

**MICROWAVE ANTENNAS**  
**KS-15676 HORN-REFLECTOR AND WAVEGUIDE SYSTEM**  
**MAINTENANCE**  
**WEATHER COVER**

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**1. GENERAL**

**1.01** This section outlines the maintenance methods to be employed to repair damage to, or correct malfunction of, the KS-15676 L2 weather cover.

**1.02** This section is reissued to update repair procedures to the weather cover and to add maintenance information.

**1.03** Loose nuts and bolts on weather cover frame shall be tightened in accordance with instructions contained in Section 402-421-201.

**1.04** Repairs to the weather cover are classified according to the nature, location, and extent of the damage. The classification of a repair will determine the repair procedure to be used.

**WEATHER COVER REPAIRS**

**Class C:** Small perforations with accompanying delaminations in the weather cover no larger than 1-1/2 by 2-1/4 inches, and not occurring in the edge reinforcement. Repair may be made without removing the weather cover from the antenna.

**Class D:** Crazed or pitted areas in the weather cover in which fibers are not ruptured, but where leaks are present or imminent. This repair shall be made by a qualified laminator in a protected area with the weather cover removed from the antenna.

**Class E:** Small perforations, ruptures, or crazed areas in the weather cover in which glass fibers are broken. Small dimensions of damage shall not exceed 2 inches and total area shall not exceed 8 square inches. Repair is to be made by a qualified laminator in a protected area with the weather cover removed from the antenna.

**2. ANTENNA ROTATION AND WEATHER COVER REPLACEMENT**

**2.01** To make the weather cover accessible, either rotate the antenna, or use the two-part platform, available from UP-Right Scaffolds, Berkely Calif. as their part number L-1586, that makes rotation of the antenna unnecessary. The platform provides a work area around the antenna above and below the tower platform. Use of the platform is recommended to avoid having to disturb antenna orientation. If the antenna's position is changed, precise electrical alignment in accordance with Section 402-421-206, 402-421-207, or 402-421-208 will be necessary.

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**2.02** The class D and E repair procedures require that the weather cover be removed from the antenna and transported to a convenient working space. The weather cover may also require replacement because of damage so extensive as to make it more economical to replace it rather than attempt repairs. It is desirable to provide a spare cover which can be used to replace a repairable cover, and to permit repairing the damaged cover at a later time. This repaired cover can then be reused as required.

### **2.03** *Equipment Necessary for Replacing Weather Cover in Class D and E Repairs*

#### **Tools**

- 2—1/2- or 3/4-ton Chain Hoists
- 2—1/2-inch Open-End Wrenches
- 2—1/2-inch drive Ratchet Wrenches
- 2—1/2-inch drive Sockets, 3/4-inch
- 1—1/2-inch drive Torque Wrench, 0-150 pound
- 2—Putty Knives
- 1—Hacksaw Blade
- 2—3/4-inch Open-End Wrenches
- 1—Fiber or Plastic Mallet

#### **Materials**

- 1—Weather Cover with Weather Cover Mounting Frame (See Fig. 1)
- ◆18—600/3030-1/2 Strat-O-Seal Washers, Sealer Strip Assembly (Part of L7 Sealing Kit)◆
- ◆1—KS-14424 Polysulfide Sealer (Minnesota Mining and Manufacturing Co. EC-1162)◆
- Clean Rags
- KS-19578 L1 Trichloroethane
- ◆Grease, 2 Pounds, Beacon P-290 or available Chassis Lubricant◆

**Caution 1:** *Immediately before applying sealing compound to a surface, clean the*

*surface with solvent and a clean rag. While the surface is still wet with solvent, use a clean dry rag and wipe away residual solvent to prevent redeposition of contaminant which may prevent proper adhesion of the sealing compound.*

**Caution 2:** *Trichloroethane should be used only in well-ventilated work areas. Avoid inhaling the fumes of this solvent.*

### **PROCEDURES FOR ROTATING THE ANTENNA**

**2.04** Mark the antenna azimuth position with a sufficient number of scribe marks in order that the antenna may be returned to this position after the repair has been completed. ◆This will provide a rough initial orientation to facilitate precise electrical alignment.◆

**2.05** The antenna may be clamped in azimuth by means of an azimuth adjusting screw and eight bolts through the mounting base and the mounting ring or by the improved method which clamps the ring and base together using the L11 mounting clamps.

**2.06** If the antenna is fastened by means of bolts, the following steps will be necessary to rotate the antenna:

(1) Remove the eight bolts clamping the base and ring together.

(2) Remove the bolts holding the azimuth adjusting screw nut bracket to the mounting base. Clamp, tie, or tape the nut in position on the screw in order to maintain its position with respect to the antenna.

**2.07** The second type of fastening requires that the setscrews in the L11 clamps be backed off completely in order to rotate the antenna. This should be done after the clamp location has been marked. Proceed as in (1) and (2).

(1) Attach two chain hoists on opposite sides of the L4 mounting base, between the mounting base and convenient tower members.

(2) Grease the mounting ring with ◆P-290 grease◆ or chassis lubricant.

(3) Disconnect the flexible circular waveguide section at the hanger plate end. ◆It may

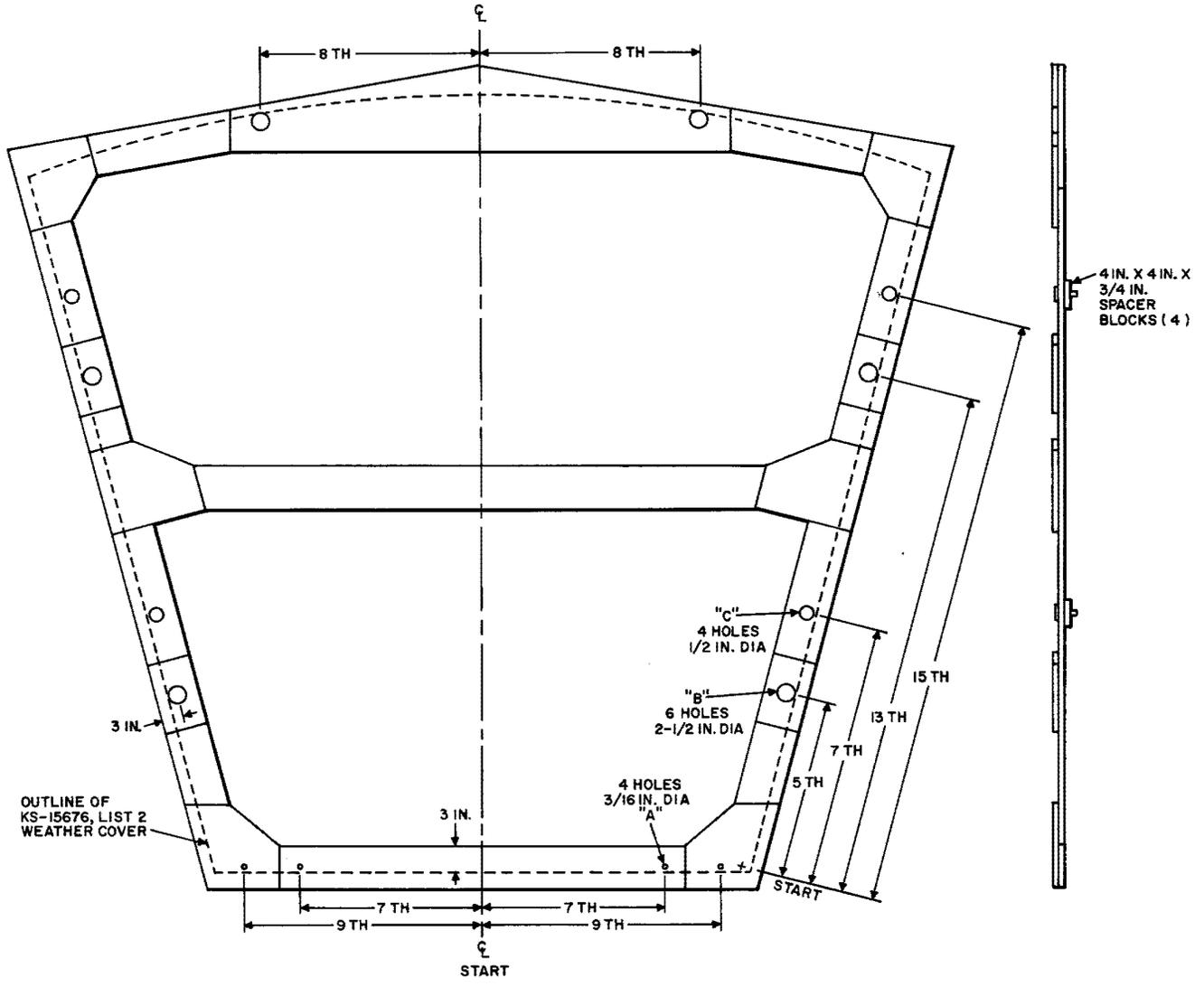
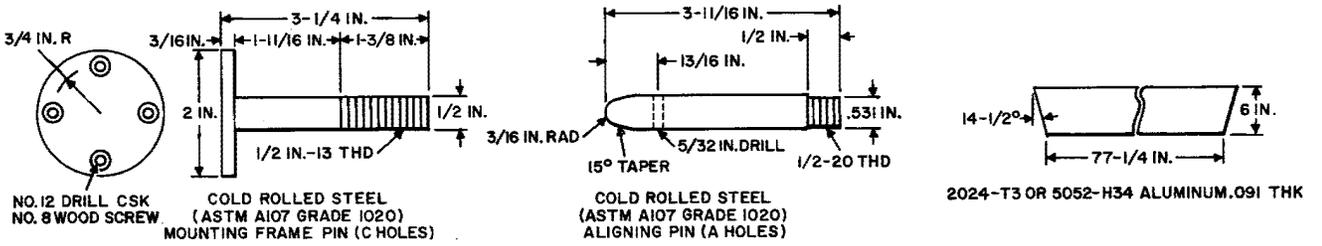
be desirable to cover the top of the rigid waveguide at the hanger plate to prevent the entrance of foreign objects.⚡

- (4) Rotate the antenna to face inboard, for convenient access to the weather cover.

#### **PROCEDURE FOR REMOVING AND REPLACING WEATHER COVER**

- 2.08** Remove four bolts along the bottom angle that register with the aligning pin holes in the weather cover mounting frame and insert four threaded aligning pins in "A" holes. Remove the remaining bolts and the clamping angle.
- 2.09** Remove all bolts and nuts in the top retaining angle, then remove the top retaining angle and place two retaining bolts and nuts through the weather cover and antenna in hole positions, corresponding to the large holes ("B" holes see Fig. 1) at the top of the weather cover mounting frame. Do this to prevent possible buckling of the cover if the sealant does not hold the cover.
- 2.10** Remove the side retaining angles and place four retaining bolts and nuts through holes in the antenna in hole positions corresponding to the large holes ("B" holes) in the side members of the weather cover mounting frame.
- 2.11** Remove the replacement weather cover from the weather cover mounting frame, replace the spacer blocks and nuts, and raise the frame to the antenna platform.
- 2.12** Remove the blocks and nuts from the weather cover mounting frame pins and install the frame over the damaged cover.
- 2.13** Run the nuts (less blocks) on the threaded mounting frame pins until the nut and pin ends are even. This will allow room for prying the cover away from the antenna.
- 2.14** Remove the six retaining bolts and nuts previously installed. (See 2.09 and 2.10.)
- 2.15** Using a putty knife or other wide blade tool, pry the cover away from the antenna assembly. This should be done carefully in order to avoid further damage to the weather cover.
- 2.16** With the mounting frame and weather cover gripped together, and the nuts removed from the threaded pins, slide the assembly off the aligning pins.
- 2.17** Replace the blocks and nuts on the frame pins and lower the frame and weather cover assembly to the ground.
- 2.18** Remove all the weather cover sealing material and clean the sealing surfaces of the antenna with trichloreothane.
- Caution:** *Be careful to avoid dropping foreign material inside the antenna.*
- 2.19** Spread KS-14424 sealing compound with a putty knife to fill all unevenness and voids at the four corners and the splice plate of the weather cover mounting surface of the antenna.
- 2.20** Place a continuous ribbon of the sealer strip assembly (included in the L7 sealing kit) inside the bolt hole pattern of the side panels and the reflector flange. Place a ribbon on each side of the nutplate hole pattern at the lower edge of the weather cover opening and across the ends inside the end holes. Location of the sealer strip assemblies are shown in Fig. 2. Make sure the strips are butted at all corners. ⚡The sealer strip assembly should be oriented so the wire fin is toward the pressurized side of joint except at lower window clamping bar where all four strips should have the sealant toward the bolt holes.⚡
- 2.21** Clean the mating surface of the replacement cover with clean rags and ⚡trichloroethane.⚡
- 2.22** Mount the replacement weather cover on the weather cover mounting frame using the spacer blocks and nuts.
- 2.23** Raise the weather cover and frame from the ground to the antenna platform.
- 2.24** Remove the nuts and spacer blocks and raise the assembled weather cover and frame and engage the aligning pins in the proper holes in the lower edge of the cover. Be careful to avoid contacting the seals.
- Caution:** *Once the weather cover has made contact with the sealing strips, it should not be removed. For this reason, considerable care must be exercised in following the installation instructions.*

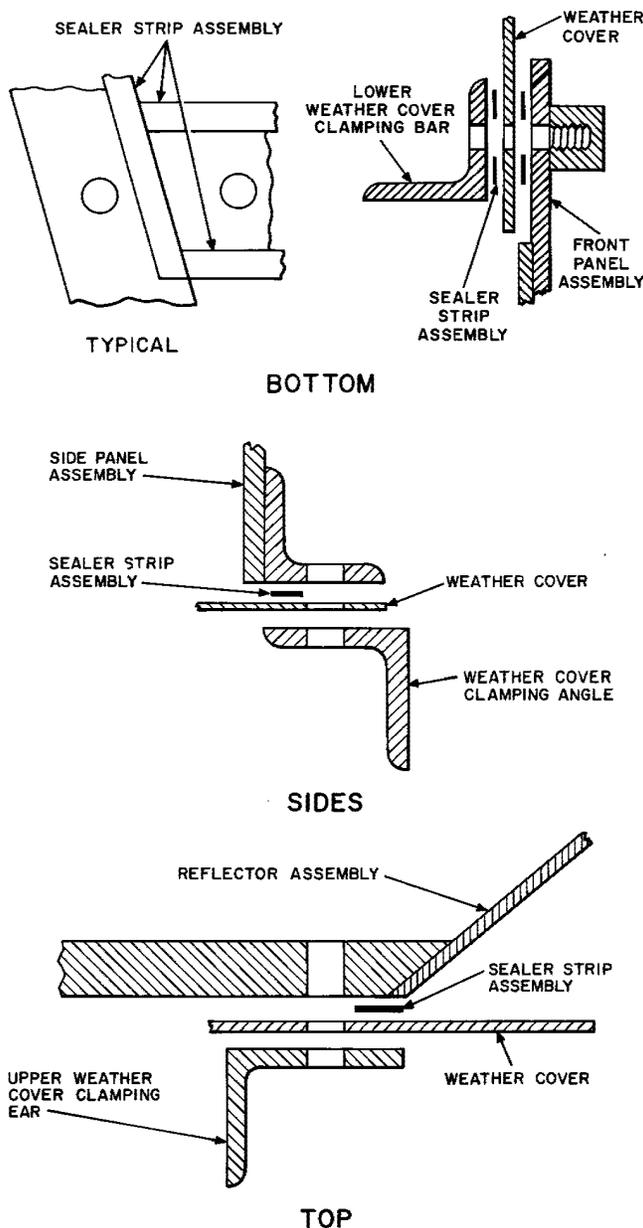
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NOTES:

1. FRAME MEMBERS SHALL BE JOINED WITH WATERPROOF GLUE AND WOOD SCREWS.
2. PAINT WITH ONE COAT OF GLYCERYL PHTHALATE VARNISH, MIL SPEC V-6894 OR PHENOLIC RESIN SPAR VARNISH, MIL SPEC TT-V-119, THINNED WITH ONE PART OF FED SPEC TT-N-97 TYPE II THINNER TO TWO PARTS VARNISH.
3. HOLES A, B AND C SHALL BE LOCATED WITH REFERENCE TO THE KS-15676, L2 WEATHER COVER SHOWN ON DRAWINGS ES-894211. THE DESIGNATIONS 5 TH, 7 TH, ETC, INDICATE THE NUMBER OF HOLES TO BE COUNTED ON THE WEATHER COVER IN LOCATING HOLES A, B AND C ON THE FRAME. THE HOLE COUNT DOES NOT INCLUDE ANY HOLE WHICH MAY EXIST AT THE INDICATED STARTING POINT.
4. ATTACH ALUMINUM PLATE WITH NO. 8 FLAT HEAD WOOD SCREWS.
5. PIN DETAILS TO BE ZINC PLATED ASTM A164 - .0005 THK PLUS CHROMATE 516A. ALTERNATE FINISH CADMIUM PLATE ASTM A165 .0003 THK PLUS CHROMATE 516A.

Fig. 1—Weather Cover Mounting Frame



**Fig. 2—Location of Sealer Strip Assembly for Weather Cover**

- 2.25** Run the nuts on the threaded mounting frame pins.
- 2.26** Insert the six retaining bolts through the large holes in the frame. Run the nuts on the bolts to hold the window in place without contacting the sealer strips.
- 2.27** Starting from the bottom, push the frame and weather cover against the antenna. Using a fiber or plastic mallet, tap the frame around the perimeter to press the weather cover against the sealer strip.
- 2.28** Tighten the retaining bolts fingertight to hold the weather cover in place. Remove the nuts from the threaded mounting frame pins and slide the frame off the aligning pins and lower to the ground.
- 2.29** Remove the side retaining bolts and install the side angles. Install the bolts and run the nuts only enough to hold the weather cover in contact with the sealer strips.
- 2.30** Install the two top clamping angles in the same manner. Note that the four bolts used at the ends and center are longer.
- 2.31** Clean the surface of the lower angle with trichloroethane.
- 2.32** Clean the window with trichloroethane.
- 2.33** Apply the sealer strips on the joining surface of the lower clamping angle on both sides of the holes and across the ends inside the end holes as shown in Fig. 2.
- 2.34** Install the angle and bolts with Stat-O-Seal washers under the bolt heads that are within the seals.
- Caution:** Do not attempt to use a longer bolt in this location because this may result in breaking off the nut plate riveted on the inside of the front panel.
- 2.35** Remove the aligning pins and insert the remaining bolts and Stat-O-Seal washers.
- 2.36** With the weather cover held flat, tighten all bolts in the bottom clamping angle to a torque of 60 foot-pounds. Then tighten all remaining bolts and nuts around the weather cover opening to a torque of approximately 60 foot-pounds. The nuts should be tightened by working from the narrow end to the wide end, and then from the center to the sides of the wide end of the weather cover.
- 2.37** Before the antenna is rotated to its operating position, it shall be tested for leakage. Methods for testing the antenna are covered in

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Section 402-421-201. The pressure drop method is suggested due to its simplicity and minimum equipment requirements.

**2.38** Return the antenna to the correct azimuth position; secure the antenna and attach the flexible waveguide.

**2.39** Recheck position electrically per Section 402-421-206, -207, or -208.

### 3. SAFETY PRECAUTIONS AND LIMITATIONS FOR CLASS C, D, AND E REPAIRS

**3.01** No repairs shall be made to the weather cover within 1 inch of corner reinforcements, except as a temporary emergency measure pending receipt and installation of a replacement weather cover.

**3.02** No patches shall extend under the metal edge mounting strips.

**3.03** Weather covers more extensively damaged than as described under class C, D, or E shall be either discarded or repaired in a qualified laminating shop by skilled technicians using void-free vacuum bag methods and controlled heat or ultraviolet cures.

**3.04** Portions of intact areas of discarded weather covers may be salvaged for filler and overlay patches for class C repairs provided the patch surface exposed in the final repair is not crazed or discolored and does not show other signs of weathering.

**3.05** In case of further damage to class C or E patched portions, the entire patched area shall be assumed to be ruptured and shall be added to the adjacent damaged areas in determining the class of repair to be applied.

**3.06** In case of further damage to class D repairs, ruptures shall be treated in accordance with instructions for class C or E repairs. In the absence of ruptures, new voids shall be treated by stripping off the cover patches of fabric and reapplying cover patches per class D.

**3.07** In the case of small void areas (less than 1-1/2 by 2-1/4 inches) occurring in previous class D repairs, the class C procedure may be employed.

**3.08** *No patches-on-patches* shall be allowed except where specifically permitted by these notes.

**3.09** In order to prevent skin irritation, loose clothing, long sleeves, hat, safety glasses, and a dust respirator should be worn. The skin should be covered with suitable protective cream during dry machining operations where the glass fibers are being cut and while using liquid resins. Hands should be washed with mild soap and water immediately upon completion of the work.

**3.10** Any resin or adhesive spilled on unprotected areas of the skin should be removed with solvent as soon as possible. The skin should be washed thoroughly with mild soap and water.

### 4. CLASS C REPAIR

#### GENERAL DESCRIPTION

**4.01** This method is limited to damaged areas not to exceed 1-1/2 by 2-1/4 inches. The repair procedure consists of cutting out the damaged portion of the weather cover to a prescribed pattern and covering with oversize internal and external patches held in place with a plastic machine screw and nut, and hermetically sealed with an adhesive. (See Fig. 3.)

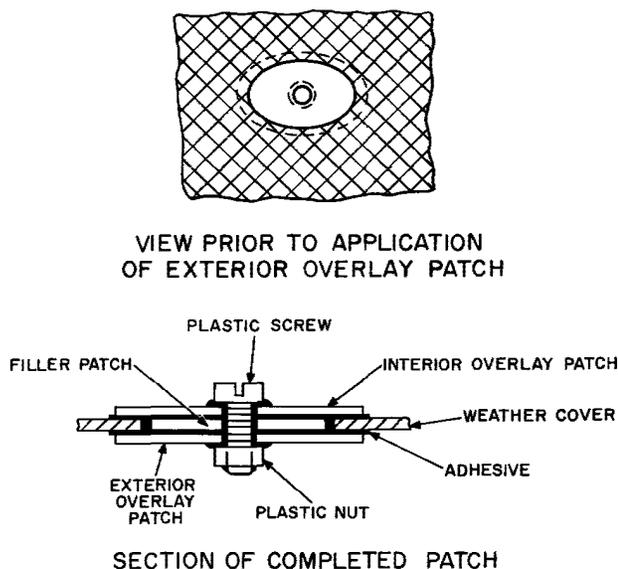


Fig. 3—Class C Repair

**4.02 Materials and Equipment Required for Class C Repairs** (Part of ♦KS-15676♦ L10 Kit)

**Materials**

Three sizes, Glass Reinforced Plastic Filler Patches, approximately 0.040 inch thick, minimum size 3/4- by 1-1/8 inches, maximum size 1-1/2 by 2-1/4 inches ♦(Same construction as window area of weather cover).♦ Filler patches are marked F1, F2, F3. F1 is the smallest and F3, the largest.

Three sizes, Glass Reinforced Plastic Overlay Patches, approximately 0.040 inch thick, maximum size 2-1/4 by 3-3/8 inches (Same construction as window area of weather cover). Overlay patches are marked 01, 02, and 03 and are to be used with filler patches F1, F2, and F3, respectively.

♦1/4-20 Fillister Head 1-1/2 inches long, natural nylon machine screws. Sources: Anti-Corrosive Metal Products Co., Inc.; Gries Reproducer Corp.; The H.M. Harper Co.; Non-Metallics, Inc.; Weckesser Co., Inc.♦

♦1/4-20 Hex Nuts, natural nylon. Sources: same as fillister head screws above.

Hardwood Tongue Depressors, 4 inch

MT-13 Adhesive Kit, 1-1/4 oz unit, Smooth-On Mfg. Co. or Chemlok 304, Hughson Chem. Co.♦

280 Mesh Aloxite Paper or equivalent

Masking Tape

Cellophane Tape

Plastic Film Saran Wrap® or equivalent

Clean Rags

KS-19578 L1 Trichloroethane

Rubbing Alcohol (isopropyl)

**Equipment**

Portable Electric Drill or Rotary Tool, high speed (min 1100 rpm)

Spiral Router to be used in electric drill or rotary tool

Scissors

Small Adjustable Open-end Wrench

Gas or Slip-joint Pliers

Hacksaw or Keyhole Saw

Scriber

Safety Glasses

Respirator, Dust

Small Battery Clip and Wire

Protective Creams, Kerodex® 51 and 71, Tubes, Ayerst Labs, or equivalent

♦Can Lids, tinned, friction type, 4 to 6 inch dia., such as paint can lids or other equivalent shallow containers♦

**PRECAUTIONS**

**4.03** This repair procedure should not be attempted during precipitation nor in winds sufficient to cause deflection of the weather cover, nor at ambient temperatures below 50 degrees F. See 4.30 for repairs below 50 degrees F.

**4.04** Great care must be taken to prevent foreign particles, tools, etc, from falling through the opening in the weather cover.

**4.05** In case multiple repairs are being made on one weather cover, it is best to begin by patching the uppermost hole in order to minimize the danger of the workman damaging completed patches.

**4.06** Hands and tools should be kept entirely free of grease or oil which may contaminate the work surfaces.

**4.07** The antenna must not be under pressure during the application and curing of the patch.

**DETAILED PROCEDURE**

**4.08** Using as a pattern the smallest filler patch that will cover the full area of the damage

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(Fig. 4), scribe the outline of the pattern on the face of the weather cover so as to encircle the damage.

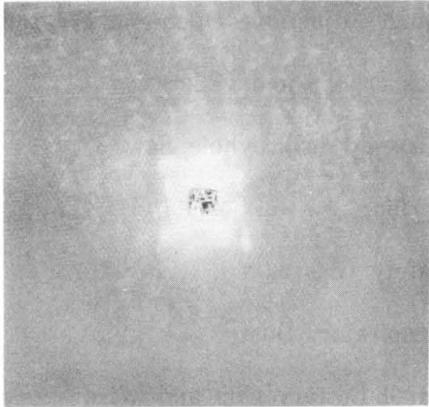


Fig. 4—Damaged Area

4.09 Using a spiral router bit in a high speed electric drill (at least 1100 rpm), cut out the damaged area (Fig. 5) to the scribed line **taking every precaution to prevent the cutout portion and the chips from falling into the antenna.** The filler patch should fit loosely into the cutout hole.

⚠**Caution:** For maximum protection during these machining and bonding operations, employ protective creams as directed on the package.⚠

**Note:** The hole may be cut by any other convenient means (e.g., saw, scissors, etc), but **the method employed should not cause delamination of the cover around the cutout.**

4.10 Take the overlay patch corresponding to the filler patch (Fig. 6 and 7) used as a pattern in 4.08 and align it parallel to the cutout so it overlaps the edges uniformly. Scribe **very lightly** or draw with a pencil the outline of this patch on the cover. Apply strips of masking tape in such a manner as to form a protective band on the weather cover 1/8 to 1/4 inch outside the scribed area.

4.11 Using the aloxite paper, or equivalent, abrade the inner and outer surfaces of the window between the hole and the scribed line. The abrading

should remove the glazed surface and expose the glass fibers very slightly.

4.12 Dust the surface with a clean cloth; wipe with a clean cloth moistened with solvent followed by wiping with a clean, dry cloth.

4.13 Prepare the adhesive mix in accordance with instructions supplied with the adhesive, mixing it on a can lid that has been wiped clean with a clean rag moistened with solvent.



Fig. 5—Making Cutout

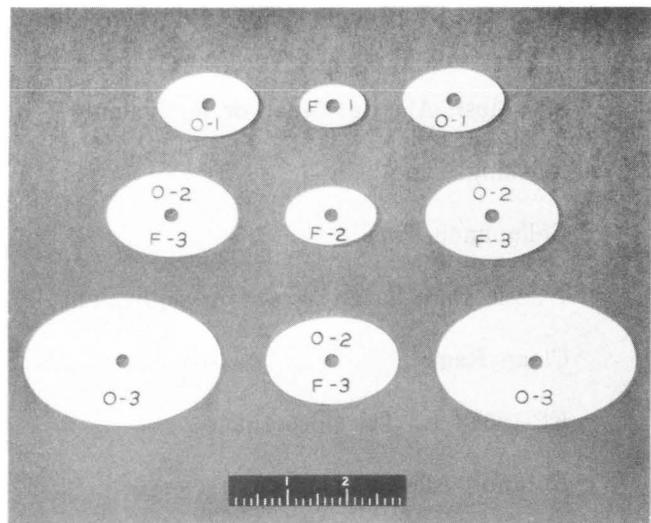
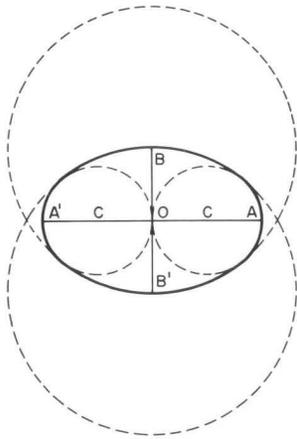


Fig. 6—Corresponding Overlay and Filler Patches



DET	AA' (IN.)	BB' (IN.)	MARKED
1	1-1/8	3/4	F1
2	1-1/2	1	F2
3	2-1/4	1-1/2	F3-02
4	1-11/16	1-1/8	01
5	3-3/8	2-1/4	03

NOTES:  
 1. AA' = 1.5 x BB'.  
 2. DRILL .3125 IN. HOLE AT O.

**Fig. 7—Class C Repair Patch**

- 4.14** Stir the adhesive mixture thoroughly with a hardwood tongue depressor until well mixed.

**Note:** The working life or usable life of the adhesive mix will vary with the adhesive used and with the temperature. If the adhesive mix thickens so it cannot be spread in a thin film, it is considered to have exceeded its working life and should be discarded.

- 4.15** Use the mixed adhesive as required in making class C repair. If during the course of using the adhesive, it should begin to thicken or becomes difficult to spread to a thin, uniform film, a new patch should be made and a fresh adhesive should be prepared.

- 4.16** At normal room temperature (70 to 75 degrees F), this adhesive will have a usable life of approximately 2 hours after mixing. At lower temperatures the life will be longer, and at higher temperatures the life will be shorter.

**Note:** A separate adhesive mix should be prepared for each patch.

- 4.17** Remains of each mix of adhesive should be retained as an indicator after completion of the patch. If a mix maintained at a temperature above 70 degrees F for 4 hours does not become firm, the patch made with this mix should be immediately replaced.

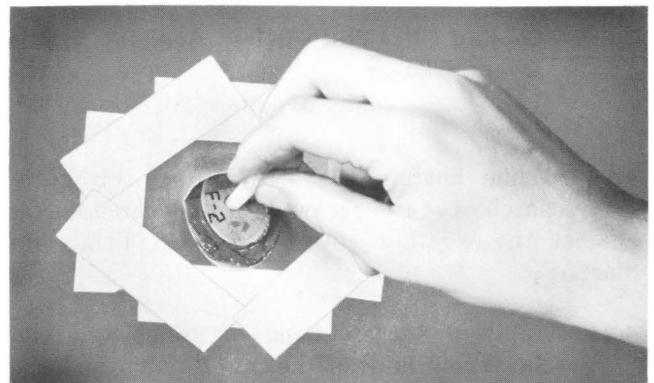
- 4.18** Apply a band of adhesive to the underside of the screwhead, and then insert it through the central hole of the overlay patch. Apply a

layer of adhesive to the surface of the patch away from the head of the screw.

- 4.19** Coat the edges of the center hole and one surface of a corresponding filler patch with a light coat of adhesive. Place the filler patch over the screw, the coated side toward the overlay patch. Align the overlay patch and filler patch concentrically and press them firmly together.

- 4.20** Holding the screw securely by the threaded end, tilt it in such a manner that the patch assembly can be passed through the cutout hole in the weather cover (Fig. 8) with the head of the screw on the inside of the antenna.

**Note:** To guard against dropping the patch inside the antenna, the threaded end of the plastic screw should be clamped in a battery clip to which is attached a weight on a length of wire. The weighted end should hang on the outside of the antenna at all times.

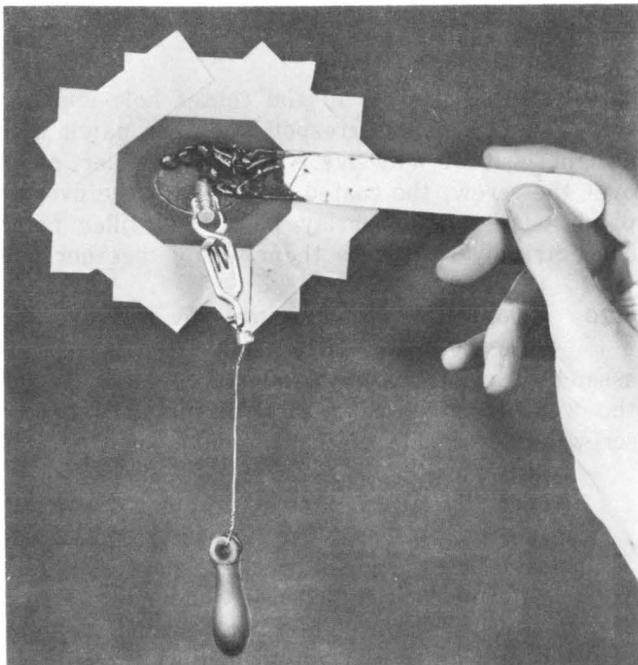


**Fig. 8—Insertion of Interior Overlay and Filler Patches**

- 4.21** After aligning the filler patch to coincide with the cutout, pull the patch assembly snugly into the cutout hole.

- 4.22** Fill the gap around the filler patch with adhesive, and then coat the surface of the filler patch and the weather cover surface between the cutout and the masking tape with a thin coat of adhesive (see Fig. 9).

- 4.23** Take another overlay patch, the same size as the first, and coat one surface with a heavy coat of adhesive.



**Fig. 9—Coating Filler Patch Before Applying Exterior Overlap Patch**

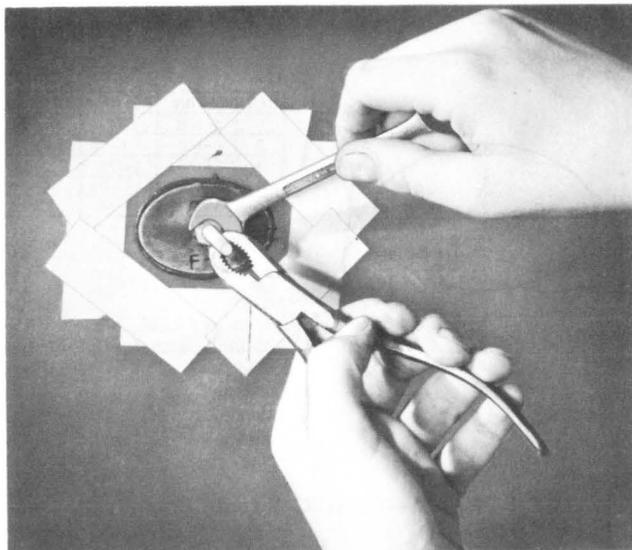
**4.24** While holding the screw, feed this coated patch over the screw with the coated surface against the weather cover and press firmly into place.

**4.25** Apply a narrow band of adhesive around the screw hole in the outer patch and then thread the plastic nut onto the screw. Hold the threaded end of the screw securely with a pair of gas or slip-joint pliers and tighten the nut with a wrench. (See (Fig. 10.)

*Note:* Use care to maintain alignment of the overlay patch and do not overtighten the nut, since the plastic will break at lower stresses than metal hardware.

**4.26** Cut the end of the screw off as close as possible to the surface of the nut with the hacksaw blade. Pliers or cutters shall not be used for this purpose.

**4.27** Apply a fillet of adhesive to all joint edges, and then clean off excess adhesive by wiping with a cloth moistened with isopropyl or rubbing alcohol.



**Fig. 10—Tightening Nut to Complete Assembly**

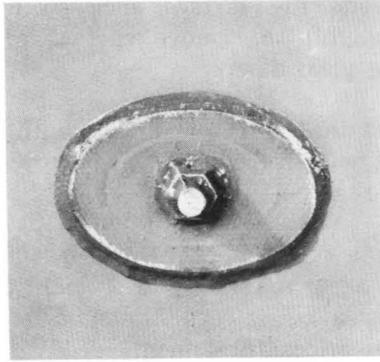
**4.28** Remove the masking tape, then center a strip of plastic film over the patch and tape it into place with cellophane tape along all edges. This plastic material is merely to protect the patch from the weather until such time as the adhesive becomes thoroughly set. Over a period of time, the tape will loosen and allow the plastic film to fall off. (See Fig. 11.)

**4.29** The antenna shall not be pressurized until the following times have elapsed at the temperatures indicated:

HOURS	DEGREES F
72	50
36	60
24	70
16	80
12	90
8	100

*Note:* A percentage of the above indicated set time at one temperature can be added to the percentage of time at a different temperature to fulfill the set time requirements.

*Example:* If 30 percent of the required set time should elapse at 45 degrees F and then the temperature should rise to 70 degrees F, only 70 percent of the time indicated for 70 degrees F shall be necessary to affect adequate set prior to pressurization.



**Fig. 11—Completed Class C Repair**

**4.30** Heat may be applied to speed the setting of the adhesive. This is particularly desirable where the prevailing temperatures are below those indicated above. Accelerated setting of the adhesive will permit early pressurization of the antenna. The recommended temperature ranges and time for setting the adhesive are tabulated below:

TEMPERATURE (DEGREES F)	TIME TO SET (MINUTES)
120 to 140	60
140 to 160	45
160 to 190	30
190 to 212	20

**Note:** Using the temperature and time indicated above may not affect a complete cure. Complete curing of the adhesive normally takes place during longer periods than those shown in the table above. Temperatures higher than 212 degrees F will further reduce the setting time; however, temperatures above 300 degrees F may damage the laminated weather cover, and should be avoided.

A heating pad or heat lamp is recommended for setting the adhesive but the method is left to the discretion of the operating company.

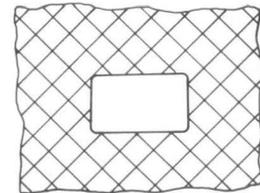
**5. CLASS D REPAIR**

**Note 1:** It is intended that class D and E repairs be carried out by a qualified laminator having access to appropriate facilities. The information included herein is intended as a guide for the laminator to ensure that the repairs are made with recommended materials in an approved manner.

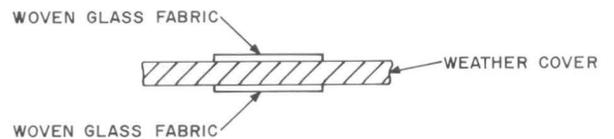
**Note 2:** For removal and replacement of weather cover see 2.04 through 2.39.

**GENERAL DESCRIPTION**

**5.01** This repair procedure consists of applying surface coverings of resin-impregnated glass cloth to reduce the porosity of crazed or pitted areas of the weather cover. (See Fig. 12 and 13).

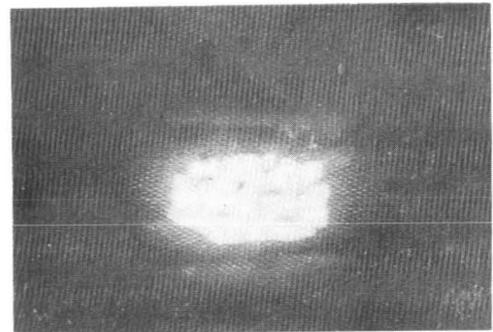


**VIEW OF COMPLETED PATCH**



**SECTION OF COMPLETED PATCH**

**Fig. 12—Class D Repair**



**Fig. 13—Damaged Area**

**5.02 Materials and Equipment Required for Class D Repairs**

**Materials**

Woven Glass Fabric per ASTM D579, Type 316 (also known as Style 116), with Volan-A, Garan, or other approved equivalent, high performance finish.

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◆Resin, Polyester, Low Pressure Laminating, Grade B, Class 1 or 2 (Radar Frequency Grade).◆

◆Catalysts, Promoters, etc, for heat or ultraviolet cure.◆

Equipment (as required)

**DETAILED PROCEDURE**

**5.03** Lay the weather cover flat on a clean surface in a *well-ventilated area maintained at a temperature above 60 degrees F.*

**Warning:** ◆*Due to the flammability of the liquid resin and solvents, no smoking or open flames should be permitted in the work area.*

**Note:** The weather cover shall be free of any load other than its own weight. Use an extension plank or other support as a bridge over the weather cover for convenience in effecting the repair.

**5.04** Apply masking tape 1 inch outside the edge of the damaged areas and extending 2 to 3 inches beyond.

**5.05** Abrade the surface enclosed by the tape (Fig. 14) to remove surface gloss and to expose the glass fibers.

**5.06** Dust the surface and wipe with a clean rag wet with solvent followed by wiping with a clean dry rag.

**5.07** Cut a piece of type 316 glass fabric to fit an area extending 1/2 inch outside the damaged area. Any corners should be rounded to a radius of at least 1/4 inch.

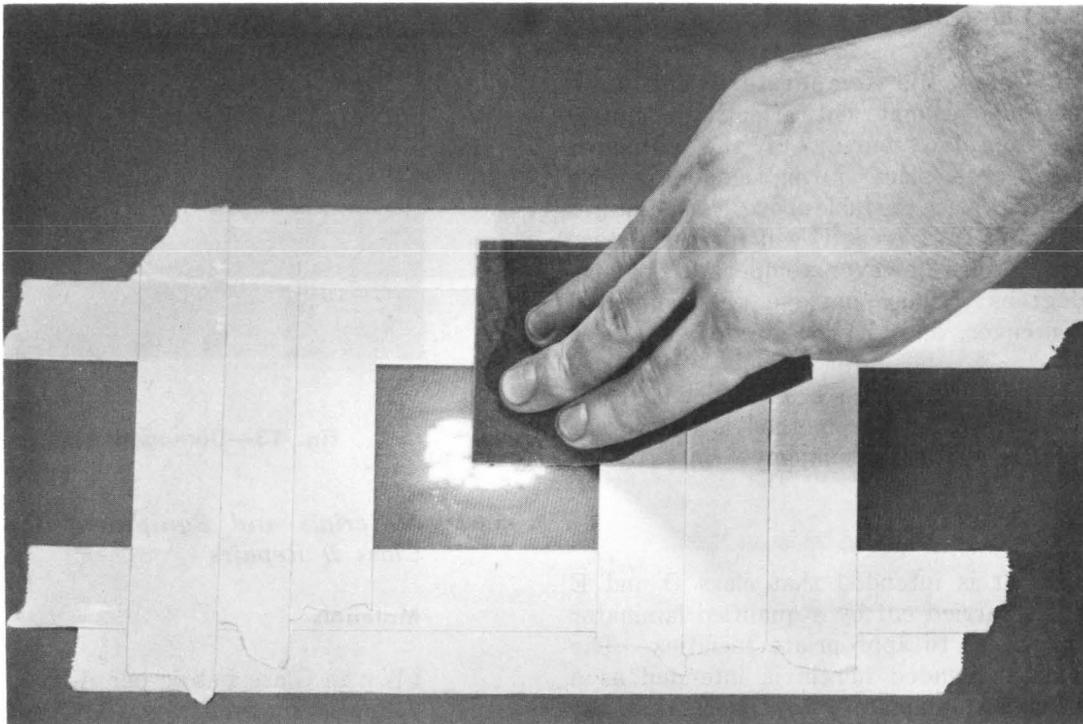
**INSTRUCTIONS FOR USE OF RESIN FOR CLASS D REPAIR**

**5.08** ◆Mix sufficient resin with appropriate quantity of suitable catalyst (and accelerator as required) to effect cure conditions to be employed. Ultraviolet or heat cures are permitted.◆

**APPLICATION OF PATCH**

**5.09** Apply the resin mix to the abraded area. Apply the patch and brush the patch with additional resin. (See Fig. 15.)

**5.10** Cover with plastic film and tape to hold in place.



**Fig. 14—Sanding Surface of Damaged Area**

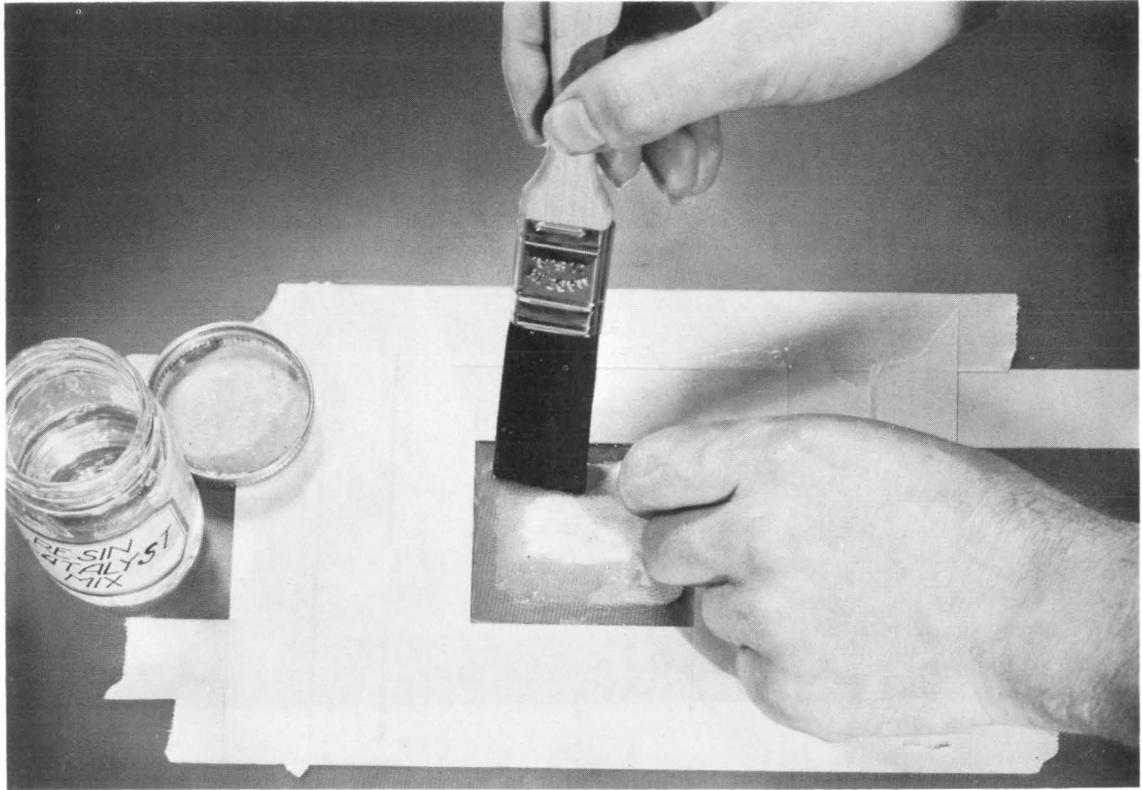


Fig. 15—Wetting Out Glass Cloth Patch

- 5.11 ♦ Work patch in such a manner (Fig. 16) as to remove excess resin and entrapped voids.♦
- 5.12 ♦ Cure with heat or ultraviolet radiation.♦
- 5.13 When one surface is repaired, turn the cover over and repeat the procedure on the opposite surface.
- 5.4 When the entire weather cover repair is completed, strip off the plastic film and masking tape. Jagged ridges of cured resin can then be sanded smooth (Fig. 17), using care to prevent cutting through the resin skin into the glass fibers. If this resin skin is broken, the abraded area must be recoated with fresh resin mix, covered with plastic film, scraped, and heat cured. (See Fig. 18.)

## 6. CLASS E REPAIR

6.01 **General Description:** This repair procedure is limited to perforations and accompanying delaminations not to exceed two (2) inches in the

small dimension nor eight (8) square inches in total area. The method consists of cutting out the damaged portion and replacing with resin-impregnated glass cloth. (See Fig. 19 and 20.)

### 6.02 **Materials and Equipment Required for Class E Repairs**

#### **Materials**

Woven Glass Fabric per ASTM D579, Type 852 (also known as Style 141) with Volan-A, Garan, or other approved equivalent, high performance finish.

♦ Woven Glass Fabric per ASTM D579, Type 316 (also known as Style 116) with Volan-A, Garan, or other approved equivalent, high performance finish.

Resin, Polyester, Low Pressure Laminating, Grade B, Class 1 or 2 (Radar Frequency Grade)

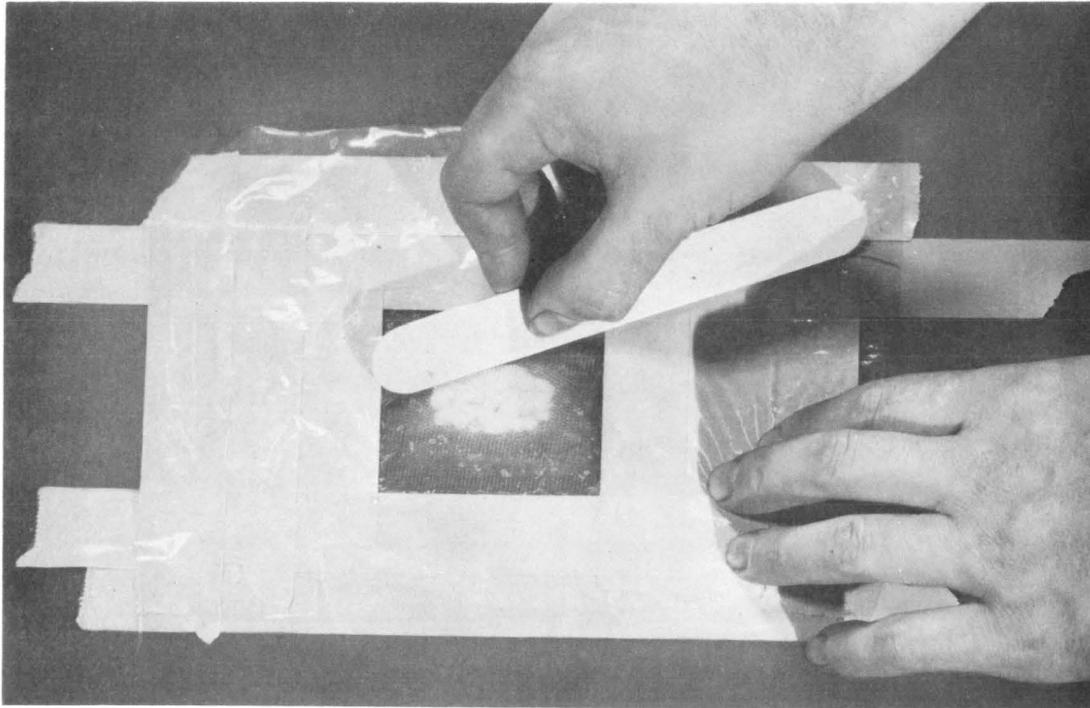


Fig. 16—Paddling or Scraping Patch to Remove Air and Excess Resin

Catalyst, Promoters, etc, as required for heat or ultraviolet cure

**Equipment**

(as required)

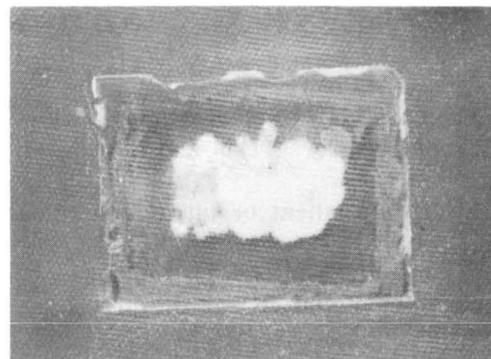


Fig. 18—Completed Class D Repair

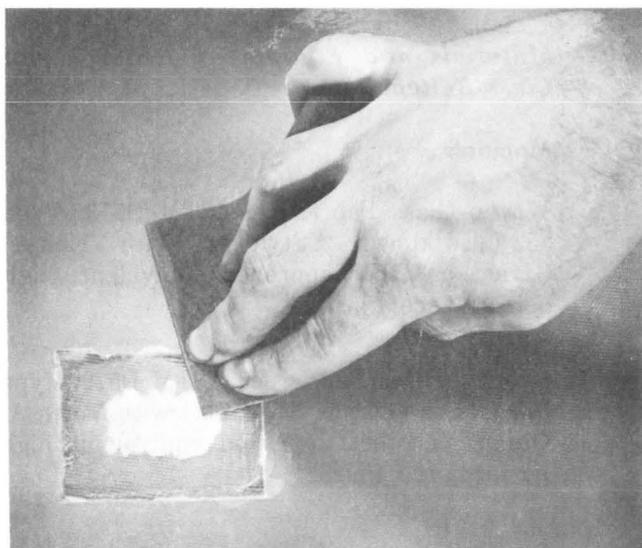


Fig. 17—Smoothing Rough Areas

**DETAILED PROCEDURE**

6.03 Place the weather cover (weather side down) on a clean, flat, horizontal surface in a well-ventilated area maintained at a temperature above 60 degrees F.

*Warning: No smoking or open flame should be permitted in the work area due to the flammability of the liquid resin and solvents.*

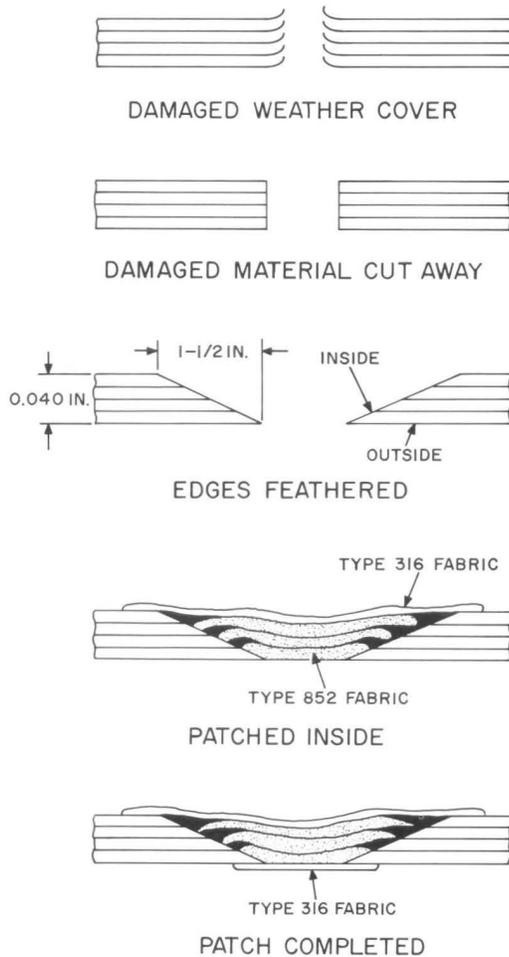


Fig. 19—Class E Repair



Fig. 20—Damaged Area

**Note:** The weather cover shall be free of any load other than its own weight. An extension plank can be used as a bridge over the weather cover for convenience in making the repair.

**6.04** Wipe the surface to be repaired with a clean rag wet with solvent followed by wiping with a clean cloth.

**6.05** Roughly outline the damaged area with a scribing tool or felt-tipped pen. For ease in making the repair, the area outlined should be roughly round or oval shaped.

**6.06** Cut away the bulk of the delaminated and ruptured areas with a fine tooth saw, knife, high-speed router, or other suitable tool which will not cause further delamination. (See Fig. 21.)



Fig. 21—Making Cutout

**6.07** Using a high-speed disc sander, abrade the edge to a smooth contour and feather approximately 1-1/2 inches beyond the edge of the hole. (See Fig. 22.)

**6.08** Lightly abrade the surface of the laminate for another 1/2 inch around the feathered portion, using care not to cut the glass fibers.

**6.09** Slip a sheet of plastic film under the hole and extend several inches beyond on all edges.

**6.10** Cut three patches from the type 852 fabric. The first should be large enough to overlap the edge of the hole by 1/2 inch. The sizes of the patches should increase in steps which will enable each succeeding one to overlap the former by 1/2 inch on every side. The patches should be cut in such a manner that the threads of the patch

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will be parallel to the threads of the weather cover when the patch is applied.

**6.11** Cut a patch of type 316 fabric to cover the feathered cutout and the area abraded around it. (See Fig. 23.)

**6.12** Dust the abraded areas with a clean, dry dusting brush or rag, then wipe with a clean cloth wet with solvent followed by wiping with a clean, dry rag.

**6.13** Outline the abraded area with masking tape for a distance of 2 to 3 inches beyond the hole edge.

### INSTRUCTIONS FOR USE OF RESIN FOR CLASS E REPAIR

**6.14** Mix the resin according to the instructions applicable to the resin used. (See instruction for class D repair.)



Fig. 22—Feathering Edge of Hole

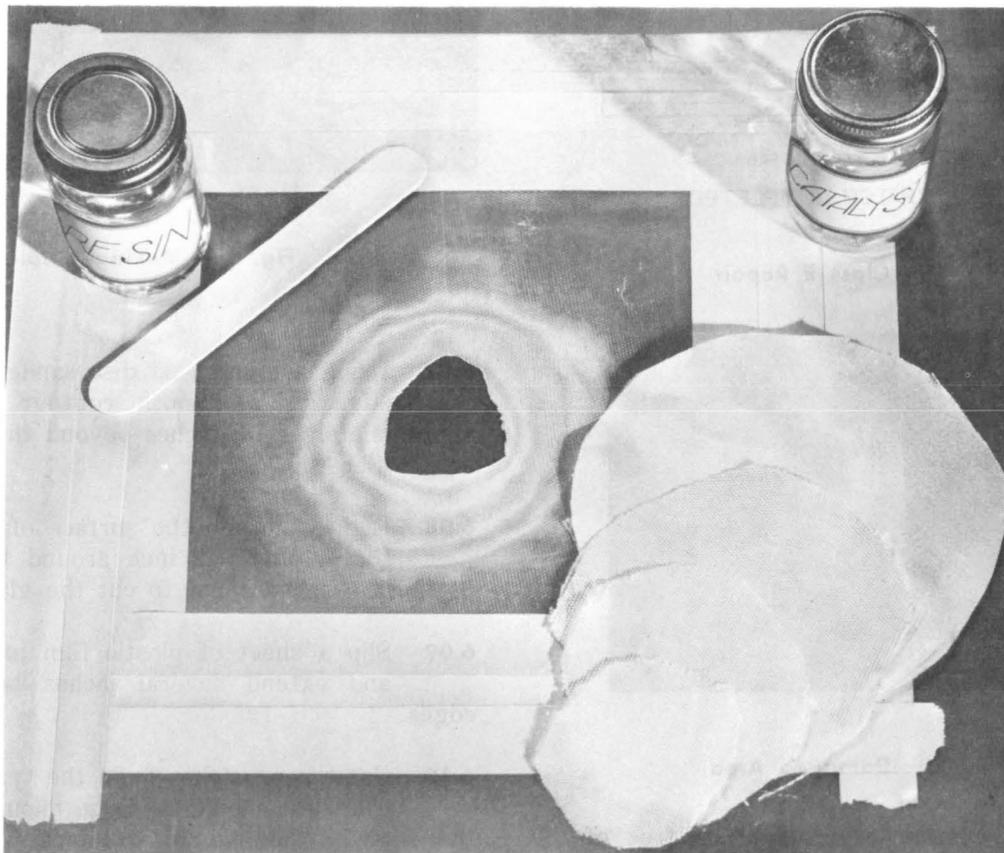


Fig. 23—Feathered Hole Ready to Receive Filler Patches

**APPLICATION OF THE INSIDE PATCH**

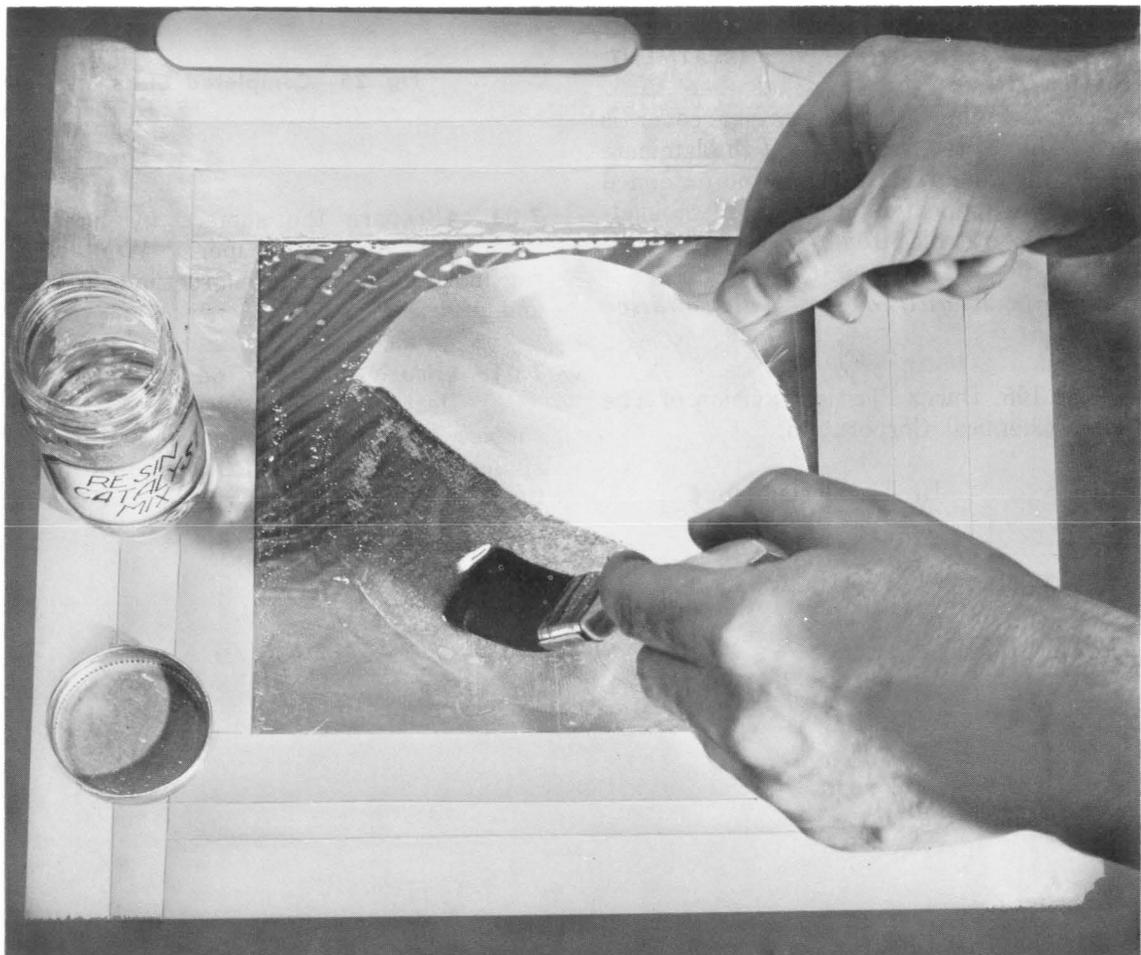
- 6.15** Apply resin mixture to the abraded area. Lay in the smallest patch and wet thoroughly with resin by brushing.
- 6.16** Repeat with the other two patches. (See Fig. 24.)
- 6.17** Apply the final covering patch of type 316 fabric and wet in a similar manner.
- 6.18** Cover the patched area with a sheet of plastic film allowing a generous margin at the edges. Then tape the film in place.
- 6.19** Work the patch in such a manner as to remove excess resin and entrapped voids.

**CURING OF THE INSIDE PATCH**

- 6.20** Cure with heat or ultraviolet radiation in accordance with temperature ranges and times tabulated in 4.30.

**APPLICATION OF THE OUTSIDE PATCH**

- 6.21** When the inside surface is repaired, turn the weather cover over carefully (avoid excessive bending particularly in the patch area) and prepare the outside surface by wiping with solvent and abrading an area extending 1/2 inch beyond the edge of the hole. Exposed inner surface of fresh patch should also be abraded.
- 6.22** Cut a patch of type 316 fabric to fit the abraded area.



**Fig. 24—Partially Completed Patch**

6.23 Apply masking tape around the abraded area. Then dust the surface and wipe with a clean cloth wet with solvent.

6.24 Apply a fresh mix of resin to the abraded area. Apply the type 316 patch and wet with resin as before.

**CURING OF THE OUTSIDE PATCH**

6.25 Cure with heat or ultraviolet radiation in accordance with temperature ranges and times tabulated in 4.30.

6.26 Upon completion of the cure, remove the plastic film and the tape. Ridges of cured resin can then be sanded smooth, using care to avoid cutting through the resin skin into the glass fibers. If this resin is broken, abraded area must be recoated with fresh resin mix, covered with plastic film, scraped and cured. (See Fig. 25.)

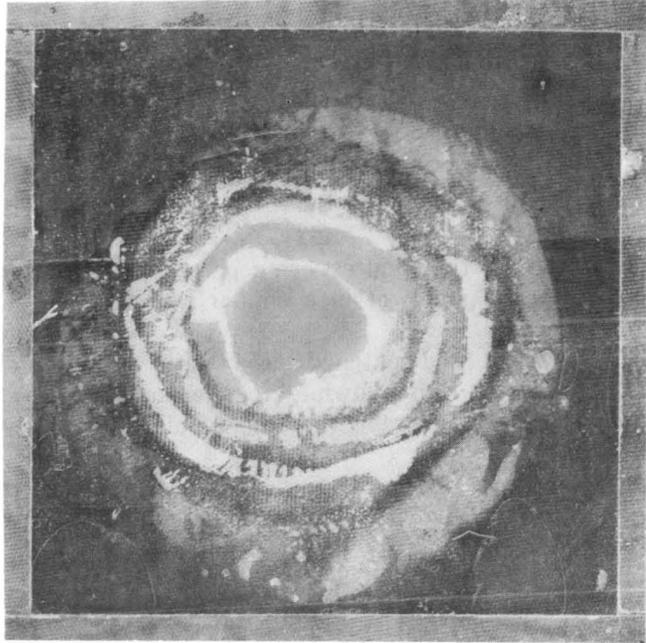


Fig. 25—Completed Class E Repair

**7. WEATHER COVER MAINTENANCE TREATMENT**

7.01 If the glass fiber of the weather cover is exposed due to resin erosion but the laminate is still structurally sound, its life may be extended significantly by the application of a clear ultraviolet-absorbing coating, Hetrolac 105.

**7.02 Materials Required for Maintenance Treatment**

Hetrolac 105, Durez Plastics Division of The Hooker Chemical Corporation.

KS-19578            L1 Trichloroethane

7.03 Prepare the surface by lightly abrading with fine sandpaper. Wipe with a clean rag moistened with trichloroethane to remove dust and grease.

7.04 Brush or spray on one or two coats of Hetrolac 105, depending on how much the surface has eroded. If a second coat is to be applied, allow at least 20 minutes but no more than 30 minutes drying time between coats.