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HARTZELL

Composite Propeller Blade Field Maintenance and Minor Repair Manual

N-shank Composite	Bantam Composite
N7605(B,K)()	75A01-2()
N7605C()	L76A01X()
N76M05C()X	H79A06X()
N()7893()	
NG8301()	
NC8834()	
NC9208()	

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REVISION HIGHLIGHTS

- New manual issued in its entirety
- The information in this manual was previously provided in Hartzell Propeller Inc. Service Letter HC-SL-61-294, Blade - Field Maintenance of Composite Blades.
- This manual obsoletes Hartzell Propeller Inc. Service Letter HC-SL-61-294, Blade - Field Maintenance of Composite Blades.

REVISION HIGHLIGHTS

1. Introduction

A. General

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.

<u>Revision No.</u>	<u>Issue Date</u>	<u>Comments</u>
New Issue	Oct/13	New Issue

RECORD OF REVISIONS

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

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RECORD OF REVISIONS

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

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RECORD OF TEMPORARY REVISIONS

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RECORD OF TEMPORARY REVISIONS

Update this page to show all Temporary Revisions inserted into this manual.

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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

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AIRWORTHINESS LIMITATIONS**1. Airworthiness Limitations Information**

- A. For airworthiness limitations information, refer to the applicable Hartzell Propeller Inc. owner's manual.

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LIST OF EFFECTIVE PAGES

Chapter	Page	Rev. Level	Date
Cover/Cover Back	Cover/Cover Back	Original	Oct/13
Revision Highlights	1 and 2	Original	Oct/13
Record of Revisions	1 and 2	Original	Oct/13
Record of Temporary Revisions	1 and 2	Original	Oct/13
Service Document List	1 and 2	Original	Oct/13
Airworthiness Limitations	1 and 2	Original	Oct/13
List of Effective Pages	1 and 2	Original	Oct/13
Table of Contents	1 and 2	Original	Oct/13
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Inspection Procedures	1-1 thru 1-8	Original	Oct/13
Damage Evaluation	2-1 thru 2-8	Original	Oct/13
Repair Limits	3-1 thru 3-18	Original	Oct/13
Minor Repair	4-1 thru 4-52	Original	Oct/13
Tooling and Materials	5-1 thru 5-8	Original	Oct/13

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1. Statement of Purpose**A. General**

- (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 the Hartzell Propeller Inc. composite blade models listed below.

Blade Model	Material / Construction
N7605(B,K)()	Kevlar®/Carbon Hybrid
N7605C()	All Carbon
N76M05C()X	All Carbon
N()7893()	Kevlar®/Carbon Hybrid
NG8301()	All Carbon
75A01-2()	All Carbon
L76A01X()	All Carbon
H79A06X()	All Carbon
NC8834()	All Carbon
NC9208()	All Carbon

- (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) 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) 778-4391, 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. A technical representative will contact you during normal business hours. Urgent AOG support is also available 24 hours per day, seven days per week via this message service.
 - (d) Additional information is available on the Hartzell Propeller Inc. website at www.hartzellprop.com.
- (4) Where possible, this manual is written in the format specified by ATA iSpec 2200.

2. Required Publications

A. Hartzell Propeller Inc. Publications

- (1) In addition to this manual, one or more of the following publications are required for information regarding specific recommendations and procedures to maintain propeller assemblies.

Manual No.	ATA No.	Title
n/a	n/a	Active Hartzell Propeller Inc. Service Bulletins, Service Letters, Service Instructions, and Service Advisories
145	61-00-45	Hartzell Propeller Inc. Propeller Owner's Manual
147	61-00-47	Hartzell Propeller Inc. Propeller Owner's Manual
181	30-60-81	Hartzell Propeller Inc. Ice Protection System Component Maintenance Manual
182	61-12-82	Hartzell Propeller Inc. De-ice Boot Removal and Installation Manual
183	61-12-83	Hartzell Propeller Inc. Anti-icing Boot Removal and Installation Manual
340	n/a	Hartzell Propeller Inc. Propeller Owner's Manual
411	61-00-11	Hartzell Propeller Inc. Propeller Owner's Manual
417	61-00-17	Hartzell Propeller Inc. Propeller Owner's Manual

NOTE: All Hartzell Propeller Inc. Owner's Manuals and Ice Protection System manuals are available at www.hartzellprop.com.

- (2) 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.
- (3) For Hartzell Propeller Inc. service literature and revisions, contact:

Hartzell Propeller Inc.	Telephone: 937.778.4200
Attn: Technical Publications Department	Fax: 937.778.4215
One Propeller Place	E-mail: manuals@hartzellprop.com
Piqua, Ohio 45356-2634 U.S.A.	

3. Personnel Requirements

A. Personnel Requirements

- (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) Damage that is within the minor repair limits as specified in this manual may be repaired by a certified airframe and powerplant mechanic, or international equivalent in accordance with the Minor Repairs chapter in this manual.

C. Major Repair

- (1) Major repair work is that which exceeds the minor repair limits as specified in this manual.
- (2) To perform composite blade major repair, the propeller repair station must employ at least one individual with valid Composite Blade Overhaul, Major Repair, and Recertification Individual Certification from Hartzell Propeller Inc.
- (3) All major repairs must be completed in a propeller repair station that is licensed by a government agency, e.g., FAA, EASA, CAA.
- (4) Refer to the Hartzell Propeller Inc. website at www.hartzellprop.com or contact the Hartzell Propeller Inc. Product Support Department for a current list of authorized facilities.

4. Safe Handling of Paints and Chemicals

- A. Always use caution when handling or being exposed to paints and/or chemicals during propeller repair procedures.
- B. Before using paint or chemicals, always read the manufacturer's label on the container and follow specified instructions and procedures for storage, preparation, mixing, and application.
- C. Refer to the product's Material Safety Data Sheet (MSDS) for detailed information about physical properties, health, and physical hazards of any chemical.

5. Component Life and Service**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 (aviation), or operating time (non-aviation).
- (2) A calendar limit between overhauls is specified in Hartzell Propeller Inc. Service Letters HC-SL-61-61Y and HM-SL-001, and in the applicable 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. Component Life

- (1) Certain components, or in some cases an entire propeller, may be life limited.
 - (a) It is a regulatory requirement that a record of the time since new 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.
- (2) 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.

- (3) Both TSN and TSO are necessary for defining the life of the component. Some parts are "life limited," which means that they must be replaced after a specified period of use (TSN).
 - (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) Time Since New (TSN) and Time Since Overhaul (TSO) records must be maintained in the propeller logbook.
 - (6) 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) Other propeller components do not require time tracking unless specified in Hartzell Propeller Inc. service publications.
 - (c) 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 assume 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 The TSN and TSO of the remaining propeller components that are required to be tracked as defined above, are not affected by the hub replacement and must be maintained separately.

C. Propeller Critical Parts

- (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.

6. 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 gives instructions for required procedures, and identifies the different inspection regions for blade models affected by this service manual.

C. Damage Evaluation

- (1) The Damage Evaluation chapter lists each damage type, and provides the applicable repair limits for blade models affected by this service manual.

D. Repair Limits

- (1) The Repair Limits chapter gives dimensional limits for Airworthy Damage and Minor 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.

7. Definitions

<u>Term</u>	<u>Description</u>
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, part number, or serial number are not certified by the FAA or international equivalent and are not intended to use on certificated aircraft.
Bantam Composite Blades.....	A composite blade that is used in Bantam series propellers
Blade Pitch Axis	An imaginary reference line through the length of a blade around which the blade rotates
Blade Station.....	Refers to the station on a bare blade, e.g. 30 inch station. A specific station is found by measurement from the blade "zero" station to a point on the blade. Blade stations are used for all blade specification data. Reference the appropriate Overhaul Inspection Form for the location of the zero station. (Note: Do not confuse blade station with reference blade radius; they may not originate at the same point.)
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 Line.....	A straight line drawn between the leading and trailing edge radii of the blade
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.

<u>Term</u>	<u>Description</u>
Composite Blade Traveler	A form that lists the applicable steps required for the overhaul of a specific blade model
Composite Material	Kevlar®, carbon, or fiberglass fibers bound together with or encapsulated within an epoxy resin
Corrosion.....	Gradual wearing away or deterioration due to chemical action
Crack.....	Irregularly shaped separation within a material, usually visible as a narrow opening at the surface
Debond.....	Separation of two materials that were originally bonded together in a separate operation
Delamination	Internal separation of the layers of composite material
Depression	Surface area where the material has been compressed but not removed
Distortion	Alteration of the original shape or size of a component
Erosion	Gradual wearing away or deterioration due to action of the elements
Exposure	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
Fretting	Damage that develops when relative motion of small displacement takes place between contacting parts, wearing away the surface
Gouge	Surface area where material has been removed
Hazardous Propeller Effect	The hazardous propeller effects are defined in Title 14 CFR section 35.15(g)(1)
Horizontal Balance	Balance between the tip and the butt of the blade

<u>Term</u>	<u>Description</u>
Impact Damage	Occurs when the blade strikes or is struck by an object, either in-flight or on the ground
Inboard	Toward the butt of the blade
Inboard Region.....	The inboard portion of the blade encompassing both the face and camber sides of the blade
Inboard Trailing Edge Region....	The inboard portion of the blade encompassing the trailing edge
Laminate	To unite composite material by using a bonding material, usually with pressure and heat
Legacy Composite Blades	Composite blades other than N-shank and Bantam
Lengthwise	A direction that is generally parallel to the pitch axis
Loose Material.....	Material that is no longer fixed or fully attached.
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 less than 10 percent of the leading edge radius or no more than 0.080 inch (2.03 mm) deep
Monocoque	A type of construction in which the outer skin carries all or a major part of the stresses
N-shank Composite Blades.....	A composite blade that is used in lightweight turbine, compact, and lightweight compact propellers
Nick	Removal of paint and possibly a small amount of composite material not exceeding one layer (typically 0.010 inch [0.25 mm])
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. These products are not certificated by any authority. There is no identification stamp comparable to TC and PC on the hubs and blades. Experimental parts are normally stamped with an "X" at or near the end of the part number.

8. Abbreviations

<u>Abbreviation</u>	<u>Term</u>
AR	As Required
ATA.....	Airline Transport Association
FAA.....	Federal Aviation Administration
Ft.-lb.	Foot-Pound
FH	Flight Hour
ICA	Instructions for Continued Airworthiness
ID.....	Inside Diameter
IPL.....	Illustrated Parts List
ITAR	International Traffic in Arms Regulations
Lb(s).....	Pound(s)
Max.	Maximum
Min.	Minimum
MIL-X-XXX	Military Specification
MPI.....	Major Periodic Inspection
MS.....	Military Standard
MSDS.....	Material Safety Data Sheet
N/A	Not Applicable
NAS.....	National Aircraft Standards
NDT	Nondestructive Testing
N•m	Newton-Meter
OD.....	Outside Diameter
OPT	Optional
PC	Production Certificate
PCP	Propeller Critical Part
PSI	Pounds per Square Inch
RF	Reference
RPM	Revolutions per Minute
TBO.....	Time Between Overhaul
TC	Type Certificate
TSN	Time Since New
TSI.....	Time Since Inspection
TSO.....	Time Since Overhaul
WIG	Wing-In-Ground-effect

INSPECTION PROCEDURES - CONTENTS

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1. Inspection Procedures

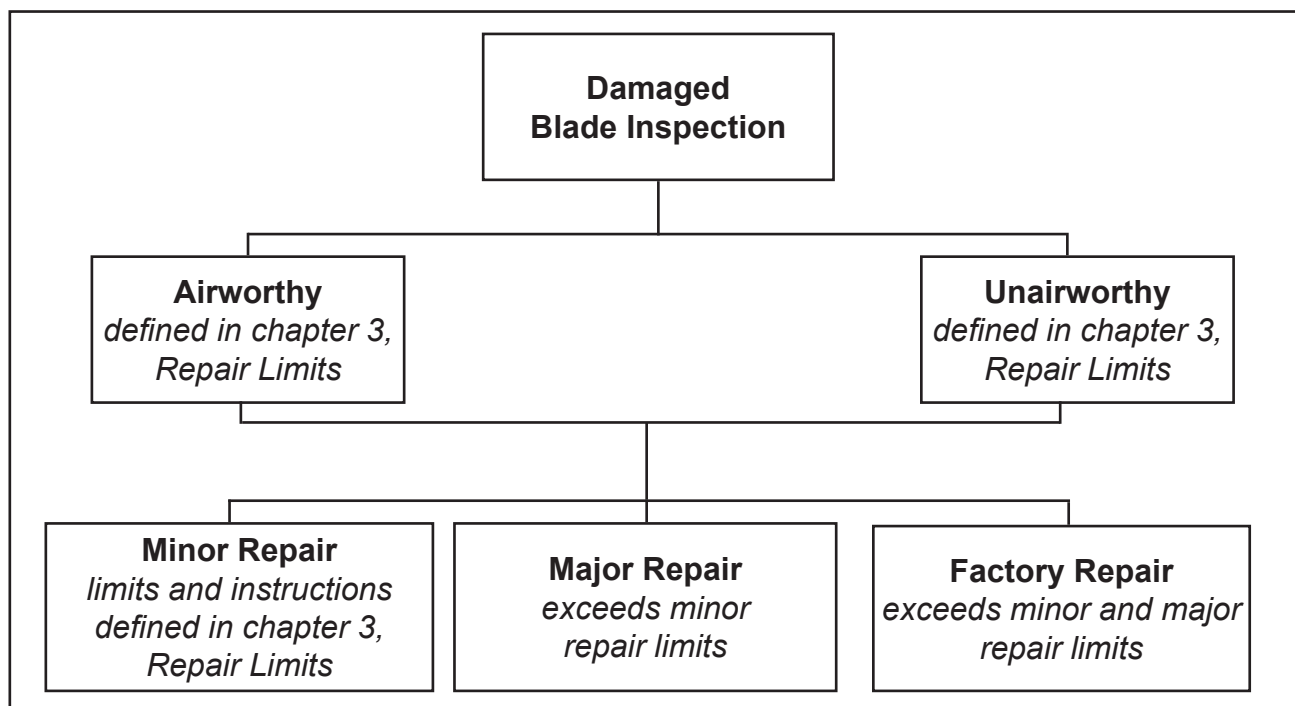
CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS.

A. Determination of Damage Limits

- (1) Upon inspection of a composite propeller blade, an operator should first determine whether the type of damage is airworthy or unairworthy. Refer to Figure 1-1 to determine the type of repair.
 - (a) If the damage is determined to be airworthy, the craft may continue in service; however, the operator should make arrangements to have repairs performed as soon as practical.
 - (b) Any damage that exceeds the airworthiness limitations stated in this manual must be repaired before further flight/operation.

B. Determination of Type of Repair

- (1) Because of the infinite types of damage possible, not all types of damage that can be considered airworthy are covered in this manual. If there is any doubt about the airworthiness of the blade, contact Hartzell Propeller Inc.



Determination of Repair Flow Chart
Figure 1-1

C. Erosion Tape Removal

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.

- (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.

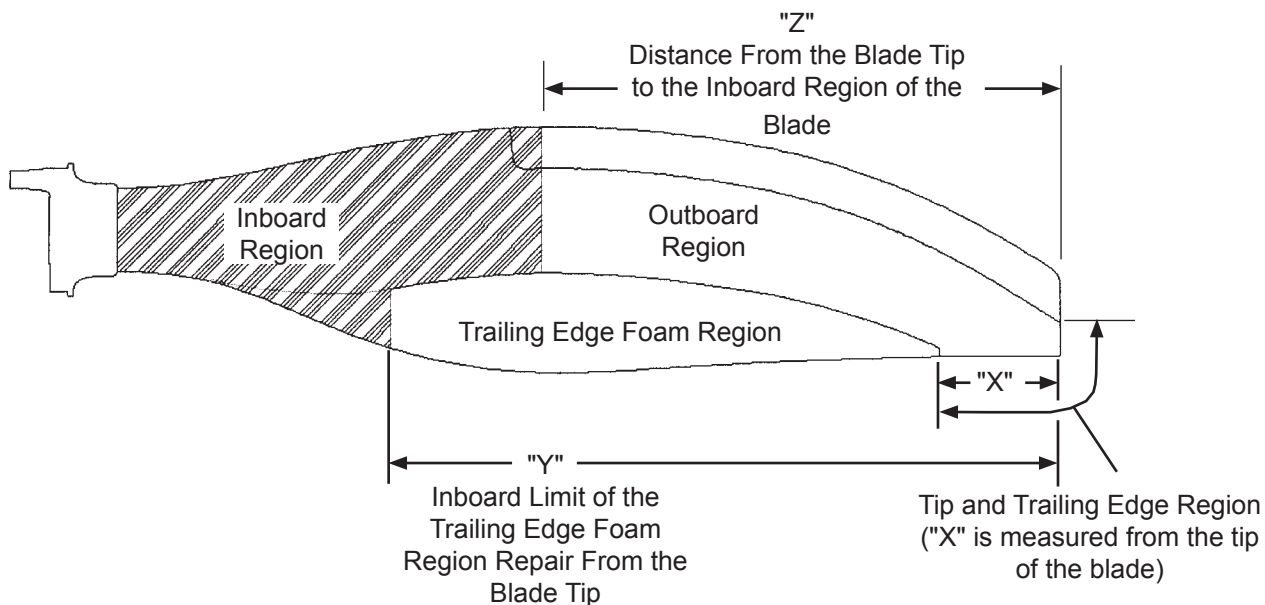
- (a) Carefully lift one edge of the erosion tape CM158.
- (b) Work around the perimeter of the erosion tape CM158, lifting the edge of the tape from the blade.
- (c) After the edge of the erosion tape CM158 is pulled up from the blade, pull the erosion tape off one side of the blade toward the leading 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.
- (f) Using a clean cloth dampened with solvent CM106 (MEK), CM219 (MPK), or CM41 (Toluene) remove all visible adhesive from the blade.

D. Coin-Tap Inspection

- (1) Composite blades are inspected for delaminations and debonds by tapping the entire surface of the blade with a washer-shaped metal tapper or "coin". If an audible change is apparent, sounding hollow or dead, a debond or delamination is likely.
 - (a) Refer to the Tooling and Materials chapter of this manual for the description of a "coin".

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For each blade model listed in this table, refer to Table 2-1 for limits of damage permitted in the regions shown (Inboard, Outboard, Trailing Edge Foam, and Tip and Trailing Edge)

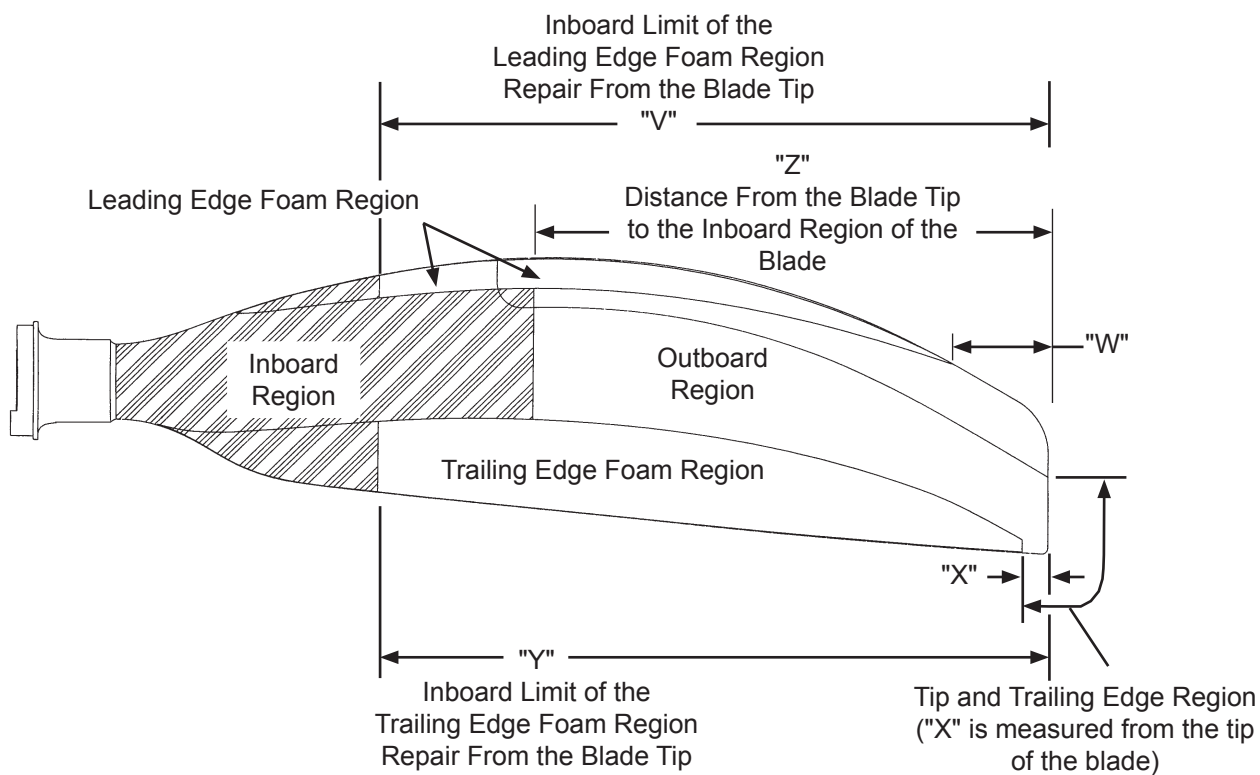


Blade Model	"X"	"Y"	"Z"
N7605(B,K)-2	3.67 inches (93.2 mm)	23.00 inches (584.2 mm)	17.93 inches (455.42 mm)
N7605(B,K)	4.67 inches (118.6 mm)	24.00 inches (609.6 mm)	18.43 Inches (468.1 mm)
N7605(B,K)+2	5.67 inches (144.0 mm)	25.00 inches (635.0 mm)	18.93 inches (480.8 mm)
N7605C()	4.67 inches (118.6 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)
NG8301()	10.52 inches (267.20 mm)	26.25 inches (666.75 mm)	20.18 inches (512.5 mm)
NG8301()-3	9.02 inches (229.10 mm)	24.75 inches (628.65 mm)	18.68 inches (474.47 mm)
NC9208()	3.63 inches (92.2 mm)	28.31 inches (719.0 mm)	21.74 inches (552.1 mm)

Repair Regions - N-shank Blades with Only Trailing Edge Foam

Figure 1-2

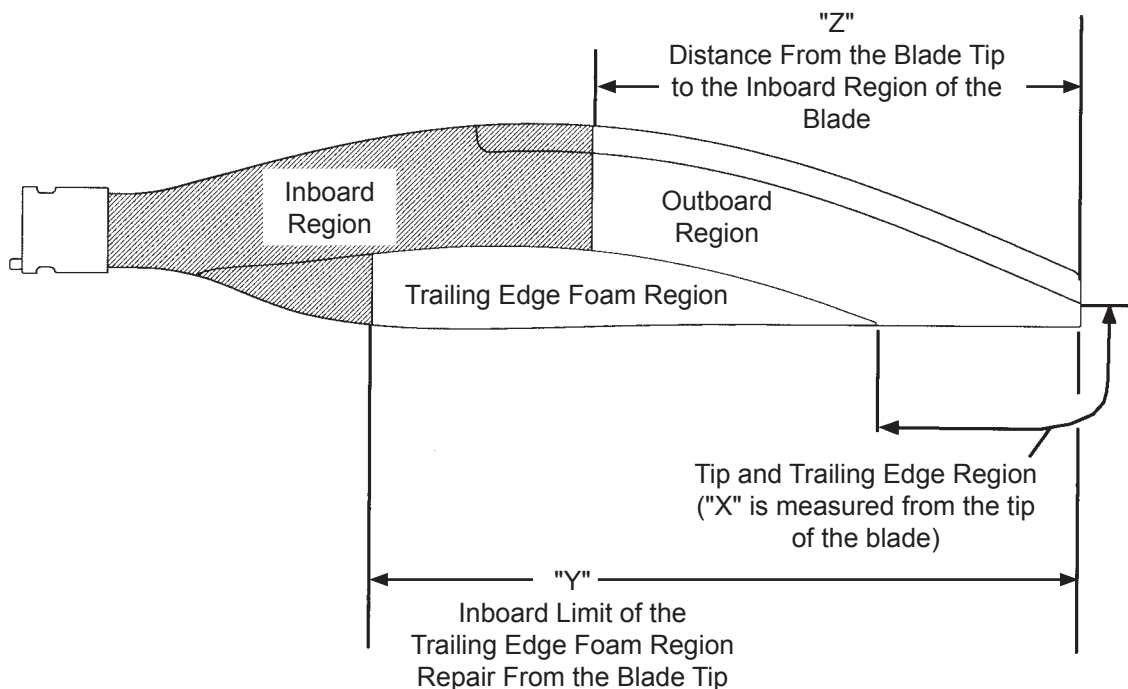
For each blade model listed in this table, refer to Table 2-1 for limits of damage permitted in the regions shown (Inboard, Outboard, Trailing Edge Foam, and Tip and Trailing Edge)



Blade Model	"V"	"W"	"X"	"Y"	"Z"
NC8834()	27.00 inches (685.8 mm)	3.85 inches (97.8 mm)	1.03 inches (26.1 mm)	27.00 inches (685.8 mm)	20.74 inches (526.7 mm)

Repair Regions - N-shank Blades With Both Trailing Edge and Leading Edge Foam
Figure 1-3

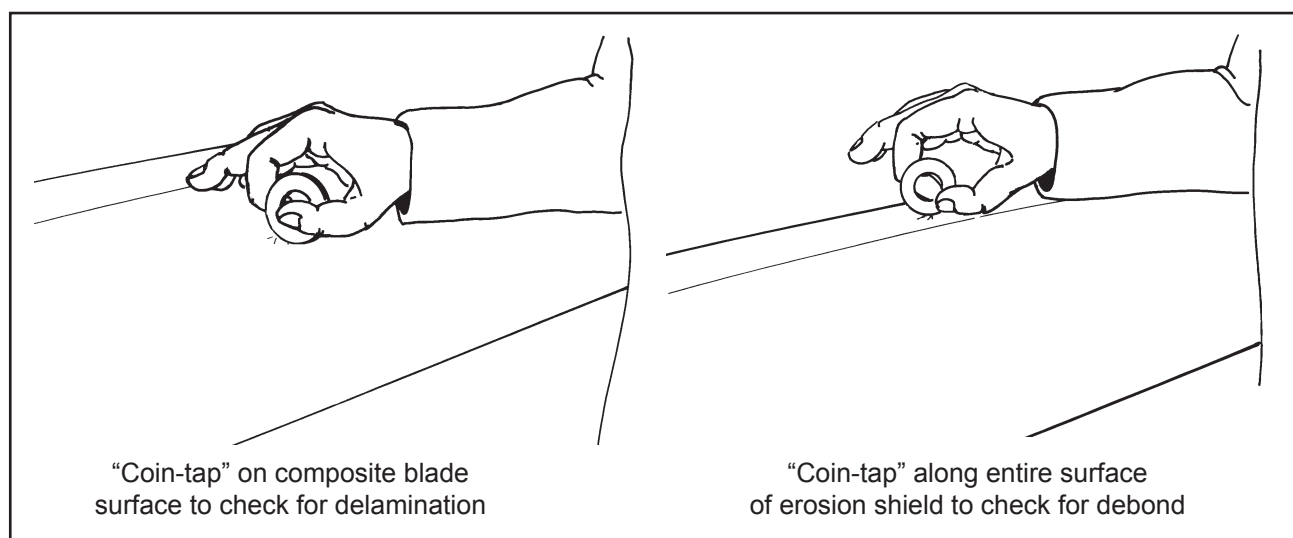
For each blade model listed in this table, refer to Table 2-1 for limits of damage permitted in the regions shown (Inboard, Outboard, Trailing Edge Foam, and Tip and Trailing Edge)



Blade Model	"X"	"Y"	"Z"
75A01-2	5.75 inches (146.0 mm)	18.00 inches (457.5 mm)	18.00 inches (457.5 mm)
L76A01X	13.85 inches (351.7 mm)	18.88 inches (479.5 mm)	18.88 inches (479.5 mm)
H79A06X	7.50 inch (190.5 mm)	28.00 inches (711.2 mm)	19.50 inches (495.3 mm)

Repair Regions - Bantam Blades
Figure 1-4

- (b) Composite blades incorporate a separate foam trailing edge and some models also have a foam leading edge. The foam regions have a different tone when coin-tapped.
 - 1 To avoid confusing sounds, coin-tap the foam region(s) and the transition area between the foam region(s) and the blade separately from the blade area. Refer to Figures 1-2 thru 1-4.
- (2) "Mapping" of the area to be coin-tapped is desirable to make sure that the entire surface is sufficiently inspected. Refer to Figure 1-5
 - (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.
- (3) Make a record of the damage and the repair in the propeller logbook.



Coin-Tap Inspection
Figure 1-5

DAMAGE EVALUATION - CONTENTS

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(9) Nickel Erosion Shield - Debonds Bounded by Two Chordwise Cracks - for all areas that are covered by external de-ice or anti-icing boot.....	2-5
 (10) thru (20) are not applicable to models included in this manual. See the NOTE included in Table 2-1.	
(21) Gouge or Loss of Composite Material - Outboard region of the blade.....	2-5
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(24) Delamination - Outboard region of the blade that is not covered by erosion screen.....	2-6
(25) Delamination - Outboard region of the blade that is covered by erosion screen.....	2-6
(26) Delamination - Trailing edge foam and leading edge foam regions of the blade.....	2-6
(27) Delamination - Inboard region of the blade.....	2-6
(28) Split Trailing Edge - Tip and trailing edge regions of the blade	2-7
(29) Split Trailing Edge - Inboard region of the blade.....	2-7

(30) Crushed or Cracked Trailing Edge - Inboard region of the blade.....	2-7
(31) Crushed or Cracked Trailing Edge - Outboard and tip regions of the blade	2-7
(32) Crushed or Cracked Trailing Edge - Trailing edge foam region of the blade	2-7
(33) Paint Erosion - for the entire blade	2-7
(34) Loss of Paint and/or Filler Material - for the erosion shield only	2-8
(35) Missing Expanded Foil Mesh.....	2-8
(36) Missing Erosion Screen.....	2-8
(37) De-ice or Anti-icing Boot - Damage, wear, debond.....	2-8
(38) Not applicable to models included in this manual. See the NOTE included in Table 2-1.	

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Damage Type by Blade Model	Table 2-1	2-3
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1. Damage Evaluation

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. Determining the Damage Type and Repair Limits

- (1) Inspection should identify the location and type of damage for each area of damage on the blade.
 - (a) Refer to Figures 1-2 thru 1-4 as applicable, for definitions of blade regions by model.
- (2) Locate the appropriate damage type in Table 2-1 based on the location and type of damage identified in the inspection.
- (3) Using Table 2-1, determine the applicable repair limit for the specific blade model.
- (4) Refer to the Repair Limits chapter in this manual for specific information regarding Airworthy Damage and Minor Repair Limits for each damage type.

Damage Type and Reference Section in this manual		N7605(B,K)()	N7605C()	N()7893()	NC9208()	NG8301()	NC8834()	75A01-2()	L76A01X()	H79A06X()	N76M05C()X
1.	Nickel Erosion Shield - Minor Deformation - for the entire erosion shield										
	(a) Limits 1	X	X	X	X	X	X	X	X	X	X
2.	Nickel Erosion Shield - Gouge - for the entire erosion shield										
	(a) Limits 1	X	X	X	X	X	-	X	X	X	X
	(b) Limits 2	-	-	-	-	-	X	-	-	-	-
<p>NOTE: The numbered damage types in this table match the numbered damage types in Hartzell Propeller Inc. Composite Propeller Blade Maintenance Manual 135F (61-13-35) for consistency only. The damage types that do not apply to the affected blades in this manual have been omitted from this table.</p>											

Damage Type by Blade Model
Table 2-1

Damage Type and Reference Section in this manual		N7605(B,K)()	N7605C()	N()7893()	NC9208()	NG8301()	NC8834()	75A01-2()	L76A01X()	H79A06X()	N76M05C()X
3.	Nickel Erosion Shield - Area Missing Along the Trailing Edge of the Erosion Shield - for the entire erosion shield										
	(a) Limits 1	X	X	X	X	X	X	X	X	X	X
4.	Nickel Erosion Shield - Debond - for all areas not covered by external de-ice or anti-icing boot										
	(a) Limits 1	X	X	X	X	X	X	X	X	X	X
5.	Nickel Erosion Shield - Chordwise Crack - for all areas not covered by external de-ice or anti-icing boot										
	(a) Limits 1	X	X	X	X	X	X	X	X	X	X
6.	Nickel Erosion Shield - Lengthwise Cracks - for all areas not covered by external de-ice or anti-icing boot										
	(a) Limits 1	X	X	X	X	X	X	X	X	X	X
7.	Nickel Erosion Shield - Debonds Bounded by a Lengthwise Crack for all areas that are covered by external de-ice or anti-icing boot										
	(a) Limits 1	X	X	X	X	X	X	X	X	X	X
<p>NOTE: The numbered damage types in this table match the numbered damage types in Hartzell Propeller Inc. Composite Propeller Blade Maintenance Manual 135F (61-13-35) for consistency only. The damage types that do not apply to the affected blades in this manual have been omitted from this table.</p>											

Damage Type by Blade Model
Table 2-1 - continued

Damage Type and Reference Section in this manual		N7605(B,K)()	N7605C()	N()7893()	NC9208()	NC8301()	NC8834()	75A01-2()	L76A01X()	H79A06X()	N76M05C()X
8.	Nickel Erosion Shield - Debonds - for all areas that are covered by external de-ice or anti-icing boot										
	(a) Limits 1	X	X	X	X	X	X	X	X	X	X
9.	Nickel Erosion Shield - Debonds Bounded by Two Chordwise Cracks - for all areas that are covered by external de-ice or anti-icing boot										
	(a) Limits 1	X	X	X	X	X	X	X	X	X	X
10.	Not Applicable - see NOTE	-	-	-	-	-	-	-	-	-	-
11.	Not Applicable - see NOTE	-	-	-	-	-	-	-	-	-	-
12.	Not Applicable - see NOTE	-	-	-	-	-	-	-	-	-	-
13.	Not Applicable - see NOTE	-	-	-	-	-	-	-	-	-	-
14.	Not Applicable - see NOTE	-	-	-	-	-	-	-	-	-	-
15.	Not Applicable - see NOTE	-	-	-	-	-	-	-	-	-	-
16.	Not Applicable - see NOTE	-	-	-	-	-	-	-	-	-	-
17.	Not Applicable - see NOTE	-	-	-	-	-	-	-	-	-	-
18.	Not Applicable - see NOTE	-	-	-	-	-	-	-	-	-	-
19.	Not Applicable - see NOTE	-	-	-	-	-	-	-	-	-	-
20.	Not Applicable - see NOTE	-	-	-	-	-	-	-	-	-	-
21.	Gouge or Loss of Composite Material - Outboard Region of the Blade										
	(a) Limits 1	-	X	-	X	X	X	X	X	X	X
	(b) Limits 2	X	-	X	-	-	-	-	-	-	-
<p>NOTE: The numbered damage types in this table match the numbered damage types in Hartzell Propeller Inc. Composite Propeller Blade Maintenance Manual 135F (61-13-35) for consistency only. The damage types that do not apply to the affected blades in this manual have been omitted from this table.</p>											

Damage Type by Blade Model
Table 2-1 - continued

Damage Type and Reference Section in this manual		N7605(B,K)()	N7605C()	N()7893()	NC9208()	NC8301()	NC8834()	75A01-2()	L76A01X()	H79A06X()	N76M05C()X
22.	Gouge or Loss of Composite Material - Trailing Edge Foam and Leading Edge Foam Regions of the Blade										
	(a) Limits 1	X	-	X	-	-	-	-	-	-	-
	(b) Limits 2	-	X	-	X	X	X	X	X	X	X
23.	Gouge or Loss of Composite Material - Inboard Region of the Blade										
	(a) Limits 1	X	X	X	X	X	X	X	X	X	X
24.	Delamination - Outboard region of the blade that is not covered by erosion screen										
	(a) Limits 1	-	X	-	X	X	X	X	X	X	X
	(b) Limits 2	X	-	X	-	-	-	-	-	-	-
25.	Delamination - Outboard region of the blade that is covered by erosion screen										
	(a) Limits 1	-	-	-	-	-	X	-	-	-	-
26.	Delamination - Trailing edge foam and leading edge foam regions of the blade										
	(a) Limits 1	X	-	X	-	-	-	-	-	-	-
	(b) Limits 2	-	X	-	X	X	X	X	X	X	X
27.	Delamination - Inboard region of the blade										
	(a) Limits 1	X	X	X	X	X	X	X	X	X	X
<p>NOTE: The numbered damage types in this table match the numbered damage types in Hartzell Propeller Inc. Composite Propeller Blade Maintenance Manual 135F (61-13-35) for consistency only. The damage types that do not apply to the affected blades in this manual have been omitted from this table.</p>											

Damage Type by Blade Model
Table 2-1 - continued

Damage Type and Reference Section in this manual		N7605(B,K)()	N7605C()	N()7893()	NC9208()	NG8301()	NC8834()	75A01-2()	L76A01X()	H79A06X()	N76M05C()X
28.	Split Trailing Edge - Tip and trailing edge regions of the blade										
	(a) Limits 1	-	X	-	X	X	X	-	-	-	X
	(b) Limits 2	Not applicable to any affected blades									
	(c) Limits 3	-	-	-	-	-	-	X	X	X	-
	(d) Limits 4	X	-	X	-	-	-	-	-	-	-
29.	Split Trailing Edge - Inboard region of the blade										
	(a) Limits 1	X	X	X	X	X	X	X	X	X	X
30.	Crushed or Cracked Trailing Edge - Inboard region of the blade										
	(a) Limits 1	Not applicable to any affected blades									
	(b) Limits 2	X	X	X	X	X	X	X	X	X	X
31.	Crushed or Cracked Trailing Edge - Outboard & tip regions of the blade										
	(a) Limits 1	X	-	X	-	-	-	-	-	-	-
	(b) Limits 2	Not applicable to any affected blades									
	(c) Limits 3	-	X	-	X	X	X	-	-	-	X
	(d) Limits 4	-	-	-	-	-	-	X	X	X	-
32.	Crushed or Cracked Trailing Edge - Trailing edge foam region of the blade										
	(a) Limits 1	X	-	X	-	-	-	-	-	-	-
33.	Paint Erosion - for the entire blade										
	(a) Limits 1	X	X	X	X	X	X	X	X	-	X
	(b) Limits 2	-	-	-	-	-	-	-	-	X	-
<p>NOTE: The numbered damage types in this table match the numbered damage types in Hartzell Propeller Inc. Composite Propeller Blade Maintenance Manual 135F (61-13-35) for consistency only. The damage types that do not apply to the affected blades in this manual have been omitted from this table.</p>											

Damage Type by Blade Model
Table 2-1 - continued

Damage Type and Reference Section in this manual		N7605(B,K)()	N7605C()	N()7893()	NC9208()	NC8301()	NC8834()	75A01-2()	L76A01X()	H79A06X()	N76M05C()X
34.	Loss of Paint and/or Filler Material - for erosion shield only										
	(a) Limits 1	X	X	X	X	X	X	X	X	-	X
35.	Missing Expanded Foil Mesh										
	(a) Limits 1	Not applicable to any affected blades									
	(b) Limits 2	X	-	X	-	-	-	-	-	-	-
36.	Missing Erosion Screen										
	(a) Limits 1	-	-	-	-	-	X	-	-	-	-
37.	De-ice or Anti-icing Boot - Damage, wear, debond										
	(a) Limits 1	X	X	X	X	X	X	X	X	X	X
38.	Not Applicable - see NOTE	-	-	-	-	-	-	-	-	-	-
<p>NOTE: The numbered damage types in this table match the numbered damage types in Hartzell Propeller Inc. Composite Propeller Blade Maintenance Manual 135F (61-13-35) for consistency only. The damage types that do not apply to the affected blades in this manual have been omitted from this table.</p>											

Damage Type by Blade Model
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(3) Nickel Erosion Shield - Area Missing Along the Trailing Edge of the Erosion Shield	3-6
(4) Nickel Erosion Shield - Debond - for all areas not covered by external de-ice or anti-icing boot.....	3-8
(5) Nickel Erosion Shield - Chordwise Crack - for all areas not covered by external de-ice or anti-icing boot.....	3-8
(6) Nickel Erosion Shield - Lengthwise Cracks - for all areas not covered by an external de-ice or anti-icing boot.....	3-8
(7) Nickel Erosion Shield - Debonds Bounded by a Lengthwise Crack - for all areas that are covered by external de-ice or anti-icing boot.....	3-9
(8) Nickel Erosion Shield - Debonds - for all areas that are covered by external de-ice or anti-icing boot.....	3-10
(9) Nickel Erosion Shield - Debonds Bounded by Two Chordwise Cracks - for all areas that are covered by external de-ice or anti-icing boot.....	3-10
(10) thru (20) are not applicable to models included in this manual.	
(21) Gouge or Loss of Composite Material - Outboard region of the blade.....	3-11
(22) Gouge or Loss of Composite Material - Trailing edge foam and leading edge foam regions of the blade.....	3-12
(23) Gouge or Loss of Composite Material - Inboard region of the blade.....	3-12
(24) Delamination - Outboard region of the blade that is not covered by erosion screen.....	3-13
(25) Delamination - Outboard region of the blade that is covered by erosion screen.....	3-13
(26) Delamination - Trailing edge foam and leading edge foam regions of the blades.....	3-13
(27) Delamination - Inboard region of the blade.....	3-14
(28) Split Trailing Edge - Tip and trailing edge regions of the blade	3-14

(29) Split Trailing Edge - Inboard region of the blade.....	3-14
(30) Crushed or Cracked Trailing Edge - Inboard region of the blade.....	3-15
(31) Crushed or Cracked Trailing Edge - Outboard and tip regions of the blade	3-15
(32) Crushed or Cracked Trailing Edge - Trailing edge foam region of the blade	3-15
(33) Paint Erosion - for the entire blade	3-16
(34) Loss of Paint and/or Filler Material - for the erosion shield only	3-17
(35) Missing Expanded Foil Mesh.....	3-17
(36) Missing Erosion Screen.....	3-17
(37) De-ice or Anti-icing Boot - Damage, wear, debond.....	3-17
(38) Not applicable to models included in this manual.	

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1. 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 as specified in Table 3-1 in this chapter.
 - (a) Airworthy damage does not affect the safety or flight characteristics of the propeller and conforms to its type design.
 - (b) Damage that is within the airworthy limits does not require repair before further flight, but should be repaired as soon as possible to prevent degradation of the damage.
- (2) Unairworthy damage is a specific condition to a blade installed on an aviation product that exceeds the airworthy damage limits as specified in Table 3-1 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) This condition makes the component unairworthy, requiring appropriate corrective action to repair or remove it from service, as applicable.

B. Operable/Inoperable Damage

- (1) Operable damage is a specific condition to a blade installed on a non-aviation product that does not affect the safety or operational characteristics of the propeller blade.
 - (a) For a blade that is used on a non-aviation application, all references in this manual to airworthy damage apply to operable damage.
 - (b) Although a blade may continue in service with operable damage, this type of damage should be repaired at the earliest practical time to prevent the damage from progressing to a condition that could require a more extensive repair to the blade.
- (2) Inoperable damage is a specific condition to a blade installed on non-aviation product that exceeds the airworthy damage limits as specified in Table 3-1.
 - (a) Inoperable damage can affect the safety or operational characteristics of the propeller and does not conform to its type design.
 - (b) This condition makes the component inoperable, requiring appropriate corrective action to repair or remove it from service, as applicable.

C. Minor/Major Repair

- (1) Minor repair is that which may be done safely in the field by a certified aircraft mechanic.
- (2) Major repair work is that which exceeds the minor repair limits as specified in Table 3-1 in this chapter.

2. Repair Limits

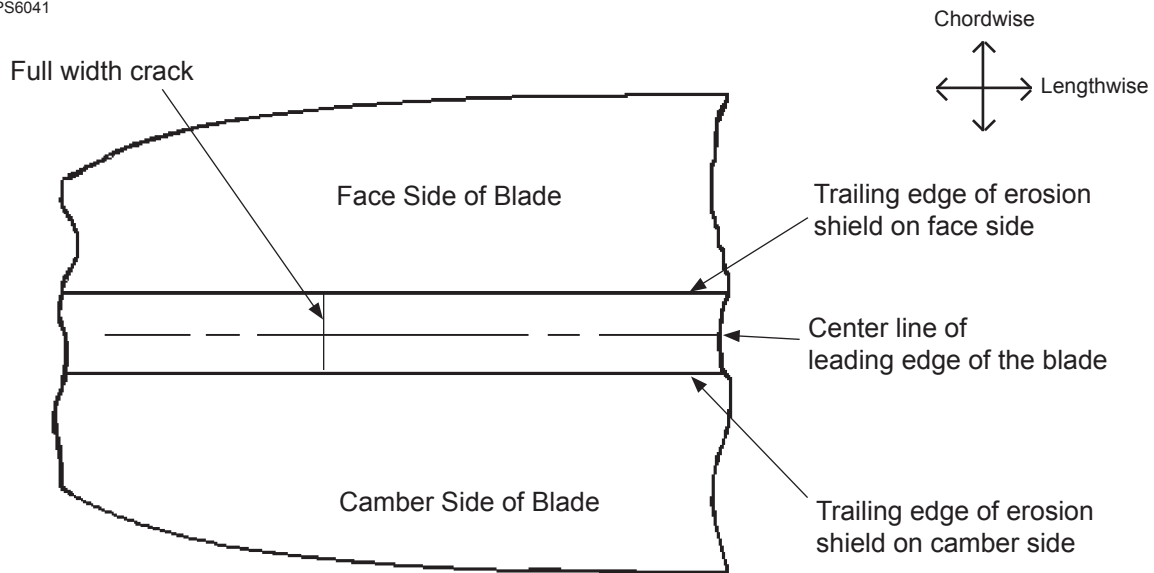
CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS SECTION INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS.

A. Repair Limits by Damage Type (Refer to Table 3-1)

<u>CAUTION:</u> REFER TO TABLE 2-1 IN THE DAMAGE EVALUATION CHAPTER OF THIS MANUAL FOR THE APPLICABLE DAMAGE TYPE AND REPAIR LIMITS BY BLADE MODEL. REFER TO THIS TABLE FOR THE AIRWORTHY AND MINOR REPAIR LIMITS FOR EACH DAMAGE TYPE.		
1. <u>NICKEL EROSION SHIELD - MINOR DEFORMATION</u> <u>- FOR THE ENTIRE EROSION SHIELD</u>		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
(a) LIMITS 1	Deformed material not associated with a crack or missing material less than 10 percent 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.
FOR MAJOR REPAIRS, REFER TO THE PERSONNEL REQUIREMENTS SECTION IN THE INTRODUCTION CHAPTER OF THIS SERVICE MANUAL		

Repair Limits by Damage Type
Table 3-1

APS6041

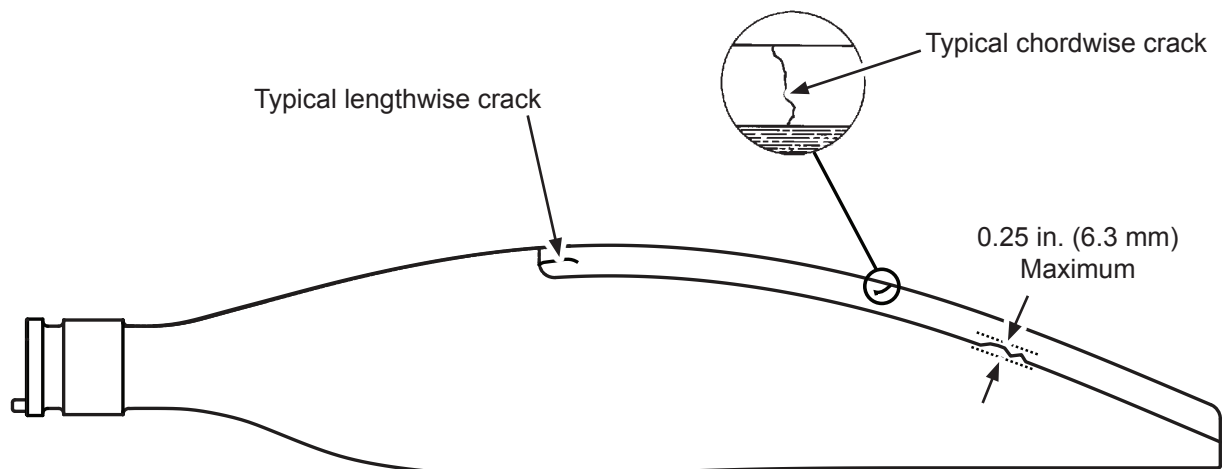


When calculating the area of damage and the proximity to other damage, look at the erosion shield as a two dimensional shape, as if it were unfolded and spread flat where the face and camber sides of the blade could be viewed at the same time.

Interpretation of Erosion Shield Damage

Figure 3-1

TI-411-006A



Missing Portions of Nickel Erosion Shield (Trail Side) and Typical Cracks

Figure 3-2

CAUTION: REFER TO TABLE 2-1 IN THE DAMAGE EVALUATION CHAPTER OF THIS MANUAL FOR THE APPLICABLE DAMAGE TYPE AND REPAIR LIMITS BY BLADE MODEL. REFER TO THIS TABLE FOR THE AIRWORTHY AND MINOR REPAIR LIMITS FOR EACH DAMAGE TYPE.

2. NICKEL EROSION SHIELD - GOUGE
- FOR THE ENTIRE EROSION SHIELD

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
(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). <u>NOTE:</u> This is two layers of fibrous material. Damage cannot be permanently repaired without replacement of the erosion shield, but within these limits, does not make the blade unairworthy.	If the damage is within the Airworthy Damage Limits, repair in accordance with section 2.A.(1) in the Minor Repair chapter in this manual. An erosion shield repaired within this limit must be replaced at overhaul.
(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.

3. NICKEL EROSION SHIELD - AREA MISSING ALONG THE TRAILING EDGE OF THE EROSION SHIELD
- FOR THE ENTIRE EROSION SHIELD

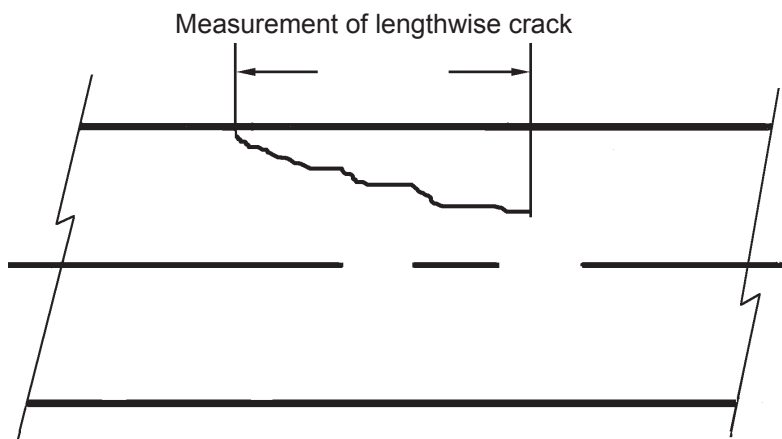
REFER TO FIGURE 3-1 AND FIGURE 3-2

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
(a) LIMITS 1	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.	If the damage is within the Airworthy Damage Limits, repair in accordance with section 2.B.(1) in the Minor Repair chapter in this manual.

FOR MAJOR REPAIRS, REFER TO THE PERSONNEL REQUIREMENTS SECTION IN THE INTRODUCTION CHAPTER OF THIS SERVICE MANUAL

Repair Limits by Damage Type
Table 3-1 - continued

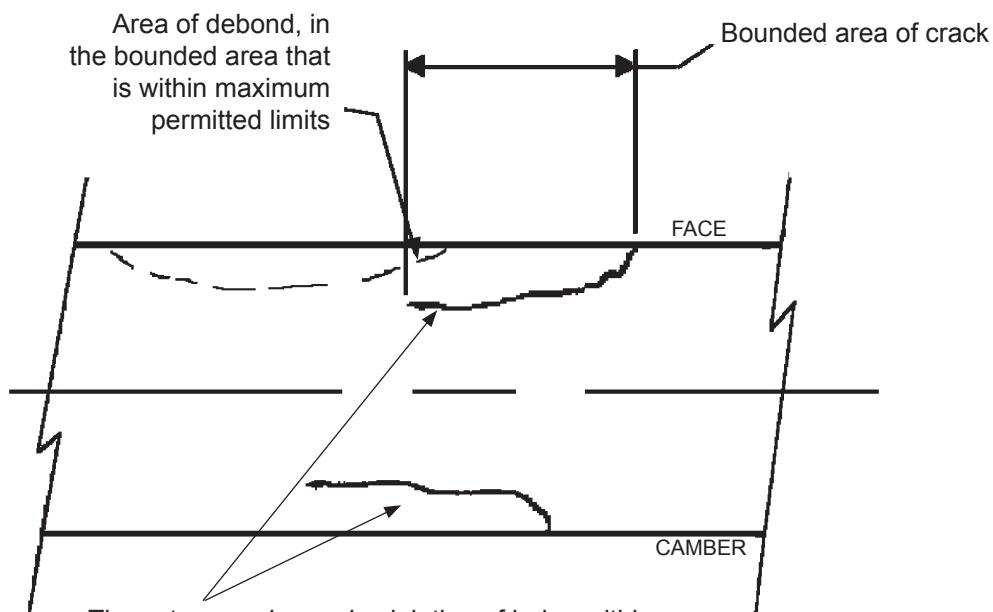
W10001



"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.

Measuring Lengthwise Crack
Figure 3-3

APS6042



These two cracks are in violation of being within the same linear length. Note that the cracks are on opposite sides of the blade.

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

Acceptable Erosion Shield Debond, Non-acceptable Crack Location
Figure 3-4

CAUTION: REFER TO TABLE 2-1 IN THE DAMAGE EVALUATION CHAPTER OF THIS MANUAL FOR THE APPLICABLE DAMAGE TYPE AND REPAIR LIMITS BY BLADE MODEL. REFER TO THIS TABLE FOR THE AIRWORTHY AND MINOR REPAIR LIMITS FOR EACH DAMAGE TYPE.

4. NICKEL EROSION SHIELD - DEBOND
- FOR ALL AREAS THAT ARE NOT COVERED BY AN EXTERNAL DE-ICE OR ANTI-ICING BOOT

REFER TO FIGURE 3-1

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
(a) LIMITS 1	A maximum of 20 percent 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 section 2.C.(1) in the Minor Repair chapter in this manual.

5. NICKEL EROSION SHIELD - CHORDWISE CRACK
- FOR ALL AREAS THAT ARE NOT COVERED BY AN EXTERNAL DE-ICE OR ANTI-ICING BOOT

REFER TO FIGURE 3-1

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
(a) LIMITS 1	Two full width, chordwise cracks may not be within 6.0 inches (153 mm) of each other. A chordwise crack may not be within 6.0 inches (153 mm) of the blade tip. A chordwise crack may not be within 6.0 inches (153 mm) of the outboard end of the de-ice or anti-icing boot. A chordwise crack may not be within 6.0 inches (153 mm) of the inboard end of the erosion shield (when not covered by a de-ice or anti-icing boot).	Minor repair is not authorized.

6. NICKEL EROSION SHIELD - LENGTHWISE CRACKS
- FOR ALL AREAS THAT ARE NOT COVERED BY AN EXTERNAL DE-ICE OR ANTI-ICING BOOT

REFER TO FIGURE 3-1, FIGURE 3-3, AND FIGURE 3-4

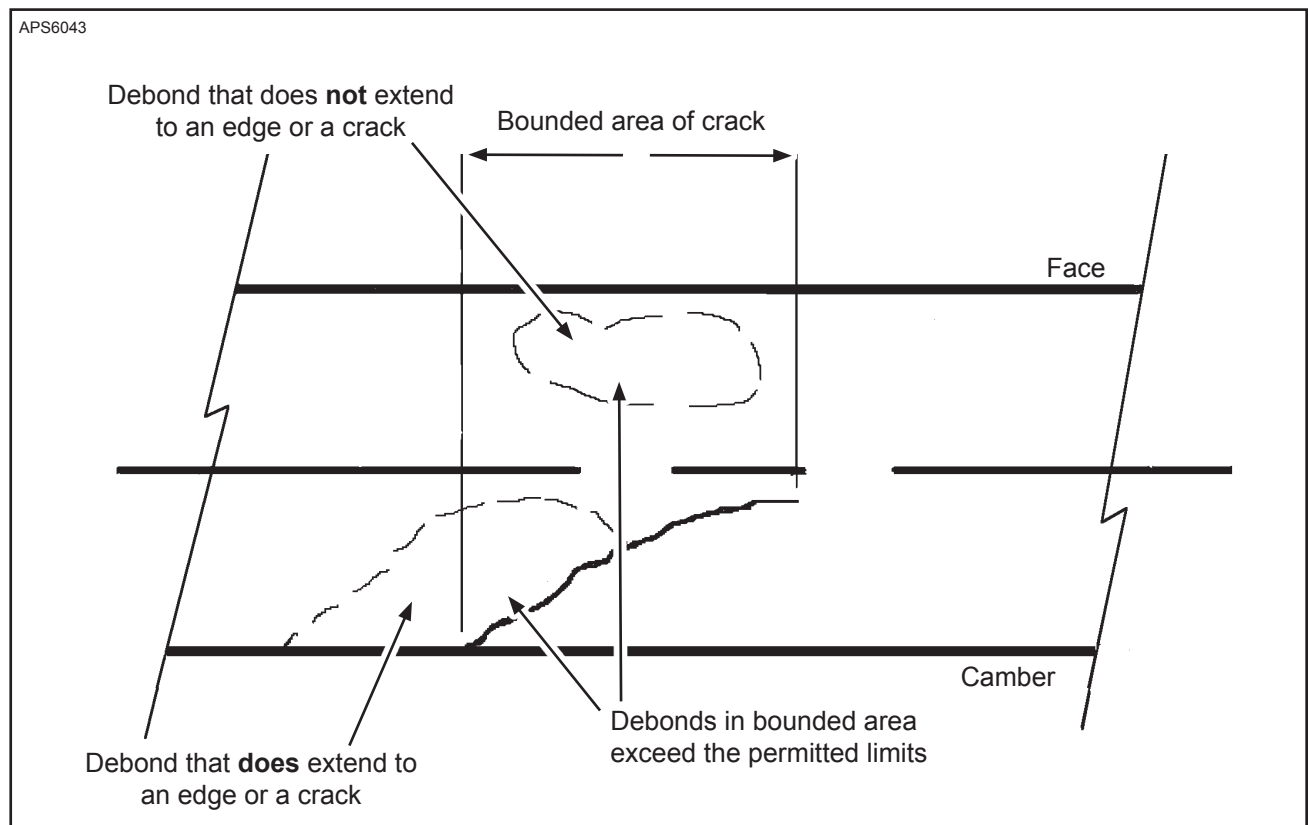
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
(a) LIMITS 1	The maximum permitted length of a crack is 2.0 inches (50 mm). Two lengthwise cracks may not be within the same linear length on the erosion shield. This includes cracks on opposite sides of the blade.	Minor repair is not authorized.

FOR MAJOR REPAIRS, REFER TO THE PERSONNEL REQUIREMENTS SECTION IN THE INTRODUCTION CHAPTER OF THIS SERVICE MANUAL

Repair Limits by Damage Type
Table 3-1 - continued

CAUTION: REFER TO TABLE 2-1 IN THE DAMAGE EVALUATION CHAPTER OF THIS MANUAL FOR THE APPLICABLE DAMAGE TYPE AND REPAIR LIMITS BY BLADE MODEL. REFER TO THIS TABLE FOR THE AIRWORTHY AND MINOR REPAIR LIMITS FOR EACH DAMAGE TYPE.		
7. <u>NICKEL EROSION SHIELD - DEBONDS BOUNDED BY A LENGTHWISE CRACK</u> <u>- FOR ALL AREAS THAT ARE COVERED BY AN EXTERNAL DE-ICE OR ANTI-ICING BOOT</u>		
REFER TO FIGURE 3-1, FIGURE 3-4, AND FIGURE 3-5		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
(a) LIMITS 1	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 percent. NOTE: For crack limits, refer to the applicable section in this table.	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 section 2.C.(1) in the Minor Repair chapter in this manual.
FOR MAJOR REPAIRS, REFER TO THE PERSONNEL REQUIREMENTS SECTION IN THE INTRODUCTION CHAPTER OF THIS SERVICE MANUAL		

Airworthy and Minor Repair Limits
Table 3-1 - continued



Debonds in Excess of Allowable Limits
Figure 3-5

CAUTION: REFER TO TABLE 2-1 IN THE DAMAGE EVALUATION CHAPTER OF THIS MANUAL FOR THE APPLICABLE DAMAGE TYPE AND REPAIR LIMITS BY BLADE MODEL. REFER TO THIS TABLE FOR THE AIRWORTHY AND MINOR REPAIR LIMITS FOR EACH DAMAGE TYPE.		
8. <u>NICKEL EROSION SHIELD - DEBONDS</u> <u>- FOR ALL AREAS THAT ARE COVERED BY AN EXTERNAL DE-ICE OR ANTI-ICING BOOT</u> REFER TO FIGURE 3-1		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
(a) LIMITS 1	A maximum of 40 percent 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 section 2.C.(1) in the Minor Repair chapter in this manual.
9. <u>NICKEL EROSION SHIELD - DEBONDS BOUNDED BY TWO CHORDWISE CRACKS</u> <u>- FOR ALL AREAS THAT ARE COVERED BY AN EXTERNAL DE-ICE OR ANTI-ICING BOOT</u> REFER TO FIGURE 3-1		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
(a) LIMITS 1	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 percent. NOTE: For crack limits, refer to the applicable section in this table.	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 section 2.C.(1) in the Minor Repair chapter in this manual.
10. <u>NOT APPLICABLE</u>		
11. <u>NOT APPLICABLE</u>		
12. <u>NOT APPLICABLE</u>		
13. <u>NOT APPLICABLE</u>		
14. <u>NOT APPLICABLE</u>		
15. <u>NOT APPLICABLE</u>		
16. <u>NOT APPLICABLE</u>		
17. <u>NOT APPLICABLE</u>		
18. <u>NOT APPLICABLE</u>		
19. <u>NOT APPLICABLE</u>		
20. <u>NOT APPLICABLE</u>		
FOR MAJOR REPAIRS, REFER TO THE PERSONNEL REQUIREMENTS SECTION IN THE INTRODUCTION CHAPTER OF THIS SERVICE MANUAL		

Repair Limits by Damage Type
Table 3-1 - continued

<p>CAUTION: REFER TO TABLE 2-1 IN THE DAMAGE EVALUATION CHAPTER OF THIS MANUAL FOR THE APPLICABLE DAMAGE TYPE AND REPAIR LIMITS BY BLADE MODEL. REFER TO THIS TABLE FOR THE AIRWORTHY AND MINOR REPAIR LIMITS FOR EACH DAMAGE TYPE.</p>		
<p>21. <u>GOUGE OR LOSS OF COMPOSITE MATERIAL</u> - <u>OUTBOARD REGION OF THE BLADE</u></p>		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
<p>(a) LIMITS 1</p> <p><u>NOTE:</u> Do not include paint when measuring the depth of a gouge or loss of composite material.</p>	<p>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).</p>	<p>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 section 3.A.(1) in the Minor Repair chapter in this manual.</p>
<p>(b) LIMITS 2</p> <p><u>NOTE:</u> Do not include paint when measuring the depth of a gouge or loss of composite material.</p>	<p>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).</p>	<p>For a gouge or loss of composite material that <u>does not</u> expose the carbon layer, repair in accordance with section 3.A.(2) in the Minor Repair chapter in this manual.</p> <p>For a gouge or loss of composite material that <u>does</u> expose the carbon layer, major repair is not authorized. Send the blade to Hartzell Propeller Inc. for evaluation.</p>
<p>FOR MAJOR REPAIRS, REFER TO THE PERSONNEL REQUIREMENTS SECTION IN THE INTRODUCTION CHAPTER OF THIS SERVICE MANUAL</p>		

Repair Limits by Damage Type
Table 3-1 - continued

CAUTION: REFER TO TABLE 2-1 IN THE DAMAGE EVALUATION CHAPTER OF THIS MANUAL FOR THE APPLICABLE DAMAGE TYPE AND REPAIR LIMITS BY BLADE MODEL. REFER TO THIS TABLE FOR THE AIRWORTHY AND MINOR REPAIR LIMITS FOR EACH DAMAGE TYPE.

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

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
(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.	If the damage is within the Airworthy Damage Limits, repair in accordance with section 3.B.(1) in the Minor Repair chapter in this manual.
(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.	If the damage is within the Airworthy Damage Limits, repair in accordance with section 3.B.(2) in the Minor Repair chapter in this manual.

23. GOUGE OR LOSS OF COMPOSITE MATERIAL
- INBOARD REGION OF THE BLADE

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
(a) LIMITS 1	A gouge or loss of composite material on the inboard region of the blade is unairworthy. Refer to Figures 1-2 thru 1-4 for specific region.	Minor repair is not authorized.

FOR MAJOR REPAIRS, REFER TO THE PERSONNEL REQUIREMENTS SECTION IN THE INTRODUCTION CHAPTER OF THIS SERVICE MANUAL

Repair Limits by Damage Type
Table 3-1 - continued

CAUTION: REFER TO TABLE 2-1 IN THE DAMAGE EVALUATION CHAPTER OF THIS MANUAL FOR THE APPLICABLE DAMAGE TYPE AND REPAIR LIMITS BY BLADE MODEL. REFER TO THIS TABLE FOR THE AIRWORTHY AND MINOR REPAIR LIMITS FOR EACH DAMAGE TYPE.		
24. DELAMINATION - OUTBOARD REGION OF THE BLADE THAT IS NOT COVERED BY EROSION SCREEN		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
(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.	If the damage is within the Airworthy Damage Limits, repair in accordance with section 3.A.(1) in the Minor Repair chapter in this manual.
(b) LIMITS 2	The maximum permitted area of delamination is 1.0 square inch (645 sq. mm)	If the damage is within the Airworthy Damage Limits, repair in accordance with section 3.A.(2) in the Minor Repair chapter in this manual. .
25. DELAMINATION - OUTBOARD REGION OF THE BLADE THAT IS COVERED BY EROSION SCREEN		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
(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 delamination for a minor repair is 0.5 square inch (322 sq. mm) . Repair in accordance with section 3.A.(1) in the Minor Repair chapter in this manual.
26. DELAMINATION - TRAILING EDGE FOAM AND LEADING EDGE FOAM REGIONS OF THE BLADE		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR INSTRUCTIONS
(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.	If the damage is within the Airworthy Damage Limits, repair in accordance with section 3.B.(1) in the Minor Repair chapter in this manual.
(b) LIMITS 2	The maximum permitted area of delamination is 2.0 square inch (1290 sq. mm).	If the damage is within the Airworthy Damage Limits, repair in accordance with section 3.B.(2) in the Minor Repair chapter in this manual.
FOR MAJOR REPAIRS, REFER TO THE PERSONNEL REQUIREMENTS SECTION IN THE INTRODUCTION CHAPTER OF THIS SERVICE MANUAL		

Repair Limits by Damage Type
Table 3-1 - continued

CAUTION: REFER TO TABLE 2-1 IN THE DAMAGE EVALUATION CHAPTER OF THIS MANUAL FOR THE APPLICABLE DAMAGE TYPE AND REPAIR LIMITS BY BLADE MODEL. REFER TO THIS TABLE FOR THE AIRWORTHY AND MINOR REPAIR LIMITS FOR EACH DAMAGE TYPE.		
27. DELAMINATION - INBOARD REGION OF THE BLADE		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS
(a) LIMITS 1	A delamination on the inboard region of the blade is unairworthy.	Minor repair is not authorized. Retire the blade or send the blade to Hartzell Propeller Inc. for evaluation.
28. SPLIT TRAILING EDGE - TIP AND TRAILING EDGE REGION OF THE BLADE		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR 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.	If the damage is within the Airworthy Damage Limits, repair in accordance with section 3.C.(1) in the Minor Repair chapter in this manual.
(b) LIMITS 2	Not applicable to any affected blades	
(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.	If the damage is within the Airworthy Damage Limits, repair in accordance with section 3.C.(3) in the Minor Repair chapter in this manual.
(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.	If the damage is within the Airworthy Damage Limits, repair in accordance with section 3.C.(4) in the Minor Repair chapter in this manual.
29. SPLIT TRAILING EDGE - INBOARD REGION OF THE BLADE		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR 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 or send the blade to Hartzell Propeller Inc. for evaluation.
FOR MAJOR REPAIRS, REFER TO THE PERSONNEL REQUIREMENTS SECTION IN THE INTRODUCTION CHAPTER OF THIS SERVICE MANUAL		

Repair Limits by Damage Type
Table 3-1 - continued

CAUTION: REFER TO TABLE 2-1 IN THE DAMAGE EVALUATION CHAPTER OF THIS MANUAL FOR THE APPLICABLE DAMAGE TYPE AND REPAIR LIMITS BY BLADE MODEL. REFER TO THIS TABLE FOR THE AIRWORTHY AND MINOR REPAIR LIMITS FOR EACH DAMAGE TYPE.		
30. CRUSHED OR CRACKED TRAILING EDGE - INBOARD REGION OF THE BLADE		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS
(a) LIMITS 1	Not applicable to any affected blades	
(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 or send the blade to Hartzell Propeller Inc. for evaluation.
31. CRUSHED OR CRACKED TRAILING EDGE - OUTBOARD AND TIP REGIONS OF THE BLADE		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR 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).	If the damage is within the Airworthy Damage Limits, repair in accordance with section 3.D.(1) in the Minor Repair chapter in this manual.
(b) LIMITS 2	Not applicable to any affected blades	
(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).	If the damage is within the Airworthy Damage Limits, repair in accordance with section 3.D.(3) in the Minor Repair chapter in this manual.
(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).	The maximum permitted area of a crushed or cracked area is 2.0 sq. inches (1290 sq. mm). Repair within the Airworthy Damage Limits in accordance with section 3.D.(4) in the Minor Repair chapter in this manual.
32. CRUSHED OR CRACKED TRAILING EDGE - TRAILING EDGE FOAM REGION OF THE BLADE		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR 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 section 3.E.(1) in the Minor Repair chapter in this manual.
FOR MAJOR REPAIRS, REFER TO THE PERSONNEL REQUIREMENTS SECTION IN THE INTRODUCTION CHAPTER OF THIS SERVICE MANUAL		

Repair Limits by Damage Type
Table 3-1 - continued

CAUTION: REFER TO TABLE 2-1 IN THE DAMAGE EVALUATION CHAPTER OF THIS MANUAL FOR THE APPLICABLE DAMAGE TYPE AND REPAIR LIMITS BY BLADE MODEL. REFER TO THIS TABLE FOR THE AIRWORTHY AND MINOR REPAIR LIMITS FOR EACH DAMAGE TYPE.

33. PAINT EROSION
- FOR THE ENTIRE BLADE

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS
(a) LIMITS 1	<p>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).</p> <p>NOTE: This limit does not refer to the primer sealer (gray layer).</p> <p>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 1 (one) month, whichever occurs first.</p>	<p>If the damage is within the Airworthy Damage Limits, repair in accordance with section 5, Finish Procedures in the Minor Repair chapter in this manual.</p>
(b) LIMITS 2	<p>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).</p> <p>NOTE: This limit does not refer to the primer sealer (gray layer).</p> <p>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 1 (one) month, whichever occurs first.</p>	<p>H79A06X blades are finish coated with a paint that is restricted by U.S. law and is subject to ITAR controls. Contact the airframe manufacturer for blade repair information or return the blade to Hartzell Propeller Inc.</p>
FOR MAJOR REPAIRS, REFER TO THE PERSONNEL REQUIREMENTS SECTION IN THE INTRODUCTION CHAPTER OF THIS SERVICE MANUAL		

Repair Limits by Damage Type
Table 3-1 - continued

CAUTION: REFER TO TABLE 2-1 IN THE DAMAGE EVALUATION CHAPTER OF THIS MANUAL FOR THE APPLICABLE DAMAGE TYPE AND REPAIR LIMITS BY BLADE MODEL. REFER TO THIS TABLE FOR THE AIRWORTHY AND MINOR REPAIR LIMITS FOR EACH DAMAGE TYPE.		
34. <u>LOSS OF PAINT AND/OR FILLER MATERIAL</u> -FOR THE EROSION SHIELD ONLY		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR 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.	If the damage is within the Airworthy Damage Limits, repair in accordance with section 5, Finish Procedures in the Minor Repair chapter in this manual.
35. <u>MISSING EXPANDED FOIL MESH</u>		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS
(a) LIMITS 1	Not applicable to any affected blades	
(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.	Minor repair of the foil mesh is not authorized. Send the blade to Hartzell Propeller Inc. for factory only repair.
36. <u>MISSING EROSION SCREEN</u>		
LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR 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 (1.2 mm) diameter, that do not exceed more than one layer of composite material in depth may be repaired in accordance with section 3.F.(1) in the Minor Repair chapter in this manual.
FOR MAJOR REPAIRS, REFER TO THE PERSONNEL REQUIREMENTS SECTION IN THE INTRODUCTION CHAPTER OF THIS SERVICE MANUAL		

Repair Limits by Damage Type
Table 3-1 - continued

CAUTION: REFER TO TABLE 2-1 IN THE DAMAGE EVALUATION CHAPTER OF THIS MANUAL FOR THE APPLICABLE DAMAGE TYPE AND REPAIR LIMITS BY BLADE MODEL. REFER TO THIS TABLE FOR THE AIRWORTHY AND MINOR REPAIR LIMITS FOR EACH DAMAGE TYPE.

37. DE-ICE OR ANTI-ICING BOOT
- DAMAGE, WEAR, DEBOND

LIMITS DESIGNATION	AIRWORTHY DAMAGE LIMITS	MINOR REPAIR LIMITS
(a) LIMITS 1	Refer to Hartzell Propeller Ice Protection System Component Maintenance Manual 181 (30-60-81). Manual 181 is available on the Hartzell Propeller Inc. website at www.hartzellprop.com .	Refer to Hartzell Propeller Inc. Propeller Electrical De-ice Boot Removal and Installation Manual 182 (61-12-82) or Hartzell Propeller Inc. Propeller Anti-icing Boot Removal and Installation Manual 183 (61-12-83), as applicable. Manuals 182 and 183 are available on the Hartzell Propeller Inc. website at www.hartzellprop.com .

38. NOT APPLICABLE

FOR MAJOR REPAIRS, REFER TO THE PERSONNEL REQUIREMENTS SECTION IN THE INTRODUCTION CHAPTER OF THIS SERVICE MANUAL

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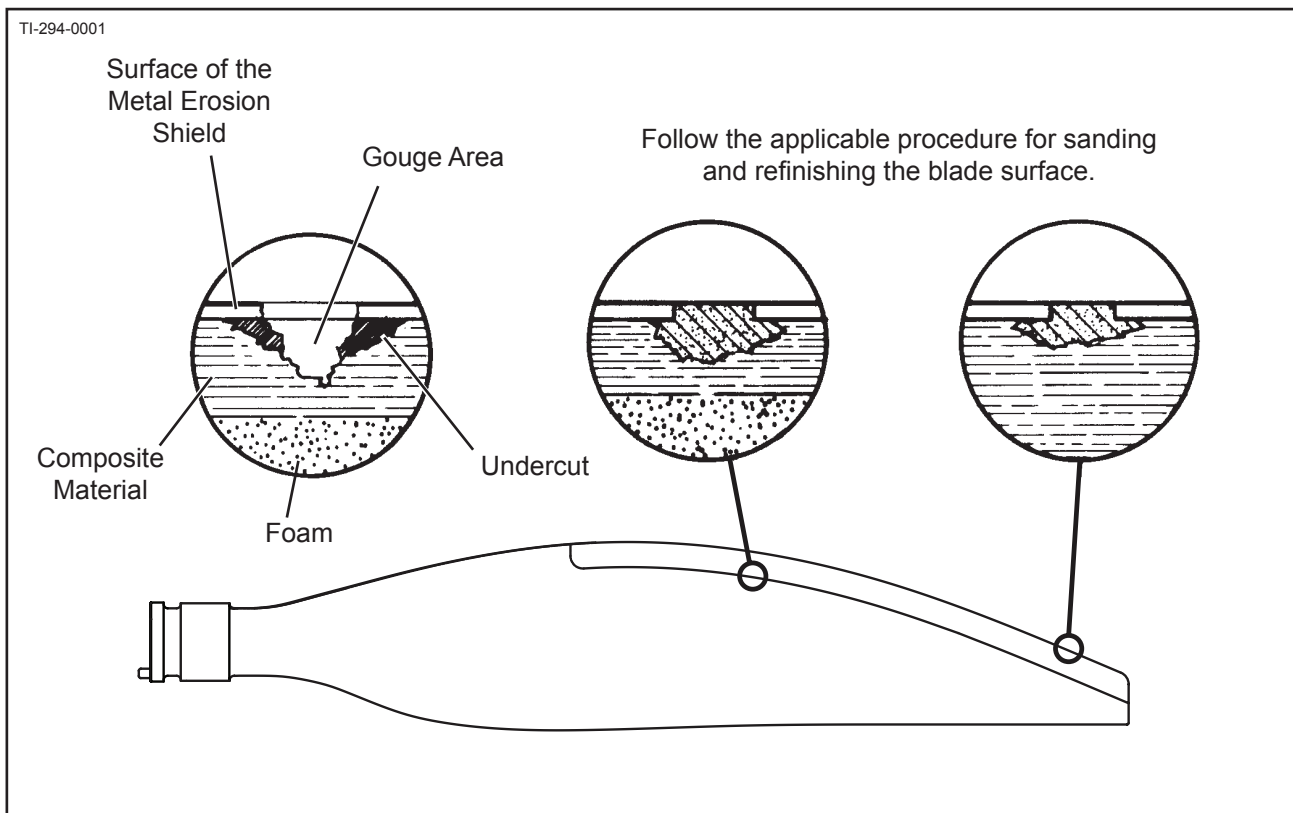
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1. General Instructions

A. General

- (1) The procedures in this section apply when specified for a minor repair of the blade models identified in this manual.
 - (a) Refer to the Personnel Requirements section in the Introduction chapter of this manual for descriptions and requirements of Minor and Major Repairs.



Field Repair of Minor Damage in Erosion Shield
Figure 4-1

2. Nickel 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.

A. Gouge

(1) Limits 1 (Refer to Figure 4-1)

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.

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 or CM15 an amount of milled fibers CM56 that is equal to the amount of adhesive, creating a paste.
 - 1 Add adhesive CM14 or CM15 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 or CM15 and milled fibers CM56.
- (g) Permit the adhesive CM14 or CM15 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 section 5. Finish Procedures in this chapter.

- (2) Limits 2 - Minor repair is not authorized.

B. Missing Area Along Trailing Edge of Erosion Shield

- (1) Limits 1

- (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.

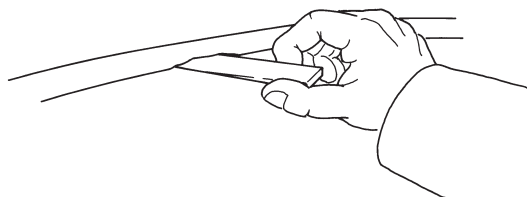
NOTE: Sanding to remove the smooth surface will permit the new composite material to adhere better.

- (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 or CM15, 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 or CM15 and layers of fiberglass fabric CM42, if necessary.
- (i) Permit the adhesive CM14 or CM154 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.

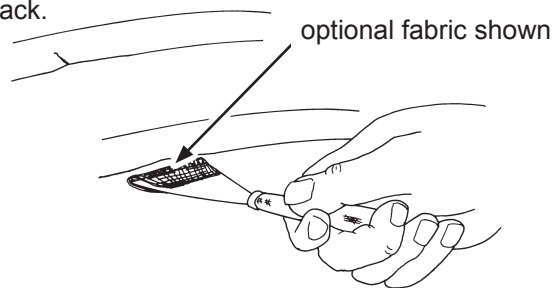
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Using a plastic wedge, gently lift edge of erosion shield far enough to permit brushing on the cleaning solvent and positioning the optional fiberglass fabric.

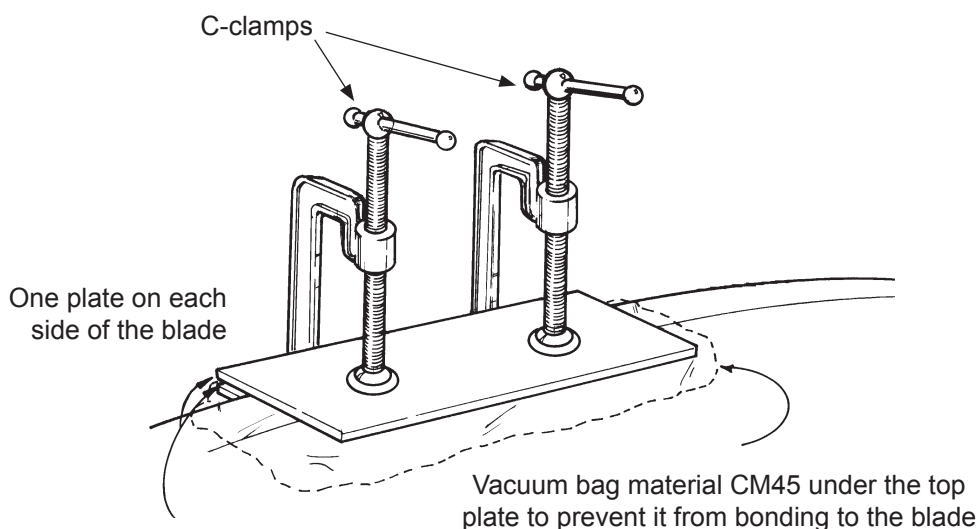
Erosion shield with debond extending to crack.

Cut optional fiberglass fabric and saturate with adhesive mixture. Place piece of fabric on putty knife, position it in front of lifted edges of erosion shield, and slide it into debond area. If fabric is not used, force adhesive into debond cavity with putty knife or small flat instrument.



Repair of Debond at Edge of Nickel Erosion Shield
Figure 4-2

APS0320



Using C-Clamps to Apply Pressure to Erosion Shield Debond Repair
Figure 4-3

- (k) Make a "Coin-Tap Inspection" in accordance with the Inspection 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 section 5. Finish Procedures in this chapter.

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

(1) Limits 1

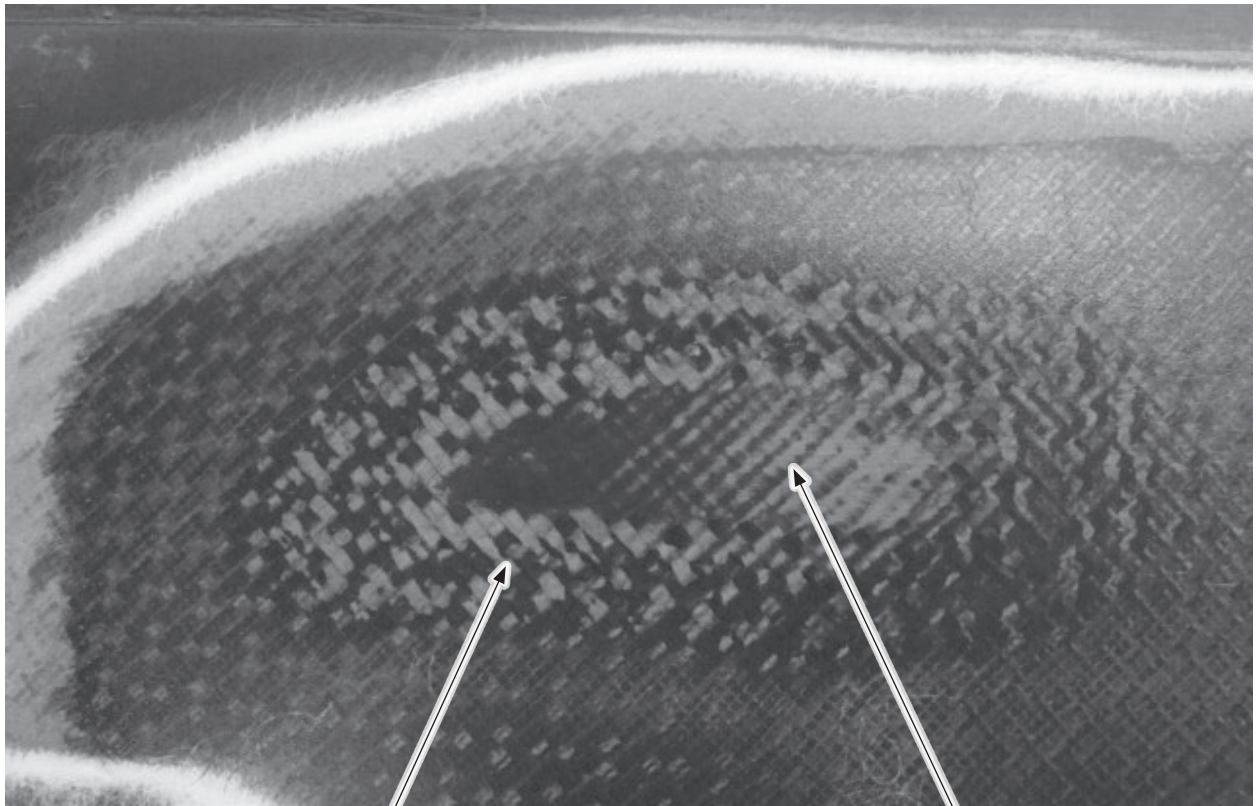
- (a) Make a "Coin-Tap Inspection" in accordance with the Inspection chapter of this manual.
 - 1 Using a pencil or felt-tip marker, outline the area of the debond of the erosion shield.

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. Refer to Figure 4-2.
- (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 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 or CM15 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 or CM15, saturate the fiberglass fabric CM42.

- c Put the fiberglass fabric CM42 that is saturated with adhesive CM14 or CM15 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 or CM15 to cure for 12 hours at room temperature or 2 hours at $145^{\circ} \pm 5^{\circ} \text{ F}$ ($63^{\circ} \pm 2^{\circ} \text{ C}$).
- (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 or CM15 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 4-3.
 - 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 or CM15 to cure for 12 hours at room temperature or 2 hours at $145^{\circ} \pm 5^{\circ} \text{ F}$ ($63^{\circ} \pm 2^{\circ} \text{ C}$).
- 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 a "Coin-Tap Inspection" in accordance with the Inspection 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 section 5. Finish Procedures in this chapter.

TI-135001



Woven Fabric

Unidirectional Material (UD)

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

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

3. Blade Material

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. Gouges, Delaminations, or Loss of Composite Material - Outboard Region of the Blade

(1) Limits 1

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 4-4.

4 If the UD material has been exposed:

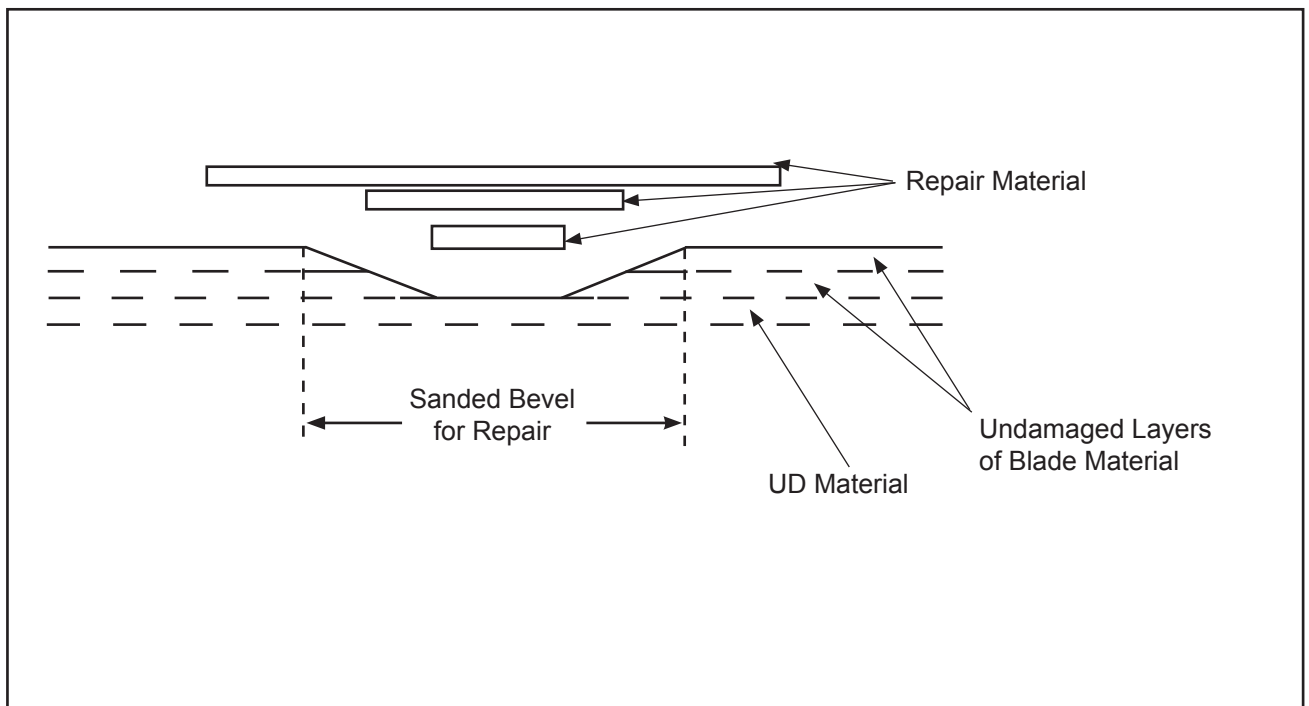
a Examine the UD material for damage, for example, a gouge.

(1) Any damage to the UD material requires a major repair. Refer to the Personnel Requirements section in the Introduction chapter of this manual for the requirements to perform a major repair.

- b** Make a "Coin-Tap Inspection" of the exposed UD material in accordance with the Inspection chapter of this manual.
 - (1)** If the results of the coin-tap inspection are not satisfactory, the blade requires a major repair. Refer to the Personnel Requirements section in the Introduction chapter of this manual for the requirements to perform a major repair.

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- (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.



**Laminating Pattern
Figure 4-5**

- (d) Determine the number of layers of carbon cloth CM111 needed for the repair, based on the depth of the damage.
 - 1 Each cured layer of carbon cloth CM111 is 0.0075 inch (0.190 mm) thick.
 - 2 Cut layers of carbon cloth CM111 to match the shape of the beveled area to create a stair step pattern when laminating. Refer to Figure 4-5.
 - a Cut each layer at a ± 45 degree angle relative to the blade pitch axis.
 - 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 4-5.

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.

- (i) Cure the repair in accordance with the section 3.G. Curing Procedures in this chapter.
- (j) Sand the repair.

CAUTION: DO NOT REMOVE ORIGINAL MATERIAL WHEN
SANDING.

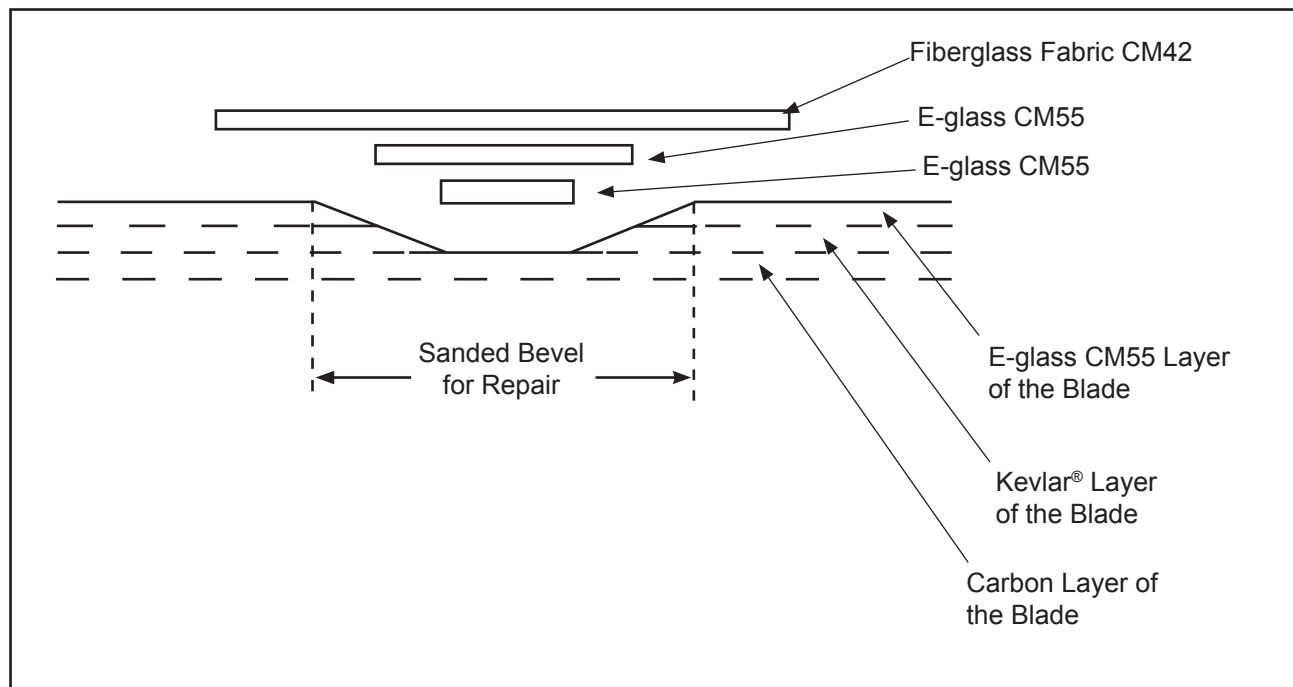
- 1 Sand the repaired area to the original shape using caution not to remove original material.
 - 2 Using progressively finer grit sandpaper, sand until the original shape is achieved.
 - 3 Use 140 grit or finer sandpaper for final sanding.
- (k) Visually examine the repaired area.
 - 1 The repaired area must be smooth and free from wrinkles, voids, or resin rich areas.
- (l) Make a "Coin-Tap Inspection" in accordance with the Inspection 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 section 5. Finish Procedures in this chapter.

(2) Limits 2

- (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 4-6.
 - 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 section 3.H. Repair Area Limits - Kevlar®/Carbon Hybrid Blade Only in this chapter.

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- (b) Using solvent acetone CM173, MEK CM106, or MPK CM219, clean the area.



Material Layers of the N-shank Kevlar®/Carbon Hybrid Blade
Figure 4-6

- (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 4-6.
 - 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.

- (h) Cure the repair in accordance with the section 3.G. Curing Procedures in this chapter.
- (i) Using no coarser than 60 grit sandpaper, sand the repaired area to the original airfoil shape.
- (j) Make a visual inspection of the repaired area.
 - 1 Repair any delaminations or voids.
- (k) Make a "Coin-Tap Inspection" in accordance with the Inspection 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) Make an inspection of the finished repaired area in accordance with section 3.H. Repair Limits - Kevlar®/Carbon Hybrid Blade Only in this chapter.
- (m) Refinish the blade in accordance with section 5. Finish Procedures in this chapter.

B. Gouges, Delaminations, or Loss of Composite Material -
Trailing Edge Foam and Leading Edge Foam Regions of the Blade

(1) Limits 1

- (a) The repair procedure is the same as for 3.A. Gouges, Delaminations, or Loss of Composite Material - Outboard Region of the Blade, Limits 2. Refer to section 3.A.(2) in this chapter.

(2) Limits 2

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.

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 a "Coin Tap Inspection" of the area around the exposed foam material in accordance with the Inspection chapter in 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.

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- (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) Determine the number of layers of carbon cloth CM111 needed for the repair, based on the depth of the damage.
 - 1 Each cured layer of carbon cloth CM111 is 0.0075 inch (0.190 mm) thick.
 - 2 Cut layers of carbon cloth CM111 to match the shape of the beveled area to create a stair step pattern when laminating. Refer to Figure 4-5.
 - a Cut each layer at a ± 45 degree angle relative to the blade pitch axis.
 - 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 4-5.

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.

- (i) Cure the repair in accordance with the section 3.G. Curing Procedures 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 a "Coin Tap Inspection" of the repaired area in accordance with the Inspection 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 section 5. Finish Procedures in this chapter.

C. Split Trailing Edge -
Tip and Trailing Edge Regions of the Blade

(1) Limits 1

- (a) Using a clean tongue depressor, utility knife, or other similar tool, gently pry apart the split edge and remove any contaminants.

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- (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.
- (g) Cure the repair in accordance with the section 3.G. Curing Procedures 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 a "Coin-Tap Inspection" of the repaired area in accordance with the Inspection 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 section 5. Finish Procedures in this chapter.
- (2) Limits 2 - not applicable to affected models
- (3) Limits 3
 - (a) The repair procedure is the same as for Limits 1. Refer to section 3.C.(1).
- (4) Limits 4
 - (a) Using a clean tongue depressor, utility knife, or other similar tool, gently pry apart the split edge and remove any contaminants.
 - (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 section 3.G. Curing Procedures 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.

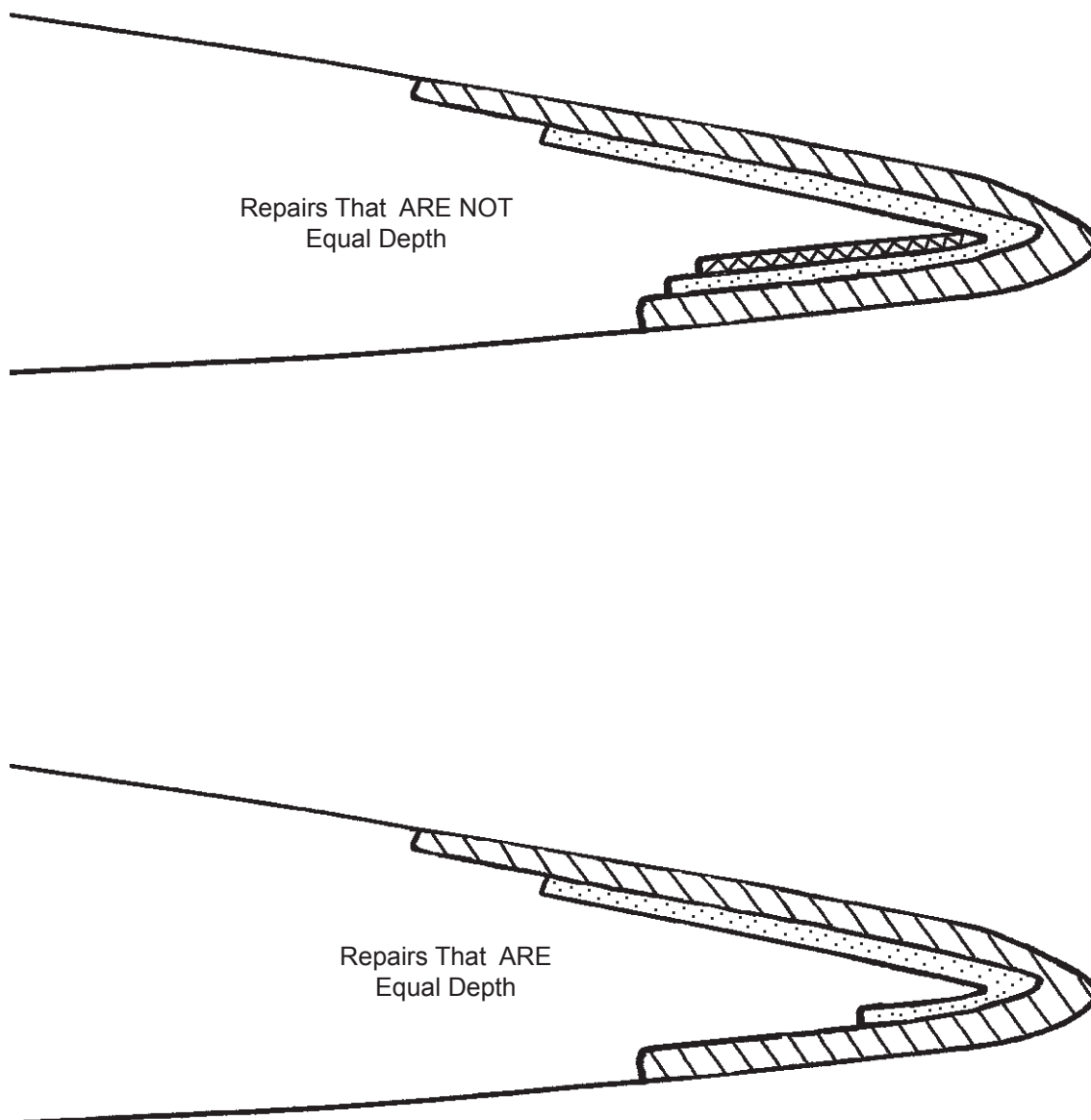
- (h) Visually examine the repaired area to make sure that it is the original airfoil shape.
 - 1 If the original airfoil shape is not achieved, send the blade to Hartzell Propeller Inc. for factory only repair.
- (i) Make a "Coin-Tap Inspection" of the repaired area in accordance with the Inspection 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 section 3.H. Repair Limits - Kevlar®/Carbon Hybrid Blade Only in this chapter.
- (k) Refinish the blade in accordance with section 5. Finish Procedures in this chapter.

**D. Crushed or Cracked Trailing Edge -
Outboard and Tip Regions of the Blade**

(1) Limits 1

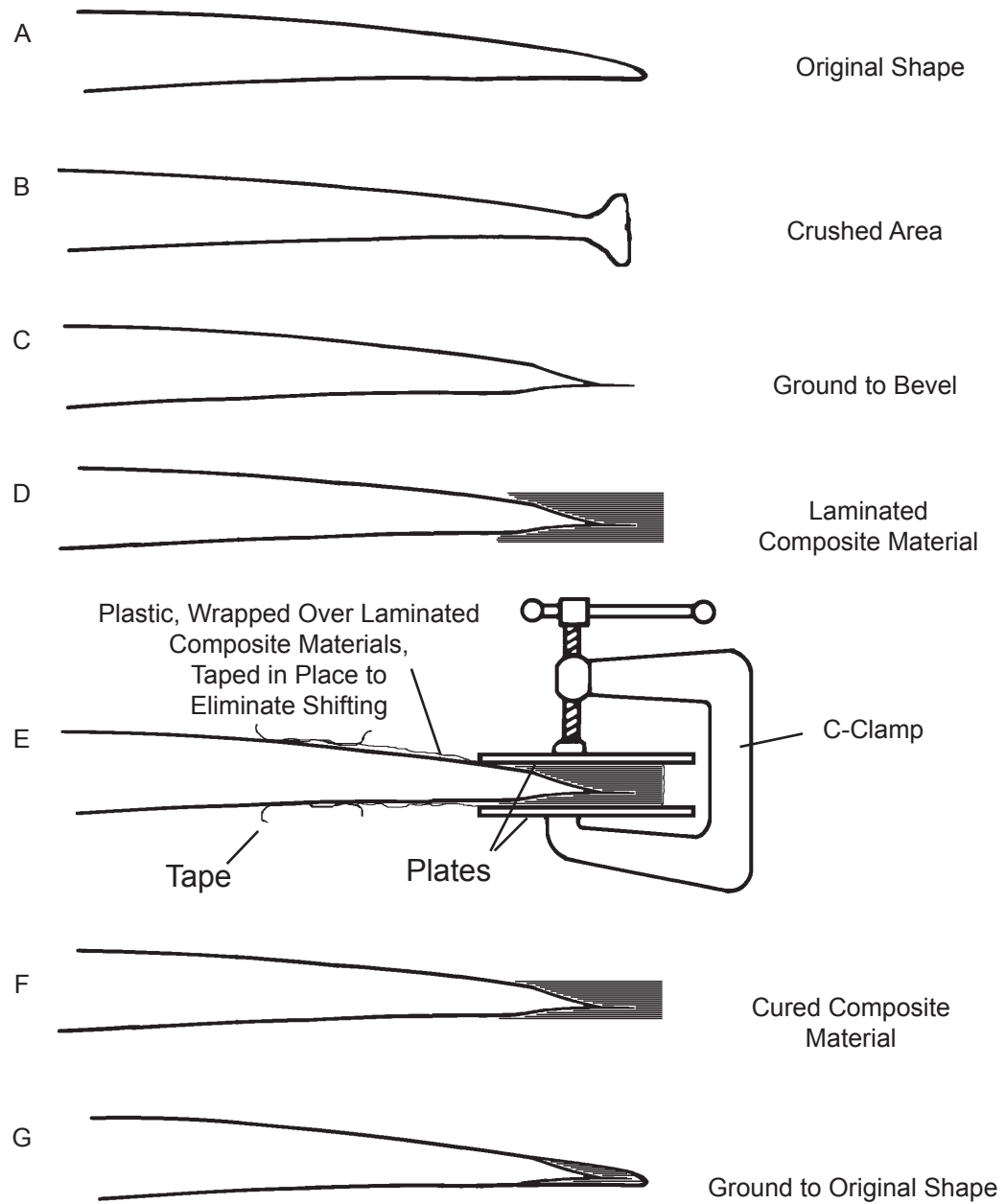
- (a) Using a grinder or sander, remove loose surface material.
 - 1 Some of the blade material, even though damaged, may remain on the blade.
 - a If damaged material is fully intact, it should remain on the blade.

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 4-6.
 - 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 3.H. Repair Area Limits - Kevlar®/Carbon Hybrid Blade Only in this chapter.
- (c) Using solvent acetone CM173, MEK CM106, or MPK CM219, wipe the repair area.



Symetrical Repairs
Figure 4-7

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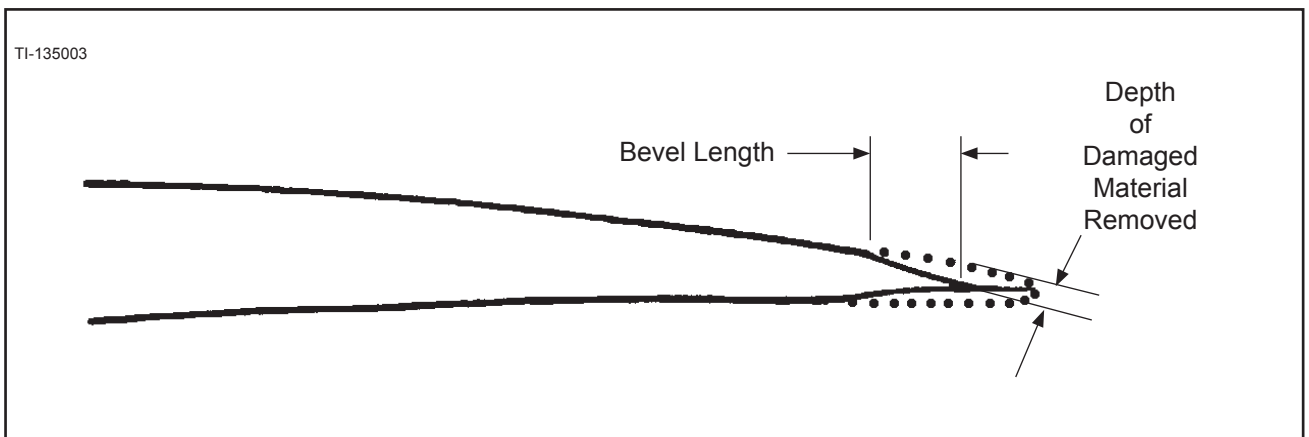


Crushed Blade Trailing Edge Repair (Cross Section View)
Figure 4-8

- (d) Permit the solvent acetone CM173, MEK CM106, or MPK CM219 to dry.
- (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 4-7.
 - 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 4-7.
 - 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 4-7.
- (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.
- (j) Cure the repair in accordance with the section 3.G. Curing Procedures in this chapter.
- (k) Using no coarser than 60 grit sandpaper, sand or grind to the original airfoil shape. Refer to Figure 4-8.
- (l) Make a visual inspection of the repaired area. Repair any delaminations or voids.
- (m) Make a "Coin-Tap Inspection" of the repaired area in accordance with the Inspection 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.
- (n) Make an inspection of the finished repaired area in accordance with section 3.H. Repair Area Limits - Kevlar®/CarbonHybrid Blade Only in this chapter.
- (o) Refinish the blade in accordance with section 5, Finish Procedures in this Service Letter.
- (2) Limits 2 - not applicable to affected models
- (3) Limits 3
- (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 4-8 and Figure 4-9.



Bevel Length and Damaged Material Depth
Figure 4-9

- 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 damage has been sufficiently removed or the airworthy damage limit has been reached.

a Make a "Coin Tap Inspection" of the area surrounding the repair in accordance with the Inspection chapter of this manual.

- (1) If the results of the coin-tap inspection are not satisfactory, the blade requires a major repair. Refer to the Personnel Requirements section in the Introduction chapter of this manual for the requirements to perform a major repair.

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 to be repaired.

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

- (e) Determine the number of layers of carbon cloth CM111 needed for the repair, based on the depth of the damage.

- 1** Each cured layer of carbon cloth CM111 is 0.0075 inch (0.190 mm) thick.

- 2** Cut layers of carbon cloth CM111 to match the shape of the beveled area to create a stair step pattern when laminating. Refer to Figure 4-5.

a Cut each layer at a ± 45 degree angle relative to the blade pitch axis.

- 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.

- (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: 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 4-8.

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 Laminate a layer or two of the repair material that is large enough to cover the repair.
- 3 While 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 keep 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 4-8.

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** 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 3.G. Curing Procedures 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 4-8.
 - 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 a "Coin-Tap Inspection" of the repaired area in accordance with the Inspection chapter in 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 section 5. Finish Procedures in this chapter.

(4) Limits 4

- (a) The repair procedure is the same as for Limits 3.
Refer to section 3.D.(3), Limits 3.

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

(1) Limits 1

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.

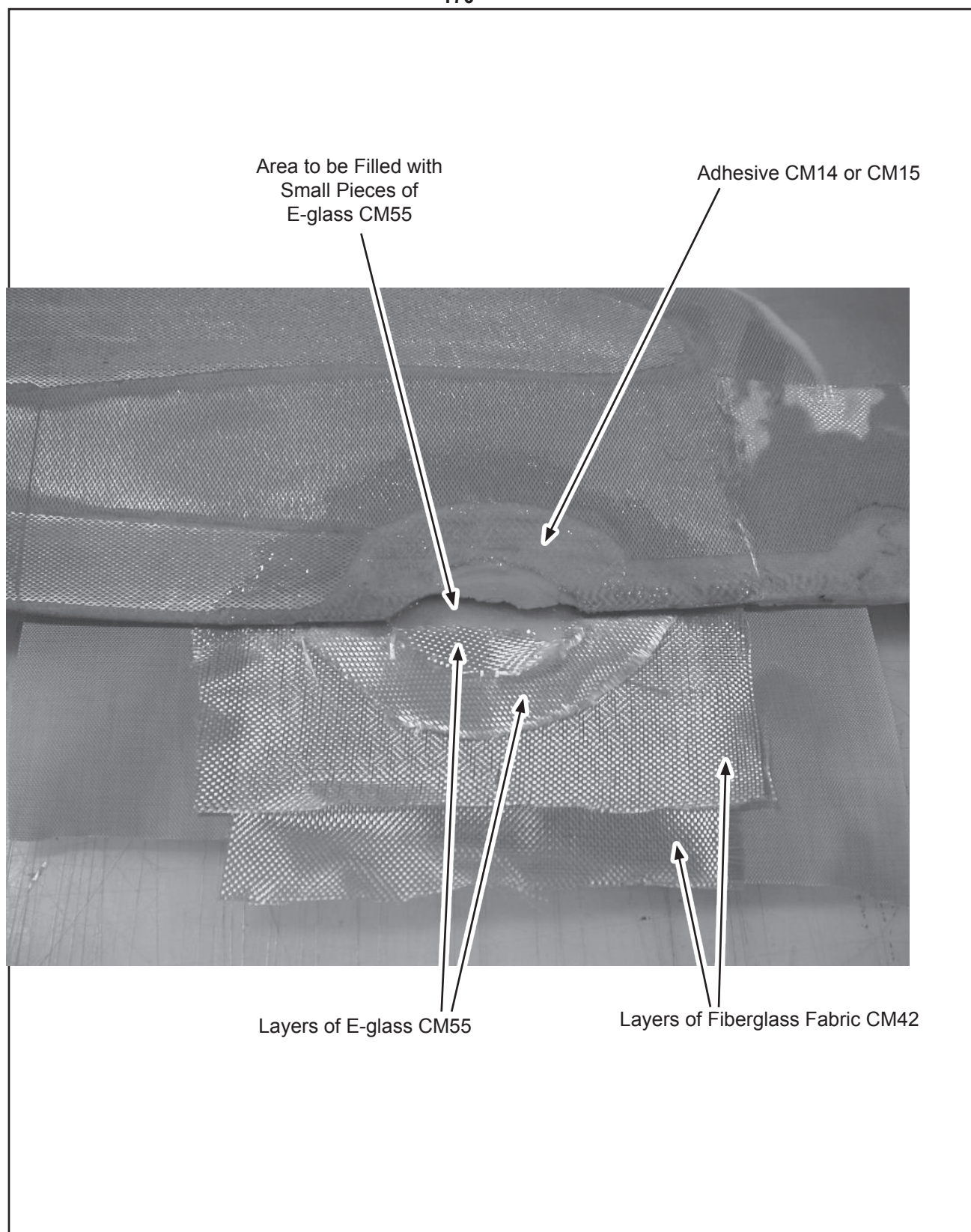
- 1 While removing material, make a bevel that extends outward from
the repair area 0.25 to 0.75 inch (6.3 to 19.0 mm) for each 0.010 inch
(0.254 mm) in depth on each side of the blade. Refer to Figure 4-6.
- 2 Stop periodically and examine the progress.

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 For repaired area limits, refer to section 3.H. Repair Area Limits -
Kevlar®/Carbon Hybrid Blade Only 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 a "Coin-Tap Inspection" of the repaired area in accordance with
the Inspection chapter in 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.



Repair Layers
Figure 4-10

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

- (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 4-10.
 - 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 4-7.
 - 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 4-10.
 - 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 4-10.

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 keep 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 4-10.

- 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.

- (o) Cure the repair in accordance with the section 3.G. Curing Procedures in this chapter.
- (p) Using no coarser than 60 grit sandpaper, sand or grind to the original airfoil shape. Refer to Figure 4-8 (G).
- (q) Make a visual inspection of the repaired area. Repair any delaminations or voids.

- (r) Make a "Coin-Tap Inspection" of the repaired area in accordance with the Inspection chapter in 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.
- (s) Make an inspection of the finished repaired area in accordance with section 3.H. Repair Area Limits - Kevlar®/Carbon Hybrid Blade Only in this chapter.
- (t) Refinish the blade in accordance with section 5. Finish Procedures in this chapter.

F. Missing Erosion Screen

(1) Limits 1

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.

NOTE: Only remove damaged material.

- (b) Examine the repair area.
 - 1 If more than one composite layer had been removed and or if the total area is greater than the minor damage size limit, retire the blade or send the blade to Hartzell Propeller Inc. for evaluation.
 - 2 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 inches (0.55 mm).
- (c) Make a "Coin-Tap Inspection" in accordance with the Inspection chapter in this manual.
 - 1 If coin tap produces an indication greater in size than the limits defined in the Minor Repair Limits, retire the blade 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 3.F.(1)(b) and 3.F.(1)(c) in this chapter.

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- (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) Determine the number of layers of carbon cloth CM111 needed for the repair, based on the depth of the damage.
 - 1 Each cured layer of carbon cloth CM111 is 0.0075 inch (0.190 mm) thick.
 - 2 Cut layers of carbon cloth CM111 to match the shape of the beveled area to create a stair step pattern when laminating. Refer to Figure 4-5.
 - a Cut each layer at a ± 45 degree angle relative to the blade pitch axis.
 - 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.

- (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 achieve the original shape.

NOTE: The repair material pattern pieces were cut so the weave overlap 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.

- (k) Cure the repair in accordance with section 3.G. Curing Procedures 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 a "Coin-Tap Inspection" of the repaired area in accordance with the Inspection chapter in 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 section 5. Finish Procedures in this chapter.

G. Curing Procedures**(1) Cure of Trailing Edge Repairs****(a) General**

CAUTION: DO NOT USE CURE OPTION 2 FOR CURING A TRAILING EDGE FOAM REPAIR.

1 There are two options for curing the repair.

a Cure Option 1 uses a room temperature or oven cure cycle for curing the repair.

(1) Plates and clamps are used to apply even pressure to the repaired area.

b Cure Option 2 uses a blade repair blanket TE304 that supplies heat for accelerated curing of the repair.

(2) The blade repair blanket TE304 and clamps are used to apply even pressure to the repaired area.

(b) Preparing the Repaired Area for Curing

1 Optionally, use Teflon® bleeder cloth CM58 and polyester absorbent cloth CM59.

NOTE: Using the Teflon® bleeder cloth CM58 and polyester absorbent cloth CM59 will absorb excess resin, minimize sanding, and make clean-up easier.

a Cut a piece of Teflon® bleeder cloth CM58 large enough to cover and extend beyond the repaired area on one side of the blade and fold over to cover and extend beyond 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.

b 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.

(1) If necessary to hold in place, apply tape to the edges of the Teflon® bleeder cloth CM58 outside of the repaired area.

- c 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.

- d 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.

- (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 on one side of the blade and fold over to cover the repaired area on the other side of the blade.

- 3 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.

- a If necessary to hold in place, apply tape to the edges of the vacuum bag material CM45 outside of the repaired area.

(c) Curing the Repair

- 1 Cure Option 1, Room Temperature Cure

- a Prepare two semi-rigid plates to clamp over the repaired area.

- (1) Make the plates from metal, plastic, Masonite®, or other semi-rigid material.
 - (2) Make one plate long enough so that when the plates are clamped on the blade, the plates will extend beyond the repaired area.
 - (3) 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.

- b Put one plate over the repaired area on each side of the blade.

- (1) 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.

- c Install clamps as necessary to apply even pressure to the repaired area.
- d Permit the adhesive to cure for 12 hours at room temperature or for 2 hours at $145^{\circ} \pm 5^{\circ} \text{ F}$ ($63^{\circ} \pm 2^{\circ} \text{ C}$).
- e Remove the plates and the cure materials from the blade.

CAUTION: DO NOT USE CURE OPTION 2 FOR CURING A TRAILING EDGE FOAM REPAIR.

2 Cure Option 2, Blade Repair Blanket Cure

CAUTION: DO NOT PUT THE TEMPERATURE INDICATING STRIPS DIRECTLY ON TOP OF THE REPAIR .

- a Put two temperature indicating strips, one each of TE306 and TE307, on each side of the blade adjacent to the repair area to monitor the temperature during the cure cycle.
 - (1) One strip TE306 has a temperature range of 120° to 180° F .
 - (2) The second strip TE307 has a temperature range of 190° to 220° F .
 - (3) 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.
 - (a) Each element is independently controlled by a nonadjustable controller contained within the blade repair blanket TE304.
- b 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.
- c 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 .

- d 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.

- e Put a minimum of two C-clamps on the metal strip of the blade repair blanket TE304, in such a way that the clamping pressure is distributed over the entire repaired area.

WARNING: DO NOT OPERATE THE BLADE REPAIR BLANKET TE304 IN A WET ENVIRONMENT OR ON A WET BLADE. DOING SO MAY CREATE AN ELECTRICAL HAZARD.

- f Connect the blade repair blanket TE304 to a 120 volt power source for a minimum of 130 minutes.

NOTE: The minimum time includes 2 hours for curing plus 10 minutes to permit the blade repair blanket to warm to the correct temperature.

- g Unplug the blade repair blanket TE304.
- h Remove the blade repair blanket TE304 and the repair hardware from the blade.
- i Examine the readings of the temperature indicating strips TE306 and TE307.

- (1) 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, the "120°." 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.

- (2) If the indicated temperature is below 120° F, inadequate heating occurred. Permit the repair to cure 12 hours at room temperature.
- (3) If the indicated temperature is above 180° F, the composite material may be damaged. Retire the blade or contact Hartzell Propeller Inc. to arrange for evaluation.

- (d) After cure, return to applicable repair procedure for additional requirements.

(2) Cure of Surface Repairs (excludes trailing edge repairs)

(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.

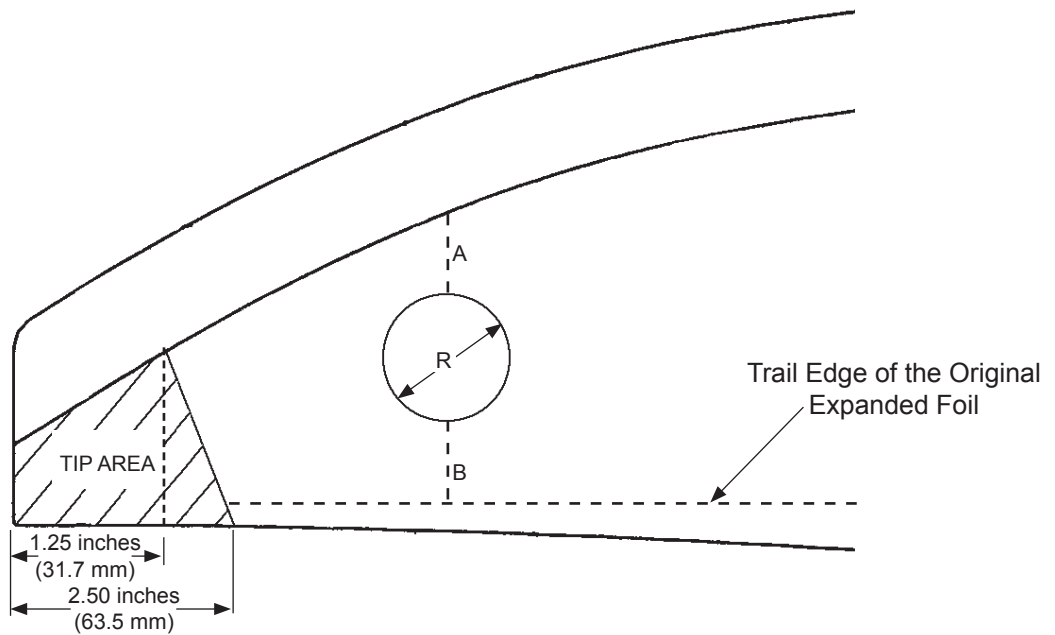
- 2 Cut a piece of vacuum bag material CM45 large enough to cover the entire repaired area.

- 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.

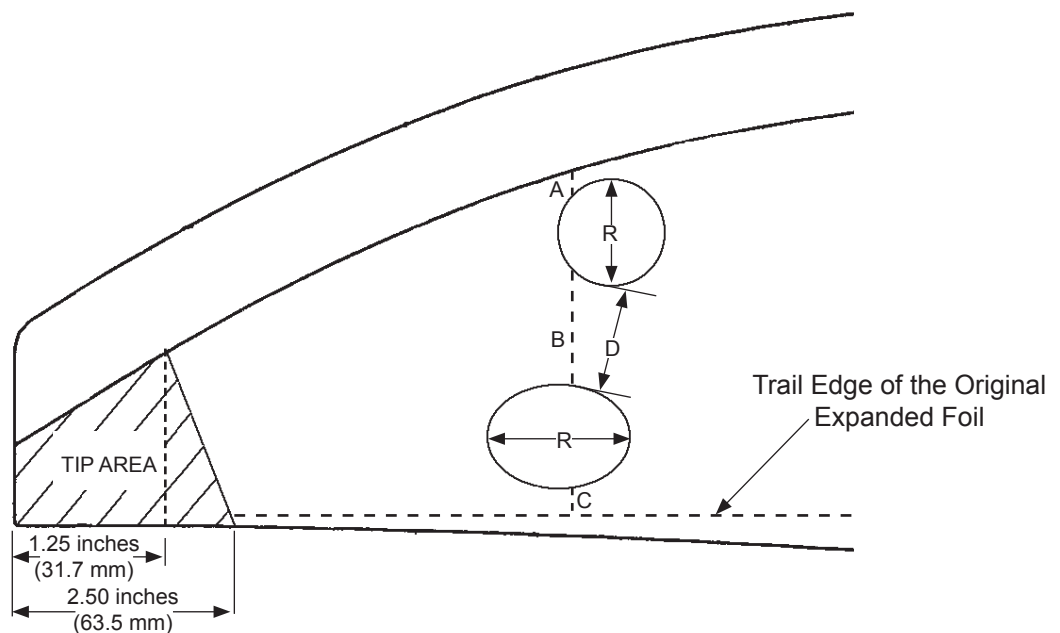
- a Make the plates from metal, plastic, Masonite®, or other semi-rigid material.
- b Make one plate long enough so that when the plates are clamped on the blade, the plates will extend beyond the repaired area.
- c When the repair is to a curved area of the blade, a layer of compressive material, such as foam rubber, may be used between the repair area and the plate to help apply uniform pressure when curing the repaired area.

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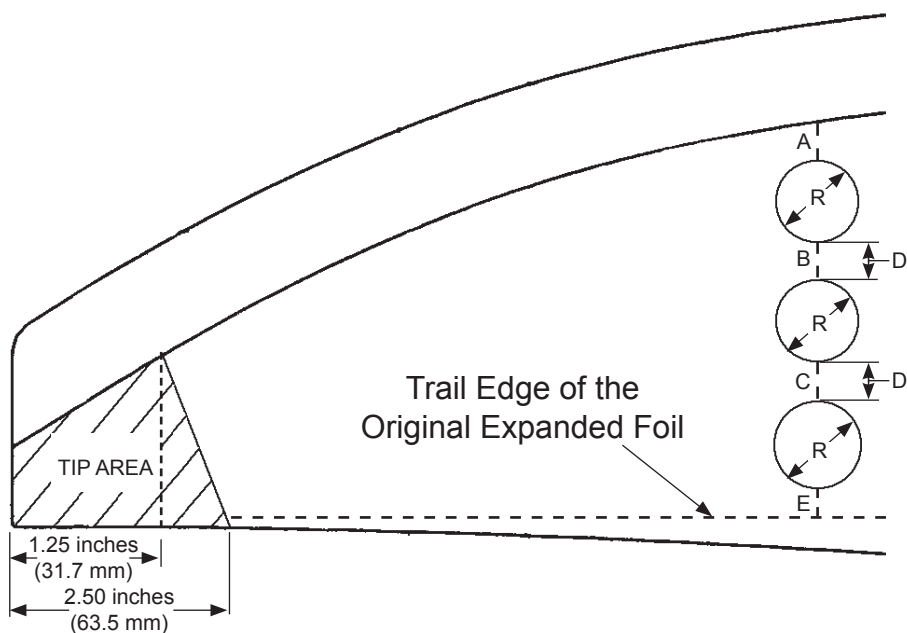
N-shank Kevlar®/Carbon Hybrid Blade Repair Limits
Figure 4-11

TI-00110L



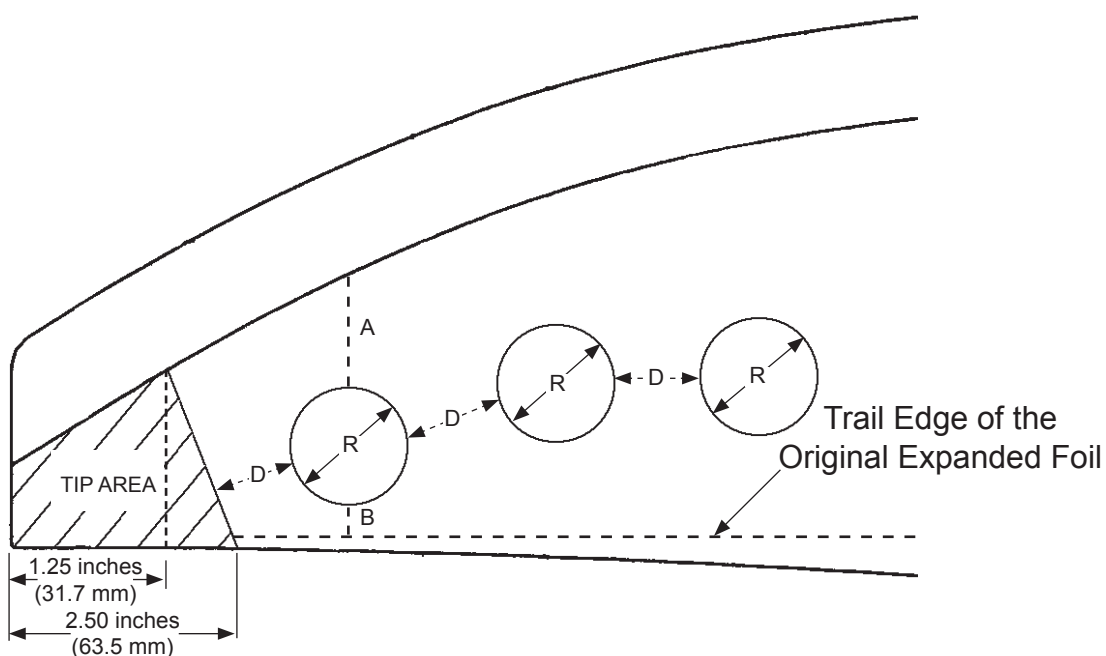
N-shank Kevlar®/Carbon Hybrid Blade Repair Limits
Figure 4-12

TI-00110M



N-shank Kevlar®/Carbon Hybrid Blade Repair Limits
Figure 4-13

TI-00110K



N-shank Kevlar®/Carbon Hybrid Blade Repair Limits
Figure 4-14

- 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 $145^{\circ} \pm 5^{\circ} \text{ F}$ ($63^{\circ} \pm 2^{\circ} \text{ C}$).

d Remove the plates and the cure materials from the blade.

- (c) After cure, return to applicable repair procedure for additional requirements.

H. Repair Area Limits - Kevlar®/Carbon Hybrid Blade Only

(1) General

- (a) The limits in this section apply when specified for a repair given in this manual.
- (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 4-11 thru Figure 4-14.

- (a) The repair procedures defined in this chapter may be performed in this area.
- (b) 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 manual.
 - 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 manual.
- (c) 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 4-11 thru Figure 4-14.
- (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 4-11 and Figure 4-14 the sum of A and B must be equal to or greater than 1.60 inches (40.6 mm).
 - (2) In Figure 4-12 the sum of A, B, and C must be equal to or greater than 1.60 inches (40.6 mm).
 - (3) In Figure 4-13 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.

4. Paint and/or Filler Material

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. Loss of Paint and/or Filler Material - For the Erosion Shield Only

(1) Limits 1

- (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.

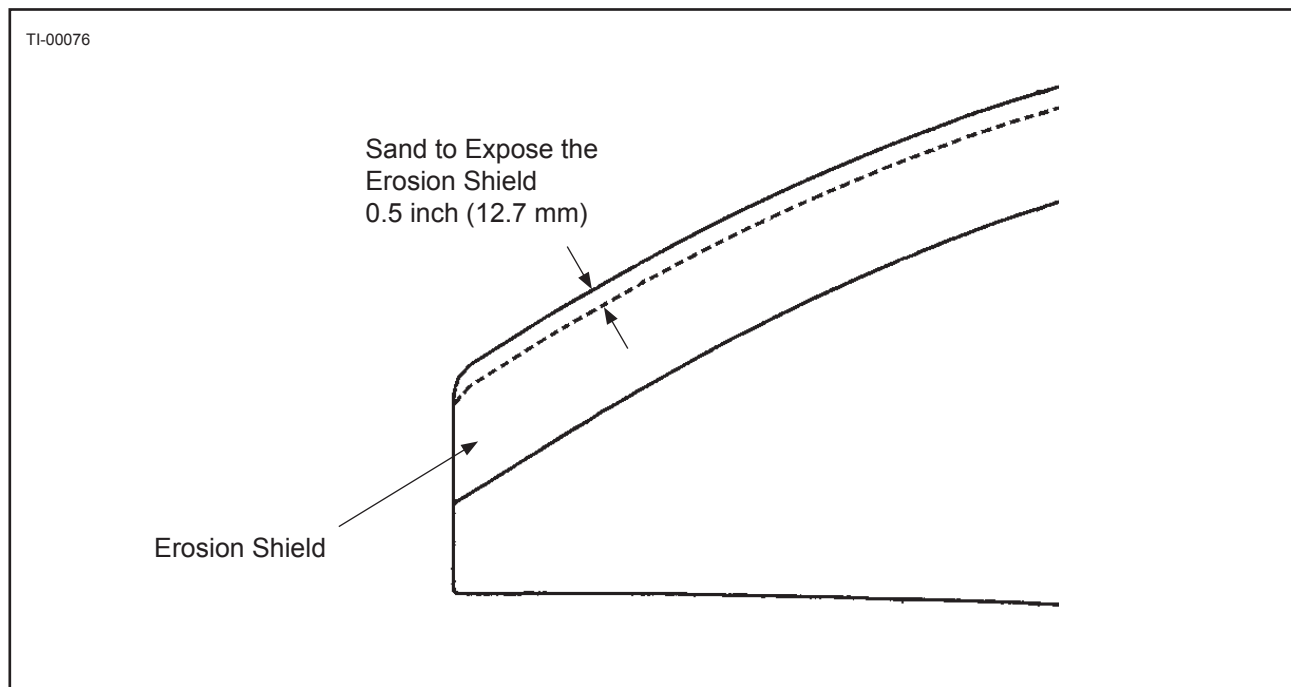
CAUTION: DO NOT SAND THROUGH THE MESH MATERIAL. USE EXTREME CARE WHEN SANDING DOWN TO THE BLADE SURFACE. AN N-SHANK COMPOSITE BLADE HAS ALUMINUM MESH ON THE BLADE SURFACE THAT FORMS PART OF THE LIGHTNING PROTECTION SYSTEM.

- (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.

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 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 section 2.B.(1), in the Tooling and Materials chapter in this manual.
- (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, apply enough individual layers fiberglass fabric CM42 to the repair area to permit sanding the repair area down to the original airfoil shape.
- (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 4-15.
- (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 section 2.B.(1), in the Tooling and Materials chapter in this manual.
- (n) Permit the wash primer Mix Number 3 to dry.
- (o) Refinish the blade in accordance with section 5. Finish Procedures in this chapter.



Sanding to Expose Erosion Shield
Figure 4-15

5. 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 Mix Number 3, do so in accordance with section 2.B.(1), 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 Painting of Composite Blades section of the Maintenance Practices chapter in the applicable Hartzell Propeller Inc. Propeller owner's manual.

B. Erosion Tape

- (1) Installation of Erosion Tape CM158, is required for N7605C(), N()7893(), NG8301(), 75A01-2(), L76A01X(), N76M05C()X, and H79A06X() non-booted blades.

CAUTION 1: EROSION TAPE CM158 MUST BE INSTALLED ON ALL N7605C(), N()7893(), NG8301(), 75A01-2(), L76A01X(), N76M05C()X, and H79A06X() NON-BOOTED BLADES. FAILURE TO INSTALL THE EROSION TAPE ON THESE PROPELLER MODELS CAN RESULT IN SERIOUS DAMAGE TO THE BLADE.

CAUTION 2: DO NOT INSTALL EROSION TAPE CM158 ON A BLADE WITH AN ANTI-ICE BOOT. INSTALLATION OF EROSION TAPE CM158 WILL PREVENT PROPER FUNCTION OF THE ANTI-ICE BOOT.

NOTE: The erosion tape CM158 or anti-icing boot, whichever is applicable, may be installed on the blade before propeller assembly, after propeller assembly, or on-wing.

- (a) A minimum temperature of 60°F (10°C) is required for erosion tape CM158 application.
- (b) Keep hands clean at all times.

Blade Model	Erosion Tape Length (per Blade)	Erosion Tape Edge Inboard Location From the Outboard End of the Metal Shank
N7605C()	14.87 inches (377.6 mm)	1.00 (25.4 mm)
N()7893()	13.33 inches (338.5 mm)	1.00 (25.4 mm)
NG8301()	13.12 inches (333.24 mm)	1.00 (25.4 mm)
75A01-2()	14.85 inches (377.1 mm)	1.00 (25.4 mm)
L76A01X()	15.60 inches (396.2 mm)	1.00 (25.4 mm)
N76M05C()X	14.87 inches (377.6 mm)	1.00 (25.4 mm)
H79A06X()	14.87 inches (377.6 mm)	1.00 (25.4 mm)

Erosion Tape Length / Location
Table 4-1

CAUTION: DO NOT INSTALL EROSION TAPE CM158 ON A BLADE THAT HAS PAINT THAT HAS CURED LESS THAN 8 HOURS .

- (c) If performed in conjunction with paint refinish or touch-up, paint must cure for a minimum of 8 hours before installing erosion tape CM158.
- (d) Cut erosion tape CM158 to the correct length for each blade. Refer to Table 4-1.
- (e) Radius the corners of the erosion tape CM158 to 0.5 inch (13mm) to remove any sharp corners.
- (f) Using a pencil or a ball-point pen, measure and make a mark on the non-adhesive side of the erosion tape CM158 to indicate the centerline of the erosion tape.
- (g) 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. Refer to Table 4-1 for the correct measurement.
 - 1 This alignment mark on the blade will be used to align the inboard edge of the erosion tape at installation.

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.

- (h) 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.
 - 1 Using a clean, lint-free cloth, immediately wipe the area dry.
 - 2 Permit the area to air dry.
 - 3 Repeat the cleaning and drying of the area.

(i) 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.

(j) Peel the backing material from the erosion tape CM158.

(k) 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 blade shank and near the leading edge), while aligning the centerline that was marked on the erosion tape with the leading edge of the blade.

(l) Press the erosion tape CM158 into position on the leading edge of the blade while maintaining light tension on the erosion tape to minimize air bubbles and keep the tape straight.

- 1 Using a roller, such as TE330 or TE331, or fingers, press the erosion tape CM158 down onto the leading edge of the blade.

(m) Using a roller, such as TE330 or TE331, or fingers, work the erosion tape CM158 into position on one side of the blade.

- 1 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.
- 2 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.

- 3 Remove air bubbles under the erosion tape by carefully puncturing the erosion tape CM158 with a sharp pin and pressing out the trapped air.
- 4 Repeat step 5.B.(1)(m) (1 thru 3) on the other side of the blade.

6. Documenting the Repair**A. Blade Damage Repair Sheet**

- (1) Complete the Blade Damage Repair Sheet from the applicable Hartzell Propeller Inc. Propeller owner's manual to log in the propeller logbook identifying all repairs.

B. Propeller Logbook

- (1) Make an entry in the propeller logbook that a repair has been made in accordance with this service manual and reference the applicable Blade Damage Repair Sheet.

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TOOLING AND MATERIALS - CONTENTS

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1. Tooling**A. "Coin"**

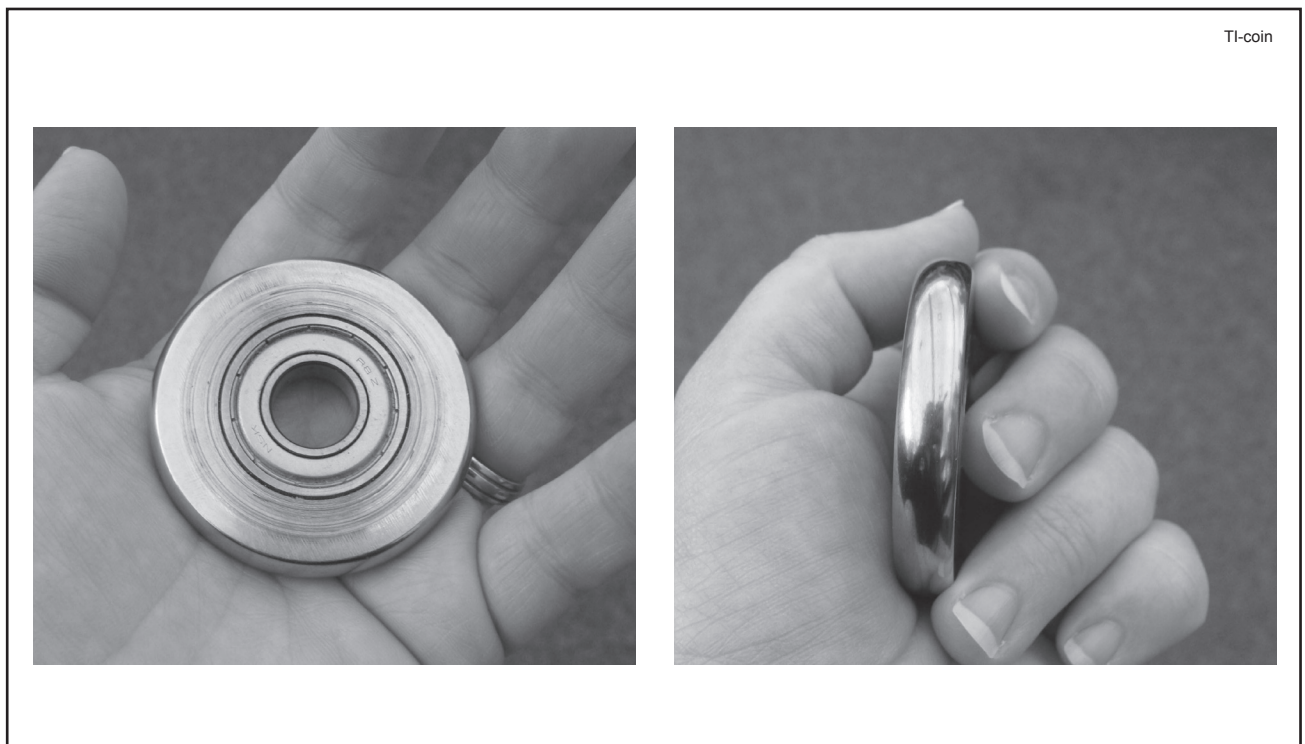
- (1) A tool, or "coin", is needed for the coin-tap inspection.
 - (a) The coin should be a washer-shaped metal tapper, approximately 2.5 inches (64 mm) OD x 1.25 inches (32 mm) ID x 0.25 inch (6.4 mm) thick, and weighing no less than 3 oz. (85.05 g). Refer to Figure 5-1.

B. Roller

- (1) A roller, such as TE330 (p/n MR0500) or TE331 (p/n MR05020), may be used for installation of the erosion tape CM158 where required.

C. Composite Blade Repair Blanket

- (1) A composite blade repair blanket, TE304 (p/n HZP161001), may be used for cure of repairs in accordance with section 3.G., Curing Procedures in the Minor Repair chapter in this manual
 - (a) If the composite blade repair blanket is used, Temp-Plate® Recorder indicating strips TE306 (p/n 240-120F) and TE307 (p/n 240-190F) must also be used.



Example of a "Coin"
Figure 5-1

2. Materials

A. General

(1) Safe Handling of Paints and Chemicals

- (a) Always use caution when handling or being exposed to paints and/or chemicals during propeller overhaul and maintenance procedures.
- (b) Before using paint or chemicals, always read the manufacturer's label on the container and follow specified instructions and procedures for storage, preparation, mixing, and application.
- (c) Refer to the product's Material Safety Data Sheet (MSDS) for detailed information about physical properties, health, and physical hazards of any chemical.

B. Consumable Materials Control Requirements

(1) Table 5-1 lists the supply basis, cure time, pot life, storage temperature, and shelf life for the consumable materials referenced in this manual.

- (a) Supply basis codes have been assigned to each consumable material to indicate if the item can be purchased from Hartzell Propeller Inc. The following supply basis codes have been assigned:
 - 1 Y = customer can get the consumable material either from Hartzell Propeller Inc. or from a local source.
 - 2 N = Hartzell Propeller Inc. does not sell the consumable material, the customer must purchase it locally.
 - 3 HPI = Hartzell Propeller Inc. is the only supplier of the consumable material, the customer must purchase the consumable material from Hartzell Propeller Inc.
- (b) The following codes are used to define shelf life:
 - 1 DOM = Date of Manufacture
 - 2 DOS = Date of Shipment
 - 3 MD = Manufacturer's Date on container
 - 4 mos = Months
- (c) The following terms are used to define temperature control:
 - 1 F = Frozen, store below 0°F (-17°C)
 - 2 R = Refrigerate, 40° - 60°F (4°-15°C)
 - 3 RT = Controlled room temperature, 60° - 80°F (15° - 26°C)
 - 4 UC = No special Hartzell Propeller Inc. requirement, follow manufacturer's requirements.

- (d) After opening the container, a consumable may remain at room temperature until it is used up or until it exceeds the pot life or shelf life limit.
- (e) For materials purchased directly from Hartzell Propeller Inc., the expiration date control information required by Hartzell Propeller Inc. will be added to the package or container in a location different than where the manufacturer's label is located. The Hartzell Propeller Inc. control information takes precedence over any conflicting information from the manufacturer or in Table 5-1 in this chapter.
- (f) Materials purchased directly from Hartzell Propeller Inc. will not have storage temperature control information added to the package or container. The temperature control information contained in Table 5-1 in this chapter takes precedence over any conflicting information from the manufacturer.
- (g) For materials purchased from other sources, the purchaser is required to record the expiration date control information required by Hartzell Propeller Inc. on the package or container in accordance with Table 5-1 in this chapter. Storage temperature control information in Table 5-1 must be observed.

C. Date Code Formats

- (1) The expiration date may be recorded using the letters "Exp" followed by a month and year. In this case, the shelf life of that material extends through the last day of the month and year recorded.

D. Consumable Material Management Procedures

- (1) Rotate stock on a "first in-first out" basis.
- (2) Epoxy and other materials normally require, at minimum, a room temperature cure. Lower temperatures may greatly increase the cure time. Temperatures below 60°F (15°C) may cause the epoxy not to cure at all.

E. Revisions**(1) Alternate**

Alternate consumable materials are identified by the term "ALTERNATE is CM ____". Alternate consumable materials are considered acceptable for continued use and existing stock of consumable materials may be used for maintenance and/or repair. The consumable materials may be used interchangeably when ordering/stocking new consumable materials.

(2) Supersedure

Consumable material changes are identified by the terms "SUPERSEDES CM ____" or "SUPERSEDED BY CM ____". Superseded consumable materials are considered acceptable for continued use and existing stock of superseded consumable materials may be used for maintenance and/or repair. Superseded consumable materials may no longer be available, and the new consumable material number must be used when ordering/stocking new consumable materials.

(3) Replacement

Consumable material changes identified by the terms "REPLACES CM ____" or "REPLACED BY CM ____" are considered airworthy for continued flight, but must be replaced with the new consumable material at overhaul. Existing stock of consumable materials may not be used for maintenance and/or repair of affected assemblies. Replaced consumable materials may no longer be available, and the new consumable material number must be used when ordering/stocking consumable materials.

3. 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.

CM No.	Hartzell Propeller Inc. Part No.	Description	Supply Basis	Manufacturer/Supplier Part Number/Specification	Cure Time	Pot Life	Storage Temp.	Shelf Life
2	n/a	Hose, Vacuum x foot	N	UA-6407-02	---	---	UC	---
3	n/a	Syringe, 30cc, Disposable-0.03 - 0.05 n. (0.7 - 1.2 mm) OD needle	N	---	---	---	UC	---
14	A-2328-21	Adhesive, Quart Kit Alternate for E13890K winding repairs only is a combination of CM192, CM193, and CM194	HPI	Henkel/Hysol, EA9330	Full: 5-7 days Handle: min of 12 hours @ 77°F (25°C)	60 minutes @ 77°F (25°C), 100 gm mass	UC	12 mos DOS
15	n/a	Adhesive, Quart Kit	N	Loctite, Henkel/Hysol, EA9430	Min 4 hours @ 77°F (25°C)	50 minutes @ 77°F (25°C), 250 gm mass	UC	12 mos DOM
24	A-6741-24	Wash Primer, gallon	Y	ASG/Randolph Paints MIL-C-8514	---	---	UC	24 mos DOM
	A-6741-24-1	Wash Primer, quart	Y	ASG/Randolph Paints MIL-C-8514	---	---	UC	24 mos DOM
25	A-6741-25	Reducer, Wash Primer, gallon	Y	Randolph Paints, T-54	---	---	UC	24 mos DOS
	A6741-25-1	Reducer, Wash Primer, quart	Y	Randolph Paints, T-54	---	---	UC	24 mos DOS
26	A-6741-26	Acid Diluent, gallon	Y	Randolph Paints, 120AC-1	---	---	UC	24 mos DOS
	A-6741-26-1	Acid Diluent, quart	Y	Randolph Paints, 120AC-1	---	---	UC	24 mos DOS
41	A-6741-41	Toluene, gallon	Y	---	---	---	UC	---
	A-6741-41-1	Toluene, quart	Y	---	---	---	UC	---
42	A-6741-42	Fiberglass, Fabric, 2 ounce, 38 in. (965 mm) wide x foot	HPI	---	---	---	UC	---
SUPPLY BASIS CODES: Y= Customer can get the consumable material either from Hartzell Propeller Inc. or from a local source. N= Hartzell Propeller Inc. does not sell the consumable material, the customer must purchase it locally. HPI= Hartzell Propeller Inc. is the only supplier of the consumable material, the customer must purchase the consumable material from Hartzell Propeller Inc.			SHELF LIFE CODES: DOM= Date of Manufacture DOS= Date of Shipment from Supplier mos= months MD= Manufacturer's Date on container			STORAGE TEMP CLASSES: F= frozen, Below 0°F (-17°C) R= refrigerator, 40°-60°F (4°-15°C) RT= controlled room temperature 60°-80°F (15°-26°C) UC= no special Hartzell Propeller Inc. requirement, follow manufacturer's requirements		

Consumable Materials
Table 5-1

CM No.	Hartzell Propeller Inc. Part No.	Description	Supply Basis	Manufacturer/Supplier Part Number/Specification	Cure Time	Pot Life	Storage Temp.	Shelf Life
45	A-6741-45	Vacuum Bag, 16 in. (406 mm) Tube X 0.004 in. (0.10 mm) Thick Polyethylene x foot	Y	New Tech Plastics	---	---	UC	---
55	A-6741-55	E-Glass 38 in. (965 mm) wide x foot	Y	7781 style cloth finished for an epoxy resin system per AMS-3824A	---	---	UC	---
56	A-6741-56	Fiberglass, Milled, 0.062 in. (1.57 mm), lb	Y	---	---	---	UC	---
58	A-6741-58	Cloth, Bleeder, Teflon®, yd (0.8 oz/yd)	Y	Northern Fiberglass, 200TFP-1	---	---	UC	---
59	A-6741-59	Polyester Absorbent Cloth, 60 inches (1524 mm) x foot	Y	---	---	---	UC	---
106	n/a	Methyl-Ethyl-Ketone (MEK), 5 gallon	N	---	---	---	UC	---
111	A-6741-111	Cloth, Carbon, 38 in (965 mm) wide x foot	HPI	---	---	---	UC	---
124	A-6741-124	Adhesive Promoter, pint	Y	3M, 86A	---	---	RT	24 mos DOM
158	A-6741-158	Erosion Tape, Polyurethane, 108 foot roll	Y	3M, 8672-2	---	---	RT	24 mos DOS
	A-6741-158-1	Erosion Tape, Polyurethane x foot	Y	3M, 8672-2	---	---	RT	24 mos DOS
159	n/a	Cheesecloth	S	AMS 3819, Class 1, Grade A, Form 1 CCP Industries, p/h CCR588043 P.O. Box 6500 Cleveland, OH 44101 Phone: 1-800-321-2840	---	---	UC	---
162	A-6741-162-1	Pencil, Non-graphite, Carmine Red, 1 dozen	Y	Sanford, SAN-02450	---	---	UC	---
	A-6741-162-2	Pencil, Non-graphite, Silver, 1 dozen	Y	Sanford, SAN-02460	---	---	UC	---
173	n/a	Acetone, 5 gallon	N	---	---	---	UC	---
219	n/a	Methyl Propyl Ketone (MPK)	N	---	---	---	UC	---
SUPPLY BASIS CODES: Y= Customer can get the consumable material either from Hartzell Propeller Inc. or from a local source. N= Hartzell Propeller Inc. does not sell the consumable material, the customer must purchase it locally. HPI= Hartzell Propeller Inc. is the only supplier of the consumable material, the customer must purchase the consumable material from Hartzell Propeller Inc.			SHELF LIFE CODES: DOM= Date of Manufacture DOS= Date of Shipment from Supplier mos= months MD= Manufacturer's Date on container			STORAGE TEMP CLASSES: F= frozen, Below 0°F (-17°C) R= refrigerator, 40°-60°F (4°-15°C) RT= controlled room temperature 60°-80°F (15°-26°C) UC= no special Hartzell Propeller Inc. requirement, follow manufacturer's requirements		

**Consumable Materials
Table 5-1**