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3M™ Polyurethane Protective Light Lens Boots

Installation and Maintenance Instructions

Effective: June 27, 2024

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1.0 Introduction

1.1 Document Scope

This document provides supplemental information and instructions regarding material definition, part installation, damaged part criteria & actions, part removal, and part replacement for 3M™ Polyurethane Protective Tapes, Boots, and Patches (PPT's) for light lens protection.

The purpose of these Instructions is to provide the owner/operator with the information necessary to ensure proper installation and maintenance of the tape, boot, or patch. These Instructions supplement 3M document number ICA-001193, Instructions for Continued Airworthiness, 3M™ Polyurethane Protective Tapes, Boots, and Patches for Light Lens Protection.

NOTE: These Instructions and ICA-001193 must be placed in the airplane operator's maintenance manual and incorporated into the operator's scheduled maintenance program.

1.2 Purpose/Rationale for Installation

3M™ Polyurethane Protective Light Lens Boots and Patches protect and prevent damage to aircraft light lenses which may lead to a reduction in light transmission and may ultimately lead to premature replacement of the lens assembly. Secondarily, light lens boots may help keep broken pieces of the lens from liberating and causing a Foreign Object Debris (FOD) hazard on runways and taxi ways when the lens is broken by an impact.

1.3 Program for the Distribution of Changes to These Instructions

Changes to these Instructions are envisioned only in the event of a change to the components that comprise the boot or patch. In the case of component changes or upgrade, the latest version of the Instructions will be distributed directly to the airplane owner/operator in hard copy and/or electronic format upon completion of the changes.

For minor typographical or grammatical changes where no functional or operational characteristics are affected, no notice of change will be made.

If document changes involve the form, fit, or function of the system, and are considered non-essential, a Provisional Service Bulletin will be issued informing the owner/operator of this change and how to go about obtaining an updated document.

If the change is of a more severe nature and is considered critical to flight safety or system operation, the FAA will be notified in accordance with 14 CFR 21.3, Reporting of Failures, Malfunctions and Defects. Upon determination by the FAA, an Airworthiness Directive may be issued describing the nature of the change, including instructions regarding document updates and any additional service requirements.

1.4 Warnings, Cautions and Notes

Warnings, cautions, and notes may be used throughout this manual to emphasize important and critical instructions as follows:

WARNING:	**An operating procedure, practice, etc., which, if not correctly followed, could result in personal injury or loss of life.**
CAUTION:	**An operating procedure, practice, etc., which, if not strictly observed, could result in damage to, or destruction of equipment.**
NOTE:	An operating procedure, condition, etc., which is essential to highlight.

1.5 Material Definition

3M™ Polyurethane Protective Tapes, Boots, and Patches are comprised of an abrasion-resistant polyurethane film, formulated for long-term resistance to ultraviolet light (UV), with a durable, solvent-resistant, pressure-sensitive, acrylic adhesive protected with an easy-release liner. This tape construction can also be formed into a three-dimensional shape or converted to a specific two-dimensional shape matching the applicable aircraft part or surface to be protected (boots and patches).

PPTs can be applied to bare metal or painted surfaces and may be painted after installation in accordance with FAA (or other Civil Aviation Authority) approved maintenance documentation.

2.0 Part Fabrication (during installation)

2.1 Removal of Excess Material at Base of Boot Shape

Patches are supplied trimmed to size (ready to install). Boots may be supplied trimmed to size (ready to install) or with excess material from the manufacturing process at the base of the boot shape that will need to be trimmed prior to installation.

Unless the boot is supplied trimmed-to-fit (ready to install), there will be excess material from the manufacturing process around the base of the boot that must be trimmed off prior to installation. See **Figure 1**.

Boots that need to be trimmed prior to installation may or may not be supplied with trim lines (3-dimensional indicators formed around the perimeter of the boot to indicate the approximate location for trimming) that can be used as a guide for final boot size. Most trim lines are located approximately 0.5 inches (12 mm) above the base of the boot. Trim lines have been chosen based on in-use field experience, but it is the installer's decision as to exactly where to trim the boot. 3M recommends trimming the boot to within 0.25 inches (6 mm) above the provided trim line. See **Figure 2**.

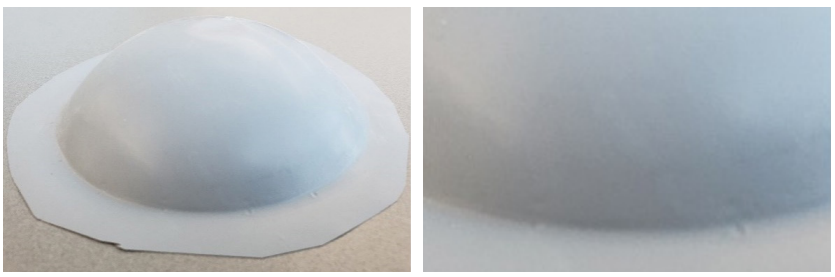
If a trim line is not present on the boot, 3M recommends trimming the boot within 1 inch (25 mm) of the base of the boot. See **Figure 3**.

Trim the boot with a pair of scissors, making clean, smooth cuts and avoid making jagged edge. See Section 3.7.

Figure 1: Representative image — Trimming of the boot.

Figure 2: Representative trim lines provided on boots.

Figure 3: Representative boot without a trim line.



3.0 Part Installation

The following is a list of steps to install 3M™ Polyurethane Protective boots and patches for light lens protection.

To maximize the effectiveness and longevity of the protective boot or patch, the boot or patch should be installed without wrinkles, blisters, or other contaminants in the bond line (area of contact between the aircraft part or surface and the boot or patch adhesive), without excessive abrasion/scuffing of the film surface and avoiding cuts or punctures in the film.

Please follow the instructions contained in this document and other applicable instructional documentation (such as technical data sheets, installation videos, service bulletins, etc.).

Please contact your 3M Engineering Representative prior to installation if clarification is required.

NOTE: When installing polyurethane protective boots and patches, it is important not to contaminate the surface of the aircraft part or the adhesive on the film. Use of clean, silicone-free and dust-free gloves and appropriate personal protective equipment is recommended.

3.1 Safety Notes

NOTE: Before handling any chemical products used for cleaning and installation of the boot or patch, always read the container label and the Safety Data Sheet (SDS).

When using solvents, extinguish all ignition sources, including pilot lights. Read and follow manufacturer's warnings and directions for use.

Local air quality regulations may regulate or prohibit the use of surface preparation and cleaning materials based on solvent (VOC) content.

3.2 Tools/Materials Required

The following is a list of materials and tools which may be needed to install the protective tape, boot, or patch (see Section 8.0 for full 3M Product Information).

- Application solution
- 3M™ Polyurethane Protective Tape Application Squeegee, Yellow
- Clean, lint-free cloth
- Scissors
- 3M™ 86A Adhesion Promoter
- 3M™ Vinyl Tape 471
- 3M™ Scotch-Weld™ RP-2220 Repair Paste
- EPX Applicator

3.3 Fit Check

Overall dimensions of the boots vary based on the aircraft part being protected. Three-dimensional boots are provided in a form intended to fit a specific part snugly. Prior to installation, confirm the boot fits the part properly by placing the boot with the adhesive liner still attached onto the surface of the part.

3.4 Light Lens and Housing Preparation

The lens housing must be in good condition before a boot is applied. The surface must be smooth without dirt or paint “nibs” on the supporting part. Inspect the surfaces of the lens and housing for pitting or erosion.

Repair or replace the light lens if pitting or erosion is not within maintenance manual damage limits.

Freshly painted surfaces should be allowed to cure or dry for a minimum of 48 hours at 72°F (22°C) before applying a boot or patch. Please check with paint manufacturer for the correct cure time and conditions.

3.5 Preparation of Application Solution

3M™ Polyurethane Protective Boots and Patches may be provided with a spray bottle to be used to apply the recommended application solution. The application solution can be made by mixing 75% water and 25% isopropanol along with 3 or 4 drops of a non-ionic detergent, such as Joy® Dishwashing detergent. An example solution would be 300 grams of water mixed with 100 grams of isopropanol and 3 drops of Joy® Dishwashing detergent. Alternatively, this solution can be purchased premade from 3M as 3M™ Protective Tape Application Solution (see Section 8.0 for product information).

3.6 Light and Boot Cleaning

Using a clean, lint-free cloth or cheese cloth, clean the light lens surface with the application solution prepared in Section 3.5.

Additionally, clean both sides of the boot with application solution to remove the white powder on the boot (used to prevent multi-pack boots from adhering to each other).

NOTE: If another approved aircraft cleaning solution is used, a second cleaning step is needed with application solution to ensure no cleaning solution residue remains which may interfere with the boot or patch adhesion to the aircraft surface.

3.7 Boot Trimming

Unless the boot is supplied trimmed-to-fit (ready to install), there will be excess material from the manufacturing process around the base of the boot (See Section 2.1 for additional guidance). See **Figure 4**.

Figure 4: Representative image — Trimming of the boot.

3.8 Adhesion Promoter Application

If you have experienced any issues with boots or patches not remaining adhered to the aircraft surface over time (around the edges, for example) it is recommended to use 3M™ Adhesion Promoter 86A (see Section 8.0 for product information).

Apply 86A to the surface where the boot or patch will be installed — around the edges only. It is not recommended to apply 86A to the entire surface area under the patch. Use only enough to wet the problem area(s) and use caution not to over-saturate.

Allow the adhesion promoter to dry for 10–15 minutes before applying the boot or patch. When dry, it will no longer have a shiny appearance. If more than 90 minutes elapse between the 86A application and adhering the patch to the surface, the 86A application will need to be repeated.

Refer to the 3M™ Adhesion Promoter 86A Technical Data Sheet for more detailed product and application information.

See the 3M™ Adhesion Promoter 86A SDS and product label for Hazard and Precautionary information before using the product.

NOTE: 3M™ 86A Adhesion Promoter is not to be applied to the aircraft lens surface. Care should be taken to ensure it is only applied to the lens housing when used with Light Lens Boots or Patches.

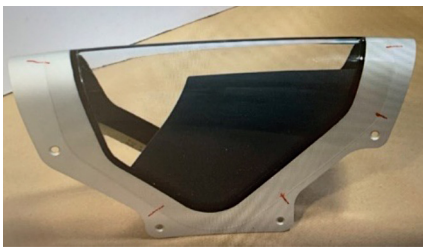
3.9 Alignment Marking

NOTE: Light Lens Boots and patches should extend beyond the lens onto the lens housing for at least a 1/4" around the perimeter to ensure maximum adhesion.

3M Vinyl Tape 471 fine line masking tape or a non-permanent marker can be used to mark points on the part clearly establishing the center point where the boot will be first applied and any fastener holes which require alignment to limit repositioning during installation.

Position boot or patch so the outer edge of the tape is positioned equally in terms of the distance it extends beyond the lens and onto the lens housing. Once this position has been established use a non-permanent marker and make perpendicular marks on the outer edge of the boot or patch that extends onto the lens housing. These are the alignment marks you will use to orient the part during installation. See **Figure 5**.

Figure 5: Representative images— Non-permanent marker alignment marks on SJ8665 FP-627 boot and aircraft lens housing and a flat patch and lens housing.



3.10 Liner Removal

3.10.1 Three-Dimensional Boots

Remove the boot from the light and turn the boot inside out such that the adhesive liner is facing out, taking care not to wrinkle the boot.

Liberally spray the light and both surfaces (film and liner) of the boot with the application solution.

Place the boot back on the aircraft light (liner will be facing up), using the light as a holder to prevent the boot from adhering to itself during liner removal (which would make the boot unusable). Lift the edge of the adhesive liner from the boot to expose a portion of the adhesive. Spray application solution on the adhesive. Carefully remove the remainder of the adhesive liner while continuously spraying application solution on the exposed adhesive. This will further prevent the boot from sticking to itself during liner removal and installation. See **Figure 6.**

Figure 6: Representative image — Removal of liner and continuously spraying adhesive surface.

3.10.2 Flat Patches

Place the lens patch on a clean, flat surface, with the adhesive side liner facing up. Using care to prevent the patch from adhering to itself during liner removal (which would make the patch unusable), lift the edge of the adhesive liner from the patch to expose a portion of the adhesive (see Section 3.10.3 below for tips if having difficulty separating the liner from the adhesive to start liner removal).

Liberally spray the light lens and both surfaces (film and liner) of the patch with the application solution.

3.10.3 Tips for Initiating Adhesive Liner Removal (or Topside Liner, if present)

NOTE: It is important not to contaminate the surface of the light lens assembly or the adhesive on the boot or patch. Use of clean, silicone-free and dust-free gloves are recommended. If gloves are unavailable, make sure your hands are clean and kept moist with the application solution.

Method 1: While holding the tape near a corner in one hand, carefully separate the tape and liner at the corner using a utility knife. See **Figure 7**.

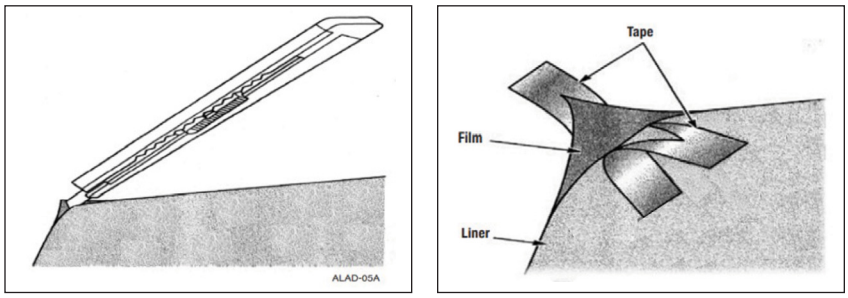
As the liner and tape separate, fold the liner over to keep them separated and assist in gripping and pulling them apart.

Applying a piece of strapping (filament) tape or packaging tape to the adhesive liner and / or topside liner at the corner can assist in initiating removal of the liner.

Avoid contaminating the exposed adhesive edge and ensure adhesive is covered with application solution during the liner removal process and installation.

NOTE: Care must be taken to ensure the knife does not cut the tape patch itself.

Figure 7: Separate tape and liner with blade. Tape can be an aide in liner removal.



Method 2: While facing the adhesive liner side and holding the tape near a corner in one hand, bend and roll the edge near the corner with your thumb towards the liner side. See **Figure 8.**

Repeat several times until the liner separates from the tape. Carefully grip the separated liner between fingertips and pull away from the tape. This method is somewhat difficult and requires the ability to grip 1/16" – 1/8" tape.

Applying a piece of strapping (filament) tape or packaging tape to the adhesive liner and/or topside liner at the corner can assist in initiating removal of the liner.

Figure 8: Roll liner corner away from tape. Tape can be an aide in liner removal.

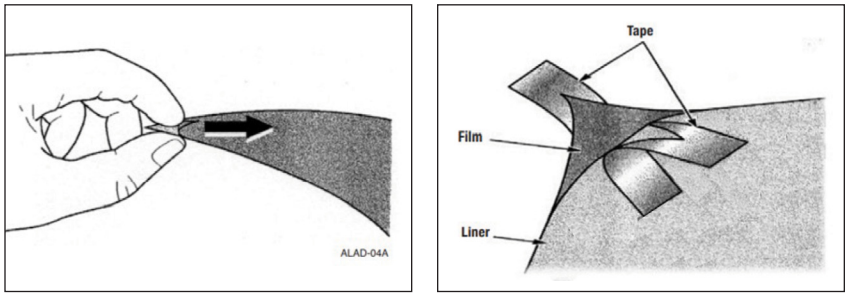
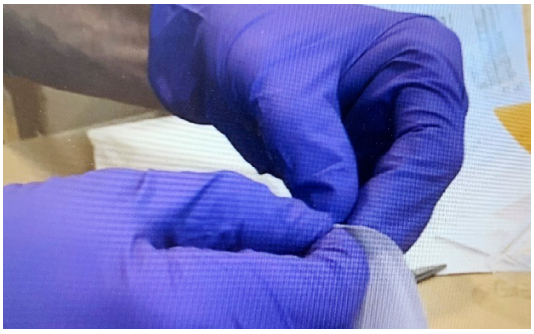
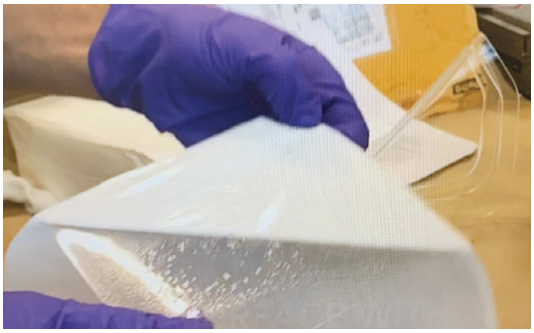


Figure 9: Representative image — Roll liner corner away from tape to start liner removal.



Application solution should be applied to the adhesive surface continuously during adhesive liner removal and to prepare for positioning and application to the aircraft. This will prevent the lens die cut from sticking to itself during installation. See **Figure 10.**

Figure 10: Representative image — Liner removal has begun, and adhesive has been wetted with application solution.



3.11 Boot Repositioning on Light

Remove the boot from the light lens and turn it inside out such that the adhesive side is facing the light. Heavily spray the light and boot with the application solution, enabling easy repositioning.

Apply the boot or patch to the light lens and housing, aligning the markings and any fastener holes, if present. Reposition and reapply the application solution as needed until proper fit is achieved.

3.12 Boot Adhesion to Light Lens and Housing

Apply additional application solution to the outside of the boot. Then, using the 3M yellow applicator squeegee, press the boot down at the center of the light lens and use one to two-inch strokes outward to smooth out the boot. Alternatively, use a clean, lint-free cloth to wipe and smooth the boot into place, working from the center outwards to the trailing edges. This will remove trapped application solution and air bubbles. Apply only light pressure to squeegee or cloth.

If a bubble is trapped, carefully peel the boot back, reapply application solution (between the polyurethane protective tape and aircraft surface and on top of the boot or patch) and use the squeegee to re-adhere.

A clean, lint-free cloth can be used to absorb excess application solution as it is pressed out.

Next, firmly press the squeegee down and outwards from the center in short strokes, working away from the center of the boot or patch and toward the trailing edge, removing any remaining application solution.

Remove alignment markings if they have been applied.

3.13 Edge Sealing

3M™ Scotch-Weld™ Repair Paste 2220 B/A (RP-2220) is recommended for edge sealing the light lens protective tape boot or patch.

The edge seal can be applied directly after the patch has been installed or after the patch has been allowed to air dry (overnight, for example).

Figure 11: 3M™ Scotch-Weld™ RP-2220 Repair Paste Cartridge.

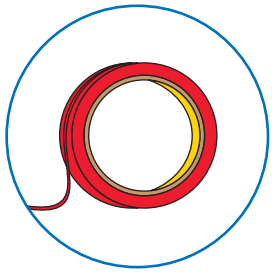
NOTE: Refer to the 3M™ Scotch-Weld™ Repair Paste 2220 B/A Technical Data Sheet for more detailed product and application information.

See SDS and product label for Hazard and Precautionary information before using the product.

3.13.1 Mask the Edge Seal Area

Prepare the polyurethane protective tape patch for edge sealing by applying a strip of 3M™ Vinyl Tape 471 across the top of the polyurethane protective tape, 1/32" back from the edge. Apply a second strip of 3M™ Vinyl Tape 471 on the aircraft surface, 1/8" from the edge of the polyurethane protective tape. This will provide a neat, defined area for the application of the urethane edge sealant. See **Figure 12.**

Figure 12: Apply masking tape to enable neat edge seal application.



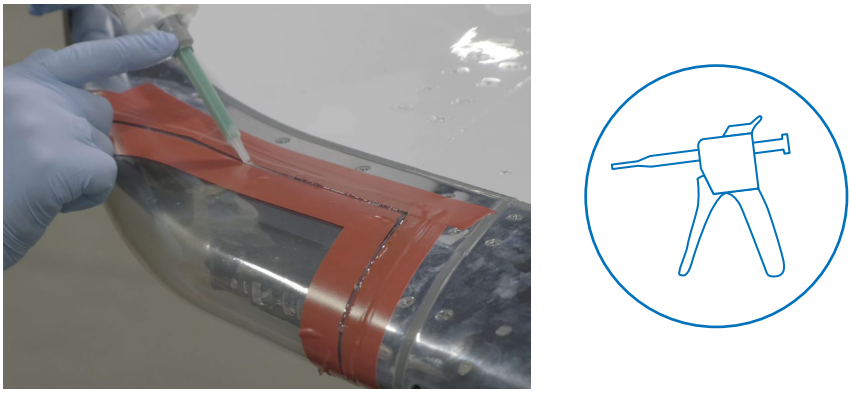
3.13.2 Apply Edge Seal

Finish by neatly applying 3M™ Scotch-Weld™ Repair Paste RP-2220 to seal the edges of the patch to the fuselage around the perimeter of the patch and any cut-outs that may be present.

Attach a RP-2220 cartridge to a 3M™ EPX™ Applicator. Attach a nozzle included in the RP-2220 product packaging to the cartridge. Dispense an approximately 1" diameter circle of mixed RP-2220 onto a scrap piece of metal, paper or other clean scrap material to ensure proper dispensing and mixing before starting application.

Apply a bead of RP-2220 between the 471 vinyl tape strips that were applied in the steps above. See **Figure 13.**

Figure 13: Edge sealant application.



3.13.3 Smooth Edge Seal

With a clean, silicone-free and dust-free protective glove, use a finger to spread and smooth the sealant bead between the strips of 471 vinyl tape. Remove vinyl tape immediately after RP-2220 application is complete. See **Figure 14.**

Figure 14: Edge seal can be smoothed after application.

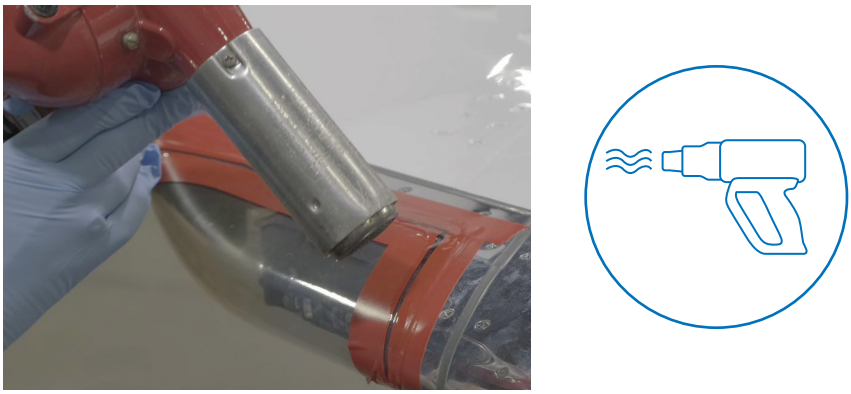
3.13.4 Allow Edge Seal to Cure

Ambient Cure — Edge seal cure is complete after 24 hours at room temperature (72°F [22°C]). However, RP-2220 is sufficiently cured to withstand flight after 6 to 8 hours.

Accelerated Heat Cure — The cure time of RP-2220 can be accelerated by gently and carefully heating it to 130–140°F (54–60°C) for 10–15 min. See **Figure 15**.

If accelerated curing is utilized, the edge seal is ready for flight when the heating period is completed.

Figure 15: Gentle heating can accelerate the edge seal cure.



3.14 Final Step

Dry the surface of the polyurethane protective boot with a clean cloth. If the boot is installed on an aircraft, allow it to dwell 6 to 8 hours at 70°F (21°C) before flight.

4.0 Maintenance Instructions

4.1 Scheduling Information

The boot or patch does not require periodic inspection, cleaning, adjustment, test, etc., to maintain its continued airworthiness. Replacement may occur as determined necessary during the course of ordinary airplane maintenance activities.

4.2 Recommended Overhaul Periods

As with any product, environmental factors, age and use affect the materials and performance of a boot or patch. Accordingly, the manufacturer recommends replacing the airplane's boot or patch at approximately 5 (five) year intervals. Use in harsh environments may necessitate more frequent replacement.

This replacement interval, however, is optional, at the owner/operator's discretion, and is in no way mandatory as a means to achieve the continued operational safety of the airplane.

4.3 Inspection Program

NOT APPLICABLE — This section is not applicable as the boot or patch does not require a periodic inspection to maintain its continued airworthiness.

5.0 Troubleshooting/Damaged Part Criteria

5.1 Damage Types and Actions

Recommendations to replace the boot or patch for any of the damage types below apply before, during, and after installation.

Torn/Cut/ Punctured Film	If there is a tear, cut, or puncture in the film in the area that will be installed on the aircraft part, the boot should not be used and should be replaced. If the tear, cut, or puncture is located in the area at the base of the boot, that will get trimmed off, the boot can be used and installed as recommended.
Wrinkles (non-permanent)	Wrinkles in the boot or patch are acceptable if the wrinkle is a non-permanent deformation. If the boot or patch with the adhered adhesive liner can be smoothed out and laid flat upon the aircraft surface, this would be considered a non-permanent deformation. If the boot or patch contains wrinkle(s) that are considered non-permanent deformations, the boot or patch can be used and installed as recommended.
Wrinkles (permanent)	If the wrinkle is such that the film cannot be laid flat on the aircraft part, e.g., the adhesive is adhered to itself or the urethane film has a fold-over or inherent wrinkle, this would be considered a permanent deformation. If a permanent deformation exists in the area that will be installed on the aircraft part, the boot or patch should not be used and should be replaced. If there is a permanent deformation located in the area at the base of the boot, that will get trimmed off, the boot can be used and installed as recommended.
Surface Abrasions/ Scuff Marks	If the boot or patch has abrasions or scuff marks that do not wash off when cleaning with 3M™ Protective Tape Application Solution in the area that will be installed on the aircraft part, the boot or patch should not be used and should be replaced. If surface abrasions or scuff marks are located in the area at the base of the boot, that will get trimmed off, the boot can be used and installed as recommended.

The aircraft owner/operator should make the final decision on accepting or rejecting a part. 3M Engineering Representatives will provide aid or guidance upon request.

6.0 Part Repair

NOT APPLICABLE — 3M does not recommend repair for damaged boots or patches. Damaged boots or patches should be replaced.

7.0 Part Removal Instructions

Boots and patches should be removed carefully to prevent damage to the aircraft surface.

The film can be removed by peeling up the edge of the film and pulling it toward the center of the boot or patch, carefully peeling back the film at 180° (back against itself).

If the film leaves adhesive residue on the aircraft surface, this can be removed with a 50/50 mixture of isopropanol and water and a cheese cloth.

8.0 Part Replacement

Replacement boots (and the following items to assist in the installation of the boots) can be ordered directly from 3M Company.

Name	3M Product #	3M ID #
3M™ Protective Tape Application Solution	56800	7100069168
3M™ Polyurethane Protective Tape Applicator Squeegee, Yellow, 5 each/pack	(no product #)	7100248577
3M™ Vinyl Tape 471	471	7100044651
3M™ Scotch-Weld™ Repair Paste RP-2220	2220	7100159064
3M™ Scotch-Weld™ EPX™ Plus II Applicator, 10 each/case	(no product #)	7100134264
3M™ Scotch-Weld™ EPX™ Mixing Nozzle Square Green, 48.5mL/50mL	(no product #)	7100104991
3M™ Adhesion Promoter 86A, 5 wipes/packet	86A	7010290333
3M™ Adhesion Promoter 86A, 12 pints/case	86A	7000002051

Please contact a 3M customer service or sales representative for ordering information. See Section 15.0.

9.0 Other General Procedural Instructions

NOT APPLICABLE — This section is not applicable as the boot or patch does not require system testing, symmetry checks, does not affect the center of gravity, lifting and shoring, nor storage limitations.

10.0 Boot or Patch Access

The boot or patch is installed on the exterior surface of the airplane. No modification of the airplane is required to gain access for inspection.

11.0 Special Inspection Techniques

NOT APPLICABLE — This section is not applicable as boot or patch does not require any special inspection techniques to determine suitability for continued use or replacement.

12.0 Protective Treatments

NOT APPLICABLE — This section is not applicable as the boot or patch does not require any protective treatments be applied to the airplane due to its installation, maintenance, removal or replacement.

13.0 Fasteners

NOT APPLICABLE — This section is not applicable as the boot or patch does not involve the use of fasteners of any type.

14.0 Special Tools

It is recommended that a 3M yellow applicator squeegee be used for the installation of boots or patches (See **Figure 16** and Section 3.2). These may be provided with boots or patches as delivered or can be ordered directly from 3M Company. See Section 8.0.

Figure 16: 3M yellow applicator squeegee.

15.0 Manufacturer Contact Information

Airplane owner/operators may contact the manufacturer at:

3M Company
3M Corporate Headquarters
3M Center
St. Paul, MN 55144-1000

3M Aerospace Customer Service
1-800-235-2376 Call Monday – Friday
8AM to 5PM Central Time

Website
3M.com/Aerospace

3M Automotive and Aerospace Solutions Division
3M Center, Building 223-3S-33
St. Paul, MN 55144-1000

Phone: 1-800-235-2376
Website: 3M.com/Aerospace

3M Aerospace Customer Service: 1-800-235-2376
Call Monday – Friday 8AM to 5PM Central Time