



SMR Technologies, Inc.
93 Nettie Fenwick Road
Fenwick, WV 26202

**PNEUMATIC DEICER/COMPOSITE LEADING EDGE INSTALLATION
AND MAINTENANCE MANUAL FOR SOCATA TBM 700/850**

SMR REPORT NO. 11-33-070

April 23, 2019

REV. 5

PREPARED BY: _____
DAN MCPHERSON
MECHANICAL DESIGN ENGINEER

APPROVED BY: _____
DEWAYNE BOWLES
DIRECTOR OF ENGINEERING

Signed Copy
on file at
SMR Technologies, Inc.

REVISIONS

Date	Rev.	Description of Change	Approval
07-03-12	1	Initial Release	BDS
09-17-12	2	Updated per AEG comments. Removed Proprietary Data Notice. Updated Airworthiness Limitations Statement 2.0.	BDS
03-28-13	3	<p>Added “with the exception of the elevator horn deicer” to end of NOTE in Section 1.</p> <p>Updated Part ID in Sections 1.2 and 1.3. Added Section 1.4 for leading edge assembly Part ID.</p> <p>Removed Tal-Strip II from Section 3.3 – Approved Stripper.</p> <p>Added “NOTE: The centerline mark on the composite leading edge and pneumatic deicer does not reflect the leading edge centerline, but rather the air inlet centerline.” to Sections 5.3.3 and 7.2.</p> <p>Changed leading edge dimple approximate depth from “0.036” to “0.0625” in Section 5.3.3</p> <p>Added statement “Confirm clearance of the longitudinal stitch lines noted in Section 5.2.2 using dashed lines printed on bond side of deicer while applying centerline, excluding vertical fin deicer.” to Sections 7.2.2 and 7.3.4 to ensure proper clearance from leading edge attachment washers.</p> <p>Updated Figure 7.6.4B, Figure 7.7.7, Figure 8.5.2A, Figure 8.8.2, Figure 8.9.4 and Figure 8.12.3</p> <p>Added note to references of Figures 8.4.1, 8.5.2, 8.10 and 8.10.1 stating that Elevator horn boot is not pictured.</p> <p>Changed “center line” to “centerline” throughout document.</p>	BDS
04-16-18	4	<p>Removed Ice Shield Leading Edge ONLY limitation from the first note of Section 1. Updated End Item User Letter to most current.</p> <p>Section 2.2 updated MSDS reference to the new SDS reference.</p> <p>Noted Toluene as the preferred solvent in Section 3.2. Updated toluene references throughout report to solvent since multiple solvents are approved.</p> <p>Changed all swab references to lint-free cloth for consistency.</p> <p>Section 5.2.1 changed aircraft verification to leading edge verification. Added note to Section 5.2.2 to provide reasoning for the clearance. Removed all dimple related notes from Section 5. Added information to Section 5 describing marking of air inlet center line and stitch line boundaries.</p> <p>Updated Section 7.2.2 to more accurately describe the installation procedure.</p>	DAB
4/23/19	5	Replaced all mentions of B/E Aerospace with SMR Technologies. Updated end item user letter.	DAB

The latest revision of this maintenance manual can be downloaded from the SMR website, www.iceshield.com. In the event Internet access is not available, contact the Customer Service office below for inquiry or copy of the latest revision:

SMR Technologies, Inc.

93 Nettie Fenwick Rd

Fenwick, WV 26202

USA

Tel: 1.304.846.6636

Fax: 1.304.846.6268

Toll Free: 1.800.767.6899

TABLE OF CONTENTS

AIRWORTHINESS LIMITATIONS	iv
1. Introduction.....	1
2. Safety Instructions	1
3. Materials	2
4. Surface Preparation.....	3
5. Adhesive Application	4
6. Apply Vacuum Source	6
7. Pneumatic Deicer Installation	6
8. Elevator Horn.....	10
9. System Checkout After Installation.....	14
10. Preflight Checkout	14
11. Maintenance	14
12. Troubleshooting.....	16
13. Storage	16
14. Accessories	17
15. End Item User Letter.....	19

AIRWORTHINESS LIMITATIONS

- 1.0 The Airworthiness Limitations section is FAA approved and specifies maintenance required under 43.16 and 91.403 of the Federal Aviation Regulations unless an alternate program has been FAA approved.

- 2.0 The installation of applicable parts herein does not result in any additional Airworthiness Limitations.

1. INTRODUCTION

This publication provides information for the removal and installation of SMR Ice Shield™ Pneumatic Deicers and composite leading edge assemblies on the Socata TBM 700/850 aircraft.

NOTE: Installation is permissible for an Ice Shield™ deicer on an Ice Shield™ or Socata leading edge.

1.1. Background


Ice Shield™ Pneumatic Deicers are used on both General Aviation and Regional (Commuter) Aircraft.

Pneumatic deicers are constructed from a fabric/elastomer matrix. Sewing two layers of fabric together creates the inflatable channels within the deicer.

To remove ice, the deicer is inflated, which stretches the deicer surface ply and breaks the adhesive interface between the ice and the deicer. The airflow over the aircraft leading edges carries away the accumulated ice. The compressed air used to inflate the deicer can be supplied either from engine-driven pumps or from turbine compressors.

1.2. Pneumatic Deicer Identification

All pertinent information regarding a particular Ice Shield™ Pneumatic Deicer is contained in the brand located on the air-side surface of the part on the inboard end. An example of the Ice Shield™ brand is shown below:

	P/N SMRXXXX-XX	CURE DATE 2Q98	FAA/PMA
	S/N XXXX	PER SMR REPORT 97-33-067	
	CONTACT: 1-800-767-6899	OR	WWW.ICEDHIELD.COM

1.3. Composite Leading Edge Identification

All pertinent information regarding a particular composite leading edge is contained in the brand located on the inner surface of the part. An example of the brand is shown below:

SMR TECHNOLOGIES, INC. COMPOSITE LEADING EDGE			
P/N SMRXXXX-XX	S/N XXXX	CURE DATE 2Q98	
FAA/PMA	PER SMR REPORT 97-33-067		

1.4. Leading Edge Assembly Identification

All pertinent information regarding a particular composite leading edge assembly is contained in the brand located on the inner surface of the part. An example of the brand is shown below:

SMR TECHNOLOGIES, INC. LEADING EDGE ASSEMBLY			
P/N SMRXXXX-XX	S/N XXXX	MFG DATE: 2Q98	
REPLACES SOCATA P/N: XXXXXXXXXXXXX			
FAA/PMA	PER SMR REPORT 97-33-067		

1.5. Scope

For installation of new leading edge assemblies, refer to Section 7.9 of this document.

WARNING: Refurbishing deicers using unauthorized additives, adhesives, waxes or polishes is not recommended and voids all manufacturers' warranties. See warranty for further information.

NOTE: This installation manual covers only the pneumatic deicer and leading edge. If inflation hardware is being installed, repaired, or replaced, refer to the Aircraft Maintenance Manual.

2. SAFETY INSTRUCTIONS

2.1. Warning

Adhesive and solvent vapors are toxic and flammable.

Use only in a well-ventilated area away from sparks and flames.

Avoid prolonged breathing of vapors. Excessive exposure may cause dizziness or nausea. If these symptoms occur, seek fresh air immediately. Avoid contact with skin or eyes. Use solvent-resistant gloves and wear eye protection to minimize chance of skin or eye contact. If eye contact occurs, flush eyes with water for 15 minutes and see a physician. If skin contact occurs, wash thoroughly with soap and water.

If swallowed, do not induce vomiting; see a physician immediately.

2.2. Caution

Obtain Manufacturer's Safety Data Sheets (SDS) for all materials specified in this document. They are available from the adhesive and solvent suppliers. SDS's supersede this document regarding environmental information as well as handling, application, removal and disposal procedures.

3. MATERIALS

3.1. Approved Bond Adhesives

3M EC1300L Scotch-Grip Rubber Adhesive

Bostik 1096M with 1007M Primer

Bostik 2402 with 9252 Primer



Figure 3.1

3.2. Approved Solvents

Acetone

Denatured Alcohol

Toluene (Preferred)



Figure 3.2

3.3. Approved Stripper

Peerco 321 Adhesive Remover

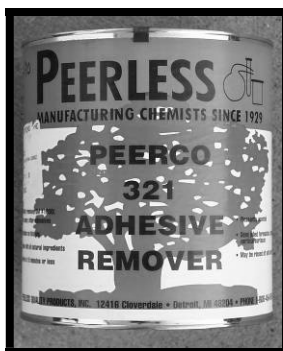


Figure 3.3

3.4. Approved Gap Filler

JFM 801 Class B

PR 1422 Class B

FlameMaster CS-3201



Figure 3.4

3.5. Approved Edge Sealer

P/N SMR-A56BP, 1/2 Pint Container

P/N SMR-A56BQ, Quart Container



Figure 3.5

3.6. Miscellaneous

- Installation Kit – Reference Section 14.1
- Paint Brushes - 2" or 3" bristle
- Rubber Roller - 2" wide
- Metal Roller - 1/2" wide
- Metal Roller - 1/16" wide
- Lint-free clean cotton cloth
- Masking tape - 1" wide
- Carpenter's chalk line
- Ball point pen or permanent marker
- Straightedge
- Transfer screws, #10
- Drill, dia. 3/16"
- Spot facer or hole saw, dia. 3/8" with 3/16" pilot
- No. 180 grit sandpaper
- Nylon probe - 1/4" diameter X 8" long (or equivalent)



Figure 3.6

4. SURFACE PREPARATION

CAUTION: If any damage, delamination, layer separation, or cracking of the composite leading edge is found, replace leading edge.

WARNING: Adhesive and solvent vapors are toxic and flammable. Use only in a well-ventilated area away from sparks and flames. Avoid prolonged breathing of vapors. Excessive exposure may cause dizziness or nausea. If these symptoms occur, seek fresh air immediately. Avoid contact with skin or eyes. Use solvent resistant gloves to minimize skin exposure. Use safety glasses to minimize chance of eye contact. If eye contact occurs, flush eyes with water for 15 minutes and see a physician. If skin contact occurs, wash thoroughly with soap and water. If swallowed, do not induce vomiting; see a physician immediately.

CAUTION: Prevent solvent run-off to avoid damage to aircraft paint. Use a minimum amount of solvent, clean up any spills immediately, and mask adjacent surfaces as needed.

4.1. Leading Edge Removal

NOTE: Composite elevator horn **SHOULD NOT** be removed to replace horn deicer boot. See Section 8 for instructions on replacing the elevator horn deicer.

- 4.1.1. Hold leading edge and remove screws and washers.

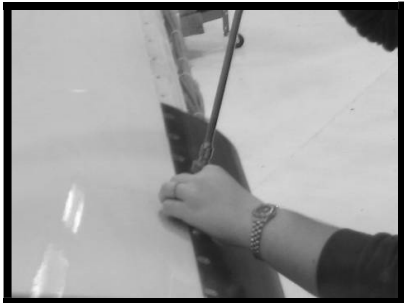


Figure 4.1.1

- 4.1.2. Carefully remove leading edge from trailing edge to reach hose connection. (See Figure 4.1.2) Loosen clamp and disconnect hose from fitting.



Figure 4.1.2

- 4.1.3. For R.H. outboard leading edge, disconnect connector for stall sensor. (See Figure 4.1.3)

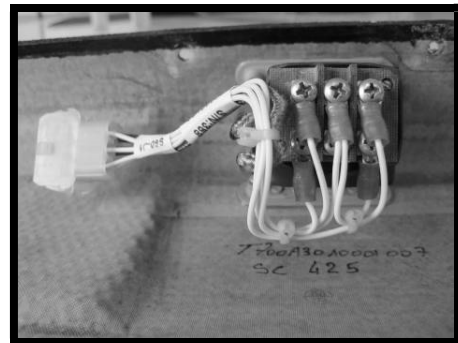


Figure 4.1.3

- 4.1.4. Remove leading edge.
4.1.5. Disconnect hose.
4.1.6. Remove stall sensor from leading edge (R.H. outboard only).

4.2. Deicer Removal

CAUTION: Manufacturer cannot accept cemented deicers for return or exchange.

CAUTION: Use caution when removing deicer to avoid damage/delamination of composite.

NOTE: BEFORE REMOVAL OF DEICERS

Dry Fit check new deicer against the leading edge surface to verify the part is correct. See Section 5.2 for further information.

- 4.2.1. To remove old deicer from leading edge, cut air inlet. (See Figure 4.2.1)



Figure 4.2.1

- 4.2.2. Using a cutter equipped with a “hook style” blade, cut/score deicer in longitudinal strips approximately 3” wide.
- 4.2.3. Cautiously, to avoid delamination of leading edge composite materials, begin to remove deicer boot beginning at one of the ends of the strips.
- 4.2.4. Using vice pliers, pull strips to remove from leading edge. Watch composite materials to avoid their separation.
- 4.2.5. Repeat 4.2.3 and 4.2.4 for the other strips by pulling toward the outer edges of leading edge to avoid composite material separation.

4.3. Residual Adhesive Removal

- 4.3.1. Remove residual adhesive with an approved adhesive stripper.
- 4.3.2. Slightly sand with 180 grit abrasive cloth to remove any adhesive film remaining on leading edge.
- 4.3.3. Check leading edge for composite material separation and crushing. If damage is found, replace leading edge.
- 4.3.4. Clean bonding surface on leading edge with a lint-free clean cloth moistened with approved solvent (toluene preferred).

4.4. Preparation to Bonding

- 4.4.1. For ease in handling when cleaning, cementing and applying the deicer, **apply vacuum** to the deicer to remove all air from deicer tube.

5. ADHESIVE APPLICATION

WARNING: Adhesive and solvent vapors are toxic and flammable.

- 5.1.1. Avoid prolonged breathing of vapors. Excessive exposure may cause dizziness or

nausea. If these symptoms occur, seek fresh air immediately.

- 5.1.2. Avoid contact with skin or eyes. Use solvent resistant gloves to minimize skin exposure. Use safety glasses to minimize chance of eye contact. If eye contact occurs, flush eyes with water for 15 minutes and see a physician. If skin contact occurs, wash thoroughly with soap and water.
- 5.1.3. If swallowed, do not induce vomiting; see a physician immediately.

5.2. Pneumatic Deicer Dry Fit Check

- 5.2.1. Dry fit the pneumatic deicer against the leading edge surface to verify that the deicer is correct for the leading edge. Verify the deicers total length, total width, air connection location, and cutout locations.

NOTE: Deicer boot includes additional trim area along all edges which will be removed after bonding.

- 5.2.2. Perform a dimensional check:

- Check that the dimension from attaching hole center to deicing area longitudinal stitch lines is 0.47 in (12mm) minimum.

NOTE: This clearance is required to ensure assembly hardware is below the stitch line.

- Check that the dimension from leading edge ends to deicing area end stitch lines is 0.63 in (16mm) minimum.

5.3. Clean Bonding Surfaces

- 5.3.1. Use a clean, lint-free cloth and approved solvent (toluene preferred) to clean the bonding surface (textured side) of the pneumatic deicer. The surface should be scrubbed lightly to remove dirt and loose particles. Turn or change the cloth often to avoid recontamination of the surface. Do not saturate the surface with solvent. Allow the solvent to dry before applying the adhesive. (See Figure 5.3.1)

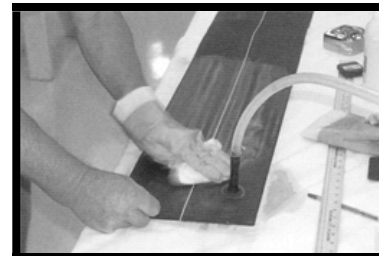


Figure 5.3.1

- 5.3.2. Following the procedures described above, clean the bonding surface of the leading edge.

5.4. Apply Bond Adhesive

CAUTION: For best bonding results, apply adhesive and make pneumatic deicer installations at temperatures between 50-75° F, and with humidity less than 75%. If humidity is 75-90%, allow additional drying time. Installations are not recommended at temperatures below 50° F or above 90% relative humidity.

NOTE: A stiff bristle brush will produce a smoother and consistent application of adhesive on the deicer and composite surface. Using scissors, trim approximately 5/8" (15mm) from a bristle brush.

- 5.4.1. Thoroughly mix approved bond adhesive.
- 5.4.2. Apply a coat of adhesive to the leading edge and deicer bonding surfaces, and then allow at least one hour for the adhesive to dry completely. (See Figure 5.4.2A and 5.4.2B)

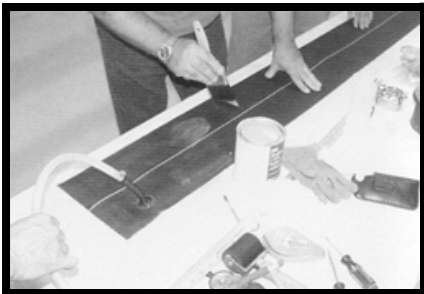


Figure 5.4.2A

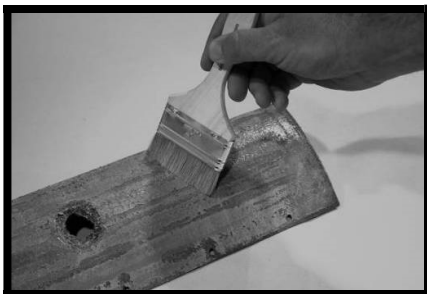


Figure 5.4.2B

- 5.4.3. Place "tick" marks along the length of the leading edge's bonding surface 0.47" above the installation holes. Using a straight edge connect the "tick" marks on each side of the leading edge's bonding surface to form stitch line boundaries.

NOTE: Sections 5.4.3 - 5.4.5 are for pneumatic deicer installation on aircraft wings and stabilizers. Pneumatic deicer

instructions for vertical leading edges can be found in Section 5.4.6.

- 5.4.4. Measure the distance between the pneumatic deicer's air inlet center line and the stitch line marking that would be bonded to the top side of the leading edge. A measurement needs to be recorded at the inboard and outboard ends of the boot.

NOTE: The centerline mark on the pneumatic deicer does not reflect the leading edge centerline, but rather the air inlet centerline.

- 5.4.5. Mark the inboard and outboard ends of the leading edge as measured in Section 5.4.6. Connect the marks using a straight edge.
- 5.4.6. For pneumatic deicer installation on vertical leading edges the top dead center of the leading edge should be marked as the air inlet centerline.
- 5.4.7. Apply a second coat of adhesive to all previously cemented surfaces.
- 5.4.8. Allow at least one hour for the adhesive to dry completely before applying the pneumatic deicer to the leading edge.
- 5.4.9. When using BOSTIK 1096M or 2402 adhesive systems, mix per manufacturer instructions. Apply an even coat of Bostik primer. Wait 1 hour, and then follow steps 5.4.1 through 5.4.4.

CAUTION: Deicer boot bonding must be performed within maximum 48 hours after having applied second adhesive coat.

NOTE: Disregard any dry-time instructions on the adhesive container. Because of the pneumatic deicers size (area), the adhesive must be applied to the surface and allowed to dry completely so that it is no longer tacky. Then, during the application of the deicer, small areas can be reactivated with solvent to make contact bonding possible. This technique allows the installer to activate only an area that can be easily handled.

NOTE: A rough adhesive coat on the leading edge or the deicer can affect the surface appearance of the deicer. In order to apply the bond adhesive smoothly, avoid brush contact on the partially dried adhesive. The adhesive dries quickly, especially in warmer ambient temperatures, so work quickly when applying the adhesive. Do not allow the brush to drag. If the brush begins to drag and the adhesive begins to "pull up", stop brushing

and begin again a new area. If this results in an area where the cement coat is too light, it can be applied again after the first coat is completely dried.

6. APPLY VACUUM SOURCE

CAUTION: Failure to apply vacuum may result in an undesirable surface appearance of the deicer.

- 6.1.1. Attach hose (through leading edge air inlet hole) to pneumatic deicer. Attach venturi and air source to hose (See Figure 6.1.1)

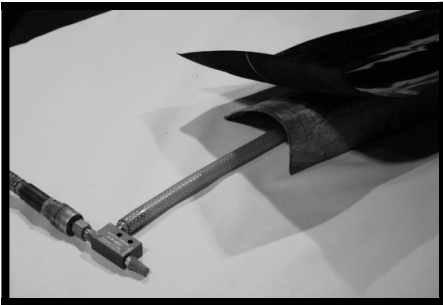


Figure 6.1.1

- 6.1.2. Electric or Air operated vacuum source is the operator's option. Use vacuum source until the deicer is completely installed on the leading edge surface then remove the vacuum source.

7. PNEUMATIC DEICER INSTALLATION

WARNING: Adhesive and solvent vapors are toxic and flammable. Use only in a well-ventilated area away from sparks and flames. Avoid prolonged breathing of vapors. Excessive exposure may cause dizziness or nausea. If these symptoms occur, seek fresh air immediately. Avoid contact with skin or eyes. Use solvent resistant gloves to minimize skin exposure. Use safety glasses to minimize chance of eye contact. If eye contact occurs, flush eyes with water for 15 minutes and see a physician. If skin contact occurs, wash thoroughly with soap and water. If swallowed, do not induce vomiting; see a physician immediately.

NOTE: Installation of a deicer may be easier with two installers. One installer holds the rolled-up pneumatic deicer and guides it onto the centerline, while the other installer activates the adhesive and uses the roller to bond the deicer firmly onto the surface. Installation proceeds in the following sequence: first, the centerline near the connections; then, the centerline out to the ends and then, from the centerline to the trailing edges, in 4" X 12" sections approximately.

NOTE: It is important not only to align the air connection(s) with the air inlet hole in the leading edge, but ensure the deicer stitch line does not lie below the stitch line boundary created on the leading edge in Section 5. In addition, to insure proper de-ice boot inflation/deflation, the installation must be performed to insure that the air connection inlet does not encounter any constrictive interference due to position near the skin of the leading edge or by material/objects within the leading edge cavity. The inlet must be free standing in order to function properly.

7.1. Activate Adhesive

- 7.1.1. Manufacturer does not recommend unbonding the surfaces once they have been bonded as this increases the likelihood of damage to the deicer.
- 7.1.2. Roll up deicer on itself, adhesive side out.
- 7.1.3. Align air inlet, unroll deicer boot on leading edge following centerline and position it according to the drawn marks.
- 7.1.4. Begin by activating the adhesive along both centerlines (on boot and leading edge) starting at the air connection. Activate both bond surfaces using a lint-free cloth dampened with solvent. Wipe the solvent cloth lightly over the area to be activated. As soon as the solvent has been activated, knuckle test by tapping the area lightly with your knuckle or fingertip. Adhesive that is ready for bonding is best described as "tacky-dry".

7.2. Apply Along Air Inlet Centerline

- 7.2.1. Apply the deicer to the leading edge surface in the activated area, beginning at the air connection. Then, use a 2" rubber roller to roll the breeze-side (outer) surface of the deicer to ensure good contact. (See Figure 7.2.1)



Figure 7.2.1

- 7.2.2.** Proceed lengthwise along the air inlet centerline in approximately 12" sections by activating the adhesive and rolling the deicer into place. Deviation from the air inlet centerline may be required to maintain the required clearance of the longitudinal stitch lines noted in Section 5.2.2 using lines marked on the bond side surface of the deicer, excluding the vertical fin deicer. The stitch line boundaries created in Sections 5.4.3 – 5.4.5 aid in maintain the specified stitch line clearance. Proceed until the entire deicer is bonded to the leading edge. (See Figure 7.2.2)



Figure 7.2.2

- 7.3.3.** Keep the activated surfaces apart to prevent premature contact while the surfaces are drying.

- 7.3.4.** Use the rubber roller to bond the deicer to the leading edge. Confirm clearance of the longitudinal stitch lines noted in Section 5.2.2 using dashed lines printed on bond side of deicer while applying remaining surfaces, excluding vertical fin deicer. Always work from the bond line toward the free edge of the section. Always work from the leading edge to the trailing edge, and overlap roller paths to ensure a continuous bond. (See Figure 7.3)



Figure 7.3.4

7.3. Apply Remaining Surfaces

NOTE: Applying Pneumatic Deicer Sections: Proceed to activate and roll down the remaining surfaces. Beginning at the air connection, roll lengthwise in 4" X 12" sections until the entire deicer is installed. Always leave a tapered end on each 4" X 12" bonded section; this will make it easy to reach the bond line with a lint-free cloth when bonding the next section.

- 7.3.1.** For each new section, fold back the uninstalled portion of the deicer as much as possible, so that it is easier to activate adhesive up to the previous bond line.
- 7.3.2.** Follow this sequence when you activate the adhesive in a 4" X 12" section:
- Begin at the bond line of the previously bonded section. Wipe the solvent-moistened lint-free cloth down the 12" length of one surface.
 - On the other surface, wipe back to the bond line.
 - Finally, press the lint-free cloth into the bond line.

NOTE: Un-bonding - if an unwanted bond is created, use a squirt bottle container to apply a minimal amount of solvent to the bonded edge, while peeling the deicer back to un-bond it. Separate the deicer from the surface, continuing to use small amounts of solvent and allowing enough time for the solvent to soften the bond line.

7.4. Trapped Air

NOTE: Removing Trapped Air: Check for trapped air after rolling down each section of the deicer visually or by running a hand over the surface of the deicer. When vacuum is applied during installation it is easier to feel and locate the trapped air. Remove the trapped air before continuing the installation. (See Figure 7.4)



Figure 7.4

- 7.4.1. Use a narrow, flat, semi-rigid probe, with rounded edges and a blunt point. Dip the probe into solvent and work it under the deicer toward the trapped air. Allow time for the solvent to penetrate and separate the adhesive bond, while gently forcing the probe toward the trapped air. Move the probe from side to side so that the bubble of trapped air is opened to form a pocket. Wait until tack is acquired before rolling the deicer back down. Start rolling at the closed end of the air pocket and work toward the area where the probe was inserted in order to avoid re-trapping air in the pocket. (See Figure 7.4.1)

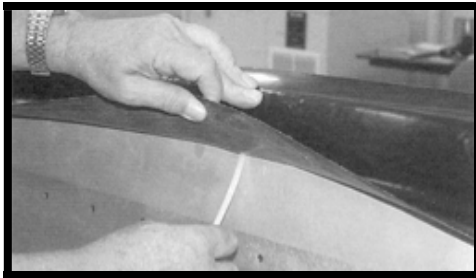


Figure 7.4.1

7.5. Trimming Deicer

CAUTION: Do not trim the deicer closer than 1/2" from tube area edges as this could result in air leakage or seam failure.

- 7.5.1. Trim deicer edges and cutout locations to leading edge periphery as necessary.
- 7.5.2. For vertical fin, trim deicer edges to fit recess of leading edge.

7.6. Finishing (Wings & Horizontal Stabilizers)

- 7.6.1. Clean edge perimeter of leading edge/deicer boot using a lint-free clean cloth moistened with solvent to remove any extra adhesive.
- 7.6.2. Mask all four sides of part on the outer surface 1/8" in from edge.
- 7.6.3. Mask all four sides of part on the inner surface 0.20" in from edge.
- 7.6.4. In the masked area between the tapes, apply a smooth, continuous brush coat of the approved conductive edge sealer (A56B) to the surface. Remove the masking tape immediately after applying the sealer and before the sealer dries. This operation will go more smoothly if one person applies the sealer while another removes the tape immediately. (See Figure 7.6.4A and 7.6.4B)

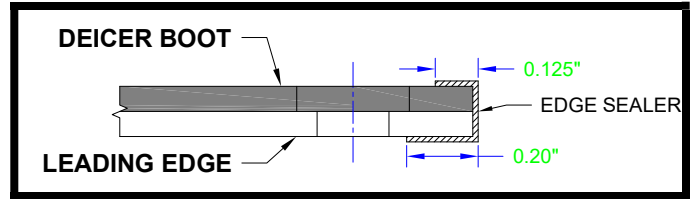


Figure 7.6.4A



Figure 7.6.4B

- 7.6.5. Allow to dry for one hour.
- 7.6.6. Fill hole around air inlet from back side of leading edge with approved gap filler.
- 7.6.7. Cautiously, to avoid damaging leading edge, drill attaching holes in deicer boot with spot facer/hole saw. (See Figure 7.6.7)

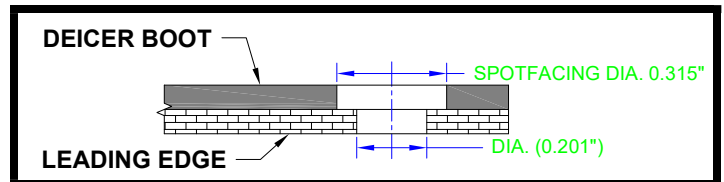


Figure 7.6.7

7.7. Finishing (Vertical Fin)

- 7.7.1. Clean edge perimeter of deicer boot using a lint-free clean cloth moistened with solvent to remove any extra adhesive.
- 7.7.2. Mask all four sides of deicer on the outer surface 1/8" in from edge deicer edge.
- 7.7.3. On the composite surface, mask a straight line about 1/8" beyond the gap along the four edges of the deicer.
- 7.7.4. Fill gap using approved gap filler. Follow manufacturer's directions for application of filler compound.
- 7.7.5. Remove masking tape and allow to cure for 6 hours until it is tack free.
- 7.7.6. Apply masking tape on the deicer surface 1/4" inside the perimeter of gap filler on the

deicer. On the composite surface, mask a neat, straight line about 1/4" beyond the gap filler. This masking should result in a straight line on the composite surface, in order to compensate for minor irregularities created during deicer installation.

- 7.7.7.** In the masked area between the tapes, apply a smooth, continuous brush coat of the approved conductive edge sealer (A56B) to the surface. Remove the masking tape immediately after applying the sealer and before the sealer dries. This operation will go more smoothly if one person applies the sealer while another removes the tape immediately. (See Figure 7.7.7)



Figure 7.7.7

- 7.7.8.** Allow to dry for one hour.

7.8. Conditioning and Reconditioning

- 7.8.1.** After adhesive curing (48 hours recommended), perform leak test:
- Inflate deicer at 18 ± 1 psi and stop supply.
 - Monitor PDI leakage for one minute.
 - Permissible pressure drop is 10% of leak test pressure.
- 7.8.2.** Before deflating, check seams for non-bonded areas, air bubbles, or blisters.
- 7.8.3.** Perform aspect check:
- Check leading edge attachment holes to verify that deicer boot is not torn away.
 - Check for presence of foreign materials in air inlet entering hole.

7.9. Leading Edge Installation (Pre-Drilled LE)

- 7.9.1.** Inspect the interfaces and hose for cleanliness and condition.
- 7.9.2.** Position leading edge on wing/tail.

- 7.9.3.** For R.H. outboard leading edge, reattach stall sensor to leading edge. Connect stall sensor connector.
- 7.9.4.** Connect hose to fitting and tighten clamp.
- 7.9.5.** Make sure all the tools and materials are removed and the work area is clean and free from debris.
- 7.9.6.** Install and secure leading edge with screws and washers. Finger tighten screws.
- 7.9.7.** Once leading edge is correctly positioned, tighten screws to 30 in.-lbs torque.

7.10. Leading Edge Installation (Undrilled LE)

- 7.10.1.** Inspect the interfaces and hose for cleanliness and condition.
- 7.10.2.** Insert transfer screws into all mounting holes of aircraft wing/tail for the leading edge section being installed.
- 7.10.3.** Position leading edge on wing/tail.
- 7.10.4.** Gently tap leading edge over transfer screw to create a dimple for each mounting location.
- 7.10.5.** Remove leading edge and drill mounting holes from the inner surface.
- 7.10.6.** Cautiously, to avoid damaging leading edge, drill attaching holes in deicer boot with spot facer/hole saw. (See Figure 7.10.6)

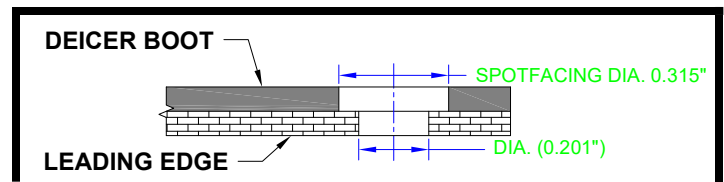


Figure 7.10.6

- 7.10.7.** Remove transfer screws from aircraft.
- 7.10.8.** Position leading edge on wing/tail.
- 7.10.9.** For R.H. outboard leading edge, reattach stall sensor to leading edge.
- 7.10.10.** Connect hose to fitting and tighten clamp. For R.H. outboard, connect stall sensor connector.
- 7.10.11.** Make sure all the tools and materials are removed and the work area is clean and free from debris.
- 7.10.12.** Install and secure leading edge with screws and washers. Finger tighten screws.
- 7.10.13.** Once leading edge is correctly positioned, tighten screws to 30 in.-lbs torque.

8. ELEVATOR HORN

8.1. Deicer Removal

CAUTION: Manufacturer cannot accept cemented deicers for return or exchange.

CAUTION: Use caution when removing deicer to avoid damage/delamination of composite.

NOTE: BEFORE REMOVAL OF DEICERS

Dry Fit check new deicer against the leading edge surface to verify the part is correct. See Section 5.2 for further information.

- 8.1.1. Using a cutter equipped with a “hook style” blade, cut/score deicer in longitudinal strips approximately 3” wide.
- 8.1.2. Cautiously, to avoid delamination of leading edge composite materials, begin to remove deicer boot beginning at one of the ends of the strips.
- 8.1.3. Using vice pliers, pull strips to remove from leading edge. Watch composite materials to avoid their separation.
- 8.1.4. Repeat 8.1.2 and 8.1.3 for the other strips by pulling toward the outer edges of leading edge to avoid composite material separation.
- 8.1.5. Pull approx. 6” of hose out through elevator horn. Loosen clamp and disconnect hose from deicer air inlet.

8.2. Residual Adhesive Removal

- 8.2.1. Remove residual adhesive with an approved adhesive stripper.
- 8.2.2. Slightly sand with 180 grit abrasive cloth to remove any adhesive film remaining on leading edge.
- 8.2.3. Check leading edge for composite material separation and crushing. If damage is found, replace leading edge.
- 8.2.4. Clean bonding surface on leading edge with a lint-free clean cloth moistened with approved solvent (toluene preferred).

8.3. Preparation to Bonding

For ease in handling when cleaning, cementing and applying the deicer, apply vacuum to the deicer to remove all air from deicer tube.

8.4. Clean Bonding Surfaces

- 8.4.1. Use a clean, lint-free cloth and approved solvent (toluene preferred) to clean the bonding surface (textured side) of the

pneumatic deicer. The surface should be scrubbed lightly to remove dirt and loose particles. Turn or change the cloth often to avoid recontamination of the surface. Do not saturate the surface with solvent. Allow the solvent to dry before applying the adhesive. (See Figure 8.4.1 – Elevator horn boot not pictured)

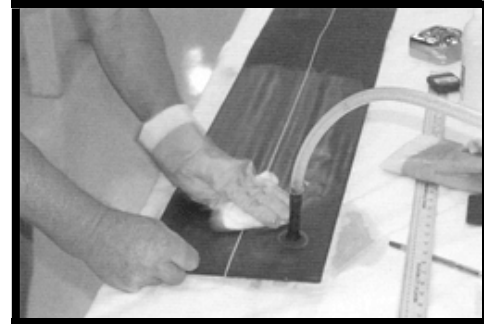


Figure 8.4.1

- 8.4.2. Following the procedures described above, clean the bonding surface of the leading edge.
- 8.4.3. On elevator horn, draw centerline spanwise through center of air inlet. Centerline should be perpendicular to inboard edge of horn.

8.5. Apply Bond Adhesive

CAUTION: For best bonding results, apply adhesive and make pneumatic deicer installations at temperatures between 50-75° F, and with humidity less than 75%. If humidity is 75-90%, allow additional drying time. Installations are not recommended at temperatures below 50° F or above 90% relative humidity.

NOTE: A stiff bristle brush will produce a smoother and consistent application of adhesive on the deicer and composite surface. Using scissors, trim approximately 5/8” (15mm) from a bristle brush.

- 8.5.1. Thoroughly mix approved bond adhesive.
- 8.5.2. Apply a coat of adhesive to the leading edge and deicer bonding surfaces, and then allow at least one hour for the adhesive to dry completely. (See Figure 8.5.2 and 8.5.2A – Elevator horn boot not pictured in Figure 8.5.2)

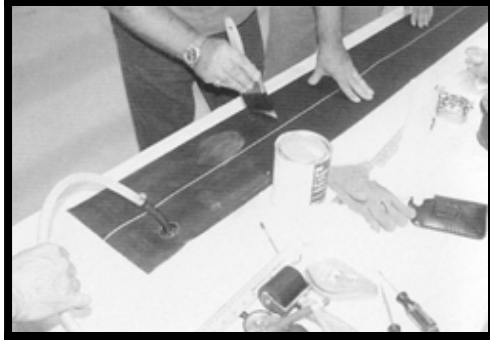


Figure 8.5.2

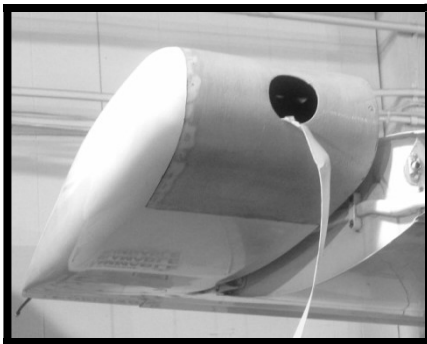


Figure 8.5.2A

- 8.5.3. Apply a second coat of adhesive to all previously cemented surfaces.
- 8.5.4. Allow at least one hour for the adhesive to dry completely before applying the pneumatic deicer to the leading edge.
- 8.5.5. When using BOSTIK 1096M or 2402 adhesive systems, mix per manufacturer instructions. Apply an even coat of Bostik primer. Wait 1 hour, and then follow steps 8.5.1 through 8.5.4.

CAUTION: Deicer boot bonding must be performed within maximum 4 hours after having applied second adhesive coat.

NOTE: Disregard any dry-time instructions on the adhesive container. Because of the pneumatic deicers size (area), the adhesive must be applied to the surface and allowed to dry completely so that it is no longer tacky. Then, during the application of the deicer, small areas can be reactivated with solvent to make contact bonding possible. This technique allows the installer to activate only an area that can be easily handled.

NOTE: A rough adhesive coat on the leading edge or the deicer can affect the surface appearance of the deicer. In order to apply the bond adhesive smoothly, avoid brush

contact on the partially dried adhesive. The adhesive dries quickly, especially in warmer ambient temperatures, so work quickly when applying the adhesive. Do not allow the brush to drag. If the brush begins to drag and the adhesive begins to "pull up", stop brushing and begin again a new area. If this results in an area where the cement coat is too light, it can be applied again after the first coat is completely dried.

8.6. Apply Vacuum Source

- 8.6.1. For elevator horn, remove horizontal leading edge.
- 8.6.2. At Y fitting at inboard end of horizontal stabilizer, loosen and remove the hose clamp. (See Figure 8.6.2)

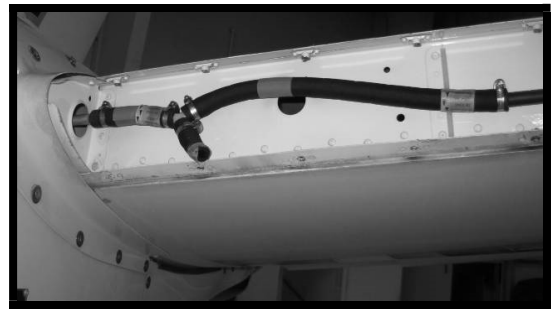


Figure 8.6.2

- 8.6.3. Attach venturi and air source to hose. (See Figure 8.6.3)

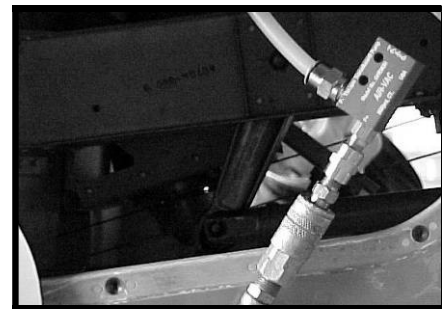


Figure 8.6.3

- 8.6.4. Electric or Air operated vacuum source is the operator's option. Use vacuum source until the deicer is completely installed on the leading edge surface then remove the vacuum source.

8.7. Activate Adhesive

- 8.7.1. Manufacturer does not recommend un-bonding the surfaces once they have been bonded as this increases the likelihood of damage to the deicer.

- 8.7.2.** Roll up deicer on itself, adhesive side out.
- 8.7.3.** Attach air inlet to deice hose inside elevator horn. Attach clamp and tighten.
- 8.7.4.** Align air inlet, unroll deicer boot on leading edge following centerline and position it according to the drawn marks.
- 8.7.5.** Begin by activating the adhesive along both centerlines (on boot and leading edge) starting at the air connection. Activate both bond surfaces using a lint-free cloth dampened with solvent. Wipe the solvent cloth lightly over the area to be activated. As soon as the solvent has been activated, knuckle test by tapping the area lightly with your knuckle or fingertip. Adhesive that is ready for bonding is best described as "tacky-dry".

8.8. Apply Along Centerline

- 8.8.1.** Apply the deicer to the leading edge surface in the activated area, beginning at the air connection. Then, use a 2" rubber roller to roll the breeze-side (outer) surface of the deicer to ensure good contact. (See Figure 8.8.1)



Figure 8.8.1

- 8.8.2.** Proceed lengthwise along the centerline in approximately 12" sections by activating the adhesive and rolling the deicer into place until the entire centerline of the deicer is bonded to the centerline of the leading edge. (See Figure 8.8.2)



Figure 8.8.2

8.9. Apply Remaining Surfaces

NOTE: Applying Pneumatic Deicer Sections: Proceed to activate and roll down the remaining surfaces. Beginning at the air connection, roll lengthwise in 4" X 12" sections until the entire deicer is installed. Always leave a tapered end on each 4" X 12" bonded section; this will make it easy to reach the bond line with a lint-free cloth when bonding the next section.

- 8.9.1.** For each new section, fold back the uninstalled portion of the deicer as much as possible, so that it is easier to activate adhesive up to the previous bond line.
- 8.9.2.** Follow this sequence when you activate the adhesive in a 4" X 12" section.
- Begin at the bond line of the previously bonded section. Wipe the solvent-moistened lint-free cloth down the 12" length of one surface.
 - On the other surface, wipe back to the bond line.
 - Finally, press the lint-free cloth into the bond line.
- 8.9.3.** Keep the activated surfaces apart to prevent premature contact while the surfaces are drying.
- 8.9.4.** Use the rubber roller to bond the deicer to the leading edge. Always work from the bond line toward the free edge of the section. Always work from the leading edge to the trailing edge, and overlap roller paths to ensure a continuous bond. (See Figure 8.9.4)



Figure 8.9.4

NOTE: Un-bonding - if an unwanted bond is created, use a squirt bottle container to apply a minimal amount of solvent to the bonded edge, while peeling the deicer back to un-bond it. Separate the deicer from the surface, continuing to use small amounts of

solvent and allowing enough time for the solvent to soften the bond line.

8.10. Trapped Air

NOTE: Removing Trapped Air: Check for trapped air after rolling down each section of the deicer visually or by running a hand over the surface of the deicer. When vacuum is applied during installation it is easier to feel and locate the trapped air. Remove the trapped air before continuing the installation. (See Figure 8.10 – Elevator horn boot not pictured)



Figure 8.10

- 8.10.1. Use a narrow, flat, semi-rigid probe, with rounded edges and a blunt point. Dip the probe into solvent and work it under the deicer toward the trapped air. Allow time for the solvent to penetrate and separate the adhesive bond, while gently forcing the probe toward the trapped air. Move the probe from side to side so that the bubble of trapped air is opened to form a pocket. Wait until tack is acquired before rolling the deicer back down. Start rolling at the closed end of the air pocket and work toward the area where the probe was inserted in order to avoid re-trapping air in the pocket. (See Figure 8.10.1 – Elevator horn boot not pictured)



Figure 8.10.1

8.11. Trimming Deicer

CAUTION: Do not trim the deicer closer than 1/2" from tube area edges as this could result in air leakage or seam failure.

- 8.11.1. Trim deicer inboard edge to elevator horn rib if necessary.

8.12. Finishing

- 8.12.1. Clean edge perimeter of deicer boot using a lint-free clean cloth moistened with solvent to remove any extra adhesive.
- 8.12.2. Apply masking tape on the deicer surface 1/4" inside the perimeter of the deicer. On the composite surface, mask a neat, straight line about 1/4" beyond the edge of the deicer. This masking should result in a straight line on the composite surface, in order to compensate for minor irregularities created during deicer installation.
- 8.12.3. In the masked area between the tapes, apply a smooth, continuous brush coat of the approved conductive edge sealer (A56B) to the surface. Remove the masking tape immediately after applying the sealer and before the sealer dries. This operation will go more smoothly if one person applies the sealer while another removes the tape immediately. (See Figure 8.12.3)
- 8.12.4. Allow to dry for one hour.



Figure 8.12.3

8.13. Control and Reconditioning

- 8.13.1. After adhesive curing (48 hours recommended), perform leak test:
- Inflate deicer at 18±1 psi and stop supply.
 - Monitor PDI leakage for one minute.
 - Permissible pressure drop is 10% of leak test pressure.
- 8.13.2. Before deflating, check seams for non-bonded areas, air bubbles, or blisters.
- 8.13.3. Perform aspect check:
- Check leading edge attachment holes to verify that deicer boot is not torn away.
 - Check for presence of foreign materials in air inlet entering hole.

9. SYSTEM CHECKOUT AFTER INSTALLATION

CAUTION: Do not exceed the maximum test pressure of 18±1 psi.

NOTE: It is recommended that pressurization of the deicers be minimized for 48 hours after installation. This results in the best long-term strength of adhesive bonds.

- 9.1.1. Actuate the de-icing system for a minimal number of cycles. For effective system operation, inflation must be rapid and deflation must be completed well before the next inflation cycle begins.
- 9.1.2. Connect aircraft to ground power unit.
- 9.1.3. On the deice switch panel, press "LTS TEST" pushbutton and verify both green indicator lights located above the "AIRFRAME DEICE" switch light up.
- 9.1.4. Start engine.
- 9.1.5. On deice switch panel, set "AIRFRAME DEICE" switch to "ON".
 - a) Above the switch, L.H. green indicator light comes on for 7 seconds, then goes off for 60 seconds.
 - b) As soon as L.H. green indicator light goes off, R.H. green indicator light comes on for 7 seconds, then goes off for 60 seconds.
 - c) Deicers of wing inboard leading edges and empennages inflate as L.H. green indicator light comes on for 7 seconds.
 - d) Deicers of wing outboard and center leading edges inflate as R.H. green indicator light comes on for 7 seconds.
 - e) The complete cycle starts again every 67 seconds.
- 9.1.6. Set "AIRFRAME DEICE" switch to "OFF".
- 9.1.7. Shut down engine

10. PREFLIGHT CHECKOUT

Refer to the Pilot's Operating Handbook for detailed procedures. If icing conditions are foreseen, particularly check good functioning of all electrical and pneumatic ice protection systems.

11. MAINTENANCE

WARNING: Refurbishing deicers using unauthorized additives, adhesives, waxes, or polishes is not recommended and voids all manufacturers' warranties.

11.1. Field Inspection

- 11.1.1. Field inspection of an uninstalled deicer is required when:
 - a) The deicer has been stored for more than eighty four (84) months.
 - b) There is evidence of damage to original packaging.
 - c) The deicer is not in original packaging.
 - d) There is evidence that the deicer was not stored properly.
- 11.1.2. Field inspection of an installed deicer is conducted when it is suspected that damage or age has affected deicer performance, or during aircraft annual inspection.
- 11.1.3. Field inspection of a composite leading edge is conducted when it is suspected that damage has affected the structural capabilities of the leading edge, or during aircraft annual inspection.
- 11.1.4. Field Inspection Procedure – Deicer

Note: Deicer should not be inflated at pressures higher than the operating pressure of 18±1 psig.

 - a) Inspect deicer carefully for surface damage: cuts, tears, abrasions, scuffs, cracking, and/or crazing. Check backside (if uninstalled) and breeze side of deicer carefully. Pay particular attention to air connection area.
 - b) Repair surface damage detected per the repair section of this report.
 - c) Inflate deicer with regulated air source to 18±1 psig. Check inflation time. Deicer should inflate to operating pressure within 6 seconds.
 - d) When deicer has reached operating pressure, seal off deicer at air connection. Check deicer pressure after 60 seconds. Pressure drop should not exceed 3 psi.
 - e) Allow deicer to deflate naturally with no vacuum applied. Deflation time should not exceed 22 seconds. When deicer is deflated, check for pockets of trapped air in tubes.
 - f) If deicer does not pass these tests, check again for damage and perform appropriate repairs and retest. If deicer still does not meet these criteria, the deicer should be replaced (if installed) or scrapped. If deicer passes all

tests, its usability is on condition and the decision to install is at user's discretion.

11.1.5. Field Inspection Procedure – Leading Edge

- a) Visually inspect leading edge carefully for signs of damage including delamination, fraying, layer separation, crushing, and/or cracking. Pay particular attention to outer edges and attachment holes.
- b) If any damage is found, leading edge must be replaced.

11.2. Cleaning

NOTE: Petroleum derivatives can be harmful to deicers. Do not use them as cleaning agents for pneumatic deicers.

- 11.2.1. Clean pneumatic deicers, when needed, with a soap and water solution. Rinse with clean water. Do not use hot water. Water should be comfortable to the bare hand.

11.3. Pneumatic Deicer Care

- 11.3.1. Do not rest ladders or work stands against pneumatic deicers. Wrap padding around those portions of work stands that could come into contact with installed pneumatic deicers.
- 11.3.2. Do not drag refueling or other servicing hoses over the pneumatic deicers. Use suitable padding for protection. Do not walk, lay tools or sharp objects on the pneumatic deicers.

11.4. Ice Shield™ Plus Application

Ice Shield™ Plus is a silicone based liquid coating that reduces ice adhesion to pneumatic deicer surfaces. This reduced ice adhesion increases the efficiency and performance of the working deicer.

NOTE: A heavy application will produce a tacky surface and hinder the effectiveness of Ice Shield™ Plus. Follow Manufacturers instructions on container.

Clean the deicer surface with mild soap and water. Rinse with clean water and allow drying.

Apply Ice Shield™ Plus by spraying a light coat on the surface and wipe with a clean cloth in smooth, lengthwise strokes to insure a consistent coat over the entire surface.

11.5. Composite Leading Edge Repair

Repair of leading edge damage is not approved. If any damage is found, leading edge must be

replaced. See Section 11.1.5 for inspection procedure.

11.6. Pneumatic Deicer Repair

Ice Shield™ brand pneumatic deicers may be repaired using Deicer Repair Kit PN 2MA1419-01 (See Section 10.7 and Accessories, Section 14.3).

11.7. Repair Limits

The Ice Shield™ Repair Kit is designed for repairs to all Ice Shield™ pneumatic deicers. Repairs are confirmed by a functional test per the Field Inspection Procedure Section 11.1.4.

Patch repairs are not recommended for the following damage:

- a) Cut, tear or rupture exceeding ¾" in length.
- b) Cut, tear or rupture within 1/8" of a stitch line (on sewn deicers).
- c) Cut, tear or rupture that extends into the fabric stitch line will require immediate deicer replacement.
- d) **Temporary** patch repairs are permissible for damage as described in (1) and (2) above, until a replacement can be scheduled, provided the part meets functional test criteria per Field Inspection Procedure Section 11.1.4. Part should be replaced within 30 days of temporary repairs.

Recommended limits for application of patches for maximum operating efficiency of a pneumatic deicer.

- Three (3) small patches (1 ¼" x 2 ½") per any 12-inch square area.
- Two (2) medium patches (2 ½" x 5") per any 12-inch square area.
- One (1) large patch (5" x 10") per any 12-inch square area.

11.8. Material List

Materials in kit PN 2MA1419-01:

<u>Number</u>	<u>Description</u>
2MA1419-07	½ pint Primer #94
4MA1929-3	30 pcs. (Pkg.) sm. patch (1 ¼" x 2 ½")
4MA1929-2	30 pcs. (Pkg.) med. patch (2 ½" x 5")
4MA1929-1	10 pcs. (Pkg.) large patch (5" x 10")
2MA1419-06	3 pcs. (Pkg.) emery cloth, coarse grit
2MA1913-01	1 ea. Patch Template/Sanding Shield

Required materials **not** supplied in kit.
(Equivalent substitutes permitted)

<u>Description</u>	<u>Vendor/Part Number</u>
2" Wide Roller	SMR Tech P/N 2MA1414-02
Bristle Brushes, ½"	SMR Tech P/N 2MA1414-10
Detergent	Commercially available
Lint-free cloths	Commercially available
Cleaning solvent, (Toluene or Alcohol)	Commercially available
"Zip-loc" bag, plastic, (One-gallon size)	Commercially available

11.9. Repair Instructions

CAUTION: Patches have one-way stretch across the width of the patch so that the patch will stretch as the deicer is inflated. The patch must be installed with the length parallel to the deicer tubes. Failure to do so may result in the patch delaminating when the deicer is inflated.

CAUTION: Patch adhesive is temperature sensitive. For best results if temperature is less than 50°F, warm deicer surface prior to applying primer and warm installed patch while drying. To warm, hold a plastic bag filled with hot water on deicer surface installed patch. Patch may not adhere if surface and installed patch are not warmed.

NOTE: Patch must extend ½-inch minimum distance beyond the damaged area and may be trimmed for small areas.

- 11.9.1. Clean deicer surface to be patched with water and detergent using a clean cloth to remove dirt, grease and silicone coatings.
- 11.9.2. Sand deicer surface with medium grit emery cloth or equivalent. Use patch template to outline damaged area and also use as a shield during sanding.
- 11.9.3. Wipe deicer surface with a clean cloth dampened with cleaning solvent (toluene) and allow drying.

11.9.4. Apply one coat of primer to deicer surface and allow drying to touch (5 - 10 minutes).

11.9.5. Remove paper backing from patch and center patch over outlined primer area on the deicer surface. Roll patch firmly with rubber roller.

11.9.6. Allow 30 minutes cure time before inflating deicer.

12. TROUBLESHOOTING

Refer to Chapter 30 of the aircraft maintenance manual for specific information on probable malfunctions and remedial actions to be taken.

13. STORAGE

The life of an uninstalled pneumatic deicer may be decreased by improper storage conditions. The following conditions should be maintained for the best service life. Where the ideal conditions are not attainable, attempt to approach them as closely as possible.

13.1. Packaging

Each pneumatic deicer is sealed in an airtight polyethylene bag and boxed prior to shipment. Store the pneumatic deicer in its original sealed packaging in an area free from sunlight, harmful fumes and excessive dust. (See Figure 13.1)



Figure 13.1

13.2. Harmful Substances

Do not store petroleum products, solvents, hydraulic fluids or other substances that may be injurious to rubber in close proximity to pneumatic deicers.

13.3. Ozone

NEVER store pneumatic deicers near electric motors or other sources of ozone.

13.4. Temperature

Store in a space protected from extreme temperatures. Ideal storage temperature is between 40° and 80°F (5 to 27°C).

13.5. Stresses

Never store pneumatic deicers under mechanical stresses that could cause kinking, wrinkling, or creasing. Never stack anything on a rolled-up pneumatic deicer.

Brush, Bristle 3 in. Wide	2 ea.
Brush, Bristle 1 in. Wide	1 ea.
Stick, Stir	2 ea.
Lint-free cloth, Sewn	2 ea.

14. ACCESSORIES

14.1. Installation Kit

2MA1414-01, Installation Kit



Kit, Adhesive P/N 2MA1425-03	
Description	Qty
1300L Adhesive	1 ea. Qt.

14.2. Ice Shield™ Plus

SMRPLUS-22, Spray Bottle

SMRPLUS-32, Container



14.3. Deicer Repair Kit

2MA1419-01, Universal Pneumatic Deicer Repair Kit



14.4. Adhesive Kit Contents

Kit, Adhesive P/N 2MA1425-02	
Description	Qty
1300L Adhesive	1 ea. Qt.
SMR-A56B Conductive Edge Cement	1 ea. ½ pt.

WARRANTY

All Ice Shield™ Pneumatic Deicers are warranted to be free from material and workmanship defects for twenty-four (24) months or 3,000 flight hours from the date of sale to the end user, whichever first occurs, but not beyond eighty-four months from date of manufacture (60 month storage).

All Ice Shield™ Propeller Deicers are warranted to be free from material and workmanship defects for eighteen (18) months or 2,000 flight hours from date of sale to the end user, whichever first occurs.

The foregoing warranties are exclusive and are accepted by the buyer in lieu of any and all other warranties, expressed or implied, including without limitation, the implied warranties of merchantability and fitness for a particular purpose. Buyer's sole remedy in the event of a breach of the foregoing warranties is the repair or replacement of the affected product by SMR Technologies, Inc. (SMR) upon return of the product, transportation charges prepaid to (SMR) and after, a charge to buyer for use of the product prior to its return. Buyer agrees that in no event will (SMR) liability under any theory of contract, negligence, strict liability, other tort or otherwise, exceed buyer's net purchase price, nor will (SMR) be liable for any special, incidental, consequential, or exemplary damages.

(SMR) assumes no liability whatsoever, whether contractual, warranty, tort or otherwise, for any federal aviation administration sanctions, product malfunctions, property damage, personal injuries, or similar incidents occurring after any substitution of parts not manufactured by (SMR) or any alteration of (SMR) manufactured parts not authorized by (SMR) manuals or other written procedures issued by (SMR).

The foregoing warranties will continue in effect for so long as the product is serviced and maintained in accordance with (SMR) instructions and with genuine (SMR) manufactured replacement parts. These warranties may not be altered or amended except by a written instrument signed by buyer and a duly authorized officer of (SMR).

14.5. Repairs and Returns

To return any parts for warranty consideration, you must first request a Return Goods (RG Authorization) number. To receive the number, simply contact a Sales & Service Representative (SSR) at:

Toll Free: 1.800.767.6899
Phone: 1.304.846.6636
Fax: 1.304.846.6268

The SSR will provide you with a return address. Please do not ship any returned parts without the RG number as this number allows SMR to track the part and the resolution of the claim.

The warranty is limited to returns for the following reasons:

1. Wrong items shipped
2. Wrong items ordered
3. Any return for credit
4. Items damaged in shipment
5. Warranted defects

Effective Date: July 1, 1998

Revised: November 5, 2002

15. END ITEM USER LETTER



SMR Technologies, Inc.
93 Nettie Fenwick Rd.
Fenwick, West Virginia 26202-4000
Phone Number: 1-800-767-6899

To: End Item User/Installer

From: SMR Technologies

Subject: End Item Use Authorization Letter

SMR Technologies hereby authorizes any end item user/installer to install this product under the issued Supplemental Type Certificate (STC). Should an actual copy of the STC be needed, please contact our facility by calling the number listed above or visit our web-site at www.iceshield.com.

A handwritten signature in blue ink that reads "Angela Bragg".

Angela Bragg
Quality Assurance Manager
SMR Technologies, Inc.