

**CHAPTER 27****DOORS AND WINDOWS**

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## CHAPTER 27

## DOORS AND WINDOWS

27-00 Description

The R44 has four passenger (cabin) doors. All four cabin doors may be removed and installed by maintenance personnel or pilots.

Passenger doors are constructed of fiberglass and thermoplastics. Passenger doors, locks, weather seal, gas springs, and door vents and hinges may be replaced, and vent pivot friction may be adjusted.

Two windshield halves are retained in aluminum frames and an aluminum tubular bow oriented vertically along the helicopter's centerline. A standard (acrylic) windshield installation and an impact-resistant (polycarbonate) windshield installation are available. Refer to § 27-30 for detailed description.

27-10 Door Assembly**A. Cleaning**

Refer to § 23-10 Part B for cleaning windows.

**B. Removal**

1. Refer to Figures 27-1 and 27-2. To disconnect door from gas spring mechanism:
  - a. Forward Doors: Pull D573-4 rod up and off of arm assembly ball joint.
  - b. Aft Doors: Insert flat-tip screwdriver and pry up spring clip locking C394-1 gas spring to channel ball joint. Pull gas spring up and off of ball joint.
2. Remove rings from door hinge pins, lift pins up from door frame hinge assemblies, and remove door.
3. Adjust weight and balance per applicable Pilot's Operating Handbook Section 6.

**C. Installation****WARNING**

**Failure to install a ring in each door's two hinge pins may allow door to depart aircraft in flight.**

1. Refer to Figures 27-1 and 27-2. Align and insert door hinge pins in door frame hinge assemblies.
2. Align forward door D573-4 rod with arm assembly ball joint, or aft door C394-1 gas spring with channel ball joint, and push down to lock.
3. Install rings in door hinge pins.
4. Adjust weight and balance per applicable Pilot's Operating Handbook Section 6.

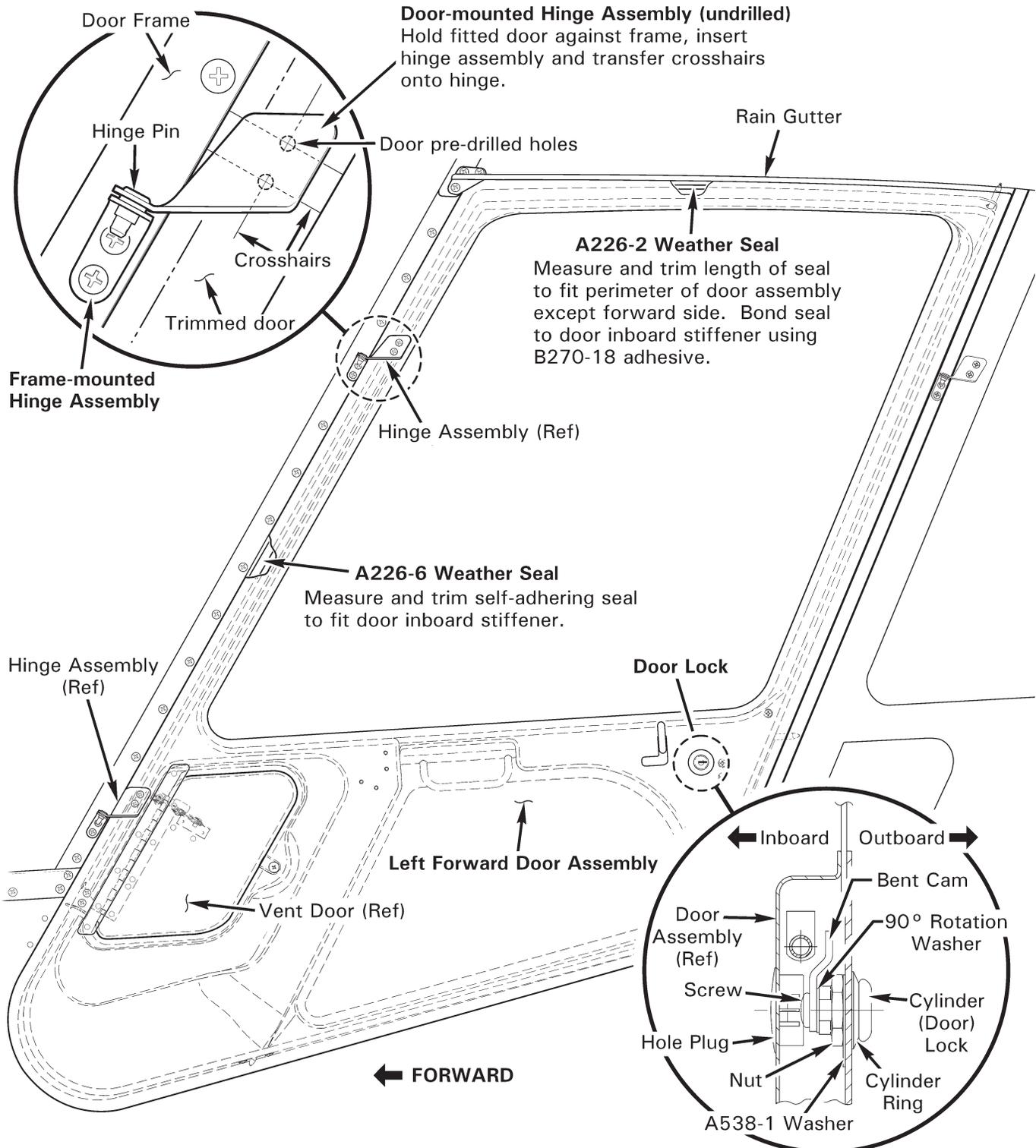


FIGURE 27-1 DOOR ASSEMBLY

27-10 Door Assembly (continued)**D. Replacement****CAUTION**

Use proper respiratory protection when handling fiberglass.

**CAUTION**

Protect door windows and paint from scratches or scuff marks when door maintenance is performed on workbench.

1. Refer to Figure 27-1. As required, lay masking tape on surfaces of door frame, new door hinges, and new door, to mark with soft pencil.
2. Press new door forward and top edge weather seals against door frame recess (rain gutter interferes with top edge until trimmed).
3. Using soft pencil, trace door forward edge onto masked frame, then transfer approximate edge distance to door. From inside cabin, estimate approximate material to be removed from door top edge, then transfer approximate edge distance to door. Remove door.
4. Using 60-grit grinder, trim forward and top door edges. Perform steps 1 thru 3 until weather seals sit approximately even against door frame recess.
5. Using soft pencil and a straight edge, draw cross hairs through (centers of) door upper hinge assembly pre-drilled holes. Hold fitted door against frame, insert new (door-mounted) hinge assembly in frame-mounted hinge assembly, and transfer cross hairs onto hinge. Remove hinge and door.
6. Drill two 0.170-inch diameter holes at cross hair intersections in hinge assembly and deburr. Remove tape, clean up debris, and prepare hinge assembly and door clamping surfaces using approved solvents per § 23-70.
7. Install upper hinge assembly on door and special torque screws per § 23-33.
8. Repeat steps 5 thru 7 for lower door-mounted hinge assembly.
9. Install door. Using 60-grit grinder, trim edges as required for final fitting. Verify doors open and close smoothly and latch correctly. Remove door and bevel edges using 60-grit sandpaper.
10. Prepare surfaces with solvent and touch-up door using approved materials per § 23-70. Install new door per Part C.

### 27-11 Door Lock Replacement

**CAUTION**

Protect door windows and paint from scratches or scuff marks when door maintenance is performed on workbench.

1. Remove door per § 27-10.
2. Refer to Figure 27-1. Remove hole plug opposite key slot on door interior.
3. Remove screw, bent cam, and 90° rotation washer. Remove nut and A538-1 washer. Press and catch cylinder lock and ring through door.
4. Install new cylinder lock and ring in door. Install lock so key is vertical with teeth down in locked position. Apply thin coat B270-10 adhesive on screw threads, install hardware, and tighten screw.
5. Bond hole plug in place using B270-9 adhesive.

### 27-12 Weather Seal (Door Assembly) Replacement

1. Remove damaged weather seal using plastic wedge or putty knife. Remove hardened adhesive using approved solvent per § 23-70, or 60-grit sandpaper, as required.
2. Refer to Figure 27-1. Measure and trim continuous length of A226-2 seal to fit perimeter of door except forward side, as shown. Neatly bond seal to stiffener using B270-18 adhesive. Wipe away excess adhesive prior to curing.
3. Measure and trim length of A226-6 seal to fit forward side of door. Remove self-adhesive preserving strip and neatly bond seal to stiffener.

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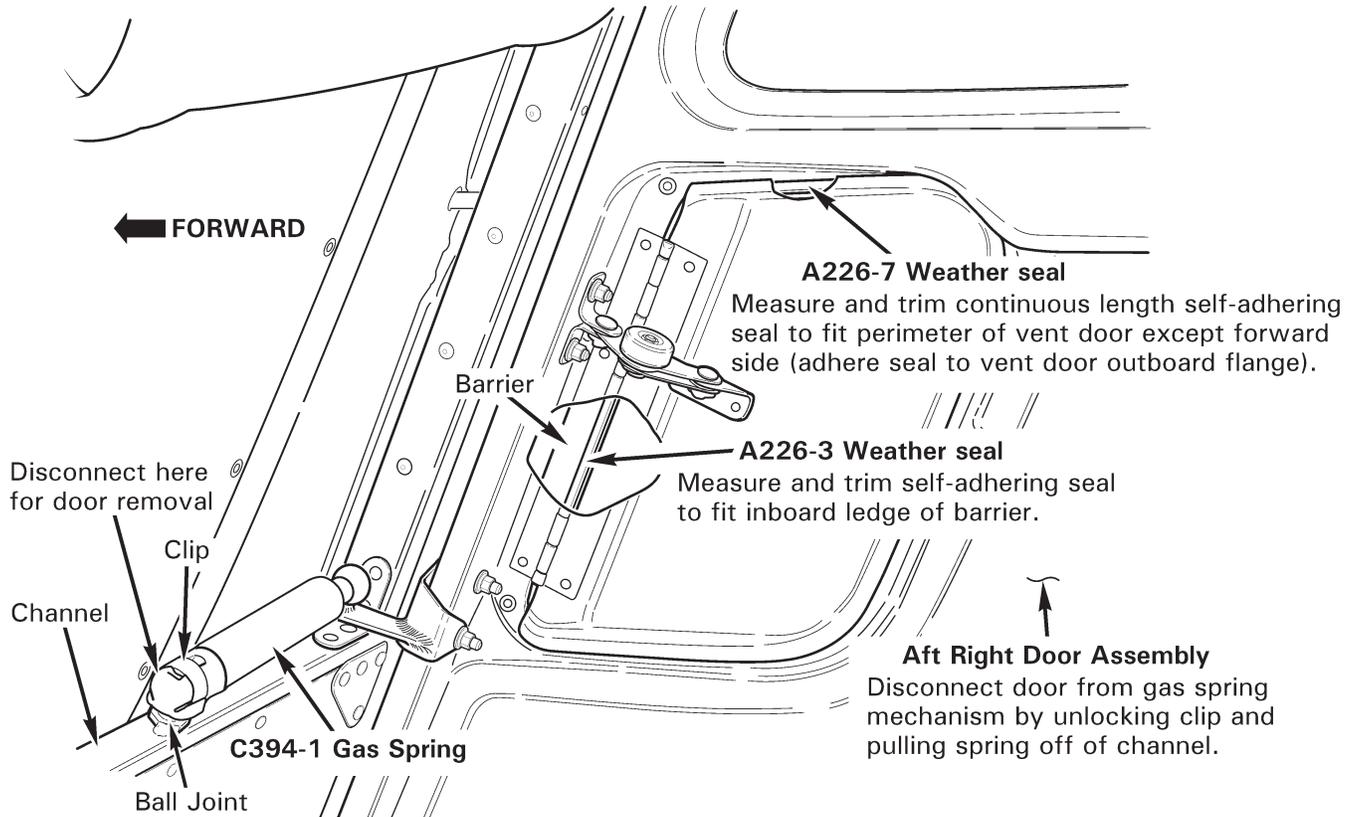
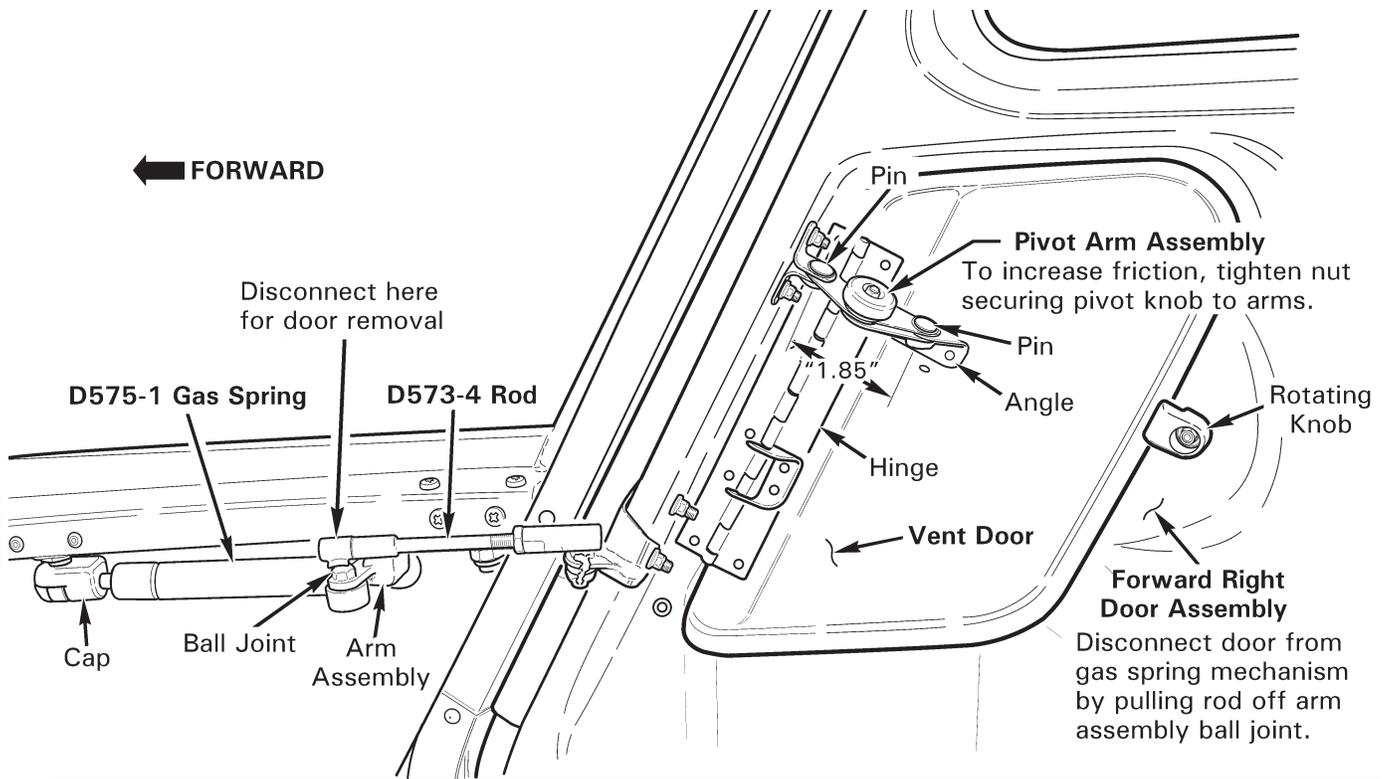


FIGURE 27-2 GAS SPRINGS AND DOOR VENTS

## 27-13 Gas Springs

### **A. Removal**

1. a. Forward Doors: Insert flat-tip screwdriver and pry down on caps to unlock D575-1 gas spring from ball joints. Push gas spring down and off of ball joints.
- b. Aft Doors: Insert flat-tip screwdriver and pry up spring clips to unlock C394-1 gas spring from ball joints. Pull gas spring up and off of ball joints.

### **B. Installation**

1. a. Forward Doors: Unlock D575-1 gas spring caps. Snap gas spring onto ball joints and lock caps.
- b. Aft Doors: Insert flat-tip screwdriver and pry up C394-1 gas spring spring clips. Snap gas spring onto ball joints and release clips.

## 27-20 Door Vent Replacement

### **CAUTION**

Use proper respiratory protection when handling fiberglass.

1. Refer to Figure 27-2. Drill out rivets securing hinge and pivot arm assembly angle to door vent. Rotate knob to unlock and remove door vent.
2. Using 60-grit grinder, trim new vent door forward edge as required to match door recess and smooth corners. Bevel edges using 60-grit sandpaper.
3. Hold fitted door vent in recess and match drill hinge four 0.098-inch diameter holes. Smooth hole edges; clean up debris. Prepare surfaces for clamping using approved solvents per § 23-70. Install rivets securing door to hinge.
4. Extend pivot arm to approximately 1.85 inch between center of pins. Match drill pivot arm assembly angle two 0.098-inch diameter holes. Smooth hole edges; clean up debris. Prepare surfaces for clamping using approved solvents per § 23-70. Install rivets securing door to arm assembly angle. Verify vent door opens and closes smoothly and latches correctly.

## 27-21 Weather Seal (Door Vent) Replacement

1. Remove damaged weather seal using plastic wedge or putty knife. Remove hardened adhesive using approved solvent per § 23-70, or 60-grit sandpaper, as required.
2. Refer to Figure 27-2. Measure and trim continuous length of A226-7 seal to fit perimeter of vent door except forward side, as shown. Remove self-adhesive preserving strip and neatly bond seal to stiffener.
3. Measure and trim length of A226-3 seal to fit ledge of barrier. Remove self-adhesive preserving strip and neatly bond seal to stiffener.

27-22 Door Vent Hinge Replacement**CAUTION**

Protect door windows and paint from scratches or scuff marks when door maintenance performed on workbench.

1. Remove door per § 27-10.
2. Refer to Figure 27-2. Drill out rivets securing hinge to door assembly and door vent. Remove hinge.
3. Smooth hole edges; clean up debris. Prepare surfaces for clamping using approved solvents per § 23-70.
4. Refer to § 27-20. Verify proper vent door fit; install rivets securing hinge to door assembly and door vent. Prepare surfaces and touch-up rivet heads and hinge using approved materials per § 23-70.

27-23 Pivot Friction Adjustment

To increase pivot arm assembly friction, tighten nut securing pivot knob to arms. Do not overtighten screw. No thread exposure required beyond nut.

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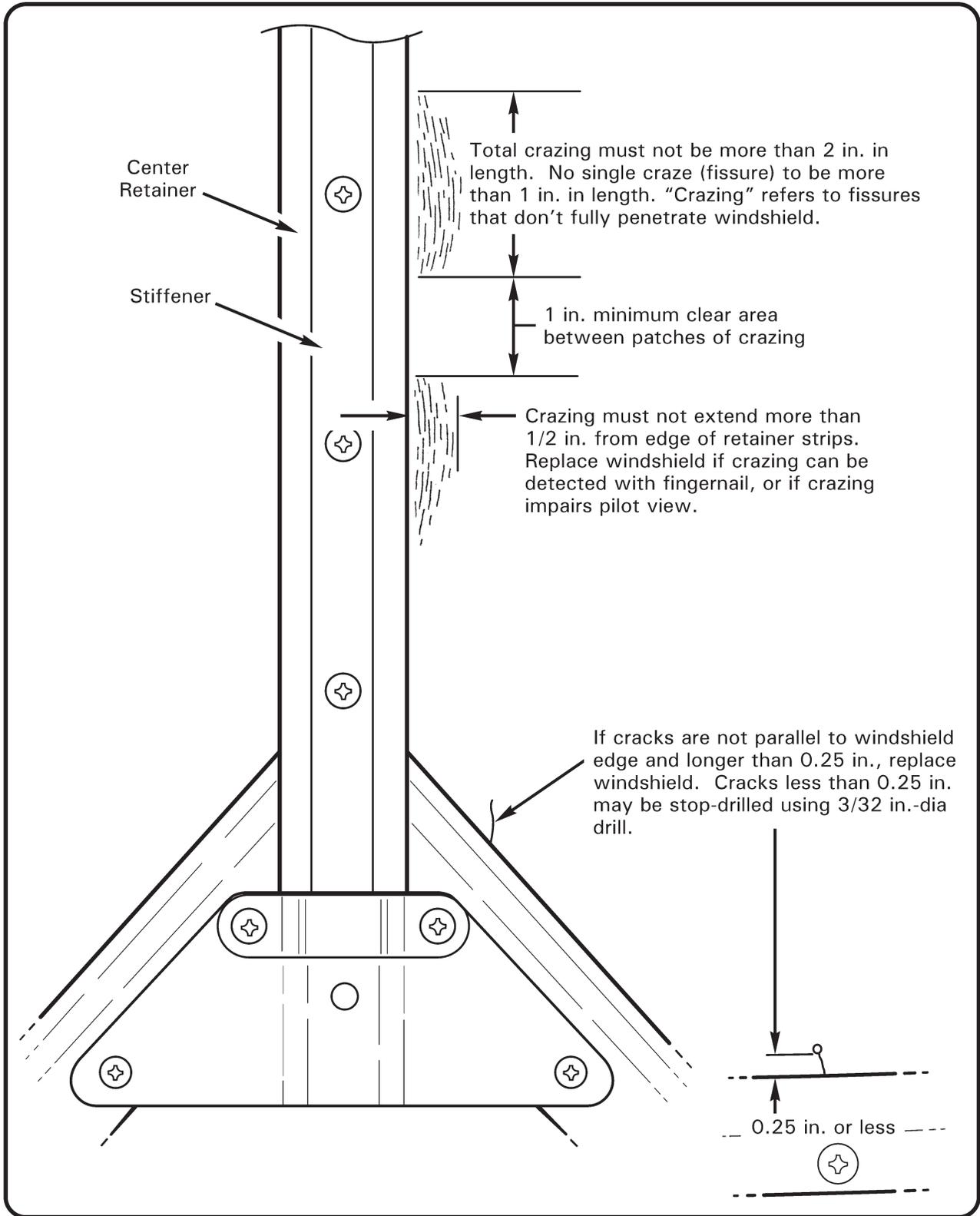


FIGURE 27-3 WINDSHIELD INSPECTION (ACRYLIC WINDSHIELD SHOWN)

## 27-30 Windshield Installation

### 27-31 Standard (Acrylic) Windshield Installation

#### **A. Description**

Acrylic windshields are sandwiched between thin aluminum retainers that are screwed to the door and windshield frames. An adhesive/sealant is applied between the retainers and the windshields for security and weatherproofing.

#### **B. Cleaning**

Refer to § 23-10 Part B for cleaning windshield.

#### **C. Inspection**

Inspect both windshields for cracks and crazing adjacent to retainers per Figure 27-3. If cracks exceed these limits, replace damaged windshield per § 27-31 Part F.

Minor defects or imperfections that do not impair pilot visibility or indicate impending structural failure are acceptable.

#### **D. Removal**

1. Remove forward door assembly per § 27-10 Part B. Remove hardware securing A228 (upper) and C228 (lower) hinge assembly to door frame and remove hinges.

#### **NOTE**

If windshield is to be reinstalled, prior to removal, tape protective paper or film to the inside and outside of the windshield to prevent damage.

2. Remove hardware securing C238-27 or C238-28 (side) retainer to door frame and remove retainer.
3. Install upper hinge assembly, and install door assemblies for cabin structure support with windshield removed.
4. Support windshield. With a second person inside cabin to remove nuts, latch forward doors. Remove hardware securing C238-29 (upper) retainer, B409-5 gusset, D805-2 restraint, C366-5 bracket, C366-8 retainer, C367 (lower) retainers, B295-1 clip with yaw string, C367-12 stiffener, and C367-10 (center) retainer to cabin and remove parts. Remove windshield.
5. Remove sealant from cabin and parts.
6. If windshield is to be reinstalled, remove sealant from windshield.
7. Repeat steps to remove opposite-side windshield, as required.

27-31 Standard (Acrylic) Windshield Installation (continued)**E. Installation****NOTE**

Prior to installation, if not previously accomplished, tape protective paper or film to the inside and outside of the windshield to prevent damage.

1. Verify sealant has been removed from cabin, parts, and windshield.
2. Position windshield on helicopter and cleco retainers to frames.
3. Attach 1/2"-wide masking tape to windshield along edge of retainers to catch sealant squeeze-out during retainer installation.
4. Remove C238-27 or C238-28 (side) retainer and install A228 (upper) and C228 (lower) door hinge assemblies. Install forward door assemblies for cabin structure support during windshield installation.
5. Remove C367-10 (center) retainer. Run a bead of B270-26 sealant along entire edge of tape line. Install hardware securing center retainer and C367-12 stiffener (do not install B295-1 clip) to cabin; special torque screws per § 23-33. Remove tape and wipe off excess sealant with cheesecloth wet with lacolene.
6. Remove C367 (lower) retainers. Run a bead of B270-26 sealant along entire edge of tape line. With a second person inside cabin to tighten nuts, latch forward doors. Install hardware securing lower retainers, C366-8 retainer, and C366-5 bracket to cabin. Remove tape and wipe off excess sealant with cheesecloth wet with lacolene.
7. Remove C238-29 (upper) retainer. Run a bead of B270-26 sealant along entire edge of tape line. With a second person inside cabin to tighten nuts, latch forward doors. Install hardware securing upper retainer and B409-5 gusset to cabin. Remove tape and wipe off excess sealant with cheesecloth wet with lacolene.
8. Remove door and hinge assembly. Run a bead of B270-26 sealant along entire edge of tape line. Install hardware securing side retainer and D805-2 restraint to cabin. Remove tape and wipe off excess sealant with cheesecloth wet with lacolene.
9. Reinstall hinge assembly, and install door assembly per § 27-10 Part C.
10. Ensure all fasteners are tight. Wipe off excess sealant with cheesecloth wet with lacolene.
11. Allow sealant to dry according to manufacturer's instruction.
12. Remove protective paper or film from inside and outside of the windshield.
13. Repeat steps to install opposite-side windshield, as required.
14. Install B295-1 clip and yaw string per § 27-33 Part B.

27-31 Standard (Acrylic) Windshield Installation (continued)**F. Replacement****NOTE**

Prior to installation, if not previously accomplished, tape protective paper or film to the inside and outside of the windshield to prevent damage.

1. Verify sealant has been removed from cabin and parts.
2. Cleco retainers to frames, checking for proper alignment. Remove retainers, except C238-27 or C238-28 (side) retainer.
3. Install A228 (upper) and C228 (lower) door hinge assemblies, and install forward door assemblies for cabin structure support during windshield installation.
4. Lay out masking tape on frames to identify location for windshield edge (estimate edge where side retainer is clecoed to frame). Hold oversized windshield in place by hand and verify it overlaps masking tape on all frames and retainer. When satisfied with alignment, lay out masking tape on windshield for trimming.

**WARNING**

**Review appropriate Safety Data Sheet (SDS) when working in proximity to hazardous materials. Specific recommendations for use of personal protective equipment are located in the SDS.**

5. A band saw with a blade containing at least 24 teeth per inch is recommended for initial trimming. Tape cardboard to band saw table to prevent scratching of windshield. Trim windshield carefully to prevent binding of saw blade and cracking windshield. Finish initial cut using an orbital sander, as required.
6. Hold windshield in place and check for fit. Re-trim as necessary.
7. After windshield is fitted, use sanding block with 100-grit paper to smooth edges. Finish edge and bevel corners using a triangular machinist's scraping tool. Verify all edges are clean and free of notches.
8. Remove trimming debris from windshield and cabin.
9. Install windshield per § 27-31 Part E.

## 27-32 Impact-Resistant (Polycarbonate) Windshield Installation

### **A. Description**

The polycarbonate windshield installation is similar to the acrylic windshield installation, but the windshields fasten to the door and windshield frames via small stainless steel straps.

While polycarbonate has superior strength and flexibility properties when compared with acrylic, it is also more susceptible to ultraviolet (UV) degradation, and has a low scratch resistance. A hardcoat is applied during manufacturing to protect against UV damage and scratching, however, further effort must be made by the operator to maximize windshield service life. Follow instructions closely to avoid scratching windshield during cleaning (refer to § 23-10 Part B). Exposure to incompatible cleaning agents or solvents can result in embrittlement or crazing. Use a cabin cover when parking helicopter outdoors, or store helicopter in hanger when possible.

### **B. Cleaning**

Refer to § 23-10 Part B for cleaning windshield.

### **C. Inspection**

Inspect both windshields for cracks and crazing adjacent to retainers per Figure 27-3. Also inspect areas adjacent to fasteners and stainless steel straps for cracks and crazing. If cracks exceed these limits, replace damaged windshield per § 27-31 Part F.

Inspect windshields for any significant discoloration or cloudiness. Minor defects or imperfections that do not impair pilot visibility or indicate impending structural failure are acceptable.

### **D. Removal**

1. Perform § 27-31 Part D steps 1 thru 3.
2. Support windshield. With a second person inside cabin to remove nuts and washers, latch forward doors. Remove hardware securing G367 ties and straps to windshield near center bow (all other hardware installed in windshield may remain in place during windshield removal). Taking care not to bend ties and straps, remove sealant as required, and remove ties & straps from windshield.
3. Remove hardware securing C238-29 (upper) retainer, B409-5 gusset, D805-2 restraint, C366-5 bracket, C366-8 retainer, C367 (lower) retainers, B295-2 clip with trim string, C367-12 stiffener, and C367-10 retainer to cabin and remove parts. Taking care not to bend ties and straps, remove windshield.
4. Remove sealant from cabin and parts.
5. If windshield is to be reinstalled, remove sealant from windshield but leave hardware and G367 ties, straps, pads, and tabs installed. If replacing windshield, remove hardware and, without deforming, remove G367 ties, straps, pads, and tabs, as required.
6. Repeat steps to remove opposite-side windshield, as required.

27-32 Impact-Resistant (Polycarbonate) Windshield Installation (continued)**E. Installation****NOTE**

Prior to installation, if not previously accomplished, tape protective paper or film to the inside and outside of the windshield to prevent damage.

**NOTE**

Inspect condition of G367 ties, straps, pads, and tabs to be installed. Verify no obvious damage, deformation, or stretching. If windshield is being replaced due to bird strike or other impact which could deform ties, straps, pads, or tabs, replacement of these items is recommended.

**NOTE**

Refer to R44 Illustrated Parts Catalog Chapter 52. Note location of G367 ties, straps, pads, and tabs on work table or by marking on tape at fasteners to facilitate installation.

1. Verify sealant has been removed from cabin, parts, and windshield.
2. Position windshield on helicopter and cleco G367 ties, straps, tabs, and retainers to frames. Also, cleco G367 ties, straps, and tabs to windshield at center bow, if drilled.
3. Install A228 (upper) and C228 (lower) door hinge assemblies. Install forward door assemblies for cabin structure support during windshield installation.
4. If windshield is drilled and has hardware, G367 ties, straps, pads, and tabs installed:
  - a. With a second person inside cabin to tighten nuts, latch forward doors. Remove clecoes and install hardware securing G367 ties and straps to windshield at center bow; special torque screws per § 23-33.
  - b. Attach 1/2"-wide masking tape to windshield along edge of retainers to catch sealant squeeze-out during retainer installation.
  - c. Remove C367-10 (center) retainer. Run a bead of B270-26 sealant along entire edge of tape line. Install hardware securing center retainer and C367-12 stiffener (do not install B295-2 clip) to cabin; special torque screws per § 23-33. Remove tape and wipe off excess sealant with cheesecloth wet with lacolene.
  - d. Perform § 27-31 Part E steps 6 thru 13.
  - e. Paint (or touch up) windshield trim per § 27-32 Part G.
  - f. Install B295-2 clip and yaw string per § 27-33 Part B.

27-32 Impact-Resistant (Polycarbonate) Windshield Installation (continued)**E. Installation (continued)**

5. Align G367 ties and straps perpendicular to retainers within 2°. Install C367-12 stiffener and special torque screws per § 23-33. Match drill #40 pilot holes through windshield and install clecos.
6. At center bow:
  - a. Remove C367-12 stiffener and C367-10 (center) retainer. Remove G367 ties and straps and expand pilot holes to 0.169–0.175 inch diameter holes thru windshield. Finish holes with reamer; deburr back side of holes using plastic razor. Clean up debris.
  - b. Apply B270-26 sealant to G367 tabs and pads and position on windshield. Run a bead of B270-26 sealant along entire edge of windshield. Install hardware securing center retainer, C367-12 stiffener (do not install B295-2 clip) to cabin. Special torque screws per § 23-33.
  - c. With a second person inside cabin to tighten nuts, latch forward doors and install hardware securing G367 ties and straps to windshield; special torque screws per § 23-33. Wipe off excess sealant with cheesecloth wet with lacolene.
7. At lower retainers:
  - a. Remove C367 (lower) retainers. Remove G367 straps and expand pilot holes to 0.169–0.175 inch diameter holes thru windshield. Finish holes with reamer; deburr back side of holes using plastic razor. Clean up debris.
  - b. Apply B270-26 sealant to G367-12 tabs and position on windshield. Run a bead of B270-26 sealant along entire edge of windshield. With a second person inside cabin to tighten nuts, latch forward doors, and install hardware securing lower retainers, C366-8 retainer, and C366-5 bracket to cabin. Install hardware securing G367 straps to windshield; special torque screws per § 23-33. Wipe off excess sealant with cheesecloth wet with lacolene.
8. At upper retainer:
  - a. Remove C238-29 (upper) retainer. Remove G367 straps and expand pilot holes to 0.169–0.175 inch diameter holes thru windshield. Finish holes with reamer; deburr back side of holes using plastic razor. Clean up debris.
  - b. Run a bead of B270-26 sealant along entire edge of windshield. With a second person inside cabin to tighten nuts, latch forward doors, and install hardware securing upper retainer and B409-5 gusset to cabin. Install hardware securing G367 straps and ties to windshield; special torque screws per § 23-33. Wipe off excess sealant with cheesecloth wet with lacolene.

27-32 Impact-Resistant (Polycarbonate) Windshield Installation (continued)**E. Installation (continued)**

9. At door frame:
  - a. Remove door and hinge assembly. Remove G367 straps and expand pilot holes to 0.169–0.175 inch diameter holes thru windshield. Finish holes with reamer; deburr back side of holes using plastic razor. Clean up debris.
  - b. Run a bead of B270-26 sealant along entire edge of windshield. Install hardware securing side retainer and D805-2 restraint to cabin. Install hardware securing G367 straps and ties to windshield; special torque screws per § 23-33. Wipe off excess sealant with cheesecloth wet with lacolene.
10. Reinstall hinge assembly, and install door assembly per § 27-10 Part C.
11. Ensure all fasteners are tight. Wipe off excess sealant with cheesecloth wet with lacolene.
12. Allow sealant to dry according to manufacturer's instruction.
13. Repeat steps to install opposite-side windshield, as required.
14. Paint (or touch up) windshield trim per § 27-32 Part G.
15. Install B295-2 clip and yaw string per § 27-33 Part B.

**F. Replacement****NOTE**

Do not use this procedure to upgrade acrylic to polycarbonate windshields.

1. Perform § 27-31 Part F steps 1 thru 4.

**WARNING**

**Review appropriate Safety Data Sheet (SDS) when working in proximity to hazardous materials. Specific recommendations for use of personal protective equipment are located in the SDS.**

2. A band saw with 20°–30° clearance angle, 0–5° rake angle, 600–1000 m/min rotation speed, and 1.5–4 mm tooth spacing is recommended for initial trimming. Tape cardboard to band saw table to prevent scratching of windshield. Trim windshield carefully to prevent binding of saw blade and cracking windshield. Finish initial cut using an orbital sander, as required.
3. Hold windshield in place and check for fit. Re-trim as necessary.
4. After windshield is fitted, use sanding block with 100-grit paper to smooth edges. Verify all edges are clean and free of notches.
5. Remove trimming debris from windshield and cabin.
6. Install windshield per § 27-32 Part E.

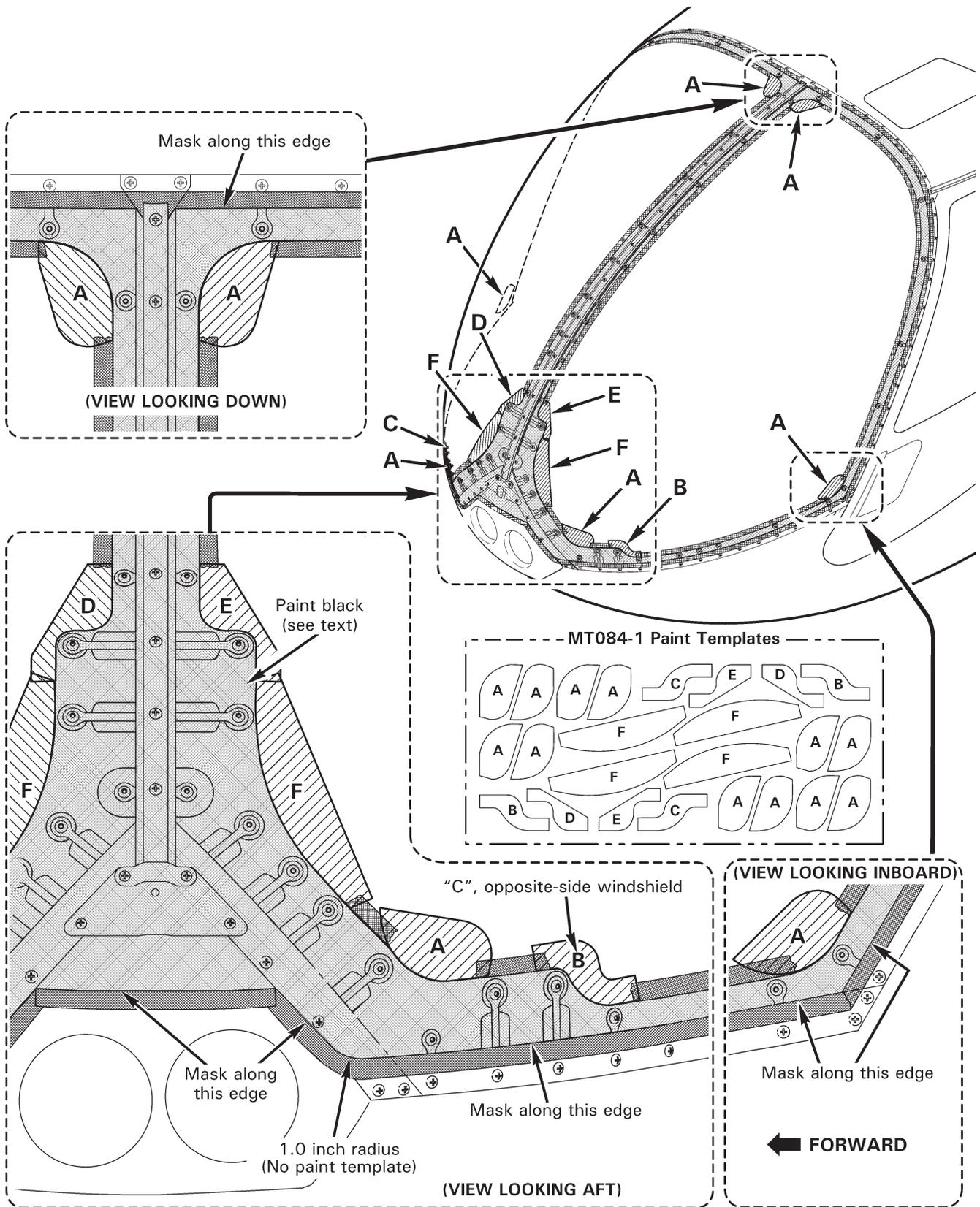


FIGURE 27-4 PAINT TEMPLATE LAYOUT

27-32 Impact-Resistant (Polycarbonate) Windshield Installation (continued)**G. Trim Paint**

1. Remove B295-2 clip and yaw string from bow assembly and reinstall screw.
2. Trim any excess sealant around perimeter of windshield using plastic razor blades; remove sealant residue using cheesecloth wet with lacolene.
3. Clean surface of windshield to be masked for paint using cheesecloth wet with lacolene.

**NOTE**

Cleaning surface of windshield prior to masking will prevent paint from "bleeding," or seeping, under tape.

4. Refer to Figures 27-4 and 27-5. Using 3M vinyl tape (or equivalent), apply masking ("Tape 1" and "Tape 2") to windshield as shown. Apply MT084-1 paint templates on windshield as shown.
5. Refer to Figure 27-4. Using 3M vinyl tape (or equivalent), apply masking to windshield retainer edges, area near landing lights, and between MT084-1 paint templates as shown.
6. Protect windshield and cabin from paint overspray.
7. Using 320-grit sandpaper and scotch-brite, lightly scuff surfaces to be painted. Avoid damaging masking edges; replace any damaged masking per steps 4 and 5 as required.
8. Remove debris using compressed air.
9. Clean scuffed surfaces to be painted using a lint-free cloth wet with Final Klean 3909S.
10. Conversion coat bare aluminum per § 23-51, as applicable.
11. Refer to § 23-77. Apply black paint to windshield trim prepared surfaces per Figure 27-4.
12. Allow paint to cure. Remove MT084-1 paint templates and masking. Clean windshield per § 23-10 Part B.
13. Install B295-2 clip and yaw string per § 27-33 Part B.

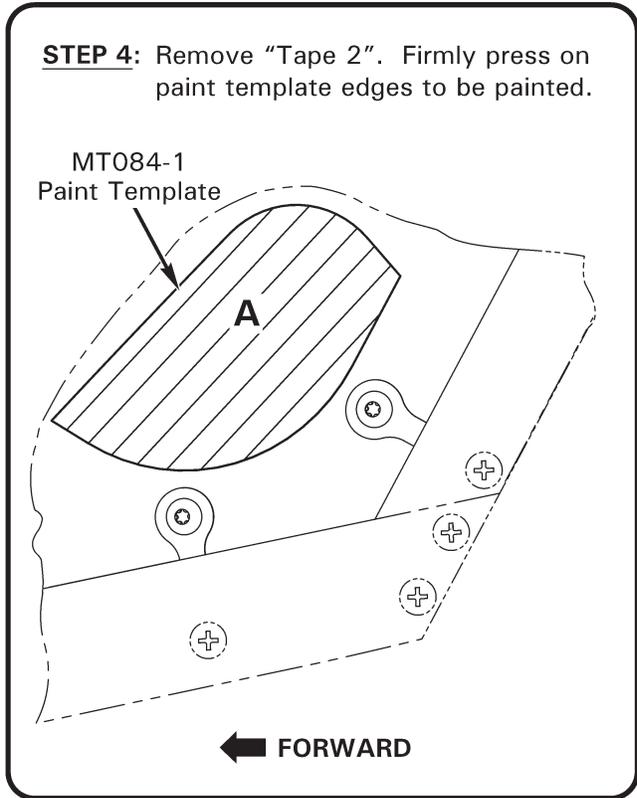
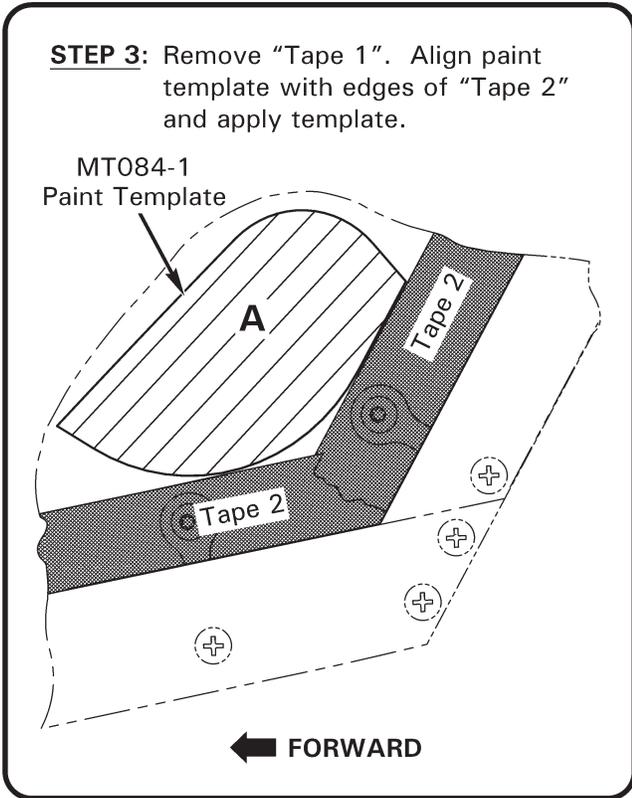
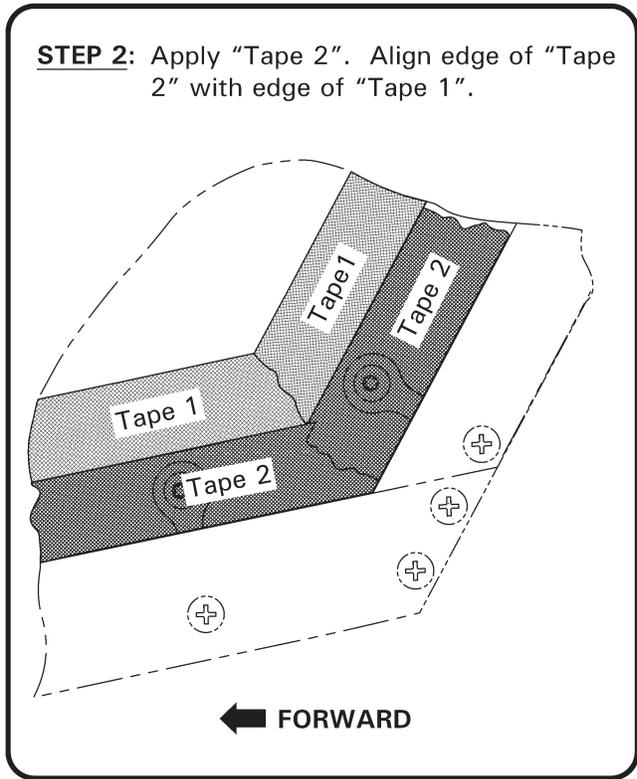
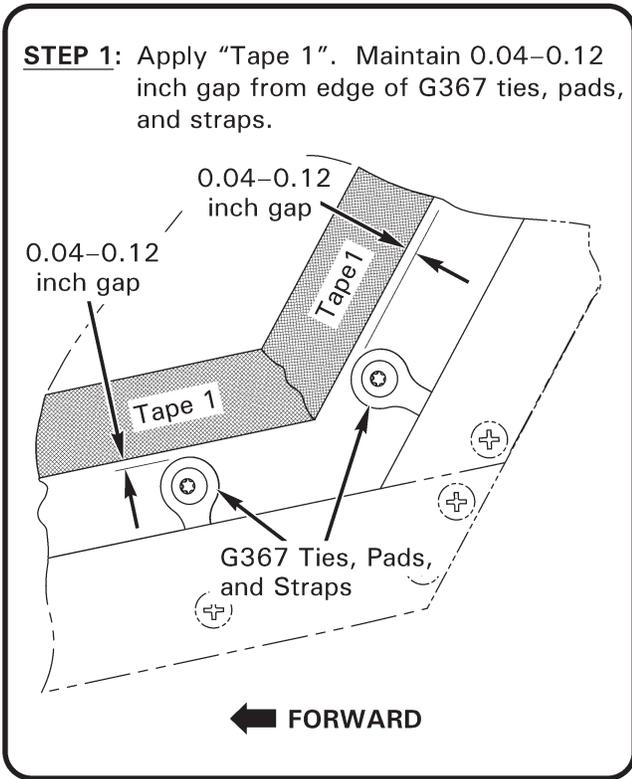


FIGURE 27-5 PAINT TEMPLATE LAYOUT PROCESS

27-33 Yaw String**A. Removal**

Remove screw securing B295-1 or B295-2 clip; remove clip and yaw string.

**B. Installation**

1. Locate 7th screw (8th screw for helicopters equipped with 10 hole console assemblies) up from bottom of C367-12 stiffener and remove screw.
2. Position yaw string on stiffener just above hole location; install screw securing B295-1 or -2 clip, finger tight. Verify 3 inches string, each side of clip; special torque screw per § 23-33. Cut replacement string to 3 inches from each side of clip, if applicable.

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