



Using C-Clamps to Apply Pressure to Erosion Shield Debond Repair
Figure 4-2

2. Erosion Shield

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION 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 THIS MANUAL FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. Debond Extending to the Trailing Edge and/or a Crack

(1) General

(a) This repair may be performed in accordance with the airworthy damage limits and the minor repair limits specified in the Repair Limits chapter of this manual.

(2) Procedure (Refer to Figure 4-1)

(a) Make an inspection in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

1 Using a pencil or felt-tip marker, outline the area of the debond of the erosion shield.

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

(b) Using a small plastic wedge or equivalent, gently lift the erosion shield and clean the debonded area with solvent acetone CM173, MEK CM106, or MPK CM219.

(c) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(d) In a container that is free from contamination, mix adhesive CM14 in accordance with the manufacturer's instructions.

(e) While using one thin wedge to gently pry up the erosion shield, use a small putty knife or other thin instrument to force adhesive CM14 into the debond.

1 If the debond occurred at a crack or where the erosion shield has been physically distorted and will not return to the original position, fiberglass fabric CM42 may be used to fill the debond.

a If needed, cut fiberglass fabric CM42 so that when folded in half it is the size of the debond.

b Using adhesive CM14, saturate the fiberglass fabric CM42.

c Put the fiberglass fabric CM42 that is saturated with adhesive CM14 in the debond cavity.

(f) Remove all tooling from the debond.

(g) If the erosion shield returns to the original position, permit the adhesive CM14 to cure for 12 hours at room temperature or 2 hours at 145° ± 5° F (63° ± 2° C).

(h) If there is a hump or deformation, or if fiberglass fabric CM42 was used to fill the debond, apply pressure when curing the adhesive CM14 as follows:

1 Put a piece of vacuum bag material CM45 over the repaired area to prevent the plates from bonding to the blade. Refer to Figure 4-2.

2 Put plates made of metal, plastic, Masonite®, or other semi-rigid material over the repaired area; one on the face side and one on the camber side of the blade.

3 Put C-clamps on the plates, and tighten the C-clamps enough to apply moderate pressure to the repair.

CAUTION: MAKE SURE THAT THE RAISED PORTIONS OF THE EROSION SHIELD ARE HELD FLAT BEFORE THE ADHESIVE CURES.

4 Permit the adhesive CM14 to cure for 12 hours at room temperature or 2 hours at 145° ± 5° F (63° ± 2° C).

5 Remove the C-clamps, plates, and vacuum bag material CM45.

(i) Using no coarser than 60 grit sandpaper, sand the repaired area smooth.

(j) Make an inspection of the repaired area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

1 Delaminations or voids are not permitted.

2 If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

3 Repeat the inspections and repair until the repair is satisfactory.

(k) The repair must be within the airworthy damage limits specified in the Repair Limits chapter of this manual before being released to service.

(l) Refinish the blade in accordance with the Finish Procedures chapter of this manual.

B. Gouge

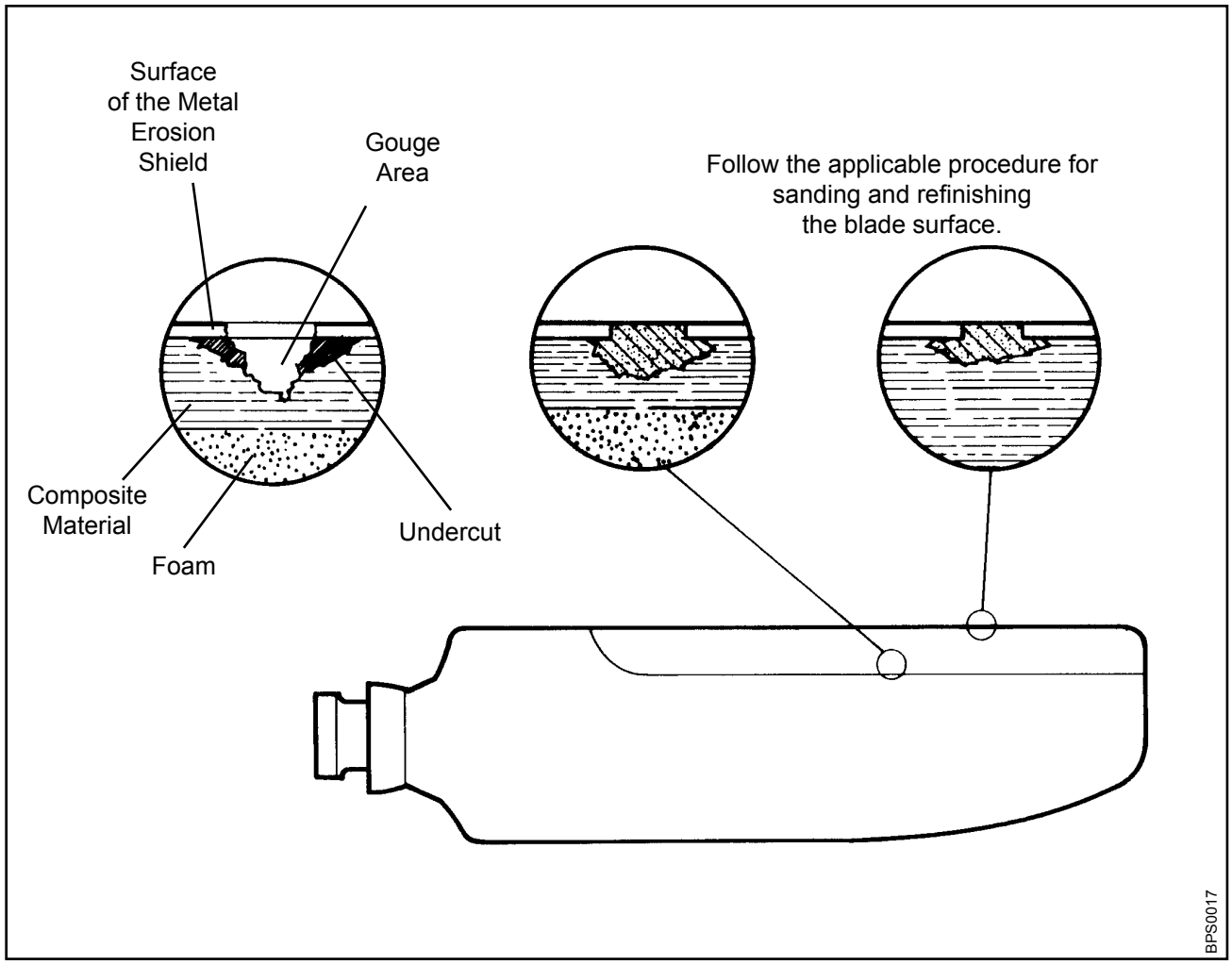
(1) General

(a) This repair may be performed in accordance with the airworthy damage limits and the minor repair limits specified in the Repair Limits chapter of this manual.

(2) Procedure (Refer to Figure 4-3).

CAUTION: DO NOT REMOVE SURFACE MATERIAL DEEPER THAN 0.020 IN (0.50 mm) INTO THE COMPOSITE MATERIAL.

(a) Using a vibratory sander and 60 to 80 grit sandpaper, remove all paint from the metal surface in the area to be repaired, if necessary, making sure to minimize abrasion to the metal surface.



Field Repair of Minor Damage in Erosion Shield
Figure 4-3

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

(b) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, wipe the area.

(c) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(d) In a container that is free from contamination, mix adhesive CM14 or CM15 in accordance with the manufacturer's directions.

CAUTION: MAKE SURE THAT THE MILLED FIBERS CM56 ARE COMPLETELY SATURATED WITH ADHESIVE CM14 OR CM15.

(e) Add to the adhesive CM14 an amount of milled fibers CM56 that is equal to the amount of adhesive, creating a paste.

1 Add adhesive CM14 to the mixture as necessary to make sure that the milled fibers CM56 are completely saturated.

(f) Fill the area to be repaired with the mixture of adhesive CM14 and milled fibers CM56.

(g) Permit the adhesive CM14 to cure for 12 hours at room temperature or two hours at 145° ± 5° F (63° ± 2° C).

(h) Using no coarser than 60 grit sandpaper, sand the repaired area smooth.

(i) Visually examine the repaired area for adhesion and correct shape.

(j) Refinish the blade in accordance with the Finish Procedures chapter of this manual.

C. Missing Area of Trail Side or Inboard End

(1) General

(a) This repair may be performed in accordance with the airworthy damage limits and the minor repair limits specified in the Repair Limits chapter of this manual.

(2) Procedure

(a) Using no coarser than 60 grit sandpaper, sand by hand the area under the missing area of the erosion shield, just enough to remove the smooth surface.

NOTE: Sanding to remove the smooth surface will permit the new composite material to adhere better.

(b) Using no coarser than 60 grit sandpaper, sand smooth any burrs, rough, or sharp areas around the missing area.

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

(c) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, wipe the area.

(d) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(e) Cut two pieces of E-glass CM55 to the shape of the missing area.

1 Alternately, four layers of fiberglass fabric CM42 may be used.

(f) Put one layer of E-glass CM55 or fiberglass fabric CM42 on the area to be repaired.

(g) Using adhesive CM14, completely saturate the layer of E-glass CM55 or fiberglass fabric CM42.

(h) Put the second layer of E-glass CM55 or fiberglass fabric CM42 on the area to be repaired, making sure that the layer is completely saturated.

1 Apply additional adhesive CM14 and layers of fiberglass fabric CM42, if necessary.

(i) Permit the adhesive CM14 to cure for 12 hours at room temperature or for 2 hours at 145° ± 5° F (63° ± 2° C).

(j) Using no coarser than 60 grit sandpaper, sand to the original shape.

(k) Make an inspection of the repaired area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

1 Delaminations or voids are not permitted.

2 If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

3 Repeat the inspections and repair until the repair is satisfactory.

(l) Refinish the blade in accordance with the Finish Procedures chapter of this manual.

D. Debond

(1) General

(a) This repair may be performed in accordance with the airworthy damage limits and the minor repair limits specified in the Repair Limits chapter of this manual.

1 If the airworthy damage limits are exceeded, replace the erosion shield with a nickel erosion shield.

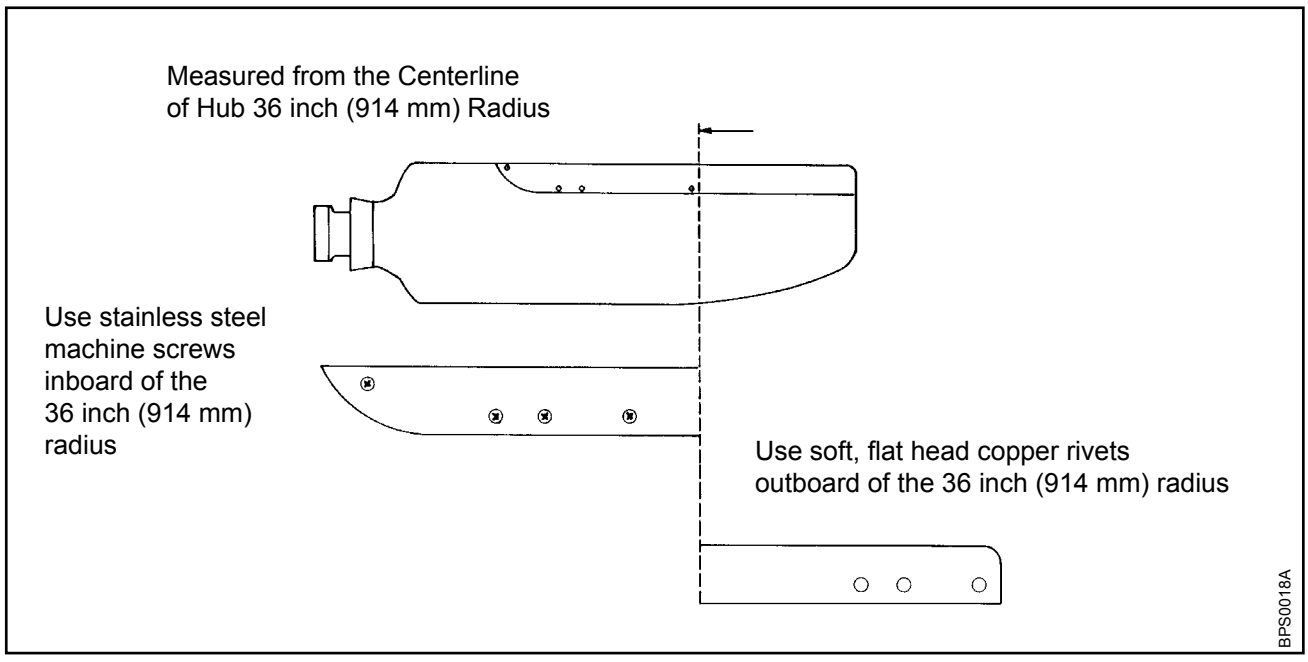
(b) If the debond is inboard of the 36 inch (914 mm) blade radius, use 6-32 x 0.375 inch stainless steel machine screws for repair.

(c) If the debond is outboard of the 36 inch (914 mm) blade radius, use copper rivets for repair.

(d) Refer to Figure 4-4 to determine the method for field repair of the stainless steel erosion shield damage.

1 It is recommended that any blade requiring rivet or screw repair have the identical repair performed to the opposite blade of a set to maintain proper balance.

a As an alternative, lead weight may be added or subtracted, or dynamic balance may be used.

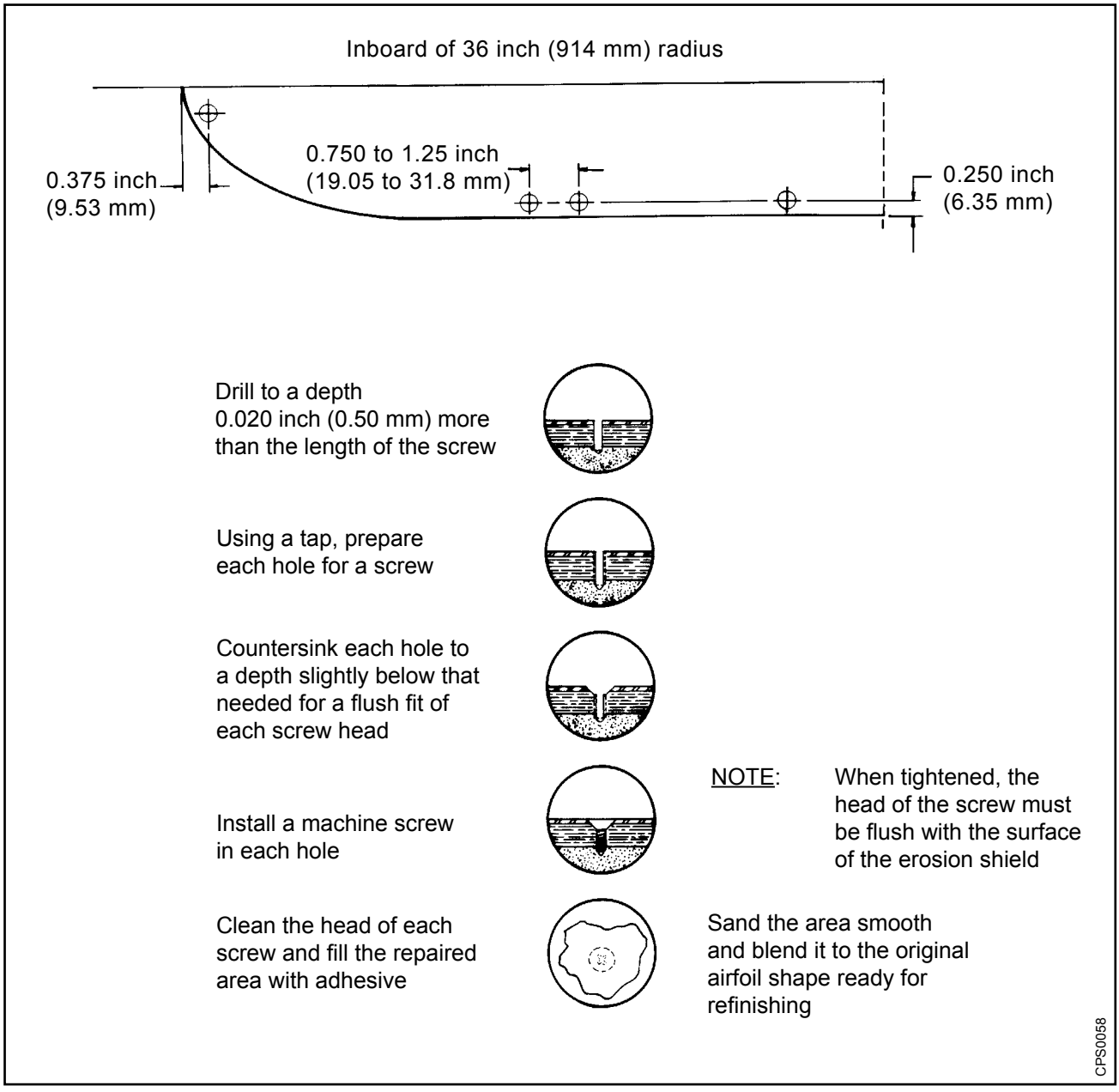


Determining Method for Repair of Stainless Steel Erosion Shield Debond
Figure 4-4

(2) Using Screws for Repair (Refer to Figure 4-5.)

CAUTION: WHEN SCREWS ARE USED TO REPAIR A DEBOND INBOARD OF THE 36 INCH (914 mm) RADIUS, MAKE SURE THEY DO NOT INTERFERE WITH RETENTION SCREWS ON THE OPPOSITE SIDE OF THE BLADE.

(a) Determine the spacing for the screws on a line 0.250 inch (6.35 mm) in from where the composite material and stainless steel erosion shield meet.



Using Screws to Repair Debond in Stainless Steel Erosion Shield
Figure 4-5

(b) Mark the location for a screw at each end of the debond.

1 Evenly space marks in between so screws will be no closer than 0.750 inch (19.05 mm) and no further apart than 1.25 inch (31.7 mm).

2 Use only the number of screws needed for adequate repair of the debond area.

(c) Center punch the erosion shield at each screw location.

(d) Using a 0.109 inch bit, drill a hole at each screw location to a depth 0.040 inch (1.016 mm) deeper than the length of the screw.

1 Penetration into the foam core is permitted, but once the foam has been penetrated, there is no reason to go deeper.

(e) Using a 6-32 tap, tap each hole.

CAUTION: DO NOT COUNTERSINK DEEPER THAN NECESSARY.

(f) Using a 0.500 inch, 90 degree countersink tool, countersink the area at each hole to a depth slightly below that needed for a flush fit of each screw head.

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

(g) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, thoroughly clean each screw.

(h) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(i) In a container that is free from contamination, mix the adhesive CM14 or CM15 in accordance with manufacturer's instructions.

(j) Put some of the adhesive CM14 or CM15 in each hole that has been prepared for a screw.

(k) Install a screw in each hole.

(l) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, clean the head of each screw and the surrounding area.

(m) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(n) Using adhesive CM14 or CM15, fill the screw heads.

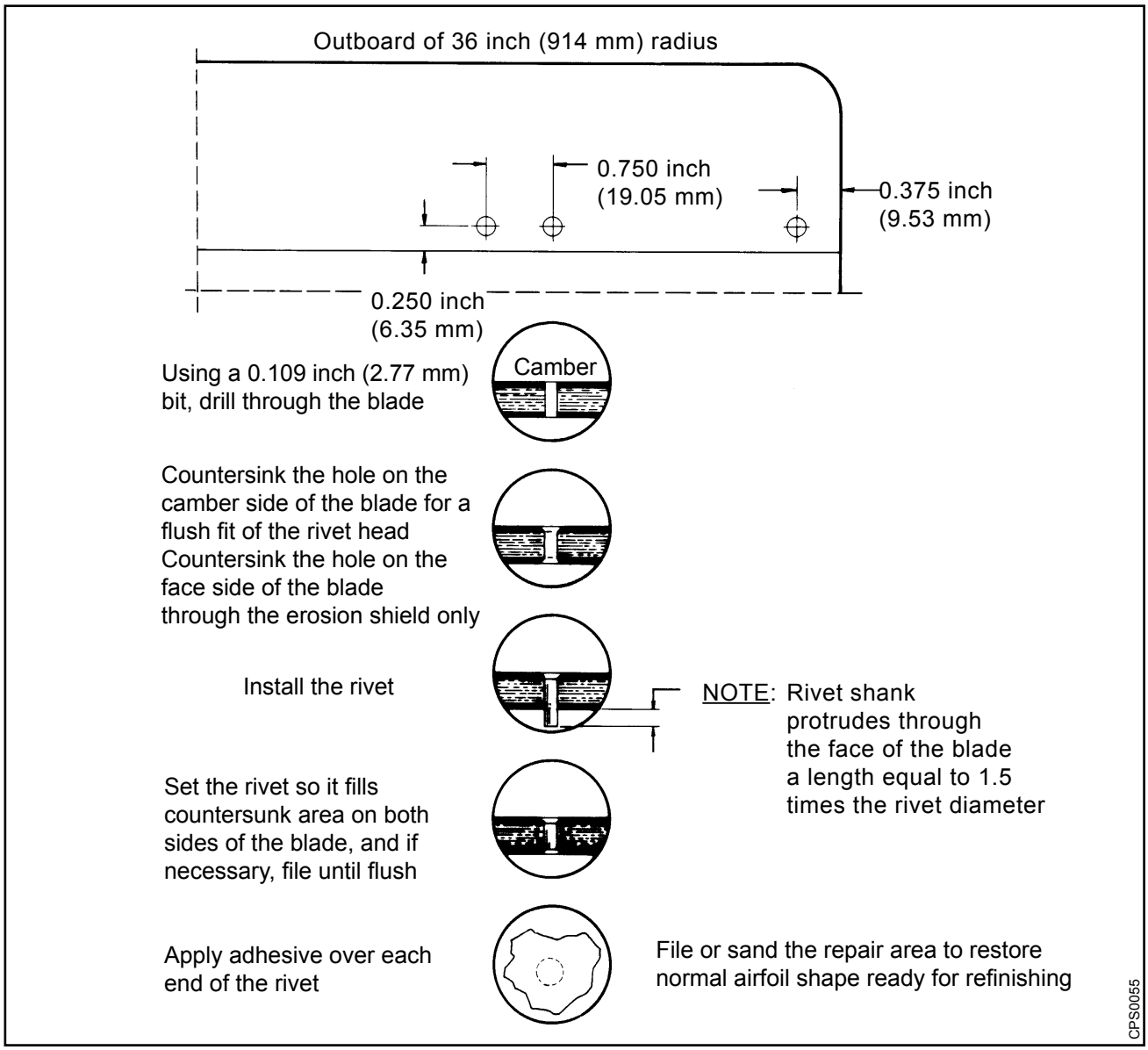
(o) Permit the adhesive CM14 or CM15 to cure for 12 hours at room temperature or 2 hours at 145° ± 5° F (63° ± 2° C).

(p) Using no coarser than 60 grit sandpaper, sand each repaired area until smooth and clean.

(q) Visually examine the repaired area to make sure that the repaired area is flush with the surrounding area.

(r) Visually examine each screw for proper set. The erosion shield must not be lifted from the blade surface.

(s) Refinish the blade in accordance with the Finish Procedures chapter of this manual.



Using Rivets to Repair Debond in Stainless Erosion Shield
Figure 4-6

(3) Using Rivets for Repair (Refer to Figure 4-6.)

(a) On the camber side of the blade, determine the spacing for rivets on a line 0.250 inch (6.35 mm) in from where the composite material and stainless steel erosion shield meet.

(b) Mark the location for a rivet at each end of the debond.

1 Evenly space marks in between so that the rivets will be no closer than 0.750 inch (19.05 mm) and no farther apart than 1.25 inch (31.8 mm).

(c) Centerpunch the erosion shield at each rivet location.

CAUTION: ALIGN THE DRILL SO THAT THE CENTERLINE OF THE EXIT HOLE IS AT LEAST 0.250 INCH (6.35 mm) FROM THE TRAILING EDGE OF THE EROSION SHIELD ON THE FACE OF THE BLADE.

(d) Using a 0.109 inch (2.769 mm) bit, drill a hole completely through the blade at each rivet location.

CAUTION: DO NOT COUNTERSINK DEEPER THAN NECESSARY.

(e) Using a 0.500 inch, 90° countersink tool on the camber side of the blade, countersink the area at each hole to a depth sufficient for chamfering the steel erosion shield to get a flush fit of the rivet head.

CAUTION: DO NOT PENETRATE THE COMPOSITE MATERIAL.

(f) On the face side of the blade, countersink through the erosion shield, making sure not to penetrate the composite material.

(g) Insert a rivet from the camber side of the blade.

(h) Make a visual examination to make sure that the rivet protrudes through a minimum of 1.5 times the diameter of the rivet.

(i) From face side of the blade, cut the rivet to the correct length.

1 The correct length of the rivet is 1.5 times the diameter of the rivet protruding from the face side.

(j) Set each rivet deep enough to fill the countersunk area on both sides of the blade.

(k) File each rivet flush with the edge on both sides of the blade as necessary.

(l) If there is a void, use the following steps:

1 In a container that is free from contamination, mix adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

2 On each side of the blade, apply a small amount of adhesive CM14 or CM15 to the end of each rivet.

3 Permit the adhesive CM14 or CM15 to cure for 12 hours at room temperature or 2 hours at 145° ± 5° F (63° ± 2° C).

(m) Using no coarser than 60 grit sandpaper, sand each repaired area until smooth.

(n) Visually examine to make sure that the repaired area is flush with the surrounding area.

(o) Visually inspect each rivet for proper set. The erosion shield must not be lifted from the blade surface.

(p) Refinish the blade in accordance with the Finish Procedures chapter of this manual.

E. Corroded Cadmium-Plated Screw

(1) General

(a) This repair may be performed in accordance with the airworthy damage limits and the minor repair limits specified in the Repair Limits chapter of this manual.

(2) Screw Repair

CAUTION: REMOVE THE LEAST POSSIBLE AMOUNT OF MATERIAL FROM A CORRODED SCREW HEAD.

(a) Using a vibratory sander with no coarser than 60 grit sandpaper, remove all of corrosion from the surface of the screw head.

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

(b) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, thoroughly clean the head of the screw.

(c) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(d) Apply a layer of primer CM67 for corrosion protection.

(e) In a container that is free from contamination, mix adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

(f) Using adhesive CM14 or CM15, fill the slot in the machine screw head and the surrounding area.

(g) Permit the adhesive CM14 or CM15 to cure for 12 hours at room temperature or 2 hours at 145° ± 5° F (63° ± 2° C).

(h) Using no coarser than 60 grit sandpaper, sand the repaired area until smooth and blended to the normal airfoil shape.

(i) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, wipe the repaired area.

(j) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(k) As necessary, refinish the blade in accordance with the Finish Procedures chapter of this manual.

(3) Screw Replacement

(a) Remove the paint primer and adhesive from the slot in the head of the screw.

CAUTION: USE A MINIMUM AMOUNT OF HEAT TO SOFTEN THE ADHESIVE THAT HOLDS THE SCREW.

(b) Heat a screwdriver to soften the adhesive that holds the screw. Insert the screwdriver into the slot, and apply gentle loosening pressure.

(c) As the pressure and heat loosen the screw, remove the screw from the blade.

(d) Retap the threaded hole.

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

(e) In a container free from contamination, mix the adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

(f) Apply a layer of adhesive CM14 or CM15 to the threads of a new screw.

(g) Insert the screw in the hole.

(h) Tighten the screw.

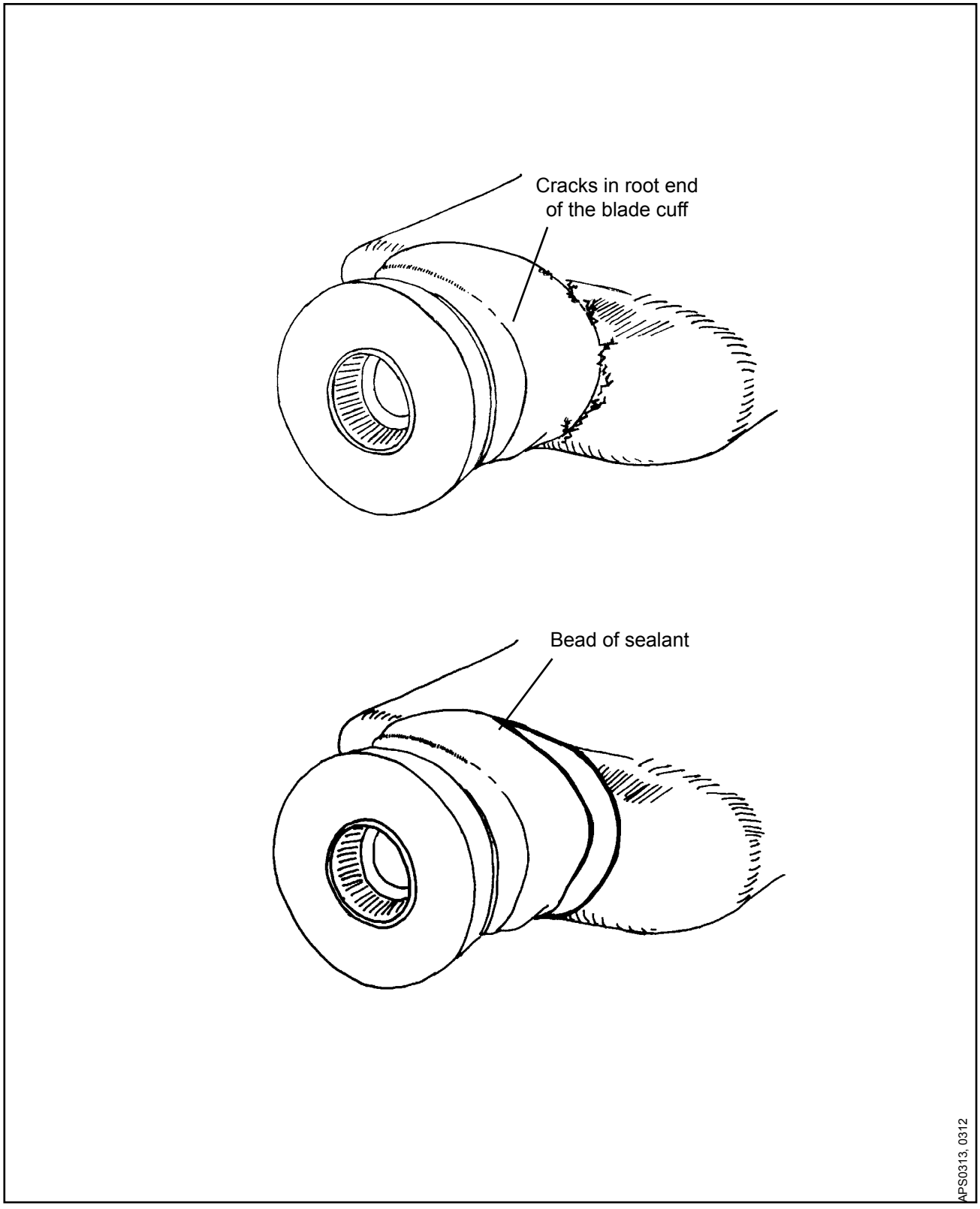
(i) Permit the adhesive CM14 or CM15 to cure for 12 hours at room temperature or 2 hours at 145° ± 5° F (63° ± 2° C).

(j) Using no coarser than 60 grit sandpaper, sand the surface area until smooth and blended into the normal airfoil shape.

(k) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, wipe the repaired area.

(l) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(m) As necessary, refinish the blade in accordance with the Finish Procedures chapter of this manual.



Blade Cuff Crack Repair
Figure 4-7

3. Blade Cuff

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION 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 THIS MANUAL FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. Cracks at the Root End of the Blade Cuff

(1) General

(a) This repair may be performed in accordance with the airworthy damage limits and the minor repair limits specified in the Repair Limits chapter of this manual.

(2) Procedure - Refer to Figure 4-7.

(a) Using no coarser than 60 grit sandpaper, sand the area by hand.

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

(b) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, clean the area.

(c) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(d) Apply a bead of sealant CM9 around the entire area of the crack, blending the sealant to the normal airfoil shape.

(e) Permit the sealant CM9 to cure.

(f) Visually examine the repaired area for correct adhesion and coverage.

CAUTION: DO NOT DISTURB THE SEALANT CM9 WHEN REFINISHING THE BLADE.

(g) Refinish the blade in accordance with the Finish Procedures chapter of this manual, being careful not to disturb the sealant.

B. Nick, Scratch, Gouge, Crack, or Delamination

(1) General

(a) The following procedure may be performed on a cuff that has no obvious damage to the foam.

(b) Repairability is determined after the damaged composite material has been removed.

(c) Following the removal of damaged composite material, repairability is determined by the amount of exposed foam, if any.

(2) Procedure

CAUTION 1: DO NOT REMOVE MATERIAL ANY DEEPER THAN NECESSARY TO FULLY REMOVE THE DAMAGE.

CAUTION 2: DO NOT REMOVE CUFF FOAM OR KEVLAR® BLADE MATERIAL.

(a) Using a grinder or sander with no coarser than 60 grit sandpaper, remove damaged composite material in the area to be repaired:

1 While removing material, make a bevel 0.25 to 0.50 inch (6.3 to 12.7 mm) for each 0.010 inch (0.25 mm) depth of damaged material removed.

2 Stop periodically and examine the progress.

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

NOTE: Wiping the area with a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219 can help to visually find the defect.

3 Stop removing material when the defect has been removed, the cuff foam has been exposed, or the Kevlar® blade material has been exposed. Refer to Figure 4-8.

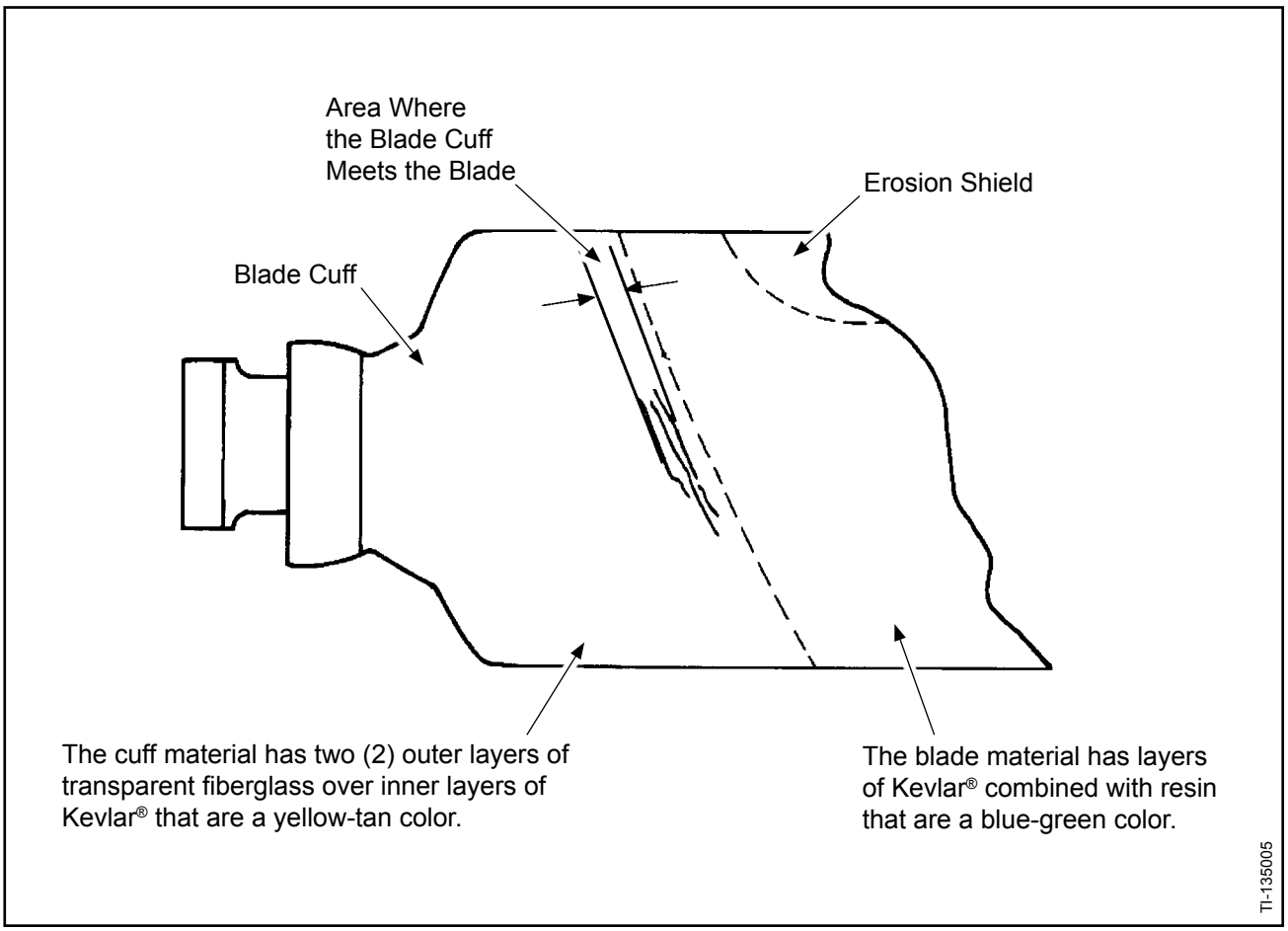
4 If the foam has been exposed:

a Visually examine the foam for damage, for example, a crack, crushed foam, or a gouge.

(1) If the foam is damaged, send the blade to Hartzell Propeller Inc. for factory only repair.

b The maximum permitted length of exposed foam is 2.0 inches (50 mm).

(1) If the amount of exposed foam is greater than the permitted limit, refer to the Major Repair Limits in the Repair Limits chapter of this manual.



Cracks in the Blade Cuff
Figure 4-8

5 If the Kevlar® blade material has been exposed:

a Visually examine the Kevlar® blade material for damage, for example, a crack or a gouge.

(1) If the Kevlar® blade material is damaged, send the blade to Hartzell Propeller Inc. for factory only repair.

b Make an inspection of the Kevlar® blade material in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

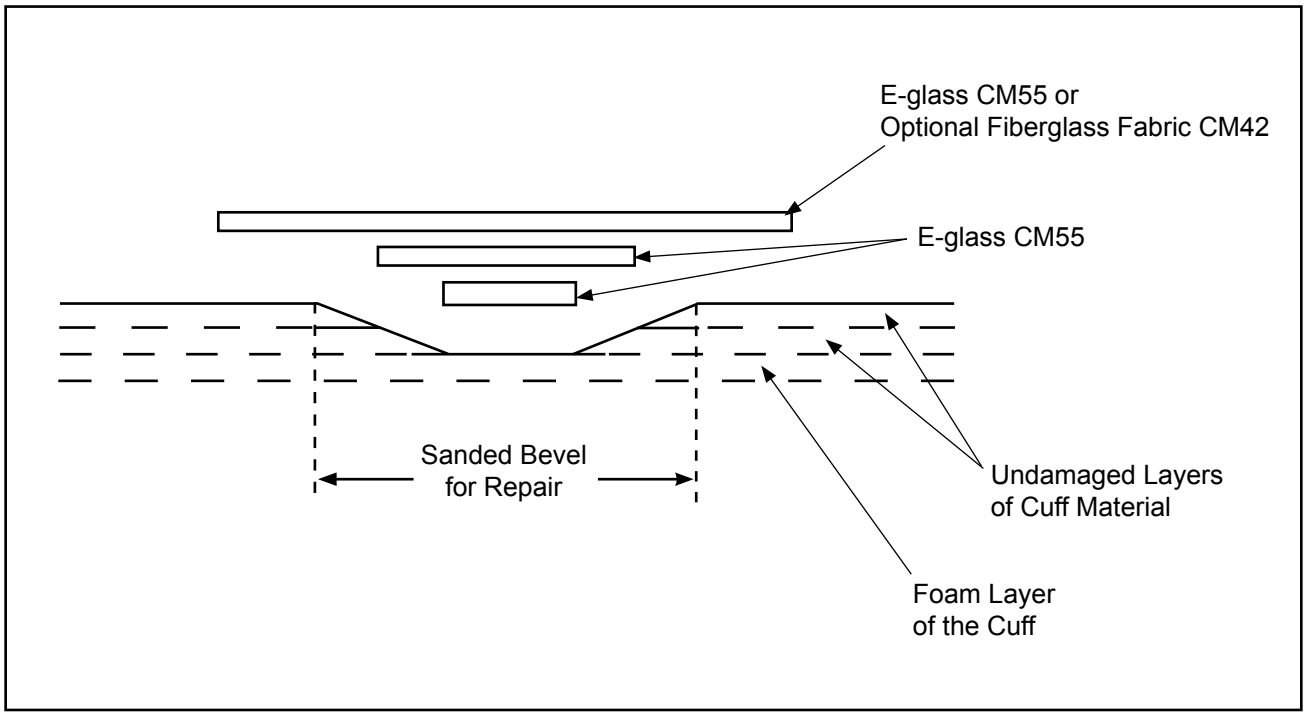
(1) If the results of the coin-tap inspection are not satisfactory, send the blade to Hartzell Propeller Inc. for factory only repair.

(b) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, wipe the area to be repaired.

(c) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(d) Cut the repair material pattern pieces.

1 Alternating the layers of E-glass CM55 at ±45 degrees, 0 - 90 degrees, cut the E-glass layer by layer to match the shape of the beveled area to create a stair step pattern when laminating. Refer to Figure 4-9.



Material Layers for a Blade Cuff Repair
Figure 4-9

2 Cut an extra layer or two of E-glass CM55, also at alternating angles, to put on top of the repair.

NOTE: The extra layers provide additional thickness that will be removed later resulting in a smooth repaired area.

a For a repair that is at the edge where the cuff and the blade meet, cut the layers of E-glass CM55 to extend onto the blade surface.

b Optionally, cut layers of fiberglass fabric CM42 that will be laminated on top of the material pattern pieces, blending the new material to the original surface.

(e) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, thoroughly clean the area to be repaired.

(f) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(g) In a container that is free from contamination, mix the adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

1 Mix enough adhesive CM14 or CM15 to perform the repair.

(h) Laminate the repair material pattern piece layers.

1 Apply adhesive CM14 or CM15 to the area to be repaired.

CAUTION: MAKE SURE THAT EACH LAYER BECOMES THOROUGHLY SATURATED WITH ADHESIVE CM14 OR CM15 AS THE LAYER LAMINATES TO THE REPAIR AREA.

2 Apply the repair material pattern piece layers over the repair area to achieve the original shape. Refer to Figure 4-9.

NOTE: The repair material pattern pieces were cut so the weave overlap direction will alternate between ±45 degrees, 0 - 90 degrees.

a Beginning with the smallest repair material pattern piece, laminate progressively larger material pattern pieces, making sure that each repair material pattern piece is thoroughly saturated before applying the next layer. Additional adhesive CM14 or CM15 may be applied if necessary.

b Optionally, laminate layers of fiberglass fabric CM42 on top of the material pattern pieces, blending the new material to the original surface.

(i) Cure the repair.

1 Permit the adhesive CM14 or CM15 to cure for 12 hours at room temperature or 2 hours at 145° ± 5° F (63° ± 2° C).

(j) Sand the repair.

CAUTION: DO NOT REMOVE ORIGINAL MATERIAL WHEN SANDING.

1 Sand the repaired area to the original shape using caution not to remove original material.

2 Using progressively finer grit sand paper, sand until the original shape is achieved.

3 Use 140 grit or finer sandpaper for final sanding.

(k) Visually examine the repaired area.

1 The repaired area must be smooth and free from wrinkles, voids, or resin rich areas.

(l) Make an inspection of the repaired area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

1 Delaminations or voids are not permitted.

2 If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

3 Repeat the inspections and repair until the repair is satisfactory.

(m) Refinish the blade in accordance with the Finish Procedures chapter of this manual.

4. Blade Repairs for All Except N-shank Kevlar®/Carbon Hybrid Blades

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION 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 THIS MANUAL FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. Gouge, Delamination, or Loss of Composite Material

NOTE: For information about composite blade repair training videos, refer to the section, "Composite Blade Repair Training Videos" in this chapter.

(1) General

(a) This repair may be performed in accordance with the minor repair limits specified in the Repair Limits chapter of this manual.

(2) Procedure

CAUTION 1: DO NOT REMOVE MATERIAL ANY DEEPER THAN NECESSARY TO FULLY REMOVE THE DAMAGE.

CAUTION 2: DO NOT SAND INTO THE UNIDIRECTIONAL (UD) MATERIAL OF THE BLADE.

(a) Using a grinder or sander with no coarser than 60 grit sandpaper, remove damaged composite material in the area to be repaired.

1 While removing material, make a bevel 0.50 to 1.00 inch (12.7 to 25.4 mm) for each 0.010 inch (0.25 mm) depth of damaged material removed.

a If the area requiring removal extends to an edge, maintain the bevel to the edge.

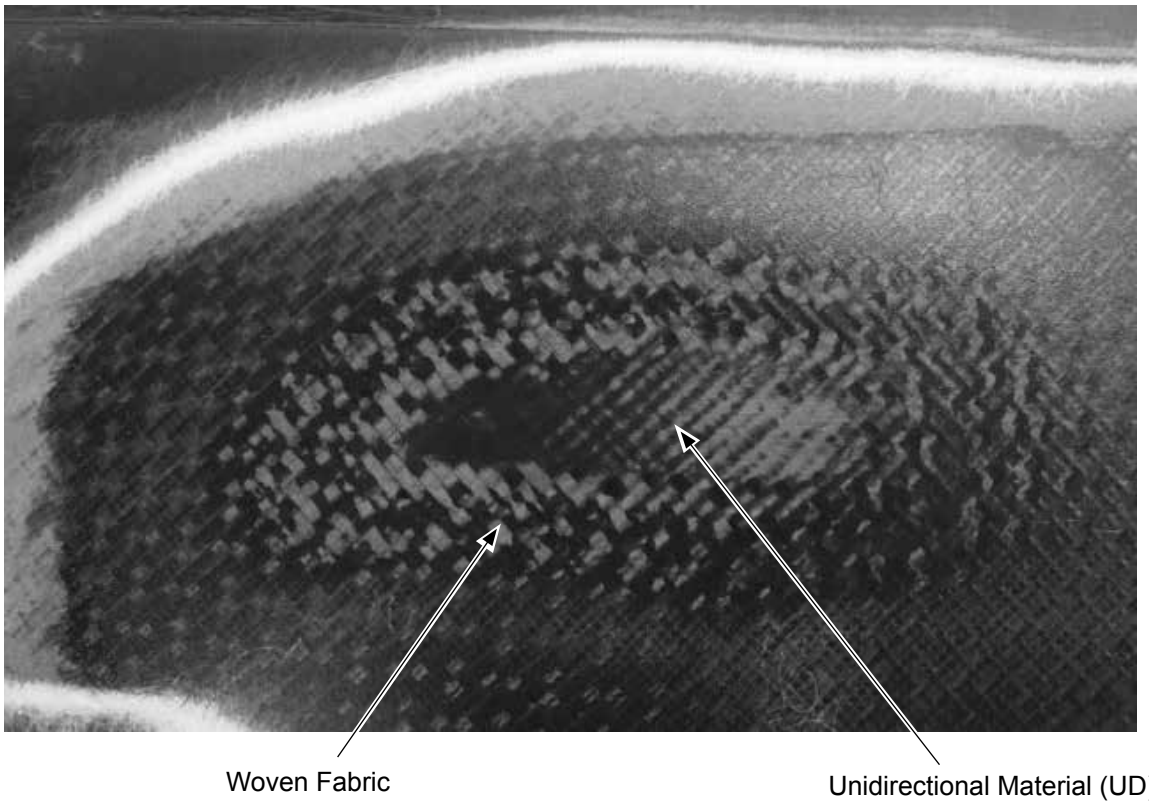
b If the area requiring removal extends outside of the original region and into another region, extend the bevel into the new region.

(1) The boundary of the region applies to the damage, not to the boundary of the repair.

2 Stop periodically and examine the progress.

NOTE: Wiping the area with a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219 can help to visually find the defect.

3 Stop removing material when the maximum permitted depth of the repair has been reached or the unidirectional (UD) material has been exposed. Refer to Figure 4-10.



NOTE: The figure shows the unidirectional material in a carbon blade.

TI-135001

Unidirectional Material and Woven Material in a Sanded Area of a Carbon Blade
Figure 4-10

4 If the UD material has been exposed:

a Examine the UD material for damage, for example, a gouge.

(1) If the UD material is damaged, repair in accordance with the section, "Gouge, Delamination, or Loss of Composite Material" in the Major Repair chapter of Hartzell Propeller Inc. Composite Blade Maintenance Manual 135F (61-13-35).

b Make an inspection of the exposed UD material in accordance with the section, "Coin-Tap Inspection" in the Check chapter of this manual.

(1) If the results of the coin-tap inspection are not satisfactory, refer to the Major Repair Limits in the Repair Limits chapter of this manual.

(b) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, wipe the area to be repaired.

(c) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

Blade Type*	Construction	Repair Material	Cured Ply Thickness
Legacy Kevlar® Blade	Kevlar®	CM55 E-Glass	0.0085 inch (0.215 mm)
Legacy Carbon Blade, except 108MH92 and 138MH91 Blade Models	Carbon	CM111 Carbon Cloth	0.0075 inch (0.190 mm)
108MH92 and 138MH91 Blade Models, Erosion Screen Areas	Carbon	CM55 E-Glass	0.0085 inch (0.215 mm)
108MH92 and 138MH91 Blade Models, Crushed Edge Areas	Carbon	CM111 Carbon Cloth	0.0075 inch (0.190 mm)
N-shank Carbon Blade	Carbon	CM111 Carbon Cloth	0.0075 inch (0.190 mm)
Bantam Blade	Carbon	CM111 Carbon Cloth	0.0075 inch (0.190 mm)
Raptor Blade	Carbon	CM111 Carbon Cloth	0.0075 inch (0.190 mm)
* For a list of blade types and the associated blade model designations, refer to the Description and Operation chapter of this manual			

Repair Materials
Table 4-1

(d) Cut the repair material pattern pieces.

1 From Table 4-1 choose the correct repair materials and make a note of the cured ply thickness.

2 Alternating the layers of repair material at ± 45 degrees, 0 - 90 degrees, cut the repair material layer by layer to match the shape of the beveled area to create a stair step pattern when laminating. Refer to Figure 4-11.

3 Cut an extra layer or two of the repair material, also at alternating angles, to put on top of the repair.

NOTE: The extra layers provide additional thickness that will be removed later resulting in a smooth repaired area.

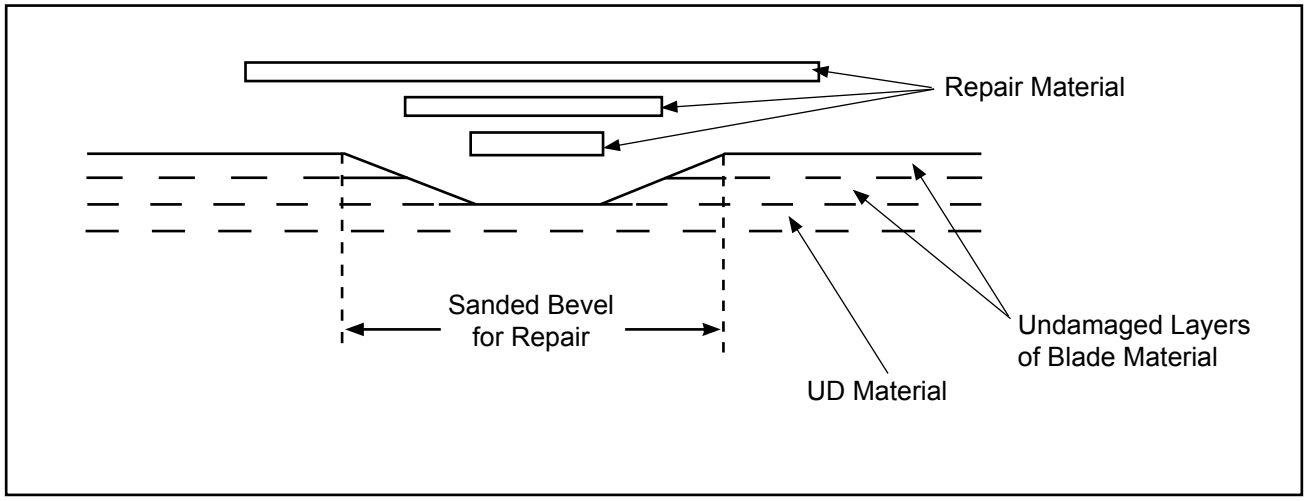
a For a Kevlar® blade only: Optionally, laminate layers of fiberglass fabric CM42 on top of the material pattern pieces, blending the new material to the original surface.

(e) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, thoroughly clean the area to be repaired.

(f) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(g) In a container that is free from contamination, mix the adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

1 Mix enough adhesive CM14 or CM15 to perform the repair.



Laminating Pattern
Figure 4-11

(h) Laminate the repair material pattern piece layers.

1 Apply adhesive CM14 or CM15 to the area to be repaired.

CAUTION: MAKE SURE THAT EACH LAYER BECOMES THOROUGHLY SATURATED WITH ADHESIVE CM14 OR CM15 AS THE LAYER LAMINATES TO THE REPAIR AREA.

2 Apply the repair material pattern piece layers over the repair area to achieve the original shape. Refer to Figure 4-11.

NOTE: The repair material pattern pieces were cut so the weave direction will alternate between ± 45 degrees, 0 - 90 degrees.

a Beginning with the smallest repair material pattern piece, laminate progressively larger material pattern pieces, making sure that each repair material pattern piece is thoroughly saturated before applying the next layer. Additional adhesive CM14 or CM15 may be applied if necessary.

b For a Kevlar® blade only: Optionally, laminate layers of fiberglass fabric CM42 on top of the material pattern pieces, blending the new material to the original surface.

(i) Cure the repair in accordance with the section, "Curing a Minor Repair in this chapter.

(j) Sand the repair.

CAUTION: DO NOT REMOVE ORIGINAL MATERIAL WHEN SANDING.

1 Sand the repaired area to the original shape using caution not to remove original material.

2 Using progressively finer grit sandpaper, sand until the original shape is achieved.

3 Use 140 grit or finer sandpaper for final sanding.

(k) Visually examine the repaired area.

1 The repaired area must be smooth and free from wrinkles, voids, or resin rich areas.

(l) Make an inspection of the repaired area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

1 Delaminations or voids are not permitted.

2 If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

3 Repeat the inspections and repair until the repair is satisfactory.

(m) Refinish the blade in accordance with the Finish Procedures chapter of this manual.

B. Gouge, Delamination, or Loss of Composite Material in the Trailing Edge Foam and Leading Edge Foam Regions

(1) General

(a) The following procedure may be performed on a blade that has no obvious damage to the foam.

(b) Repairability is determined after the damaged composite material has been removed.

(c) Following the removal of damaged composite material, repairability is determined by the amount of exposed foam, if any.

(2) Procedure

CAUTION 1: DO NOT REMOVE MATERIAL ANY DEEPER THAN NECESSARY TO FULLY REMOVE THE DAMAGE.

CAUTION 2: DO NOT SAND INTO THE FOAM MATERIAL OF THE BLADE.

(a) Using a grinder or sander with no coarser than 60 grit sandpaper, remove damaged composite material in the area to be repaired.

1 While removing material, make a bevel 0.50 to 1.00 inch (12.7 to 25.4 mm) for each 0.010 inch (0.25 mm) depth of damaged material removed.

a If the area requiring removal extends to an edge, maintain the bevel to the edge.

2 Stop periodically and examine the progress.

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

NOTE: Wiping the area with a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219 can help to visually find the defect.

3 Stop removing material when the damage has been removed or the foam material has been exposed.

4 If the foam material has been exposed:

a Visually examine the foam for damage, for example, a crack, crushed foam, or a gouge.

(1) If the foam is damaged, send the blade to Hartzell Propeller Inc. for factory only repair.

b The maximum permitted length of exposed foam is 1.0 inch (25 mm).

(1) If the amount of exposed foam is greater than the permitted limit, send the blade to Hartzell Propeller Inc. for factory only repair.

c Visually examine the composite material in the area that contacts the exposed foam material for tight adhesion to the blade. Loose material is not permitted.

(1) If there is loose material, send the blade to Hartzell Propeller Inc. for factory only repair.

d Make an inspection of the area around the exposed foam material in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

(1) If the results of the coin-tap inspection are not satisfactory, send the blade to Hartzell Propeller Inc. for factory only repair.

(b) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, wipe the area to be repaired.

(c) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(d) Cut the repair material pattern pieces.

1 From Table 4-1 choose the correct repair materials and make a note of the cured ply thickness.

2 Alternating the layers of repair material at ±45 degrees, 0 - 90 degrees, cut the repair material layer by layer to match the shape of the beveled area to create a stair step pattern when laminating. Refer to Figure 4-12.

3 Cut an extra layer or two of the repair material, also at alternating angles, to put on top of the repair.

NOTE: The extra layers provide additional thickness that will be removed later resulting in a smooth repaired area.

(e) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, thoroughly clean the area to be repaired.

(f) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(g) In a container that is free from contamination, mix the adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

1 Mix enough adhesive CM14 or CM15 to perform the repair.

(h) Laminate the repair material pattern piece layers.

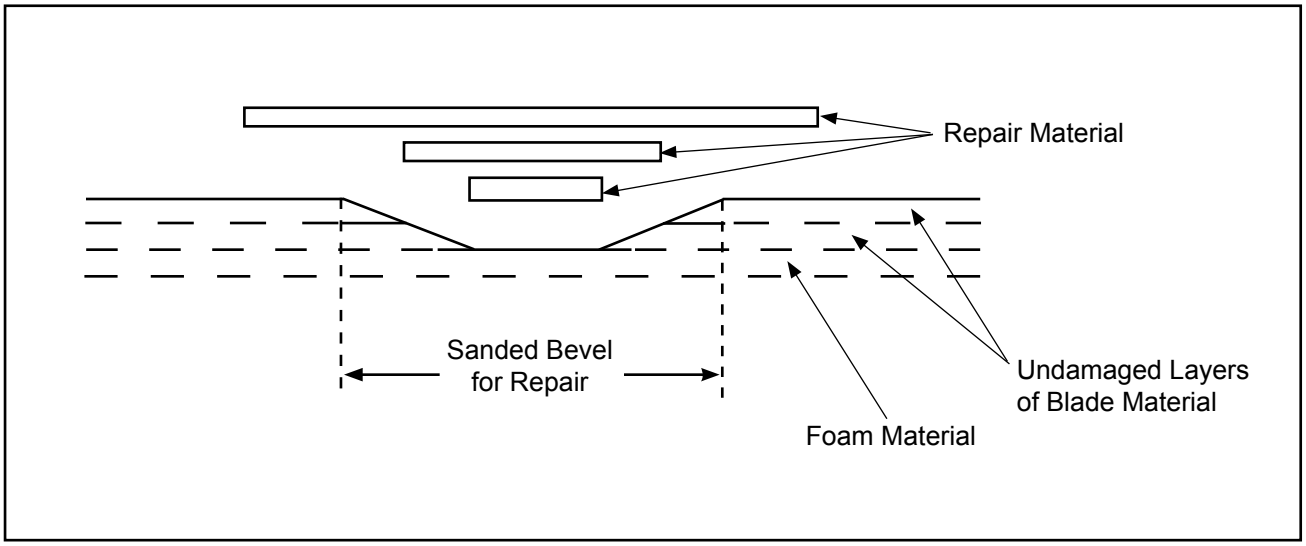
1 Apply adhesive CM14 or CM15 to the area to be repaired.

CAUTION: MAKE SURE THAT EACH LAYER BECOMES THOROUGHLY SATURATED WITH ADHESIVE CM14 OR CM15 AS THE LAYER LAMINATES TO THE REPAIR AREA.

2 Apply the repair material pattern piece layers over the repair area to achieve the original shape. Refer to Figure 4-12.

NOTE: The repair material pattern pieces were cut so the weave direction will alternate between ± 45 degrees, 0 - 90 degrees.

a Beginning with the smallest repair material pattern piece, laminate progressively larger material pattern pieces, making sure that each repair material pattern piece is thoroughly saturated before applying the next layer. Additional adhesive CM14 or CM15 may be applied if necessary.



Material Layers for a Repair in the Trailing Edge Foam
Figure 4-12

(i) Cure the repair in accordance with the section, "Curing a Minor Repair" in this chapter.

(j) Sand the repair.

CAUTION: DO NOT REMOVE ORIGINAL MATERIAL WHEN SANDING.

1 Sand the repaired area to the original shape using caution not to remove original material.

2 Using progressively finer grit sand paper, sand until the original shape is achieved.

3 Use 140 grit or finer sandpaper for final sanding.

(k) Visually examine the repaired area.

1 The repaired area must be smooth and free from wrinkles, voids, or resin rich areas.

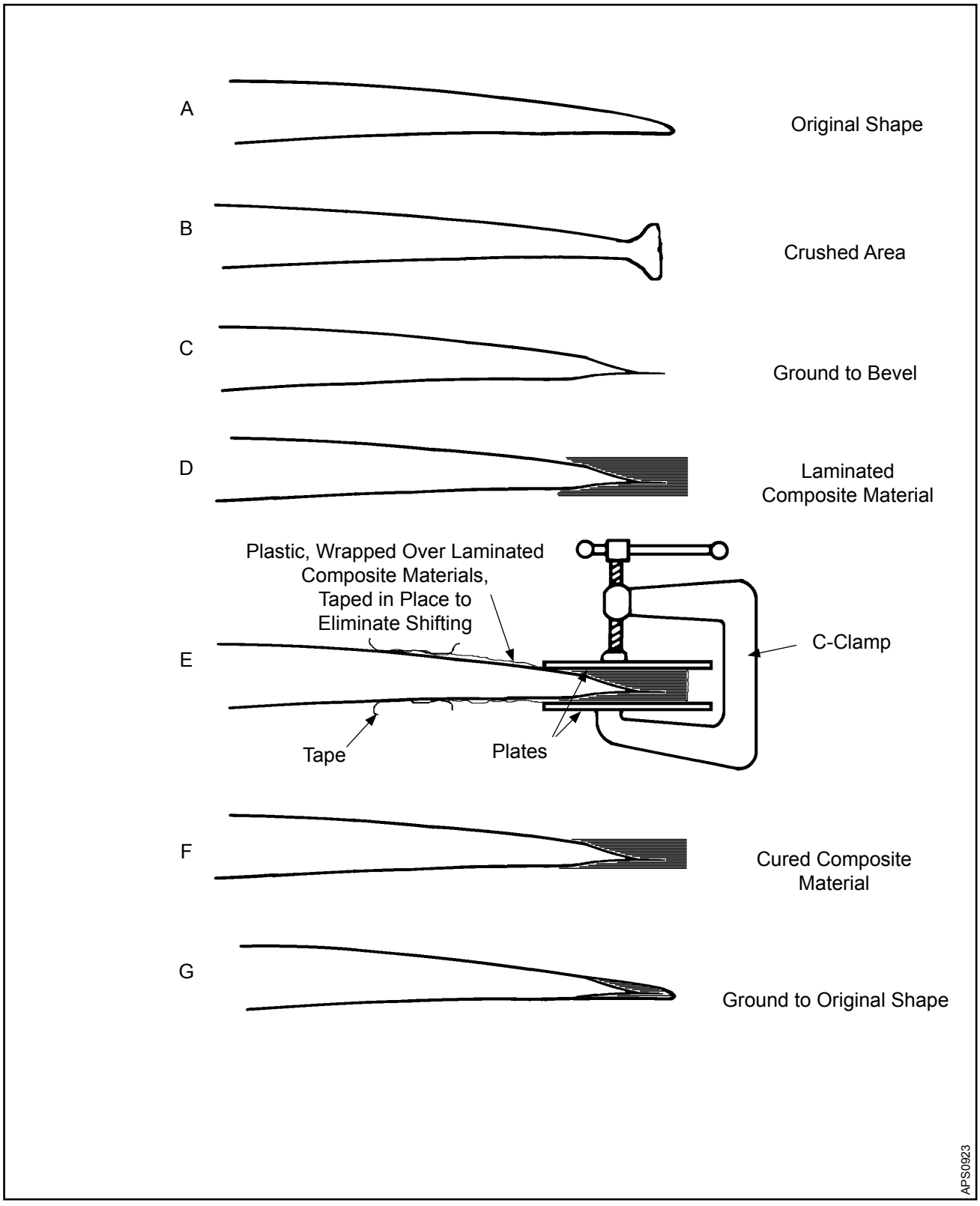
(l) Make an inspection of the repaired area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

1 Delaminations or voids are not permitted.

2 If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

3 Repeat the inspections and repair until the repair is satisfactory.

(m) Refinish the blade in accordance with the Finish Procedures chapter of this manual.



Crushed Blade Trailing Edge Repair (Cross Section View)
Figure 4-13

C. Crushed or Cracked Trailing Edge

NOTE: For information about composite blade repair training videos, refer to the section, "Composite Blade Repair Training Videos" in this chapter.

(1) General

(a) This repair may be performed in accordance with the airworthy damage limits and the minor repair limits specified in the Repair Limits chapter of this manual.

(2) Procedure

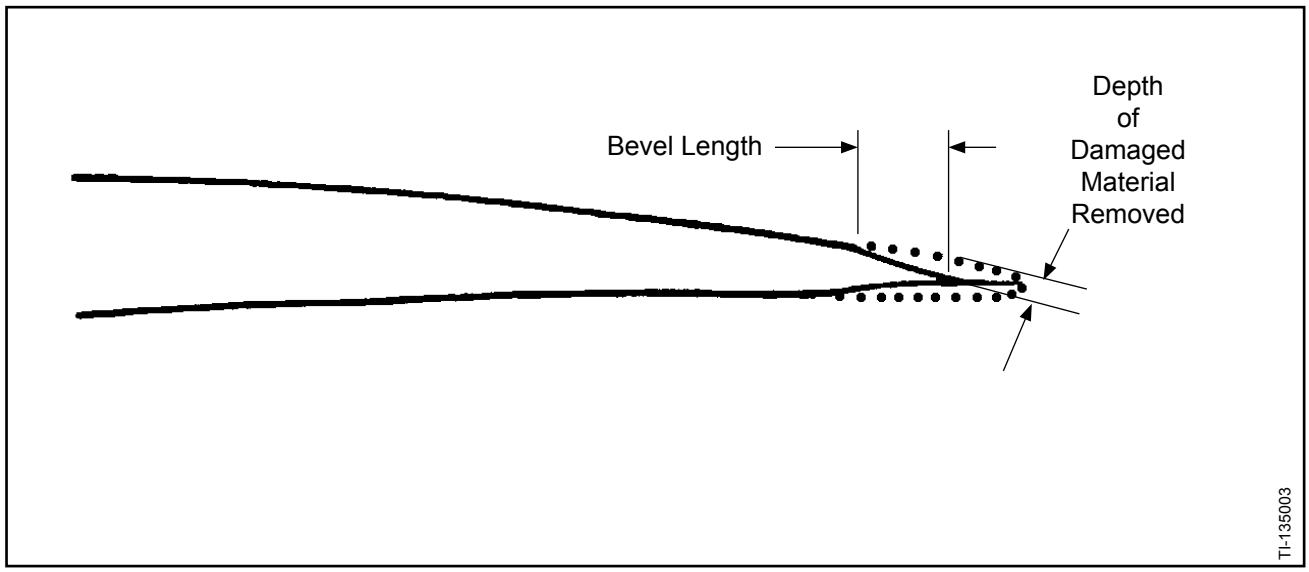
(a) Some of the blade material even though damaged, may remain on the blade.

1 If damaged material is fully intact, it should remain on the blade.

NOTE: If more than one layer remains on the blade, but the layers are separated from each other, adhesive CM14 or CM15 will be injected between these layers when the repair is made.

(b) Using a grinder or sander with no coarser than 60 grit sandpaper, remove damaged composite material in the area to be repaired.

1 While removing material, make a bevel 0.25 to 0.75 inch (6.3 to 19.0 mm) for each 0.010 inch (0.25 mm) depth of damaged material removed. Refer to Figure 4-13 and Figure 4-14.



Bevel Length and Damaged Material Depth
Figure 4-14

2 Stop periodically and examine the progress.

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

NOTE: Wiping the area with a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219 can help to visually find the defect.

3 Stop removing material when the damage has been sufficiently removed or the airworthy damage limit has been reached.

a If damaged material remains after reaching the airworthy damage limit, repair in accordance with the section, "Crushed or Cracked Blade Trailing Edge" in the Major Repair chapter of Hartzell Propeller Inc. Composite Blade Maintenance Manual 135F (61-13-35).

b Make an inspection of the area surrounding the repair area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

(1) If the results of the coin-tap inspection are not satisfactory, refer to the Major Repair Limits in the Repair Limits chapter of this manual.

(c) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, wipe the area to be repaired.

(d) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(e) Cut the repair material pattern pieces for each side of the blade.

1 From Table 4-1, choose the correct repair materials and make a note of the cured ply thickness.

2 Alternating the layers of repair material at ± 45 degrees, 0 - 90 degrees, cut the repair material layer by layer to create a stair step pattern that matches the shape of the beveled area and extends approximately 0.25 inch (6.3 mm) beyond the trailing edge of the blade. Refer to Figure 4-14.

NOTE: It is easier to apply more material than is needed instead of trying to match the shape of the blade.

3 Alternating angles, cut an extra layer or two of the repair material that is large enough to cover the repair on each side of the blade.

NOTE: The extra layers provide additional thickness that will be removed later resulting in a smooth repaired area.

(f) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, thoroughly clean the area to be repaired.

CAUTION: MAKE SURE THAT THE SOLVENT IS DRY BETWEEN THE COMPOSITE MATERIAL LAYERS, IF APPLICABLE.

(g) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

1 Additional drying time may be needed for solvent acetone CM173, MEK CM106, or MPK CM219 that is between the composite layers.

(h) In a container that is free from contamination, mix adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

1 Mix enough adhesive CM14 or CM15 to perform the repair.

(i) If applicable, inject adhesive CM14 or CM15 with a syringe CM3 between all the layers of the original material remaining in the damaged area.

(j) Laminate the repair material pattern piece layers.

1 Apply adhesive CM14 or CM15 to the area to be repaired.

CAUTION: M.AKE SURE THAT EACH LAYER BECOMES THOROUGHLY SATURATED WITH ADHESIVE CM14 OR CM15 AS THE LAYER LAMINATES TO THE REPAIR AREA.

2 Apply the repair material pattern piece layers over the repair area to achieve the original shape. Refer to Figure 4-13.

NOTE: The repair material pattern pieces were cut so the weave direction will alternate between ± 45 degrees, 0 - 90 degrees.

a Beginning with the smallest repair material pattern piece, laminate progressively larger material pattern pieces, making sure that each repair material pattern piece is thoroughly saturated before applying the next layer. Additional adhesive CM14 or CM15 may be applied if necessary.

b Laminate a layer or two of the repair material that is large enough to cover the repair.

3 Holding all of the layers firmly in place, carefully turn the blade over to the other side.

NOTE: Holding or temporarily taping a flat plate over the layers will help hold the layers in place when turning the blade.

4 Apply adhesive CM14 or CM15 to the area to be repaired.

CAUTION: MAKE SURE THAT EACH LAYER BECOMES THOROUGHLY SATURATED WITH ADHESIVE CM14 OR CM15 AS THE LAYER LAMINATES TO THE REPAIR AREA.

5 Apply the repair material pattern piece layers over the repair area to achieve the original shape. Refer to Figure 4-13.

NOTE: The repair material pattern pieces were cut so the weave direction will alternate between ± 45 degrees, 0 - 90 degrees.

a Beginning with the smallest repair material pattern piece, laminate progressively larger material pattern pieces, making sure that each repair material pattern piece is thoroughly saturated before applying the next layer. Additional adhesive CM14 or CM15 may be applied if necessary.

b Laminate a layer or two of the repair material that is large enough to cover the repair on one side of the blade and extend approximately 0.05 inch (12 mm) beyond the edge of the blade.

(k) Cure the repair in accordance with the section, "Curing a Minor Repair" in this chapter.

(l) Sand the repair.

CAUTION: DO NOT REMOVE ORIGINAL MATERIAL WHEN SANDING.

1 Sand the repaired area to the original shape using caution not to remove original material.

2 Using progressively finer grit sandpaper, sand until the original shape is achieved. Refer to Figure 4-13.

3 Use 140 grit or finer sandpaper for final sanding.

(m) Visually examine the repaired area.

1 The repaired area must be smooth and free from wrinkles, voids, or resin rich areas.

(n) Make an inspection of the repaired area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

1 Delaminations or voids are not permitted.

2 If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

3 Repeat the inspections and repair until the repair is satisfactory.

(o) Refinish the blade in accordance with the Finish Procedures chapter of this manual.

D. Crushed or Cracked Trailing Edge - Foam Region of the Blade

NOTE: For information about composite blade repair training videos, refer to the section, "Composite Blade Repair Training Videos" in this chapter.

(1) General

(a) This repair may be performed in accordance with the airworthy damage limits and the minor repair limits specified in the Repair Limits chapter of this manual.

(b) If foam is missing within the repair area, small pieces of carbon cloth CM111 will be used to replace the missing foam.

(2) Procedure

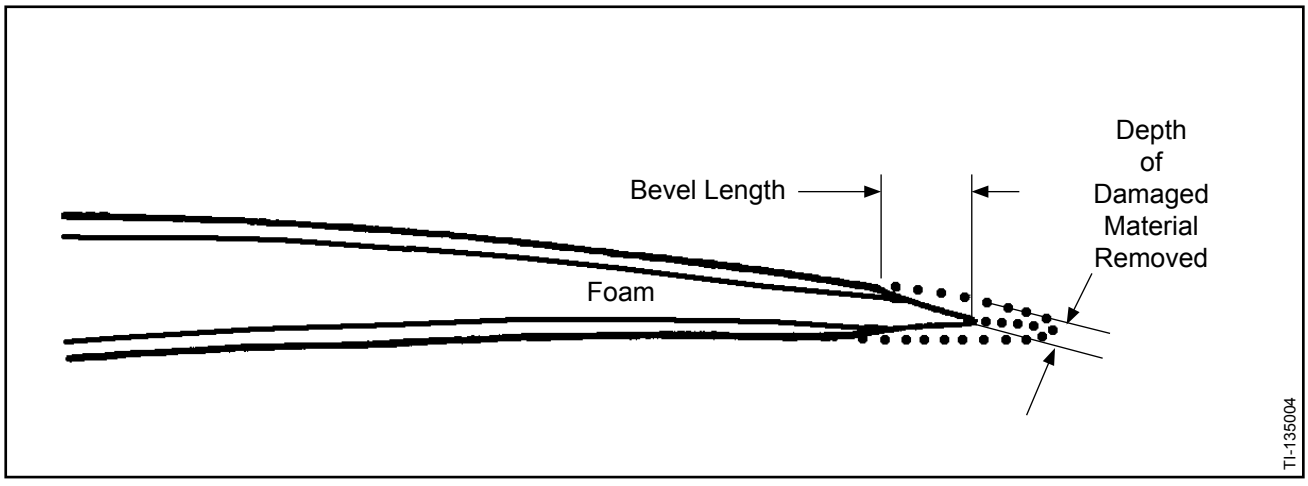
CAUTION: USE CARE WHEN GRINDING TO REMOVE MATERIAL. GRINDING MAY CAUSE DAMAGE BEYOND THE SERVICEABLE LIMITS.

NOTE: It is recommended to use 180 grit sandpaper or equivalent when removing material in and around the damaged area.

(a) Using a customer supplied small angle grinder or equivalent, remove damaged material, including damaged foam, on the camber side and face side of the blade, approximately 0.5 inch (13 mm) around the damaged area.

(b) Using a grinder or sander, remove damaged composite material to create a bevel in the area to be repaired.

1 While removing material, make a bevel that extends outward from the repair area 0.25 to 0.75 inch (6.3 to 19.0 mm) for each 0.010 inch (0.254 mm) in depth on each side of the blade. Refer to Figure 4-15.



Bevel Length and Depth of Damaged Material Removed
Figure 4-15

2 Stop periodically and examine the progress.

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

NOTE: Wiping the area with a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219 can help to visually find the defect.

3 Stop removing material when the damage has been sufficiently removed or the minor repair limit has been reached.

(c) After removing material, examine the repair area.

1 The remaining layers must be fully bonded.

2 If damaged material remains after reaching the minor repair limit, send the blade to Hartzell Propeller Inc. for factory only repair.

3 Make an inspection of the area surrounding the repair area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

a If the coin-tap inspection is not satisfactory, send the blade to Hartzell Propeller Inc. for factory only repair.

(d) Using a cloth saturated with solvent acetone CM173, MEK CM106, or MPK CM219, wipe the repair area.

(e) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(f) Cut the repair material pattern pieces for each side of the blade.

1 From Table 4-1 choose the correct repair materials and make a note of the cured ply thickness.

2 Alternating the layers of repair material at ± 45 degrees, 0 - 90 degrees, cut the repair material layer by layer to create a stair step pattern that matches the shape of the beveled area and extends approximately 0.25 inch (6.3 mm) beyond the trailing edge of the blade. Refer to Figure 4-15.

NOTE: It is easier to apply more material than is needed instead of trying to match the shape of the blade.

3 Alternating angles, cut an extra layer or two of the repair material that is large enough to cover the repair on each side of the blade.

NOTE: The extra layers provide additional thickness that will be removed later resulting in a smooth repaired area.

(g) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, thoroughly clean the area to be repaired.

(h) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(i) In a container that is free from contamination, mix adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

1 Mix enough adhesive CM14 or CM15 to perform the repair.

(j) Laminate the repair material pattern piece layers.

1 Apply adhesive CM14 or CM15 to the area to be repaired.

CAUTION: MAKE SURE THAT EACH LAYER BECOMES THOROUGHLY SATURATED WITH ADHESIVE CM14 OR CM15 AS THE LAYER LAMINATES TO THE REPAIR AREA.

2 Apply the repair material pattern piece layers over the repair area to achieve the original shape. Refer to Figure 4-13.

NOTE: The repair material pattern pieces were cut so the weave direction will alternate between ± 45 degrees, 0 - 90 degrees.

a Beginning with the smallest repair material pattern piece, laminate progressively larger material pattern pieces, making sure that each repair material pattern piece is thoroughly saturated before applying the next layer. Additional adhesive CM14 or CM15 may be applied if necessary.

b Laminate a layer or two of the repair material that is large enough to cover the repair.

3 Holding all of the layers firmly in place, carefully turn the blade over to the other side.

NOTE: Holding or temporarily taping a flat plate over the layers will help hold the layers in place when turning the blade.

4 Apply adhesive CM14 or CM15 to the area to be repaired.

CAUTION: MAKE SURE THAT EACH LAYER BECOMES THOROUGHLY SATURATED WITH ADHESIVE CM14 OR CM15 AS THE LAYER LAMINATES TO THE REPAIR AREA.

5 Using very small pieces of repair material, fill in the area where foam is missing, if applicable.

6 Apply the repair material pattern piece layers over the repair area to achieve the original shape. Refer to Figure 4-15.

NOTE: The repair material pattern pieces were cut so the weave direction will alternate between ±45 degrees, 0 - 90 degrees.

a Beginning with the smallest repair material pattern piece, laminate progressively larger material pattern pieces, making sure that each repair material pattern piece is thoroughly saturated before applying the next layer. Additional adhesive CM14 or CM15 may be applied if necessary.

b Laminate a layer or two of the repair material that is large enough to cover the repair.

CAUTION: DO NOT USE OPTION NO. 2, BLADE REPAIR BLANKET CURE WHEN CURING A TRAILING EDGE FOAM REPAIR.

(k) Cure the repair in accordance with the section, "Curing a Minor Repair" in this chapter.

(l) Sand the repair.

CAUTION: DO NOT REMOVE ORIGINAL MATERIAL WHEN SANDING.

1 Sand the repaired area to the original shape using caution not to remove original material.

2 Using progressively finer grit sandpaper, sand until the original shape is achieved. Refer to Figure 4-13.

3 Use 140 grit or finer sandpaper for final sanding.

(m) Visually examine the repaired area.

1 The repaired area must be smooth and free from wrinkles, voids, or resin rich areas.

(n) Make an inspection of the repaired area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

1 Delaminations or voids are not permitted.

2 If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

3 Repeat the inspections and repair until the repair is satisfactory.

(o) Refinish the blade in accordance with the Finish Procedures chapter of this manual.

E. Split Trailing Edge

(1) General

(a) This repair may be performed in accordance with the airworthy damage limits and the minor repair limits specified in the Repair Limits chapter of this manual.

(2) Procedure

(a) Using a clean tongue depressor, utility knife, or other similar tool, gently pry apart the split edge and remove any contaminates.

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

(b) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, wipe the repair area.

CAUTION: MAKE SURE THAT THE SOLVENT IS DRY BETWEEN THE COMPOSITE MATERIAL LAYERS, IF APPLICABLE.

(c) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

1 Additional drying time may be needed for solvent acetone CM173, MEK CM106, or MPK CM219 that is between the composite layers.

(d) In a container that is free from contamination, mix adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

(e) Using adhesive CM14 or CM15 in a syringe CM3, inject as much adhesive as possible in the split, making sure of coverage of the entire surface.

1 Alternately, push the adhesive CM14 or CM15 into the split using a clean, flat tool.

(f) For a Kevlar® blade only: Optionally, laminate layers of fiberglass fabric CM42 on top of the material pattern pieces on one side of the blade and fold the fiberglass fabric CM42 over to the other side of the blade, blending the new material to the original surface.

NOTE: Using the CM42 helps prevent fuzzing of the Kevlar® material when sanding the repaired area.

(g) Cure the repair in accordance with the section, "Curing a Minor Repair" in this chapter.

(h) Sand the repair.

CAUTION: DO NOT REMOVE ORIGINAL BLADE MATERIAL WHEN SANDING.

1 Using no coarser than 60 grit sandpaper, sand to remove excess adhesive CM14 or CM15 and fiberglass fabric CM42 if applicable.

a After the final sanding the blade must have a smooth surface.

(i) Visually examine the repaired area to make sure that it is the original airfoil shape.

1 If the original airfoil shape is not achieved, send the blade to Hartzell Propeller Inc. for factory only repair.

(j) Make an inspection of the repaired area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

a Delaminations or voids are not permitted.

b If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

c Repeat the inspections and repair as necessary until the repair is satisfactory.

(k) Refinish the blade in accordance with the Finish Procedures chapter of this manual.

F. Frayed Trail Edge

(1) General

(a) This repair may be performed in accordance with the airworthy damage limits and the minor repair limits specified in the Repair Limits chapter of this manual.

(2) Repair Procedure

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

(a) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, clean the area.

(b) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(c) In a container that is free from contamination, mix adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

(d) Apply adhesive CM14 or CM15 directly on the frayed area.

1 If necessary, laminate with fiberglass fabric CM42 that has been saturated in adhesive CM14 to achieve the original airfoil shape.

(e) Permit the adhesive CM14 or CM15 to cure for 12 hours at room temperature or for 2 hours at 145° ± 5° F (63° ± 2° C).

(f) Using no coarser than 60 grit sandpaper, sand the repaired area until smooth.

(g) Make an inspection of the repaired area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

1 Delaminations or voids are not permitted.

2 If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

3 Repeat the inspections and repair as necessary until the repair is satisfactory.

(h) Refinish the blade in accordance with the Finish Procedures chapter of this manual.

G. Resin Cracks in the Trail Edge for Model M10877K Only

(1) General

(a) This procedure may be performed in the area shown in Figure 4-16.

(2) Repair Procedure

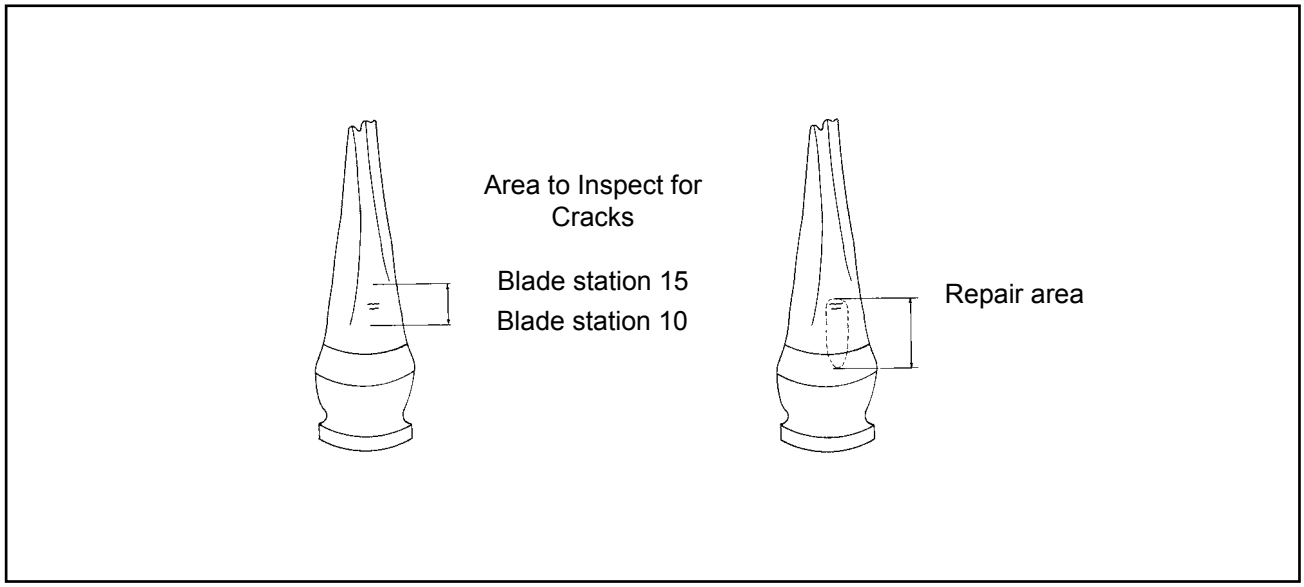
CAUTION: DO NOT REMOVE ANY KEVLAR® MATERIAL FROM BLADE SURFACE.

(a) Using 140 grit sandpaper, sand the area around the cracks to remove the paint in the area where the repair will be performed.

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

(b) Using a clean cloth dampened with solvent acetone CM173, MEK CM106, or MPK CM219, wipe the area.

(c) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.



Typical Cracks and Area of Repair
Figure 4-16

(d) Cut the repair material pattern pieces.

1 Cut the first layer of fiberglass fabric CM55 at ± 45 degrees to the centerline of the blade when applied to extend 0.5 inch (12.7 mm) beyond the crack.

2 Cut a second layer of fiberglass fabric CM55 at ± 45 degrees to the centerline of the blade when applied to extend 1 inch (25 mm) beyond the cracks.

3 Cut two layers of fiberglass fabric CM42 to extend 0.5 inch (12.7 mm) beyond the above layers with fibers at ± 90 degrees to help feather in material.

(e) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, thoroughly clean the area to be repaired.

(f) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(g) In a container free from contamination, mix adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

1 Mix enough adhesive CM14 or CM15 to perform the repair.

(h) Laminate the repair material pattern piece layers.

1 Apply adhesive CM14 or CM15 to the area to be repaired.

CAUTION: MAKE SURE THAT EACH LAYER BECOMES THOROUGHLY SATURATED WITH ADHESIVE CM14 OR CM15 AS THE LAYER LAMINATES TO THE REPAIR AREA.

2 Apply the repair material pattern piece layers over the repair area to achieve the original shape.

NOTE: The repair material pattern pieces were cut so the weave direction will alternate between ± 45 degrees, 0 - 90 degrees.

a Apply the layers of fiberglass CM55 to the blade, making sure that each layer is thoroughly saturated before applying the next layer. Additional adhesive CM14 or CM15 may be applied if necessary.

b Apply the layers of fiberglass fabric CM42 to the blade, making sure that each layer is thoroughly saturated before applying the next layer. Additional adhesive CM14 or CM15 may be applied if necessary.

(i) Cure the repair in accordance with the section, "Curing a Minor Repair" in this chapter.

(j) Sand the repair.

CAUTION: DO NOT REMOVE ORIGINAL MATERIAL WHEN SANDING.

1 Sand the repaired area to the original shape using caution not to remove original material.

2 Using progressively finer grit sandpaper, sand until the original shape is achieved. Refer to Figure 4-13.

3 Use 140 grit or finer sandpaper for final sanding.

(k) Visually examine the repaired area.

1 The repaired area must be smooth and free from wrinkles, voids, or resin rich areas.

(l) Make an inspection of the repaired area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

1 Delaminations or voids are not permitted.

2 If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

3 Repeat the inspections and repair until the repair is satisfactory.

(m) Refinish the blade in accordance with the Finish Procedures chapter of this manual.

H. Erosion Screen Repair

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION 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 THIS MANUAL FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

(1) General

(a) This repair may be performed in accordance with the minor repair limits specified in the Repair Limits chapter of this manual.

(2) Procedure

CAUTION 1: DO NOT REMOVE MATERIAL ANY DEEPER THAN NECESSARY TO FULLY REMOVE THE DAMAGE.

CAUTION 2: DO NOT SAND INTO THE UNIDIRECTIONAL (UD) MATERIAL OF THE BLADE.

(a) Using a grinder or sander with no coarser than 60 grit sandpaper, remove damaged screen, and if applicable, composite material in the area to be repaired. When all damage has been removed, there should be no loose or deformed screen wire.

1 Only remove damaged material.

(b) Examine the repair area.

1 If more than one composite layer has been removed or if the total area is greater than the minor damage size limit, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

2 For blade models NC8834( ), 108MH92, 138MH91, (J)NC10904( ), JNC10905( ), and GC1111(4,5)( ) from the surface of the blade with the paint removed, the total depth of the screen and one layer of composite will be 0.022 inch (0.55 mm).

3 For blade models 78D01( ), NC9405( ), NC10244( ), NC10245( ), NC10320, and NC10445( ) from the surface of the blade with the paint removed, the total depth of the screen and one layer of composite will be 0.018 inch (0.45 mm).

(c) Perform a coin tap in the repair and surrounding area.

1 If coin tap produces an indication greater in size than the limits defined in the Minor Repair Limits, retire the blade in accordance with the Part Retirement Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) or send the blade to Hartzell Propeller Inc. for evaluation.

2 If the coin tap indication is within Minor Repair Limits, remove delaminated material and re-inspect in accordance with 4.H.(2)(a) and 4.H.(2)(b) in this chapter.

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

(d) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, wipe the area to be repaired.

(e) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(f) Cut the repair material pattern pieces.

1 From Table 4-1 choose the correct repair materials and make a note of the cured ply thickness.

2 Alternating the layers of repair material at ± 45 degrees, 0 -90 degrees, cut the repair material layer by layer to match the shape of the repair area.

3 Cut an extra layer or two of the repair material, also at alternating angles, to put on top of the repair.

NOTE: The extra layers provide additional thickness that will be removed later resulting in a smooth repaired area.

4 For a Kevlar® blade only: Optionally, laminate layers of fiberglass fabric CM42 on top of the material pattern pieces, blending the new material to the original surface.

(g) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, thoroughly clean the area to be repaired.

(h) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(i) In a container that is free from contamination, mix the adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

1 Mix enough adhesive CM14 or CM15 to perform the repair.

(j) Laminate the repair material pattern piece layers.

1 Apply adhesive CM14 or CM15 to the area to be repaired.

CAUTION: MAKE SURE THAT EACH LAYER BECOMES THOROUGHLY SATURATED WITH ADHESIVE CM14 OR CM15 AS THE LAYER LAMINATES TO THE REPAIR AREA.

2 Apply the repair material pattern piece layers over the repair area to get the original shape.

NOTE: The repair material pattern pieces were cut so the weave direction will alternate between ± 45 degrees, 0 - 90 degrees.

a Laminate each repair pattern piece, making sure that each repair material pattern piece is thoroughly saturated before applying the next layer. Additional adhesive CM14 or CM15 may be applied if necessary.

b For a Kevlar® blade only: Optionally, laminate layers of fiberglass fabric CM42 on top of the material pattern pieces, blending the new material to the original surface.

(k) Cure the repair in accordance with the section, "Curing a Minor Repair in this chapter.

(l) Sand the repair.

CAUTION: DO NOT REMOVE ORIGINAL MATERIAL WHEN SANDING.

1 Sand the repaired area to the original shape using caution not to remove original material.

2 Starting with 80 grit or finer sandpaper and using progressively finer grit sandpaper, sand until the original shape is achieved.

3 Use 140 grit or finer sandpaper for final sanding.

(m) Visually examine the repaired area.

1 The repaired area must be smooth and free from wrinkles, voids, or resin rich areas.

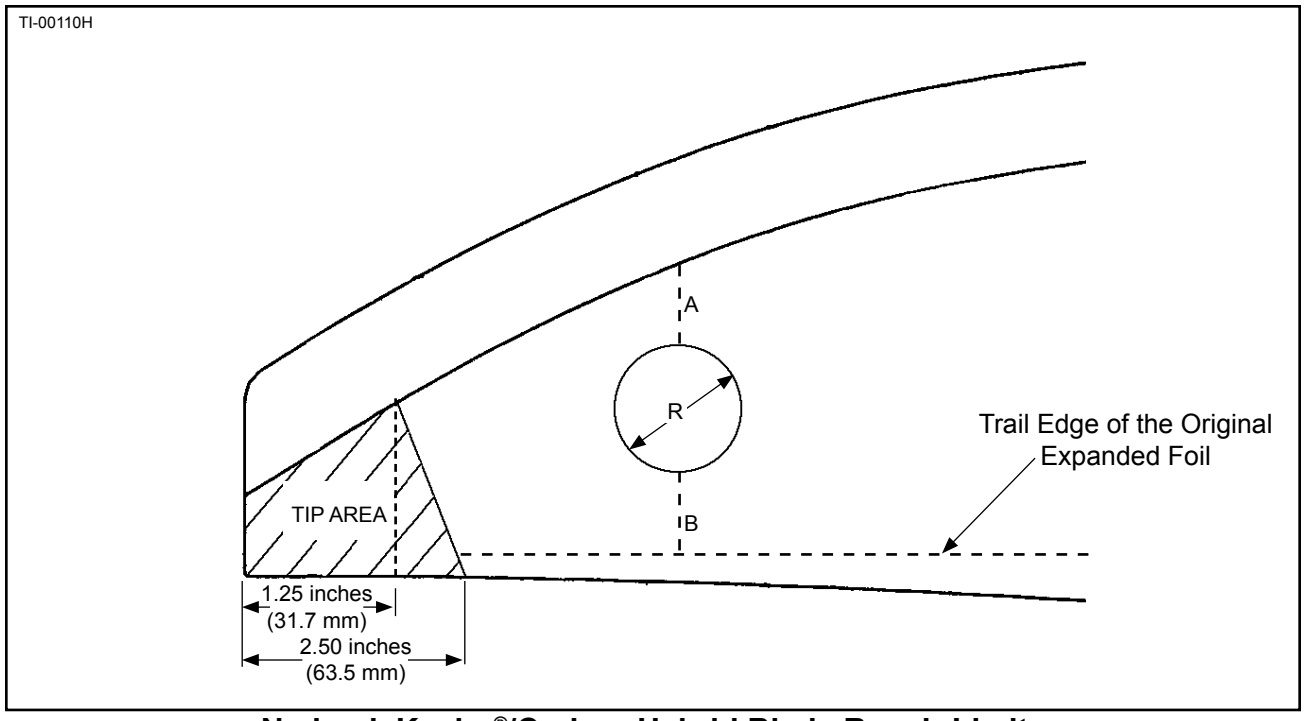
(n) Make an inspection of the repaired area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

1 Delaminations or voids are not permitted.

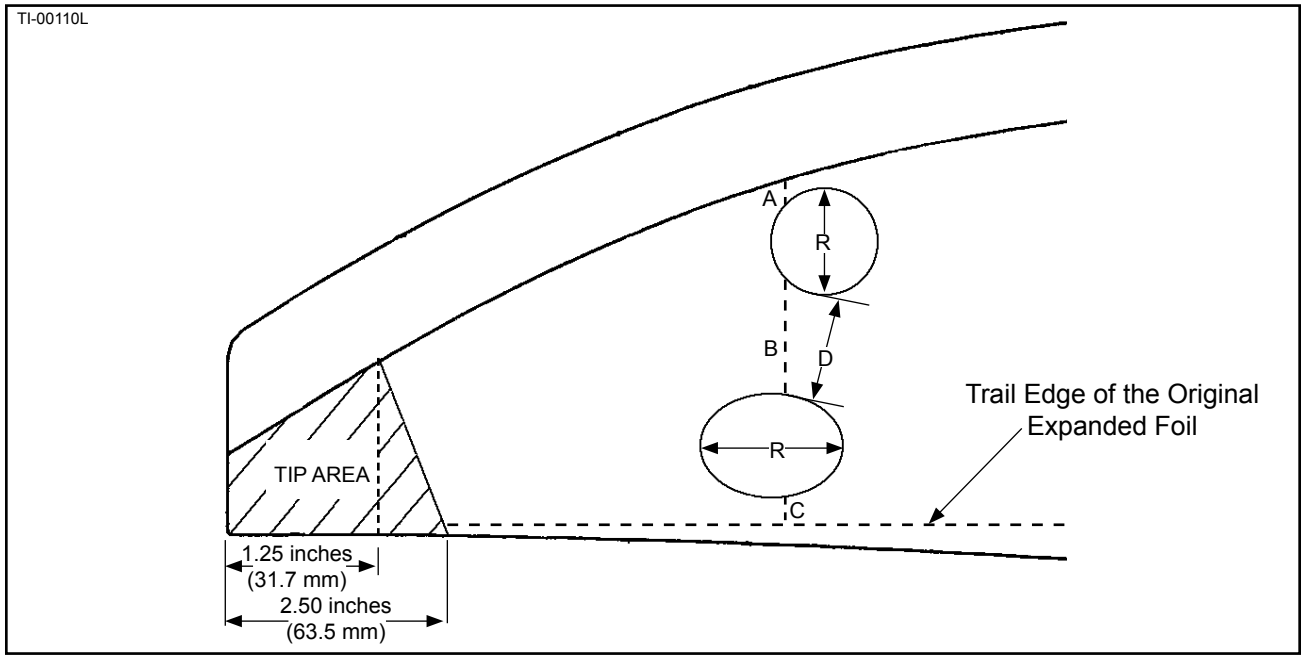
2 If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

3 Repeat the inspections and repair until the repair is satisfactory.

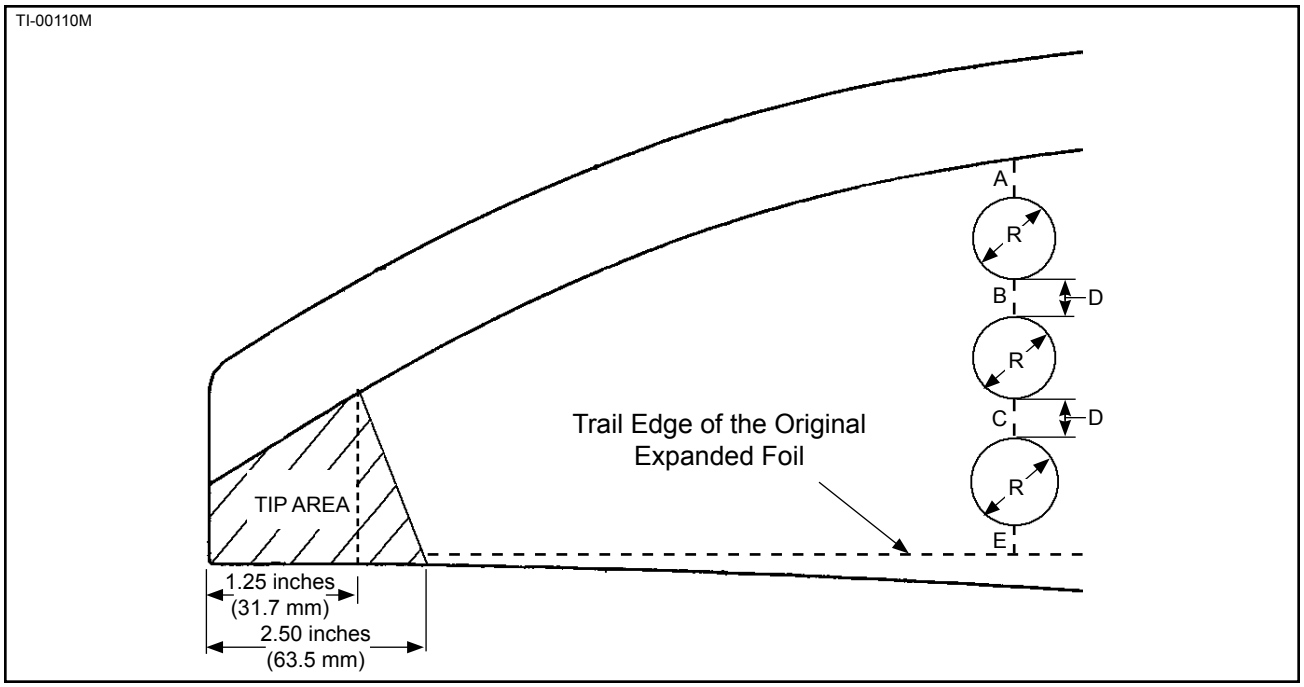
(o) Refinish the blade in accordance with the Finish Procedures chapter of this manual.



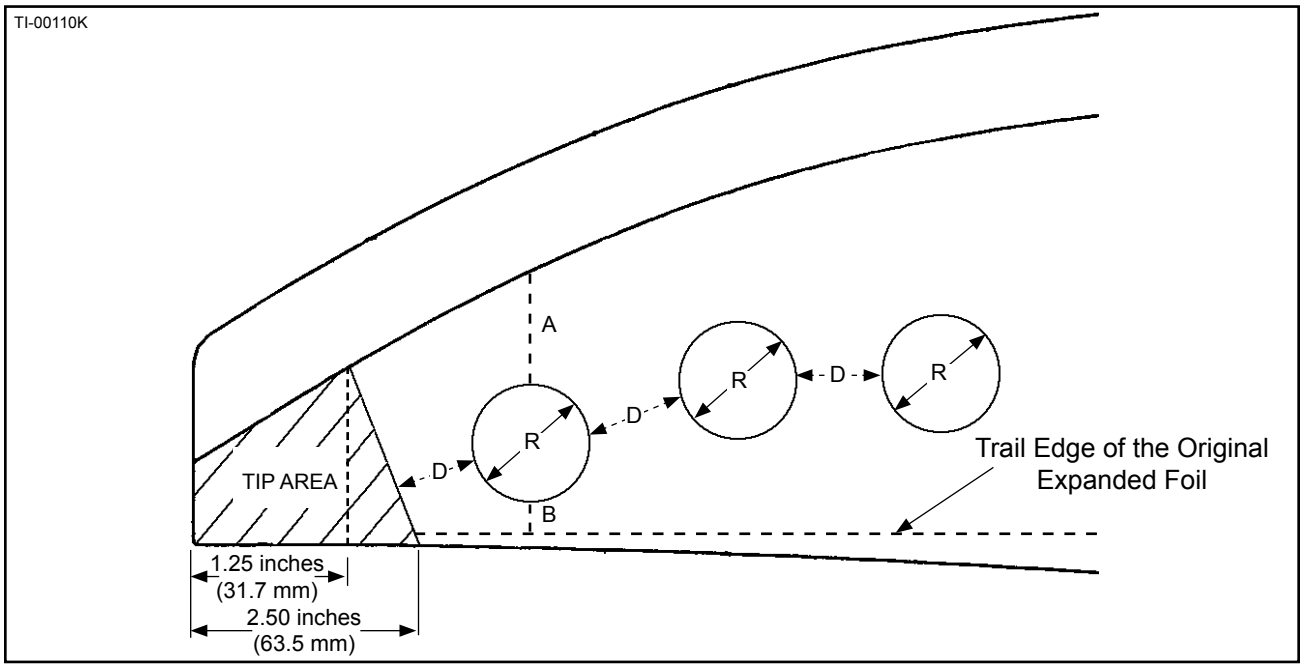
N-shank Kevlar®/Carbon Hybrid Blade Repair Limits
Figure 4-17



N-shank Kevlar®/Carbon Hybrid Blade Repair Limits
Figure 4-18



N-shank Kevlar®/Carbon Hybrid Blade Repair Limits
Figure 4-19



N-shank Kevlar®/Carbon Hybrid Blade Repair Limits
Figure 4-20

5. Blade Repairs for N-shank Kevlar®/Carbon Hybrid Blades Only

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION 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 THIS MANUAL FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. Repair Area Limits

(1) General

(a) The limits in this section apply when specified for a repair given in this chapter.

(b) If the amount of expanded foil remaining is less than the permitted limits given in this section, factory only repair of the expanded foil may be possible. Contact Hartzell Propeller Inc. for determination.

(2) Tip Area - Refer to Figure 4-17 through Figure 4-20.

(a) If any damage or repair area extends beyond the tip area of the blade:

1 The damage in the tip area must be repaired in accordance with the repair procedures for the tip area as given in this chapter.

2 The damage that extends beyond the tip area must be repaired in accordance with the repair procedures specific to that area as given in this chapter.

(b) Even though removal of the entire expanded foil in the Tip Area is permitted, it is recommended to keep each repair as small as possible.

(3) All Other Areas - Refer to Figure 4-17 through Figure 4-20.

(a) The location and size of each finished repair area is determined by the amount of expanded foil removed to maintain lightning protection.

(b) Before starting any repair, remove the paint around the repair area and inspect the expanded foil to make sure the finished repair and any previous repairs will meet the finished repair area limits stated below.

1 Using 120 grit or finer sandpaper, remove the paint around the area to be repaired to expose the expanded foil and/or previous repair areas for inspection.

(c) The following finished repaired area limits apply:

1 R is the largest permitted dimension of any individual finished repair area.

2 R must be less than or equal to 2.75 inches (69.8 mm).

3 D is the distance between two individual finished repair areas.

4 D must be equal to or greater than R.

5 After the repair is completed, there must be a minimum total of 1.60 inches (40.6 mm) measured in a straight line of original expanded foil remaining between the trail edge of the erosion shield and the trail edge of the original expanded foil at any blade section.

a Examples:

(1) In Figure 4-17 and Figure 4-20 the sum of A and B must be equal to or greater than 1.60 inches (40.6 mm).

(2) In Figure 4-17 the sum of A, B, and C must be equal to or greater than 1.60 inches (40.6 mm).

(3) In Figure 4-19 the sum of A, B, C and E must be equal to or greater than 1.60 inches (40.6 mm).

(d) Example:

1 Choose two finished repaired areas.

2 Determine R for each finished repaired area (must be less than or equal to 2.75 inches [69.8 mm]).

3 Select the largest R of the two finished repaired areas.

4 Determine D between the two individual finished repair areas.

5 D must be equal to or greater than the largest R.

B. Loss of Paint and/or Filler Material

(1) General

(a) This repair may be performed in accordance with the airworthy damagelimits and the minor repair limits specified in the Repair Limits chapter of this manual.

(2) Repair Procedure

(a) Using 120 grit or finer sandpaper, remove the paint and expose the entire area to be repaired.

1 Feather the area into the non-repair area of the blade.

CAUTION: DO NOT SAND THROUGH THE MESH MATERIAL. USE EXTREME CARE WHEN SANDING DOWN TO THE BLADE SURFACE. AN N-SHANK COMPOSITE BLADE HAS ALUMINUM MESH ON THE BLADE SURFACE THAT FORMS PART OF THE LIGHTNING PROTECTION SYSTEM.

(b) If the damaged area still contains filler material, continue to sand the area using 120 grit or finer sandpaper until all filler material and damaged material is removed.

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(c) Using cheesecloth CM159 or equivalent, dampened with solvent acetone CM173, MEK CM106, or MPK CM219, thoroughly wipe the area.

(d) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(e) Apply wash primer Mix Number 3 to the exposed erosion shield in accordance with the Paint and Finish chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(f) Permit the wash primer Mix Number 3 to dry.

(g) In a container that is free from contamination, mix adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

(h) Using adhesive CM14 or CM15, laminate enough fiberglass fabric CM42 in individual layers to permit sanding the repair area down to the original airfoil shape.

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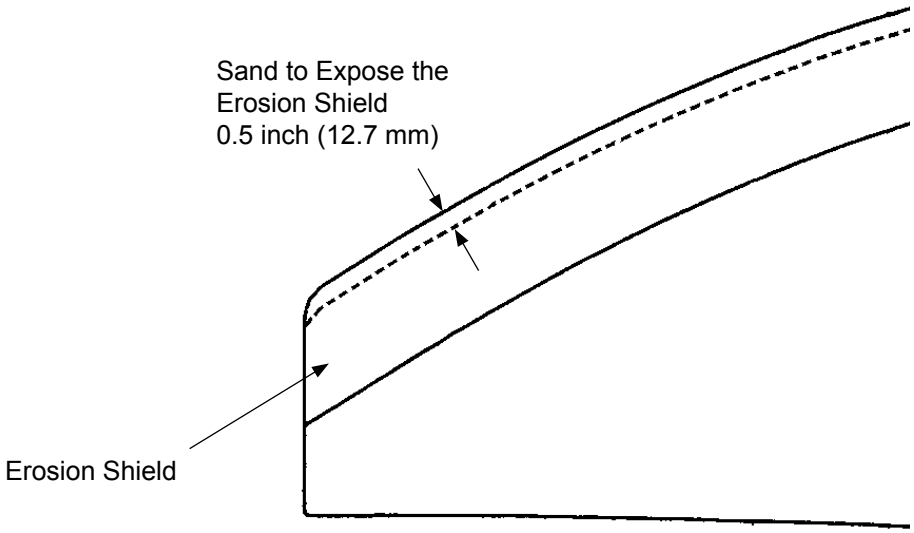


Sanding to Expose Erosion Shield
Figure 4-21

(i) Permit the adhesive CM14 or CM15 to dry.

(j) Using 120 grit or finer sandpaper, sand the blade until the original airfoil shape has been restored.

(a) If 0.50 inch (12.7 mm) (measured normal to the leading edge radius aft toward the trailing edge of the section) has not been exposed, sand to expose this area. Refer to Figure 4-21.

(k) Using cheesecloth CM159 dampened with solvent acetone CM173, MEK CM106, or MPK CM219, thoroughly wipe the blade.

(l) Permit the acetone CM173, MEK CM106, or MPK CM219 to dry.

(m) Apply wash primer Mix Number 3 to the exposed erosion shield in accordance with the Paint and Finish chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(n) Permit the wash primer Mix Number 3 to dry.

(o) Refinish in accordance with the Finish Procedures chapter of this manual.

C. Gouges, Delaminations, or Loss of Composite Material

NOTE: For information about composite blade repair training videos, refer to the section, "Composite Blade Repair Training Videos" in this chapter.

(1) General

(a) This repair may be performed in accordance with the airworthy damage limits and the minor repair limits specified in the Repair Limits chapter of this manual.

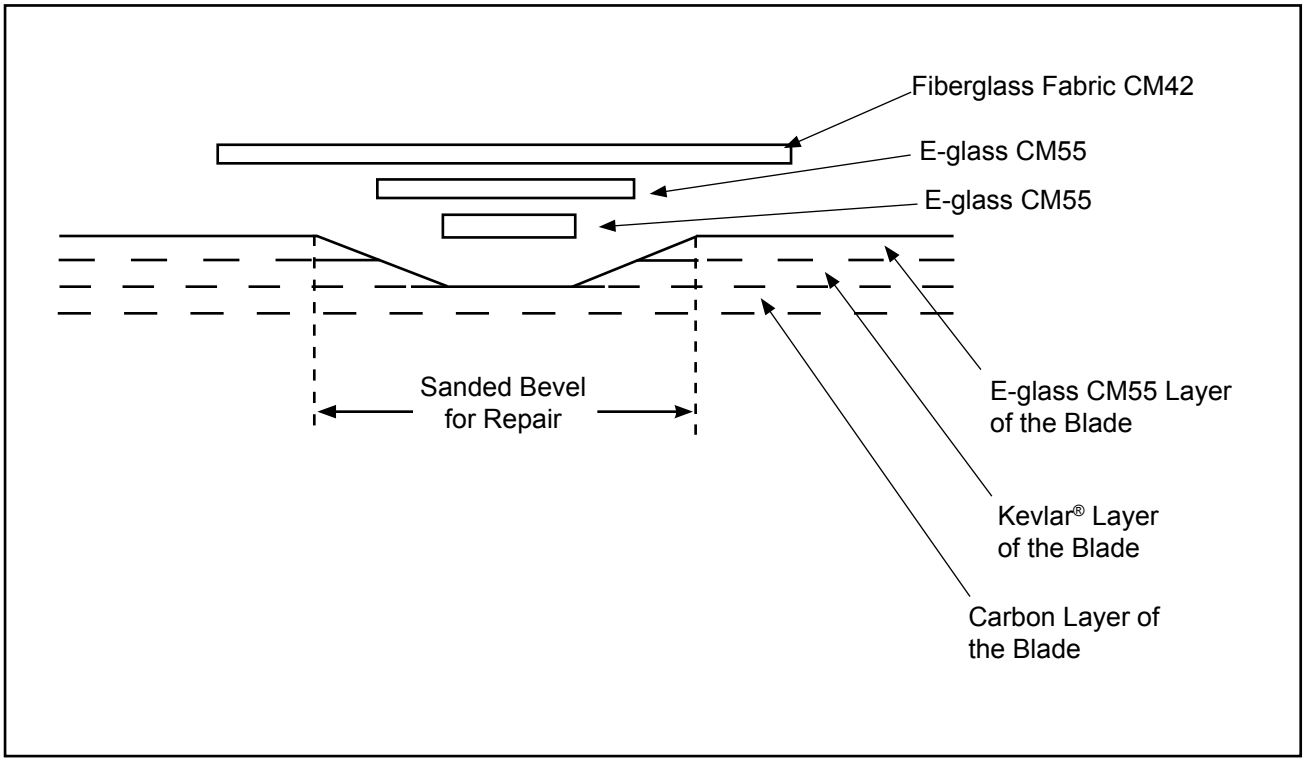
(2) Procedure

(a) Using a grinder or sander, remove material to create a bevel that extends outward from the repair area 0.50 inch (12.7 mm) for each 0.010 inch (0.254 mm) in depth. Refer to Figure 4-22.

1 If the bevel extends into the leading edge, the erosion shield must be removed to complete the repair.

a Replacement of the erosion shield is a major repair performed at overhaul.

2 For repaired area limits, refer to the section, "Repair Area Limits" for N-shank blades in this chapter.



Material Layers of the N-shank Kevlar®/Carbon Hybrid Blade
Figure 4-22

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

(b) Using solvent acetone CM173, MEK CM106, or MPK CM219, clean the area.

(c) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(d) Determine the number of layers of E-glass CM55 needed for the repair, based on the depth of the damage.

1 The maximum permitted number of layers of E-glass CM55 that may be used is two.

2 Each cured layer of E-glass CM55 is 0.0085 inch (0.215 mm) thick.

3 Cut layers of E-glass CM55 to match the shape of the beveled area to create a stair step pattern when laminating. Refer to Figure 4-22.

a Cut each layer at a ± 45 degree angle relative to the blade pitch axis.

(e) In a container that is free from contamination, mix adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

(f) Using adhesive CM14 or CM15, laminate one or two layers of E-glass CM55.

(g) Using adhesive CM14 or CM15, laminate an additional layer(s) of fiberglass fabric CM42 over the entire repair area to achieve the original airfoil shape and to aid in the transition.

NOTE: This layer(s) helps blend the layers and most of it may be sanded away.

(3) Cure the repair in accordance with the section, "Curing a Minor Repair" in this chapter.

(4) After Curing

(a) Using no coarser than 60 grit sandpaper, sand the repaired area to the original airfoil shape.

(b) Make a visual inspection of the repaired area.

1 Repair any delaminations or voids.

(c) Make an inspection of the repaired area in accordance with the section, "Coin-Tap inspection" in the Inspection Procedures chapter of this manual.

1 Delaminations or voids are not permitted.

2 If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

3 Repeat the inspections and repair until the repair is satisfactory.

(d) Make an inspection of the finished repaired area in accordance with the section, "Repair Area Limits" for N-shank blades.

(e) Refinish the repaired area in accordance with the Finish Procedures chapter of this manual.

D. Crushed or Cracked Trailing Edge - Tip Region of the Blade

NOTE: For information about composite blade repair training videos, refer to the section, "Composite Blade Repair Training Videos" in this chapter.

(1) General

(a) This procedure may be performed in accordance with the airworthy damage limits and the minor repair limits specified in the Repair Limits chapter of this manual.

(2) Repair Procedure

(a) Using a grinder or sander, remove loose surface material.

1 Some of the blade material, even though damaged, may remain on the blade.

a If damaged material is fully intact, it should remain on the blade.

NOTE: If more than one layer remains on the blade, but the layers are separated from each other, adhesive CM14 or CM15 will be injected between these layers when the repair is made.

(b) Using a grinder or sander, remove material to create a bevel that extends outward from the repair area 0.500 inch (12.7 mm) for each 0.010 inch (0.254 mm) in depth on each side of the blade. Refer to Figure 4-22.

1 If the bevel extends into the leading edge, the erosion shield must be removed to complete the repair.

a Replacement of the erosion shield is a major repair performed at overhaul.

2 For repaired area limits, refer to the section, "Repair Area Limits" for N-shank blades.

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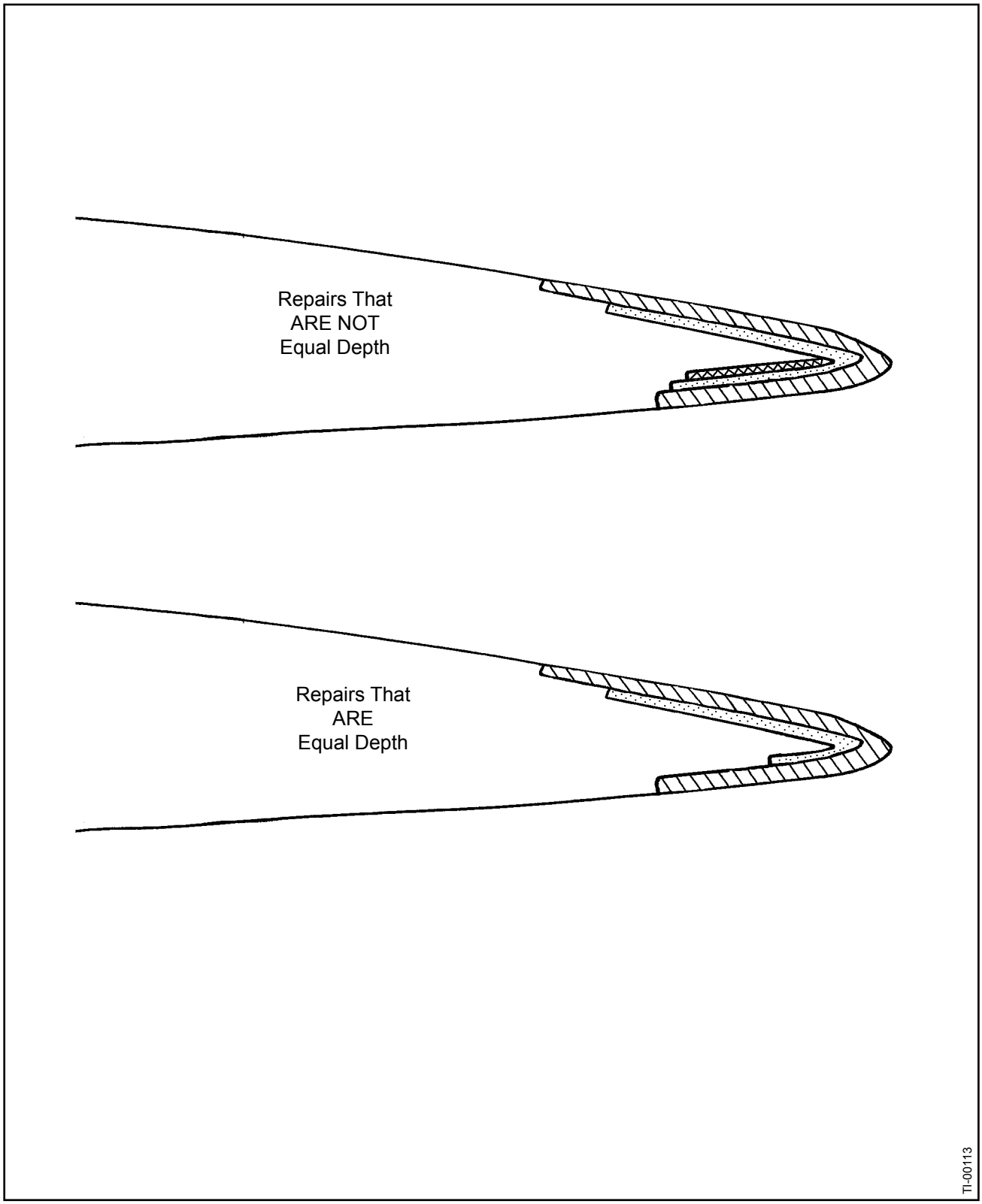
(c) Using solvent acetone CM173, MEK CM106, or MPK CM219, wipe the repair area.

(d) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.



Symetrical Repairs
Figure 4-23

(e) Determine the number of layers of E-glass CM55 needed for each side of the repair, based on the depth of the damage.

1 In areas where the depth of repairs on both sides are equal, the repair materials may be folded to both sides of the blade. Refer to Figure 4-23.

2 In areas where the depth of repairs on both sides are not equal, use additional layers(s) on the deeper side, then the repair materials may be folded to both sides of the blade. Refer to Figure 4-23.

3 The maximum permitted number of layers of E-glass CM55 that may be used on each side is three.

4 Each cured layer of E-glass CM55 is 0.0085 inch (0.215 mm) thick.

5 Cut each layer of E-glass CM55 at a ± 45 degree angle relative to the blade pitch axis to match the shape of the beveled area to create a stair step pattern when laminating. Refer to Figure 4-23.

(f) In a container that is free from contamination, mix adhesive CM14 or CM15 in accordance with the manufacturer's directions.

(g) If applicable, inject adhesive CM14 or CM15 with a syringe CM3, or equivalent, between all the layers of the original material remaining in the damaged area.

(h) Put the previously cut E-glass CM55 layers on the repair area.

(a) Using adhesive CM14 or CM15, saturate each layer of E-glass CM55 after it is applied to the repair area.

(i) Using adhesive CM14 or CM15, put layer(s) of fiberglass fabric CM42 over the entire repair area to achieve the original airfoil shape and to aid in the transition.

NOTE: The fiberglass fabric CM42 helps to blend the layers and most of it may be sanded away.

(3) Cure the repair in accordance with the section, "Curing a Minor Repair" in this chapter.

(4) After Curing

(a) Using no coarser than 60 grit sandpaper, sand or grind to the original airfoil shape. Refer to Figure 4-13 G.

(b) Make a visual inspection of the repaired area. Repair any delaminations or voids.

(c) Make an inspection of the repaired area in accordance with the section, "Coin-tap Inspection" in the Inspection Procedures chapter of this manual.

1 Delaminations or voids are not permitted.

2 If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

3 Repeat the inspections and repair as necessary until the repair is satisfactory.

(d) Inspect the finished repaired area in accordance with the section, , "Repair Area Limits" for N-shank blades.

(e) Refinish the repaired area in accordance with the Finish Procedures chapter of this manual.

E. Crushed or Cracked Trailing Edge Foam Region of the Blade

NOTE: For information about composite blade repair training videos, refer to the section, "Composite Blade Repair Training Videos" in this chapter.

(1) General

(a) This repair may be performed in accordance with the airworthy damage limits and the minor repair limits specified in the Repair Limits chapter of this manual.

(b) If foam is missing within the repair area, small pieces of E-glass CM55 will be used to replace the missing foam.

(2) Procedure

CAUTION: USE CARE WHEN GRINDING TO REMOVE MATERIAL. GRINDING MAY CAUSE DAMAGE BEYOND THE SERVICEABLE LIMITS.

NOTE: It is recommended to use 180 grit sandpaper or equivalent when removing material in and around the damaged area.

(a) Using a customer supplied small angle grinder or equivalent, remove damaged material, including damaged foam, on the camber side and face side of the blade, approximately 0.5 inch (13 mm) around the damaged area.

(b) Using a grinder or sander, remove damaged composite material to create a bevel in the area to be repaired.

1 While removing material, make a bevel that extends outward from the repair area 0.25 to 0.75 inch (6.3 to 19.0 mm) for each 0.010 inch (0.254 mm) in depth on each side of the blade. Refer to Figure 4-22.

2 Stop periodically and examine the progress.

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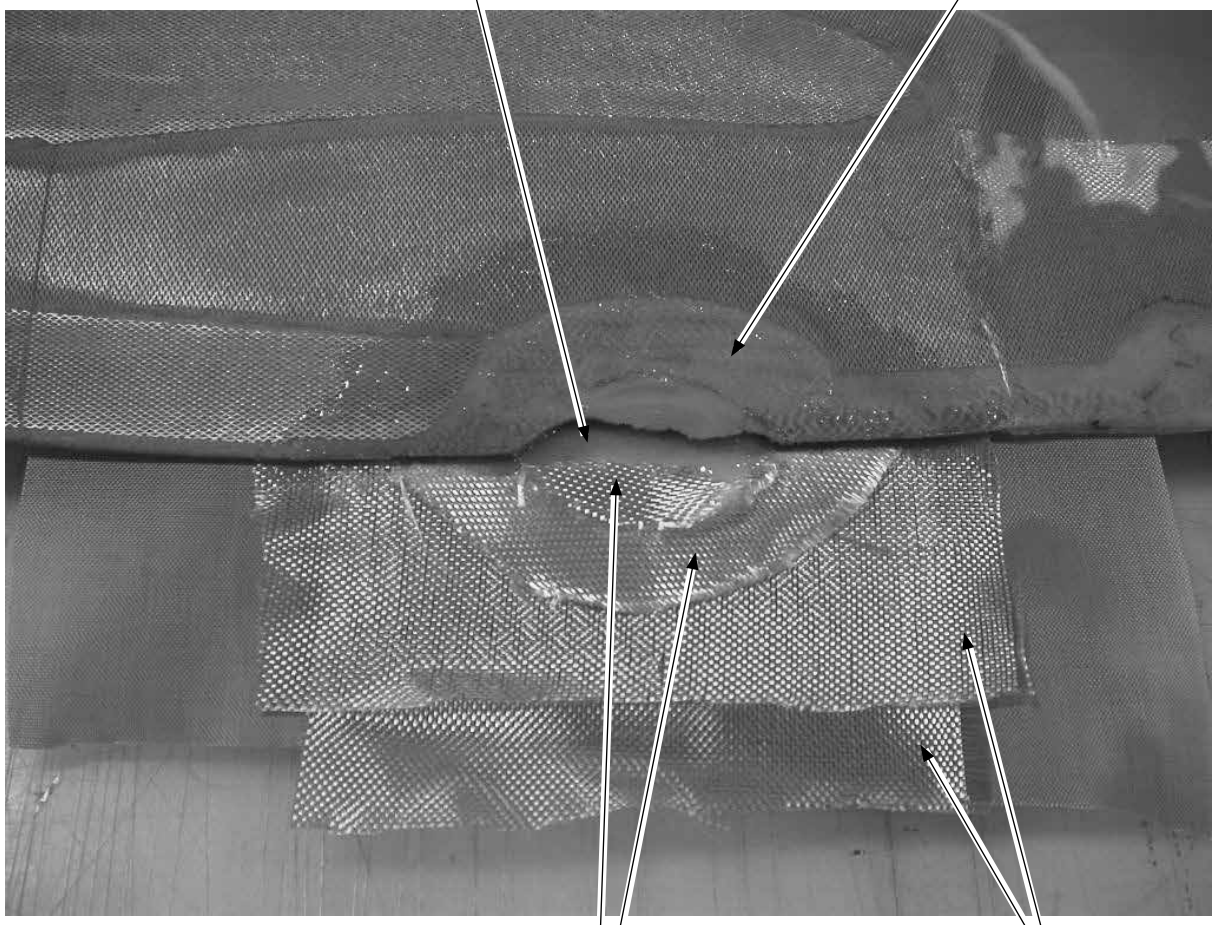
NOTE: Wiping the area with a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219 can help to visually find the defect.



Repair Layers
Figure 4-24

3 For repaired area limits, refer to the section, "Repair Area Limits" for N-shank Kevlar®/Carbon Hybrid blades in this chapter.

4 Stop removing material when the damage has been sufficiently removed or the minor repair limit has been reached.

(c) After removing material, examine the repair area.

1 The remaining layers must be fully bonded.

2 If damaged material remains after reaching the minor repair limit, send the blade to Hartzell Propeller Inc. for factory only repair.

3 Make an inspection of the area surrounding the repair area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

a If the results of the coin-tap inspection are not satisfactory, send the blade to Hartzell Propeller Inc. for factory only repair.

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(d) Using a cloth saturated with solvent acetone CM173, MEK CM106, or MPK CM219, wipe the repair area.

(e) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

(f) Cut layers of E-glass CM55 and fiberglass fabric CM42. Refer to Figure 4-24.

1 Cut layers of E-glass CM55.

a Cut each layer at a 45 degree angle relative to the blade pitch axis to match the shape of the beveled area to create a stair step pattern when laminating. Refer to Figure 4-23.

b Cut each layer large enough to cover the repair area on one side of the blade and to wrap around the trail edge of the blade and cover the repair area on the opposite side of the blade.

2 Cut layers of fiberglass fabric CM42 large enough to cover the repair area on one side of the blade and to wrap around the trail edge of the blade and cover the repair area on the opposite side of the blade.

(g) In a container free from contamination, mix adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

(h) On one side of the blade apply adhesive CM14 or CM15 to the repair area.

(i) Put layers of the precut E-glass CM55 in the repair area and align the layers to fit within the repair area adjacent to the foam surface and the Kevlar® surface. Refer to Figure 4-24.

1 Using adhesive CM14 or CM15, saturate each layer of E-glass CM55 after it is applied to the repair area.

2 Use the layers of precut E-glass CM55 that were cut to wrap around the trail edge of the blade and cover the opposite side of the repair area, but do not wrap the layers around the blade at this time.

(j) Apply layer(s) of precut fiberglass fabric CM42 over the entire repair area to achieve the original airfoil shape, but do not wrap the layer(s) around to the other side of the blade at this time. Refer to Figure 4-24.

NOTE: The fiberglass fabric CM42 helps to blend the layers and most of it may be sanded away.

1 Using adhesive CM14 or CM15, saturate the fiberglass fabric CM42.

(k) Holding all of the layers firmly in place, carefully turn the blade over to the other side.

NOTE: Holding or temporarily taping a flat plate over the layers will help hold the layers in place when turning the blade.

(l) Using very small pieces of E-glass CM55, fill in the area where the foam is missing. Refer to Figure 4-24.

1 Using adhesive CM14 or CM15, saturate the E-glass CM55 that was used to fill in the area where the foam is missing and the entire repair area.

(m) Wrap E-glass CM55 from the other side of the blade around the blade and apply to the repair area on this side of the blade.

1 Align each layer of E-glass CM55 to fit within the repair area adjacent to the foam surface and the Kevlar® surface.

2 Using adhesive CM14 or CM15, saturate each layer of E-glass CM55 after it is applied to the repair area.

(n) Wrap the fiberglass fabric CM42 from the other side of the blade around the blade and over the entire repair area to achieve the original airfoil shape.

1 Using adhesive CM14 or CM15, saturate the fiberglass fabric CM42.

CAUTION: DO NOT USE OPTION NO. 2, BLADE REPAIR BLANKET CURE WHEN CURING A TRAILING EDGE FOAM REPAIR.

(3) Cure the repair in accordance with the section, "Curing a Minor Repair" in this chapter.

(4) After Curing

(a) Using no coarser than 60 grit sandpaper, sand or grind to the original airfoil shape. Refer to Figure 4-13 G.

(b) Make a visual inspection of the repaired area. Repair any delaminations or voids.

(c) Make an inspection of the repaired area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

1 Delaminations or voids are not permitted.

2 If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

3 Repeat the inspections and repair until the repair is satisfactory.

(d) Inspect the finished repaired area in accordance with the section, "Repair Area Limits" for N-shank blades.

(e) Refinish the repaired area in accordance with the Finish Procedures chapter of this manual.

F. Split Trailing Edge

(1) General

(a) This repair may be performed in accordance with the airworthy damage limits and the minor repair limits specified in the Repair Limits chapter of this manual.

(2) Procedure

(a) Using a clean tongue depressor, utility knife, or other similar tool, gently pry apart the split edge and remove any contaminates.

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

(b) Using a clean cloth CM159 or equivalent dampened with solvent acetone CM173, MEK CM106, or MPK CM219, wipe the repair area.

CAUTION: MAKE SURE THAT THE SOLVENT IS DRY BETWEEN THE COMPOSITE MATERIAL LAYERS, IF APPLICABLE.

(c) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.

1 Additional drying time may be needed for solvent acetone CM173, MEK CM106, or MPK CM219 that is between the composite layers.

(d) In a container that is free from contamination, mix adhesive CM14 or CM15 in accordance with the manufacturer's instructions.

(e) Using adhesive CM14 or CM15 in a syringe CM3, inject as much adhesive as possible in the split, making sure of coverage of the entire surface.

1 Alternately, push the adhesive CM14 or CM15 into the split using a clean, flat tool.

(f) Cure the repair in accordance with the section, "Curing a Minor Repair" in this chapter.

(g) Sand the repair.

CAUTION: DO NOT REMOVE ORIGINAL BLADE MATERIAL WHEN SANDING.

1 Using no coarser than 60 grit sandpaper, sand to remove excess adhesive CM14 or CM15 and fiberglass fabric CM42 if applicable.

a After the final sanding, the blade must have a smooth surface.

(h) Visually examine the repaired area to make sure that it is the original airfoil shape.

1 If the original airfoil shape is not achieved, send the blade to Hartzell Propeller Inc. for factory only repair.

(i) Make an inspection of the repaired area in accordance with the section, "Coin-Tap Inspection" in the Inspection Procedures chapter of this manual.

a Delaminations or voids are not permitted.

b If the area of repair is not within the limits specified, repair in accordance with the applicable repair instructions.

c Repeat the inspections and repair as necessary until the repair is satisfactory.

(j) Make an inspection of the finished repaired area in accordance with the section, "Repair Area Limits" for N-shank blades in this chapter.

(k) Refinish the blade in accordance with the Finish Procedures chapter of this manual.

6. Curing a Minor Repair

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION 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 THIS MANUAL FOR THE IDENTIFICATION OF SPECIFIC PROPELLER CRITICAL PARTS.

A. Procedure for Curing a Blade Surface Repair - Clamping Method

(1) Optionally, Teflon® bleeder cloth CM58 and polyester absorbent cloth CM59 may be used.

NOTE: Using the Teflon® bleeder cloth CM58 and polyester absorbent cloth CM59 will absorb excess resin, minimize sanding, and make clean up easier.

(a) Put the piece of Teflon® bleeder cloth CM58 over the repaired area.

NOTE: Making the Teflon® bleeder cloth CM58 approximately 1 inch (25.4 mm) larger than the repaired area will prevent sticking of the vacuum bagging material to the repaired area.

1 If necessary to hold in place, apply tape to the edges of the Teflon® bleeder cloth CM58 outside of the repaired area.

(b) Put a piece of polyester absorbent cloth CM59 over the Teflon® bleeder cloth CM58 in the repaired area.

NOTE: Making the polyester absorbent cloth CM59 slightly smaller than the Teflon® bleeder cloth CM58 will reduce the sanding needed.

1 If necessary to hold in place, apply tape to the edges of the polyester absorbent cloth CM59 outside of the repaired area.

(2) Cut a piece of vacuum bag material CM45 large enough to cover the entire repaired area.

(3) Put the piece of vacuum bag material CM45 on the repaired area.

(4) Prepare two semi-rigid plates to clamp over the repaired area.

(a) Make the plates from metal, plastic, Masonite®, or other semi-rigid material.

(b) Make one plate long enough so that when the plates are clamped on the blade, the plates will extend beyond the repaired area.

(c) When the repair is to a curved area of the blade, a layer of compressive material, such as foam rubber, may be used between the repair area and the plate to help apply uniform pressure when curing the repaired area.

(5) Put one plate over the repaired area and the other plate on the other side of the blade.

(a) If necessary to hold in place, apply tape to the plate.

CAUTION: EXCESSIVE CLAMP FORCE WILL DAMAGE THE BLADE. SECURE THE PLATE TO THE BLADE WITH MINIMAL FORCE.

(b) Install clamps as necessary to apply even pressure to the repaired area.

(c) Permit the adhesive to cure for 12 hours at room temperature or for 2 hours at 145° ± 5° F (63° ± 2° C).

(d) Remove the plates and the cure materials from the blade.

(6) After cure, return to the applicable repair procedure for additional requirements.

B. Procedure for Curing a Trailing Edge Blade Repair

(1) General

CAUTION: DO NOT USE CURE OPTION 2 FOR CURING A TRAILING EDGE FOAM REPAIR.

(a) There are two options for curing the repair.

1 Cure Option 1 uses a room temperature or oven cure cycle for curing the repair.

a Plates and clamps are used to apply even pressure to the repaired area.

2 Cure Option 2 uses a blade repair blanket TE302 or TE304 that supplies heat for accelerated curing of the repair.

a The blade repair blanket TE302 or TE304 and clamps are used to apply even pressure to the repaired area.

(2) Preparing the Repaired Area for Curing

(a) Optionally, Teflon® bleeder cloth CM58 and polyester absorbent cloth CM59 may be used.

NOTE: Using the Teflon® bleeder cloth CM58 and polyester absorbent cloth CM59 will absorb excess resin, minimize sanding, and make clean up easier.

1 Cut a piece of Teflon® bleeder cloth CM58 large enough to cover the repaired area on one side of the blade and fold over to cover the repaired area on the other side of the blade.

NOTE: Making the Teflon® bleeder cloth CM58 approximately 1 inch (25.4 mm) larger than the repaired area will prevent sticking of the vacuum bagging material to the repaired area.

2 Put the piece of Teflon® bleeder cloth CM58 over the repaired area on one side of the blade and fold it over to cover the repaired area on the other side of the blade.

a If necessary to hold in place, apply tape to the edges of the Teflon® bleeder cloth CM58 outside of the repaired area.

3 Cut a piece of polyester absorbent cloth CM59 large enough to cover the repaired area on one side of the blade and fold over to cover the repaired area on the other side of the blade.

NOTE: Making the polyester absorbent cloth CM59 slightly smaller than the Teflon® bleeder cloth CM58 will reduce the sanding needed.

4 Put the piece of polyester absorbent cloth CM59 over the Teflon® bleeder cloth CM58 in the repaired area on one side of the blade and fold it over to cover the repaired area on the other side of the blade.

a If necessary to hold in place, apply tape to the edges of the polyester absorbent cloth CM59 outside of the repaired area.

(b) Cut a piece of vacuum bag material CM45 large enough to cover the entire repaired area on one side of the blade and fold over to cover the repaired area on the other side of the blade.

(c) Put the piece of vacuum bag material CM45 on the repaired area on one side of the blade and fold it over to cover the repaired area on the other side of the blade.

1 If necessary to hold in place, apply tape to the edges of the vacuum bag material CM45 outside of the repaired area.

(3) Curing the Repair

(a) Cure Option 1, Room Temperature Cure

1 Prepare two semi-rigid plates to clamp over the repaired area.

a Make the plates from metal, plastic, Masonite®, or other semi-rigid material.

b Make one plate long enough so that when the plates are clamped on the blade, the plates will extend beyond the repaired area.

c When the repair is to a curved area of the blade, a layer of compressive material, such as foam rubber, may be used between the repair area and the plate to help apply uniform pressure when curing the repaired area.

2 Put one plate over the repaired area on each side of the blade.

a If necessary to hold in place, apply tape to the plate outside of the repaired area.

CAUTION: EXCESSIVE CLAMP FORCE WILL DAMAGE THE BLADE. SECURE THE PLATE TO THE BLADE WITH MINIMAL FORCE.

3 Install clamps as necessary to apply even pressure to the repaired area.

4 Permit the adhesive to cure for 12 hours at room temperature or for two hours at 145° ± 5° F (63° ± 2° C).

5 Remove the plates and the cure materials from the blade.

CAUTION: DO NOT USE CURE OPTION 2 FOR CURING A TRAILING EDGE FOAM REPAIR.

(b) Option No. 2, Blade Repair Blanket Cure

CAUTION: DO NOT PUT THE TEMPERATURE INDICATING STRIPS DIRECTLY ON TOP OF THE REPAIR.

1 Put two temperature indicating strips TE306 and TE307 on each side of the blade adjacent to the repair area.

a Two temperature indicating strips are needed on each side of the blade to monitor the temperature during the cure cycle.

(1) One strip TE306 has a range of 120° to 180° F.

(2) The second strip TE307 has a temperature range of 190° to 220° F.

b Monitoring of the temperature of both sides of the blade is necessary because the blade repair blanket TE304 is constructed with two heating elements, one for each side of the blade.

(1) Each element is independently controlled by a nonadjustable controller contained within the blade repair blanket TE304.

2 Cut a piece of vacuum bag material that is large enough to prevent adhesive from getting on the blade repair blanket TE304 when it is applied.

3 Put the piece of vacuum bag material CM45 over the blade.

CAUTION: DO NOT LET THE HINGE OF THE BLADE REPAIR BLANKET TE304 CRUSH THE LAMINATED COMPOSITE MATERIALS OF THE REPAIR.

4 Put the blade repair blanket TE304 on the trailing edge of the blade, centered over the repair, making sure that the hinge of the blade repair blanket does not crush the laminated composite materials.

a Optionally, for E10950P(C)(B,K) Design: Blade repair blanket TE302 is available that is specially designed to conform to the outboard trailing edge of the blade.

5 Put a minimum of two C-clamps on the metal strip of the blade repair blanket TE304 or TE302, in such a way that the clamping pressure is distributed over the entire repaired area.

WARNING: DO NOT OPERATE THE BLADE REPAIR BLANKET TE304 OR TE302 IN A WET ENVIRONMENT OR ON A WET BLADE. DOING SO MAY CREATE AN ELECTRICAL HAZARD.

6 Connect the blade repair blanket TE304 or TE302 to a 120 volt power source for a minimum of 130 minutes.

NOTE: The time includes 2 hours for curing plus 10 minutes to permit the blade repair blanket to warm to the correct temperature.

7 Unplug the blade repair blanket TE304 or TE302.

8 Remove the blade repair blanket TE304 or TE302 and the repair hardware from the blade.

9 Examine the readings of the temperature indicating strips TE306 and TE307.

a The temperature readings must be greater than 120° F and less than 180° F.

NOTE: Temperature indicating strips consist of four silver/white dots. Each dot is identified with the temperature at which it will turn black. When examining the temperature indicating strips, after removal of the blade repair blanket TE304 or TE302, the "120° F." dot must be black while the "180° F" through the "220° F" dots must be white. The colors of the "140° F" and "160° F" dots do not matter.

b If the indicated temperature is below 120° F, inadequate heating occurred. Permit the repair to cure 12 hours at room temperature.

c If the indicated temperature is above 180° F, the composite material may be damaged. Retire the blade or return the blade to Hartzell Propeller Inc. for evaluation.

10 After cure, return to the applicable repair procedure for additional requiements.

7. Finish Procedures

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

A. Paint

(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.

(2) Polane® finish coating is a more durable coating than the aerosol finish coating. However, the aerosol finish coating is a quicker process and is an acceptable option for field repairs given time and location constraints.

(a) Regardless of the finish option, wash primer Mix Number 3 is needed for good paint adhesion to the erosion shield.

1 Wash primer Mix Number 3 is required for use with the Polane finish option when refinishing any portion of the erosion shield.

2 Wash primer Mix Number 3 is not required for use with the aerosol finish option.

3 When applying wash primer Mixture Number 3, do so in accordance with the section, "Mixtures" in the Tooling and Materials chapter in this manual.

(b) If the Polane® finish coat is preferred, contact one of the following:

1 An authorized propeller repair facility to complete the finish procedure.

2 Hartzell Propeller Inc. Product Support for the applicable procedure information from Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02)

(c) If the aerosol finish coat is preferred, refinish the repaired area(s) in accordance with the Maintenace Practices chapter in the applicable Hartzell Propeller Inc. propeller owner's manual.

B. Erosion Tape

(1) General

CAUTION: DO NOT INSTALL EROSION TAPE CM158 ON A BLADE WITH AN ANTI-ICING BOOT. INSTALLATION OF EROSION TAPE CM158 WILL PREVENT PROPER FUNCTION OF THE ANTI-ICING BOOT.

(a) This section provides instructions for installing erosion tape CM158 on a blade that will not have an anti-icing or de-ice boot installed.

1 For the installation of erosion tape on a blade that has a de-ice boot installed, refer to the De-ice Boot chapter of Hartzell Propeller Ice Protection System Manual 180 (30-61-80).

Blade Model	Erosion Tape Length (per Blade)	Erosion Tape Edge Inboard Location From the Outboard End of the Metal Shank
N7605(C)( )	14.87 inches (377.6 mm)	1.00 inch (25.4 mm)
N( )7893( )	13.33 inches (338.5 mm)	1.00 inch (25.4 mm)
N( )8301( )-( )	13.12 inches (333.2 mm)	1.00 inch (25.4 mm)
N( )8302( )-( )	13.12 inches (333.2 mm)	1.00 inch (25.4 mm)
N( )8304( )-( )	13.12 inches (333.2 mm)	1.00 inch (25.4 mm)
NM8410( )-( )	14.34 inches (364.2 mm)	1.00 inch (25.4 mm)
( )75A01( )	14.85 inches (377.1 mm)	1.00 inch (25.4 mm)
76C( )03( )	14.50 inches (368.3 mm)	1.00 inch (25.4 mm)
76C04( )	14.50 inches (368.3 mm)	1.00 inch (25.4 mm)
L76A01( )X( )	15.60 inches (396.2 mm)	1.00 inch (25.4 mm)
N76M05C( )X	14.87 inches (377.6 mm)	1.00 inch (25.4 mm)
( )79A06X( )	14.87 inches (377.6 mm)	1.00 inch (25.4 mm)
( )79C03( )-( )	14.50 inches (368.3 mm)	1.00 inch (25.4 mm)
80C( )01( )	14.34 inches (364.2 mm)	1.00 inch (25.4 mm)
JNC10904( )	22.70 inches (576.5 mm)	1.00 inch (25.4 mm)
75C( )08( )	14.34 inches (364.2 mm)	1.00 inch (25.4 mm)

Erosion Tape Length/Location (Blades without De-ice/Anti-icing Boot Only)
Table 4-2

CAUTION: EROSION TAPE CM158 MUST BE INSTALLED ON ALL NON-BOOTED BLADE MODELS LISTED IN TABLE 4-2. FAILURE TO INSTALL THE EROSION TAPE ON THESE BLADE MODELS CAN RESULT IN SERIOUS DAMAGE TO THE BLADE.

(b) Installation of erosion tape CM158 is required for the blade models listed in Table 4-2 that will not have an anti-icing or de-ice boot installed.

(c) A minimum temperature of 60°F (10°C) is required for erosion tape CM158 application.

(d) Keep hands clean at all times.

(e) Paint must cure for a minimum of 8 hours before installing erosion tape CM158.

(2) Materials Required

(a) The materials necessary to complete the erosion tape installation procedure
are as follows:

1 Erosion Tape CM158

2 Solvent Methyl-Ethyl-Keytone (MEK) CM106, Methyl Propyl Ketone (MPK) CM219, or Acetone CM173

3 Cheesecloth CM159

4 Ball Point Pen or Pencil, Locally Procured

5 Measuring Tape, Locally Procured

6 Rubber Roller TE330, Silicone Roller TE331, or equivalents

7 Masking Tape, Locally Procured

(3) Installation Procedure

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

CAUTION: DO NOT INSTALL EROSION TAPE CM158 ON A BLADE THAT HAS PAINT THAT HAS CURED LESS THAN 8 HOURS.

(a) Preparation

1 Cut the correct length of erosion tape CM158 in accordance with Table 4-2.

2 Radius the corners of the erosion tape CM158 to 0.5 inch (13 mm) to remove any sharp corners.

3 Using a pencil or a ball point pen, measure and make a mark on the nonadhesive side of the erosion tape CM158 to indicate the centerline of the erosion tape.

4 Using a non-graphite pencil CM162 or equivalent, measure and make a mark on the blade outboard of the metal blade shank near the leading edge.

a For the required measurement, refer to Table 4-2.

b This alignment mark on the blade will be used to align the inboard edge of the erosion tape at installation.

5 Using a clean cloth dampened with solvent CM106 (MEK), CM219 (MPK), or CM41 (toluene) thoroughly clean the area of the blade where the erosion tape CM158 will be installed.

a Using a clean, lint-free cloth, immediately wipe the area dry.

b Permit the area to air dry.

c Repeat the cleaning and drying of the area.

(b) Application of Optional Adhesive Promoter CM124

NOTE: Adhesive promoter CM124 will increase the adhesion between the erosion tape CM158 and the blade.

1 Apply masking tape or equivalent as masking material to the perimeter of the area where the erosion tape CM158 will be installed.

2 Apply a thin, uniform layer of adhesive promoter CM124 to the area of the blade where the erosion tape CM158 will be installed.

3 Remove the masking material.

CAUTION: THE ADHESIVE PROMOTER CM124 WILL BEGIN TO LOSE ADHESION AFTER 60 MINUTES AT ROOM TEMPERATURE.

4 Permit the adhesive promoter CM124 to dry at room temperature for a minimum of 15 minutes and a maximum of 60 minutes.

(c) Installation of the Erosion Tape CM158

1 Peel the backing material from the erosion tape CM158.

2 Holding the erosion tape CM158 with the adhesive side toward the blade, align the end of the erosion tape with the alignment mark on the blade (outboard of the metal shank and near the leading edge), while aligning the centerline that was marked on the erosion tape with the leading edge of the blade.

3 Press the erosion tape CM158 into position on the leading edge of the blade while maintaining tension on the erosion tape to minimize air bubbles and wrinkles, and to keep the tape straight.

4 Using a roller, such as TE330 or TE331, or fingers, press the erosion tape CM158 down onto the leading edge of the blade.

5 Using a roller, such as TE330 or TE331, or fingers, work the erosion tape CM158 into position on one side of the blade.

a Starting at the outboard end of the blade and working toward the shank, use a hard rubber or nylon roller, such as TE330 or TE331, or fingers to firmly seat the erosion tape CM158 to the blade.

b Make sure that there are no wrinkles and that no air is trapped under the erosion tape CM158.

CAUTION: DO NOT DAMAGE THE BLADE WHEN REMOVING AIR BUBBLES.

c Remove air bubbles under the erosion tape by carefully puncturing the erosion tape CM158 with a sharp pin and pressing out the trapped air.

6 Repeat steps (3)(c) 1 thru (3)(c) 5 of this procedure on the other side of the blade.

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TOOLING AND MATERIALS - CONTENTS

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1. Special Tools and Consumable Materials

   A. Special Tools

      (1) Special tooling may be required for procedures in this manual. The reference number for a special tool will appear with the prefix "TE" directly following the tool name to which it applies. For example, a roller that is reference number 330 will appear as: roller TE330.

         (a) Hartzell Propeller Inc. Illustrated Tool and Equipment Manual 165A (61-00-65) contains a listing of special tools referenced in Hartzell manuals.

         (b) It is the responsibility of the repair station or the technician performing the repair or servicing to use these special tools as required.

   B. Consumable Materials

      (1) Consumable materials are referenced in certain sections throughout this manual. The reference number for a consumable material will appear with the prefix "CM" directly following the material to which it applies. For example, an adhesive that is reference number 16 will appear as: adhesive CM16. Only those items specified may be used.

         (a) Specific approved materials and their shelf life, pot life, etc. are listed in Hartzell Propeller Inc. Standard Practices Manual 202A - Volume 7, Consumable Materials (61-01-02).

2. Mixtures

   A. Mixture Number 3, Washer Primer

      4 parts Wash Primer (CM24)

      4 parts Reducer, Wash Primer (CM25)

      1 part Acid Diluent (CM26)

      Let stand 1/2 hour before using

      NOTE: The Hartzell Propeller Inc. required mix ratio is as shown here. The mix ratio differs from the manufacturer's label. Make sure to use the mix ratio that is specified by Hartzell Propeller Inc.

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